Gender Differences in Labor Market Outcomes during the COVID-19 Pandemic

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Abstract

In the events of the COVID-19 pandemic, the Department of Homeland security released guidelines on who would be an essential worker and required to keep going to work for the benefit of society. Two of the industries deemed essential were healthcare and education, both of which are heavily concentrated by female workers. In this study, I use Current Population Survey data spanning November 2019 to December 2021 to test for gender differences in earnings among those working in the healthcare and education occupations during the pandemic. I estimate a regression model which includes controls for time trends and other factors, allowing me to isolate the impact of the pandemic on the gender difference in earnings. The pandemic has presented new challenges to these employees, especially those who must provide childcare. The goal of this analysis is to see how the pandemic has affected the gender wage gap in these occupations and determine what factors contribute to this gap.

**Keywords:** COVID-19, Recession, Essential workers, Gender-wage gap
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**Introduction**

In this paper, we will evaluate the labor market from November 2019 to December 2021 to determine any disproportional effects on male and female employees during the COVID-19 pandemic. Specifically, an emphasis is put on workers in health and education fields. These were two crucial industries during the pandemic, as they were deemed essential workers by the Department of Homeland Security in March of 2020. This means these employees were still expected to work during uncertain times and also in an economic recession. Employees had to face unforeseen challenges like caring for their children at home, who now had to navigate online school and social distancing.

It is important to see how female and male employees in the health and education industries are affected differently during the pandemic, as there is a large female presence in these occupations. The gender pay gap has existed since women entered the labor force, although there is evidence that the gap is closing. During this time of uncertainty and economic recession, however, the effects of wage discrimination will be evaluated in these occupations to determine the wage differences between male and female employees.

**Literature Review**

As more data is released on the economic effects of the pandemic, there are many sources to review that will aid in this analysis. The economic recession brought on by the global pandemic happened quickly and unexpectedly, which affected men and women differently. The gender wage gap has already put women behind men, for many factors outside the existence of Covid-19. This pays gap has existed ever since women entered the labor force. Even if a male and female had similar qualifications, the male employee seemed to be preferred. According to
Francine D. Blau (1996) of Cornell University, “…industry and union representation effects strongly favored women at the bottom and middle of the skill distribution relative to those at the top”. This shows the discrimination of women in higher-paying and more experienced positions. The wage gap has been everlasting but has seemed to be growing smaller throughout the years as women become more skilled and are granted more opportunities in male-dominated industries. However, the recession brought on by the pandemic broke usual expectations of the impact on male employees versus female employees and could be a setback in closing the gender wage gap further.

According to the National Bureau of Economic Research, in economic downturns such as the 2008 recession, men lost the majority of jobs compared to women (Alon et al., 2020). This was due to job losses affecting male-dominant industries, such as construction and manufacturing, while women held more hospitality jobs that were not as affected. The pandemic, however, introduced new and unusual circumstances that had to be dealt with. Child care and school closures presented difficulties for working parents who were still expected to go into their workplace. Before the pandemic, women were already experiencing unequal opportunities in education and the workplace which created the gender wage gap to begin with. Historically, women "published fewer articles, received fewer grants and citations, and were less likely to be granted tenure or promoted than men" (Deryugina et al., 2021, p. 3). This resulted in less lateral movement of women in their careers. Now with the added stress of social distancing, having to provide their childcare and schooling, and other economic implications, the disproportionate opportunities between men and women only become more relevant.

For families with children in the household, both men and women experienced an increase in housework and childcare (Deryugina et al., 2021). However, women reported a much
higher intake of this responsibility than men. Even women in academics, especially those with children, reported more disruptions to furthering their education due to these burdens. This will factor into the gender-wage gap even past the end of the pandemic, as women are coming out less educated and experienced than their male counterparts.

Women are already affected differently than men in the pandemic by lacking the same educational and career opportunities. Employers laying off their employees or moving to a work-from-home platform also adds another layer of stress. By April of 2020, employment rates fell by 14% (Han et al., 2020). In this analysis, however, there is a focus on essential workers, those who still had to go into their workplace and some of whom worked frontline. In March of 2020, the Department of Homeland Security released a list of employees that were deemed “essential”, among these were healthcare workers and educators. While women make up almost half of the labor force, they only consisted of 39% of essential positions (Blau et al., 2020). These essential workers had to continue doing their jobs to help protect the community. These jobs deemed essential, though, were already male-dominated and provided lower wages (Blau et al., 2020). For employees who had children at this time, they would have to choose between altering their hours, staying home so the spouse could continue to work, or trying to find the limited resources at this time to continue doing their job per usual. This ultimately would affect income and could further the divide between men’s and women’s weekly earnings, which will be studied in this analysis.

**Data and Methods**

To determine the effects of earnings based on gender in the Covid-19 pandemic, gender and occupation are of the most important variables to consider. State/region, household size, and educational experience are also important in determining earnings. Data from these variables can
be found using CPS data. This analysis focuses on adults in the labor market, ages 16+, in essential worker occupations throughout the United States who are employed. Specifically, those employed in health and education occupations will be evaluated. To meet the criterion for this analysis, they would have had to have reported their weekly earnings, number of college years completed, marital status, race/ethnicity, number of children in their household, and reported an occupation code falling within the education instruction or healthcare practitioner occupations. CPS responses with any missing data in these categories were omitted due to a lack of information. The summary statistics for the sample used in this analysis can be found in Table 1. In Table 2, all of the job titles that fall under the essential health and education occupations are listed.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Summary Statistics of CPS Data</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Male</strong></td>
<td><strong>Female</strong></td>
</tr>
<tr>
<td>Average Weekly Income</td>
<td>$505.77</td>
</tr>
<tr>
<td>Average Years of College Education</td>
<td>2.174838</td>
</tr>
<tr>
<td>Average Number of Children</td>
<td>1.06</td>
</tr>
<tr>
<td>% Married</td>
<td>52.7%</td>
</tr>
<tr>
<td>% Non-Hispanic White</td>
<td>68.6%</td>
</tr>
<tr>
<td>% Non-Hispanic Black</td>
<td>10.2%</td>
</tr>
<tr>
<td>% Hispanic</td>
<td>11.7%</td>
</tr>
<tr>
<td>% Asian</td>
<td>5.4%</td>
</tr>
<tr>
<td>% Other Races</td>
<td>4.1%</td>
</tr>
</tbody>
</table>
## Table 2
### Occupation Titles

<table>
<thead>
<tr>
<th>Health Occupation Title</th>
<th>Education Occupation Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pharmacists</td>
<td>Elementary and middle school teachers</td>
</tr>
<tr>
<td>Other physicians</td>
<td>Secondary school teachers</td>
</tr>
<tr>
<td>Surgeons</td>
<td>Special education teachers</td>
</tr>
<tr>
<td>Physician assistants</td>
<td>Tutors</td>
</tr>
<tr>
<td>Audiologists</td>
<td>Other teachers and instructors</td>
</tr>
<tr>
<td>Occupational therapists</td>
<td>Teacher assistants</td>
</tr>
<tr>
<td>Physical therapists</td>
<td>Other educational instruction and library workers</td>
</tr>
<tr>
<td>Radiation therapists</td>
<td></td>
</tr>
<tr>
<td>Respiratory therapists</td>
<td></td>
</tr>
<tr>
<td>Registered nurses</td>
<td></td>
</tr>
<tr>
<td>Nurse anesthetists</td>
<td></td>
</tr>
<tr>
<td>Nurse practitioners</td>
<td></td>
</tr>
<tr>
<td>Emergency medical technicians</td>
<td></td>
</tr>
<tr>
<td>Paramedics</td>
<td></td>
</tr>
<tr>
<td>Pharmacy technicians</td>
<td></td>
</tr>
<tr>
<td>Other healthcare practitioners and technical occupations</td>
<td></td>
</tr>
<tr>
<td>Nursing assistants</td>
<td></td>
</tr>
<tr>
<td>Healthcare diagnosing or treating practitioners</td>
<td></td>
</tr>
</tbody>
</table>
The Current Population Survey (CPS) is one of the largest and most well-recognized surveys in the United States. The goal of CPS is to collect information each month to provide a robust amount of labor, economic, and social statistics. This survey is offered to around 60,000 households each month and offers supplemental questions for the household to answer. The households chosen are meant to represent a wide range of locations and economic backgrounds to provide data for the entire country. For the household to complete the survey, they have the option to submit their answers through a computer-assisted survey instrument, telephone interview, or in-person interview (US Census Bureau, 2021). While this survey is completed on a voluntary basis, the response rate is high at about 90% after excluding those households that were found to be unoccupied and those not eligible for the survey. This is one of the highest response rates of any government survey, which is why this data can be confidently used for accurate results. This data can be evaluated on a month-by-month basis as it is collected, or aggregated into annual results.

To see the effects of earnings by gender in essential positions during the Covid-19 pandemic, data will be pulled from the months leading up to the beginning of the pandemic in the United States, November of 2020, to the most recent CPS data month at the time of this project, January of 2021. The monthly census survey does not include work hours, so there will be a focus on weekly earnings in this analysis, which assumes both wages as well as work hours. Monthly data during this time will provide other ample information on the labor force and various economic interests, so the Current Population Survey will be used. The Census Bureau also provides an annual survey, the CPS ASEC. This survey is offered to around 98,000 households across the United States. The CPS ASEC differs from the general CPS by collecting more detailed statistics about income, poverty, and foreign-born households (US Census Bureau,
2021). However, the sample size for the general CPS is much larger and still provides adequate details about the statistics this analysis is interested in.

In March of 2020, when the pandemic began in the United States, the collection of CPS data faced challenges. At this point, the Current Population Survey temporarily suspended any in-person interviews to collect data. This disrupted how data is normally collected. Phone interviews and computer-based surveys continued, however, there was a much lower response rate during this time than usual. In-person visits and interviews were allowed to continue again in July on a regional basis and then started up as normal again by September of 2020 (McIllece, 2020). The impact of the initial suspension of in-person interviews may underestimate some of the data within these months, however, the CPS participation rate has increased back to normal shortly after home visits were allowed again, so the overall data for this analysis should still be deemed reliable.

The variables used in this analysis can be found in Table 3. These variables will be weighted based on the final weight created by the CPS data. This final weight (WTFINL) is generated when pulling data from CPS to correctly weight data by month.

### Table 3
**Regression Variables**

<table>
<thead>
<tr>
<th>Type of Variable</th>
<th>Variable Name</th>
<th>Construction</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent Variable</td>
<td>Weekly Earnings</td>
<td>Weekly earnings == log(weekly earnings)</td>
<td></td>
</tr>
<tr>
<td>Independent Variable</td>
<td>State</td>
<td>Dummy variables created for each state</td>
<td>Absorbed in regression</td>
</tr>
<tr>
<td>Independent Variable</td>
<td>Sex</td>
<td>Sex = 0 if sex == 1&lt;br&gt;Sex =1 if sex == 2</td>
<td>Male = 0, Female = 1</td>
</tr>
</tbody>
</table>
To estimate the weekly earnings of employees, first, we estimate the month-by-month effects of the pandemic using Equation 1:

\[ \ln (y_{ist}) = \sum_{r=-5}^{1} \delta^r D^T_{it} + \sum_{r=1}^{16} \delta^r D^T_{it} + y_s + X_{it} \theta + \epsilon_{ist} \]  

In Equation 1, \( y_{ist} \) is a labor market outcome for individual \( i \) living in state \( s \) at time \( t \).

The term \( D^T_{it} \) represents a set of indicators for three months before the pandemic (November 2019 – January 2020) and 21 months after the pandemic (April 2020-December 2021), with February 2020 normalized to 0, making this our baseline month. March 2020 was dropped as it was a transition month during this time. The model includes state-fixed effects. The individual controls \( X_{it} \) include dummy variables for female, Black, Asian, Other race/ethnicity, Hispanic origin, married, number of children in household, and years of college education completed. The estimated coefficients \( \delta^1 - \delta^{16} \) capture the month-by-month effects of the pandemic — the
difference in outcome variables in each month around the time of the pandemic relative to the corresponding month in previous calendar years. To estimate and evaluate the heterogeneity by gender of the pandemic effect, we use Equation 2 below:

\[
\ln (y_{ist}) = \sum_{t} \sum_{r=-5}^{1} \zeta_t^r Female_i \times D_{it} + \sum_{t} \sum_{s=1}^{16} \zeta_t^s Female_i \times D_{it} + \gamma_s + X_{it}\theta + \epsilon_{ist} \quad (2)
\]

To test for heterogeneity in the effects, we include interaction terms between \( D_{it} \) and the variable \( Female \). In Equation 2, the estimated coefficients \( \zeta_t^1 - \zeta_t^{16} \) capture the additional, differential effects of the pandemic for females vs. males. In all models, we apply CPS person weights and estimate robust standard errors with two-way clustering on state and year-month.

When estimating earning outcomes, taking the natural log of the weekly earnings estimate will allow the model to follow a normal distribution and comply with OLS assumptions. Figure 1 and Figure 2 show the distributions of weekly earnings as they stand. Figure 1 shows the earning distribution of females, while Figure 2 shows the earning distribution for males. Both figures represent the earnings of employed people in the health and education occupations. When taking the natural log of the dependent variable, these distributions are corrected and better follow a normal distribution. This is shown in Figure 3 and Figure 4. Figure 3 represents the distribution of log earnings for females, and Figure 4 represents the distribution of log earnings for males.
Figure 1. Distribution of Female Earnings

Figure 2. Distribution of Male Earnings
Figure 3. Distribution of Log Male Earnings

Figure 4. Distribution of Log Female Earnings
Results

By using regression Equation 1 and Equation 2, weekly earnings for male and female employed essential workers were estimated. Figures 5 and 6 track the estimated coefficients by
month for both males and females in health and education occupations. There was significant volatility in earnings for both men and women during the pandemic, making it difficult to ascertain whether there were month-by-month differences in gender. Figure 7 and Figure 8 show the estimated coefficients for male and female employees. Figure 7 focuses on the estimated changes in earnings in health occupations, while Figure 8 shows those for education occupations. These figures are split by male and female.

Overall, during the months of the pandemic used in this analysis, female employees in health and education occupations made on average 23.05% less than their male counterparts. This is an increase in earnings discrimination from the national average, which was around 17.7% in 2019. There is also a further earnings gap in non-Hispanic Black, Hispanic, Asian, and other race employees. Compared to non-Hispanic White males on average, non-Hispanic Black employees made 5.74% less, Hispanic employees made 2.91% less, Asian employees made 6.48% less, and employees identifying as another race made 13.9% less. Female employees of all of these races made even less, with the biggest disparity being in female employees who identified as “other race”, earning an estimated 30.1% less per week than non-Hispanic White male employees.

As shown in Figure 7, male workers employed in health occupations during the pandemic are estimated to have higher earnings increases per week on average than females when they reported having 1-4 children. This is likely due to female employees being more likely to substitute household production for labor during this time, leading to a decrease in their weekly earnings. Male employees in health occupations during this time also reaped higher benefits per week by earnings the more they were educated, these benefits are less drastic for women
employees in this field. The same can be said for males that reported being married during this time versus females with the same report.

Figure 8 shows similar results for male and female employees working in education occupations during the months of the pandemic. Male employees were estimated to have higher increases in earnings on average when reporting 1-4 children and married status. The estimated results for years of education were less volatile for education occupations than health occupations, but overall males still reported higher weekly earnings across all categories during these pandemic months.

**Figure 7.** Weekly Earnings – Health Occupations
These findings show that throughout the Covid-19 Pandemic in the United States, the gender-wage gap took a further hit. This is an indication that female employees were more affected by the limitations the pandemic introduced. These female workers remained employed during the pandemic but still had to bear most of the weight of household production during this time, like increased child care.

In future adaptations of this project, work hours are something that should also be evaluated to determine if males were able to work more during the pandemic, or if women had to work less. Assumptions like these were made due to the differences between male and female labor outcomes. Using the CPS ASEC, the annual CPS collection, rather than the monthly CPS
would provide work hours along with wages, rather than weekly earnings as a whole. Therefore, in this analysis they could not be evaluated separately, causing a limitation in this study. Also, only health and education occupations were evaluated during this analysis, however, the essential working positions defined by the Department of Homeland Security included a wider scope of industries. These industries could be evaluated as well to see if there are similar outcomes.

As the United States moves further away in time from the start of the pandemic that caused an economic crisis, there are hopes of recovery in earnings in these occupations. The gender wage gap has a long way to go to close, especially in these health and education occupations, but it is more likely to be fixed once the pandemic is in the past.
References


