



Unveiling Inequality: Exploration of Gender Pay Disparities

3rd December 2024

OVERVIEW

This project aims to explore the issue of gender pay disparities through the lens of Data Feminism, using data visualization techniques to uncover, highlight, and challenge existing inequalities in the workplace. Gender pay gaps exist across industries and countries, disproportionately affecting women, especially those from marginalized backgrounds (e.g., women of color, mothers, and women in low-wage sectors). Despite numerous policies aimed at reducing these gaps, they persist, reflecting deeper power imbalances in our social and economic structures.

Toronto: March 7, 2023: As we approach International Women's Day on March 8, we continue to fight against the persistent gender pay gap that persists throughout Canada.

The gender pay gap refers to the difference in average earnings of people based on gender. The gender pay gap is worse for those who face multiple barriers, including racialized women, indigenous women, and women with disabilities [1].

RATIONALE

Gender pay disparities are an important issue both personally and societally. From a personal perspective, addressing this issue is vital because it ensures fairness in the workplace. Everyone, regardless of gender, should be compensated based on their abilities, experience, and contributions. Understanding and advocating for fair pay structures in professional settings not only promotes equality but also strengthens workplace morale. When employees feel respected and valued for their work, it fosters collaboration and innovation, which ultimately benefits the organization and personal growth.

On a broader societal level, eliminating gender pay disparities has the potential to drive significant economic and social improvements. Economically, a more equitable pay structure allows individuals to contribute their full potential, which leads to a more efficient and productive labor market. When people are paid fairly, society benefits from a more inclusive and robust workforce. Moreover, addressing this issue plays a critical role in advancing social justice. It helps to dismantle systemic inequalities that have long held back women and marginalized groups, contributing to a fairer and more just society.

Furthermore, reducing gender pay gaps can help increase the representation of women and other underrepresented groups in leadership roles, which brings diverse perspectives to decision-making processes. This diversity is crucial for solving complex challenges and making more balanced decisions. Finally, by actively working to close the gender pay gap, we set a powerful example for future generations, showing them that their potential is not limited by their gender and that they can strive for success without being held back by inequities.

CRITICAL PERSPECTIVE

- **Data Science by Whom?**

This project examines the salary data, addressing potential biases. Men, especially in senior or high-paying roles, often disproportionately benefit from existing wage inequalities.

- **Data Science for Whom?**

The visualizations are designed to benefit women, employers, policymakers, and advocacy groups working toward pay equity. The project highlights systemic barriers, particularly for women of color and mothers, through intersectional data visualization.

- **Who Benefits?**

Transparent salary data empowers women and supports fair compensation practices, benefiting individuals and organizations advocating for equity.

- **Who Loses?**

Resistance may arise from organizations that gain from pay opacity, as the project challenges such inequitable structures.

DATA 1.0

The data on median weekly earnings of full-time wage and salary workers by detailed occupation and sex for 2023 (by the US Bureau of Labor Statistics) highlights significant disparities in pay between men and women across various fields [2]. This data provides insights into gender-based earnings differences, allowing for an in-depth analysis of how these gaps vary by occupation. Such information is vital for understanding systemic inequities and fostering informed discussions about improving pay equity in the workforce.

DATA PREPROCESSING

The occupations were categorised into 8 different categories i.e. admin & organisation, care & education, creative & media, law & justice, manual work, sales & serving others, science tech & engineering and senior managers & execs. Each category includes a range of occupations performed by both men and women, along with their median weekly earnings and the associated wage gap.

VISUALIZATION

To illustrate the gender pay disparity, several visualizations were sketched on paper. From these, the following design was chosen for implementation using D3.js [3].

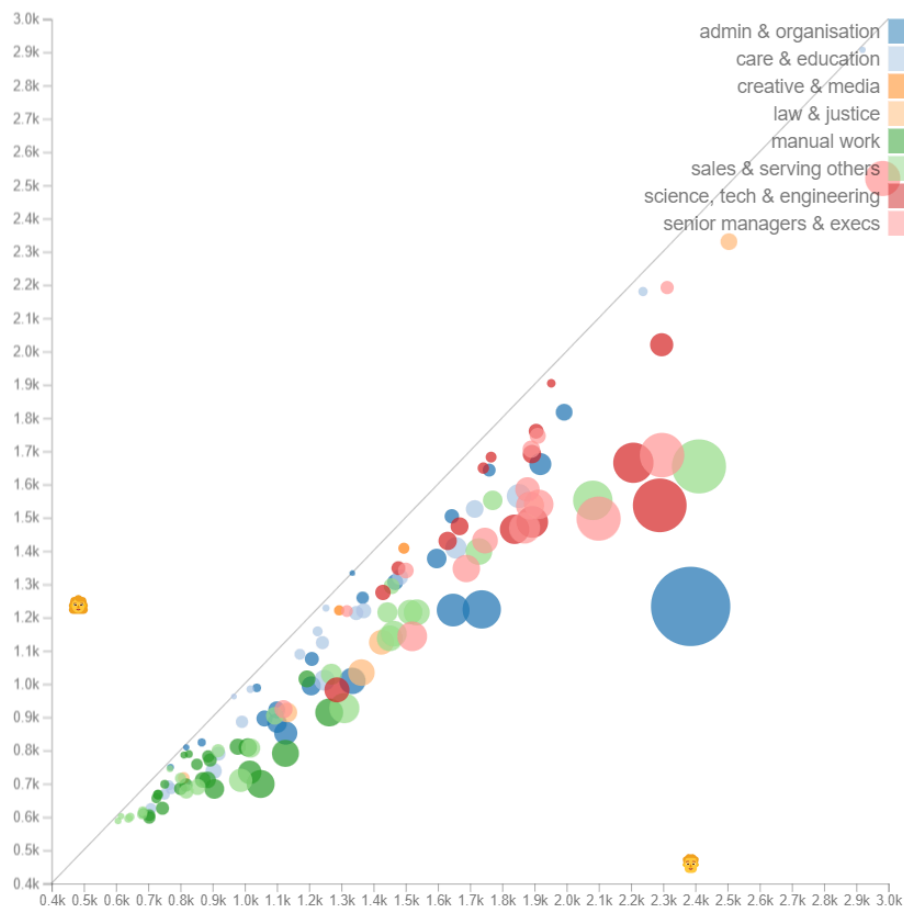
Each category is assigned a distinct color to enhance the visualization's clarity and comprehensibility. To interact with the visualization, hover over a bubble to reveal details about the occupation, median weekly earnings, and the wage gap, with male earnings represented on the x-axis and female earnings on the y-axis. The size of each bubble represents the wage gap (in \$) between males and females for a specific occupation.

To see the viz, click on this [link](#).

OBSERVATIONS

1. The gap between women's and men's earnings generally is larger in occupations with higher median earnings.

2. Most of the bubbles are on the right side of the diagonal, indicating that in these roles, men earn more than women. This highlights a persistent gender pay gap where women, on average, earn less than their male counterparts for similar roles.
3. Categories like "science, tech, & engineering" (red bubbles) and "admin & organization" (blue bubbles) are positioned further away from the $x = y$ line, demonstrating larger gender pay gaps.
4. "care & education" (light blue bubbles) is closer to the $x = y$ line, suggesting a smaller gap in these traditionally female-dominated sectors.
5. Other financial specialists (under the category of admin & organization) had the greatest percentage difference in median weekly earnings between women (\$1,233) and men (\$2,386), followed by first-line supervisors of housekeeping and janitorial workers (\$699 women; \$1,050 men); and medical scientists (\$1,537 women; \$2,290 men); and securities, commodities, and financial services sales agents (\$1,654 women; \$2,412 men). These disparities are visually apparent from the size of the bubbles corresponding to each occupation.



The Institute for Gender and the Economy says: “most people think the wage gap comes from women being paid unequally for the same work, but this only accounts for a small portion of the gap. However, the bigger source of the gap comes from job segregation where women end up working in lower paid job categories or industry sectors”.

CHALLENGES

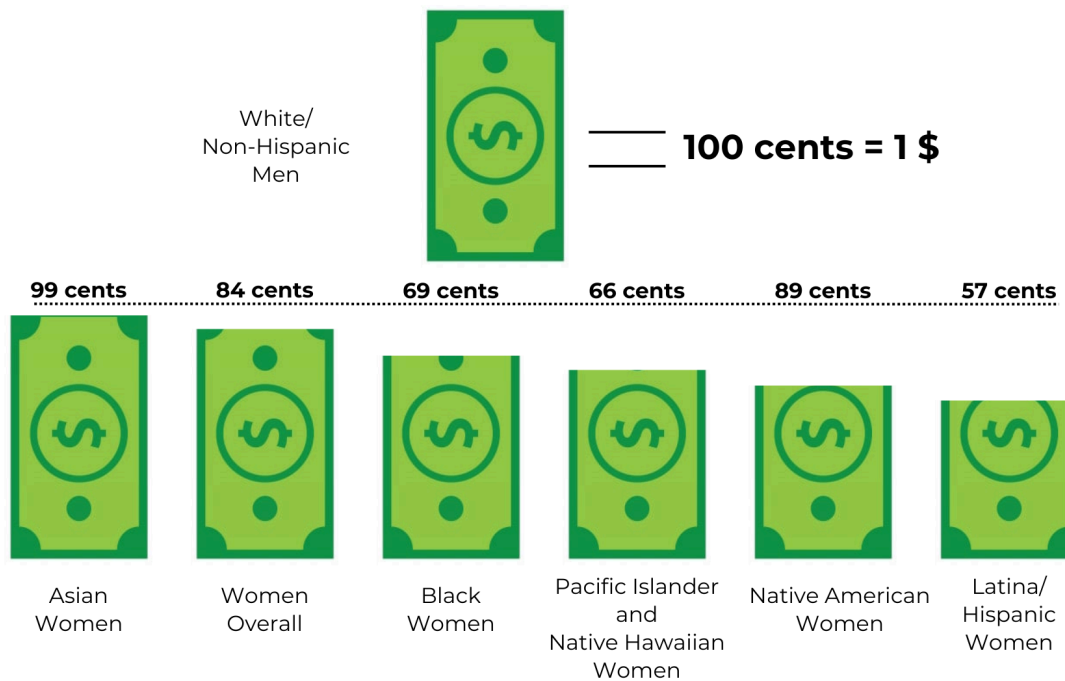
- **Data Availability and Quality:** High-quality intersectional pay data is scarce, with limited reporting on race and ethnicity alongside gender. Lack of transparency in some industries and reliance on self-reported data introduce biases.
- **Isolating Variables:** Factors like education, experience, and systemic hiring biases complicate isolating the exact impact of gender on pay disparities.
- **Stereotypes and Bias:** Social norms and stereotypes penalize women for negotiating salaries, perpetuating a cycle of lower advocacy and pay, which is difficult to quantify but critical to address.

DATA 2.0

To incorporate an intersectional analysis of gender pay disparity across different ethnic groups, additional data was explored. This intersectional data, highlighting disparities by gender and ethnicity, was collected by the AAUW in 2023 [4].

VISUALIZATION

To represent the intersectional analysis of gender pay disparity, multiple visualization concepts were sketched on paper. The final chosen design is presented below:



OBSERVATIONS

Following are some key insights from the above visualization about the gender pay gap for various racial and ethnic groups in the US (for the year 2023):

- **Asian Women:** Earn **99 cents** for every dollar earned by white, non-Hispanic men, showing the smallest pay gap.
- **Women Overall:** Earn **84 cents** for every dollar earned by white, non-Hispanic men, reflecting a noticeable gender pay gap.

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- **Black Women:** Earn **69 cents** for every dollar earned by white, non-Hispanic men, highlighting a significant disparity.
 - **Pacific Islander & Native Hawaiian Women:** Earn **66 cents** for every dollar earned by white, non-Hispanic men, indicating a large pay gap.
 - **Native American Women:** Earn **59 cents** for every dollar earned by white, non-Hispanic men, one of the widest gaps observed.
 - **Latina/Hispanic Women:** Earn **57 cents** for every dollar earned by white, non-Hispanic men, the lowest earnings compared to all other groups shown.

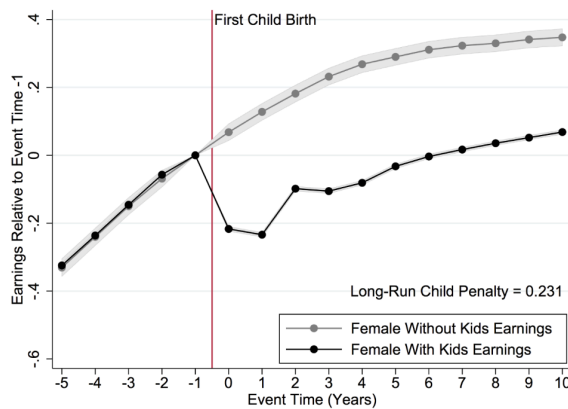
MOTHERHOOD PENALTY

- **Motherhood Earnings Gap:** Mothers with children under 18 earn 85 cents for every dollar fathers earn, while childless women earn 90 cents for every dollar earned by childless men (Moyser, Statistics Canada, 2017) [5]. The motherhood earnings gap can last at least five years after mothers return to work; the gap is more pronounced for younger mothers (ages 25-29) than for those who have children later (2019 report).
- **Fatherhood Premium:** Men generally do not face penalties after becoming fathers; instead, they often experience increased earnings. Fathers may earn more than childless men, according to a study of over 18,000 men (Fuller and Cooke, 2018) [6].
- **Job Flexibility:** Mothers may shift to jobs with family-friendly hours and policies, though this option is often available only to those in middle- to upper-level positions. Women in low-paid or precarious jobs face more challenges due to a lack of job flexibility (Schofield, 2019) [7].

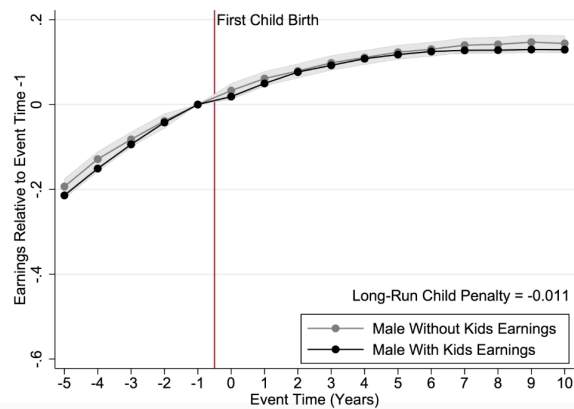
Mothers may continue to face earning penalties even when their children are grown, particularly if they assume caregiving responsibilities for aging relatives, a growing concern due to Canada's aging population (The Vanier Institute of the Family, 2017) [8].

The fact that the motherhood penalty is indeed about 'motherhood' and not 'parenthood', is supported by further evidence. A recent study, also from Denmark, tracked men and women over the period 1980-2013 and found that after the first child, women's earnings sharply dropped and never fully recovered [9]. But this was not the case for men with children, nor the case for women without children. These patterns are shown in the chart here. The first panel shows the trend in earnings for Danish women with and without children. The second panel shows the same comparison for Danish men.

A: Women Who Have Children vs Women Who Don't
Earnings Impact



B: Men Who Have Children vs Men Who Don't
Earnings Impact



Note that these two examples are from Denmark, a country that ranks high on gender equality measures and where there are legal guarantees requiring that a woman can return to the same job after taking time to give birth. This shows that, although family-friendly policies contribute to improving female labor force participation and reducing the gender pay gap, they are only part of the solution. Even when there is generous paid leave and subsidized child care, as long as mothers disproportionately take additional work at home after having children, inequities in pay are likely to remain.

REASONS

The motherhood penalty contributes significantly to the gender pay gap for several reasons:

- **Career interruptions:** Mothers often experience breaks in employment for childbearing and childrearing, leading to less job experience and reduced earnings potential [10].
- **Reduced work hours:** Many mothers shift to part-time work or flexible schedules to accommodate childcare responsibilities, resulting in lower wages [10].
- **Employer discrimination:** Mothers face biases in hiring, promotion, and wage decisions, being perceived as less committed or competent compared to non-mothers and men [10].
- **Productivity assumptions:** Employers may assume mothers are less productive due to family responsibilities, affecting their wages and career advancement [11].
- **Occupational segregation:** Mothers are more likely to work in lower-paying, female-dominated sectors or "mother-friendly" jobs that offer flexibility but lower wages [10].

- **Lack of family-friendly policies:** Insufficient paid parental leave, affordable childcare, and flexible work arrangements can force mothers to make career sacrifices [10].
- **Unequal division of household labor:** Women often take on more unpaid domestic work and childcare, impacting their career progression and earning potential [12].
- **Cumulative disadvantage:** The wage penalty compounds over time, with mothers experiencing slower wage growth and reduced lifetime earnings.
- **Shift to public sector employment:** Mothers are more likely to move to public sector jobs, which often offer more family-friendly policies but lower wages [13].

HOW TO ELIMINATE THIS GAP?

- Make closing the gender gap a human rights priority
- Legislate card check and promote access to collective bargaining
- Enforce and expand pay equity measures
- Increase the minimum wage
- Implement equity compliance legislation for workplaces and businesses
- Provide affordable, high-quality, universal childcare
- Combat violence and harassment against women
- Introduce Pay Transparency Legislation

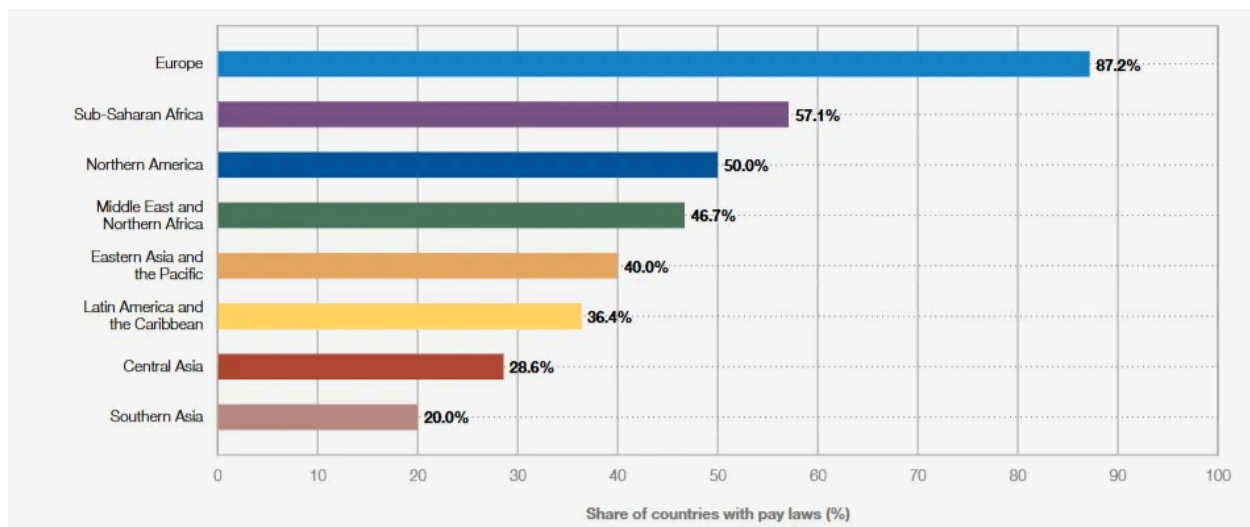


Fig. Share of economies with laws regarding equal pay in 2024 [14]

CONCLUSION

This project seeks to use data science for social good by applying the principles of Data Feminism to analyze and visualize gender pay disparities. By doing so, it aims to provide not only a critical examination of gender inequality but also practical, data-driven insights. The use of data visualization makes these disparities tangible and actionable, helping policymakers, employers, and advocacy groups to prioritize equitable practices. This project exemplifies the critical role of data in uncovering and addressing social injustices.

FUTURE WORK

To deepen the impact of addressing gender pay disparities, the project should prioritize exploring additional datasets, particularly those incorporating intersectional data that highlight how race, ethnicity, and other demographic factors intersect with gender to exacerbate inequities. Expanding visualizations can include not only data-driven insights but also elements that evoke emotional resonance, helping viewers connect on a deeper, human level with the realities of the pay gap. Additionally, investigating societal norms and biases that perpetuate gendered expectations, such as discouraging women from negotiating salaries, can inform targeted interventions to dismantle these systemic barriers. Writing blogs and thought pieces will further amplify the message, raising public awareness about the root causes of pay disparities including stereotypes, systemic biases, and the motherhood penalty, thereby fostering a broader understanding and encouraging collective action to close the gap.

DATA TIMELINE

| Date | Data | Results |
|--------------------|--|--|
| 17 September, 2024 | Data from Statistics Canada [14] Problems: Not diversified, didn't include low-paying sections | NA |
| 20 October, 2024 | Data 1.0 = Data from US Bureau of Labour Statistics 2023 [2] Problems: Intersectional perspective is missing | Visualization of gender pay disparity among different sectors covering low-paying sections as well |
| 10 November, 2024 | Data 2.0 = Data from American Association of University Women (AAUW) [4] | Visualization of intersectional analysis of gender pay disparity |

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