

# **San Francisco Job Market**

An analysis of the effects of Covid-19 on jobs and organizations and understanding the future labor force.

## Motivation

In the beginning of 2020, the bloom of a virus, COVID-19, changes the way everyone lives and it affects different people in many different ways. The virus that causes COVID-19 is infecting people and spreading easily from person-to-person. On March 11, the COVID-19 outbreak was characterized as a pandemic by the WHO. Many countries were and still are on lockdown due to this fast-spreading COVID-19 virus. This lockdown directly caused a severe increase in unemployment. The United States has not seen this level of job loss since the Great Depression; specifically, there were 22 millions job losses because of this pandemic. San Francisco was the first city in the United States to issue a lockdown, and how will this affect the future of hiring jobs in San Francisco?

## Data

To understand more precisely which factors and features affect the, we used data from San Francisco City Employee Compensation and created some questions that determine the features of the employment system in San Francisco that would help people for their further career after the pandemic. From the dataset that we use,

The dataset is limited from year 2013-2020. Since 2020 does not have a complete dataset, we used the years 2013-2019. We further filtered out this data to analyze only fiscal years, since this would provide more accurate data on the government's business. San Francisco has split its governmental jobs into 7 different organization groups. We will be using the first 6 organization group codes and leave out the 7th organization group (General City Responsibilities). The reason is due to this organization's group being highly fluctual. The variables we included in this analysis were:

- **Year Type:** Fiscal (July through June) or Calendar (January through December).
- **Year :** An accounting period of 12 months. The City and County of San Francisco operates on a fiscal year that begins on July 1 and ends on June 30 the following year. The Fiscal Year ending June 30, 2012 is represented as FY2011-2012.
- **Organization Group Code:** Org Group is a group of Departments. For example, the Public Protection Org Group includes departments such as the Police, Fire, Adult Probation, District Attorney, and Sheriff.
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- **Union Code:** Unions represent employees in collective bargaining agreements. A job belongs to one union, although some jobs are unrepresented (usually temporarily).
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- **Job Family Code:** Job Family combines similar Jobs into meaningful groups.
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- **Salaries:** Normal salaries paid to permanent or temporary City employees.
- **Overtime:** Amounts paid to City employees working in excess of 40 hours per week.
- **Other Salaries:** Various irregular payments made to City employees including premium pay, incentive pay, or other one-time payments.
- **Total Salary:** The sum of all salaries paid to City employees.
- **Retirement:** City contributions to employee retirement plans.
- **Health and Dental:** City-paid premiums to health and dental insurance plans covering City employees.
- **Total Benefits:** The sum of all benefits paid to City employees.
- **Total Compensation:** The sum of all salaries and benefits paid to City employees.

One detail of the data worth mentioning is that San Francisco is predicted to face a budget cut of more than \$1 billion. This further questions the future job market and compensation.

After taking consideration of the data, we raised 4 questions in total in order to analyse the data precisely.

### Question 1:

#### **Which jobs have the higher chances of funding cuts?**

In order to answer this question, we used a heat map to show the probability of the jobs will potentially have a lower funding:

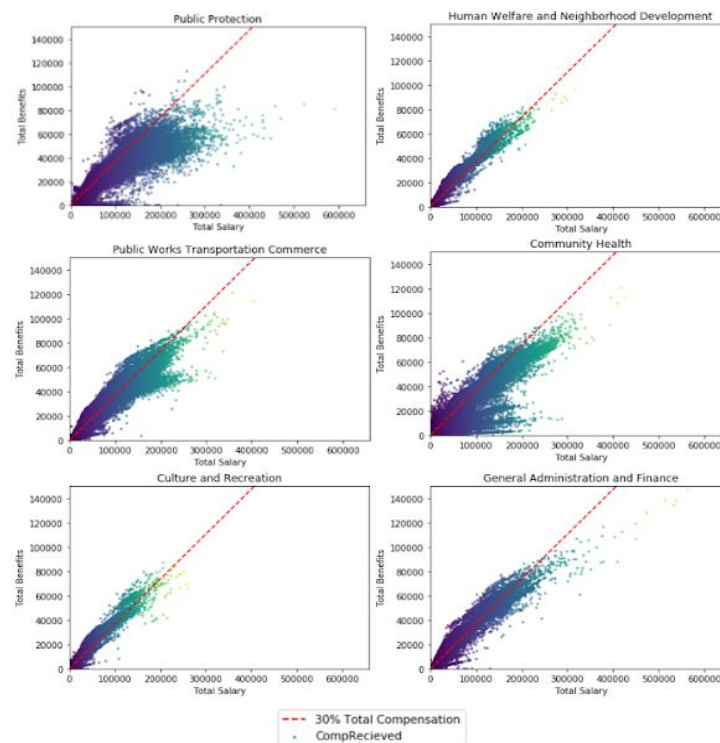


The heat map uses color to communicate relationships between data values. Specifically, from the figure above, the darker a square is, the less that position is being compensated compared to the same job title in other organizations, and vice versa. Therefore, according to the heat map, we can conclude that the less compensated job would be IT Operation support Admin, and followed by IS Project Director and Senior Management Assistant.

## Question 2:

**Which organization groups provide the best compensation package for their employees?**

We used individual scatterplots for each organization to plot each employee data point. This will reveal which organization groups pay their employees a fair salary and an appropriate benefits package. There is a general rule that an employee's total benefits should equal to 30% of their total compensation. We conducted a hypothesis testing with 30% as the null hypothesis and  $<30\%$  as the alternative hypothesis. In this hypothesis testing, we took the total salaries greater than \$10,000 and total benefits greater than \$0 to remove the edge cases.



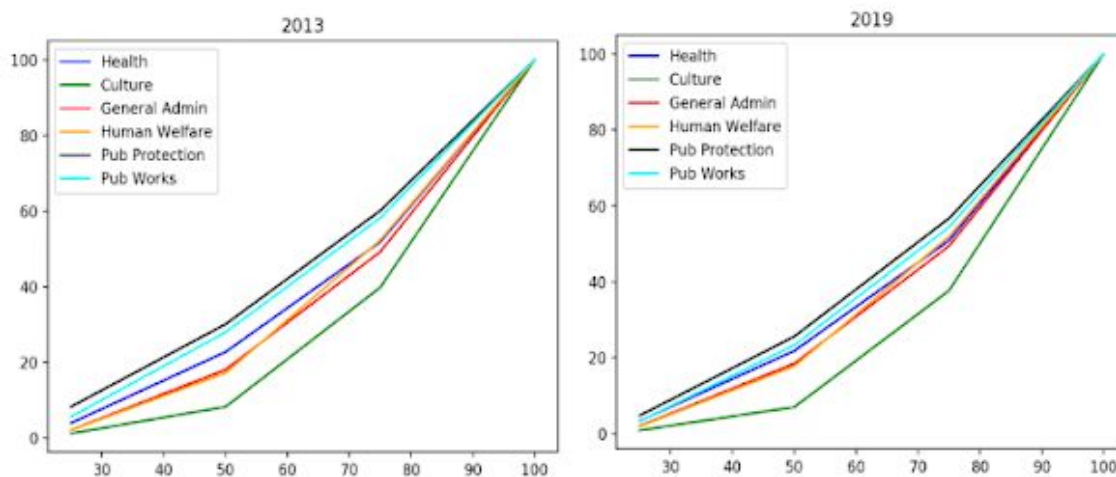
**Insight:** As shown in Figure, this gave various insights such as that after approximately a \$23,000 salary the benefits are not above the 30% Total Compensation line. When examining the other figures, the general correlation was as the salary got higher the benefits did not remain above the null hypothesis. When choosing a hypothesis testing for a 95% Confidence Interval, only Human Welfare (0.9699) and

Culture (0.9583) organizations gave their employees with benefits greater or equal to 30% of total compensation. This showed that these two organization's employees received a fair compensation package. Every other organization had approximately 0 probability, revealing these organization groups can not guarantee the benefits rule.

### Question 3:

#### How the total compensation within each organization is distributed between its lower and higher compensated employees?

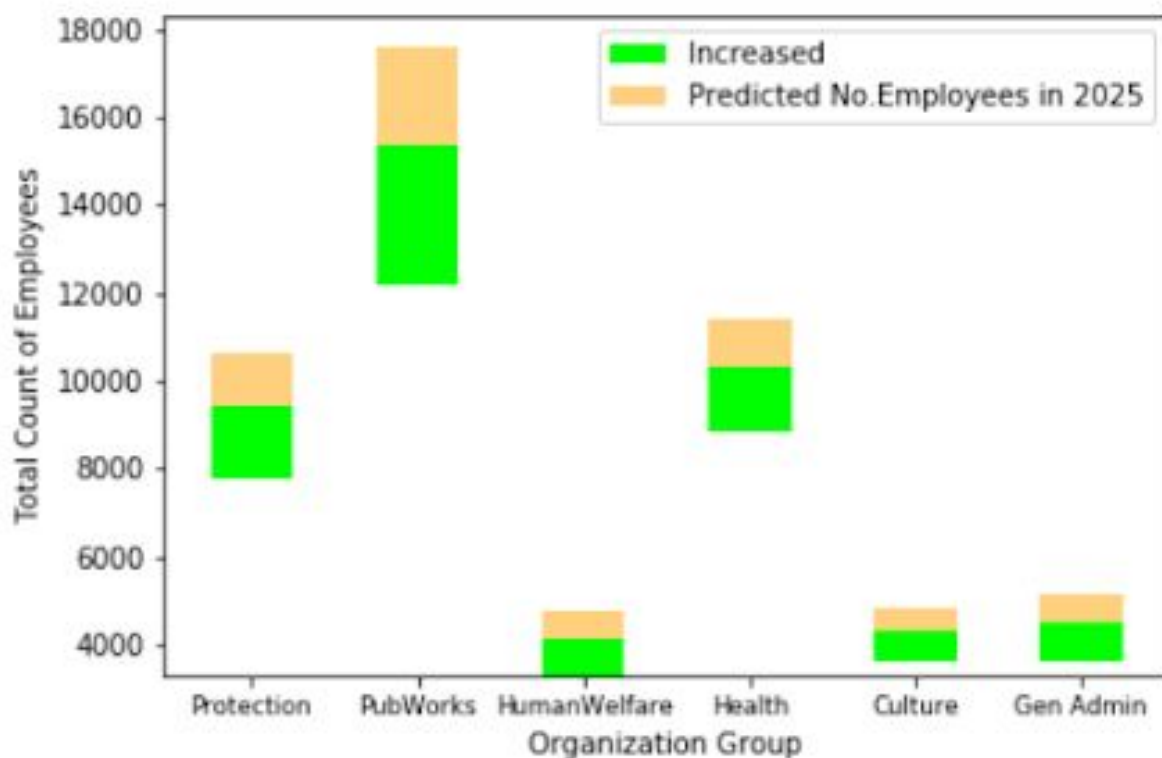
In times of crisis, it is ideal for the top compensated workers to face budget cuts rather than laying off the less compensated workers. However, not many top executives have made commitments to take pay cuts. This led us to think that the organizations with the less evenly distributed compensation packages for its workers will face major layoffs because there are a higher number of less compensated workers.



**Insight:** The curve of a line shows us how unevenly distributed the money is within an organization. From what we see in the plots, most organizations have the bottom 50% of workers, organized by their compensation packages, making less than 50% of the total compensation within their organization. The Culture and Recreation

organization is predicted to face the most percentage of layoffs. The organization paid 50% of its employees, who were on the lower income scale, only 7.04% of the overall total compensation in 2019. Since the number of entry-level employees is high compared to other organizations, the Culture organization will face the highest percentage of layoffs.

We further used bar plots to show the change of job count employees between each organization group from 2013 to 2019. Using linear regression, we predicted the number of employees in 2025, when we assume the economy will start to slowly improve.



From the bar plot above, we can clearly see that Public Works has the highest number of employees and also the highest predicted number of employees in 2025. Specifically, Public Works has grown from 12,179 to 15,336 in their employee count between these years, while the other, for example, the second highest growth rate (Community Health)

grew by 1,667 employees in the past 7 years. The lowest number of employees belongs to Human Welfare.

Due to COVID-19 pandemic, the city of San Francisco will limit funding, especially due to the highest funded organization. This will lead to our next question.

#### Question 4:

#### Which jobs are the highest paying post budget crisis?

To answer this question, we created a model to predict the years 2025, 2030, and 2040 and gave the top ten compensated jobs for each predicted year.

| org                                      | job                         | year2025  |
|--|-----------------------------|-----------|
| Community Health                         | Physician Assistant         | 467183.32 |
| General Administration & Finance         | Chief Investment Officer    | 445822.47 |
| General Administration & Finance         | Managing Director           | 412848.59 |
| Community Health                         | Dept Head V                 | 391886.11 |
| Public Protection                        | Chief Of Police             | 390806.50 |
| General Administration & Finance         | Controller                  | 382267.94 |
| Human Welfare & Neighborhood Development | Dept Head V                 | 379398.12 |
| Community Health                         | Administrator, DPH          | 376465.34 |
| Public Works, Transportation & Commerce  | Dept Head V                 | 373185.38 |
| Public Works, Transportation & Commerce  | Executive Contract Employee | 366756.75 |

| org                                      | job                      | year2030  |
|--|--------------------------|-----------|
| Community Health                         | Physician Assistant      | 476412.71 |
| General Administration & Finance         | Chief Investment Officer | 453726.47 |
| General Administration & Finance         | Managing Director        | 420556.91 |
| Community Health                         | Dept Head V              | 401115.50 |
| Public Protection                        | Chief Of Police          | 390553.19 |
| General Administration & Finance         | Controller               | 390163.44 |
| Community Health                         | Administrator, DPH       | 385694.73 |
| Human Welfare & Neighborhood Development | Dept Head V              | 383650.62 |
| Public Works, Transportation & Commerce  | Dept Head V              | 378792.50 |
| General Administration & Finance         | Dept Head V              | 374387.72 |

| org                                      | job                      | year2040  |
|--|--------------------------|-----------|
| Community Health                         | Physician Assistant      | 494871.50 |
| General Administration & Finance         | Chief Investment Officer | 469418.00 |
| General Administration & Finance         | Managing Director        | 437288.00 |
| Community Health                         | Dept Head V              | 419574.28 |
| General Administration & Finance         | Controller               | 405900.00 |
| Community Health                         | Administrator, DPH       | 404153.52 |
| Human Welfare & Neighborhood Development | Dept Head V              | 392162.00 |
| Public Protection                        | Chief Of Police          | 391498.50 |
| Public Works, Transportation & Commerce  | Dept Head V              | 389921.00 |
| General Administration & Finance         | Dept Head V              | 388215.50 |



Insight: These are the top ten compensated jobs that we conducted from the model. These are considered as higher level jobs. People can actually based on this data to apply for jobs and try to work their way up in the near future, specifically from 2025 to 2040.

## Conclusion and future directions:

Despite the fact that there are more factors that would affect the future of the San Francisco job market, we can not neglect the consequences that the early impact of the coronavirus pandemic was much worse than any economists expected, signaling further damage to the economy ahead. Analyzing employee data in San Francisco undoubtedly helped for potential further careers.

After using the data to answer the question we raised, we found that only 2 organization groups give at least a 95% guarantee of appropriate benefits to the salary ratio which was interesting. Also, we can see how the government would react to stabilize the economy. Specifically, they would try to cut off compensation for some job, and significantly reduce the hiring rate in these organizations. Furthermore, we could potentially see the trendy and highest paid jobs in the next 10-20 years.

Overall, in San Francisco, the highest paid compensation would be working from Community Health and General Administration and Human Welfare organizations.