## Income Research Paper Series

# Low Income Measure: Comparison of Two Data Sources, T1 Family File and 2016 Census of Population

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Release date: April 5, 2018
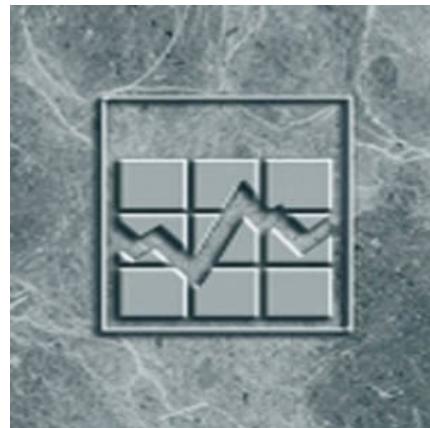
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# Low Income Measure: Comparison of Two Data Sources, T1 Family File and 2016 Census of Population

By **Dominique Pinard and François Pagé**

## Overview

This report sheds lights on the differences between the Low Income Measure calculated by the 2016 Census of Population and the T1 Family File (T1FF; tax filer data). The highlights are as follows:

- The Census of Population (LIM-AT) and T1 Family File (CFLIM-AT) are two data sources for the Low Income Measure. Both data sources contain income information for the large majority of Canadians, and use income data from Canada Revenue Agency's tax and benefits returns to calculate the after-tax income of Canadians.
- The main differences between the two data sources that should be considered when using the LIM:
  - ▶ The census presently excludes individuals living in territories, Indian reserves[1] and collective dwellings from the calculation of the LIM while the T1 Family File includes them.
  - ▶ The census calculates LIM using household income while the T1 Family File uses census family income.
- These and other differences result in different estimates of the numbers of people living in low income depending on the data source.
- When choosing the data source for the LIM, it is important to establish the guiding parameters of the research or analysis since using Census or T1FF presents different advantages and limitations.

## Introduction

In September 2017, Statistics Canada released data on income of Canadians based on the 2016 Census of Population. Included in this release were statistics on the Low Income Measure, a widely used measure of low income. Low Income Measure statistics are also produced annually from the T1 Family file (T1FF). The T1FF resembles the census in that it contains income information for a large majority of individuals residing in Canada, it is derived from tax data, and it is often used for analysis at detailed geographic levels. Despite these similarities, they do not yield identical low-income trends and counts.

This paper aims to describe the differences in the Low Income Measure statistics between the two programs.

## 1. The Census of Population

The Census of Population is conducted every five years – the last census occurred in May 2016. It collects data through questionnaires on various socio-economic topics for all the population living in Canada[2]. The census combines this information with income and other data from Canada Revenue Agency's T1 income tax and benefit returns and other tax and benefits slips to develop income estimates for each individual aged 15 and over for the year prior to the census. For example, for Census 2016, the reference period for the income data was 2015[3].

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1. A discussion paper from Income Statistics Division: "Interpreting low-income statistics for the on-reserve and territorial populations using Census and National Household Survey data" is forthcoming in 2018.
2. This population includes:
   - All persons who have their main residence in Canada, including newborn babies, room-mates and persons who are temporarily away;
   - Canadian citizens, landed immigrants (permanent residents), persons asking for refugee status, persons from another country with a work or a study permit and family members living in Canada with them;
   - Persons staying in Canada with no main residence elsewhere.
3. For the first time in the 2016 Census, the income information was available for the full population aged 15 years and older and was not limited to households selected for the long form.

Using the information collected about the relationship of individuals living at the same address, the Census of Population is able to establish four units of analysis: individuals, census families[4], economic families[5] and private households[6].

For any measure of low income, it is necessary to decide upon a unit of analysis. The census LIM follows the international standard practice which is to aggregate income to the household level. Therefore, the principle applied in calculating the LIM is that a household is in low income if its income is significantly below the median income of all households.

While the census collects data for the full population, the target population for income estimates published on the website is the population in private households, which excludes the population living in collective dwellings such as senior's homes, hospitals, hotels, jails and work lodgings. Further, in the census, the calculation of the Low Income Measure presently excludes the population living in the territories and on Indian reserves.[7]

## 2. The T1 Family File

The T1 Family File (T1FF) is an annual income database produced using administrative records. It relies centrally on data from Canada Revenue Agency's T1 income tax and benefit returns and from the Canada Child Tax Benefits program data. The population covered by T1FF corresponds to all tax filers in Canada and their dependents, 95% of the total estimated population in Canada in 2015. It covers provinces and territories and includes individuals living in collective dwellings and on Indian reserves.

In T1FF, it is possible to establish a basic relationship between individuals and construct census families. However, information needed to construct the economic family and household is not available. Therefore, the only units of analysis available on T1FF are "census families and persons not in census families" and "individuals".

For LIM construction in T1FF, the unit of analysis is therefore "census families and persons not in census families". Accordingly, the T1FF convention is to refer to this measure as the "Census Family Low Income Measure" or CFLIM. For the purposes of CFLIM calculation, a "person not in a census family" is considered a census family of size 1. The principle applied in calculating the CFLIM is that a census family is in low income if its income is significantly below the median income of all census families.

In 2018, T1FF changed its Low Income Measure calculation and released a time series presenting the new Low Income Measure data starting with 2004[8]. This paper uses data produced with this new method as the methodology is more comparable to the census.

## 3. Data comparison

Differences in low-income estimates between the census and T1FF can derive (mainly) from differences in the target population and differences in the unit of analysis[9]. At the provincial and the census metropolitan area level, differences in the target population are not expected to significantly affect low-income estimates, since the population differences are not important enough for these levels of geography. Estimates for census subdivisions and lower levels geography are more likely to be affected by these coverage differences particularly where large collective dwellings or Indian reserves are present.

**Table 3.1**
**Summary of the main differences between Census and T1FF which affect low income comparisons.**

|  | Census | T1FF |
| --- | --- | --- |
| Target population for low-income estimates | All Canadians in private households, excluding the population on reserve and in the Territories. | All tax filers and their dependents |
| Unit of analysis for low-income estimates | Households | Census Families and persons not in a census family |

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4. A **census family** is a married or common-law couple with or without children, or a loneparent family. All members of a census family live in the same dwelling.
5. An **economic family** is a group of two or more people who live in the same dwelling and are related to each other by blood, marriage, common law, adoption or a foster relationship.
6. A **private household** is a person or group of people who occupy the same dwelling.
7. A discussion paper from Income Statistics Division: "Interpreting low-income statistics for the on-reserve and territorial populations using Census and National Household Survey data" is forthcoming in 2018.
8. Please refer to "*Methodological Changes: Census Family Low Income Measure based on the T1 Family File*", catalogue no. 75F0002M, 2018.
9. There are also differences in the methodology applied in the production of income estimates from the two data sources which could influence results. For example, the census makes more use of tax filer "slips" such as the T4.

In section 3.1, we focus on the differences in units of analysis as this is expected to be important for all levels of geography.

## 3.1 Units of analysis for Low Income Measure

Census families and households are two different concepts that can, when available, be used as unit of measure in social-economic analysis. Census families are members of a couple family, with or without children, and lone-parents and their children. All other individuals are considered to be outside the census family. In order to cover the entire population when using the census family as the unit of measure, individuals not in a census family are considered as being a census family of size 1.

Households represent a larger unit of measure. Although a large proportion of households are made up of just one census family or just one individual, 65.5% and 28.2% (respectively) of households in the 2016 Census of Population, the remaining 6.3% of households drives differences between the LIM in census and CFLIM in T1FF. These more unique households are, for example, two census families living in the same private dwelling, three unrelated roommates living together, or a family who has a relative or a boarder within the same private dwelling (among other possible types). In each of these cases, multiple census families are grouped together to create a household.

## 3.2 The Low Income Measure After Tax

The Low Income Measure is calculated using the following steps.

1. Compute after-tax income aggregated to the relevant unit of analysis (households for LIM-AT and census families for CFLIM-AT) to take into account that individuals within these unit of measure pool their economic resources together.

2. For each household or family, compute their adjusted (equivalised) income. This is to reflect the fact that a unit of analysis' needs increase as it includes more individuals, but at a decreasing rate: adjusted income = unadjusted income divided by the square root of the unit of analysis size. Assign this value to all persons within the unit of analysis.

3. The Low Income Measure threshold is defined as 50% of the median adjusted income of the unit of analysis assigned at the person level.

4. A person is deemed to be in low income if their adjusted income is less than this Low Income Measure threshold.

In principle, the CFLIM-AT threshold could be higher than, lower than or equal to the LIM-AT threshold. Likewise, adjusted household income can be higher than, equal to or lower than adjusted census family income. As a result, the expected effect of unit of analysis differences on the low-income rates is ambiguous.

This can be demonstrated with a simple example. Say a population is composed of five individuals living in two households. Persons A and B live in one household ($H_{AB}$) and comprise one census family ($CF_{AB}$). Persons C, D and E live in the second household ($H_{CDE}$) yet form two census families ($CF_{CD}$ and $CF_{E}$). If the personal after-tax incomes of the persons were [$20,000, $30,000, $15,000, $15,000, $0] the LIM-AT and CFLIM-AT thresholds would be [$8,660, $10,607; Situation 1]. If person E's income was $6,745, the thresholds would basically be equal [$10,608, $10,607; Situation 2]. If persons E's after-tax income was greater than $6,745 then the LIM-AT threshold would be greater than the CFLIM-AT threshold.

**Table 3.2.1**
**Situation 1, Individual E with an income of $0**

| Household | Family | Person | Individual income | Household size | Family size | Household income | Family income | Adjusted household income | Adjusted family income |
|---|---|---|---|---|---|---|---|---|---|
| $H_{AB}$ | $CF_{AB}$ | A | $20,000 | 2 | 2 | $50,000 | $50,000 | $35,355 | $35,355 |
| $H_{AB}$ | $CF_{AB}$ | B | $30,000 | 2 | 2 | $50,000 | $50,000 | $35,355 | $35,355 |
| $H_{CDE}$ | $CF_{CD}$ | C | $15,000 | 3 | 2 | $30,000 | $30,000 | $17,321 | $21,213 |
| $H_{CDE}$ | $CF_{CD}$ | D | $15,000 | 3 | 2 | $30,000 | $30,000 | $17,321 | $21,213 |
| $H_{CDE}$ | $CF_{E}$ | E | $0 | 3 | 1 | $30,000 | $0 | $17,321 | $0 |
| LIM and CFLIM thresholds: 50% of the median adjusted income | | | | | | | | $8,661 | $10,607 |

**Table 3.2.2**
**Situation 2, Individual E with an income of $6,745**

| Household | Family | Person | Individual income | Household size | Family size | Household income | Family income | Adjusted household income | Adjusted family income |
|---|---|---|---|---|---|---|---|---|---|
| $H_{AB}$ | $CF_{AB}$ | A | $20,000 | 2 | 2 | $50,000 | $50,000 | $35,355 | $35,355 |
| $H_{AB}$ | $CF_{AB}$ | B | $30,000 | 2 | 2 | $50,000 | $50,000 | $35,355 | $35,355 |
| $H_{CDE}$ | $CF_{CD}$ | C | $15,000 | 3 | 2 | $36,745 | $30,000 | $21,215 | $21,213 |
| $H_{CDE}$ | $CF_{CD}$ | D | $15,000 | 3 | 2 | $36,745 | $30,000 | $21,215 | $21,213 |
| $H_{CDE}$ | $CF_{E}$ | E | $6,745 | 3 | 1 | $36,745 | $6,745 | $21,215 | $6,745 |
| LIM and CFLIM thresholds: 50% of the median adjusted income | | | | | | | | $10,608 | $10,607 |

In practice, the LIM-AT threshold was higher than the CFLIM-AT by about $2,000 in 2015 ($22,133 for census vs. $20,137 for T1FF for a unit of size 1).

## 3.3 Percentage of population below LIM

The proportion of individuals in low income is higher when using CFLIM-AT from T1FF (17.3%) than the LIM-AT from the census (14.2%).

**Table 3.3.1**
**Low-income rates by sex, age, province, CFLIM-AT (T1FF) and LIM-AT (Census), 2015**

| | CFLIM-AT | LIM-AT |
|---|---|---|
| | % | % |
| All | 17.3 | 14.2 |
| Males | 16.3 | 13.4 |
| Females | 18.2 | 14.9 |
| **Age** | | |
| 0-17 | 20.9 | 17.0 |
| 18-24 | 26.0 | 16.9 |
| 25-34 | 17.8 | 13.0 |
| 35-44 | 15.8 | 12.3 |
| 45-54 | 14.3 | 11.7 |
| 55-64 | 15.3 | 13.2 |
| 65-74 | 12.6 | 13.3 |
| 75+ | 14.1 | 16.5 |
| **Province** | | |
| Newfoundland and Labrador | 15.4 | 15.4 |
| Prince Edward Island | 16.9 | 16.9 |
| Nova Scotia | 18.8 | 17.2 |
| New Brunswick | 18.1 | 17.1 |
| Quebec | 16.7 | 14.6 |
| Ontario | 17.7 | 14.4 |
| Manitoba | 21.1 | 15.4 |
| Saskatchewan | 17.7 | 12.8 |
| Alberta | 13.0 | 9.3 |
| British Columbia | 19.3 | 15.5 |
| Yukon | 12.9 | ... |
| Northwest Territories | 18.3 | ... |
| Nunavut | 31.1 | ... |

... not applicable

**Source:** Statistics Canada, 2016 Census of Population, *Census profile*, catalogue no. 98-316-X2016001 and 2015 T1FF, CANSIM table 111-0046 and custom tabulation.

However, the situation differs when looking strictly at seniors in Canada. The overall proportion of individuals aged 65 and over is generally higher with LIM-AT from the census than with CFLIM-AT from T1FF, respectively 14.5% as compared to 13.2%.

The difference between the two data sources for this segment of the population comes from the distribution of seniors by household types as compared to the rest of the population. According to the census, seniors live in a one-person household (25.7%) more often than the total population (11.5 %). It is also less frequent to find seniors living in multiple-census-family households - 87.4% of seniors live in a one-census-family household as compared

to 83.6% of people of all ages. The adjusted income of seniors will therefore be more similar between census and T1FF, regardless of the fact that census uses household income and T1FF uses census family income. Since the LIM-AT threshold of the census is higher than the one for CFLIM-AT in T1FF, this means that seniors are more likely to be below the LIM-AT threshold than below the CFLIM-AT.

**Chart 3.3.1**
**Low-income rates for individuals of all ages and seniors, CFLIM-AT (T1FF) and LIM-AT (census), 2015**

percent of individuals below the LIM
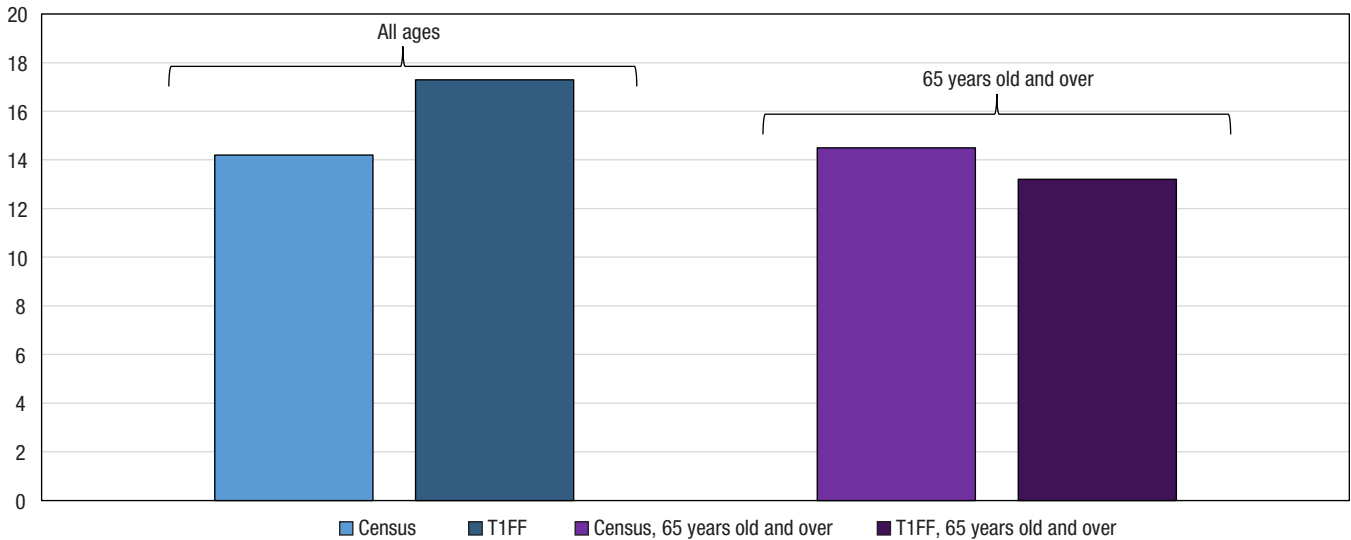


**Source:** Statistics Canada, *2016 Census of Population, Census profile*, catalogue no. 98-316-X2016001 and 2015 T1FF, CANSIM 111-0046.

**Table 3.3.2**
**Seniors, low-income rates by sex, province, CFLIM-AT (T1FF) and LIM-AT (Census), 2015**

|  | CFLIM-AT | | | LIM-AT | | |
|---|---|---|---|---|---|---|
|  | All | Men | Women | All | Men | Women |
|  | % | | | % | | |
| All | 13.2 | 10.6 | 15.4 | 14.5 | 12.0 | 16.7 |
| **Province** | | | | | | |
| Newfoundland and Labrador | 14.2 | 11.1 | 16.9 | 23.4 | 20.3 | 26.1 |
| Prince Edward Island | 14.7 | 11.3 | 17.6 | 19.8 | 16.2 | 22.9 |
| Nova Scotia | 13.9 | 10.6 | 16.7 | 17.9 | 14.8 | 20.6 |
| New Brunswick | 15.6 | 12.2 | 18.5 | 20.2 | 17.1 | 23.0 |
| Quebec | 15.6 | 11.6 | 18.9 | 18.7 | 15.0 | 21.8 |
| Ontario | 12.1 | 9.6 | 14.1 | 12.0 | 9.9 | 13.8 |
| Manitoba | 12.6 | 10.5 | 14.3 | 13.9 | 11.2 | 16.2 |
| Saskatchewan | 10.4 | 8.5 | 11.9 | 14.5 | 11.4 | 17.1 |
| Alberta | 4.8 | 4.8 | 4.8 | 8.6 | 6.9 | 10.1 |
| British Columbia | 17.1 | 14.9 | 19.0 | 14.9 | 13.1 | 16.5 |
| Yukon | 11.0 | 11.3 | 10.7 | ... | ... | ... |
| Northwest Territories | 12.1 | 11.8 | 12.5 | ... | ... | ... |
| Nunavut | 13.2 | 10.0 | 16.2 | ... | ... | ... |

... not applicable

**Source:** Statistics Canada, 2016 Census of Population, *Census profile*, catalogue no. 98-316-X2016001 and 2015 T1FF, CANSIM table 111-0046 and custom tabulation.

# 4. Guide to choosing a data source

When choosing which data source is best suited for an analysis of the low-income situation of Canadians, multiple factors should be considered. The best conceptual practices for LIM calculations, the coverage of the data source, the frequency of data availability, the stability of the methodology and, if only updating an existing analysis, what low-income data was previously used, are all things that should be considered.

The census establishes the LIM-AT using the household income while T1FF CFLIM-AT is limited to census family income. The household approach, in addition to being the recommended conceptual approach, is also more comparable to approaches used in international data on the low-income situation of individuals, as well as other Statistics Canada approaches such as that used by the Canadian Income Survey (CIS) and Census of Population.

Population coverage can also influence the choice of data source. One reason to use T1FF instead of the census is that low-income data for the territories is presently only disseminated in the T1FF data. T1FF also includes population living on Indian reserves and in collective dwellings in the estimation of the CFLIM-AT. These exclusions in the census are partially due to data collection limitations (for certain census years, some Indian reserves refused to participate in the census), to the desire to be consistent over time (income data was not always collected for people in collective dwellings), and to the acknowledgment that the economic situations in some areas are impacted by factors not considered when strictly looking at the income of individuals (areas with high levels of subsidized housing or where  sharing of resources is more common). The same exclusions also exist for the CIS, but for this survey, the reason for the exclusions is more basic: no data is collected for these areas.

Both the census and T1FF offer low-income statistics for small geographic areas. However, census data is only updated every five years while data on low income is available annually from T1FF.

For the census, the collection and sampling methodology over the last few censuses has also varied. For trend analysis, there are more similarities in the collections methods for the 2006 and 2016 censuses than with the 2011 National Household Survey[10]. In 2018, T1FF released its updated CFLIM-AT based on a uniform methodology going back to 2004.

The availability of additional socio-economic variables and of other low-income indicators (Low Income Cut-Off and Market Basket Measure) are factors that may also guide users in their choice of low-income statistics data source.

## Conclusion

The 2016 Census of Population and the 2015 T1 Family File are two data sources available from Statistics Canada which users often use as a source of low-income statistics. Both sources cover the majority of the Canadian population and both are primary based on income data from Canada Revenue Agency's tax and benefits T1 returns. Nevertheless, the two sources produce different low-income rates. By comparing low-income rates between the two sources and describing reasons for their differences, this report helps user to better understand the LIM data. It also provides some information users may consider when choosing to use data from one source or the other.

## References

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10.  The 2011 National Household Survey contains similar information included in long form questionnaire of the 2006 and 2016 censuses.