January 2025

The Impact of Age on the Gender Pay Gap in the Federal Sector

U.S. Equal Employment Opportunity Commission
Research, Evaluation, & Applied Data Division | Office of Federal Operations

Table of Contents

Executive Summary

The U.S. Equal Employment Opportunity Commission (EEOC) enforces laws that prohibit gender discrimination and discrimination against workers age 40 and over. Previous research has found that gender pay inequality varies by age in the general population (Aragão, 2023; Chamberlain, 2016). However, the EEOC could not find any previous research focusing on how gender pay inequality varies by age within the Federal workforce.

To fill this gap, the EEOC examined data on over two million Federal employees to answer two questions:

- Does the gender pay gap in the Federal workforce differ for people under age 40 as compared to people age 40 and over?
- How do factors associated with the gender pay gap (e.g., human capital and occupation) differ for these age groups?

Main Findings

Using statistical regressions,[1] the EEOC measured gender pay gaps for Federal workers under age 40 and age 40 and over. This included the overall gross pay gap, the human capital-controlled pay gap (which accounts for personal characteristics and human capital),[2] and the within-job pay gap (which further accounts for workplace geography, agency, and occupation). The EEOC also measured how gender differences in key attributes and rewards[3] explained the gender pay gap in each age group.

The main findings from these analyses include:

- Regardless of how it was measured, the gender pay gap was larger among employees age 40 and over.
- In the younger age group, Federal work experience was the most influential attribute, increasing the gender pay gap by $2,105 annually or 2.9 cents on the dollar on average.[4] Pay generally increases with experience, and the average man under age 40 had about 1.1 more years of federal work

[1] See Appendix C for more information on the methodology.

[2] This study included education, Federal work experience, and age (an indicator of total work experience) as measures of human capital.

[3] Men and women may get rewarded (in this case, paid) in different ways for the same attributes. For example, an employer could pay employees more for additional years of work experience or greater educational attainment but do so unequally for men and women. Unequal rewards for the same attributes contribute to the gender pay gap.

[4] Average pay differs by age group. As a result, between age group comparisons of the effect of attributes and rewards for attributes on the gender pay gap differ when looking at cents on the dollar (a percentage of average pay) vs. annual average difference in dollars paid. Examining cents on the dollar accounts for the between age group difference in average pay.

experience than their female counterparts. Occupation was the second most influential attribute at $1,153 annually or 1.6 cents on the dollar.

- In the older age group, occupation was the most influential attribute ($2,005 annually or 2.1 cents on the dollar), followed by Federal work experience ($743 annually or 0.8 cents on the dollar).
- Gender distribution differences by agency contributed 1.0 cents on the dollar ($742 annually) to the pay gap of women under age 40 and 0.5 cents on the dollar ($461 annually) to the pay gap of women over age 40.
- Among the younger age group, educational attainment was the attribute most associated with decreasing the gender pay gap, decreasing it by $1,665 annually or -2.3 cents on the dollar.
- Veteran status also helped decrease the gender pay gap by $1,157 annually (-1.6 cents on the dollar) for the younger group and by $1,314 annually (-1.4 cents on the dollar) for the older group.
- In both age groups, age was the attribute for which rewards most favored men over women, increasing the gender pay gap by $2,420 annually (3.4 cents on the dollar) for those under age 40 and by $10,534 annually (11.2 cents on the dollar) for those over age 40.
- In the older age group, rewards to occupation ($1,572 annually or 1.7 cents on the dollar) and education ($466 annually or 0.5 cents on the dollar) were also significantly associated with a larger gender pay gap.

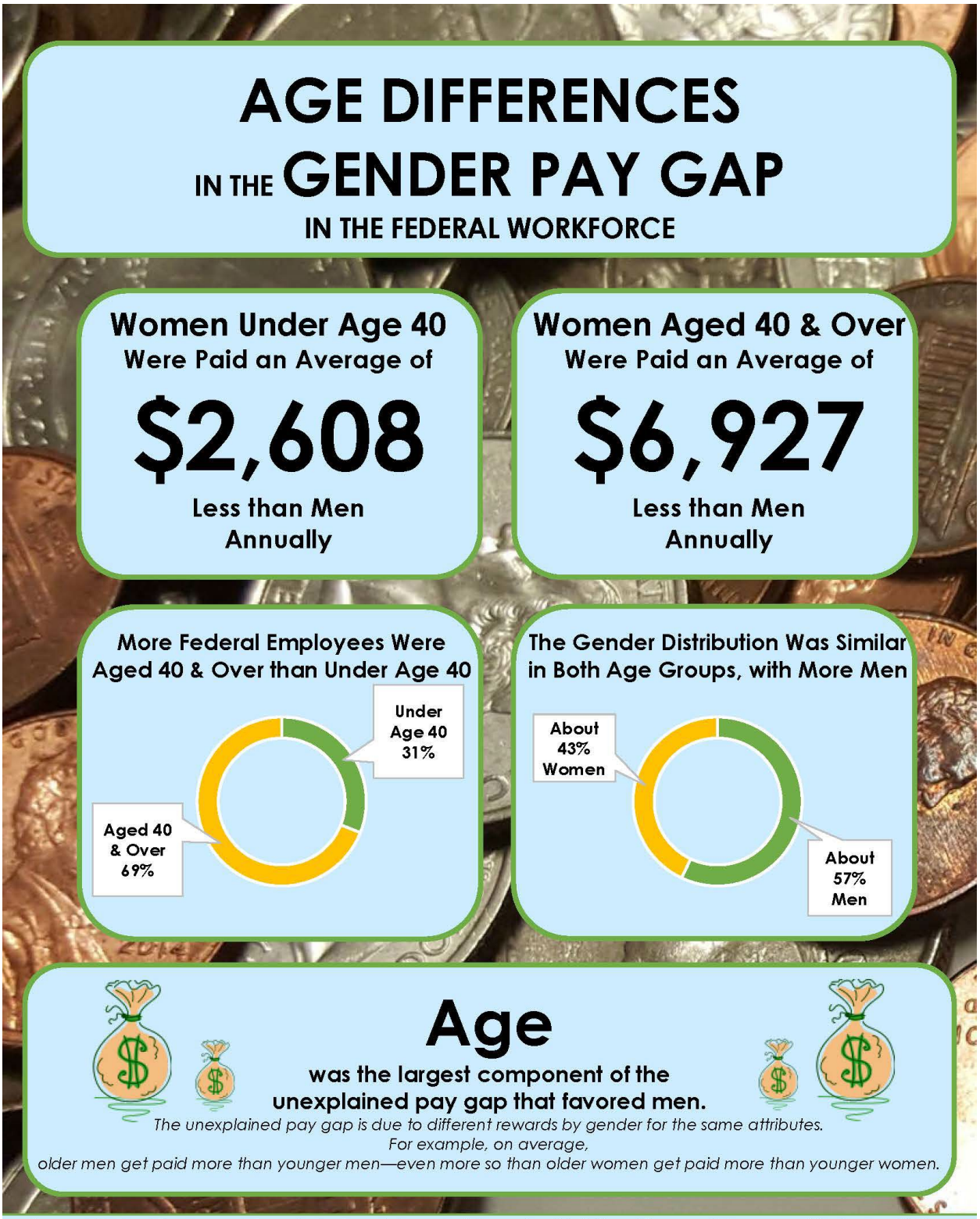
Recommendations

Based on the above findings, the EEOC recommends the following:

- Federal agencies should make efforts to identify and address barriers creating gender differences in occupation, which are greater among workers age 40 and over.
- Governmentwide initiatives to eliminate gender pay inequities should target the agencies with the largest gender pay gaps.
- Additional research should seek to identify the personnel practices and occupations most associated with gender pay differences across age groups in the Federal sector.

Research often has found that employment inequities are more severe for certain groups who have multiple, intersecting characteristics—for example, older women. Focused recruitment and outreach efforts may help reduce pay inequities, allowing agencies to better focus their efforts and resources where they are needed most. The EEOC will continue to support stakeholders in achieving greater equal employment opportunity.

Infographic: Age Differences in the Gender Pay Gap in the Federal Workforce



Source: U.S. Equal Employment Opportunity Commission calculations using U.S. Office of Personnel Management September 2021 Enterprise Human Resources Integration – Statistical Data Mart (EHRI-SDM) Status Data.

Introduction

The Civil Rights Act of 1964 established the U.S. Equal Employment Opportunity Commission (EEOC) as the Federal agency responsible for the oversight, examination, and enforcement of laws prohibiting employment discrimination. For employers with 15 or more employees, Title VII of the same act prohibits discrimination on the basis of race, color, religion, sex (including pregnancy, sexual orientation, and gender identity), and national origin. The Equal Pay Act of 1963 prohibits pay discrepancies on the basis of sex for work of equal skill, effort, and responsibility under similar working conditions. Lastly, the Age Discrimination in Employment Act of 1967 (ADEA) prohibits employment discrimination against people age 40 and over.

Courts have applied various legal theories to extend the protections under these laws to people who experience discrimination on the basis of two or more protected classes and select other characteristics (Coleman et al., 2021). Sex-plus discrimination occurs when an employer discriminates against an employee on the basis of sex and another characteristic, such as "women with children" (Bradley, 2020). The U.S. Supreme Court has held that sex-plus discrimination amounts to a Title VII violation, even if the policy only adversely affects a select portion of the protected class (Coleman et al., 2021). On the other hand, intersectional discrimination occurs at the intersection of two or more protected classes, such as race and sex, or sex and age (Coleman et al., 2021).

This report examines pay discrepancies in the Federal sector at the intersection of age and gender. Although researchers have examined gender pay gaps within the civilian labor force (CLF; Chamberlain, 2016; Aragão, 2023), less is known about how age and sex discrimination work together to influence pay. Furthermore, the EEOC could not find previous research focusing specifically on age differences in gender pay gaps within the Federal Government. This report uses data on over two million employees and measures how a variety of factors, including age, occupation, agency, education, and race and ethnicity impact the gender pay gap differently for older and younger workers. The results of this report highlight the underlying causes of gender pay gaps within the Federal sector and how employee age affects such gaps. Agencies may use this information to help improve pay equity across gender and age groups.

Background

Federal agencies have conducted research on the gender pay gap in the Federal sector, but those studies did not specifically focus on the impact of age on the gender pay gap. For example, in 2021, the EEOC published research on pay equity among Federal employees (Coleman et al., 2021), and included key obstacles women faced in attaining equal pay in the Federal workplace:

- Inflexible workplace policies created challenges for women with caregiver obligations.
- Higher level and management positions remained harder to obtain for women.
- Unconscious gender biases and stereotypical perceptions about women still play a significant role in employment decisions in the Federal sector.

In addition, a 2022 EEOC report found that the average salary for Federal employees age 40 and over was higher than the governmentwide average. However, the EEOC still found a gender pay gap within this older group. In fiscal year (FY) 2017, among Federal workers age 40 and over, men were paid $7,414 more annually than women (EEOC, 2022). That report focused specifically on older workers and did not examine gender pay gaps across different age groups.

A report published by the U.S. Office of Personnel Management (OPM, 2014) found that the gender pay gap was larger among older Federal employees. While women age 25 to 34 earned 95.1 percent of what men earned, women age 55 to 64 earned 83.1 percent. Occupational differences may be behind these pay gaps by age (OPM, 2014).

The U.S. Government Accountability Office (GAO, 2020) also found that the gender pay gap increased with age, with the average gap at 1.7 percent for Federal employees age 25 to 35 and 11.1 percent for those age 55 to 65. However, the OPM (2014) and GAO (2020) reports focused on the gender pay gap broadly, with minimal focus on age. Although the ADEA prohibits employment discrimination against employees age 40 and over, the age categories used in the OPM and GAO reports did not allow for a comparison by protected age category (that is, age 40 and over vs. under age 40).

The academic literature on the gender pay gap by age in the U.S. general population is limited. A study using Current Population Survey (CPS) data from 2011, 2012, 2017, and 2018 found that, among workers under age 25, men were paid approximately 3 percent more than women (Meara et al, 2020). However, among workers age 25 and older, the pay gap was approximately 12 percent (Meara et al., 2020). That study did not group workers in older age levels.

Another study combined 2000 Decennial Census data and 1995 through 2008 Longitudinal Employer Household Dynamics (LEHD) data to examine workers age 25 to 45 (Barth et al., 2021). Within that age group, the study compared gender pay gaps by age, education, marital status, and occupational group (Barth et al., 2021). In most subgroups, the gender pay gap increased with age until around age 35 or 40 (Barth et al., 2021). The widening of the gender pay gap with age was most notable among married, college-educated workers (Barth et al., 2021).

A 2016 U.S.-based article from Glassdoor found that, in the United States, workers age 18 to 24 had the smallest gender pay gap at 2.2 percent, after adjusting for differences between workers, jobs, and employers (Chamberlain, 2016). In other words, men age 18 to 24 earned about 2.2 percent more than women of the same age. By comparison, workers age 25 to 34 had a gender pay gap of 3.3 percent, while older workers age 55 to 64 had a gender pay gap of 10.5 percent—nearly twice the U.S. average (Chamberlain, 2016).

The EEOC also examined international research on age and the gender pay gap. Using data from over a million employees in Germany, Schrenker and Zucco (2020) found that the gender pay gap increased with age—tripling from 9 to 28 percent between the ages of 30 and 50 (Schrenker & Zucco, 2020). This increase correlated with changes in employment behavior. With age, men increased their hours worked but women decreased theirs, with a third of German women working part-time by the age of 34 (Schrenker & Zucco, 2020). The study noted that women with children were more likely to become part-time workers. Among full-time workers age 25 to 40 with no children, both women and men earned similar pay (Schrenker & Zucco, 2020).

A 2022 study conducted in Australia also found that the gender pay gap increased with age (Workplace Gender Equality Agency, 2022). For employees under age 24, men made 2.5 percent more than women—and that rate increased with age, with men making over 30 percent more than women among employees age 45 to 64 (Workplace Gender Equality Agency, 2022).

While this report does not include data on parenthood, it is a key factor to consider when examining gender pay gaps by age. Kochhar (2023) found that women age 25 to 44 with children were less likely to participate in the labor force and, on average, worked fewer hours than those with no children, leading to lower overall earnings and a lower likelihood of promotion. In contrast, fathers age 25 to 54 earned more than both mothers of the same age and men of the same age without children (Kochhar, 2023). Additional research points to the impact of gendered social norms and preconceptions of mothers as less competent, capable, and committed than women without children (Glauber, 2018). Another study found that employed women were more likely to feel significant pressure to focus on at-home responsibilities compared to men, with that likelihood increasing for women with children (Aragão, 2023).

Further research is needed to understand how gender and age discrimination may together produce larger gender pay gaps for older women in the Federal workforce.

Data and Methodology

This report expands upon previous research by comparing the gender pay gap for Federal employees age 40 and over to those under age 40. This report addresses two questions about gender pay gaps in the Federal Government:

1. Does the gender pay gap differ for people under age 40 as compared to people age 40 and over?
2. How do factors associated with the gender pay gap differ for these age groups?

To answer these questions, EEOC researchers used status data from OPM's September 2021 Enterprise Human Resources Integration – Statistical Data Mart (EHRI).[5] The EHRI status data is a quarterly dataset of personnel employed in most Federal agencies.[6] There is one observation per Federal employee. EEOC researchers focused on the 2,079,576 full-time non-seasonal employees for whom the dataset provides complete data. The dataset was then divided into two groups: employees under age 40 and employees age 40 and over.

EEOC researchers used regression and decomposition analyses to measure the gender pay gap and employee characteristics associated with it. See Appendix C for more information on how the EEOC conducted these statistical analyses.

The analyses examined the following employee characteristics:

1. Annual salary
2. Gender
3. Other demographic characteristics (veteran status, disability, race, ethnicity)

[5] The EEOC collects limited pay data from Federal agencies in its Federal Agency Annual Equal Employment Opportunity Program Status Reports (MD-715 Reports). That agency-level data by race, ethnicity, and gender is collected in $10,000 pay bands. It does not include age data. Therefore, the EEOC chose to use the more detailed EHRI data in this report. The EHRI collects data at the employee level, including gender, age, salary to the dollar amount, veteran status, disability status, race, ethnicity, education, Federal work experience, geography, agency, and occupation.

[6] EHRI data come from human resources data found in Official Personnel Folders (OPFs) that most Executive Branch agencies must report to OPM for Governmentwide reporting purposes. The applicability of regulations related to OPFs are in 5 CFR § 293.301. OPM's (2021) Guide to Human Resources Reporting describes the coverage of this data, including the agencies and types of Federal civilian employees for whom data is not reported. Notable coverage exceptions include intelligence agencies, the U.S. Postal Service, and the Tennessee Valley Authority.

4. Human capital (age within age group,[7] educational attainment, Federal work experience)[8]
5. Geographic region in seven categories: (1) Washington, D.C., Maryland, and Virginia; (2) the remainder of the South Census Region; (3) the Northeast Census Region; (4) the Midwest Census Region; (5) the West Census Region; (6) U.S. territories; and (7) foreign countries.
6. Agency
7. Occupation

See Appendix D for additional information on data definitions.

Results

Overall, the results of the EEOC's analysis show that the gender pay gap is larger among Federal employees age 40 and over. The following sections detail the results from the descriptive statistics, regression, and decomposition.

Descriptive Statistics: Gender Differences Within Age Groups

In FY 2021, the Federal Government employed older workers at over twice the rate as younger workers. Figure 1 shows that employees under age 40 accounted for 30.9 percent of the Federal workforce, compared to 69.1 percent for those age 40 and over (see also Table 1 in Appendix A). Within the two age groups, EEOC researchers did not find a significant age difference between men and women.[9] The average age for both men and women under age 40 was 32.7 years old. For those age 40 and over, the average age for men was 52.7 years and for women 52.4 years (Table 2 in Appendix A).

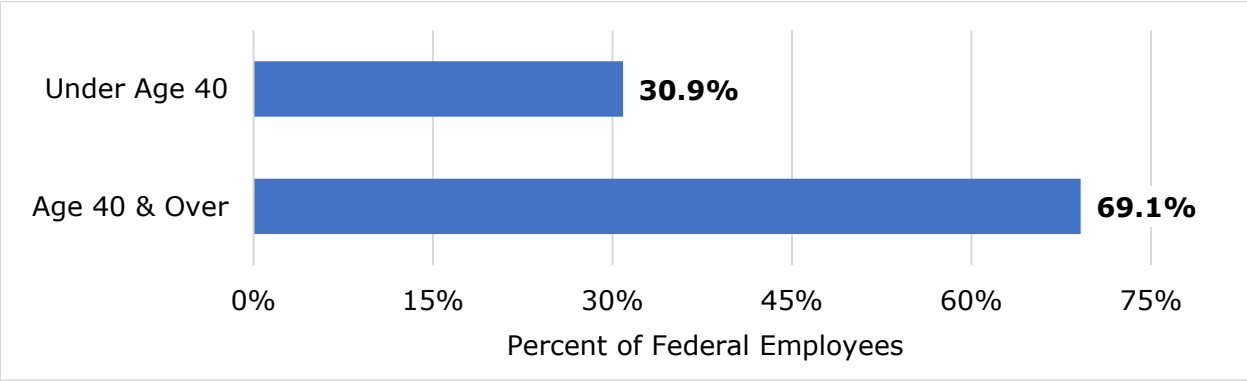
Gender distributions within both age groups were also similar. Among employees under age 40, 56.3 percent were men and 43.7 percent were women. Among those age 40 and over, 56.7 percent were men and 43.3 percent were women.

[7] In the absence of data on overall work experience, previous researchers have used age as a proxy for overall work experience (GAO, 2009, 2020; Smith-Doerr et al., 2019).

[8] In addition, the regression and decomposition models included data on age-squared and work experience-squared to account for decreasing rewards for additional years of age or additional years of experience. For examples of previous research doing this, see Chamberlain (2016) and Bolitzer and Godtland (2012).

[9] All descriptive statistic differences between genders were statistically significant in part due to the large dataset. Statistical significance refers to findings that are not due to random variability or chance (Smith, 2023). This report focuses on numerical differences rather than statistical significance.

Figure 1. Age Group Distributions Governmentwide, September 2021

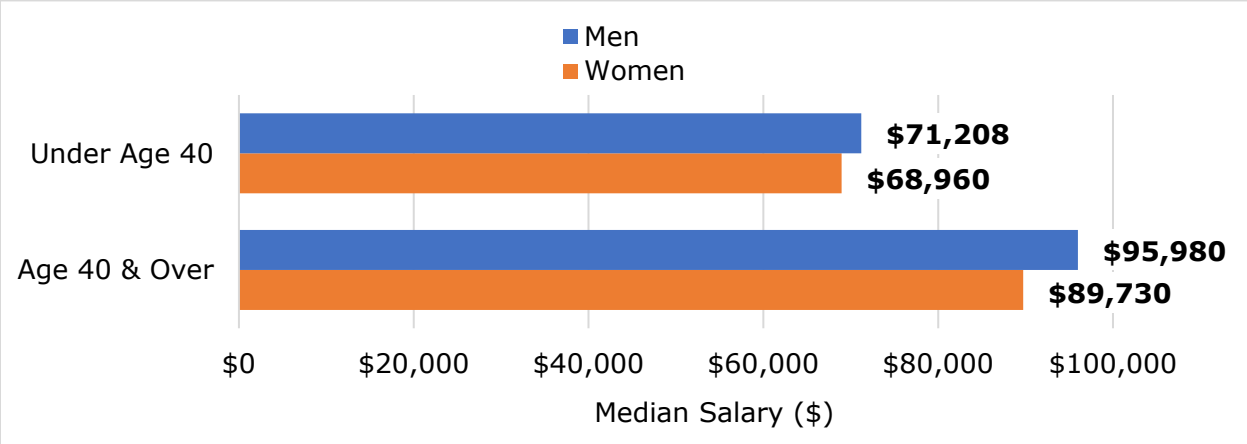


Note: Data only include full-time, non-seasonal employees.

Source: U.S. Equal Employment Opportunity Commission calculations using data from the U.S. Office of Personnel Management's September 2021 Enterprise Human Resources Integration – Statistical Data Mart.

Figure 2 and Table 2 in Appendix A show median[10] salary data by gender and age group. Based on median salary without accounting for other explanatory factors, the gender pay gap of employees age 40 and over ($6,250) was about three times larger than that of employees under age 40 ($2,248)—with men making more than women in both age groups. Later in this report, regression and decomposition analyses provide further information on the gender pay gaps within age groups.

Figure 2. Median Salary of Federal Employees by Gender and Age Group, September 2021



Note: Data only include full-time, non-seasonal employees. The median is the middle value of a set of numbers ordered from lowest to highest (Purdue University, 2022).

Source: U.S. Equal Employment Opportunity Commission calculations using data from the U.S. Office of Personnel Management's September 2021 Enterprise Human Resources Integration – Statistical Data Mart.

[10] The median is the middle value of a set of numbers ordered from lowest to highest (Purdue University, 2022). The median was used instead of the mean (average) because the median better accounts for outliers (extremely low and high earners) and thus provides a more accurate measure of centrality.

Some individual characteristics—most notably, veteran status, having a high school diploma, and having a master's degree—may affect pay but vary by gender within age groups. Men were more likely to be veterans in both age groups, but this pattern was more pronounced in the older age group. Among employees age 40 and over, 48.4 percent of men were veterans, compared to 15.6 percent of women. Among employees under age 40, 25.7 percent of men were veterans, compared to 10.7 percent of women (Table 3 in Appendix A).

Table 4 in Appendix A breaks down the data by education level. Among employees under age 40, 34.7 percent of men and 22.2 percent of women had a high school diploma as their highest level of education. In contrast, among employees age 40 and over, 26.2 percent of men and 21.2 percent of women had a high school diploma as their highest level of education. Although in both age groups men were more likely to have only a high school diploma, this pattern was more pronounced in the younger age group.

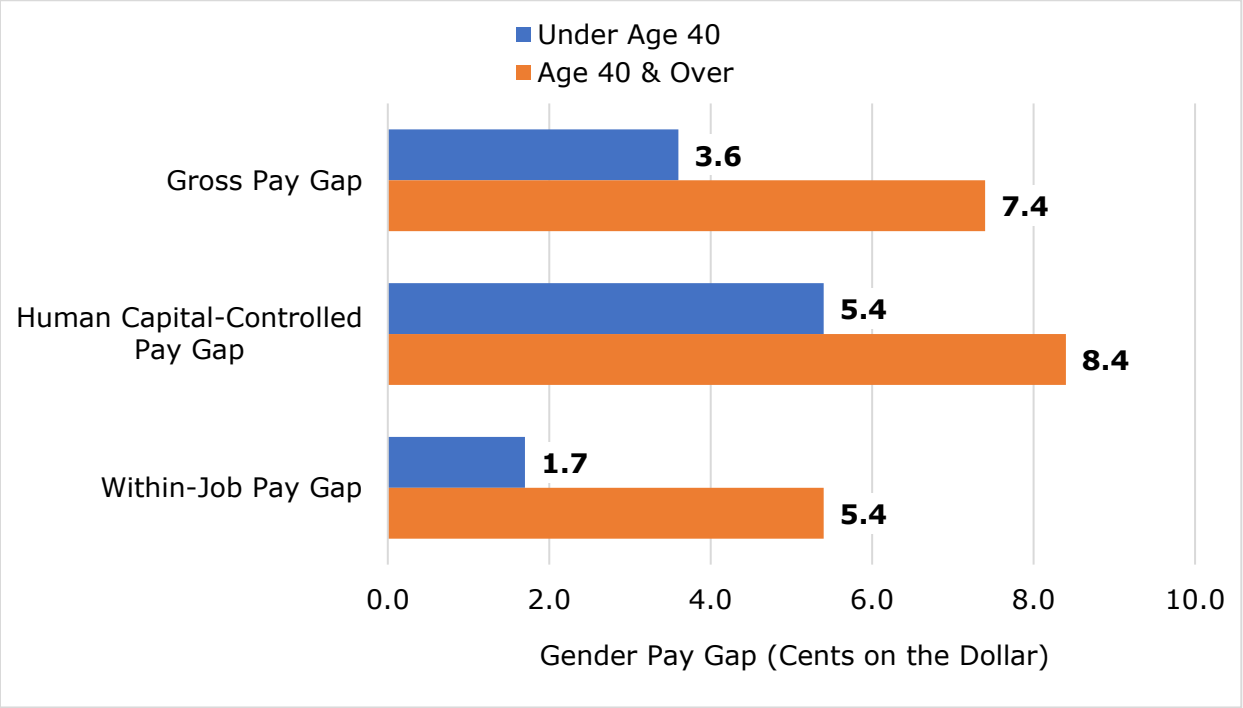
Women were more likely to have a master's degree as their highest level of education in both age groups. Among employees under age 40, 11.4 percent of men and 18.1 percent of women had a master's degree as their highest level of education. In contrast, among employees age 40 and over, 18.2 percent of men and 19.4 percent of women had a master's degree as their highest level of education.

Appendix A shows the full descriptive statistics. The regression and decomposition results below more closely examine additional factors that may explain gender pay gaps and differences in gender pay gaps by age group.

Regression Results: Pay Gaps by Age Group Accounting for Other Factors

The regression analysis accounts for various factors that may influence the gender pay gap. Figure 3 shows that older age had a statistically significant impact on the gender pay gap, even when this was measured in different ways.

Figure 3. Gender Pay Gaps by Age Group, September 2021



Note: Data only include full-time, non-seasonal employees. The gross pay gap is the percent difference between men's pay and women's pay, not accounting for other factors. The human capital-controlled pay gap is the percent difference between men's pay and women's pay accounting for personal characteristics (race/ethnicity, veteran status, and disability status) and human capital (education, age, age-squared, Federal work experience, and Federal work experience-squared). The within-job pay gap is the percent difference between men's pay and women's pay accounting for personal characteristics, human capital, geographic region, agency, and occupation. All gender pay gaps were statistically significant favoring men. This means the results are not due to random variability or chance (Smith, 2023).

Source: U.S. Equal Employment Opportunity Commission calculations using data from the U.S. Office of Personnel Management's September 2021 Enterprise Human Resources Integration – Statistical Data Mart.

Gross Gender Pay Gaps

The top set of bars in Figure 3 shows the gross pay gaps—how much less women were paid than men, not accounting for other factors. In the Federal sector, women age 40 and over were paid 7.4 cents on the dollar less than men in the same age group. This equates to the average woman age 40 and over being paid approximately $6,927 less annually than the average man age 40 and over.

The gender pay gap among older employees was more than double the gender pay gap among younger employees. Women under age 40 were paid 3.6 cents on the

dollar less than men in the same age group.[11] This equates to the average woman under age 40 being paid approximately $2,608 less annually than their male counterparts.

Human Capital-Controlled Gender Pay Gaps

The second set of bars in Figure 3 shows gender pay gaps between men and women with the same personal characteristics (race/ethnicity, veteran status, and disability status) and human capital (education, age, and years of Federal work experience). For both age groups, the human capital-controlled gender pay gap was larger than the gross pay gap. One explanation is that women had attributes (personal characteristics or human capital) that generally would result in more pay—but, in practice, men with the same attributes were paid more. Therefore, after controlling for the differences in personal characteristics and human capital, the measured gender pay gap increased.

Among the older group, the human capital-controlled pay gap was 8.4 cents on the dollar. This equates to the average woman over age 40 being paid approximately $8,228 less annually than their male counterparts. Among the younger group, the human capital-controlled pay gap was 5.4 cents on the dollar. This equates to the average woman under age 40 being paid about $4,154 less annually than their male counterparts.

The difference between the two age groups was smaller in the human capital-controlled pay gap than in the gross pay gap. Decomposition analyses later in this report explore possible reasons why the gender pay gap narrowed between the two age groups after accounting for personal characteristics and human capital.

Within-Job Gender Pay Gaps

Finally, the third set of bars in Figure 3 shows the within-job gender pay gaps—which not only account for personal characteristics and human capital, but also employees' geographic region, agency, and occupation. The within-job gender pay gap is sometimes referred to as the "unexplained gender pay gap," the part of the gender pay gap that cannot be explained by the measured factors in the regression. Although the unexplained pay gap is likely due in part to discrimination, it cannot be directly interpreted as discrimination because there are other unmeasured factors that could explain part of this pay gap.

The within-job gender pay gap among the older group (5.4 cents on the dollar) was more than triple that of the younger group (1.7 cents on the dollar). This equates to the average woman over age 40 being paid approximately $5,230 less than their

[11] These amounts differ from the amounts reported in the Descriptive Statistics section because the pay gap in that section was based on median pay and the regression results accounted for the skewed distribution of pay by analyzing the natural logarithm of salary.

male counterparts annually, compared to the average woman under age 40 being paid $1,248 less.

For example, take an average woman under age 40 with a bachelor's degree working in Washington, D.C., Maryland, or Virginia at a large Federal agency (U.S. Department of Veterans Affairs) in the most common occupational series (Miscellaneous Administration and Program series). This woman would be paid $84,074 annually, while a comparable man would be paid $85,510. If the woman was age 40 and over, she would be paid $106,988, while a comparable man age 40 and over would be paid $113,155.

Cumulative disadvantage may help explain why the older age group had larger gender pay gaps. A cumulative disadvantage occurs when an initial advantage or disadvantage—for example, a relatively small pay gap at younger ages—leads to larger differences over time.

For both age groups, the within-job gender pay gap was smaller than the gross pay gap and the human capital-controlled pay gap. This suggests that that the within-job gender pay gap accounts for at least one additional factor (region, agency, and/or occupation) that is strongly associated with the variation in the gender pay gap. In other words, this result suggests that men were more likely to work in better paying geographic regions, agencies, and/or occupations. This would match previous research on the Federal sector that found that differences in occupation and agency were key factors in explaining the gender pay gap (Bolitzer & Godtland, 2012; OPM, 2014; Smith-Doerr et al., 2019; Brummond, 2022).

Summary

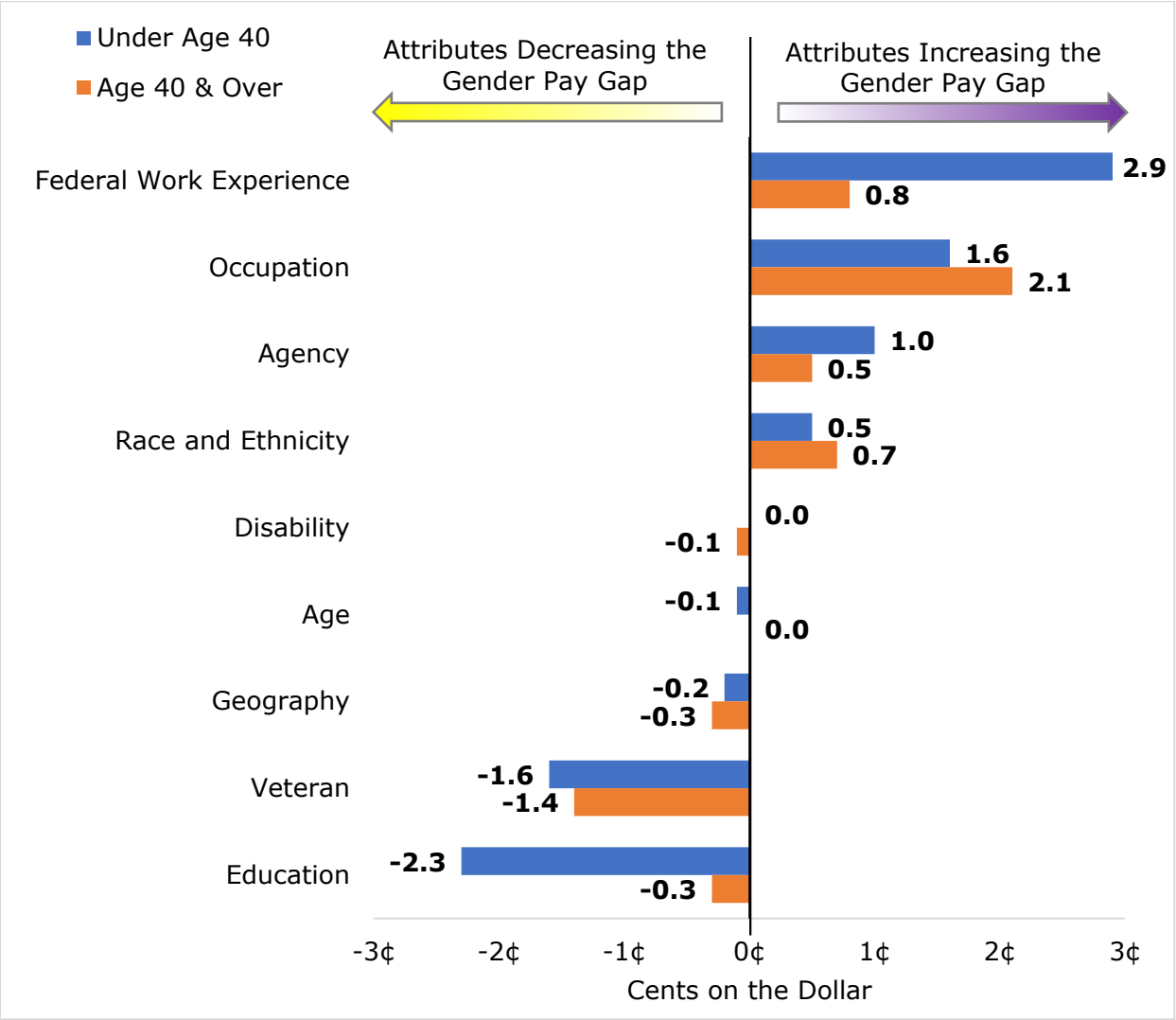
To summarize, this regression analysis shows that:

- Gender pay gaps exist among Federal employees (both under age 40 and age 40 and over), as measured in three different ways.
- For both age groups, the human capital-controlled pay gaps were the largest gaps, while the within-job pay gaps were the smallest gaps.
- Across all three measurements, employees age 40 and over had larger gender pay gaps than their younger counterparts.

Decomposition Part 1: Attributes Explaining the Gender Pay Gap

Decomposition helps explain how different employee attributes contribute to the gender pay gap by age group. Figure 4 and Table 8 in Appendix B show that some gender differences in attributes were associated with an increase in the gender pay gap, while others were associated with a decrease. Usually, the gender differences in attributes affected the gender pay gap in the same direction for both age groups, but not necessarily with the same magnitude.

Figure 4. Attributes Explaining the Gender Pay Gap by Age Group, September 2021



Note: Data only include full-time, non-seasonal employees. Positive values indicate that gender differences in having these attributes were associated with larger gender pay gaps favoring men. Negative values indicate that gender differences in having these attributes were associated with smaller gender pay gaps favoring men. All results displayed were statistically significant. Statistical significance refers to findings that are not due to random variability or attributed to random chance (Smith, 2023).

Source: U.S. Equal Employment Opportunity Commission calculations using data from the U.S. Office of Personnel Management's September 2021 Enterprise Human Resources Integration – Statistical Data Mart.

Attributes Increasing the Pay Gap

The decomposition results show that years of Federal work experience was the attribute contributing the most to the gender pay gap for younger workers. Assuming no gender differences in the rewards for additional years of experience, the decomposition results show that Federal work experience contributed 2.9 cents on the dollar ($2,105 annually on average) to the gender pay gap in the younger

age group, compared to 0.8 cents on the dollar ($743 annually) in the older age group. Pay in the Federal Government generally increases with experience. Table 2 in Appendix A shows that the average man under age 40 had 6.7 years of Federal work experience, whereas their female counterparts had an average of 5.6 years of experience. This difference was smaller among older employees, with men age 40 and over having an average of 16.6 years of experience and women age 40 and over having 16.4 years of experience.

Another important factor was occupation. Certain occupations pay more than others, and men may be more highly represented in these occupations. Differences in occupation added 1.6 cents on the dollar ($1,153 annually) to the gender pay gap for younger workers and 2.1 cents on the dollar ($2,005 annually) for older workers. Although the analyses did not produce results on specific occupations, this finding indicates that gender differences in occupation that affected pay and disadvantaged women were more prevalent among workers age 40 and over.

Different Federal agencies use different pay scales to compensate their employees. If gender distributions differ by agency, this could affect the gender pay gap. The decomposition results show that differences in agency contributed 1.0 cents on the dollar ($742 annually) to the pay gap of women under age 40, compared to 0.5 cents on the dollar ($461 annually) to the pay gap of women over age 40.

Racial and ethnic differences were also associated with pay differences. Men were more likely to belong to more highly paid racial and ethnic groups, explaining 0.5 cents on the dollar ($369 annually) of the gender pay gap in the under age 40 group and 0.7 cents on the dollar ($636 annually) gap in the age 40 and over group.

Attributes Decreasing the Pay Gap

Some gender differences in attributes decreased the gender pay gap. Educational attainment contributed the most, decreasing the pay gap by 2.3 cents on the dollar ($1,665 annually) for younger women and 0.3 cents on the dollar ($246 annually) for older women. Employees with greater educational attainment tend to be paid more. In both age groups, men were more likely to have no more than a high school diploma, while women were more likely to have a master's, professional, or doctoral degree. These educational differences by gender were more pronounced in the younger age group, which explains why this group saw a greater decrease in the pay gap due to educational attainment.

Veteran status was another important attribute that decreased the gender pay gap. Veteran status decreased the gender pay gap by 1.6 cents on the dollar ($1,157 annually) for younger women and 1.4 cents on the dollar ($1,314 annually) for older women. On the whole, veterans were paid slightly less than non-veterans, and women were less likely to be veterans than men.

Although all attributes measured in Figure 4 showed significant results, a few attributes had smaller contributions. Geography, age, and disability status helped slightly decrease the gender pay pap in both age groups.

Summary

In short, the decomposition analysis found that:

- In the younger age group, Federal work experience (2.9 cents on the dollar or $2,105 annually) was the most influential attribute increasing the gender pay gap, followed by occupation (1.6 cents on the dollar or $1,153 annually).
- In the older age group, occupation (2.1 cents on the dollar or $2,005 annually) was the most influential attribute increasing the gender pay gap, followed by Federal work experience (0.8 cents on the dollar or $743 annually).
- In the younger age group, education (2.3 cents on the dollar or a $1,665 annual reduction) was the most influential attribute decreasing the gender pay gap, followed by veteran status (1.6 cents on the dollar or a $1,157 annual reduction).
- In the older age group, veteran status (1.4 cents on the dollar or a $1,314 annual reduction) was the most influential attribute decreasing the gender pay gap, followed by geographic region and education (0.3 cents on the dollar or about a $250 annual reduction each).

Decomposition Part 2: Unequal Rewards for the Same Attributes

Men and women may get rewarded (in this case, paid) in different ways for the same attributes. For example, an employer could pay employees more for additional years of work experience or greater educational attainment but do so unequally for men and women. Unequal rewards for the same attributes contribute to the gender pay gap.

Additional decomposition results (Table 9 in Appendix B) showed that within both age groups—out of all the attributes examined—age rewarded older men, in particular. Within the under age 40 group, on average, 3.4 cents on the dollar ($2,420 annually) of the gender pay gap were due to men receiving greater rewards for age than women. In the age 40 and over group, the effect more than tripled—with 11.2 cents on the dollar ($10,534 annually) of the gender pay gap being due to men receiving greater rewards for age than women.

This finding shows that pay inequality exists at the intersection of age and gender in the Federal workforce, affecting older workers more than younger workers. This offers evidence for cumulative disadvantage, where an initial advantage or disadvantage (such as a small pay gap at younger ages) leads to larger differences over time.

For workers under age 40, no other attribute was associated with significantly greater rewards for men. For workers age 40 and over, inequality in rewards for occupation contributed 1.7 cents on the dollar ($1,572 annually) to the gender pay gap. This suggests that older women in higher paying occupations were not getting higher pay to the same degree as men in those same occupations. In a similar manner, it suggests that, in lower paying occupations, women were also paid less than men in the same occupations.

In addition, for older workers, inequality in rewards for education contributed 0.5 cents on the dollar ($466 annually) to the gender pay gap. This means that having greater educational attainment did not pay off as much for women as for men.

Attributes With Greater Rewards for Women

Some attributes offered greater rewards for women than men. For the younger age group, women were rewarded significantly more than men (or penalized less than men) for:

- The geographic region of their workplaces (1.0 cent on the dollar or a $711 annual reduction in the gender pay gap)
- Their race and ethnicity (0.9 cents on the dollar or $634 annually)
- Their Federal work experience (0.2 cents on the dollar or $157 annually)
- Their disability status (0.2 cents on the dollar or $176 annually).[12]

For the older age group, women were rewarded significantly more than men (or penalized less than men) for their Federal work experience (2.2 cents on the dollar or a $2,018 annual reduction in the gender pay gap) and race and ethnicity (0.4 cents on the dollar or $391 annually).

Summary

In short,

- In both age groups, age was the attribute with rewards that most favored men over women. This increased the gender pay gap by 3.4 cents on the dollar ($2,420 annually) for those under age 40 and 11.2 cents on the dollar ($10,534 annually) for those age 40 and over.

[12] For categorical variables with more than one category, like region and race and ethnicity, the decomposition analysis tells only how the variable as a whole—not its specific categories—contributed to the gender pay gap. Therefore, the effects of these variables are not analyzed in depth here. However, the significant results indicate that it was important to include these variables in the statistical analysis. Additional research on pay equity at the intersection of gender and region and at the intersection of gender, race, and ethnicity is warranted, but outside the scope of this report.

- In the older age group, rewards to occupation (1.7 cents on the dollar or $1,572 annually) and education (0.5 cents on the dollar or $466 annually) were also significantly associated with a larger gender pay gap.
- In the younger age group, rewards to workplace geographic region (1.0 cent on the dollar or $711 annually) and race and ethnicity (0.9 cents on the dollar or $634 annually) were most associated with a smaller gender pay gap.
- In the older age group, rewards to only Federal work experience (2.2 cents on the dollar or $2,018 annually) and race and ethnicity (0.4 cents on the dollar or $391 annually) were significantly associated with a smaller gender pay gap.

Recommendations

This report examined the impact of age on the gender pay gap in the Federal sector. The report used data on more than two million employees and accounted for the diversity of Federal employees, even within age groups. It controlled for individual-level and organization-level measures including Federal work experience, occupation, agency, education, race and ethnicity, and importantly, age within age group. These analyses support the recommendations that follow.

This report measured the gender pay gap in three different ways for Federal employees under age 40 and those age 40 and over. Regression analyses showed that not only do gender pay gaps persist in the Federal Government, but that the intersection of age and gender magnifies the gender pay gap—with older women experiencing a greater disadvantage. This disadvantage was more pronounced after accounting for differences in occupation, workplace geography, and agency. Decomposition analyses found that gender differences in occupation and agency contributed to the gender pay gap. Therefore, the EEOC recommends that:

- Federal agencies make efforts to identify and address barriers creating gender differences in occupation, particularly among workers age 40 and over, to ensure that hiring officials do not sort women into lower paying occupations.
- Governmentwide initiatives to eliminate gender pay inequities should focus on the agencies with the largest gender pay gaps.

Decomposition of the unexplained component of the gender pay gap showed that, in both age groups, age was the attribute for which rewards most favored men over women—increasing the gender pay gap. This provides further evidence of inequality at the intersection of age and gender. Therefore, the EEOC recommends that:

- Additional research should be conducted to identify the personnel practices most associated with gender differences in pay across age groups.

Finally, within the older age group, rewards to occupation and education were significantly associated with a larger gender pay gap. Of the independent variables examined in this report, men and women in the older age group differed most by their occupations. This magnifies the unequal effect of rewards to occupation. Identifying occupations requiring similar skills but with different pay and different gender and age distributions may provide opportunities for addressing barriers and focused recruitment and outreach efforts. Therefore, the EEOC recommends that:

- Additional research should be conducted to identify occupations with the largest pay gaps and occupations that may benefit from focused efforts to address barriers.

Conclusion

This report examined the gender pay gap separately for Federal employees under age 40 and those age 40 and over. Previous research had examined the gender pay gap in the Federal sector without a focus on age or examined pay inequity with consideration for the intersection of age and gender but in the general population. This report used a large dataset to identify factors contributing to the gender pay gap in the Federal sector and how those factors differed by age group.

This report found that gender pay gaps in the Federal sector differed by age group. Even within these age groups, men and women were rewarded differently based on age. In addition, for older workers, rewards to occupation and education were significantly associated with a larger gender pay gap. Based on these findings, the EEOC recommended that initiatives designed to reduce the gender pay gap should focus on age and occupational differences. Moreover, this report noted potential paths for future research.

Research has often shown that employment inequities are more severe for certain groups who have multiple, intersecting characteristics. The results of this report can help EEO practitioners to better focus their efforts to address barriers. The EEOC will continue to collaborate with and support stakeholders as they strive to achieve greater equal employment opportunity.

References

Allison, P.D. (1999). *Multiple regression: A primer*. Pine Forge Press.

Aragão, C. (2023). Gender pay gap in U.S. hasn't changed much in two decades. In *Pew Research Center*. Pew Research Center. Retrieved June 9, 2023 from https://www.pewresearch.org/short-reads/2023/03/01/gender-pay-gap-facts/#:~:text=The%20gender%20gap%20in%20pay,%2D%20and%20part%2Dtime%20workers

Barth, E., Kerr, S.P., & Olivetti, C. (2021). The dynamics of gender earnings differentials: Evidence from establishment data. *European Economic Review, 134*. https://doi.org/10.1016/j.euroecorev.2021.103713

Bolitzer, B., & Godtland, E. M. (2012). Understanding the gender–pay gap in the federal workforce over the past 20 years. *The American Review of Public Administration*, *42*(6), 730-746.

Bradley, A. (2020, July 17). *Bostock v. Clayton County: An Unexpected Victory*. Marquette University Law School Faculty Blog; Marquette University Law School. Retrieved September 21, 2023 from https://law.marquette.edu/facultyblog/2020/07/bostock-v-clayton-county-an-unexpected-victory/

Brummond, K.M. (2022). Organizational variation in Federal agencies' gender pay gaps. *Doctoral Dissertations*, 2503. https://doi.org/10.7275/28479863

Chamberlain, A. (2016). Demystifying the gender pay gap: Evidence from Glassdoor salary data. In *Class Law Group*. Glassdoor. Retrieved June 9, 2023 from https://www.classlawgroup.com/wp-content/uploads/2016/11/glassdoor-gender-pay-gap-study.pdf

Coleman, A., Dupont, R., & Rivera, N. (2021, November). *In Pursuit of Pay Equity: Examining Barriers to Equal Pay, Intersectional Discrimination Theory, and Recent Pay Equity Initiatives*. U.S. Equal Employment Opportunity Commission. Retrieved June 9, 2023 from https://www.eeoc.gov/pursuit-pay-equity-examining-barriers-equal-pay-intersectional-discrimination-theory-and-recent-pay

Glauber, R. (2018). Trends in the motherhood wage penalty and fatherhood wage premium for low, middle, and high earners. *Demography*, *55*(5), 1663–1680. https://doi.org/10.1007/s13524-018-0712-5

Jann, B. (2008). The Blinder-Oaxaca decomposition for linear regression models. *The Stata Journal, 8*, 453-479. https://doi.org/10.1177/1536867X0800800401

Kochhar, R. (2023). The enduring grip of the gender pay gap. *Pew Research Center*. Retrieved June 9, 2023 from https://www.pewresearch.org/social-trends/2023/03/01/the-enduring-grip-of-the-gender-pay-gap/

Kim, C. (2019, January 22). *Week 6. Oaxaca-Blinder Decomposition*. [Course Weekly Summary]. University of Kansas. Retrieved September 19, 2023 from http://people.ku.edu/~chkim/soc910/note/Soc910_Note_05_Decompose.pdf

Meara, K., Pastore, F., & Webster, A. (2020). The gender pay gap in the USA: A matching study. *Journal of Population Economics, 33*, 271-305. https://doi.org/10.1007/s00148-019-00743-8.

Purdue University. (2022). *Descriptive Statistics*. Purdue Online Writing Lab; Purdue University. Retrieved September 18, 2023 from https://owl.purdue.edu/owl/research_and_citation/using_research/writing_with_statistics/descriptive_statistics.html

Schrenker, A., & Zucco, A. (2020). The gender pay gap begins to increase sharply at age of 30. *DIW Weekly Report*, *10*(10), 75–82. ECONSTOR. https://www.econstor.eu/bitstream/10419/220007/1/1692667602.pdf

Smith, J. (2023). *Science sleuths: The science that shapes diagnostic tests: What does "statistically significant" actually mean?* Ag Equine Programs; University of Kentucky. Retrieved September 18, 2023 from https://equine.ca.uky.edu/content/what-does-%E2%80%98statistically-significant%E2%80%99-actually-mean

Smith-Doerr, L., Alegria, S., Husbands Fealing, K., Fitzpatrick, D., & Tomaskovic-Devey, D. (2019). Gender pay gaps in US federal science agencies: An organizational approach. *American Journal of Sociology*, 125(2), 534-576. https://www.journals.uchicago.edu/doi/abs/10.1086/705514.

Treiman, D.J. (2009). *Quantitative data analysis: Doing social research to test ideas*. John Wiley & Sons, Inc.

University of Minnesota School of Public Health. (2004). Section 4. What is a logarithm? *Math Review: Useful Math for Everyone*. Retrieved September 23, 2016 from http://www.mclph.umn.edu/mathrefresh/logs2.html.

U.S. Census Bureau. (2021). *Geographic Levels*. U.S. Census Bureau. Retrieved July 17, 2023 from https://www.census.gov/programs-surveys/economic-census/guidance-geographies/levels.html#par_textimage_34

U.S. Equal Employment Opportunity Commission. (2022). *Special Topics Annual Report Fiscal Year 2017: The State of Federal Sector Age Discrimination*. Retrieved June 9, 2023 from https://www.eeoc.gov/federal-sector/reports/special-topics-annual-report-state-federal-sector-age-discrimination#_Toc32412432

U.S. Government Accountability Office. (2009). *Gender Pay Gap in the Federal Workforce Narrows as Differences in Occupation, Education, and Experience Diminish*. https://www.gao.gov/assets/gao-09-279.pdf

U.S. Government Accountability Office. (2020). *Gender Pay Differences: The Pay Gap for Federal Workers Has Continued to Narrow, but Better Quality Data on Promotions Are Needed*. https://www.gao.gov/assets/gao-21-67.pdf

U.S. Office of Personnel Management. (n.d.). *Data, Analysis & Documentation: Data Standards*. Retrieved September 22, 2023 from https://dw.opm.gov/datastandards/list

U.S. Office of Personnel Management. (2014). *Governmentwide Strategy on Advancing Pay Equality in the Federal Government*. https://www.opm.gov/policy-data-oversight/pay-leave/reference-materials/reports/governmentwide-strategy-on-advancing-pay-equality-in-the-federal-government.pdf

U.S. Office of Personnel Management. (2018). *Handbook of Occupational Groups and Families*. Retrieved September 22, 2023 from https://www.opm.gov/policy-data-oversight/classification-qualifications/classifying-general-schedule-positions/occupationalhandbook.pdf

U.S. Office of Personnel Management. (2021). *Enterprise Human Resources Integration: Guide to Human Resources Reporting, Update 4-4*. https://www.opm.gov/policy-data-oversight/data-analysis-documentation/data-policy-guidance/hr-reporting/ghrr4-4.pdf

Workplace Gender Equality Agency. (2022, June 27). *Wages and Ages: Mapping the Gender Pay Gap by Age*. Commonwealth Government of Australia. Retrieved June 9, 2023 from https://www.wgea.gov.au/publications/wages-and-ages#:~:text=employee%20age%20increased.-

Appendix A: Descriptive Statistics

Table 1. Federal Workforce Participation Rates by Gender and Age Group, September 2021

Gender	Under Age 40	Age 40 & Over	Total
Men	17.4%	39.2%	56.6%
Women	13.5%	29.9%	43.4%
Total	30.9%	69.1%	100.0%

Note: Data only include full-time, non-seasonal employees. Gender differences within age groups were statistically significant. This means that the results are not due to random variability or chance (Smith, 2023). Rounding may cause totals to not equal 100 percent.

Source: U.S. Equal Employment Opportunity Commission calculations using data from the U.S. Office of Personnel Management's September 2021 Enterprise Human Resources Integration – Statistical Data Mart.

Table 2. Salary, Age, and Federal Work Experience by Age Group, September 2021

Category	Men Under Age 40	Women Under Age 40	Gender Difference Within Under Age 40 Group	Men Age 40 & Over	Women Age 40 & Over	Gender Difference Within Age 40 & Over Group
Average Salary	$77,615	$75,743	$1,873	$102,290	$95,330	$6,960
Median Salary	$71,208	$68,960	$2,248	$95,980	$89,730	$6,250
Average Age	32.7	32.7	-0.1	52.7	52.4	0.3
Federal Work Experience (Average Years)	6.7	5.6	1.2	16.6	16.4	0.2

Note: Data only include full-time, non-seasonal employees. All gender differences within age groups were statistically significant. This means that the results are not due to random variability or chance (Smith, 2023). The median is the middle value in a set of numbers ordered from lowest to highest (Purdue University, 2022). The difference of the gender-specific values shown in this table may differ from the values in the gender difference within age group columns due to rounding.

Source: U.S. Equal Employment Opportunity Commission calculations using data from the U.S. Office of Personnel Management's September 2021 Enterprise Human Resources Integration – Statistical Data Mart.

Table 3. Veteran Status by Gender and Age Group, September 2021

Veteran Status	Men Under Age 40	Women Under Age 40	Men Age 40 & Over	Women Age 40 & Over
Veteran	25.7%	10.7%	48.4%	15.6%
Non-Veteran	74.3%	89.3%	51.6%	84.4%

Note: Data only include full-time, non-seasonal employees. Gender differences within age groups were statistically significant. This means that the results are not due to random variability or chance (Smith, 2023). Rounding may cause totals to not equal 100 percent.

Source: U.S. Equal Employment Opportunity Commission calculations using data from the U.S. Office of Personnel Management's September 2021 Enterprise Human Resources Integration – Statistical Data Mart.

Table 4. Educational Attainment by Gender and Age Group, September 2021

Educational Attainment	Men Under Age 40	Women Under Age 40	Men Age 40 & Over	Women Age 40 & Over
No High School Diploma	1.7%	2.5%	1.3%	2.6%
High School Diploma	34.7%	22.2%	26.2%	21.2%
Some College, No Bachelor's Degree	16.5%	17.2%	19.0%	22.2%
Bachelor's Degree	30.6%	31.5%	27.7%	26.8%
Master's Degree	11.4%	18.1%	18.2%	19.4%
Doctoral or Professional Degree	5.1%	8.6%	7.6%	7.8%

Note: Data only include full-time, non-seasonal employees. Gender differences within age groups were statistically significant. Statistical significance refers to findings that are not due to random variability or attributed to random chance (Smith, 2023). Rounding may cause totals to not equal 100 percent.

Source: U.S. Equal Employment Opportunity Commission calculations using data from the U.S. Office of Personnel Management's September 2021 Enterprise Human Resources Integration – Statistical Data Mart.

Table 5. Race and Ethnicity by Gender and Age Group, September 2021

Race/Ethnicity	Men Under Age 40	Women Under Age 40	Men Age 40 & Over	Women Age 40 & Over
Hispanic or Latino	11.5%	10.7%	9.3%	8.4%
White	67.2%	56.4%	66.4%	53.6%
Black or African American	10.5%	20.9%	14.8%	26.7%
Asian	6.1%	6.8%	6.1%	7.1%
Native Hawaiian or Other Pacific Islander	0.7%	0.6%	0.6%	0.5%
American Indian or Alaska Native	1.1%	1.7%	1.2%	2.1%
Two or More Races	2.9%	3.0%	1.6%	1.7%

Note: Data only include full-time, non-seasonal employees. Gender differences within age groups were statistically significant. This means the results are not due to random variability or chance (Smith, 2023). Rounding may cause totals to not equal 100 percent.

Source: U.S. Equal Employment Opportunity Commission calculations using data from the U.S. Office of Personnel Management's September 2021 Enterprise Human Resources Integration – Statistical Data Mart.

Table 6. Reported Disability Distributions by Gender and Age Group, September 2021

Category	Men Under Age 40	Women Under Age 40	Men Age 40 & Over	Women Age 40 & Over
No Reported Disability	85.5%	84.9%	81.0%	84.9%
Has Reported Disability	14.5%	15.1%	19.0%	15.1%

Note: Data only include full-time, non-seasonal employees. Gender differences within age groups were statistically significant. This means the results are not due to random variability or chance (Smith, 2023). Rounding may cause totals to not equal 100 percent.

Source: U.S. Equal Employment Opportunity Commission calculations using data from the U.S. Office of Personnel Management's September 2021 Enterprise Human Resources Integration – Statistical Data Mart.

Table 7. Geographic Distributions by Gender and Age Group, September 2021

Geographic Region	Men Under Age 40	Women Under Age 40	Men Age 40 & Over	Women Age 40 & Over
Washington, DC, Maryland, & Virginia	18.2%	21.4%	21.1%	23.2%
Northeast Region	13.1%	11.9%	10.1%	10.4%
Midwest Region	13.9%	15.1%	12.5%	14.2%
South Region	26.7%	27.5%	30.9%	31.1%
West Region	26.3%	22.0%	22.8%	19.4%
U.S. Territories	0.9%	0.9%	0.8%	0.7%
Foreign Countries & Other Locations	0.9%	1.2%	1.8%	1.0%

Note: Data only include full-time, non-seasonal employees. Gender differences within age groups were statistically significant. This means the results are not due to random variability or chance (Smith, 2023). Rounding may cause totals to not equal 100 percent.

Source: U.S. Equal Employment Opportunity Commission calculations using data from the U.S. Office of Personnel Management's September 2021 Enterprise Human Resources Integration – Statistical Data Mart.

Appendix B: Decomposition Results

Table 8. Attributes Explaining the Gender Pay Gap by Age Group (Cents on the Dollar), September 2021

Attributes	Under Age 40	Age 40 & Over
Federal Work Experience	2.9¢	0.8¢
Occupation	1.6¢	2.1¢
Agency	1.0¢	0.5¢
Race and Ethnicity	0.5¢	0.7¢
Disability	0.0¢	-0.1¢
Age	-0.1¢	0.0¢
Geographic Region	-0.2¢	-0.3¢
Veteran	-1.6¢	-1.4¢
Education	-2.3¢	-0.3¢

Note: Data only include full-time, non-seasonal employees. Positive values indicate that gender differences in having these attributes were associated with larger gender pay gaps favoring men. Negative values indicate that gender differences in having these attributes were associated with smaller gender pay gaps. All results were statistically significant, meaning that they are not due to random variability or chance (Smith, 2023).

Source: U.S. Equal Employment Opportunity Commission calculations using data from the U.S. Office of Personnel Management's September 2021 Enterprise Human Resources Integration – Statistical Data Mart.

Table 9. Differences in Rewards for Attributes by Gender and Age Group (Cents on the Dollar), September 2021

Rewards for Attributes	Under Age 40	Age 40 & Over
Age	3.4¢	11.2¢
Occupation	0.3¢ [X]	1.7¢
Agency	0.3¢ [X]	0.2¢ [X]
Education	0.0¢ [X]	0.5¢
Veteran	0.0¢ [X]	0.0¢ [X]
Disability	-0.2¢	0.0¢ [X]
Federal Work Experience	-0.2¢	-2.2¢
Race and Ethnicity	-0.9¢	-0.4¢
Geographic Region	-1.0¢	0.0¢ [X]

Note: Data only include full-time, non-seasonal employees. Positive values indicate that different rewards for having these attributes were associated with larger gender pay gaps favoring men. Negative values indicate that different rewards for having these attributes were associated with smaller gender pay gaps. The tick mark ([X]) indicates that the result was not statistically significant. All other values were statistically significant, meaning that they are not due to random variability or chance (Smith, 2023).

Source: U.S. Equal Employment Opportunity Commission calculations using data from the U.S. Office of Personnel Management's September 2021 Enterprise Human Resources Integration – Statistical Data Mart.

Appendix C: Regressions and Decomposition

Regressions

To measure gender pay gaps, the EEOC used multiple linear regression.[13] The EEOC used the natural logarithm of salary[14] as the dependent variable. Demographic characteristics (including gender), human capital measures, geography, agency, and occupation were the independent variables. The coefficients of the independent variables were exponentiated[15] so that the results could be reported in dollars.

EEOC researchers measured the gender pay gaps for each age group using the exponentiated coefficient of the gender variable. Researchers conducted additional z-tests to identify statistically significant age group differences in the gender pay gap.[16]

The analyses described above measured three types of gender pay gaps separately for the two age groups:

1. *Gross pay gap* – the percent difference between men's and women's pay not accounting for other factors.

[13] Regression is "a statistical method for studying the relationship between a single dependent [outcome] variable and one or more independent [explanatory] variables. … [T]he independent variables are regarded as causes of the dependent variable" (Allison, 1999, p. 1-2).

[14] Salary was right skewed because a relatively small number of employees had very high salaries compared to the mean (average) salary. With the methodology, skewed distributions produce inaccurate results. As is common in studies where pay is the dependent (outcome) variable, using the natural logarithm of salary corrects this issue. "A logarithm [or log] is the power to which a number must be raised in order to get some other number" (University of Minnesota School of Public Health, 2004).

[15] To exponentiate a result means to take *e*, a mathematical constant approximately equal to 2.71828, to the power of the result's coefficient. This is the inverse of the natural logarithm. Thus, exponentiating a value in logged form yields the originals units (in this case, dollars).

[16] In this case, a z-test determined whether the gender coefficient for the older age group differed from the gender coefficient for the younger age group in a statistically significant manner. Statistical significance refers to findings that are not due to random variability or chance (Smith, 2023). A z-test uses the coefficients and the standard errors of the coefficients to calculate a z-statistic. A standard error is a measure of statistical accuracy incorporating the variability in the results and the number of observations. Standard errors are smaller when there is less variability and more observations, increasing the probability of finding statistically significant differences. The calculated *z*-statistic corresponds to a probability (*p*-value) that the difference in coefficients is not due to chance. The formula for a z-test in this scenario is:

$$z = \frac{b_1 - b_2}{\sqrt{SE_{b_1}^2 + SE_{b_2}^2}}$$

where b_1 is the gender coefficient for the older group, b_2 is the gender coefficient for the younger group, $SE_{b_1}^2$ is the standard error of the gender coefficient for the older group squared, and $SE_{b_2}^2$ is the standard error of the gender coefficient for the younger group squared.

2. *Human capital-controlled pay gap* – the percent difference between men's and women's pay after accounting for personal characteristics and human capital.
3. *Within-job pay gap* – the percent difference between men's and women's pay after accounting for personal characteristics, human capital, geography, agency, and occupation.

Detailed Decomposition

Kitagawa-Blinder-Oaxaca[17] decomposition is a common statistical method for calculating the amount that independent variables explain average outcome differences, such as differences in pay between genders (Jann, 2008). EEOC researchers used decomposition to divide the gender pay gap into two parts:

1. That which is "explained" by observed gender differences in the independent variables.
2. An "unexplained" part that quantifies how much of the pay gap can be attributed to gender differences in rewards across the same characteristics measured by the independent variables (Jann, 2008; Kim 2019).

Although the unexplained pay gap is likely due in part to discrimination, it cannot be directly interpreted as discrimination because there are omitted variables that could explain part of this pay gap.

Detailed decomposition measures the contributions of independent variables or groups of independent variables towards the explained pay gap and the unexplained pay gap. This report uses detailed decomposition results to learn:

1. How much observed gender differences in specific independent variables explain the gender pay gap.
2. How much gender differences in rewards to the same characteristics contribute to the gender pay gap.
3. Whether the variables contributing to the explained and unexplained gender pay gaps differ by age group.

The Oaxaca command in Stata statistical software was used to complete this analysis using detailed pooled decomposition. For more information, see Jann (2008).

[17] Demographer Evelyn Kitagawa first introduced this methodology in 1955, but it is more commonly known as Blinder-Oaxaca decomposition after economists Ronald Oaxaca and Alan Blinder who wrote on the topic separately in 1973 (Treiman, 2009).

Appendix D: Data Definitions and Coding of Variables

For extensive information on data definitions, see OPM's Data Standards page at https://dw.opm.gov/datastandards/list.

Age

Age was calculated using month and year of birth. Subtraction from September 2021 (the date of the dataset) was used to calculate age in years.

In addition, the regression and decomposition analyses included age-squared as an independent variable. This is common in pay analyses. On average, pay increases with age, but it increases at a smaller rate as one gets older. Age and age-squared have a strong positive correlation, with age-squared always increasing with age. Such correlations between independent variables can change the statistical results.

Therefore, before calculating the age-squared variable, age within each age group was centered around the mean (average). First, the mean age within each age group was calculated. Then, the mean was subtracted from each individual's age. Finally, this mean-centered age was squared—yielding the age-squared variable used in the regression and decomposition analyses.

Agency

The dataset includes categories for parent agencies and, where applicable, their subcomponents. Parent agency categories were used, except for employees who worked at agencies with less than 1,000 employees. Employees working at agencies with 100 to 999 employees in the dataset were categorized as working at medium agencies. Employees working at agencies with less than 100 employees in the dataset were categorized as working at micro agencies. This resulted in a total of 42 agency categories.

Annual Salary

Annual salary comes from the variable adjusted basic pay in OPM's Enterprise Human Resources Integration – Statistical Data Mart. OPM (n.d.) defines annual salary as "the sum of an employee's rate of basic pay and any basic pay supplement (standard OR special), after applying any applicable pay cap."

A basic pay supplement is defined as "a regular, fixed supplemental payment (paid in conjunction with base pay) for non-overtime hours of work that is creditable as basic pay for retirement purposes, excluding any type of premium payment or differential that is triggered for working certain hours of the day or week or for being subjected to certain working conditions." In the dataset provided by OPM, this value is annualized (i.e., reported as the employee's annual salary should they work a full year).

As footnotes 11 and 14 explain, the regression and decomposition analyses used the natural logarithm of salary.

Disability

In the dataset, there were 86 potential categories for specific disabilities or disability statuses. Employees who reported "no handicap," "I do not have a disability or serious health condition," "handicap not identified," or "I do not wish to identify my disability status" were classified as having no reported disability. All other employees were classified as having a disability.

Gender

Gender was a binary variable, with responses given as either male (men) or female (women). The EEOC acknowledges that gender can be non-binary. However, the dataset did not allow for such an analysis.

Geographic Region

Workplace geographic region was coded into seven categories: (1) Washington D.C., Maryland, and Virginia; (2) the remainder of the South Census Region; (3) the Northeast Census Region; (4) the Midwest Census Region; (5) the West Census Region; (6) U.S. territories; and (7) foreign countries (U.S. Census Bureau, 2021).

Occupation

The original dataset had two main variables related to occupation: PATCOB (Professional, Administrative, Technical, Clerical, Other white collar, and Blue collar) occupational category and OPM occupational series.

There are six PATCOB occupational categories as named above. OPM's Data Standards webpage defines these categories (OPM, n.d.).

In the original dataset, there were 669 categories for OPM occupational series, given as a four-digit code. In addition, occupational series are part of larger occupational groups (for white-collar positions) and families (for blue collar positions) that can be distinguished using the first two digits of an occupational series' code. OPM's Handbook of Occupational Groups and Families defines the occupational series, groups, and families (OPM, 2018).

Some occupational series are very large (over 100,000 employees), while others are very small (as few as one employee). The EEOC's research team wanted to define occupations in a manner that would not allow any group to be so large that distinctions within the occupation would be overlooked, or so small that no variation would be found. To do this, the research team performed the following steps:

1. Since the clerical PATCOB category is relatively small, they combined clerical with other white collar, creating a classification they called PATOB.

2. They created a new variable containing two-digit occupational groups and families.
3. For occupational groups and families with more than 100,000 employees, they combined the two-digit occupational groups and families with the PATOB to get more specific occupations.
4. For occupations that still had over 100,000 employees, they defined the occupation with a combination of the four-digit occupational series and PATOB.
5. They combined all two-digit blue collar occupational families with fewer than 1,000 employees into an "other blue-collar" category.

This resulted in an occupational variable with 82 categories, ranging in size from 327 to 98,499 employees.

Race/Ethnicity

There were seven categories for race and ethnicity: Hispanic or Latino (regardless of race), White, Black or African American, Asian, Native Hawaiian or other Pacific Islander, American Indian or Alaska Native, and people of two or more races. All people in categories outside of the Hispanic or Latino (regardless of race) category were non-Hispanic.

Veteran Status

Veteran status from the original data set included 7 categories: exempt from reporting, not a veteran, not a veteran (assumption based on veterans' preference), and four additional categories defining the era in which the person served in the military to become a veteran. The first three categories—exempt from reporting, not a veteran, and not a veteran (assumption based on veterans' preference)—were classified as non-veterans. The remaining four categories were classified as veterans. This created a binary variable for veteran status.