



## Urban Physical Environments and Health Inequalities: A Scoping Review of Interventions



## Who We Are

Established in 1994, CIHI is an independent, not-for-profit corporation that provides essential information on Canada's health system and the health of Canadians. Funded by federal, provincial and territorial governments, we are guided by a Board of Directors made up of health leaders across the country.

## Our Vision

To help improve Canada's health system and the well-being of Canadians by being a leading source of unbiased, credible and comparable information that will enable health leaders to make better-informed decisions.

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# Reports From the Canadian Population Health Initiative

Reports from the Canadian Population Health Initiative (CPHI), a part of the Canadian Institute for Health Information, aim to synthesize key research findings on a given theme and share evidence from a policy and program perspective. The underlying goal of each report is to tell a story that will be of interest to policy- and decision-makers to advance thinking and action on population health in Canada.

CPHI does not make policy or program recommendations. Our approach is to review and synthesize what is known and what is not known about policies and programs and to make that information available to support evidence-informed policy- and decision-making.



# 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 analyses 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 policies and programs, and analyzes evidence of their effectiveness;
- 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.

A Council of respected researchers and decision-makers from across Canada guides CPHI in its work. As of August 2011, the following individuals were members of the CPHI Council:

- **Cordell Neudorf**, Chair, CPHI Council; Chief Medical Health Officer, Saskatoon Health Region, Saskatchewan
- **David Allison**, Medical Officer of Health, Eastern Health Region, Newfoundland and Labrador
- **Honourable Elinor Caplan**, Privy Council
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- **Lynn Barr-Telford**, Director General, Health, Justice and Special Surveys Branch, Statistics Canada

# 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.

As of October 2011, the following individuals were members of CIHI's Board of Directors:

- **Brian Postl**, Chair of the Board, CIHI; Dean of Medicine, University of Manitoba
- **John Wright** (ex officio), President and Chief Executive Officer, Canadian Institute for Health Information
- **Luc Boileau**, President and Director General, Institut national de santé publique du Québec
- **Marshall Dahl**, Consultant Endocrinologist, Vancouver Hospital and Health Sciences Centre and Burnaby Hospital, British Columbia
- **Janet Davidson**, President and Chief Executive Officer, Trillium Health Centre, Ontario
- **Chris Eagle**, President and Chief Executive Officer, Alberta Health Services
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- **Marlene Smadu**, Associate Dean of Nursing, University of Saskatchewan
- **Wayne Smith**, Chief Statistician, Statistics Canada
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Please note that the analyses and conclusions presented herein do not necessarily reflect those of the individual members of CIHI's Board, the CPHI Council, peer reviewers or their affiliated organizations.

## Project Team

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# Executive Summary

This scoping review is the second report in a two part-series on urban physical environments and health inequalities by the Canadian Population Health Initiative (CPHI). It builds on previous research by CPHI, which explored two aspects of the urban physical environment known to negatively affect health: outdoor air pollution and heat extremes. The objective of this report is to identify and review the extent, range and nature of interventions in the urban physical environment that have the potential to mitigate health inequalities. Drawing on peer-reviewed literature, grey literature and consultation, the review highlights interventions in two ways. The first section uses a typology to describe what action is taking place to improve urban physical environments. This section also speaks to the extent to which the interventions that were reviewed have been evaluated, as well as to the nature of that evaluation. The second part of the report explores how the concept of equity was integrated in the interventions that were reviewed. This section presents a framework that outlines interventions according to five equity categories, which were informed by a consultation process. This framework clarifies the elements involved in applying an equity lens and may provide guidance for those interested in incorporating equity into future interventions.

Section 1 describes the extent to which the interventions that were reviewed were evaluated, as well as the nature of those evaluations. Of the evaluated interventions, most were process-oriented or involved disseminating information to target audiences and uptake by those audiences. Outcome evaluations were limited, with few conclusive results. Additional short-term, intermediary and long-term steps to assess implementation challenges and successes, and evidence related to maintenance, scale-up and sustainability of interventions, could help in future planning and decision-making.

The report highlights a range of intervention activities. The majority of these activities focused on features of the urban built environment or on outdoor air pollution; most consisted of procedural and informational types of interventions. Intervention activities typically involved targeting messages to populations deemed to be at risk. These messages included information about heat extremes and poor air quality, as well as about activities that could be taken at the individual or community level to mitigate the associated poor health outcomes. Analyses point to potential for action in a number of areas related to heat extremes, green space and urban form. There are also opportunities to explore regulation activities and implement fiscal incentives that support improvement in urban environments.

Section 2 explores how the concept of equity was integrated into the interventions that were reviewed. To distinguish among the ways that equity can be integrated, the report characterizes intervention activities according to five equity dimensions. Overall, results indicate that identifying and working with at-risk groups were the most common strategies for incorporating equity into urban physical environment interventions. Interventions that integrated equity considerations were most often related to communicating messages about health hazards in the physical environment and targeted at-risk groups through tailored programs and campaigns. Fewer actions were related to addressing the determinants of health that influence capacity to act on information or to assessing equity outcomes and unintended consequences. In addition to describing intervention activities that address inequalities, the framework clarifies elements of an equity lens and can perhaps provide guidance for incorporating equity into future intervention planning and scoping reviews.

## Introduction

In March 2011, the Canadian Population Health Initiative (CPHI) released *Urban Physical Environments and Health Inequalities*. That report explored two aspects of urban physical environments that are known to negatively affect health—outdoor air pollution and heat extremes—and their relationship with socio-economic status and health inequalities. Based on new analyses and a review of the research literature, that report indicated that those who are already more vulnerable to poor health, namely those of lower socio-economic status, may be at increased risk of exposure to the effects of air pollution and heat extremes because of the areas in which they live.<sup>1</sup>

The work on urban physical environments builds on previous CPHI research that used the lens of place to examine links between the urban environment, socio-economic status and health:

- *Reducing Gaps in Health: A Focus on Socio-Economic Status in Urban Canada* examined socio-economic status and health inequalities in Canada's largest cities.<sup>2</sup>
- *Improving the Health of Canadians: An Introduction to Health in Urban Places* focused on the links between urban neighbourhoods, housing, indoor air quality and health.<sup>3</sup>

To learn more about the health and determinants of health of rural Canadians, refer to *How Healthy Are Rural Canadians? An Assessment of Their Health Status and Health Determinants*.<sup>4</sup>

These reports can be accessed free of charge on CIHI's website, at [www.cihi.ca/cphi](http://www.cihi.ca/cphi).

To supplement the findings presented in *Urban Physical Environments and Health Inequalities*, this current report focuses on interventions involving outdoor air pollution, heat extremes and green space. The objective of the report is to identify and review a range of interventions that have the potential to mitigate inequalities in health. This report is intended for community leaders, decision-makers and researchers from various sectors who have an interest in how the urban physical environment influences the health of residents in their jurisdictions.

“Inequalities in health” refers to differences between individuals or groups of people in terms of health status, presence of disease, access to health care or health outcomes, regardless of the cause of these differences. “Health equity” refers to the presence or absence of differences in health or in the major social determinants of health that are unnecessary or avoidable between population groups with different social advantages (such as wealth, power, prestige,

education, gender, ethnicity or religion). It underlines an ethical principle closely related to human rights and social justice in health.<sup>5</sup> Inequities in health systematically put groups of people who may already be socially disadvantaged at a further disadvantage with respect to their health.<sup>6</sup>

For the purposes of this report, “intervention” refers to strategies intended to alter and improve the physical or social environment.<sup>7</sup> This includes any action that works to influence the determinants of health and the contexts that shape the health of communities.<sup>8</sup> This broad definition captures a range of policies, research projects, instruments, tools, community-based activities and strategies set out by federal-, provincial- and municipal-level governments, planners and community leaders working both inside and outside the health sector.

## Scoping Method and Approach

A scoping review is a form of literature review that provides a rapid assessment of the nature and characteristics of available information within a given field in an accessible and summarized format.<sup>9</sup> While systematic reviews are driven by tightly focused questions and exclude studies on the basis of methodological and quality criteria, scoping reviews are more exploratory and aim to describe a broader field of inquiry.<sup>9</sup> In-depth assessment of the quality of the literature—a key pursuit of systematic reviews—is beyond the aims of a scoping review, which instead seeks to profile the existing literature on a topic and, in so doing, identify where research is sparse.<sup>9</sup> The urban physical environment is an extensive field of inquiry with multiple contexts for and actors involved in interventions. As such, CPHI conducted a scoping review that illustrates the extent, range and nature of activity in this area. While peer-reviewed literature and accounts of evaluated interventions were included, the review did not exclude interventions based on quality criteria and thus profiles a broader range of potential action in the field.

Analyses were guided by a scoping review methodology that consisted of six stages:

1. Develop appropriate research questions;
2. Identify studies relevant to these research questions;
3. Select studies to include in the review;
4. Chart information and data from the included studies;
5. Consult with decision-makers and knowledge users on preliminary findings to ensure that all relevant material is included and the analysis framework is appropriate; and
6. Summarize and report key research findings.<sup>9</sup>

## Report Breakdown

The report considers interventions in two ways. The first section uses a typology to describe what action is taking place to improve urban physical environments. This section also speaks to the extent to which the interventions reviewed have been evaluated and to the nature of that evaluation. The second part of the report explores how the concept of equity was integrated in the interventions. This section presents a framework that outlines interventions according to five equity categories, which were informed by a consultation process.

## How Can This Report Be Used?

Many national and provincial organizations have made contributions to synthesizing research and promoting action in the fields of the built environment and health.<sup>10–17</sup> Although there are references to the many features of physical environments in this built-environment evidence base, there is little discussion of the connections among health, health inequalities and specific environmental hazards such as pollution and heat extremes. This report describes a range of interventions to inform the identification of gaps, as well as practice and policy development, in these areas. The report also presents a guide to assess how interventions can apply a health equity lens and proposes a model that researchers could use to assess equity in future intervention reviews. The goal of sharing these innovative methods and the findings of the review is to contribute to the development of useful, evidence-based, actionable policies that will positively affect urban physical environments and, ultimately, the health of Canadians.

## Section 1: Describing the Terrain

### Identifying the Research Questions

Building on the evidence presented in *Urban Physical Environments and Health Inequalities*, CPHI set out to identify and investigate a range of interventions in the urban physical environment that have the potential to mitigate inequalities in health. To align efforts with the initial report, five key themes were used to prioritize the review:

- Urban built environment: the physical design and layout of neighbourhoods and communities, including buildings and public spaces;<sup>1</sup>
- Urban form: the pattern of building and development in a city and the structural elements that form cities, such as natural features, transportation corridors and open spaces;<sup>18</sup>

- Outdoor air pollution: the presence of pollutants harmful to health that result from vehicle or industrial emissions, such as particulate matter, nitrogen dioxide and carbon monoxide;<sup>1</sup>
- Heat extremes: the structure and design of physical environments that lead to the presence of urban heat islands<sup>1</sup> or extremes where temperatures hover above average high temperatures for several weeks;<sup>19</sup> and
- Green space: the presence of green space and vegetated areas within urban settings to mitigate the harmful effects of heat extremes and air pollution.<sup>1</sup>

In addition to these themes, a series of research questions guided the review:

- What is known about what could address exposure to pollution and urban heat extremes and reduce the health impacts of this exposure?
- What interventions have been tried in these areas?
  - For which populations?
  - In what contexts?
  - With what impact and outcomes across social groups?
- What interventions have been evaluated in these areas?
  - For which populations?
  - In what contexts?
  - With what impact and outcomes across social groups?

## Identifying and Selecting Interventions

A search protocol using keywords from three areas was developed to identify interventions:

1. Main themes of urban physical environment, urban form, outdoor air pollution, heat extremes and green space
2. Intervention terms such as program, policy, initiative and intervention
3. Terms related to the concept of equity and the social determinants of health, such as equality, social isolation and poverty

With these areas in mind, CPHI staff searched for peer-reviewed materials, conducted hand searches of publications specific to public health and urban planning, searched for systematic reviews and grey literature and scanned publicly available information on Canadian federal, provincial and territorial websites. Due to the large number of municipalities and regions across Canada, scanning did not include municipal websites; however, municipal interventions were included in the review if they were referenced in the peer-reviewed, systematic or grey literature that was identified during the search. Searches were limited by language (English and French only), to those resources published or available between 2000 and 2011, to Canadian interventions and to interventions

from jurisdictions comparable to Canada (for example, the United States and the United Kingdom). The results of the searches indicated that there are many interventions under way across Canada and internationally and that a wide range of organizations, levels of government, communities, disciplines and professions are involved in their implementation. Due to the large number of references identified in the initial stages, title, abstract and full article reviews were conducted to assess relevance and to refine the interventions into a manageable sample. More information on the method and approach can be found in Appendix A.

## Reporting the Findings

After the screening process, a sample of 53 interventions remained. Following a consultation process, a second search was conducted, which yielded additional interventions. These new interventions along with the original 53 were re-appraised based on learning from the consultation, leading to the removal of some interventions from the original sample and resulting in a final sample of 58. A more detailed review of the content was then conducted for the final sample of 58 interventions. By including both evaluated and non-evaluated interventions in this review, analyses point to opportunities for action and potential for future intervention and policy-oriented research within a number of contexts and jurisdictions. A full list of the final sample can be found in Appendix B.

The preliminary framework that was developed to guide the extraction and documentation of relevant information captured the following for each intervention: date of release, theme, intervention type, jurisdiction, assessed health outcomes, target population, reference to equity and evaluation status.

## Evaluation and Outcome Measurement

Most of the identified interventions (86%) were not evaluated. In some cases, while the intervention under review included reference to future evaluation, findings were not readily apparent from the review. Potential future evaluations included commitments to report cards for specific measures, annual reporting and government-required reporting.<sup>20, 21</sup>

**Table 1: Evaluation at a Glance**

Evaluation	Evaluation Focus	Evaluation Findings and Gaps
<ul style="list-style-type: none"> <li>• 15% of interventions reviewed noted some kind of formal evaluation process.</li> </ul>	<ul style="list-style-type: none"> <li>• Larger focus on shorter-term assessment of behavioural outcomes.</li> <li>• Some assessment of process and implementation outcomes.</li> <li>• Few longer-term assessments of health, health-related and environmental outcomes.</li> </ul>	<ul style="list-style-type: none"> <li>• Evaluations revealed some reduction in pollutant exposure and physiological improvements.</li> <li>• Most evaluations found improvements in knowledge uptake and adoption of health-protecting behaviours.</li> <li>• Review results suggest that evaluations are rare, and longer-term impact studies have yet to produce conclusive results.</li> <li>• The evidence base could be enhanced through increased identification of short-term, intermediate and long-term outcomes across a range of areas related to reach, effectiveness, adoption, implementation and maintenance.</li> </ul>

Of the eight interventions that did note some kind of evaluation findings, there were two main areas of focus: process and outcome. Process-oriented evaluations focused on the challenges of and lessons learned from implementing the intervention and involved aspects of partnership and engaging communities,<sup>22</sup> the most effective mechanisms for improving reach<sup>23</sup> and cost-effectiveness.<sup>24</sup> Outcome-oriented evaluations included studies that assessed behavioural outcomes and studies that assessed health and environmental impacts. Evaluations looking into behavioural outcomes assessed reach of messages,<sup>25</sup> knowledge or skills development<sup>26</sup> and the extent of behaviour change.<sup>24, 27</sup> The remaining studies assessed outcomes related to a combination of longer-term health measures and measures of exposure to environmental pollutants.<sup>28</sup> For example, one study assessed the impact of a bypass by measuring changes in levels of traffic-derived air pollutants and traffic volume on specific roadways, as well as changes in the respiratory health of individuals residing in the vicinity of the bypass.<sup>28</sup>

The results of the review suggest that evaluations are rare, and longer-term impact studies have yet to produce conclusive results (see Appendix C for more detailed information on the evaluated interventions, including more detail on evaluation type, approach, measures and findings). Measures of reach and effectiveness are integral to understanding the complexity of interventions in the urban physical environment. Furthermore, components related to adopting, implementing and maintaining intervention activities could also be considered when accounting for the complex pathways and incremental successes of interventions that are related to the built environment.<sup>29</sup> Identifying short-term, intermediate and long-term outcomes within this range of categories may help to ensure that improvements to health can be tracked, sustained and later replicated.

The analyses that follow include the evaluated interventions noted in Appendix C in addition to a range of other non-evaluated initiatives. This range of potential intervention activities may be of value to those acting or planning to act on the challenges associated with urban physical environments, vulnerable populations and health inequalities and may point to opportunities for future collaboration on those actions.

## **Themes**

Interventions predominantly focused on activities that address air quality in specific communities. Twenty-two of the interventions in the sample were designed to address outdoor air pollution that results from vehicle and industrial emissions. Interventions with a focus on the urban built environment or the physical design and layout of individual neighbourhoods, buildings and public spaces were the second most common theme (19), followed by interventions focusing on heat (8), urban form (6) and green space (3).

## **Intervention Typology**

Interventions were categorized using a typology of policy instruments. Within the final sample, most interventions were procedural (29) or informational (23). Six interventions were categorized as fiscal, and no interventions qualified as regulatory. In many cases, interventions had elements of multiple policy types—being both procedural and fiscal in nature for instance. In these cases, primary and secondary types were noted based on the central focus of the intervention activities, and the primary type was used for subsequent analyses. Interventions across the following types ranged from focusing on the entire population to targeting specific at-risk groups within the population and consisted of a variety of activities acting at different socio-ecological levels, such as individual, family, community or societal contexts.

**Table 2: Typology at a Glance**

Policy Type	Number of Interventions	Characteristics
<b>Procedural</b>	29/58	Instruments generally issued by administrative authorities or other agencies in the form of internal or non-binding rules, policies and guidelines. Examples of procedural interventions are tools for planning, policy development and collaboration and might include codes of practice, discussion papers or planning guides. <sup>30</sup>
<b>Informational</b>	23/58	Instruments that attempt to influence the knowledge, beliefs or values that underpin behaviour. These interventions might include disseminating information through various media, such as websites, printed materials or community workshops. These are the least-coercive measures aimed at informing the public or transferring knowledge among researchers and providers. <sup>30</sup>
<b>Regulatory</b>	0/58	Instruments that include rules to promote or prohibit certain activities among individuals or organizations. These interventions consist of legislation and formal regulations (for example, an environmental protection act) that are forms of law. Note that regulations are passed by government agencies only through authority granted to them by legislation. <sup>30</sup>
<b>Fiscal<sup>i</sup></b>	6/58	Although many policy-related activities may have expenditure-based elements, in fiscal interventions money is the central instrument. Fiscal interventions can be either incentives or disincentives. Cash transfers, grants, subsidies, loans, taxes and fines are all examples of fiscal interventions. <sup>30</sup>

## Procedural

Half of the interventions used procedural instruments. These included procedure guides or action plans for decision-makers, municipal strategies for sustainable community design<sup>31</sup> and provincial guidelines that encourage consideration of the environment in community-level planning.<sup>32</sup> Many procedural resources suggest strategies to guide decision-makers through planning and implementation processes.<sup>32</sup> While these types of interventions are not necessarily mandated and therefore cannot be enforced, they can inform the process of intervention. Among the many procedural instruments in the sample were presentations, action plans or guides that encourage

- Creating transport alternatives to decrease a community’s exposure to pollutants;<sup>33</sup>
- Ensuring safe and affordable transit, bike lanes and community gardens in urban spaces,<sup>34</sup> and

i. The term “fiscal” is often applied to budgetary policy or long-term spending and priority-setting. CPHI has selected the term to describe any intervention that utilizes monetary spending as the main instrument of action. The former description may be included in this report’s findings; however, we included interventions that funded specific projects or theme areas (even at a single point in time) under the broad descriptor of fiscal policy.

- Supporting the health and sustainability of communities by considering density, mixed land use, mobility and connectivity, street and building design, and green infrastructure.<sup>14</sup>

## Informational

Informational instruments represented 40% of the interventions and mainly consisted of advisories for poor air quality or extreme heat. Many of these interventions identified groups at risk for adverse health events induced by exposure and communicated appropriate action to avoid negative health effects.<sup>35</sup> The groups identified as at risk included seniors, young people, people with chronic conditions and people working or playing outdoors.<sup>36</sup> Messages about air quality or extreme weather risks were conveyed through a range of mediums:

- Radio and television announcements, websites<sup>23</sup> and telephone hotlines, intended for at-risk populations and the general public;<sup>36, 37</sup>
- Background research and printed promotional material distributed to health professionals and service providers who work with at-risk groups;<sup>23, 38</sup> and
- Workshops, meetings and training sessions designed to engage and educate communities.<sup>26, 39, 40</sup>

Other informational interventions were designed to improve monitoring and decision-making processes. One such example was the development of a research station that modelled the impacts of green roof versus traditional construction methods; this information can contribute cost-benefit analyses and assessments of urban heat island effects related to green roofs.<sup>41</sup>

## Regulatory

Upon further consideration, the few intervention activities originally categorized as regulatory were re-assigned to other intervention types. Analyses did show that some informational and procedural interventions contained elements of informal regulation. One such intervention was the *City of St. John's Integrated Community Sustainability Plan*, which used the city's municipal plan along with additional information about a series of sustainability outcomes and dimensions to produce a range of projects that set out to fulfill these outcomes and selected policy goals. The plan therefore guided the process of community planning but was not a formal part of municipal regulations.<sup>42</sup>

To be classified as a regulation, an intervention must have been passed into law and must be maintained by an oversight body.<sup>30</sup> The number of jurisdictional, social and economic pressures and constraints involved with developing these kinds of interventions<sup>30</sup> may limit the number of organizations and jurisdictions able or willing to carry out such activities, and this may also have limited the interventions initially found. Following the consultation process, CPHI identified two organizations that have conducted extensive reviews of existing regulatory interventions that are relevant to urban physical environments:

- The National Collaborating Centre for Environmental Health has compiled a list of federal, provincial and territorial acts and regulations that are related to environmental health in Canada,<sup>16</sup> and
- The *Prevention Policies Directory*, a searchable database of Canadian policies that includes legislation and regulation related to cancer and chronic disease, has been established by Cancer View Canada.<sup>17</sup>

To manage the project's scope, and because of the detail already provided in these inventories, CPHI's analyses did not include the regulatory interventions listed in these resources or found through other leads in the sample.

## Fiscal

Analyses indicated six primarily fiscal interventions. Among these interventions were awards to local governments for supporting physical activity, energy conservation and other environmental benefits;<sup>43</sup> and funding for neighbourhood organizations that supported revitalization of the physical, economic and social environment.<sup>44</sup> Other fiscal interventions supported green space initiatives by funding the development of unused lands and the renewal of underused commercial and industrial sites,<sup>45</sup> supporting non-profit organizations' and local governments' efforts to reduce the impact of urban heat islands on vulnerable populations<sup>46</sup> and planting trees to mitigate heat and air pollution.<sup>47</sup>

Several procedural and informational interventions also had predominant fiscal elements. For instance, the *B.C. Air Action Plan*—a procedural intervention that outlined measures for pollution reduction—also included a funding component reserved for innovative pilot projects.<sup>48</sup>

## Jurisdiction

In Canada, responsibility for various dimensions of environmental regulation resides with the federal, provincial/territorial and municipal governments.<sup>30</sup> Interventions were distributed across levels of jurisdiction in expected patterns. For example, informational interventions related to air quality and heat advisories reflected a collaborative effort between federal and provincial/territorial governments, while interventions that targeted the urban built environment were exclusively within the jurisdiction of provinces/territories or municipalities.

These patterns reflect the responsibility for specific policy areas within the Canadian federation and the shared responsibility for some but not all areas of action related to urban physical environments. Of the interventions reviewed, action was predominantly led by municipal/regional and provincial/territorial jurisdictions.

**Table 3: Jurisdictions at a Glance**

Jurisdiction	Number of Interventions	Areas of Action and for Development
<b>Municipal/Regional</b>	17/58	<ul style="list-style-type: none"> <li>Interventions under way across Canada and internationally indicate a shared responsibility involving a wide range of organizations, levels of government, communities, disciplines and professions.</li> <li>Of the interventions reviewed, action was predominantly led at the municipal/regional and provincial/territorial levels, although collaboration across government levels and departments was common.</li> </ul>
<b>Provincial/Territorial</b>	26/58	
<b>Federal</b>	6/58	
<b>International</b>	9/58	

### Intergovernmental Collaboration

Given this context of shared responsibility, collaboration across government levels and departments may be required for effective implementation of interventions. Several interventions demonstrate such intergovernmental collaboration. The National Air Quality Health Index (AQHI) Program, for example, involves collaboration among provincial/territorial and federal governments.<sup>24</sup> AQHIs are supported by partnerships between federal government departments—Health Canada and Environment Canada—and provincial/territorial governments, which are responsible for regulations and for operating air quality monitoring networks.<sup>24</sup> Across Canada, local public health units and municipalities also play a role in supporting this program. One such example is Toronto Public Health, which provides information that supplements the air quality health information in that region. Toronto Public Health provides information about the adverse effects of poor air quality on the health of citizens, as well as actions that can be taken to help improve air quality in their respective communities. The City of Toronto has also implemented additional measures to support improved air quality, such as passing idling control bylaws and tracking emissions from government operations.<sup>49</sup>

## Describing the Terrain: A Summary

*What is known about what could address exposure to pollution and urban heat extremes and reduce the health impacts of this exposure? What has been tried and what has been evaluated?*

Analyses considered the extent to which interventions were evaluated and the objectives of those evaluations. Of the evaluated interventions, most were process-oriented or focused on uptake and dissemination. These included activities such as Smart Growth on the Ground, a B.C. intervention that supported community engagement when planning for sustainability (discussed further on page 25 of this report).<sup>40</sup> Outcome evaluations, such as those designed to assess long-term health and environmental impacts, were limited in number and yielded few conclusive results.

Most evaluated and non-evaluated intervention activities that are highlighted in this report focused on urban built environments in general and outdoor air pollution more specifically. The themes of heat, green space and urban form were also represented in the sample, though to a lesser extent. The majority of the interventions found consisted of procedural and informational interventions, with a few interventions focused primarily on fiscal activities. Intervention activities typically involved targeting messages to communities or populations that were identified as being at risk based on specific characteristics, such as age and health status. These messages often included information about heat extremes and poor air quality, as well as about steps that could be taken by individuals or communities to mitigate poor health outcomes that can result from exposure to these conditions. *Smog and Your Health*, a report released by Health Canada, is an informational intervention that provides communities with tools and options to reduce their exposure to toxic airborne pollutants.<sup>35</sup> Across the sample, interventions varied by jurisdiction and included municipal/regional, provincial/territorial, national and international focuses.

This descriptive summary identifies examples of actions taken to address issues related to urban physical environments and health, highlighting potential gaps in action and evaluation. Another goal of the review was to assess how and to what extent the needs of vulnerable populations are being addressed. The following section presents a framework designed to explore how the concept of equity is integrated into the interventions identified in the sample. The framework clarifies the components of an equity lens and can therefore provide guidance to those who are interested in incorporating equity into future interventions.

## Section 2: Applying an Equity Lens

This section explores how the concept of equity was integrated into the sample of interventions. An initial set of analyses is presented in which basic criteria were used to identify interventions that had an equity focus. The section then presents a framework that outlines five equity categories, which were informed by a consultation process, and subsequently discusses the equity-oriented components in greater detail.

### Initial Findings: Equity and Populations of Interest

One of the initial objectives of this review was to identify interventions related to the urban physical environment that focused on the needs of vulnerable populations or integrated equity into their activities. In total, 17 of the 53 interventions that comprised the preliminary sample met these initial equity criteria. Intervention activities within this group of interventions included

- Advisories and educational activities that communicated messages to at-risk populations<sup>35</sup> and provided resources to health professionals working with those populations;<sup>23, 38</sup>
- Surveillance mechanisms to identify, monitor and reach communities that are vulnerable to exposure to extreme heat<sup>50</sup> or poor air quality;<sup>51</sup>
- Procedural documents containing principles that favour sustainable building, community and neighbourhood characteristics;<sup>52</sup> and
- Resources for community development activities that include
  - Renovations and local amenity improvements;<sup>44</sup>
  - Increasing green space;<sup>14, 44, 53</sup> and
  - Developing community gardens.<sup>54</sup>

Intervention activities defined at-risk populations in different ways. Some evaluated individuals' risk based on characteristics such as age and health status.<sup>27, 35</sup> Other interventions defined vulnerability based on population characteristics within a given geographic area, such as large immigrant or minority populations and high numbers of residents with low income<sup>26</sup> or socio-economic status.<sup>44</sup> Similarly, interventions employed different approaches to mitigating vulnerability. Some intervention activities focused on informing populations deemed to be at risk and empowering communities by building the capacity of at-risk groups to act on information.<sup>26, 33, 39</sup> Other initiatives focused on improving sustainability and features of the physical environment, such as accessible and affordable housing.<sup>42</sup>

## Refining the Lens

The consultation was an opportunity to validate and enhance these preliminary findings. Participants suggested additional interventions that were not captured in the initial scanning (increasing the sample to 58) and discussed the need for a more nuanced understanding of strategies to address health inequalities, beyond identifying and targeting vulnerable groups. In this way, the consultation led to the development of a more robust framework, informed by a range of literature, for applying an equity lens to the review of interventions.

**Table 4: Equity Lens at a Glance**

- A more nuanced understanding of equity requires discussions that extend beyond identifying vulnerable populations.
- One way to apply a more comprehensive equity lens to the review of interventions is to explore activities across a range of five dimensions:
  - Addressing determinants;
  - Identifying at-risk groups;
  - Assessing equity outcomes;
  - Planning for unintended consequences; and
  - Ensuring community engagement.

To create a more robust tool for applying an equity lens to the analysis, CPHI consulted a range of peer-reviewed and grey literature on the topics of public policy analysis,<sup>10, 55, 56</sup> application of an equity lens<sup>57–61</sup> and health impact assessment.<sup>62, 63</sup> Although it was common to find reviews and tools designed to help implement initiatives,<sup>64</sup> there were no examples of review frameworks to assess how interventions addressed the concept of equity. Based on a review of the literature, CPHI created a framework that included three domains with a series of sub-domains and sample questions to extract relevant equity-oriented information from literature about interventions. These elements are presented in Table 5. For more information on the method, including consultation and framework development, see Appendix A.

Table 5: Equity-Oriented Analysis Framework

Domains	Sub-Domains
Description	<p><b><i>What Is Happening?</i></b></p> <ul style="list-style-type: none"> <li>• What are the goals of the intervention?</li> <li>• What activities comprise the intervention?</li> <li>• What is the context under which it was initiated (for example, electoral platform, research funding, news story, pilot project)?</li> </ul>
	<p><b><i>Jurisdiction</i></b></p> <ul style="list-style-type: none"> <li>• Where is it happening?</li> <li>• What level of government (if any) or private sector must approve its implementation?</li> </ul>
	<p><b><i>Topic</i></b></p> <ul style="list-style-type: none"> <li>• Are the interventions clearly focused on one of the major theme areas of green space, outdoor air pollution or heat extremes?</li> <li>• Are the interventions focused on urban form (larger city-wide interventions) or urban built environment (smaller/neighbourhood-scale interventions) when there are multiple or no clear theme areas?</li> </ul>
	<p><b><i>Intervention Type</i></b></p> <ul style="list-style-type: none"> <li>• Procedural</li> <li>• Informational</li> <li>• Regulatory</li> <li>• Fiscal</li> </ul>
	<p><b><i>Determinants of Health</i></b></p> <ul style="list-style-type: none"> <li>• Which determinants of health does the intervention address?</li> </ul>
	<p><b><i>Program Sustainability/Expansion</i></b></p> <ul style="list-style-type: none"> <li>• Briefly describe any sort of sustainability plan, including resources, activities and those responsible.</li> <li>• Has the intervention addressed potential new barriers?</li> </ul>
	Equity
<p><b><i>At-Risk Groups</i></b></p> <ul style="list-style-type: none"> <li>• What is the target population?</li> <li>• What challenges are faced by this group in particular?</li> </ul>	

**Table 5: Equity-Oriented Analysis Framework (cont'd)**

Domains	Sub-Domains
<b>Equity (cont'd)</b>	<p><b><i>Equity Outcomes</i></b></p> <ul style="list-style-type: none"> <li>• How have various outcomes of the target population improved?</li> <li>• In what ways has the gap between the most disadvantaged and the better-off been narrowed?</li> <li>• What supports are in place to ensure that the target population benefits from the intervention?</li> <li>• Does the intervention create, reinforce or reduce social inequalities in health?</li> </ul>
	<p><b><i>Unintended Consequences</i></b></p> <ul style="list-style-type: none"> <li>• Who might be disadvantaged by this initiative (for example, is there the potential for programs to widen disparities)?</li> <li>• What impact would the proposed intervention have on other groups (beyond the target)?</li> </ul>
	<p><b><i>Community Engagement</i></b></p> <ul style="list-style-type: none"> <li>• How are target populations and communities engaged in the planning, implementation and reporting process?</li> <li>• What specific measures are taken to address challenges such as geography, access or language barriers?</li> </ul>
<b>Evaluation</b>	<p><b><i>Type/Method of Evaluation</i></b></p> <ul style="list-style-type: none"> <li>• What evaluation mechanisms are in place?</li> <li>• Who is performing the evaluation?</li> <li>• How does the evaluation account for other factors that may have influenced outcomes (confounders)?</li> </ul>
	<p><b><i>Outcomes Evaluated</i></b></p> <ul style="list-style-type: none"> <li>• What is being measured?                             <ul style="list-style-type: none"> <li>– Reach: Is there an estimate of the number of people reached by the intervention and the representativeness of the group reached?</li> <li>– Effectiveness: Is there a measure of effects on health and non-health outcomes?</li> <li>– Adoption: Is there an estimate of the number of settings participating in the intervention and the representativeness of those settings in influencing target populations?</li> <li>– Implementation: Is there fidelity to the principles of the intervention?</li> <li>– Maintenance/sustainability: Are individual behaviour changes maintained over time, system-level changes sustained and new barriers prevented?</li> </ul> </li> </ul>

**Note**

The framework was based on a review of suggested key questions from several sources.<sup>10, 29, 55–60, 62, 63</sup>

This framework allowed us to conduct a thorough analysis of the various equity dimensions of the selected interventions. The following sections discuss the equity-oriented components in greater detail, incorporating relevant findings from available evaluations.

## Refined Findings: Exploring Equity-Oriented Components

### Addressing Determinants

The consultation highlighted the need for comprehensive strategies to address health disparities. This involves going beyond identifying and targeting vulnerable groups to also addressing the broader determinants of health. A framework for interventions to reduce health disparities that was proposed by the Ministry of Health in New Zealand includes four key areas for action, which help to clarify these ideas:

- Structural: interventions that address social, economic, cultural and historical factors;
- Intermediary pathways: interventions that address how structural factors influence health;
- Health and disability services: interventions that improve the distribution, availability, acceptability and affordability of services designed to treat health problems; and
- Impact: interventions to reduce the impact of illness on socio-economic status.<sup>56</sup>

Two of these four action areas, structural factors and intermediary pathways, were noted across the intervention sample. More specifically, analyses indicated that the sample consisted of some interventions that were designed to

- Address or mitigate social, economic or cultural factors that may impede the uptake of interventions or information; or
- Address broader structural factors that influence health, including poverty, housing and employment.

**Table 6: Studies That Address Determinants at a Glance**

Equity Dimension	Number of Interventions	Key Intervention Activities
<b>Addressing Determinants</b>	36/58	<ul style="list-style-type: none"> <li>• Many interventions provided guidance for addressing determinants of health, though few implemented concrete actions.</li> <li>• Interventions addressed social, economic or cultural factors that may impede the uptake of information through community outreach and training and providing educational tools.</li> <li>• Interventions addressed broader structural factors that influence health, such as housing and employment, mostly through procedural instruments that outlined sustainable community planning at national, provincial and municipal levels.</li> </ul>

### Mitigating Factors

Approximately one-third of the interventions in the sample addressed intermediary pathways by attempting to mitigate factors—such as low literacy rates, language barriers or limited access to popular media sources—that limit the reach and uptake of messages related to changing behaviour and improving health. These interventions employed strategies such as offering community outreach and training or providing low-cost tools and resources to individuals or communities. Examples include the following:

- An air quality education initiative integrated multiple strategies in a low-income minority neighbourhood during a highway reconstruction project. A community notification system consisted of the intentional placement of colour-coded air quality reading posters. In addition, a community education component involved training local facilitators who then conducted workshops that focused on learning where to find and how to access air quality information and adapting behaviour in response to that information. Workshops were held near public housing, in libraries and in other accessible spaces.<sup>39</sup>
- The Sustainable Cleveland Partnership implemented an environmental health action guide to generate interest in, as well as increase availability of and access to, environmental information within communities. As part of this effort, a series of community workshops was held to improve community capacity to assess risk and address environmental issues. As a result of the partnership, environmental leaders emerged from the communities equipped with new knowledge and an interest in advocating for change. A neighbourhood audit project was also launched to engage individuals in identifying and collecting data on environmental attributes such as demographics, pollution and park space.<sup>26</sup>

- In addition to media and web-based hot weather responses, Toronto Public Health identified high-risk individuals, households and neighbourhoods and provided them with priority services during heat events. The provision of services to high-risk populations was conducted both in their homes and at facilities where higher-risk individuals may congregate.<sup>50, 65</sup>
- A Montréal-based heat-health education and awareness campaign that targeted seniors and those suffering from chronic disease provided specific messages about protective measures that can be taken during heat events. The campaign included an information relay network through which health and community services professionals were informed about health issues associated with heat waves. Recipients were asked to distribute the information and were encouraged to educate and counsel their clients and patients on protective measures against extreme heat.<sup>23</sup>

### Structural Determinants of Health

Less than one-third of the identified interventions incorporated structural determinants of health as a strategy to reduce health inequalities in urban physical environments. Most were procedural interventions or, more specifically, instruments outlining sustainable community planning that were initiated at national, provincial and municipal levels. For the purposes of this analysis, interventions designed to change specific structural factors and those that provided guidance for structural change were combined; however, action did appear to be less common than tools to guide action. The most common examples of determinants, beyond those related to the physical environment, addressed by these initiatives are housing affordability<sup>42</sup> and employment.<sup>66</sup> Other structural determinants related to such factors as poverty, education, taxation and discrimination were identified to a much lesser extent. The following are more detailed examples from the interventions reviewed:

- With the goal of improving the physical environment, the *City of St. John's Integrated Community Sustainability Plan* outlines a series of actions across environmental, cultural, social, economic and governance dimensions. The plan encourages activities that address structural determinants; examples include encouraging mixed land use, increasing the non-profit housing stock and the availability of affordable housing, maintaining a system of public parks and offering free cultural events in public spaces.<sup>42</sup>
- The Ontario Ministry of Municipal Affairs and Housing and the Ontario Professional Planners Institute created a handbook to support municipalities in their efforts to create healthier physical environments. The resource outlines research that links land use planning and design with health. It also lists key considerations in sustainable planning, references a series of planning tools and showcases best practices.<sup>14</sup>

- In its National Strategy for Neighbourhood Renewal, the U.K. government committed to reducing disadvantage with policies, funding and targets. The strategy combined national support for initiatives with local involvement to improve education, employment, health, crime and anti-social behaviour, housing and liveable communities. It references a range of programs and structures for improving the delivery of public services that are relevant to urban physical environments: commitment to improve parks and public spaces, support for community groups to manage and maintain local green spaces and documentation of promising practices.<sup>66</sup>

## At-Risk Groups

A total of 32 interventions identified at least one population as vulnerable or at risk and targeted that group as part of its activities. Groups were identified as vulnerable either through

- *Physiological* characteristics (for example, children, seniors and those with pre-existing health conditions); or
- *Social* characteristics (for example, populations characterized by low income, low socio-economic status and low levels of education; the homeless; or ethnic minorities).

Of these interventions, 12 targeted *physiologically vulnerable* groups and focused on air quality, heat and urban planning. The 15 interventions that focused on aspects of *social vulnerability* most often showcased activities related to heat, urban planning and green space. Five interventions listed both socially and physiologically vulnerable groups. Examples of these distinctions are included in Table 7. These interventions were selected as examples because they have clear explanations of target groups, the most detail in their descriptions and intervention activities that are relevant to other equity components; they also provide illustrations at municipal, provincial, federal and international levels.

Table 7: Targeted Groups at a Glance

Intervention	Goals	Group Characteristics
<b>Social Characteristics</b>		
<b>Neighbourhoods Alive! Winnipeg Neighbourhood Renewal Fund</b> <sup>44</sup>	Builds local capacity, promotes stability and economic development, and heightens the well-being of residents across the designated vulnerable neighbourhoods.	Communities experiencing high rates of poverty, unemployment and crime, as well as those with inadequate recreation space, family support, affordable housing and economic opportunities.
<b>California Healthy Cities and Communities</b> <sup>54</sup>	Encourages food security, increased physical activity and improved access to nutritious food through the implementation of community gardens.	Low-income areas as well as ethnically diverse communities.
<b>Physiological Characteristics</b>		
<b>National Air Quality Health Index Program</b> <sup>24</sup>	Delivers daily information on levels of air pollution and the associated health risks using a risk-ranking scale to foster public awareness and improve health.	Those with pre-existing health problems, seniors and children.
<b>Develop With Care: Community Planning</b> <sup>32</sup>	Highlights steps required of local jurisdictions to produce sustainable environmental planning practices.	Air quality guidelines mention those at risk of developing cardiovascular conditions or asthma, children, seniors, pregnant women and those who are ill.
<b>Social and Physiological Characteristics</b>		
<b>The Chicago Community Education Program</b> <sup>39</sup>	Provides information about how individuals and communities might obtain or act on air quality information through community notification and education programs.	Those at risk of experiencing adverse health outcomes, such as seniors or small children and low-income, predominantly ethnic, minority communities.

Although some interventions focused solely on vulnerable populations,<sup>44</sup> most named the entire population as the audience for the intervention and also identified specific sub-populations. The most common examples of this integrated universal and targeted approach were indices for air quality and heat<sup>23, 24</sup> and supports for community planning.<sup>33, 42</sup> For example, the *Plan montréalais de prévention et protection en cas de chaleur accablante ou de chaleur extrême* identified the general public as the main audience for the health promotion intervention but also noted target groups—including seniors and individuals with chronic disease—that are particularly vulnerable to heat-related illness.<sup>23</sup>

## Equity Outcomes

Applying an equity lens involves considering whether an intervention benefits diverse groups<sup>57</sup> and creates, reinforces or reduces social inequalities in health.<sup>10</sup> Monitoring inequalities can reveal whether the health of the worst-off has improved, whether the gap between the most disadvantaged and the better-off has narrowed and whether the most disadvantaged groups are making more progress toward improved outcomes compared with other groups.<sup>60</sup> Such measures of equity mark the potential differential impact of an intervention.

**Table 8: Outcomes at a Glance**

Equity Dimension	Number of Interventions	Key Intervention Activities
<b>Equity Outcomes</b>	26/58	<ul style="list-style-type: none"> <li>• Interventions assessed the impacts of their activities or discussed potential targets and future assessment possibilities that would be focused on physical environment, health or social environment outcomes.</li> <li>• A limited number of interventions assessed their differential impact.</li> <li>• Interventions that did consider gaps across groups typically measured changes between deprived neighbourhoods and national averages or the differential uptake and use of intervention-related information across target groups and the general population.</li> </ul>

## Outcomes Assessed

Interventions that assessed the impacts of their activities or that discussed potential targets and future assessment possibilities focused on three categories of outcomes:

- Physical environment: assessing change in the built environment, such as indicators of development of green space<sup>54</sup> and reduction of outdoor air pollutants like ozone and fine particulate matter;<sup>48</sup>
- Health: measuring health outcomes, such as relevant individual behaviour modification,<sup>24</sup> decreased morbidity<sup>28, 67</sup> and reduced mortality;<sup>24</sup> and
- Social environment: measuring awareness of and improvement to characteristics of the social environment, such as community engagement<sup>54</sup> and the capacity for action.<sup>26</sup>

## Assessing Gaps and Disparities

Of the interventions reviewed, several considered inequalities in health determinants and health outcomes between groups. For example, the U.K.'s National Strategy for Neighbourhood Renewal evaluated improvement by measuring changes in the gap between the most deprived neighbourhoods and the national average for education, employment and life expectancy outcomes.<sup>66</sup> Other interventions focused on gaps in knowledge and the differential uptake and use of the information provided to support behaviour changes that could help improve health outcomes. For example, the *Evaluation of the National Air Quality Health Index Program* assessed the program's objective of overall reductions in air quality-related morbidity and mortality across various populations.<sup>24</sup> Baseline measures suggested that people who live in rural areas have less access to air quality monitoring and information compared with those living in urban settings; thus the evaluation identified an area to target to reduce the knowledge gap between rural citizens and their urban counterparts.<sup>24</sup> Another survey of the program showed inequalities in uptake of information between groups more or less at risk. In this evaluation, it was found that while high-risk groups (for example, seniors or those with cardiovascular or respiratory illnesses) were marginally more likely to have consulted air quality indices, they were not more likely to understand the information than other groups.<sup>25</sup>

## Unintended Consequences

Another aspect of equity considers whether there are likely to be unplanned effects as a result of an intervention, for example, whether individuals or groups may be disadvantaged by an initiative.<sup>62</sup> This dimension draws attention to positive and negative impacts that are not part of the original goals of an intervention.<sup>10</sup> Thirteen interventions in the sample had strategies to mitigate unintended consequences. These interventions addressed challenges presented by inaccessible information and barriers that may complicate healthy and sustainable development.

**Table 9: Unintended Consequences at a Glance**

Equity Dimension	Number of Interventions	Key Intervention Activities
<b>Unintended Consequences</b>	13/58	<ul style="list-style-type: none"> <li>• A limited number of interventions identified strategies to address positive and negative impacts that were not part of their original goals.</li> <li>• Interventions that did outline strategies addressed challenges presented by inaccessible information and barriers that may complicate healthy and sustainable development.</li> </ul>

Interventions that promoted awareness of air quality or extreme heat often used the internet to deliver messages. Access to computers and the internet, as well as the knowledge and skills to use these resources, is required to benefit from this type of health promotion message. Strategies that rely on these technologies could create and widen gaps between communities with resources and those disadvantaged communities where understanding and uptake of information is hindered by accessibility and literacy challenges.<sup>26</sup> One approach to addressing this disparity is to provide training on the use of the internet.<sup>26</sup> Other informational interventions attempted to mitigate these unintended consequences by offering activities through alternative media to ensure accessibility for disadvantaged populations, including telephone hotlines,<sup>68</sup> community workshops and posters,<sup>39</sup> home visiting and other in-person service delivery.<sup>50</sup>

Changes to zoning standards that regulate development are one way to protect populations from environmental hazards and reduce the risk associated with exposure to toxins and pollutants. In attempting to mitigate risk of exposure, however, regulatory changes may result in single land-use developments that may not support diverse community characteristics.<sup>52</sup> The Living Building Challenge 2.0 is an example of an intervention that attempts to mitigate this unintended consequence by promoting building standard activities that take into account equity of vulnerable populations and the need for diverse communities. In any change to improve the physical environment, the project supports human-scale development, accessible infrastructure, affordable housing and access to nature and green space.<sup>52</sup>

From the interventions reviewed, analyses indicate that unintended consequences can also be positive. For instance, the opening of a bypass that relieved traffic congestion and air pollution was associated with improvements in the physical environment and health-related measures in both the community under study and in a nearby community with lower baseline exposure to air pollution.<sup>28</sup>

## Community Engagement

Research indicates that communities play an important role in improving population health and reducing health disparities and that engaging with communities can benefit the implementation and outcomes of a given intervention.<sup>69</sup> Approximately 60% of the interventions that were reviewed documented some kind of engagement process. Across these interventions, two main themes of engagement were evident. The first involved engaging a wide array of communities, and the second concerned including actual target groups and communities in the implementation of interventions. The interventions reviewed indicate that urban physical environment activities involved a range of action from organizations, communities, disciplines and professions in addition to various levels of government.

**Table 10: Community Engagement at a Glance**

Equity Dimension	Number of Interventions	Key Intervention Activities
<b>Community Engagement</b>	35/58	<ul style="list-style-type: none"> <li>• Many interventions had some kind of engagement process, either by working across government, industry, community and business groups within various sectors or by consulting and actively involving communities.</li> <li>• Examples of activities that engaged multiple types of communities involved visioning resources, network development and partnership in development planning.</li> <li>• Community engagement activities ranged from time-limited consultation events to more active involvement of citizens in intervention planning and implementation.</li> </ul>

### Engaging Multiple Communities

There were 26 cases of engagement between government and different types of non-government communities both within and outside of the health sector, including those from industry, provincial health advocacy groups and local businesses. Of these examples, some involved visioning resources, network development and partnership in community development planning:

- Visioning resources: Pedestrian charters were one visioning example identified in the review. They articulate a municipality's vision for policies to support decreased car dependence, improved air quality and increased options for active transportation. The engagement of multiple communities was evident in the need for individual citizens, community groups and agencies, businesses and government to work together to achieve those goals.<sup>70, 71</sup>
- Network development: One example of a network, the Canadian National Forest Strategy, is a strategic initiative involving foresters, managers, arborists, planners, community workers and politicians. Recognizing the need for knowledge exchange among urban forestry communities, the general public, allied professions and organizations, and policy-makers, participants have established tools to improve coordination and communication. Working groups that engage government, non-government organizations and private-sector partners have also been established.<sup>53</sup>
- Partnership in planning: Smart Growth on the Ground is a pilot intervention that supports communities with sustainable development projects. The Smart Growth partnership includes academics, an association of real estate professionals and a non-governmental organization and thus provides an example of partnership in planning. This initiative encourages communities to collectively envision, design and implement developments with appropriate land use, urban design and transportation considerations along with economic and market analyses.<sup>40</sup>

## Consultation and Active Involvement

Across the sample, the mode of engagement varied by community. Activities ranged from time-limited consultation events to the more active involvement of citizens in intervention planning and implementation.

Community consultations that were conducted as part of a government planning process often took the form of public meetings intended to solicit feedback from citizens on a proposed intervention plan.<sup>21, 42</sup> The sample contained several examples of consultation documents that were used to inform these meetings and regulatory policy development.<sup>72, 73</sup> This form of engagement involves less ongoing and active involvement of communities and may exclude populations that are unable to attend such consultation events.

There were several examples of interventions that incorporated more active involvement of communities. This involvement included engaging community volunteers in data collection,<sup>33</sup> developing tools and resources with community members, training individuals to disseminate information<sup>26</sup> and hosting deliberative dialogues in which citizens participated in hands-on planning activities.<sup>40</sup>

## Applying an Equity Lens: A Summary

*What interventions have been tried? For which populations? In what contexts? With what impact across groups?*

This section explored how the concept of equity was integrated into the interventions that were included in this review. Based on a consultation and literature review process, CPHI developed an equity framework. Using the framework, findings were grouped within five equity categories:

- Addressing determinants: Some interventions mitigate barriers to the uptake of health information among vulnerable groups, while others incorporate determinants of health, such as housing and employment, into planning for future improvements to the urban physical environment. A U.S. example, the Sustainable Cleveland Partnership, implemented an environmental health action guide to better disseminate environmental information within at-risk urban communities.<sup>26</sup>
- At-risk groups: At-risk groups are often identified in interventions by characteristics that are physiological, social or a combination of the two. Winnipeg's Neighbourhoods Alive! Neighbourhood Renewal Fund identifies socially at-risk areas, investing resources to improve physical spaces, promote stability and improve well-being.<sup>44</sup>

- Equity outcomes: Some interventions assessed or articulated targets related to the physical environment and to health and social outcomes, although there is little mention of assessing gaps between populations. Environment Canada's *Evaluation of the National Air Quality Health Index Program* explored the differential uptake of air quality monitoring information between urban and rural populations (the index sought to reduce the knowledge gap between these populations).<sup>24</sup>
- Unintended consequences: There was some mention of unintended consequences that may transpire as a result of the intervention, mainly involving challenges presented by inaccessible information and barriers that may complicate healthy and sustainable development. Conversely, positive consequences were also identified; activities in the U.K. that were intended to reduce traffic congestion were subsequently associated with improvements in health across a number of communities adjacent to the improved traffic corridors.<sup>28</sup>
- Community engagement: Community engagement was the most commonly employed equity dimension, with evidence of engagement across health and non-health sectors, communities and target populations. Engagement ranged from holding community consultation programs to including community residents in planning and implementing specific development activities (such as community garden and green space development).

Overall, identifying and working with at-risk groups are common strategies. Addressing determinants of health as well as planning for and assessing equity outcomes and unintended consequences were evident, although to a lesser extent. Interventions that met the equity criteria were largely informational activities related to health hazards in the physical environment; they targeted at-risk groups through tailored programs and campaigns. Analyses presented here suggest that equity considerations can be integrated in various types of interventions. However, there is only partial evidence about what works to reduce inequalities; long-term impact evaluations are rare and have few conclusive results.

## Conclusions

Drawing on peer-reviewed literature, grey literature and consultation, this scoping review describes the extent, range and nature of interventions that have the potential to mitigate health inequalities in the urban physical environment. The range of actions described in this review can inform the identification of gaps and provide guidance for future research and decision-making related to urban physical environments.

*What is known about what could address exposure to pollution and urban heat extremes and reduce the health impacts of this exposure? What has been tried and what has been evaluated?*

Section 1 described the extent to which the interventions that were reviewed had been evaluated, as well as the nature of those evaluations. Of the evaluated interventions, most were process-oriented or involved disseminating information to target audiences and monitoring the uptake of that information. Outcome evaluations were limited and had few conclusive results. Additional short-term, intermediary and long-term steps to assess implementation challenges and successes, as well as evidence related to maintenance, scale-up and sustainability of interventions, could help point the way to future goals and actions.

Beyond the evaluated interventions, the report describes a range of intervention activities under way across Canada and in other similar countries. Most of these interventions focused on features of the urban built environment or on outdoor air pollution. This focus points to gaps in a number of other areas, such as interventions related to heat and heat extremes, green space and structural elements of urban construction and development.

Most of the identified interventions were procedural and informational. Activities typically involved targeting messages to populations deemed to be at risk. These messages included information about heat extremes and poor air quality, as well as actions that could be taken at the individual or community level to mitigate poor health outcomes. These findings highlight the generally non-binding nature of action in this field.

*What interventions have been tried? For which populations? In what contexts? With what impact across groups?*

Section 2 reviewed the ways that the needs of vulnerable populations are addressed by exploring how the concept of equity is integrated into interventions. There is only incomplete evidence about what works in urban physical environments to address health and health inequalities, although existing evidence suggests various approaches that could improve equity.

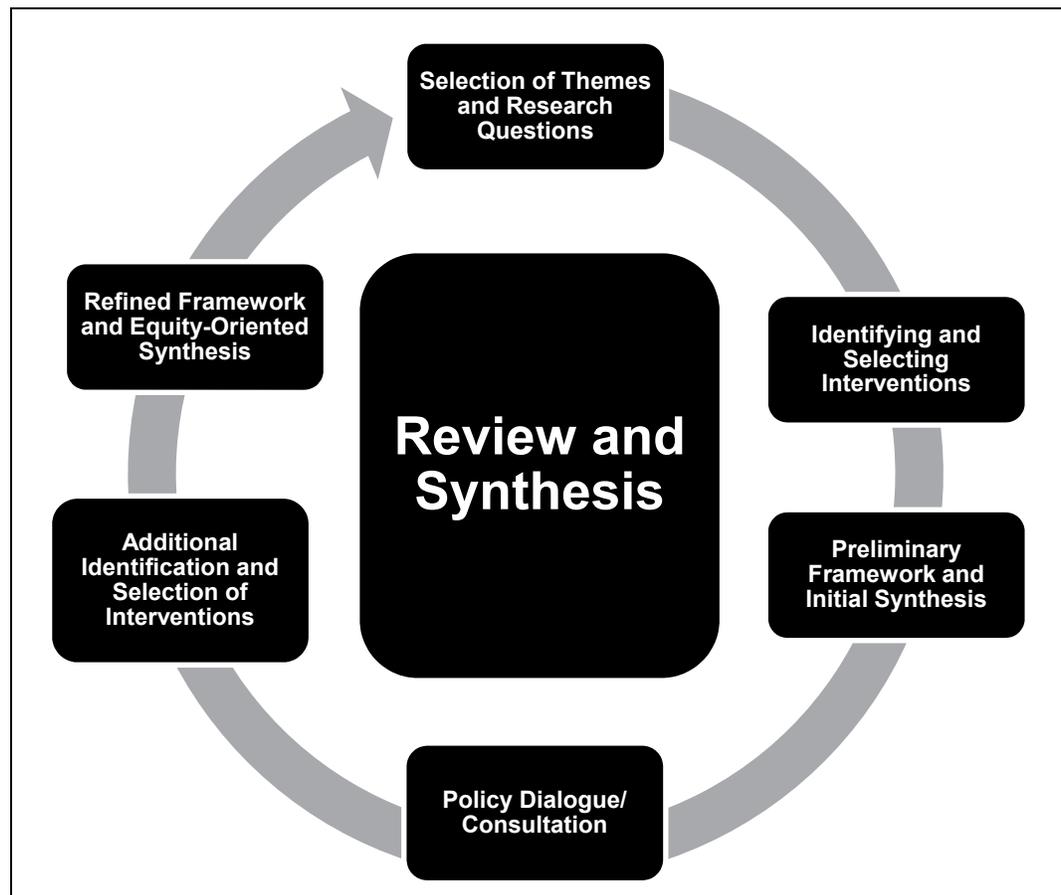
Overall, identifying and working with at-risk groups were the most common strategies for incorporating equity into urban physical environment interventions. Interventions that integrated equity considerations were most often related to communicating messages about health hazards to targeted at-risk groups through tailored programs and campaigns. These findings point to gaps in action related to addressing the determinants of health that influence the capacity to act on information as well as gaps in evidence involving equity outcomes and unintended consequences. In addition to describing intervention activities that address inequalities, the framework clarifies elements of an equity lens and provides guidance for incorporating equity into future intervention planning and scoping reviews.

# Appendix A: Detailed Methodology and Process

## Overview

CPHI set out to review the extent, range and nature of activity in the area of health inequalities and urban physical environments. To accomplish this goal, CPHI staff conducted a search and relevance appraisal of peer-reviewed research and grey literature and scanned publicly available information on federal, provincial and territorial websites to uncover interventions related to a series of urban physical environment themes. This search protocol and the subsequent analysis and synthesis work were complemented by a consultation to verify and enhance the preliminary findings—a step recommended in the scoping review literature.<sup>9</sup> Figure 1 represents the logic model developed to guide this process. The model represents an iterative review process and is an adaptation of methodological approaches from the scoping review and public policy synthesis literature.<sup>9, 10</sup>

**Figure 1: Urban Physical Environments and Health Inequalities—Scoping Review of Interventions Logic Model and Process**



## Selection of Themes and Research Questions

Building on the evidence presented in *Urban Physical Environments and Health Inequalities*, CPHI identified and investigated interventions in the urban physical environment that may have the potential to mitigate inequalities in health. The five following themes guided this scoping review:

- Urban built environment: the physical design and layout of neighbourhoods and communities, including buildings and public spaces;<sup>1</sup>
- Urban form: the pattern of building and development in a city and the structural elements that form cities, such as natural features, transportation corridors and open spaces;<sup>18</sup>
- Outdoor air pollution: the presence of pollutants harmful to health that result from vehicle or industrial emissions, such as particulate matter, nitrogen dioxide and carbon monoxide;<sup>1</sup>
- Heat extremes: the structure and design of physical environments that lead to the presence of urban heat islands<sup>1</sup> or extremes where temperatures hover above average high temperatures for several weeks;<sup>19</sup> and
- Green space: the presence of green space and vegetated areas within urban settings to mitigate the harmful effects of heat extremes and air pollution.<sup>1</sup>

In addition to these themes, a series of research questions guided the analysis:

- What is known about what could address exposure to pollution and urban heat extremes and reduce the health impacts of this exposure?
- What interventions have been tried in these areas?
  - For which populations?
  - In what contexts?
  - With what impact and outcomes across social groups?
- What interventions have been evaluated in these areas?
  - For which populations?
  - In what contexts?
  - With what impact and outcomes across social groups?

## Identifying and Selecting Interventions

A search protocol using keywords from three areas was developed to identify interventions:

1. Main themes of urban physical environment, urban form, outdoor air pollution, heat extremes and green space
2. Intervention terms such as program, policy, initiative and intervention
3. Terms related to the concept of equity and the social determinants of health, such as equality, social isolation and poverty

Peer-reviewed materials were searched using Medline, Econlit and PsycInfo. Hand searches of specific public health journals, such as the *Canadian Journal of Public Health* and the *American Journal of Public Health*, and publications specific to urban planning, including the *Journal of Urban Planning and Development*, *Urban Affairs Review* and *Landscape and Urban Planning*, were also conducted. CPHI staff also undertook web-based searches of the Cochrane Collaboration (Cochrane reviews), [healthevidence.ca](http://healthevidence.ca) and the Canadian Best Practices Portal for Health Promotion and Chronic Disease Prevention. A scan of publicly available information on Canadian federal, provincial and territorial websites, as well as websites of selected jurisdictions outside of Canada, was conducted. Due to the large number of municipalities and regions across Canada, scanning did not include municipal websites; however, municipal interventions were included in the review if they were referenced in the peer-reviewed, systematic or grey literature that was identified during the search or if they were referenced in the web-based resources.

Searches were limited by language (English and French only), to those resources published or available between 2000 and 2011, to Canadian interventions and to interventions from jurisdictions comparable to Canada (for example, the United States and the United Kingdom). Title and abstract screenings were also conducted. The objective of the title screening was to identify

- Literature that links the urban physical environment or similar terms with outcomes such as health, well-being, quality of life, poverty or other determinants of health; and
- Literature that refers to interventions related to the urban built environment, urban form, outdoor air pollution, heat extremes and green space.

After title screening, the remaining interventions underwent an abstract review to further refine the sample by favouring recent, Canadian, evaluated interventions. Additional criteria included promising or evaluated interventions from a region or country often compared with Canada in the academic and policy literature.

A final screening for relevance confirmed the explicit or implicit potential of an intervention to address health inequalities and confirmed the relationship between the intervention and the key themes. Sources that did not meet the criteria for inclusion but that offered relevant policy recommendations were filed for future consideration.

## Preliminary Framework and Initial Synthesis

The identification and selection process yielded 53 interventions. A preliminary framework was developed to guide the extraction and documentation of relevant information from each of these interventions. The following information was documented for each intervention: date of release, theme, intervention type, jurisdiction, assessed health outcomes, target population, reference to equity and evaluation status. Of the 53 interventions identified during the scan and literature review, 17 met the equity criteria, defined by a focus on vulnerable or at-risk populations and/or the explicit use of terms such as equity, inequity and inequality.

## Policy Dialogue/Consultation

Decision-makers and researchers benefit from working together to develop research questions and share research findings.<sup>74</sup> CPHI supports this by hosting policy dialogues where people who work in a variety of fields are invited to share ideas and engage in activities that relate to findings from major CPHI reports. These policy dialogues also provide the opportunity to discuss how to effectively change research, practice and policies in specific population health-related fields. To create a space for improving and refining the preliminary efforts of the review and synthesis, CPHI partnered with other pan-Canadian organizations to implement a policy dialogue on the topic of the built environment and health and subsequently integrated a consultation component into the event.<sup>ii</sup>

Policy dialogues, or deliberative processes, are methods used to better support and engage in evidence-informed decision-making.<sup>75-77</sup> They draw on several forms of evidence to facilitate discussion about how and in what contexts evidence can be used to take action, and they can be seen as useful evidence in their own right to complement other forms of scientific evidence.<sup>77</sup> Policy dialogues serve to engage various stakeholder groups in decision-making processes<sup>76</sup> and to integrate scientific evidence with stakeholder views.<sup>77</sup>

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ii. The workshop *Sharing Knowledge, Building Links—Advancing Research, Policy and Practice on the Built Environment* was held in Ottawa, Ontario, from March 7 to 9, 2011. Bringing together a wide range of researchers, planners and policy-makers, the event was organized and co-sponsored by the Heart and Stroke Foundation of Canada, the Canadian Institute for Health Information, the Canadian Partnership Against Cancer, the Public Health Agency of Canada and the Canadian Institutes of Health Research.<sup>18</sup>

The goal was to create an opportunity for knowledge transfer, exchange and application by sharing findings and experiences, encouraging collaboration and identifying priority actions. Invited participants included researchers, practitioners, planners and representatives of community organizations and different levels of government.<sup>18</sup>

On the first day of the dialogue, participants shared findings and experiences from relevant research, policy and practice. CPHI hosted a concurrent session to consult with experts on the concept of health equity and how to better incorporate equity into our analyses and appraisal of interventions. The session also provided the opportunity to identify additional interventions that could be included in the review. As part of the process, CPHI shared the findings from *Urban Physical Environments and Health Inequalities* and the preliminary findings from this scoping review. Participants provided feedback through facilitated break-out and plenary discussions, which encouraged further exploration of the concept of equity and the differential impacts of built environments on specific populations.<sup>18</sup>

The second day of the dialogue was dedicated to group work and plenary sessions to identify, develop and refine actions that may address the challenges articulated during the first day. Participants identified a number of themes and then worked in small groups to consider specific actions in these areas:

- Developing a strategic and coordinated approach;
- Demonstrating the value of action;
- Reaching and engaging the public;
- Exploring mental health and the built environment;
- Reducing sedentary behaviour;
- Understanding the connection between built environment and health equity;
- Improving knowledge of rural/smaller communities; and
- Improving knowledge of urban/suburban communities.<sup>18</sup>

While numerous steps were recommended across the themes, four common ones emerged:

1. Ensure leadership in carrying out next steps;
2. Create a clear and coordinated strategic plan;
3. Synthesize current research; and
4. Profile promising practices to increase visibility of potential action.<sup>18</sup>

Throughout various sessions, participants emphasized the need for cities to be designed with equity as a goal and for people of all ages and abilities to live in healthy built environments; these might incorporate more inclusive spaces where multiple populations feel safe and connected and have the ability to thrive.<sup>18</sup>

Participants emphasized the importance of community engagement and encouraged a more comprehensive equity lens that moves beyond identifying at-risk groups and

begins to explore other characteristics and activities. There was agreement about the need for more research that highlights the context of interventions and sheds light on how equity is incorporated into promising interventions.<sup>18</sup>

### **Additional Identification and Selection of Interventions**

In response to the policy dialogue and consultation, CPHI consulted a range of peer-reviewed and grey literature to supplement the preliminary framework and approach. These sources involved the following topics:

- Analyzing public policy;<sup>10, 55, 56</sup>
- Applying an equity lens,<sup>57–61</sup>
- Health impact assessment;<sup>62, 63</sup> and
- Evaluation processes,<sup>29, 55</sup> particularly a framework that integrates traditional clinical measures, such as reach and efficacy, with additional concepts related to adopting, implementing and maintaining interventions.<sup>29</sup>

A supplementary environmental scan was also conducted. This included reviewing additional peer-reviewed literature that was identified at the dialogue and scanning additional web resources developed by the Public Health Agency of Canada, the Heart and Stroke Foundation of Canada, the Canadian Partnership Against Cancer and the National Collaborating Centre for Environmental Health. As a result of this additional scanning, the final sample totalled 58 interventions (up from 53).

Engaging in this dialogue was an exceptional opportunity to learn from and share with other researchers and decision-makers working in this area. In particular, the experience helped us to better understand two of the initial analysis domains—equity and evaluation.

## Refined Framework and Equity-Oriented Synthesis

Following the policy dialogue and consultation, and in addition to further exploration of the evidence, CPHI revisited the framework and developed a more robust mechanism for extracting information about equity. The interventions found in the initial scanning were retained and analyzed with the original guiding themes, research questions, search domains and instrument typology. Additional equity-oriented components of the revised framework capture whether, in addressing equity, the intervention considered

- Addressing determinants;
- At-risk groups;
- Equity outcomes;
- Unintended consequences; and
- Community engagement.

The framework is presented in more detail in Table 5. With this revised framework for assessing equity and evaluation, analyses can more thoroughly explore various dimensions of the selected interventions. The revised analytical framework helped clarify the elements inherent in applying an equity lens and provides guidance to those who are interested in incorporating equity into interventions.



## Appendix B: Detailed Table of Intervention Sample

Outdoor Air Pollution									
Title and Reference	Project Description			Equity Dimensions					Evaluated
	What Is Happening?	Jurisdiction	Intervention Type	Addressing Determinants	At-Risk Groups	Equity Outcomes	Unintended Consequences	Community Engagement	
<b>National Air Quality Health Index Program</b> <sup>24, 25</sup>	An online information tool to alert the public of air quality on a daily basis and reduce adverse health effects of exposure to pollutants. The AQHI provides the public with an indication of the short-term risks posed by pollution present in the outdoor environment.	Federal	Informational	x	x	x		x	x
<b>British Columbia Air Quality Health Index</b> <sup>78</sup>	An online tool that supports British Columbians' decisions about limiting short-term exposure and structuring activity levels based on the air quality readings for the day, with a focus on people particularly sensitive to air pollution.	Provincial/Territorial	Informational	x	x	x	x	x	

Outdoor Air Pollution (cont'd)									
Title and Reference	Project Description			Equity Dimensions					Evaluated
	What Is Happening?	Jurisdiction	Intervention Type	Addressing Determinants	At-Risk Groups	Equity Outcomes	Unintended Consequences	Community Engagement	
<b>British Columbia Air Action Plan</b> <sup>48</sup>	B.C.'s AAP is part of the provincial strategy for a cleaner environment. This plan sets goals for three years, to be funded by the province and implemented in various partnerships. It also presents 28 specific actions and activities.	Provincial/ Territorial	Procedural	x		x			
<b>Alberta Air Emissions (Issues in the Industrial Heartland)</b> <sup>79</sup>	Outlines the new strategy for managing cumulative emissions (as opposed to site-by-site) across the Edmonton census metropolitan area and the process for stakeholder engagement in designing an emissions allocation system and offset plans.	Municipal/ Regional	Informational					x	
<b>Alberta Air Quality Index</b> <sup>80</sup>	Provides hourly reporting on air quality; reports are available online and by telephone.	Provincial/ Territorial	Informational	x					
<b>Saskatchewan Air Quality Index</b> <sup>81</sup>	An online information tool that provides guidance on daily air quality for public information, using a scale from 0 to 100 (100 = worst air quality).	Provincial/ Territorial	Informational						
<b>Saskatchewan Air Quality Monitoring</b> <sup>51</sup>	The Saskatchewan Air Monitoring Lab is a mobile unit that tracks location-specific air quality information across the province. A specially equipped truck draws and measures for a variety of air quality indicators.	Provincial/ Territorial	Informational						

Outdoor Air Pollution (cont'd)									
Title and Reference	Project Description			Equity Dimensions					Evaluated
	What Is Happening?	Jurisdiction	Intervention Type	Addressing Determinants	At-Risk Groups	Equity Outcomes	Unintended Consequences	Community Engagement	
<b>Manitoba Air Quality Health Index</b> <sup>36</sup>	Online index tracks daily variations in pollution levels and includes possible actions people can take to protect their health. Currently available for Brandon and Winnipeg only.	Provincial/Territorial	Informational	x	x	x	x		
<b>Northwest Territories Air Quality Monitoring Network</b> <sup>82</sup>	Website offering air quality readings for various communities across the Northwest Territories. Readings include particulate matter and ground-level ozone.	Provincial/Territorial	Informational						
<b>An Introduction to Air Quality in New Brunswick</b> <sup>83</sup>	Overviews how pollutants can affect the environment and peoples' health; policies and programs related to understanding air quality and mitigating some of its negative effects.	Provincial/Territorial	Informational	x	x				
<b>Prince Edward Island Air Quality Health Index</b> <sup>84</sup>	An online tool that links to Environment Canada's website where individuals can find readings on local air quality and can determine whether current air quality conditions may pose a risk to their health.	Provincial/Territorial	Informational	x			x	x	

Outdoor Air Pollution (cont'd)									
Title and Reference	Project Description			Equity Dimensions					Evaluated
	What Is Happening?	Jurisdiction	Intervention Type	Addressing Determinants	At-Risk Groups	Equity Outcomes	Unintended Consequences	Community Engagement	
<b>Toward a Greener Future— Nova Scotia’s Climate Change Action Plan<sup>85</sup></b>	Includes 68 actions, including funding to support adaptation research and development and development of regulations on fuel consumption and emission standards for new vehicles; proposes pollution targets and more stringent emission caps for 2015 and 2020.	Provincial/ Territorial	Procedural					x	
<b>San Francisco Health, Traffic and Environmental Justice: Collaborative Research and Community Action<sup>33</sup></b>	A participatory research project conducted by a community organization, community public health and a local university that ultimately informed a resolution by the San Francisco Board of Supervisors to ensure that transportation planning gives consideration to environmental and health outcomes.	Municipal/ Regional	Procedural	x	x	x		x	
<b>The Chicago Community Education Program<sup>39</sup></b>	Provides information about how individuals and communities might obtain and/or act on air quality information. Aims to improve public understanding of both the relationships between air quality and health and how to obtain air quality information.	Municipal/ Regional	Informational	x	x	x	x	x	x

Outdoor Air Pollution (cont'd)									
Title and Reference	Project Description			Equity Dimensions					Evaluated
	What Is Happening?	Jurisdiction	Intervention Type	Addressing Determinants	At-Risk Groups	Equity Outcomes	Unintended Consequences	Community Engagement	
<b>Toronto Air Quality and Health Portal</b> <sup>49</sup>	Provides information to the public about air quality, effects on health and recommendations for individuals who may be at risk for health issues associated with increased pollution levels.	Municipal/ Regional	Informational	x	x				
<b>The Ontario Smog Alert Network</b> <sup>68</sup>	Subscription-based electronic notification service from the Province of Ontario notifies when poor air quality is expected. Information also available in French and English via a toll-free number. Users identify the region(s) for which the alert is to be generated.	Provincial/ Territorial	Informational				x		
<b>Quebec Winter Info-Smog</b> <sup>37</sup>	Provides daily (winter only) air quality forecasts for southern regions of Quebec. Warnings issued through this program focus on air quality, the relationship between air quality and health outcomes, and strategies to mitigate health risks associated with poor air quality.	Provincial/ Territorial	Informational		x				

Outdoor Air Pollution (cont'd)									
Title and Reference	Project Description			Equity Dimensions					Evaluated
	What Is Happening?	Jurisdiction	Intervention Type	Addressing Determinants	At-Risk Groups	Equity Outcomes	Unintended Consequences	Community Engagement	
<b>Effects on Respiratory Health of a Reduction in Air Pollution From Vehicle Exhaust Emissions</b> <sup>28</sup>	Explores the construction of a road bypass that relieved traffic congestion on previously busy streets in North Wales, U.K. This intervention was associated with moderate reductions in levels of air pollutants adjacent to the identified roads and with modest reductions in related respiratory health conditions.	Municipal/Regional	Procedural	x	x	x	x		x
<b>Smog and Your Health</b> <sup>35</sup>	One of a series of articles entitled <i>It's Your Health</i> published by Health Canada. Online document explains types and sources of air pollution as well as potential negative health effects and ways to minimize risk.	Federal	Informational	x	x				
<b>ChemTrac</b> <sup>86</sup>	Aims to improve public health and support an environmentally friendly local economy through the reduction of toxic chemicals. The initiative works with businesses to ensure annual tracking and reporting on toxic chemicals and support for pollution prevention strategies. It also provides information to the public concerning chemical exposure.	Municipal/Regional	Informational		x	x		x	

Outdoor Air Pollution (cont'd)									
Title and Reference	Project Description			Equity Dimensions					Evaluated
	What Is Happening?	Jurisdiction	Intervention Type	Addressing Determinants	At-Risk Groups	Equity Outcomes	Unintended Consequences	Community Engagement	
<b>Alberta Industrial Release Limits Policy</b> <sup>87</sup>	Outlines the principles and procedures used by government staff to limit the release of toxic substances. Covers two sets of standards and recommends applying the most stringent release limit of those two options. Goals are to protect the environment and human health, ensure appropriate prevention measures are in place and encourage continuous improvement.	Provincial/ Territorial	Procedural			x		x	
<b>Alberta Ambient Air Quality Objectives</b> <sup>88</sup>	Identifies a series of objectives and guidelines related to air quality to ensure that industrial facilities limit emissions based on best available evidence.	Provincial/ Territorial	Procedural					x	

Urban Form									
Title and Reference	Project Description			Equity Dimensions					Evaluated
	What Is Happening?	Jurisdiction	Intervention Type	Addressing Determinants	At-Risk Groups	Equity Outcomes	Unintended Consequences	Community Engagement	
<b>City of St. John's Integrated Community Sustainability Plan<sup>42</sup></b>	Incorporates policies related to mixed land use, non-profit housing stock, green space requirements and developers' adherence to Leadership in Energy and Environmental Design (LEED) building standards.	Municipal/ Regional	Procedural	x	x			x	
<b>Simcoe–Muskoka District Health Unit—Healthy Community Design<sup>89</sup></b>	Drew on the Ontario provincial policy statement, growth plans and public health unit initiatives to create a policy guide to support healthy community planning. Provides health-related goals, proposed objectives and suggested planning policies and implementation strategies for five health issues affected by the built environment.	Municipal/ Regional	Procedural						
<b>Smart Growth: Developing and Implementing Greenhouse Gas Reduction Program<sup>31</sup></b>	Resource for planning intended for energy managers, planners and citizen groups, among others. Consists of an implementation toolkit that includes case studies and website resources intended to provide users with “an understanding of smart growth principles and how they can be applied in practice.”	Federal	Informational						

Urban Form (cont'd)									
Title and Reference	Project Description			Equity Dimensions					Evaluated
	What Is Happening?	Jurisdiction	Intervention Type	Addressing Determinants	At-Risk Groups	Equity Outcomes	Unintended Consequences	Community Engagement	
<b>Develop With Care: Community Planning</b> <sup>32</sup>	Guide to lead jurisdictions through development, with a focus on actions that address urban sprawl management and conservation of peripheral rural areas. Reviews legislation and best practices in responsible land development and is intended primarily for use by local government staff and politicians, provincial governments, federal agencies and First Nations.	Provincial/ Territorial	Procedural		x	x		x	
<b>New York Street Design Manual</b> <sup>90</sup>	Provides detailed options for designers, city planners and developers to improve city streetscapes for durability, safety, attractiveness and improved environmental sustainability. Promotes public safety and environmentally sound construction, reduced urban heat, improved accessibility to active transit and improved long-term quality of the built environment.	Municipal/ Regional	Procedural					x	

Urban Form (cont'd)									
Title and Reference	Project Description			Equity Dimensions					Evaluated
	What Is Happening?	Jurisdiction	Intervention Type	Addressing Determinants	At-Risk Groups	Equity Outcomes	Unintended Consequences	Community Engagement	
<b>La prise de décision en urbanisme</b> <sup>91</sup>	Toolkit for urban planners and developers intended to aid in the interpretation of legislation related to urban regions.	Provincial/ Territorial	Procedural						

**Urban Built Environment**

Title and Reference	Project Description			Equity Dimensions					Evaluated
	What Is Happening?	Jurisdiction	Intervention Type	Addressing Determinants	At-Risk Groups	Equity Outcomes	Unintended Consequences	Community Engagement	
<b>Region of Waterloo Pedestrian Charter</b> <sup>71</sup>	Aims to maintain infrastructure, ensure access to walking routes and increase use of public transit. Goals include improving health, vitality and safety of communities and increasing public green space and social interaction.	Municipal/ Regional	Procedural	x	x			x	
<b>British Columbia Smart Growth on the Ground</b> <sup>22, 40</sup>	Engages communities in planning for sustainable land use, transportation and urban design.	Provincial/ Territorial	Procedural					x	x
<b>Green Building Policy for Government of Manitoba Funded Projects</b> <sup>20, 92</sup>	This policy is intended to “green” new and renovated buildings funded by the Province of Manitoba to reduce the negative impact of the building sector on the environment and human health. Because no single set of standards exists, the government relies on a set of voluntary programs (such as LEED and PowerSmart) to meet the objectives of the province’s <i>Sustainable Development Act</i> .	Provincial/ Territorial	Procedural						

Urban Built Environment (cont'd)									
Title and Reference	Project Description			Equity Dimensions					Evaluated
	What Is Happening?	Jurisdiction	Intervention Type	Addressing Determinants	At-Risk Groups	Equity Outcomes	Unintended Consequences	Community Engagement	
<b>Mitigating New York City's Heat Island With Urban Forestry, Living Roofs and Light Surfaces<sup>93</sup></b>	Modelling exercise intended to demonstrate to policy-makers the potential for urban forestry, living roofs and light surfaces to mitigate the urban heat island effect that is observed in the New York metropolitan region. The project is also intended (among other objectives) to evaluate the consequences of heat islands by monitoring air quality readings and/or health impacts.	Municipal/ Regional	Procedural	x		x			
<b>Ottawa 20/20: Environmental Strategy<sup>21</sup></b>	Outlines commitments to improve environmentally sustainable practices, with a strong focus on external engagement. Actions and commitments set out in the plan are aimed at city operations and influencing the actions of other organizations and individuals within the community.	Municipal/ Regional	Procedural			x	x	x	

Urban Built Environment (cont'd)									
Title and Reference	Project Description			Equity Dimensions					Evaluated
	What Is Happening?	Jurisdiction	Intervention Type	Addressing Determinants	At-Risk Groups	Equity Outcomes	Unintended Consequences	Community Engagement	
<b>The Sustainable Cleveland Partnership</b> <sup>26</sup>	Recognizing the need within low-income and minority communities for access to information on aspects of environmental risk that may impact their health, the project engages participants in identifying both risks and potential actions to mitigate those problems and trains communities to identify risks within their own neighbourhoods.	Municipal/ Regional	Informational	x	x	x	x	x	x
<b>Neighbourhoods Alive! Winnipeg Neighbourhood Renewal Fund</b> <sup>44</sup>	Fund available to incorporated non-profit organizations to support initiatives that enhance urban neighbourhoods. Eligible activities include neighbourhood capacity-building, neighbourhood stability and the improvement of physical infrastructure to support the health and well-being of residents (improved public park spaces and community gardens).	Provincial/ Territorial	Fiscal	x	x			x	

Urban Built Environment (cont'd)									
Title and Reference	Project Description			Equity Dimensions					Evaluated
	What Is Happening?	Jurisdiction	Intervention Type	Addressing Determinants	At-Risk Groups	Equity Outcomes	Unintended Consequences	Community Engagement	
<b>Green Roofs in the New York Metropolitan Region</b> <sup>41</sup>	Explores the development of green rooftops in New York City to mitigate high urban temperatures. Research report provides policy-makers with information (including on cost-effectiveness) to inform the implementation of green roof policies as a solution to improve New York City's environmental challenges.	Municipal/Regional	Informational			x			
<b>Live Smart B.C.: Green Cities Awards (2007–2008)</b> <sup>43</sup>	Offers financial incentives to community-level projects or programs that support healthier, greener lived environments. The program's goal is to fund interventions that meet set criteria.	Provincial/Territorial	Fiscal	x					

Urban Built Environment (cont'd)									
Title and Reference	Project Description			Equity Dimensions					Evaluated
	What Is Happening?	Jurisdiction	Intervention Type	Addressing Determinants	At-Risk Groups	Equity Outcomes	Unintended Consequences	Community Engagement	
<b>Draft Manitoba Provincial Land Use Policies</b> <sup>73</sup>	Designed to guide the development of land use planning in the province, this resource seeks to ensure sustainable development in the province and development in the best interests of the public. The resource consists of several policy areas related to development, natural or heritage resources, water, infrastructure and transportation and mineral resources.	Provincial/Territorial	Procedural	x				x	
<b>The National Strategy for Neighbourhood Renewal</b> <sup>66</sup>	Governed by the U.K. Neighbourhood Renewal Unit. Focuses on six themes of renewal in under-served, lower-income or otherwise deprived areas to create sustainable, healthy communities within 10 to 20 years. Housing and built environment comprise 7% of the total spending.	Federal	Procedural	x	x	x	x	x	x

Urban Built Environment (cont'd)									
Title and Reference	Project Description			Equity Dimensions					Evaluated
	What Is Happening?	Jurisdiction	Intervention Type	Addressing Determinants	At-Risk Groups	Equity Outcomes	Unintended Consequences	Community Engagement	
<b>Living Building Challenge 2.0</b> <sup>52</sup>	Standards for the production of “socially just, culturally rich and ecologically benign” communities based on seven focus areas, including health and equity. Provides a framework for design, construction and the symbiotic relationship between people and “all aspects of the built environment.”	International	Procedural	x	x	x	x	x	
<b>Let’s Move Cities and Towns</b> <sup>34</sup>	Toolkit with steps for local communities to design and implement policies to improve children’s activity levels and nutrition. Addresses aspects of healthy built environments to improve access to recreational or safe walking areas, integrate physical activity and green space planning into “every physical improvement to the city” and identify high-traffic areas that limit active transit to and from schools. Developed out of the Let’s Move campaign championed by Michelle Obama.	Federal	Procedural	x	x	x		x	

Urban Built Environment (cont'd)									
Title and Reference	Project Description			Equity Dimensions					Evaluated
	What Is Happening?	Jurisdiction	Intervention Type	Addressing Determinants	At-Risk Groups	Equity Outcomes	Unintended Consequences	Community Engagement	
<b>Toronto Pedestrian Charter</b> <sup>70</sup>	Promotes increased use of public transit, decreased car dependence, reduction of conflict between vehicles and pedestrians, cleaner air, increased public green space and green tourism.	Municipal/Regional	Procedural	x	x	x		x	
<b>Sudbury Pedestrian Charter</b> <sup>94</sup>	Adapted from the Toronto Pedestrian Charter. Promotes consideration of health in planning for the municipality, and encourages walker-friendly environments.	Municipal/Regional	Procedural	x	x	x			
<b>Pedestrians and Sidewalks: New York Public Plaza Program</b> <sup>95</sup>	Promotes the development of environmentally friendly public plazas throughout the city to ensure that every New Yorker lives within a 10-minute walk of a "quality open space."	Municipal/Regional	Fiscal	x	x			x	
<b>Leadership in Energy and Environment Design (LEED) Green Building Rating System</b> <sup>96</sup>	Targets new commercial construction, major renovation projects and high-rise residential buildings. Addresses the reduction of heat island effects through green or energy-efficient construction.	International	Procedural					x	

Urban Built Environment (cont'd)									
Title and Reference	Project Description			Equity Dimensions					Evaluated
	What Is Happening?	Jurisdiction	Intervention Type	Addressing Determinants	At-Risk Groups	Equity Outcomes	Unintended Consequences	Community Engagement	
<b>Planning by Design</b> <sup>14</sup>	Presents best practices from across Canada for planning healthy, active communities to improve human health. Developed by the Ministry of Municipal Affairs and Housing in partnership with the Ontario Professional Planners Institute.	Provincial/ Territorial	Procedural	x	x	x		x	
<b>City of Waterloo Draft Official Plan</b> <sup>72</sup>	Outlines Waterloo's urban planning and design policy. Includes strategies to create "healthy, liveable spaces" and to promote a healthy physical environment with improved air quality and reduced adverse conditions, such as urban heat island effects.	Municipal/ Regional	Procedural	x		x		x	

Green Space									
Title and Reference	Project Description			Equity Dimensions					Evaluated
	What Is Happening?	Jurisdiction	Intervention Type	Addressing Determinants	At-Risk Groups	Equity Outcomes	Unintended Consequences	Community Engagement	
<b>British Columbia Brownfield Renewal Strategy</b> <sup>45</sup>	Supports redevelopment of unused or underused lands that are thought to be contaminated from past commercial or industrial activity. Funds are available to non-profit organizations, First Nations, local governments and others. Fosters public policy that supports redevelopment and targets investment to encourage remediation.	Provincial/ Territorial	Fiscal						
<b>City of Toronto Tree Planting Services</b> <sup>47</sup>	A brochure that details how to obtain a free tree on City-owned street allowances, which make up the front of residential properties.  Accompanying materials explain how trees can help mitigate problems such as heat and air pollution.	Municipal/ Regional	Fiscal	x					

Green Space (cont'd)									
Title and Reference	Project Description			Equity Dimensions					Evaluated
	What Is Happening?	Jurisdiction	Intervention Type	Addressing Determinants	At-Risk Groups	Equity Outcomes	Unintended Consequences	Community Engagement	
<b>California Healthy Cities and Communities</b> <sup>54</sup>	California-based community gardening program implemented in partnership with municipalities and non-governmental organizations that provided funding, land and capacity-building support/training. Supports policy, advocacy and public education, involving local residents as partners in the development and maintenance of the gardens.	Provincial/Territorial (U.S. State)	Informational	x	x	x	x	x	

Heat									
Title and Reference	Project Description			Equity Dimensions					Evaluated
	What Is Happening?	Jurisdiction	Intervention Type	Addressing Determinants	At-Risk Groups	Equity Outcomes	Unintended Consequences	Community Engagement	
<b>Heat Awareness and Response Among Montréal Residents With Chronic Cardiac and Pulmonary Disease</b> <sup>27</sup>	Evaluates access to information and resulting behaviour change within populations affected by chronic heart and lung disease (changes in awareness, attitudes and behaviours) as a result of heat advisories in Montréal.	Municipal/ Regional	Informational	x	x			x	x
<b>Toronto Shade Policy</b> <sup>67</sup>	Promotes development of shaded public spaces across the city. Primary goal is to reduce individuals' exposure to UV radiation and the incidence of related cancers. Encourages planning for and creation of natural (such as trees) and constructed (such as awnings) shade.	Municipal/ Regional	Procedural		x	x		x	
<b>Toronto Heat Vulnerability Assessment</b> <sup>50, 65</sup>	Designed to provide in-depth information about the methods used by Toronto Public Health during declared heat events to identify groups or individuals who are at risk of mortality based on pre-determined risk factors.	Municipal/ Regional	Informational	x	x	x	x		

Heat (cont'd)									
Title and Reference	Project Description			Equity Dimensions					Evaluated
	What Is Happening?	Jurisdiction	Intervention Type	Addressing Determinants	At-Risk Groups	Equity Outcomes	Unintended Consequences	Community Engagement	
<b>Canadian National Forest Strategy</b> <sup>53</sup>	Supports funding for public education, promotes knowledge exchange between and engagement of multiple sectors and encourages development of communication tools and external research.	Federal	Procedural	x	x	x		x	
<b>Évaluation de la campagne d'éducation sur les risques à la santé reliés aux épisodes de chaleur accablante et sur les mesures à prendre pour se protéger</b> <sup>23</sup>	An evaluation of Montréal's heat extremes education and awareness campaign. Designed to assess uptake of advisories disseminated to the public during heat events, particularly to at-risk groups. Evaluation found promotional tools were most effective when used alongside other sources of information and when specific strategies were established to ensure that people with reduced mobility had access to messages and dissemination pathways.	Provincial/ Territorial	Informational	x	x	x	x	x	x

Heat (cont'd)									
Title and Reference	Project Description			Equity Dimensions					Evaluated
	What Is Happening?	Jurisdiction	Intervention Type	Addressing Determinants	At-Risk Groups	Equity Outcomes	Unintended Consequences	Community Engagement	
<b>Guide d'intervention chaleur accablante, volet santé publique</b> <sup>38</sup>	Developed in response to extreme heat events experienced in summer 2005. Outlines steps for coordinating public health practice in hot weather responses. Indicates thresholds based on research and specifies general phases in mobilization, as well as particular tasks to be completed. Suggests responsibilities for public health and public safety officials.	Provincial/Territorial	Procedural	x	x			x	
<b>Plan d'action 2006-2012 sur les changements climatiques (PACC)—Volet santé</b> <sup>46</sup>	Climate change strategy focuses on six areas; includes public health preventive efforts and urban planning initiatives to reduce impact of urban heat islands on vulnerable populations. Funding for projects carried out by municipalities or non-profit organizations.	Provincial/Territorial	Fiscal	x	x			x	

Heat (cont'd)									
Title and Reference	Project Description			Equity Dimensions					Evaluated
	What Is Happening?	Jurisdiction	Intervention Type	Addressing Determinants	At-Risk Groups	Equity Outcomes	Unintended Consequences	Community Engagement	
<b>Plan régional socio-sanitaire de prévention et protection en cas de chaleur accablante et de chaleur extrême</b> <sup>97</sup>	Outlines policies and practices for public health heat response (including prevention, preparation, surveillance and emergency response). Highlights levels of alert and mobilization and defines at-risk populations. Initiatives include distribution of water and contact with and support for at-risk populations.	Municipal/Regional	Procedural	x	x			x	

**Note**

An X in the equity and evaluation cells indicates that analyses readily identified that component in the related documentation. Certain interventions may have equity or evaluation components in some form, beyond what was available in the sample. Limitations related to scope and methodology of this review should be considered when interpreting these results.

## Appendix C: Detailed Table of Evaluated Interventions

Intervention	Evaluation Type	Approach	Measures	Findings
<b>National Air Quality Health Index Program (2010 Survey of Knowledge and Attitudes About Air Quality and Air Quality Indices in Canada)</b> <sup>25</sup>	Behavioural Outcomes	Survey of general public and groups at risk for health effects from ambient air pollution. Telephone interviews conducted by third party with 1,405 members of general public and 396 people identified as having a risk factor.	Awareness of health effects of air quality; reach and adoption of the air quality index.	Findings suggest that Canadians are aware of the health risks of outdoor air pollution; however, less than half seek out air quality information occasionally or regularly. Those with a chronic condition are more likely to seek out information.
<b>National Air Quality Health Index Program (Evaluation)</b> <sup>24</sup>	Process; Behavioural and Health Outcomes	Document and data review; key informant interviews with program managers and regional stakeholders; third-party program performance measurement data.	Relevance, reach (awareness of air quality health index); effectiveness (likely to use it, knowledge and behaviour change, incidences of air quality-related mortality and morbidity); cost-effectiveness.	Stakeholders agree the index was relevant for improving health; the intervention is widely available across Canada, although attention is needed in rural and remote areas; intervention is effectively disseminating messages and targeting vulnerable populations, although there should be more engagement with local and emerging media sources; it was too early to determine changes in behavioural and health-related outcomes, although there was progress in establishing baseline data; intervention is cost-effective and well managed.
<b>The Chicago Community Education Workshop</b> <sup>39</sup>	Behavioural Outcomes	Pre- and post-intervention questionnaire with participants (n = 99) immediately before and following the intervention and a follow-up survey one year after the intervention.	Knowledge retention.	Post-intervention testing showed information gain immediately following the workshop; however, the one-year follow-up survey found declines in knowledge about how to find air quality information compared with knowledge immediately following the intervention. Results were not statistically significant.

Intervention	Evaluation Type	Approach	Measures	Findings
<b>Smart Growth on the Ground</b> <sup>22</sup>	Process	Literature review; self-assessment questionnaire with staff, partner advisory committee members and funders; focus groups with community participants; key informant interviews with staff and partners.	Strengths, challenges and lesson learned from the process of implementing the intervention.	Findings suggest adequate sharing of information and awareness-raising and an appropriate format for working together. Results also show not enough efforts to consider social determinants of health, such as employment and affordable housing, and not enough engagement with Aboriginal communities.
<b>Heat Awareness and Response Among Montréal Residents With Chronic Cardiac and Pulmonary Disease</b> <sup>27</sup>	Behavioural Outcomes	One hour face-to-face interviews with patients (n = 238) with chronic conditions (heart failure and chronic obstructive pulmonary disease).	Reach of heat advisories and adoption of messages.	90% recalled hearing a heat advisory (239); 85% could name a recommended action to take; all reported applying one of the recommended measures “always” or “often.”
<b>Effects on Respiratory Health of a Reduction in Air Pollution From Vehicle Exhaust Emissions</b> <sup>28</sup>	Health and Environmental Outcomes	Natural experiment related to construction of a bypass. Pre- and post-intervention traffic counts, pollutant measures, respiratory health measures from survey and testing devices with residents and local workers in high-traffic and lower-traffic areas.	Changes in pollutant levels, pulmonary function test and various self-reported health measures (such as respiratory, ocular and nasal symptoms).	Decreases in traffic counts in congested areas and decreases in outdoor air pollution in both congested and non-congested areas. There were also significant improvements in ocular and nasal symptoms; however, lung function did not improve and there were no reductions in reporting wheezing or asthma.
<b>Plan d'action 2006-2012 sur les changements climatiques (PACC)—Volet santé</b>  <b>Evaluation of the Education Campaign on Health Risks Associated With Heat Waves and on Related Protection Measures</b> <sup>23</sup>	Process; Behavioural Outcomes	Content and media analysis; visits to information-distribution sites; third-party telephone survey and focus groups with at-risk populations age 65 and older.	Reach and adoption of messages.	Television media had the highest reach; information distribution site and format of materials improved reach; for groups with moderate to high exposure, there was a link between increased knowledge and adoption of protective behaviours.

Intervention	Evaluation Type	Approach	Measures	Findings
<b>The Sustainable Cleveland Partnership</b> <sup>26</sup>	Behavioural Outcomes	Website hits; internet use and access; leadership training program graduates.	Reach, effectiveness, adoption, replication, internet use (skills enhancement).	Information available to residents has improved; internet access and use has improved; actions have been spurred by the intervention—petition to prevent pollution-emitting equipment from entering their neighbourhood; program has been replicated in other cities.
<b>The National Strategy for Neighbourhood Renewal</b> <sup>66</sup>	Health and Health-Related Outcomes	Analysis of community characteristics pre- and post-strategy implementation.	Gap between deprived and less-deprived areas based on life expectancy; employment and education outcomes.	Improved education outcomes in deprived areas; employment outcomes improved for ethnic communities; gaps in life expectancy between deprived and less-deprived areas remained static.



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