

A7: Project Report

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DATA 512

Evaluating Effects of a Global Pandemic on Arrest Rates and Police Violence in Broward, Florida

Introduction

The past two years have been shaped and characterized by a rare health crisis caused by the coronavirus, also known as COVID-19. In 2020, the infections of this virus spread rapidly across the globe causing a global pandemic and millions of casualties. The impact and effects that this health crisis has caused and will continue to cause is still being evaluated today as we are still in the midst of it in December 2021. The goal of this project is to focus on a small area of the world and shed some understanding of the ramifications of the pandemic on this area. In particular, we examine Broward County in the state of Florida and look at social and political aspects of this county at the time of the pandemic to comprehend the narrative that played out over the past year. What makes this study interesting for a county of the United States is that while there was a global pandemic going on for almost all of 2020, this year was also a time of important social and political change where a particular emphasis was placed on police reform and policies surrounding the law enforcement. Some events that prompted such change include the killings of George Floyd and Breonna Taylor, the Black Lives Matter protests, and the violence, looting, and demolition that ensued during the riots[1].

Background/Related Work

The recent deaths of George Floyd, Breonna Taylor, and Rayshard Brooks at the hands of police sparked widespread protests across the country against police violence and racial injustice in the United States. Despite making up only 13% of the US population, Black people make up 27% of victims of police killings, they are also 3.5 times more

likely than white people to be killed by police when they are unarmed and unthreatening, George Floyd is an example. [2] A series of changes were made in police body and dash cameras after the beatings of Rodney King by LAPD in 1991. [3] Even though video proof has increased the number of police officers being charged, it still falls short in holding them accountable for the killings they have committed.

In terms of illustrating the disparities that exist in law enforcement, the Mapping Police Violence authors utilize a variety of visualizations to represent trends, patterns, and statistics for police violence in the United States. To represent temporal and geospatial patterns a heat map was used to depict days in a year with the most killings, geographical map of the United States to show where each killing has taken place, time series graph to show rates of police killings, along with bar charts to show the disproportions in killing rates. In terms of getting into lower level details through filtering and sorting users are able to filter the killing rates by several categories including gender, agency, and race and filtering the killings by department, states, year, etc. Users can also filter killings on similar categories to get into the details of each killings at the end of the dashboard.

The research questions I want to answer with this study is:

1. How do arrest rates in Broward, Fl. compare in a 2019 (non-covid year) vs. 2020?
2. Who is more likely to be a victim of police violence in Broward county?

Methodology

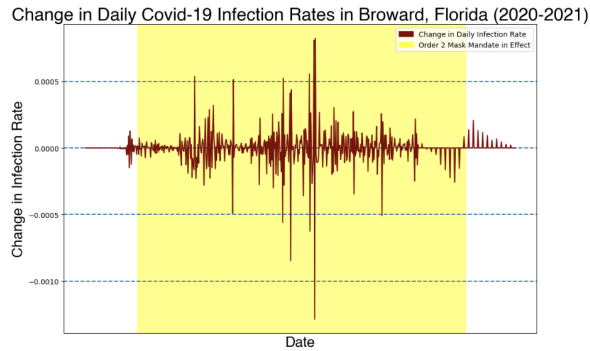
The analysis for this study is broken down into two parts. In part one of the analysis, our primary goal is to understand what the pandemic was like for residents of Broward county, how government officials responded, and the attitudes of residents. The types of data we look at include infection rates, masking mandates, and overall mask compliance of residents. The analysis for this part includes descriptive statistics of mask compliance attitudes and a data visualization illustrating the county's confirmed cases and masking policies over the past year. All the analysis for part one is conducted using the Python programming language in the Jupyter Notebook environment. With the insights we get from this type of data, we're able to acquire a more informed understanding of the general health and the social and political responses and attitudes of this county.

In part two of the analysis, I hope to learn the unique story of Broward county and understand how it fits in the context of a profound moment in history. The data I'm interested in are the arrest rates and police violence tendencies in this county to potentially provide more insight into the law enforcement trends and issues happening in the United States. For arrest rates, I conduct a simple percent change analysis to get an overall idea of what crime was like during the pandemic compared to a non-pandemic year (2019). Next I do a two-sided comparison of two proportions statistical inference test to see whether this change is significant and should be something worth investigating further. Lastly, since we're dealing with count data and we're trying to model the number of victims to police violence in Broward county, I do a Poisson regression analysis with the police violence dataset to find out what type of people are victims in this county and if there are meaningful disparities that are worth exploring. The predictors of our model are race, gender, if the suspect had a mental illness or not, if the suspect was armed or not, and did the police officer have a body camera at the time of the incident. I then compute the relative risk associated for each group of individuals. The tools we use in the second part of the cleaning and analysis includes excel, SPSS, and R Studio. This problem is human-centered in nature as we are primarily interested in providing context to our story: the characters, the setting, the resolutions, etc. Additionally, as depicted in the human-centered framework, the design, the development, and the goal of the project is motivated by human perspectives and ideals.

Findings

We summarize our findings in this section of the report. In the middle of 2020, from July 2 and July 14, the New York Times distributed a survey on mask use and received about 250,000 response. From the mask compliance survey results, we see that the estimated response for Broward county to the following question, "How often do you wear a mask in public when you expect to be within six feet of another person?" is 79.1% for 'always' and the 2.6% for 'never' illustrating that residents are more inclined to stop the spread of the virus by adopting masking protocols.

Next we look at infection rates in Broward along with the mandates were placed on this county. The data visualization I created represents the change in daily COVID-19 infection rates in the county,



Broward, Florida. The temporal coverage is from January 23, 2020 to October 29, 2021. The data used to produce this graphic comes from several sources. The first source is confirmed cases of COVID-19 data from John Hopkins University used in counting in the numerator for daily infection rates.

Being that 'the daily numerical population change is assumed to be constant' as noted by census.gov, we make the simplifying assumption that the denominator for population at risk is a fixed constant in the daily totals throughout this time interval. Once daily infection rates are computed, we take the derivative of that function to get change in daily infection rates over time. The second data set used in this graph comes from the Centers for Disease Control and Prevention (CDC). In the dataset, "U.S. State and Territorial Public Mask Mandates From April 10, 2020 through August 15, 2021 by County by Day" data was collected "to determine when members of the public in states and territories were subject to state and territorial executive orders, administrative orders, resolutions, and proclamations for COVID-19 that require them to wear masks in public". One of the important codings to take note of in this dataset is the *Face_Masks_Required_in_Public* attribute where they represent "a requirement for individuals operating in a personal capacity to wear masks 1) anywhere outside their homes or 2) both in retail businesses and in restaurants/food establishments." Moving to the data visualization, on the x-axis we have the date and on the y-axis we have the change in daily infection rates. The yellow shaded area represents the days in which mandates were set in place for residents of Broward corresponding to Order 2. Additionally, as represented in the legend, the maroon line represents the time series of the change in daily infection rates. One of the major things to note about this visualization is that the right end of the graph isn't representative of the change in daily infection rates. From June 2021 to present, instead of daily totals, the dataset only contained what I assume to be weekly cumulative totals. I make this assumption as 6 days prior to each Saturday in June, the daily totals are 0. Additionally, the daily infection rates would be significantly higher than previous months which leads me to believe that they aren't representative of the daily infections. Regardless, from this graphic we can see that for the first few months, there isn't much variability in the change in infection rates as they are relatively low. However, as we move along the x-

axis, we can see that the data becomes more variable with peaks and dips in infection rates. From this visualization we cannot really say much in terms of the relationship between daily infection rates and masking mandates as we only have order type 2 from our dataset.

In the second part of our analysis, we start by looking at a simple percent change of arrests rates in the year before the pandemic, 2019, and compare it with 2020. The yearly counts of arrests against another person are collected from Florida Department of Law Enforcement. These types of arrests include rape, homicides, and aggravated assaults. After standardizing the rates using data from [census.gov](https://www.census.gov), we conduct the percent change analysis that yields a couple interesting insights. The first thing to note is that for every type of arrest, we see a decline in the percent change, showing that not as many arrests were made in 2020 vs. 2019. Another interesting thing to note is that among all the rates from 1998-2020, the rates for 2020 were at an all time low for 6 of the 9 types of arrests categories.

	RATES PER 100,000			Note
	2019	2020	Percent change	
Crimes against peoples arrest	289.4503375	257.0491803	-11.19402985	ALL TIME LOW
Aggravated Assault arrests	85.0144648	82.03150113	-3.50877193	ALL TIME LOW
Forcible Sex Offense arrests (rape/fondling)	3.96014434	3.291546127	-16.88311688	ALL TIME LOW
Homicide (murder/arrests)	3.085824494	2.931533269	-5	
Intimidation Arrests	2.62295082	1.182899389	-54.90196078	
Kidnapping/Abduction arrests	1.080038573	0.565734491	-47.61904762	
Nonforcible Sex Offense arrests	8.177434908	4.423015108	-45.91194969	ALL TIME LOW
Simple Assault arrests	194.4583735	167.6117004	-13.80587146	ALL TIME LOW
Miscellaneous arrests	1347.065252	699.2992607	-48.0872022	ALL TIME LOW

The next thing we're interested in is whether or not these changes in proportions of arrests are meaningful or not. From the two-sided difference of two proportion test, I report the confidence intervals along with decision of our hypothesis test. For six out of nine types of arrests, we do not have sufficient evidence to say that their is a meaningful change between the two years. However, for crimes against peoples arrest, simple assault arrests, and miscellaneous arrests, we do have sufficient evidence to reject the null hypothesis.

Lastly, we model the number of victims to police violence in Broward county. To do with we do a poisson regression on several predictors. Some things to note about the model

is that it has a temporal coverage that corresponds to our infection rates analysis, there are 443 observations removed out of 1587 due to missingness in the data, and we account for over-dispersion in our model. Our reference groups are white, male, suspect has no mental illness, suspect is not armed, and police officer did not have a camera at the time of the incident. I report the relative risk associated for each group and discover several significant disparities. The first finding is that among the four gender categories: male, female, transgender, and unknown, females are about 70% less likely to be killed by police in Broward county than their Male counterparts. Among suspect's race: white, black, indigenous, asian, pacific islander, black individuals are 100% more likely to be killed by police in Broward county than their White counterparts. Among suspect's mental illness condition, people with mental illness are 70% more likely to be killed by police in Broward county than people with no mental illness. For the remaining predictors, armed status and police officer in possession of a body camera at the time of the incident, we do not see any significant disparities for each group.

Discussions/Implications

When designing the second part of my analysis, I struggled with figuring out how to extend upon the first part. What kind of problem did I want to look into and how to I approach such a problem in human-centered fashion. I started to focus in on the acronym I created in my brain at the beginning of the quarter, Audience, Purpose, and Context, APC. Who do I want my audience to be? What do I want to say with this problem? Why is this problem important? Framing the project in such a way made it much easier on the design front. The audience for my problem are the people of Broward county, law enforcement agencies, and elected officials and policy makers. The purpose of this research is to focus in on a particular part of the United States during the pandemic and examine a systemic issue of police violence. With several political and social events surrounding this problem occurring during a global pandemic, it was obvious why this problem is important. People are furious with racial injustice ingrained in the law enforcement system and are putting their foot down and demanding change. My goal for this project is to contribute to our understanding of this injustice.

In the first part of this study, one insight is that majority of the people of Broward county are willing to comply to masking mandates and stop the spread of the deadly virus by masking up when they are within six feet of another person. This illustrates that at the individual level, people care about minimizing the deadly effects of the virus and

protecting their community. With the virus being highly infectious, we can see that although there is initiative from the people, the spread of the virus persisted throughout the year with highly variable daily infections rates. In the visualization, that the peaks and valleys show the best and worst days where the change in infections rates were at it's highest and lowest. At the second part of our study, we delve into more interesting insights on the law enforcement front. First off, in our analysis of arrests rates, we can see that the total number of arrests went down for every type of arrests for crimes against another person. This could mean that there was less opportunity to commit these crimes as people were minimizing interactions with others during the pandemic or maybe that residents were less inclined to commit such crimes as they themselves had to deal with the ramifications of the virus. When we examine the results of our poisson regression model for the number of victims of police violence in this county, we see that there exists significant disparities in gender, race, and mental illness. These disparities potentially echo similar stories that other counties in the United States are experiencing and hinting at a systemic injustice in law enforcement behavior, policy, and decision making.

Limitations

There are some clear limitations that exist in this study and in this section we highlight and discuss them. First we'll cover some of the limitations with the data used in this project. In the COVID-19 data from John Hopkins University we makes several assumptions about the data before our analysis. First we make the simplifying assumption that the denominator for population at risk is a fixed constant in the daily totals throughout this time interval. This may not necessarily be the case as we could have seen highly probable effects on the death and birth rates of this county. This assumption also doesn't account for daily deaths meaning that the people at risk yesterday who could have died a covid-related death is still a person at risk throughout the year. Although this assumption is a clear flaw, I do not think it has great impact on the insights of the analysis. In the mask mandate data, one clear limitation is that we simply don't have data on all the masking policies that were placed on this county. There were orders on the national, state, and local level that could have had effect on infection rates. Since we only have one type of mandate, there isn't much insights we can extract from that part of the analysis. With the mask-wearing survey data, there are several limitations that we need to take note of. The data doesn't account for change in masking compliance as the data was only collected for about two weeks which may not

be representative of the attitudes throughout the pandemic. Additionally, this data was collected via survey responses and the weighted average of the 200 nearest responses that corresponded with the zip codes which may not be representative of Broward county's actual population. In the second part of the analysis, one thing to note about the arrests dataset is that there doesn't seem to be a data dictionary or meta-data on the dataset so we make the assumption that the data that the Florida Department of Law Enforcement is exhaustive and accurate.

Conclusion

Despite these limitations, we do not completely disregard the implications of this study. The people of Broward county care about minimizing the effects of the pandemic and protecting their community. On top of that, we clearly saw a decrease in arrest rates for every type of category for crimes against another person which is worth asking and understanding why this was the case for the first year of the pandemic. Another thing to point out is that racial disparities in law enforcement is a systemic issue that transcends across the United States, and Broward county is no exception. Black individuals are killed at a much higher rate than their white counterparts and it is important that this disparity is understood and minimized to its full extent. The pandemic has not only had an impact on the health of the population, but it has also caused us to take a closer look at the important social and political issues that were and are potentially exacerbated by the pandemic. While it is important that we protect ourselves and others in these trying times, we must also keep in mind and correct the injustices ingrained in our systems.

References

[1]: <https://www.nytimes.com/article/george-floyd-protests-timeline.html>

[2]: <https://mappingpoliceviolence.org>

[3]: <https://www.aclusocal.org/en/news/long-after-rodney-king-we-need-transparent-policing-more-ever>

Data Sources

Analysis Part 1

- Confirmed Cases: https://www.kaggle.com/antgoldbloom/covid19-data-from-john-hopkins-university?select=RAW_us_confirmed_cases.csv
 - License: <https://creativecommons.org/licenses/by/4.0/>

- Mask Mandate: <https://data.cdc.gov/Policy-Surveillance/U-S-State-and-Territorial-Public-Mask-Mandates-Fro/62d6-pm5i>
- Mask Compliance: <https://github.com/nytimes/covid-19-data/tree/master/mask-use>

Analysis Part 2

- Arrests for Crimes Against Another Person: <https://www.fdle.state.fl.us/FSAC/CJAB-Home/Uniform-Crime-Report/Individual-Crime/Arrests/Persons>
- Broward Population Data: <https://www.census.gov/quickfacts/browardcountyflorida>
- Mapping Police Violence: <https://mappingpoliceviolence.org>