COVID-19 EFFECTS ON EMPLOYMENT IN MARGINALIZED COMMUNITIES

NORFOLK COUNTY, MASSACHUSETTS

1. Introduction

Norfolk is a county in Massachusetts. It is currently made up of one city and twenty-seven towns. The population of the county is 703, 740 and the employed population (as of 2020) is 376,643. I am interested in finding out how COVID 19 impacted the employment rate in the county. I would like to understand how many unemployment claims were filed during 2020-2021, and how COVID 19 affected different genders, races, education levels, ethnicities. I chose this analysis because COVID 19 was a tough time for all of humanity but in general it was tougher for some more than others. I want to understand if there was an impact on unemployment due to COVID 19, were some marginalized communities more affected than the others. Human Centered Data Science focuses on fundamental principles of data science and its human implication. This includes doing research ethically, creating reproducible works and societal impacts of data science. I want to work on this problem statement as it helps me utilize the potential of data science in understanding the impact of COVID 19 on the livelihoods of the Norfolk County people. Since this work is focused on a small part of the US, I don't expect my work to be representative of the entire US population but it could be somewhat representative of the state. Making this work reproducible and open source can help me create a work that helps us understand what steps can be taken if ever another pandemic hits and how government resources could probably be distributed among different communities. Ensuring that it is reproducible also makes it possible to be extended upon in different counties/ towns/ states.

2. Background/Related Work

There has been a lot of research done in the area of the impacts of COVID-19 on marginalized communities. National crises have often highlighted inequalities in the labor market that disproportionately affect individuals from marginalized backgrounds [1]. The changes due to COVID-19 pandemic has showcased inequities in access to decent work, and experiences of discrimination resulting in many of the vulnerable populations in the United States experiencing a much harsher impact on economic and work-related factors. The most vulnerable populations are those with less access to resources, which makes life more complicated for them," says Clinical Associate Professor Annette Johnson. "Even before the pandemic, lack of access to resources and opportunity, and lack of access to health care made those individuals and families more vulnerable. During a health crisis such as COVID 19, the situation becomes exacerbated in many marginalized communities [2]. Due to the lack of such resources and opportunities, marginalized communities of color have been at high COVID 19 risks. According to the University of California, Riverside, in the United States, COVID-19 cases and death rates have been disproportionately high in Latino and Indigenous populations [3]. All these studies point out that the marginalized communities have suffered more during the period of the pandemic. I wanted to explore more on how COVID-19

impacted employment rates. The US Bureau of Labor Statistics states that the COVID 19 brought the economic expansion to a sudden halt leading to a rise in unemployment in 2020[4]. Research in [5], analyzes unemployment outcomes in a context of a multi-dimensional social disadvantage that unfolded during COVID-19 in Tennessee. A report on the Unemployment Rates during COVID-19 Pandemic by the Congressional Research Service states that in April 2020, the unemployment rate in the US reached the highest rate observed since data collection began in 1948 and in July 2021, unemployment remained higher than it had been in February 2020 [6]. This is something I found interesting, so I tried to look up labor force data for Norfolk County to see if I could find the same trend as noted by the Congressional Research Service. During my search for the data, I found a dataset on Unemployment claims that was categorized by demographics. This led me to find if any research was done on unemployment claims. I found a report on analysis of unemployment insurance claims in California during the pandemic that states that since the start of the COVID-19 crisis in March 2020 nearly 45% of the California workforce filed for unemployment insurance (UI) benefits - a labor market crisis unprecedented in the state's history [7]. This presented an in-depth analysis of neighborhoods affected within California, which demographics were affected the most, even had analysis on different industries. So, I decided to try to replicate a part of these studies, and see if these impacts are noticeable in Norfolk County too.

This leads me to my problem statements:

1. How did the increase in COVID-19 cases impact employment in Norfolk County in 2020-2021?
2. Was there an increase in the unemployment claims as COVID-19 progressed in 2020-2021?
3. What proportion of unemployment claims to the population for gender, race/ethnicity to understand how much such demographic groups were impacted?
    a. Hypothesis 1: The average number of unemployment claims raised by female identifying people is equal to the average number of unemployment claims raised by male identifying people.
    b. Hypothesis 2: The average number of unemployment claims raised by people with Hispanic background is equal to the average number of unemployment claims raised by people with non-Hispanic background.
    c. Hypothesis 3: The average unemployment claims of all groups are equal.

3. Methodology

To answer the problem statements, I first started out with visualizing the daily COVID 19 cases and the employment/unemployment numbers in the county to see if I could find any trends. The plot below shows the rise in Covid Cases and Labor Force in Norfolk County from 2020-2021.

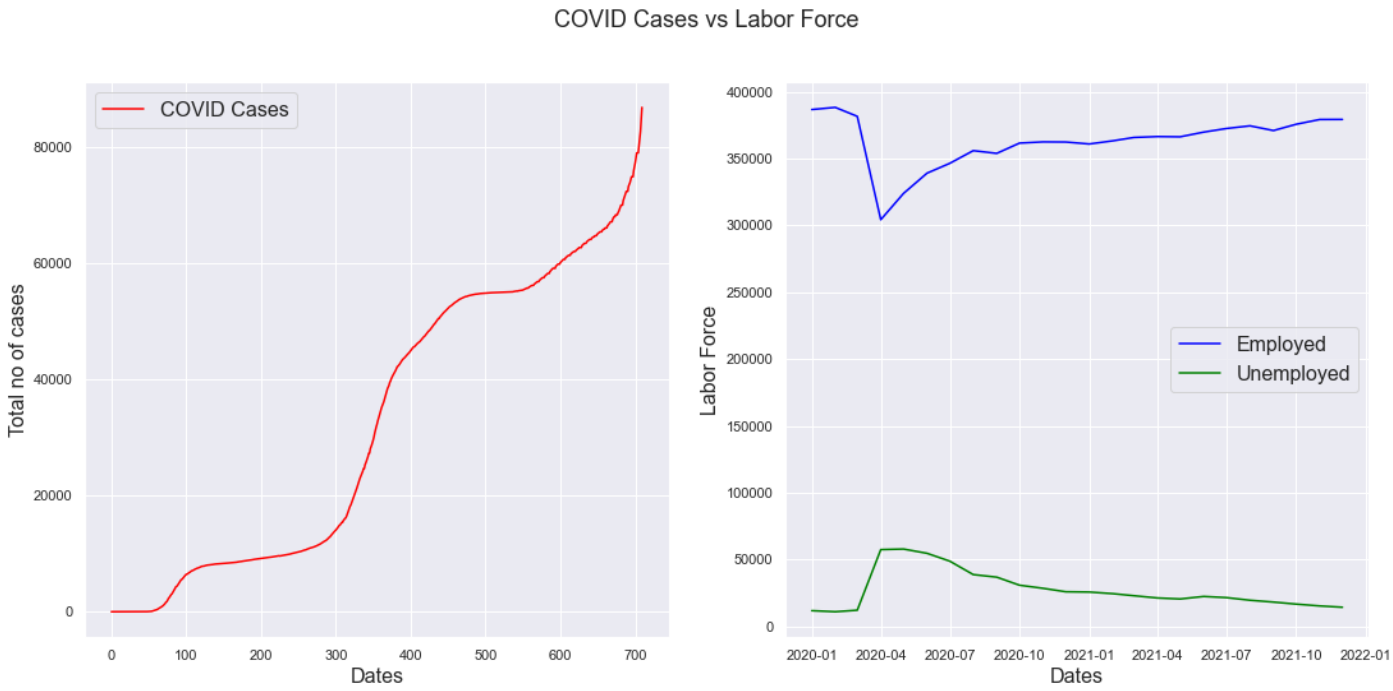

Figure 1. Confirmed COVID Cases vs Labor Force

OBSERVATIONS FROM FIGURE 1:

1. At the onset of the pandemic, during the first increase of COVID cases, it can be observed that there is a sharp increase in unemployment in the county.

2. However, as the pandemic progresses and we see a rise in cases, the unemployment in the county gradually decreases.

3. From the above plots, we cannot say for sure that the impact on employment was solely due to covid cases but it does seem to point that in the face of unexpected disaster, the employment numbers do get impacted until economic support is provided by governments.

4. Interestingly, the plots do align with observations noted in [6] (stated in the second section). We can see a peak in unemployment in April 2020 and the unemployment is higher for the rest of 2020 as compared to the rate in February 2020.

To answer the third problem statement, I explore the unemployment claims data and see how various demographics were impacted during the pandemic period. The following plot is a visualization of the unemployment claims in Norfolk County.

Figure 2. Unemployment claims in Norfolk County

OBSERVATIONS FROM FIGURE 2:

There is a very big rise in unemployment claims at the onset of the pandemic. This corresponds with the unemployment trend that we noticed in Figure 1. The unemployment claims also peak in April-May2020 and remain higher for the end of the year than they were at the beginning of the year.

Next step is to delve deeper into the unemployment claims and see how claims by gender, race, ethnicity and education level behave during this period.

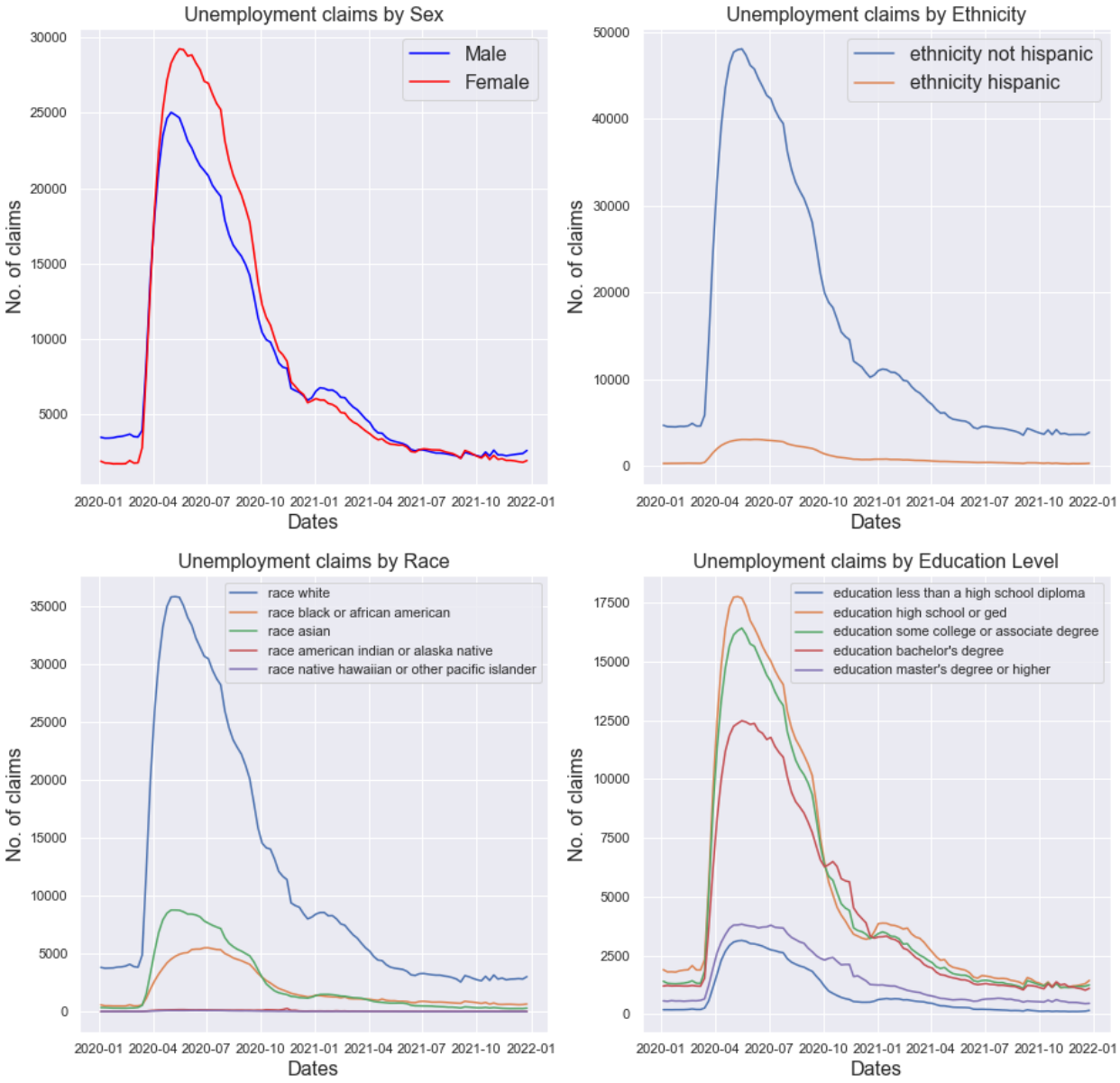

Figure 3. Unemployment Claims by Demographics

OBSERVATIONS FROM FIGURE 3:

1. From the first plot (top left corner), the number of unemployment claims applied by female-identifying people is more than for male-identifying people.

2. From the second plot (top right corner), people having a non hispanic ethnicity have applied for more unemployment claims as compared to people having a background of hispanic ethnicity.

3. From the third plot (bottom left corner), people of white race have applied for the most number of unemployment claims followed by Asians, black/African Americans. The races that have applied for the least number of unemployment claims are American Indians/ Alaskans and native Hawaiians/ Pacific Islanders.

4. From the last plot (bottom right corner), people having an educational background of high school/GED, some college or associate degree and bachelor's degree have raised the maximum number of unemployment claims. Interestingly, people having a master's degree or education level less than high school have applied for the least number of unemployment claims.

What is missing in these observations is that it does not take into consideration the proportion of distribution of the demographics in Norfolk County. To understand what proportion of the population by demographics applied for unemployment claims, I look into the demographic distribution in Norfolk County from the US Census Bureau.

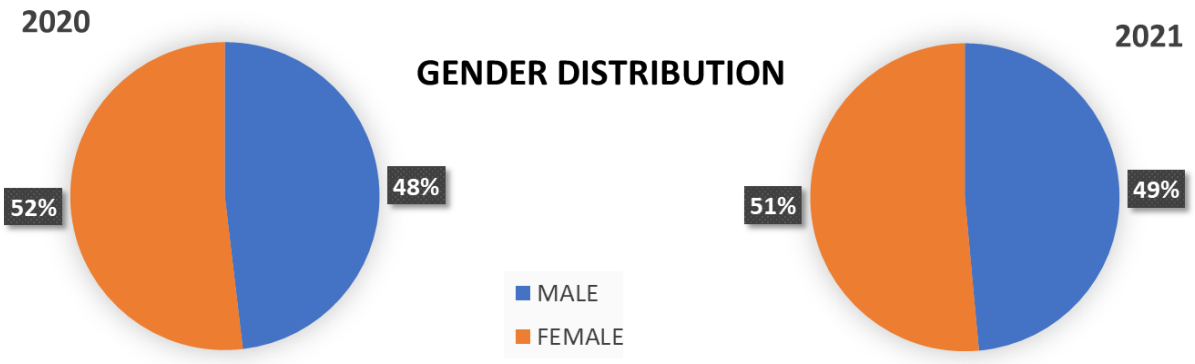

Figure 4. Gender Distribution in Norfolk County

Norfolk County has an approximately equal gender distribution with more female identifying population than male-identifying population in both 2020 and 2021.

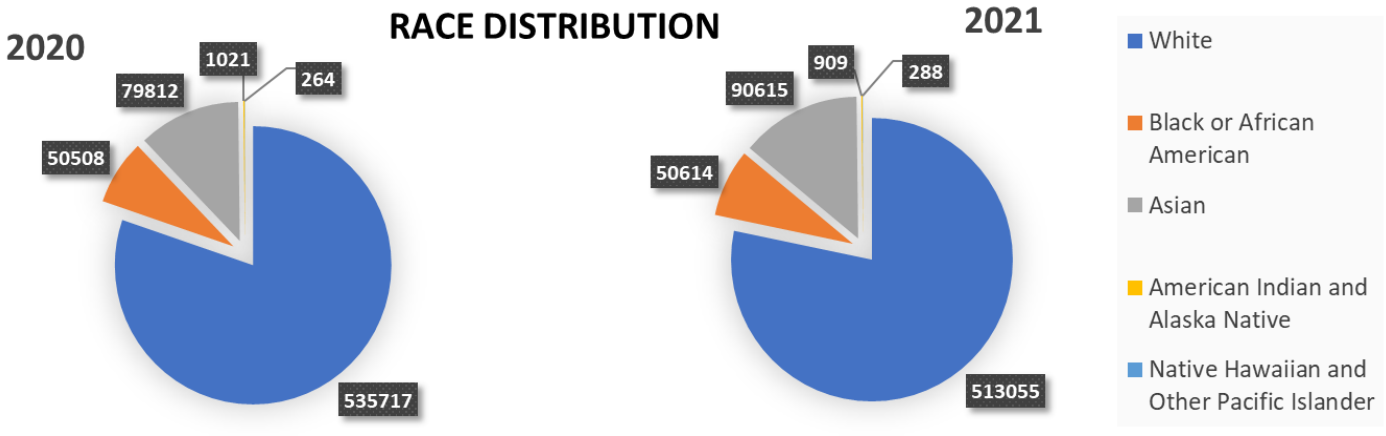

Figure 5. Race Distribution in Norfolk County

Norfolk County has a majority of White population followed by Asians and Black/African Americans. The distribution of American Indians, Alaskan Natives, Native Hawaiians and other Pacific Islanders is much smaller than the rest of the population in the county for both years.

Figure 6. Ethnicity Distribution in Norfolk County

Norfolk County has a majority of people with a not Hispanic background and there is no change in the distribution between 2020 and 2021.

The idea is to visualize the unemployment claims as a proportion of the population for each demographic category so that we can understand how many claims were raised by each community. It will also help us see if any communities were more impacted by the others.

However, such visualizations just reiterate our suspicions on minority communities being more affected by the pandemic in terms of employment than others. To be able to see if there is an actually statistically significant difference and help to confirm my suspicions, I am going to perform a two-tailed Z test for sex, ethnicity and pairwise test for Race. The primary reason for hosing the statistical tests is to ensure human centeredness in the project by using scientific thinking to craft a good, relevant and meaningful research questions. The assumption and limitations have been identified in the sixth section of the report.

5. Findings

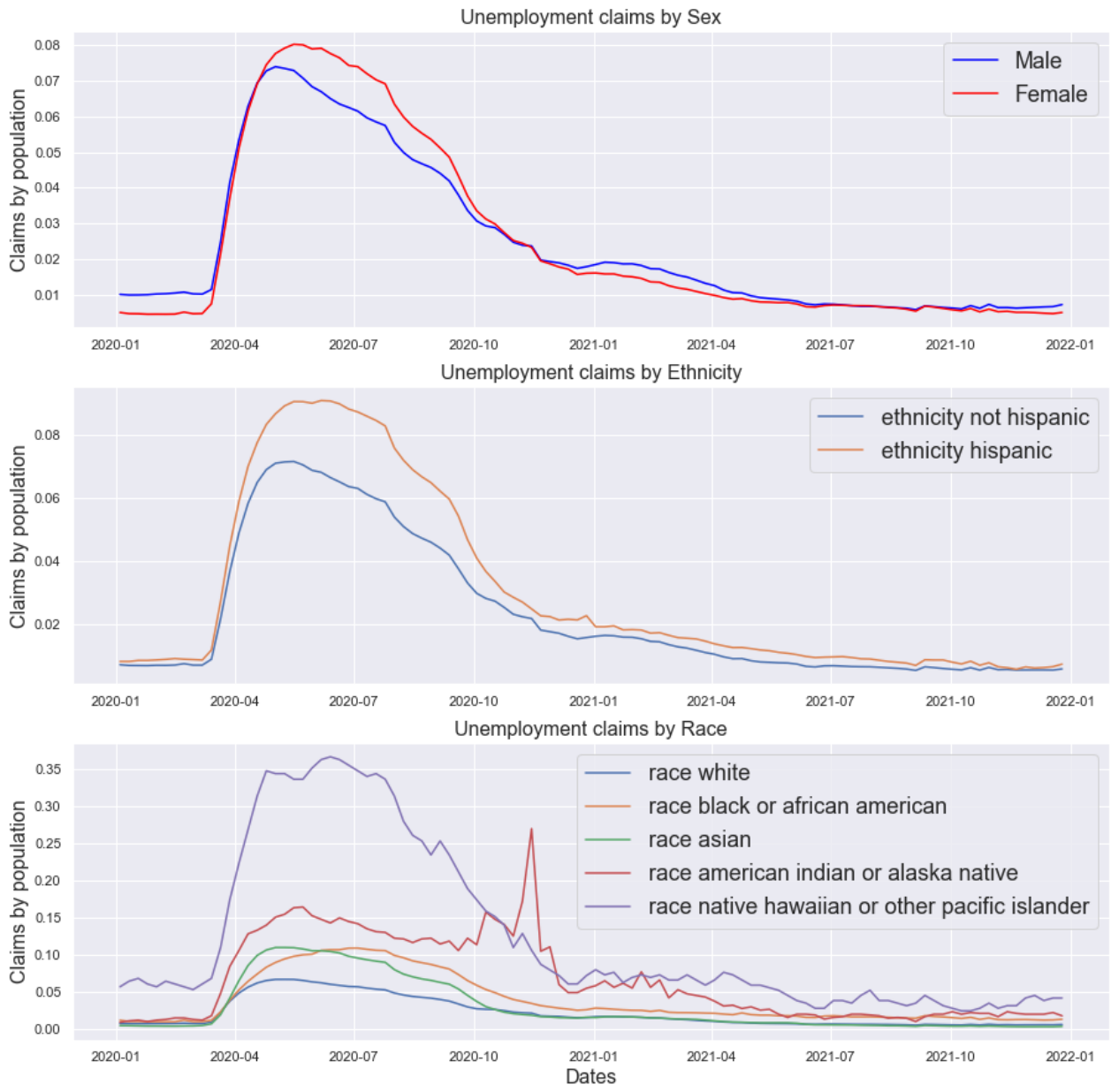

Figure 7. Unemployment claims as a proportion of demographic population

OBSERVATIONS FROM FIGURE 7:

1. The number of unemployment claims raised by the female-identifying population is still more than that raised by male-identifying population. However, it is noticeable that the gap between the two peaks is not as big as it was in the previous graph. There doesn't seem to be a significant difference between the number of claims between two gender categories.

2. Unemployment Claims by ethnicity is a stark contradiction to the previous graph. It can be seen that people of Hispanic ethnicity have raised much more unemployment claims especially at the peak which is closer to the onset of the pandemic.

3. Unemployment claims by Race is also a stark contradiction to the previous graph. Minority communities like the American Indians and native Hawaiians seem to have raised more number of unemployment claims followed by Asians and blacks/African Americans with the lowest number of unemployment claims being race by white people.

4. It can also be seen that the unemployment claims were much higher all throughout 2020 and decreased to a huge extent as we progress into 2021 which is when governments had started releasing economic relief packages to help people out.

Applying statistical tests to demographic proportions to test the hypothesis previously mentioned:

Hypothesis 1:

Null Hypothesis: The average number of unemployment claims raised by female identifying people is equal to the average number of unemployment claims raised by male identifying people.

Test: 2 tailed Z test

Test Results:

test statistic: -0.16969006442715895, p-value:0.8652538881885855

Conclusion: Since the p value is much greater than 0.05, we do not have sufficient evidence to reject the null hypothesis. This means the average number of unemployment claims raised by both make and female identifying population are equal.

Hypothesis 2:

Null Hypothesis: The average number of unemployment claims raised by people with Hispanic background is equal to the average number of unemployment claims raised by people with non-Hispanic background.

Test: 2 tailed Z test

Test Results:

test statistic: 1.9897214640854368, p-value:0.04662162691004829

Conclusion: Since the p value is less than 0.05, we have enough evidence to reject the null hypothesis. This means the average number of unemployment claims raised by people of Hispanic background is not equal to that raised by people of non-Hispanic background.

Hypothesis 3:

Test: Pairwise Z-test

Null Hypothesis: The average unemployment claims of all groups are equal.

Test Results:

S. No.	Group 1	Group 2	Test Statistic	p value
1.	White	African-American	-4.430770905568302	9.38968036676055e-06
2.	White	Asian	-1.936438272083813	0.0528140458792887
3.	White	American Indian/ Alaskan Natives	-7.552437276075564	4.27187395892061e-15
4.	White	Native Hawaiian/ Pacific Islanders	-9.070888939099634	1.18049927655561e-21
5.	African-American	Asian	1.900258513184823	0.05739920285609601
6.	African-American	American Indian/ Alaskan Natives	-4.292536298822846	1.76643661024265e-05
7.	African-American	Native Hawaiian/ Pacific Islanders	-7.380336251221838	1.57890258488529e-13
8.	Asian	American Indian/ Alaskan Natives	-5.593555230632853	2.22466412323793e-08
9.	Asian	Native Hawaiian/ Pacific Islanders	-8.11640224774663	4.80207182166821e-16
10.	American Indian/ Alaskan Natives	Native Hawaiian/ Pacific Islanders	-4.65015580297311	3.31684364696965e-06

Conclusion:

1. The p-value is greater than 0.05 for White race and Asian race which means we do not have sufficient evidence to reject the null hypothesis that the average unemployment claims raised by people of white race is equal to the average unemployment claims raised by asian people.

2. The p-value is greater than 0.05 for Black race and Asian race which means we do not have sufficient evidence to reject the null hypothesis that the average unemployment claims raised by people of black race is equal to the average unemployment claims raised by asian people.

3. For all other comparisons the p value is less than 0.5, which means that we have sufficient evidence to reject the null hypothesis. The number of unemployment claims are not equal among all other groups. Which indicates that certain groups have been more impacted than others by the onset of the pandemic.

6. Discussion/Implications

The results show us that marginalized communities/ minorities are impacted more at the onset of an unexpected disaster. Steps can be taken by the government and organizations in the face of such

disasters to help affected communities beforehand. These results help us understand what unemployment looks like during a pandemic. COVID 19 may not be the only pandemic that we humanity may have to face and by learning from the previous pandemic we can ensure that we plan the future better. This analysis is done for one county of one state. If this could be replicated on a larger scale, at the state/ country level, we may be able to find areas of improvement to prepare ourselves better. Another aspect of the research would be to not just rely on the quantitative data but also conduct qualitative research that can help us understand what people went through and what steps they think would have helped them better. Future works would include taking into account how each unemployment impacted different industries and what age groups were more affected - these have not been taken into consideration in the current analysis. There is a possibility that older people have applied for unemployment claims as compared to younger generation. Another aspect of research would be to do the analysis on the initial unemployment claims, and a combination of initial and continuing claims.

7. Limitations

Unemployment claims have been taken as a representation of the unemployment. It could be possible that there were more people who were affected but did not apply for the claims or maybe were not enrolled in such insurance programs. This analysis may not be the most accurate analysis of marginalized communities.

Unemployment claims can be broken down into two parts: Initial claims and Continuing claims. Initial claims represent all the new claims that have been applied for during the week and continuing claims is data on those continuing to apply for claims every week. This analysis is primarily focused on continuing claims. Initial claims have currently not been taken into consideration but can be included as a part of future works.

Races, Ethnicity and Gender are taken as per the buckets that the US Census Bureau uses to define the population. This is not representative of the entire population. For example, there could be people who identify with multiple races or do not identify themselves in the binary gender buckets. The datasets do not represent such people and hence they have been excluded in the analysis.

Assumption of independence between ethnicity, race and gender categories has been made for performing the Z test. Assumption of equal variance is not necessarily satisfied as shown below:

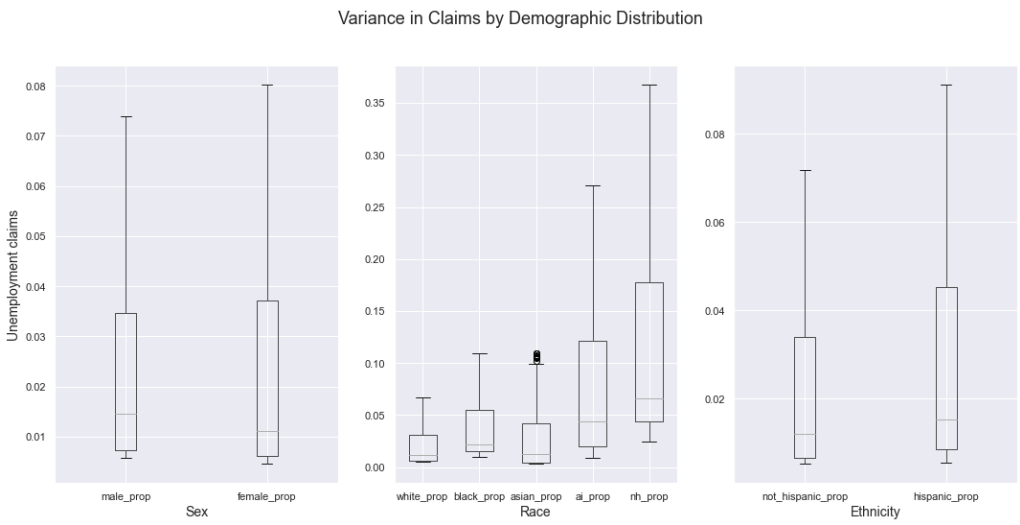

Figure 8. Variance in Unemployment Claims by Demographic

In the first part of the analysis, we assume the rise in COVID-19 cases and the peak in unemployment are related. But correlation does not indicate causation. The unemployment could have peaked due to multiple other reasons and the rise of confirmed covid cases may or may not be one of the direct causes for it.

This analysis also does not take into consideration the number of deaths, recovery rates or reinfected cases and its influence on the labor force.

8. Conclusion

To summarize this analysis, there is an increase in unemployment at the onset of COVID 19. However, as the cases continue to rise, we do not see any corresponding increase in the unemployment. In fact, the unemployment gradual decreases although the numbers are still higher than the numbers before pandemic. This points to how the economy and subsequently the employment is impacted in the face of an unexpected disaster. The economic relief packages released by the government throughout the course of the pandemic may have contributed to the unemployment claims peak coming down, however we do not exact causes for such high increase and decrease in the unemployment rates.

The results of the analysis of unemployment claims data by demographic show that marginalized communities or minorities are more effected by at the onset of pandemic. At the peak of unemployment it can seen that more number of women applied for unemployment claims and it was minority population that was applying for the most number of unemployment claims. We can take back these important lessons from this data and its findings to ensure that this kind of effect of marginalized communities can be mitigated in future events.

Human centeredness in the project comes from using statistical tests as a method for scientific thinking to craft a good, relevant and meaningful research questions. I have tried to identify all the assumptions and limitations that the analysis in the sixth section of the report. It is also ethical to take into consideration population statistics and not to resolve to meaningless observations from

the data provided. I have created a reproducible work, placed my work on GitHub with the required licenses and tried to communicate results in the best way possible to be able to broaden the potential impact of my work and to give peers the opportunity to build upon my work.

9. References

[1] Kantamneni N. The impact of the COVID-19 pandemic on marginalized populations in the United States: A research agenda. J Vocat Behav. 2020 Jun;119:103439. doi: 10.1016/j.jvb.2020.103439. Epub 2020 May 8. PMID: 32390658; PMCID: PMC7205696.

[2] *Jane Addams college of social work*. COVID-19: The Disproportionate Impact on Marginalized Populations | Jane Addams College of Social Work | University of Illinois Chicago. (n.d.). Retrieved December 12, 2022, from https://socialwork.uic.edu/news-stories/covid-19-disproportionate-impact-marginalized-populations/

[3] *Marginalized communities of color face high COVID-19 risk*. News. (2022, May 25). Retrieved December 12, 2022, from https://news.ucr.edu/articles/2022/05/25/marginalized-communities-color-face-high-covid-19-risk

[4] U.S. Bureau of Labor Statistics. (n.d.). *Unemployment rises in 2020, as the country battles the COVID-19 pandemic : Monthly Labor Review*. U.S. Bureau of Labor Statistics. Retrieved December 12, 2022, from https://www.bls.gov/opub/mlr/2021/article/unemployment-rises-in-2020-as-the-country-battles-the-covid-19-pandemic.htm

[5] Antipova, A., & Momeni, E. (2021, July 22). *Unemployment in socially disadvantaged communities in Tennessee, US, during the COVID-19*. Frontiers. Retrieved December 12, 2022, from https://www.frontiersin.org/articles/10.3389/frsc.2021.726489/full

[6] *Unemployment Rates During the COVID-19 Pandemic*. Congressional Research Service reports. (n.d.). Retrieved December 12, 2022, from https://sgp.fas.org/crs/

10. Data Sources

Primary sources of data:

1. ***Weekly Unemployment Claims Data:***
    - **Link to dataset:** https://lmi.dua.eol.mass.gov/lmi/ClaimsData
    - This data is hosted on a website operated by the Department of Economic Research and was funded by a grant awarded by the U.S. Department of Labor's Employment and Training Administration.
    - **Terms of Use:** https://www.mass.gov/terms-of-use-policy
    - **Dataset Description**: Initial and continued weekly Unemployment Insurance claims by county. Includes claimant demographics (gender, race and ethnicity), industry, occupation, and education.

2. ***Labor and Unemployment Data:***

- **Link to Dataset:** https://lmi.dua.eol.mass.gov/LMI/LaborForceAndUnemployment#
- This data is hosted on a website operated by the Department of Economic Research and was funded by a grant awarded by the U.S. Department of Labor's Employment and Training Administration.
- **Terms of Use**: https://www.mass.gov/terms-of-use-policy
- **Dataset Description**: Information on the labor force, employment, unemployment, and unemployment rates for each county in Massachusetts.

3. ***John Hopkins University COVID-19 data:***

- **Link to dataset:** https://www.kaggle.com/datasets/antgoldbloom/covid19-data-from-john-hopkins-university
- **Dataset Description:** The list of confirmed COVID cases by county.

Secondary sources of data:

1. ***Employment and Wages Data:***

- **Link to dataset:** https://lmi.dua.eol.mass.gov/LMI/EmploymentAndWages#
- This data is hosted on a website operated by the Department of Economic Research and was funded by a grant awarded by the U.S. Department of Labor's Employment and Training Administration.
- **Terms of Use:** https://www.mass.gov/terms-of-use-policy
- **Dataset Description:** Information on employment and wages is available by industry for counties in Massachusetts.

2. ***Race & Ethnicity Demographic Data:***

- **Link to dataset:** https://data.census.gov/table?g=0500000US25021&tid=ACSDT1Y2019.B03002
- **Terms of Use:** https://www.census.gov/data/developers/about/terms-of-service.html
- **Dataset Description:** Race and Ethnicity Demographic Data in Norfolk County for 2020 and 2021

3. ***Age and Sex Demographic Data:***

- **Link to dataset:** https://data.census.gov/table?g=0500000US25021&tid=ACSST5Y2019.S0101
- **Terms of Use:** https://www.census.gov/data/developers/about/terms-of-service.html
- **Dataset Description:** Age and Gender Demographic Data in Norfolk County for 2020 and 2021

4. ***Education Demographic Data:***

- **Link to dataset:** https://data.census.gov/table?tid=ACSST5Y2020.S1501&g=0500000US25021

- **Terms of Use:** https://www.census.gov/data/developers/about/terms-of-service.html
- **Dataset Description:** Education level Data in Norfolk County for 2020 and 2021