Analysing the effects of COVID-19 on Crime in the United States*

A deep dive into criminal activity during the pandemic

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Abstract

The COVID-19 pandemic caused the various state-level governments in the United States to issue stay-at-home orders in early 2020. These policy measures resulted in sweeping impacts on the everyday life of people with mostly negative implications. The more negative implications of the pandemic have generally eclipsed the more positive aspects such as the reduction of crime rates by 37% worldwide (Boman and Mowen 2021), and also the noticeable drop in carbon emissions (Bauwens et al. 2020) and elevation of air quality around the world—in turn reducing pollution-related respiratory issues (Dutheil, Baker, and Navel 2020). While crime rates globally have gone down, it is also important to take a granular look at the crime data to observe which types of crimes have been most affected, and further, examine if there is a significant correlation between crime rates and COVID-19 cases — which is precisely the goal of this study. We achieve our goal of analyzing the pandemic data in conjunction with crime data obtained from the official city websites through time series modeling and also exploratory data analysis focusing on the criminal activity in key US cities such as Chicago, Los Angeles, Philadelphia, and Seattle. Each city has been chosen specifically to reflect different American aspects, geographical as well as socio-economic, to enable us to form more generalizable as well as granular conclusions.

Keywords: COVID-19 Pandemic, Criminal Behaviour, Time Series Modelling, Correlation, Dataset Creation, Criminal Psychology

1 Introduction

The COVID-19 pandemic caused the various state-level governments in the United States to issue stay-at-home orders in early 2020. These policy measures resulted in sweeping impacts on the everyday life of people with mostly negative implications. The onset of the pandemic brought with it a host of other issues like job losses, unemployment, financial crisis, and mental health issues. The pandemic also forced people to stay at home for prolonged periods, sometimes over a month, which seemed to have exasperated opioid abuse and also relapse of a host of other addictions. Furthermore, it has also been shown that the pandemic has led to increased stress and anxiety levels among individuals (Boman and Gallupe 2020). These negative implications of the pandemic have generally eclipsed the more positive aspects such as the reduction of crime rates by 37% worldwide (Boman and Mowen 2021), and also the noticeable drop in carbon emissions (Bauwens et al. 2020) and elevation of air quality around the world—in turn reducing pollution-related respiratory issues (Dutheil, Baker, and Navel 2020). While crime rates globally have gone down, it is also important to take a granular look at the crime data to observe which types of crimes have been most affected, and further, examine if there is a significant correlation between crime rates and COVID-19 cases — which is precisely the goal of this study.

The main goal of our paper is to examine the effect that the pandemic has brought in terms of specific crimes such as assault, battery, criminal theft, and much more based on state-level crime data within the United States. The main motivation behind this research is the scarcity of work examining the effect of

*Code and data are available at: https://github.com/the-infiltrator/COVID-19-Crime

the pandemic on crime, even though there has been a lot of work done examining other aspects concerning the pandemic. News stations have consistently reported lower crime rates but have based their analyses on simply the rate of 911 calls and not actual police data. We aim to bridge this gap by focusing on the criminal activity in key US cities such as Chicago, Los Angeles, Philadelphia, and Seattle. Each city has been chosen specifically to reflect different American aspects, geographical as well as socio-economic, to enable us to form more generalizable as well as granular conclusions.

The key motivation for our work is previous work showing that certain crimes like domestic violence saw a significantly smaller drop as compared to other crimes after the onset of the pandemic (Bullinger, Carr, and Packham 2020), indicating the importance of the nature of the actual crime committed. Our focus on individual city data is due to known data collection issues for such research (Boman and Gallupe 2020) and is motivated by preliminary studies showing that the crime rates for specific crimes are largely dependent on the city (Ashby 2020). There are also other factors such as the George Floyd protests in June 2020 that we hypothesize may have resulted in a noticeable increase in the vandalism and theft crimes in certain cities.

Overall, our paper is a small contribution building upon and motivated by several recent papers that have covered the impact of the pandemic on the human psyche and crime rates across different states and countries Nivette et al. (2021) alongside work prompting further research in the area (Eisner, Nivette, et al. 2020). We achieve our goal of analyzing the pandemic data in conjunction with crime data obtained from the official city websites, using R statistical programming (R Core Team 2020), through time series modeling and also exploratory data analysis.

In the following section, we outline how data for this study was collected alongside an overview of the data. In Section 3 we outline, in detail our modeling approaches and in Section 4 the results are provided for each city. We conclude our study with a detailed discussion in Section 5, explaining some of our key findings and conclusions.

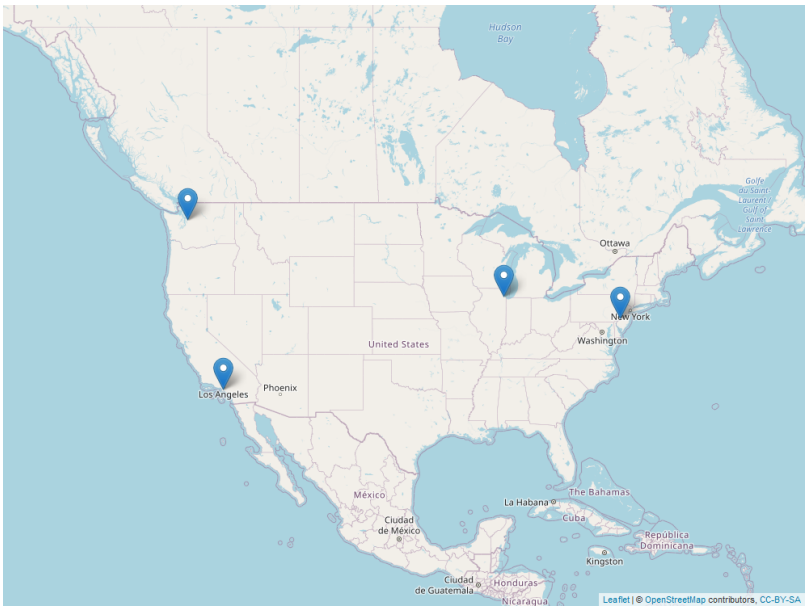

Figure 1: Geographical overview of the cities being examined under this study.

2 Data

The primary data set used is publicly available from the the R, COVID-19 Data Hub (Guidotti and Ardia 2020) containing a daily summary of COVID-19 cases, deaths, recovered, tests, vaccinations, and hospitalizations for 230+ countries, 760+ regions, and 12000+ administrative divisions of lower level including policy

measures, mobility, and geospatial data. Furthermore, we use city data for each city involved in our study to examine the crime rates across the pandemic and the city-wise data sources are outlined below alongside exploratory analyses of both COVID-19 and crime data.

2.1 Chicago

The city of Chicago was chosen for this analysis because it has the highest crime rates in America. The gang culture and gun laws have made Chicago the hub of specifically violent crimes, with higher homicide rates on average as compared to other cities. Furthermore, during the early stages of the COVID-19 pandemic, it was found that Chicago was one of the first few cities to harbor several virus strains (Anderson, n.d.), leading to a disaster proclamation by then Governor Pritzker. Chicago has since then seen roughly three waves of the virus as shown in Figure 2. The data for the city of Chicago was sourced from the Chicago police, spanning six main categories of criminal activity which are assault, battery, criminal damage, deceptive practices, vehicle theft, and general theft.

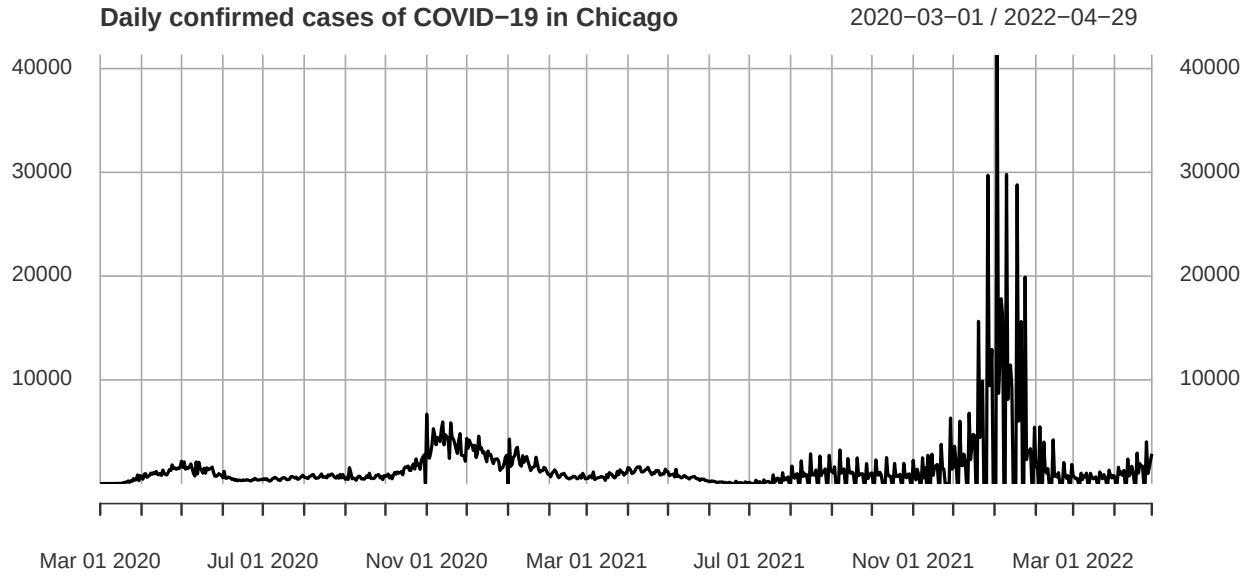

Figure 2: Daily Confirmed Cases of COVID-19 in Chicago

When closely examining yearly trends for the different crimes, Figure 3, it can be observed that theft rates and battery noticeably went down in March of 2020 while crimes like assault and Vehicle Theft remained steady. Furthermore, it can be observed throughout the pandemic, these levels remained relatively consistent throughout 2021 and 2022.

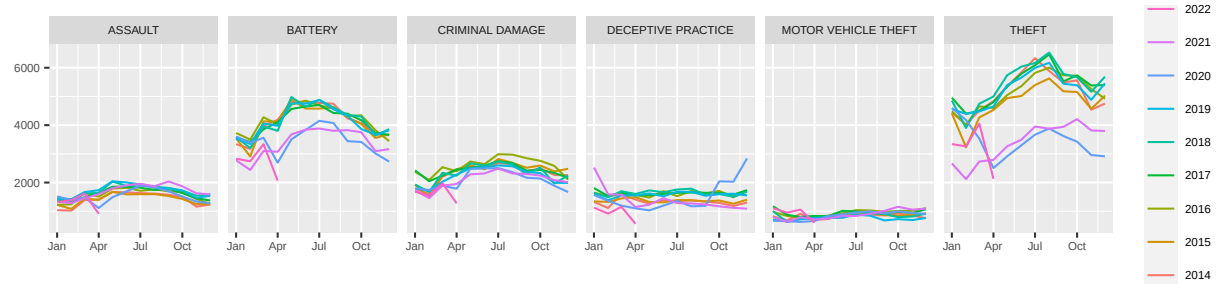

Figure 3: Yearly Trends for the top five crimes in Chicago

In general, it is also noted that most crimes, with the exception of vehicle theft and deception, went up generally in summer and then reduced when the temperatures fell for winter, indicating a seasonal trend. Finally, a more granular look at the frequency of each crime only during the pandemic, as shown in Figure 4, shows that most crimes during the pandemic remained relatively consistent with the exception of criminal damage and theft. A sudden uptick in criminal damage and theft is noted in June 2020, which can be attributed to the violence caused by certain bad actors during the George Floyd Protests.

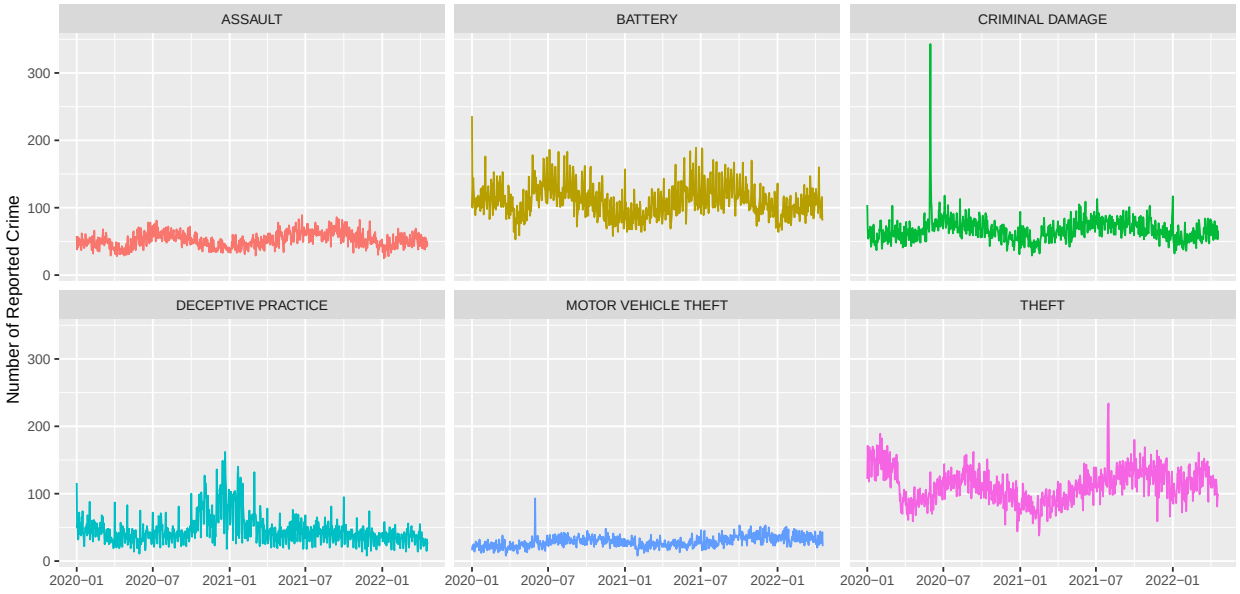

Figure 4: Frequency of each crime in Chicago during months spanning the COVID-19 pandemic.

2.2 Los Angeles

Los Angeles, located in California, has historically been a hub of criminal activities mainly centered around narcotics due to its proximity to Tijuana and in general the US-Mexico border. Crime in Los Angeles is also prevalent due to the presence of one of the largest populations of homeless people in the United States mostly within the Skid-Row locality. Los Angeles was at the peak of criminal activity between 1970 and 1990, and more recently in 2015, it was revealed that the Los Angeles Police were under-reporting criminal activity for roughly 8 years, artificially lowering the crime rates and making it an intriguing city to examine from a data perspective (Bird et al. 2018). To examine the crime rates within the city we source data directly from the Los Angeles Police Department Socrata API and look at the top five crimes which are mainly variants of burglary and theft crimes, alongside vehicle theft and assault. Finally, as shown in Figure 5, the pandemic had a significant impact in Los Angeles with some of the first patients of COVID-19, including "patient zero", being from Los Angeles. California overall also faced a severe health crisis with cases up to ten times more than were anticipated.

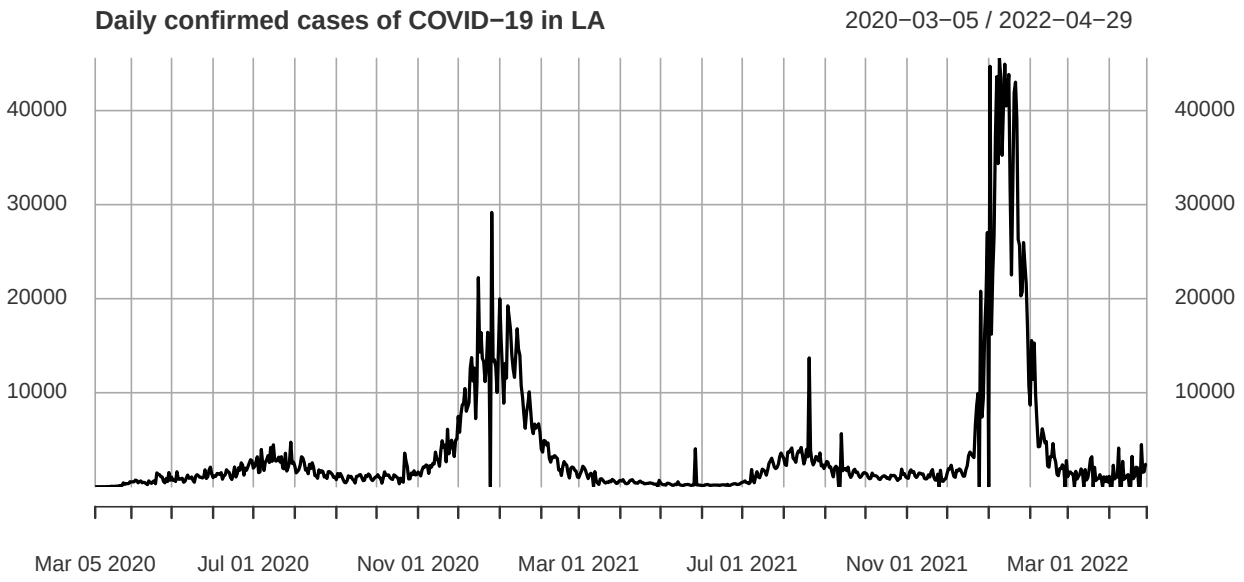

Figure 5: Daily Confirmed Cases of COVID-19 in L.A

Further examining yearly trends for several crimes, based on Figures 6 and 7, it was found that several crimes like battery/assault, vehicle theft, and burglary increased. The noticeable increase in these crimes remained consistent for years spanning the pandemic, although a noticeable drop in battery, burglary, and vehicle theft was observed in January 2022.

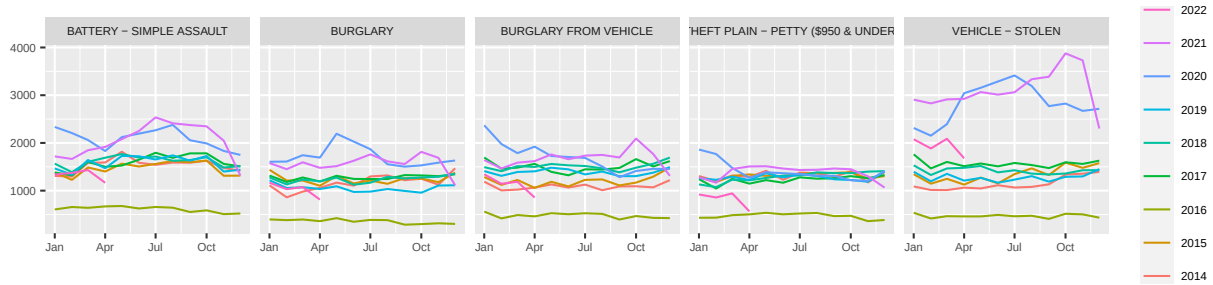

Figure 6: Yearly Trends for the top crimes in Los Angeles

2.3 Seattle

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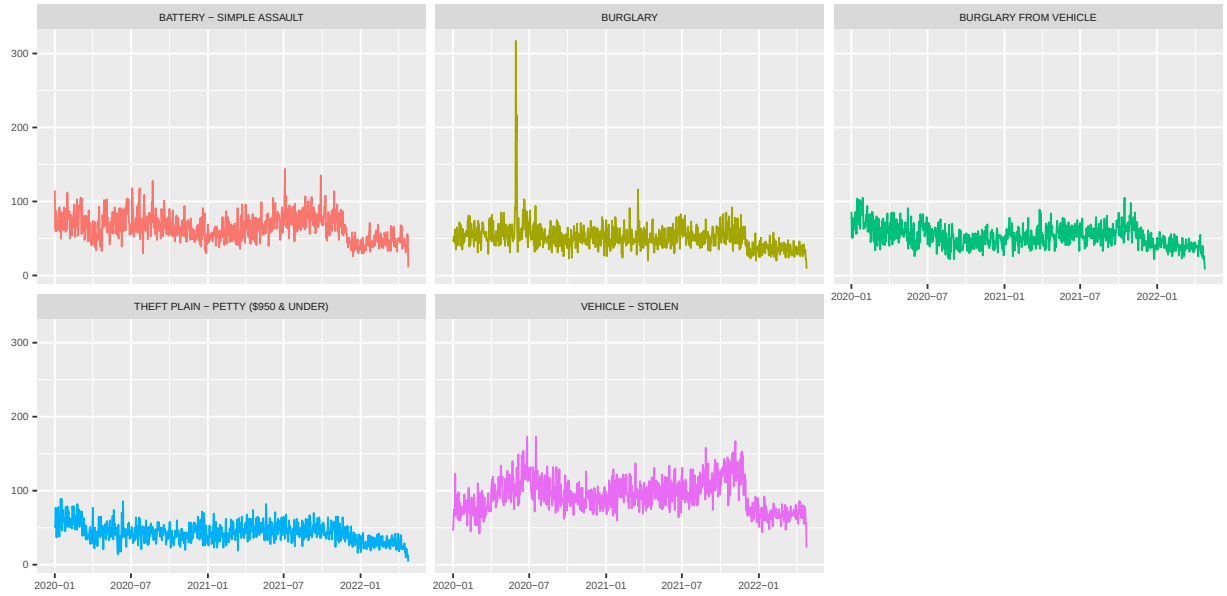

Figure 7: Frequency of each crime in LA during months spanning the COVID-19 pandemic.

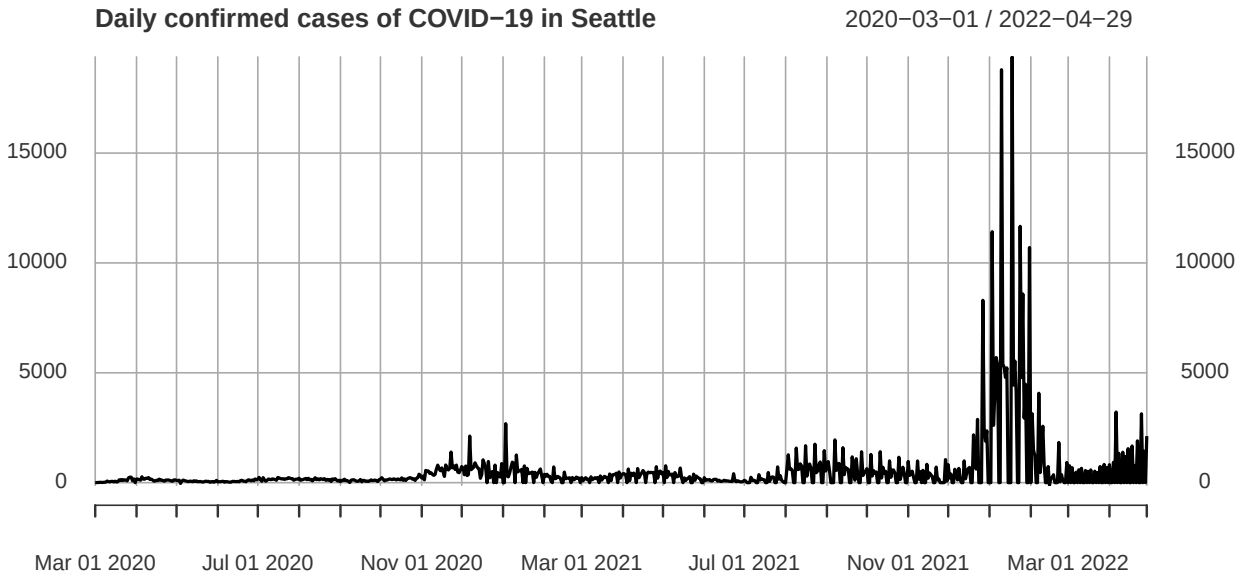

Figure 8: Daily Confirmed Cases of COVID-19 in Seattle

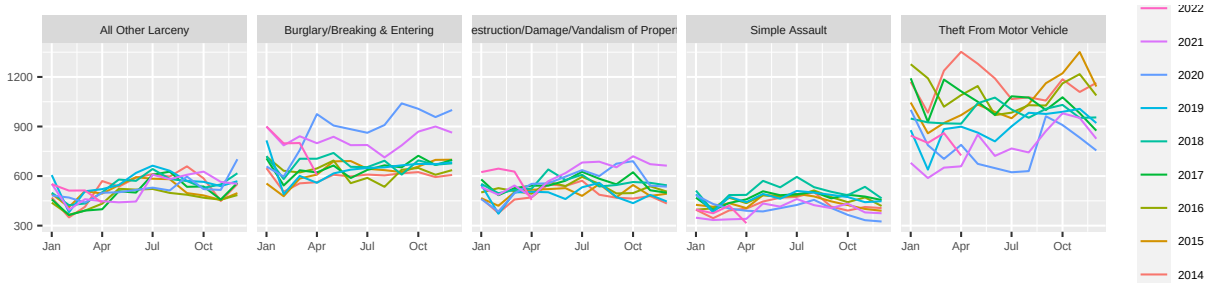

Figure 9: Yearly Trends for the top crimes in Seattle

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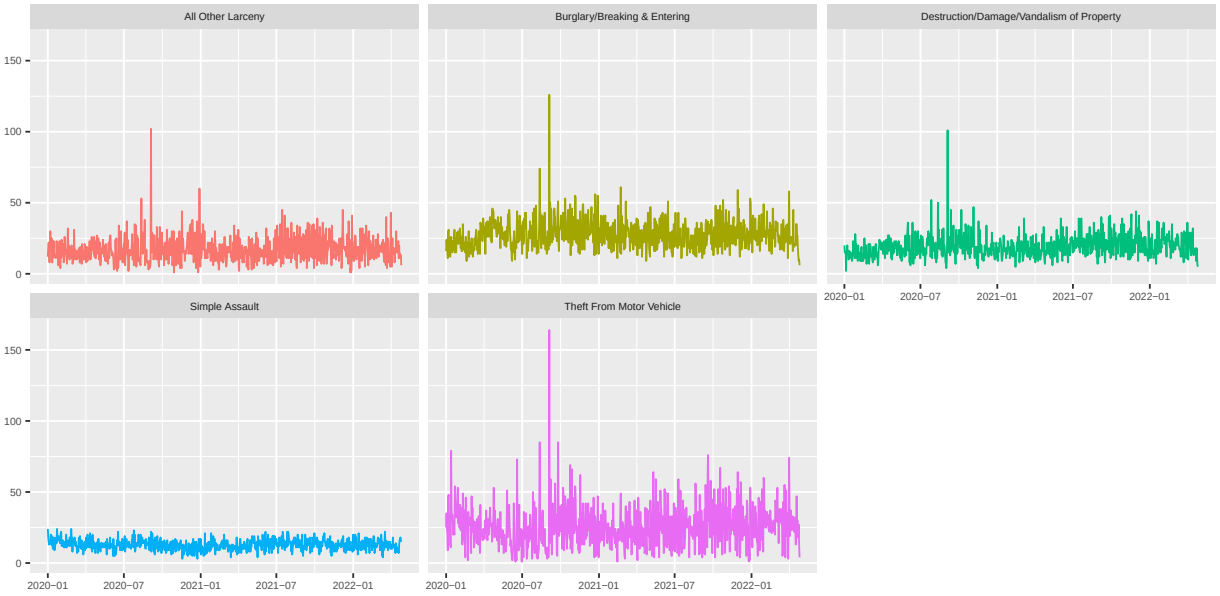

Figure 10: Frequency of each crime during months spanning the COVID-19 pandemic.

2.4 Philadelphia

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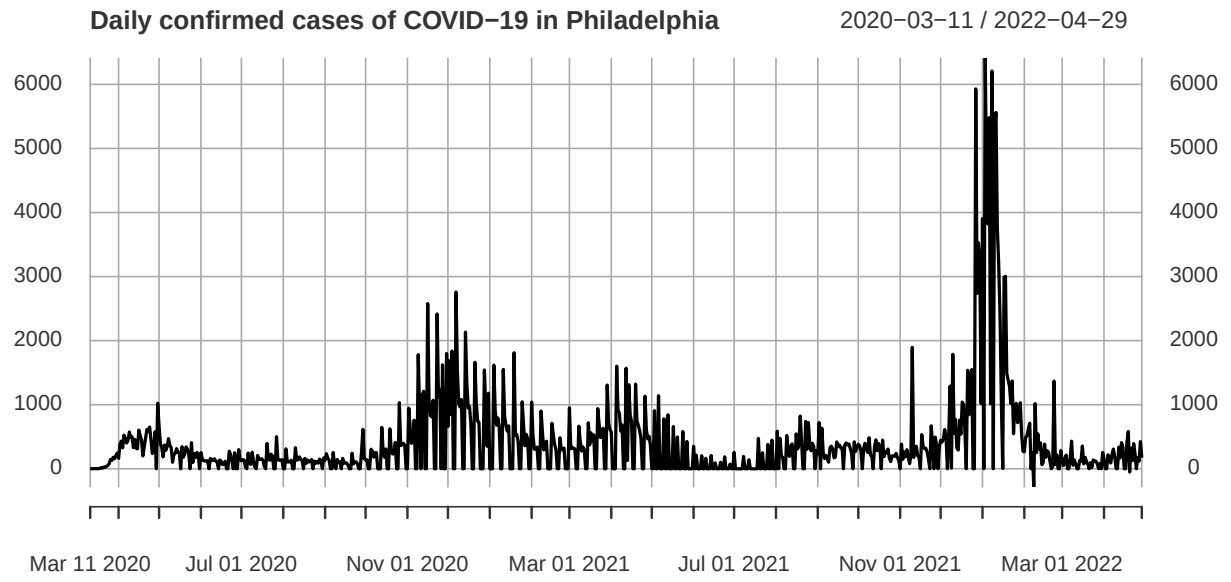

Figure 11: Daily Confirmed Cases of COVID-19 in Philadelphia

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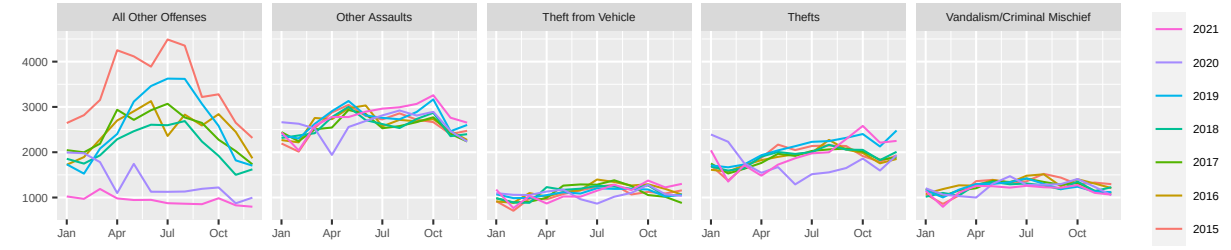

Figure 12: Yearly Trends for the top crimes in Philadelphia

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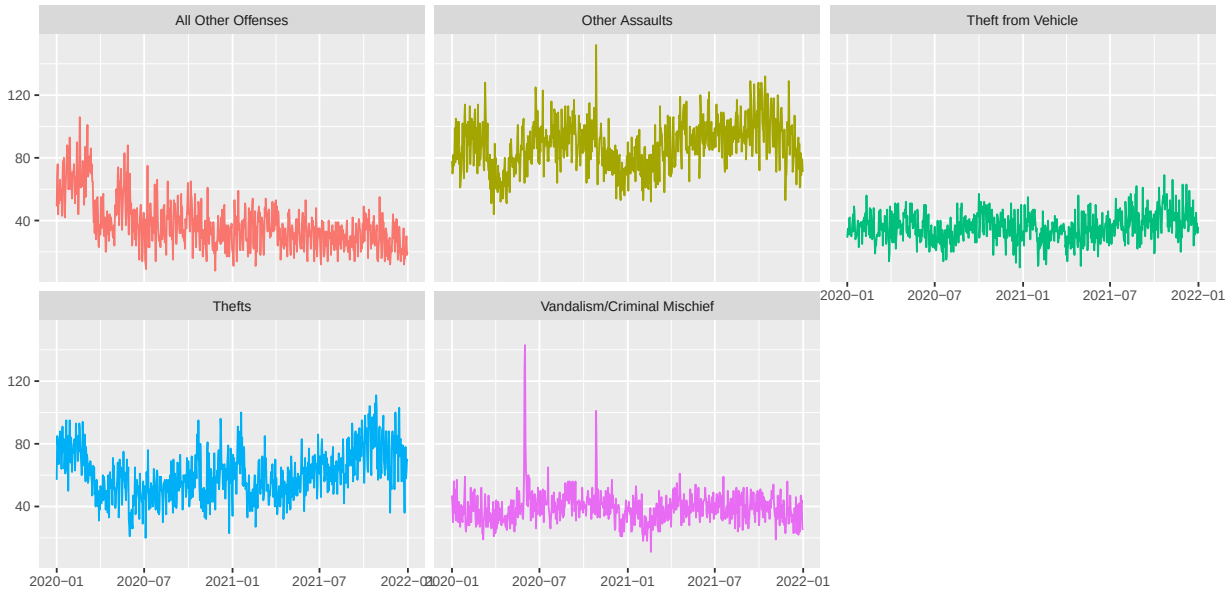

Figure 13: Frequency of each crime during months spanning the COVID-19 pandemic.

3 Methods

3.1 Vector autoregression Model (VAR)

Vector autoregression (VAR) is a statistical model used to capture the relationship between multiple quantities as they change over time. VAR is a type of stochastic process model. VAR models generalize the single-variable (univariate) autoregressive model by allowing for multivariate time series. VAR models are often used in economics and the natural sciences. A pth-order VAR is denoted "VAR(p)" and sometimes called "a VAR with p lags". A pth-order VAR model is written as

$$y_t = c + A_1 y_{t-1} + A_2 y_{t-2} + \cdots + A_p y_{t-p} + e_t, y_t = c + A_1 y_{t-1} + A_2 y_{t-2} + \cdots + A_p y_{t-p} + e_t,$$

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3.3 Forecasting and Impulse Response

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4 Results

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4.1 Chicago

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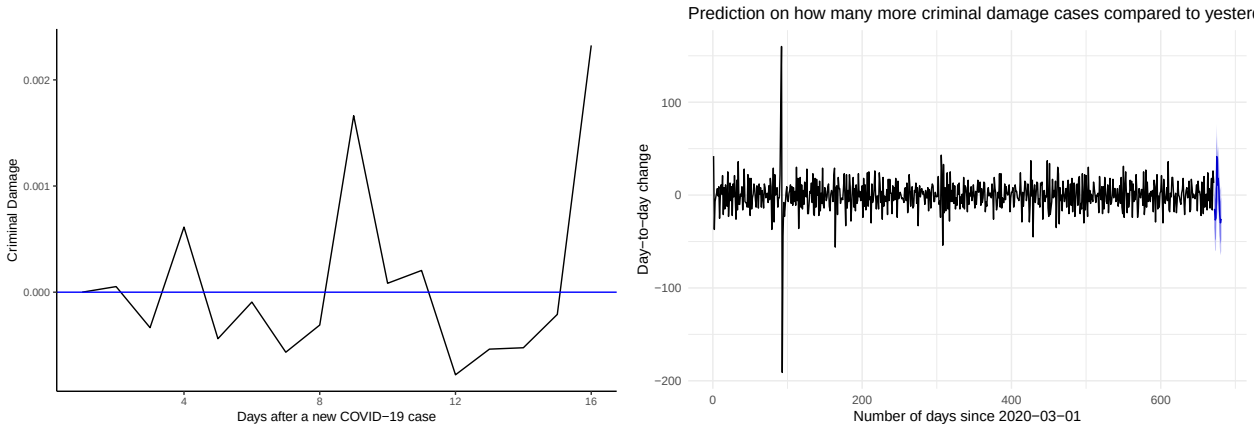

Figure 14: Frequency of each crime during months spanning the COVID-19 pandemic. Frequency of each crime during months spanning the COVID-19 pandemic.

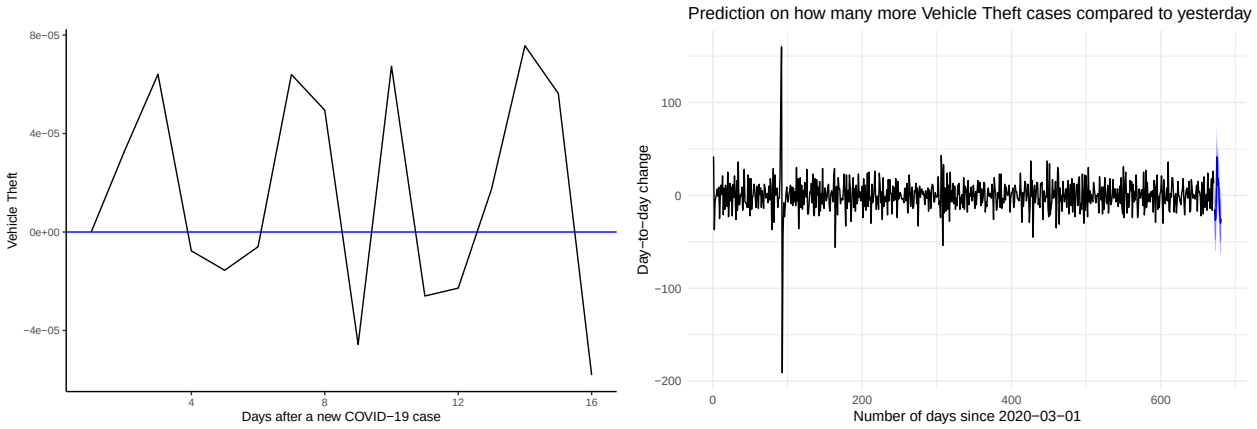

Figure 15: Frequency of each crime during months spanning the COVID-19 pandemic. Frequency of each crime during months spanning the COVID-19 pandemic.

4.2 Los Angeles

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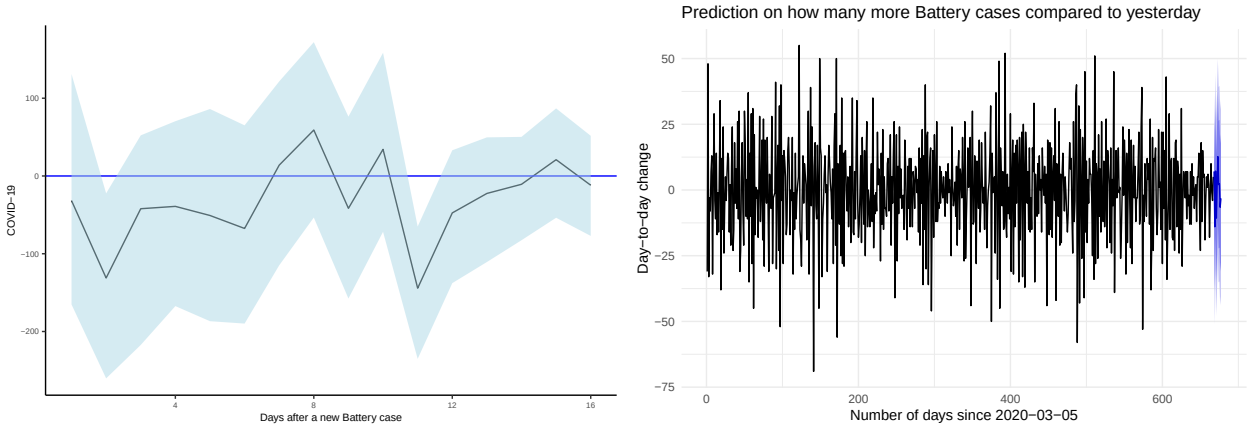

Figure 16: Frequency of each crime during months spanning the COVID-19 pandemic. Frequency of each crime during months spanning the COVID-19 pandemic.

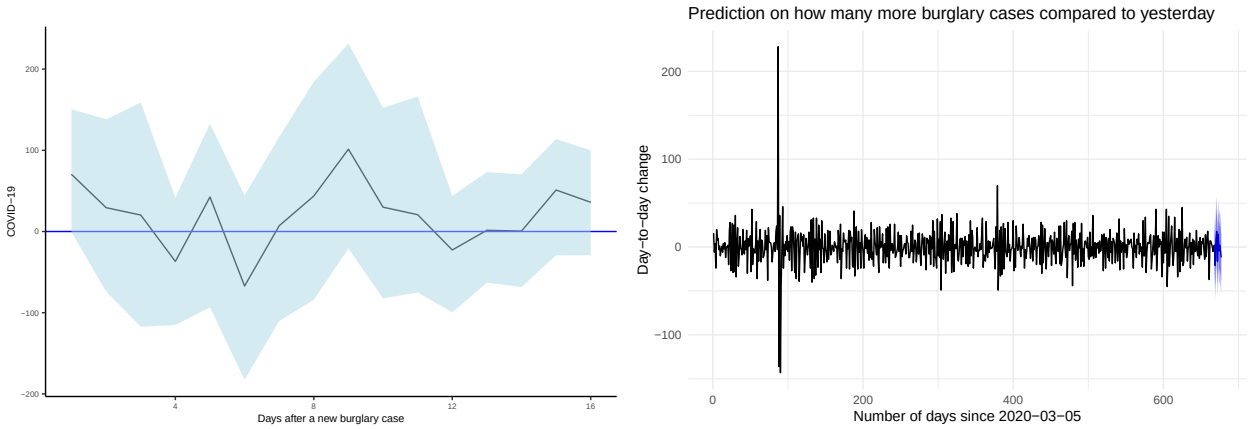

Figure 17: Frequency of each crime during months spanning the COVID-19 pandemic. Frequency of each crime during months spanning the COVID-19 pandemic.

4.3 Philadelphia

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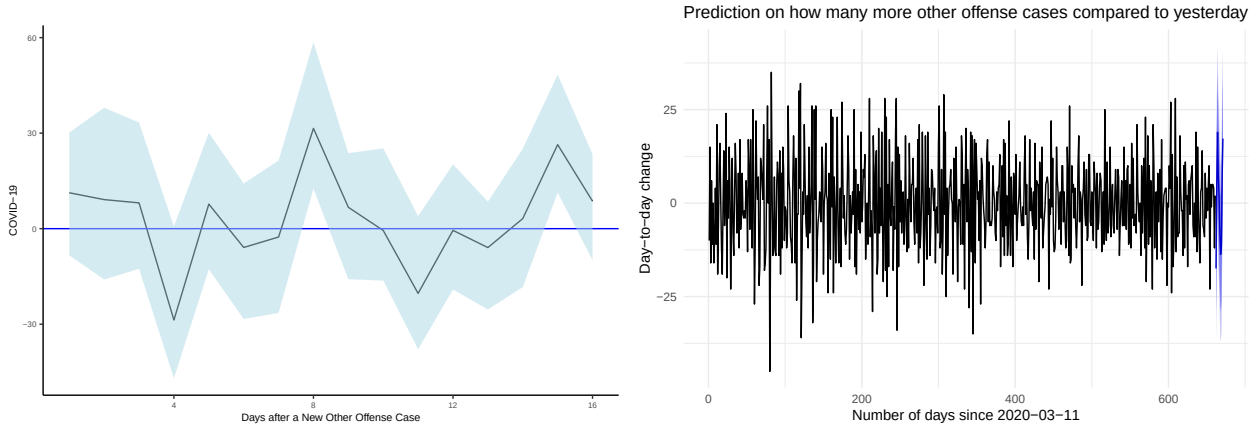

Figure 18: Frequency of each crime during months spanning the COVID-19 pandemic. Frequency of each crime during months spanning the COVID-19 pandemic.

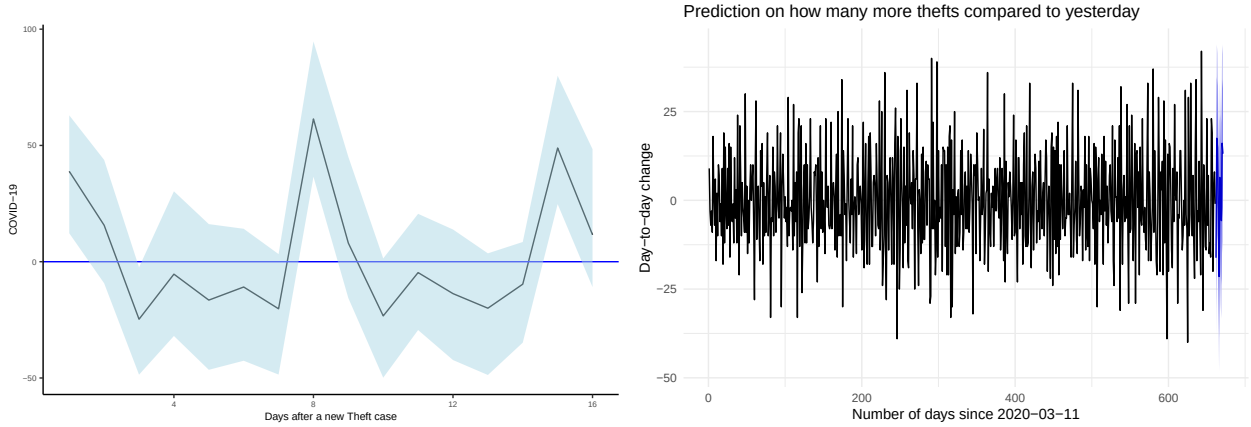

Figure 19: Frequency of each crime during months spanning the COVID-19 pandemic. Frequency of each crime during months spanning the COVID-19 pandemic.

4.4 Seattle

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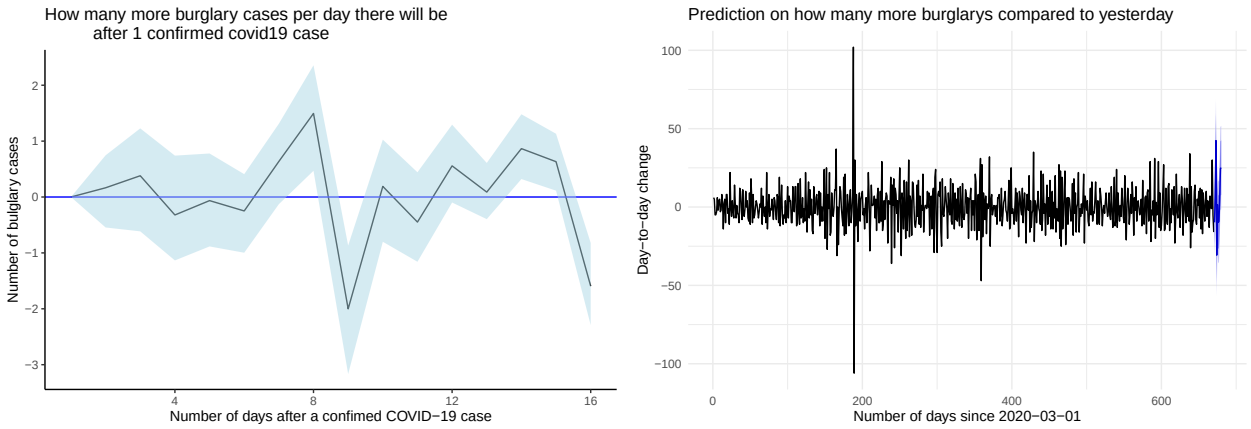

Figure 20: Frequency of each crime during months spanning the COVID-19 pandemic. Frequency of each crime during months spanning the COVID-19 pandemic.

5 Discussion

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