

INCOME INEQUALITY, INCOME POLARIZATION, AND POVERTY

How Are They Different? How Are They Measured?

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THE NEIGHBOURHOOD CHANGE RESEARCH PARTNERSHIP

Income Inequality, Income Polarization, and Poverty: How Are They Different? How Are They Measured?

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Building Opportunity is a United Way Toronto & York Region initiative that seeks to build understanding, foster dialogue, and consider action on the issue of growing income inequality and its impact on equitable access to opportunity in the city. By creating new research and leveraging the research of its partners, Building Opportunity seeks to create a common understanding of income inequality in Toronto. This knowledge will be used to generate a city-wide conversation about why income inequality matters to Torontonians and how we can all work together to mitigate its impacts. www.unitedwaytyr.com

The Neighbourhood Change Research Partnership is examining trends in inequality, diversity, and change at the neighbourhood level across Canadian cities with academic and non-academic partners, including United Way Toronto & York Region. The objective is to better understand the connection between inequality and socio-spatial exclusion. A key part of the research agenda is to identify similarities and differences among and within major metropolitan areas. The research is funded by a multi-year grant from the Social Sciences and Humanities Research Council of Canada. The research initiative is titled *Neighbourhood Inequality, Diversity and Change: Trends, Processes, Consequences and Policy Options for Canada's Large Metropolitan Areas* (J David Hulchanski, Principal Investigator). www.NeighbourhoodChange.ca

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Introduction

Income inequality has become the defining economic issue of our times. "Severe income inequality" topped the list of global risks identified by experts from industry, government, academia, and civil society who were surveyed for the World Economic Forum's Global Risks 2012 report.

In the past, income inequality in developed countries increased during recessions and decreased in times of economic growth. However, since the 1980s, income inequality has risen even during periods of solid economic growth. Canada has mirrored these international trends. Different measures of income inequality all tell a similar story: income inequality has increased in Canada over the past two decades. Yet defining income inequality is a challenge. The term is applied to a range of measures using different kinds of data. In addition, income inequality is often confused with income polarization and with poverty.

This backgrounder explains the differences between income inequality, income polarization, and poverty, and describes how they are measured. The intent is to help readers interpret research and media commentary on income inequality and income polarization.

The paper also lays the groundwork for further research on the Toronto Region that is part of the United Way Toronto & York Region's Building Opportunity initiative and the Neighbourhood Change Research Partnership.

What are income inequality and income polarization? How do they differ from poverty?

Income inequality describes a situation in which income is distributed unevenly in a country or region. Inequality exists when one group receives income that is disproportionate to its size. Income inequality has implications for health, political participation, educational outcomes, and general social well-being. Income inequality increases when the poor get poorer, the rich get richer, or the middle-income group declines in numbers or in income, or when any combination of these processes occurs. **Income polarization** describes a process in which income concentrates into two separate poles or groups, one rich, and another poor. Often this means that there are fewer people in the middle-income group and more in the high-income and low-income groups.

Rising polarization is associated with claims about the "disappearing middle class." The "middle class" is a commonly used but vague term. While it is difficult to precisely define and measure a middle class for research purposes, it is possible to define and measure a group in the

middle of the income spectrum. Tracking such a measure over a number of years establishes whether or not the proportion of people in the middle-income group is increasing or decreasing.

Income polarization may occur if changes in income mean that those in the middle group move towards one of the two poles (either the rich or the poor pole), or if population growth occurs only among the poor or the rich, not among the middle-income group. It may also occur if the level of variability of incomes among the rich declines such that rich incomes come closer to the average income of the rich group and at the same time, the level of variability of incomes among the poor similarly declines such that poor incomes come together closer to the average income of the poor group.

What is the difference between income inequality and income polarization?

The two terms are often confused. Measures of income inequality look at how income is distributed across the entire population. If income is transferred from a richer person to someone poorer, inequality decreases (or if transferred from a poorer to a richer person, inequality increases). Polarization, meanwhile, refers to the tendency for income to shift away from the centre of a distribution and into two separate groups – the rich and the poor – creating a hollowed-out middle.

In measuring income polarization, researchers consider two principles, or "axioms." The first is the "spread axiom," which is that polarization increases whenever the income distribution of the population shifts away from the median income (that is, the "spread widens"). This first axiom is also typically associated with increasing inequality. The second is the "bipolarity axiom," in which polarization increases when the income distribution becomes concentrated into two poles that do not straddle the middle. The bipolarity axiom is met whenever the population becomes more concentrated into these two poles, even when this means that the very poorest see their income increase (but to a level less than the average for the poor pole) or the richest see their incomes fall (but to a level higher than the average for the rich pole). Note that the latter case could represent a situation in which polarization is increasing, while inequality is decreasing.

Poverty is a term that defines the amount of income required for a particular standard of living and the ability to purchase the necessities of life. The level of poverty in a society (or city) is usually measured in relation to the number of individuals, families, or households with incomes below a defined income cut-off line. Absolute measures of poverty set the poverty cut-off line at a minimum income necessary to maintain a particular standard of living. Relative measures of poverty set the poverty cut-off in relation to the average income in a city, region, province, or nation. Poverty measures are separate and distinct from measures of income inequality and income polarization, and poverty rates may increase or decrease without affecting whether income inequality or income polarization increases or decreases.

How does poverty contrast with inequality?

Poverty research focuses on individuals, families, households, or neighbourhoods with incomes below a defined level. In contrast, the study of income inequality focuses on disparities in living standards across the entire population, not only on people whose incomes fall below a poverty line. A focus on income inequality advances a broader analysis of societal trends, one that includes much more than the subset of the population defined as those living in poverty.

At the same time, however, actions to prevent rising income inequality and income polarization can help reduce poverty levels. Addressing income inequality is a poverty reduction strategy. A holistic focus on inequality rather than poverty can address problems related to the distribution of income that a more narrow focus on those living in poverty cannot address. Addressing poverty, something that affects a defined subgroup within society, is not the same as addressing income inequality and income polarization, issues that affect all people in society.

Two ways to report on income inequality and income polarization: people (individuals, households) or places

Income inequality and polarization measures that describe income differences among individuals, families, or households throughout a city, province, or nation reflect non-geographic inequality and polarization. Where individuals, families, or households live is not taken into account, except as a general identifier for the whole group (e.g., Canadians as a whole, or Torontonians as a whole).

However, income inequality and polarization measures can also describe income differences among areas where individuals, families, or households live, that is, geographic (or socio-spatial) inequality and polarization. In this case, the specific places where individuals, families, or households live are being compared. The terms geographic, spatial, and socio-spatial are used here interchangeably.

The urban geographic unit typically used in spatial inequality and polarization research is the neighbourhood. In Canada, census tracts are commonly used to represent neighbourhoods. They are geographic units created by Statistics Canada whose boundaries follow main transportation routes, waterways, or features such as parks. They typically contain between 2,000 and 8,000 residents.

Geographic measures of inequality and polarization indicate the extent to which individuals, families, or households are geographically concentrated and segregated by income in a city or region. In association with other data, these geographic measures can capture processes that affect the spatial distribution of income. For instance, it is possible to examine how shifts in the labour market or in government transfers affect either the distribution of income among households in general (that is, non-geographically), or among neighbourhoods (geographically, or socio-spatially). Inequality or polarization may increase among all households without changing the differences among neighbourhoods. This would occur if, for example, every neighbourhood includes some rich and poor, and the rich became richer or the poor became poorer everywhere at the same rates. Similarly, inequality or polarization may increase among neighbourhoods (geographically), but not among households (non-geographically). The latter situation could arise if incomes did not change, but the rich moved out of poor neighbourhoods and the poor moved out of rich neighbourhoods, leaving rich and poor more segregated from each other.

Examining both processes – geographic and non-geographic inequality and polarization – allows researchers to determine what is producing rising socio-spatial inequality and polarization, that is, whether sociospatial inequality and polarization are being driven by income changes among households, or by the active segregation of households of different incomes from each other, or both (see Figure 1). Usually, both processes happen together, and feed off each other: income inequality usually spurs the rich to become more concentrated in rich neighbourhoods, while the poor are displaced from all but the poorest neighbourhoods because they can no longer afford to live anywhere else.

Although changes in geographic and non-geographic inequality and polarization often move in the same direction, they tend to change at different rates. Because they are distinct processes, geographic and non-geographic forms of inequality and polarization need to be analyzed separately. Figure 1: Non-geographic and geographic income inequality and polarization



Non- geographic inequality and polarization refers to the comparison of all individuals or households with each other in a large jurisdiction, such as a municipality, province, or country. *The unit being measured is individual or household income.*



Geographic inequality and polarization refers to the comparison of geographic clusters of individuals or households (e.g., neighbourhoods or census tracts). *The unit being measured is the average income of the geographic area.*

How do we measure income inequality and income polarization?

Measures of income inequality

Measures of inequality focus on the relative position of different individuals, families, or households within an income distribution. Inequality measures should not be affected by the population size or by absolute levels of income. Inequality measures must, however, decrease when income is transferred from a richer to a poorer unit (individual, family, household, or neighbourhood, depending on the unit of analysis) and increase when income is transferred from a poorer to a richer unit, all other things being equal. Most measures of inequality vary between zero and one, with 0.0 indicating perfect equality, and 1.0 indicating absolute inequality, in which only the top group, individual, place, or household has all the income.

Different measures of income inequality are sensitive to different parts of the income distribution – some are better at measuring changes at the bottom of the income distribution, while others are better at measuring changes at the middle or top. The following measures of income inequality have been used in Canadian studies.

Share and ratio of income

One straightforward way to describe how income inequality is articulated is by looking at how the total income in an area is shared amongst various segments of the population. For example, in 2009, the top 20 percent of Canadians received 39 percent of the national income, while the bottom 20 percent received only 7 percent (Conference Board of Canada, 2009). We have evidence of rising inequality if the share of the top 20 percent increases, the share of the bottom 20 percent decreases, and if there is no change in the middle 60 percent of the distribution.

Another common approach is to compare the incomes of two different groups in the form of a ratio. Decile or quintile ratios are frequently used and compare the income earned by the top 10 percent (decile) or 20 percent (quintile) of individuals, families, households, or neighbourhoods with the income earned by the poorest 10 percent or 20 percent of individuals, families, households, or neighbourhoods. For example, in 2011, Canadian families in the top 20 percent had after-tax in-

comes that were 9.28 times larger than the incomes of those in bottom 20 percent. If this ratio increases, inequality is rising (Statistics Canada, 2011).

These measures, however, typically do not capture what is happening to the income distribution as a whole. Therefore other formal measures, such as the Gini coefficient, have been developed.

Gini coefficient

The Gini coefficient is the best-known and most accurate income inequality measure. It is therefore the one cited most extensively in international studies that compare income inequality among countries. The Gini coefficient meets all the criteria for valid measures of inequality.

The Gini coefficient measures the extent to which the distribution of income among individuals, families, households, or geographic areas within a country or region deviates from an absolutely equal distribution. A coefficient of 0.0 represents perfect equality among individuals,



families, or households (in the case of non-geographic equality) or among neighbourhoods (in the case of geographic equality) in society. A coefficient of 0.0 would mean that every unit in the group studied is receiving the same amount of income. A coefficient of 1.0 represents a situation of total inequality in which one person, household, or family (or one neighbourhood) receives all the income and everyone else receives no income at all.

An intuitive way of understanding the Gini coefficient is that the number corresponds to the share of total income that would need to be redistributed to achieve perfect income equality. For example, in 2010, the after-tax Gini coefficient for all family units in Canada was 0.39, which means that 39 percent of Canada's national after-tax income would need to be redistributed among families to have each family ending up with exactly the same income (Statistics Canada, Cansim database). Figure 2 shows that 54 percent of the income going to individuals in the Toronto CMA would need to be redistributed in 2005 for everyone to have the same income.

Other measures

The following table lists a few other measures of income inequality that may appear in research reports.

Name	Uses	Limitations
Exponent coefficient	A method for analyzing the amount of income dispersion from the mean	More sensitive to changes in the lower end of income distribution
Coefficient of Variation Squared	A method for analyzing the amount of income dispersion from the mean	More sensitive to changes in the upper end of the income distribution
Theil measure	Focuses on the lack of diversity or the extent of non-random distribution of incomes. The Theil indices have the advantage of being de-composable into constituent parts	Overly sensitive to extreme values, particularly at the lower end

Measures of income polarization

Income polarization measures have been developed more recently than inequality measures. Some general properties are common to a range of polarization measures. Polarization increases when numbers of people (or households, or other units) shift away from the middle of the income distribution towards the extremes. Instead of the mean, polarization measures typically examine distance from the median (or middle) value in a distribution.

Because the properties of income polarization measures are distinct from those of income inequality measures, research may find that inequality trends are different and even opposite to polarization trends. The following measures of income polarization have been used in Canadian studies.

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Size of the middle-income group

A simple, although inaccurate, way to measure polarization is to measure the size of the middle-income group relative to the total population and determine whether this group has become smaller over time. The middle-income group can be defined in different ways. For example, the group may be defined as individuals, families, or households that receive incomes that are 50 to 150 percent of the median income, or 75 to 125 percent of the median income. It is important to inspect multiple ranges around the median before establishing if polarization is truly present in an income distribution. Although this method is commonly used, it does not adhere to the bipolarity axiom (described in section 2, above), and thus is not a true polarization measure.

Foster-Wolfson ("P") and Esteban & Ray ("ER") indices

The Foster-Wolfson "P" index (or Wolfson index) and Esteban and Ray index are the two main indices for measuring income polarization. The

Figure 3





Wolfson index varies between zero and one, where 0.0 indicates no polarization at all (perfect equality) and 1.0 indicates that half of the population has no income, and the other half collectively has twice the average income. The Esteban and Ray index is a measure of income polarization that focuses on the rise of income groups that are becoming more internally homogenous and more separate from other groups.

While considered the best measures for detecting polarization among individuals, families, or households, these two measures cannot be calculated using income data grouped into ranges or geographic units such as neighbourhoods with different populations. Unfortunately, this is often the format of census data made available for public use, so it is difficult to use the Wolfson or ER indices for analyzing neighbourhoodbased polarization.

Polarization measures that use income data grouped into ranges or geographic units

The Wang-Tsui (WT) index and the Coefficient of

Polarization (CoP) can be calculated using data grouped into ranges or neighbourhoods. The WT index is highly sensitive to changes in the upper end of the income distribution, but not as much to changes in incomes below the median. The CoP is better at capturing changes in both the upper and lower ends of the income distribution, but cannot take into account people, households, or other units that have no income at all.

Both measures are fairly flexible for policy analysis. However, their values are not capped at 1.0 (that is, 0.0 indicates a lack of polarization, but 1.0 does not necessarily indicate absolute polarization). Nevertheless, the ranges of values of the WT and CoP indices generally vary in similar ways to the measures discussed above. Because these measures can be calculated using income data aggregated in spatial units with different populations, they are appropriate for calculating neighbourhood-based income polarization.



Figures 3 and 4 show how Canada's three largest metropolitan areas have changed in terms of socio-spatial inequality at the neighbourhood level, as measured using the Gini Coefficient (Figure 3), and socio-spatial polarization as measured using the Coefficient of Polarization (Figure 4). While the patterns of neighbourhood-based income segregation are similar between the two figures, as you can see they are not the same. While inequality and polarization measures often move in tandem, they are nonetheless distinct measures.

What else do we need to know to make sense of the existing research on income inequality and polarization?

The source of the data

The advantages and drawbacks of the different sources of data should be considered when comparing results from different sources.

Source	Characteristics
Census	Available every five years since 1971, using income data for the preceding year, at the census tract level. The 1971 census (using 1970 income data) is the earliest census containing information comparable to that of later censuses
Tax-filer data	Available every year since 1982
Survey of Consumer Finance (SCF)/ Survey of Labour Income Dynamics (SLID)	Available annually since 1976. SCF replaced by SLID in 1996.

Before 2011, the Census provided the most reliable and complete data for analyzing income inequality in Canada, because it collected comprehensive information at both the high and low ends of the income scale, as well as for geographic areas large and small. The federal government under the Harper Conservatives cancelled the 2011 long-form census. It was replaced by a voluntary survey, the National Household Survey, the results from which are not comparable to previous censuses because a different sampling methodology was used. A further shortcoming of the Census is the lack of information on after-tax income before 2006. Tax-filer data for individuals are based on a large sample size; however, they contain much less socio-economic information than the Census and SCF/SLID, and the income variables are limited: there is no household income data, nor average family income (only median), in the tax-filer datasets.

SCF/SLID provides information on both income transfers and taxes for individuals. However, in comparison with census and tax-filer data, this source underrepresents individuals and households with either very low or very high incomes.

All these data sources collect information only on specific types of income. This limitation, as well as issues related to underreported or unreported income, can affect the quality of income statistics, and, implicitly, the results of income inequality analyses. Inequality studies using different sources of data cannot be compared if the data sources do not track the same types of income.

Researchers have documented considerable under-reporting of certain types of income, such as employment insurance and social assistance incomes, as well as self-employment income and stock options. Unreported income, such as offshore accounts, tips, or rental income, would ideally also be considered in discussing the findings and recommendations of inequality studies, as this income affects the values of inequality measures.

The income measure

The choice of income measure sometimes depends on the availability of data, and the data source may affect the findings of inequality and polarization studies. The following types of income are most often used in Canadian studies on income inequality and polarization.

Type of income	What it includes	
Employment	Wages, salaries, and self-employment income	
Market income	Wages, salaries, self-employment income, investment income, private pension income	
Before-tax (but after transfers) income, or total income	Market income, plus government transfers (Employment Insurance benefits, social assistance, workers' compensation, GST tax cedit, child tax benefits, public pensions)	
After-tax income	All forms of income, plus transfers, minus taxes	

Market income is sometimes used to illustrate changes in income inequality generated from the economy as a whole. Measures of income inequality and polarization based on market income overestimate income inequality and polarization by ignoring the effects of income transfer mechanisms on the overall social effects of redistribution.

After-tax income is used to determine whether the policy system keeps pace with changes in income inequality generated from the economy. It is generally considered the income measure most closely related to well-being, as it reflects the total purchasing power after personal income taxes have been paid and transfers received. However, after-tax income is not available in the census before 2006, which makes comparisons over time difficult. For this reason, many studies of income inequality and polarization use before-tax income.

The income reporting unit

Besides different definitions of income, there are various income reporting units, mainly the individual, the family, and the household.

There is no ideal unit to measure income for the purpose of assessing inequality and polarization. Neighbourhood income values (including average and median incomes by neighbourhood) may use any of the following income-reporting units.

Since each income reporting unit has its own limitations, the purpose of the inequality research will guide the rationale for choosing one unit over another. Moreover, the interpretation of the findings should acknowledge the limitations associated with the use of the specific income-reporting unit.

Income-reporting unit	Characteristics
Individual income	Pertains to the total population, or to the popula- tion above a certain age. May be misleading if the researcher fails to consider the number of dependents who share an individual's income
Family income	The measure used most often by Statistics Can- ada and other researchers in income inequality studies. It indicates how families pool resources, but leaves out non-family households, which made up about 30 percent of all households in 2006
Household income	Represents the basic spending unit in any soci- ety. However, household size has been declining over time, and many households are now made up of unrelated people who may or may not pool their resources
Adjusted adult-equivalent income variable	Used in some studies to measure the resources available to adults within a family after adjusting for family size and economies of scale. However, calculating this variable requires access to raw census data, which is not available for public use. Furthermore, researchers disagree on whether this measure is adequate to determine the difference among households in real income- related capacities to consume

Conclusion

This backgrounder is intended for those who read and write about income inequality and income polarization.

Research and media reports on income inequality, income polarization, and poverty need to distinguish between income inequality and income polarization. Research and reports should also not confuse inequality with poverty, since many measures of poverty have little to do with measuring income inequality and polarization. It is also inaccurate to refer to the "middle class" rather than "middleincome groups" in discussions of the "disappearing middle."

Finally, any reports about these trends should identify what is being measured and why certain measures have been used – such as the type of income (before-tax or after-tax) and the reporting unit (individual, household, census tract, etc.) – as well as clearly identifying the source of the data used and its limitations.

Glossary of terms

After-tax income: includes wages, salaries, self-employment, investment income, and private pension income, plus government transfers and minus federal and provincial income taxes; also referred to as disposable income.

Census tract: geographic unit created by Statistics Canada the boundaries of which follow main transportation routes, waterways, or features such as parks. Each census tract typically contains between 2,000 and 8,000 residents. Census tracts are commonly used as proxies for neighbourhoods.

Coefficient of Polarization (CoP): a polarization measure proposed by Walks (2013), determined by comparing incomes to the median income, and calculated by dividing the population (households, individuals, etc.) into income ranges. It is fairly equally sensitive to both the upper and lower ends of the income range.

Coefficient of variation: the ratio of a standard deviation to the mean that shows the extent of income variability in relation to the mean income of the population.

Decile: one of ten equal groups into which a population can be divided according to the distribution of income.

Earnings income: includes wages, salaries, and self-employment.

Esteban and Ray index: a measure of income polarization that focuses on the rise of income groups that are becoming more internally homogenous and more separate from one another.

Exponent coefficient: a measure of income inequality that mainly captures changes in the lower end of income distribution.

Foster-Wolfson "P" index: a measure of income polarization that compares all incomes in a distribution to the median income and simultaneously tracks both the dispersion of incomes in relation to the median as well as the extent to which they are clustered.

Geographic inequality: income inequality between spatial units – areas where individuals, families, or households live.

Geographic polarization: income polarization between spatial units – areas where individuals, families, or households live.

Gini coefficient/Gini concentration ratio: a standard measure of income inequality that ranges from 0 (perfect equality – income is distributed evenly among the population) to 1.0 (perfect inequality – one person has everything and everyone else has nothing).

Government transfers: financial support given by the government to individuals through programs and services such as Employment Insurance benefits, social assistance, workers' compensation, GST tax credits, child benefits, and public pensions.

Income inequality: the extent to which income is distributed unevenly in a country or region. Inequality exists when any group or individual receives income that is disproportionate to the group's size or share of the population.

Income polarization: the extent to which the middle of the income distribution becomes hollowed out and the population moves from the middle to two poles in the higher and lower tails of the income distribution.

Market income: includes wages, salaries, self-employment, investment income, and private pension income.

Middle class: term commonly used to refer to a group of people that occupies the intermediate position between the poor and the rich. A strong middle class is seen as an important indicator of economic development, political stability, and social cohesion.

Middle-income group: group of people whose income is equal to the median income of the entire group or falls within a certain percentage of the median income (for example, 15 percent or 20 percent, rendering 30 percent or 40 percent of the entire group in the middle of the income distribution).

National Household Survey (NHS): the replacement for the mandatory long-form census used in Canada's 2011 Census; considered less accurate than the long-form census.

Neighbourhood: a geographic section of a larger community, city, or region that contains residents (and sometimes institutions) and has distinct characteristics with definable boundaries.

Non-geographic inequality: income inequality between individuals, families, or households calculated without regard to where they live.

Non-geographic polarization: income polarization between individuals, families, or households calculated without regard to where they live.

Polarization index: see Foster-Wolfson "P" index, Esteban-Ray (ER) Index, Coefficient of Polarization (CoP), and Wang-Tsui (WT) Index.

Quintile: one of five equal groups into which a population can be divided according to the distribution of income.

Survey of Consumer Finance (SCF)/Survey of Labour Income Dynamics (SLID): an annual survey of Canadian individuals and households, last conducted in 2011, that tracks changes in family makeup, paid work, receipt of government transfers, and other factors. SCF was replaced by SLID in 1996.

Theil measures: a measure of income inequality that focuses on the lack of diversity or the extent of non-random distribution of incomes.

Total income: includes market income plus government transfers; also referred to as before-tax (but after transfers) income.

Wang-Tsui (WT) index: a measure of income polarization produced from the sum of the absolute differences in income between each individual (or the average income of individuals in a given income range) and the median income. It is highly sensitive to changes in the upper end of the income distribution, but not very sensitive to changes in incomes below the median.

Wolfson index: see Foster-Wolfson "P" index.



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- 12 Income Inequality, Income Polarization, and Poverty

Average Individual Income, Toronto Census Metropolitan Area, 2012



Average Individual Income, City Of Toronto, 2012



Census Tract Average Individual Income compared to the Toronto Census Metropolitan Area Average of \$46,666

High - 120% to 140%

(28 CTs, 5% of the City)



Very High - 140% to 697%

(87 CTs, 16% of the City)



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Canada

Middle Income - 80% to 120%

(162 CTs, 30% of the City)



Low - 60% to 80%

(192 CTs, 36% of the City)

December 2015

Very Low - 36% to 60%

(72 CTs, 13% of the City)