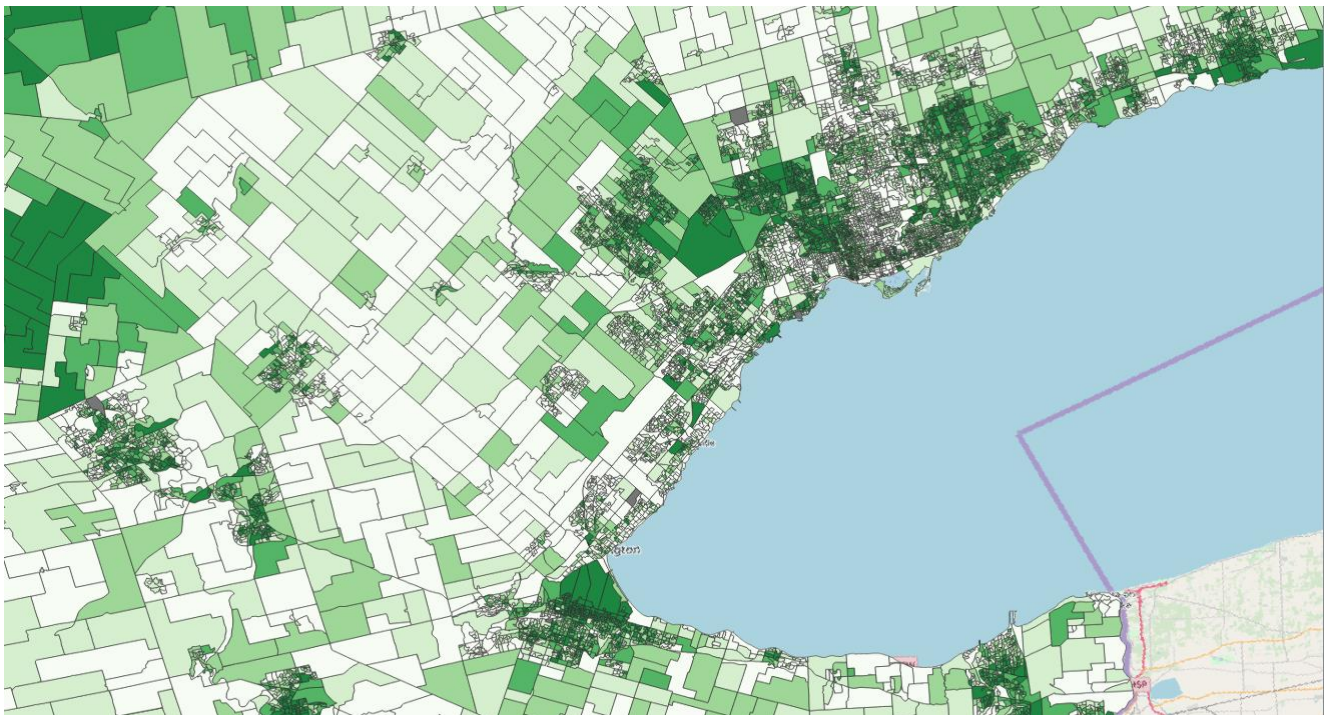


2016 Ontario Marginalization Index



User Guide
October 2018

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https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/details/download-telecharger/comp/GetFile.cfm?Lang=E&TYPE=CSV&GEONO=044_ONTARIO

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Background

The purpose of this document is to describe the Ontario Marginalization Index, how it was created and how it can be used to study marginalization in Ontario.

The Ontario Marginalization Index (ON- Marg) is an area-based index that seeks to:

- show differences in marginalization between geographic areas
- understand inequalities in various measures of health and social well-being, either between population groups or between geographical areas

ON-Marg is an Ontario-specific version of the [Canadian Marginalization Index](#) (CAN-Marg), which has been in use since 2006. The 2011 and 2016 iterations of ON-Marg are unique in that they use Ontario-specific data and are not derived directly from CAN-Marg.

ON-Marg is multifaceted, allowing researchers and policy and program analysts to explore multiple dimensions of marginalization in urban and rural Ontario. The four dimensions are:

- residential instability
- material deprivation
- dependency
- ethnic concentration

The Index was developed using a theoretical framework based on previous work on deprivation and marginalization. It was then empirically derived using principal component factor analysis. It has been demonstrated to be stable across time periods and across different geographic areas (e.g., cities and rural areas). It has also been demonstrated to be associated with health outcomes including: hypertension, depression, youth smoking, alcohol consumption, injuries, body mass index and infant birthweight.¹⁻⁷

ON-Marg can be used for

1. **Planning and needs assessment:** For example, if the goal is to identify service gaps, ON-Marg can be used to identify where rates of hospitalizations for a particular disease, such as diabetes, are high and additional services might be needed.
2. **Resource allocation:** For example, marginalization indexes could be used in funding formulae for primary health care services.
3. **Monitoring of inequities:** For example, marginalization indexes can provide a way to monitor changes in areas over time to look for improvement or to identify areas that may be in decline.
4. **Research:** For example, there is a long history in the health sector of using small area indexes to describe the relationship between marginalization and health outcomes; greater marginalization is associated with higher mortality rates and higher rates of many diseases.⁸⁻¹²

Historical Versions of ON-Marg

The [2001 and 2006 versions of ON-Marg](#) were calculated using data from both the short and long-form census. In 2011, the federal government replaced the mandatory long-form census with a voluntary National Household Survey (NHS). The voluntary nature of the NHS introduced the possibility that indicators using this data would be subject to non-response bias if sampled individuals who chose to respond were different from sampled individuals who chose not to respond. For this reason, the 2011 update to ON-Marg does not use data from the NHS and instead uses alternative data sources to replace indicators formally based on the long-form census (see [2011 Ontario Marginalization Index: Technical Document](#) for full details).

The long-form census was reinstated for the 2016 census and so the 2016 iteration of ON-Marg was once again created using data exclusively from the short and long-form census. The 2016 iteration is based on the original 18 census indicators and methodology used in the 2001 and 2006 versions of the Index.

Technical Details

Methods

Following a literature review, 42 variables were selected from the 2001 Canadian Census of Population for potential inclusion in the Index (see Appendix 1). Principal component factor analysis yielded four factors with Eigenvalues greater than one. Of the original variables, 18 were included in the four factors (see Table 1). The 2001 Index was created from two core files with 49,153 dissemination areas (DAs) and 4,757 census tracts (CTs). The Index was replicated using 2006 data with 52,973 DAs and 5,017 CTs. Due to the replacement of the mandatory long-form census with the voluntary National Household Survey in 2011, the 2011 version of ON-Marg was created using a mix of census and alternative data sources (see [2011 Ontario Marginalization Index: Technical document](#) for details). The 2016 Index was created using

the original 18 census variables derived from 2016 census data on 20,640 DAs and 2,376 CTs from Ontario.

For DAs that experienced suppression from Statistics Canada, indicator data from higher level census geographies were used in its place. Data from census tracts were used in place of suppressed DA level indicator data, where available. In cases where DA-level data was suppressed and census tract was not available, data from either the corresponding census sub-division or aggregate dissemination area was used, depending on which geography had the smallest population.

Factor loadings were used to compute a separate index for each of the four dimensions. Each dimension is an asymmetrically standardized scale.

ON-Marg applies to areas, not individual people. Scores for each dimension are available for every census tract and dissemination area in Ontario, except where data is suppressed.

Geographies

The 2001, 2006, 2011 and 2016 ON-Marg files have tabs for the following geographies:

- dissemination areas
- census tracts
- aggregate dissemination areas (2016 only)
- census divisions
- census subdivisions
- Local Health Integration Networks (LHIN)
- LHIN sub-regions
- public health units
- consolidated municipal service manager areas

ON-Marg values for larger geographies were derived from the original DA factor scores.

Quintile values are not provided for LHINs, public health units, census divisions and consolidated municipal service manager areas because there are too few geographic units to create meaningful quintiles.

Dissemination area (DA) is a small, relatively stable geographic unit composed of one or more adjacent dissemination blocks with an average population of 400 to 700 persons. It is the smallest standard geographic area for which all census data are disseminated. DAs cover all the territory of Canada.¹³

Census tract (CT) is a small, relatively stable geographic unit with a population of less than 10,000 people constructed similarly with respect to economic status and social conditions. Census tracts are located in census metropolitan areas and in census agglomerations having an urban core population of 50,000 or more as of the most recent census.¹³

Limitations

Missing data: There is some missing data in the DA and CT files due to data suppression (e.g., income). Additionally, in some areas, input variables have a value of zero. For example, a DA may not have any recent immigrants.

Time period of data: Data for the Index is from the 2001, 2006, 2011 and 2016 census years and users should be aware of this when selecting the most appropriate year for their own analyses. For example, if your outcome data set was collected in 2010 or 2012, you would use the 2011 Index to ensure data comparability. If your outcome data set was collected in 2005 or 2007, you would use the 2006 Index.

Coverage of census: Some populations, for example Indigenous people living on reserves, may be under-counted in the census. ON-Marg may not be as sensitive for these populations. Additionally, institutionalized populations, such as those living in nursing homes or penitentiaries, are not counted in the long-form census and so are not included in the Index. Refer to Statistics Canada to see if census coverage will impact your analyses.

Using ON-Marg for Analysis

I. Exploring the Relationship between Outcomes and Area-Level Marginalization

Outcomes can include the following:

- individual health status
- individual risk or protective factors
- rates of disease or any health related event

Research questions that could be answered include:

1. What is the association between health outcomes, such as mortality and diabetes rates and area-level marginalization?
2. What is the association between health behaviours, such as smoking and alcohol consumption and area-level marginalization?
3. What is the association between access to routine surgical procedures, such as joint replacement and area-level marginalization?

To answer such questions, merge the outcome file with ON-Marg, following the steps below:

1. Prepare the outcome file:
 - Ensure the addresses are error-free.
 - Geocode each observation in your outcome data set (e.g. mortality, crime events, hypertension) to CT or DA. Often this is accomplished using the PCCF+ SAS program created by Statistics Canada.¹⁴ Now every record is associated with a particular CT or DA.
2. Merge your health outcome data set with the ON-Marg CT or DA, thus linking each geocoded outcome with the appropriate area marginalization scores.

II. Using ON-Marg as an Individual-Level Proxy

In some instances, ON-Marg can be used as a proxy for individual-level data when actual data are not available. If individual-level socio-economic status data are unavailable, for example, DA-level factor scores or quintiles for deprivation can be assigned to each individual based on the DA in which the individual resides and used as a proxy for socioeconomic status.

To minimize measurement error, use the smallest spatial area available. In the case of ON-Marg, this is DA data. The reason is similar to that provided under the “caution” for weighted averages on page six. As the size of the geographic unit increases (e.g., CTs and sub-LHINs), the potential for ecological fallacy increases as well, since not everyone in a marginalized area is marginalized.

In effect, using areas larger than the DA will weaken any relationship between individual- and area-level marginalization. The larger the geographic area, the less likely it is that an individual’s socio-economic status will actually correspond to the deprivation score of the area in which they live.

III. Mapping the Index

The Index can be displayed geographically using mapping software such as ArcGIS or MapInfo.

IV. Comparing the Marginalization of Two or More Groups

If you want to compare levels of marginalization between two or more groups (e.g., hypertensive versus non-hypertensive; diabetic versus non-diabetic) you can compare the distributions of quintiles (or factor scores) using a non-parametric test. This test is used because quintile values are ordinal and the principal component scores are skewed.

V. Comparing Rates of Events

If you are comparing rates of events with marginalization (e.g., mortality rates in a region compared across the five marginalization scale values) you can calculate a rank correlation coefficient or simply plot your results. Note that the denominators for your rates can be obtained from the CT or DA populations.

Dimensions

The original factor analysis of 42 indicators from the 2001 Canadian census selected 18 indicators grouped across four dimensions of marginalization. These four dimensions have remained fairly consistent for the 2001, 2006, 2011 and 2016 versions ON-Marg; however, there are differences over time. The definitions of some indicators have changed over time; additionally, in 2011 alternative data sources were used for indicators previously based on the long-form census (see the [2011 Ontario Marginalization Index: Technical document](#) for more details.). The following tables describe the indicators that are included in each dimension and any indicator analyses notes or differences over time.

Residential Instability

This measure refers to area-level concentrations of people who experience high rates of family or housing instability. The indicators included in this dimension measure the types and density of residential accommodations, as well as certain family structure characteristics. Residential instability is important, as it related to neighborhood quality, cohesiveness and supports.¹⁵

Indicator	Notes
Proportion of the population living alone	No notes
Proportion of the population who are not youth (age 5-15)	Reverse coded
Average number of persons per dwelling	Reverse coded
Proportion of dwellings that are apartment buildings	Alternative data source used in 2011. See 2011 Ontario Marginalization Index: Technical document .
Proportion of the population who are single/divorced/widowed	Reverse coded
Proportion of dwellings that are not owned	Alternative data source used in 2011. See 2011 Ontario Marginalization Index: Technical document .
Proportion of the population who moved during the past 5 years	Alternative data source used in 2011. See 2011 Ontario Marginalization Index: Technical document .

Material Deprivation

Material deprivation is closely connected to poverty and it refers to inability for individuals and communities to access and attain basic material needs. The indicators included in this dimension measure income, quality of housing, educational attainment and family structure characteristics.¹⁶

Indicator	Notes
Proportion of the population aged 20+ without a high-school diploma	<p>Not included in 2011 version, as alternative data source could not be identified.</p> <p>Due to a change in the Statistics Canada definition, the 2006 and 2016 version uses “proportion of the population aged 25 to 64 without a certificate, diploma or degree.”</p>
Proportion of families who are lone parent families	No notes
Proportion of total income from government transfer payments for population aged 15+	<p>Alternative data source used in 2011. The 2011 version instead measures “Ratio of income from government transfers payments to employment income.” See 2011 Ontario Marginalization Index: Technical document.</p> <p>For the 2016 Census, the reference period is the calendar year 2015.</p>
Proportion of the population aged 15+ who are unemployed	Not included in 2011 version, as alternative data source could not be identified.
Proportion of the population considered low-income	<p>Defined as earning less than the Low Income Cut-Off (LICO) in 2001, 2006 and 2016 and earning less than the Low Income Measure (LIM) in 2011. Alternative data source used in 2011. See 2011 Ontario Marginalization Index: Technical document.</p> <p>For the 2016 Census, the reference period is the calendar year 2015.</p>
Proportion of households living in dwellings that are in need of major repair	Alternative data source used in 2011. The 2011 version instead measures “proportion of dwellings in fair/poor condition.” See 2011 Ontario Marginalization Index: Technical document .

Dependency

This measure refers to area-level concentrations of people who do not have income from employment. It includes seniors, children and adults whose work is not compensated. Adults included under this measure may be taking care of households, taking care of people in the community and/or prevented from working due to disability.

Indicator	Notes
Proportion of the population who are aged 65 and older	No notes
Dependency ratio (total population 0-14 and 65+ / total population 15 to 64)	No notes
Proportion of the population not participating in labour force (aged 15+)	Alternative data source used in 2011. The 2011 version instead measures “employment rate.” See 2011 Ontario Marginalization Index: Technical document .

Ethnic Concentration

This measure refers to high area-level concentrations of people who are recent immigrants and/or people belonging to a ‘visible minority’ group (defined by Statistics Canada as “persons, other than aboriginal peoples, who are non-Caucasian in race or non-white in colour”). Statistics Canada Aboriginal status indicators did not load on any of the factors during initial factor analysis. Research on immigration in Ontario shows that newcomers to Canada often have better overall health outcomes¹⁷, a phenomenon commonly known as the “healthy immigrant effect.” At the same time, research is clear that both structural racism and anti-immigrant discrimination have profound impacts on individual, community and population health.¹⁸

Indicator	Notes
Proportion of the population who are recent immigrants (arrived in the past 5 years)	Alternative data source used in 2011. See 2011 Ontario Marginalization Index: Technical document .
Proportion of the population who self-identify as a visible minority	Alternative data source used in 2011. The 2011 version instead measures “proportion of population who have immigrated in previous 20 years and below to a visible minority group.” See 2011 Ontario Marginalization Index: Technical document .

How to Use the Dimensions

The ON-Marg dimensions can be used separately or combined into a composite index (see the next section). Whether you use individual dimensions or the combined index will be determined by the research question.

For each dimension, ON-Marg is provided in two forms:

- **Factor scores (interval scale):** Factor scores are constructed from the principal component factor analysis. They were derived from the CAN-Marg and, when the full Canadian Index is used, represent a standardized scale with a mean of zero and a standard deviation of one. Lower scores on each dimension correspond to areas that are the least marginalized; higher scores on each dimension correspond to areas that are the most marginalized.
- **Quintiles (ordinal scale):** Quintiles have been created by sorting the marginalization data into five groups, ranked from one (least marginalized) to five (most marginalized). Each group contains a fifth of the geographic units. For example, if an area has a value of five on the material deprivation scale, it means it is in the most deprived 20% of areas in Ontario. The quintiles were created province-wide to enable comparability across the province; however, if you are interested in a particular city or urban area, it may be possible to re-create the quintiles using the individual factor scores for that city/urban area.

The objectives of your analysis and the methods you are using will determine whether you use factor scores or quintiles in your analysis. For example, a mapping exercise might be best presented using quintiles, whereas a regression model might benefit from the detail of the factor scores.

Summary Score for the ON-Marg Dimensions

Users may wish to examine overall marginalization using a summated score. This can be done using the quintile scales for each dimension. Follow these steps in order to calculate the summated score:

- 1. Compare the correlations between each dimension with the outcome.** This allows you to determine if the associations are in the same direction. If the associations are either all positively or all negatively associated with the outcome then an average marginalization score can be computed. If one or more dimensions are in the opposite direction, it is not recommended to combine the dimensions. For example, if ethnic concentration is negatively associated with the outcome of interest, this may represent a protective factor (e.g., a healthy immigrant effect) and it may not be appropriate to combine ethnic concentration with the other dimensions that are positively associated with the outcome and therefore represent risk factors.
- 2. Sum the quintile values across the four dimensions.**
- 3. Divide by 4 (which is the number of dimensions).**

Summary Score =

(instability_quintile + deprivation_quintile + dependency_quintile + ethniccon_quintile) / 4

These steps will produce a score ranging from one to five, where one reflects low levels of marginalization and five reflects high levels of marginalization.

Caution: Factor scores cannot be used to obtain a summary score.

Calculating an Average ON-Marg Score Value for Higher-Order Geographical Units

Commonly-used Ontario geographies have already been aggregated and are available as part of the ON-Marg package; however, some research and policy questions require geo-coding at custom geographic units. You can use the DA and CT data in ON-Marg and the methods described in this section to create values for your own geographies, using population-weighted average scores.

Example: calculating weighted average scores for a single Ontario urban health region from 2016 CT- or DA-level marginalization scores.

1. Define the health region in terms of the component CTs and/or DAs.
2. Using the population counts, take the weighted average of each factor score value across all the CTs or DAs in the health region. Use the CT (or DA, depending on your analysis) worksheet of the ON-Marg file ON-Marg_2016.xls to obtain the weighted average for the health region, following these steps:
 - a) Multiply each CT or DA marginalization score value by the population within the CT or DA for the health region.
 - b) Sum the multiplied values from a). This becomes the numerator.
 - c) Sum the population values from each CT or DA to obtain a total population count for the health region. This becomes the denominator.
 - d) Divide the total from (b) by the total from (c). This is your weighted average.

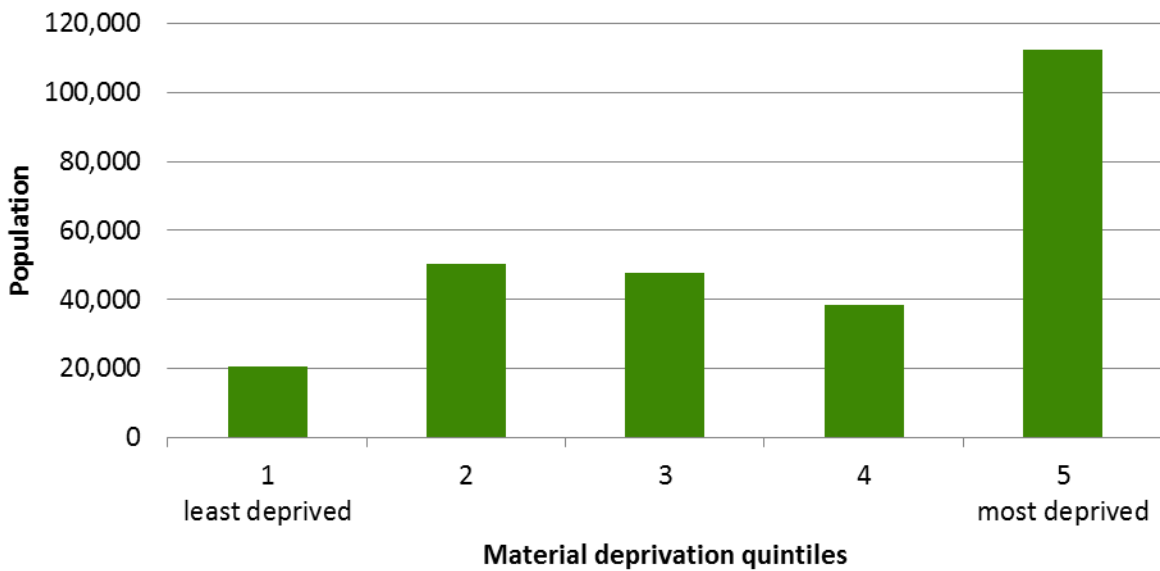
Weighted average deprivation score:

$$\frac{\sum(\text{ON-Marg}_{\text{CT}_{2016}} * \text{ONPop}_{\text{CT}_{2016}})}{\sum (\text{ONPop}_{\text{CT}_{2016}})}$$

3. You can now use these weighted averages to create quintiles.

Caution: Weighted averages can disguise heterogeneity within large geographic areas. For example, when the weighted average method is used to determine the deprivation quintile for the East Toronto LHIN sub-region, the result is five (most deprived). Figure 1, however, shows the true variation in this LHIN sub-region by using summed DA population counts by quintile, not weighted averages, to show the number of people in each quintile. The resulting graph shows there are pockets of low, moderate and high deprivation in the East Toronto sub-region that would be masked by using the summary score of five.

Figure 1. Population in each quintile in East Toronto subregion, based on DA population



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Appendix 1: Census Variables

1. Proportion of the population who moved during the past 5 years
2. Proportion living in same house as 1 year ago
3. Proportion of population lone parent families
4. Proportion of population living alone
5. Dependency ratio (total population 0-14 and 65+/ total population 15 to 64)
6. Proportion of population youth (aged 5-15)
7. Proportion foreign born
8. Proportion Aboriginal
9. Proportion of the population who are recent immigrants (arrived in the 5 years prior to census)
10. Proportion with no official language
11. Proportion unemployed (aged 15+)
12. Labour force participation rate (aged 15+)
13. Proportion who self-identify as a visible minority
14. Proportion aged 15-24 not attending school
15. Proportion aged 20+ without high school diploma
16. Proportion of the population considered low income using the low income cut off (LICO)
17. Average household income
18. Proportion of income from government transfer payments
19. Proportion with no religious affiliation
20. Average dollar value of dwelling
21. Proportion of dwellings that are apartment buildings
22. Proportion of owner households spending 30% or more of household income on major payments
23. Proportion of tenant households spending 30% or more of household income on rent

24. Proportion of dwellings that are owned
25. Proportion of occupied units that are rentals
26. Proportion of population self-employed
27. Proportion of population female
28. Proportion of population married/common law
29. Proportion of households living in dwellings that are in need of major repair
30. Proportion of population aged 15+ doing unpaid housework
31. Proportion of population aged 15+ looking after children without pay
32. Proportion of population aged 15+ providing unpaid care/assistance to seniors
33. Raw population count
34. Average number of persons per dwelling
35. Average number of persons per room
36. Ratio of employment to population
37. Average income
38. Proportion of persons separated, divorced or widowed
39. Proportion of children younger than 6 years
40. Persons per square kilometer
41. Unemployment rate in private households with children under 6 years
42. Proportion of the population who are aged 65 and older

Disclaimers

St. Michael's Hospital

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Public Health Ontario

This document was developed by Public Health Ontario (PHO). PHO provides scientific and technical advice to Ontario's government, public health organizations and health care providers. PHO's work is guided by the current best available evidence at the time of publication.

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Ethical Approval

This study was approved by the institutional review board at Sunnybrook Health Sciences Centre, Toronto, Canada, the St. Michael's Hospital Research Ethics Board, and the Ethics Review Board of the Ontario Agency for Health Protection and Promotion (Public Health Ontario).

About the Author Organizations

Centre for Urban Health Solutions – St. Michael’s Hospital

The Centre for Urban Health Solutions is an inter-disciplinary research centre within St. Michael’s Hospital in Toronto. The Centre seeks to improve health in cities, especially for those experiencing marginalization, and to reduce barriers to accessing factors essential to health, such as appropriate health care and quality housing. We are committed to developing and implementing concrete responses within health care and social service systems and at the level of public policy.

St. Michael’s Hospital provides compassionate care to all who enter its doors. The hospital also provides outstanding medical education to future health care professionals in more than 29 academic disciplines. Critical care and trauma, heart disease, neurosurgery, diabetes, cancer care, care of the homeless, and global health are among the Hospital’s recognized areas of expertise. Through the Keenan Research Centre and the Li Ka Shing International Healthcare Education Center, which make up the Li Ka Shing Knowledge Institute, research and education at St. Michael’s Hospital are recognized and make an impact around the world. Founded in 1892, the hospital is fully affiliated with the University of Toronto.

For more information, visit the [Centre for Urban Health Solutions](#) website.

Public Health Ontario

Public Health Ontario is a Crown corporation dedicated to protecting and promoting the health of all Ontarians and reducing inequities in health. Public Health Ontario links public health practitioners, frontline health workers and researchers to the best scientific intelligence and knowledge from around the world.

Public Health Ontario provides expert scientific and technical support to government, local public health units and health care providers relating to the following:

- communicable and infectious diseases
- infection prevention and control
- environmental and occupational health
- emergency preparedness
- health promotion, chronic disease and injury prevention
- public health laboratory services

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