The Economic Benefit of Public Funding of Insulin Pumps in ALBERTA
Introduction

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. Persons diagnosed with diabetes can be classified as having either type 1, type 2, gestational or prediabetes. Type 1 and type 2 diabetes currently affects about 9% of the population in Alberta.

Every day, Albertans living with type 1 diabetes take insulin so that they can live healthy lives. Many choose to deliver the insulin by manually injecting it several times a day while others use an insulin pump to deliver the appropriate amount of insulin when required throughout the day.

There is compelling evidence of the medical benefits of insulin pumps versus multiple daily injections of insulin.\(^1\) This report builds on that evidence to demonstrate that not only does the use of insulin pump technology lead to better health outcomes for people living with diabetes, but that government investment into insulin pump programs is a cost effective method of addressing the burden of diabetes in the province.

This report will identify how the use of an insulin pump, in place of multiple daily injections will, over the long-term, reduce the number of serious complications experienced by people living with type 1 diabetes. These complications are the true drivers of the increasing diabetes-related costs in the province.\(^2\) The report will also demonstrate the province’s savings from the reduced number of complications will be matched and exceed the financial costs of implementing an insulin pump program in the province. Further, the amount of savings will continue to grow each year.

Research shows that:

- In the first year of implementation, the net financial savings to Alberta is projected to reach approximately $800,000 and;
- The net financial savings is projected to grow each year, reaching approximately $10.8 million by 2032.

---


\(^2\) Canadian Diabetes Association, Diabetes: Canada at the Tipping Point – Charting a New Path www.diabetes.ca/dpr
Diabetes in Alberta

According to recent findings from the Canadian Diabetes Association’s Alberta Diabetes Cost Model, diabetes in Alberta is expected to rise from 245,000 people in 2012 to 544,000 people by 2032 (see Figure 1). Of this total, the estimated number of people living with type 1 diabetes is estimated at 13,800 people in 2012, and is projected to rise to 24,400 by 2032.3

Figure 1

People living with type 1 diabetes are also at high-risk of developing one or more serious long term complications that can be attributed to the disease, such as end stage renal disease (kidney failure), myocardial infarction (heart attack), stroke and limb amputation. For Albertans, based on the numbers estimated above, the greatest impact will be on the number of persons requiring dialysis for end stage renal disease, as their number will rise from 409 persons in 2012 to 1,100 persons by 2032.

3 Based on this population size, the number of publically funded pumps in 2012 is estimated to be 6,200, rising to 11,000 by 2032 – representing about 45% of all persons with type 1 diabetes. This estimate is based on the assumption that 60% of persons with type 1 diabetes under the age of 20 would use an insulin pump while 40% of persons over the age of 20 would do so. Existing programs in Canada typically only serve 30 to 35 percent of eligible persons.
The number of people projected to suffer from acute myocardial infarction, stroke and require lower limb amputations in the province are also projected to rise over the next two decades (see Figure 2).

Figure 2
Health Impact

The use of an insulin pump in place of multiple daily injections has been shown to improve A1C values and will, over the long-term, reduce the number of serious complications experienced by Albertans living with type 1 diabetes. Research conducted by IMS using the CORE model estimated the average annual change in the incidence of myocardial infarction, end stage renal disease, lower limb amputations and stroke shown in Table 1.

The IMS research also included sensitivity analysis to determine the 95% confidence interval bounds for these estimates. The average cost per case (measured in 2009 dollars) reveals the burden that each of these complications places upon our healthcare system.

Table 1

<table>
<thead>
<tr>
<th>Complication</th>
<th>% Change in Annual Incidence Rate</th>
<th>Average Cost per Case (2009$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Base Case</td>
<td>Low 95% CI</td>
</tr>
<tr>
<td>Myocardial Infarction</td>
<td>-10.0%</td>
<td>-3.3%</td>
</tr>
<tr>
<td>End Stage Renal Disease</td>
<td>-20.4%</td>
<td>-16.3%</td>
</tr>
<tr>
<td>Lower Limb Amputation</td>
<td>-7.0%</td>
<td>-1.9%</td>
</tr>
<tr>
<td>Stroke</td>
<td>17.5%</td>
<td>4.4%</td>
</tr>
</tbody>
</table>

Switching from multiple daily insulin injections to an insulin pump reduces the overall expected reduction of secondary complications, most notably in end stage renal disease. The research also indicates that there will be an increase in the number of people expected to suffer from stroke. While this may not seem to be a positive outcome, persons using the insulin pump live longer lives without experiencing as many other complications from diabetes, thus, have more opportunity to suffer an age-related stroke.


5 Although the CORE model and the DCM both include a broader set of complications associated with the disease, the four included in this research account for over 99% of the costs. This study uses these average annual changes in incidence to generate the expected average change in the number of complications and their cost. It can, however, take up to a decade for these health care benefits to be realized by patients. As a result, the short-term benefits arising from public funding of insulin pumps may be overstated.
Economic Impact

Insulin pumps and their supplies are expensive. Currently, there are a number of public funding models to assist with costs, which then transfer some or all of the cost to the public healthcare system. The overall annual cost of providing insulin pumps and supplies to persons with type 1 diabetes in Alberta is estimated to be $8.6 million in 2012 rising to $15.1 million after twenty years. The reduction in the annual cost of treatment for serious complications from diabetes is $8.8 million in 2012 but rises to $25.1 million by 2032. This is an initial net savings to the healthcare system of $0.2 million in 2012, but becomes a net savings of $9.9 million by 2032.

Beyond the direct costs, there are indirect costs which arise from increases in mortality and disability associated with diabetes. The indirect costs for persons switching from daily insulin injections to an insulin pump lead to fewer serious complications. This, in turn, leads to fewer deaths and a reduction in the people experiencing difficulty with daily living.

When considering both direct and indirect costs savings, by implementing an insulin pump program, Alberta will save an estimated $800,000 in 2012 (the first year the program would be introduced), with $200,000 coming from a reduction in direct costs to the healthcare system. The net savings after two decades amount to $10.8 million a year with $9.9 million of those savings arising from net direct costs.

Figure 3

---

6 The actual profile of cash outlays for the insulin pumps and supplies may differ from that shown in this analysis depending on the financing options arranged with pump vendors and the involvement of private health insurance plans. Without financing, the costs would be considerably higher in the first year and then much lower in each subsequent year.

7 The DCM mortality and disability costs are relatively conservative at $225,000 and $4,000 per person respectively.

8 It is important to note that these figures concerning the reduction in the cost of treatment for long-term diabetes-related complications are estimates and may be subject to change. The 95% confidence bounds were used to estimate upper and lower bound savings in direct costs from reduced long-term complications. The overall net benefit to society (direct and indirect costs) is, with 95% certainty, expected to lie between a net cost of $1.3 million and a net benefit of $3.5 million in 2012. The net benefit is expected to rise over the next twenty years to between $4.6 million and $16.5 million.
About the Report

The report was prepared by Robin Somerville of The Centre for Spatial Economics (C4SE) using the Core Model in conjunction with Alberta Diabetes Cost Model to produce the Canadian Diabetes Association’s specific scenarios. 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.

Disclaimer:

The Alberta Diabetes Cost Model was created for the Association by the Centre for Spatial Economics based on the Canadian Diabetes Cost Model developed by Informetrica Limited. The two main sources of data used for the estimate and forecasts come from the National Diabetes Surveillance System (NDSS) and Health Canada’s study the Economic Burden of Illness in Canada (EBIC). The Model aimed to integrate the administrative prevalence and incidence estimates from NDSS with the economic cost estimates from EBIC. The Model supports analysis of the sensitivity of the prevalence and cost estimates to changes in demographic data, incidence and mortality rates by age and sex, as well as the cost and utilization of health care services.
About the Canadian Diabetes Association
Today, more than nine million Canadians live with diabetes or prediabetes. 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. Our community-based network of supporters help us provide education and services to people living with diabetes, advocate for our cause, break ground towards a cure and translate research into practical applications.

For more information, please visit diabetes.ca or call 1-800-BANTING (226-8464).

The development of the report was supported through an unrestricted educational grant provided by Medtronic of Canada Ltd - a global leader in medical technology changing the face of chronic disease.

We thank Medtronic Canada for its ongoing commitment to diabetes in Canada.