Healthy Canada by Design
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Introduction

On behalf of the Heart and Stroke Foundation, I am proud to present this special supplementary issue of the Canadian Journal of Public Health, which is dedicated to the work undertaken by the partners of the Healthy Canada by Design (HCBD) CLASP I Coalition.

The HCBD CLASP Coalition, which began in 2009, has been funded for five years by the Canadian Partnership Against Cancer through the Coalitions Linking Action and Science for Prevention (CLASP) initiative and Health Canada. There have been two phases to the HCBD CLASP Coalition: CLASP I, funded from 2009 to 2012, and CLASP Renewal, funded from 2012 to 2014. The current CJPH Supplement contains articles based on projects funded under CLASP I only. The HCBD CLASP Coalition is an intersectoral partnership. Under CLASP I, it included ten partners: four national partners and six public health authorities from three provinces.

The Coalition’s vision is one in which health officials, planners, engineers, non-governmental organizations and academics in communities across Canada collaborate to create healthy built environments that support and foster health and healthy living. The Coalition is particularly focused on creating communities that promote physical activity, with the long-term goal of reducing chronic diseases such as heart disease, cancer and diabetes.

The eight articles in this Supplement address the policy-oriented research conducted, the tools and resources that were developed, and the interventions that were employed, all with the goal of bringing health considerations into land use and transportation planning processes that shape communities and affect the health of those who reside in them.

It has been the Foundation’s privilege to be the lead agency providing strategic and administrative support to the Healthy Canada by Design Coalition for the last five years.

*Manuel Arango, Director, Health Policy
Heart and Stroke Foundation*
Healthy Canada by Design: Translating science into action and prevention

David L. Mowat, MBChB, MPH, FRCPC, FFPH

Ten years ago, few readers of the Canadian Journal of Public Health would have had more than a passing acquaintance with the issue of the built environment and health. Today, it has entered the mainstream of public health practice. The topic appears on conference programs, students expect to hear about it, and more research is undertaken and published. From 1993 to 2003, Medline listed 176 articles related to the built environment; between 2003 and 2013, there were 1,003. Most published studies examine relationships among land use planning, walkability, active transportation and a variety of health outcomes, such as body mass and diabetes, as well as topics as diverse as social connectedness, injuries and air quality.

What can we conclude from this body of research? Cross-sectional associations — such as those between land use planning measures, particularly residential density, use of active means of transportation, and the prevalence of obesity — have been consistently replicated. This evidence is far from conclusive, however; there are few results from longitudinal studies, and methodological challenges abound. For instance, measurements of land use characteristics on one geographic scale may not capture the whole effects on a different scale: example, a small oasis of new urbanism set in a large area of car-dependent suburbs may not be completely effective. The challenge often lies in the inherent complexities of the objects under study: built form, systems of land use and transportation planning, and interventions. Little wonder that today we cannot confidently answer questions such as “How can we design neighbourhoods in which children are more likely to walk or cycle to school?” or “What is the net effect of traffic roundabouts on health?”

While there is clearly a need for more empirical research, we should be realistic about the likelihood of generating simple answers that can easily be translated into action everywhere. As Pawson puts it: “Social interventions are so complex that there is little hope of reproducing them lock, stock and barrel, and, even if one could, they are so context sensitive that the “same” assemblage may then go on to misfire. However, what one can do by way of planning in open systems is to gather vast experience of the options and possibilities and to figure out what kinds of things work for what kinds of subjects in what kinds of situations.”

Practitioners of public health are convinced that the characteristics of the built environment exert an important influence upon health, but are not yet able to find solid evidence to guide specific interventions in their local circumstances. But the argument for acting now is persuasive. Between 1978 and 2009, the prevalence of diabetes is rising – from 6.4% in 2002/03 to 8.7% in 2008/09. Only 15% of adults and 7% of children and youth engage in recommended levels of physical activity, and the fitness levels of children and youth declined between 1981 and 2007-09. Around major cities, farmland continues to be paved over for low-density, car-dependent housing developments. At the same time, those concerned with environmental sustainability, quality of life or the economic losses due to traffic congestion or the maintenance of sprawling infrastructure have voiced their own concerns. Better land use planning and transportation policies appear to offer a wide range of societal benefits with little indication of negative effects. The challenge is to find the means of effecting the desired change.

Coalitions Linking Action and Science for Prevention (CLASP), a granting program funded by the Canadian Partnership against Cancer and by Health Canada, is intended to translate knowledge into action, to promote partnership among interested parties and to generate “practice-based evidence” in recognition that coupling innovative practices with the appropriate research apparatus may lead to breakthrough knowledge about the processes and effects of complex systems such as population health interventions. One of the coalitions funded by CLASP is Healthy Canada by Design (HCBD), whose members include the Urban Public Health Network (the medical officers of health of 19 large cities), the Heart and Stroke Foundation, the Canadian Institute of Planners, the National Collaborating Centre for Healthy Public Policy, and the Canadian Institute of Transportation Engineers. The first phase encompassed work from six health authorities in three provinces, as described by Miro and colleagues in the summary of HCBD. The current phase of work, which is not reflected in this supplement, has expanded to include six additional health authorities from five additional provinces.

The papers in this supplement describe some of the activities of HCBD taking place in Vancouver, Toronto and Montreal, and the progress that has resulted. Macfarlane and colleagues, writing about Toronto, provide a reminder that the built environment as a health issue has, in some places, a history of several decades, in the form of the Healthy Cities movement, providing a foundation for the current initiatives. Montreal has a history of engaging neighbourhoods and non-governmental organizations (NGOs) in issues concerning the built environment, as related in the paper by Dubé and colleagues on the participation of citizens in the development of public policies for active transportation.

The paper by Gagnon and Bellefleur examines two aspects of the development of healthy public policies: predicting effects and assessing political viability. The first of these is taken up by Ulmer et al., who describe the application of an evidence-based software tool to guide specific interventions in their local circumstances.
tool in a health impact evaluation of the redevelopment of a brownfield site in Toronto. The paper by Moloughney et al. describes another evidence-based tool and how it is being adopted for routine use in the assessment of development proposals, mainly in greenfield sites, in the Region of Peel. Miro and colleagues reflect upon the experience in British Columbia in increasing the capacity to participate in planning processes for land use and transportation, building relationships among stakeholders and influencing plans and policies. Last, illustrating the issue of political acceptability, the results of a residential preferences survey conducted in the Greater Toronto Area and Metro Vancouver by Frank and colleagues demonstrate a demand for walkable communities that is not being fully met by present patterns of development.

The projects described here show how it is possible to build upon empirical evidence to develop initiatives that test practical approaches and to share the findings with others. These represent a small part of the activity undertaken by public health in collaboration with planners, transportation engineers, NGOs and others across Canada. At the same time, we must continue to assess new practices as rigorously as possible in order to produce knowledge that is generalizable. This will be challenging, for the reasons given above; however, only through a combination of both empirical research and theoretically informed, critical observation of practice will this field continue to advance.

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Healthy Toronto by Design: Promoting a healthier built environment

Ronald G. Macfarlane, MSc, Linda P. Wood, MA, Monica E. Campbell, PhD

ABSTRACT

Chronic diseases, obesity and sedentary lifestyles are some of the health challenges facing Canada today. There is increasing recognition and evidence that the way our cities are planned, designed and built can contribute to these problems. Many of the policy levers to address the built environment exist outside the health sector and at the municipal level in areas such as urban planning, transportation, parks and recreation, and housing. The challenge for the public health sector is to build and sustain partnerships and collaboration across various sectors to ensure that health is considered in built environment policies. As the public health unit for the city of Toronto and part of the municipal government, Toronto Public Health is in a unique position to provide leadership, advocacy and support for healthy municipal public policies related to the built environment. This article provides some examples of CLASP (Coalitions Linking Action and Science for Prevention) initiatives undertaken to help create support for healthy public policies in the built environment and suggests that the “Healthy Cities” approach is a useful framework to promote policy change in the built environment at the municipal level.

KEY WORDS: Public policy; public health; built environment; urban planning; urban health; intersectoral action


A Healthy Cities approach to the built environment

The concept of a Healthy City can be traced back to Edwin Chadwick, secretary to the Health in Towns Commission established in England in 1843. Canada established the Commission on Conservation in 1909. Its Public Health Committee identified good town planning as integral to the preservation of the environment and people’s health. Toronto was one of the first cities in the world to begin chlorination of drinking water in 1910, which by 1915 was followed by chlorination of sewage and water filtration. In July 1915, Maclean’s magazine declared Toronto the healthiest of large cities in the world. This high level of public health was achieved through the leadership of Dr. Charles Hastings, Toronto’s Medical Officer of Health, the political commitment of City Council and the support of the community. These public health interventions and those that followed have greatly reduced the burden of illness from communicable diseases.

After a post-World War II hiatus, the 1980s brought a renewed interest in the impacts of urban environments on health. The Healthy Cities concept grew out of the Beyond Health Care Conference held in Toronto in 1984. This was followed by a project of the World Health Organization (WHO) Regional Office for Europe initiated in 1985, which eventually led to the creation of the global Healthy Cities movement, in which cities around the world adopted an intersectoral approach to urban health. This movement sought to apply the health promotion concepts and strategies as identified in the Ottawa Charter at the local level.

The Healthy City approach recognizes that health is influenced by the social, economic and environmental conditions of cities.
HEALTHY TORONTO BY DESIGN

Making Toronto healthy by design

At the same time as the WHO was developing its Healthy Cities initiatives, Toronto was taking steps in the same direction. In 1986, the Toronto Board of Health established a Healthy Toronto 2000 Subcommittee to provide guidance on how to create a healthier city, which ultimately led to the creation of a Healthy City Office in 1989. At the recommendation of the Board, in 1987 the former City of Toronto also approved the creation of the Environmental Protection Office (EPO) within the health department with the mandate to identify and prevent environmental threats to human health in Toronto.

After the amalgamation of the six municipalities of Metropolitan Toronto in 1998, there was a shift from a focus on a healthy city to environmental sustainability. The Healthy City Office, which had been integrated into the office of the Chief Administrative Officer Strategic and Corporate Policy unit, steered the publication of the Environmental Plan in 2001. During a reorganization of City departments in 2006 the Office was dissolved and the Toronto Environment Office (TEO) created. The TEO released the Climate Change, Clean Air and Sustainable Energy Action Plan in 2007. The municipal elections of 2010 resulted in a major change in the City’s policy environment, the Mayor and City Council focusing on fiscal responsibility in the City’s administration. In 2010, Toronto Public Health (TPH) created the Healthy Policy Directorate into which the EPO was integrated. The new directorate’s mandate is to address environmental, social and economic determinants of health.

In Toronto, the public health department is part of the municipal government. This provides a more direct opportunity to influence the local decision-making process. TPH is the largest health unit in Canada and is responsible for protecting and promoting the health of approximately 2.7 million residents of the City of Toronto. Public health units are mandated by the Ontario Public Health Standards (2008) to work with the municipality in order to support the development of healthy public policies and create supportive built environments. Championing healthy public policy using whole-of-government approaches and cross-sectoral collaboration has been identified as a strategic priority for TPH. TPH used the release of the report Healthy Toronto by Design in October 2011 to champion consideration of health in municipal government decision-making through the renewed application of the Healthy City approach at a time when the Mayor was focused on reducing public expenditures.

Initiatives to improve Toronto’s built environment

As an active member of the Urban Public Health Network, TPH was invited in 2009 to participate in several CLASP initiatives: developing health-based decision-support tools for use in land-use planning processes; improving understanding and awareness of the relationship between the built environment and health outcomes; and exploring how policy enhancements and public engagement can be used to develop healthier environments that will ultimately contribute to preventing chronic diseases (Table 1). These initiatives have involved collaboration with City divisions, such as City Planning, the Tower Renewal Office and Transportation Services, and community partners, including the Centre for Urban Growth and Renewal, the Toronto Centre for Active Transportation and the United Way. They contribute to advancing healthy built environments by increasing the evidence base through research, synthesizing knowledge, providing decision-support tools, improving knowledge transfer and enhancing promotion of healthier options.

DISCUSSION

Healthy Cities has been described as a social movement that aims to improve the health of people living in cities. Its foundational
Health is often a powerful motivator for addressing planning issues. Putting evidence into the local context, with local data and the cost-benefit of the proposed policy, can make it easier to obtain support from municipal decision-makers. As described below, the CLASP initiatives have provided information relevant to the Toronto context.

The Walkable City used results from the Residential Preferences Survey to outline the benefits of a more walkable built environment and the latent demand for living in more activity-friendly neighbourhoods. As reflected in the degree of media attention it received, the message found widespread resonance in the community. This fosters greater support for changes that are needed to create walkable neighbourhoods. Similarly, Road to Health and Toward Healthier Apartment Neighbourhoods were prepared in order to inform the debate by making evidence more directly relevant to the lived experience of people and decision-makers in Toronto. These reports spurred collaborations with different partners to address the concerns highlighted. TPH is now working with the City's Transportation Services Division and the Toronto Centre for Active Transportation to demonstrate options for making neighbourhoods safer for cyclists and pedestrians. As well, City Planning has invited TPH to collaborate with them in addressing zoning barriers to the transformation of existing apartment neighbourhoods into healthier spaces.

Taking advantage of windows of opportunities for intervention is also critical. In July 2011, City Council approved a public and stakeholder consultation strategy for development of the Parks Plan. TPH used modules of the Built Environment Health Impact Assessment Software Tool to identify low-income areas of the City that were underserved. This led the Board of Health to recommend that specific attention be given to these areas when plans are made to create new park space, enhance tree cover or build recreation facilities.

City Planning is undertaking the five-year review of Toronto’s Official Plan. The roundtable workshop Planning a Healthier Toronto identified high-priority issues in Toronto, which were presented to the Board of Health and used to provide feedback to the City’s Chief Planner. As a result of this effort, City Planning has recognized the need for the Official Plan to better address neighbourhoods that are not currently designed optimally for health and that are experiencing little or no new development, including areas that are less walkable as identified using the Software Tool.
The inventory Creating Healthy Built Environments\textsuperscript{18} provides evidence in another way – it shows what can be done. The aim is to demonstrate to decision-makers and other stakeholders that certain options are feasible and to thus provide support for their wider implementation.

The Healthy Cities approach fosters intersectoral action, uses evidence to create a common understanding and puts health as a common goal to effect changes in policies. If, as Fafard\textsuperscript{19} suggests, policy-making is a social process whereby evidence is socially constructed, then deliberations between people with different understandings of how best to solve an issue are a critical part of the policy-making process and the advancement of healthier built environments. Healthy Toronto by Design\textsuperscript{8} provides an overall framework around which TPH frames the debate. To the extent that there is agreement among various actors about the goal of creating a healthy city, it provides a common ground on which to start deliberations on how best to achieve this goal. The CLASP initiatives highlighted here can be seen as supporting policy change through the provision of health evidence to create a common understanding and purpose.

CONCLUSION
Shifts in urban planning decision-making in favour of environments and policies that integrate population health goals and aim to reduce health inequalities will likely happen in small increments. Building the evidence base and engaging in dialogue with elected representatives, various government actors, the general public and the business sector can create a common understanding and build alliances for positive change.

Creating a healthy built environment requires municipal decision-makers to be aware of the potential health impacts of various decisions and the benefits of ensuring that health is considered in the decision-making process. TPH has used evidence from CLASP initiatives and tools to promote healthier built environments. Various strategies are needed to incorporate health in municipal decision-making, such as fostering system-wide, whole-of-government policies in order to develop common approaches to cross-cutting issues that affect health, and collaborating with colleagues in other municipal sectors, such as city planning, transportation, and parks and recreation, to promote healthy municipal public policy.

Making a healthy and sustainable built environment is a complex process in which the public health sector can provide leadership and support. To be successful, it will require civic participation, partnerships and collaboration among all sectors of society: government, business and the community. Healthy Cities provides a framework to foster change that uses the common goal of health to mobilize action.

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Influencing public policies: Two (very good) reasons to look toward scientific knowledge in public policy

François Gagnon, PhD, Olivier Bellefleur, MSc

ABSTRACT

The healthy public policy movement rests on the belief that a range of public policies should be at least partly informed by evidence demonstrating the positive effects of these policies on population health, health inequalities and their determinants. In order to address certain difficulties that the movement faces, knowledge produced in various scientific disciplines regarding public policies may provide some valuable guidance.

In this short commentary, we examine how knowledge from the scientific disciplines investigating public policies makes it possible to address two difficulties in the development of healthy public policies: 1) adequately anticipating the effects of public policies, and 2) assessing the political viability of the policies being promoted. Since urban traffic policies are of interest to most of the other contributors to this supplement, we use examples from this field to illustrate some of our points.

KEY WORDS: Public policy; effects; context; scales; temporal horizons; political viability

COMMENTARY

The healthy public policy movement rests on the belief that a range of public policies should be at least partly informed by evidence demonstrating the positive effects of these policies on population health, health inequalities and their determinants. In order to address certain difficulties that the movement faces, knowledge produced in various scientific disciplines regarding public policies may provide some valuable guidance.

In this short commentary, we examine how knowledge from the scientific disciplines investigating public policies makes it possible to address two difficulties in the development of healthy public policies: 1) adequately anticipating the effects of public policies, and 2) assessing the political viability of the policies being promoted. Since urban traffic policies are of interest to most of the other contributors to this supplement, we use examples from this field to illustrate some of our points.

Adequately anticipating the effects of public policies

When the effects of policy options have been poorly or incompletely evaluated, promoting these options may have favourable, neutral or even detrimental effects on population health, health inequalities and their determinants. This is why significant work in public health has gone into developing methods of analysis that can produce valid and reliable knowledge about these effects. However, an examination of methodologies developed in public health as well as scientific literature on public policies reveals that these methodologies still face at least two major obstacles: the transferability of research results, and public policies’ multiple levels, temporal horizons and scales of effects.

The transferability of research results is a concept that can well be summarized by the question: To what extent do study results make it possible to adequately anticipate what would happen if the policy option were implemented in a different context? While it may seem innocuous, this question nevertheless lies at the crossroads of several important and ongoing debates in the healthy public policy movement. These debates spring, in particular, from the temptation to apply “the gold standard” of evidence-based medicine – the randomized clinical trial – when developing evidence-based public policy. The randomized trial is an experimental protocol used to completely isolate a given intervention from all conjunctural or contextual factors that can influence its effects (whereas some variables are said to be confounding). This approach quickly comes up against a postulate of public policy science: the effects of a public policy depend partly on the conjuncture or context in which it is...
implemented. As a simple illustration of this idea, a given stretch of highway that resulted from a transportation policy will not have the same effects on population health, health inequalities and their determinants if it is built in a rural environment as if it were built in a densely populated environment.

So it is not enough to only ask which interventions generally allow a given health objective to be reached. Public health actors must also be able to assess the conditions under which such interventions produce the desired effects. For example, analyzing the mechanisms of action of interventions, in addition to their effects, is one way for public health actors to adjust the policy options they promote to the context in which they are working. Assessing these conditions and mechanisms of action has another evident benefit: it can help in understanding diverging and sometimes downright contradictory evaluation results, something in the face of which systematic reviews and metaanalysis leave us powerless. Various methodologies have indeed been developed to take into account the complexity of these dynamics, including “realist evaluation,” the work of the Cochrane Collaboration’s Public Health Group, and that of the National Collaborating Centre for Healthy Public Policy.

In addition, the literature on the effects of public policies clearly shows that attention must also be paid to another dimension of policy options that is sometimes insufficiently addressed in public health: the multiple levels, temporal horizons and scales of effects of public policies. Continuing with our previous example, a stretch of highway can have both positive and negative effects on different levels (the number and severity of collisions, physical activity and active transportation, noise, air quality, social relations, etc.). These effects will vary depending on the temporal horizon considered (short, medium or long term). They will also vary according to the scale or the geographic territory covered by the analysis. For example, one analysis has shown that areas immediately adjacent to highway stretches had been highly affected by their construction while more remote areas were significantly less so. The multiple levels, temporal horizons and scales of effects explain why public policies necessarily have different effects on various groups or subgroups within a given population. For example, many North American highway infrastructures in urban environments were built in close proximity to, if not directly through, disadvantaged neighbourhoods. The residents of these neighbourhoods (disadvantaged and less motorized) were thus obliged to endure more or less directly the impacts of such construction. The levels of impact, temporal horizons and scales of effects examined thus affect any evaluation of the effects of a policy option and any judgements that can be made about it.

Some of these issues are already being explored in the public health field, in particular through the use of health impact assessment methods. But it is necessary for public health actors to begin making more systematic examinations of the multiple levels of impact, temporal horizons and scales of effects of the policy options they are evaluating. This will certainly not simplify their task but it may lead to more complete assessments of the policy options they are asked to evaluate.

By context, we refer among other things to the “policy context” (or the policies concurrent to the one under scrutiny), the “organizational context” (or the structures, resources, ideological systems, etc. of the organizations concerned with a policy), the “environmental context” (the material physical and human milieu), etc.

Assessing the political viability of the policies being promoted

The contexts in which public health actors work determine which policy proposals have a chance of being implemented. In reality, at any given time certain types of change may be either completely or partially blocked, or more or less widely accepted. To take just one example: in recent years a growing increase in commute times by car has helped stimulate demand for other forms of mobility. This has helped create an opening for policies that promote a modal shift toward active and collective transportation. Such a conjunction could result in the recommendations of public health actors in this policy field being favourably received in the coming years.

Public health actors thus have an interest in carefully examining the contexts in which they are operating in order to be able to diagnose the blockages and openings present, and to determine their nature and scope. When facing more significant blockages, public health actors may need to consider medium- and long-term strategies. For example, they could begin by working on the social and cultural norms underpinning these blockages, as was done in the struggle against tobacco use.

Several analyses and analytical frameworks can be used, alone or in combination, to assess the political conjunctures in which public health actors operate and develop strategies to transform them. For example, work based on the Advocacy Coalition Framework shows how public policies implemented in a given political context can be understood as stemming from power relationships among changing coalitions of actors. Such actors will have both convergent (within a given coalition) and divergent (between different coalitions) ideologies and interests. This work notably demonstrates that policy change can come about in several ways. One such type of change is how external shocks can provoke a reorganization of the interests and ideologies of various actors and thus lead to a more or less significant reorganization of the relationships among coalitions. These new relationships can create different political conjunctures. For example, the return of more socio-economically advantaged groups to the core central neighbourhoods of many of Canada's cities has led to increased political demands for more peaceful environments and reduced environmental pressures, and thus for transportation policies that mitigate or reduce the impact of motorized travel on such living environments.

In summary, there are good reasons for public health actors who work to promote healthy public policies to become familiar with the science of public policy. In this short commentary, we have addressed two such reasons: 1) that knowledge in this field points to key issues to consider when developing and using knowledge, allowing one to adequately anticipate the effects of public policies on population health, and 2) that knowledge in this field can help public health actors to better analyze intervention contexts and thus develop more politically viable policy options and strategies.

By context, we refer among other things to the “policy context” (or the policies concurrent to the one under scrutiny), the “organizational context” (or the structures, resources, ideological systems, etc. of the organizations concerned with a policy), the “environmental context” (the material physical and human milieu), etc.

This change has occurred, despite the pursuit of a mobility policy, in most of the country’s large urban centres (with the exception of Vancouver) based on maintaining traffic fluidity even with a continually rising number of vehicle-km travelled.

This phenomenon is often referred to as “gentrification.”
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The unmet demand for walkability: Disparities between preferences and actual choices for residential environments in Toronto and Vancouver

Lawrence D. Frank, PhD, Suzanne E. Kershaw, MSA, James E. Chapman, MS, Monica Campbell, PhD, Helena M. Swinkels, MD, FRCPC

ABSTRACT

OBJECTIVES: Individual preferences for residential location, neighbourhood character and travel options are not always met. The availability and cost of housing and several other factors often require compromise. The primary objectives of this study were to examine neighbourhood preferences, quantify unmet demand for more walkable environments and explore associations between the built environment, travel behaviour and health after controlling for neighbourhood preference.

METHODS: A web-based, visually oriented residential preference survey was conducted with 1,525 adults in the Greater Toronto Area and 1,223 adults in Metro Vancouver aged 25 and older (5.8% and 11.8% of total potential recruits, respectively). Participants were randomly selected from a pre-recruited panel across a range of objectively calculated walkability and income levels at the forward sortation area level.

RESULTS: Depending on the neighbourhood design attribute, between 45% and 64% of residents in the cities of Toronto and Vancouver strongly preferred living in walkable settings, compared with between 6% and 15% who strongly preferred auto-oriented places. Of participants who perceived their current neighbourhood as very auto-oriented, between 11% and 20% of City of Toronto participants and 6% and 30% of City of Vancouver participants strongly preferred a very walkable neighbourhood. Residents of highly walkable neighbourhoods reported walking significantly more for utilitarian purposes, taking public transit more frequently and driving fewer kilometres.

CONCLUSION: Strong preferences for walking and transit-supportive neighbourhoods exist in two of Canada's largest metropolitan regions, with considerable unmet demand observed for such environments. The findings provide evidence for policies that enable walkability and inform market analysis, planning and regulatory approaches that better align with the supply and demand of more walkable neighbourhood environments. Providing increased opportunities for active transportation can have positive impacts on health-enhancing behaviours.

KEY WORDS: Residential selection; walking; city planning; environment and public health; neighbourhood; Canada

The health impacts of neighbourhood design features have gained increasing attention in recent years. The World Health Organization, US Centers for Disease Control and Prevention, the Heart and Stroke Foundation of Canada and other organizations have all established policy statements to promote healthy urban environments globally in light of rapid urbanization, aging populations, low rates of physical activity and obesity.1,2,4,6

Rapidly accumulating evidence documents consistent positive associations between built environments that are supportive of walking and non-motorized travel.4,6 Specifically, residents of neighbourhoods with higher residential density, proximity to commercial destinations, increased street connectivity and good public transportation walk more for transportation purposes and drive less than residents of less walkable neighbourhoods, characterized by low-density development and homogenous land uses often described as “suburban”.7,9 Although associations between the built environment and health outcomes are less consistent, recent studies also show an inverse association between neighbourhood walkability and obesity,10,11 cardiovascular disease risk factors12,13 and type 2 diabetes.14 The causal link between the built environment and physical activity has been further investigated by studies that account for residential “self-selection”, or the tendency for individuals to select neighbourhoods that support their physical activity and

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Conflict of Interest: None to declare.
Canadian research about the influence of neighbourhood design on physical activity and travel behaviour is more limited, although several recently published studies have found positive associations between walkability and transportation-based walking. A study in Calgary found that residents of highly walkable neighbourhoods were more likely to engage in ≥150 minutes of transportation walking in a usual week, although associations between neighbourhood walkability and recreational walking were weaker, similar to other results in Canada and elsewhere. Associations between walkability and health outcomes have also been found in Canadian cities, with residents of highly walkable neighbourhoods in Toronto experiencing a lower incidence of diabetes and obesity, although these findings did not account for neighbourhood self-selection factors.

Given growing evidence that the built environment offers potential to improve population health by supporting active travel, it is important to understand how and to what extent neighbourhood design influences where people choose to live. Choosing where to live is often the most complex consumer decision many people ever make. Choices are based on trade-offs about costs, house and property characteristics, transportation accessibility and neighbourhood design features. The relative importance of these factors varies considerably according to individual socio-demographic factors. Understanding the demand for different types of neighbourhood environment is a core aspect of urban planning and real estate market research, and in a public health promotion context illuminates the degree to which the public will support policies that prioritize walking and transit-supportive neighbourhoods. Studies in the US over the last decade suggest that preferences for more compact, walkable neighbourhoods are becoming more common, even if it means giving up desirable aspects of low-density environments, such as single-family housing and larger lots. An Atlanta-based study reported that between 18% and 38% of respondents expressed a strong preference for walkable neighbourhoods, and a US national study found that support for traditionally designed, walkable communities increased from 44% in 2003 to 59% in 2005. The shift towards preferences for more compact development typically found near city centres has been attributed to the convergence of several factors, including an aging population, smaller households and fewer children, rising fuel costs, severe traffic congestion, and increasing health and environmental concerns associated with low density, suburban areas.

Research linking residential preferences with revealed location choices, travel behaviour and activity patterns is limited, particularly in a Canadian context. The present study seeks to fill this gap by examining residential preferences in two of Canada’s largest metropolitan regions – the Greater Toronto Area (GTA) and Metro Vancouver (MV). Specifically, it gauges support for walkable neighbourhoods by reporting on neighbourhood design characteristics that people are willing to “trade-off” to live in a more walkable place. It also investigates demand for more walkable neighbourhoods among those who live in areas with low walkability. Finally, it reports on how travel behaviour and weight status are related to objective walkability after adjustment for socio-demographic characteristics and stated neighbourhood preferences.

**METHODS**

**Study area**

Participants were located in the GTA in southern Ontario and MV, British Columbia (5.1 and 2.1 million people in 2011, respectively). The cities of Toronto and Vancouver are the most densely populated municipalities in each region.

**Data collection**

A cross-sectional residential preference survey was conducted online in 2011 by Urban Design 4 Health, Ltd., in partnership with Ipsos-Reid Public Affairs, a marketing research firm that maintains a nationwide pre-recruited panel. Panelists who were 25 years or older and who lived in eligible areas of the GTA or MV were randomly selected from a pre-recruited panel to participate in the residential preference survey. There were approximately 26,000 and 10,000 total potential recruits respectively in these two areas.

Participant recruitment was stratified according to the range of walkability and incomes present in each region at the forward sortation area (FSA) level. Walkability index values were calculated for FSAs in each region on the basis of the following built environment measures: residential density, intersection density and median FSA “walk scores” (see www.walkscore.com). The FSA-level values of these measures were normalized within each region and summed to produce a walkability index, which was then divided into quartiles to produce four walkability categories. FSA-level income was based on 2006 Census household median income data. Each FSA was categorized into one of 12 cells (four walkability categories by three income categories of <$50,000, $50-$70,000 and >$70,000). The distribution of potential recruits was not equal across the 12 cells. In both regions, there were no potential recruits in the high walkable and high income cell, and in MV there were also no potential recruits in the second-highest walkability and high-income cell.

**Measures**

**Participant Characteristics**

Participants provided information about their age, sex, ethnicity, immigration status, household income, household size and number of children, number of licensed drivers and number of vehicles in the household. Body mass index (BMI) was calculated as kg/m² using self-reported height and weight. Individuals with BMI values ≥25 were classified as overweight or obese. Participants also indicated whether they were currently restricting their physical activity for any reason.

**Travel Behaviour**

Self-reported utilitarian and recreational walking trips lasting 10 minutes or longer were captured (# of days in a usual week)
a) Illustration for Trade-off #1: Closeness to shops and services

Auto-oriented

Walkable

My neighbourhood preference is...

<table>
<thead>
<tr>
<th></th>
<th>strongly prefer A</th>
<th>somewhat prefer A</th>
<th>neutral</th>
<th>somewhat prefer B</th>
<th>strongly prefer B</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b) Textual descriptions of neighbourhood trade-offs

<table>
<thead>
<tr>
<th>Trade-off</th>
<th>Walkable</th>
<th>Auto-oriented</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Closeness to shops and services</td>
<td>Where houses and commercial areas are within a 10-minute walk of each other so that I can walk to stores, libraries or restaurants.</td>
<td>Where commercial areas are kept separate (more than a 30-minute walk) from houses, even if this means I cannot walk to stores, libraries or restaurants.</td>
</tr>
<tr>
<td>2. Level of activity and mix of housing</td>
<td>With lots of services and activities nearby, even if this means a mixture of housing types that are close together on various sized lots with less private backyard space.</td>
<td>Single family houses, farther apart, on lots 10 metres wide or more, with more private backyard space, even if this means it is not an area with services or activities nearby.</td>
</tr>
<tr>
<td>3. Home size and travel options</td>
<td>Where I can walk, cycle or take public transit for trips because commercial areas are nearby (within a 10-minute walk), even if it means smaller homes with less interior living space.</td>
<td>With larger homes with more interior living space, where the commercial areas are distant (more than a 45-minute walk away) from the houses, even if this means driving for all trips.</td>
</tr>
<tr>
<td>4. Lot size and commute distance</td>
<td>Within 5 km of work, school and other important destinations, even if it means houses are close together on smaller lots.</td>
<td>Houses farther apart on larger lots, even if it means travelling more than 25 km (over 30 minutes) to work, school or other important destinations.</td>
</tr>
<tr>
<td>5. Street design and travel options</td>
<td>Where I can walk, cycle or take public transit for some of my trips, even if it has through streets and people from other neighbourhoods walking or driving on them.</td>
<td>Neighbourhood with cul-de-sacs and few people from other neighbourhoods walking or driving on them, even if this means I must drive for all my trips.</td>
</tr>
<tr>
<td>6. Public recreation and lot size</td>
<td>Within a short walk of public recreation and green space, but there is little space for recreation on private property.</td>
<td>Ample space on private property for recreational activities, but little public recreation and green space within a short walk.</td>
</tr>
<tr>
<td>7. Access to and size of food stores</td>
<td>Where I could easily walk to a wide range of small and medium sized grocery stores, fruit and vegetable stands, butchers, bakers and specialty food stores.</td>
<td>Few food stores within walking distance, but several very large supermarkets within a 10-minute drive.</td>
</tr>
</tbody>
</table>

Figure 1. Neighbourhood trade-offs showing contrasting neighbourhood types captured participant attitudes towards pedestrian-friendly versus auto-dependent residential environments. Illustrations accompanied each trade-off. A sample illustration for Trade-off #1, Closeness to Shops and Services, is shown (a), along with the accompanying textual descriptions that were used for each neighbourhood trade-off (b).
using items from the Neighbourhood Physical Activity Questionnaire, which have been shown to have accepted reliability among adults. Self-reported public transit trips in a usual week and annual vehicle kilometres travelled (VKT) were also captured.

Objective Neighbourhood Walkability

Objective neighbourhood walkability was measured at the six-digit postal code level for the City of Toronto and MV by integrating street network and parcel-level land use data from 2011 into a geographic information system. A 1 km street network-based buffer was created around each postal code centroid and the walkability index calculated as a function of network-based buffer was created around each postal code digit postal code level for the City of Toronto and MV by including visual presentation in the survey. Respondents were analyzed separately for participants in i) the City of Toronto (TOR); ii) the Outer GTA (OGTA), which includes all other GTA municipalities; iii) the City of Vancouver (VAN); and iv) Outer Metro Vancouver (OMV), which includes all other MV municipalities.

Table 1. Descriptive statistics for socio-demographic variables (2006 Census statistics for each region are presented to assess the representativeness of the sample compared with the population)

<table>
<thead>
<tr>
<th></th>
<th>GTA (n=1525)</th>
<th>MV (n=1223)</th>
<th>2006 Census demographics*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)/</td>
<td>Mean (SD)/</td>
<td>Mean (SD)/</td>
</tr>
<tr>
<td></td>
<td>percent</td>
<td>percent</td>
<td>percent</td>
</tr>
<tr>
<td>Age</td>
<td>50.0 (13.3)</td>
<td>48.7 (12.4)</td>
<td>50.5 (13.6)</td>
</tr>
<tr>
<td>% female</td>
<td>56.7</td>
<td>52.2</td>
<td>58.4</td>
</tr>
<tr>
<td>% married</td>
<td>47.9</td>
<td>60.9</td>
<td>42.7</td>
</tr>
<tr>
<td>% living in single detached dwelling</td>
<td>37.8</td>
<td>55.3</td>
<td>30.6</td>
</tr>
<tr>
<td>% own dwelling</td>
<td>59.9</td>
<td>75.9</td>
<td>53.6</td>
</tr>
<tr>
<td>Average household size</td>
<td>2.4 (1.3)</td>
<td>2.7 (1.2)</td>
<td>2.3 (1.3)</td>
</tr>
<tr>
<td>% households with children ≤ 18 years</td>
<td>22.3</td>
<td>23.4</td>
<td>19.4</td>
</tr>
<tr>
<td>Annual household income</td>
<td></td>
<td>4.9 (1.9)</td>
<td>5.1 (1.8)</td>
</tr>
<tr>
<td>% immigrated to Canada</td>
<td>34.3</td>
<td>32.4</td>
<td>35.0</td>
</tr>
<tr>
<td>% visible minority</td>
<td>19.0</td>
<td>17.9</td>
<td>19.4</td>
</tr>
<tr>
<td># vehicles/household</td>
<td>1.2 (0.9)</td>
<td>1.7 (1.0)</td>
<td>1.0 (0.9)</td>
</tr>
</tbody>
</table>

GTA=Greater Toronto Area; MV=Metropolitan Vancouver.
† Quartiles 1 and 2 of neighbourhood preference component (GTA: n=435; MV: n=335).
‡ Quartiles 3 and 4 of neighbourhood preference component (GTA: n=1090; MV: n=888).
§ Median age based on the entire age range in the Census, as compared with the survey’s age range beginning at 25 years.
¶ Income ranges: 1=$10,000-$19,999; 2=$20,000-$29,999; 3=$30,000-$39,999; 4=$40,000-$49,999; 5=$50,000-$59,999; 6=$60,000-$79,999; 7=$80,000-$99,999; 8=$100,000-$119,999; 9=$120,000+
¶ Median income in 2003 ($) private households (before tax).
To investigate the relative contribution of neighbourhood preference and walkability in explaining travel behaviour and weight status, principal component analysis (PCA) was conducted separately for each region to extract a single component per participant for neighbourhood preference (Question A) and current neighbourhood responses (Question B) for the seven neighbourhood trade-offs. Cronbach’s alpha exceeded 0.85 in all cases, indicating that PCA reflected each input variable and was suitable. All components explained between 53.8% and 58.0% of the variation in the data, and loadings on the preference and self-described neighbourhood walkability components for both regions ranged from 0.59 to 0.85. The resulting component scores were used to categorize participants into equal range, region-based “preference” and self-described “walkability” quartiles. The full set of participants in each region was pooled into quartiles rather than stratified by city or suburb residency because of sample size limitations.

Chi-square and Welch ANOVA (analysis of variance) analyses with Games-Howell post hoc comparisons assessed whether there were significant differences between i) self-described walkability quartiles and ii) objective walkability quartiles for utilitarian walking, recreational walking, public transit use, annual VKT and overweight/obesity incidence. All travel outcomes were positively skewed and were log-transformed to approximate a normal distribution.

Logistic regression analyses were then performed on the following four dependent variables: the likelihood of participants making a utilitarian walk trip, recreational walk trip and public transit trip in a usual week, and overweight/obesity incidence. The purpose of the models was to determine the independent effects of socio-demographic factors, neighbourhood preference and objective neighbourhood walkability on the above outcomes. When the outcome prevalence exceeded 10% and the odds ratios associated with preference or walkability were significantly different from the reference group, corrected odds ratios are reported to provide a more accurate estimate of relative risk.33

Linear regression analyses assessed the relative contribution of neighbourhood preference and objective neighbourhood walkability on variation in annual VKT. Partial r-squared results ($r^2$) are presented to show the explained variance attributable to each variable. Socio-demographic control variables used in the predictive modelling included age, sex, household income, visible minority status, immigration status, household size, number of children in household, licensed drivers per vehicle, vehicle ownership and physical activity status.

**RESULTS**

**Sample characteristics**
Survey responses were collected from 1,525 participants in the GTA and 1,223 participants in MV (5.8% and 11.8% of total potential recruits, respectively). A minimum of 30 surveys were obtained for 10 (GTA) and 8 (MV) of 12 walkability/income cells. The percentage of GTA study participants in the City of Toronto was 74.2%, and 41.9% of MV participants resided in the City of Vancouver. The sample had an average age of about 50 years and nearly half were married (Table 1). There was a lower proportion of males, households with children, immigrants and visible minorities in the GTA compared to MV.
minorities in the sample compared with 2006 Census statistics in both regions. Those preferring more walkable neighbourhoods tended to be unmarried, live in a smaller household, rent their dwelling and have a lower annual household income.

**Neighbourhood preference**

A strong preference for walkable neighbourhoods was exhibited across all seven trade-offs describing different aspects of neighbourhood design, particularly among city residents (TOR: 52%; VAN: 57%). By contrast, just 11% and 8% in the cities of Toronto and Vancouver respectively strongly preferred an auto-oriented neighbourhood (Figure 2a). A high premium was placed on living within walking distance of shops and services (TOR: 61%, VAN: 64%) and a variety of food stores (TOR: 54%, VAN: 62%). Suburban participants also preferred a walkable neighbourhood, although to a lesser degree than their city counterparts. On average, OMV participants showed greater preference for walkable places (34%) than those living in the OGTA (25%). Living near a variety of food stores was strongly desired by about one third of suburban participants (OGTA: 30%, OMV: 40%), as was living within walking distance of shops and services (OGTA: 31%, OMV: 38%). Living near public recreation and green space was strongly valued by OMV residents (37%), even if it meant having a smaller backyard. The neighbourhood trade-off that had the most support for auto-oriented features was one with single-family lots, ample backyard space and fewer shops nearby (trade-off #2).

**Unmet demand for different residential environments**

Among participants who perceived their current neighbourhood as very auto-oriented (0-2 on the Likert scale), depending on the attribute, between 11% and 20% of City of Toronto participants and 6% and 30% of City of Vancouver participants reported that they preferred a very walkable neighbourhood (Figure 2b). Regardless of region, participants living in areas with low walkability placed greatest value on living within walking distance of a variety of food stores and living nearer to shops and services. Unmet demand for these types of neighbourhood amenities was reported by between 20% and 25% living in low walkable suburban areas of the GTA and MV. On average, individuals living in low walkable suburban areas of MV showed the greatest demand for a more walkable environment (17%). Demand for auto-oriented neighbourhoods among those who perceived their current neighbourhood as very pedestrian
Table 3. Model results examining associations between neighbourhood preference, walkability, travel behaviour and weight status

(a) City of Toronto

<table>
<thead>
<tr>
<th></th>
<th>Any utilitarian walk trip (95% CI)</th>
<th>Any recreational walk trip (95% CI)</th>
<th>Any public transit trip (95% CI)</th>
<th>Overweight/obese (BMI ≥ 25.0) (95% CI)</th>
<th>Annual vehicle kilometres travelled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Est. Odds</td>
<td>0.151</td>
<td>0.022</td>
<td>0.132</td>
<td>0.075</td>
<td>0.022</td>
</tr>
<tr>
<td>(95% CI)</td>
<td>(0.98-1.0)</td>
<td>(1.0-1.02)</td>
<td>(0.96-0.98)</td>
<td>(1.01-1.03)</td>
<td>(0.047-0.78)</td>
</tr>
<tr>
<td>Age</td>
<td>1.07 (1.0-1.15)</td>
<td>0.91 (0.85-0.97)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>1.41 (1.07-1.87)</td>
<td>0.75 (0.57-0.98)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual household income†</td>
<td>0.72 (0.60-0.87)</td>
<td>0.74 (0.53-1.05)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visible minority</td>
<td>0.54 (0.38-0.78)</td>
<td>2.01 (1.41-2.87)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neighbourhood preference quartile‡</td>
<td>-0.34 (0.18)</td>
<td>-0.07 (0.21)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q2: Medium-low</td>
<td>3.28 (1.51-6.95)§</td>
<td>0.98 (0.46-2.08)</td>
<td>2.07 (0.89-4.82)</td>
<td>0.89 (0.39-2.02)</td>
<td></td>
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<tr>
<td>Q3: Medium-high</td>
<td>5.44 (2.60-10.95)§</td>
<td>1.09 (0.53-2.26)</td>
<td>3.04 (1.37-6.56)§</td>
<td>0.65 (0.30-1.44)</td>
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<tr>
<td>Q4: High</td>
<td>10.12 (4.96-19.21)§</td>
<td>1.35 (0.65-2.79)</td>
<td>6.32 (2.94-12.86)§</td>
<td>0.64 (0.29-1.40)</td>
<td></td>
</tr>
<tr>
<td>Objective neighbourhood walkability quartile</td>
<td>-0.50 (0.11)§</td>
<td>-0.07 (0.16)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Q2: Medium-low</td>
<td>1.62 (1.19-2.14)§</td>
<td>1.23 (0.86-1.76)</td>
<td>1.59 (1.18-2.10)§</td>
<td>0.75 (0.52-1.09)</td>
<td></td>
</tr>
<tr>
<td>Q3: Medium-high</td>
<td>2.55 (1.65-3.66)§</td>
<td>1.09 (0.69-1.74)</td>
<td>1.74 (1.19-2.47)§</td>
<td>0.64 (0.40-1.01)</td>
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<tr>
<td>Q4: High</td>
<td>N/A</td>
<td>2.25 (0.73-7.0)</td>
<td>5.28 (2.19-7.69)§</td>
<td>0.60 (0.23-1.56)</td>
<td></td>
</tr>
</tbody>
</table>

(b) Metro Vancouver

<table>
<thead>
<tr>
<th></th>
<th>Any utilitarian walk trip (95% CI)</th>
<th>Any recreational walk trip (95% CI)</th>
<th>Any public transit trip (95% CI)</th>
<th>Overweight/obese (BMI ≥ 25.0) (95% CI)</th>
<th>Annual vehicle kilometres travelled</th>
</tr>
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<tbody>
<tr>
<td>Est. Odds</td>
<td>0.178</td>
<td>0.044</td>
<td>0.175</td>
<td>0.092</td>
<td>0.022</td>
</tr>
<tr>
<td>(95% CI)</td>
<td>(0.98-1.0)</td>
<td>(1.0-1.02)</td>
<td>(0.96-0.98)</td>
<td>(1.01-1.03)</td>
<td>(0.047-0.78)</td>
</tr>
<tr>
<td>Age</td>
<td>1.01 (1.0-1.02)</td>
<td>0.97 (0.96-0.98)</td>
<td>1.02 (1.01-1.03)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>1.37 (1.03-1.82)</td>
<td>0.76 (0.59-0.99)</td>
<td>0.52 (0.40-0.67)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual household income†</td>
<td>0.70 (0.49-1.0)</td>
<td>0.82 (0.76-0.88)</td>
<td>0.56 (0.39-0.79)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visible minority</td>
<td>1.34 (1.02-1.75)</td>
<td>0.63 (0.45-0.88)</td>
<td>1.89 (1.34-2.66)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neighbourhood preference quartile‡</td>
<td>-0.50 (0.11)§</td>
<td>-0.15 (0.01)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q2: Medium-low</td>
<td>1.46 (0.86-2.50)</td>
<td>1.59 (0.94-2.69)</td>
<td>2.18 (1.06-4.41)§</td>
<td>1.57 (0.91-2.71)</td>
<td></td>
</tr>
<tr>
<td>Q3: Medium-high</td>
<td>2.69 (1.69-4.20)§</td>
<td>1.98 (1.25-3.04)§</td>
<td>3.54 (1.80-6.71)§</td>
<td>1.22 (0.72-2.04)</td>
<td></td>
</tr>
<tr>
<td>Q4: High</td>
<td>4.43 (2.79-6.75)§</td>
<td>2.51 (1.58-3.84)§</td>
<td>5.86 (3.04-10.66)§</td>
<td>1.35 (0.80-2.29)</td>
<td></td>
</tr>
<tr>
<td>Objective neighbourhood walkability quartile</td>
<td>-0.50 (0.11)§</td>
<td>-0.15 (0.01)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q2: Medium-low</td>
<td>1.75 (1.43-2.09)§</td>
<td>0.99 (0.71-1.39)</td>
<td>1.67 (1.30-2.11)§</td>
<td>0.80 (0.64-0.99)§</td>
<td></td>
</tr>
<tr>
<td>Q3: Medium-high</td>
<td>3.10 (2.36-3.74)§</td>
<td>1.41 (0.80-2.51)</td>
<td>2.48 (1.79-3.24)§</td>
<td>0.69 (0.43-1.11)</td>
<td></td>
</tr>
<tr>
<td>Q4: High</td>
<td>2.88 (2.04-3.63)§</td>
<td>1.0 (0.55-1.83)</td>
<td>1.92 (1.29-2.71)§</td>
<td>0.62 (0.40-0.92)§</td>
<td></td>
</tr>
</tbody>
</table>

Note: B = unstandardized coefficient
* 1=male; 2=female.
† 1=<$10,000, 2=$10,000-$19,999; 3=$20,000-$39,999; 4=$40,000-$59,999; 5=$60,000-$79,999; 6=$80,000-$99,999; 7=$100,000-$119,999; 8=$120,000+
‡ Individual quartile comparisons made relative to the lowest quartile of that variable.
§ Adjusted odds ratio and 95% CI presented.
|| Low sample size (n<30).
¶ 100% of Q4 participants made a utilitarian walk trip.
friendly (8-10 on the Likert scale) was notably lower in the cities of Toronto and Vancouver, averaging 5% and 4% respectively across the seven trade-offs.

Associations between neighbourhood walkability, travel behaviour and weight status

Living in the two highest quartiles of neighbourhood walkability (perceived or objective) was associated with greater likelihood of making a utilitarian walk trip and public transit trip, and with significantly lower annual VKT (Table 2). The likelihood of making a recreational walk trip was significantly higher \( (p=0.028) \) among GTA participants in the highest quartile of perceived walkability; however, between-quartile differences were not significant when objective walkability was used. GTA participants living in the highest quartile of perceived walkability were less likely to be overweight or obese (46.2%) than those in the lowest quartile (59.2%) \( (p=0.041) \).

Logistic regression results predicting the likelihood of utilitarian walk trips, recreational walk trips, public transit trips and weight status are provided in Table 3. After adjustment for socio-demographic characteristics and neighbourhood preference, the likelihood of making a utilitarian walk trip increased with each objective walkability quartile removed from the lowest walkability quartile (pseudo \( R^2 \): TOR=0.15; MV=0.18). In the MV sample, those living in the most walkable areas were nearly three times more likely to make a utilitarian walk trip (odds ratio [OR]=2.88, confidence interval [CI]: 2.04-3.63) and almost twice as likely to make a public transit trip (OR=1.92, CI: 1.29-2.71) than those living in areas with the lowest walkability. Similarly, City of Toronto participants living in the two highest quartiles of neighbourhood walkability were over 1.5 times more likely to make a utilitarian walk trip and public transit trip than those in quartile 1.

The likelihood of making a recreational walk trip did not vary significantly by walkability quartile in either region after adjustment for socio-demographic characteristics and preferences. In MV, the likelihood of making a recreational walk trip was significantly greater for those in the third and fourth quartiles of neighbourhood preference \( (p<0.001) \). MV participants in the highest quartile of walkability had significantly lower odds of being overweight or obese \( (Q1: 59.7%; Q4: 38.4\%) \) at the 95% confidence level \( (OR=0.62, CI: 0.40-0.92) \).

Being female, living in a household with lower income, with fewer licensed drivers per vehicle, less vehicle access, and living in a more walkable area were associated with fewer annual VKT in the City of Toronto \( (R^2=0.29) \) and MV \( (R^2=0.29) \), with participants residing in the third and fourth quartiles of objective walkability reporting nearly 2.5 times fewer annual VKT than those living in areas with low walkability.

**DISCUSSION**

This study provides important insights into attitudes towards different types of residential environment in two of Canada’s largest metropolitan regions. It also reports on the relationship between perceived and objectively measured walkability, travel patterns and weight status at a higher level of detail than previously reported in Canada. Depending on the attribute, between 45% and 61% (City of Toronto) and between 52% and 64% (City of Vancouver) stated a strong preference for neighbourhoods in which they could walk or take transit. Suburban residents also demonstrated considerable support for walkable neighbourhoods, with about one third preferring such a place. These findings are consistent with those reported in the US\(^{25,26}\) and support the argument for some changes to suburban areas that better align with residential preferences.

Unmet demand for walkable neighbourhoods where commercial areas and food stores are in walking distance was observed for between 20% and 25% of individuals in suburban areas who perceive their neighbourhood as very unwalkable, with a stated willingness to sacrifice auto-oriented elements to live in such a place. These findings are similar to those reported elsewhere,\(^{25,34}\) although the present study used perceived neighbourhood walkability to assess unmet demand. Developing objective built environment measures that correspond directly with the neighbourhood trade-off questions would allow the direct measurement of supply and demand relationships across key factors, such as lot and home size, recreation space and food access, and would enable further assessment of where unmet demand for walkable neighbourhood features is greatest.

Objectively assessed neighbourhood walkability was positively associated with utilitarian walking, even after adjustment for neighbourhood preference, consistent with findings reported elsewhere.\(^{8,15-17}\) Neighbourhood preference contributed significantly to the utilitarian walking, public transit and VKT models, providing further evidence of the importance of adjusting for residential self-selection factors when examining associations between the built environment and travel behaviour.\(^{9,18}\) Notably, a lower incidence of being overweight or obese was found in the most walkable areas of Metro Vancouver after adjustment for socio-demographics factors and neighbourhood preference. However, walkability did not contribute to the incidence of overweight or obesity in the City of Toronto, which may be attributable to less variation in the built environment.

The strengths of the present study are its unique comparative nature between the Toronto and Vancouver regions and between urban and suburban settings, and the ability to control for neighbourhood preferences in evaluating associations between travel behaviour, weight status and objective walkability. Another strength is the forced trade-off design, which provides the ability to gauge underlying preferences for a specific neighbourhood feature, all else being equal. However, the study design requires participants to assume that factors such as price and school quality are held constant across neighbourhood choice, which may not be viewed as realistic. Furthermore, some of the choices provided may not exist in one of the two study regions, and some neighbourhoods may have a mix of walkable and auto-oriented features.

The study has several limitations. Its cross-sectional design limits the ability to infer causation, and the ability of the sample to accurately represent the population in each region is constrained by the absence of potential recruits in the high walkable and high income categories. Likewise, there were notable differences between the sample and the 2006 Census in terms of sex, households with children, and proportion of immigrants and visible minorities, which may limit generalizability.
WALKABLE NEIGHBOURHOODS PROVIDE IMPORTANT HEALTH AND SOCIAL BENEFITS THROUGH OPPORTUNITIES FOR DAILY PHYSICAL ACTIVITY, SOCIAL INTERACTION, BETTER ACCESS TO HEALTHY FOOD CHOICES AND COMMUNITY SERVICES. LOW-DENSITY, SPRAWLING URBAN DEVELOPMENT HAS LED TO CAR-DEPENDENT NEIGHBOURHOODS WITH LIMITED OPPORTUNITIES FOR ACTIVE TRANSPORT. THIS STUDY PROVIDES SUPPORT FOR INCREASING THE SUPPLY OF HOUSING IN SETTINGS THAT ARE MORE WALKABLE TO MEET CONSUMER DEMAND AND IMPROVE POPULATION HEALTH. IT DEMONSTRATES THAT A SIGNIFICANT PROPORTION OF THE PUBLIC WILL SUPPORT WALKABLE AND TRANSIT-ORIENTED NEIGHBOURHOODS, WHICH, WHEN PROVIDED, ENABLE PEOPLE TO BETTER MATCH THEIR RESIDENTIAL LOCATION WITH THEIR PREFERENCE. DEVELOPERS AND PLANNERS CAN ALSO USE THIS INFORMATION TO HELP DEMONSTRATE TO DECISION-MAKERS AND FINANCERS THE MARKETABILITY AND LATENT DEMAND FOR SPECIFIC FEATURES THAT CONSTITUTE WALKABLE URBAN ENVIRONMENTS.

HOUSE PRICE CHANGES IN RECENT YEARS SHOW AN INCREASING DEMAND FOR MORE WALKABLE ENVIRONMENTS, AS REFLECTED IN THE RESULTS PRESENTED IN THIS STUDY, WITH BOTH THE TORONTO AND VANCOUVER HOUSING MARKETS RANKED AS “SEVERELY UNAFFORDABLE”. WHILE THE DATA ARE CROSS-SECTIONAL, THE RESULTS SUGGEST THAT AN UNDERSUPPLY OF WALKABLE ENVIRONMENTS RELATIVE TO DEMAND MAY EXPLAIN THESE PRICE INCREASES. POLICY MEASURES THAT PRIORITIZE THE DEVELOPMENT OF WALKABLE NEIGHBOURHOODS WITH DIVERSE HOUSING OPTIONS GEARED TOWARDS A RANGE OF INCOMES WILL PROVIDE EQUAL OPPORTUNITIES FOR RESIDENTS TO ENGAGE IN HEALTHY BEHAVIOURS.

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Grassroots projects aimed at the built environment: Association with neighbourhood deprivation, land-use mix and injury risk to road users

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ABSTRACT

OBJECTIVES: 1) To describe grassroots projects aimed at the built environment and associated with active transportation on the Island of Montreal; and 2) to examine associations between the number of projects and indicators of neighbourhood material and social deprivation and the built environment.

METHOD: We identified funding agencies and community groups conducting projects on built environments throughout the Island of Montreal. Through website consultation and a snowballing procedure, we inventoried projects that aimed at transforming built environments and that were carried out by community organizations between January 1, 2006, and November 1, 2010. We coded and validated information about project activities and created an interactive map using Geoclip software. Correlational analyses quantified associations between number of projects, neighbourhood characteristics and deprivation.

RESULTS: A total of 134 community organizations were identified, and 183 grassroots projects were inventoried. A large number of projects were aimed at increasing awareness of/improving active or public transportation (n=95), improving road safety (n=84) and enhancing neighbourhood beautification and greening (n=69). The correlation between the presence of projects and the extent of neighbourhood material deprivation was small (Kendall’s τ=0.26, p<0.001), but in areas with greater social deprivation there were more projects (Kendall’s τ=0.38, p<0.001). Larger numbers of projects were also associated with the presence of more extensive land-use mix (Kendall’s τ=0.23, p<0.001) and a greater proportion of road intersections with injured pedestrians, cyclists and motor vehicle users (Kendall’s τ=0.43, p<0.001).

CONCLUSION: There is significant community mobilization around built environments and active transportation. Investigations of the implementation processes and impacts are warranted.

KEY WORDS: Sustainable transportation; active transportation; community mobilization; built environment; material and social deprivation


There is growing evidence that over-reliance on motorized transportation modes has had negative health effects (e.g., obesity, sedentary living) and environmental consequences (e.g., air and noise pollution).1-3 Intervention efforts are underway to render built environments more conducive to active transportation (cycling and walking).4-6 Previous research shows that active transportation is supported by greater accessibility to services,7-10 availability of public transportation amenities and walking and cycling infrastructure,7,9,11,12 greater safety from traffic and crime,7,9,13,14 areas with more green cover, and the presence of natural environments (e.g., lakes, forests). Some research suggests that disadvantaged groups often live in environments that are less conducive to active transportation.15

Recognizing that built environments are constructed and transformed by urban planners, engineers and other municipal workers, much of the research has focused on how to mobilize these professionals.16,17 A growing body of research has focused on the role played by community groups and civil society, which exert pressures on policy-makers and elected officials to approve and financially support changes to the built environment enacted by urban planners and engineers.18-21 Specifically, evidence shows that collaboration between professionals and community groups is essential to changing environments and to maximizing health impacts.19,22

Special attention has been paid to the challenges involved in establishing partnerships and finding the best means of supporting community organizations, which most often experience limited and inconsistent funding.22,23 Despite the key

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Conflict of Interest: None to declare.
role played by community groups in giving a voice to citizens, there is limited knowledge about how many community organizations have grassroots projects unfolding, what the targets of built environment change are and in which neighbourhoods projects are being implemented. This information is key to establishing partnerships and moving the agenda of transformation of built environments forward.

The purposes of this study were to 1) describe grassroots projects aimed at the built environment and associated with active transportation on the Island of Montreal, and 2) examine associations between the number of projects and indicators of neighbourhood material and social deprivation and the built environment.

**METHOD**

The current study was part of a larger initiative named Healthy Canada by Design, a Canadian coalition of health units, planning organizations and non-governmental organizations that came together to unite existing and emerging cross-sector efforts to promote healthy built environments by translating the latest research into state-of-the-art intervention tools.

**Procedures for developing an inventory of grassroots projects**

Agencies that awarded funds to community groups throughout the Island of Montreal to modify built environments were first identified. A list of agencies had been compiled as part of ongoing operations at the Montreal Public Health Department. Community groups were defined as organizations that contributed to the exercise of citizenship and were not-for-profit organizations, were rooted in the community, maintained the life of an association and were free to establish their mission, approaches, practices and orientations. These criteria included community organizations dealing with the environment and other local dialogue groups (like neighbourhood round tables or local revitalization committees), but they excluded religion-based organizations, foundations whose mission consisted essentially of collecting and redistributing funds, and organizations consisting only of volunteers.

Projects to be inventoried were retained on the basis of two inclusion criteria: 1) projects that unfolded between January 1, 2006 and November 1, 2010, and 2) projects aimed at promoting walking, physical activity or active transportation through intervention in built environments to support sustainable transportation through any of the following dimensions, known to be related to sustainable transportation: i) increasing accessibility to services and amenities (e.g., implementing public markets); ii) increasing awareness and improving amenities or infrastructure for public transit or active transportation (e.g., adding bicycle racks, elaborating transportation plans); iii) improving road safety (e.g., implementing traffic calming measures); iv) improving safety against crime (e.g., improving lighting and road signaling); v) beautification and greening of neighbourhoods (e.g., community gardens, green roof); and vi) protecting and promoting natural environments (e.g., waterfront, forests, nature conservatories).

Initially, information regarding projects was gathered through existing databases and archival information within ongoing activities of the Montreal Public Health Department. Funding agencies were also contacted to obtain information about the community groups and projects they had funded if this information was unavailable through web sites. This allowed for a snowballing procedure to occur whereby contacts identified projects that may not have been registered on web sites or that were funded by an agency that was not on original lists.

Once a list of projects had been identified, information about the activities and partners was extracted from project descriptions and documentation. This information was then coded to indicate the six dimensions, as already listed, of the built environment that the projects aimed to change. Coded information was sent to community groups for validation and corrections. Erroneous information was corrected.

**Creation of a georeferenced inventory**

All community organizations conducting projects were georeferenced with a software program called Geoclip (developed by emc³) using their street address and postal code. An interactive map with clickable dots for each community organization was created. Clicking called up a new window with fact sheets showing project titles, project duration, project promoters, dimensions of sustainable transportation aimed at through the project, project objectives, description of activities and territorial reach of the project, partners and funding support program.

**Material and social deprivation, and built environment in areas where grassroots projects unfold**

In order to determine the extent of material and social deprivation in areas where grassroots projects were occurring, we used the indices of material and social deprivation developed by Pampalon et al., which are widely used in Quebec as markers of social inequalities. Pampalon’s material deprivation index is a composite index that combines census data on education, employment and income, whereas the social deprivation index is a composite index combining family structure, marital status and living status (see references for further details on the validity of these indicators). Values were recoded into quintiles for purposes of analysis, more deprivation being expressed by higher quintiles.

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**Table 1. Number and targets of grassroots projects that were active between January 1, 2006 and November 1, 2010 on the Island of Montreal**

<table>
<thead>
<tr>
<th>Dimensions of the built environment associated with sustainable transportation that were targeted</th>
<th>Number of grassroots projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessibility to services and amenities (e.g., implementing public markets)</td>
<td>27</td>
</tr>
<tr>
<td>Increasing awareness of/improving active or public transportation options (e.g., adding bicycle racks, elaborating transportation plans)</td>
<td>95</td>
</tr>
<tr>
<td>Improving road safety (e.g., traffic calming measures, Pedibus)</td>
<td>84</td>
</tr>
<tr>
<td>Improving safety against crime (e.g., improving lighting and road signaling)</td>
<td>46</td>
</tr>
<tr>
<td>Beautification and greening of neighbourhoods (e.g., community garden, green roof)</td>
<td>69</td>
</tr>
<tr>
<td>Protecting and promoting natural environments (e.g., waterfront, forests, nature conservatories)</td>
<td>7</td>
</tr>
</tbody>
</table>

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Since these indicators are census-based, indicators of material and social deprivation can be aggregated to different territorial units. Given our interest in the work of community groups involved in local grassroots projects, we used indicators of material and social deprivation at the level of neighbourhoods. The Montreal Public Health Department has adopted neighbourhood territorial divisions ($n=111$ neighbourhoods) based on census tract boundaries, physical or natural boundaries (e.g., railroad track, parks) and residents’ recognition and feeling of belonging to a neighbourhood. We used these territorial divisions to locate community groups into neighbourhoods, and we computed material and social deprivation for each of the neighbourhoods.

In addition, indicators of neighbourhood built environment were derived. Using data from the City’s property evaluation roll, land was categorized as either residential, high density residential mixed with commercial, institutional, commercial or industrial. A score was given to each type of land use, and then values were combined into a score ranging from 0 to 1 with higher scores indicating greater land-use mix in the neighbourhood. From accident report data from the uniformed ambulance service, the proportion of intersections in the neighbourhood that had been the site of an ambulance visit for an injured pedestrian, cyclist or motor vehicle user between 1999 and 2008 was calculated.

**RESULTS**

We identified 134 community organizations throughout the Island of Montreal, which ran 183 grassroots projects aimed at transforming dimensions of built environments associated with sustainable transportation between January 1, 2006 and November 1, 2010. The locations of these community organizations were geocoded. Mapping is available on a web site (http://emis.santemontreal.qc.ca/outils/atlas-sante-montreal/ressources/les-ong-projets-en-environnement-bati-et-mobilite-durable/).

Table 1 shows that there were more projects involving the dimensions of increasing awareness or improving active or public transportation options and of improving road safety than other dimensions. Ten projects aimed to intervene in three or more targets, 107 projects in two targets and 64 projects in a single target. As depicted in Figure 1, projects were concentrated in the central, more urbanized areas of the Island of Montreal. Across the 111 neighbourhoods, a subgroup of 52 had no community groups running projects whereas 26, 15 and 17 neighbourhoods had respectively 1, 2 or 3 or more community groups leading grassroots projects.

Examination of correlations showed that there was a small and statistically significant association between the presence of projects and the extent of the material (Kendall’s $\tau=0.26$, $p<0.001$) and social (Kendall’s $\tau=0.38$, $p<0.001$) deprivation of local residents. To further illustrate the nature of the associations, we created box-plots of associations (see Figure 2). As can be seen, the association with material deprivation is modest whereas the association with social deprivation is stronger. As well, more projects were associated with the presence of more extensive land-use mix (Kendall’s $\tau=0.23$, $p<0.001$) and with a greater proportion of intersections in the neighbourhood with injured pedestrians, cyclists or motor-vehicle users (Kendall’s $\tau=0.43$, $p<0.001$).

**Statistical analyses**

After having georeferenced each community group, we examined correlations (Kendall’s tau $\tau$) given the frequency count of number of projects) between the number of projects in each of the 111 neighbourhoods and the level of material and social deprivation of populations living in these neighbourhoods and built environment indicators.
The results of the inventory and mapping of grassroots projects on the Island of Montreal showed that a large number of projects (i.e., 183) aimed at transforming dimensions of the built environment associated with sustainable transportation were unfolding between January 1, 2006 and November 1, 2010. The largest number of projects targeted improvement of amenities or infrastructure for public transit or active transportation and improvements in safety against crime. Beautification and greening of environments, including community gardens, was also a frequently pursued target. These data indicate that community groups are quite active in attempting to change built environments.

We observed that there were more projects going on in areas where social deprivation, material deprivation, land-use mix and injury risks to road users were greater. The weaker association observed for material deprivation may be related to community action in these neighbourhoods being aimed at other priorities, such as housing or employment. The stronger association between number of projects and social deprivation may suggest an adaptive response of communities attempting to better an area where people are in greater need of community supports.

To our knowledge, this is the first attempt to produce an inventory of grassroots projects aimed at built environments and sustainable mobility. The results of the study provide a visual, albeit descriptive, account of where community mobilization around this issue is located. This information is useful to policy-makers, who can more effectively plan built environment transformations around community needs and concerns. The fact that the presence of projects is associated with greater material and social deprivation also provides a better understanding of the context within which efforts to transform built environments occur.

The replication and extension of these findings in other Canadian cities seems warranted, as community groups often focus efforts on activities and projects that are most treasured by citizens. The implementation processes of this type of community mobilization are also of interest, as they may allow for the crafting of more effective financial and social supports of community groups as well as more sustainable partnerships.

Limitations
The study has several limitations. Efforts were made to identify all community groups and grassroots projects aimed at built environments and sustainable mobility. However, funding agencies and community organizations may have been too busy to thoroughly double-check all the information that was forwarded to them. It is possible that selected projects are missing from the inventory. However, this number is probably negligible since the snowballing procedure led to saturation. Although we were able to geolocate the street address for the community groups, we were unable to precisely describe the territorial reach of projects and to depict this reach with the interactive software tool. Many projects had a diffuse territorial reach, and some projects simply did not compile this type of information. Further data collection methods need to be developed to ascertain these dimensions of projects. At a minimum, though, we were able to pinpoint the neighbourhoods in which projects unfolded.

Last, the data collected on community groups and their projects did not allow us to determine whether projects were initiated in response to community requests or priorities (bottom up), or whether they were initiated because of funding opportunities (top down). Further research is warranted to understand more about how projects emerge and why community groups decide to act on the chosen targets. More information on the effectiveness and complementarity of bottom-up and top-down approaches would also be a fruitful area for future research.

CONCLUSION
A large number of grassroots projects aim to improve dimensions of built environments associated with active transportation on the Island of Montreal. Projects were concentrated in more urbanized neighbourhoods where more socially isolated and
materially deprived people live and where a greater number of road intersections are the site of injuries. Future research on the impact of these projects on the built environment is needed, as community groups represent a voice for populations and a mechanism through which they can exercise citizenship.

REFERENCES

Application of an evidence-based tool to evaluate health impacts of changes to the built environment

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ABSTRACT

OBJECTIVES: To create and apply an empirically based health and greenhouse gas (GHG) impact assessment tool linking detailed measures of walkability and regional accessibility with travel, physical activity, health indicators and GHG emissions.

METHODS: Parcel land use and transportation system characteristics were calculated within a kilometre network buffer around each Toronto postal code. Built environment measures were linked with health and demographic characteristics from the Canadian Community Health Survey and travel behaviour from the Transportation Tomorrow Survey. Results were incorporated into an existing software tool and used to predict health-related indicators and GHG emissions for the Toronto West Don Lands Redevelopment.

RESULTS: Walkability, regional accessibility, sidewalks, bike facilities and recreation facility access were positively associated with physical activity and negatively related to body weight, high blood pressure and transportation impacts. When applied to the West Don Lands, the software tool predicted a substantial shift from automobile use to walking, biking and transit. Walking and biking trips more than doubled, and transit trips increased by one third. Per capita automobile trips decreased by half, and vehicle kilometres travelled and GHG emissions decreased by 15% and 29%, respectively.

CONCLUSION: The results presented are novel and among the first to link health outcomes with detailed built environment features in Canada. The resulting tool is the first of its kind in Canada. This tool can help policy-makers, land use and transportation planners, and health practitioners to evaluate built environment influences on health-related indicators and GHG emissions resulting from contrasting land use and transportation policies and actions.

KEY WORDS: Environment and public health; decision support techniques; city planning; geographic information systems; health impact assessment; spatial analysis

The current obesity epidemic is well documented.1,2 In Canada, the prevalence of overweight increased from 28% to 34% between 1985 and 2003, and obesity increased from 7% to 16% over the same time period.3 Commonly cited societal factors include a shift from active to sedentary occupations, the current dominance of the automobile as the primary mode of transportation, an increase in sedentary leisure time, inadequate leisure-time physical activity and easy access to inexpensive, calorie-dense foods.4,5 Inadequate physical activity and excess weight or obesity are risk factors for multiple chronic diseases (e.g., cardiovascular disease, type 2 diabetes), which are also on the rise.6,7 These conditions have an increasingly detrimental impact on individual quality of life and repercussions for both individual and public spending on health care.9,10

Reversing the upward trends in body weight and chronic disease will require both individual and population-level approaches in multiple settings.11 To date, published evidence indicates that the built environment has a small but significant impact on physical activity, obesity and chronic disease.12 The evidence identifies features of the built environment that are associated with greater levels of active transportation (e.g., mixed land use), recreational physical activity (e.g., access to park and recreational facilities) and healthy food consumption (e.g., access to stores selling fresh produce).13,15 Studies have also identified features that discourage physical activity (e.g., heavy traffic) or are associated with unhealthy food consumption (e.g., access to fast food restaurants).16,17

Recent Canadian studies have begun to confirm these findings in both adults and children.18 Glazier et al. found higher neighbourhood walkability for Toronto adults to be significantly associated with more active travel, less automobile travel, lower prevalence of being overweight or obese, and lower prevalence of...
diabetes mellitus.19 Pouliou and Elliott reported that higher residential density was associated with lower body mass index (BMI) for Toronto adults and that higher land-use mix, residential density, street connectivity and a walkability index were all associated with lower BMI for Vancouver adults.20 In a study of 10-14 year olds in London, Ontario, Gilliland et al. found better residential access to recreational opportunities to be associated with lower BMI and better school access to fast food outlets to be associated with higher BMI.21

At the individual level, the effect size of built environment interventions is likely to be small, but these benefits are important because they are experienced by many people, which creates a population-level exposure to structural changes to the environment that is sustained over time. Changes to the built environment are a lasting form of prevention and should be one of many complementary strategies utilized to improve public health. Structural changes to the built environment are often required for other programmatic changes to be effective. For example, promoting walking and active travel is not effective without adequate infrastructure. Current cost-benefit tools used to prioritize major transportation investments do not consider the full array of health impacts that research suggests would result from changes to the built environment. Evidence from the current study along with the growing body of research in this area suggests that these tools should include costs associated with a wider range of health outcomes.

Health impact assessments (HIAs) are increasingly being incorporated into local practice to provide stakeholders and decision-makers with health-related information. HIAs can be applied to proposed laws, policies, programs, plans, development projects or investment priorities to evaluate potential impacts on human health. The use of HIAs has gained popularity in North America in recent years, though they most often rely on non-quantitative assessment measures based on translation of limited published evidence about a given decision or project. Recent reviews found that quantitative assessment measures were provided in only 11 of 27 HIAs in the United States and 17 of 98 in Europe.22,23 The specificity and defensibility of HIAs can be substantially strengthened by the incorporation of quantitative data based on local evidence.24,25 This is particularly important when interventions to major land development and transportation proposals to improve health and environmental outcomes can have large-scale fiscal consequences and will likely be challenged. Qualitative data are less likely to hold up under legal challenge.

The current study provides an overview of the model development and case study application of an evidence-based, quantitative HIA tool created and applied within the City of Toronto. The tool was developed for Toronto Public Health as a part of the Healthy Canada by Design’s Coalitions Linking Action and Science for Prevention (CLASP) initiative funded by the Canadian Partnership Against Cancer.26 It has already been applied elsewhere in Canada and was designed to predict levels of physical activity, health-related indicators and GHG emissions associated with proposed land use and transportation developments.

**METHODS**

Development of the CLASP tool involved two major steps: fitting predictive models associating built environment characteristics to health behaviours/indicators using local Toronto cross-sectional data, and modifying an existing software tool (CommunityViz, developed by Placeways, LLC, Boulder, CO) to predict changes in health behaviours/indicators in response to user-defined changes in built environment characteristics. The tool was then applied to the West Don Lands Redevelopment in Toronto as a case study to demonstrate the functionality.

CommunityViz (CViz) is a commercially available extension to ArcMap (ESRI, Redlands, CA) software. CViz was selected for implementation of the CLASP tool because it is already widely used by urban planners for evaluating basic impacts (e.g., on transportation, environmental, school) of future land development and transportation investment scenarios, and could be customized to include health impact models. CViz provides a user-friendly geographical information system interface that can be used by planners and stakeholders to analyze existing built environment conditions, modify future conditions and receive feedback on their impacts. CViz users manipulate future conditions in two basic ways to generate information on the health impacts: develop/redevelop land uses and modify transportation infrastructure. CViz feedback is presented through a combination of maps, numbers and charts that compare base conditions and future scenarios on the metrics of interest.

**Dependent variables**

Dependent variables were derived from two data sources: the 2007/2008 wave of the Canadian Community Health Survey (CCHS) and the 2006 Transportation Tomorrow Survey (TTS).

Dependent variables considered for model building consisted of (from the CCHS) walking and biking for exercise, walking and biking to work/school, body mass index, daily energy expenditure and the likelihood of having high blood pressure; and (from the TTS) walk/bike trips/day, transit trips/day, automobile trips/day, kilometres of travel/day and estimated vehicular emissions of CO2/day. The CCHS sample contained 4,077 participants within the City of Toronto who were geocoded to postal codes. The TTS sample contained 22,091 participants within the City of Toronto geocoded to postal codes. It was not possible to obtain records for each TTS participant; rather, the data represent postal code-level averages.

**Independent variables**

Built environment variables were measured for all 47,246 postal codes in the City of Toronto using spatially registered local parcel, transportation network (transit, roadway, pedestrian and bike) and destination (food outlet, park and school) data. The area within a 1 kilometre network buffer surrounding each postal code was included in the calculation of built environment variables. Buffers were created to encompass the area that can be traveled from the centre of the postal code, in all directions, for a kilometre along the street network (excluding limited-access roadways). This approach has been validated repeatedly in other peer-reviewed research.27,28 The built environment variables included the length of roads; bicycle and sidewalk facilities; distance to nearest major arterial, school and transit stop/station; accessibility to major regional destinations; several density vectors, including net-residential, intersection, schools, transit stop and type of each food location (sit down and fast food,
grocery and convenience stores); and measures of land use, including an entropy-based measure of mix, retail floor-to-land area and park area.

Demographic and socio-economic covariates were also included as independent control variables in the models. The covariates were derived directly from the CCHS and TTS surveys when available. When critical covariates were not provided from these survey sources, covariate values for each participant were imputed from the 2006 Census in Canada. These data were available only at the level of the dissemination area (DA). DA values were assigned to all postal codes falling within the DA, and then assigned to the survey participants falling within each postal code. Demographic variables used in the predictive modelling included those of the survey participants as well as Census based variables. These variables included age, sex, household income, household size, vehicle ownership, education level, employment status and DA minority population percentage.

Analytical methods
Data were joined at the postal code level, the smallest common geographic unit. Multivariate regression models were used to predict the value of each health outcome/behaviour based on each participant’s built environment and demographic/socio-economic characteristics. Four different types of regression model were used, depending on the type and distribution of the outcome variable: linear, log-linear, binary logistic and two-stage (zero-inflated). In each case, a base model was first built to include any statistically significant (p<0.05) demographic/socio-economic variables.

Next, built environment variables were added to the model until the combination of variables providing the highest predictive fit (r-squared) to the outcome was found. The modelling process was constrained by the fact that resulting variable formulations needed to be usable within the modelling software and applicable to real-world scenario testing. Therefore, predictive modelling (not hypothesis testing) was the ultimate goal of the analyses. In addition, built environment variables were included in a few instances in which they were not significantly associated with the outcome of interest because they improved the predictive fit of the model. As shown in the past, built environment variables were found to be multicollinear and were combined into an index. Log transformations were used for variables with extreme positive skew.

Some practical limitations related to the need to apply these models in a scenario-planning software tool constrained the selection of independent variables. For example, all model variables needed to be available for every Toronto postal code for the base scenario and modifiable for future scenarios. Similarly, all measurements required for calculating each variable must be technically possible within the software tool and able to be calculated in less than an hour (as the software tool is intended for use in real time at public meetings). CViz is more constrained in this manner than other software platforms that access external computing capacity through the Internet.

Case study area selection and model application
The West Don Lands (WDL), indicated in Figure 1, was selected for the test case study for the CLASP tool. The test scenario is based on the WDL Precinct Plan redevelopment of this underutilized, waterfront industrial land. It defines the location, scale, character and function of all public spaces, streets, buildings and facilities to be provided and developed within the
Table 1. Demographic characteristics of residents of the West Don Lands (WDL) study area and impact area, the City of Toronto, and CCHS and TTS participants

<table>
<thead>
<tr>
<th>Variable</th>
<th>WDL study area (postal code level, n=15)*</th>
<th>WDL impact area (postal code level, n=350)*</th>
<th>City of Toronto†</th>
<th>CCHS (participant level, unless otherwise noted), mean (N)</th>
<th>TTS (average survey participant at the postal code level, unless otherwise indicated), mean (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median age</td>
<td>45.2</td>
<td>38.4</td>
<td>38.4</td>
<td>46.6 (4077)</td>
<td>42.4 (22,102)</td>
</tr>
<tr>
<td>% female</td>
<td>53.0</td>
<td>48.3</td>
<td>51.9</td>
<td>54.0 (4077)</td>
<td>56.2 (21,028)</td>
</tr>
<tr>
<td>Average no. per household</td>
<td>2.6</td>
<td>2.6</td>
<td>2.5</td>
<td>2.5 (4077)</td>
<td>2.7 (22,113)</td>
</tr>
<tr>
<td>% with university degree</td>
<td>47.8</td>
<td>38.5</td>
<td>37.3</td>
<td>32.3 (3926)</td>
<td>30.0 (21,828)*</td>
</tr>
<tr>
<td>Median household income ($)</td>
<td>61,078</td>
<td>76,082</td>
<td>52,833</td>
<td>77,049 (3127)*</td>
<td>83,988 (21,828)*</td>
</tr>
</tbody>
</table>

* Statistics Canada, 2006 Census dissemination area values assigned to participants/postal code centroids.
† Statistics Canada, 2006 Census Community Profile.
‡ Household income 2006.
CCHS=Canadian Community Health Survey; TTS=Transportation Tomorrow Survey.

Table 2. Study area built environment measures

<table>
<thead>
<tr>
<th>Variable</th>
<th>Existing conditions</th>
<th>Future: WDL Precinct Plan</th>
<th>% change from existing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net residential density</td>
<td>72.4</td>
<td>119.0</td>
<td>64.4%</td>
</tr>
<tr>
<td>Land-use mix</td>
<td>0.5</td>
<td>0.5</td>
<td>0.0%</td>
</tr>
<tr>
<td>Retail floor-to-lot area ratio</td>
<td>0.8</td>
<td>1.2</td>
<td>50.0%</td>
</tr>
<tr>
<td>Schools</td>
<td>12.0</td>
<td>13.0</td>
<td>8.3%</td>
</tr>
<tr>
<td>Food locations</td>
<td>159.0</td>
<td>193.0</td>
<td>21.4%</td>
</tr>
<tr>
<td>Intersection density</td>
<td>134.8</td>
<td>152.0</td>
<td>12.8%</td>
</tr>
<tr>
<td>Transit density</td>
<td>40.4</td>
<td>42.0</td>
<td>4.0%</td>
</tr>
<tr>
<td>Pedestrian-accessible roads</td>
<td>58.4</td>
<td>62.2</td>
<td>6.5%</td>
</tr>
<tr>
<td>Bicycle facilities (km)</td>
<td>11.8</td>
<td>18.5</td>
<td>56.8%</td>
</tr>
</tbody>
</table>

Table 3. Estimated outcome values for West Don Lands (WDL) study and impact area

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Study area (15 postal codes)</th>
<th>Impact area (350 postal codes)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>WDL existing conditions</td>
<td>WDL plan</td>
</tr>
<tr>
<td>Active trips/person per day</td>
<td>0.23</td>
<td>0.48</td>
</tr>
<tr>
<td>Transit trips/person per day</td>
<td>0.60</td>
<td>0.79</td>
</tr>
<tr>
<td>Automobile trips/person per day</td>
<td>1.00</td>
<td>0.52</td>
</tr>
<tr>
<td>Trip kilometres/person per day</td>
<td>18.17</td>
<td>15.43</td>
</tr>
<tr>
<td>Vehicular CO2 emissions</td>
<td>3.38</td>
<td>2.39</td>
</tr>
<tr>
<td>Leisure walking episodes/month</td>
<td>13.63</td>
<td>14.40</td>
</tr>
<tr>
<td>Walk trips to work/school/month</td>
<td>7.79</td>
<td>10.94</td>
</tr>
<tr>
<td>Leisure biking episodes/month</td>
<td>1.08</td>
<td>1.53</td>
</tr>
<tr>
<td>Bike trips to work/school/month</td>
<td>0.80</td>
<td>1.53</td>
</tr>
<tr>
<td>Daily energy expenditure</td>
<td>2.28</td>
<td>2.73</td>
</tr>
<tr>
<td>Body mass index</td>
<td>24.31</td>
<td>24.41</td>
</tr>
<tr>
<td>Likelihood of high blood pressure</td>
<td>9.63%</td>
<td>9.19%</td>
</tr>
</tbody>
</table>

* Daily energy expenditure, expressed in kcal/kg/day (PACDTLE), was derived by Statistics Canada on the basis of participant responses to several activity questions. It was calculated by combining the time each participant spent engaging in leisure (e.g., walking, cycling, sports) and transportation (e.g., walking/cycling to work) activities in the previous three months. The total number of calories burned during all activities was calculated and converted into a daily value based on the participant's weight. Respondents are classified as follows: 3.0 kcal/kg/day or more=physically active; 1.5 to 2.9 kcal/kg/day=moderately active; less than 1.5 kcal/kg/day=inactive.


WDL community. Significant changes are planned for this east of downtown, 80 acre site:
• 6,000 to 6,500 housing units, 1,300 of which will be affordable rental housing
• Residences in a mix of housing types from townhouses to mid-rise buildings and towers
• 1 million square feet of office and retail space
• New streets improving connectivity
• New parks, including an 18-acre park immediately adjacent to the Don River
• A new streetcar line
• A new school

Changes to the built environment within the study area are expected to have an impact not only on the behaviour of people in that area but also on those living in the area immediately surrounding it. For example, new retail, employment or transit that is built within the study area will offer new destination choices for people nearby. For this reason, models were applied to both the study area (n=15 postal codes) and the “impact area”, defined as the study area plus any postal code that has its 1 kilometre buffer intersecting the study area (n=350 postal codes).

Demographic and socio-economic characteristics for the case study were derived from Census (2006) DA data. Table 1 provides average values of demographic characteristics at the postal code level for the study and impact areas, overall for the City of Toronto, and at the individual level for the CCHS and TTS participants whose data were used to create the regression models. Residents of study area postal codes are older, more educated and have a higher income than in the City as a whole. Residents of the impact area are more similar to those of the City.
as a whole, with the exception of a lower proportion of female residents and much higher household income.

The final regression models were then applied at the postal code level for each outcome of interest for both base conditions and the future development scenario. For ease of interpretation, demographic and socio-economic profiles for each postal code were held constant between the two scenarios. Outcome estimates were generated for both the study area and the impact area.

RESULTS

Regression results are summarized as follows. Characteristics that were most commonly associated with more physical activity, lower body weight, better health and reduced vehicular impacts were higher land-use mix, intersection density, retail floor-to-area ratio, residential density, transit stop/station density and retail food store density. Greater access to parks and to trails was associated with walking for exercise, while greater sidewalk coverage and bike facility access were associated with more walking or bicycling for transportation. Better regional accessibility was associated with more walking, bicycling and transit trips, fewer/shorter vehicle trips and reduced GHG emissions.

Table 2 provides values for a subset of the built environment values used by the regression models and calculated for the study area’s existing and planned future conditions. These values are based on the area encompassed by the buffered study area postal codes. Under the WDL Plan the area is expected to become denser with more destinations, and while the mix of residential and non-residential land uses is unchanged, the amount and density of new retail are increased. The transportation network is expected to expand for walkers, bicyclists and transit users.

Table 3 shows the predicted results for each outcome and the percent change between future and baseline conditions. The left half of the table indicates the results for people living only inside the study area, and the right half of the table indicates the results for people living within the impact area. Only the study area results will be discussed in detail below. In all cases, those living outside the study area experienced similar positive impacts at a lower magnitude than those living within the study area.

Upon implementation of the Precinct Plan for redevelopment, it is anticipated that there will be a substantial shift from automobile use to active modes (walking and biking) and transit.
For residents living within the study area, active mode trips are expected to more than double and transit trips to increase by one third. In contrast, automobile trips are expected to decrease almost by half. Concurrent with the reduction in automobile trips would be a 15% decline in vehicle kilometres travelled per person and a 29% reduction in vehicle-related GHG emissions per household.

Study area residents are projected to walk or bike to work or school with far greater frequency upon implementation of the Precinct Plan, increasing walking by 40% and biking by 238%. Smaller increases in recreational walking and biking are anticipated, a 5.7% projected increase for walking and 42% increase for biking. This increased walking and biking leads to a 20% projected increase in daily energy expenditure for study area residents upon implementation of the Precinct Plan, from 2.3 to 2.7 kcal per person per day.

The health benefits for study area residents of the shift to active transportation modes and the increase in recreational physical activity upon implementation of the Precinct Plan are demonstrated by the decrease in projected BMI and reduced likelihood of having high blood pressure. Average BMI is projected to decrease by 0.17 points, while the prevalence of high blood pressure is projected to decrease from 9.6% of the population to 9.2%.

Application of the model results can also be used to create city-wide, postal code-level thematic maps for the outcomes. Figure 2 shows results by quartile for one selected outcome, daily energy expenditure. It is clearly seen that the central downtown and areas to the west and north, represented in yellow, indicate higher activity, with less activity estimated away from these areas.

DISCUSSION

This study reports on the development and application of an evidence-based software tool to predict the health impacts of built environment changes. The West Don Lands application of the tool demonstrated the potential to predict how proposed changes to the built environment can improve human health by increasing levels of physical activity. The implementation of a development plan to infill the WDL with additional housing, retail opportunities and improved transportation infrastructure was predicted to increase walking, cycling and transit use among residents, particularly for utilitarian purposes but also in terms of leisure activity. The predicted increase in active transportation and leisure physical activity resulted in increased total daily energy expenditure. While not conclusive based on cross-sectional data alone, it is logical that increased energy expenditure would lead to lower body weight and improved health over time. The case study results are consistent with these causal relationships, as WDL residents are also predicted to have lower BMI and reduced likelihood of high blood pressure.

Although not measured for the case study, the health benefits are also anticipated to reduce the health care costs related to obesity. In addition to the physical activity and health benefits, the results also demonstrated important transportation and environmental co-benefits, including a reduction in vehicular trips, vehicle kilometres travelled and GHG emissions. Although the magnitude of change was relatively small for many of the outcomes, the number of people affected by the Plan (not to mention the co-benefits) suggests that built environment changes merit consideration as one of many complementary strategies that can be used to combat rising rates of obesity and chronic disease.

Regression model development and case study development suffered from a few limitations. First, the data used to build the regression models were cross-sectional. While the predictive modelling application implies a cause-and-effect relationship, it is important to recognize that causality cannot be determined from these data. Second, variable selection and modelling methods were constrained by sample (CCHS and TTS) and population-wide data availability and the limitations of the CViz application tool. Thus we were unable to adjust for variables in the final models known to be associated with the outcomes of interest, such as diet, attitudinal factors and genetics. Third, demographic and socio-economic characteristics were held constant between base and future scenarios. This decision was made purely for ease of interpretation. Arriving at an agreed-upon predicted future demographic mix of a given location is one of the most difficult parts of scenario planning. Modifying only the built environment characteristics allowed us to isolate the impact of built environment changes disentangled from potential impacts related to change in individual-level characteristics. The resulting software tool is fully capable of simultaneously modelling both individual-level and built environment changes, and doing so is recommended for real-world applications.

Despite these limitations, the regression modelling and case study results were intuitive and consistent with other published findings. Greater local accessibility and access to walking/biking/transit infrastructure have been associated with more transportation-related and total physical activity, reduced body weight and reduced blood pressure. Better access to park and recreation facilities has been associated with more leisure physical activity. Both local and regional accessibility have been associated with reduced vehicle kilometres of travel and GHG emissions.

The development of a quantitative health impact assessment tool and its pilot testing in Toronto are important contributions to the field, as they demonstrate the value of using local data sources to generate evidence-based health predictions in response to proposed changes in the built environment. The tool was also successfully applied in the rapidly growing City of Surrey in British Columbia, showing considerable health benefits of the adopted downtown redevelopment plan. Rather than being a one-off analysis, this tool can be used by the City of Toronto to routinely evaluate development proposals and inform plan updates and infrastructure funding prioritization decisions. Conducting routine health impact analyses helps to elevate the importance of health as a key consideration in urban planning, increasing the likelihood that “healthy living” is ingrained more generally into both government and private sector culture. The ability to quantify health impacts has the added benefit over non-quantitative assessments of providing measurable and defensible metrics that can be compared against competing proposals or plans.
REFERENCES


Incorporating consideration of health impacts into land use development approval processes: Development of a Health Background Study Framework

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ABSTRACT

OBJECTIVES: This project involved development of a Health Background Study (HBS) Framework to support consideration of health impacts within municipalities’ approval process for land use development.

PARTICIPANTS: Peel Public Health and Toronto Public Health led the project with the participation of planners, urban designers, engineers, public health staff and development industry representatives.

SETTING: Historical growth in the Region of Peel and suburban Toronto has resulted in extensive low-density development, creating car-dependent communities with disconnected streets and segregated land uses.

INTERVENTION: The inclusion of an HBS in developers’ applications to municipalities is one approach by which health-related expectations for the built environment can be established within the approval process. Development of the HBS Framework used the six core elements of the built environment with the strongest evidence for impact on health and was informed by analysis of the provincial and local policy contexts, practices of other municipalities and stakeholder interviews. The Framework’s contents were refined according to feedback from multidisciplinary stakeholder workshops.

OUTCOMES: The HBS Framework identifies minimum standards for built environment core elements that developers need to address in their applications. The Framework was created to be simple and instructive with applicability to a range of development locations and scales, and to various stages of the development approval process. Peel Public Health is leading several initiatives to support the use of the HBS as a part of the development application process.

CONCLUSION: The HBS Framework is a tool that public health and planning can use to support the consideration of health impacts within municipalities’ land use development processes.

KEY WORDS: Environment and public health; urban planning; physical activity; public policy; walkability

Regular physical activity has substantial health benefits. Despite longstanding efforts to promote physical activity, only 15% of Canadian adults meet physical activity recommendations. A major challenge is that physical activity has been engineered out of people’s lives, decreasing the need to walk and establishing disincentives to do so.

A growing body of evidence links the built environment to activity and health outcomes. The characteristics of conventional suburban development, with low density, single-family dwellings and automobile dependency for even short trips, are associated with reduced physical activity, obesity and chronic diseases. In contrast, compact, walkable, transit-supportive built environments are associated with higher amounts of active transportation and overall physical activity. Existing evidence-based reviews recommend a comprehensive range of policies to support greater physical activity (see text box, below left). In addition to their impact on physical activity, improvements in the built environment could be physically active.

Evidence-Based Recommendations for Population-Based Policies to Support Physical Activity

- Enhance infrastructure supporting bicycling and walking.
- Support the location of schools within easy walking distance of residential areas.
- Improve access to public transportation.
- Zone for mixed-use development – integration and interrelationships of residential, school, work, retail and public spaces.
- Enhance personal safety and traffic safety in areas where people are or could be physically active.
- Improve walkability, a composite indicator that incorporates aspects of land-use mix, connectivity, pedestrian infrastructure, aesthetics, traffic safety, and/or crime safety.

Conflict of Interest: None to declare.
professionals across multiple sectors. Often, the same solutions would also be anticipated to reduce traffic-related air pollution, improve mental health and social well-being, promote transportation equity and provide better support for an aging population.6,16

While existing recommendations provide guidance to public health and others regarding which built environment policies to seek, it is less clear how best to influence their adoption.4 Despite public health’s involvement in the design of healthier cities starting in the late 1800s, in recent decades public health has been mostly situated outside of the institutionalized urban planning regime. Nevertheless, collaboration between public health and urban planning professionals is essential to improve the built environment in support of improved health outcomes. Fortunately, there is a convergence of perspectives on the components of a healthier and more sustainable built form among a range of stakeholders, especially those advocating from environmental, social or economic perspectives.

Building healthier communities by design is a major departure from the status quo of low density, car-dependent development.21 While provincial policy provides a high-level vision for achieving healthy, compact communities,24 it is the multiple levels of plans from region/city-wide official plans down to detailed site plans (see Appendix A) that need to comprehensively support increased walking, cycling and transit use.13,14,25 In Ontario, public health has funding, governance and, in many urban centres, administrative linkages with municipal governments. This provides an opportunity to work more closely with planners, transportation engineers and others to seek common goals of compact, healthy communities.

Discussions with urban planners indicated that the preparation of development application background studies was one approach by which health-related expectations for the built environment could be established. Developers’ applications to municipalities typically comprise several types of reports or “studies” that are required to show that undue adverse impacts are not associated with the nature, scale and form of development. Accordingly, Peel Public Health and Toronto Public Health collaborated on the development of a Health Background Study (HBS) Framework to establish a mechanism for integrating considerations of health impacts into the land use development approval process. The purpose of this article is to describe the development and components of the HBS Framework and the next steps towards its implementation.

**CONTEXT**

The Region of Peel and the City of Toronto are two of Canada’s largest municipalities. The Region of Peel is a two-tier municipality with a population of 1.3 million that includes three local municipalities: the City of Mississauga, the City of Brampton and the Town of Caledon.26 The City of Toronto, with a population of 2.6 million, operates as a single-tier municipality.27 During the post-WWII era and up to the 2000s, growth in the Region of Peel resulted in extensive low-density development in which agricultural fields were converted to car-dependent communities with disconnected streets and segregated land uses. Although this model is characteristic of most post-WWII suburbs in North America, municipalities like the Region of Peel are now recognizing the multiple, undesirable impacts of this type of development and are attempting to change course by adopting planning policies that support a healthier development model. The old City of Toronto, which was established before the car era, is well endowed with walkable streets, greater development densities and mixed land uses. However, the remainder of the city, known as the “inner

**Figure 1.** Path to developing the Health Background Study Framework
suburbs”, demonstrates the same post-war planning features that characterize suburbs across the continent.

DEVELOPING THE HEALTH BACKGROUND STUDY FRAMEWORK

Overview
Figure 1 provides an overview of the project in which an initial Health Development Index (HDI) evolved into a comprehensive HBS Framework.

The Health Development Index
When Peel Public Health became involved in reviewing development applications in collaboration with planning staff in 2005, it became apparent that evidence-based criteria to identify potential health impacts were needed.3 With funding support from the provincial government, Peel Public Health retained a research team to prepare a comprehensive literature review and develop the HDI. The HDI includes the seven elements of the built environment with the greatest strength of evidence of association with health (see text box, below).3 For each element, health-related targets were identified, and these were the subject of consultations with regional and local planners and private planning firms.

Core Elements of the Built Environment Associated with Health

- Density
- Service proximity
- Land use mix
- Street connectivity
- Road network & sidewalk characteristics
- Parking
- Aesthetics & human scale

HDI review and HBS situational assessment
A planning consulting firm applied the HDI to two conventional and three recent developments. The latter were based on the latest conceptions of good planning.23 While the HDI’s results were reasonable, it was recommended that its usability be enhanced with greater use of narrative commentary and the creation of an implementation guide. Combined with the intent to have developers prepare a health-related study, this led to the development of the HBS Framework.

As an initial step, a situational assessment was conducted to examine the policy context and existing approaches towards addressing the linkage between the public’s health and land use planning.3,28-31 The assessment highlighted the provincial policies promoting the development of complete, healthy and active communities, which include places to live, work, shop, play and go to school, and opportunities to walk, cycle and take public transit.24,32 Adopting these policies requires approaches that support mixing land uses at higher, transit-supportive densities; managing growth through intensification requirements; and directing new development to centres and corridors.24 This vision is being pursued within the Region of Peel and its constituent municipalities.25-36

Many municipal jurisdictions across North America are adopting language in their long-term planning documents that recognizes the linkage between the built environment and health outcomes. Few, however, have developed and/or implemented mechanisms to directly influence health outcomes through the planning and development approval process.37

In order to assess the level of support for a new study requirement and seek advice about its content, a series of 25 interviews were completed with planners, developers, public health staff and private health consultants who would likely be involved in the future application of any new proposed processes. Table 1 summarizes the divergent opinions on the need for an HBS.

Since an HBS is a novel approach that has not yet been applied and evaluated, the range of existing opinions is not surprising. In Peel Region, it was felt that having a separate tool was important to encourage a comprehensive and visible approach to creating a health-supporting built environment.

On the basis of the findings from the HDI review and HBS situational assessment, several areas for building upon the HDI were identified (see text box, below). Recognizing that in Peel Region there are several separate planning departments, three municipal and one regional, the Framework provides flexibility, so that it can be integrated within the approval process or used as a reference to existing processes at the discretion of an individual municipality.

Summary of Recommended Improvements to the HDI

- Establishing a format for the HBS that is simple, standardized and instructive to applicants with an explanatory implementation guide.
- Utilizing a checklist to evaluate the success of new developments in achieving standards supportive of community health.
- Identifying how to adapt the HBS to different levels of planning.
- Addressing overly prescriptive aspects.
- Allowing more narrative description of how design elements are to be addressed.

Development of the HBS Framework
The HBS Terms of Reference (ToR) define the study requirements and the main issues that developers need to address as they prepare an HBS as part of their application. The ToR were organized around six of the HDI’s key elements of the built environment; “aesthetics and human scale” was excluded because of its overlap with existing urban design policies and guidelines. For each core element, minimum standards were developed based on expert opinion and a review of best practice standards and guidelines. The team also drew on principles in the Toronto Green Standard specifying that criteria should be measurable, performance-oriented, focused on the design and construction of built form and user-friendly, and should set a high but achievable expectation for performance.28

Responding to the advice of key informants, the project team formatted the standards as a checklist and introduced complementary sections for each core element, which addressed

<table>
<thead>
<tr>
<th>Table 1. Summary of interview themes on whether to include or exclude use of a Health Background Study (HBS)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Favouring HBS process</strong></td>
</tr>
<tr>
<td>- Health-related elements of the built environment are interdependent. Having a separate HBS may contribute to their being addressed in a comprehensive and integrated manner.</td>
</tr>
<tr>
<td>- Indicates the priority that the municipality is placing on the health of its citizens.</td>
</tr>
<tr>
<td><strong>Not favouring HBS process</strong></td>
</tr>
<tr>
<td>- Potential to create additional costs and time delays.</td>
</tr>
<tr>
<td>- Health impacts could be incorporated into existing study requirements.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Core Elements of the Built Environment</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Density</td>
</tr>
<tr>
<td>Service proximity</td>
</tr>
<tr>
<td>Land use mix</td>
</tr>
<tr>
<td>Street connectivity</td>
</tr>
<tr>
<td>Road network &amp; sidewalk characteristics</td>
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<tr>
<td>Parking</td>
</tr>
<tr>
<td>Aesthetics &amp; human scale</td>
</tr>
</tbody>
</table>
DEVELOPING A HEALTH BACKGROUND STUDY FRAMEWORK

its rationale, objectives, key questions and reporting requirements. Appendix B provides examples of minimum standards, as well as descriptions and a rationale for each element. In the HBS User Guide, these sections were expanded in a more user-friendly format, with illustrations, background information and resources. Figures 2 and 3 reproduce illustrations from the User Guide showing hypothetical developments at approximate densities of 50 and 150 residents and jobs combined per hectare. They also depict, depending upon the context, other desired features, including mixed land use, service proximity and planning for pedestrians, cyclists and transit.

The ToR and User Guide were refined through a workshop attended by 50 public and private planners, transportation engineers, public health staff, urban designers, parks and recreation staff, developers and representatives from a conservation authority and school boards. Participants were organized into six groups and were asked to apply the design standards and User Guide against three development case studies: a greenfield (previously undeveloped area) plan, an urban infill (community redevelopment) project and a phased greenfield-infill plan. Extensive feedback was received with regard to the validity and specificity of the standards; their applicability across the development contexts; and the applicability of the HBS Framework throughout the various stages of the existing development approvals process (Secondary Plan, Block Plan and Site Plan). The standards were then amended to increase their defensibility in terms of their connection to health outcomes and their applicability in varying contexts. Following the completion of the ToR and User Guide, an Implementation Strategy was prepared with recommended actions at the regional and local levels of government.

DISCUSSION

The HBS Framework includes minimum development standards that have the potential to change the shape of development so that new (and retrofitted) communities may be more health promoting than those built during the post-WWII era.

Figure 2. Hypothetical streetscape depicting the growth plan’s density targets for designated greenfield areas (density of approximately 50 residents and jobs combined per hectare)

Copyright Queen’s Printer for Ontario, image source: Ontario Growth Secretariat, Ministry of Infrastructure. Used with permission (see https://www.placestogrow.ca/index.php?option=com_rsgallery2&Itemid=2&catid=9)

Figure 3. Hypothetical downtown streetscapes depicting the growth plan’s density targets for urban growth centres (density of approximately 150 residents and jobs combined per hectare)

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Blending evidence and multiple perspectives in public policy development

Development of the HBS Framework was based on the evidence reviewed in the HDI, which identified those elements of the built environment with the strongest evidence for an impact on the public’s health.5 Evidence, however, is only one ingredient influencing policy decisions, with personal beliefs, values, external factors (e.g., election), interest group pressure and institutional constraints also contributing.38 Better land use and transportation planning is an ambiguous problem that involves economic, social, environmental and health perspectives. For such problems, the Multiple Streams Framework emphasizes that the policy solution needs to be technically feasible and achieve value acceptance.39,40 Accordingly, a consultative process was pursued so that the research evidence could be “brought together with the views, experiences and tacit knowledge of those who will be involved in, or affected by, future decisions”38 about implementing the HBS Framework.

Table 2 summarizes the findings from the several stakeholder consultations that were held in developing the HDI and HBS.

Over the course of this process, the focus shifted from which elements to include to how best to support developers, planning staff and public health staff in applying them. The iterative consultation process was critical to increasing the Framework’s validity and usability, and for building support for its uptake. While the intent of the elements remained constant, how best to craft and apply standards benefited from further review and discussion. For example, the density standards in the HDI initially were framed as dwelling density and minimum average floor area ratios. Over the consultations, a shift to people and jobs per hectare was chosen, which aligns with provincial policy direction. By testing the standards against development studies, information on their usability was received. This led to improvements in the HBS Framework, clarifying applicability of the standards to different types of development as well as planning stages.

While there was widespread agreement regarding the important effect of built environment characteristics on the public’s health, there was variable support for incorporating higher standards for
building communities in a way that supports physical activity and healthier living. As a result of the input received from workshop participants, the HBS implementation strategy was adjusted to begin to address development industry concerns regarding delays and associated costs. These could be minimized by incorporating the HBS within the existing approval process, utilizing many of the same measures that developers currently report upon (e.g., through urban and sustainable design guidelines) and recommending that municipalities adopt limitations on the approvals duration (e.g., maximum 60 days). The piloting also provided insight into the capacity required for implementation.

**Implementation**

Recognizing that municipal leaders must balance multiple considerations when planning, the HBS Framework provides a stronger mechanism for the consideration of health outcomes within existing policy processes. Through action by public health and its planning partners, Peel’s regional and local governments are creating the policy context through their official plans to enable the use of the HBS. Achievement of healthy communities will depend upon these governments realizing their commitment to deliver public transit, accessible streetscape treatments and diverse parkland systems to encourage walking and cycling. This involves providing travel options, local destinations and focal points in all sizes of communities. In particular, transportation improvements must be a priority if denser, mixed-use development is to yield a shift away from previous forms of development.

Given the magnitude of the shift from conventional suburban development, public health’s continuing collaboration with planners is critical to support application of the HBS Framework. There is no shortage of high-level recommendations for building healthy communities. The intrinsic challenge is translating what is known about the health impacts of the built environment into specific design guidance that is then integrated into all stages of planning. To this end, Peel Public Health is actively collaborating with planners on applying the HBS for specific scenarios, which is supported by dedicated capacity and the establishment of joint positions with planning and transportation departments. In addition, the HBS implementation strategy recommends a number of activities, including staff training workshops, municipally led demonstration projects, a monitoring program and an awards program that recognizes new, healthy development.

Public health action needs to be based on the best available evidence and guided by understanding gained by assessing the impacts of interventions. Regional public health staff are currently working with regional and municipal planners to integrate the HBS elements into relevant policies, plans and by-laws to optimize the health-promoting potential of various planning instruments. These include community improvement plans, transportation master plans, urban design guidelines and secondary plans. Furthermore, regional and municipal staff are also beginning to require health assessments as part of a complete application for development proposals, including land use concept plans such as block plans and site plans. This incremental approach to implementation is encouraging for new users and demonstrates the ongoing need to strategically build support for change by demonstrating the validity and usefulness of this new tool. As a novel intervention, it will be necessary to learn from HBS implementation and to continually improve its content and associated processes.

**CONCLUSION**

Improving the public’s health requires promoting and creating built environments that encourage and support health. Public health leadership includes not only identifying what needs to change but also becoming actively involved in facilitating these changes. The HBS Framework translates the evidence concerning the relationship of the built environment and health into the land use development approval process. It is one approach by which public health can contribute to establishing built environments supportive of the public’s health. Future work will focus on increasing understanding and use of the Framework and assessing its impact on future development.
REFERENCES


Appendix A. Hierarchy of Municipal Plans

The following provides a high-level description of the major types of plans used by municipalities.

**Official Plan** – describes the upper, lower or single-tier municipal council’s policies on how land in a region/community should be used. It is reviewed and updated on a multi-year basis.

**Secondary Plan** – establishes local development policies to guide growth and development in defined areas of a city where major changes are expected and desired. Secondary plans are adopted by amendment into the Official Plan to ensure that their intent is binding.

**Block Plan** – shows the relationship among buildings in a block/neighbourhood to show streets, main points of public utilities and an overall design scheme. A Block Plan comprises several blocks. Block plans are also adopted by amendment into the Official Plan.

**Site Plan** – a detailed plan for a building on a single property, with associated features such as paths, landscaping, parking, drives, etc. At this stage, the principles of development (use, density, height limits) have been established in other documents. It does not embrace neighbouring properties, but it may include some features on the immediate road frontage.
## Health Background Study Design Elements and Description

The following table outlines the HBS design elements with descriptions of what they look like and why they matter. In addition, examples of minimum standards are provided. The HBS provides many additional standards and explanatory material.

<table>
<thead>
<tr>
<th>Element</th>
<th>Minimum standards (examples only, see HBS for full details)</th>
<th>What does it look like?</th>
<th>Why does it matter?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density</td>
<td>• All development on designated greenfield areas shall achieve a minimum overall density target of 50 people and jobs per hectare.</td>
<td>• Reduced lot sizes, frontages and setbacks.</td>
<td>• Higher density creates demand and support for a broader variety of services, employment opportunities and other community destinations/facilities within a closer distance.</td>
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<tr>
<td>Service proximity</td>
<td>• The distance between at least 50% of the projected population of the development and a low-order transit stop shall be no more than 200 m. The transit service proposed should provide a direct route to a Regional Urban Node, Intensification Corridor or smaller higher-density, mixed-use transit supportive activity centre with a maximum transit trip of 30 minutes.</td>
<td>• Achieve a reasonable cluster of key services and employment opportunities to residents and transportation nodes, based on walking distance.</td>
<td>• Creates opportunities for active transportation.</td>
</tr>
<tr>
<td>Land use mix</td>
<td>• Where the scale of the residential community is large enough, a range of uses should be provided as follows: – For communities of 5,000 or more, provide neighborhood-scale retail and services (such as corner store, elementary school, library). – For communities of 10,000 or more, provide a full range of uses, including larger-scale retail, services and employment opportunities.</td>
<td>• Standards complement service proximity and density to promote a broad mix of land uses that are convenient and connected by safe and comfortable routes to residential areas, which provide a variety of housing options.</td>
<td>• Providing a range of housing creates more equitable communities.</td>
</tr>
<tr>
<td>Street connectivity</td>
<td>• Infill development should identify opportunities to increase street connectivity.</td>
<td>• Characterized by smaller block sizes and the avoidance of certain street types (e.g., cul-de-sacs).</td>
<td>• Allows residents to remain within their community and prevents the changing needs (live alone, as a couple, a family, with or without children, or as a senior).</td>
</tr>
<tr>
<td>Streetscape Characteristics</td>
<td>• All streets must have sidewalks on each side that are at least 1.5 m wide in low-density residential areas and at least 2 m wide in medium-density residential neighbourhoods, high-density residential neighbourhoods, mixed use areas and commercial areas.</td>
<td>• Includes facilities for pedestrians, cyclists and transit users along the public right of way, such as sidewalks, bikeways, street furniture, intersection treatments, shading, lighting, wayfinding and traffic calming measures.</td>
<td>• Creating communities with high street connectivity reduces route distances, promotes active transportation by increasing route options and convenience, and dissipates vehicular traffic throughout the network.</td>
</tr>
<tr>
<td>Parking</td>
<td>• Reductions in parking requirements should be given to buildings and other facilities within 400 m of a transit stop; and apartments/condominiums should offer car share parking spots (each car share space equivalent to 10 regular spaces).</td>
<td>• Seek to reduce the supply of car parking while increasing the supply of bike parking.</td>
<td>• Objective of parking standard is to discourage private automobile use and promote active modes of transportation, including walking, bicycling and public transit.</td>
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</tbody>
</table>

Source: Region of Peel. Health Background Study – Terms of Reference & User Guide.
Building the capacity of health authorities to influence land use and transportation planning: Lessons learned from the Healthy Canada by Design CLASP Project in British Columbia

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ABSTRACT

OBJECTIVES: The main objective of the Healthy Canada by Design CLASP Initiative in British Columbia (BC) was to develop, implement and evaluate a capacity-building project for health authorities. The desired outcomes of the project were as follows: 1) increased capacity of the participating health authorities to productively engage in land use and transportation planning processes; 2) new and sustained relationships or collaborations among the participating health authorities and among health authorities, local governments and other built environment stakeholders; and 3) indication of health authority influence and/or application of health evidence and tools in land use and transportation plans and policies.

PARTICIPANTS: This project was designed to enhance the capacity of three regional health authorities, namely Fraser Health, Island Health and Vancouver Coastal Health, and their staff. These were considered the project’s participants.

SETTINGS: The BC regions served by the three health authorities cover the urban, suburban and rural spectrum across relatively large and diverse geographic areas. The populations have broad ranges in socio-economic status, demographic profiles and cultural and political backgrounds.

INTERVENTION: The Initiative provided the three health authorities with a consultant who had several years of experience working on land use and transportation planning. The consultant conducted situational assessments to understand the baseline knowledge and skill gaps, assets and objectives for built environment work for each of the participating health authorities. On the basis of this information, the consultant developed customized capacity-building work plans for each of the health authorities and assisted them with implementation. Capacity-building activities were as follows: researching health and built environment strategies, policies and evidence; transferring health evidence and promising policies and practices from other jurisdictions to local planning contexts; providing training and support with regard to health and the built environment to health authority staff; bringing together public health staff with local planners for networking; and participating in land use planning processes.

OUTCOMES: The project helped to expand the capacity of participating health authorities to influence land use and transportation planning decisions by increasing the content and process expertise of public health staff. The project informed structural changes within health authorities, such as staffing reallocations to advance built environment work after the project. Health authorities also forged new relationships within and across sectors, which facilitated knowledge exchange and access of the public health sector to opportunities to influence built environment decisions. By the end of the project, there was emerging evidence of a health presence in land use policy documents.

CONCLUSIONS: The project helped to prioritize, accelerate and formalize the participating health authorities’ involvement in land use and transportation planning processes. In the long term, this is expected to lead to health policies and programs that consider the built environment, and to built environment policies and practices that integrate population health goals, thereby reducing the risk of chronic diseases.

KEY WORDS: Environment and public health; inter-institutional relations; environment design; chronic disease

A large body of research has identified significant associations between the built environment, which is the physical layout and infrastructure of a community, and health variables, such as physical activity,14 food choices, traffic-related injuries and mental health.5 Accordingly, several health organizations have identified the built environment as an important determinant of health.610

A community’s built environment is the result of multiple decisions regarding land use and transportation planning and policy, operationalized over the course of many years at various levels of government. Community planning policies and decisions can be influenced by a complex and sizeable array of stakeholders outside of public health, including developers, local residents and businesses, non-governmental organizations (NGOs) and community organizations.1114 Accordingly, as with many other social determinants of health, aligning built

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Conflict of Interest: None to declare. The views expressed in this article represent the views of the authors and not necessarily the views of the project’s funders and supporters.
environment policies, practices and decisions with health-promotion objectives requires collaboration across sectors.15

Intersectoral collaboration between public health and community planners on the built environment is a relatively new phenomenon. In Canada, a substantial level of intersectoral work has been initiated in Ontario over the last decade in response to two provincial policies: the 2005 Provincial Policy Statement, which provides direction on matters of provincial interest related to land use planning and development, including a number of policies connected with the creation of healthy, livable and/or active communities; and the 2008 Ontario Public Health Standards, guidelines for the programs and services that are mandated for public health by the Ontario Ministry of Health and Long-term Care; these include built environment work under both the Chronic Diseases and Injuries Program Standards and the Environmental Health Program Standards.16

A 2011 descriptive case study documents the strategies employed by 10 of the 36 public health authorities in Ontario to bring health considerations related to physical activity, injury prevention, healthy eating, air quality, water quality and climate change into the land use and transportation planning processes in their communities. While this report makes no attempt to assess the effectiveness of these strategies, the policies and practices documented suggest that public health is effectively forging relationships with its planning counterparts, engaging in the land use and transportation planning processes, and bringing health considerations into the policies and plans in those communities.16

In New South Wales, Australia, where the health sector has been engaging in land use planning processes with the goal of creating urban environments that are more sustainable and equitable, researchers conducted a post-implementation study to evaluate the effectiveness of this approach. An audit was conducted of all correspondence between Sydney South West Area Health Services and local government and other organizations between 2005 and 2010 on issues related to land use planning documents. The researchers found that 75% of the recommendations offered by the health authority during this period were included in 77% of the revised land use planning documents, suggesting that the health sector can effectively influence land use planning processes.17

In British Columbia (BC), public health leadership and stewardship are provided mainly by the Ministry of Health, by a provincial health authority and by five regional health authorities. In 2013, an additional health authority was established, namely the First Nations Health Authority, which runs the delivery of First Nations health programs and services. The five regional health authorities report to the Ministry of Health and are independent of local governments. Their mandate spans public health, home health and acute care, which is their primary focus.

On a parallel track, BC municipalities and regional districts have a significant degree of autonomy in making land use and transportation decisions, as well as negotiating and approving land development applications in their jurisdiction. Key legislation for regional local governments is the provincial Local Government Act and, in the case of the City of Vancouver, the Vancouver Charter.

In BC, as elsewhere, the health sector has had only sporadic involvement in land use and transportation planning for issues beyond sewer, air and water. This began to change in 2005 in BC with the resurgence of the Healthy Communities approach18 and the publication of a Ministry of Health framework describing the core public health functions for the province. This document recognized that “the physical and social structures of our communities and neighbourhoods affect our health in many ways, and public health needs to be involved in the creation of healthy neighbourhoods.” It also called for public health officials to provide input into land use and environmental planning.19

Momentum for healthy built environments continued to grow. The Provincial Health Services Authority published a webpage and resources on the topic of “health and planning”20 and, in 2008, helped to establish the BC Healthy Built Environment Alliance to foster intersectoral networks, and coordination of knowledge exchange and key activities around health and the built environment.21 In 2009, representatives of all five regional health authorities received training by the Provincial Health Services Authority on the fundamentals of community planning.11,22

Some health authorities started to consider how they might mobilize their staff to influence land use and transportation planning decisions. The following key questions arose: “How can BC health authorities most effectively mobilize their staff to influence land use and transportation planning decisions? How can they help create environments that encourage healthy living through their involvement in community planning processes? How can health authorities collaborate to adopt a consistent approach to their healthy built environment work and recommendations?”

In the summer of 2009, the opportunity arose for Fraser Health, Island Health (formerly Vancouver Island Health Authority) and Vancouver Coastal Health to join forces with the Urban Public Health Network, three urban health authorities in Quebec and Ontario, and several national NGOs to apply for a Coalitions Linking Action and Science for Prevention (CLASP) grant offered by the Canadian Partnership Against Cancer to launch the Healthy Canada by Design CLASP Initiative.23 This was seen as an opportunity to accelerate the health authorities’ progress in defining and formalizing their role in shaping the built environment, and to develop networks for knowledge exchange and coordination across health authorities.

The successful CLASP funding application marked the beginning of the Healthy Canada by Design CLASP Initiative described in an accompanying paper in this volume. In addition to providing funding for a capacity-building project at the local level in BC, participation in CLASP gave health authorities access to the following:

1) A national backdrop for built environment work;
2) Learning and knowledge exchange opportunities with like-minded health bodies in other provinces; and
3) Networking prospects with researchers, policy-makers and practitioners from across Canada to advance the field locally in British Columbia.

This paper describes the capacity-building project that was developed and delivered in BC under the Healthy Canada by Design CLASP Initiative. The long-term goal of the Initiative was
to create a) a built environment policy environment that fully integrates population health goals; and b) a health policy environment that fully integrates built environment considerations, in order to reduce risk factors for chronic disease and to improve population health.

There were three desired outcomes of the Healthy Canada by Design CLASP project in BC:

1) Increased capacity of the three health authorities to productively participate in land use and transportation planning processes;
2) New and sustained relationships or collaborations among the three health authorities, as well as among the three health authorities, local governments and other built environment stakeholders; and
3) Indication of health authority influence and/or application of health evidence and tools in land use and transportation plans and policies.

PARTICIPANTS

Target population

This project was designed to enhance the capacity of three regional health authorities, namely Fraser Health, Island Health and Vancouver Coastal Health, and their staff. These were considered the project’s participants (11 staff members who were directly involved in this project and were invited to participate in the project’s evaluation surveys).

Fraser Health and Vancouver Coastal Health had a total of four staff each who participated for the entire duration of the project. Four of these were medical health officers, one was an Environmental Health Officer, and three were population health staff at the coordinator and manager levels.

Vancouver Island Health Authority had one staff member who participated for the entire duration of the project (a Medical Health Officer). Additionally, two population health staff at the coordinator level participated for half of the project each, because of staffing transitions.

The three health authorities collaborated with local government staff from the communities in which the projects unfolded (n=14 planners in total across the three health authorities) and/or with planners from local transportation authorities (n=1), university academics (n=2), a provincial government official (n=1) and a provincial health authority official (n=1). These were considered project collaborators and totaled 19 individuals from 14 different organizations.

Project collaborators were involved in a variety of ways. Planners, for example, identified specific land use or transportation planning processes that could benefit from health authorities’ input; made suggestions of how health professionals could be most productively involved; helped to establish formal mechanisms for health authorities’ ongoing participation in planning processes; helped to organize knowledge exchange and networking events across sectors; set up strategic meetings between local government stakeholders and the health authorities; and facilitated opportunities for the health authorities to make presentations to key committees and decision-makers. All collaborators provided input into draft reports, “health and built environment” briefs and other stakeholder outreach materials produced by the health authorities.

SETTING

The three health authorities altogether serve a population of 3.4 million (BC total=4.6 million), residing in urban, suburban and rural settings across south-western BC. The populations have broad ranges of socio-economic status, demographic profiles and cultural and political backgrounds. For this project, the participants worked with collaborators in a variety of settings:

- Suburban and urban settings (City of Richmond, City of Surrey, District of North Vancouver, City of North Vancouver, Greater Victoria and Metro Vancouver regions as a whole); and
- Rural communities at the edge of large metropolitan regions (City of Powell River, Sunshine Coast Regional District’s Area D-Roberts Creek, Resort Municipality of Whistler, City of Chilliwack, Sunshine Coast Regional District and Fraser Valley Regional District as a whole).

INTERVENTION

Public health intervention

The project work occurred in two phases, aligned with phases of funding. The first phase of funding, from October 2009 through December 2010, was provided by the Canadian Partnership Against Cancer’s CLASP program. The second phase, from January 2011 through September 2012, was funded by the Canadian Partnership Against Cancer’s CLASP program, the Heart and Stroke Foundation of Canada (BC & Yukon), the Real Estate Foundation of BC and the Bullitt Foundation.

Leadership and responsibility for the project came from different programs within each of the three health authorities: Population Health (Vancouver Coastal Health), Healthier Community Partnerships (Fraser Health) and the Office of the Medical Health Officer (Island Health and Fraser Health). Medical health officers, environmental health officers and other health authority staff provided leadership and participated in or contributed to the project on either an ongoing or an ad hoc basis as appropriate to the role and task.

The Heart and Stroke Foundation, acting as the lead agency and administrator for the Healthy Canada by Design CLASP Initiative, sought a Planning Consultant (hereinafter, “consultant”) with several years of local municipal planning experience. The selected consultant was a professional and registered Community and Regional Planner with 10 years of experience working in local governments on policy and development planning in BC. She had also demonstrated understanding of the land use policies and programs that BC local governments can adopt to promote healthy living.

The consultant reported to the Project Manager for the Healthy Canada by Design CLASP Initiative and worked with the health authorities from January 2010 until January 2012. She worked a total of 1,500 hours and devoted about 85% to 90% of this time assisting the three health authorities in reaching out to potential project collaborators; developing work plans to guide their participation in the project; and facilitating implementation of the work plans. Each health authority received just under one third of a full-time equivalent in support. The remaining 10% to
15% of time was devoted to overall project administration, facilitating knowledge exchange among the three health authorities and reporting to external stakeholders such as project funders.

The consultant’s work was carried out through phone and e-mail communication, in-person work sessions, and meetings with each health authority and with local planning and community stakeholders. The consultant divided her time equally across the three health authorities and worked with them concurrently, in order to increase the potential for diffusion of ideas and promising practices across health authorities.

For each health authority there were several specific actions:

1) Conducting a situational assessment (two months)
   - The consultant:
     i. Met with lead staff for each of the health authorities to assess their baseline capacity, knowledge and tools for built environment work;
     ii. Gathered the health authorities’ preliminary ideas for built environment projects to pursue with local governments and relationships to build with community planning stakeholders through this initiative; and
     iii. Informally contacted planners in local governments to identify potential opportunities for productive involvement of the health sector in forthcoming planning processes.

2) Developing a “capacity-building” work plan for each health authority (one month)
   - Using the information gathered through the situational assessment and working in close collaboration with the Project Manager, the project teams and the consultant drafted a nine-month work plan for each health authority.
   - The work plans were designed to
     i. Increase the capacity of health authorities to productively participate in land use and transportation planning processes, particularly through increased content and process expertise;
     ii. Create new and sustained relationships or collaboration mechanisms with other health authorities, with local governments and with other built environment stakeholders; and
     iii. Show evidence of health authority’s influence in land use and transportation plans and policies.
   - For each capacity-building project selected by the health authorities, the work plans contained the following sections:
     1) brief description of the project and objectives; 2) tasks/activities; 3) outputs; 4) description of how this project would increase the capacity of the health authority to work on built environment issues; 5) human resources, and roles of the planning consultant and health authority staff; and 6) timelines and milestones.
   - The three health authorities met for one day to exchange their draft work plans and refine them according to mutual feedback.
   - Upon completion of the first set of work plans, additional project funding was secured, and the planning consultant and project participants developed another set of work plans for the second year of the initiative.

3) Implementation of the work plans
   Depending on the specific needs, opportunities and context of each health authority, the planning consultant worked with the project participants on a variety of outputs and tasks:
   - Development of resources, such as “healthy built environment” briefs and template PowerPoint presentations, to assist health authority staff in participating in land use and transportation planning processes.
   - Production of reports, such as a case study of how a local neighbourhood association engaged with the health authority to address a land use concern.
   - Facilitating cross-sector knowledge exchange by, among other means, bringing together planners, researchers and health professionals to hear about the latest evidence linking health and the built environment and identify collaboration opportunities at the local level.
   - Reviewing and commenting on draft land use policy documents, such as official community plans and regional growth strategies.

Evaluation

The evaluation for this project was integrated into the overall evaluation for the Healthy Canada by Design CLASP Initiative. A PhD-level research and evaluation firm supported the health authorities in developing an evaluation framework outlining the intended outputs and outcomes of their project; preparing an evaluation plan and tools; and evaluating projects at specified intervals and upon completion.

In this paper, we report on evaluation data generated by two online surveys administered to project participants in December 2010 and November 2011; for BC, n=6 and response rate=60%, with respondents from all three health authorities, for both years. These surveys included both Likert scales and open-ended questions. We also include data collected through end-of-project interviews conducted by the National Collaborating Centre for Healthy Public Policy (NCCHPP) in 2012 (n=5 project participants from three health authorities). 7

Evaluation data collected from the project collaborators 19 months and 27 months into the project are also provided. These data were generated through a) an anonymous online survey administered to the project collaborators in May 2011 (n=6 collaborators of Fraser Health and Vancouver Coastal Health Authority, response rate=60%); b) an anonymous online survey administered to the project collaborators in January 2012 (n=5 collaborators of Fraser Health Authority and Vancouver Island Health Authority, response rate=31%); and c) a non-anonymous focus group held with health authority staff participants and planning staff collaborators on October 17, 2011, to reflect on their partnership to date (n=2 planning staff, who were collaborators of Vancouver Coastal Health, participation rate=50% of four invited to the focus group).

OUTCOMES

A total of 11 health authority staff from three health authorities worked with the consultant to develop and deliver three capacity-building work plans. Nine of the 11 participants from three health authorities were involved throughout the entire duration of the project. In an anonymous, online survey
administered to project participants in November 2011 (n=6 and response rate=60%), two respondents reported devoting between 41% and 79% of their time in a typical month to this project, and four respondents reported devoting less than 40% of their time to the project in a typical month. Tables 1-4 list the main outputs that were generated through this project.

**Intended outcome one: Increased capacity of health authorities to productively participate in land use and transportation planning processes**

The annual surveys completed by project participants in 2010 and 2011 suggest that the project increased the capacity of some of the project participants to engage in community planning processes, in part by enhancing their content and process expertise. The surveys’ results can be summarized as follows:

- In 2010, all but one survey respondent reported *having increased their knowledge of healthy built environments* as a result of this project. In 2011, all survey respondents reported having increased their understanding. In the open-ended section of the survey, one respondent commented, *I have increased my awareness of the research base regarding health and the built environment.*

- In 2010, four out of six survey respondents indicated that they had *gained new or enhanced skills as a result* of this project. In 2011, all survey respondents indicated this. A survey respondent provided an example: *We have developed some expertise in working with our local governments and understanding their needs.*

- In 2011, all respondents somewhat agreed, agreed or strongly agreed that they had *increased their awareness of other organizations working in the area.* This had ranked noticeably lower in the 2010 survey responses.

Comments from the NCCHPP interviews about the project’s impacts reflect the results above:

CLASP has helped [health authority] to develop and hone the tools and approaches that are most effective in our work. For example, we have developed and adapted a Memorandum of Understanding agreement for defining and solidifying partnerships. We have also developed tools and resources that help us to proactively connect and work with the various audiences that are involved in land use planning processes: elected officials, community and stakeholders, and community/residents.25

We [health authority] have developed a modest foundation of resources pertaining to HBE [Healthy Built Environments] (library, information sheets, community engagement precedents, etc.) that will help the HBE “leads” within our organization start involving others as we move forward. We have developed more concrete ideas about what HBE means within our context, and we have a much greater overall literacy and confidence in the issue than when we began CLASP a couple of years ago.25

The project might have also helped to expand the capacity of the participating health authorities to engage in land use and transportation planning processes by facilitating changes to the health authorities’ strategies, programs, human resource allocations or practices. In 2010, half of the survey respondents stated with conviction that *their organizations were developing a new program or changing an existing program as a result of this project*, for example:

- [We have a new] community engagement strategy;
- Province has prioritized HBE [Healthy Built Environment], each Health Authority [is] now developing programming to fit with this;
- Hopefully the report on healthy facilities will be used to inform future planning and development of health facilities in [health authority];
- The built environment is now included in our overall strategic planning; and
- Likely a greater involvement of staff in official community planning at the local or regional government level.

Through this project, the consultant directly trained and supported between three and four staff in each health authority. These staff, in turn, leveraged the experience and knowledge gained through this project to help inform the organizational structures and practices for built environment work within each health authority. Supporting evidence of this can be found in the NCCHPP interviews:

*Internally (within [health authority]) through the CLASP Initiative, we have been able to incrementally develop a model of how to work on HBE [Healthy Built Environments] that works for [health authority]. There are many staff and departments within [health authority] that are part of HBE subject matter (Health Protection, Population Health, MHO [Medical Health Officer], Aboriginal Planning, Housing, and more), and we have been able to work with these groups to gradually build up awareness, buy-in, commitment and practice at doing this work together. We have learned – through practice and reflection – how to form our [health authority] teams at a local level and allocate [health authority] staff’s roles in order to support communities most effectively. This approach of including [health authority] staff from various groups has provided us with a range of perspectives and angles about what is included in HBE work.*25

[...] [health authority] is developing the capacity for HBE [Healthy Built Environments] work within our organization. The CLASP projects that we chose have allowed us to experiment with which departments and which staff need to be involved in municipal planning initiatives and what roles they can play. For example: in 2010 Healthier Community Partnerships, Health Protection and medical health officers teamed up to analyze land use options that were being considered for a neighbourhood plan. We combined our expertise and knowledge to provide the municipality with a health lens on the various land use options. We are looking at what is a sustainable model within [health authority] for our HBE work across the broad region that we serve.25

**Intended outcome two: New and sustained relationships or collaboration mechanisms with other health authorities, local governments and other built environment stakeholders**

By 2011, all project participants who completed the evaluation surveys reported that the project enabled them to forge new relationships or collaborations with colleagues in other health authorities, local governments or other sectors with a stake in built environment decisions. On the other hand, improvements or changes in the way health authorities reported working with other organizations in the same field were not as strong. One of
New insights on partnership work.

New linkages across sectors at the local level; of collaboration:

Survey answers suggest that the project increased several aspects impact that generated the richest input by evaluation health authority staff who completed the annual surveys.

Survey respondents commented:

- Received input from local, regional and provincial governments in the survey.
- Based on info sheets (above), proposed elements included template Official Community Plan (OCP) Workbook.
- Organized a “lunch and learn” event for health authority staff and City of Participating in planning processes and building relationships with planners.

Workshop for health authority staff
- Designed and implemented a day-long, built environment workshop for environmental health officers and community health promotion staff (n=31).
- Two local planners gave presentations on their current work and policy directions.
- The Medical Health Officer participating in this project presented key “health and built environment” principles and evidence.
- Workshop participants analyzed a sample municipal plan and discussed a) whether it contributed, or not, to a healthier built environment, b) some of the barriers and competing interests that could arise in developing a land use plan and c) strategies that health officials could use to provide feedback to a proposed plan and offer support to planners.
- Project participants from this health authority also presented parallel and complementary projects through which the health authority is engaging local municipalities.

Participating in planning processes and building relationships with planners
- Reviewed and commented on the City of Surrey’s draft Official Community Plan, the District of Mission draft Official Community Plan, and a draft Neighbourhood Plan for the City of Surrey.
- The purpose of this exercise was to develop relationships with municipal planning staff, learn more about how to be effectively involved, and help strengthen the health promotion potential of the plans under development.
- Organized a “lunch and learn” event for health authority staff and City of Surrey planning staff to foster networking, knowledge exchange and sharing of one another’s experience, perspectives and priorities with respect to the built environment.

Official Community Plan (OCP) Workbook
- Based on info sheets (above), proposed elements included template PowerPoint presentations and other resources, and an algorithm to help staff at the health authority and at the local government’s planning department find the appropriate contacts in each other’s organizations.
- Received input from local, regional and provincial governments in the development of the workbook.
- the survey respondents commented: Lots of interesting challenges in collaborating with new partners and with communities – a never-ending process of learning!

When asked to comment on project benefits and impacts, health authority staff who completed the annual surveys provided numerous examples of new or enhanced relationships with other organizations or other sectors. This is the area of impact that generated the richest input by evaluation participants. Key themes that emerged from the open-ended survey answers suggest that the project increased several aspects of collaboration:

- Opportunities for knowledge exchange or collaboration across BC health authorities;
- New linkages across sectors at the local level;
- Networking, coordination or collaboration between health authorities and local governments (especially planning departments);
- Access to potential partners and knowledge from other provinces, from across Canada nationally, and even internationally; and
- New insights on partnership work.

This was also somewhat supported by the results of the online surveys administered to the project collaborators in May 2011 and January 2012 (n=6, participation rate=60%, and n=5, participation rate=31% respectively). Collaborators were asked: To what extent do you agree or disagree that, in this project, knowledge, technical advice, expertise or recommendations it gained from Health Authority/Healthy Canada by Design CLASP have helped the health and planning sectors in my region work more closely together? Here, 67% of respondents in 2011 and 60% of respondents in 2012 stated that they agreed or totally agreed. On the other hand, 0% in 2011 and 20% In 2012 stated that they disagreed, and 33% in 2011 and 20% in 2012 did not answer. Similarly, to the statement, My organization has applied knowledge, technical advice, expertise or recommendations it gained from Health Authority/Healthy Canada by Design CLASP, 60% of respondents to the January 2012 survey said “yes”, 20% said “no”, and 20% did not answer. When asked to describe how their organization had applied knowledge, technical advice, expertise or recommendations it gained from Health/Healthy Canada by Design CLASP, survey respondents wrote:

- In developing the new Official Community Plan, as well as secondary plans such as neighbourhood plans, greenways & walking plans etc., the partnership has enhanced the consideration of the health consequences of alternative policies.

- [Health authority] provided feedback on our regional plan. They provided a “health lens” and provided policy advice on how to strengthen the plan from a health perspective.

Additional examples of impacts that were provided by the online survey respondents (n=5; 31% response rate) and by...
Table 3. Activities and products delivered by Vancouver Coastal Health as part of its involvement in the Healthy Canada by Design CLASP project in BC (2009-2012)

Description of activities and products

Participating in municipal planning processes (urban communities)
- Participated extensively in the District of North Vancouver Official Community Plan review, the City of North Vancouver Official Community Plan review and the City of Richmond Official Community Plan review.
- This involved reviewing and commenting on draft plans, making presentations to stakeholders (Mayor, council, residents and local community agencies) and preparing printed materials, such as issue papers and posters, for public consultations.
- For the District of North Vancouver and the City of North Vancouver, this also involved writing and signing a Memorandum of Understanding between the local governments (planning departments) and the health authority to set parameters for collaboration and to define each entity’s roles.
- Participated in the review of municipal development guidelines and a municipal transportation plan.

Participating in municipal planning processes (rural communities)
- Compiled community health profiles relevant to community planning for the Sunshine Coast Region and its municipalities, then conducted a focus group with planners and community organization representatives to obtain their feedback.
- Reviewed and commented on the draft Sunshine Coast Regional Sustainability Strategy, the draft Roberts Creek Official Community Plan, the draft Powell River Electoral Area Official Community Plan and the draft Official Community Plan for the Resort Municipality of Whistler.
- Developed a digital binder of resources to support health authority staff’s involvement in rural planning processes in rural and small communities.

Table 4. Activities and products delivered in partnership by Fraser Health and Vancouver Coastal Health as part of their involvement in the Healthy Canada by Design CLASP project in BC (2009-2012)

Description of activities and products

Metro Vancouver Healthy Community Design Collaborative
- Partnered with the regional government, the local transportation authority and university researchers to convene planners, health professionals and researchers for knowledge exchange and identification of collaboration opportunities. These partnerships built on discussions and input during the Regional Growth Strategy process in which the two health authorities participated.
- Planned and implemented two regional workshops with over 100 participants each, including planners and health professionals from throughout the region.

Metro Vancouver – regional planning
- The two health authorities met several times with regional planners and made a presentation to the Regional Planning Advisory Committee (formerly Technical Advisory Committee), comprising planning directors or chief administrative officers from Metro Vancouver’s 21 municipalities and two local entities.

planners who participated in a focus group to help evaluate the project (n=2, response rate=50%) were as follows:
- The issue of health and planning has been brought to the forefront for planners, in part due to [health authority] and the CLASP Initiative.
- Used the resources around the table to work on a common issue. This couldn’t have happened in a siloed approach.
- [health authority] did provide input that led to content shifts and policy change; e.g., food security – [health authority] helped to strengthen policies around food security/urban agriculture.
- [health authority] as a significant partner in the OCP [Official Community Plan] lent some political weight in terms of Council’s endorsement of the OCP.

The Healthy Canada by Design CLASP Initiative likely also stimulated increases in networking, coordination and cooperation among BC health authorities and organizations that participated in the Healthy Canada by Design CLASP project in provinces across Canada. This was shown by the annual surveys, in which BC project participants were asked to classify their interactions with organizations in Ontario, Quebec and nationally, before and after their involvement in this project (Figure 1).

Stories related to project impact on collaboration also emerged from the NCCHPP interviews. For example:
- CLASP also helped [health authority] to step up and take a proactive role with interagency partnerships […] Throughout CLASP we have also had increased contact with other partners (municipal planners, etc.) and established some newer connections that will help our future work. For example, we consulted with planners at the outset of our CLASP projects and could re-establish contact with this group.25

Intended outcome three: Influence land use and transportation plans and policies

By the end of the project, there was modest evidence of public health influence on one land use plan. The District of North Vancouver Official Community Plan, adopted in 2011, explicitly mentions Vancouver Coastal Health as a participant involved in crafting the document.26

Areas of improvement

When asked open-ended questions to understand what would be needed to improve or facilitate the Healthy Canada by Design CLASP project or to accelerate changes to the built environment, health authority staff who responded to the online surveys provided several examples and ideas:
1) More time and resources;
2) More defined roles and partnerships, and clearer understanding of health’s specific role and potential contribution to the planning process;
3) Greater collaboration across projects or health authorities; and
4) Support of upper management, involvement of a more diversified contingent of staff/departments and greater integration of this work with the organization’s existing plans and strategies.

Project collaborators who completed the online survey also identified areas of improvement. When asked, How could knowledge, technical advice, expertise or recommendations received from Health Authority/Healthy Canada by Design CLASP be improved? survey respondents noted:

- The growing research base linking community design with health outcomes is positive, but this research needs to be more specific and nuanced to be of greater use as an evidence-based component of planning decision-making.
- When appropriate (e.g., if scale of project is large, if there are significant health impacts), it would be beneficial to have [health authority’s] input on the health impacts of major projects or developments proposed in the [region]. It would be helpful to better understand the types of measures that can be used to assess healthy communities.
- Need to work more with communities, general public and politicians. Planners and public health professionals are already very closely aligned and “singing off the same song sheet”. Where we run into challenges is with the public and decision-makers. Hospital boards should also be the target for further education.
- There is an opportunity for [health authority] and the District to better get the information (on issues, solutions and successes) “out there” (to community members).
- The implementation of the OCP [Official Community Plan] is key, and the District needs [health authority] to be involved in that. Moreover, when asked, How could meetings or events organized by [XX] Health Authority/Healthy Canada by Design CLASP be improved? the project collaborators who took the survey gave the following feedback:
  - These meetings could be more targeted to developers and development consultants, who often resist the implications of a healthier community and neighbourhood design, since it is perceived to limit their development options or add costs onto projects.
  - Include decision-makers, members of the public, hospital board members. Perhaps also some of the other disciplines like municipal engineers...but again, my feeling is that we have common ambitions and approaches. Challenge is with general mind set about car usage, lifestyle choices, built environment.
  - The work they do should continue. Meetings, events, networking, relationship building should continue at the regional and municipal levels. Advocacy by [health authority] continues to be important. [Health authority] can be clearer on the types of actions municipalities and regions can take to make healthy communities.

CONCLUSIONS

The project described in this paper was novel. It provided health authorities with a professional planner as consultant to help them influence land use and transportation planning decisions. Traditionally, health authorities’ involvement in planning processes in BC had been largely limited to water, sewer and air quality issues. This project brought together health professionals and community planners to boost the health authorities’ capacity to help shape land use and transportation plans, and align them with health-promotion objectives.

The evaluation data reported in this paper suggest that the project increased the built environment expertise of the health authorities involved. Tables 1-4 list the many resources and outputs that were generated by the consultant with the health authorities. Following the CLASP project, the BC Provincial Health Services Authority used some of these resources to inform the development of the Healthy Built Environment Linkages Toolkit,27 which provides common healthy built environment principles for all BC health authorities. On the basis of this and the survey data summarized in the Outcomes section, we speculate that the project might have helped to accelerate the rate at which regional health authorities across BC are working collaboratively to develop more consistent messages and approaches to built environment work.

The NCCHP evaluation interviews indicated that some of the project participants gained new insights as to how human resources within health authorities could be reallocated to support engagement in land use and transportation planning. Two years after the project’s completion, beyond the time frame of the project’s evaluation reported in this paper, one can see evidence of changes to the health authorities’ structures to facilitate engagement in planning processes. For example, some health authorities added built environment topic areas to the job descriptions of community health staff and environmental health officers; two health authorities went as far as creating a new team of environmental health officers (3.5 and 2.5 full-time equivalent employees per health authority) who are dedicated to working with local governments and other stakeholders on the built environment and related policies. While these structural changes cannot be solely attributed to the Healthy Canada by Design CLASP project, health authority representatives who are co-authoring this paper concur that this project helped to inform these changes.

This project also laid a foundation for cross-sector and cross-organizational partnerships. An international review of the literature has found that these kinds of alliances, at the local and national levels, are an important facilitator affecting the integration of health considerations into land use decisions.28 Similar observations were brought forward anecdotally in Colorado (US). Here, based on their experience working on land use planning issues, health professionals recommended that the first step by which environmental health officers can influence the built environment is to build relationships with planners and municipal decision-makers.29 Nationally, the Healthy Canada by Design CLASP project fostered networking, knowledge exchange and collaboration between BC health authorities and peer agencies in other provinces. Locally, in BC, this initiative gave public health professionals an opportunity to start learning how to work with colleagues in the land use and transportation planning sector on issues that go beyond sewer, air quality and water.

By the end of the project in 2012, there was emerging evidence of health sector influence in land use and transportation planning policies and documents. Between October 2012 and spring 2014, several additional planning policy documents included a strong health presence. Some examples of these include the City of Richmond Official Community Plan, adopted in November 2012;30 the latest draft of the City of Surrey Official Community Plan, planned for submission in June 2014; the City of Burnaby Official Community Plan, planned for submission in December 2014; and the City of Delta Official Community Plan, currently in development, which includes a section on healthy community design and planning. The CLASP project increased the built environment expertise of the health authorities involved and supported their increased participation in land use and transportation planning processes. This project also laid a foundation for cross-sector and cross-organizational partnerships, and helped to inform changes in the structures of health authorities across BC that will facilitate engagement in planning processes.
Community Plan (currently under review); the draft City of Chilliwack draft Official Community Plan (currently under review); and the draft Capital Regional District Sustainability Strategy (currently under development). The next challenge for the health sector in BC will be to ensure that these high-level planning documents are actually implemented, which is likely to take several decades.

**Lessons learned**

Some of the key insights gained through this project include the following:

1) **Time to deliver outcomes.** The process of change required to fully and productively integrate a new and complex area of work, such as the built environment, into the health authorities’ modus operandi takes time and a broader vision for health. Moreover, most community planning processes extend over several months, if not years, and can be further delayed by political or other factors outside the control of the health sector. This made it very difficult to deliver policy outcomes within the project’s timelines. Future interventions of this kind should consider extending implementation timelines.

2) **Need for defined roles and a clear understanding of health’s specific role and potential contribution to the planning process.** The cross-sectoral and pioneering nature of integrating health stakeholders and evidence into land use and transportation planning added an additional level of challenge to this project. It took almost the full two years of project implementation for participants to start having a sense of “who should do what and when”. However, answers to this role definition exercise could only be established through an experiential process of sending a small team of early adopter staff into the field. This “learn by doing” approach was challenging but gave the health authorities important insights as to how they can most effectively influence built environment decisions. These included gaining more clarity on the roles that various health authority staff can play in influencing built environment decisions, human resource requirements, evidence gaps and the challenges of translating the available evidence on health and the built environment into policy and practice recommendations for a diversity of contexts across the urban, suburban and rural spectrum.

3) **Erratic support for this area of work by upper management.** One health authority struggled to be fully involved in this project because of lack of support for population health projects, such as this one, by top executives who were prioritizing acute care initiatives.

4) **Time required to foster broad buy-in for this novel area of work within the health authorities.** For all health authorities, it took several years to cultivate buy-in and in-house capacity for this work among other departments and staff. Given the early stage of the built environment portfolio within health authorities and the relatively small number of staff with advanced expertise in the field at this juncture, the capacity of these organizations to effectively engage in land use and transportation planning is particularly vulnerable to staffing transitions.

**Limitations of the project’s evaluation reported in this paper**

Participation rates in the annual self-assessment surveys were somewhat low (60%). This is most likely because almost 50% of project participants were medical health officers, who have very heavy workloads. Nonetheless, those who participated in the surveys contributed thorough, detailed answers to the surveys’ open-ended questions, which provided a valuable glimpse into the impacts of the Healthy Canada by Design CLASP project in BC.

Representatives from all three regional health authorities completed the online evaluation surveys and participated in evaluation interviews conducted by the National Collaborating Centre for Healthy Public Policy. However, what is presented in this paper may not be generalizable given the small number of project participants.

Another limitation was the absence of detailed logs of participants’ hours on this project (“in-person work”). In the November 2011 online evaluation survey, project participants were asked, *On average, what percentage of your work time have you spent in a typical month on CLASP activities?* Here, survey respondents were given the following answer choices: a) less than 40% of my time; b) between 41% and 79% of my time, and c) over 80% of my time. This approach does not allow us to explore any potential associations between the amount of time health authority staff participants spent on this project and the success of the initiative.

We were also limited by the low response rate of project collaborators in the online evaluation surveys. For the most part, collaborators were planning staff in local governments served by the health authorities that participated in this project. While we had no problems engaging local government planners in meetings or dialogues focused on planning policy development directly relevant to their communities and day-to-day job descriptions, we found it very difficult to have them make time for the evaluation survey. Moreover, one of the health authorities held a two-hour evaluation focus group with key collaborators in October 2011, which might have used up the planners’ maximum capacity or willingness to take part in further evaluation activities, such as the online survey. Future evaluation efforts for similar types of projects should focus on understanding how the project and role of the health authorities in planning processes could be improved from the perspective of planners in local governments or other key collaborators, such as health NGOs.

Overall, this project benefitted greatly from being part of a Pan-Canadian initiative. In the words of one project participant:

*The CLASP project has been effective [for our health authority] because it has allowed [us] to link up to a national movement, and internally (within [our health authority!]) through the CLASP Initiative we have been able to incrementally develop a model of how to work on HBE that works[...]. CLASP has really raised the profile of HBE [Healthy Built Environment] work, by demonstrating that our HBE work is part of a groundswell of progressive practice that is happening across the country.*

Future research should further take advantage of a national perspective by examining how the structure of public health in various Canadian provinces, e.g., source of funding, relationship...
to local governments, affiliation with acute care or provincial health budget allocations, is facilitating or impeding the effective involvement of health authorities in land use and transportation planning. The resulting information would help in understanding how the structure of public health in BC could be improved to further support the integration of health evidence into built environment decisions and, ultimately, to promote healthy lifestyles and reduce the risk of chronic disease.

REFERENCES

Healthy Canada by Design CLASP: Lessons learned from the first phase of an intersectoral, cross-provincial, built environment initiative

Alice Miro, BSc,1 Natalie A. Kishchuk, PhD, CE,2 Kim Perrotta, MHSc,3 Helena M. Swinkels, MD, FRCP1

ABSTRACT

OBJECTIVES: The Healthy Canada by Design (HCBD) CLASP (Coalitions Linking Action and Science for Prevention) Initiative promotes the building of communities that support health by 1) facilitating the integration of health evidence into built environment decision-making; 2) developing new, cross-sector collaboration models and tools; and 3) fostering a national community of practice.

PARTICIPANTS: A coalition of public health professionals, researchers, professional planners and non-governmental organization (NGO) staff from across Canada developed, implemented and participated in the Initiative.

SETTINGS: In the first phase, HCBD interventions took place for the most part in large urban and suburban settings in Quebec, Ontario and British Columbia. National knowledge transfer and exchange (KTE) activities were delivered both locally and nationally.

INTERVENTION: Project participants developed tools or processes for collaboration between the health and the community planning sectors. These were designed to increase the capacity of the health sector to influence decisions about land use and transportation planning. Tool or process development was accompanied by pilot testing, evaluation, and dissemination of findings and lessons learned. On a parallel track, NGOs involved with HCBD led national KTE interventions.

OUTCOMES: The first phase of HCBD demonstrated the potential for public health organizations to influence the built environment determinants of cancer and chronic diseases. Public health authorities forged relationships with several organizations with a stake in built environment decisions, including municipal and regional planning departments, provincial governments, federal government agencies, researchers, community groups and NGOs. The Initiative accomplished the following: 1) created new relationships across sectors and across health authorities; 2) improved the knowledge and skills for influencing land use planning processes among public health professionals; 3) increased awareness of health evidence and intent to change practice among built environment decision-makers; and 4) facilitated inclusion of health considerations in local plans, policies and decisions.

CONCLUSIONS: The first phase of HCBD engaged built environment stakeholders, including public health professionals, planners, researchers, community groups and NGOs, in ways that would be expected to influence health risk factors and population health outcomes in the long term.

KEY WORDS: Environment and public health; interinstitutional relations; environment design; chronic disease

A significant body of evidence suggests that the ‘built environment’, or the physical layout and design of communities, is strongly associated with health risk factors such as levels of recreational and utilitarian physical activity. Indeed, the built environment is well recognized as a key determinant of health. Built environments can support population health by not only preventing exposure to environmental hazards but also facilitating practices that prevent or limit chronic diseases (e.g., increasing physical activity, supporting a healthy diet, increasing social connectedness and reducing stress). There is also evidence that the built environment can mediate health inequalities.

The Healthy Canada by Design (HCBD) CLASP (Coalitions Linking Action and Science for Prevention) Initiative promotes the building of Canadian communities that encourage healthy living. Prior to its launch, work to foster health-promoting built environments by public health professionals, researchers, policymakers and community groups across Canada was largely uncoordinated across sectors and jurisdictions. Coordination was complicated by the multiple levels of government and sectors across which the levers to address unhealthy built environments are found. In addition, little had been done to evaluate or disseminate methods, findings and lessons learned by the various organizations involved in this field. Public health organizations needed evidence-based information on how to extend their influence beyond the realm of traditional environmental health to facilitate the integration of health considerations into the hierarchy of land use and transportation policies, plans and

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Conflict of Interest: None to declare. The views expressed in this article represent the views of the authors and not necessarily the views of the project’s funders and supporters.
practices that shape the built environment. This paper describes the activities and early outcomes of the first phase of the overall HCBD Initiative. Results of component activities are described in the accompanying papers in this volume.

OBJECTIVES

HCBD brought together partners from across sectors and provinces into a coordinated and integrated network focusing on built environment and health. Funded by Health Canada through the Canadian Partnership Against Cancer’s CLASP program, the first phase of HCBD united research, practice and policy experts across disciplines and jurisdictions to build on existing efforts in this field. There were three objectives of the first phase of the Initiative:

1) Facilitate the integration of health evidence into built environment decision-making;
2) Develop new cross-sector collaboration models and tools; and
3) Foster a national community of practice uniting community planners, public health professionals and non-governmental organizations (NGOs).

Ultimately, the Initiative aimed to contribute to the prevention of chronic disease by helping to ensure that health policies and programs consider the built environment and that built environment policies and practices integrate population health goals.

PARTICIPANTS, SETTING, INTERVENTION AND EVALUATION

Target population
Between 2009 and 2012, HCBD partners engaged sectors that can influence built environments: public health, urban and transportation planning, NGOs and community organizations. These sectors were involved through organizations designated as HCBD partners. Between 2 and 10 staff members or volunteers from each partner organization were directly involved in HCBD initiatives and considered HCBD participants. The partners and participants were as follows:

1) Six health authorities – Montreal Public Health, Toronto Public Health, Peel Public Health, Fraser Health, Vancouver Coastal Health and Island Health (which was then called Vancouver Island Health Authority). These organizations are members of the Urban Public Health Network, which addresses public health issues common to urban populations. The health authority staff involved were
Table 1. Healthy Canada by Design (HCBD) CLASP (Coalitions Linking Action and Science for Prevention) activities

<table>
<thead>
<tr>
<th>Type of activity (see logic model)</th>
<th>HCBD lead organizations</th>
<th>Examples of activities carried out under HCBD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development of sustainable and effective processes, relationships and collaboration mechanisms among the health, community and planning sectors</td>
<td>Peel Public Health</td>
<td>Embedded planning expertise in public health by creating the position of a Health Planning Facilitator to act as a liaison between the Planning Department and the Public Health Department.</td>
</tr>
<tr>
<td>Fraser Health, Vancouver Coastal Health, Vancouver Island Health</td>
<td>Created and capitalized on opportunities to engage with planners in the municipalities, in Peel region and provincially, to achieve integration of health concepts and tools in current planning initiatives and policies, e.g., Brampton’s Sustainable Design Guidelines.</td>
<td></td>
</tr>
<tr>
<td>Production of tools and resources to support integration of health evidence into built environment decision-making.</td>
<td>Urban Public Health Network (UPHN) and Canadian Institute of Planners (CIP)</td>
<td>Developed the National Health and Built Environment Resources Inventory. This is an evidence-based inventory of more than 150 case studies, guidelines, tools and key scientific papers related to health and the built environment. It is searchable by theme, type of resource, target population and key word.</td>
</tr>
<tr>
<td>CIP</td>
<td>Developed the Healthy Communities Practice Guide, a manual to guide Canadian planners towards more evidence-informed practice and increased collaboration between health and planning.</td>
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</tr>
<tr>
<td>Heart and Stroke Foundation and CIP</td>
<td>Prepared research briefs on the Built Environment &amp; Health: A Summary of Canadian Health and Built Environment Research (2007 to 2011), organized under themes of relevance to day-to-day planning practice.</td>
<td></td>
</tr>
<tr>
<td>Peel Public Health</td>
<td>Managed the refinement, validation and pilot testing of a Healthy Development Index. This is a set of evidence-informed targets and ranges for various built environment elements that can be used to provide consistent, quantifiable health recommendations for planning decisions.</td>
<td></td>
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<tr>
<td>Montreal Public Health</td>
<td>Managed the development of a Health Background Study Framework. This is a tool for developers and planning authorities that provides a rationale and specific recommendations for integrating health considerations into land development processes at the development application and prior policy stages.</td>
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</tr>
<tr>
<td>Toronto Public Health</td>
<td>Developed and validated a Walkability Auditing Tool for community organizations, an evidence-informed tool to assess the potential of street segments to support travel by foot or wheelchair.</td>
<td></td>
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<tr>
<td>Toronto Public Health</td>
<td>Produced the policy report, The Walkable City (2012), based on the survey results, to support comments offered on Toronto’s Official Plan.</td>
<td></td>
</tr>
<tr>
<td>National knowledge transfer and exchange (KTE) activities and products</td>
<td>Heart and Stroke Foundation, UPHN, National Collaborating Centre for Healthy Public Policy and CIP</td>
<td>Conducted various KTE activities, for example:</td>
</tr>
<tr>
<td>Heart and Stroke Foundation</td>
<td>Created three major websites on health and the built environment; delivered conference presentations and webinars targeting professionals in planning and public health; and published project outcomes, reflections and lessons learned through professional journals, newsletters, peer-reviewed journals and reports.</td>
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</tbody>
</table>

2) Four national organizations – the Heart and Stroke Foundation, the Urban Public Health Network (UPHN), the National Collaborating Centre for Healthy Public Policy and the Canadian Institute of Planners (CIP). These organizations have access to some of the key target sectors for healthy built environments. The staff involved from these organizations included a director of policy, two research officers and a director of policy and public affairs. Several volunteer professional planners participated through the CIP Healthy Communities Committee, and several MOH volunteered through the UPHN.

HCBD participants consulted or collaborated with a variety of built environment stakeholders, including municipal or regional planners, researchers, provincial government officials, federal government officials, private sector association representatives, local community members, staff at community-based
organizations and NGOs involved in built environment initiatives. These individuals and their organizations are considered HCBD collaborators.

The extent to which collaborators were involved varied widely across health authorities, as well as over time. In three out of six health regions, collaborators were involved from the early onset of the project, for example, by helping to draft the scope of work of specific activities, select project contractors and identify key stakeholders. In these instances, collaborators often continued to be actively involved throughout the duration of the project through weekly or monthly meetings, frequent interactions with HCBD participants and joint ‘hands-on’ work on policy analysis, stakeholder engagement and tool development. In one health region, collaborators were heavily involved at the beginning of the project, to identify needs and define the scope of work, but were engaged more sporadically during project implementation. Finally, in the remaining two health regions, collaborators were engaged through occasional consultations at two or fewer junctures in the project.

Setting
The six health authorities that participated in the 2009-2012 phase of HCBD have public health responsibilities for over 9 million people living in several of the largest urban and suburban centres in Canada, representing approximately one quarter of the Canadian population. Although most of the tools and processes developed in the first phase of HCBD apply to urban or suburban settings, some resources were developed for rural settings. Knowledge transfer and exchange (KTE) activities took place in greater Victoria, greater Vancouver, greater Toronto and greater Montreal, and on a national scale.

Public health intervention
Between October 2009 and March 2012, HCBD participants developed and implemented a suite of region-specific, cross-regional and national activities, aiming to achieve the set of common outcomes illustrated in the HCBD logic model (Figure 1). Interventions were largely centred on increasing the capacity of public health to incorporate health evidence into land use and transportation planning documents.

The types of activities carried out by HCBD partners and collaborators are summarized in Table 1.

Evaluation method and outcomes measured
The HCBD Evaluation Working Group, made up of project participants interested in providing evaluation oversight, was facilitated by a professional evaluator. HCBD as a whole is a conglomeration of regional and national projects (Table 1). Evaluation participants assessed the parts of HCBD that they were directly involved in, and their survey responses and interview comments are presented in this paper as initiative-wide findings. The evaluation focused on outputs and early outcomes, recognizing that built environment changes that can affect chronic disease risk factors would not be observable within the project’s timeline of three years. The early outcomes measured the extent of the following:

- The building of relationships across sectors, as well as within the same sector but across organizations and jurisdictions;
- Increased understanding and improved skills for influencing built environments to promote health;
- Increased awareness of and commitment to consideration of health in built environment decisions; and
- Inclusion of health concerns in built environment plans, policies and decisions.

Data collection was integrated with a parallel evaluation conducted by the Canadian Partnership Against Cancer for the CLASP funding program.

Participants
To provide evaluation data, HCBD participants responded to surveys and interviews:

- On-line survey December 2010: 13 respondents, response rate 56%. Respondents included MOH and health authority staff.
- On-line survey November 2011: 21 respondents, response rate 78%. Respondents mostly included MOH and health authority staff, 6 of whom (29%) had participated in the 2010 survey.
- Semi-structured group or individual telephone or in-person interviews, January and February 2012: 10 interviews with 12 project leads in all but one regional health authority.
- E-mail exploration of policy impacts (6 on-line interviews conducted by the National Collaborating Centre for Healthy Public Policy with project participants from each of the six health authorities).

Collaborators
HCBD collaborators provided evaluation data through surveys and, in one case, a focus group.

- On-line survey May 2011: 34 respondents, response rate 49%.
- On-line survey January 2012: 52 respondents (response rate 42%), 14 of whom (27%) had participated in the 2011 survey.

Collaborators who responded to the surveys were in both years most often municipal government staff (52% in 2011 and 56% in 2012) and also included staff of provincial and regional governments and authorities (e.g., regional transportation authority), NGOs, community groups, citizens and private companies (the latter in 2011 only).

- Focus group of 8 municipal planners and health authority staff in one of the regional jurisdictions.

Impact of KTE activities

- Individuals who were reached by HCBD through workshops or presentations were invited to complete a post-event questionnaire (n=356, of whom 50%, 22% and 26% respectively were from the planning, health and other sectors, including elected officials, citizens and NGOs).
- On an ongoing basis, the HCBD Project Manager kept a logbook of KTE events and organizations engaged by HCBD, including collaborators.

Limitations
The evaluation has limitations, some of which are inherent to the nature of the intervention being studied. They are presented here so that readers are able to take them into consideration when reading the results. First, the population of both participants and collaborator organizations evolved over time, both because the intervention developed in emergent ways to capitalize on
opportunities for public health engagement in planning systems and because there was staff turnover and reorganization, whereby individuals representing organizations sometimes changed over time. Survey data are thus a cross-sectional indication of the situation at those time points and not of change over time. Inherent to organizational research, individual respondents’ views may not represent the views of the entire organization, and populations of organizations are far smaller than populations of individuals, limiting potential sample sizes. Another key limitation was low survey response rates. Those reported here are based on the entire population of individuals invited to participate in the surveys, some of whom might have been relatively uninvolved in HCBD at that particular time, and this may have affected their interest in responding. Overall, however, according to our knowledge of the organizations involved, the views of all key participants and collaborators are represented in the data.

RESULTS

By the end of the project, in September 2012, HCBD had generated two main outputs and four main outcomes.

Output 1: Cross-sector reach and collaboration mechanisms of HCBD

Through the projects and interventions identified above, HCBD worked with over 100 organizations, government agencies, and departments (Table 2). In addition, over 4,000 elected officials, citizens and professionals in the planning, health, environment and food security fields attended local workshops, presentations or public events offered by HCBD.

Output 2: New tools and methods

HCBD developed several tools and methods:

- A suite of tools and methods used by health authorities to support their involvement in land use and transportation planning processes, and/or to facilitate the inclusion of health evidence in land use planning decisions;
- Canadian evidence to fill in a key knowledge gap around residential preferences and the impact of neighbourhood design on modes of travel, levels of physical activity and vehicle kilometres travelled; and
- KTE materials and websites to support dissemination of the above knowledge products.

Several of the tools and methods developed for this Initiative are first-of-their-kind in Canada. As most tools produced by HCBD were not available until the end of the funding period, it was not possible to measure their uptake or use.

By the end of the project HCBD had generated four main outcomes.

Outcome 1: Relationships across sectors

HCBD participants built relationships across sectors, as well as within the same sector but across organizations and jurisdictions. HCBD participants rated the relative frequency of five levels of intensity of relationships between project participants before and after the launch of the Initiative: no or minimal interactions, networking, coordination, cooperation and collaboration. The most common form of current relationship (i.e., after the launch) at both time points was networking (Figure 2). In the 2011 survey, respondents indicated that their relationships had shifted from no or minimal interactions to all of the other types, most notably collaboration. A similar perceived shift is also present in the 2010 data, although from no interaction to cooperation. As per the limitations mentioned above, change over time should not be inferred between the two surveys.

Collaboration mechanisms developed between the public health and planning sectors included the following:

- Creating or taking advantage of opportunities for public health staff to become aware of and provide informal input into
planning processes, including scoping meetings and community consultations;
• Creating or taking advantage of opportunities for public health staff to formally review draft planning documents in order to provide the “health lens” on development choices;
• Creating memoranda of understanding to establish public health as a proactive member of the planning team.

The above findings are supported by other survey data. For example, in 2011, 90% of survey respondents (n=20) agreed that, as a result of their participation in HCBD, they had increased their awareness of other organizations working in this area. Similarly, 75% of survey respondents in 2011 (n=20) reported having formed new partnerships or relationships with other organizations.

Qualitative data identified challenges in building and sustaining relationships. From the collaborators’ perspective, their internal timelines and imperatives, including municipal election cycles, made relationship-building with public health quite challenging. As one collaborator noted: We did manage to incorporate some material provided by [public health] but there were lots of missed opportunities because of our crazy timelines. Also, our meeting schedule changed a lot and it was hard to actually coordinate having [public health] be part of our planning staff team.

The linkages established between public health and the built environment sector often involved multiple intra- and inter-organizational layers:
• Within public health, between the roles of MOH and professional staff. In several regions, public health staff were developing interfaces with municipal planning staff, while MOHs were developing platforms to influence elected officials or public bodies. When planning staff were already promoters of healthy built environments, this dual-level action was particularly effective. For example, planning staff noted that: When building up to launch the [planning] process, our city’s planning group was mindful that when the health authority weighs in as an objective/neutral outsider – and speaking on behalf of the public’s health – it really helps to support the municipal initiatives and [planning] process.
• Within public health, between the traditional practice of environmental health as health protection and the newer focus on health promotion through the built environment. For example, in an evaluation of an internal workshop, environmental health officers varied in how familiar they were with the healthy built environment (HBE) field and suggested role clarification was still needed: Still not quite sure how health protection can implement HBE initiatives; There is potential for a role; still a bit unclear exactly how.
• Within regional health authorities, between public health and the health care system with its curative focus. Public health staff noted that this was a tough sell internally.... not seen as the business we’re in.

• Between contiguous health regions that shared municipal or regional partners or interests. Some issues arose when the contiguous regions did not have the same approach or level of readiness to work on built environment and health. In one case, this led two HCBD public health units to decouple their work.
• In a three-way relationship, engaging the community sector in order to later use citizen mobilization as a pathway to influencing municipalities.

Overall, although relationships were built, their sustainability is unknown, especially after the end of the CLASP program funding.

Some mechanisms by which the health sector can engage with other sectors on built environment issues may be more effective. In 2011, collaborators rated having HCBD as part of meetings or events as most effective for working relationships, whereas in 2012 they rated sharing knowledge, technical advice, expertise or recommendations most highly (Table 3). In interviews, the role of the public health embedded planner was seen as particularly useful in building relationships. For example, an interviewee noted: Our best success has been being able to get in on different committees; we’ve been able to ask to be part of them because we know what’s going on in planning. In both years, using tools, resources or other types of knowledge product developed by HCBD was rated by external collaborators as being the least likely to have helped to forge closer relationships between the health and the planning sectors.

### Table 3. Interactions or engagement that helped the health and planning sectors work more closely together

<table>
<thead>
<tr>
<th>Type of engagement or interaction</th>
<th>% agree or strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Having HCBD or [a health authority] be part of their meetings or events</td>
<td>2011 (n=34) 2012 (n=46)</td>
</tr>
<tr>
<td>General support and strategic alliance</td>
<td>90% 45%</td>
</tr>
<tr>
<td>Sharing knowledge, technical advice, expertise or recommendations</td>
<td>78% 48%</td>
</tr>
<tr>
<td>Using tools, resources or other types of knowledge products developed by HCBD</td>
<td>71% 61%</td>
</tr>
<tr>
<td>Having HCBD or [a health authority] be part of their meetings or events</td>
<td>44% 44%</td>
</tr>
</tbody>
</table>

Source: Collaborators’ surveys, May 2011 and January 2012. The n values per question in 2012 varied according to the types of relationship held.

**Outcome 2: Increased understanding and improved skills**
HCBD increased understanding and improved skills among its participants and collaborators for influencing the built environment to promote health:
• 89% and 70% of 2010 and 2011 respondents respectively indicated increased understanding of the relationship between built environment and health as a result of HCBD; and
• 62% and 80% of 2010 and 2011 respondents respectively indicated increased skills for working with partners outside of public health to improve the built environment.

Results from the online surveys of HCBD collaborators were similar:
• 56% and 83% of 2010 and 2011 respondents respectively indicated increased understanding of the relationship between built environment and health as a result of HCBD; and
• 56% and 67% of 2011 and 2012 respondents respectively indicated increased skills for working with public health to address health through the built environment; and
• 68% and 65% of 2011 and 2012 respondents respectively indicated increased skills for working with their organization to address health through the built environment.

For municipal collaborators, one of the results of their involvement with public health through HCBD was a form of demystifying the nature of the public health organization and its...
Table 4. Collaborators’ views of the results of Healthy Canada by Design meetings or events

<table>
<thead>
<tr>
<th>Type of result</th>
<th>2011 (n=26)</th>
<th>2012 (n=34)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I had the opportunity to further a relationship or make a new connection.</td>
<td>88%</td>
<td>73%</td>
</tr>
<tr>
<td>My awareness or thinking about the issue was changed.</td>
<td>69%</td>
<td>74%</td>
</tr>
<tr>
<td>My knowledge was increased.</td>
<td>62%</td>
<td>94%</td>
</tr>
<tr>
<td>My skills were increased.</td>
<td>46%</td>
<td>67%</td>
</tr>
<tr>
<td>My attitude was changed.</td>
<td>23%</td>
<td>50%</td>
</tr>
</tbody>
</table>

Source: Collaborators surveys, May 2011 and January 2012. The n values per question in 2012 varied according to the types of relationship held.

roles in the built environment. For example, a collaborator stated: I think that there is a better understanding of how another partner can add to a municipal planning process not just as a “stakeholder” but as a true partner ...I think my organization struggled with understanding how best to involve [public health] and, though not perfect, this project helped to shine a light on what worked and what didn’t, which I think is a positive thing when considering future partnerships.

Outcome 3: Increased awareness of and commitment to health in built environment decisions

Among non-health stakeholders, HCBD increased awareness of and commitment to consideration of health in the built environment. Attendees of HCBD workshops and KTE events were asked to rate how likely they were to change their practices as a result of what they had learned. Of 166 individuals from the planning sector who attended 13 HCBD workshops, 92% said they were somewhat or very likely to change their practices as a result of what they had learned. In response to questions about the impacts of attending meetings or events organized by HCBD, collaborators were most likely to agree that there had been some type of impact on knowledge or networking (Table 4).

Low ratings for attitude change may have been due to underestimation by public health of the existing high endorsement of healthy built environment concepts, as this quote from a planning collaborator indicates: We were already aware of relationship between urban form and health, and while we support the efforts, based on the background we have and the need to look at each situation based on its own circumstances, there was little new that we could use. A public health participant noted about its initial consultations with planners: We were surprised by the very clear message that came from the planners that day: They all understood the benefits of HBE and incorporating HBE principles into municipal policy, and didn’t need more education on it. What they needed was support from health authorities in developing and implementing policy.

Outcome 4: Inclusion of health concerns in built environment plans, policies and decisions

The evaluation suggested that the HCBD Initiative contributed to the inclusion of health concerns in built environment plans, policies and decisions. By the end of the first phase of the project, in Peel Region and in Metro Vancouver there was evidence of regional and municipal plans that referenced health as a result of HCBD. For example, in Peel, five regional policies and three municipal planning policies were amended to facilitate application of the Health Background Studies Framework developed by Peel Public Health as part of the HCBD project.

Another example is the District of North Vancouver’s Official Community Plan, which formally acknowledges the local health authority’s role in shaping this policy document.

Examples provided in the 2012 survey of collaborators of how new knowledge had been applied in developing or reviewing specific plans, guidelines or assessments included the following: In developing the new Official Community Plan, as well as secondary plans such as neighbourhood plans, greenways & walking plans etc., the partnership has enhanced the consideration of the health consequences of alternative policies. My organization has promoted the inclusion of policies for healthy community design in local official plans and secondary plans. We created a healthy design checklist for reviewing major development proposals. In an interview, a HCBD participant noted: We have been told by municipal staff that there are many built environment policies that [public health] was instrumental in supporting; if [we] had not been a strong supporter of [policies for connected neighbourhood centres and active transportation, it is quite possible that these policies would have been diluted in the Plan.

Challenges and successes of delivering the HCBD intervention

Some of the challenges in the first phase of HCBD stemmed from the complexity of working on built environment issues at a cross-provincial scale. HCBD interventions were led by health authorities situated in three provinces with different public health structures, land use planning legislation and relationships between local and regional municipalities. For example, one of the two HCBD health authorities based in Ontario operates as a department in a two-tiered regional municipality, whereas the other operates as a division within a single-tiered local municipality. In Quebec and British Columbia, the HCBD health authorities operate independently from both the local and regional governments.

The six public health authorities had different levels of experience with, capacity for, involvement in and understanding of health and built environment work when HCBD began. This made it difficult to find common projects that could be delivered across all health authorities: the result was a wide diversity of interventions undertaken.

Developing appropriate staffing and governance structure for this large and innovative Initiative proved complex and took over a year. Managing the administration, evaluation, KTE and partnership development of the first phase of HCBD required two, instead of the planned one, full-time equivalent staff member. A few attempts and restructurings were required to achieve an efficient governance structure that allowed all HCBD partners to have input into the project’s direction and influence key decisions.
CONCLUSION
The first phase of the HCBD project was ground-breaking, as it united once disparate built environment and health stakeholders around a pan-Canadian network. The Initiative’s resources and unique melding of research, policy and practice allowed professionals from the planning, public health and NGO sectors to collaborate on projects at both a local and national level; provided the opportunity for public health professionals in different provinces to collaborate on built environment projects; and supported applied research to be directed at policy gaps in the built environment. Despite its limitations, the project’s evaluation provided valuable insights into whether the project set HCBD participants on the ‘right track’ towards achieving the Initiative’s long-term chronic disease prevention goal.

Between 2009 and 2012, HCBD helped to accelerate health-promoting changes to the built environment in Canada, in part by creating a basis for networking and coordination around this issue among health authorities, planners and NGOs. Community and system changes are often associated with the implementation of collaborative partnerships. Accordingly, the HCBD Initiative laid the groundwork for strategic alliances and cross-sector partnerships that may lead to systemic changes in the built environment. Although the initiatives and strategies developed by phase 1 of HCBD focused mainly on urban Canada, they may also be applicable to rural settings and to built environments worldwide.

Collaborators of HCBD found in-person sharing of knowledge, technical advice, expertise or recommendations as the most likely tactics to have helped the health and planning sectors collaborate more effectively and generate local policy outcomes. On the other hand, the more traditional form of knowledge transfer in public health, using one-way dissemination of documents from one sector (health) to the other (planning), was rated as the least effective way to facilitate cross-sector collaboration. This strategy may have increased the background knowledge necessary but was not sufficient on its own to initiate relationships that would fuel cross-sector collaborations. This observation highlights the importance of dedicating human resources and setting up mechanisms across sectors for ongoing relationship-building, knowledge exchange, dialogue, joint action and collaborative resource development.

The first phase of the HCBD Initiative also boosted the content expertise and skills of participating public health organizations so that they could reach municipal and regional planners and influence built environment decisions. HCBD participants improved their understanding of how to navigate the complex labyrinth of stakeholders and agents that influence built environment decisions, within and beyond municipal planning. They also developed and put into action a wide range of tools and processes. The most effective path to policies and practices that promote healthy built environments varies from context to context, depending on provincial and regional legal frameworks, the priorities and constraints of local governments, political circumstances and organizational culture. This suggests that initiatives like HCBD, which produce a variety of tools, can increase the likelihood that their outputs will be relevant to a diversity of health regions.

Few external collaborators reported changes in organizational practices, policies or programs as a result of interaction with HCBD. This could be due to the relatively short timeframe of the project. However, the ‘early adopter’ collaborators that implemented organizational changes set a precedent that could be leveraged to foster institutional changes at broader scales in the medium term.

The built environment is shaped by a hierarchy of policy documents and decisions that starts at the provincial level and cascades down to the regional, municipal, neighbourhood, street and land lot levels. HCBD was developed on the premise that having health evidence embedded in policy documents at the regional and municipal levels, ‘upstream’, sets the foundation necessary to facilitate the integration of health considerations ‘downstream’, at the neighbourhood, street and land lot decision-making levels, in the medium term. The first phase of the HCBD Initiative contributed to the inclusion of health considerations in some upstream policies; this was considered an encouraging level of impact, given the complexities of the built environment field and the timeframe required for policy changes, and a first step towards healthier built environments.

However, it is important to note that the actual implementation of health-promoting built environment policies will likely present significant challenges. Applying strategies such as densification, mixing of land uses and allocation of road space to active transportation often generates resistance from local residents or businesses and is further complicated by economic pressures and the needs of real estate developers. Moreover, actual construction of health-promoting communities will be likely confronted by market pressures to build new developments on greenfields, i.e., undeveloped land parcels outside or on the edge of existing developed areas. There is emerging evidence that new developments built to promote walking at the neighbourhood and street levels in greenfields located far from established urban or suburban centres are associated with low levels of walking for daily transportation. We caution health officials to be aware of the potential challenges and to consider them when developing healthy built environment knowledge translation, policy and advocacy programs.

In summary, the results of the first phase of the Healthy Canada by Design Initiative indicate that the health sector can be a valuable asset and ally to the planning sector in creating the potential for healthier built environments. The project illustrates both the potential and the hurdles facing public health organizations when working with new partners and in new ways to influence built environment factors that are determinants of chronic disease. Consistent with capacity-building models for public health practice, the Initiative laid a foundation of skills and cross-sector relationships that can begin to bring health and built environment work in Canada to a coherent and more coordinated community of practice. Finally, HCBD engaged municipal governments and planning sectors in ways that, in the long term, have potential to achieve health and built environment policy settings that are fully integrated and contribute to reduced risk of chronic disease and improved health equity.
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Building a community of practice: Healthy Canada by Design CLASP Renewal – Postscript

Kim Perrotta, MHSc

The Healthy Canada by Design (HCBD) CLASP Coalition, which began in 2009, was funded for five years by the Canadian Partnership Against Cancer (CPAC) through the Coalitions Linking Action and Science for Prevention (CLASP) initiative and Health Canada. There were two phases to the HCBD CLASP Coalition initiative; CLASP I, funded from 2009 to 2012, and the CLASP Renewal, funded from 2012 to 2014. This Supplement is dedicated to the work undertaken by the HCBD CLASP I partners. As a postscript, we wanted readers to be aware of the work that continued under the HCBD CLASP Renewal between October 1, 2012 and September 30, 2014. This article provides a high-level summary of the activities undertaken by partners in the HCBD CLASP Renewal.

Under the second round of funding, the HCBD partners agreed to build on the work conducted under HCBD CLASP I; focus their attention on active transportation; extend their work from urban to rural contexts; and expand the partnership to include the following: one additional national partner, the Canadian Institute of Transportation Engineers; six additional health authorities from Saskatchewan, Manitoba, New Brunswick, Nova Scotia, Newfoundland and Ontario; two non-governmental organizations; and one academic partner (see Box 1). One of the health authority partners from the HCBD CLASP I, Island Health Authority, did not participate in the HCBD CLASP Renewal.

With the HCBD CLASP Renewal, work was done under three themes: deepening the impact by focusing on challenges identified under HCBD CLASP I; broadening the impact by extending the work of the HCBD CLASP Initiative into new jurisdictions and rural contexts; and increasing the impact of the HCBD CLASP Coalition with a knowledge translation and communications program.

Deepening the impact of the HCBD CLASP Coalition

The HCBD projects directed at challenges identified under the HCBD CLASP I initiative consisted of two data projects, one environmental scan, one case study report and three pilot projects:

1. Health and Active Transportation Data – Lower Mainland of British Columbia (BC): This project was led by the HCBD CLASP Renewal partner in Simon Fraser University. Working with 2 HCBD health authority partners, 15 municipalities and 2 regional districts in BC, the project team identified the data needed to bring health considerations into the transportation planning processes and then identified where those data were and were not available. The completed report offers recommendations for improving the availability and accessibility of these data for local, regional and provincial governments in BC.

2. Health Impact Assessment for Transportation Scenarios in Montreal: This project was conducted by researchers and public health practitioners from Montreal Public Health, the University of Montreal, McGill University and the Québec National Institute of Public Health. It involved the collection of data needed to support the development of a software model that can be used to predict positive and negative health impacts associated with various transportation planning scenarios for the Region of Montreal, giving consideration to the effects on air quality, physical activity and motor vehicle collisions.

3. Healthy Communities Legislative Comparison Survey: An environmental scan of provincial legislation was conducted by the Canadian Institute of Planners. Using interviews with planners across the country, this scan examined how legislation, programs and policies in different provinces affect planners’ ability to develop and implement healthy community policies at a local and regional level.

Acknowledgements: The author thanks the following for their comments and advice on this article: Gene Chin and Alice Miro, Heart and Stroke Foundation, Vancouver, BC; and Natalie Kishchuk, Program Evaluation and Beyond Inc.
4. Case Studies – Innovative Street Designs Developed and/or Implemented: This project was conducted by the Canadian Institute of Transportation Engineers to extend the concept of healthy built environments into the transportation planning and engineering sector. Working with the University of British Columbia (Okanagan) a survey of innovative transportation practices was conducted with municipalities across Canada. The resulting report was used in webinars to raise awareness among transportation professionals.

5. Community Engagement & Active Transportation: Two Demonstration Projects in Toronto: Undertaken by the Toronto Centre for Active Transportation and Toronto Public Health, with support from the Montreal Urban Ecology Centre, the project team engaged two neighbourhoods in Toronto with regard to their active transportation needs. One of the neighbourhoods is a fairly affluent one with a long history of activism for active transportation, whereas the other has a high percentage of low-income families with little history of engagement on civic issues.

6. Health Impact Assessment of a Transit-oriented Development Proposed for Sainte-Catherine in Québec: The National Collaborating Centre for Healthy Public Policy worked with the Region of Montérégie in Québec to demonstrate how traffic-calming principles and other active transportation-oriented interventions might be applied to a development proposal within that jurisdiction using a health impact assessment approach.

7. Promoting Sustainable Transportation in Clearwater, BC: Led by the Heart and Stroke Foundation, a project team worked with municipal staff and residents in the small town of Clearwater, BC, to incorporate active transportation into road and subdivision designs as the first step in the development and implementation of an active transportation bylaw.

Broadening the impact of the HCBD CLASP Coalition

To broaden the impact of the HCBD CLASP Coalition, five additional health authorities and the Newfoundland and Labrador Wellness Advisory Council (NL Council) made a commitment to bring health considerations into the land use and transportation planning processes in their communities, using the model employed by the BC health authorities under the HCBD CLASP I initiative. Four of the five health authorities and the NL Council received funding through the HCBD CLASP Renewal Coalition as a whole. The plan for the Coalition is a multi-layered plan with activities designed to meet four objectives:

1. To support new health authority project teams by building a multi-community collaborative of professionals who can support one another;
2. To build awareness and understanding about the actions to be taken to create communities that foster and support physical activity and active transportation among local stakeholders in the communities in which new health authority project teams are working;
3. To build an intersectoral community of practice in which professionals from different sectors across the country can share information, build on one another’s work and identify opportunities for collaboration; and
4. To support the dissemination of information respecting HCBD CLASP resources, tools, interventions, activities and lessons learned with professionals within the health, public health, planning and transportation sectors across Canada.

Objective #1: Building a Multi-Community Collaborative of Professionals

Several strategies were employed to build a multi-community collaborative of professionals:

- Formal peer-to-peer sessions were organized to support the six new health authority project teams with their HCBD CLASP Renewal projects. These sessions included presentations from HCBD CLASP Renewal members and guests with opportunities for questions and discussion. The goal was to provide members with the opportunity to share information and experience with one another and to learn from peers beyond the Coalition who are also working to create communities that support and foster physical activity and active transportation.
- Informal peer-to-peer sessions were also organized to support ongoing information sharing and discussion among HCBD CLASP Renewal members. These sessions did not involve major
Presentations or guest speakers. They were used to support less formal information sharing and discussion on specific issues of immediate interest to HCBD CLASP Renewal members.

- A HCBD hub website was established in March 2013 to facilitate information sharing among HCBD CLASP Renewal members. It includes webpages for HCBD CLASP resources, tools and reports; presentations and recordings from peer-to-peer sessions; presentations given by HCBD members at conferences and webinars; project updates on password protected webpages; project evaluation reports; and healthy community resources produced by other organizations (http://hcbd-clasp.com/).

**Objective #2: Building Support among Local Stakeholders**

Each of the four funded health authorities and the NL Council were provided with access to a high-profile healthy built environments expert who could help to build awareness and understanding among stakeholders in their local communities about the actions that can be taken to create healthy built environments and about the many co-benefits that can be associated with those actions. The expert’s time was directed at keynote presentations at conferences organized with the planners’ institutes, workshops, public meetings, media interviews, and meetings with stakeholders, such as local planners, provincial staff, medical officers of health, health professionals and the boards of trade in the local communities for each of the five funded health authority projects.

**Objective #3: Building an Intersectoral Community of Practice**

Several strategies were employed to build an intersectoral community of practice among partners within the HCBD CLASP Renewal:

- One face-to-face meeting was convened for all HCBD CLASP Renewal partners in Winnipeg in November 2013. This two-day session included popcorn presentations from all 19 partners; presentations on several technical projects conducted under the first and second rounds of funding; a strategic question-and-answer panel with medical officers of health; and round-table discussions on a variety of topics, including the sustainability of the HCBD CLASP Coalition. The face-to-face meeting provided HCBD CLASP Renewal members from all of the partner organizations the opportunity to meet in person, hear about one another’s projects, network about issues of common interest, and identify areas for potential collaboration.

- Formal peer mentoring sessions were organized for HCBD CLASP Renewal members and guests from partner organizations. Within HCBD, there were about 50 members who were actively involved in currently funded projects or activities. For the peer mentoring sessions, invitations were extended to other individuals within the partner organizations who, while not members of HCBD, have an interest in healthy communities and/or active transportation. Invitations were extended, for example, to managers and directors across the Heart and Stroke Foundation and to all members of the Urban Public Health Network. These sessions, conducted by teleconference, featured presentations by high-profile guest speakers from jurisdictions that are leaders in the field of intersectoral collaboration, active transportation, the provision of transit to small and remote communities, and/or in the links between active transportation and public transit.

- Several e-newsletters were prepared for the HCBD CLASP Coalition to keep members, who are spread across the country, informed about each other’s work. The e-newsletters were also useful for keeping decision-makers and other members within our partner organizations aware of the work that the Coalition was doing. These newsletters included highlights of recent or upcoming HCBD CLASP Coalition events, links to recent articles on the HCBD CLASP website, and links to new resources that may be of interest to people working on healthy communities and/or active transportation.

**Objective #4: Supporting Dissemination of Information**

Several strategies were used to disseminate information about the work being done by the HCBD CLASP Coalition:

- The HCBD CLASP Coalition website was used to facilitate information sharing with the broader network of professionals in the health, public health, planning and transportation sectors in Canada, as well as with HCBD CLASP Renewal members. Since its creation in March 2013, the website received, on average, approximately 1,300 hits per month.

- Blogs – short articles with photos and links – were prepared to promote the tools developed, reports prepared and events organized by HCBD CLASP Renewal partners. These 500-word articles were posted on the website and circulated through e-mails, list serves, LinkedIn and Twitter. In total, 21 articles were prepared with each one generating, on average, 450 hits on the website.

- Four national webinars were organized to showcase 12 of the HCBD CLASP projects that were funded under the CLASP Renewal. Each webinar featured presentations from two to four of the HCBD project teams.

- While HCBD members frequently made presentations on their projects at local, provincial and national conferences, abstracts for HCBD CLASP Renewal panel presentations were submitted to the 2014 annual conferences for the Canadian Public Health Association, the Canadian Institute of Planners, and the Canadian Institute of Transportation Engineers, to ensure that each of the 12 currently funded projects was presented, at least once, to a national audience of public health, planning or transportation professionals.

**Concluding comments**

As part of its funding commitment to CPAC, the HCBD CLASP Renewal was formally evaluated to assess the extent to which it accelerated relationship building, intersectoral collaboration and policy changes within participating communities and organizations. It will also be contributing to an overall evaluation of the CPAC CLASP Initiative, particularly with respect to the outcomes of the knowledge translation components. These results will be reported in 2015. The HCBD CLASP evaluation report found that the HCBD CLASP Initiative played a significant role in incubating effective working relationships and policy development on healthy built environments in the local communities in which our partners were operating across the country.