COMP20008 - Assignment 2 Final Report

Group 82

Phoebe Fan ([redacted])

Sean Chen ([redacted])

Jayn Wong ([redacted])

Jason Susanto ([redacted])

Introduction

The covid-19 pandemic has led to many setbacks, especially in Victoria, where lockdowns have been the longest. The impact of the pandemic on crime rates has not yet been in significant discussion and its effect remains unclear. Hence, our research has investigated the question: “What is the correlation between the covid-19 pandemic and crime rates in Victoria?”. Upon identifying the relationship, measures improving the quality of life can be put into place.

Higher crime rates negatively affect the sense of security of Victorians and the physical health of victims, and may reflect a diminished level of wellbeing for the perpetrators, our research question is closely linked to the health and liveability of Victorian communities. Higher crime rates may also be costly to the economy (eg. loss of goods damaged by criminal activity, decreased tourism revenue). Through this investigation, we will be able to gauge whether the services provided to Victorians are sufficient and are appropriately distributed. This will contribute to a better understanding of the inclusivity across the state. Therefore, this research is linked to the health and liveability of communities in Victoria.

Datasets

Five datasets in the format of CSV were utilised for this research: four datasets relating to crime rates, and one relating to covid-19 confirmed cases, while all datasets represent data collected in Victoria with respect to LGAs.

Crime datasets

Two of the crime datasets contained data regarding the annual total number of recorded offences per LGA, with one ranging from the year ending December 2011 to the year ending December 2020, and the other ranges from the year ending June 2012 to the year ending June 2021. The other two datasets contain the offence division, subdivision and subgroup of recorded offences for each LGA, and the offence count, LGA rate per 100,000 population. Like the first two crime datasets, these covered the same time periods respectively. Each pair of the datasets measure the same elements and are presented identically, differing only in their time periods. These datasets are easily linked, as each pair measures the same elements and are presented identically, differing only in their time periods.

Covid-19 dataset

The dataset on covid-19 confirmed cases introduces the diagnosis date, postcode and LGA of each case, starting from January 2020 to June 2021.

Data Wrangling

Wrangling of Crime Datasets

As the crime datasets came from the CSA (Crime Statistics Agency), no data structuring was required and the data was read from the CSV files into four individual data frames. For the

first two datasets which contained aggregate offence data, the only data cleaning required was using RegEx and type casting to remove commas from strings which represented numerical values and removing redundant rows (eg. Containing totals) which would skew the results. Non-matching LGAs such as ‘Justice Institutions and Immigration Facilities’ and ‘Unincorporated vic’ were also removed.

Upon noticing that our later analysis could be enriched by dividing the crime data into half-yearly intervals, a fifth set of data containing the number of recorded offences from January to June 2020 was manually created, based on a report on crime trends in Victoria between January and June 2020 (Crime Statistics Agency, 2020, p.9). Due to the relatively short duration of covid, having half-yearly data would likely produce more accurate analysis and results, and this would only be possible by merging the December and June datasets via this fifth dataset. Hence, the recorded offences per LGA for each year was first summed together to produce the number of recorded offences in Victoria per year, for June to June and December to December respectively, before calculating the half-yearly figures. To validate this process, the half-yearly periods were then summed back together into annual periods and compared to the two original datasets.

Table 2. Recorded offences by location division – January to June 2020

	Recorded Offences						% of Total					
Location	Jan	Feb	Mar	Apr	May	Jun	Jan	Feb	Mar	Apr	May	Jun
Residential	21,683	18,846	19,879	17,222	19,798	22,280	*44%*	*42%*	*44%*	*47%*	*44%*	*46%*
Community	13,845	13,233	13,289	11,419	15,090	14,311	*28%*	*30%*	*29%*	*31%*	*34%*	*29%*
Other	10,970	10,434	10,020	6,482	8,109	9,427	*22%*	*23%*	*22%*	*18%*	*18%*	*19%*
Unknown	2,332	1,921	1,995	1,210	1,940	2,792	*5%*	*4%*	*4%*	*3%*	*4%*	*6%*
Grand Total	**48,830**	**44,434**	**45,183**	**36,333**	**44,937**	**48,810**	***100%***	***100%***	***100%***	***100%***	***100%***	***100%***

To clean the two datasets containing the specific offence divisions, unnecessary columns were first removed, such as ‘Offence Subdivision’ and ‘Offence Subgroup’, to ensure that later visualisations will be easy to interpret. Like the two earlier datasets, the use of RegEx and typecasting was necessary to represent numerical values, previously stored as strings, appropriately. Rows containing data from the same year, same LGA and same offence division were then aggregated, summing the ‘Offence Count’ column values and averaging both the ‘LGA Rate per 100,000 population’ and ‘PSA Rate per 100,000 population’ columns. The ‘PSA’ column was retained in the final data frames in case the high number of different LGAs might make the visualisations difficult to understand. Whitespaces were stripped from the ‘Local Government Area’ column values to allow an inner join with COVID-19 case dataset.

From the wrangling of the four crime datasets, two final data frames were produced, presenting all the relevant data in an organised and concise form ready for analysis and visualisation.

Wrangling of Covid-19 Dataset

The COVID-19 case dataset was in CSV format containing the diagnosis date, postcode and LGA of each case. The data was aggregated per month and LGA, then further aggregated on a half yearly basis. The postcode column was dropped as our comparisons will be based

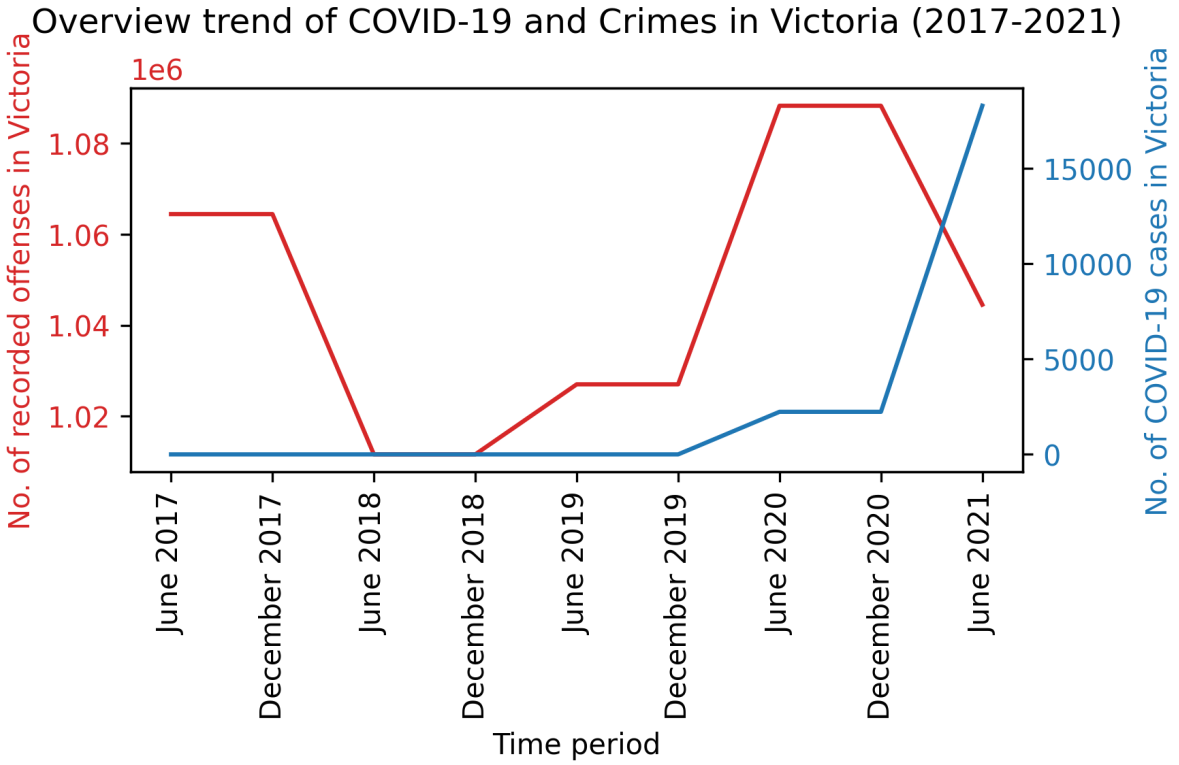
on LGAs. Relevant columns were renamed to assist with future inner join of crime and COVID-19 case dataframes. Data, which was comparable to those in the crime dataset but in a different format, was adjusted to also assist with the inner join. Irrelevant records such as cases from 'interstate' were removed. Dataframe indices were reset to allow for iteration and 3 dataframes for COVID-19 cases in each LGA in June 2020, December 2020 and June 2021 were extracted.

Analysis Methods

Linear regression was used to create the trend lines in Figures 2-4 and determine whether the correlation between COVID-19 cases and crime rate of Victorian LGAs changed over the course of the pandemic. This was done by merging the crime and COVID-19 case dataframe for a specific time period and plotting the scatterplot and regression line using seaborn lmplot. Visual analysis was then performed on the graphs to compare their differences.

Key Results

Figure 1



Shown in figure 1 is a time-series of recorded offenses in Victoria from June 2017 to June 2021, colored in red; overlapping the trend of number of covid-19 confirmed cases in Victoria in the same period, colored in blue. Although the first recorded case occurred in January 2020, plotting the trend in the same period (including June 2017 to December 2019) would be beneficial in comparing the two data. As shown on the graph, starting in 2020, crime rates have soared to record high, peaked in June 2020 and plateaued until December of 2020. At the same time, covid-19 confirmed cases have displayed the same characteristics of

peaking in June 2020, and plateauing until the end of the year. However, from December 2020 onwards, the trend of drastically decreasing crime rates opposes the equally steep slope of increasing confirmed cases.

Figure 2

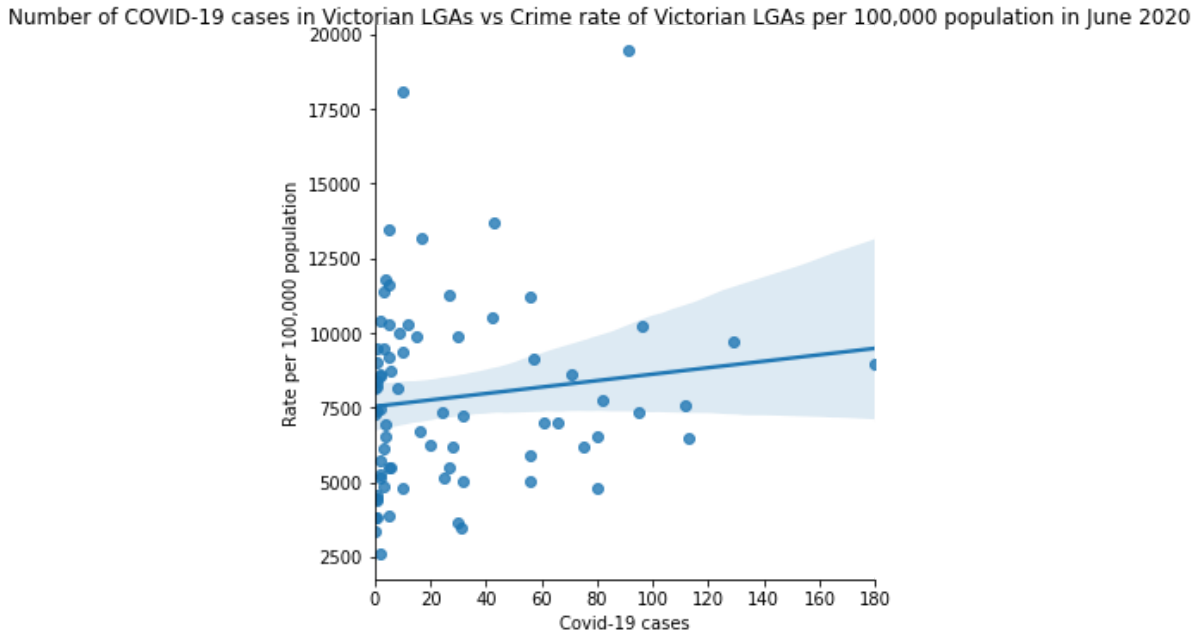


Figure 3

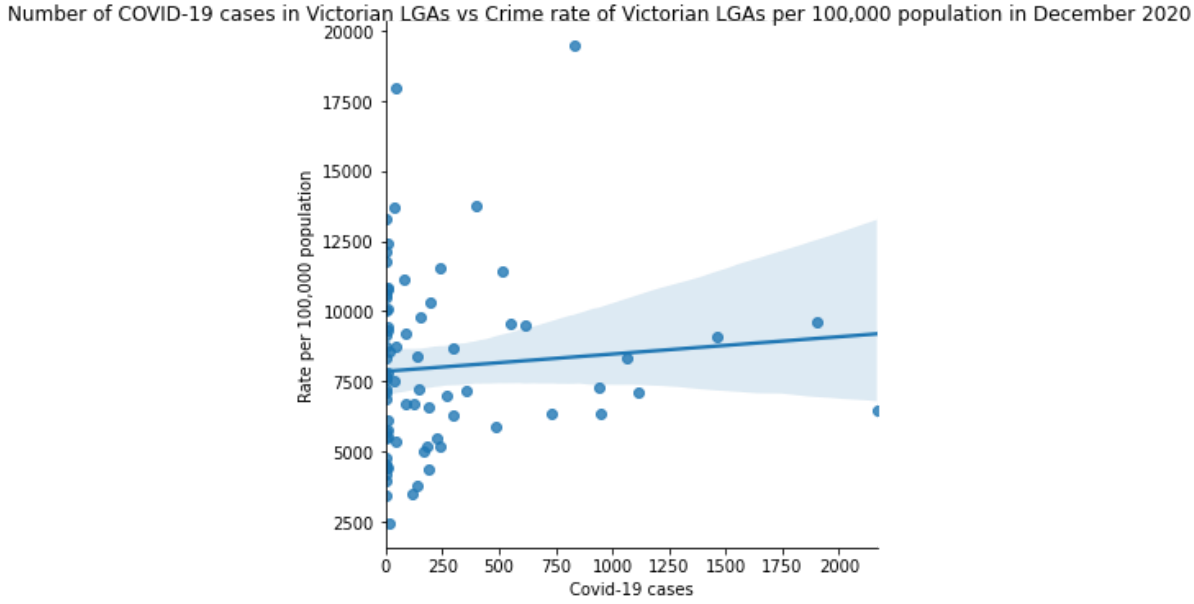
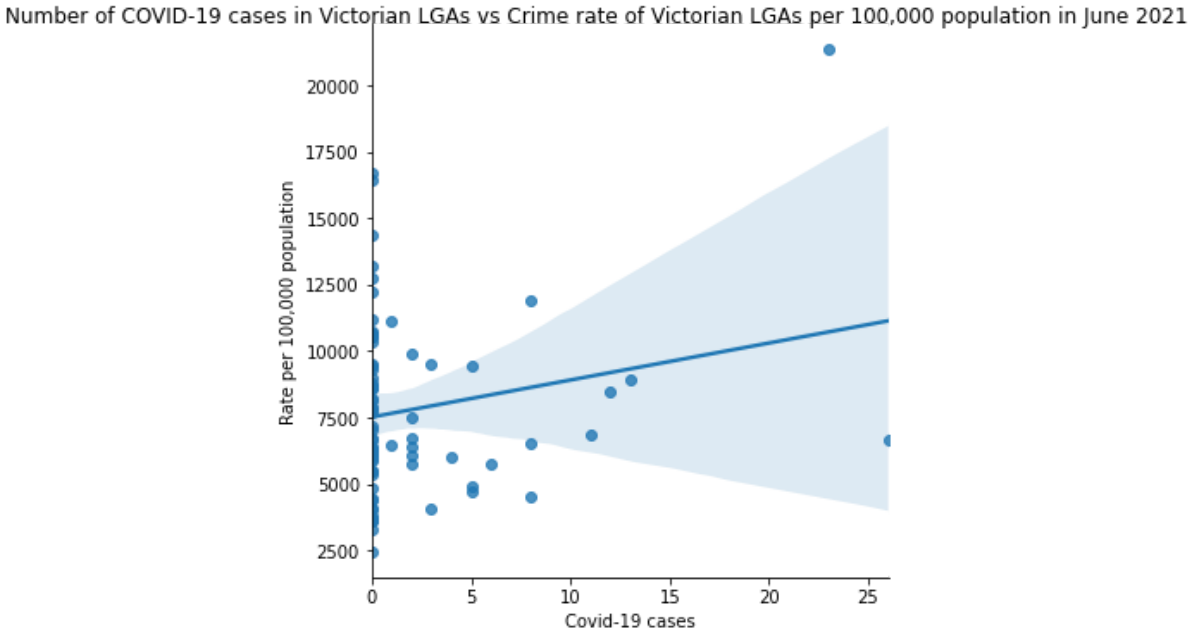


Figure 4



From the regression line of Figure 2, it can be seen that at the beginning of the pandemic there was a weak correlation between number of cases in LGAs and crime rate. This correlation gradually became stronger as the pandemic progressed, with it becoming slightly stronger in Figure 3 almost a year into the pandemic and significantly more so in Figure 4 over a year into the pandemic. Overall, this means that on average, the number of cases in an LGA had an increasing positive effect on the crime rate of that LGA as the pandemic progressed. It can also be seen that more COVID-19 cases were detected in June 2020 and December 2020 than June 2021, suggesting that despite the case drop in absolute terms, each new COVID-19 case correlated to a larger increase in crime rate for Victorian LGAs. This may be indicative of “lockdown fatigue syndrome”, where people become exhausted by frequent lockdowns and other public health measures such as mask-wearing and participating in unlawful demonstrations and other illegal acts.

Figure 5

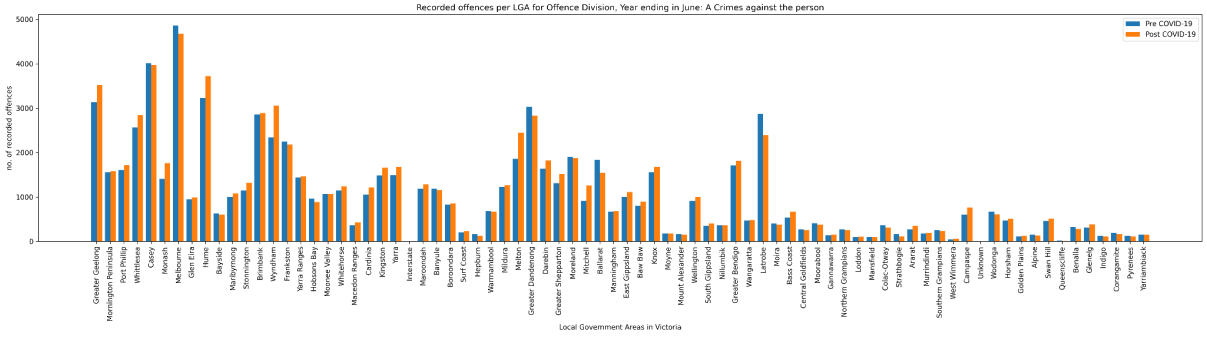
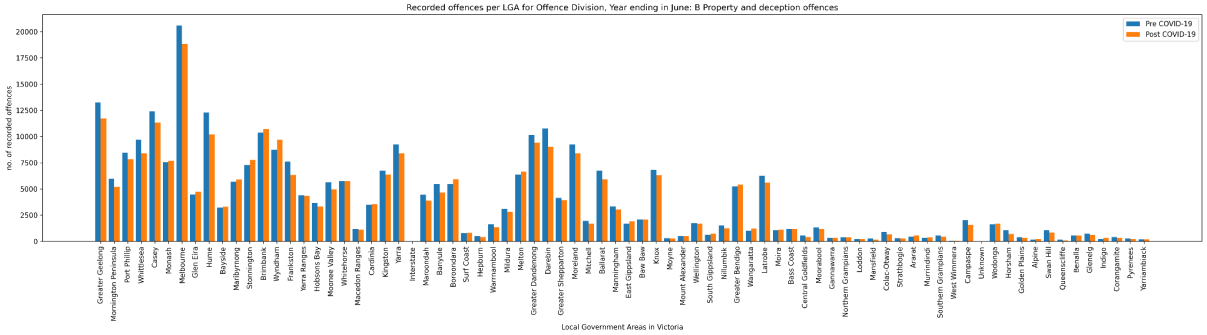


Figure 5 shows the total number of recorded offences in the subdivision of “crimes against the person” per LGA. From figure 5 onwards, blue columns indicate the data accumulated before the pandemic, and orange indicates data collected after December 2019. The graph

shows that crimes against a person have no significant changes, some LGAs have increased recorded crimes during the pandemic and some decreased.

Figure 6



Similar to figure 5, figure 6 shows the total number of recorded offences throughout June 2017 to June 2021; however, it focuses on the subdivision of property and deception offences. Most LGAs have recorded less crimes recorded after December 2019, such as Greater Geelong, Melbourne and Hume.

Figure 7

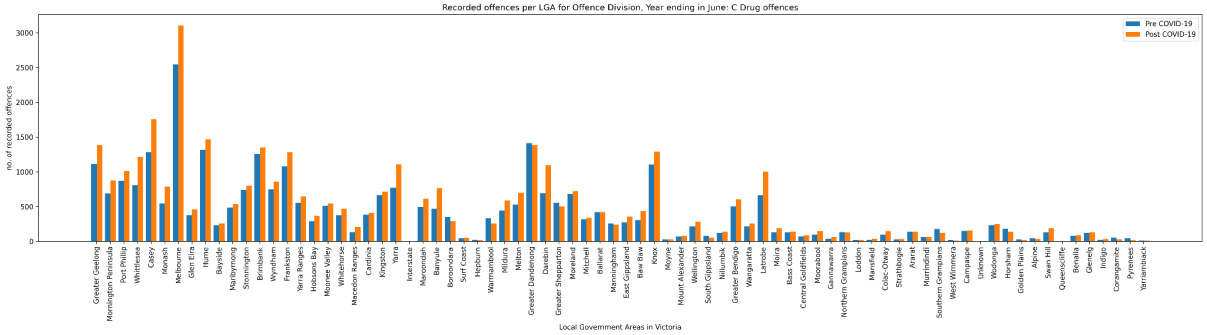


Figure 7 shows recorded offences focusing on drug offences. All 79 LGAs in Victoria have recorded more drug offences during the pandemic except 7 LGA, such as Northern and Southern Grampians. Given that there are increases in 91% of LGAs, it indicates that the trend of drug offences increased during the pandemic.

Figure 8

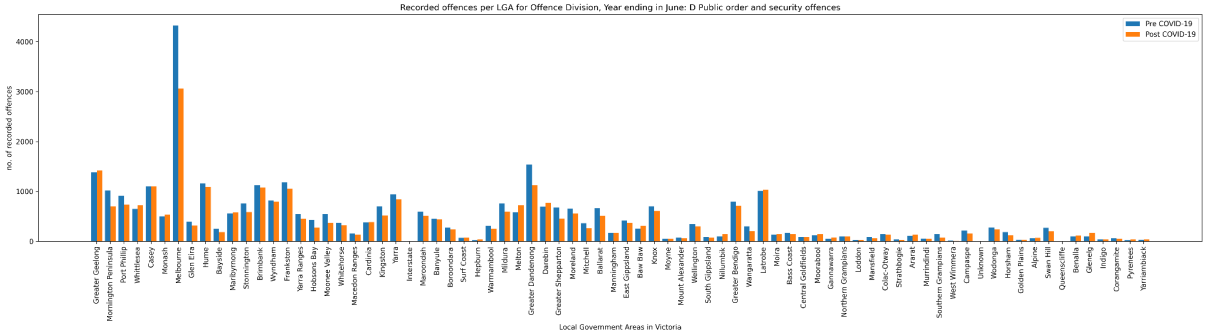


Figure 8 shows recorded offences focusing on public order and security offences. Melbourne was the LGA that had the most significant number of recorded crime in this subdivision before the pandemic, and the number drastically decreased during the pandemic, yet remains the highest among other LGAs' records. All other LGAs fluctuate in the change of recorded crimes in this subdivision but all changes in recorded offences are relatively small compared to that in Melbourne.

Figure 9

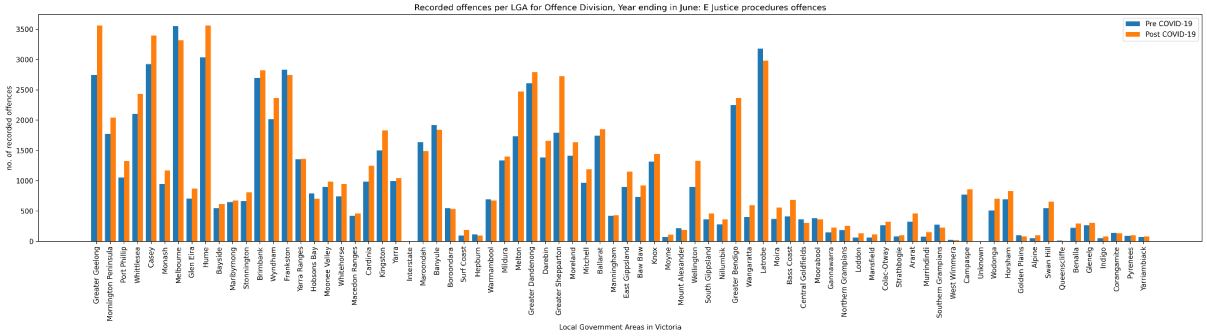


Figure 9 shows recorded offences focusing on justice procedures offences. Most LGAs have recorded more offences during the pandemic; however, in Melbourne and Latrobe and a few other LGAs, that was not the case. Before the pandemic, these two LGAs had one of the most significant records in this subdivision but the offences have decreased since the pandemic.

Figure 10

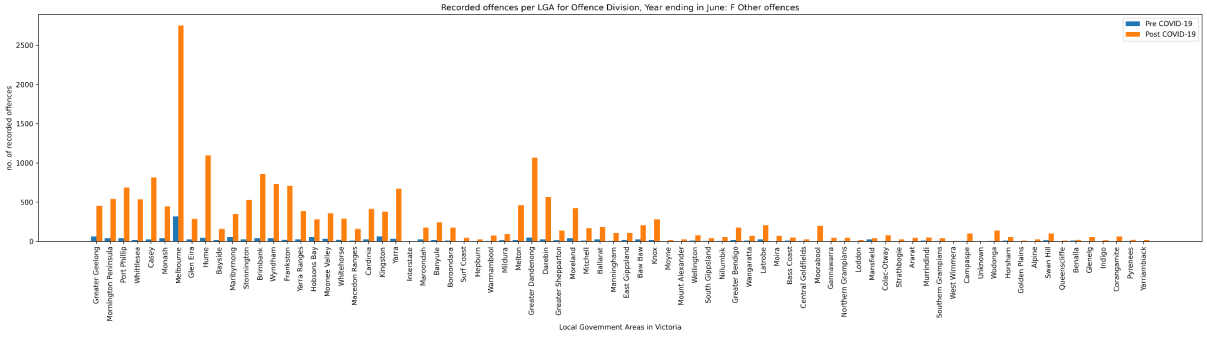


Figure 10 shows all other crimes that are not categorized into the previous subdivisions. As shown in the graph, recorded offences in this subdivision prior to the pandemic was negligible except in Melbourne, but even in Melbourne, the records were low. During the pandemic, the recorded offences increased approximately seven-fold in Melbourne, which remained the most significant among all LGAs. Other LGAs also had drastic increases in recorded offences, though to a lesser degree.

Overall, regarding the trend of recorded offences in Victoria, most LGAs have experienced less property and deception crimes, an obvious increase in drug offences, a drastic decrease in public order and security offences, an increase in justice procedures offences, and a serious rise in other offences.

Significance of Results

The results are significant to all stakeholders, especially policymakers and the Victorian public. According to these results, an increased correlation between COVID-19 case numbers and crime rate is expected if the pandemic is prolonged, even if case numbers reduce. Certain offence types have increased significantly to record numbers during the pandemic, and regardless of whether caused by the virus or not, measures should be taken to tackle the issue. To policymakers, these results highlight the urgent need to reduce the impacts of the pandemic and allow Victoria to return to a form of pre-pandemic normalcy as soon as possible. To the Victorian public, these results underline the pandemic's threat to civil society and emphasise the need to fully comply with public health measures in order to bring an end to the pandemic and its debilitating effects as soon as possible. These results can also be used as future reference to compare data from future time periods of the pandemic to see whether the identified trend is exacerbated or broken.

Limitations of Results

Due to the relatively short timeframe in which covid has affected Australia, it is unclear whether the observed changes in crime rate and their relationship with the covid pandemic is coincidental or merely a short-term effect, or represent a more serious problem. Additionally, correlation analysis applies specifically to linearly-related variables and, due to the insufficient time period of covid, this relationship may not be true.

Consequently, this project could be further improved by continuing to analyse similar data over a longer period of time, in order to ensure any observed relationships are not circumstantial. Considering different offence subgroups and weighting crimes from Low Harm to High Harm, in order to differentiate between their varying degrees of harm according to the CSA's 'Categorical presentation of harm caused by crime' (CSA, n.d.), would also portray the situation in more detail. Likewise, other important indicators of crime outside of Recorded Offences (eg. Family Incidents) could be analysed. Alternatively, an investigation into the other potential causes for changes in the crime rate during covid might contribute to an understanding as to which services could be improved to decrease the number of perpetrators.

Conclusion

In conclusion, the pandemic has an increasing positive correlation with overall crime rates recorded per LGA; however, depending on the category of the crime, the correlation may be inverted or insignificant. According to the CSA, the graver offences are primarily categorised in Offence Division A. Since the most significant increase in recorded offences was observed in 'Other Offences', this increase will have a less deleterious effect on societal wellbeing. Although our research has its limitations, there is no doubt that its findings can aid future policy implementations and measures to improve the health and livability in Victoria.

References

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Appendix

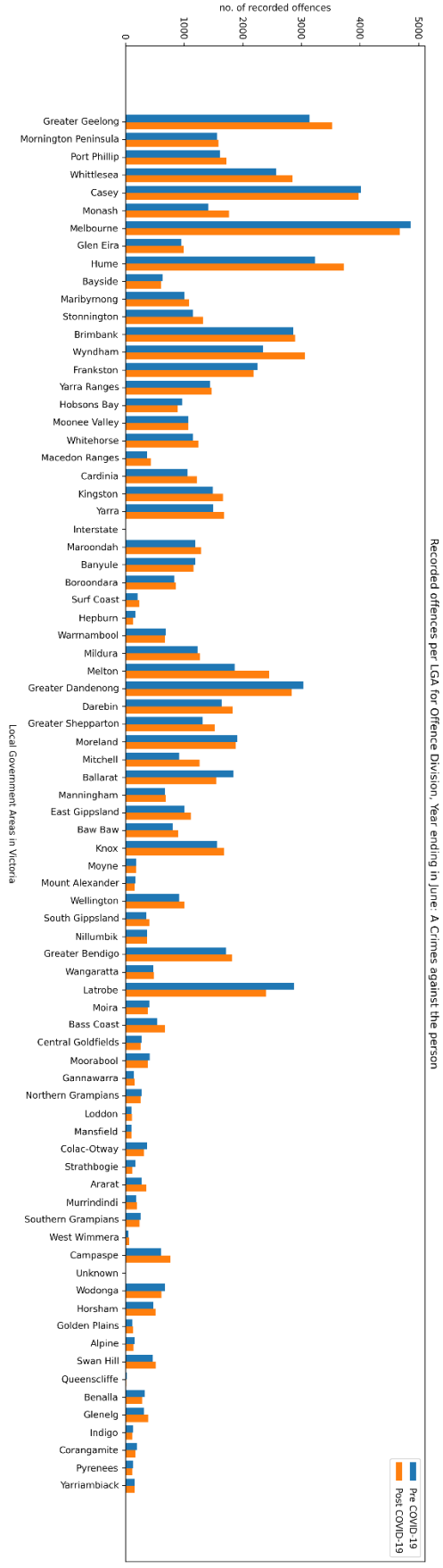
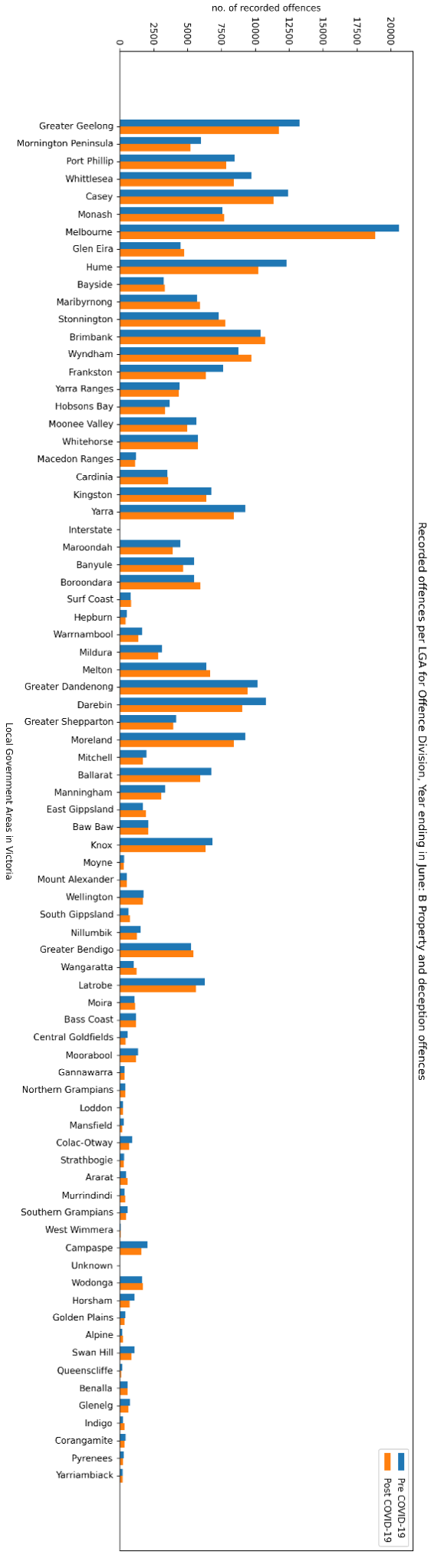


Figure 5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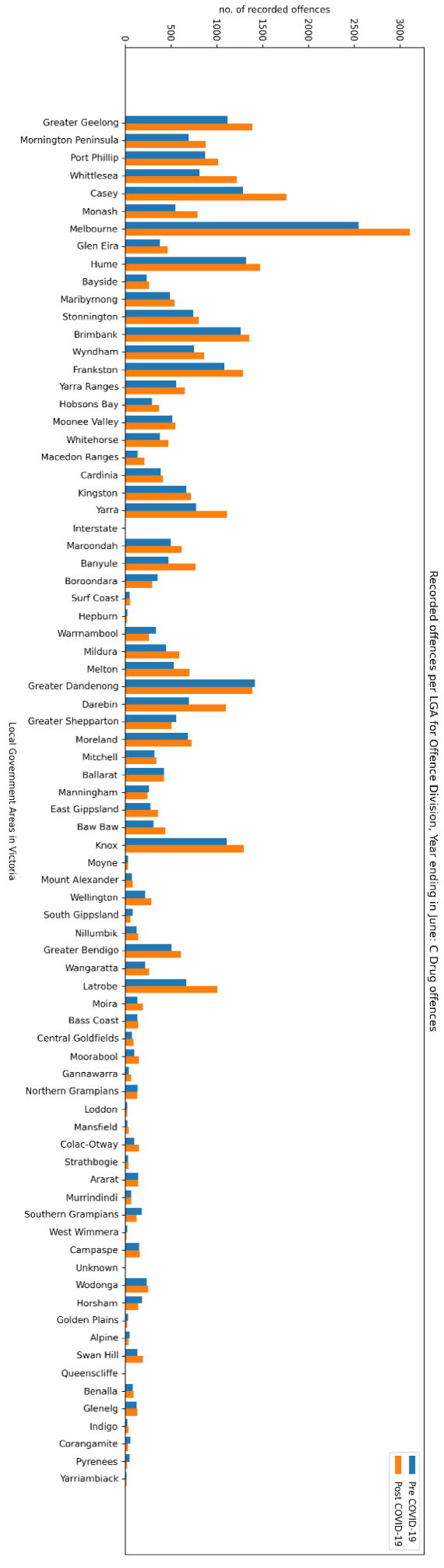
Local Government Areas in Victoria
Recorded offences per LGA for Offence Division, Year ending in June: B Property and deception offences
Pre COVID-19
Post COVID-19

Figure 6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Post COVID-19

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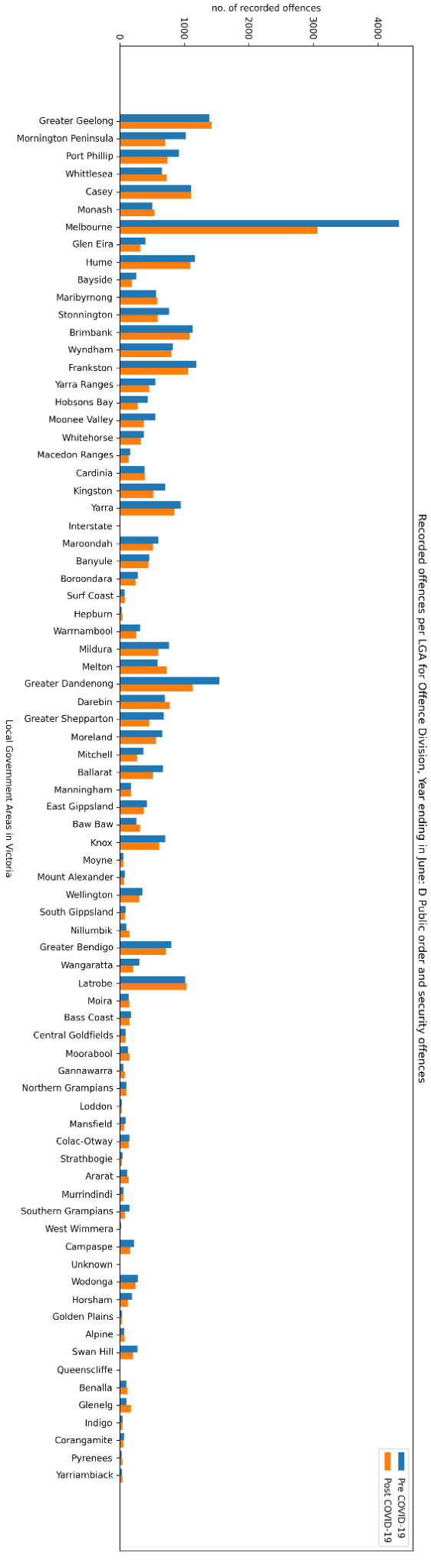
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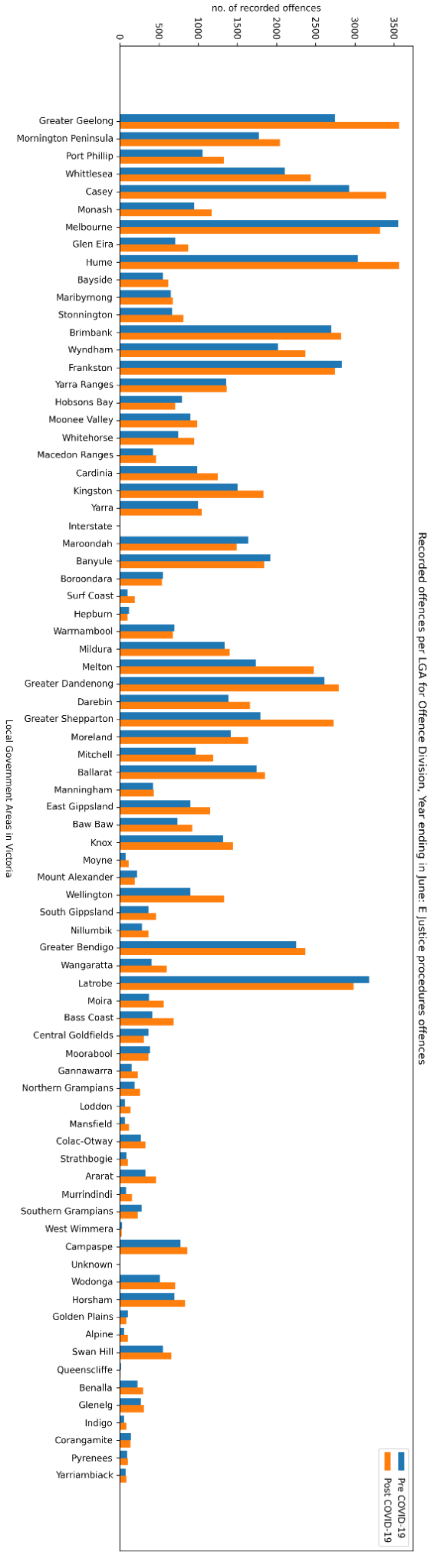
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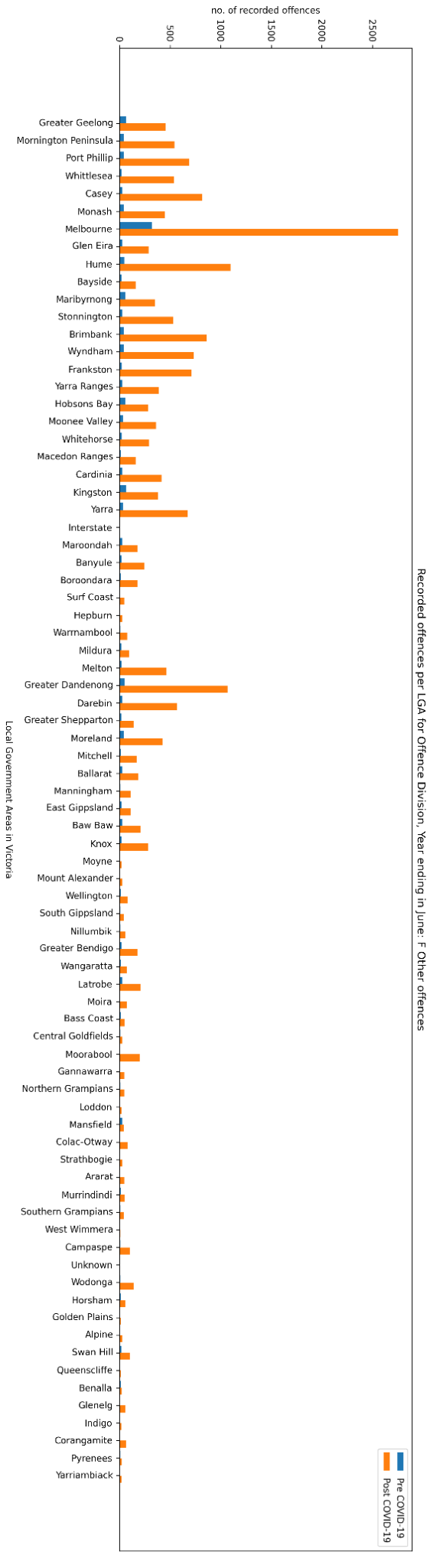
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Figure 10