CHAPTER 2: OVERVIEW OF THE DIABETES BURDEN IN THE PEEL REGION

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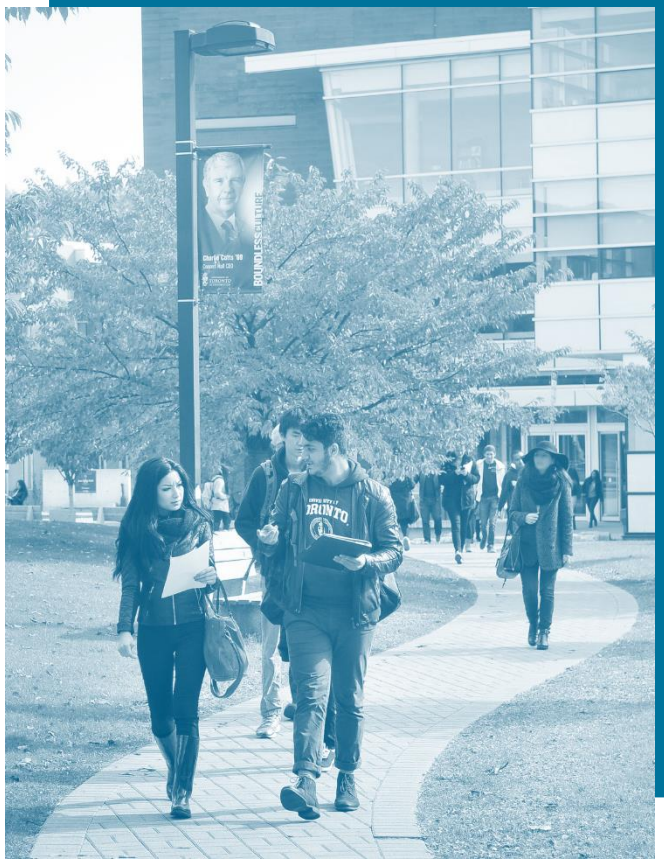
KEY FINDINGS

TYPE 2 DIABETES PREVALENCE VARIES ACROSS THE REGION OF PEEL

- In 2020, there were 175,000 people living with diabetes in Peel Region, compared to 161,000 people in 2015.
- Factoring in age, the rate of type 2 diabetes in adults over 20 in Peel was higher than the provincial and national average.
- Rates of diabetes prevalence differ substantially across the Region and are especially high (upwards of 26.5 per 100) in adults aged 45-64 living in Brampton.
- Among adults aged 65 and above, diabetes prevalence rates remained elevated in all areas of Peel, with the highest rates being reported in Brampton.



SOCIO-DEMOGRAPHIC PROFILE OF PEEL AND TYPE 2 DIABETES

- The number of **low-income households** in the region is higher in central and the north-east of Mississauga and across the south-east region of Brampton, encompassing central and south-west Brampton. Also, north-east Mississauga and regions across south-east and south-west Brampton specifically have a higher prevalence of diabetes than their surrounding areas.
- Peel region is home to a **greater proportion of newcomers** relative to the rest of the country and has among the largest concentrations of ethnic minorities (62.3% of Peel's population) in Canada.
- Most of the equity-deserving population in the area identify as South Asian (50.8%) or Black (15.3%).
- In 2021, there was a higher concentration of **recent immigrants** living in certain neighbourhoods of the Region, including the city centres of Mississauga and Brampton, as well as the northwest regions of Brampton, and in these same areas, diabetes prevalence rates are also very elevated.

THE RISING BURDEN OF DIABETES

With a global estimate of the number of 20–79-year-olds rapidly reaching 537 million in 2021, diabetes continues to pose one of the most significant public health challenges worldwide.[1] The current prevalence of diabetes continues to exceed projected estimates, creating significant challenges for health systems and economies. In 2022, four million Canadians (10% of the adult population) are living with diagnosed diabetes,[2] representing an increase from 3.1 million (8.6%) in 2013.[3]

Although there are three major forms of diabetes (type 1, type 2, and gestational diabetes), this report focuses on type 2 diabetes (herein referred to as diabetes), which represents over 90% of cases.[4] Diabetes is a chronic progressive condition characterized by impaired production or action of insulin, which regulates blood sugar or serum glucose.[5] The complications arising from uncontrolled diabetes and associated risk factors can be severe and include cardiovascular disease, chronic kidney disease, as well as microvascular nerve and vision damage.[2]Diabetes and related complications also disproportionately affect many equity-deserving groups such as racialized communities, ethnic minorities, and persons with low income, highlighting the intersection between social determinants of health and shifts in living environments that promote unhealthy behaviours and weight gain.[6] There is evidence that for some individuals, diabetes can be prevented /delayed by adopting and maintaining regular physical activity, a healthy diet, and a healthy weight and that complications of diabetes can be reduced with adequate treatment and diabetes care.[7-10] Yet the prevalence of diabetes is expected to increase in many low- and middle-income settings and socially disadvantaged groups, underscoring the urgent need for greater efforts to translate this evidence into action in an equitable way.[1] Thus, as an essential first step, we sought to understand the existing burden of diabetes and socio-demographic disparities across the region.

This chapter describes the prevalence of diabetes and socio-demographic risk factors in the Region of Peel and how these vary by neighbourhood. We used population-based data sources housed at ICES from 2020 to collect information on adults living with diabetes and their socio-demographic and place of residence characteristics. Diabetes cases were based on physician diagnoses and hospital records (see technical appendix for more details). Maps are displayed by Peel Health Data Zones, which are defined geographic areas within Peel and are smaller than municipality levels (See Technical appendix for further details on the maps provided in this chapter).

DIABETES PREVALENCE VARIES ACROSS THE REGION OF PEEL

In 2020, there were 175,000 people with a diagnosis of diabetes in Peel Region, compared to 161,000 people in 2015.[11] The overall age-standardized prevalence of diabetes among adults over age 20 in 2020 was 15.5% for Peel, and this figure is higher than both the provincial (9.8%) and national (10.0%) age-standardized prevalence.[2] However, the age-standardized diabetes prevalence for 20+ year olds differs substantially across the Region, from as low as 9% in southern regions of Mississauga and swathes of Caledon to 20% for areas of Brampton (*Exhibit 2.1*). The burden of diabetes also varies by biological sex, whereby males have a higher age-standardized prevalence (16.1 %) than females (14.8 %) (*Exhibit 2.2*).

Further, diabetes prevalence appeared to be particularly high (upwards of 26.5%) among adults aged 45-64 years living in Brampton (*Exhibit 2.3*). In all areas of Peel, diabetes prevalence rates tend to vary by age group, with the highest rates being among adults aged 65 and above (*Exhibit 2.3*).

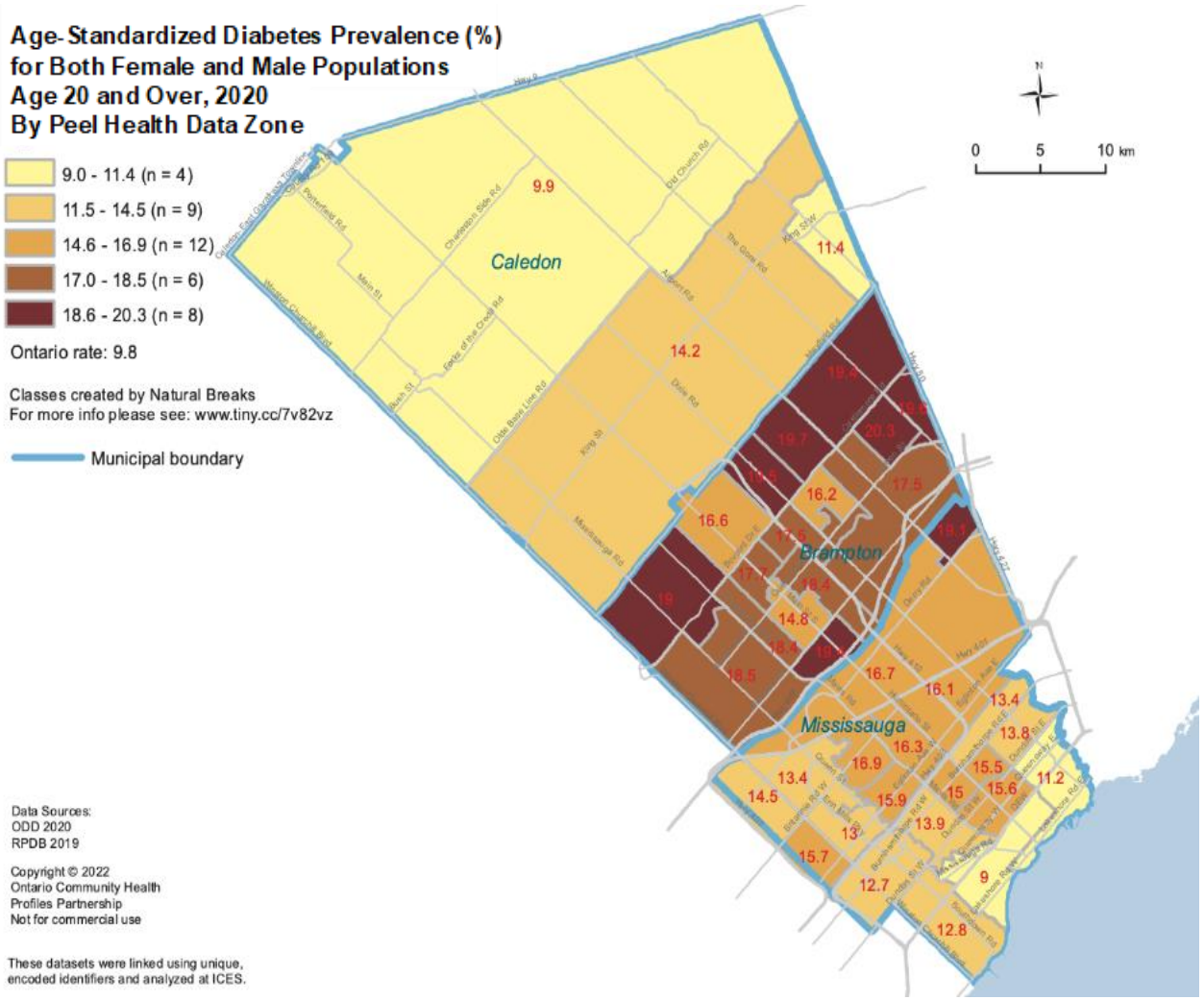


Exhibit 2.1 Age-standardized diabetes prevalence (%), for people aged 20 years and over in 2020 by Peel Health Data Zone. Source: Ontario Community Health Profiles Partnership.

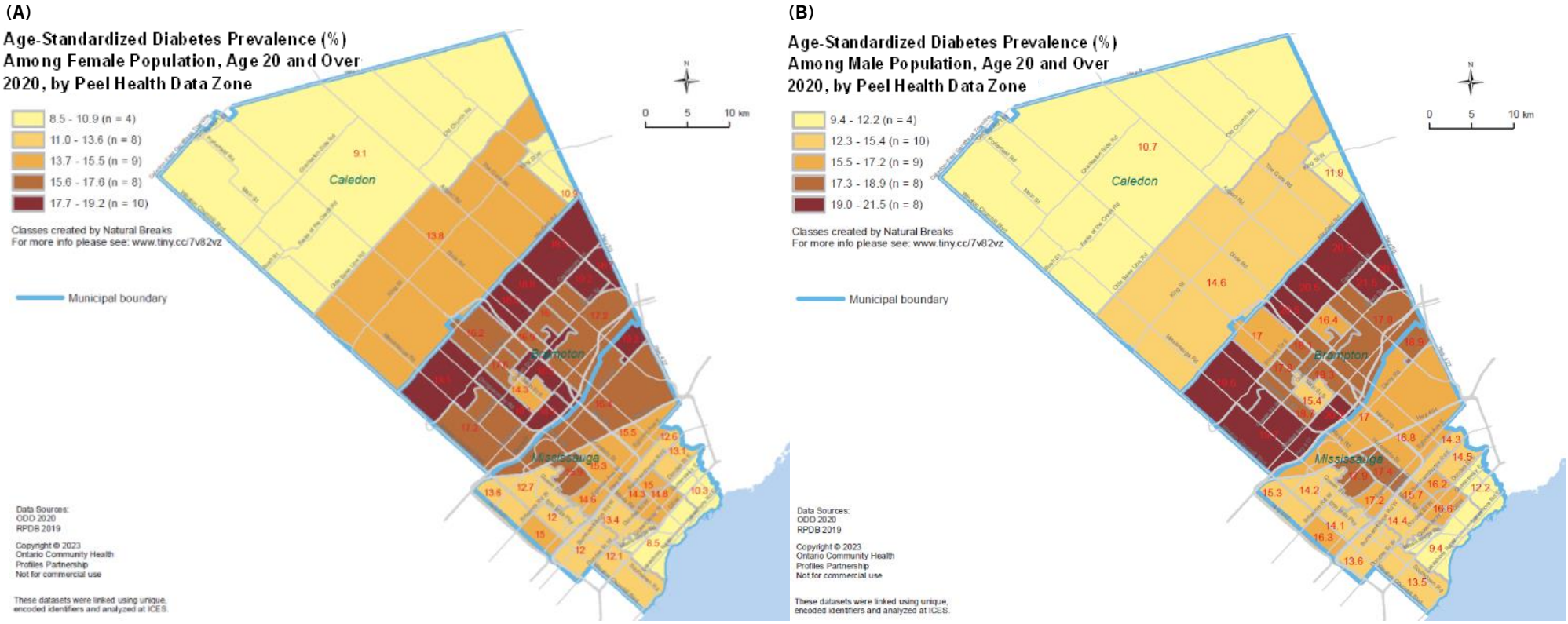


Exhibit 2.2 Age-standardized diabetes prevalence (%), by sex among adults aged 20 years and over in 2020 by Peel Health Data Zone (A) Female (B) Male. Source: Ontario Community Health Profiles Partnership.

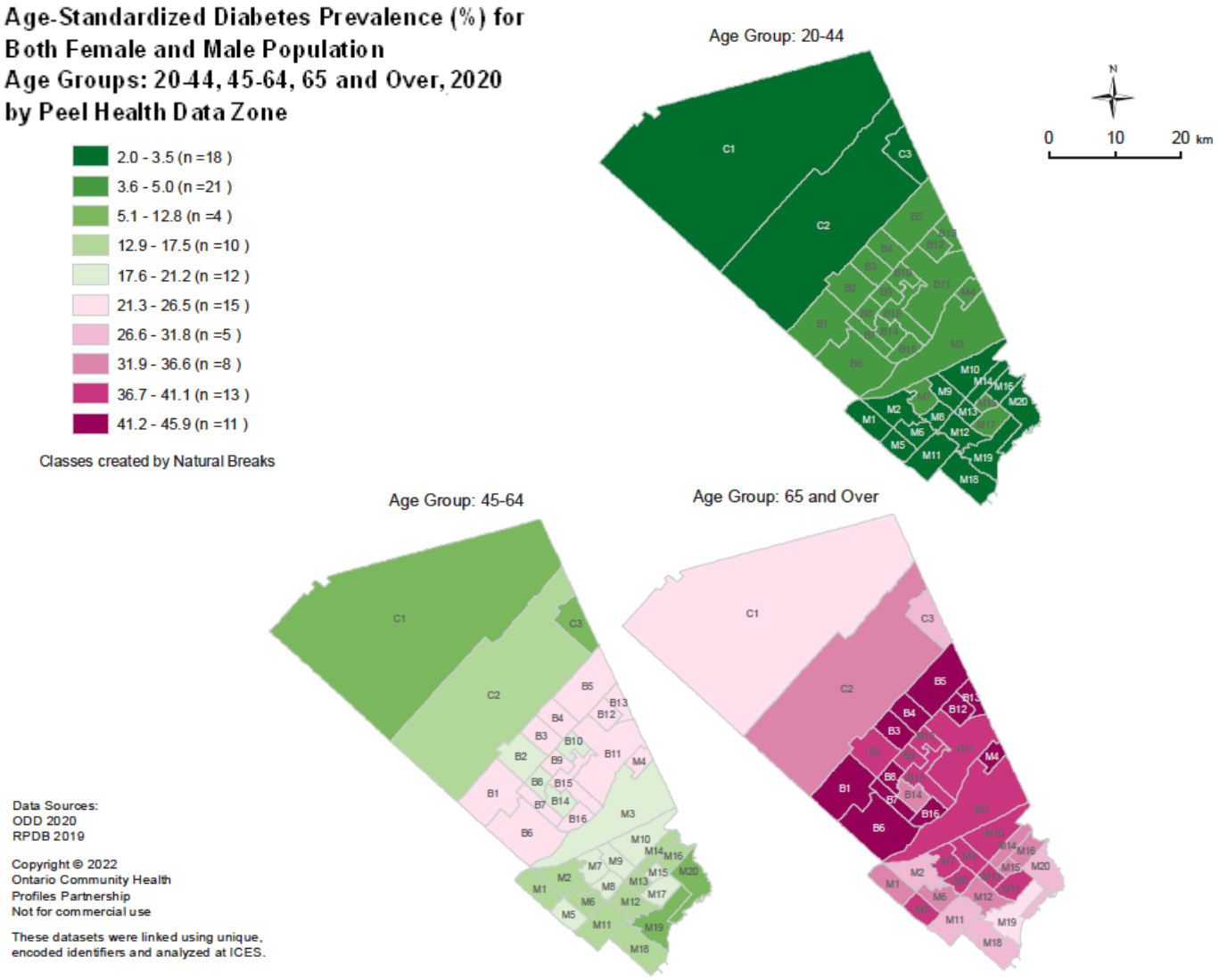


Exhibit 2.3 Age-standardized age-specific prevalence diabetes, among adults of 20+ years of age in 2020 by Peel Health Data Zone. Source: Ontario Community Health Profiles Partnership.

SOCIAL DETERMINANTS OF HEALTH LINKED TO DIABETES VARY SPATIALLY ACROSS THE REGION

Diabetes burden differs across groups of people by social and demographic characteristics. There is considerable evidence demonstrating that an inverse gradient exists for diabetes prevalence across multiple measures of socioeconomic status, whereby diabetes prevalence is higher among those in the lowest income group.[6,12-13] As well, certain socially disadvantaged populations have been found to be at higher risk of diabetes and diabetes-related complications.[14]

Certain ethnic minority groups, such as persons of South Asian, Black, and Indigenous heritage, also have a higher risk of diabetes.[2] A previous study from Ontario has shown a higher incidence of prediabetes (a condition with elevated levels of blood glucose that has not yet reached the level of diabetes) for immigrants of non-European ethnic backgrounds.[15] These populations also experience a more rapid progression from prediabetes to diabetes than people of European ancestry or the population as a whole.[16] The excess risk of diabetes in socially disadvantaged and ethnic minority groups can at least partly be attributed to inequities in the social determinants of health, such as material deprivation, housing affordability and food insecurity, neighbourhood design, as well as racism and structural inequalities, along with other barriers that shape preventive health behaviours. These social conditions can have long-lasting and cumulative effects on health, from early life before birth to childhood and all the way to adulthood. In fact, the disproportionate risk of diabetes in ethnic groups from low- and middle-income countries has been partly explained by effects of early life exposures in the womb, such as prenatal undernutrition and maternal stress, that can program long-term, multi-generational epi-genetic metabolic changes.[17] These changes provide an early survival advantage in resource-poor environments but can increase the risk of disease later in life when nutritional conditions are modified. For many populations, these developmental factors add to ongoing socioeconomic inequalities and have a cumulative burden on the risk of obesity and diabetes. While diabetes risk tends to increase with age, this complex interplay between the genetic and epi-genetic risk factors of diabetes and the ongoing influence of social determinants of health contribute to an earlier onset of diabetes that is more marked among high-risk populations.

SOCIO-DEMOGRAPHIC PROFILE OF PEEL REGION

Peel has been described as an example of 'hyper-diversity', referring to the region's intense diversity in socioeconomic status, racial and ethnic identities, gender, and age, in addition to there being differing lifestyles, attitudes, and activities among diverse immigrant populations.[18-19] Therefore, the socio-demographic profile of Peel Region tends to vary across several neighbourhood-level characteristics, including low income, recent immigrant status, and household structure (e.g., persons in one-parent families and persons living alone).

The proportion of households with low income in this region (5.4%) is comparable to the number of households living in low income in Ontario (5.3%).[20] In Peel, the proportion of low-income households appears to be more concentrated in central and the north-east of Mississauga and across the southeast region of Brampton, encompassing central and south-west Brampton (*Exhibit 2.4*). However, north-east Mississauga and regions across southeast and southwest Brampton specifically have a higher age-standardized prevalence of diabetes than their surrounding areas (*Exhibit 2.1*).

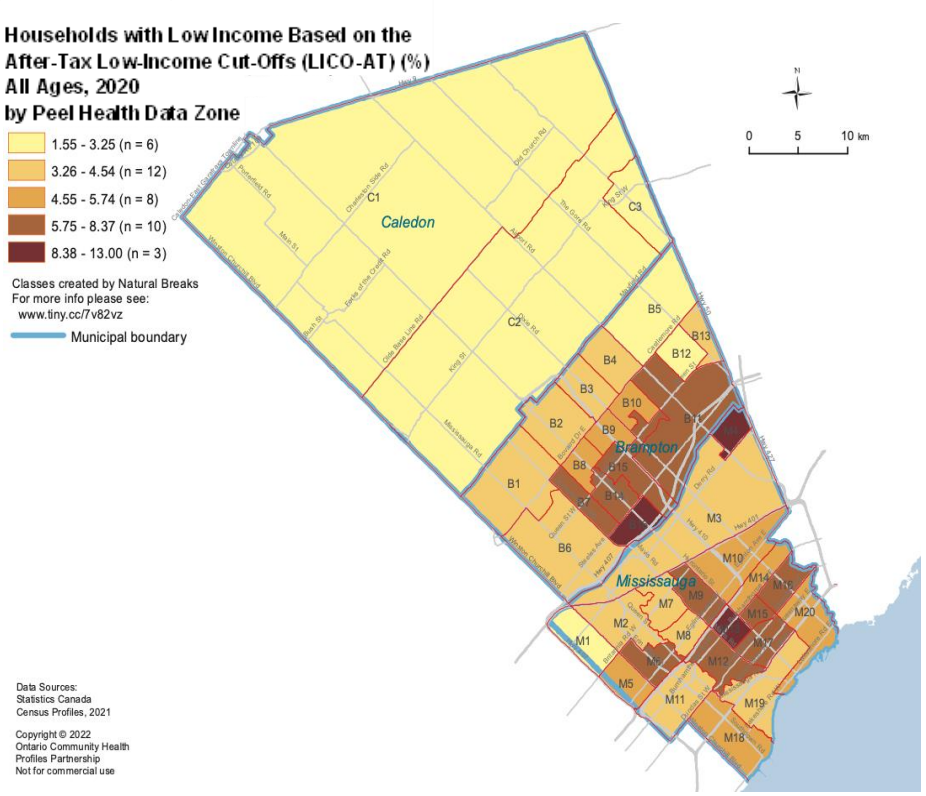


Exhibit 2.4 Proportions of households with low income, based on Low-Income Cut-Offs After Tax (LICO-AT), females and males aged 20 and over in 2020 by Peel Health Data Zone. Source: Ontario Community Health Profiles Partnership.

In terms of the immigrant population, this region is home to a greater proportion of newcomers relative to the rest of the country and has among the largest concentrations of racialized people (62.3% of Peel's population) in Canada, the largest groups of which are South Asian (50.8%) and Black (15.3%).[21] Specifically, in 2021, there is a higher concentration of recent immigrants living in certain neighbourhoods of the Region, including the city centres of Mississauga and Brampton, as well as the northwest regions of Brampton (*Exhibit 2.5*), and in these same areas, the prevalence of diabetes is particularly high (as shown in *Exhibit 2.1*).

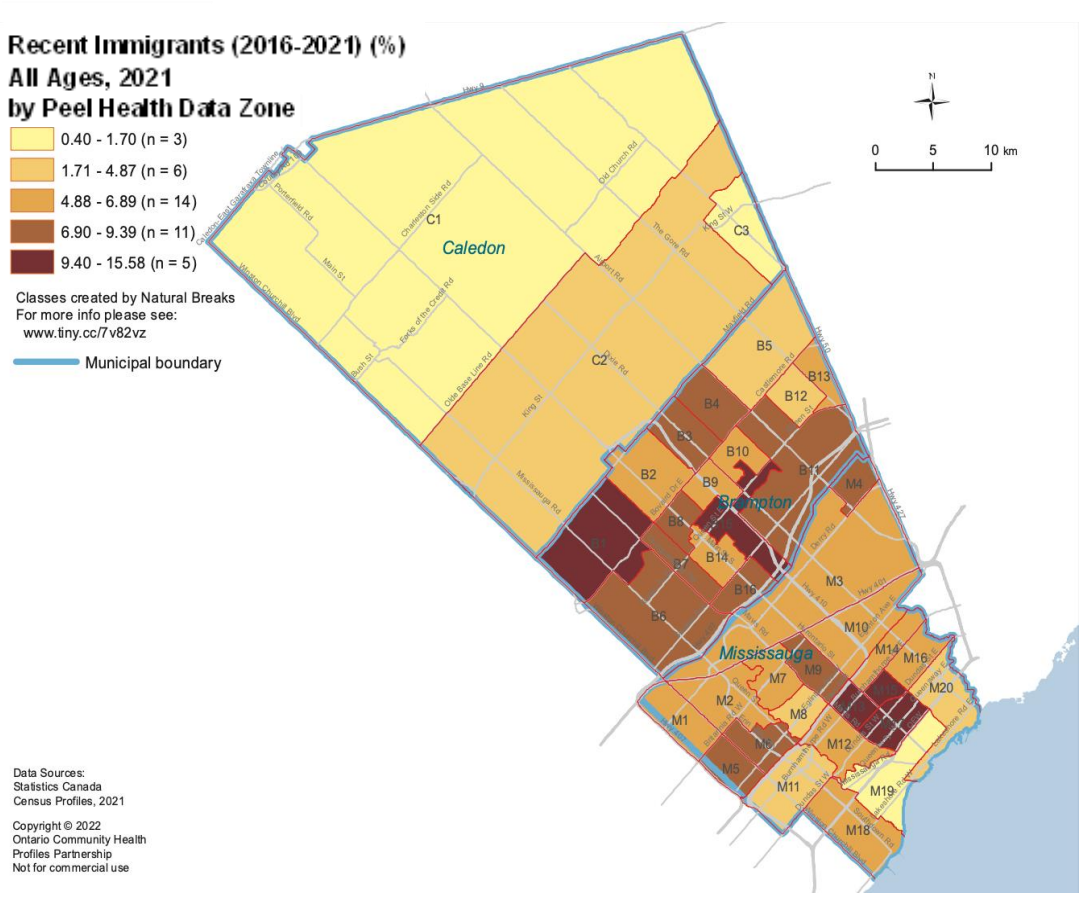


Exhibit 2.5 Recent immigrants (%), all ages, in 2021 by Peel Health Data Zone. Source: Ontario Community Health Profiles Partnership.

Additionally, prior research has shown that loneliness has been associated with a 2-fold higher risk of diabetes.[22-23] While loneliness and social isolation were not captured in this report, we evaluated the proportion of single-adult households in Peel Region as a signal for potential social isolation. These figures show the proportion of one-parent households in Peel Region, defined as households with one adult and one or more children, and households of persons living alone, defined as those with one single person aged 15 years or older. While Central Brampton is home to the greatest proportion of single-parent households as well as higher diabetes prevalence rates (*Exhibit 2.6*), there are more residents living alone in Mississauga's city centre and the southeast region of Mississauga (*Exhibit 2.7*), where diabetes prevalence rates are lower relative to the surrounding neighbourhoods. This paradoxical relationship at the neighbourhood level will need to be explored further to determine what factors drive the potential relationships between these neighbourhood characteristics and the diabetes burden in Peel Region.

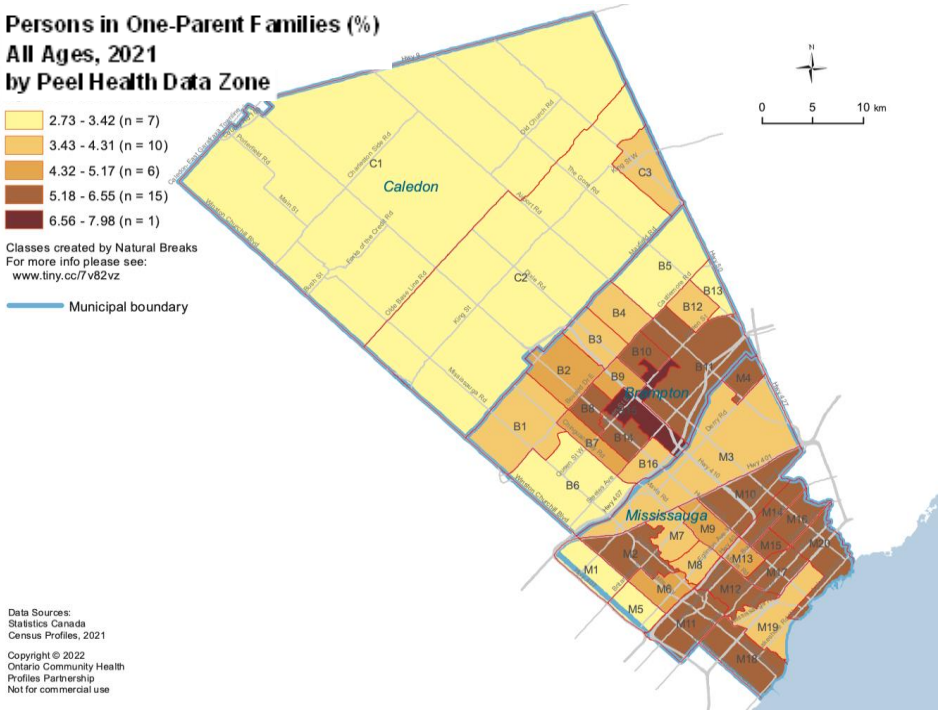


Exhibit 2.6 Percentage of single-parent households, all ages, in 2021 by Peel Health Data Zone. Source: Ontario Community Health Profiles Partnership.

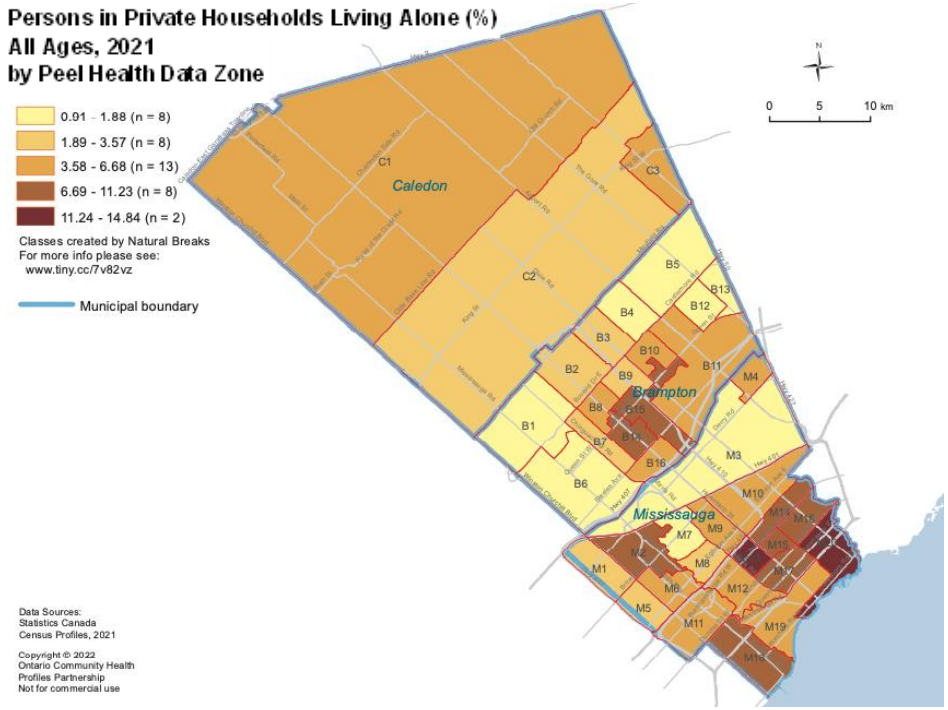


Exhibit 2.7 Percentage of persons living alone, all ages, in 2021 by Peel Health Data Zone. Source: Ontario Community Health Profiles Partnership.

UNDERSTANDING THE DETERMINANTS OF DIABETES

The Public Health Agency of Canada's new *National Framework for Diabetes in Canada* calls for more holistic and comprehensive approaches to understanding and, ultimately, preventing and managing diabetes by targeting the upstream factors and improving health and health equity.[24] For example, previous research has shown that socioeconomic indicators and other factors influence health-related behaviours and diabetes risk and management in Peel Region, especially among ethnic minority populations.[25-27] The impacts of these factors have been further exacerbated due to the COVID-19 pandemic, as Peel Region was one of the hardest-hit regions in Canada.[28-29]

To understand factors that affect the risk of diabetes and related chronic diseases and identify potential challenges and opportunities for prevention and improving care, this report and the overarching work of the Network is adopting a comprehensive, multi-sectoral baseline data strategy framework (*Exhibit 2.8*) that includes factors at several levels:

Level 1- Macro: This level targets factors that affect the entire population and examines the role of environmental determinants of chronic disease related to how we design and build our neighbourhoods. Interventions targeting the macro level may include municipal and regional policies and urban planning to optimize the built environment and improve access to nutritious foods, physical activity, and housing to ultimately **create healthy environments**.

Level 2- Meso: This level focuses on groups that are disproportionally affected by diabetes and address how to promote healthy living and behaviours through socioculturally-specific co-designed interventions. Interventions may involve strengthening and enhancing community action and mobilization by designing and implementing prevention programs across various settings and contexts to raise awareness and promote **healthy living and behaviours**.

Level 3- Micro: This level addresses individuals with or at risk of diabetes and chronic disease within the healthcare system and examines how access and quality of chronic disease healthcare can influence potential health outcomes and quality of life. Interventions may focus on patients and families, healthcare providers and administrators to **improve chronic disease care** by making health services more coordinated, effective, accessible, and equitable.

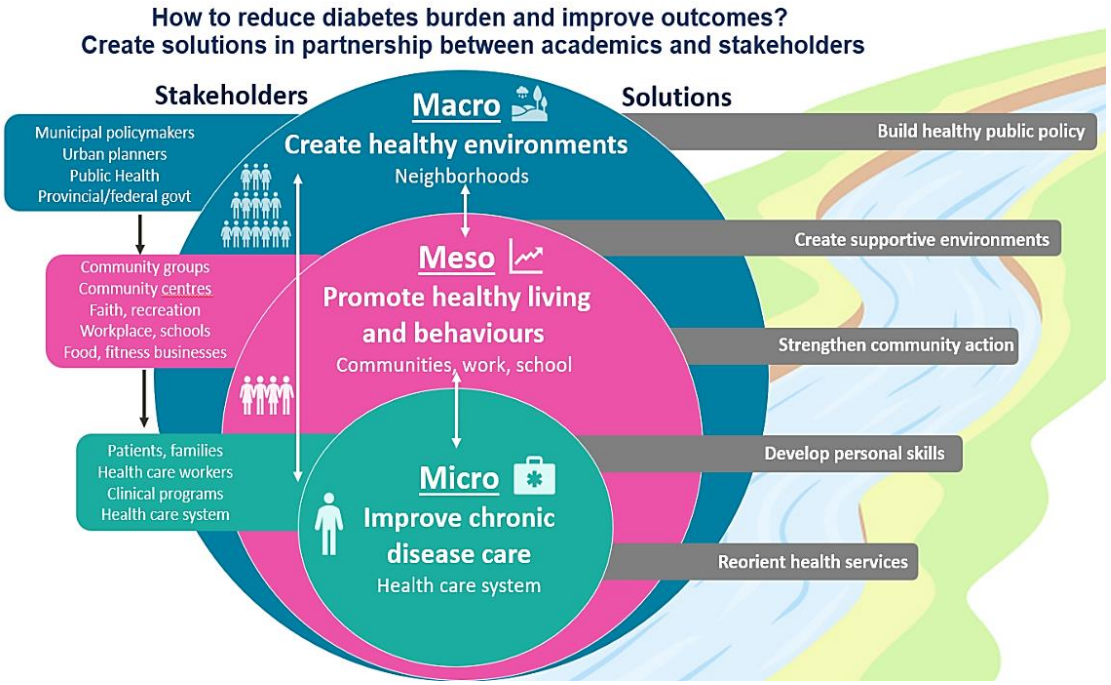


Exhibit 2.8 Interventions for reducing the burden of diabetes must target micro, meso, and macro-level risk factors and involve multi-sectoral partnerships and collaboration across academic disciplines, policy, and community organizations.

This report has been divided into three chapters, each addressing key indicators within the three levels of engagement and intervention depicted in Figure 2.8.

Chapter 3: Macro Level

Neighbourhood environments are the *macro-level* factors which comprise the conditions that enable or prevent the adoption of active lifestyles and healthy behaviours such as physical activity and nutrition (*Exhibit 2.8*). How we design our neighbourhoods and policies significantly influences health behaviours and quality of life across all ages, which can be understood as upstream determinants of health and community wellbeing. By 2051, Peel's population is expected to grow from 1.5 to 2.2 million alongside a massive demographic shift with both an ageing population and the arrival of newcomers to Canada.[30-32] In response to the growing need for housing and infrastructure support, the Region has recently been undergoing rapid development, resulting in neighbourhoods dominated by low-density, sprawling areas and largely car-dependent for transportation. The Region's landscape includes five 400-series highways, including the busiest highway 401, which has undergone further expansion in recent years (*Exhibit 2.9*). These highways serve as major transport routes to the Toronto Pearson International Airport and support car use for travelling from and to the Region from all other surrounding cities. In addition, sprawling, low-population-density residential neighbourhoods, if poorly designed, limit opportunities for physical activity.[33] This type of infrastructure prevents pedestrian foot traffic, exacerbates car dependency and serves as a major source of extremely high air pollution exposure. Other environmental characteristics also enable or limit the adoption of healthy behaviours such as physical activity and healthy diets, including lack of access to transit, safe, adequate, and affordable housing, and healthy food options (also called the food environment). Chapter 3 provides an overview of key built environment and neighbourhood features and their spatial relationship with diabetes prevalence in the Peel Region to prompt future research and policy actions in these areas.

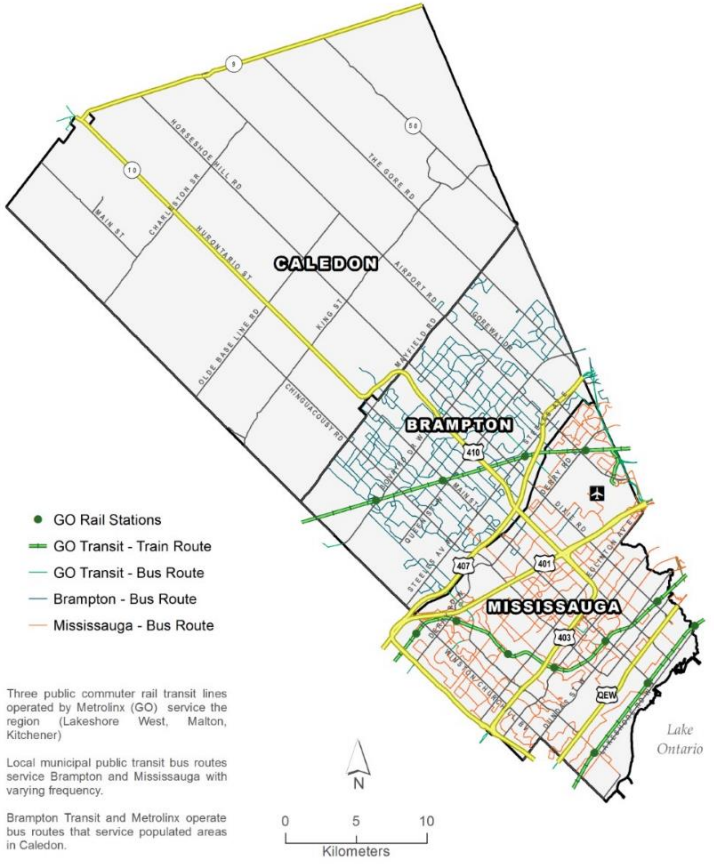


Exhibit 2.9 Highways, roads, municipal and regional public transit systems, in Peel Region.

Chapter 4: Meso Level

Several individual and community-level determinants of health also influence the risk and burden of diabetes through effects on healthy living, which we term *Meso-level* factors in this report. Specifically, the rising prevalence of diabetes in Peel Region can be attributed to the interaction between sociodemographic factors such as age, socioeconomic status, race/ethnicity and immigrant status, and the unequal distribution of deeply rooted determinants that include, but are not limited to, psychosocial (perceived health and mental health, self-efficacy), community-level (housing, food insecurity, sense of belonging, and material deprivation), and more upstream health mediators such as racism, trauma, and oppression, which together influence health behaviours that contribute to diabetes that increase incidence (new cases) of diabetes, alongside improvements in survival of people with diabetes.[34-35] In Chapter 4, we have mapped these risk factors to the Socio-ecological Model of Health to understand the extent to which they may be associated with the future risk of diabetes development in the Peel Region (*Chapter 4*). This will provide the opportunity to identify and guide the development and implementation of programmes and interventions targeting these factors (*Exhibit 2.8*) to reduce the risk of diabetes incidence in the Peel Region.

Chapter 5: Micro Level

In Peel Region and across Ontario, people with diabetes and related chronic conditions receive health services from various sources, including primary care providers, nurses and dietitians employed at community- and hospital-based diabetes education programs, and specialist physicians, with support from community pharmacists.[36] This report focuses on the care of people with diabetes in the region as the most common and readily identifiable chronic disease. Around 80% of health services for people with diabetes are provided in the primary care setting.[37]

In 2014, the *Peel Diabetes Atlas* reported that family physicians were fairly evenly distributed across Peel Region, with a higher concentration in central Mississauga and longer travel distances for patients in Caledon and northeast Brampton, based on geospatial analysis of the distance between resource locations.[33] Eye specialists were evenly distributed, and endocrinologists were located only near major hospitals.[33] Diabetes education programs were located throughout Mississauga and Brampton, with only one location in Caledon.[33] To our knowledge, the quality of diabetes health services provided in the Peel Region has not yet been assessed and reported.

The health services and quality of care working group is focused on identifying and measuring the key quality of care processes and outcome indicators, which we refer to as *micro-level* indicators in this report (*Exhibit 2.8*). Diabetes-related health services are administered under regional bodies, which have recently been restructured as Ontario Health Teams (OHTs) to improve the integration of health services.[32] Peel Region is served by multiple OHTs, including the Central West, Mississauga, and Hills of Headwaters Collaborative OHTs. The Mississauga OHT (MOHT) serves a population of 859,392 individuals who receive most of their health services in Mississauga. [38] Most individuals in the MOHT reside in East and Northwest Mississauga, while others reside in Southwest Mississauga, Brampton, and other areas of Peel Region and Ontario (*Exhibit 2.10*).[38] In Chapter 5, we focus on health services and the quality of care for people living with diabetes in the MOHT.

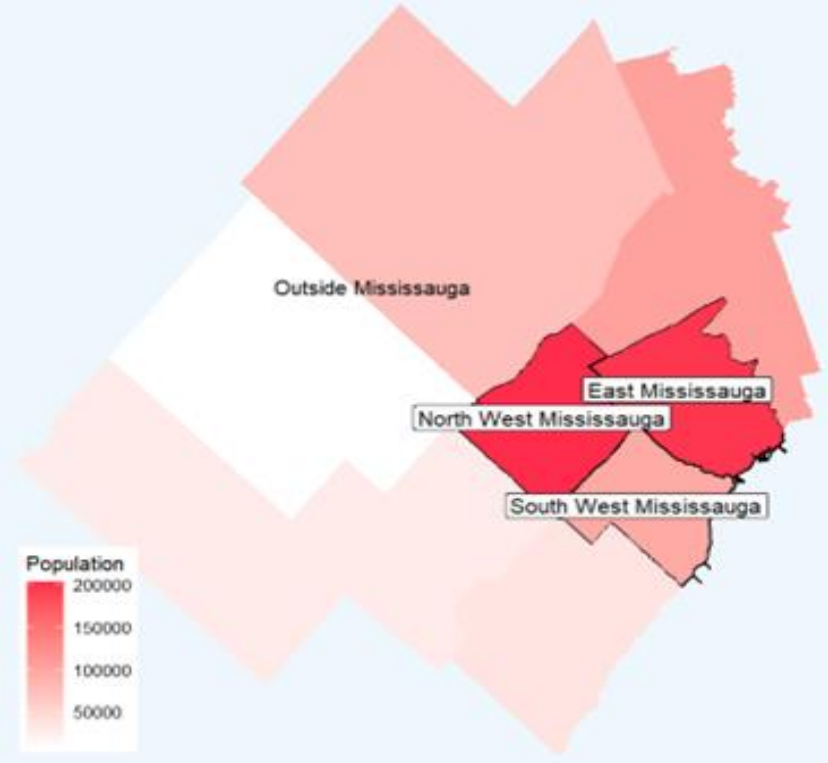


Exhibit 2.10 Place of residence for individuals in the Mississauga Ontario Health Team.*
*Only neighbouring Mississauga sub-regions are shown; those living outside Mississauga extend beyond this map.
Source: Rosella et al., 2021[31]

COMMUNITY ENGAGEMENT

Community partners and other key decision-makers provided essential guidance on the objectives of this report and its approach to understanding the risk and burden of diabetes in the Peel Region. The NHP engaged community members, researchers, public health officials, policymakers, and physicians in Peel Region at an online event held on June 6, 2022, to seek input on the potential indicators of the burden of diabetes and chronic disease in Peel related to healthcare, risk factors and living conditions. We also sought insight into the needs and opportunities for our baseline data evaluation plan in Peel to help shape this report and future research. We identified several opportunities for partnerships and future collaborations on the identified priorities and areas of action.

The overarching themes identified from this consultation highlighted the importance of recognizing health equity and social justice issues as well as the integration of services and intersectoral collaborations to address the risk and burden of diabetes and chronic disease in the Region. Webinar participants also provided input on the current gaps and suggested approaches to addressing them, including:

- Lack of access to services and primary care.
- Lack of system funding for health services.
- The impact of the COVID-19 pandemic.
- Need for intersectoral work and collaborations.
- Need to examine the impact of other environmental exposures beyond the built environment (such as climate) on diabetes-related health outcomes and wellbeing.

The gaps identified by our community partners and network members, as well as the proposed approaches to addressing them, are an integral component of NHP's efforts to collectively work towards addressing diabetes and chronic disease burden in the Peel Region. The information garnered by community consultation also provided the necessary context and direction informing the aims and preliminary reporting, in addition to informing the future efforts of the Baseline Data Strategy Team.

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