



# State of Utah Executive Branch Pay Equity Study



Governor's Office of Planning and Budget  
State of Utah  
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# Executive Branch Pay Equity Study

*An Administrative Data Analysis of the Determinants to State of Utah Executive Branch Employee Wages*

## EXECUTIVE SUMMARY

Face-value executive branch wage data suggest state employees who identify as male earn 21% more than females and those who report as White and Non-Hispanic or Latino earn 17% more than those who report as Non-White or Hispanic or Latino. In light of this phenomenon, state policy makers have recently expressed interest in analyzing the State of Utah executive branch workforce for gender and minority wage gaps. In response to Governor Cox's Roadmap objective to "continue to narrow the gender pay gap by implementing new policies for state employees and help spur change in the private sector," the Governor's Office of Planning and Budget (GOPB) conducted an executive branch pay gap analysis. Through this research, GOPB tested whether wage differences across state executive branch employees are attributable to gender and minority status when other worker and workplace characteristics are taken into account.

The findings of this research show that worker and workplace characteristics such as work performed, tenure, schedule code, equal opportunity designation, and agency largely explain the variance in state employee wages. After modeling for determinants to wages, average pay gaps are estimated such that males earn 2.2% more than females and non-minorities earn 0.6% more than minorities. Statistical tests provide insufficient confidence that these estimated pay gaps are greater than zero. While these findings indicate that employee pay is generally explained by non-demographic influences on average, this research detects evidence for pay gaps across gender among individual state employees within some agencies and like-job levels.

From an equity of opportunity perspective, descriptive statistics show considerable disparities in women and minority representation across higher-compensated leadership positions. In addition to identifying pay gap determinants, this research uncovers relationships in the

## Major Findings

1) On average, executive branch employee pay is generally explained by non-demographic worker characteristics and other workplace factors.

2) In contrast to average effect findings, additional modeling and further interpretation of analytical results provide evidence for individual instances of gender and minority pay gaps within some agencies and like-job levels.

3) Even when controlling for other variables, the agency, schedule code and occupational class in which an employee works has influence on wages – a conclusion relevant for efforts to increase equity in opportunity.

4) A positive relationship exists between employee leave balances and wages, by level of work performed, holding other explanatory features constant. This finding may have implications for paid family leave benefit policies and other employee work-life balance initiatives.

data that may be informative in shaping policy interventions to increase opportunities for women and minorities to engage and advance within the state's executive branch workforce. Among these discoveries are that:

1. Even when controlling for level of work performed and other determinants to pay (e.g., tenure), certain agencies, schedule codes, and occupational classes offer higher wages to incumbent employees.
2. A positive relationship exists between state employee leave balances and wages within like-job levels.

These patterns suggest that equity-oriented recruitment and promotion practices may be more effective when applied in some agencies and positions. Additionally, the relationship between leave balances and wages may have possible implications for leave policies designed to increase state employee labor force retention among women.

The Department of Human Resource Management (DHRM) and GOPB have provided a set of action items that align with and address the analytical results herein.

## BACKGROUND AND RESEARCH OBJECTIVES

Utah's national placement in wage disparities based on gender and minority status frequently gains media attention and concern from various groups including state government leadership. According to data from the U.S. Census Bureau, Utah has among the largest gender wage gaps in the nation with women earning 71.2% of that of men, on average (2019). U.S. Department of Labor data suggest that Utah ranks 34th, 28th, and 17th relative to other states in earning differentials among those who identify as Latino and/or Hispanic, Black and/or African American, and Asian-Pacific Islander, respectively (2020). Specifically, it is estimated that Utah labor force participants who identify as Non-White and/or Latino or Hispanic earn between 75% (African American) to 98% (Asian-Pacific Islander) of White peers. Al-

though these statistics fail to account for factors that likely affect a worker's ability to secure wages (e.g., human capital and occupation), other public use data and research literature supports the existence of a pay gap across worker demographic characteristics when other labor inputs are considered (Blau 2006; National Center for Education Statistics 2016).

The Cox Administration's *One Utah Roadmap* sets forth the vision and principles for a better Utah through six strategic priorities. Chiefly among these priorities is Equality and Opportunity, with action items to "recruit and designate a diverse group of Utahns for gubernatorially appointed positions, including boards and commissions" (Office of the Governor 2021, 5.A.iii), and to "continue to narrow the gender pay gap by implementing new policies for state employees and help spur change in the private sector" (5.B.v). The intent of this administrative data analysis is to provide an empirical contribution to relevant policy discussions and to generally inform decision-making with respect to these roadmap objectives by pursuing the following research questions:

*What are the most explanatory attributes of wage differences among executive branch state employees? How do these factors relate to the level of opportunity afforded to women and minority populations?*

*After controlling for worker and workplace characteristics, do pay gaps exist across demographic variables of interest?*

*How do the demographic variables of interest interact with the most powerful predictors of employee wages? Could these interactions be illustrative of individual instances of pay gaps disguised by the average results?*

*"Economic prosperity alone is hollow if we don't work to lift everyone."*

*Governor Spencer J. Cox*

*Given the richness of data and rigor of modeling methods, what other inferences can be made that may inform additional Roadmap objectives such as “increase investment in and support of state employees” and “improve state performance management system (6.B.ii-iii) (State of Utah Governor’s Office, 2021)”?*

As these research questions are addressed and potential policy implications enumerated, DHRM and GOPB have provided a set of corresponding action items and operational proposals.

## DATA SET AND DESCRIPTIVE STATISTICS

The data for this analysis were provided by DHRM and include 24,507 State of Utah government employee-level observations as of the pay period ending March 5, 2021. The scope of the analysis was narrowed to executive branch entities under the Governor’s direct discretion because it is uncertain that data comparison with other constitutional offices is appropriate given differences in processes for personnel record collection, standardization and storage. Furthermore, recent calls for state employee compensation studies with consideration toward demographic characteristics have typically centered on this subset of state government.

The data were further distilled to filter out observations for employees whose gender is unidentified or who declined to report their race or ethnicity status. Observations with hourly pay below minimum wage (e.g., some board members, and active duty National Guard members) were also removed. The final data set used for modeling includes 17,530 executive branch observations, with variables across the following dimensions used as controls for wage differences in this analysis (see Appendix B for details on these control variables).

**Employee Demographics:** Employee age, gender, race and ethnicity were generally available for use as independent variables. For this analysis, gender refers to the binary identification of male or female as self-reported by state employees. For employees who elected to self-identify race and ethnicity, those data were available across seven categories of American Indian/Alaskan Native, Asian, Black or African American, Native Hawaiian or Other, Two or More Races, White, and Hispanic or Latino. Because 85% of the observations represented employees who self-identified as White and Non-Hispanic or Latino, race and ethnicity status was converted to a binary variable representing either minority status (employees who reported race and ethnicities other than White and Non-Hispanic or Latino) or non-minority status (employees who self-identified as White and Non-Hispanic or Latino).

**Classification Title and Work Performed:** Given the research objective of identifying and quantifying potential pay gaps under an “equal pay for equal work” concept, controlling for work performed was of critical importance in the analysis “equal pay for equal work” is used in this analysis under the general context of the definition established by the Fair Labor Standards Act, but more narrowly applied only to wage compensation). Intuitively, job title is seemingly the best measure of work performed with an expectation that employees working in the same job title are paid equally, holding other factors constant. However, there are more than 1,100 unique job titles within the data, which preclude the use of job title as an independent variable because there are too few observations in each of its categories than the amount needed for a robust statistical analysis. As an alternative, this analysis leveraged classification-level salary ranges as a proxy for work-performed hierarchy. This was achieved by modeling on a continuous variable for the midpoint of the classification salary range associated with each observation. Controls

*“In order to live up to our remarkable heritage we need a strong economy, and equal, abundant opportunity for all Utahns.”*

*Lt. Governor Deidre Henderson*

*“As Utah becomes more racially and ethnically diverse, we need to ensure that Utah is a state where all have the opportunity to enjoy a remarkable quality of life, no matter their gender, ethnicity, sexual orientation, or religion”*

*Governor Spencer J. Cox*

were also included for groups of outlying classification titles, representing just more than 6% of the data set.

**Executive Branch Agency:** 25 executive branch agencies were included in the analysis, with a small number of entities aggregated together for modeling purposes: the Career Service Review Office was combined with the Department of Human Resource Management, the Public Lands Policy Coordinating Office was combined with the Department of Natural Resources, and the Governor’s Office of Energy Development was combined with the Governor’s Office of Economic Development.

**Schedule Code:** Schedule codes represent one of many taxonomies used by DHRM to classify state government positions. Ten distinct schedule codes, aggregated into four broad categories of codes, were used as controls in the modeling.

**Equal Employment Opportunity (EEO) Classification:** Employers, including state and local governments, must file reports with the federal Equal Employment Opportunity Commission to ensure compliance with federal anti-discrimination and equity laws. As part of this reporting, eight occupational category labels are applied to positions in state government (Berkshire Associates 2017). These categories were used as higher-level occupational controls in the modeling.

**Other Position Level Attributes:** Additional controls across other position-level features include Fair Labor Standards Act status, full-time/part-time status, whether the position qualifies for overtime pay, compensatory hours or neither, and whether the position allows the employee to accrue leave.

**Other Employee Level Attributes:** Additional con-

trols across other employee-level features include days of tenure in current job title, days of tenure with the state, total hours of annual and sick leave balances, whether the employee had an interruption in continuous employment with the state, and the total number of leave hours taken across Family Medical Leave Act (FMLA), Leave Without Pay (LWOP), and other administrative leave.

Table 1 shows the distribution of employees by agency along with the share of employees who self-identified as female/minority and wages with respect to male/non-minority counterparts. This table shows that the gender mix in the data set is nearly evenly balanced, with 51.6% male and 48.4% female employment splits. Women are slightly more represented in the sample relative to the Utah labor market as a whole, with employment across the broader economy measuring 55% men and 45% women. In terms of minority representation, 15% of the observations in the data set represent employees who identify as Non-White or Latino or Hispanic. This is also slightly higher than the 13% minority employment share across Utah’s total economy (U.S. Census Bureau 2019).

At the agency level, Table 1 shows the employment concentration among women starting at 16.3% in the Department of Transportation and reaching 70.6% in the Department of Health, and the proportion of female to male hourly wages ranging from 101.7% in the Department of Transportation (i.e., women earning more than men on average in the Department of Transportation) to 68% in the Governor’s Office. When it comes to employment shares of individuals identifying as minorities, the Department of Natural Resources combined with the Public Lands Policy Office employs the lowest concentration in the data set at 5.6%, whereas the Navajo Trust Administration employs the great-

Table 1 depicts raw summary data by agency before controlling for the determinants to pay as contemplated in this research. As such, the average pay disparities reflected below are unadjusted for influences related to job-level, tenure, schedule code, and other factors that must be taken into account when estimating pay gaps under an “equal pay for equal work” framework.

Table 1: Descriptive Statistics of Data Set Used for Analysis							
	Employees	Male Wage	Non-Minority Wage	Female Emp %	Female Wage % of Male	Minority Emp %	Minority Wage % of Non-Minority
<b>Data Set</b>	17,530	\$27.50	\$25.70	48.4%	82.5%	15.0%	85.2%
Alcoholic Beverage Control	530	\$14.31	\$14.20	52.1%	96.7%	17.4%	94.6%
Board of Pardons	33	\$43.26	\$37.57	57.6%	70.6%	12.1%	63.9%
Administrative Services	411	\$29.27	\$28.88	36.0%	91.7%	11.9%	86.0%
Agriculture and Food	260	\$24.15	\$23.49	36.9%	91.0%	7.3%	91.5%
Commerce	255	\$31.12	\$27.76	53.3%	74.8%	14.1%	79.1%
Corrections	2,158	\$26.21	\$25.52	27.8%	86.5%	10.3%	88.8%
Environmental Quality	338	\$35.51	\$33.08	44.4%	81.8%	10.7%	87.5%
Health	1,257	\$33.33	\$29.75	70.6%	81.5%	19.2%	86.5%
Heritage and Arts	141	\$26.71	\$27.32	68.1%	99.8%	16.3%	85.6%
Human Services	3,639	\$22.88	\$21.73	67.2%	88.1%	20.9%	85.2%
Insurance	83	\$39.03	\$33.17	57.8%	72.3%	18.1%	93.4%
Public Safety	1,471	\$28.04	\$25.30	40.7%	72.7%	11.1%	86.7%
Technology Services	682	\$38.31	\$37.66	22.6%	88.5%	12.0%	92.3%
Transportation	1,586	\$27.50	\$27.80	16.3%	101.7%	9.5%	91.7%
Veterans' Affairs	30	\$34.81	\$34.19	43.3%	76.6%	33.3%	74.4%
Workforce Services	2,014	\$26.73	\$24.65	68.9%	85.8%	19.2%	88.7%
Human Resources/Career Service Review	115	\$34.67	\$30.21	66.1%	80.4%	16.5%	99.3%
Natural Resources/Public Lands Policy	1,277	\$25.77	\$24.53	31.0%	82.5%	5.6%	87.6%
Financial Institutions	47	\$40.15	\$36.72	42.6%	76.7%	6.4%	76.4%
Governor's Office	119	\$44.57	\$35.27	64.7%	68.0%	21.8%	101.0%
Governor's Office of Energy/Economic Dev.	92	\$37.01	\$34.23	50.0%	84.3%	8.7%	96.2%
Labor Commission	110	\$34.29	\$31.87	50.9%	73.6%	25.5%	73.1%
Navajo Trust Administration	20	\$18.34	\$33.35	25.0%	87.1%	95.0%	50.8%
Tax Commission	586	\$28.13	\$23.87	70.1%	74.4%	17.6%	80.9%
National Guard	276	\$24.93	\$25.21	29.0%	91.6%	20.3%	82.7%

FIGURE 1

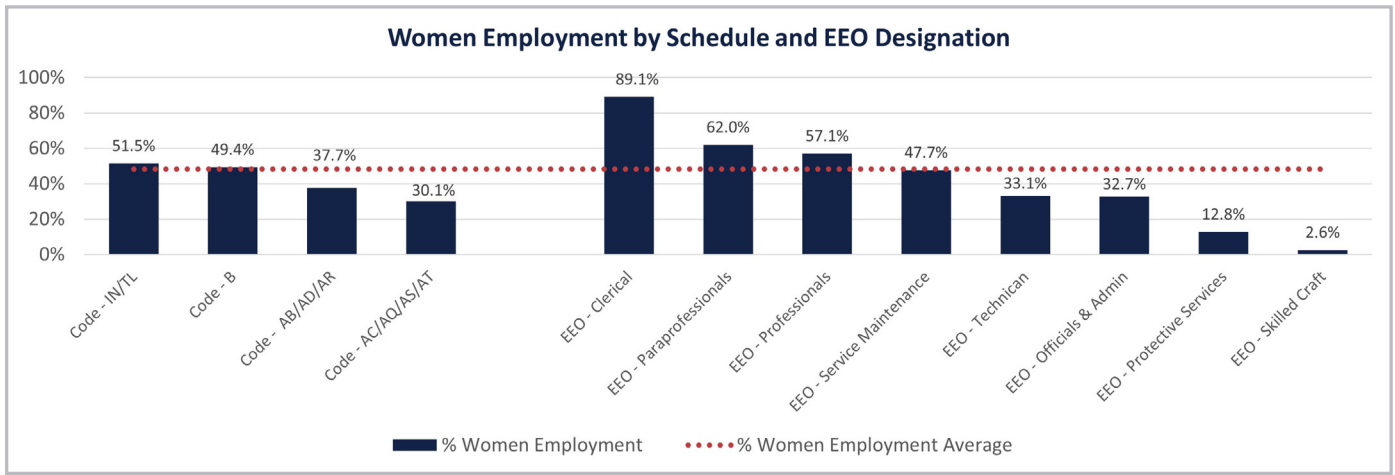
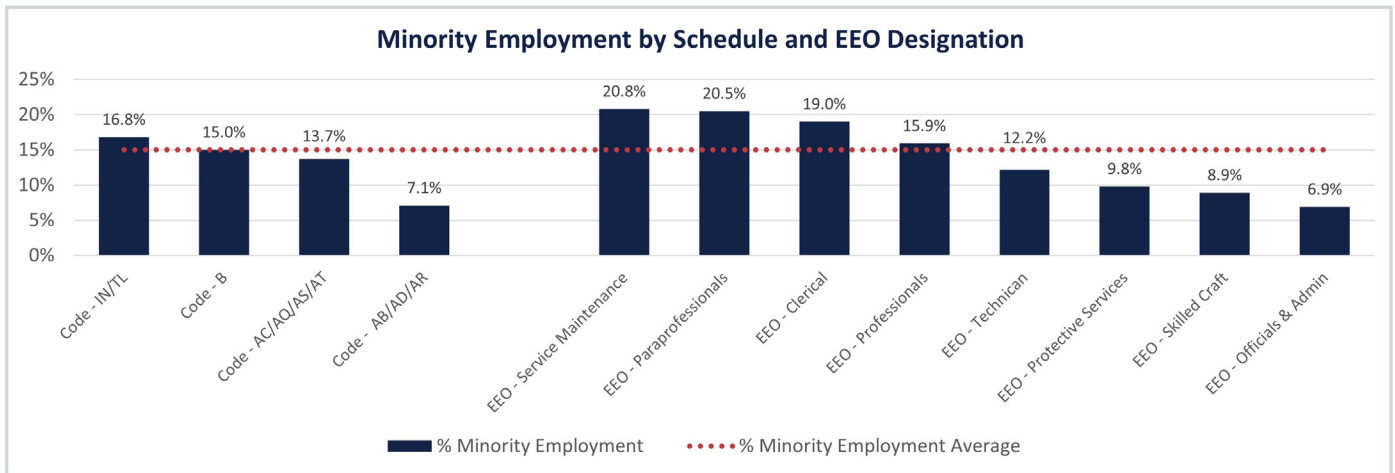


FIGURE 2



est percentage at 95%. Likewise, the proportion of minority to non-minority hourly wages ranges from 101% in the Governor’s Office to 50.8% in the Nava-jo Trust Administration.

Figures 1 and 2 show the share of women and minority status representation by employee schedule code and EEO designation. The figures illustrate that women and minority populations are underrepresented across leadership positions in the data set. Specifically for schedule code, women and minorities comprise 37.7% and 7.1% of employment within appointments of authority as defined by the schedule codes of AB, AD and AR. In addition, employees who identify as male and White Non-Hispanic or Latino make up a greater share of the Officials and Administrators designation than what would be expected given their representation in the data.

Similarly, women and minorities comprise disproportionately greater shares of employment in lower-paying temporary or part-time positions, with

51.5% and 16.8% employment shares in IN and TL schedule codes, respectively. Women also make up a large percentage of employment in clerical positions (89.1%), and employees with race or ethnicities other than White Non-Hispanic or Latino are most represented in Service Maintenance occupations (20.8%).

As seen in Figures 3 and 4, the unconditional average hourly wages are male and White/Non-Hispanic or Latino skewed, with splits of \$27.50 for males and \$22.70 for women, and \$25.70 for non-minorities and \$21.90 for those identifying with minority status.

While informative for descriptive purposes, these average wage comparisons illustrate the importance of controlling for the determinants to wages when making inferences about the existence of potential pay gaps based on work performed. On the other hand, to the extent the agency in which an employee works influences wages after

FIGURE 3: Before controlling for determinants to pay, women are paid 83% that of males.

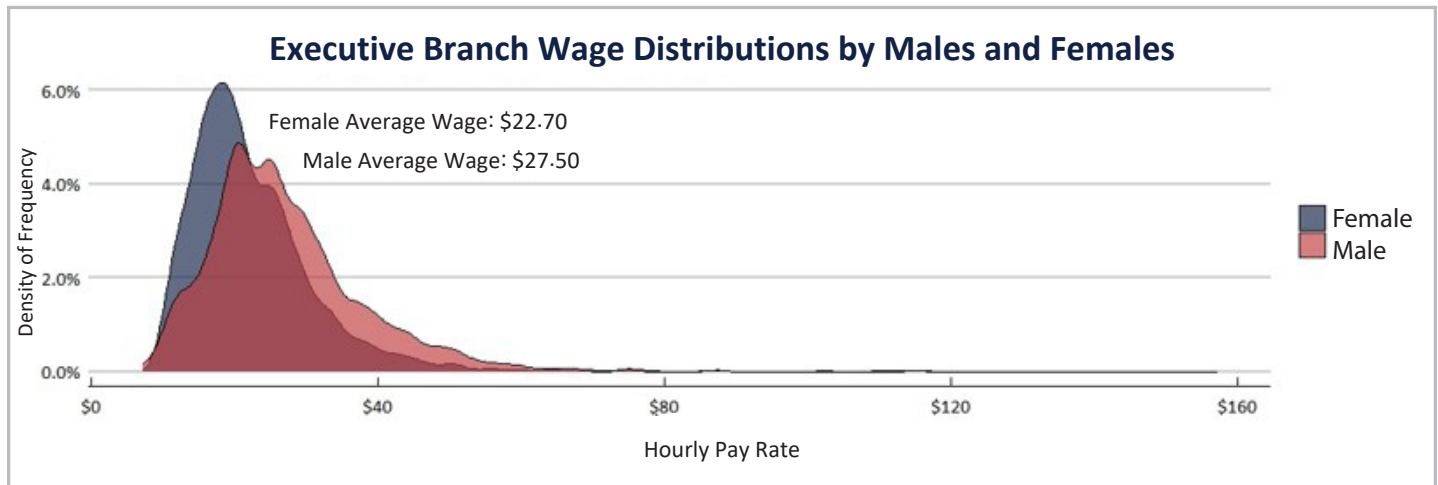
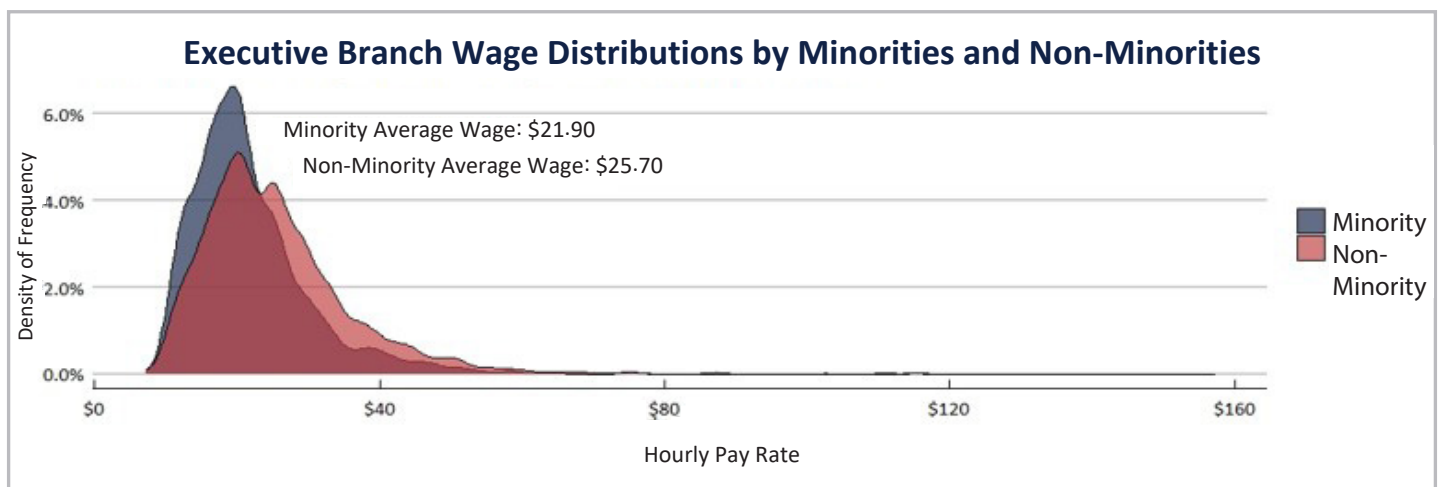


FIGURE 4: Before controlling for determinants to pay, minorities are paid 85% that of non-minorities.



controlling for other determinants, latent factors contributing to a lack of diversity across agencies (e.g. narrow recruitment and promotion practices, inadequate employee performance measures and rewards, etc.) could be inhibiting upward wage mobility and other opportunities for career advancement among populations of interest.

## METHODOLOGY

The statistical analysis in this report primarily employs Bayesian Additive Regression Trees (BART). BART blends a Bayesian perspective with machine-learning concepts within a tree-based analytic framework (Chipman, George and McCulloch 2008). Such methods have gained popularity for statistical analysis in settings where it is unlikely that the strict assumptions underpinning traditional approaches are fulfilled. A major benefit

of BART over more traditional methods is its ability to model complex non-linear relationships without requiring a priori specification. Overall, BART allows researchers to extract robust predictions and provides them with insight into whether the variables included in the process have a significant influence on the outcome of interest.

More generally, statistical techniques such as BART are required to turn data into information by adding context and meaning. For example, the descriptive statistics in Table 1 convey some information but do not answer the question as to whether pay gaps exist, holding other important factors constant. Through empirical modeling, the dependent variable (wages) can be estimated using independent variables (controls that the research is holding equal such as agency in which an employee works, the employee's age and years of



service, etc.). A well-performing model will generate estimates that closely approximate the dependent variable's actual values. Moreover, a model designed to allow for an inference to a larger population will be able to capture the effect sizes, signs and significance that explanatory variables have on the dependent variable. BART was applied to this research to explore the extent to which gender and minority status explain differences in employee wages.

While BART offers a plethora of advantages over other statistical approaches when it comes to investigating deep non-linear patterns within data, an array of methodological tools are occasionally required to fully investigate research questions of interest. In this case, estimates for average wage premiums by gender and minority status by agency were desired, and while BART generally did not find strong interactions across these variables, a linear model did. The linear model was generally specified in the same way as the BART model, but with log-transformed values for hourly rate, the midpoint of the salary range, employee age, and days of service.

Measures commonly used to assess how well statistical models perform indicated that BART produced reliable results in the context of this analysis. In particular, Figure 5 illustrates the model's high performance by showing the estimates it generated against the actual observations plotted by blue dots in reference to a 45-degree line. The plot for a model that performed perfectly (i.e., model estimates exactly equal actual observations) would have blue dots that exactly overlapped with the reference line. A plot for a model

with poor performance would show blue dots that were scattered far from the reference line. Figure 5 indicates that the BART model produced robust results, given that the blue dots and the reference line closely align.

## MAJOR FINDINGS AND POLICY RECOMMENDATIONS

After ensuring that the BART model produced robust estimates, the analysis turned toward investigating variable importance. Figure 6 shows selected controls included in this analysis and highlights those variables identified by BART as having an important relationship to employee hourly pay. It is worth noting that the proxy for work performed, the midpoint of the hourly pay scale, stands out as the most important predictor. Other variables that were identified as important were those associated with agency, equal opportunity designation, schedule code, FLSA status, and tenure. The major findings center on these results.

**Finding 1:** The influence of demographic characteristics such as age, gender, and minority status on wage is not statistically significant. In other words, executive branch employee pay is generally explained by non-demographic influences, on average.

The model detected a small average effect of a 2.2% male wage premium and 0.6% non-minority wage premium, but as mentioned, these variables were not detected as having a relationship with hourly wage that could be deemed statistically important across the entire workforce.

FIGURE 5

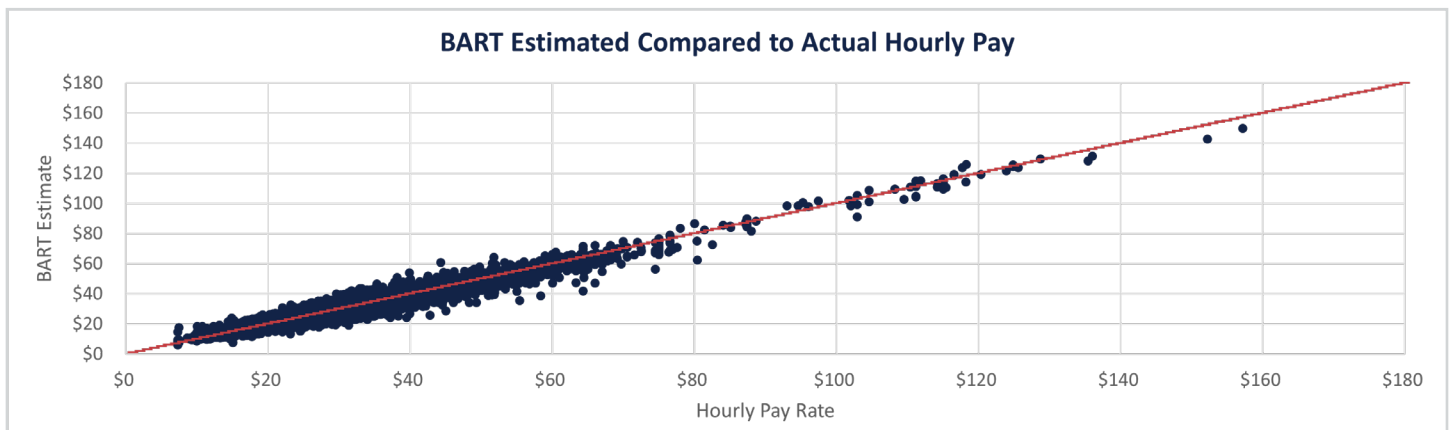
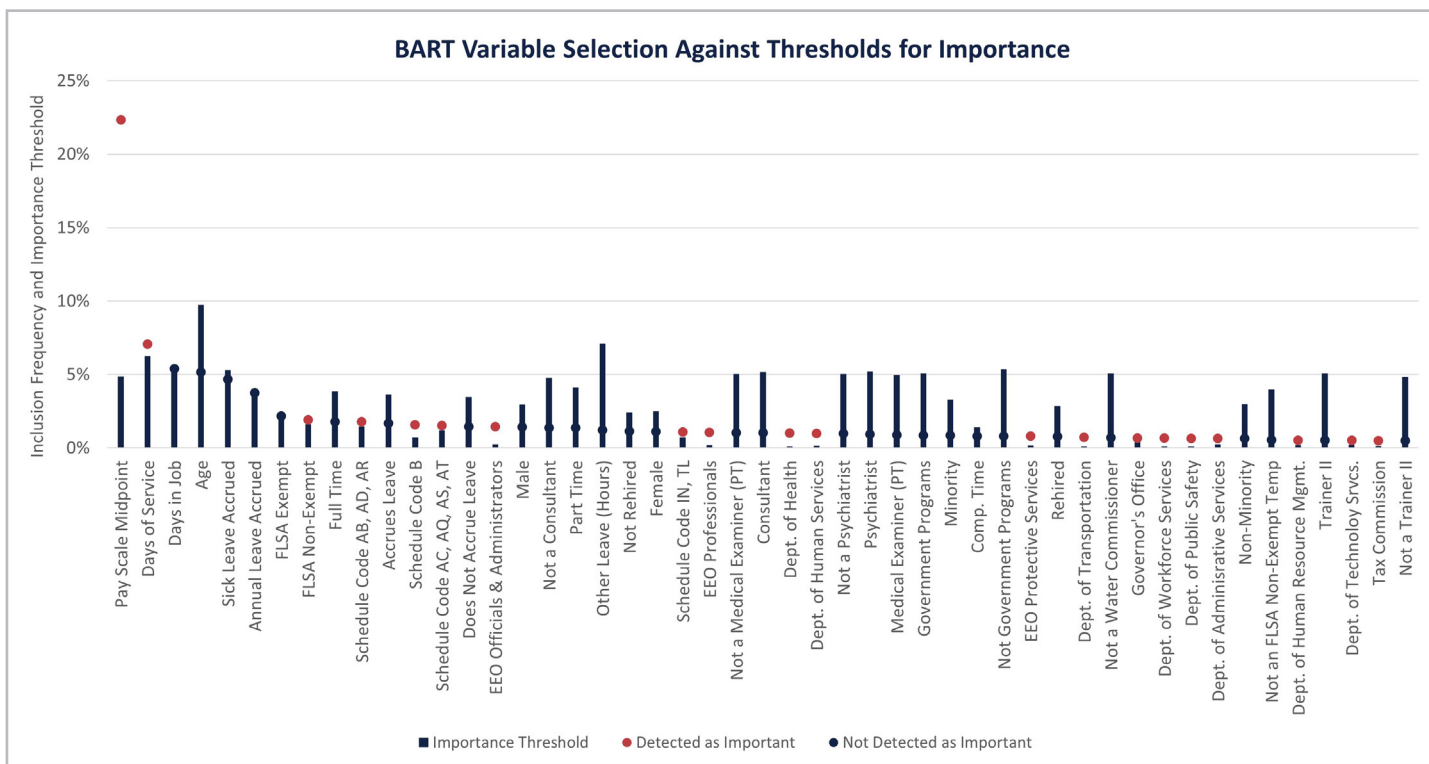


FIGURE 6: Variables detected as statistically meaningful for predicting employee wages are shown by high inclusion rates (red dots) measuring above the importance thresholds (blue bars).



**Action Item 1:** Given the somewhat rigid structure of the state government remuneration and appropriations process, it is perhaps unsurprising that employee gender and minority status do not present effects on wages across the workforce on average when controlling for other determinants to pay as included in this analysis. It is recommended that this finding be carefully interpreted in the context of an “equal pay for equal work” concept and that this study be updated periodically to confirm the absence of a gap. As discussed in the *Caveats, Limitations, and Further Research Opportunities* section, this finding should be further evaluated by alternative research methods and additional data, if available.

**Finding 2:** Despite insignificant demographically driven average effects, there is evidence for individual instances of gender and minority status associated pay gaps within the executive branch. A primary result of this analysis is that the proxy for work performed, pay scale midpoint, is a strong indicator of employee hourly pay. Particularly, the model’s results indicate a positive relationship between work performed and hourly wage. This provides evidence that an employee’s hourly pay

rate is expected to increase as they move to jobs in higher pay ranges while holding other influences considered here constant.

While the results failed to indicate that gender is substantially related to an employee’s hourly pay on its own, an investigation into interactions among independent variables with an emphasis on pay scale range midpoint uncovered that the effect that classification level proxy has on this outcome may be dependent on gender to some degree. In other words, the model is identifying clusters of classifications where gender-driven pay gaps may exist. However, this did not appear to be the case for minority status. Visual inspections of the relationship between hourly pay, pay scale midpoint, gender, and minority status provide insight into these findings.

Figures 7 and 8 illustrate the estimated hourly pay for all employees along the midpoint of pay ranges. Both figures include a yellow line that shows the average positive relationship between the midpoint of the salary range and hourly pay. Each figure illustrates the estimated value of hourly wage along the pay scale midpoint for each observation

and utilizes red and blue coloration to highlight respective demographic characteristics.

Figure 7 depicts employee gender with red to indicate that an employee identifies as female and blue for male. The higher concentration of red lines below the average estimated hourly pay suggests that many employees who are identified as female tend to have lower estimated hourly wages relative to their male peers within the same pay range.

Figure 8 illustrates minority status among employees with red coloration indicating the employee has identified as being in the minority status group and blue that the employee identified as White Non-Hispanic or Latino. The fact that the red and

blue lines are moving in the same direction, and are largely concentrated around the average estimated hourly pay, implies that the model is not detecting a substantial interactive effect between minority status and pay scale midpoint.

Finally, while underperforming relative to BART, the linear model suggests that there may be agency-level pay differentials across gender and minority status, as shown in Tables 2 and 3. Note that negative coefficients in these tables depict earnings premiums among women and minorities when controlling for available regressors. It should be reiterated that the existence of agency-level pay gaps are carefully characterized as 'potential' and 'possible' (among the use of other qualifiers)

FIGURE 7: With each line representing the predicted wage for a single employee across different pay scales, the concentration of female observations below the yellow-line-average illustrate that gender associated pay gaps may exist among individual female employees within certain job-levels.

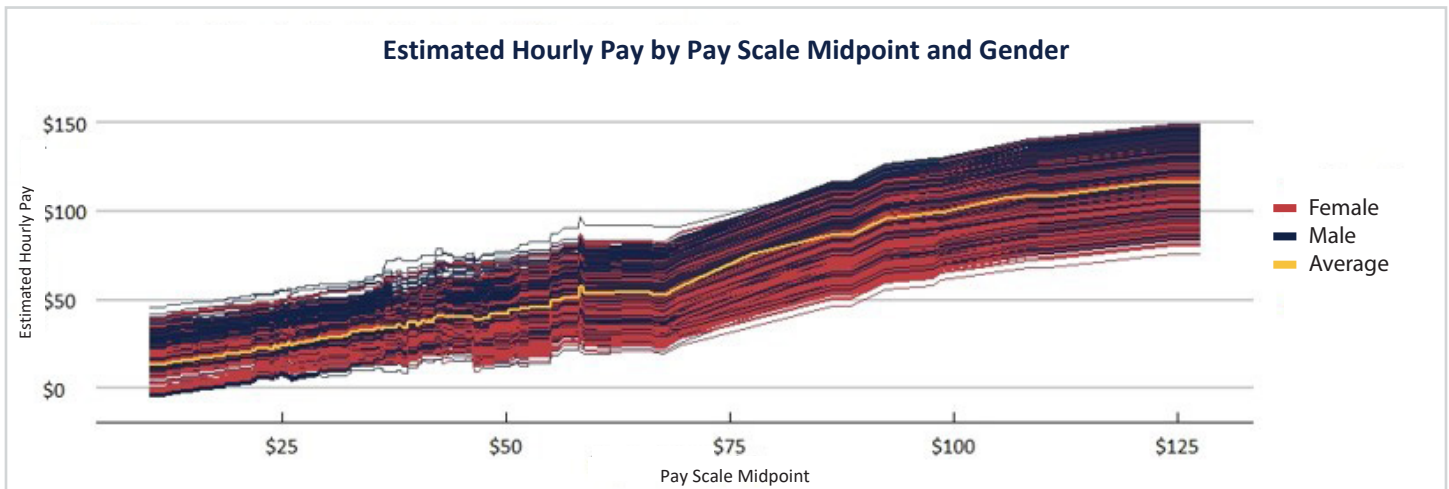
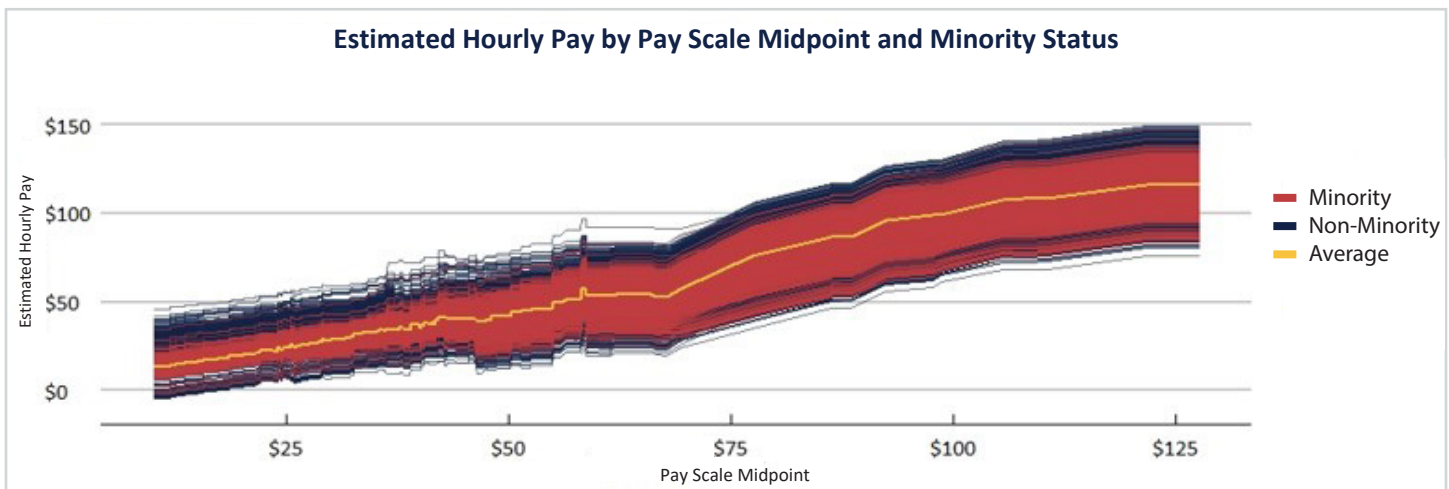


FIGURE 8: With each line representing the predicted wage for a single employee across different pay scales, the equal distribution of observations relative to the yellow-line-average do not show patterns of minority associated pay gaps among individual employees.



due to the possibility of omitted variable bias and other analytical limitations.

**Action Item 2:** Potential pay gaps as they may exist by agency and within like-job classification hierarchies require further evaluation by DHRM and respective agency leadership. To support this work, DHRM field offices will partner with the agencies, perform root cause analysis, define remedial strategies, and plan to improve general protocols. Through this partnership, agency practices regarding starting pay, allowable differences in pay, and merit and performance pay increases will be evaluated. Due to the strong explanatory influence of the nature of work performed, DHRM will review agency use of classification structure to ensure business needs are met, and employee pay is commensurate with work performed.

**Finding 3:** Even when controlling for other variables, the agency, schedule code, and occupation-

al class in which an employee works has influence on wages – a conclusion relevant for efforts to increase equal opportunity.

This analysis supports the intuitive connection between employment position attributes and hourly pay. All four schedule code aggregations included in the analysis were found to have an important connection to hourly pay when holding other factors constant. As expected, the average hourly pay tends to increase with movement from schedule B to schedules AB, AD, and AR. Table 4 shows the average estimated percent increase in hourly wage associated with movement from schedule code B to the remaining schedule codes (e.g., on average, it is expected that an employee would earn approximately 13.7% more within an AB, AD, and AR schedule code than within schedule code B, holding the other independent variables included in this analysis constant).

Agency	Resampled Coefficient	Resampled CI 2.5%	Resampled CI 97.5%
Department of Public Safety	7.9%	6.7%	9.2%
Tax Commission	5.5%	3.5%	7.5%
Department of Health	4.7%	3.4%	6.2%
Department of Alcoholic Beverage Control	2.4%	0.4%	4.4%
Department of Natural Resources & PLPCO	-0.6%	-2.0%	0.8%
Department of Environmental Quality	-1.8%	-4.1%	0.6%
Department of Commerce	-1.8%	-4.8%	1.0%
Utah National Guard	-2.3%	-5.4%	0.6%
Financial Institutions	-5.5%	-11.9%	0.4%

Agency	Resampled Coefficient	Resampled CI 2.5%	Resampled CI 97.5%
Governor's Office of Energy/Economic Dev.	12.1%	3.7%	20.6%
Department of Public Safety	3.4%	1.7%	5.3%
Governor's Office	-7.4%	-12.3%	-2.6%

Schedule Code	Percent Change (Schedule B Reference)
B	0.0%
IN, TL	2.3%
AC, AQ, AS, AT	4.1%
AB, AD, AR	13.7%

While this analysis provides support that the state is effectively implementing an on-average “equal pay for equal work” approach, the finding that schedule code and EEO designations are important drivers of hourly wage underscores the recommendation for further efforts to increase diversity, equity, and inclusion within different levels of state executive branch employment. As highlighted in the *Data Set and Descriptive Statistics* section of this report, unequal representation across gender and minority status persists through these employment attributes. Specifically, women and minorities are largely underrepresented in the AB, AD, and AR schedule code aggregation and in the Officials & Administrators EEO designations. Both of these areas are associated with higher levels of pay and decision-making power.

**Action Item 3:** DHRM will conduct an evaluation of state recruitment practices, applicant pools (with an emphasis on openings for key leadership positions), and the labor pipeline into state employment. DHRM will invest in diversity, equity, and inclusion capacity and develop recommendations for improving state hiring outcomes.

**Finding 4:** A connection exists between employee leave balances and wages within similar levels of work performed, holding other explanatory features constant. That is, when annual leave balances are higher, wages are predicted to be higher. This finding may have implications for paid family leave benefit policies and other employee work-

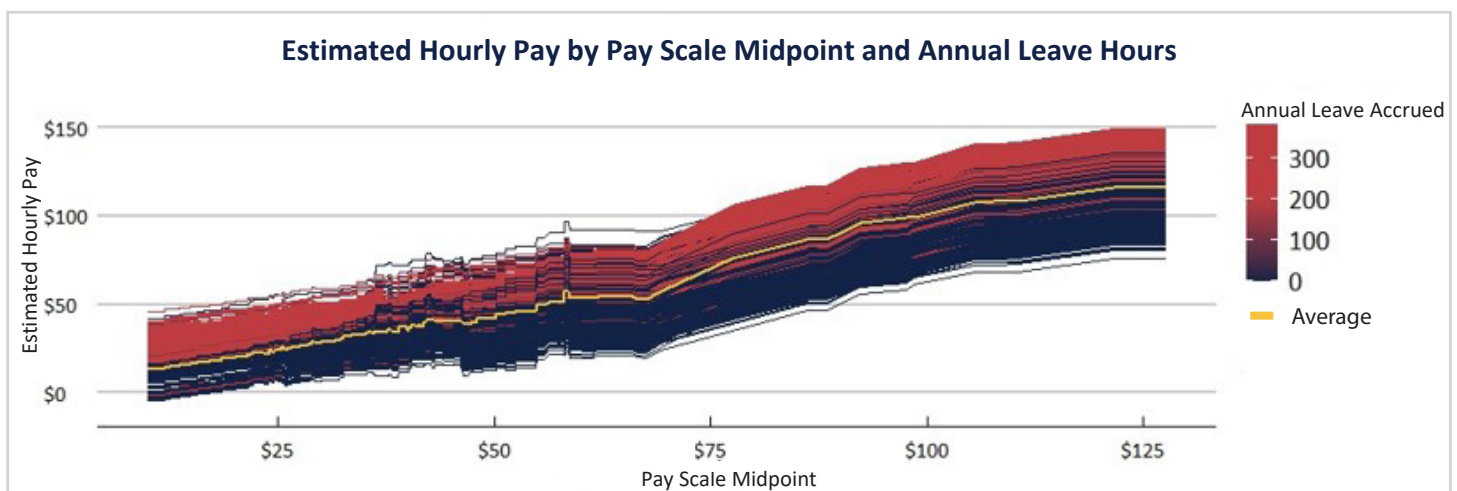
life balance initiatives, since offering leave benefits may be less effective if employees must trade-off upward wage mobility in order to use the corresponding leave benefits.

While neither annual leave nor sick leave balances were important predictors of hourly wages on their own, they were shown as highly interactive with the midpoint of the salary range. As seen in Figure 9, employees with higher-than-average leave balances are predicted to have higher wages, within the same midpoints of the pay scale.

With some surveys finding that nearly half (45%) of U.S. employers offer paternity leave (Oxford Economics 2020), paid family leave benefits for new fathers will become an increasingly important part of the state’s compensation strategy. However, previous research has shown that many new fathers do not fully utilize these benefits when offered due to “pressures at work such as impending deadlines, current projects or the amount of time it would take to catch up when they returned to work” (Harrington *et al.* 2014).

**Action Item 4:** As DHRM develops strategies and recommendations to further the Roadmap objective to “increase investment and support of state employees,” including recommendations for paid family leave benefits and worklife balance initiatives, informal leave use allowance policies could be reviewed and considered by agency leadership. Since wage advancement opportunities within a

FIGURE 9: With each line representing the predicted wage for a single employee across different pay scales, the concentration of observations with lower annual leave balances below the yellow-line-average illustrate that employee leave use may have meaningful effects on wages within like job-levels.



salary range should contemplate performance, DHRM will review the sufficiency of executive branch performance management practices. As raised elsewhere in this report, employee performance is a control omitted from this analysis. As such, improving performance management practices and related documentation will provide greater transparency into potential wage gap issues generally.

## CAVEATS, LIMITATIONS AND FURTHER RESEARCH OPPORTUNITIES

This analysis did not detect material average pay disparities within the executive branch across employee characteristics of gender, race, or ethnicity. To the extent such disparities were identified at the agency level or job classification level via interactions between pay scale midpoint and gender, interpretations of these effects should be made carefully due to the below limitations and caveats. Rather than viewing these research findings as the conclusion, results should be operationalized to inform general approaches and initiation points for DHRM and agency evaluation of specific instances of potential employee pay gaps.

**Data:** Statistical analyses are only as good as the data that inform them. Concerns around data generally center on quality and availability. The State of Utah is in a unique position in that it has robust data collection processes in many areas, including human resource management. However, non-experimental research that utilizes data collected for other purposes often face limitations because the data rarely include the precise information best suited to the analysis. A primary limitation to the research summarized by this report is that a set of observations had to be excluded because of incomplete information. A further issue is that the data do not contain some factors that are likely important for estimating employee hourly pay. These limitations and their implications are summarized below.

- **Excluded Observations:** Of the original 24,507 observations provided by DHRM, 17,530 were used in this analysis. About half (3,229) of the excluded records pertained to non-executive branch agencies. Since this research specified

hourly wages as the dependent variable of interest, another 2,082 observations with an hourly wage rate of less-than minimum wage (e.g. per diem reimbursements for board members without other compensation, some elected positions and active duty national guard, etc.) were excluded. Similarly, with gender, race, and ethnicity status as key independent variables of interest, 114 observations with 'protected' gender status and 1,552 with missing or 'declined to disclose' race or ethnicity status were removed from the data set. It is possible that major findings would be sensitive to incorporation of data that allowed for otherwise unnecessarily excluded observations.

- **Omitted Independent Variables:** Another analytical concern is omitted variable bias, meaning data on employee educational attainment, work performance, and other likely determinants to wages were unavailable. Excluding important variables from the model is problematic because the influence of the omitted variables will be erroneously attributed to the variables that have been included. The research findings summarized in this report may have been different if the variables that were omitted because of unavailable data were included as independent controls.

**Methods:** This study relies on a cross-sectional analysis of employee records as of pay period ending March 5, 2021. Since a given employee's current wage is influenced by her or his own unique career path (e.g., market rates during the initial hiring period, previous job titles held with state government, etc.), a longitudinal research design may capture additional pay disparity effects beyond the scope of this analysis. Seasonal changes in the employee workforce would also be captured with a longitudinal or time series approach. Second, diagnostics of final models used in this analysis show that theoretical assumptions underpinning the approaches used may not have been entirely fulfilled.

**Research Question:** As noted above, the research question of interest is one of "equal pay for equal work," which classically relies on controlling for work performed as much as possible. Ideally, this would be achieved through accounting for specific job classification titles for all employees. However, because more than 1,100 discrete job titles exist

across the 17,530 observations used in the analysis, and the research interest involves variance in wages among demographic characteristics underneath those job titles, a lack of heterogeneity by job title precluded its use as an independent variable. Consequently, it may be the case that employees in the same agency, same schedule code, same equal opportunity designation, and same salary range (among other similar characteristics) perform different work and are in different occupational titles. To the extent this phenomenon occurs in the data, existing pay disparities could be disguised.

Another issue related to over stratification in the data involves race and ethnicity status. Seven categories of race and ethnicity status are found in the data: White (Non-Hispanic or Latino), Hispanic or Latino, American Indian/Alaskan Native, Asian, Black or African American, Native Hawaiian or Other, and Two or More Races). Of these categories, 85% of the records are associated with the White (Non-Hispanic or Latino) race/ethnicity. For modeling purposes, the race and ethnicity variables were aggregated into a new factor variable with two levels representing non-minority and minority status. It is possible that aggregating minority status in this way masks average pay disparities among employees who identified with a particular category of race or ethnicity. Finally, while Finding 3 calls attention to important determinants to pay relevant to equal opportunity for upward wage mobility and incumbency in positions of authority, a separate analysis could be conducted to explore equity in recruitment, promotion, and placement of women and minority employees. Such analysis would require additional data on the number and frequency of state job openings, the characteristics of individuals who apply, and how prospective job candidates are recruited and screened for interviews, among other information. Instead of estimating hourly wages, a model could be constructed to estimate the probability of female and/or minority hires into a position of influence.

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# APPENDIX A: DEFINITIONS

**A Priori Specification:** Constructing a model using information or knowledge which proceeds from theoretical deduction rather than from observation or experience.

**Bayesian Additive Regression Trees (BART):** A method for making predictions and inferences that leverages machine learning concepts within a Bayesian statistical framework.

**Determinants to Pay:** The variables that influence employee wages.

**Diversity:** The representation of identities and differences, specifically in this analysis based on gender, race, ethnicity, and age.

**Effect Size:** The estimated degree of relationship between an independent variable and the outcome of interest.

**Equal Pay for Equal Work:** The concept of wage equity within work performed and controlling for legitimate factors of wage variance.

**Equity:** Fairness of treatment/access to information and resources and equality of opportunity.

**Gender:** In this analysis, gender refers to the binary identification of male or female as self-reported by State of Utah employees.

**Inclusion:** Actively inviting contribution and participation of all people.

**Linear Model:** In this analysis, a linear model refers to an ordinary least squares regression used to develop coefficients for explanatory variables of employee wages.

**Machine Learning:** A process in which patterns and features are identified from large amounts of data through an algorithmic process to help automate analytical model building.

**Minority:** Employees who reported race and ethnicities other than White and Non-Hispanic or Latino.

**Non-Minority:** Employees who self-identified as White and Non-Hispanic or Latino.

**Proxy:** A substitute variable for an unobservable or otherwise unusable variable in the analysis.

**Resampled CI 2.5% & 97.5%:** The 2.5 and 97.5 percentile values of the coefficient, resampled with replacement 1,000 times.

**Resampled Coefficient:** Average effects that the explanatory variable has on the dependent variable, resampled with replacement 1,000 times.

**Statistical Significance/Importance:** BART determines variable importance using selection procedures that contemplate the proportion of times a variable is included in the model against a user-defined threshold. This differs from classical tests for statistical significance that offer probabilities for observed correlations in data resulting from random chance.

**Unconditional Average:** Simple average value before holding other explanatory variables constant.

**Wage Gap:** The wage differential between two groups of people.

**Work Performed:** The job in which an individual works.

# APPENDIX B: VARIABLES TABLE

Variable	Definition
Hourly Wage	Employee hourly wage.
Midpoint of Pay Scale	The midpoint of the classification pay scale as defined by DHRM.
Executive Branch Agency	Alcoholic Beverage Control, Board of Pardons, Administrative Services, Agriculture and Food, Commerce, Corrections, Environmental Quality, Health, Heritage and Arts, Human Services, Insurance, Public Safety, Technology Services, Transportation, Veterans and Military Affairs, Workforce Services, Human Resource Management & Career Review Service Office (aggregated), Natural Resources & Public Lands Policy Coordinating Office (aggregated), Financial Institutions, Governor's Office (Governor's Office, Lieutenant Governor's Office, Governor's Office of Planning and Budget, and the Utah Commission on Criminal and Juvenile Justice), Governor's Office of Economic Development & Governor's Office of Energy Development (aggregated), Labor Commission, Utah Navajo Trust Administration, Utah State Tax Commission, Utah National Guard.
Equal Opportunity Occupational Designation	<p><i>Officials and Administrators:</i> Occupations in which employees set broad policies, exercise overall responsibility for execution of these policies, or direct individual departments or phases of the agency's operations.</p> <p><i>Professionals:</i> Occupations which require specialized and theoretical knowledge which is usually acquired through college training or through specialized post-secondary school education or through equivalent on-the-job training.</p> <p><i>Technicians:</i> Occupations requiring a combination of basic scientific or technical knowledge which can be obtained through specialized post-secondary school education or through equivalent on-the-job training.</p> <p><i>Protective Service Workers:</i> Occupations in which workers are entrusted with public safety, security, and protection from destructive forces.</p>

<p>Equal Opportunity Occupational Designation (continued)</p>	<p><i>Paraprofessionals:</i> Occupations in which workers perform some of the duties of a professional or technician in a supportive role, which usually requires less formal training and/or experience normally required for professional or technical status.</p> <p><i>Clerical:</i> Occupations in which workers are responsible for internal or external communication, recording and retrieval of data and/or information and other paperwork required in an office.</p> <p><i>Skilled Craft Workers:</i> Occupations in which workers perform jobs which require special manual skill and a thorough and comprehensive knowledge of the processes involved in the work, which is acquired through on-the-job training and experience or through apprenticeship or other formal training programs.</p> <p><i>Service-Maintenance:</i> Occupations in which workers perform duties which result in or contribute to the comfort, convenience, hygiene, or safety of the general public or which contribute to the upkeep and care of buildings, facilities or grounds of public property.</p>
<p>Schedule Code</p>	<p><i>AB/AD/AR:</i> These codes include department heads and commissioners, deputy directors, division directors and high-level positions determining state policy.</p> <p><i>B:</i> Career service employees subject to merit principles and grievance rights.</p> <p><i>AC/AQ/AS/AT:</i> Employees in elected offices, board and council members, employees required by law to be exempt from DHRM compensation statute and some employees of the Department of Technology Services.</p> <p><i>IN/TL:</i> Temporary employees on a time-limited or indefinite basis.</p>
<p>Fair Labor Standards Act Status</p>	<p>Whether the position is exempt from federal Fair Labor Standards Act regulations.</p>
<p>Accrue Leave Status</p>	<p>Whether the employee is eligible to accrue sick or annual leave benefits.</p>
<p>Full-time/Part-time Status</p>	<p>Whether the employee works full or part time.</p>
<p>Age</p>	<p>Employee age in years</p>
<p>Gender</p>	<p>A binary identification of male or female as self-reported by employees.</p>

Minority Status	Employees who reported race and ethnicities other than White and Non-Hispanic or Latino.
Outlying/High-Leverage Classification Groupings	<p><i>Consultant:</i> Includes job titles of 'Consultant', 'Disability Determination Services Consultant', 'Chief, Disability Determination Services Consultant', 'Operational Excellence Consultant', and 'Senior Consultant'.</p> <p><i>Trainer II:</i> Includes job title of 'Trainer II'.</p> <p><i>Office Specialist:</i> Includes job titles of 'Office Specialist I' and 'Office Specialist II'.</p> <p><i>Medical Doctor Part-time:</i> Includes job title of 'Medical Doctor, Part-time'.</p> <p><i>Temporary Seasonal FLSA Non-Exempt:</i> Includes job title of 'Temporary Seasonal FLSA Non-Exempt Job'.</p> <p><i>Temporary Seasonal FLSA Exempt Job:</i> Includes job title of 'Temporary Seasonal FLSA Exempt Job'.</p> <p><i>Water Commissioner:</i> Includes job title of 'Water Commissioners &amp; Deputies, FLSA Non-Exempt'.</p> <p><i>Psychiatrist:</i> Includes job title of 'Psychiatrist'.</p> <p><i>Government Programs:</i> Includes job titles of 'Federal Procurement Specialist', 'Program Director, Career Service Exempt', and 'Program Specialist, Exempt'.</p>
Annual Leave Balances	Employee Annual Leave Balances.
Sick Leave Balances	Employee Sick Leave Balances.
All Leave Without Pay	Employee leave without pay hours charged this fiscal year.
Days of Service	Employee total days of service tenure with state government.
Days in Job	Employee days of continuous service tenure in job.
Rehire	Whether the employee experienced an interruption in service and has been rehired.
Overtime, Comptime or None	Whether the employee is paid overtime, accrues compensation time hours or neither for time worked beyond 40 hours a week.