Chapter 3

Socioeconomic STATUS & DIABETES

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HIGHLIGHTS

Issue

- Education and income are the most commonly used measures of socioeconomic status (SES) and important social determinants of health.
- Low SES is often associated with worse health outcomes. This relationship has also been found for diabetes. However, it is unclear how strong these relationships are at the neighbourhood level in a largely suburbanized area.
- In this chapter, area-level median household income and per cent of the population who fell below Statistics Canada’s low income cut-off (LICO) are used to measure income. Per cent of the population that did not complete their high school education is used as a measure of education.
- This chapter presents the spatial distribution of these socioeconomic characteristics, along with associated prevalence rates of diabetes, across Peel region.

Key Findings

- In Peel, there was a fairly consistent spatial relationship between rates of diabetes and socioeconomic variables. Higher rates of diabetes were generally found in areas with lower SES.
- Somewhat different patterns for income and education (components of SES) were seen across the three Peel municipalities. In Brampton, the majority of areas with high rates of diabetes were in the middle income category and had lower levels of educational attainment. In northeast Mississauga, there was a cluster of neighbourhoods, surrounded by industrial land, that had high rates of diabetes, lower income and a higher percentage of residents who did not complete high school. Relatively-high SES profiles and low diabetes rates were seen across Caledon and in south Mississauga.

Implications

- Both education and income appear to be strongly related to patterns of diabetes prevalence in Peel.
- Diabetes is often the outcome of poor quality diets and lack of physical activity – both of which need to be addressed in the general population. The consequences of developing diabetes, including the high cost of managing this condition and the risk of developing other serious health complications, are especially burdensome for people with low SES.
- The needs of people living in low-SES areas should be specifically kept in mind when policy makers and health planners design programs to prevent diabetes and help those living with the disease manage their condition.
- Low-SES populations may also live in areas with poor access to healthy resources, low walkability and inadequate public transit. Planners may need to especially attend to these aspects of the built environment in low-SES areas.
Socioeconomic status (SES) refers to the position an individual or group holds in a society’s socioeconomic hierarchy. There is a well-established connection between SES and the risk of developing chronic diseases including diabetes and cardiovascular disease. For these and many other diseases, individuals with low SES tend to have worse health outcomes. As well, individuals living in more socioeconomically disadvantaged areas have higher rates of illness and mortality resulting from chronic disease.

There is no single “best” way to measure SES. Rather, different measures emphasize different aspects of the socioeconomic hierarchy. Education and income are the most commonly-used measures of SES; they are also important social determinants of health. From this point in the atlas, income and education will be used to describe SES.

Low income and low levels of education have both been associated with higher rates of diabetes prevalence. Canadian men and women in the lowest income and education groups share a disproportionately high burden of diabetes. For example, in 2005 in Ontario, 8% of women and 10% of men in the low income group reported having diabetes compared with 3% of women and 5% of men in the highest income group. Between 1994 and 2009, diabetes incidence – the onset of new diabetes cases – was highest among Canadian men and women with the lowest levels of household income or education.

Individuals living in lower income areas are also known to be at higher risk of diabetes. Two recently published atlases both show a significantly higher prevalence of diabetes among residents of lower income neighbourhoods than among those living in more affluent neighbourhoods. In Ontario, individuals residing in the lowest income neighbourhoods have diabetes rates that are at least 50% higher than those living in the wealthiest neighbourhoods. While the underlying causes are not well understood, many factors may contribute to the different rates of diabetes seen among individuals of varying levels of SES. Levels of income and education shape overall living conditions and health-related behaviours such as diet, physical activity and tobacco use. Diets low in fruits and vegetables, low levels of physical activity and higher rates of obesity are often seen among people in lower SES groups. However, it is important to point out that these factors do not fully account for the higher rates of diabetes experienced by persons in low-SES groups. Other effects of low-SES conditions, such as the stress of living with economic hardship and in low-quality housing – throughout a person’s life-course – are likely to be very important in shaping the relationship between SES and health. Researchers are just beginning to understand how such factors relate to diabetes.

The purpose of this chapter is to present the spatial distribution of socioeconomic characteristics across Peel and their association with rates of diabetes. The specific socioeconomic factors presented in this chapter are median household income, per cent of the population who fell below
Statistics Canada's low-income cut-off (LICO) and those who did not complete their high school education. Median income and per cent of people below the LICO are both common measures of income in Canada. The LICO is a commonly used indicator to identify those who are substantially economically worse off than the average. Measuring the per cent of population without a high school diploma is important because individuals in the least educated groups typically experience the poorest health.

**LIST OF EXHIBITS**

**Exhibit 3.1** Median annual household income (in dollars, after-tax) [2005] and age- and sex-standardized diabetes prevalence rates per 100 persons aged 20+ [2007], by census tract [2006], in Peel region

**Exhibit 3.2** Spatial relationship between median annual household income (in dollars, after-tax) [2005] and age- and sex-standardized diabetes prevalence rate-ratios* [2007], by census tract [2006], in Peel region

**Exhibit 3.3** Per cent of the population who fell below Statistics Canada's low income cut-off (LICO; after-tax) [2005] and age- and sex-standardized diabetes prevalence rates per 100 persons aged 20+ [2007], by census tract [2006], in Peel region

**Exhibit 3.4** Spatial relationship between per cent of the population under Statistics Canada's low income cut-off (LICO; after-tax) [2005] and age- and sex-standardized diabetes prevalence rate-ratios* [2007], by census tract [2006], in Peel region

**Exhibit 3.5** Per cent of the population aged 25-64 who did not complete their high school education [2006] and age- and sex-standardized diabetes prevalence rates per 100 persons aged 20+ [2007], by census tract [2006], in Peel region

**Exhibit 3.6** Spatial relationship between per cent of the population aged 25-64 who did not complete their high school education [2006] and age- and sex-standardized diabetes prevalence rate-ratios* [2007], by census tract [2006], in Peel region
Findings:

- High-income areas were visible in north, west and south areas of Mississauga, fringe areas of Brampton, and throughout Caledon. Lower and middle-income areas were located in central and southwest Brampton, and in parts of Mississauga, particularly the central, east and northeast portions.

- Areas with high diabetes rates (above 11.8 cases per 100 people) were found in many middle- and lower-middle income neighbourhoods throughout Brampton and northeast Mississauga.

- Lower diabetes rates (below 8.8 cases per 100 people) were visible in many middle- to high-income areas of Mississauga and Caledon.
Findings:

- In Mississauga, most high-diabetes areas (with rates 20% or higher than the GTA) were in the lowest income category. By contrast, in Brampton, most high-diabetes areas were in the middle-income category.

- Areas with lower diabetes rates (compared with the GTA) and higher income were found throughout most of Caledon and in south Mississauga.

- No lower income area had low diabetes rates (20% or more below the GTA rate).
Findings:

• Areas with higher percentages of residents (greater than 15%) who fell below the LICO were visible in northeast, southeast, west and central Mississauga, and in south-central Brampton. None were found in Caledon.

• High-diabetes areas in northeast Mississauga and in parts of Brampton had medium-to-high percentages of residents falling below the LICO.

• However, half of all high-diabetes neighbourhoods in Brampton had a relatively low percentage of residents below the LICO.

Exhibit 3.3. Per cent of the population who fell below Statistics Canada’s low income cut-off (LICO; after-tax) [2005] and age- and sex-standardized diabetes prevalence rates per 100 persons aged 20+ [2007], by census tract [2006], in Peel region
Findings:

• In Mississauga, most high-diabetes areas (with rates at least 20% higher than the GTA) had a medium-to-high percentage of residents falling below the LICO. In Brampton, the pattern was more mixed, with more high-diabetes areas having a low percentage of residents below the LICO.

• No lower- or middle-income area in Peel (with more than 8.2% of residents falling below the LICO) had diabetes rates at least 20% lower than the GTA rate.
Findings:

- Areas of Peel with the lowest level of educational attainment were found throughout Brampton, in northeast and southeast Mississauga, and in southwest Caledon.

- Most areas with a higher percentage of residents (above 15%) who did not complete high school had either medium or high diabetes rates.

- High-diabetes areas had consistently lower levels of educational attainment.
Exhibit 3.6. Spatial relationship between per cent of the population aged 25-64 who did not complete their high school education [2006] and age- and sex-standardized diabetes prevalence rate-ratios* [2007], by census tract [2006], in Peel region

Findings:

• In Brampton, most areas with a high percentage of residents who did not complete high school also had high diabetes rates (at least 20% above the GTA rate). In Mississauga, this pattern was more mixed.

• With few exceptions, areas with higher levels of educational attainment in south Mississauga and north Caledon had lower rates of diabetes (at least 20% below the GTA).

*Rate-ratio calculated as:
Overall Greater Toronto Area (GTA) diabetes rate: 9.0%
DISCUSSION

In Peel, there was generally a consistent relationship between lower socioeconomic status (SES) and higher rates of diabetes prevalence. However, different patterns for the components used to define SES for this atlas (income and education) were visible across the three Peel municipalities.

Throughout Caledon and in south and west Mississauga, higher income areas had consistently lower rates of diabetes. The association of diabetes rates with level of educational attainment (secondary school) appeared to be more mixed. In Caledon, diabetes rates were in the lowest range regardless of education level. In contrast, in Mississauga, which on average has the highest education levels in Peel, areas with higher levels of educational attainment generally had lower rates of diabetes. In northeast Mississauga, a cluster of lower income and lower education areas surrounded by industrial land had a disproportionately high burden of diabetes.

The associations between household income and education with rates of diabetes were somewhat different in Brampton, the municipality with the largest number of high-diabetes areas. Here, most areas with high rates of diabetes were in the middle-income category. Many of these areas also had lower levels of educational attainment.

Although strongly linked to one another, a person’s income and education may have independent effects on health and various behaviours that relate to health.\(^1,14\) For example, education may influence a person’s choice of foods through greater knowledge of nutrition and make people more receptive to health education messages. It may also make it easier for people to communicate with and access appropriate health services. In turn, a higher income makes it easier to access better quality resources and services such as housing, nutritious food and leisure-time exercise activities, all of which have important implications for health.

There are many potential explanations for the association between SES and diabetes prevalence. Risk factors for diabetes such as obesity, less healthy eating patterns and sedentary lifestyles appear to be more common among population groups with lower SES.\(^6,11,13\) These and other health-related behaviours are strongly shaped by levels of income, education and overall living conditions throughout a person’s life-course.

Also, Peel is home to one of the largest immigrant communities in the Greater Toronto Area (GTA) which further complicates the link between SES and diabetes. New immigrants often experience a prolonged period of low income as a result of the resettlement process. The high rates of immigration also bring with them a diverse mix of ethnic origins which are known to impact health through diet, health-related behaviours and genetic make-up. Many recent immigrants who settle in Peel are from ethnic groups that have an inherently increased risk of developing diabetes, particularly those of South Asian, African, Latin American and Caribbean ancestry.\(^16,17\) Peel is also home to many established immigrants and persons born in Canada who identify themselves as being part of these ethnocultural groups. In 2006, Brampton was home to the largest South Asian community in Peel.\(^18\) Black and Chinese were the second most commonly reported visible minority groups in Peel. Immigrants belonging to high-risk ethnocultural groups who are more established in Canada and have higher SES may have a higher residual risk of diabetes due to genetic susceptibility.\(^17\) This could partly account for the high rates of diabetes throughout many higher and middle-income areas of Brampton and Mississauga shown in these analyses (for more details about patterns of ethnicity and immigration in Peel and about how these factors relate to diabetes, see Chapter 4).

It is important to note that the cross-sectional nature of this research cannot prove a causal link between lower SES and diabetes because lower SES may occur after the development of diabetes (i.e., cause and effect cannot be determined). Persons with diabetes often have higher rates of unemployment due to disability associated with the disease.\(^19,20\) Thus, a person’s social status may deteriorate as a direct consequence of developing diabetes. Furthermore, the analyses presented in this chapter use aggregate data to show rates of...
diabetes and SES across neighbourhoods. That is, there was no information on, for example, whether a particular individual had diabetes and also had a low level of education. This is a common issue in this type of research and must be kept in mind as one interprets the results of these analyses.

The findings of this chapter have a number of implications. Canadians diagnosed with diabetes who were in the highest household income group ($60,000 and over) were twice as likely to receive the recommended care to prevent complications than those in the lowest income group (less than $20,000). 

Persons in lower SES groups also experience a higher rate of cardiovascular disease and are more likely to be hospitalized for an acute complication of diabetes. This means that the consequences of developing diabetes may be more severe for those with low income. In addition, diabetes is a costly condition to manage, requiring the use of multiple medications and supplies to regularly monitor levels of blood glucose. This places an even greater burden on persons in lower income groups who have fewer resources to purchase these medications and supplies. Among some individuals with lower levels of educational attainment, low levels of health literacy – the ability to access, understand and act on medical information – may be an additional obstacle to managing this complex condition.

The cost of maintaining a healthy lifestyle can pose an additional barrier to persons with lower incomes. Regular exercise can help prevent weight gain, a major risk factor for the development of diabetes. Research from randomized trials shows that physical activity, along with changes in diet, plays an essential role in reducing the occurrence of diabetes in high-risk populations (i.e., in individuals with prediabetes). 

The costs associated with sports and other leisure activities could give wealthier individuals a health advantage over those in lower income groups who simply cannot afford to engage in certain sporting activities or join fitness clubs. The higher cost of healthy foods (e.g., fruits and vegetables, lean meats, fish) relative to energy-dense convenience foods is also likely to contribute to obesity and diabetes among people with low incomes.

The association between SES and diabetes may be also driven by differences in access to healthy resources (e.g., stores selling fresh fruits and vegetables) and opportunities to engage in physical activities (e.g., nearby parks or recreation centres). In some cities in Canada and the United States, lower income neighbourhoods have worse access to such resources as a result of unequal distribution of these amenities. Low-SES populations may also live in areas that are less pleasant for walking, have fewer walkable destinations and poor access to public transit than higher SES areas. Thus, urban planners may need to especially attend to these aspects of the built environment in low-SES areas. Because this research is cross-sectional, it is also possible that the apparent clustering of individuals with diabetes and low SES in particular neighbourhoods may be due to some other factor or group of factors. For example, individuals with low SES and diabetes may be more likely to settle in particular areas because of more affordable housing.

Public health interventions focused on reducing the risk of diabetes in low-education and low-income groups may be more challenging to implement than public health measures in other high-risk populations. Such measures will require approaches that are multi-faceted and tailored to the unique needs of the local community.
CONCLUSIONS AND IMPLICATIONS

In Peel, there was a fairly consistent spatial relationship between rates of diabetes prevalence and income and education, the components used to define socioeconomic status (SES) for this atlas. Higher rates of diabetes were generally found in lower SES areas. However, somewhat different patterns for the components of SES (income and education) were visible across the three Peel municipalities. In Brampton, the majority of areas with high rates of diabetes were in the middle-income category and had lower levels of educational attainment. In northeast Mississauga, a cluster of neighbourhoods – surrounded by industrial land – with high rates of diabetes, lower income and a higher percentage of residents who did not complete high school was identified. Relatively high SES profiles and low diabetes rates were seen across Caledon and in south Mississauga. Many factors may explain the relationship between neighbourhood SES and diabetes prevalence, including the distribution of ethnocultural groups across municipalities, as well as local access to healthy foods and opportunities for physical activity. The relationship between these factors and diabetes across neighbourhoods of varying SES will be explored in later chapters of this atlas.

APPENDIX 3.A – RESEARCH METHODOLOGY

Data sources

- The socioeconomic factors examined in this chapter and population estimates for Peel region were gathered from the 2006 Canadian census for each census tract.
- The total population included Canadian citizens, landed immigrants, refugees, students, people with work permits and people with Minister’s permits whose usual place of residence is in Canada.
- The median household income represented the median after-tax income reported by households within a given census tract in the year 2005.
- The percentage of individuals living below Statistics Canada’s low income cut-off (LICO, after-tax) was derived for economic families and persons aged 15 years or older in private households who were not in economic families. The LICO refers to income levels at which individuals spent 20% or more of their total income than the average family on food, shelter and clothing.
- The proportion of residents with less than high school education was based on the percentage of the non-institutionalized population aged 25 to 64 years who did not receive their secondary school graduation certificate or equivalent. The standard approach to measuring educational attainment in a population is to restrict the measure to adults aged 25 to 64 years. This approach is endorsed by the Organisation for Economic Co-operation and Development (OECD) and by Statistics Canada. Only adults aged 25 to 64 years are included because individuals younger than 25 may not have yet completed their schooling. Levels of education among adults aged 65 and older reflect educational attainment many decades ago, a time when general levels of education were lower than today.
• Age- and sex-adjusted diabetes rates per 100 adults aged 20 years or older were calculated using the Ontario Diabetes Database and other administrative data sources held at the Institute for Clinical Evaluative Sciences (ICES) (for a detailed description of the data sources of diabetes rates, please refer to Appendix 2.A in Chapter 2).

Analysis

Bivariate maps were created to display the spatial relationship between socioeconomic variables and rates of diabetes. Choropleth (shaded) maps were produced for each socioeconomic variable. The classifications ranges for median household income and proportion of residents with less than high school education were determined using natural breaks in the distribution of the data, which is a common classification method for choropleth mapping. The classifications ranges for per cent of the population below LICO (after-tax) were generated based on population-weighted quintiles for Exhibit 3.3 and population-weighted tertiles for Exhibit 3.4.

Diabetes rates were depicted in three categories using proportional circles. The ranges for these categories were determined by first ordering the population-weighted diabetes rates of all Peel census tracts from lowest to highest, and then selecting the four points that divide the rates into five equal population-weighted groups (quintiles). Three different proportional circle sizes were used to correspond to the magnitude of diabetes rates (i.e., larger circles correspond to progressively higher ranges of diabetes rates). The lowest category of diabetes rates consisted of the first (lowest) quintile and the highest category consisted of the last (highest) quintile. The middle category of diabetes rates was made up of the middle three quintiles grouped together. These circles were then overlaid on top of the choropleth maps of socioeconomic variables. This was done so that the reader could observe whether there is a spatial correspondence between, for example, areas with higher diabetes rates and lower household income.

A second type of map for each socioeconomic variable was created in order to highlight areas of Peel where diabetes rates were substantially higher or lower than the overall prevalence rate in the Greater Toronto Area (GTA) of 9.0%. Because these analyses use population-based data, even small differences in rates could easily reach statistical significance. Thus, in order to identify areas of Peel with rates of diabetes that were meaningfully different from the GTA rate, a difference of at least 20% was chosen for examination because a difference of this magnitude is likely to have public health significance. For each Peel census tract, the diabetes rate was divided by the overall GTA rate in order to calculate a rate-ratio. Census tracts with diabetes rates at least 20% higher than the GTA rate (rate-ratio of ≥1.20) were depicted in shades of red according to the ranges of values of each socioeconomic variable. Census tracts with rates at least 20% below the GTA rate (rate-ratio of ≤ 0.80) were depicted in shades of blue. All census tracts whose rates did not differ substantially from the GTA rate (rate-ratio between 0.81 and 1.19) were depicted using a single grey colour. The classification ranges for median household income and proportion of residents with less than high school education were determined using natural breaks in the distribution of the data, which is a common classification method for choropleth mapping. The classification ranges for percent of the population below LICO (after-tax) were generated based on population-weighted quintiles for Exhibits 3.3 and population-weighted tertiles for Exhibit 3.4 (for more information on maps see the section, How to Read the Maps).
REFERENCES


