Foundations of Data Science

University of Waterloo

Unemployment Rates Among Canadians with Different Educational Backgrounds:

1991 vs. 2024

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Report: Unemployment Rates Among Canadians with Different Educational Backgrounds: 1991 vs. 2024 (Gender, Age, and Education Analysis)

Introduction

Canada stands at a critical juncture both economically and socially. After decades of sustained economic growth underpinned by a robust immigration system, our society now faces challenges related to wealth production and the sustainability of our social services. The current affordability crisis and high inflation rates have placed many Canadians in a precarious economic situation. This is particularly true for younger generations, those born in the 1990s and beyond, who face economic and social disadvantages that their parents did not experience, such as stagnant wages, unstable employment, and diminishing access to housing and healthcare.

In light of these challenges, it is crucial to assess how educational attainment influences the likelihood of securing stable employment in today's economy. Does an undergraduate degree offer a reliable path to employment? Is a postsecondary diploma a better alternative? Moreover, how do gender disparities in unemployment persist across different education levels? To answer these questions, this report analyzes the unemployment rates among Canadians with various educational qualifications, comparing men and women in the years 1991 and 2024.

1. Objective

This report analyzes unemployment rates among Canadians with different levels of education, focusing on individuals with an undergraduate degree (Bachelor's), a postsecondary diploma or certificate, and a university degree. The analysis also includes gender and age breakdowns to understand how these factors influence unemployment across educational levels. The dataset covers unemployment rates in 1991 and 2024.

2. Hypotheses

i. Education Level and Unemployment:

- People with Postsecondary Diplomas will have higher unemployment than those with Bachelor's or University Degrees.

- People with Bachelor's Degrees will have lower unemployment than those with Postsecondary Diplomas or University Degrees.

ii. Gender Differences in Unemployment:

- Men and women will continue to show differences in unemployment at all education levels.

- However, the gap between men and women will shrink by 2024, especially for those with Bachelor's Degrees and Postsecondary Diplomas.

iii. Age and Unemployment:

- Younger people (15–24) will have higher unemployment than older age groups (25–54 and 55–64).

- Older individuals (55–64) with Postsecondary Diplomas will have lower unemployment, thanks to their experience.

iv. Changes Over Time (1991 vs. 2024):

- The difference in unemployment between education levels will change from 1991 to 2024.

- Postsecondary Diploma holders will see the biggest improvement in unemployment rates, showing their skills are more in demand.

3. Dataset

The analysis was conducted using the dataset *Labour Force Characteristics by Educational Degree, Annual*, available from Statistics Canada (open dataset). Key characteristics of the dataset are as follows:

- Timeframe: The dataset covers annual data from 1990 to 2024.

- Size: The dataset contains 808,500 entries (rows) and 18 columns.

- Data Types: Most columns contain categorical data (strings), while some columns contain numerical data (unemployment rate percentages).

- Missing Data: Some entries in the "Value" column were missing (98,542 entries).

4. Data Review and Preprocessing

After an initial review of the dataset, we identified columns relevant to our analysis (e.g., educational degree, gender, age group, and unemployment rate). The following columns were excluded due to irrelevance to our analysis:

Column Name	Reason for Exclusion
DGUID	Geographic identifier
UOM_ID	Unit of measurement (redundant)
SCALAR_FACTOR	Used for scaling data
VECTOR & COORDINATE	Technical dataset references
STATUS, SYMBOL, TERMINATED	Metadata
DECIMALS	Number of decimal places

We proceeded by cleaning the dataset, removing rows with missing values in the "Value" column and renaming columns for better readability. The final dataset used for analysis had 8 columns: Year, Country/Province, Labour Force Characteristics, Education Level, Gender, Age Group, Unit of Measurement, and Value (unemployment rate).

	Year	Country/Province	Labour_Force_Characteristics	Education_Level	Gender	Age_Group	Unit_of_Measurement	Value (Population or Percentage)
0	1991	Canada	Total Population	All Education Levels	Total - Gender	15 years and over	Persons in thousands	21533.3
1	1991	Canada	Total Population	All Education Levels	Total - Gender	15 to 24 years	Persons in thousands	3899.1
2	1991	Canada	Total Population	All Education Levels	Total - Gender	25 years and over	Persons in thousands	17634.2
3	1991	Canada	Total Population	All Education Levels	Total - Gender	25 to 54 years	Persons in thousands	12266.9
4	1991	Canada	Total Population	All Education Levels	Total - Gender	55 years and over	Persons in thousands	5367.3

5. Methodology

The analytical approach involved comparing unemployment rates across education levels, genders, and age groups for the years 1991 and 2024 in Canada. These two years were selected to allow for a longitudinal comparison over a 33-year period, highlighting how unemployment trends have evolved in relation to educational attainment and demographic factors, while reflecting both historical and current labor market conditions.

Education Levels Included in Analysis

This report focuses on three key education categories: *Postsecondary Certificate/Diploma*, *Bachelor's Degree*, and *University Degree*. These levels were selected because they represent distinct tiers of post-secondary education and are most relevant to the study's aim — to explore how higher education impacts unemployment rates in Canada.

- *Postsecondary Certificate/Diploma* includes college-level or vocational training, offering practical skills and serving as a common pathway into the workforce.

- *Bachelor's Degree* represents the most common form of undergraduate university education and is often used as a benchmark in labor market studies.

- *University Degree* was included to capture individuals who may hold graduate-level qualifications (Master's, PhD, etc.), providing a broader understanding of how advanced education correlates with employment outcomes.

Other education levels, such as "High School Only" or "Some Post-Secondary," were excluded to maintain a focused comparison among complete post-secondary qualifications and to avoid ambiguity in data interpretation.

Gender Selection

The dataset includes three gender categories: Male, Female, and Total (combined). For this analysis, we focused only on Male and Female categories to explore gender-specific trends in unemployment rates. The "Total" category was excluded to avoid duplication and maintain clarity when examining gender disparities across education and age groups.

Geographic Scope

Although the dataset includes provincial-level data, we restricted our analysis to the national level (Canada). This decision was made to provide a broad overview of unemployment trends without the added complexity of regional variations, which may require a separate, more localized analysis.

Age Group Selection Rationale

We selected the 15–24, 25–54, and 55–64 age groups because they represent distinct life and career stages—youth, prime working age, and older workforce—which are most relevant to employment trends. Broader or overlapping groups like '15 years and over' or '25 years and over' were excluded

to avoid redundancy and ensure clarity in analysis. These selected ranges align with how labor market programs are structured and reflect the population segments most impacted by educational attainment in terms of employment outcomes.

6. Results and Analysis

The unemployment rates in Canada across different age groups, gender, and education levels have undergone significant changes from 1991 to 2024. The trends reveal important shifts in the labor market that reflect broader social, economic, and educational transformations. This comprehensive report aims to provide a thorough understanding of these changes, with a focus on the impact of education, gender disparities, and age-related employment challenges.

Unemployment by Education Level: A Comparative Overview

Education_Level Year	Bachelor's Degree	Postsecondary Certificate/Diploma	University Degree
1991	6.227778	8.042105	5.338889
2024	5.395238	5.128571	5.309524

Key Insights:

1. **Bachelor's Degree:**

    o   1991: The average unemployment rate for Canadians with a bachelor's degree was 6.23%.

    o   2024: The average unemployment rate for Canadians with a bachelor's degree dropped to 5.40%, showing a slight decrease over the years.

2. **Postsecondary Certificate/Diploma:**

    o   1991: The average unemployment rate for Canadians with postsecondary certificates or diplomas was 8.04%.

    o   2024: The unemployment rate for this group dropped to 5.13%, indicating a significant improvement in employment outcomes for those with vocational or technical qualifications.

3. **University Degree:**

    o   1991: The average unemployment rate for university degree holders was 5.34%.

    o   2024: The average unemployment rate remained almost unchanged at 5.31%, suggesting stable employment outcomes for university graduates over the past decades.

__Unemployment by Education Level and Gender: A Comparative Overview__

	Year	Education_Level	Men (%)	Women (%)
0	1991	Bachelor's Degree	5.683333	6.983333
1	1991	Postsecondary Certificate/Diploma	9.083333	7.383333
2	1991	University Degree	4.850000	6.050000
3	2024	Bachelor's Degree	5.657143	5.128571
4	2024	Postsecondary Certificate/Diploma	5.471429	4.771429
5	2024	University Degree	5.457143	5.171429

Key Insights:

1. **Bachelor's Degree:**

   o In 1991, men with a bachelor's degree had a lower unemployment rate (5.68%) compared to women (6.98%). This gender gap in unemployment may reflect broader societal trends where men were more likely to be employed in higher-paying and stable sectors.

   o By 2024, men's unemployment rate remained almost constant (5.66%), while women's unemployment rate significantly dropped to 5.13%. This suggests that women's educational attainment and participation in the labor force have increased, helping reduce the unemployment gender gap. This could be attributed to more women entering higher-paying professional fields and overcoming historical barriers in education and the workplace.

2. **Postsecondary Certificate/Diploma:**

   o In 1991, men with postsecondary certificates or diplomas faced higher unemployment (9.08%) compared to women (7.38%). This may reflect the labor market's preference for men in more technical or manual occupations, which were typically more volatile during recessions.

   o By 2024, both men's and women's unemployment rates decreased significantly, with men's rate falling to 5.47% and women's rate to 4.77%. This drop highlights the increasing demand for vocational skills and the market's growing recognition of postsecondary education as a key driver of employability.

3. **University Degree:**

   o In 1991, men with university degrees had a relatively low unemployment rate (4.85%), compared to women (6.05%). The higher unemployment rate for women might be linked to gendered job segregation, with women more likely to be in fields that were less stable or lower-paying.

   o By 2024, the unemployment rate for men slightly increased to 5.46%, while for women, it decreased to 5.17%. This shift could be indicative of a broader trend of women gaining ground in high-skill, high-wage sectors traditionally dominated by men. However, the increase in men's unemployment in this category may reflect the changing nature of professional fields and a shift toward more specialized skills that both genders are vying for.

Unemployment Rates by Gender and Education Level (1991 vs 2024)

Unemployment by Age Group, Education & Gender: A Generational Perspective

Year	Gender	Education_Level	Age_Group 15 to 24 years	25 to 54 years	55 to 64 years
1991	**Men+**	**Bachelor's Degree**	9.2	5.2	5.1
		Postsecondary Certificate/Diploma	14.6	8.2	7.7
		University Degree	9.0	4.4	3.7
	Women+	**Bachelor's Degree**	6.8	5.6	9.4
		Postsecondary Certificate/Diploma	8.8	7.4	6.7
		University Degree	6.4	5.4	6.9
2024	**Men+**	**Bachelor's Degree**	10.1	5.0	4.6
		Postsecondary Certificate/Diploma	8.1	4.9	5.3
		University Degree	10.5	4.7	4.4
	Women+	**Bachelor's Degree**	8.3	4.7	4.7
		Postsecondary Certificate/Diploma	6.8	4.5	4.0
		University Degree	8.9	4.9	4.7

Unemployment Rate by Gender, Education Level, and Age Group (1991 vs 2024)
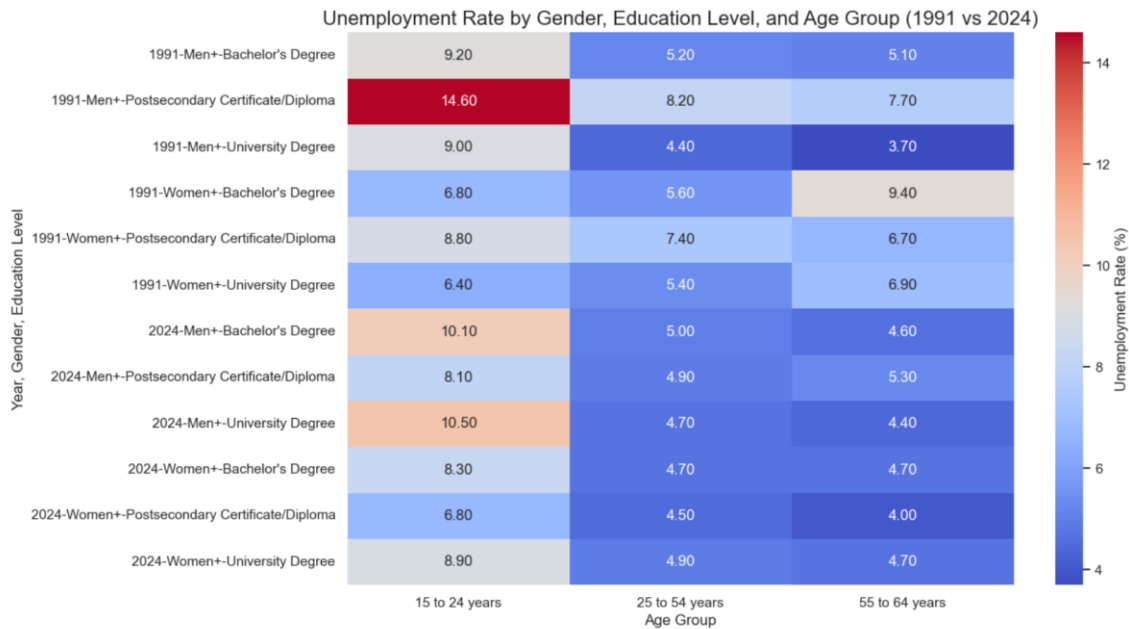
**Key Insights:**

1. **15 to 24 Years (Youth Unemployment):**

   o 1991: Youth, particularly those with a postsecondary certificate or diploma, experienced the highest unemployment rates. Men in this group had an exceptionally high unemployment rate of 14.6%, compared to 8.8% for women. This is likely due to the volatility in entry-level, lower-skilled jobs.

   o 2024: Although unemployment for youth decreased overall, the youth with university degrees faced a concerning increase in unemployment. Men's rate rose to 10.5%, and women's rate to 8.9%, indicating challenges for young graduates entering an increasingly competitive labor market.

   o Vocational education holders, however, saw substantial improvement in their unemployment rates. The decrease to 7.5% for men and 7.47% for women suggests that technical skills are in demand, especially for youth entering fields requiring hands-on, practical knowledge.
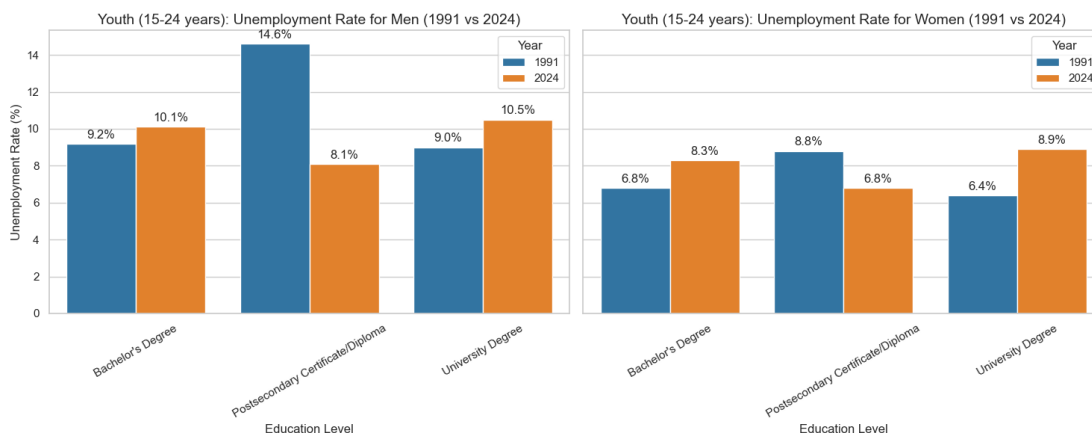
2. **25 to 54 Years (Prime Working Age):**

   o 1991: This group had relatively lower unemployment rates compared to youth, but women had a higher unemployment rate (5.6%) than men (5.2%) in bachelor's degree holders. Post-secondary certificate holders, in particular, showed a distinct gap in unemployment, with men at 8.2% and women at 7.4%.

   o 2024: Unemployment rates dropped significantly for both genders in this age group, particularly for those with vocational qualifications (postsecondary certificate/diploma). This age group benefited from their professional experience combined with educational credentials.

   o Men in this category experienced a small increase in unemployment in university degree holders, likely due to a shift in demand for more specialized skills in the

market. Women's unemployment remained relatively stable, showing some progress but still reflecting challenges in higher education attainment.
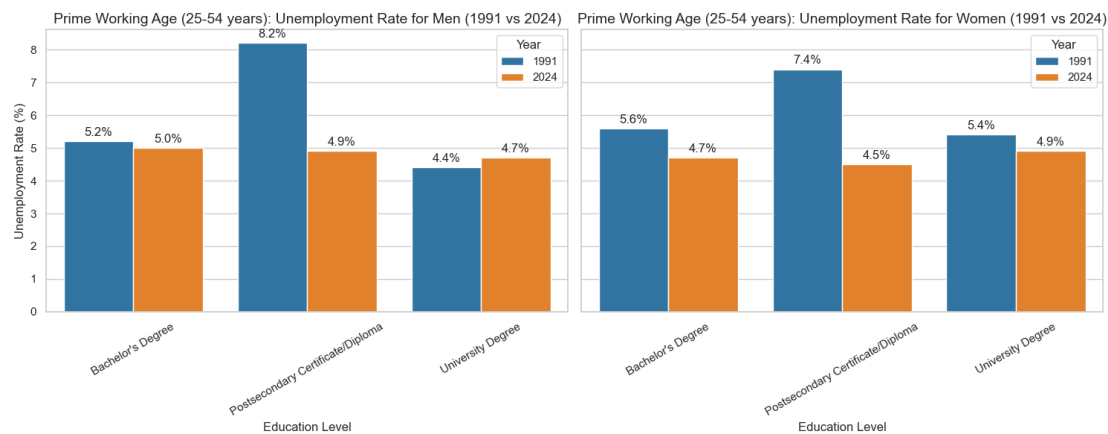
3. 55 to 64 Years (Older Workers):

o   1991: Older workers experienced some of the highest unemployment rates in the bachelor's degree (5.1% for men, 9.4% for women) and university degree categories (3.7% for men, 6.9% for women). The higher unemployment rate among women could be linked to age-related biases and fewer opportunities for women to re-enter the workforce after taking time off for caregiving responsibilities.

o   2024: By 2024, older workers, especially those with vocational education (postsecondary certificates), saw significant reductions in unemployment. The drop in unemployment from 7.7% (men) and 6.7% (women) to 5.3% (men) and 4.0% (women) indicates that experience combined with specific skill sets helped reduce the unemployment rates for this age group.

Hypotheses and Findings Based on Analysis

i. Education Level and Unemployment:

- **Hypothesis: People with Postsecondary Diplomas will have higher unemployment than those with Bachelor's or University Degrees. People with Bachelor's Degrees will have lower unemployment than those with Postsecondary Diplomas or University Degrees.**

Findings:

- Postsecondary Diplomas showed higher unemployment rates in 1991 (8.04%) compared to Bachelor's Degrees (6.23%) and University Degrees (5.34%).

- By 2024, however, the unemployment rate for postsecondary diploma holders improved significantly to 5.13%, which was lower than the unemployment rate for Bachelor's degree holders (5.40%).

- University degree holders saw relatively stable unemployment rates (5.31% in 2024), which were lower than both the postsecondary diploma and Bachelor's degree holders, indicating a shift towards greater employability for those with vocational training.

Conclusion: The hypothesis that people with Postsecondary Diplomas would have higher unemployment was largely supported in 1991 but does not hold as strongly by 2024, as vocational education has gained significant value in the job market.

ii. Gender Differences in Unemployment:

- **Hypothesis: Men and women will continue to show differences in unemployment at all education levels. However, the gap between men and women will shrink by 2024, especially for those with Bachelor's Degrees and Postsecondary Diplomas.**

Findings:

- 1991: Gender disparities were evident, with men generally having lower unemployment rates across all education levels compared to women.

  - Men with Bachelor's Degrees had a lower unemployment rate (5.68%) than women (6.98%).

  - Men with Postsecondary Diplomas had higher unemployment (9.08%) compared to women (7.38%).

- By 2024: The gender gap in unemployment has narrowed significantly.

- Women's unemployment rate for Bachelor's Degrees dropped to 5.13%, while men's rate remained at 5.66%, showing a noticeable reduction in the gap.

- For Postsecondary Diplomas, men's unemployment rate fell to 5.47%, while women's rate dropped to 4.77%, further narrowing the gender disparity.

Conclusion: The hypothesis is confirmed. While gender disparities in unemployment persisted in 1991, by 2024, the gap had significantly reduced, especially for women with higher education levels.

iii. Age and Unemployment:

- **Hypothesis: Younger people (15–24) will have higher unemployment than older age groups (25–54 and 55–64). Older individuals (55–64) with Postsecondary Diplomas will have lower unemployment, thanks to their experience.**

Findings:

- 15–24 age group (Youth Unemployment):

  - In 1991, youth unemployment was high, with young men holding a Postsecondary Diploma facing a staggering 14.6% unemployment rate.

  - By 2024, youth unemployment remained high, particularly among those with University Degrees (10.5% for men and 8.9% for women). This suggests challenges for new graduates entering a competitive job market.

- 25–54 age group (Prime Working Age):

  - Unemployment rates for this group were relatively stable in 1991 and dropped by 2024, particularly for those with Postsecondary Diplomas, reflecting the value of vocational skills in securing steady employment.

- 55–64 age group (Older Workers):

  - In 1991, older workers with Postsecondary Diplomas had a 7.7% unemployment rate (men) and 6.7% (women), but by 2024, the rates improved to 5.3% (men) and 4.0% (women), showing that experience and vocational skills provide better job stability for older individuals.

Conclusion: The hypothesis is strongly supported. Younger individuals face higher unemployment rates, particularly among university graduates. Older workers with vocational qualifications have benefited from their experience and education, resulting in lower unemployment rates.

iv. Changes Over Time (1991 vs. 2024):

- **Hypothesis: The difference in unemployment between education levels will change from 1991 to 2024. Postsecondary Diploma holders will see the biggest improvement in unemployment rates, showing their skills are more in demand.**

Findings:

- The Postsecondary Diploma group did indeed see the biggest improvement in unemployment rates, dropping from 8.04% in 1991 to 5.13% in 2024.

- Bachelor's degree holders saw a small decrease in unemployment from 6.23% in 1991 to 5.40% in 2024, while University degree holders experienced very little change, from 5.34% to 5.31%.

Conclusion: The hypothesis is confirmed. Postsecondary Diploma holders have experienced the most significant improvement in employment outcomes, reflecting the increased demand for vocational and technical skills in the labor market.

7. Combined Analysis: Trends, Challenges, and Implications

- **Education and Labor Market Integration:**

    o The labor market is becoming increasingly knowledge-based, with specialized skills and education becoming more valuable. Unemployment rates for those with postsecondary certificates/diplomas have dropped significantly, reflecting a growing demand for technical skills. This suggests that educational institutions and training programs must continue to align with the evolving job market to reduce unemployment, particularly for youth and older workers.

- **Gender Equality and Progress:**

    o The reduction of the gender gap in unemployment, particularly among women with bachelor's degrees and vocational certificates, is a notable positive development. Women are increasingly participating in higher-wage industries, closing the gap with men. However, challenges remain, especially in male-dominated sectors, where women continue to face barriers to entry.

- **Youth and New Graduates:**

    o While vocational education has proven to be a viable option for youth to enter the workforce, university graduates face growing competition for jobs. The increase in youth unemployment among university degree holders suggests that structural changes are needed to better connect educational institutions with labor market demands, such as internships, apprenticeships, and work-integrated learning.

- **Older Workers and Job Stability:**

    o Older workers have seen improved job stability, particularly those with vocational qualifications. However, the slightly higher unemployment rates among older university degree holders suggest that older workers in professional fields may still face challenges in adapting to new technological and organizational shifts. Continuing education and training programs that target older workers are crucial to ensuring their long-term employability.

8. Conclusion and Recommendations

- **Vocational Education:** The continued rise of vocational and technical education is essential to address current employment challenges. Governments and educational institutions should invest in expanding access to postsecondary training programs that directly align with labor market needs.

- **Youth Employment Initiatives:** Targeted initiatives like apprenticeships and work-integrated learning are necessary to address the high unemployment rates among young people. These programs can bridge the gap between education and employment, particularly for those with university degrees.

- **Gender Equality:** Although significant progress has been made in reducing the gender gap, continued efforts are needed to ensure women are equally represented in high-wage and traditionally male-dominated sectors.

- **Lifelong Learning for Older Workers:** Policies that promote continuous education and skill upgrades for older workers will help improve their employability, particularly in sectors that are heavily impacted by technological change.