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Technical Reference Guides for the Education and Labour Market Longitudinal Platform (ELMLP)

Labour market outcomes for college and university graduates, 2010 to 2018

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Labour market outcomes for college and university graduates, 2010 to 2018

1. Introduction

Each year, Statistics Canada releases data on the labour market outcomes of college and university graduates using data from the Education and Labour Market Longitudinal Platform (ELMLP).

Statistics Canada has developed the ELMLP in collaboration with the provincial and territorial ministries of education, Employment and Social Development Canada (ESDC), and other stakeholders. The ELMLP allows longitudinal integration of administrative data related to education with other data sources to provide anonymized, customized datasets for analytical purposes. For more information on the ELMLP, please refer to the document "Overview of the Education and Labour Market Longitudinal Platform and Associated Datasets, 2022".

2. Data sources

2.1 Data sources and data integration

The data used for the calculation of graduate outcome indicators are derived from the Postsecondary Student Information System (PSIS) and selected tax variables from the T1 Family File (T1FF) and the Administrative Personal Income Masterfile (APIM).

Postsecondary Student Information System (PSIS)

The PSIS is a national annual administrative database that enables Statistics Canada to provide detailed information on enrolments and graduates of Canadian public postsecondary educational institutions in order to meet policy and planning needs in the field of postsecondary education. PSIS collects information pertaining to the programs and courses offered at an institution, as well as information regarding the students themselves and the program(s) and course(s) in which they were registered, or from which they have graduated.

The start date for each reporting year in PSIS is the day after the end of the institution's previous winter term, which is usually a date in April, May or June, however this may vary by institution. The reference period is one year from this start date.

T1 Family File (T1FF)

The T1FF is a database that combines individuals and variables from the T1 and T4 tax files and the Canada Child Tax Benefit into a family composition file. It includes income, demographic and geographic variables for each tax filer and their spouse, family and children.

Administrative Personal Income Masterfile (APIM)

The APIM is a database of individuals that combines variables from various administrative sources such as the T1 and T4 tax files, as well as many other administrative sources related to detailed non-employment income, benefits and contributions that are not included in the T1FF, in order to produce a complete picture of their annual personal income. It includes income, demographic and geographic variables for individuals. APIM data are available on a more timely basis than the T1FF, and are currently available for the years 2016 to 2020.

Reference period: Calendar year (January to December).
PSIS data for the reference years 2009/2010 to 2018/2019, T1FF data for 2011 to 2015 and APIM data for 2016 to 2020 have been used for the 2022 release of the indicator tables.

Note: Information about graduates must be available from all relevant sources to be used in the employment income indicators calculations. PSIS data that have been imputed[1] or graduate records for which no tax data were available were not used in these calculations.

3. Methodology to derive the graduate outcome indicators

3.1 Deriving the study population

Using both PSIS and tax data, nine graduating cohorts from the 2010 to 2018 calendar years were derived for the 2022 release. These cohorts are included in tables 37-10-0114-01, 37-10-0115-01, 37-10-0122-01, 37-10-0156-01, 37-10-0157-01, 37-10-0158-01, 37-10-0215-01, 37-10-0216-01, 37-10-0217-01 and 37-10-0218-01.

In PSIS, graduate counts refer to the total number of degrees, diplomas and certificates awarded to graduates. For example, if an individual graduates with two educational qualifications in a calendar year, this individual appears twice in the PSIS graduate file for that year.

In contrast to the PSIS published counts, the approach used for the graduate outcome indicators focuses on outcomes for unique persons, rather than for each reported educational qualification earned. This method is more appropriate for matching PSIS graduates to tax data and for simplifying the interpretation of the outcomes over time.

The derivation of the study population thus requires some adjustments to the source population data and is described below.

Creation of the cohort of graduates

Students graduate at different times over the year. PSIS information on graduates can be assessed according to either the institution's PSIS reporting year or a calendar year. As tax data are compiled based on a calendar year, the graduating cohorts were constructed based on the unique individuals who graduated in each calendar year. Complete cohorts were constructed for calendar years 2010 to 2018. Calendar year graduates are derived from two PSIS reporting years, e.g., 2010 graduates come from the second part of the 2009/**2010** reporting year data and the first part of **2010**/2011.

For consistency between provinces, those who were registered full time or part time in the fall of the year of graduation (e.g. full-time in September 2010 and graduated in 2010) have their graduation year pushed to the next calendar year (e.g. 2011).

Exclusion of some PSIS programs

A number of program types, credential types and fields of study were excluded from the graduate population definition. Some of these were considered 'out-of-scope' for looking at postsecondary graduate outcomes as they are either related to the in-class components of apprenticeship training, are non-postsecondary in nature, do not result in an educational qualification, or they specifically prepare students to enter another postsecondary program rather than the labour market. They are:

1. Records may be imputed for PSIS using other information if a particular institution does not respond to PSIS in a given year. These records cannot be matched to tax data and therefore are removed from the analysis.

1. Apprenticeship programs;
2. High school/secondary diploma and certificate programs;
3. Pre-technology education/pre-industrial art programs;
4. Basic education programs;
5. Undergraduate or graduate qualifying programs;
6. Micro-programs (related to co-operative education terms in Quebec); and
7. Non-programs (PSIS records for students taking courses or involved in educational activities that are not officially part of a credential program).

Grouping by educational qualification

Graduates were grouped by educational qualification using the 'Classification of programs and credentials – professional degree variant' (a combination of the PSIS program type and credential type variables) according to the credentials they received.

The educational qualification category definitions make two adjustments compared to PSIS to permit greater consistency and homogeneity of grouping when studying graduate outcomes:

1. Undergraduate or post-baccalaureate non-graduate degrees in the six fields of study of Dentistry (DDS, DMD), Law (LLB, JD, BCL), Medicine (MD), Optometry (OD), Pharmacy (PharmD, BS, BSc, BPharm) and Veterinary medicine (DVM) were moved to their own category named "professional degree".
2. Post-baccalaureate non-graduate degrees in Education or in Social work were regrouped with the undergraduate degrees group for more consistency across provinces and territories. A small number of post-baccalaureate non-graduate degrees in some other fields of study were also regrouped with undergraduate degrees for consistency across provinces and territories. Thus, very few graduates remained in the post-baccalaureate non-graduate degree category.

Note: These changes made to the groupings of programs and credentials did not impact the final total study population count, only the classification within it.

Removing multiple records for an individual in the same cohort

To simplify the analysis of graduate outcomes by educational qualification groups, only one record was retained for individuals who obtained more than one educational qualification in the same calendar year and thus appeared more than once in the year's PSIS graduate data.

To retain only ONE educational qualification record per graduate, a set of sequential rules were applied in the following order to choose the most relevant record for the outcome analysis:

1. Keep the record with the highest program type, e.g. graduate program level is retained over undergraduate level;
2. If program types are the same, then keep the record with the highest credential type, e.g. degree is retained over diploma;
3. If credential types are also the same, but one educational qualification is in the field of study of 'Education' then it is retained over the other fields of study;
4. If credential types are also the same, but neither educational qualification is in the field of study of 'Education' then one of the graduate records is chosen at random.

These rules were established in consultation with the provincial and territorial ministries of education. If an individual obtained more than one educational qualification in the same calendar year and one of their educational qualifications is in the field of 'Education', this record is retained as the graduate will often pursue a career in a field related to education.

Missing information and out-of-scope individuals

Graduate records with missing key demographic information (gender or age) were removed since not enough information was present to classify them. Graduates younger than 15 or older than 64 were also removed and deemed out-of-scope as the study focused on outcomes in the labour market. Age is defined as reported on December 31 of the calendar year of graduation. It is assumed that graduates over age 64 are more likely to complete programs for personal achievement and development, rather than as an asset for the labour market. However, these numbers are generally quite small.

Records for graduates associated with non-postsecondary and non-credit programs and/or the field of study 'Personal improvement and leisure' were not included.

Final study population

The final study population contains one record per graduate aged 15 to 64 with an in-scope postsecondary educational qualification (no multiple records), and excludes individuals missing selected key (gender or age) demographic variables.

3.2 Criteria used to derive subpopulations for the median employment income calculations

For a graduate to be included in the subpopulation for calculating the median employment income indicators, the following criteria must have been met. The criteria were applied slightly differently for the cross-sectional analysis versus the longitudinal cohort analysis (see below).

a. **Criteria based on tax record availability**

Information on the graduates after graduation, including their earnings and student status for those returning to school, comes from the tax records. Hence the income indicator calculations only include graduates whose academic records could be integrated with their tax record during the year or period of earnings measurement.

b. **Criteria based on school attendance**

Graduates who returned to school full time during the year or period of analysis after their graduation were excluded from the median employment earnings analysis because their employment and earnings profiles differed both from graduates who were working and attending school part time, and from graduates who were working and not attending school[2].

Graduates who returned to school full time or part time were identified through tax variables indicating eligibility for full-time or part-time education-related tax credits. Starting in the 2017 tax year, the full-time and part-time education-related tax credits variables were replaced with comparable variables representing the number of months of full-time and part-time education.

The group of graduates who returned to school part time only (and were eligible for tax credits) was not significantly different from graduates who did not return to school in terms of their average earnings or earnings distribution one year after graduation. For the earnings analysis, it was decided that graduates who returned to school part time would be grouped with graduates who did not return to school.

In contrast, a large difference exists in employment earnings (mean, median and distribution) for graduates who returned to school full time compared to graduates who returned to school part time and those who did not return to school. These results confirm that graduates who returned to school full time should not be included in the analysis of earnings together with the other graduates, and they were excluded from further analysis.

2. A tax variable was also added for students who were enrolled as part time but had an impairment such that they could not reasonably be expected to be enrolled as full-time students. These part-time students were reclassified as being full-time.

Two different types of analysis are then used to develop the graduate outcome indicators:

Cross-sectional analysis means that the exclusion criteria above were applied only in the year in which earnings were measured (e.g., in the second, fifth or tenth year after graduation). Therefore, cross-sectional data for two, five and ten years after graduation should not be compared to each other, because the underlying populations are different.

Longitudinal analysis means that graduates who met the exclusion criteria in any of the years after graduation (e.g. from the first year after to the fifth year after or from the first year after to the tenth year after) were excluded from the analysis for the entire period. Doing this ensures that the subpopulation for analysis is the same in every year and the results can be compared over time.

Note: Results from the cross-sectional and longitudinal analysis should not be compared because the underlying populations are different.

Graduate outcome indicators:

The tables show the counts of graduates in the study population who, during the cross-sectional year or longitudinal period of analysis:

- had no tax information (i.e. they were not found in the tax data);
- had returned to school full time;
- had employment income (wages, salaries or commissions or self-employment income);
- had only wages, salaries or commissions (but no self-employment income).

The median employment income indicators are calculated only for the last two groups of graduates:

- graduates who had employment income;
- graduates who had only wages, salaries or commissions.

These indicators are released for different graduating year cohorts (where data allow) and according to dimensions such as the province of postsecondary institution of graduation, educational qualification (type of program and credential), field of study, gender, age group, and status of student in Canada. Fields of study are provided in two ways: field of study (cannabis primary groupings) and field of study (cannabis STEM and BHASE (non-STEM) groupings). Within cannabis primary groupings, the two-digit subseries is provided. Within the cannabis STEM and BHASE (non-STEM) groupings, the two and three-digit STEM and BHASE subseries are presented. Estimates are available for two, five and ten years after graduation for both a cross-sectional analysis and a longitudinal analysis. Additional results for other years (e.g., one year, three years, four years or nine years after graduation) are available by request. The estimates are subject to annual revision.

Geography associated with graduates

The province or territory associated with each graduate is the province or territory of the institution from which they graduated.

Treatment of graduates reporting $0 in employment income

Graduates reporting $0 in employment income in a given year are excluded from the median employment income calculations for the cross-sectional income analysis. The proportion is usually quite small and it is assumed that most graduates who reported $0 in employment income for the entire calendar year were out of the labour market. In this way, the earnings measure only includes those who actually worked in that year.

However, for the longitudinal cohort income analysis, graduates who were found in the tax data in all five years or in all ten years, but reported $0 in employment income are included in the median employment income calculations.

Post-doctoral fellowships may in some cases be reported as 'other income'. Doctoral graduates with postdoctoral fellowships who report $0 in employment income are excluded from the median employment income calculations for the cross-sectional analysis.

4. Quality analysis

As a result of limited data availability, Ontario college data could not be used for the 2009/2010 to 2012/2013 academic years. This gap also has an impact on national-level indicators for college-level certificates and diplomas, as well as undergraduate degrees offered at colleges from 2009/2010 to 2012/2013.

Quebec CEGEP graduates with a diploma in the stream leading to labour market entry were included in the outcomes analysis, while pre-university diploma graduates from CEGEPs were excluded. University micro-programs and attestations were also excluded from the analysis at the undergraduate, master's and doctoral levels.

As a result of limited data availability, graduate outcome indicators for the 2010 cohort are not available for New Brunswick college graduates.

As a result of limited data availability, graduate outcome indicators for the 2010 cohort are not available for Manitoba college graduates and for graduates who obtained career, technical or professional training program certificates from Manitoba universities.

The Territories include the Northwest Territories, Yukon and Nunavut. As a result of limited data availability, graduate outcome indicators for the Territories are not available for the 2010 and 2011 graduate cohorts.

Postsecondary Student Information System (PSIS) – Tax Data Integration Quality

- Over 88% of PSIS graduate records could be found in the tax data two years after graduation. This proportion varies across the 2010 to 2018 graduate cohorts from a minimum of 89% for the 2010 cohort to a maximum of 95% for the 2018 cohort.
- Among graduates, the proportion of Canadian students that could be found in the tax data ranged from a minimum of 92% for the 2010 cohort to a maximum of 98% for the 2017 cohort.
- The proportion of graduates who were international students varies across cohorts from a minimum of 7% for the 2010 cohort to a maximum of 18% for the 2018 cohort. However, compared with Canadian students, a smaller proportion of international students could be found in the tax data two years after graduation. Among international students, the proportion of graduates who could be found in the tax data ranged from a minimum of 48% for the 2010 cohort to a maximum of 79% for the 2018 cohort.

4.1 Confidentiality and rounding

All data are subject to the confidentiality procedure of rounding. Median employment income data are also subject to suppression.

Constant dollar conversion and rounding:

All median employment income figures are adjusted for inflation using the Consumer Price Index (CPI) and are presented in 2020 constant dollars to correspond with the most recent year of tax data available when the indicators were calculated. To protect the confidentiality of graduates, counts and amounts are rounded. Rounding may increase, decrease, or cause no change to counts and amounts.

When producing estimates on graduate incomes, the disclosure control rules as outlined on the webpage for the T1FF were used.

4.2 Limitations

Limitations for data integration and data interpretation should be taken into consideration.

- Data coverage: The PSIS data have some limitations such as some institution-level non-response or non-matching to tax data for certain years, with the more recent years generally being more complete. These gaps are mostly concentrated by province or territory and by type of institution. These gaps are imputed for regular PSIS estimates, but imputed data cannot be used when integrating with tax data. The gaps thus affect which graduating cohorts and educational qualifications are included in the tables for each province or territory. Improvements to response and data integration rates for these institutions are ongoing and time will yield more complete years of longitudinal data.
- Administrative data, like survey data, are not free of errors and inconsistencies. There may be differences in the way in which some institutions report different variables or program records for PSIS. For some variables, some institutions may provide best proxies rather than not respond at all. Recognized inconsistencies can sometimes be dealt with by adapting the indicator methodology.
- Incorrectly integrated data: There may be some potential bias or measurement errors in graduate outcome indicators due to a small proportion of incorrectly integrated data and records that were not able to be integrated as a result of missing or incomplete information.
- Non-filers or late filers: Another potential bias to graduate outcome indicators may be due to individuals who do not file taxes (or individuals that file more than 6 months after the June 15th deadline). These individuals do not file their taxes for various reasons, including the fact that some individuals are not required to file. Therefore, they have no information in the tax data. As some classes of individuals (e.g. lower earners and those out of the labour force) might be more likely to not file taxes, this might affect the analytical results. This study cannot distinguish between individuals who do not file taxes and individuals who were not integrated due to missing data.

Additionally, the present analysis does not identify students with multiple credentials to assess if they have different outcomes. This kind of analysis requires a different and more complex methodology and will require more years of graduation data to get better results. Work has started on this analysis; however, results/findings are not available as of this data release.

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Appendix A

Glossary of terms

BHASE: field of study grouping (CIP 2016 variant – Cannabis STEM and BHASE groupings) that includes the following sub-groupings: business and administration; arts and humanities; social and behavioural sciences; legal professions and studies; health care; education and teaching; and trades, services, natural resources and conservation.

Cross-sectional income analysis: employment income analysis for cohorts of graduates who had tax records in a given year and who did not return to school full time in that year. The number of graduates in this analysis will be different from year to year.

Educational qualification: This variable classifies the educational qualification a student obtained (e.g., undergraduate degree, master's certificate) according to the 'Classification of programs and credentials – professional degree variant' which essentially combines the two PSIS variables of program type (e.g., undergraduate program, master's program) and credential type (e.g., degree, diploma or certificate) and also creates a separate category for professional degree. Some combinations were renamed for easier identification by data users (e.g., master's degree, and doctoral degree). The educational qualification obtained is expected to be an important contributor to determining the earnings of graduates.

Employment income: Employment income includes wages, salaries and commissions (wages, salaries, commissions, training allowances, tips, gratuities, and tax-exempt employment income earned by registered Indians) and net self-employment income (net income from business, profession, farming, fishing and commissions). Net self-employment income may be positive, negative or zero. In the analysis where the self-employed subpopulation is excluded, wages, salaries and commissions will make up all of employment income.

Field of study and Classification of Instructional Programs (CIP) 2016: The CIP is used to classify the main field of study of postsecondary programs at four standardized levels of aggregation (classes, sub-series, series and 13 Primary Groupings). The 'Variant of CIP 2016 – Cannabis STEM and BHASE groupings' and the 'Variant of CIP 2016 – Cannabis primary groupings' are used in the release tables, with the STEM and BHASE groupings being the most aggregated. CIP is most useful for analysis when combined with information on educational qualification.

Longitudinal cohort income analysis: This refers to graduates of a given calendar year (cohort) who have tax records for all years of the analysis period, and who did not return to school full time at any time during the period from one year after graduation to the final year of analysis (e.g. five years after graduation or ten years after graduation). The graduates in a longitudinal cohort will be the same for all the analysis years.

Median employment income: The median employment income of a specified group is the amount that divides the employment income distribution of that group into two halves, i.e., the incomes of half of the graduates in that group are below the median, while those of the other half are above the median.

Note that median employment income after graduation does not control for any additional education that may have been obtained since the cohort graduation year for the cross-sectional cohorts.

Some income earned by doctoral graduates in some post-doctoral fellowships may be included in "Other income" on their tax form, which is not included in the definition of employment income in this study. The 'Other income' category on the T1 form includes other amounts from lump sum payments, retiring allowance, death benefits, and other kinds of income.

All dollar figures are rounded to the nearest hundred. All median employment income figures are adjusted for inflation using the Consumer Price Index (CPI) and are presented in 2020 constant dollars to correspond with the most recent year of tax data available when the indicators were calculated.

Self-employed: Self-employed individuals are identified using the tax variable for any non-zero gross or net self-employment income, since a negative or exactly zero net income can be reported. Gross self-employment income includes at least one of the following types of earnings: gross farming income, gross commission income, gross business income, gross fishing income or gross professional income.

Status of student in Canada: The status of student in Canada is defined at the end of the winter term, during the year of graduation. 'Canadian students' include Canadian citizens and permanent residents. 'International students' include students studying in Canada on student visas, non-Canadian students in Canada on other types of visas, non-Canadians whose status is unknown, and non-Canadian students studying in Canadian postsecondary institutions from outside Canada (e.g., by Internet).

STEM: field of study grouping (CIP 2016 variant – Cannabis STEM and BHASE groupings) that includes the following sub-groupings: science and science technology; engineering and engineering technology; and mathematics and computer and information sciences.

T1 Family File (T1FF): The T1FF combines variables from the T1 tax file, T4 tax file and the Canada Child Tax Benefit into a family composition file. It includes income, demographic and geographic variables for each tax filer and their spouse, family and children. Only selected tax variables are added to the PSIS postsecondary graduate records.