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Future of San Francisco City Job Market

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

San Francisco was the first city in the United States to issue a lockdown due to the unprecedented Covid-19 pandemic. While this issue not only raises health concerns for many, it also questions their future employment status. Since everyone is mandated to stay at home, this affects the economy severely, with nearly 33.5 million American employees filing for unemployment benefits within 7 weeks of the lockdown[1]. This brings up a valuable question, how will this affect the future hiring of jobs?

After researching the San Francisco City Employee Compensation[2], we formulated a few questions we would like to research to determine which are the best jobs and organizations to be a part of in the future. There are a few details to understand before explaining our analysis. The dataset has the years from 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. Public Protection represents the police force, fire department, probation officers, and such that protect the general public. Public Works contains employees that help the general lives of citizens such as MUNI, building inspections, and water supply. Human Welfare includes children funding programs, human rights commission, and such jobs that deal with citizens well being. Community Health involves any health services or health centers including hospitals that are run by the city. Culture & Recreation consists of museums, public libraries, public parks, or anything that people can do recreationally that the city funds. General Administration includes city government positions like the mayor, city attorney, and supervisors that help run the city. 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. This group had a total job count of 138 in 2013, 12 in 2014-2016, 28849 in 2018, and 93 in 2019. The employees did not seem to receive a salary in 2019 and received only benefits, while in 2018 only 14 employees received benefits. We

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[1] https://www.wsj.com/articles/unemployment-benefits-weekly-jobless-claims-coronavirus-05-07-2020-11588813872
[2] https://data.sfgov.org/City-Management-and-Ethics/Employee-Compensation/88g8-5mnd

contacted the dataset owner to understand more about the data inconsistency or if this may have been an error in the dataset, but we did not receive a reply.

San Francisco is predicted to face a budget cut of more than $1 billion[3]. This further questions the future job market and compensation.
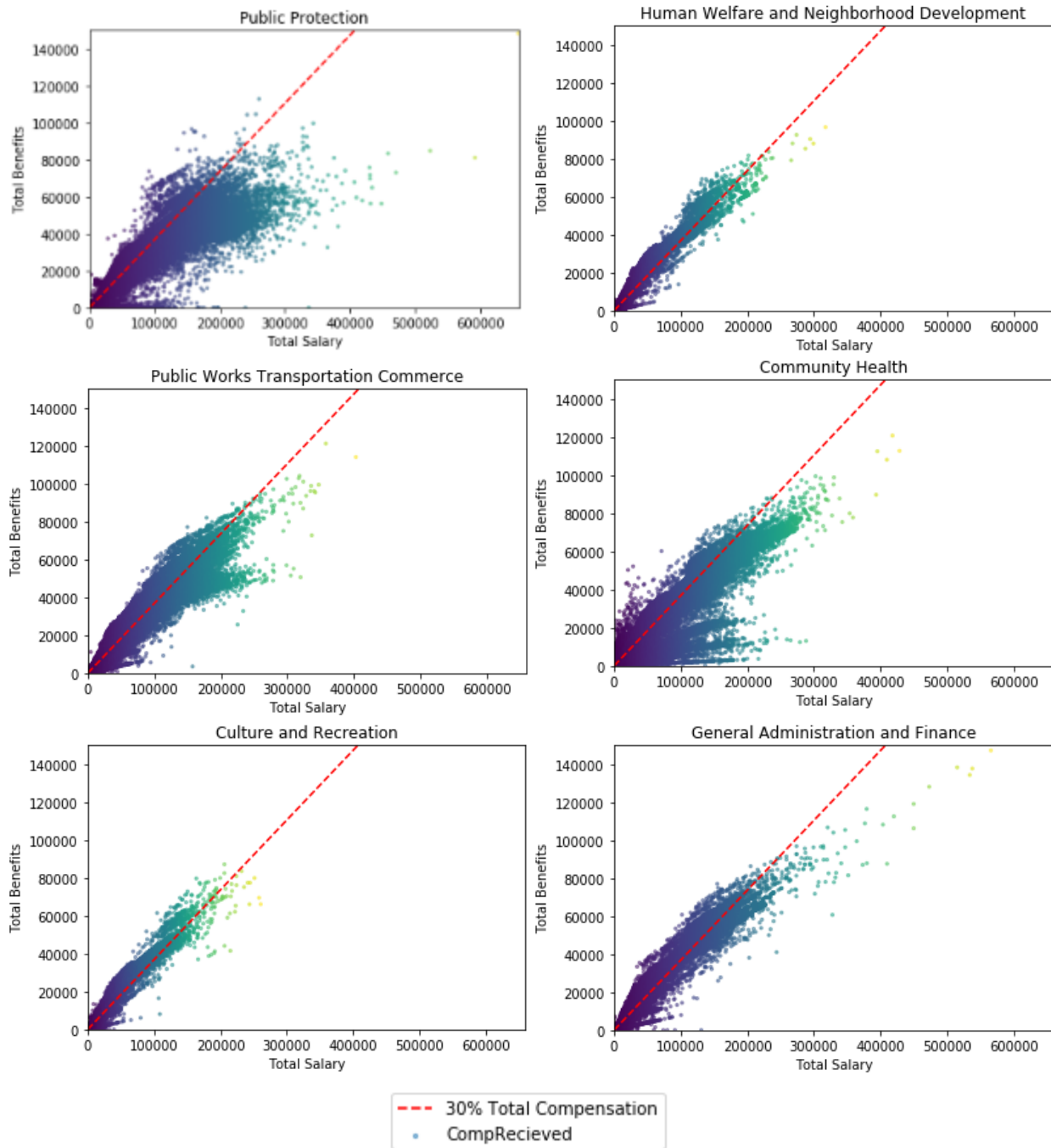
We did some exploratory data analysis about the dataset to further understand the type of data available.

Before predicting the future values, we analyzed employee compensations and total employee headcount over the years for each job title and organization groups. Nearly every employee wants a good compensation package to support their lives and possibly others. We analyzed 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[4]. 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.

[3] https://sfciti.org/news/the-covid-19-effect-on-san-franciscos-budget/
[4] https://smallbusiness.chron.com/benefits-percentage-wages-14587.html

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As shown in Public Protection, this gave various insights such as that after approximately a $20,000 salary the benefits are generally not above the 30% Total Compensation line. When examining the other figures, the general correlation was as the salary got much 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 (0.9584) 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.

As part of our EDA, we also wanted to look at 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[5] 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. We created the plots below, to see which organizations have the more unevenly compensated packages for its workers.
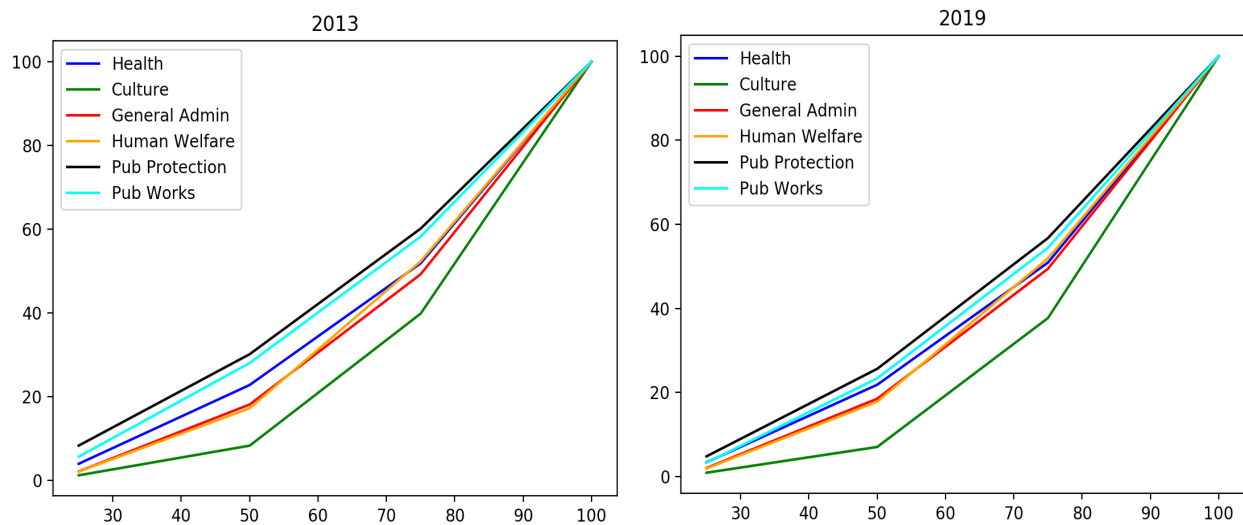

The way we read these plots are by looking at how curved the lines are compared to other lines in the same year. How curved a line is shows us how unevenly distributed the money is within an organization. From what we see in the plots, most organizations have the bottom 50% of workers, organized by their compensation packages, making less than 50% of the total compensation within their organization. The Culture and Recreation organization is predicted to

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[5] https://www.forbes.com/sites/jackkelly/2020/03/25/ceos-should-take-pay-cuts-before-firing-workers-especially-if-theyre-getting-bailed-out/#62a4ab2e11a1

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.
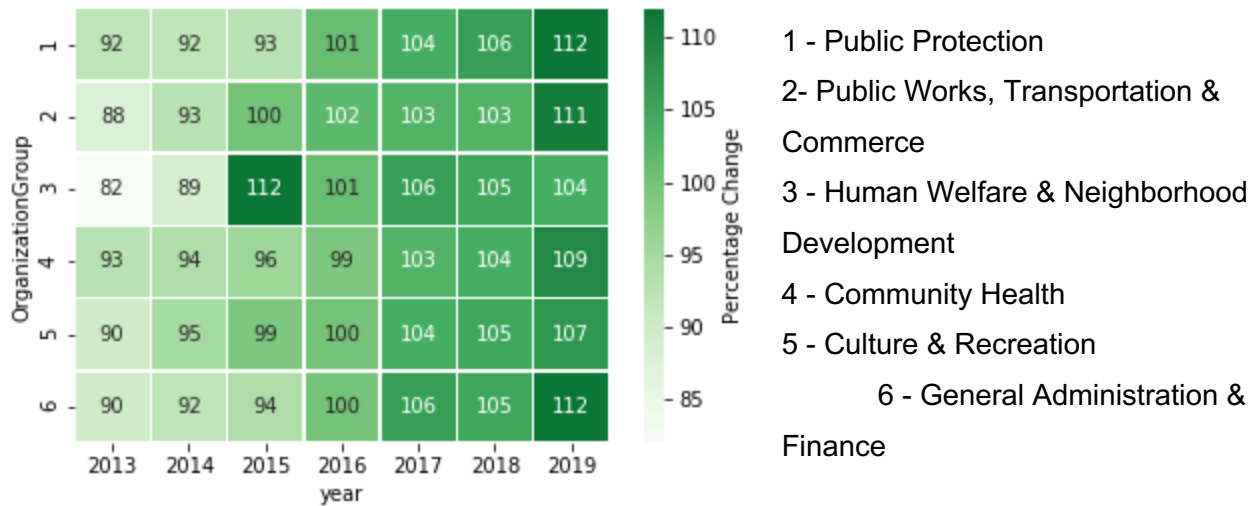
With organizations reported to lay off more entry-level employees, we wondered which organizations have the most employees to see which groups will face the most contraction in hiring.

We 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[6].
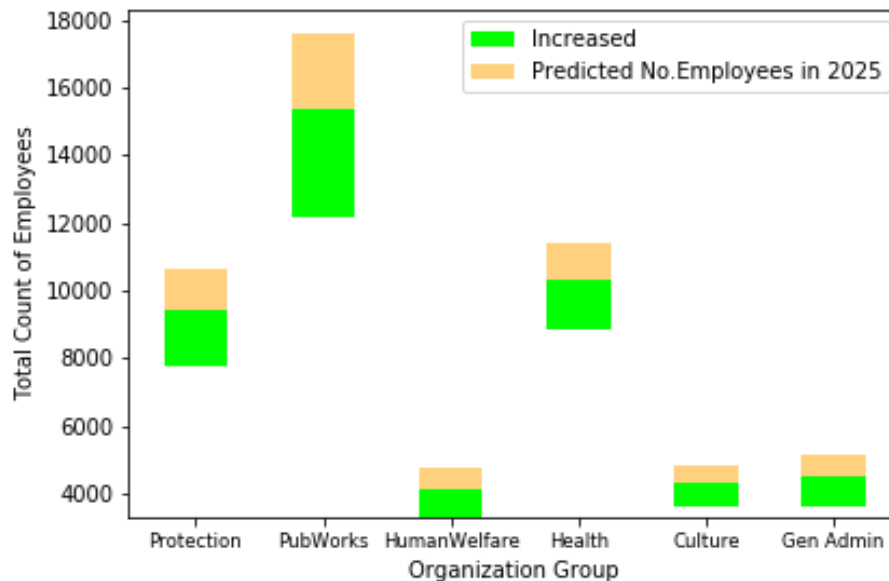
Referencing the graph above, it is revealed that Public Works has the highest count of employees in 2019, thus the number employed could be cut out easier than other organizations. They are flexible since they had the highest growth from 2013 to 2019. Public Works has grown from 12,179 to 15,336 in their employee count between these years, while only the second highest growth rate (Community Health) grew by 1,667 employees in the past 7 years.

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[6] https://www.charlotteobserver.com/news/coronavirus/article242596966.html

1 - Public Protection

2- Public Works, Transportation & Commerce

3 - Human Welfare & Neighborhood Development

4 - Community Health

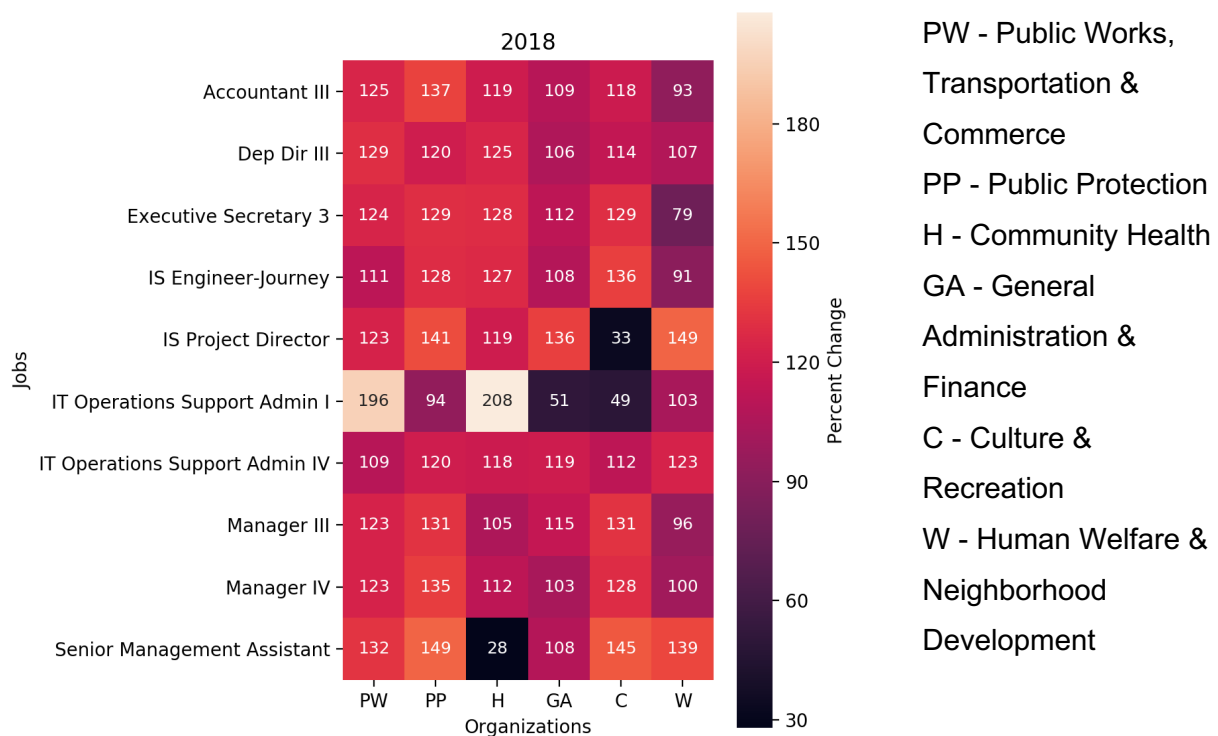5 - Culture & Recreation

6 - General Administration & Finance

In 2019, there was also a surge of hiring within each organization. Therefore each organization will probably face an approximately equal reduction in hiring compared to the year before. An exception to this is Human Welfare, which will face moderate reduction, since it has not had a significant surge in hiring.

With the recent budget cut due to Covid-19, the city will try to limit funding overall especially to the highest funded organizations. This will lead to our prediction to the increase in employee headcount to not be as accurate, due to the reduction of hiring in the workforce, but the general trend is hypothesized to be accurate.

With organizations facing budget cuts, we wondered which jobs have the highest probability of facing cuts. Inside each organization every job will not be reduced the same amount, since close to minimum wage jobs can not be cut a lot, but the highest paid jobs should be cut more.

To show which jobs have the highest chance of receiving pay cuts, we created a heat map that shows which jobs exist in all organizations and compared the jobs to each other as seen in the graph below.

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PW - Public Works, Transportation & Commerce

PP - Public Protection

H - Community Health

GA - General Administration & Finance

C - Culture & Recreation

W - Human Welfare & Neighborhood Development

The darker a square is, the less that position is being compensated compared to the same job title in other organizations. Unfortunately, there were no jobs that existed in all organizations in 2019, so we decided to use the 2018 job titles. With the same logic as the previous heatmap, we think that jobs in organizations that paid comparatively a lot means that they are more flexible. Flexible jobs suggest that in times of crisis, they are the ones likely to receive reduced compensation packages. So according to the map, we think that the top five jobs to be reduced are IT Operations Support Admins in Public Works, Transportation & Commerce and Community Health, IS Project Director in Human Welfare & Neighborhood Development, and Senior Management Assistant in Public Protection and Culture & Recreation.

The next thing we wanted to know is which jobs are the highest paying post budget crisis. As mentioned above, we created our data set by first filtering the data by looking at the fiscal year values only as well as removing any jobs that are purely benefits or purely salary.

For our final data analysis, 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	390006.50
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

As we can see, the top ten compensated jobs are high level positions, so it by no means is saying that they are easy jobs to attain. But that's why we are predicting the near and far future, so that you can apply for a job related to one of these positions in the near future and maybe work your way up in the far future. One thing to notice is that by 2030, seven of the top ten jobs are in the Community Health and General Administration & Finance organizations, so those might be good organizations to apply to for the future.

Covid-19 undoubtedly will create a hole in the hiring process for many in the coming years. Even though many people have filed for unemployment, organizations will still be hiring through these tough times. Analyzing the San Francisco City employee data proved to give various insights. We found the 30% total compensation interesting, which we did not know and did not expect the result either. We found that only 2 organization groups give at least a 95% guarantee

of appropriate benefits to the salary ratio which was interesting. But we also wonder if a person who earns a high salary is required to have the 30% total benefits package, since after a certain point we believe people would want an increase in salary rather than an increase in their benefits package.

Also, we gained more insights into how the government will attempt to stabilize their economy as much as possible. The government will most likely cut jobs in the organizations with the highest job count and the most unevenly distributed compensation between its workers throughout the organization, significantly reducing the hiring rate in these organizations. In San Francisco, the Public Works have the highest job count and is predicted to have the highest job hiring increase, but due to the San Francisco budget slash, this will result in a substantial reduction in job hirings. It does seem for the near future, Human Welfare would be a prime organization to join since they provide the 30% Benefit rule and does not seem to have a significant reduction in job hiring compared to the other organizations. The line graph also reveals that Culture and Recreation isn't the safest job opportunity to join in the near future, since they will most likely layoff entry-level employees compared to other organizations.

Another result found was that there is a high probability of reduction in compensation in the jobs Personnel Clerks in Public Protection and Culture & Recreation, Secretary in Community Health, Senior Personnel Clerk in Community Health, and Accountant in Human Welfare & Neighborhood Development. This is due to these jobs increasing the most in total compensation in its organization compared to the same job title in other organizations over the years from 2013 to 2019. With these compensation reductions in the near future, we found in the long run that Physician Assistants in Community Health, Chief Investment Officer in General Administration, and Managing Director in the General Administration are predicted to be the top 3 highest paid jobs in San Francisco in the future.

Overall, we recommend in San Francisco if you're applying to a professional job, the Community Health and General Administration organizations would provide the highest paid compensations, but if you're applying to a entry to middle-level jobs, Human Welfare would be the best organization due to their great benefits package and not have severe budget cuts as the other organizations.