

An economic tsunami

the cost of diabetes in Canada

December 2009



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About this report

This report was commissioned by the Canadian Diabetes Association to understand for the first time the true economic costs of diabetes using Canadian data. This initiative became a priority for the Association as we observed the dramatic rise in diabetes prevalence in Canada and world-wide. The Association is a leading authority on diabetes in Canada and around the world. 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. Across the country, the Association leads the fight against diabetes by helping people with diabetes live healthy lives while it works to find a cure. The Association is supported in its efforts by a community-based network of volunteers, employees, healthcare professionals, researchers, and partners. By providing education and services, advocating on behalf of people

with diabetes, supporting research, and translating research into practical applications, the Association is delivering on its mission.

The Canadian Diabetes Association sought to determine the economic impact of diabetes on Canadian society, both now and in the future. To accomplish this, Informetrica Limited developed a forecasting model, The Canadian Diabetes Cost Model, on behalf of the Association to determine the costs associated with diabetes. The Model also projects the incidence and prevalence of this disease, as well as several key comorbidities among the population with diabetes, to 2025. Informetrica is one of the pioneers of economic forecasting in Canada. It provides industrial and geographic forecasts and analysis to a wide variety of government and private sector clients.

The final report was prepared by Robin Somerville of The Centre for Spatial Economics (C4SE) using the Model to produce Canadian Diabetes Association-specific scenarios for this report. The C4SE monitors, analyzes and forecasts economic and demographic change throughout Canada at virtually all levels of geography. It also prepares customized studies on the economic, industrial and community impacts of various fiscal and other policy changes, and develops customized impact and projection models for in-house client use.



This initiative was supported by an unrestricted educational grant provided by



We thank Novo Nordisk Canada Inc. for its ongoing commitment to diabetes in Canada.

Executive summary

This report highlights the dramatic increase in the prevalence of diabetes in Canada over the last decade and provides a sobering view of the outlook for the next decade. Diabetes is a chronic disease that affects not only the health of people living with diabetes, but also imposes significant direct and indirect costs on them and on society as a whole. These costs have escalated sharply over the last decade and are expected to continue their rapid ascent for the foreseeable future.

This report introduces a Canadian Diabetes Cost Model that, for the first time, uses Canadian National Diabetes Surveillance System (NDSS) data and the Economic Burden of Illness (EBIC) in Canada approach to calculate the prevalence and the economic burden of diabetes in Canada. The Model is a powerful tool designed to provide insight into the prevalence and costs of diabetes. In addition, it explores the potential benefits of initiatives designed to delay or prevent the onset of type 2 diabetes and reduce the occurrence and severity of complications arising from the disease for people living with diabetes.

Prevalence

The number of people diagnosed with diabetes in Canada is expected to double between 2000 and 2010, from 1.3 million to about 2.5 million. More than 20 people are diagnosed with the disease every hour of every day. While the number of diagnosed Canadians is large, it is estimated that an additional 700,000 have the disease but don't know it.

From 2010 to 2020, another 1.2 million people are expected to be diagnosed with diabetes, bringing the total to about 3.7 million. These increases escalate the share of the total population with diabetes from 4.2% in 2000 to 7.3% in 2010 to 9.9% in 2020. Rising obesity rates, sedentary lifestyles, an aging population, and changes in the ethnic mix of new immigrants have and will continue to drive these increases.

The economic burden

Diabetes is a personal crisis for people living with the disease, and for their family. Diabetes is also a financial crisis for our healthcare system. It is consuming an ever-larger share of provincial and territorial healthcare budgets, and will force an increase in those expenditures.

The economic burden of diabetes in Canada is expected to be about \$12.2 billion in 2010, measured in inflation-adjusted 2005 dollars. This is an increase of \$5.9 billion or nearly double its level in 2000. The cost of the disease is expected to rise by another \$4.7 billion by 2020. The direct cost of diabetes now accounts for about 3.5% of public healthcare spending in Canada and this share is likely to continue rising given the expected increase in the number of people living with diabetes in Canada.

[More than 20 people are diagnosed with the disease every hour of every day.]

The Canadian Diabetes Cost Model – its potential and next steps

The Model provides the first comprehensive picture of the economic impact of type 1 and type 2 diabetes on Canadian society. It has the potential to accomplish much more with respect to developing provincial costing models and cost benefit assessments of diabetes intervention and prevention strategies.

The Canadian Diabetes Association will be exploring these and other ways that the Model can assist the Association and governments in developing effective diabetes policies and strategies. In the meantime, the Association calls upon governments to take immediate action in a number of key areas, including the enhancement of the Canadian Diabetes Strategy and the renewal of the Aboriginal Diabetes Initiative, enhanced tax strategies for people living with diabetes and further investment into diabetes research.





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Introduction

The analysis in this report was conducted using the Canadian Diabetes Cost Model. This Model was constructed by Informetrica Limited¹ and is the first model to use Canadian National Diabetes Surveillance System (NDSS) data and the Economic Burden of Illness in Canada (EBIC) approach to determine the economic impact of type 1 and type 2 diabetes on Canadian society, both now and in the future.

The Model can:

- Project the costs, incidence and prevalence of diabetes, as well as the co-morbidities common among people with the disease;
- Determine, where efficacy data exists, the financial cost-benefit of initiatives designed to delay or prevent the onset of type 2 diabetes and to reduce the occurrence and severity of complications arising from the disease for persons with diabetes; and
- Be developed further to provide province-specific information that will allow for even broader applications to assess the cost effectiveness of potential diabetes interventions, programs and services that could aid governments in developing future diabetes strategies.

The Model is an important tool in the fight against diabetes in Canada. Future enhancements could expand the variety of analyses possible with this Model.

[The Canadian Diabetes Cost Model is an important tool in the fight against diabetes in Canada.]

What is diabetes?

Diabetes is a chronic, often debilitating, and sometimes fatal disease in which the body either cannot produce insulin or cannot properly use the insulin it produces. This leads to high levels of glucose in the blood, which can damage organs, blood vessels and nerves. The body needs insulin to use glucose as an energy source.

There are three types of diabetes:²

- Type 1 diabetes is an autoimmune disease that occurs when the pancreas no longer produces any insulin or produces very little insulin. Type 1 diabetes usually develops in childhood or adolescence and affects up to 10% of people with diabetes. There is no cure. It is treated with lifelong insulin injections and careful attention to diet and physical activity. Type 1 diabetes was formerly known as insulin-dependent diabetes or juvenile diabetes.
- Type 2 diabetes is a disease that occurs when the pancreas does not produce enough insulin to meet the body's needs and/or the body is unable to respond properly to the actions of insulin (insulin resistance). Type 2 diabetes usually occurs later in life (although it can occur in younger people) and affects approximately 90% of people with diabetes. There is no cure. It is treated with careful attention to diet and exercise and usually also diabetes medications (oral antihyperglycemic agents) and/or insulin. Type 2 diabetes was formerly known as non-insulin-dependent diabetes or adult-onset diabetes.

1. Informetrica Limited. *Economic Cost of Diabetes in Canada: An Overview*. Toronto, ON: Canadian Diabetes Association; 2009.

2. Canadian Diabetes Association, Diabetes Dictionary. Available at www.diabetes.ca/about-diabetes/what/dictionary/.

- Gestational diabetes is first diagnosed or first develops during pregnancy. It affects 2% to 4% of all pregnancies. Blood glucose levels usually return to normal following delivery. Both mother and child are at higher risk of developing type 2 diabetes later in life.³

Prediabetes refers to a condition where a person's blood glucose levels are higher than normal, but not yet high enough to be diagnosed as type 2 diabetes (i.e. a fasting plasma glucose level of 7.0 mmol/L or higher). It is estimated that nearly six million Canadians are living with prediabetes. Although not everyone with prediabetes will develop type 2 diabetes, many people will (nearly 50%). Research has shown that some long-term complications associated with diabetes – such as heart disease and nerve damage – may begin during prediabetes.⁴

[A healthy diet, regular physical activity and maintaining a healthy body weight are important factors for effective management of type 2 diabetes.]

Approximately 90% of all diabetes cases are type 2 diabetes. Type 2 diabetes is usually diagnosed in people 40 years of age or older, although it is increasingly being diagnosed in children and adolescents. The number of people with type 2 diabetes is rising dramatically due to a number of factors:⁵

- An aging population – the risk of developing type 2 diabetes rises with age;
- Rising obesity rates – obesity dramatically increases the likelihood of developing type 2 diabetes;
- Increasingly sedentary lifestyles are contributing to rising obesity rates, particularly in younger Canadians, which can lead to type 2 diabetes;
- People of Aboriginal descent are three to five times more likely than the general population to develop type 2 diabetes; and
- Almost 80% of new Canadians are from populations that have a higher risk for type 2 diabetes. These include people of Hispanic, Asian, South Asian, or African descent.

3. Canadian Diabetes Association Clinical Practice Guidelines Expert Committee. Canadian Diabetes Association 2008 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada. *Canadian Journal of Diabetes*. 2008;32(supplement 1):S1-S201.

4. Public Health Agency of Canada. National Diabetes Fact Sheet, Canada 2007. and Canadian Diabetes Association. *Prediabetes: The Chance to Change the Future*. Available at www.diabetes.ca/about-diabetes/what/prediabetes/.

5. Canadian Diabetes Association. *The Prevalence and Costs of Diabetes*. Available at www.diabetes.ca.

Diabetes can lead to serious complications and premature death:⁶

- 80% of Canadians with diabetes die from a heart attack or a stroke;
- 42% of new kidney dialysis patients in 2004 had diabetes;
- 30% of Canadians with diabetes will become blind;
- 7 of 10 non-traumatic limb amputations are the result of diabetes complications;
- 25% of people with diabetes suffer from depression;
- The life expectancy for people with type 1 diabetes may be shortened by as much as 15 years; and
- The life expectancy for people with type 2 diabetes may be shortened by 5 to 10 years.

Older Canadians are more likely to have diabetes: In 2005–2006, 22% of people (approximately 1 in 5) in the 75- to 79-year-old age group had been diagnosed with diabetes. This was almost ten times the proportion seen in Canadian adults aged 35 to 39, where the prevalence was 2.3%, or one in 43.⁷

Treatment depends on the type of diabetes, and can include lifestyle modifications and/or medications, including insulin.

A healthy diet, regular physical activity and maintaining a healthy body weight are important factors for effective management of type 2 diabetes. Controlling blood glucose, blood pressure and cholesterol levels are also necessary to reduce the complications associated with diabetes. Self-management of diabetes is an essential part of overall care. Regular screening for complications and early treatment can also reduce or delay the complications of diabetes by as much as 50%.⁸



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6. Public Health Agency of Canada. *Diabetes in Canada – Facts and Figures*. National Diabetes Fact Sheets, Canada 2008. Available at www.phac-aspc.gc.ca/publicat/2008/ndfs-fnrd-08/index-eng.php
 7. Public Health Agency of Canada. *The Face of Diabetes in Canada*. Available at www.phac-aspc.gc.ca.
 8. Canadian Diabetes Association. *The Prevalence and Costs of Diabetes*. Available at www.diabetes.ca.

Canadian Diabetes Cost Model

The analysis in this report was conducted using the Canadian Diabetes Cost Model. This Model was constructed by Informetrica Limited and provides the first comprehensive picture of the economic impact of type 1 and type 2 diabetes on Canadian society, both now and in the future. The Model also projects the costs, incidence and prevalence of the disease, as well as the co-morbidities common among people with diabetes.

Forecasting diabetes prevalence

The Model estimates the number of diabetes cases prevalent in the population using national estimates (2005 data) from the National Diabetes Surveillance System (NDSS) of the rate of new incident cases and the all-cause mortality rate for persons with diabetes. This information is combined with Statistics Canada's medium population projection to estimate the total number of persons with diagnosed diabetes through time.

Projecting health system activity

NDSS provides estimates of all-cause health system usage for persons with and without diabetes. The difference between the risks for the two groups is calculated as a net rate. This net rate, defining the incremental risk attributable to diabetes, is used to project net or incremental system activity measures, such as:

- All-cause hospitalization in days;
- Visits to general practitioners (GPs);
- Visits to specialists;
- Hospitalization for cardiovascular disease (CVD); and
- Hospitalization for amputation.

Projecting costs

The treatment and service costs are determined by applying the rates of occurrence or use to the number of people with diabetes by age and sex over time. Cost data for these treatments and services are derived from Health Canada's Economic Burden of Illness in Canada (EBIC)⁹ report and are expressed in 2005 (inflation-adjusted) dollars.

Health costs can be partitioned into two categories, direct and indirect. The direct costs, representing healthcare outlays, include:

- Direct hospitalization costs (including amputation, dialysis, etc.);
- Net (incremental) CVD hospitalization costs;
- Net (incremental) general practitioner costs;
- Net (incremental) specialist costs; and
- Diabetes medication costs.

The specific net elements are estimated as the difference between the costs incurred by people with diabetes and those without diabetes; thus, they represent the incremental costs attributable to diabetes.

The indirect costs capture the economic costs of diabetes that occur outside the healthcare system. These costs represent the loss of economic output arising from either illness (morbidity costs) or premature death (mortality costs) attributable to diabetes.

9. Health Canada. *Economic Burden of Illness in Canada, 1998*. Ottawa, ON: Health Canada; 2002. Available at www.hc-sc.gc.ca.

It is important to note that numerous other costs can also be attributed to diabetes, but are not captured in the Model. These include long-term care costs, public health spending and capital spending by the healthcare sector, and the direct costs associated with third-party support such as family caregivers or volunteer healthcare activity.

Summary of key assumptions

The prevalence and cost of diabetes provided in this report is driven by the following assumptions:

- Statistics Canada's medium growth population projection;
- Incidence rates for males and females for all age groups up to age 69 are assumed by the Canadian Diabetes Association in the reference case to rise at a rate of 0.75% a year – well below the 1.8% national average annual increase observed between 1998 and 2005. This forecast may reflect future developments better than the constant age-sex incidence rate assumption made by NDSS and in other standard forecasts;
- Mortality rates by age and sex are fixed at the average of the last three years of available NDSS data;
- Rates of occurrence/use – for hospitalizations, doctor visits, medication use, etc. – are assumed to remain unchanged from their last observed values; and
- The per unit cost of these treatments/services is assumed to remain unchanged from the EBIC values inflated to 2005 dollars using appropriate health price weights obtained from Statistics Canada and contained in the Model. All costs in the Model are in 2005 dollars.

These assumptions could well be conservative and lead the Model to understate the prevalence and cost of diabetes in the future, rather than to overstate it.

Sensitivity and scenario analysis

The Model supports analysis of the sensitivity of the prevalence and cost estimates to changes in national demographic data, incidence and mortality rates by age and sex, and the average annual number of net general practitioner and specialist visits by people with diabetes. Future enhancements could expand the variety of analysis possible with the Model. In particular, the Model could be used to determine, where efficacy data exists, the financial cost-benefit of initiatives designed to delay or prevent the onset of type 2 diabetes and to reduce the occurrence and severity of complications arising from the disease for persons with diabetes.

Areas for future research and development

In order to remain relevant, the Model should be updated to include revisions to NDSS data and other data. The Model should also be updated to reflect expected improvements and methodological revisions in the EBIC data. Finally, the development of specific provincial models would allow for even broader applications to assess the cost effectiveness of potential diabetes interventions, programs and services that could aid governments in developing future diabetes strategies. These models would likely incorporate a combination of national and province-specific data due to data limitations at the provincial level.

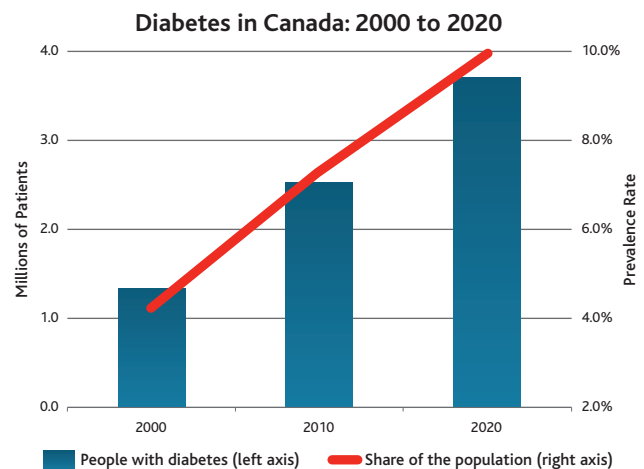
Diabetes in Canada: cause for alarm

Diabetes is a global pandemic. Where 30 million people lived with diabetes in 1980, it is anticipated that more than 400 million people world-wide will have the disease by 2030.¹⁰

According to the Canadian Diabetes Cost Model, the number of people diagnosed with diabetes in Canada is expected to nearly double between 2000 and 2010, from 1.3 million to about 2.5 million. More than 20 people are diagnosed with the disease every hour of every day. While the number of Canadians diagnosed with diabetes is large, it is estimated that an additional 700,000 people have the disease but don't know it.⁹

From 2010 to 2020, the number of people with diabetes is expected to rise by another 1.2 million, bringing the total to about 3.7 million. These increases escalate the proportion of the total population with diabetes from 4.2% in 2000 to 7.3% in 2010 and to 9.9% by 2020 (see Figure 1).

Figure 1



Source: Canadian Diabetes Cost Model

[More than 20 people are diagnosed with the disease every hour of every day.]

10. International Diabetes Federation. *IDF Diabetes Atlas*. (4th ed). Brussels, Belgium: International Diabetes Federation; 2009. Available at www.diabetesatlas.org.
11. The Conference Board of Canada. *How Canada Performs: A Report Card on Canada (Health)*. Available at www.conferenceboard.ca/HCP/Details/Health/mortality-diabetes.aspx#rates.
12. Public Health Agency of Canada. *Diabetes in Canada – Facts and Figures*. National Diabetes Fact Sheets, Canada 2008. Available at www.phac-aspc.gc.ca/publicat/2008/ndfs-fnrd-08/index-eng.php.

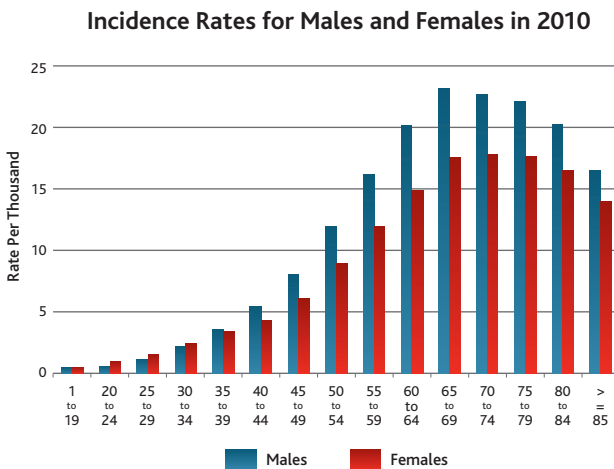
The increased prevalence of diabetes is indeed dramatic. Canada now has the third-highest rate of mortality due to diabetes among its peer countries, and the mortality rate from diabetes has risen steadily since the 1980s.¹¹

What are the demographic forces driving the increase?

First, an increase in the population over the period, not surprisingly, is in part responsible. Statistics Canada’s medium growth population projection calls for the population to rise 8% over the period, and this is responsible for 9% of the increase in the number of people with diabetes over the next decade.

Second, Canada’s population will continue to age over the same period. Since the incidence of diabetes increases with age (see Figure 2), this factor will escalate the number of people with diabetes and accounts for 13% of the increase over the next decade.

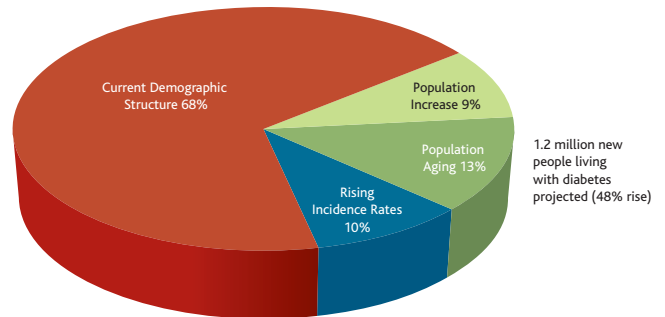
Figure 2



Source: Canadian Diabetes Cost Model

Figure 3

Factors Driving the Increase in Prevalence from 2010 to 2020



Source: Canadian Diabetes Cost Model

Third, the likelihood of developing diabetes has risen sharply over the last few years (as much as 1% per year for nearly all age groups up to age 70 for both sexes).¹² Rising obesity rates, sedentary lifestyles and changes in the ethnic mix of new immigrants have driven these increases. These factors are likely to remain, and even intensify from 2010 to 2020. This report assumes a 0.75% annual increase in incidence rates for both men and women for all age groups up to age 70 over the next decade (a conservative assumption), and constant mortality rates for all age groups. Rising incidence rates account for about 10% of the increase in the number of people with diabetes over the next decade (see Figure 3).

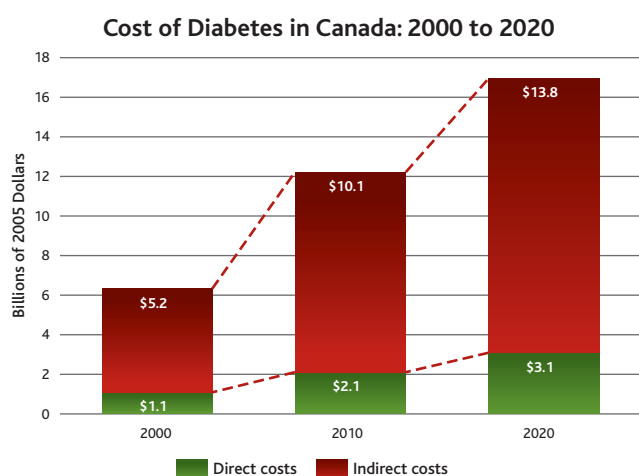
The economic burden of diabetes

People with diabetes incur medical costs that are up to three times higher than those without diabetes. A person with diabetes can face direct costs for medication and diabetes supplies ranging from \$1,000 to \$15,000 per year.¹³ To help determine the overall cost to society, Health Canada has published a number of reports examining the economic burden of illness in Canada. Its methodology considers both direct and indirect costs of illness:

- Direct costs include all costs for which payment was made and resources were used in the treatment, care and rehabilitation of an illness or injury. These costs include hospital and institutional care, primary (general and specialist) care and medication.
- Indirect costs include the value of economic output lost due to illness, injury-related work disability or premature death.

The Canadian Diabetes Cost Model uses this same methodology to determine the current and future economic burden of diabetes in Canada.

Figure 4



Source: Canadian Diabetes Cost Model

Figure 4 shows that the economic burden of diabetes in Canada is expected to be approximately \$12.2 billion in 2010 (measured in 2005 dollars). This is an increase of \$5.9 billion, or nearly double the level in 2000. The cost of the disease is expected to rise by another \$4.7 billion by 2020. The direct cost of diabetes now accounts for about 3.5% of public healthcare spending in Canada; this share is likely to continue rising given the expected increase in the number of people with diabetes in Canada.

The direct costs estimated by the Canadian Diabetes Cost Model include:^{14,15}

- Direct hospitalization costs (including amputation, dialysis, etc.);
- CVD-related hospitalization costs;
- General practitioner costs;
- Specialist costs; and
- Diabetes medication costs.

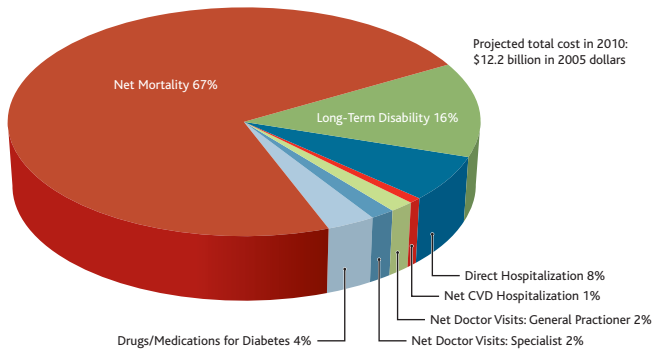
The indirect costs estimated by the Model represent the loss of economic output from the impact of diabetes on society, and include:^{14,15}

- Mortality costs: the value, in terms of lost production, of premature death as a result of both type 1 and type 2 diabetes; and
- Long-term disability costs: the value, in terms of lost production, of reduced productivity and time away from work that can be attributed to diabetes.

13. Canadian Diabetes Association. *The Prevalence and Costs of Diabetes*. Available at www.diabetes.ca/about-diabetes/what/prevalence/.

Figure 5

Economic Cost of Diabetes in Canada by Source in 2010



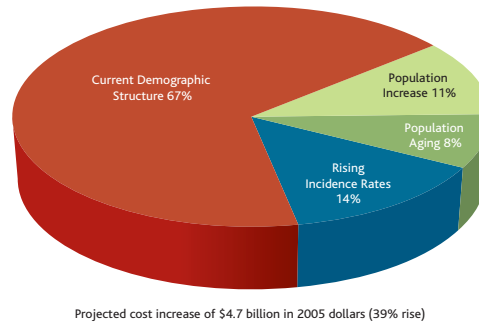
Source: Canadian Diabetes Cost Model

The distribution of direct and indirect costs of the economic burden of diabetes is shown in Figure 5. The cost associated with premature death accounts for about two-thirds of total costs expected in 2010. Direct costs represent about 17% of the total, with hospitalization costs accounting for over half of that share.

The demographic forces driving the increase in the number of people with diabetes between 2010 and 2020 yield a similar distribution for each factor with respect to the economic burden of diabetes. The increase in the population accounts for 11% of the increase in costs, population aging for 8% and higher incidence rates for 14%, while the current demographic structure accounts for 67% of the increase in costs (see Figure 6).

Figure 6

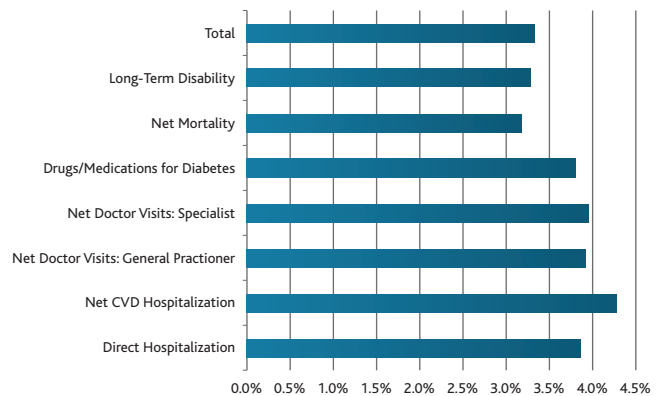
Factors Driving the Increase in the Cost of Diabetes from 2010 to 2020



Source: Canadian Diabetes Cost Model

Figure 7

Average Annual Inflation-Adjusted Growth in the Cost of Diabetes in Canada between 2010 and 2020



Source: Canadian Diabetes Cost Model

The average inflation-adjusted cost of diabetes in Canada is expected to rise 3.3% per year between 2010 and 2020 (see Figure 7). Direct costs – such as hospitalization for CVD and primary care visits – are expected to rise the fastest, by 4.3% and 3.9%, respectively. These cost increases will severely tax the healthcare system over the next decade.

- Harris SB, Ekoé JM, Zdanowicz Y, et al. Glycemic control and morbidity in the Canadian primary care setting (results of the diabetes in Canada evaluation study). *Diabetes Research and Clinical Practice*. 2005;70(1):90-97.
- Public Health Agency of Canada. *Diabetes in Canada – Facts and Figures*. National Diabetes Fact Sheets, Canada 2008. Available at www.phac-aspc.gc.ca/publicat/2008/ndfs-fnrd-08/index-eng.php.

This rise in spending is a result of significant increases in the amount of time spent in hospitals, visits to doctors' offices and medical procedures such as amputations. In 2005, one in ten hospital admissions was due to the treatment of diabetes and its complications.¹⁶ Figure 8 shows that the number of days spent by people living with diabetes in hospital is expected to rise from 1.9 million in 2000 to 3.6 million in 2010 to 5.4 million by 2020.

Visits to general practitioners will rise from 5 million in 2000 to more than 14 million by 2020, while visits to specialists will rise from 3.2 million in 2000 to 9.1 million by 2020. Furthermore, the number of amputations is expected to rise from 210,000 in 2000 to 630,000 in 2020. These activities will require a significant addition to the capacity of the healthcare system in this country, resulting in higher costs for governments and taxpayers.

Figure 8



Source: Canadian Diabetes Cost Model

16. Hux JE, Booth GL, Slaughter PM, et al, eds. *Diabetes in Ontario. An ICES Practice Atlas*. Toronto, ON: Institute for Clinical Evaluative Sciences; 2003.

Action on diabetes: an ounce of prevention

Diabetes is a personal crisis for people living with the disease, and for their family. Diabetes is also causing a financial crisis for our healthcare system. Treatment of the disease and its related complications are consuming an ever-larger share of healthcare budgets, and will soon force a tremendous increase in those budgets. Both personal and policy changes are needed.



Currently, there is no known way to prevent type 1 diabetes. Therefore, investments need to be made in access to health services, education, research, and supplies and devices that will assist those with type 1 diabetes manage their disease effectively. While there is a genetic predisposition for diabetes, it is estimated that more than 50% of type 2 diabetes cases could be delayed – or even prevented – with healthier eating and increased physical activity.¹⁷ Weight loss of 5% to 10% of initial body weight – approximately 4.5 to 9.0 kg for a 90-kg person – has been shown to significantly reduce the risk of diabetes.¹⁸

For those with diabetes, achieving the optimal blood glucose, cholesterol and blood pressure targets recommended by the Canadian Diabetes Association's 2008 Clinical Practice Guidelines will help avoid or delay diabetes complications. Intensive multi-factorial intervention to improve blood pressure, cholesterol and glycemic control can reduce cardiovascular events by 60% and mortality by 56% in patients with type 2 diabetes.¹⁹ Moreover, weight loss of 5% to 10% of initial body weight in people with diabetes can substantially improve insulin sensitivity, glycemic control, blood pressure, and cholesterol levels.²⁰

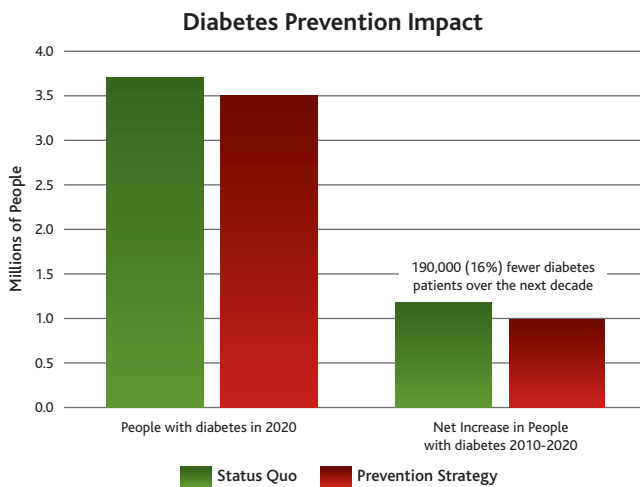
Unfortunately, fewer than half of Canadians with type 2 diabetes are at the recommended A1C target – more than half do not know what their recommended target level should be.²¹ Fewer than half of all people with type 2 diabetes are regularly tested for A1C, blood pressure and cholesterol levels, or kidney function. Surveys indicate that people with diabetes receive too little education and too little support.²²

17. Canadian Diabetes Association Clinical Practice Guidelines Expert Committee. Canadian Diabetes Association 2008 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada. *Canadian Journal of Diabetes*. 2008;32(supplement 1):S1-S201.
18. Public Health Agency of Canada. *Report from the National Diabetes Surveillance System: Diabetes in Canada, 2008*. Available at www.phac-aspc.gc.ca.
19. Gaede P, Lund-Andersen H, Parving HH, Pedersen O. *Effect of a multifactorial intervention on mortality in type 2 diabetes*. *N Engl J Med*. 2008 Feb 7;358(6):580-91.
20. Canadian Diabetes Association Clinical Practice Guidelines Expert Committee. Canadian Diabetes Association 2008 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada. *Canadian Journal of Diabetes*. 2008;32(supplement 1):S1-S201.
21. Ékoé J, Aras M, Markon P, et al. *Insight Into Canadians Living With Type 2 Diabetes: A Survey Of Patients And Physicians*. Presentation from the 2008 Canadian Cardiovascular Society annual meeting; Montréal, Québec.
22. Diabetes Task Force. *Report to the Ministry of Health and Long-Term Care*. Toronto, ON: 2004.

Reducing the prevalence of diabetes in Canada will take time and happen very gradually. It will require broad-based personal and societal change. The Canadian Diabetes Cost Model was used to estimate the impact of an effective campaign to:

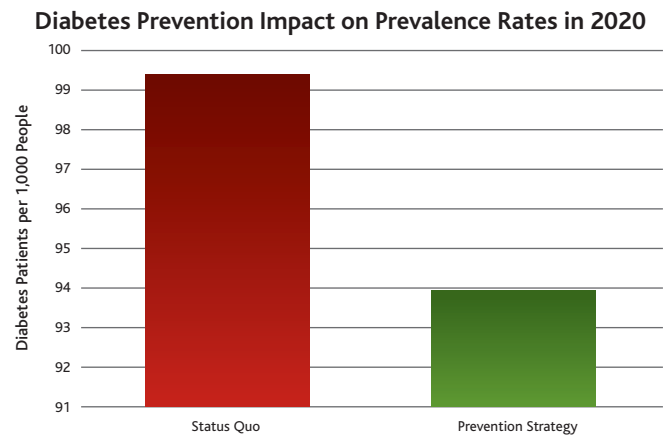
- (i) Reduce the number of people developing diabetes over the next decade; and
- (ii) Reduce the number of complications arising from the disease and decrease the number of patient visits to family doctors and specialists.

Figure 9



Source: Canadian Diabetes Cost Model

Figure 10

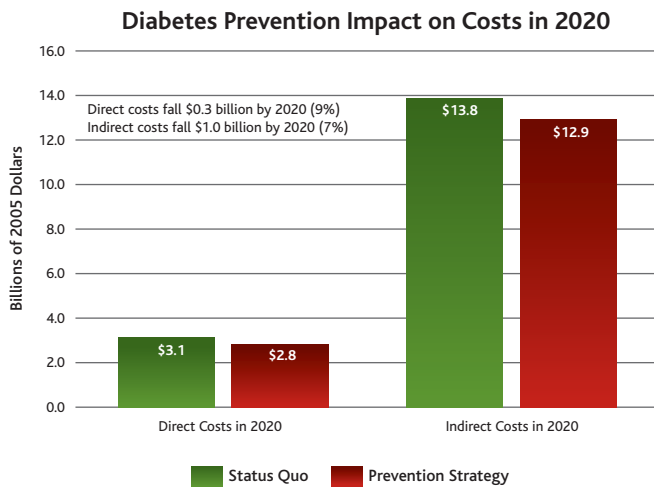


Source: Canadian Diabetes Cost Model

In this estimate, the incidence rate of new cases is assumed to fall 2% per year relative to the incidence rates used in the previous section and, reflecting better health outcomes, the number of annual visits per patient to family doctors and specialists is assumed to fall 0.5% per year. While these assumptions are arbitrary, they demonstrate the benefits of robust, positive action to reduce the personal and societal burden of diabetes.

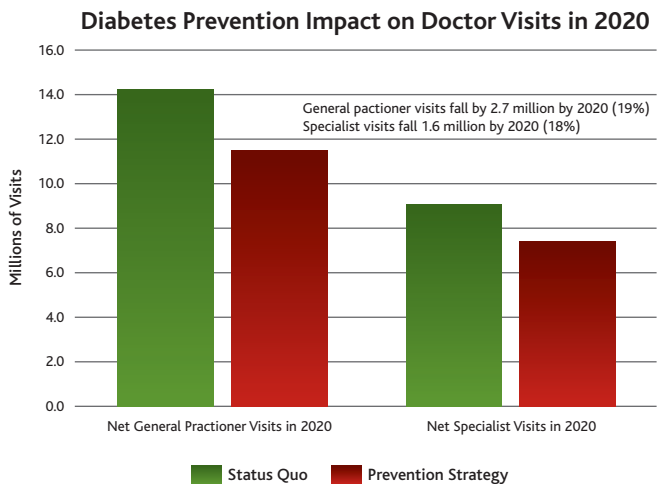
Positive action to reduce the number of complications would also affect hospitalization rates, amputation rates, medication use, etc. The Canadian Diabetes Cost Model does not have the capability to simulate direct changes in the demand for these services and treatments, although it is an enhancement that is expected in the next version of the Model.

Figure 11



Source: Canadian Diabetes Cost Model

Figure 12



Source: Canadian Diabetes Cost Model

Figure 9 shows the impact of this program in reducing the number of people with diabetes in 2020 to 3.5 million from 3.7 million in the current forecast. Despite a 16% drop in the number of new diagnoses of diabetes over the decade, the overall number of people with the disease still rises by about 1.0 million people.

The prevalence of the disease falls from more than 99 cases per 1,000 to about 94 cases per 1,000 in 2020. This is still significantly higher than the 73 per 1,000 cases expected in 2010 (see Figure 10). There is no quick solution. Reducing the number of people with diabetes in Canada will require long-term planning and action.

While the lack of dramatic progress in eliminating the disease may be discouraging, these efforts make a difference to the cost of diabetes. Direct costs in 2020 are 9% below what would be expected without taking action (see Figure 11). This reduction will make it easier for governments to ensure that healthcare spending keeps up with the increased demand.

The larger percentage decline in direct costs relative to indirect costs is driven by the assumption that improved education and healthcare management could reduce the number of times that patients need to visit their family doctor or a specialist each year (i.e. better management leads to fewer medical crises). Figure 12 shows that visits to general practitioners and specialists fall 19% and 18%, respectively, by 2020.

Next steps

The Canadian Diabetes Cost Model and its potential

The Model is based on the data that existed at the time it was developed. In order to remain relevant, the Model must be updated routinely to take into account new and revised data and other considerations, including:

- The approach to forecasting the prevalence of diabetes generally replicates the NDSS forecasting methodology at the national level. The initial revisions and updates to the Model will focus on the inclusion of revised NDSS data;
- The economic costs are extrapolated from the 2000 EBIC data, which is currently being updated. Extensions to the standard EBIC approach include:
 - The recognition of co-morbidities such as cardiovascular disease; and
 - The use of all-cause mortality rates to highlight the higher risks of death experienced by people with diabetes due to co-morbid conditions.
- Over the course of the next year, it will be necessary to incorporate data improvements and methodological revisions that are expected in the EBIC data, as well as a change in the base year of analysis from 2000 to a more recent year; and
- Revised population forecasts that incorporate the most recent census estimates will soon be available. This will affect the demographic structure to a modest extent.
- The development of specific costing estimates of the burden of diabetes at the community, regional and provincial levels;
- More sophisticated impact studies incorporating detailed assumptions from epidemiological models to assess the cost effectiveness of diabetes intervention and prevention strategies; and
- A detailed treatment of co-morbidities and associated health status impacts with complex linkages to costs.

The Canadian Diabetes Association will be exploring these and other ways the Model can assist the Association and governments in more effectively developing diabetes policies and strategies. However, while the use of this Model can be further explored, it should not stop governments from taking action today.

The Canadian Diabetes Association is already working to address the economic burden of diabetes in Canada by:

- Focusing our efforts and resources on the needs of people living with diabetes or prediabetes;
- Providing people with diabetes and healthcare professionals with education and services;
- Advocating on behalf of people living with diabetes;
- Supporting diabetes research; and
- Translating research into practical applications for both healthcare providers and people living with diabetes.

This Report highlights the serious burden of diabetes in Canada. The bearers of this burden go well beyond those directly affected by the disease itself. All Canadians, due to the direct and indirect cost of diabetes, pay the price. While the Model provides a more comprehensive picture of the economic impact of diabetes on Canadian society, it has the potential to accomplish much more. The Model's potential includes:

The need for action

While the Canadian Diabetes Association is leading the fight against diabetes by helping people with diabetes live healthy lives as it works to find a cure, we cannot do it alone. Governments must recognize this growing burden and take immediate action.

That action should include, but not be limited to, the following:

1. Canadian Diabetes Strategy and Aboriginal Diabetes Initiative

The Canadian Diabetes Strategy requires significant enhancements and the current Aboriginal Diabetes Initiative is due to expire in 2010. The federal government must renew and significantly enhance these two strategies with a focus on:

- Increasing investment levels for both the Canadian Diabetes Strategy and the Aboriginal Diabetes Initiative;
- Establishing an arms-length partnership body with clear annual and multi-year targets in a number of clearly defined areas;
- Establishing programs and services for those living with diabetes and prediabetes;
- Translating research into practical applications for managing diabetes for both healthcare professionals and people living with diabetes; and
- Meeting the specific and cultural needs of populations at risk.

2. An enhanced tax strategy for Canadians living with diabetes

The out-of-pocket costs associated with diabetes are perceived as a major barrier to those living with diabetes in effectively managing their disease. In fact, 57% of Canadians living with diabetes say they do not comply with their prescribed therapy due to cost and lack of access to medications, devices, supplies, and health providers. This leads to higher hospitalization rates, increased healthcare system costs and even more serious co-morbidities and complications.

Action is needed to ensure that people living with diabetes can afford to manage their disease. The federal government is urged to take action to address the cost and access to medications, devices and supplies through increased tax credits, medical expense deductions and other forms of income support.

3. Increased investment in high-quality, investigator-driven research

Insulin was discovered in Canada and the Canadian Diabetes Association's funding continues to ensure that Canadian researchers remain at the forefront of diabetes breakthroughs. Since 1975, the Association has invested more than \$95 million to support excellence in diabetes research in Canadian universities, institutions and hospitals.

[The Canadian Diabetes Association is already working to address the economic burden of diabetes in Canada.]

The United States recently invested \$21.5 billion in research and development. Canada needs a comparable commitment to investment in research to preserve and build on the accomplishments that previous investments in research have achieved.

Public sector investment in diabetes prevention will reduce both direct healthcare costs and the cost to the economy from reduced production. A recent report determined that the long-term receipt of appropriate clinical procedures by patients with type 2 diabetes may result in the avoidance of \$4 in acute care cost for every \$1 in physician costs.²³



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About the Canadian Diabetes Association

Across the country, the Canadian Diabetes Association is leading the fight against diabetes by helping people with diabetes live healthy lives while we work to find a cure. We are supported in our efforts by a community-based network of volunteers, employees, healthcare professionals, researchers and partners. By providing education and services, advocating on behalf of people with diabetes, supporting research, and translating research into practical applications – we are delivering on our mission.

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