

CHAPTER 5: HEALTH SERVICES AND QUALITY OF CARE

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KEY FINDINGS

- The **quality of diabetes services** in the Mississauga OHT is **broadly similar to those** in the rest of **Ontario**.
- Diabetes Canada's recommended ideal standard for **regular blood glucose monitoring (HbA_{1c} testing)** was not met in more than 50% of people with diabetes in the Mississauga OHT.
- Nearly 40% of people with diabetes in the Mississauga OHT did not meet Diabetes Canada's **ideal recommended target HbA_{1c} level**.
- Diabetes Canada's recommended ideal standard for **regular blood cholesterol monitoring (LDL cholesterol testing)** was not met in around 30% of people with diabetes in the Mississauga OHT.
- 43% of people with diabetes in the Mississauga OHT did not meet Diabetes Canada's recommended **ideal target cholesterol level**.
- Diabetes Canada's recommended **ideal standard for regular retinopathy** (eye) screening was not met in around 45% of people with diabetes in the Mississauga OHT.
- The proportion of those attending **retinopathy screening** was slightly lower in the Mississauga OHT than in the rest of Ontario.
- In the Mississauga OHT, 65% and 74% of people with diabetes aged 65 years or older received **kidney- and heart-protective medications**; these figures fell short of the recommended ideal standard benchmark of 80% despite these medications being subsidized by the provincial drug benefit plan.



INTRODUCTION

Type 2 diabetes (90% of all diabetes) is a lifelong chronic disease that requires multifaceted management, including nutrition and physical activity support, medications, and regular healthcare visits and testing. Intensive type 2 diabetes management supported by a professional team has been shown to prevent the health consequences of diabetes known as “complications” (e.g., heart attack, stroke).¹⁻³ Diabetes management includes lifestyle modifications and medications for blood sugar (glucose) control, regular monitoring of diabetes control and early signs of complications, and medications to prevent vascular consequences, such as heart attack and stroke.

Thus, Diabetes Canada’s *Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada* recommend that health services for people with type 2 diabetes should include regular monitoring of blood glucose (glycated hemoglobin or HbA_{1c}), blood cholesterol (low-density lipoprotein or LDL), the eyes (checking for retinopathy), and the feet.¹

Many people with diabetes are also recommended to take heart- and kidney-protective medications to help prevent complications (e.g., angiotensin-converting enzyme (ACE) inhibitors, angiotensin-receptor blockers (ARBs), and statins).⁴⁻⁶ These tests and preventive treatments are collectively known as “processes of care.” We defined five indicators to assess the quality of these processes of care within eligible age groups (see *Exhibit 5.1*).

Aside from processes of care, the quality of type 2 diabetes care can also be measured by examining various “outcomes of care.” These outcomes include the levels of blood sugar and cholesterol and whether these levels meet Diabetes Canada’s recommended targets. It has been shown that meeting these targets helps prevent complications.^{4,7} People with type 2 diabetes may require admission to the hospital to treat the immediate short-term complications of abnormal blood sugars (e.g., diabetic ketoacidosis, hypoglycemia) and complications that occur because of

long-term high blood sugars (e.g., heart attack, stroke).

In Ontario, health services are administered at the level of the Ontario Health Team (OHT).⁸ Because the Mississauga OHT serves many individuals living in Mississauga and throughout Peel Region (see Chapter 2), our team chose Mississauga OHT as the focus for this chapter. Our objectives were to determine (1) whether Mississauga OHT meets the recommended ideal standards for type 2 diabetes care (see *Exhibit 5.1*); (2) how Mississauga OHT’s performance compares to Ontario; and (3) how Mississauga OHT’s performance has changed during the peak of the coronavirus disease 2019 (COVID-19) pandemic from 2019 to 2022.

Type of Indicator	Indicator	Definition and/or recommended ideal standard of care	Age Group*
Processes of Care	Blood sugar (HbA _{1c}) monitoring	At least two HbA _{1c} tests in the past 12 months	≥40 years
	Blood cholesterol monitoring	At least one low density lipoprotein (LDL) cholesterol test in the past 12 months	≥40 years
	Screening for eye disease (retinopathy)	Attended an eye exam in the past 24 months	≥40 years
	Kidney-protective medication prescription	At least one prescription for ACE inhibitor or ARB filled within the past 12 months	≥66 years
	Heart-protective medication prescription	At least one prescription for statin filled within the past 12 months	≥66 years
Outcomes of Care	Blood sugar (HbA _{1c}) on target	Mean HbA _{1c} level ≤7% among those with at least one test performed	≥40 years
	Blood cholesterol on target	Mean LDL cholesterol level ≤2 mmol/L among those with at least one test performed	≥40 years
	Short-term complications (hospitalizations only)	Rate of hospitalization (per 1,000 population) for a short-term complication: diabetic ketoacidosis, hyperglycemic hyperosmolar state, mixed ketoacidosis, hypoglycemic or insulin coma	≥18 years
	Long-term complications (hospitalizations only)	Rate of hospitalization (per 1,000 population) for a long-term complication: ophthalmic, renal, neurologic, circulatory, or multiple complications of diabetes	≥18 years

Exhibit 5.1 Classification of indicators for health services and quality of care. Unless otherwise indicated, all values are percentages of adults in the age group listed in the last column. The recommended ideal standard is no short- or long-term complications, and 100% achievement of the other indicators, except for prescriptions. The recommended ideal standard for the prescription indicators is at least 80% of the population, based on our previous work.⁹

*Age groups vary based on data availability

METHODS

This was a retrospective descriptive study of adults with diabetes (both type 1 and type 2) using population-based healthcare administrative data housed at ICES (see Technical Appendix for details). We evaluated diabetes care process and outcome in adults assigned to the Mississauga Ontario Health Team (OHT) and the entire adult population of Ontario (inclusive of Mississauga OHT). Adults assigned to the Mississauga OHT include (1) those whose primary care physician was assigned to the Mississauga OHT; or (2) those without a primary care physician but resided in a neighbourhood where the majority of residents had a primary care physician assigned to the Mississauga OHT (see Technical Appendix for details). Processes and outcomes of care listed in Exhibit 5.1 were reported for each fiscal year between April 1, 2019 to March 31, 2022. Results were presented for the Mississauga OHT overall and stratified by area of residence (East Mississauga, Southwest Mississauga, Northwest Mississauga, outside Mississauga).



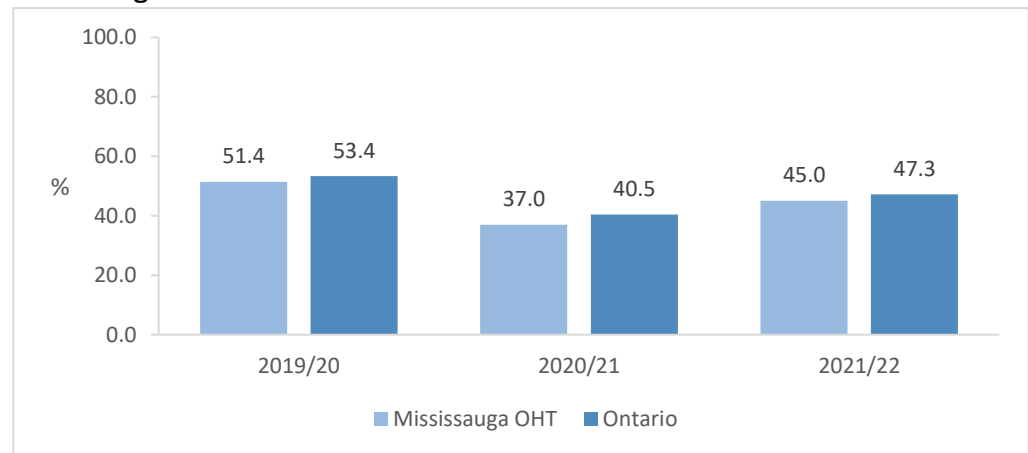
RESULTS

Blood Sugar Monitoring (HbA_{1c} Testing)

Key Findings

- Diabetes Canada’s recommended ideal standard for regular blood glucose monitoring (HbA_{1c} testing) was not met in **more than 50% of people with diabetes in the Mississauga OHT.**
- HbA_{1c} testing frequency in the Mississauga OHT was marginally lower than Ontario.
- Within the Mississauga OHT, HbA_{1c} testing frequency was marginally higher among those residing within Mississauga compared to those living outside Mississauga.
- During the peak of the COVID-19 pandemic (2020/21), HbA_{1c} testing frequency dropped by a greater extent in the Mississauga OHT (absolute reduction: 14.5%) than in Ontario (absolute reduction: 12.9%) but partially recovered to pre-pandemic levels in 2021/22.

A. Blood Sugar Monitoring (HbA_{1c} Testing) in Adults with Diabetes Assigned to Mississauga OHT and the Province of Ontario



B. Blood Sugar Monitoring (HbA_{1c} Testing) in Adults with Diabetes Assigned to Mississauga OHT, Stratified by Area of Residence

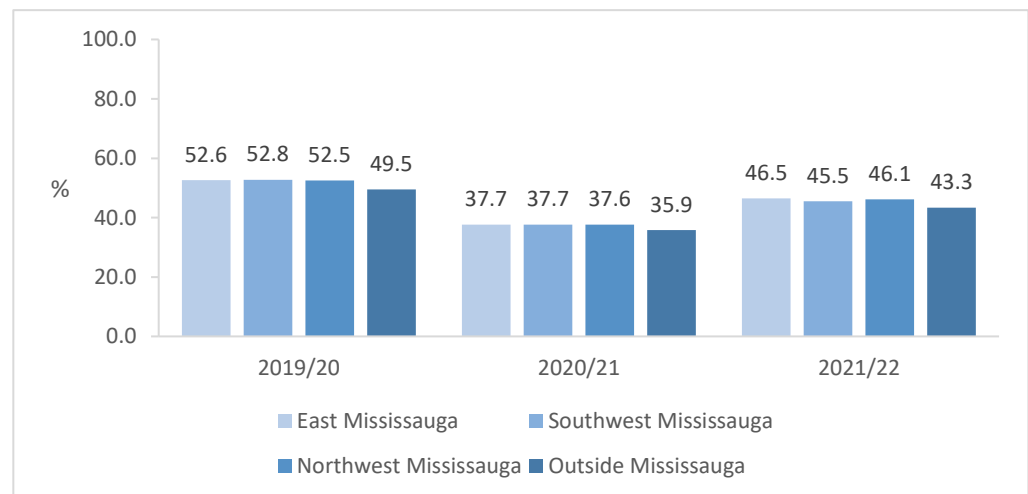


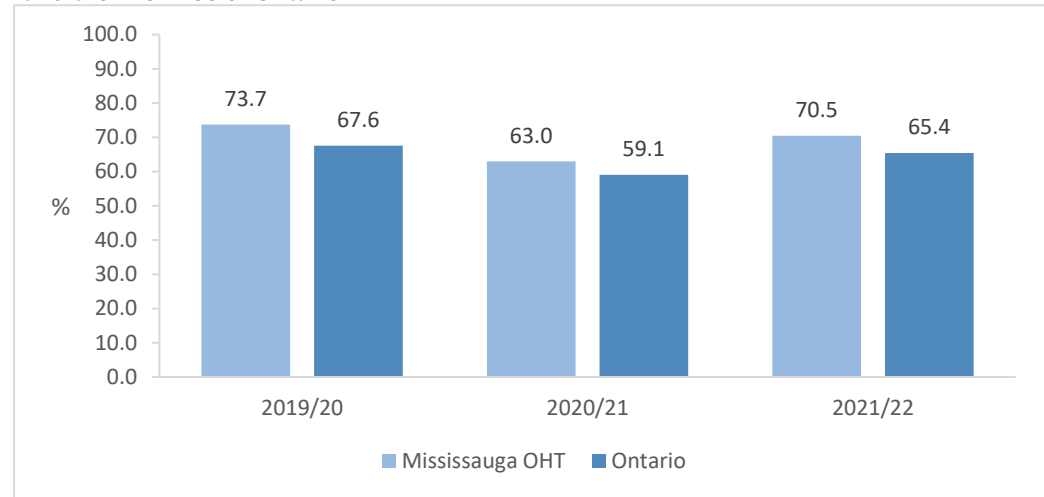
Exhibit 5.2 Percentage of adults with diabetes (aged ≥40 years) receiving at least two HbA_{1c} tests in the past 12 months.

LDL Cholesterol Monitoring

Key Findings

- Diabetes Canada’s recommended ideal standard for regular blood cholesterol monitoring (LDL cholesterol testing) was not met in around **30% of people with diabetes** in the Mississauga OHT.
- LDL cholesterol testing frequency in the Mississauga OHT was higher than Ontario.
- Within the Mississauga OHT, LDL cholesterol testing frequency was marginally higher among those residing within Mississauga compared to those living outside Mississauga.
- During the peak of the COVID-19 pandemic (2020/21), LDL cholesterol testing frequency dropped by a greater extent in the Mississauga OHT (absolute reduction: 10.7%) than in Ontario (absolute reduction: 8.5%) but nearly recovered to pre-pandemic levels in 2021/22

A. LDL Cholesterol Monitoring in Adults with Diabetes Assigned to Mississauga OHT and the Province of Ontario



B. LDL Cholesterol Monitoring in Adults with Diabetes Assigned to Mississauga OHT, Stratified by Area of Residence

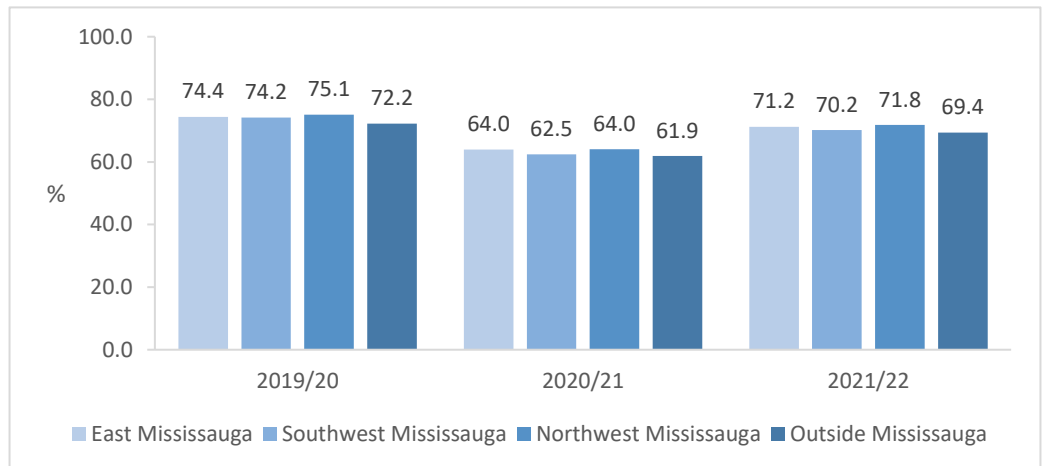


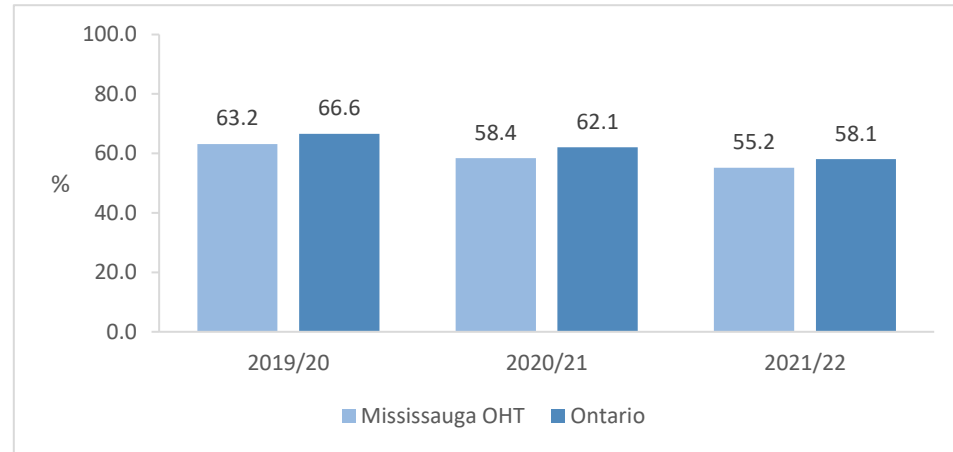
Exhibit 5.3 Percentage of individuals receiving at least one LDL cholesterol test in the past 12 months among people aged ≥40 years, stratified by year and place of residence.

Retinopathy Screening

Key Findings

- Diabetes Canada’s recommended ideal standard for regular retinopathy screening was not met in around **45% of people with diabetes** in the Mississauga OHT.
- The proportion of those attending retinopathy screening was slightly lower in the Mississauga OHT than Ontario.
- Within the Mississauga OHT, the proportion of those attending retinopathy screening was higher among those residing within Mississauga compared to those living outside Mississauga.
- During the peak of the COVID-19 pandemic (2020/21), the proportion of those attending retinopathy screening dropped to a similar extent in the Mississauga OHT and Ontario.

A. Retinopathy Screening in Adults with Diabetes Assigned to Mississauga OHT and the Province of Ontario



B. Retinopathy Screening in Adults with Diabetes Assigned to Mississauga OHT, Stratified by Area of Residence

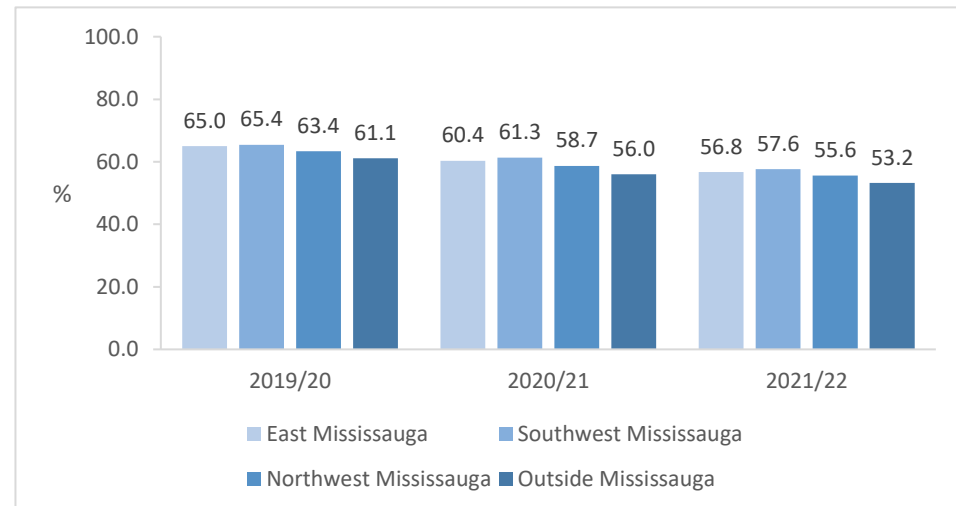


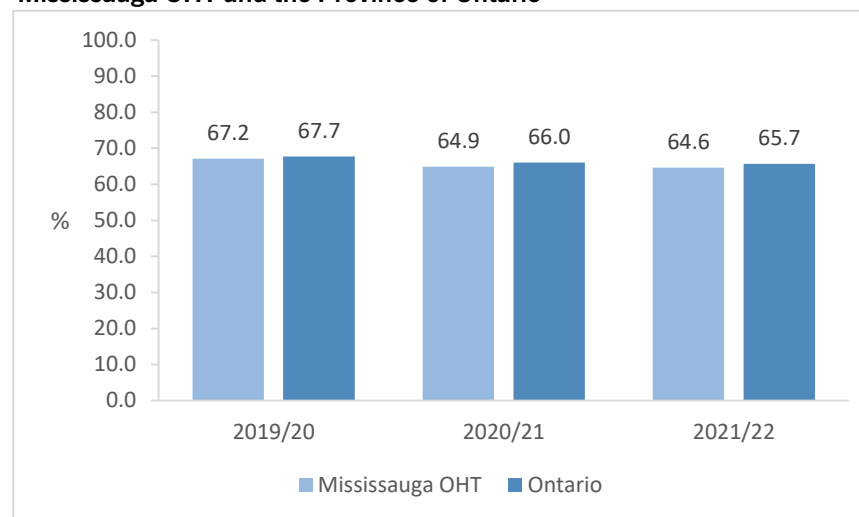
Exhibit 5.4 Percentage of adults with diabetes (aged ≥ 40 years) attending screening for eye disease (retinopathy) in the past 24 months, stratified by year and place of residence.

Medication Prescriptions

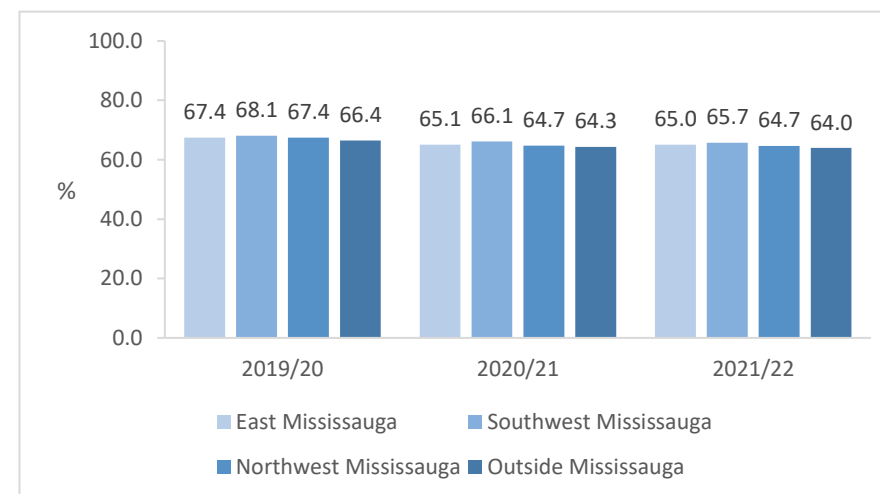
Key Findings

- In the Mississauga OHT, 65% and 74% of people with diabetes aged 65 years or older received kidney- and heart-protective medications; these figures fell short of the recommended ideal standard benchmark of 80%, despite these medications being subsidized by the provincial drug benefit plan.
- The proportion of those aged 65 years or older with at least one prescription filled for ACE inhibitor, ARB, or statin was similar in the Mississauga OHT (especially those living in Mississauga) and Ontario.
- During the peak of the COVID-19 pandemic, the proportion of those with at least one prescription filled for ACE inhibitor or ARB dropped more in the Mississauga OHT (absolute reduction 2.3%) than in Ontario (absolute reduction 1.6%).
- During the peak of the COVID-19 pandemic, the proportion of those with at least one prescription filled for statin fluctuated with a slight drop in the Mississauga OHT (absolute reduction 0.8%) and an even smaller drop in Ontario (absolute reduction 0.2%), but has now improved beyond pre-pandemic levels in the Mississauga OHT and Ontario.

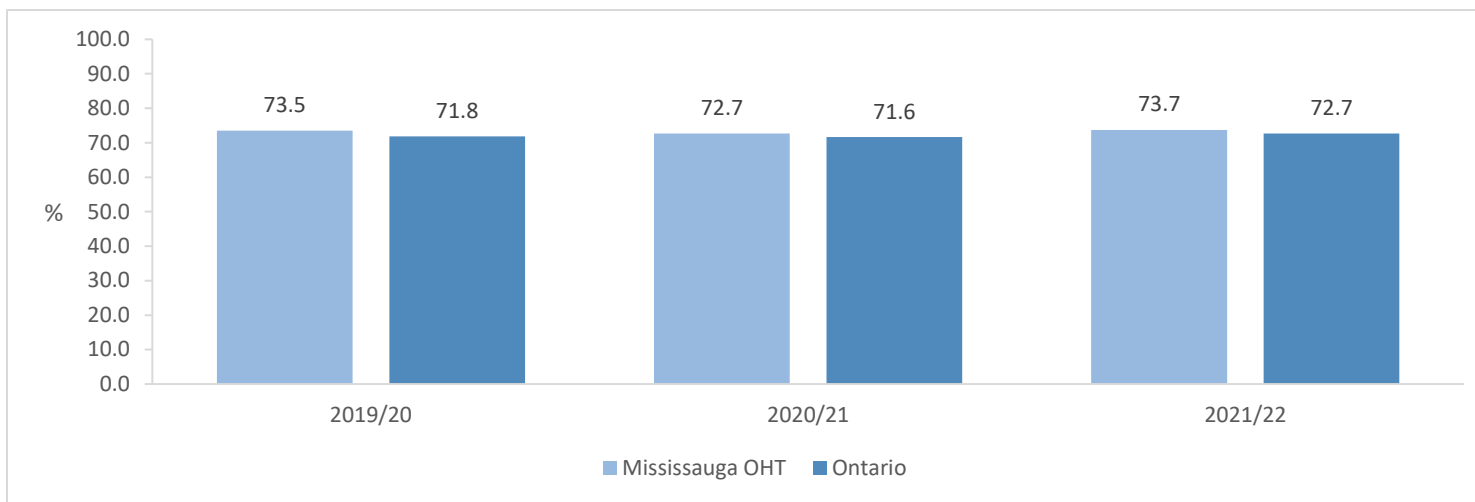
A. Kidney-Protective Medication Prescriptions in Adults with Diabetes Assigned to Mississauga OHT and the Province of Ontario



B. Kidney-Protective Medication Prescriptions in Adults with Diabetes Assigned to Mississauga OHT, Stratified by Area of Residence



C. Heart-Protective Medication Prescriptions in Adults with Diabetes Aged 65 Years or Older Assigned to Mississauga OHT and the Province of Ontario



D. Heart-Protective Medication Prescriptions in Adults with Diabetes Aged 65 Years or Older Assigned to Mississauga OHT, Stratified by Area of Residence

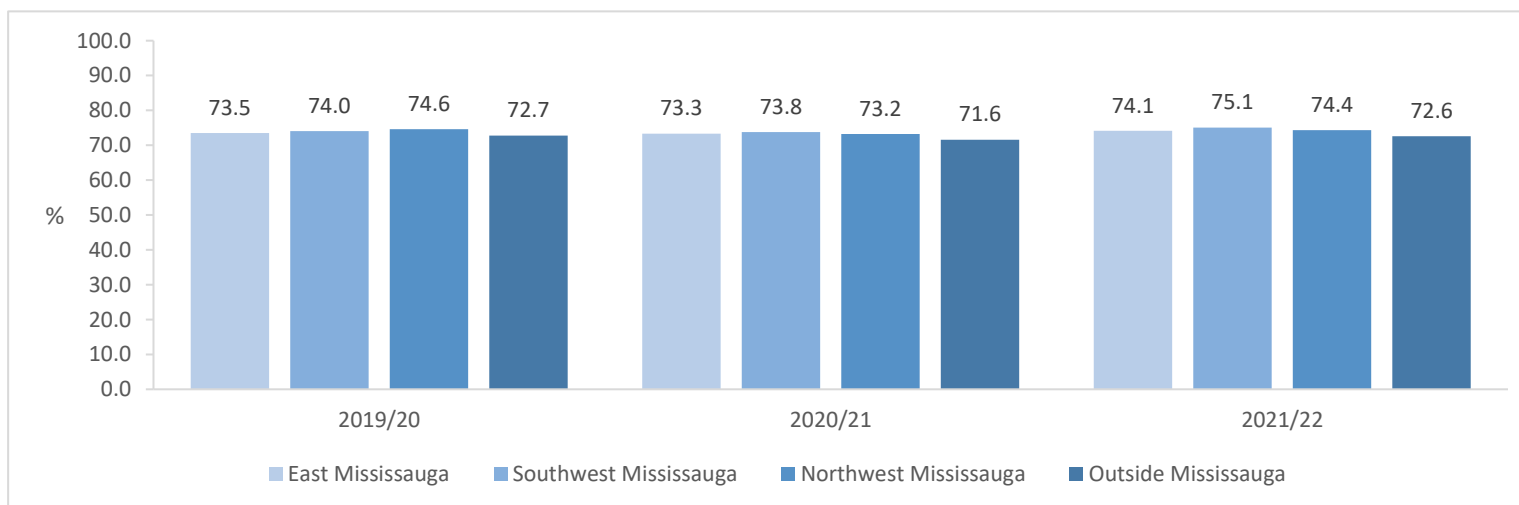


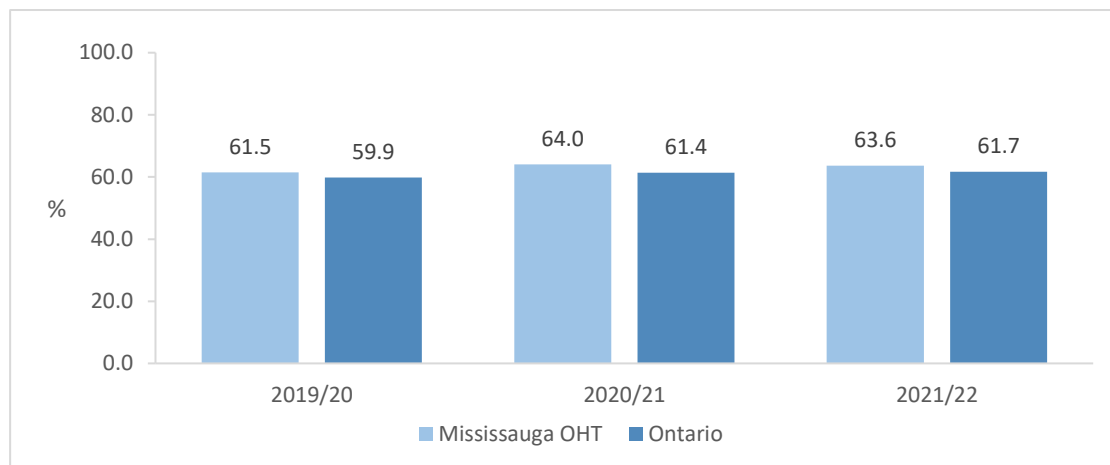
Exhibit 5.5 Percentage of adults with diabetes (aged ≥ 65 years) with at least one prescription filled within the past 12 months for (A, B) ACE inhibitor or ARB, and (C, D) statin. Results are stratified by year and place of residence.

Blood Sugar on Target

Key Findings

- Nearly 40% of people with diabetes in the Mississauga OHT did not meet Diabetes Canada’s ideal recommended target HbA_{1c} level.
- The proportion of those achieving HbA_{1c} ≤7% was slightly higher in Mississauga OHT than Ontario.
- Within Mississauga OHT, the proportion of those achieving HbA_{1c} ≤7% was slightly higher among those residing within Mississauga compared to those living outside Mississauga.
- During the peak of the COVID-19 pandemic, the proportion of those achieving HbA_{1c} ≤7% appeared to increase slightly in both Mississauga OHT and Ontario; these proportions remained higher than pre-pandemic levels in both Mississauga OHT and Ontario.

A. Blood sugar (HbA_{1c}) on Target in Adults with Diabetes Assigned to Mississauga OHT and the Province of Ontario



B. HbA_{1c} on Target in Adults with Diabetes Assigned to Mississauga OHT, Stratified by Area of Residence

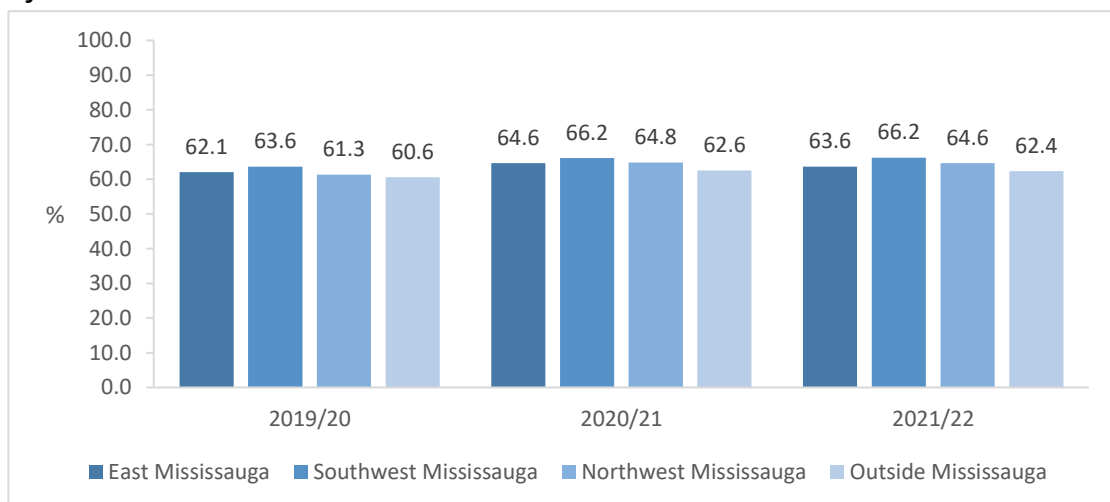


Exhibit 5.6 Percentage of adults with diabetes (aged ≥40 years) with a mean HbA_{1c} ≤7% among those with at least one test performed,* stratified by year and place of residence.

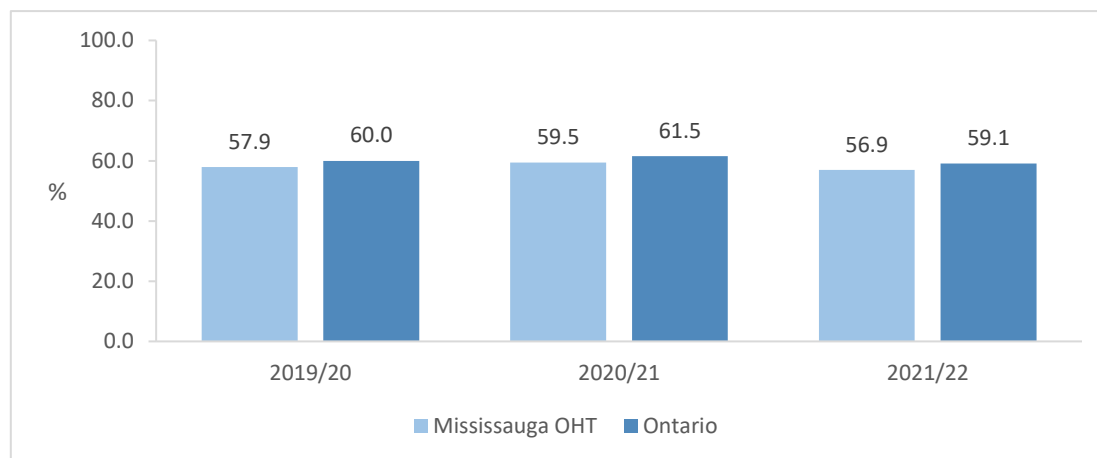
*individuals with missing laboratory tests are excluded

Cholesterol on Target

Key Findings

- 43% of people with diabetes in the Mississauga OHT did not meet Diabetes Canada’s recommended ideal target cholesterol level.
- The proportion of those achieving LDL cholesterol ≤ 2 mmol/L was slightly lower in Mississauga OHT than Ontario.
- Within Mississauga OHT, the proportion of those achieving LDL cholesterol ≤ 2 mmol/L was slightly higher among those residing within Mississauga compared to those living outside Mississauga.
- During the peak of the COVID-19 pandemic, the proportion of those achieving LDL cholesterol ≤ 2 mmol/L appeared to increase slightly, but this proportion has now dropped to below pre-pandemic levels in Mississauga OHT and Ontario.

A. LDL Cholesterol on Target in Adults with Diabetes Assigned to Mississauga OHT and the Province of Ontario



B. LDL Cholesterol on Target in Adults with Diabetes Assigned to Mississauga OHT, Stratified by Area of Residence

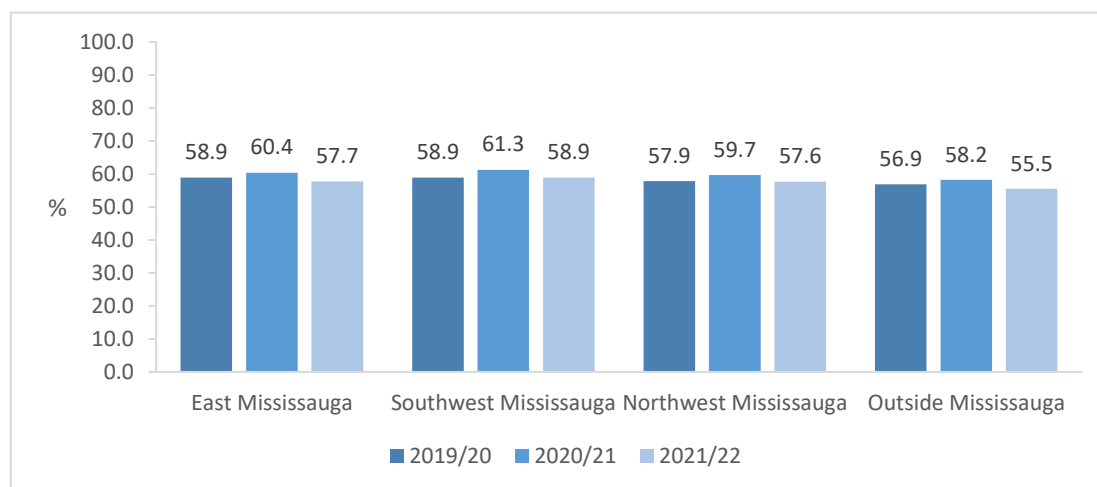


Exhibit 5.7 Percentage of adults with diabetes (aged ≥ 40 years) with a mean LDL cholesterol ≤ 2 mmol/L among those with at least one test performed,* stratified by year and place of residence.

*individuals with missing laboratory tests are excluded

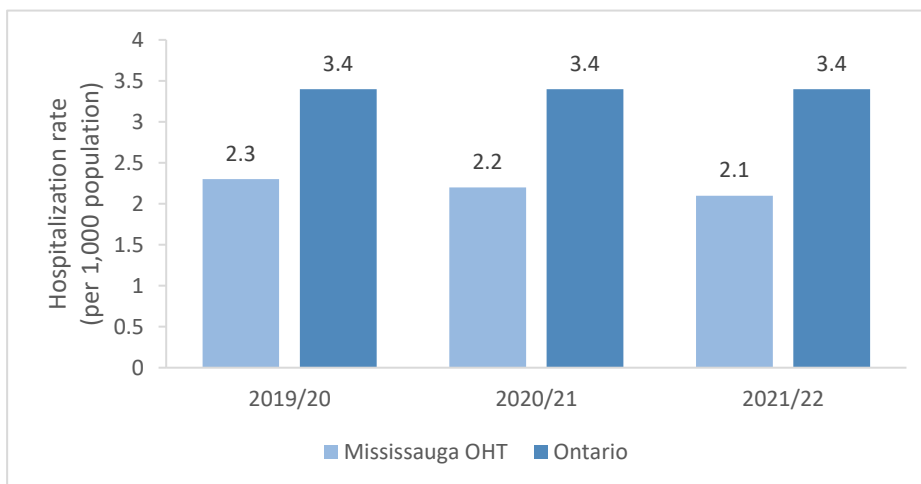
Hospitalizations for Complications of Diabetes

Key Findings

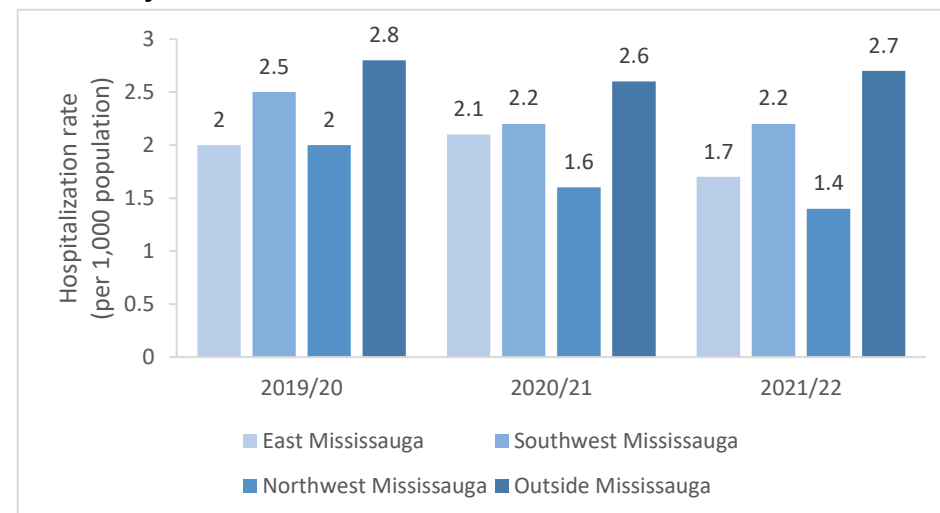
- Hospitalizations for preventable short- and long-term complications* of diabetes, were substantially lower in the Mississauga OHT than Ontario.
- Hospitalizations for long-term complications dropped over time in both the Mississauga OHT and Ontario.

**Short-term complications:* diabetic ketoacidosis, hyperglycemic hyperosmolar state, mixed ketoacidosis, hypoglycemic or insulin coma
Long-term complications: retinopathy, chronic kidney disease, neuropathy, cardiovascular, or multiple complications of diabetes. All reported rates are crude (not adjusted for age or other factors).

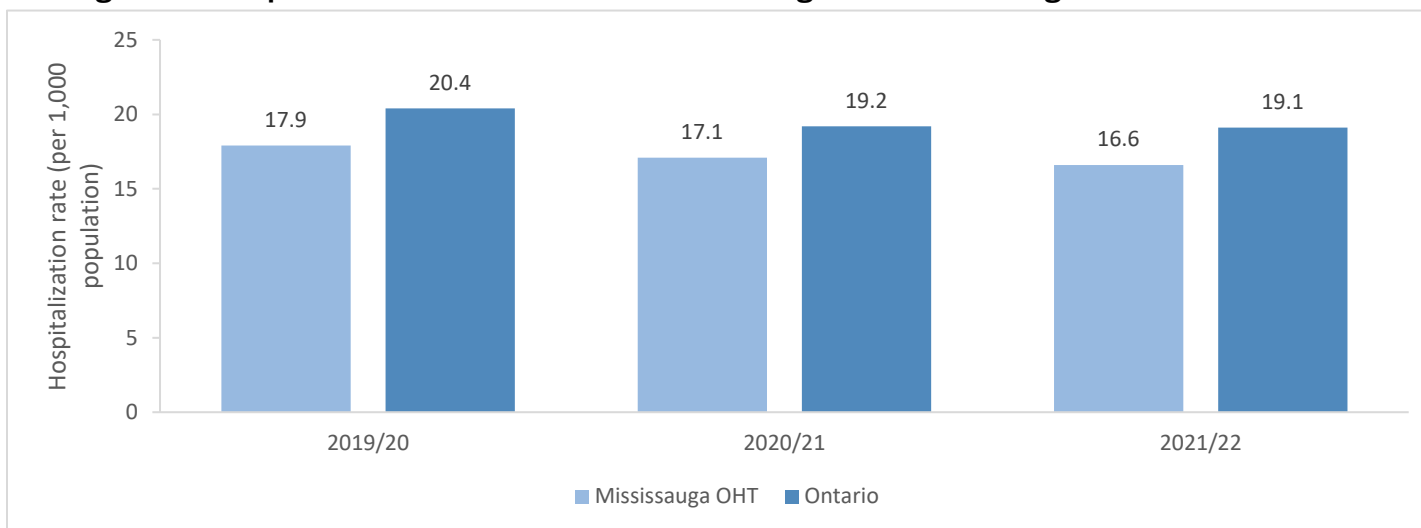
A. Short-Term Complications* in Adults with Diabetes Assigned to Mississauga OHT and the Province of Ontario



B. Short-Term Complications* in Adults with Diabetes Assigned to Mississauga OHT, Stratified by Area of Residence



C. Long-Term Complications in Adults with Diabetes Assigned to Mississauga OHT and the Province of Ontario



D. Long-Term Complications in Adults with Diabetes Assigned to Mississauga OHT, Stratified by Area of Residence

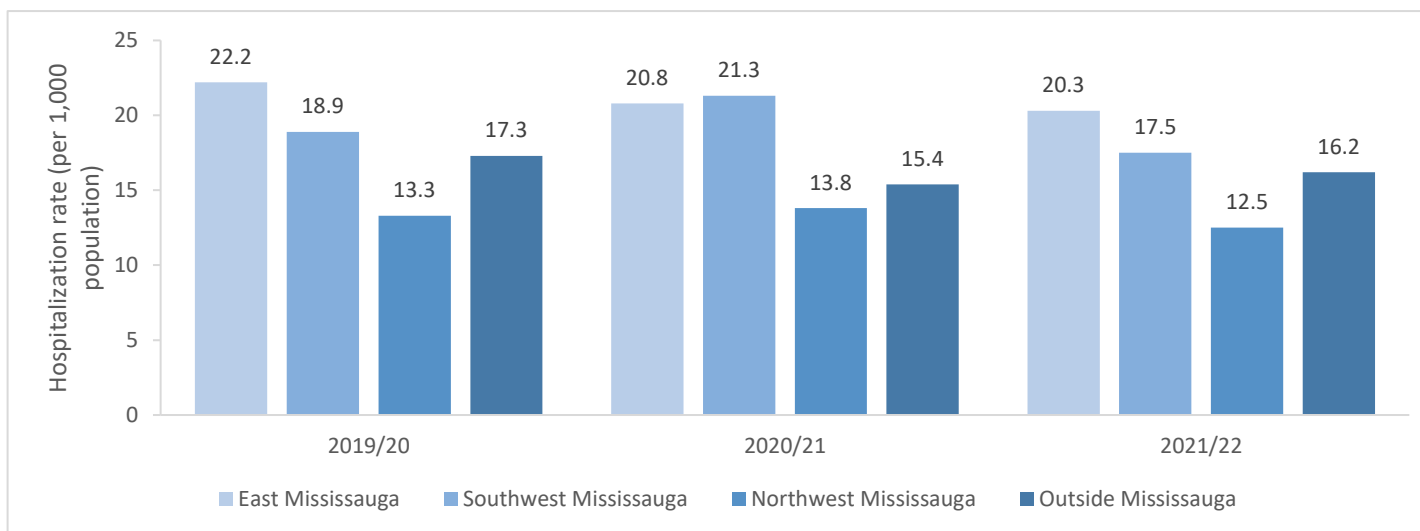


Exhibit 5.8 Rates of hospitalization (per 1,000 population) of adults with diabetes (aged ≥ 18 years) for (A, B) short-term complications of diabetes and (C, D) long-term complications of diabetes. Results are stratified by year and place of residence.

INTERPRETATION

Summary of Findings

In the Mississauga OHT, overall diabetes process and outcome of care indicators were achieved in around half to two-thirds of adults with diabetes, respectively, while 2 and 17 per 1,000 people with diabetes were hospitalized for short- or long-term complications. These findings demonstrate substantial gaps in meeting recommended standards of diabetes care for people with diabetes in the Mississauga OHT. Further research is needed to identify those groups who are more likely to experience disparities in diabetes care and outcomes in the region.

The proportions of individuals achieving care indicators in Mississauga OHT are comparable to or better than those previously reported in other populations. For example, the proportion of patients who achieved target levels for blood glucose and cholesterol was higher in Mississauga OHT than reported among adults of a similar age group in five Canadian provinces and in the US.^{10,11} The use of heart- and kidney-protective medications in the Mississauga OHT also

exceeded the US and five Canadian provinces, although we only had data on those aged ≥ 65 years, thus limiting direct comparisons.^{10,11}

The quality of diabetes services in the Mississauga OHT is broadly similar to that in Ontario. The frequency of blood cholesterol testing in the Mississauga OHT was marginally better than in Ontario, yet marginally worse for HbA_{1c} testing (which we defined as requiring two tests per year) and for screening for eye disease. For persons 65 years or older with diabetes, prescriptions for heart- and kidney-protective medications, including ACE inhibitors, ARBs, and statins, were similar across the Mississauga OHT and Ontario. We note that the proportion of seniors who filled these prescriptions fell short of the recommended benchmark despite these medications being subsidized by the Ontario Drug Benefit Plan. Hospitalization rates for short-term and long-term complications among adults with diabetes were modestly less common in the Mississauga OHT than in Ontario. These differences may be driven

in part by a younger age distribution in the Mississauga OHT compared to Ontario. Within the Mississauga OHT, those living within Mississauga generally appeared to have more favourable indicators than those living outside Mississauga.

Of all the outcomes examined, laboratory testing and eye examinations appeared to be the most negatively impacted during the peak of the COVID-19 pandemic. Yet, despite the decrease in laboratory testing in 2020–2021, blood glucose and cholesterol levels appeared to improve slightly during this period. This pattern may suggest that those who were able to undergo laboratory tests during the pandemic were those who tended to be managing better with their condition—thus reflecting how health inequities were exacerbated during the peak of the COVID-19 pandemic. Frequencies of laboratory testing and eye examinations continued to fall short of pre-pandemic levels in 2021/22. The peak of the COVID-19 pandemic was also associated with small fluctuations in the filling of prescriptions for heart- and

kidney-protective medications and a greater reduction in hospitalization for long-term complications than for short-term complications.

Limitations

We were unable to capture some outcomes, such as prescriptions for adults aged <65 years and processes of care and treatment targets for blood pressure, due to limitations of the data sources. We also lacked data on people living in Peel Region who were not part of the Mississauga OHT. Our analyses were descriptive at this preliminary stage, and we were unable to explore differences based on primary care model, sociodemographic factors, or other potential variables that might influence quality of diabetes care. Finally, we lacked data on patient-reported outcomes.

Implications and Future Directions

These rich preliminary data suggest that the quality of diabetes care in the Mississauga OHT and in Ontario in

general falls far below the ideal standards of care recommended by the Diabetes Canada *Clinical Practice Guidelines*. Additional analyses are needed to provide further insights into reasons for the patterns observed and variability by sociodemographic and health care factors. Considering Peel Region's relatively younger age distribution and the high complication risks associated with developing diabetes at younger ages, we will aim to determine how these indicators differed across younger and older adults. We will also conduct further analyses to explore why some indicators, especially hospitalization for complications, appeared to be better in the Mississauga OHT than in Ontario. For example, Peel Region has a large South Asian population, and it has been hypothesized that South Asians may develop a form of diabetes that results in a lower incidence of cardiovascular complications.^{12,13} Future analyses may help disentangle the contributions of factors such as ethnicity, immigration, socioeconomic status, and geography to

the observed differences in these baseline indicators.

Interventions are needed to address existing gaps in processes and outcomes of care, and our data might inform how interventions could target these gaps in Mississauga OHT. Serial measurement of these indicators could reliably track the impact of future interventions as they are implemented over time. Successful interventions in Mississauga OHT could then be scaled up to address similar gaps across the province of Ontario. For example, in Hong Kong, the use of a structured assessment tool and personalized report that provided tailored feedback was associated with greater likelihood of achieving risk factor management targets and decreased risk of complications.^{14,15} This intervention was initially developed in Hong Kong as a local initiative at a single hospital, and evidence of effectiveness motivated the intervention's gradual scale-up across the entire territory with a population of 7.4 million people.¹⁶

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Current State of Type 2 Diabetes in the Peel Region

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