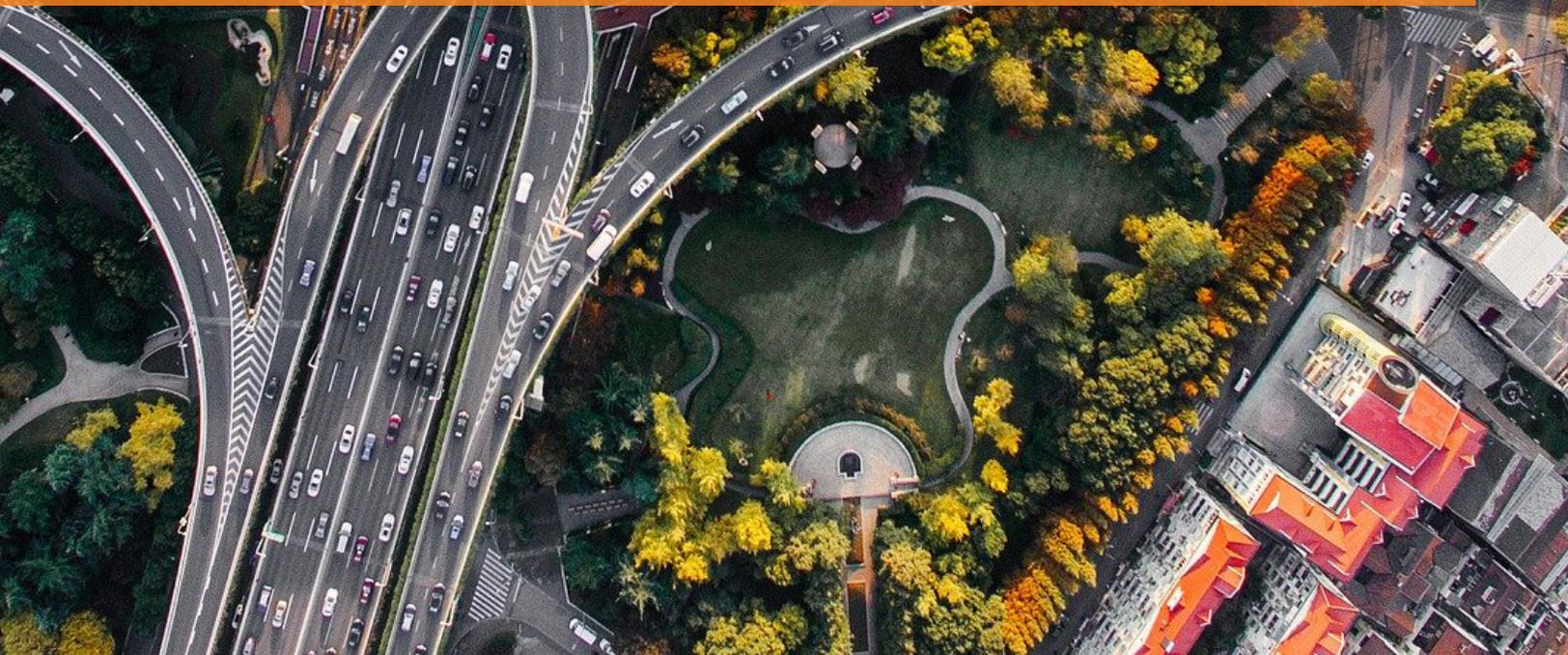




The Built Environment and Diabetes

A Position Statement



DIABETES
CANADA

About Diabetes Canada

Diabetes Canada is a national health charity representing close to 11 million Canadians living with diabetes or prediabetes. Diabetes Canada leads the fight against diabetes by helping those affected by diabetes live healthy lives, preventing the onset and consequences of diabetes, and discovering a cure. It has a heritage of excellence and leadership, and its co-founder, Dr. Charles Best, along with Dr. Frederick Banting, is credited with the co-discovery of insulin. Diabetes Canada is supported in its efforts by a community-based network of volunteers, employees, health-care professionals, researchers, and partners. By providing education and services, advocating on behalf of people living with diabetes, supporting research, and translating research into practical applications, Diabetes Canada is delivering on its mission. Diabetes Canada will continue to change the world for those affected by diabetes through healthier communities, exceptional care, and high-impact research.

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For More Information: Please visit www.diabetes.ca

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Position Statement

The built environment consists of features that are dictated by human design, including transportation systems, land development patterns, and microscale urban design (e.g., sidewalks, curbs, etc.) (1–3). Specific components of the built environment include infrastructure to enable active transportation and neighborhood walkability, such as buildings, roads, and parks (1–3). It is the very foundation of how we plan, design, and build our communities (3).

The built environment influences the development of type 2 diabetes, and the management of type 1 and type 2 diabetes. Policies and programs that address urban design, transportation systems, and land-use planning can act as either facilitators or inhibitors to levels of overweight and obesity, physical activity, and healthy eating, which are major modifiable risk factors for the development of type 2 diabetes and its related complications.

Diabetes Canada recommends that **municipalities**:

- Develop urban containment policies to manage urban sprawl and promote density, facilitating opportunities for active transportation.
- Implement infrastructure that supports active transportation, such as bike lanes, safe crossings and paths, well-maintained sidewalks, and adequate lighting.
- Ensure that affordable, efficient, and reliable public transportation is provided.
- Ensure mixed land use development so that employment, schools, and shops are within close proximity of each other, and walking or biking can be the primary methods of transportation.
- Provide equitable access to recreation facilities, especially for those living in rural, remote, and northern regions. Recreational facilities need to take into consideration the cultural traditions of Indigenous communities and other cultural/ethnic groups.

Diabetes Canada recommends that **provincial and territorial** governments:

- Prioritize physical activity and health in the development and implementation of

transportation and municipal affairs policy.

- Provide adequate support for municipal infrastructure and development, including retrofitting neighbourhoods where necessary, and public transportation.

Diabetes Canada recommends that the **federal** government continue to:

- Support and collaborate with provincial/territorial and municipal governments to develop an active transportation plan for Canada.
- Explore ways of ensuring sufficient funds are available for municipal infrastructure that promotes active transportation through investments in sidewalks, trails, and bike paths and lanes.
- Allocate funding to municipal and provincial/territorial governments for the development of recreation facilities.

Diabetes Canada recommends that **Canadians**:

- Acknowledge and value communities that encourage active transportation and physical activity. Citizens enjoy and value the presence of nearby shops and services, well-lit sidewalks, greenspace, safe street crossings, recreational facilities, and reasonable access to desirable destinations.
- By making their voices heard, Canadians should encourage municipal counsellors, mayors, and advisory councils to implement public policies that promote active living and better health outcomes.

Why is the Built Environment Important to Diabetes Canada?

A population-health approach highlights the importance of environmental changes in addition to individual behavioural changes that improve health outcomes. This has led to a growing recognition of the role of the built environment as a critical element to address population-level health differences, and as an intervention to reduce chronic disease rates, including type 2 diabetes. Research has demonstrated that features

of the built environment that support active transportation, such as increased urban design, transportation systems, land-use planning, and their corresponding policies, can protect against some of the effects of the determinants of health, such as low socioeconomic status (4–11). The built environment can positively influence health, independent of socioeconomic status and other determinants of health (4–6,12–14).

This position statement is based on a review of the evidence about the role of the built environment on the prevention and development of type 2 diabetes, and the management of type 1 and type 2 diabetes. Recommendations to build healthy environments through upstream policy and infrastructure interventions are provided. This statement can inform policymakers and program managers working at all levels of government in their assessment of the effect of the built environment on the prevention, development, and management of diabetes, through a range of public health and public policy interventions.

Diabetes Canada developed the present evidence-informed recommendations using a systematic approach and deliberative process. The steps in this process included:

- Identification of priority questions and outcomes;
- Retrieval of the evidence;
- Assessment and synthesis of the evidence;
- Formulation of recommendations;
- Review and input from experts including clinicians, researchers, and policymakers; and
- Planning for communication, dissemination,

implementation, evaluation, and updating of the recommendations.

Diabetes

Diabetes is a major chronic disease in Canada. Currently, the prevalence of diagnosed diabetes (type 1 and type 2) in Canada is 3.8 million and is projected to increase to 4.9 million by 2030 (15). The economic burden of diabetes on the health care system is substantial; and costs the Canadian health care system \$3.8 billion annually in direct health care costs (15).

Diabetes is a condition characterized by an elevation in blood glucose levels caused by a lack of insulin or a reduced effectiveness of one's own insulin. People living with diabetes need to manage their glucose levels to achieve their target blood glucose range. Diabetes is a leading cause of blindness, end-stage renal disease, heart disease, stroke, and non-traumatic amputation in Canadian adults (16). The all-cause mortality rate among Canadians living with diabetes is twice as high as the all-cause mortality rate for those without diabetes (17–19).

There are three common types of diabetes (20). Type 1 diabetes occurs in people when their beta cells, located in the pancreas, no longer function (20). Consequently, very little or no insulin is released into the blood. As a result, glucose builds up in the blood instead of entering the cells to be used as energy. Approximately 5-10% of people living with diabetes have type 1 diabetes (20). Type 1 diabetes generally develops in childhood or adolescence, but can develop in adulthood (20).

Policies and programs that address urban design, transportation systems, and land-use planning can act as either facilitators or inhibitors to levels of overweight and obesity, physical activity, and healthy eating, which are major modifiable risk factors for the development of type 2 diabetes and its related complications.



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Over 90% of people living with diabetes have type 2 diabetes.

The all-cause mortality rate among Canadians living with diabetes is

2X
as high as the rate for those without diabetes.

Insulin therapy, which varies in methods of delivery, is required for the treatment of type 1 diabetes and is life-sustaining (21).

Type 2 diabetes occurs when the body cannot properly use the insulin that is released or does not make enough insulin (20). Glucose builds up in the blood instead of being used as energy. Over 90% of people with diabetes have type 2 diabetes (20). Type 2 diabetes usually develops in adulthood but children are increasingly affected (20). Various treatment options exist for treating type 2 diabetes including: nutrition guidance and physical activity, glucose-lowering medications, and insulin therapy (22). The treatment plan prescribed by a clinician will depend on goals, lifestyle, meal plan, age, and general health (22).

A third type of diabetes, gestational diabetes, is a temporary condition that occurs during pregnancy (20). It affects up to 1% of all pregnancies and increases the risk of developing type 2 diabetes for both mother and child in the future (20).

If blood glucose, blood lipids, and blood pressure levels are properly managed, people living with diabetes are able to live healthy lives, and delay or prevent the onset of diabetes related complications (20). Therefore, reducing the risk of developing type 2 diabetes and improving the

management of type 1 and type 2 diabetes is associated with positive health outcomes for the Canadian population and should be a priority for the health sector.

Modifiable Risk Factors

The development of type 2 diabetes is multifaceted. Socioeconomic, environmental, genetic, metabolic, and behavioural factors play a role in protecting against or advancing its onset (17). Major modifiable and non-modifiable risk factors include age, family history, physical inactivity, and high body mass index (BMI) (e.g., overweight and obesity) (17). Modifiable risk factors describe socioeconomic, behavioural, metabolic, and environmental factors that can be modified to increase or decrease one's risk of developing type 2 diabetes (17). Modifiable socioeconomic factors include education, income, and precarious work; and can be addressed through government-initiated policies and social programs (17). Modifiable environmental factors may include characteristics of the built environment; while behavioural and metabolic factors may include body weight, diet, and exercise behaviours (17).

Adults who live with obesity are two to four times as likely to have diabetes, since excess body weight impairs the effectiveness of insulin in the body (17). According to Diabetes Canada's Clinical

Practice Guidelines, a 5% reduction in body weight can reduce the risk of developing type 2 diabetes from prediabetes conditions (16). This reduction in body weight can be achieved through healthy behavioural interventions including the consumption of a low-calorie, low-fat, and high fibre diet, and engaging in at least 150 minutes per week of moderate-intensity physical activity (23,24). Furthermore, literature consistently demonstrates that physical activity decreases the risk of developing type 2 diabetes by improving glycemic control, decreasing insulin resistance, lowering blood pressure, and improving blood lipid levels (24–26).

Dietary management also plays an important role in the prevention of diabetes. A meta-analysis of prospective cohort studies found that after adjusting for confounding factors such as age, body weight, waist circumference, energy intake, family history of diabetes, physical activity, and smoking, healthy dietary patterns reduced the risk of developing type 2 diabetes by 20% (27). For people diagnosed with diabetes, adhering to a healthy diet optimizes glycemic control and reduces the risk of developing complications. Canada's Food Guide recommends that Canadians consume vegetables, fruit, whole grains, and protein foods regularly (28). However, among protein foods, plant-based proteins should be consumed more often (28). Diabetes Canada's Clinical Practice Guidelines recommend that individuals consume a variety of food from the four food groups (16). Healthy dietary patterns, such as the Mediterranean Diet and DASH diet, are associated with a reduced risk of developing type 2 diabetes (16,29). These dietary patterns emphasize the consumption of fruits and vegetables, beans

and pulses, low-sodium foods, plant-based proteins, and lean meats such as fish. For people diagnosed with diabetes, adhering to a healthy diet optimizes glycemic control, aids in achieving and maintaining a healthy body weight, and reduces the risk of developing complications such as heart and blood vessel disease.

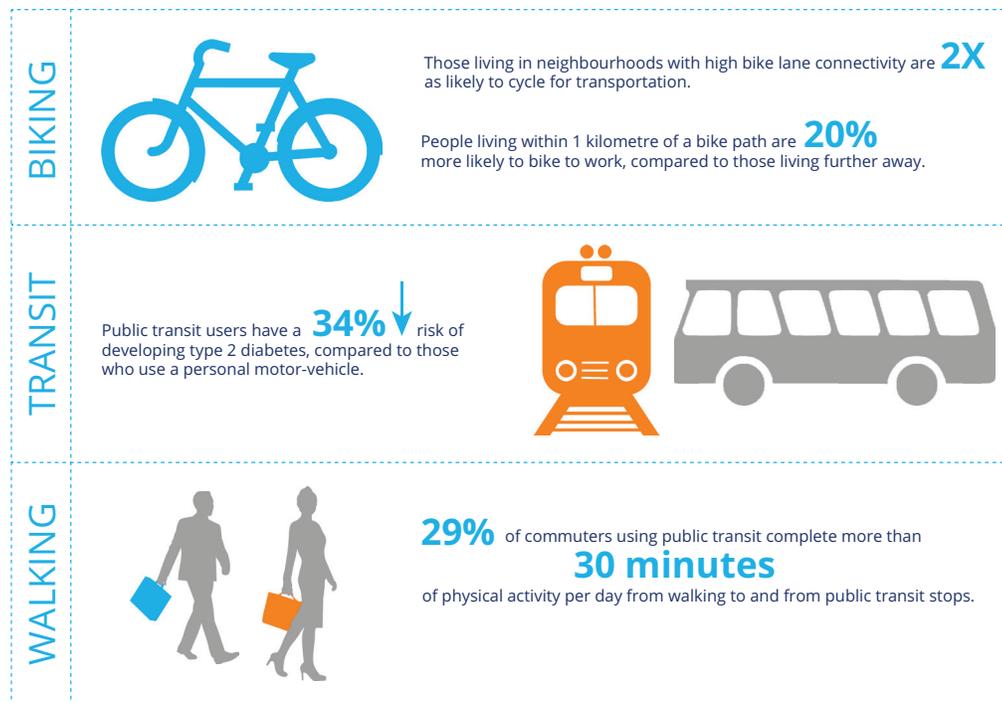
Overall, targeting modifiable risk factors like maintaining a healthy body weight, engaging in regular physical activity, and promoting healthy dietary patterns will decrease the risk for developing type 2 diabetes and improve health outcomes with type 1 and type 2 diabetes management.

The Built Environment

Individual-level health promotion interventions aimed at modifying behaviours may be insufficient for reducing the risk of type 2 diabetes, as the development and management of diabetes is influenced by a multitude of factors. The environment in which people live largely impacts whether they engage in healthy behaviours (30). An environment which supports healthy behaviours, such as physical activity and healthy eating, provides the opportunity to improve community-wide health outcomes, including reducing the risk of developing type 2 diabetes and the management of type 1 and type 2 diabetes.

The built environment comprises all aspects of a setting constructed by humans, including neighbourhoods, streets, buildings, and parks (4). Factors of the built environment – such as urban design, transportation systems, land-use planning, and their corresponding policies – can act as facilitators or inhibitors to engaging in healthy

Factors of the built environment – such as urban design, transportation systems, land-use planning, and their corresponding policies – can act as facilitators or inhibitors to engaging in healthy behaviours such as physical activity and healthy eating.



behaviours such as physical activity and healthy eating (4,5). These modifiable behavioural risk factors (physical activity and healthy eating), along with overweight and obesity, are largely associated with the development of type 2 diabetes and the management of type 1 and type 2 diabetes (4,5). Further, the built environment can indirectly impact health through its role in air pollution, safety (e.g., injuries), housing, heat, ultra-violet (UV) exposure, climate change, and natural disasters (3). Addressing the built environment will have important implications for population health, diabetes rates, and health outcomes (4,5).

Factors of The Built Environment

Active Transportation

Active transportation is any form of human-powered transportation such as walking, running, cycling, skating, or skateboarding (31). In many cases public transit is also included because the majority of transit trips start and/or end with active transportation (31). Benefits of active transportation for healthy communities include improved public health by reducing rates of

chronic disease, such as diabetes, while decreased greenhouse gas emissions and road congestion (3,31). Promoting incidental exercise through active transportation may be a more effective strategy to increase overall physical activity among Canadians than the promotion of leisure-time exercise, as it is incorporated into everyday life and is not an additional activity that must be scheduled (32).

Individuals residing in cities with higher levels of active transportation experience a reduced risk of all-cause mortality, cardiovascular disease, hypertension, and type 2 diabetes (33–35). One prospective cohort study that followed 8,576 men for four years found that those who walk approximately twenty minutes to work experienced a 27% risk reduction of developing type 2 diabetes compared to those who walked under ten minutes, after adjusting for age, BMI, smoking habits, leisure-time physical activity, and parental history of diabetes (36). Similarly, another prospective cohort study found that there is a 34% risk reduction of developing type 2 diabetes for those actively travelling for over thirty minutes per day compared to non-active travellers, after adjusting for confounding factors (age, sex, blood pressure,

smoking, education, BMI, and occupational and leisure-time physical activity) (37). The promotion and uptake of active transportation could provide the opportunity to support population-wide health benefits and reduce the burden of diabetes among Canadians.

The built environment impacts one's decision to shift from personal motor-vehicle usage to active transportation. Studies have found that highly developed biking infrastructure is positively correlated with bike-use among commuters (38,39). Specifically, those living in neighbourhoods with high bike lane connectivity are twice as likely to cycle for transportation (38); and people living within one kilometre of a bike path are 20% more likely to bike to work, compared to those living further away (39).

Safety concerns, such as traffic injuries and exposure to air pollution, impact people's decisions to engage in cycling. Highly walkable environment can have high concentrations of traffic-related air pollution, which can increase the likelihood of developing chronic conditions such as hypertension and diabetes (40,41). One study which surveyed participants on 73 potential motivators and deterrents for cycling found that the top motivator was safe infrastructure such as routes separate from traffic, noise, and air pollution; while the top deterrents included streets congested with road traffic, streets with high speed traffic, and roads with litter (glass and debris) and air pollution (42). Further, cyclists and non-cyclists reported preferring bike lanes over travelling in mixed-traffic, as it increases the degree of perceived safety (43). However, a number of studies contend that the health benefits of biking greatly outweigh the associated risks (44–48). This highlights the need for safe biking infrastructure to promote the use of active transportation and mitigate associated risks.

The Toronto Charter for Physical Activity advocates that the implementation of policies which support access to safe walk-bike infrastructure, including sidewalks, bike lanes, and footpaths, is one of

the best investments for sustainable physical activity across the population (49). Along with having access to appropriate biking infrastructure, considerations related to walkability such as street connectivity, proximity of destinations of interest, aesthetics, and mixed land use positively correlate with motivation for active transportation (8). Increasing population-wide levels of active transportation requires a multi-faceted strategy for policy makers and urban planners.

Public Transportation

The World Health Organization states that an efficient public transportation system increases physical activity levels in the population by providing more opportunities for walking and other forms of active transportation (32). Approximately 29% of commuters using public transit complete more than 30 minutes of physical activity per day from walking to and from public transit stops (50). Additionally, within a five-day work or school week, these commuters are able to achieve the recommended 150 minutes per week of physical activity solely through commuting (50).

There are also positive associations between some health indicators and the use of public transit. A systematic review and meta-analysis published in 2019 reported that switching from personal motor-vehicle use to public transportation is correlated with a lower BMI (51). Moreover, one study found that public transit users have a 34% reduced risk of developing type 2 diabetes, compared to those who use a personal motor-vehicle (52). Having access to an affordable, reliable, and efficient public transportation system is an important aspect of the built environment that can lead to increased physical activity and positive health outcomes.

Walkability

Walkability is one of the most important factors of the built environment for health promotion and disease prevention (53). Improving walkability provides opportunities to

support the prevention of type 2 diabetes and management of type 1 and type 2 diabetes by facilitating physically active lifestyles (54,55) and promoting active transportation (11,56), which are affordable to all members of the community. In activity-friendly neighbourhoods, residents achieve 68 to 89 minutes more per week of moderate-to-vigorous physical activity than those who live in less walkable neighbourhoods (54). This additional activity contributes to over half of the 150 minutes of physical activity per week recommended by the Canadian Physical Activity Guidelines (57). Those living in highly walkable environments have increased opportunities to engage in physical activity and often have a lower BMI (58,59), blood pressure, blood glucose measures, and triglycerides measure, compared to those in less walkable areas (60,61).

Walkable neighbourhoods have positive effects on health outcomes and rates of chronic diseases (62). One recent cross-sectional study indicated that there is a link between neighbourhood walkability and decreased hospitalisation rates due to myocardial infarction (14). Furthermore, a review of the relationship between walkability and diabetes revealed that highly walkable neighbourhoods are associated with a reduced risk of developing type 2 diabetes (63). This relationship was also demonstrated in two recent cohort studies based in Canada. A cohort study based in five urban regions in Ontario, found that younger adults (aged less than 65 years) living in high-walkability neighbourhoods had a lower 10-year incidence of diabetes than similar aged adults living in low-walkability neighbourhood (56). Another cohort study based in Ontario also found that high-walkability neighbourhoods are associated with decreased prevalence of overweight and obesity and decreased incidence of diabetes (64).

Certain population groups are at increased risk of the adverse health effects of low-walkability neighbourhoods. Recent immigrants in low-income neighborhoods, have an accelerated risk of developing diabetes compared with those living

in more walkable areas. A cohort study found that men who are recent immigrants living in a low-walkability neighbourhood had 1.58 (95%CI 1.42-1.75) times the risk of diabetes compared to men who are recent immigrants living in a high-walkability neighbourhood; whereas women who are recent immigrants living in a low-walkability neighbourhood had 1.67 times the risk of diabetes compared to women who are recent immigrants in high-walkability neighbourhoods (65). This relationship is amplified by the coexistence of poverty; the diabetes incidence was threefold higher among recent immigrants living in low-income/low-walkability neighbourhoods (16.2 per 1,000 persons) compared to those living in high-income/high walkability neighbourhoods (5.1 per 1,000 persons) (65).

Neighbourhoods designed to promote regular physical activity also reduce the risk of diabetes-related complications, including diabetic retinopathy, nephropathy, and foot complications (66). Therefore, prioritising the development and maintenance of walkable neighbourhoods in city planning and policymaking will help create health-promoting and disease-preventing environments for Canadians, to achieve many positive health outcomes, including reduced rates of type 2 diabetes and diabetes complications.

Walkability refers to the degree to which a neighbourhood promotes walking, and is comprised of the following factors:

Street Connectivity: Neighbourhoods with a greater number of intersections improve pedestrian mobility by increasing route options for pedestrians, reducing walking time to destinations, and decreasing the speed of motorised traffic (67). In addition, highly connected neighbourhoods attract commercial businesses and retailers, which contributes to increased pedestrian traffic (68).

Mixed Land Use: The heterogeneity of land use within a neighbourhood includes residential,

commercial, retail, office, institutional, and recreational spaces (69). The presence of diverse land use within a geographic area improves pedestrian experience by providing a greater number of destinations within walking distance of residents (e.g., banks, recreation centres, grocery stores, restaurants, retail stores, etc.). Municipal zoning bylaws determine how land is used, where buildings are located, and what types of uses those buildings serve (70). Zoning laws can be a useful tool to promote and increase mixed land use.

Population and Residential Density: Population density describes the number of people per square kilometre (km²), while residential density describes the number of occupied residential dwellings per km². Higher population and residential densities result in increased walkability, as they generate a higher demand for accessible routes and destinations (67). Further, they decrease the appeal for motor traffic due to the higher likelihood for congestion and limited parking spaces (71). Urban sprawl describes urban development practices that promote the rapid geographic expansion of cities, which often leads to low population density and poor walkability (72). Urban development strategies should include zoning laws to contain urban sprawl and improve neighbourhood walkability.

Neighbourhood Aesthetics: Although often excluded from neighbourhood walkability indices, outdoor aesthetics contribute significantly to one's perception and attitudes towards walking for both active transportation and exercise (73–76). Aesthetic features include cleanliness (e.g., clean and well-maintained buildings), interesting destinations (e.g., public art, visually appealing buildings), greenery, and natural elements (e.g., vegetation, waterfalls, and beaches) (73–76). These features help promote leisure-time physical activity, active transportation, and increase the time people spend outside (73–76). Research has shown that those who report living in an unfavourable aesthetic environment are 41% less likely to walk for exercise, compared



to those who report living in a highly favourable aesthetic environment (77). Safety features, which also contribute to neighbourhood aesthetics, include lighting, measures of traffic (e.g., speed, volume, crossing aids), and personal or crime-related (e.g., evidence of disorder or incivilities) safety, and were found to positively impact active transportation and physical activity (73–76). Notably, a systematic review found that women felt uncomfortable undertaking physical activity outdoors at night, while environments that were well-lit, well populated, and that provide safe spaces from crimes promoted outdoor physical activity among women (75).

Green Space: Describes accessible outdoor areas with a high degree of vegetation, such as parks, forests, and nature areas; and which promote a variety of free or low-cost physical activities, including walking (78–81). Evidence

from a meta-analysis indicated that increased exposure to green spaces leads to many statistically significant positive health outcomes, including a 28% reduced risk of developing type 2 diabetes (82). Green space has also been linked to reduced stress (82,83), which contributes to positive outcomes in blood glucose management (84). Green space can contribute to neighbourhood walkability and can be a key strategy to improving diabetes prevention and management in the population.

The Food Environment

According to the National Collaborating Centre for Environmental Health, the food environment broadly describes the “physical, social, economic, cultural, and political factors that impact the accessibility, availability, and adequacy of foods within a community or region” (85).

A healthy food environment impacts the quality of one’s diet and may lead to nutrition-related health outcomes by improving the availability and accessibility of healthy foods. When describing the community nutrition environment, the literature cites three types of geographic areas (86):

Food Deserts: People residing in neighbourhoods with limited access to healthy foods may have to travel further distances to access nutritious foods and incur additional travel costs (86). Alternatively, residents may rely on convenience stores and fast food restaurants, leading to lower quality diets and increased risk of type 2 diabetes (87). The relationship between food deserts and diabetes is unclear. Some studies show that the presence of supermarkets decreases the risk for developing type 2 diabetes (88,89), whereas others find no association (90,91). Nevertheless, living in a census

tract with one or more supermarkets is associated with approximately a 25% decrease in the likelihood of living with obesity, whereas proximity to both supermarkets and convenience stores is associated with a 35% higher prevalence of obesity (92). Food deserts are most likely to occur in neighbourhoods with a lower socioeconomic status, as supermarkets and other retailers prefer to locate their stores amongst clientele with higher incomes (93). Having a lower income, along with the increased cost of obtaining healthy foods in a food desert, increases residents’ risk of developing type 2 diabetes.

Food Swamps: Describe geographic areas where there is an abundance of food retailers selling foods that are high in fat, sugar, and calories, relative to the number of retailers selling more nutritious options (94). This environment influences the consumption of lower quality foods by increasing one’s exposure to those food types (95). In Canadian urban environments, food swamps are more common than food deserts (96), and they may have a larger influence on overweight and obesity rates within a community than food deserts (94). Fast food restaurant and convenience store density is positively associated with the prevalence of type 2 diabetes (87,89,97,98) and gestational diabetes (9). Furthermore, adults with both type 1 and type 2 diabetes who reside in food swamps experience greater hospitalization rates compared to those who live in healthier food environments (7). Local zoning laws which regulate the concentration of fast food restaurants and convenience stores, while ensuring the accessibility of healthy food retailers such as farmers’ markets and grocery stores, can prevent the formation of food swamps.

Food Mirages: Describe individuals who experience monetary barriers in accessing

Living in a census tract with one or more supermarkets is associated with approximately a 25% decrease in the likelihood of living with obesity, whereas proximity to both supermarkets and convenience stores is associated with a 35% higher prevalence of obesity.

nutritious foods in their neighbourhood (86). In these environments, healthy food retailers may be present, but financially inaccessible to residents of the neighbourhood. The resulting effect on diet quality is similar to that of living in a food desert. Thus, individuals residing in a food mirage are classified as food insecure (99).

Providing a health-promoting food environment to all Canadians would improve the affordability and accessibility of nutritious food options, which may result in positive health outcomes, including improved type 2 diabetes prevention and type 1 and type 2 diabetes management.

The Built Environment and Equity

In Canada, neighbourhood socioeconomic status is a significant predictor of population health indicators, such as rates of overweight and obesity, cardiovascular disease, and type 2 diabetes (4,5,12,100). Diabetes disproportionately affects those living with low-income. Individuals with an income below \$29,999 per year are three times as likely to live with diabetes compared to those with an income higher than \$80,000 (6). This association may be mediated by the level of engagement in health-promoting behaviours, including physical activity and fruit and vegetable consumption (10,13). Residents of low-income neighbourhoods have less disposable income, are more likely to work precarious jobs, and have less access to recreation facilities and gyms, leading to decreased rates of physical activity (6,10,11,13). Similarly, these neighbourhoods may have poorer access to nutritious foods, leading to a lower diet quality.

Compared to low-income neighbourhoods in urban regions, low-income neighbourhoods in rural, remote, and northern regions experience even more barriers to accessing physical activity such as community infrastructure, limited revenue, short construction seasons, and high cost of living (1). Limitations to physical activity include a poor built environment (e.g., no or

poor footpaths, uneven road surfaces, and poor lighting), lack of access to facilities, safety concerns (e.g., animals, traffic, and weather), and lack of public transportation (1).

Features of the built environment can protect against some of the effects of poverty by creating a supportive environment in which people naturally engage in more health-promoting behaviours. Therefore, policies that influence the built environment to support physical activity and access to healthy foods, may provide an opportunity to promote health equity among the Canadian population in the prevention of type 2 diabetes and management of type 1 and type 2 diabetes.

Conclusion

The rising prevalence and economic burden of diabetes is a major public health concern. Factors of the built environment including urban design, transportation systems, land-use planning, and their corresponding policies can act as facilitators or inhibitors to levels of overweight and obesity, physical activity, and healthy eating, which are major modifiable behavioural and metabolic risk factors for diabetes. Policy makers at all levels of government should consider how determinants of the built environment impact the health of Canadians, and prioritise active and public transportation, neighbourhood walkability, and healthy food environments when designing cities. Building healthy environments through upstream policy and infrastructure interventions will help to reduce inequities associated with diabetes and improve health outcomes for all Canadians.

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An aerial photograph of a complex highway interchange with multiple overpasses and ramps. The roads are filled with cars. To the left, there are residential buildings with red roofs. A large area of trees with autumn foliage in shades of yellow and orange is situated between the buildings and the highway. In the center, a large, modern white building with a unique, angular design is visible. The overall scene is a mix of urban infrastructure and nature.

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