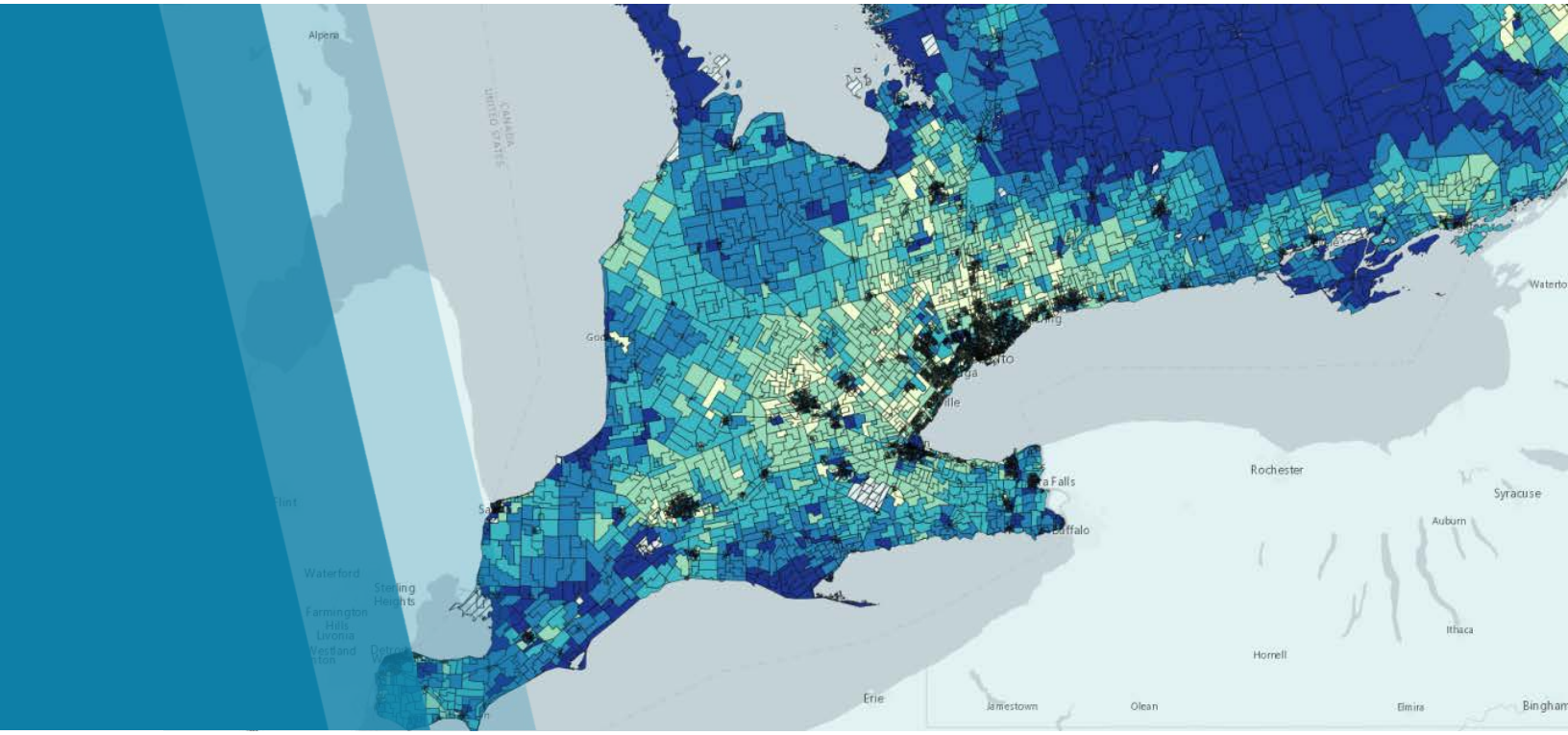
Public Health Ontario | Santé publique Ontario

Social Determinants of Health Map



Technical Notes

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Public Health Ontario

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Contents

Introduction

The Social Determinants of Health Map application is an online interactive tool intended to support evidence-based public health in Ontario by promoting understanding of the distribution of the social determinants of health in the Ontario. This document will provide information about the Statistics Canada taxfiler and Ontario Marginalization Index data included in the tool. A description of the analytical process used to prepare data for use in this tool, including interpolation and indicator definitions, is provided along with description of the data sources used in this tool.

2011 Statistics Canada T1 Family File Taxfiler

Description

Statistics Canada T1 Family File (T1FF) data contains information on income and employment characteristics for persons of any age who have completed a T1 tax return for the year of reference or who have received Canada Child Tax Benefits, including their non-filing spouses and children. Late filers, as well as individuals who received a T4 but did not file a T1 and cannot be linked to a family unit are excluded. The 2011 T1FF data provided in this tool is taken from 2011 T1 tax returns filed in most cases in the spring of 2012. Data is aggregated to the dissemination area (DA) level, which are standard census geographies containing populations of roughly 400 to 700 persons. In 2011, when compared to the Canadian census, T1FF data at the DA level had a coverage rate of 98.9% at the provincial level in Ontario.

Geocoding

For the custom tabulation of the 2011 T1FF data obtained by Public Health Ontario, Statistics Canada used a single-link postal code conversion file to assign taxfiler records to 2011 census DAs. Some areas are susceptible to having populations that are misattributed to a given DA. Statistics Canada uses the postal code as the basis for assigning different levels of census geography to the T1FF data; however, postal codes do not align with standard census geographic boundaries. As a result, some postal codes overlap the boundaries of two or more DAs. In these cases, the single-link postal code conversion methodology assigns the full population of the postal code to the single dissemination area containing the majority of the dwellings, and none of that postal code's population is assigned to the other overlapping DAs. In the case of the 2011 T1FF data obtained for this mapping application, approximately 14% of all Ontario DAs did not have population assigned to them for this reason.

For a small number of taxfilers, the addresses used for filing T1 tax records are sometimes associated to a P.O. box or an address for an accountant or lawyer. Areas which include P.O. boxes or commercial buildings with accountants' or lawyers' offices might have tax filers associated to that DA who do not

reside there. Instances of this behaviour are assumed to be low, but might cause some DAs to not represent the true residential addresses.

Data Suppression

Data obtained from Statistics Canada has been subjected to suppression procedures to maintain confidentiality of taxfilers recorded in the T1 Family File. Records were suppressed for DAs with less than 100 taxfilers, numerators with less than 15 observations, and for DAs where dominance occurred (a handful of taxfilers who reported a dramatically different amount). For those DAs where suppression was performed, estimates based on Inverse Distance Weighted (IDW) interpolation were provided in the tool. **Caution should be taken when interpreting values based on interpolation.**

Dissemination areas that fall within First Nation reserve areas have been excluded, and have been given the flag "Reserve". This was done in consideration of the differences in the ways First Nation populations report T1 tax returns.

Interpolation

As described above, the postal code conversion methodology used to assign taxfilers to DAs for this product has resulted in 2,751 out of 19,166 (14.4%) DAs with no taxfilers assigned. These DAs occur most often in rural areas.

IDW interpolation using five nearest measured points (neighbours) in ArcGIS (version 10.3) was used to estimate rate values for DAs for which indicator values were missing, due to postal code conversion or suppression by Statistics Canada. Inverse distance weighting is a spatial interpolation technique which uses known values to estimate values for unknown areas. It makes the assumption that unknown values are more similar to known values that are close and less similar to known values that are further away. All DAs which use IDW-based interpolated values have been marked with an "Estimate" flag. Validation of interpolated DAs was conducted by comparing 2006 T1FF to 2006 Canadian census values for those indicators included in this tool (see Validation section for more details). **Caution should be taken when interpreting values based on interpolation.**

Taxfiler Indicator Definitions

Four indicators of socioeconomic status have been derived from the T1FF data. These indicators were selected for their ability to closely replicate 2006 Canadian census variables used in the creation of the 2006 Ontario Marginalization Index, so that they could be used as alternatives to the long-form census in the creation of a 2011 Ontario Marginalization Index. The indicators are defined as follows:

Low Income Persons

Numerator: Number of people living in census families earning less than the after-tax low income measure[1]

Denominator: Total number of people

Employment Rate

Numerator: Number of people receiving labour income, including wages and salaries, commissions from employment, training allowances, tips and gratuities, self-employment income, Indian Employment Income, and employment insurance benefits

Denominator: Total number of people

Government Transfers

Numerator: Median dollar amount from government transfer for census families

Denominator: Median dollar amount from all income sources for census families

Receiving Employment Insurance

Numerator: Number of people living in census families that reported receiving employment insurance (EI) benefits

Denominator: Number of people living in census families earning labour income

Validation

To validate the use of IDW for interpolating missing DAs, the 2011 T1FF indicators included in the Social Determinants of Health Map were recalculated using 2006 T1FF data, and then compared to the similar indicators calculated using 2006 Canadian census variables. Details on the census indicators used in this analysis are provided in Appendix A.

Dissemination areas were ranked into five equal groups (quintiles) for both 2006 T1FF and 2006 census, and the absolute difference in quintiles assignment was calculated to determine the level of agreement between the two data sources. Indicators where most DAs show small differences (±1) in quintile assignment reflect stronger agreement between the census and T1FF. Pearson correlation coefficients were also calculated to measure the strength of the association between taxfiler and census variables measured at the DA level for all of Ontario. These analyses were completed for all DAs and separately for only those DAs which use interpolated values.

[1] The Low-income measure (LIM) is defined as 50% of the median Canadian income, adjusted by household size.

Results of this validation are provided in Appendix B. The analysis demonstrated that the "low income", "government transfers" and "employment" T1FF indicators showed good agreement with the census, with 75% of all Ontario DAs within ±1 quintiles of the census, and Pearson correlation coefficients of greater than 0.7. The "receiving EI" indicator shows the least strong agreement between T1FF and census, with only 55% of DAs within ±1 quintiles of the census, and Pearson correlation coefficients of 0.09. This is possibly related to differences in the way the T1FF "receiving EI" indicator is defined compared to the census indicator which measures more specifically unemployment in the week prior to Census Day (May 16, 2006).

There was less agreement when considering only those DAs where interpolation was used to estimate T1FF data. All four indicators showed decreases in the percent of DAs that were within ±1 quintiles of the census, although no indicator dropped below 50%. All four indicators also showed Pearson correlation coefficients of below 0.7. The differences between the census and the interpolated T1FF data could be partially explained by limitations in the ability of IDW interpolation to estimate missing values related to single-link postal code conversion. IDW relies on the assumption that the true values for missing geographies are similar to neighboring areas, which may be less valid for large rural geographies in Ontario. Another contribution to the observed differences is that the variations in the way indicators were defined between the census and T1FF data sources outlined in Appendix A could result in differences in observed rates of those indicators. For example, the census low income indicator uses the Low Income Cut-Off (LICO) as the basis for determining low income, while the T1FF data relies on the Low Income Measure (LIM) for determining low income. The LICO thresholds for low income are adjusted based on community size, while the LIM thresholds are not. This could result in greater differences between census and T1FF low income indicators in rural DAs compared to the rest of Ontario.

As demonstrated in both the indicator definitions as well as the results outlined in Appendix B, there are differences between indicators derived from T1FF and census. The high level of overall agreement between indicators derived from T1FF and census data at the DA level for Ontario validates the use of 2011 T1FF data as an alternative to 2011 census data. DAs using interpolated estimates show less agreement to the census, and while this could partially be attributed to differences in indicator definitions, **caution is advised when interpreting values based on interpolated estimates.**

Ontario Marginalization Index

The Ontario Marginalization Index (ON-Marg) is an area-based tool that combines a wide range of demographic indicators into four distinct dimensions of marginalization. As a multifaceted index, ON-Marg measures multiple axes of deprivation in Ontario, including economic, ethno-racial, age-based, and social marginalization. It can be used for:

- research
- population health assessments
- resource allocations and program planning
- assessing health inequities

Public Health Ontario, in collaboration with researchers at the Centre for Urban Health Solutions at St. Michael's Hospital, have created a 2011 update to the ON-Marg. ON-Marg was originally developed using a principal component factor analysis of 42 variables derived from the Canadian census. In an iterative process, variables with low factor scores were removed until four primary factors, or dimensions, of marginalization emerged: material deprivation, ethnic concentration, residential instability, and dependency. The 2001 and 2006 versions of the index were derived using dissemination area level data from the short and long-form components of the census. In 2011, the mandatory long-form census was replaced with the National Household Survey, which, due to its voluntary nature and higher non-response rate, is less appropriate for studying marginalized populations. The 2011 update uses dissemination area level data from alternative administrative sources which are better suited for providing this information, including Municipal Property Assessment Corporation, Statistics Canada taxfiler, Registered Persons Database, and Immigration, Refugees and Citizenship Canada data.

For more information on the Ontario Marginalization Index, and the 2011 update derived from alternative data sources, please see the Ontario Marginalization Index website.

Data Sources

1. Ontario Marginalization Index
   Matheson et al. "Development of the Canadian Marginalization Index: a new tool for the study of inequality." Canadian Journal of Public Health, 2012;103 (Suppl. 2):S12-S16.

   Matheson, FI; Ontario Agency for Health Protection and Promotion (Public Health Ontario). 2011 Ontario marginalization index: user guide. Toronto, ON: St. Michael's Hospital; 2017. Joint publication with Public Health Ontario.

2. 2011 Statistics Canada T1FF Taxfiler
   Adapted from Statistics Canada, Special tabulation, based on T1 Family File 2011, Reference 16005. This does not constitute an endorsement by Statistics Canada of this product.

   Statistics Canada makes no representation or warranty as to, or validation of, the accuracy of any Postal CodeOM data.

3. Dissemination Area Geographies
   Statistics Canada. 2006. Dissemination Area Boundary File, 2006 Census. Statistics Canada Catalogue no. 92-169-X.

   Statistics Canada. 2011. Dissemination Area Boundary File, 2011 Census. Statistics Canada Catalogue no. 92-169-X.

Appendix A: Indicators Validation

Four indicators of socioeconomic status were derived using the T1FF and included in this map application. To validate the ability of T1FF to provide information on socioeconomic status similar to the existing long form Canadian census (gold standard), these indicators were compared with similar indicators derived from the census. Due to the way data was collected, and the type of data available for analysis, there are several differences between the census and T1FF indicators which will impact the comparability of indicators derived from these two sources. The primary differences in the way indicators were defined are outlined below:

Low Income

T1FF indicator: Prevalence of people in census families earning less than the after-tax Low Income Measure

Census: Prevalence of people in economic families earning less than the after-tax Low Income Cut Off

Differences between census and taxfiler:

- The family unit used in the T1FF is the census family, while the Canadian census uses the broader economic family as the family unit.[2]
- The T1FF considers income earned in the reference year and reported on in that year's tax returns, while the census considers income earned in the year prior to the census year. For example, the 2006 T1FF describes income earned in 2006, while the 2006 census describes income earned in 2005.
- Census uses the Low-Income Cut-Off (LICO) while the taxfiler uses the Low Income Measure (LIM). The LICO and LIM are both measurements of low income that adjust for family size, but use different income cut-offs and approaches for adjusting for family size. Additionally, the LICO adjust for community size, while the LIM does not.

[2] The T1FF uses the concept of the census family as the family unit. Census families include a person, their spouse and their children who live in the same dwelling. In comparison, the Canadian census uses the Economic Family as the family unit, which is defined more broadly as two or more persons who live in the same dwelling who are related to each other by blood, marriage, common-law or adoption. For example, a multi-generational family comprised of a couple, their children and their parents living in the same dwelling would be considered a single economic family, but two separate census families.

Employment

T1FF: Proportion of the population receiving labour income

Census: Proportion of the population currently employed

Differences between census and taxfiler:

- The census definition refers to the number of people who were employed in the week prior to Census Day (May 16, 2006), while the taxfiler indicator includes any person who received income from employment or employment insurance at any point in the year.

Government Transfers

T1FF: Ratio of median dollar amount from government transfers to all income for census families

Census: Proportion of income for economic families derived from government transfers

Differences between census and taxfiler:

- The T1FF considers the census family as the family unit, while the census considers the broader economic family as the family unit. Neither the census nor taxfiler variables consider income from non-family persons (i.e. single adults living alone).
- The census measures the actual composition of family income from different sources for all economic families living in a given dissemination area, while the taxfiler indicator calculates a simple ratio comparing the median amounts of income from government transfers and all income sources.

Receiving Employment Insurance

T1FF: Proportion of census families that received employment insurance benefits

Census: Proportion of population who are unemployed

Differences between census and taxfiler:

- The census unemployment rate captures individuals who were not engaged in paid work during the week prior to Census Day (May 16, 2006), and were a) actively looking for paid work, b) on a temporary lay-off and expected to return to work, or c) had definite arrangements to start a new job within a month. The taxfiler indicator captures people living in families where one or more people have collected employment insurance benefits during the past calendar year. Eligibility for employment insurance in Canada depends on a number of factors which could limit its comparability to the unemployment rate.
- Non-family persons (i.e. any adult living alone) are not included in the T1FF definition.

Appendix B: Validation Results

The following tables show the results of an analysis comparing the agreement between T1FF and Canadian census data for four indicators of socioeconomic status. The results are summarized in the Validation section above, and in general demonstrate that there is a high proportion of DAs with only small differences (±1) in the quintile they are assigned for most indicators. Additionally, Pearson correlation coefficients comparing T1FF and census data are greater than 0.7 for most indicators. DAs using interpolated T1FF estimates show less agreement with the census, and suggest that caution should be advised when interpreting values based on interpolated estimates.

Table 1. Quintile differences and Pearson correlation coefficients comparing after tax low income rate indicator derived from 2006 T1FF and 2006 census data sources, for all Ontario dissemination areas (n=18,727) and only dissemination areas based on interpolation (n=2799).

Low Income (After Tax)

Absolute difference in quintiles	All DAs (%)	Interpolated Das (%)
0	39.98	22.83
1	36.78	42.41
2	17.26	25.47
3	5.64	8.04
4	0.94	1.25
Pearson Correlation Coefficient	0.74887	0.18366

Table 2. Quintile differences and Pearson correlation coefficients comparing employment rate indicator derived from 2006 T1FF and 2006 census data sources, for all Ontario dissemination areas (n=18,727) and only dissemination areas based on interpolation (n=2799).

Employment

Absolute difference in quintiles	All DAs (%)	Interpolated Das (%)
0	42.02	31.83
1	39.69	42.98
2	14.27	18.29
3	3.59	6.11
4	0.43	0.79
Pearson Correlation Coefficient	0.71867	0.4941

Table 3. Quintile differences and Pearson correlation coefficients comparing government transfers indicator derived from 2006 T1FF and 2006 census data sources, for all Ontario dissemination areas (n=18,727) and only dissemination areas based on interpolation (n=2799).

Government transfers

Absolute difference in quintiles	All DAs (%)	Interpolated Das (%)
0	47.19	37.58
1	39.81	44.34
2	10.74	14.26
3	1.86	2.93
4	0.4	0.89
Pearson Correlation Coefficient	0.74805	0.51877

Table 4. Quintile differences and Pearson correlation coefficients comparing unemployment indicator derived from 2006 T1FF and 2006 census data sources, for all Ontario dissemination areas (n=18,727) and only dissemination areas based on interpolation (n=2799).

Unemployment

Absolute difference in quintiles	All DAs (%)	Interpolated Das (%)
0	23.38	21.76
1	31.74	33.05
2	24.21	23.65
3	13.54	15.22
4	7.12	6.32
Pearson Correlation Coefficient	0.09362	0.26525

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