Accessing Diabetes Medications
A Pan-Canadian Analysis of Patient Experiences
Preface
As part of a broader research agenda designed to inform dialogue on options for universal pharmacare in Canada, The Conference Board of Canada completed research examining access to necessary medications for patients with diabetes.

This research brings to light the issues that patients face in efforts to manage, treat, and control their health conditions over the long term. It also points to the need for a more integrated health system focused on needs and outcomes that are meaningful to, and thereby defined by, patients.

This report is based on quantitative analysis, validated by interviews with patients and physicians.

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Accessing Diabetes Medications: A Pan-Canadian Analysis of Patient Experiences

Key findings
Medicines are a key component of a range of therapeutic interventions that Canadians use to prevent, manage, and cure health conditions. Patients living with diabetes depend on access to evidence-based, individualized treatments to maintain and improve their health outcomes, reduce complications, and increase their overall quality of life and lifespan.

As part of a broader research agenda exploring options for universal pharmacare in Canada, The Conference Board of Canada completed research on how patients with diabetes access necessary medications. Results of quantitative analysis, validated by interviews with patients and physicians, showed that:

• In Canada, 3.3 million people live with diabetes, up from 2.6 million in 2010. This represents a 28.7 per cent growth in prevalence.
• Reimbursement costs for drugs to treat diabetes have increased by an average of 13 per cent per year since 2010.
• This report also observes a major shift toward private coverage for glucose-lowering drugs for every province in Canada except Ontario.

• Reimbursement costs are lower for public plans than for private plans; however, private plans cover more active ingredients and more expensive drugs than public plans.
• Canadians living with diabetes who have no medical insurance continue to face distinct and unnecessary difficulties.

This research brings to light the issues patients face when managing, treating, and controlling their health conditions over the long term. It also points to the need for a more integrated health system focused on outcomes that are meaningful to patients. To this end, it is essential that these outcomes be measured and assessed in a standardized way, and used as the basis for continuous quality improvement efforts.
**Introduction**

Medicines are a significant part of the basket of therapies that Canadians receive to prevent, manage, and cure health conditions.¹ New and existing medicines can extend and improve the lives of Canadians. Previous research by The Conference Board of Canada has demonstrated that improving medication adherence and encouraging drug innovation can offset, or even lower, overall health care spending. A large portion of this offsetting and lowering is due to reductions in the amount of productivity lost due to patient illness.²

There is visible variation in drug coverage and access across the provinces. This variation continues to motivate discussions on the need for a national pharmacare program in Canada.³ For instance, the Office of the Parliamentary Budget Officer recently estimated that federal health care costs would be lower under a national pharmacare program.⁴ Additional literature suggests that a national pharmacare program would lead to long-term savings.⁵ However, some health system observers note that a national pharmacare program could limit access to new pharmaceuticals and increase patient tax burdens.⁶

What has been missing from the current discourse on pharmacare, and from the development and analysis of possible options, is the lived experience of patients and their caregivers. While relatively few Canadians have no prescription drug coverage, significant gaps mean that patients and caregivers continue to

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¹ These therapies also include health behaviour interventions.
² Hermus and others, *Reducing the Health Care and Societal Costs of Disease*.
⁴ Busby, *Federal Cost of a National Pharmacare Program*.
⁵ Morgan and others, “Estimated Cost of Universal Public Coverage of Prescription Drugs in Canada.”
⁶ Lybecker, *The Unintended Consequences of National Pharmacare Programs*.
face important challenges when trying to access the medicines they need. These challenges include, but are not limited to:

- differences in public and private coverage for specific drugs within and across provinces;
- process and administrative barriers that make it difficult for patients to register for coverage or to access medications;
- out-of-pocket costs that occur when medications are partially covered, or not covered at all;
- inequity of access, based on patients’ health status, income level, and location.

These challenges are especially relevant for persons living with diabetes, for whom coverage for medicines and supplies is noticeably different across provinces. As is the case for many health conditions, there is no one-size-fits-all approach to treating diabetes. Treatment regimens should be tailored to individual needs and based on clinical evidence; however, patients’ capacity to manage their condition depends heavily on their insurance coverage, which largely determines their access to treatment.

**Diabetes in Canada**

Diabetes is a chronic condition affecting all body systems and involves a combination of varying degrees of insulin deficiency and/or an inability to use the insulin produced naturally. The two most common types of diabetes are:

- type 1, in which the pancreas is functioning improperly and fails to produce insulin, causing sugar to accumulate in the bloodstream. Type 1 diabetes most commonly develops during childhood, though people may also be diagnosed later in life.
- type 2, in which the body does not produce enough insulin, or does not properly use the insulin naturally produced. While type 2 diabetes most commonly develops during adulthood, it is increasingly being seen in pediatric populations as well.

An additional, less common, condition is gestational diabetes, in which some women temporarily develop diabetes while pregnant. Depending on the presence of various risk factors, gestational diabetes occurs in between 3 and 20 per cent of pregnant women. Women who develop gestational diabetes are at an increased risk of developing type 2 diabetes in the future. Their children may also be at risk of developing diabetes later in life.

In Canada, approximately 3.1 million people have been diagnosed with some form of diabetes. People living with type 1 diabetes account for 5 to 10 per cent of all persons living with diabetes in Canada, while persons living with type 2 diabetes account for 90 per cent. Additionally, close to 200,000 Canadians are newly diagnosed with diabetes every year—with higher prevalence rates among middle-aged and senior citizens.

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7 Sutherland and Dinh, *Understanding the Gap*.
8 Diabetes Canada, “Diabetes Basics.”
10 Ibid.
11 Public Health Agency of Canada, “Diabetes in Canada.” Analogous to 8.1 per cent of Canada’s total population.
12 Public Health Agency of Canada, “Diabetes in Canada.”
13 Ibid.
Research objectives
The objectives of this report are to compare public and private drug plans with respect to:

• coverage (formulary) of necessary glucose-lowering medications;
• the administrative burden experienced by patients and caregivers in accessing medications;
• the out-of-pocket burden experienced by patients and caregivers in accessing necessary medications.

Results
Reimbursement costs for drugs to treat diabetes
Diabetes places an increasingly large burden on patients and on Canada’s health care system. Reimbursement costs for glucose-lowering drugs totalled $1.8 billion in 2017. Of this, $857.4 million (47 per cent) was reimbursed by public programs, $787.4 million (43 per cent) by private plans, and $181.4 million (10 per cent) through out-of-pocket expenses. (See Chart 1.) Total reimbursement costs have increased by an average of 13 per cent per year since 2010. (See Chart 1.) Thus, they amount to increasingly larger shares of total drug expenditures in Canada. (See Chart 2.) Reimbursement costs for glucose-lowering drugs are now second highest among all other drug classes. (See Chart 3.)

Methodology
We used a quantitative analysis to examine administrative data related to drug and supplies coverage, while qualitative analysis was used to understand the patient experience with respect to accessing medications and out-of-pocket costs. Specifically, we used a pan-Canadian, longitudinal, and prevalence-based approach to analyze the use and reimbursement of glucose-lowering medications. This approach allowed examination of how people living with diabetes obtain their medications, and how this access is affected by their insurance coverage and place of residence. Interviews with patients and providers were completed to understand the patient experience with accessing medications to treat diabetes. See Appendix A for additional details on this methodology, including study limitations.

1 A prevalence-based approach typically examines themes related to cost and cost outcomes that are not based directly on economic principles. Usually, this approach to population economics also looks at broader trends in health services over several years—compared with incidence-based approaches that focus heavily on individual utility maximization. In addition, while this report employs a pan-Canadian approach, data unavailability prevented us from analyzing the use and reimbursement of glucose-lowering medications in Nunavut, the Northwest Territories, and the Yukon.

14 We use the term “reimbursement cost” due to the data used for analysis. While these data can be referred to as “drug spending,” they specifically relate to costs that were reimbursed to patients.
15 Because preventative care treatments for diabetes-related complications are omitted from this analysis, the reimbursement cost likely exceeds $1.8 billion.
**Chart 1**
Reimbursement costs for glucose-lowering drugs
($ millions)

Sources: The Conference Board of Canada; IQVIA Canada, PharmaStat Plus Database.

**Chart 2**
Glucose-lowering drugs’ share of total drug expenditures
(per cent)

Source: IQVIA Canada, PharmaStat Plus Database.

**Chart 3**
Reimbursement costs for glucose-lowering drugs second highest among top 10 high-cost drug classes, 2017
($ millions)

COPD = chronic obstructive pulmonary disease
Note: “Other nervous system drugs” refers to central nervous system drugs other than anesthetics, analgesics, antipilpetics, anti-Parkinson drugs, psycholeptics, and psychoanaleptics.

Source: IQVIA Canada, PharmaStat Plus Database.

Find Conference Board research at conferenceboard.ca.
Our interviews with patients and providers suggest that some patients experience a larger financial burden than others. These include uninsured persons who incur out-of-pocket costs, or patients who exceed their yearly deductible limits. Some patients may reduce their medication consumption to help manage these costs, despite the negative health implications associated with improper medication use.

Other patients may have additional related conditions, such as high blood pressure or heart disease, and use insurance plans that require co-payments for multiple medications. This additional burden sometimes means that patients cannot afford to access the most effective medication for each condition.

**Prevalence rates and claim submissions**

Noted cost increases for glucose-lowering drugs are partially explained by overall increases in the number of Canadians living with diabetes. (See Chart 4.) Between 2010 and 2017, the number of persons living with diabetes increased by 28.7 per cent. This growth is most significant among Canadians aged 65 and older (27 per cent), followed by those between 50 and 64 years of age (19 per cent). The growth in diabetes prevalence rates is significantly steeper than Canada's population growth during the same time period.

16 Interview findings.
17 Ibid.
18 For example, some coverage programs require only co-payments for glucose-lowering medications.
19 Interview findings.
20 As the remainder of this report shows, these increases can also be explained by increases in the median cost per claim. (See Chart 9.)
21 In principle, growth in the prevalence rate for diabetes should be matched with concurrent increases in reimbursement costs as more and more patients claim drug expenses. Our data show that this is the case—while the prevalence rate of diabetes has increased by 22.2 per cent between 2010 and 2017, public reimbursement costs have increased by 250.7 per cent and private reimbursement costs by 259.8 per cent. Newer drugs to market for persons with diabetes have also been much higher in cost than their predecessors.
The number of claims submitted for glucose-lowering medications has also grown substantially. Since 2010, the number of private and public claims submitted for glucose-lowering drugs increased by 52.9 per cent—from approximately 23 million to roughly 35 million. (See Chart 5.) Absolute claims growth is highest for persons 65 and older (60 per cent), followed by those between 20 and 34 years of age (56 per cent). (See Chart 6.) This increase in number of claims is steeper than the growth in prevalence rates and reimbursement costs, which implies that health care utilization rates are rising for persons living with diabetes. It is important to note that this does not imply either over- or under-utilization, as appropriateness of therapy cannot be determined from this analysis.

Average annual growth rates in public plans, private programs, and out-of-pocket payments

Increased usage for glucose-lowering drugs places significant financial pressure on public and private payers, and on patients’ out-of-pocket costs. For example, public program reimbursement costs for glucose-lowering drugs have risen by an average of 14.1 per cent per year from 2010 to 2017. The largest increases are seen in Ontario (21 per cent), Quebec (13.0 per cent), and in the Non-Insured Health Benefits program (NIHB) (12.0 per cent).22 (See Chart 7.) The average annual increase for private plans, across all provinces, was 14.7 per cent. However, the lowest average annual increase for private plans (10.3 per cent, in Newfoundland and Labrador) is noticeably higher than the lowest increase for public plans (less than 1 per cent, in British Columbia). (See Chart 8.)

22 When adjusted for inflation, reimbursement spending in British Columbia and Manitoba trends downward.
Out-of-pocket expenses for drugs to treat diabetes rose an average of 6.9 per cent per year from 2010 to 2017. Across provinces, these increases ranged from 0.1 per cent (in New Brunswick) to 11.2 per cent (in Quebec). (See Chart 9.) Because there are no data on the number of individual payers, variation in the level of per-patient costs is unknown. Our analysis assumes that per-patient costs vary with the number of medications required to manage diabetes; the costs are expected to be higher for patients living with more progressive diabetes compared with those whose conditions are less progressive or complicated.23

23 Prescribing practices impact cost variation as well. Specifically, suboptimal treatment and poor health services, for example, might increase cost variation in the long run.
Increases in out-of-pocket costs are especially concerning for low-income patients living with diabetes, who often choose not to purchase medically necessary glucose-lowering drugs due to a lack of coverage or high out-of-pocket payments. Some prescribers have tried to improve medication access for these patients by offering free samples of medication. Other health care professionals have attempted to improve the consistency of medication access by focusing on prescribing medications covered by a patient’s insurance plans and through carefully considering distinct patient characteristics.

The costs of public plans, private programs and out-of-pocket expenses have all increased to some degree between 2010 and 2017 while, over this same period, prevalence rates for diabetes in Canada have grown marginally. (See Chart 10.) More specifically, the prevalence rate for diabetes has increased by an annual average growth rate of 2.8 per cent compared with 14.1 per cent for public programs, 14.7 per cent for private plans, and 6.9 per cent for out-of-pocket expenditures.

**Drug expenditures by glucose-lowering drug classification**

Expenditures by specific glucose-lowering drug class are presented in Table 1. Most of these expenditures represent non-insulin blood glucose-lowering agents (65 per cent), followed by insulins and analogues for injection (35 per cent). Long-acting insulin and analogues (such as insulin degludec and insulin glargine), oral anti-diabetic drug combinations, DPP-4 inhibitors (such as linagliptin and sitagliptin), and SGLT2 inhibitors (such as canagliflozin and dapagliflozin) constitute approximately two-thirds (or $1.2 billion) of all reimbursement costs, which amounted to $1.8 billion in 2017. (See Chart 11.) Reimbursement costs vary significantly between glucose-lowering drug types. For example, the reimbursement costs for SGLT2 inhibitors, a new therapy for patients with diabetes approved for sale in Canada in May 2014, have increased by an average of 370 per cent per year from 2014 to 2017. In contrast, reimbursement costs for thiazolidinediones have decreased by an average of 30 per cent per year over the same period. (See Table 2.)

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24 Interview findings.
25 Ibid.
26 Combination products refer to drugs containing a group of active ingredients under different drug classes that can be used to treat the condition.
27 Reimbursement costs for newly released glucose-lowering drugs, and their respective average annual growth rates, were measured between their release and 2017.
There are several reasons and factors that help to explain why Canadians are spending less on certain drugs and more on others. Sales for SGLT2 inhibitors, for example, continue to grow exponentially because of evidence showing that they can improve health outcomes in some patients with high cardiovascular risk.\(^{28}\) In contrast, sales for thiazolidinediones have slowed significantly because of newer and more effective drugs that have been brought to market and due to their unwanted health side effects like weight gain and heart failure.\(^{29}\)

28 Thewjitcharoen and others, “Effectiveness of Long-Term Treatment With SGLT2 Inhibitors.”
29 Rizos and others, “How Safe Is the Use of Thiazolidinediones in Clinical Practice?”
Table 2
Average annual growth of expenditures on glucose-lowering drugs, 2010–17

<table>
<thead>
<tr>
<th>Drug class</th>
<th>Average annual growth rate (per cent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulins and analogues</td>
<td>10.0</td>
</tr>
<tr>
<td>Long-acting</td>
<td>16.0</td>
</tr>
<tr>
<td>Rapid-acting</td>
<td>8.0</td>
</tr>
<tr>
<td>Intermediate- or long-acting combined with rapid-acting</td>
<td>–3.0</td>
</tr>
<tr>
<td>Intermediate-acting</td>
<td>–2.0</td>
</tr>
<tr>
<td>Non-insulin blood glucose-lowering agents</td>
<td>16.0</td>
</tr>
<tr>
<td>Combinations of oral blood glucose-lowering drugs</td>
<td>49.0</td>
</tr>
<tr>
<td>Dipeptidyl peptidase 4 (DPP-4) inhibitors</td>
<td>30.0</td>
</tr>
<tr>
<td>Sodium-glucose co-transporter 2 (SGLT2) inhibitors (2014–17)</td>
<td>370.0</td>
</tr>
<tr>
<td>Glucagon-like peptide-1 (GLP-1) analogues</td>
<td>126.0</td>
</tr>
<tr>
<td>Biguanides</td>
<td>–4.7</td>
</tr>
<tr>
<td>Sulfonylureas</td>
<td>–2.4</td>
</tr>
<tr>
<td>Thiazolidinediones</td>
<td>–30.0</td>
</tr>
<tr>
<td>Other blood glucose-lowering drugs</td>
<td>–16.0</td>
</tr>
<tr>
<td>Alpha glucosidase inhibitors</td>
<td>–6.0</td>
</tr>
<tr>
<td>All classes</td>
<td>8.3</td>
</tr>
</tbody>
</table>

Note: Average annual growth rate since 2010 except for SGLT2, which begins in 2014.
Source: IQVIA Canada, PharmaStat Plus Database.

Public coverage varies from person to person and from province to province due to distinctions in provincial formularies based on population demographics like age, socio-economic status, and Indigenous identity. Private plans are tailored to individual organizations and differ from public plans in coverage and cost. For example, median reimbursement costs are significantly lower for public plans than for private plans, a difference that continues to increase over time. (See Chart 12.) This difference is partially explained by the fact that public plans negotiate cheaper drug prices than private plans. However, private plans cover a wider variety of drugs than public plans and may cover more expensive drugs than public plans.

Costs per claim and access to medications by drug program

Canada’s complex network of insurance coverage creates disparities in access and affordability for drugs to treat diabetes within and across the provinces. According to Health Canada, there are more than 100 public and 100,000 private prescription drug insurance plans in the country.

31 C.D. Howe Institute, High Drug Prices, Big R&D Spenders and “Free Riders.”
32 Interview findings.
Public insurance plans are typically focused on cost-effectiveness from the perspective of the public payer. This means that patients on public plans are often prescribed drugs determined to be cost-effective for most people, which, in turn, might not meet the needs of patients with unique or special circumstances.³³ In these cases, the administrative burden involved in applying for special exemptions necessary to access drugs not covered by public formularies sometimes prevents patients and providers from accessing these medications in a timely way (if at all).³⁴

Disparities in health coverage across provinces have led to significant interprovincial variation in the use of drugs to treat diabetes. In 2017, a wide variety of active ingredients (A.I.) used to treat diabetes were claimed on public and private plans across Canada. In Quebec, 40 of these ingredients were claimed on public plans compared with 29 in Newfoundland and Labrador and 35 through the federal NHIB program. Compared with public plans, private plans generally fund more clinical compounds, some of which are unique to private plans. Importantly, private plans across the country cover different quantities and types of clinical compounds. In Quebec, for example, four compounds are unique to private plans, compared with 14 in Alberta and Ontario, and 12 in British Columbia and Newfoundland and Labrador. (See Table 3.)

³³ Ibid.
³⁴ Ibid.
Table 3  
Number of active ingredients in diabetes medications claimed, 2017

<table>
<thead>
<tr>
<th>Province</th>
<th>A.I. claimed in public plans</th>
<th>A.I. claimed in private plans</th>
<th>A.I. unique to private plans</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alberta</td>
<td>30</td>
<td>44</td>
<td>14</td>
</tr>
<tr>
<td>British Columbia</td>
<td>33</td>
<td>45</td>
<td>12</td>
</tr>
<tr>
<td>Manitoba</td>
<td>35</td>
<td>41</td>
<td>7</td>
</tr>
<tr>
<td>New Brunswick</td>
<td>35</td>
<td>41</td>
<td>8</td>
</tr>
<tr>
<td>Newfoundland and Labrador</td>
<td>29</td>
<td>41</td>
<td>12</td>
</tr>
<tr>
<td>NHIB program</td>
<td>35</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td>Nova Scotia</td>
<td>30</td>
<td>40</td>
<td>11</td>
</tr>
<tr>
<td>Ontario</td>
<td>32</td>
<td>46</td>
<td>14</td>
</tr>
<tr>
<td>Prince Edward Island</td>
<td>n.a.</td>
<td>38</td>
<td>n.a.</td>
</tr>
<tr>
<td>Quebec</td>
<td>40</td>
<td>44</td>
<td>4</td>
</tr>
<tr>
<td>Saskatchewan</td>
<td>30</td>
<td>39</td>
<td>10</td>
</tr>
</tbody>
</table>

A.I. = active ingredients; n.a. = not available.  
Source: IQVIA Canada, PharmaStat Plus Database.

Many of the above-noted differences in drug coverage occur in a small subset of medications. These include long-acting insulins and analogues, sulfonylureas, glucagon-like peptide-1 (GLP-1) analogues, and combination products. Almost all use of GLP-1 analogue active products is unique to private claimants in every province except Quebec. These differences result partly from the delisting of ingredients by some plans and not others. Delisting typically occurs when an older drug, or newer drug, is removed from an insurer’s list of covered pharmaceuticals due to various reasons, mostly because of cost, ineffectiveness, and/or inferiority to other drugs.\(^{35}\)

The high costs of private plans mean that many patients with low and medium incomes cannot access them without employer-sponsored coverage. This implies that patients who are unable to work, or whose employers provide minimal benefits, may face challenges accessing the medications they need. Some health care professionals claim that access to high-quality care is available only to those with good employment and comprehensive sponsored coverage.\(^{36}\) Access challenges are compounded for patients who do not have access to employer-sponsored coverage, do not qualify for public coverage, and/or who cannot afford private coverage of their own.\(^{37}\)

\(^{35}\) Lasio, Delisting of Pharmaceuticals From Insurance Coverage.  
\(^{36}\) Interview findings.  
\(^{37}\) Ibid.
Summary of findings and discussion

This report reveals several key lessons about the lived experience of patients with diabetes. In particular:

- Expenditures for glucose-lowering medications have grown steadily over the past eight years, consistent with higher prevalence rates for diabetes, longer life expectancies for persons living with diabetes, and the introduction of several important new classes of diabetes medications. The scale of these increases varies across provinces, coverage types, and drug types. Some of these increases result from the development of new medicines—reimbursement costs for SGLT2 inhibitors, for example, increased an average of 370 per cent every year between 2014 and 2017. Managing these costs is a key challenge for patients and for public and private payers.

- Increases in reimbursement costs suggest that plans are focused on ensuring that prescription drug use is cost-effective for the plan. However, excessive focus on cost-effectiveness risks compromising patient outcomes if it restricts patient access to effective and appropriate medications.

- Patients with private insurance coverage generally have more extensive coverage, and have access to more medications, than patients with public coverage. Private plans provide access to a wider variety of medicines than public plans, including to new and innovative medicines that may better meet patients’ individual needs. The high cost of private plans means that they are generally accessible only to high-income earners or to patients with employer-sponsored plans.

- Health insurance inequities persist between privately insured and publicly insured persons with diabetes, warranting careful assessment, further discussion and pharmacare reform—with special interest toward patients with diabetes with no type of insurance support.

Indeed, while our analysis has focused on the experiences of patients with health insurance, it is critical to acknowledge the challenges for patients without health insurance. Many other “underinsured” patients have access to minimal or restricted coverage. Uninsured and underinsured patients represent a key service gap in Canada’s health care system, which is often closely linked with patients’ age, income, employment status, and place of residence.38

Accessing glucose-lowering medications is especially challenging for patients without health insurance. For example, the high cost of some medications means that some uninsured patients cannot afford medically necessary medications like insulin, which can, in turn, severely impact their health outcomes. The challenges posed by high medication costs are sometimes compounded by distance to medical services, the time required to access these services, and transportation costs.39 To help overcome these challenges, patient advocacy organizations, such as the International Diabetes Federation and Diabetes Canada, recommended that ongoing health care reforms consider how to provide equitable access to treatment for uninsured patients living with diabetes.

39 International Diabetes Federation, “Global Survey on Access to Medicines and Supplies for People With Diabetes.”
Conclusion

Patients living with diabetes depend on access to evidence-based, individualized treatments to maintain and improve their health outcomes; reduce complications; and increase their overall quality of life and lifespan. This access depends on efficient interactions between providers, patients, and public and private payers. However, medication access varies across provinces and socio-economic groups. It also varies according to patients’ access to public and private plans. This variation continues to motivate discussion on improving patient access and broader pharmacare reform in Canada.40

Absent from this discussion, however, has been the lived experience of patients and their caregivers. Globally, there is a movement toward value-based health care (VBHC) approaches to health system transformation. At the centre of this movement is a focus on patient-defined outcomes and value of health care. The Conference Board of Canada, with its partners, has launched VBHC Canada to advance this movement in our country.

40 Canadian Pharmacists Association, Prescriptions for a Healthy and Prosperous Canada; Canadian Medical Association, Improving the Health of All Canadians; Mackenzie and Rachlis, The Sustainability of Medicare.
Appendix A

Methodology and analysis

Administrative data: Insurance coverage, claims, and reimbursement for glucose-lowering medications

A pan-Canadian, longitudinal, and prevalence-based approach was employed to analyze the use and reimbursement of glucose-lowering medications. This approach allowed examination of how people living with diabetes obtain their medications, and how this access is affected by their insurance coverage and place of residence.

First, a list of medications available to treat persons living with diabetes was compiled in October and November 2018. This list is based on information from the Anatomical Therapeutic Chemical Classification System (ATC) developed by the World Health Organization. In the ATC classification system, the A10 subgroup includes insulins and analogues, blood glucose-lowering drugs, and other drugs used to treat diabetes. Using this ATC code, a comprehensive list of glucose-lowering drugs approved for sale in Canada (hereafter referred to as the Health Canada list) was retrieved from Health Canada’s Drug Product Database. All drugs containing active ingredients for the treatment of persons living with diabetes are included on the Health Canada list, although they may vary in terms of dosage, form, manufacturer, and route of administration. Some drugs on this list may no longer be available in Canada due to discontinuation by their manufacturer, safety concerns, or other regulatory reasons.

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1 A prevalence-based approach typically examines themes related to cost and cost outcomes that are not based directly on economic principles. Usually, this approach to population economics also looks at broader trends in health services over several years, compared with incidence-based approaches that focus heavily on individual utility maximization.

2 Referred to as aldose reductase inhibitors.

3 Insulins and analogues for inhalation, sulfonamide (glymidine), and aldose reductase inhibitors are not approved for sale in Canada.
Prevalence data were obtained from the Canadian Chronic Disease Surveillance System database, and included data collected from 2010 to 2015. Estimates for 2016 and 2017 data were developed using a combination of provincial and national population estimates produced by Statistics Canada and historical trends in diabetes prevalence by province.4

Claims and reimbursement data were obtained from IQVIA Canada’s PharmaStat Plus database for 2010 to 2017.5 First, data were extracted from PharmaStat Plus for each glucose-lowering drug on the Health Canada list. The detailed drug information on this list was then merged with the claims and reimbursement data. This merge created an integrated working database categorizing all glucose-lowering medications purchased in Canadian retail pharmacies during the eight-year period from 2010 to 2017.

Claims by age were estimated using findings from the Diabetes in Canada6 report, which includes information on the proportions of patients living with diabetes who use:

• insulin
• non-insulin medications only
• insulin and non-insulin medications
• no medications

These proportions were applied to the claims data and then adjusted to generate age profiles for persons living with diabetes who had submitted a claim for (a) prescription drug(s).

Claims in the PharmaStat Plus database are attributed to the primary payer (i.e., payer responsible for the larger portion of the prescription claim). This allows differentiation between claims paid by public or private payers, or through out-of-pocket payments by patients. The PharmaStat Plus database assigns the full reimbursement cost, including dispensing fees, to the primary payer. This means that:

• deductible payments, regardless of whether they are required by public or private plans, are classified as out-of-pocket payments;
• any amounts above the deductible limit are classified as payments by public or private payers, depending on the plan;
• prescriptions paid in cash at retail pharmacies, but later reimbursed by public or private plans, are classified as out-of-pocket payments;
• premiums and co-payments are not included.

Patient and provider interviews: Access to therapies that treat diabetes

Interviews with patients and providers were completed to understand more about patients’ experiences accessing medications to treat diabetes. Lists of interview participants, as well as interview guides, were developed by Conference Board researchers in consultation with Diabetes Canada. Interview questions focused on types of medications, insurance coverage, involvement with the health care system, and the potential role of a national pharmacare program.

5 IQVIA Canada, PharmaStat Plus Database, 2010 to 2017. All data in the charts and tables in this document are special tabulations obtained from IQVIA Canada.
6 Public Health Agency of Canada, Diabetes in Canada.
In total, seven interviews were conducted: three with patients and four with health care providers. Conference Board researchers followed a semi-structured interview process, allowing interviewees to freely report their experiences and allow for the exploration of new viewpoints.

Recorded telephone interviews lasted between 30 and 60 minutes. Findings from these interviews were then incorporated into our discussion of administrative data to help illuminate key barriers to accessing medications. To protect the anonymity of participants, no identifying information has been included.

**Study limitations**

- Data related to medical supplies and devices to treat diabetes, while helpful to analysis of patient utilization rates and expenditures, were omitted from our analysis due to data unavailability.
- Medications provided by private companies through compassionate care programs are not analyzed or incorporated into this analysis. Drugs funded through these programs would alleviate some administrative burden and some costs to persons living with diabetes at the aggregate level.
- This report does not analyze the personal burden imposed on patients living with diabetes, as such analysis was beyond the scope of this report.
- The number of interviews conducted is small and does not necessarily represent the lived experiences of persons with diabetes across Canada.
- It is possible that our analysis underestimates out-of-pocket payments, due to potential misclassification bias. For example, our analysis assumes that any payments over the deductible limit are covered by patients’ insurance plans, whether private or public. As a result, our analysis does not include instances where such payments are not covered by patients’ insurance plans. Lastly, our analysis did not quantify the out-of-pocket value associated with prescriptions that could be filled if affordability were not an issue for some persons living with diabetes.
- This report does not quantify any correlations or covariance between the variables discussed, including patient access against insurance co-payments, deductibles, annual maximums, lifetime maximums, private coverage, and public coverage. This type of economic analysis was beyond the scope of this report and is therefore an area for future research within the Canadian context.

7 Health care providers include one registered nurse, one registered dietitian, and two registered pharmacists.
8 Aira and others, “Factors Influencing Inquiry About Patients’ Alcohol Consumption.”
9 Personal burden (also known as health-related quality of life, or HRQoL) is defined as the distinct conditions that affect persons living with diabetes, both objectively and subjectively.
Active ingredients were identified and cross-referenced using several databases, including those found on Diabetes Canada, Health Canada, and the Canadian Agency for Drugs and Technologies in Health. Of course, there are subcategories and sub-classes for many drugs listed below; however, these overarching categories were also selected due to their similarity to the IQVIA Canada PharmaStat database. While these databases do include drug identification numbers (DIN) for each reimbursement cost listed, our analysis did not evaluate cost growth or claims growth for each specific DIN and instead chose to examine broader glucose-lowering drug categories.

Medications to treat diabetes that were released between 2010 and 2017 and post-2017 are identified below by NOC (Notice of Compliance) followed by the year in which they were available for commercialization in Canada. This information is critical in understanding why some drug types have undergone exponential growth in our period of analysis—such as the SGLT2 inhibitors that were released post-2010 and replaced older medications that were not as effective for many patients.

**Insulins and analogues for injection, rapid-acting**
- Insulin aspart
- Insulin glulisine
- Insulin injection human biosynthetic
- Insulin lispro
- Insulin semisynthetic human

**Insulins and analogues for injection, intermediate-acting**
- Insulin biosynthetic human BR
- Insulin isophane human biosynthetic
- Insulin isophane injection pork
- Insulin NPH human DNA origin
Insulins and analogues for injection, long-acting

- Insulin degludec (NOC, 2017)
- Insulin detemir
- Insulin glargine
- Insulin glargine, lixisenatide (NOC, 2018)
- Insulin degludec, liraglutide (NOC, 2018)

Insulins and analogues for injection, intermediate- or long-acting combined with rapid-acting

- Insulin aspart, insulin aspart protamine
- Insulin isophane (NPH), insulin
- Insulin isophane human biosynthetic, insulin injection human biosynthetic
- Insulin lispro, insulin lispro protamine suspension

Biguanides

- Metformin hydrochloride

Sulfonylureas

- Chlorpropamide
- Gliclazide
- Glimepiride
- Glyburide
- Tolbutamide

Alpha glucosidase inhibitors

- Acarbose

Thiazolidinediones

- Pioglitazone
- Rosiglitazone

Dipeptidyl peptidase 4 (DPP-4) inhibitors

- Alogliptin (NOC, 2014)
- Linagliptin (NOC, 2011)
- Saxagliptin
- Sitagliptin

Glucagon-like peptide-1 (GLP-1) analogues

- Dulaglutide (NOC, 2015)
- Exenatide (NOC, 2011)
- Liraglutide (NOC, 2010)
- Lixisenatide (NOC, 2017)
- Semaglutide (NOC, 2018)

Meglitinides

- Repaglinide

Sodium-glucose co-transporter 2 (SGLT2) inhibitors

- Canagliflozin (NOC, 2014)
- Dapagliflozin (NOC, 2014)
- Empagliflozin (NOC, 2016)
- Ertugliflozin (NOC, 2018)

Combinations of oral blood glucose-lowering drugs

- Linagliptin (NOC, 2011), empagliflozin (NOC, 2016)
- Metformin Hydrochloride, alogliptin (NOC, 2014)
- Metformin Hydrochloride, canagliflozin (NOC, 2014)
- Metformin Hydrochloride, dapagliflozin (NOC, 2014)
- Metformin Hydrochloride, empagliflozin (NOC, 2016)
- Metformin Hydrochloride, ertugliflozin (NOC, 2018)
- Metformin Hydrochloride, linagliptin (NOC, 2011)
- Metformin Hydrochloride, saxagliptin
- Metformin Hydrochloride, sitagliptin
- Saxagliptin, apagliflozin (NOC, 2014)
- Sitagliptin, Ertugliflozin (NOC, 2018)
### Table 1

**Age composition of persons living with diabetes in Canada: 2010–17**

*(number of persons; per cent)*

<table>
<thead>
<tr>
<th></th>
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<th></th>
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<tbody>
<tr>
<td>&lt; 19</td>
<td>24,400</td>
<td>24,660</td>
<td>24,840</td>
<td>25,020</td>
<td>25,070</td>
<td>24,170</td>
<td>25,315</td>
<td>26,513</td>
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<tr>
<td>Per cent</td>
<td>0.93</td>
<td>0.9</td>
<td>0.88</td>
<td>0.85</td>
<td>0.82</td>
<td>0.79</td>
<td>0.79</td>
<td>0.79</td>
</tr>
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<td>20–34</td>
<td>78,130</td>
<td>80,200</td>
<td>81,720</td>
<td>83,570</td>
<td>85,300</td>
<td>84,380</td>
<td>88,376</td>
<td>92,561</td>
</tr>
<tr>
<td>Per cent</td>
<td>2.99</td>
<td>2.94</td>
<td>2.88</td>
<td>2.84</td>
<td>2.8</td>
<td>2.75</td>
<td>2.75</td>
<td>2.75</td>
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<tr>
<td>35–49</td>
<td>340,570</td>
<td>346,990</td>
<td>349,370</td>
<td>351,650</td>
<td>354,420</td>
<td>348,280</td>
<td>364,773</td>
<td>382,046</td>
</tr>
<tr>
<td>Per cent</td>
<td>13.04</td>
<td>12.71</td>
<td>12.31</td>
<td>11.94</td>
<td>11.62</td>
<td>11.36</td>
<td>11.36</td>
<td>11.36</td>
</tr>
<tr>
<td>50–64</td>
<td>897,040</td>
<td>926,550</td>
<td>951,800</td>
<td>980,130</td>
<td>1,006,400</td>
<td>1,003,490</td>
<td>1,051,010</td>
<td>1,100,780</td>
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<tr>
<td>Per cent</td>
<td>34.33</td>
<td>33.93</td>
<td>33.54</td>
<td>33.27</td>
<td>32.99</td>
<td>32.74</td>
<td>32.74</td>
<td>32.74</td>
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<td>&gt;65</td>
<td>1,272,580</td>
<td>1,352,600</td>
<td>1,430,110</td>
<td>1,505,770</td>
<td>1,579,730</td>
<td>1,604,340</td>
<td>1,680,313</td>
<td>1,759,884</td>
</tr>
<tr>
<td>Per cent</td>
<td>48.71</td>
<td>49.53</td>
<td>50.39</td>
<td>51.11</td>
<td>51.78</td>
<td>52.35</td>
<td>52.35</td>
<td>52.35</td>
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<tr>
<td>Total</td>
<td>2,612,720</td>
<td>2,731,000</td>
<td>2,837,840</td>
<td>2,946,140</td>
<td>3,050,920</td>
<td>3,064,660</td>
<td>3,209,787</td>
<td>3,361,784</td>
</tr>
</tbody>
</table>

*Sources: Government of Canada, Canadian Chronic Disease Surveillance System; Public Health Agency of Canada, *Diabetes in Canada.*

### Table 2

**Claims distribution by age group, 2010–17**

*(number of persons)*

<table>
<thead>
<tr>
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<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 19</td>
<td>200,069</td>
<td>206,946</td>
<td>214,120</td>
<td>219,252</td>
<td>224,130</td>
<td>228,403</td>
<td>242,344</td>
<td>275,071</td>
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<tr>
<td>20–34</td>
<td>615,742</td>
<td>646,889</td>
<td>677,055</td>
<td>703,879</td>
<td>732,968</td>
<td>766,401</td>
<td>813,167</td>
<td>960,317</td>
</tr>
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<td>35–49</td>
<td>2,666,940</td>
<td>2,780,983</td>
<td>2,876,123</td>
<td>2,942,961</td>
<td>3,026,081</td>
<td>3,143,194</td>
<td>3,334,990</td>
<td>3,959,750</td>
</tr>
<tr>
<td>50–64</td>
<td>7,907,408</td>
<td>8,359,220</td>
<td>8,820,294</td>
<td>9,233,642</td>
<td>9,672,716</td>
<td>10,194,624</td>
<td>10,816,684</td>
<td>11,426,265</td>
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<tr>
<td>&gt;65</td>
<td>11,410,435</td>
<td>12,412,550</td>
<td>13,480,361</td>
<td>14,429,217</td>
<td>15,443,845</td>
<td>16,578,656</td>
<td>17,590,258</td>
<td>18,258,736</td>
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<tr>
<td>Total</td>
<td>22,800,594</td>
<td>24,406,589</td>
<td>26,067,953</td>
<td>27,528,952</td>
<td>29,099,741</td>
<td>30,911,278</td>
<td>32,797,443</td>
<td>34,880,140</td>
</tr>
</tbody>
</table>

*Sources: Government of Canada, Canadian Chronic Disease Surveillance System; Public Health Agency of Canada, *Diabetes in Canada.*
### Table 3
**Claims distribution by province, 2010–17**

<table>
<thead>
<tr>
<th>Province/NIHB</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>AAGR (per cent)</th>
<th>Absolute growth (per cent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alberta</td>
<td>1,423,689</td>
<td>1,538,906</td>
<td>1,667,100</td>
<td>1,737,114</td>
<td>1,806,013</td>
<td>1,951,595</td>
<td>2,069,936</td>
<td>2,201,572</td>
<td>6.4</td>
<td>55.0</td>
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<tr>
<td>British Columbia</td>
<td>1,876,403</td>
<td>1,894,738</td>
<td>2,016,564</td>
<td>2,017,603</td>
<td>2,095,774</td>
<td>2,164,232</td>
<td>2,351,297</td>
<td>2,429,192</td>
<td>3.8</td>
<td>29.0</td>
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<tr>
<td>Manitoba</td>
<td>641,647</td>
<td>637,290</td>
<td>704,552</td>
<td>743,997</td>
<td>774,895</td>
<td>831,846</td>
<td>900,581</td>
<td>954,542</td>
<td>5.9</td>
<td>49.0</td>
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<tr>
<td>New Brunswick</td>
<td>401,377</td>
<td>426,126</td>
<td>461,069</td>
<td>481,813</td>
<td>495,680</td>
<td>517,211</td>
<td>545,213</td>
<td>569,702</td>
<td>5.1</td>
<td>42.0</td>
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<tr>
<td>Newfoundland and Labrador</td>
<td>355,293</td>
<td>373,777</td>
<td>384,424</td>
<td>385,885</td>
<td>396,835</td>
<td>411,481</td>
<td>425,141</td>
<td>447,819</td>
<td>3.4</td>
<td>26.0</td>
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<tr>
<td>NIHB</td>
<td>696,850</td>
<td>748,577</td>
<td>806,454</td>
<td>812,955</td>
<td>845,252</td>
<td>942,335</td>
<td>1,009,296</td>
<td>1,066,866</td>
<td>6.3</td>
<td>53.0</td>
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<tr>
<td>Nova Scotia</td>
<td>527,191</td>
<td>559,042</td>
<td>577,737</td>
<td>602,386</td>
<td>611,551</td>
<td>646,470</td>
<td>671,238</td>
<td>708,453</td>
<td>4.3</td>
<td>34.0</td>
</tr>
<tr>
<td>Ontario</td>
<td>6,957,494</td>
<td>7,732,372</td>
<td>8,252,325</td>
<td>8,858,727</td>
<td>9,459,034</td>
<td>10,146,472</td>
<td>10,674,879</td>
<td>11,528,317</td>
<td>7.5</td>
<td>66.0</td>
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<td>Prince Edward Island</td>
<td>20,811</td>
<td>22,483</td>
<td>23,921</td>
<td>25,914</td>
<td>39,473</td>
<td>61,364</td>
<td>64,917</td>
<td>67,516</td>
<td>20</td>
<td>224.0</td>
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<td>Quebec</td>
<td>9,377,168</td>
<td>9,922,238</td>
<td>10,578,470</td>
<td>11,244,106</td>
<td>11,923,615</td>
<td>12,529,284</td>
<td>13,343,908</td>
<td>14,136,489</td>
<td>6</td>
<td>51.0</td>
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<tr>
<td>Saskatchewan</td>
<td>522,671</td>
<td>551,040</td>
<td>595,337</td>
<td>618,452</td>
<td>651,619</td>
<td>708,988</td>
<td>741,037</td>
<td>769,672</td>
<td>5.7</td>
<td>47.0</td>
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<tr>
<td>Total</td>
<td>22,800,594</td>
<td>24,406,589</td>
<td>26,067,953</td>
<td>27,528,952</td>
<td>29,099,741</td>
<td>30,911,278</td>
<td>32,797,443</td>
<td>34,880,140</td>
<td>6.3</td>
<td>53.0</td>
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</tbody>
</table>

Note: NIHB included in grand totals.

Sources: Public Health Agency of Canada, Diabetes in Canada; IQVIA Canada, PharmaStat Plus Database.

### Table 4
**Claim type distribution, 2010–17**

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</tr>
</thead>
<tbody>
<tr>
<td>Oral medication only</td>
<td>852,204</td>
<td>905,791</td>
<td>957,697</td>
<td>1,008,364</td>
<td>1,057,893</td>
<td>1,074,373</td>
<td>1,125,250</td>
<td>1,178,536</td>
<td>1,238,783</td>
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<tr>
<td>Oral medication and insulin</td>
<td>142,529</td>
<td>151,491</td>
<td>160,172</td>
<td>168,464</td>
<td>176,930</td>
<td>179,686</td>
<td>188,192</td>
<td>197,197</td>
<td>206,470</td>
<td></td>
</tr>
<tr>
<td>Insulin only</td>
<td>100,110</td>
<td>106,405</td>
<td>112,502</td>
<td>118,454</td>
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<td>126,208</td>
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<td>138,444</td>
<td>143,026</td>
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<tr>
<td>No medication, no insulin</td>
<td>401,377</td>
<td>426,126</td>
<td>461,069</td>
<td>481,813</td>
<td>495,680</td>
<td>517,211</td>
<td>545,213</td>
<td>569,702</td>
<td>610,051</td>
<td></td>
</tr>
<tr>
<td>Total unadjusted estimate</td>
<td>29,008,553</td>
<td>30,339,781</td>
<td>31,548,001</td>
<td>32,771,971</td>
<td>33,955,768</td>
<td>35,740,034</td>
<td>37,432,478</td>
<td>39,111,278</td>
<td>40,880,140</td>
<td></td>
</tr>
</tbody>
</table>

Note: Unadjusted and adjusted estimates were calculated based on various estimates using Conference Board methodology.

Sources: Public Health Agency of Canada, Diabetes in Canada; IQVIA Canada, PharmaStat Plus Database.
Table 5
Expenditure distribution by drug classification, 2010–17
($)

<table>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfonylureas</td>
<td>53,350,831</td>
<td>54,924,301</td>
<td>54,284,646</td>
<td>54,198,420</td>
<td>55,796,294</td>
<td>51,902,966</td>
<td>49,910,354</td>
<td>44,489,245</td>
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<tr>
<td>Combinations of oral blood glucose-lowering drugs</td>
<td>23,566,786</td>
<td>23,264,862</td>
<td>49,420,399</td>
<td>96,292,720</td>
<td>145,824,714</td>
<td>200,288,932</td>
<td>258,690,492</td>
<td>313,214,738</td>
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<td>Thiazolidinediones</td>
<td>123,709,410</td>
<td>81,251,043</td>
<td>45,783,889</td>
<td>25,191,920</td>
<td>17,527,825</td>
<td>13,746,596</td>
<td>11,344,468</td>
<td>9,110,471</td>
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<tr>
<td>Glucagon-like peptide-1 (GLP-1) analogues</td>
<td>3,946,733</td>
<td>30,342,528</td>
<td>55,766,607</td>
<td>71,017,025</td>
<td>83,234,135</td>
<td>96,915,309</td>
<td>128,913,653</td>
<td>176,410,558</td>
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<tr>
<td>Sodium-glucose co-transporter 2 (SGLT2) inhibitors</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>8,634,792</td>
<td>93,433,207</td>
<td>185,862,574</td>
<td>238,273,079</td>
</tr>
<tr>
<td>Other blood glucose-lowering drugs, excl. insulins</td>
<td>16,183,902</td>
<td>11,566,561</td>
<td>9,291,721</td>
<td>7,274,067</td>
<td>6,832,190</td>
<td>6,419,152</td>
<td>5,379,240</td>
<td>4,682,689</td>
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<tr>
<td>Insulins and analogues for injection, intermediate-acting</td>
<td>43,920,511</td>
<td>45,574,369</td>
<td>45,538,739</td>
<td>43,755,703</td>
<td>42,438,662</td>
<td>40,900,585</td>
<td>39,236,513</td>
<td>37,909,953</td>
</tr>
<tr>
<td>Insulins and analogues for injection, intermediate- or long-acting combined with rapid-acting</td>
<td>49,167,372</td>
<td>51,531,715</td>
<td>52,313,850</td>
<td>51,122,807</td>
<td>49,582,262</td>
<td>47,002,121</td>
<td>43,921,085</td>
<td>40,190,442</td>
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<tr>
<td>Insulins and analogues for injection, long-acting</td>
<td>134,099,593</td>
<td>165,825,210</td>
<td>205,824,703</td>
<td>247,931,131</td>
<td>289,786,221</td>
<td>323,614,486</td>
<td>357,632,485</td>
<td>382,530,433</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>760,910,482</strong></td>
<td><strong>844,884,667</strong></td>
<td><strong>955,341,397</strong></td>
<td><strong>1,069,388,718</strong></td>
<td><strong>1,203,571,454</strong></td>
<td><strong>1,394,184,081</strong></td>
<td><strong>1,627,377,350</strong></td>
<td><strong>1,826,328,641</strong></td>
</tr>
</tbody>
</table>

Source: IQVIA Canada, PharmaStat Plus Database.
Appendix D

Bibliography


Where insights meet impact

Accessing Diabetes Medications: A Pan-Canadian Analysis of Patient Experiences
Cameron MacLaine, Junyi Feng, Monika Slovinec D’Angelo, and Nigel Russell


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