



Food Security and Diabetes

A Position Statement

**DIABETES
CANADA**

About Diabetes Canada

Diabetes Canada is a national health charity representing 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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Table of Contents

01 Position Statement

02 Why is Food Security Important to Diabetes Canada?

03 Diabetes

04 Modifiable Risk Factors

04 Food Insecurity in Canada

06 Determinants of Food Security

08 Policies and Programs

11 Conclusion

12 References

Position Statement

Food security exists when individuals have access to sufficient, safe, and nutritious food, which meets their dietary needs and food preferences for an active and healthy life (1). Approximately 4 million people, or 1 in 8 Canadian households, are food insecure (1). Population groups that are more susceptible to financial constraints and low-income households, including households with lone parents, children, lower levels of education, Indigenous Peoples, and those living in remote regions are more severely affected by food insecurity (1,2).

Food insecurity is compounded by various factors, which increases peoples risk of developing select chronic diseases (3,4). Food insecurity is associated with an increased risk of developing type 2 diabetes and gestational diabetes and compromising the management of type 1 diabetes and type 2 diabetes through several mechanisms (5).

Diabetes Canada recommends that **municipal** governments:

- Support the development of healthy food environments through the establishment of grocery stores, farmers markets, and fruit and vegetable stands in low-income neighbourhoods.
- Ensure that grocery stores are accessible via safe walking infrastructure or public transit.
- Consider local food banks as emergency solutions to address immediate hunger, but insufficient for providing food security.
- Ensure that recent immigrants are connected to organizations that provide settlement support; helping them find and secure employment, residence, methods of transportation, and other services.
- Increase recent immigrants' knowledge of social services that offer financial support.
- Establish a surveillance mechanism to monitor food insecurity as a social determinant of health, to determine if the problem is worsening or improving, and whether certain population groups continue to be disproportionately impacted.

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

- Evaluate the adequacy of minimum wage standards in providing households with an adequate income to support a healthy diet at all times.
- Increase investments in subsidized affordable and stable housing.
- Ensure sufficient income protection for households who rely on precarious employment and low wages.
- Establish a surveillance mechanism to monitor food insecurity as a social determinant of health, to determine if the problem is worsening or improving, and whether certain population groups continue to be disproportionately impacted.

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

- Continue to provide national income benefits for vulnerable populations; reevaluate eligibility criteria, timing, conditions, and amounts to ensure adequacy for all Canadians.
- Consider implementing a national basic income guarantee to provide all Canadians, regardless of employment, with enough money to pay for their basic needs.
- Address the higher cost of food in remote and northern regions of Canada through subsidy programs that encourage the consumption of nutritious and traditional foods.
- Consider implementing a national school food program to supplement a nutritious diet for children and youth.
- Ensure that sufficient funding is provided to provinces to support investments in affordable housing.
- Evaluate the adequacy of Nutrition North in reducing food insecurity in remote northern regions.
- Establish a surveillance mechanism to monitor food insecurity as a social determinant of health, to determine if the problem is worsening or improving, and whether certain population groups continue to be disproportionately impacted.

- Ensure that sufficient funding is invested in innovative health services, policy, and program research focused on supporting and increasing food security in Canada.

Diabetes Canada recommends that **health-care providers**:

- Increase their awareness and knowledge of the role of food insecurity as a social determinant of health.
- Incorporate a food insecurity assessment as part of their patients' clinical assessment routine.
- Identify patients living in food insecure households while they are in a health care setting; and refer those patients and their families to social assistance and/or food programs.

Diabetes Canada recommends that **Canadians**:

- Advocate to governments to take a comprehensive approach to mitigate the underlying causes of food insecurity.

Diabetes Canada will:

- Work with partners and stakeholders with similar values and goals to promote healthy food environments in Canada.
- Advocate for minimum wage standards and affordable housing to ensure that all Canadians have sufficient income to afford healthy food.
- Continue to contribute to the development of the federal government's Food Policy for Canada and Healthy Eating Strategy.
- Support Indigenous organizations and communities as they work towards achieving greater food security in remote and northern regions.

Why is Food Security Important to Diabetes Canada?

Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life (1). When individuals are food secure, they are more likely to consume a varied and nutrient-rich diet, leading to positive health outcomes including decreasing the risk for overweight and obesity, cardiovascular disease, and type 2 diabetes and its complications (1).

Food insecurity is associated with an increased risk of developing type 2 diabetes and gestational diabetes, and compromises the management of type 1 diabetes and type 2 diabetes through several mechanisms (5). Individuals who are food insecure may consume a less diverse diet dominated with more inexpensive food choices that are high in energy, sugar, and saturated and trans fats, leading to weight gain and poor glycemic control (6). The diets and foods outlined by Diabetes Canada's 2018 Clinical Practice Guidelines (5) are often more costly and financially unattainable for individuals who experience food insecurity, leading to an increased risk of developing type 2 diabetes and diabetes-related complications.

This position statement is based on a review of the evidence about the role of food security in the prevention of type 2 diabetes and gestational diabetes, and the management of type 1 and type 2 diabetes. Recommendations to build a sustainable food secure environment across Canada through upstream policy and infrastructure interventions are provided. This statement can inform

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The prevalence of diagnosed type 1 and type 2 diabetes in Canada is **3.8 million** and is projected to increase to **4.9 million** by 2030.

90%

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



Economic burden:
\$3.8 billion
annually in direct health-care costs.

The all-cause mortality rate among Canadians living with diabetes is **2X** as high as the rate for those without diabetes.

policymakers and program managers working at all levels of government in their assessment of the effect of food security on the prevention 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 increased to 4.9 million by 2030 (7). 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 (7).

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 (5). The all-cause mortality rate among Canadians living with diabetes is twice as high as the all-cause mortality rate for those without diabetes (8,9).

There are three common types of diabetes (10). Type 1 diabetes occurs in people when their beta cells, located in the pancreas, no longer function (10). 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 (10). Type 1 diabetes generally develops in childhood or adolescence, but can develop in adulthood (10).

Type 2 diabetes occurs when the body cannot properly use the insulin that is released or does not make enough insulin (10). Glucose builds up in the blood instead of being used as energy. Over 90% of people with diabetes have type 2 diabetes (10). Type 2 diabetes usually develops in adulthood but children are increasingly affected (10).

A third type of diabetes, gestational diabetes, is a temporary condition that occurs during pregnancy (10). It affects up to 1% of all pregnancies and increases the risk of developing type 2 diabetes for mother and child in the future (10).

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 health complications (10). 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 multi-faceted. Socio-economic, environmental, genetic, metabolic, and behavioural factors play a role in protecting against or promoting its onset (11). Major modifiable and nonmodifiable risk factors include age, family history, physical inactivity, and high body-mass index (BMI) (e.g., overweight and obesity) (11). Modifiable risk factors describe socio-economic, behavioural, metabolic, and environmental factors that can be modified to increase or decrease one's risk of developing type 2 diabetes (11). Modifiable socio-economic factors include education, income, and precarious work, and can be addressed through government initiated policies and social programs (11). Modifiable environmental factors include characteristics of the built environment; while behavioural and metabolic factors include body weight, diet, and exercise behaviours (11).

Adults who live with obesity are two to four times as likely to have type 2 diabetes, since excess body weight impairs the effectiveness of insulin in the body (11). 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 (5). 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 (12,13). 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 (13–15).

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% (16). 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 (17). However, among protein foods, plant-based proteins should be consumed more often (17). Diabetes Canada's Clinical Practice Guidelines recommend that individuals consume a variety of food from the four food groups (5). Healthy dietary patterns, such as the Mediterranean Diet and DASH diet, are associated with a reduced risk of developing type 2 diabetes (5,18). 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 such as maintaining a healthy body weight, engaging in regular physical activity, and consuming a nutritious diet will decrease the risk for developing type 2 diabetes and improve health outcomes with type 1 and type 2 diabetes management.

Food Insecurity in Canada

Despite Canada's relative wealth, food insecurity affects many individuals and families.

Approximately 4 million people, or 1 in 8 households, in Canada are food insecure (1). Further, Canadian adults from food-insecure households are more likely to die prematurely than their food-secure counterparts (19). The adjusted hazard ratios (HRs) of all-cause premature mortality for moderate and severe food insecurity are 1.11 (95%CI 1.05–1.18) and 1.37 (95%CI 1.27–1.47), respectively (19).

The rates of food insecurity vary by age, sex, and cultural/racial background (20,21). Approximately 1 in 6 children, or 10.2% (95%CI 9.6%-10.9%) of children, under the age of 18 is affected by household food insecurity (1,22). Females aged 18 and older (8.0%, 95%CI 7.7%-8.3%) are disproportionately affected by food insecurity compared to men age 18 and older (6.4%, 95%CI 6.1%-6.7%) (22). Further, lone female household families are particularly affected; one third of households led by female lone-parents are food insecure (1). Certain cultural/racial groups are disproportionately affected by food insecurity. The age standardized prevalence of food insecurity is highest among the Black population (17.6%, 95%CI 15.1%-20.0%), followed by the First Nations off reserve, Inuit and Métis Peoples (16.9%, 95%CI 15.7%-18.2%), the Latin American population (14.1%, 95%CI 11.0%-17.2%), and the Arab and West Asian population (11.0%, 95%CI 7.9%-14.1%) (22).

Food insecurity is significantly higher in some areas of Canada. Rates in the Northern Territories and the Maritimes are higher than in other areas

(1). In 2013-2014, the percentage of households reporting food insecurity was 24.1% in Nunavut, 46.8% the Northwest Territories, and 15.0% in the Maritimes (1). Further, 84.0% of Canadians who experience food insecurity live in Ontario, Quebec, Alberta, and British Columbia (1).

Adults who experience food insecurity are two times more likely to live with type 2 diabetes than those who are food-secure, and this relationship persists even when controlling for other risk factors like income, employment status, and lifestyle factors (4). The prevalence of type 2 diabetes in food insecure households rises with increasing severity of food insecurity: 10.0% of households who experience mild food insecurity have a person living with type 2 diabetes, and over 16.0% of households who experience severe food insecurity have a person living with type 2 diabetes (4,23). Further, women who experience marginal food insecurity are more than twice as likely to develop gestational diabetes than women who are food-secure (3).

Those living with diabetes who experience food insecurity may be forced to make the choice between buying food over other necessities including purchasing medications, devices, and supplies (24–27). Cost-related non-adherence (CRNA) describes individuals who are food insecure and that delay filling prescriptions, reuse needles, monitor their blood glucose less frequently than recommended, and make other compromises to their diabetes care plan in order to help conserve funds (24–27). In Canada, food security affects 47.9% (95%CI 38.1%-57.7%) of people who engage in CRNA (26). Therefore, when individuals who are food insecure face the choice between food and medications, they are at increased risk of diabetes-related complications, such as hypoglycemia or hyperglycemia (28). Increased access to affordable medications can help alleviate CRNA.



**Food insecurity affects
1 in 8
Canadian households**

Cyclical eating patterns, characterized by having alternating times of food adequacy and times of scarcity, also increase the risk of hyperglycemia and hypoglycemia (29). Periods of scarcity may occur during seasons of higher household expenditure,

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such as in the winter when heating costs are higher, or in the summer when school food programs are not running. Loss of employment or unforeseen expenditures may also result in times of scarcity. Many households who experience food insecurity may live “pay cheque to pay cheque”; thus, the money received from one pay period may not be sufficient to support the household’s dietary needs until the next lump sum of money arrives (29). In these cases, a household may increase their food expenditures at the beginning of the month when pay cheques and benefits arrive, and ration spending towards the end (25,28,30). For many, this leads to a phenomenon described as “end-of-the-month hypoglycemia”, which results in higher hospital admissions of people living with diabetes at the end of each month (25,28,30). The average household facing food insecurity may go through cycles of adequacy and inadequacy seven times within one year, making it difficult to maintain proper blood glucose levels (29).

Food insecurity is also associated with higher emotional distress arising from the financial, social, and physical burdens of accessing food. Chronic stress leads to poor glycemic control, which can increase one’s risk of developing type 2 diabetes and diabetes-related complications (29).

For these reasons, minimising population-wide levels of food insecurity is a priority for decreasing diabetes incidence rates, diabetes-related complications, and diabetes distress.

Determinants of Food Security

The following determinants impact the development and intensity of food insecurity and

should be considered when developing policies and programs. Since the determinants of food security are complex and varied, reducing the risk of food insecurity and the associated health risks requires the coordination of multiple strategies at all levels of government to address the underlying causes.

Income and Poverty

Household income is the single strongest predictor of food insecurity (1,31). As household income declines, the probability of food insecurity rises, and this relationship is strongest at lower levels of household income (1,31). Healthy food options such as fruit, vegetables, dairy, lean meats, and whole grains are often more expensive and therefore less attainable for those with low-income. Population groups that are more susceptible to chronic poverty, including households with lone parents, children, lower levels of education, Indigenous Peoples, and those living in remote regions have higher rates of food insecurity (1,2).

Reliance on social assistance is also a determinant for food insecurity, as more than 60% of households with social assistance are food insecure (1). Policies which ensure the provision of sufficient income to meet an individual’s or household’s basic needs are necessary to decrease the prevalence of food insecurity.

Employment

Food security is not solely affected by net income but also by the stability of income. Approximately 20% of Canadians are working in unstable forms of employment and another 20%

share characteristics of precarious work (e.g., no benefits, variable work hours, contract work) (32). People who rely on precarious employment are twice as likely to face food insecurity as those with secure incomes living in low-income households (32). Further, they are less likely to be able to anticipate when they will receive money and how much they will receive; therefore, planning a sustainable food budget is a barrier to being food secure (32). Addressing the structure of labour, as well as the social and financial burdens of those who experience precarious employment, is essential for reducing the risk of food insecurity.

Health

People living with one or more chronic conditions are more likely to face food insecurity than those without a chronic condition. Furthermore, this relationship is linear; the greater the number of chronic conditions a person has, the more likely they are to experience food insecurity (33). First, those with chronic conditions may not be able to maintain a steady income, increasing their risk of food insecurity (33). Second, chronic conditions may require additional expenses such as costs to account for transportation to appointments, medications, and medical devices. These health

expenses divert financial resources that could be used to purchase nutritious foods (33). Third, those who live with chronic conditions may not be able to make the same compromises to household budgets as those without chronic conditions, when faced with food insecurity (33). For instance, those without chronic conditions may be able to alter their diet to accommodate their food budget. Those with chronic diseases such as diabetes may not have this flexibility, making them more at risk of food insecurity (33).

Geographic Location

People residing in areas where access to healthy food is limited may have to travel further distances to obtain nutritious foods. This places a burden on time and incurs travel costs that people with low-income may not be able to afford. Alternatively, residents may rely on more easily accessible convenience stores and fast-food restaurants, leading to lower quality diets. In Canada, people in Northern Provinces and Territories are particularly vulnerable to food insecurity, with rates well above the national average, as foods need to be transported vast distances via trucks and planes, driving up the costs of healthy foods (34). Those who reside in these regions will continue to experience an increased risk for poor health outcomes, such as

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the development of type 2 diabetes and related complications, if nothing is done to address food access and food affordability.

Housing Affordability

Research demonstrates that a negative relationship exists between the proportion of income spent on housing and the proportion allocated to food for low-income households (35). Recently, housing prices have been on the rise in Canada, while increases in the average household income and government subsidies have not kept up with the rate of growth (36). In large urban cities, Canadians who work full-time for minimum wage spend up to 60% of their income on rent alone (36). This leaves households with a limited budget to cover basic necessities including healthy foods (36). With the cost of housing and other non-food essentials continuing to rise, food insecurity and its negative effects on health will become more and more prevalent in Canada.

Newcomer Status

Generally, newcomers to Canada have better health statuses than Canadian-born individuals (37). However, upon migrating to Canada, their health deteriorates over time to levels comparable to people born in Canada, with some groups being prone to developing chronic diseases, such as type 2 diabetes, at a higher rate, earlier age, and lower BMI than those born in Canada (37,38). The experience of food insecurity plays a role in increasing these risks, as newcomers to Canada are more likely to be food insecure than non-immigrant households and immigrant households who have been in Canada for over five years (39). Upon arrival in Canada, they are likely to experience challenges with securing employment, which may lead to financial burdens in accessing healthy and culturally-appropriate foods (40). Newcomers may experience difficulties in having their international education and training credentials recognised (40). Additionally, employers may choose not to hire newcomers due to their lack of Canadian experience or for discriminatory reasons (40).

These challenges make it difficult for newcomers to gain employment, putting them at a greater risk for food insecurity.

Newcomers may also be unaware of how to access social support services that offer financial support, putting them at even greater risk for food insecurity than the general population. They are likely to be unfamiliar with where to access healthy and affordable foods that are traditional to their diet, as not all grocery stores carry international foods, and those that do may be difficult to access via public transit (41). Therefore, newcomers may resort to purchasing unhealthy foods options such as fast food and ultra-processed foods, leading to increased health risks, because they are unable to cook healthy food that they are familiar with (41).

Policies and Programs

Activities to address food insecurity range from interventions which deal with the immediate need for food to policies that tackle the root determinants of food insecurity. The following are local, provincial, and national programs, policies, and strategies which impact food security in Canada.

Income Policies

Adequate income is the foundation for healthy living and remains the most important determinant for food access in Canada (42). Ensuring that individuals and households have adequate income to attain a variety of nutritious and culturally appropriate foods will help reduce the risk of negative health outcomes associated with food insecurity, including the development of type 2 diabetes and diabetes-related complications. Provincial and Federal social assistance programs and income policies can mitigate the effects of poverty, to ensure that the majority of vulnerable Canadians can attain the necessary resources to lead healthier lives.

Seniors Benefits: The Old Age Security Pension (OAS) and Guaranteed Income Supplement

(GIS), available to people aged 65 years and older, has been shown to reduce the number of seniors living below the poverty line. According to the 2014 Canadian Community Health Survey (CCHS), the lowest rates of food insecurity were in households where the main source of income was a senior's income (43). Further, 22% of adults between the ages 55-64 years old with an income below \$20,000 experience food insecurity (43). This number is reduced by half in the over 65 year old demographic where senior benefits become a main source of income (43). Older adults have a greater risk of developing diabetes-related complications due to having more comorbidities and/or frailty; therefore, adhering to a diabetes care plan is of upmost importance (44). Providing adequate income to seniors can reduce the risk of food insecurity and provide an opportunity for improved diabetes prevention and management.

Social Assistance: Across the provinces, 60-80% of households on social assistance experience food insecurity, with the exception of Newfoundland and Labrador, where the prevalence is significantly lower (45). Between 2007 and 2012, Newfoundland and Labrador adopted a strategy, which consisted of a series of specific changes to the social assistance program including increased rates, earning exemptions, tax thresholds, asset limits, and indexing rates to inflation, to reduce poverty (45). This resulted in a decrease in the prevalence of food insecurity in households receiving social assistance from 60% to 34% (45). Expansion of this model in other provinces should be considered.

Child Benefit: Families with children are more likely to face food insecurity than families without children (31). The Canada Child Benefit is a monthly supplement paid by the government to assist with the cost of raising children under 18 years of age. It has been estimated that the Canada Child Benefit system reduced one quarter of national household food insecurity rates between 2001 and 2009, with greater reductions in vulnerable populations (46). Providing income benefits to support specific populations who are at increased risk of food insecurity, such as families with children, is an

effective strategy for reducing food insecurity and the associated risks.

Basic Income Guarantee: Basic income is a policy which guarantees that individuals or couples have a minimum income to meet their basic needs, regardless of employment status. Manitoba and Ontario have implemented experimental basic income projects to determine how the provision of a basic income might affect various indicators of poverty among households with low-income, including food security (47,48). The Ontario Basic Income Pilot project was terminated before results could be evaluated, but the Mincome project in Manitoba revealed positive health outcomes through decreased health-care usage and hospitalization rates (49). These results suggest that the provision of a basic income may help individuals and households afford the resources necessary to achieve optimal health outcomes.

Minimum Wage: Minimum wage standards are one mechanism by which provinces in Canada can support people with low incomes. The number of people working for minimum wage is increasing year by year, amounting for over 10% of the Canadian workforce (50). Full-time minimum wage workers often do not receive enough income to purchase adequate amounts of nutritious foods after monthly costs for shelter, utilities, child care, and other expenses are accounted for (42), making these populations vulnerable to food insecurity. Policy makers should consider the adequacy of provincial minimum wage standards in combination with other poverty reduction strategies in helping households achieve food security.

Food Programs

Local and national food programs are available to supply food to individuals facing food insecurity. It has been suggested that focusing on these programs and food banks draws attention away from the underlying systemic causes of food insecurity, such as poverty, housing affordability, and geographic location (51). Reducing the risk of developing type 2 diabetes and improving the management of type 1 and type 2 diabetes

requires a more comprehensive strategy that does not solely rely on food programs. Nonetheless, these food programs serve an important purpose by increasing access to affordable and nutritious foods to individuals facing food insecurity and providing short-term solutions to address an individual's immediate need for food.

Food Banks: The charitable provision of food through food banks has grown significantly in Canada in the last 40 years. However, the effect of food banks on reducing food insecurity at a population level is limited. The donation model of food banks means that the quality and quantity of food available fluctuates greatly and is likely insufficient to support a health-promoting diet for clients, as outlined in *Canada's Food Guide* (17). Furthermore, people living with diabetes who rely on food banks experience challenges with diabetes management including an inability to schedule food intake, make dietary choices, and coordinate medications with meals (52). Those who access food banks often describe the food they receive as "junk food" (53,54), damaged or unsafe to eat, and insufficient for people with dietary restrictions (55). Clients have a strong preference for fresh fruits and vegetables, dairy products, eggs, and meat, which contribute to a healthy diet but are usually unavailable at food banks (56). Further, the charitable provision of food directly impacts recipients' self-esteem, dignity, and autonomy (54). A recent study reported that the dignity and autonomy of recipients was undermined from being fed without any choice and queuing for food in public places (54). Food banks should strive to prioritize nutritious and good-quality foods that meet recipients' individual needs, while promoting dignity and social inclusion (54). Nevertheless,

though emergency food services may meet one's immediate need for food, they should not be supported as a solution for food insecurity.

Community Food Programs: Local programs, such as community kitchens, community gardens, and food skills workshops help to build personal skills and provide opportunities for positive social engagement. They also offer an additional source of food for community members. These programs have positive effects on self-reported feelings of improved skills, health, and mental well-being (57).

Overall, these programs may enable households to make the most of their limited resources, but they do not address the underlying systemic causes of food insecurity. Community food program would be most effective when coupled with population-level policies that address the underlying social determinants.

National Food Programs: National food provision programs include school nutrition programs, food stamp programs, and food subsidies. Canada is one of the only industrialized countries that does not have a national school food program (58). There is some evidence to indicate that these programs are effective at improving the nutritional value of the diet of participants (59,60) and can improve household food security (61).

The US Supplemental Nutrition Assistance Program (SNAP, formerly food stamps) is a means-tested program for people on low incomes to access food. Studies have shown the program reduces rates of food insecurity and obesity and improved glycemic control in people with diabetes (62,63). However, food

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insecurity rates remain high in SNAP participant groups suggesting that the level of support is not adequate to completely prevent food insecurity (57).

The Nutrition North Program subsidizes the cost of certain food items in Canada's northern isolated communities. Though some reports state that the Nutrition North Program has increased food access and affordability for northern communities (64,65), other studies indicate that the subsidies are insufficient for reducing food insecurity (66,67) due to factors like community eligibility, subsidy rates, and variety of eligible food items. Diabetes rates are higher in northern and remote regions, making a more comprehensive northern food security strategy essential.

Other Policies and Programs

Subsidized Housing: Among families with low-income living in urban areas, the odds of experiencing food insecurity are greater for those waiting for subsidized housing compared to families who already have subsidized housing (68). With housing affordability being an important determinant of food security, the provision of subsidized housing alleviates some financial burden associated with non-negotiable expenses like rent and utilities, and leaves households with more money to allocate to food. For people living with diabetes, subsidized housing may leave more financial flexibility to choose health-promoting foods and afford prescribed medications, without having to make sacrifices for other necessities. Direct government investments in housing and the provision of housing benefits for vulnerable individuals could increase the supply of affordable residence; however, federal spending on housing initiatives have been declining over the past 25 years (69), leaving more people at risk of food insecurity and the associated health risks.

Zoning Practices: Along with the financial burden of accessing nutritious foods, households in

lower-income communities are more prone to food insecurity due to the scarcity of healthy food outlets in their neighbourhoods. Compared to high-income communities, land-use regulations in lower-income neighbourhoods are significantly less likely to have supermarkets or grocery stores (70). Zoning codes in high-income neighbourhoods are more than twice as likely to permit farmer's markets and fruit and vegetable stands, and over three times as likely to allow for community gardens (70). These regulations create a greater health disparity across high- and low-income neighbourhoods by increasing the risk for food insecurity among low-income households. Reforming local zoning laws can help create a supportive built environment that enables residents to have increased access to healthy food.

Conclusion

Food insecurity is a growing issue in Canada and is associated with an increased risk of developing type 2 diabetes and gestational diabetes and difficulties managing type 1 and type 2 diabetes. It is a complex problem associated with a multitude of social, environmental, and economic risk factors, thus requiring multi-sectoral and multi-pronged solutions.

Minimizing population-wide levels of food insecurity will require a comprehensive strategy with action at all levels of government to address the underlying social determinants of health which impact the risk of food insecurity. Policies which address the underlying causes of food insecurity include income policies, subsidized housing, and land zoning practices. Some food programs, such as food banks, address the immediate need for food but do little to change the structural issues that contribute to and perpetuate food insecurity. Programs which increase equitable access to nutritious foods are integral to improving food security. Overall, addressing food insecurity will have numerous positive outcomes including decreased incidence of type 2 diabetes, gestational diabetes, and diabetes-related complications.

References

1. Tarasuk V, Mitchell A, Dachner N. Household food insecurity in Canada, 2014 [Internet]. Toronto, Ontario: Research to identify policy options to reduce food insecurity (PROOF); 2016 Apr. Available from: <https://proof.utoronto.ca/wp-content/uploads/2016/04/Household-Food-Insecurity-in-Canada-2014.pdf>
2. Key Health Inequalities in Canada: A National Portrait [Internet]. Ottawa: Public Health Agency of Canada; 2018 May. Available from: <https://www.canada.ca/en/public-health-services/publications/science-research-data/key-health-inequalities-canada-national-portrait-executive-summary.html>
3. Laraia BA, Siega-Riz AM, Gundersen C. Household food insecurity is associated with self-reported pregravid weight status, gestational weight gain, and pregnancy complications. *J Am Diet Assoc.* 2010 May;110(5):692–701.
4. Seligman HK, Bindman AB, Vittinghoff E, Kanaya AM, Kushel MB. Food insecurity is associated with diabetes mellitus: results from the National Health Examination and Nutrition Examination Survey (NHANES) 1999–2002. *J Gen Intern Med.* 2007 Jul;22(7):1018–23.
5. Diabetes Canada Clinical Practice Guidelines Expert Committee. Diabetes Canada 2018 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada. *Can J Diabetes* [Internet]. 2018 [cited 2019 Oct 28];42. Available from: <http://guidelines.diabetes.ca/docs/CPG-2018-full-EN.pdf>
6. Adams EJ, Grummer-Strawn L, Chavez G. Food insecurity is associated with increased risk of obesity in California women. *J Nutr.* 2003 Apr;133(4):1070–4.
7. Canadian Diabetes Cost Model. Ottawa: Diabetes Canada; 2016.
8. Twenty Years of Diabetes surveillance using the Canadian Chronic Disease Surveillance System [Internet]. Ottawa: Public Health Agency of Canada; 2019 Nov. Available from: <https://www.canada.ca/content/dam/phac-aspc/documents/services/publications/diseases-conditions/twenty-years-of-diabetes/64-03-19-2467-Diabetes-Infographic-EN-11.pdf>
9. Diabetes in Canada: Facts and figures from a public health perspective. Ottawa: Public Health Agency of Canada; 2011.
10. Diabetes Canada Clinical Practice Guidelines Expert Committee, Punthakee Z, Goldenberg R, Katz P. Definition, Classification and Diagnosis of Diabetes, Prediabetes and Metabolic Syndrome. *Can J Diabetes.* 2018 Apr;42 Suppl 1:S10–5.
11. Diabetes in Canada: Facts and figures from a public health perspective [Internet]. Ottawa: Public Health Agency of Canada; 2011 p. 126. Available from: <https://www.canada.ca/content/dam/phac-aspc/migration/phac-aspc/cd-mc/publications/diabetes-diabète/facts-figures-faits-chiffres-2011/pdf/facts-figures-faits-chiffres-eng.pdf>
12. Diabetes Prevention Program Research Group. Reduction in the Incidence of Type 2 Diabetes with Lifestyle Intervention or Metformin. *N Engl J Med.* 2002 Feb 7;346(6):393–403.
13. Tuomilehto J, Lindström J, Eriksson JG, Valle TT, Hääläinen H, Ilanne-Parikka P, et al. Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. *N Engl J Med.* 2001 May 3;344(18):1343–50.
14. Thomas DE, Elliott EJ, Naughton GA. Exercise for type 2 diabetes mellitus. *Cochrane Database Syst Rev.* 2006 Jul 19;(3):CD002968.
15. Hu FB, Manson JE, Stampfer MJ, Colditz G, Liu S, Solomon CG, et al. Diet, lifestyle, and the risk of type 2 diabetes mellitus in women. *N Engl J Med.* 2001 Sep 13;345(11):790–7.
16. Esposito K, Chiodini P, Maiorino MI, Bellastella G, Panagiotakos D, Giugliano D. Which diet for prevention of type 2 diabetes? A meta-analysis of prospective studies. *Endocrine.* 2014 Sep;47(1):107–16.
17. Canada's food guide [Internet]. Health Canada. 2020 [cited 2020 Feb 5]. Available from: <https://food-guide.canada.ca/en/>
18. Heart and Stroke Foundation of Canada. DASH Diet [Internet]. Heart and Stroke Foundation of Canada. [cited 2019 Oct 31]. Available from: <https://www.heartandstroke.ca/en/get-healthy/healthy-eating/dash-diet/>
19. Men F, Gundersen C, Urquia ML, Tarasuk V. Association between household food insecurity and mortality in Canada: a population-based retrospective cohort study. *CMAJ Can Med Assoc J Assoc Medicale Can.* 2020 Jan 20;192(3):E53–60.
20. Leroux J, Morrison K, Rosenberg M. Prevalence and Predictors of Food Insecurity among Older People in Canada. *Int J Environ Res Public Health* [Internet]. 2018 Nov [cited 2019 Oct 31];15(11). Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6267450/>
21. Strings S, Ranchod YK, Laraia B, Nuru-Jeter A. Race and Sex Differences in the Association between Food Insecurity and Type 2 Diabetes. *Ethn Dis.* 26(3):427–34.
22. Public Health Agency of Canada, Pan - Canadian Public Health Network, Statistics Canada, Canadian Institute of Health Information. Pan-Canadian Health Inequalities Data Tool, 2017 Edition [Internet]. Public Health Agency of Canada. 2019 [cited 2019 Oct 31]. Available from: <https://health-infobase.canada.ca/health-inequalities/data-tool/>
23. Seligman HK, Laraia BA, Kushel MB. Food insecurity is associated with chronic disease among low-income NHANES participants. *J Nutr.* 2010 Feb;140(2):304–10.
24. Billimek J, Sorkin DH. Food insecurity, processes of care, and self-reported medication underuse in patients with type 2 diabetes: results from the California Health Interview Survey. *Health Serv Res.* 2012 Dec;47(6):2159–68.
25. Seligman HK, Bolger AF, Guzman D, López A, Bibbins-Domingo K. Exhaustion of food budgets at month's end and hospital admissions for hypoglycemia. *Health Aff Proj Hope.* 2014 Jan;33(1):116–23.
26. Men F, Gundersen C, Urquia ML, Tarasuk V. Prescription medication nonadherence associated with food insecurity: a population-based cross-sectional study. *CMAJ Open.* 2019 Jul 17(3):E590–7.
27. Patel MR, Piette JD, Resnicow K, Kowalski-Dobson T, Heisler M. Social Determinants of Health, Cost-related Nonadherence, and Cost-reducing Behaviors Among Adults With Diabetes: Findings From the National Health Interview Survey. *Med Care.* 2016;54(8):796–803.
28. Biros MH, Hoffman PL, Resch K. The prevalence and perceived health consequences of hunger in emergency department patient populations. *Acad Emerg Med Off J Soc Acad Emerg Med.* 2005 Apr;12(4):310–7.
29. López A, Seligman HK. Clinical Management of Food-Insecure Individuals With Diabetes. *Diabetes Spectr.* 2012 Feb 1;25(1):14–8.

30. Basu S, Berkowitz SA, Seligman H. The Monthly Cycle of Hypoglycemia: An Observational Claims-based Study of Emergency Room Visits, Hospital Admissions, and Costs in a Commercially Insured Population. *Med Care.* 2017;55(7):639-45.
31. Howard A, Edge J. Enough for All: Household Food Security in Canada [Internet]. The Conference Board of Canada; 2013. Available from: https://tfss.ca/wp-content/uploads/2017/11/Enough-for-All_Household-Food-Security-in-Canada_CBoC.pdf
32. Lewchuk W, Lafleche M, Dyson D, Meisner A, Procyk S, Rosen D, et al. It's More than Poverty: Employment, Precarity, and Household Well-being [Internet]. McMaster University; Available from: https://socialsciences.mcmaster.ca/peps/documents/2013_itsmorethanpoverty_report.pdf
33. Tarasuk V, Mitchell A, McLaren L, McIntyre L. Chronic physical and mental health conditions among adults may increase vulnerability to household food insecurity. *J Nutr.* 2013 Nov;143(11):1785-93.
34. Food Secure Canada. Affordable food in the north [Internet]. Food Secure Canada. 2016 [cited 2019 Oct 31]. Available from: <https://foodsecurecanada.org/resources-news/news-media/we-want-affordable-food-north>
35. Kirkpatrick SI, Tarasuk V. Adequacy of food spending is related to housing expenditures among lower-income Canadian households. *Public Health Nutr.* 2007 Dec;10(12):1464-73.
36. Quan A, King A, Fotheringham E. Hunger Report 2017: The Rising Cost of Housing and Its Impact on Hunger in Ontario [Internet]. Ontario Association of Food Banks; Available from: <https://feedontario.ca/wp-content/uploads/2017/11/Hunger-Report-2017.pdf>
37. Adhikari R, Sanou D. Risk Factors of Diabetes in Canadian Immigrants: A Synthesis of Recent Literature. *Can J Diabetes.* 2012 Jun 1;36(3):142-50.
38. De Maio F. Immigration as pathogenic: a systematic review of the health of immigrants to Canada. *International Journal for Equity in Health [Internet].* 2010 Nov 10 [cited 2019 Oct 31];9(27). Available from: <https://equityhealthj.biomedcentral.com/articles/10.1186/1475-9276-9-27>
39. Office of Nutrition Policy and Promotion Health Products and Food Branch. Canadian Community Health Survey, Cycle 2.2, Nutrition (2004)— Income-Related Household Food Security in Canada [Internet]. Health Canada; 2007. Available from: https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/fn-an/alt_formats/hpb-dgpsa/pdf/surveill/income_food_sec-sec_alim-eng.pdf
40. Rudenko M. "Canadian Experience" And Other Barriers To Immigrants' Labour Market Integration: Qualitative Evidence Of Newcomers From The Former Soviet Union" [Internet]. [Toronto, Ontario]: Ryerson University; 2012. Available from: <https://digital.library.ryerson.ca/islandora/object/RULA%3A2279>
41. Soo K. Newcomers And Food Insecurity: A Critical Literature Review On Immigration And Food Security [Internet]. Ryerson University; 2012. Available from: <https://digital.library.ryerson.ca/islandora/object/RULA%3A2379>
42. Newell FD, Williams PL, Watt CG. Is the minimum enough? Affordability of a nutritious diet for minimum wage earners in Nova Scotia (2002-2012). *Can J Public Health Rev Can Sante Publique.* 2014 May 9;105(3):e158-165.
43. McIntyre L, Dutton DJ, Kwok C, Emery JCH. Reduction of Food Insecurity among Low-Income Canadian Seniors as a Likely Impact of a Guaranteed Annual Income. *Can Public Policy [Internet].* 2016 Aug 24 [cited 2019 Nov 1]; Available from: <https://www.utpjournals.press/doi/abs/10.3138/cpp.2015-069>
44. Diabetes Canada Clinical Practice Guidelines Expert Committee, Meneilly GS, Knip A, Miller DB, Sherifali D, Tessier D, et al. Diabetes in Older People. *Can J Diabetes.* 2018 Apr;42 Suppl 1:S283-95.
45. Loopstra R, Dachner N, Tarasuk V. An Exploration of the Unprecedented Decline in the Prevalence of Household Food Insecurity in Newfoundland and Labrador, 2007-2012. *Can Public Policy [Internet].* 2015 Aug 7 [cited 2019 Nov 1]; Available from: <https://www.utpjournals.press/doi/abs/10.3138/cpp.2014-080>
46. Ionescu-Ittu R, Glymour MM, Kaufman JS. A difference-in-differences approach to estimate the effect of income-supplementation on food insecurity. *Prev Med.* 2015 Jan;70:108-16.
47. Hyndman B, Simon L. Basic Income Guarantee Backgrounder [Internet]. Ontario Public Health Association; 2015 Oct. Available from: <https://opha.on.ca/getmedia/bf22640d-120c-46db-ac69-315fb9aa3c7c/alpha-OPHA-HEWG-Basic-Income-Backgrounder-Final-Oct-2015.pdf.aspx?ext=.pdf>
48. Government of Ontario. Ontario Basic Income Pilot [Internet]. Government of Ontario. 2019 [cited 2019 Nov 1]. Available from: <https://www.ontario.ca/page/ontario-basic-income-pilot>
49. Forget EL. New questions, new data, old interventions: the health effects of a guaranteed annual income. *Prev Med.* 2013 Dec;57(6):925-8.
50. Morissette R, Dionne-Simard D. Recent changes in the composition of minimum wage workers [Internet]. Insights on Canadian Society, Statistics Canada; 2018 Jun. Available from: <https://www150.statcan.gc.ca/n1/en/pub/75-006-x/2018001/article/54974-eng.pdf?st=oph9pYRq>
51. Power E, Dietitians of Canada. Individual and household food insecurity in Canada: position of Dietitians of Canada. *Can J Diet Pract Res Publ Dietit Can Rev Can Prat Rech En Diet Une Publ Diet Can.* 2005;66(1):43-6.
52. Hwang SW, Bugeja AL. Barriers to appropriate diabetes management among homeless people in Toronto. *CMAJ Can Med Assoc J Assoc Medicale Can.* 2000 Jul 25;163(2):161-5.
53. Loopstra R, Tarasuk V. The Relationship between Food Banks and Household Food Insecurity among Low-Income Toronto Families. *Can Public Policy Anal Polit.* 2012;38(4):497-514.
54. Booth S, Begley A, Mackintosh B, Kerr DA, Jancey J, Caraher M, et al. Gratitude, resignation and the desire for dignity: lived experience of food charity recipients and their recommendations for improvement, Perth, Western Australia. *Public Health Nutr.* 2018 Oct;21(15):2831-41.
55. Teron AC, Tarasuk VS. Charitable food assistance: what are food bank users receiving? *Can J Public Health Rev Can Sante Publique.* 1999 Dec;90(6):382-4.
56. Wright KE, Ross M, Webb K. Improving the Nutritional Quality of Emergency Food: A Study of Food Bank Organizational Culture, Capacity, and Practices. *J Hunger Env Nutr.* 8(3):261-80.
57. Loopstra R. Interventions to address household food insecurity in high-income countries. *Proc Nutr Soc.* 2018;77(3):270-81.
58. Coalition for Healthy School Food. For a Universal Healthy School Food Program [Internet]. Coalition for Healthy School Food; Available from: <https://foodsecurecanada.org/sites/>

- foodsecurecanada.org/files/coalitionforhealthyschoolfood.sm_.pdf
59. Skinner K, Hanning RM, Metatawabin J, Martin ID, Tsuji LJS. Impact of a school snack program on the dietary intake of grade six to ten First Nation students living in a remote community in northern Ontario, Canada. *Rural Remote Health*. 2012;12:2122.
 60. Muthuswamy E. Feeding Our Future Program : Enhancing Student Success and Well-being. *Res Today*. 2011;7(1):3–4.
 61. Ralston K, Treen K, Coleman-Jensen A, Guthrie J. Children's Food Security and USDA Child Nutrition Programs [Internet]. Economic Research Service, United States Department of Agriculture; 2017 Jun. Report No.: 174. Available from: <https://www.ers.usda.gov/webdocs/publications/84003/eib-174.pdf?v=0>
 62. Mayer VL, McDonough K, Seligman H, Mitra N, Long JA. Food insecurity, coping strategies and glucose control in low-income patients with diabetes. *Public Health Nutr*. 2016 Apr;19(6):1103–11.
 63. Heflin C, Hodges L, Mueser P. Supplemental Nutrition Assistance Progam benefits and emergency room visits for hypoglycaemia. *Public Health Nutr*. 2017 May;20(7):1314–21.
 64. Evaluation, Performance Measurement, and Review Branch, Audit and Evaluation Sector. Implementation Evaluation of the Nutrition North Canada Program Evaluation [Internet]. Aboriginal Affairs and Northern Development; 2013 Sep. Report No.: 1570-7/12023. Available from: https://www.aadnc-aandc.gc.ca/DAM/DAM-INTER-HQ-AEV/STAGING/texte-text/ev_nnn_1395347742084_eng.pdf
 65. Government of Canada. Nutrition North Canada: Results from 2011-2016 [Internet]. Government of Canada; 2014 Nov [cited 2019 Nov 1]. Available from: <https://www.nutritionnorthcanada.gc.ca/eng/1415649594068/1415649613120>
 66. St-Germain A-AF, Galloway T, Tarasuk V. Food insecurity in Nunavut following the introduction of Nutrition North Canada. *CMAJ Can Med Assoc J Assoc Medicale Can*. 2019 May 21;191(20):E552–8.
 67. Galloway T. Canada's northern food subsidy Nutrition North Canada: a comprehensive program evaluation. *Int J Circumpolar Health*. 2017;76(1):1279451.
 68. Kirkpatrick SI, Tarasuk V. Housing circumstances are associated with household food access among low-income urban families. *J Urban Health Bull N Y Acad Med*. 2011 Apr;88(2):284–96.
 69. Londerville J, Steele M. Housing Policy Targeting Homelessness [Internet]. Canadian Alliance to End Homelessness; 2014 Sep. Available from: <https://homelesshub.ca/sites/default/files/SOHC2014-Backgrounder.pdf>
 70. Chirqui J, Thrun E, Rimkus L, Barker D, Chaloupka F. Zoning for Healthy Food Access Varies by Community Income [Internet]. Bridging the Gap Program, Health Policy Center, Institute for Health Research and Policy; 2012 Apr. Available from: http://www.bridgingthegapresearch.org/_asset/n5qtpc/btg_food_zoning_final-0612.pdf

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