Title 3 - Assessing the associations between unemployment and cost of living on criminal activity and the general impact of covid-19 lockdowns on criminal activity : A district based analysis of Christchurch and Wellington

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Abstract

Introduction: Criminal activity has been widely reported on in the New Zealand media of late. With no shortage of suggestions as to possible factors that may be influencing this apparent spike in crime such as the return of the 501's from Australia or the perception that law enforcement has gone soft on crime in general. Nonetheless, research does appear to be lacking somewhat in regards to both the factors of unemployment and cost of living and their association with crime in a New Zealand district specific context. In addition, the emergence of covid in recent years has also been postulated as impacting upon crime, yet evidence also appears to be lacking somewhat in terms of its effect in a New Zealand setting.

Objectives: The aim of this study and subsequent analysis is to explore the associations between unemployment, cost of living and covid lockdowns on crime in both Canterbury (which includes the Christchurch metropolitan area plus Mid/South Canterbury) and Wellington (which includes Upper and Lower Hutt) to see if any noticeable trends or differences arose when comparing and contrasting the two districts.

Methods: Data was collected from online available sources such as the New Zealand Police website and Stats Aotearoa. The data was then broken down into three specific subcategories of crime being: 1) robbery; 2) theft of property and 3) unlawful entry with intent to commit burglary. The initial analysis looks at whether a linear relationship exists between unemployment and cost of living. This was achieved by constructing a correlation coefficient and linear regression model for both factors. With further analysis done using both a time series analysis and change point analysis to see if there does appear to be a noticeable difference in terms of crime rates when looking at both the 2020 and 2021 lockdowns that occurred in New Zealand due to covid.

Results: In our initial analysis (using both correlation and regression models) there appeared to be no statistically significant relationship between either unemployment or the cost of living on the three specific subcategories of crime. However, change point analysis clearly showed the impact that covid-19 lockdowns had on the general crime rate in both 2020 and 2021. In

addition, the crime rate for all the subcategories of crime has followed similar trends in Christchurch and Wellington.

Discussion and Conclusion: It was observed that neither unemployment or the cost of living had an effect on the particular types of crime that was investigated in this study. Whether these results are applicable in the context of other New Zealand urban areas such as Auckland or Dunedin is somewhat questionable given how aspects such as city population do vary drastically within New Zealand as well as the multitude of other factors that are also likely to be influencing the individual's capacity to commit crime. We did however see somewhat of an impact on criminal activity in both Wellington and Christchurch over the lockdowns.

Introduction: New Zealand (NZ) as a nation has long enjoyed an excellent reputation relative to many other countries around the world (NZ Herald, 2011). The ability of NZ citizens to do regular everyday tasks such as driving to work, going for a run or catching up with friends for lunch without the likelihood and/or fear of falling victim to crime is something that differentiates us from many other countries. From this prelude, it would seem rather contradictory then that NZ as a nation appears to be in the midst of a spike in criminal activity, particularly in recent years, with some media outlets even going as far as labelling the current state of criminal offending as a "crisis" (NZ Herald, 2022). It is these media reportings that have formed the inspiration for our investigation, with particular emphasis being placed around what possible factors might be influencing this rise in crime.

In addition, it has also been postulated by the media that crime has increased since covid-19 first reached NZ in 2020. However, due to the recent nature of covid-19, academic studies demonstrating its effects on criminal activity are rather limited, especially in a NZ specific environment, with Cheung & Gunby, (2022) being the only NZ specific study available in respect to how certain types of crime were affected over the 2020 lockdowns. This study therefore also aims to assess whether or not there does appear to be a difference in criminal activity rate in terms of: before; during and after the lockdowns that occurred in both 2020 and 2021 within two major urban districts in NZ, these being Christchurch and Wellington respectively.

Ultimately, this research aims to provide insights into an area that, although well studied in certain contexts, certainly appears to be rather topical today for those of us currently living in NZ. By doing a compare and contrast between two major NZ districts we hope that our findings may be able to assist central government agencies when it comes to improved decision making capabilities and as such allows them to ideally allocate increased law enforcement resources appropriately aimed at reducing specific criminal activity in both districts. This research could also potentially be the base from which further academic studies centering around crime in NZ could be developed.

Literature Review: The topic of crime (or criminal activity) is one that has been studied amongst various academic institutions over the years, as well as among many different nations. One nation that has had a multitude of academic research centred around the topic of crime is NZ (see den Heyer, 2021; Pearson & Breetzke, 2014 and Horrocks, 2011). Nonetheless, despite these informative and recently published studies being in a NZ context there does not appear to be many existing studies done in NZ on whether factors such as the unemployment rate and/or the cost of living index for households appear to be associated with criminal activity. It is evident that there is a gap in the existing academic literature from a NZ specific context on the relationship these factors may have with crime. In addition, our research topic was also swayed towards investigating these two possible factors due to how we were able to collect relevant data from sources like Stats Aotearoa. It was these data sets which provided us with the necessary foundational aspects required for this particular avenue of crime research (this is covered in more depth later on in the report).

The term crime (or criminal activity) is very broad. Thotakura, (2011) defines crime to be "an offence that violates the law and is generally met with societal disapproval" whilst DiCristina, (2016) defines crime to be a ".. an intentional act in violation of the law". It is these existing definitions within the literature that highlight how crime represents an intentional act and something that violates expected societal norms. It is also obvious from these definitions that many activities could in fact constitute crime. When further researched in a NZcontext crime can be broken down into four sub categories, ranging from offences like reckless driving all the way up to murder. Our particular research has refined the term crime to focus on criminal activity relating to property as opposed to crimes against a person like manslaughter, which prima facie also clearly satisfy the definition of crime (or criminal activity).

To also ensure that we did not simply repeat any existing studies on crime/criminal activity this research paper also sought to explore the impacts that covid lockdowns may have had in terms of criminal activity that occurred in two major NZ districts, being Christchurch and Wellington. As per the findings of Cheung & Gunby, (2022) the original covid lockdown inNZ that occurred from March 2020 to May 2020 did appear to impact upon certain types of crime around the nation, with their study indicating a notable drop off in crimes like robbery (which they classified as residential property crime). Although the Chung & Gunby article provided an extremely useful framework for this component of our research (with regards to covid) their study did not specify the effects of the second lockdown on crime rates, with this second nationwide lockdown occurring from August 2021 to September 2021. In addition, a distinguishing element of our study is how we have incorporated a city (or district) specific analysis.

Hypotheses:

Edmark, (2005) found that as unemployment rates rose in Sweeden over the 1990's so did certain types of criminal activity. In comparison, Tang & Lean, (2007) took this finding a step further and examined the effects that the determinants of both unemployment and inflation had on crime in a United States setting. Using Edmark's study as well as applying intuitive sense, it would be logically expected that both unemployment and criminal activity are somewhat positively correlated (i.e. as unemployment goes up so does criminal activity). With our first hypothesis therefore being:

   a) Is there a positive correlation between unemployment rate and the crime rate?

Recent research from Consumer NZ suggests that the top national concern for the majority of New Zealanders is now the cost of living. There definitely appears to be a financial concern for many New Zealanders, with aspects such as the high cost of groceries and housing affordability perhaps reflecting deep seated economic issues in our nation. This may in turn be contributing to increased anxiety amongst some families and cause some of those who have families to support to view crime as the only logical alternative to afford basic needs such as food and rental payments. This base knowledge, as well as the findings from Tang & Lean, (2007) has helped us form our second hypothesis for this study which looks at :

   b) Is there a positive correlation between cost living index and the crime rate?

Finally, it has been postulated that covid lockdowns in countries like Australia and NZ helped contribute to a reduction in certain types of crime. Nevertheless, the time that people may have spent in their 'bubbles' may have contributed to other types of crime such as domestic abuse. Therefore, we have also elected to investigate (alongside the two above mentioned factors) the possible impact that covid lockdowns may have had on the crime rate in both Christchurch and Wellington.

Data Collection:

Based on the hypothesis, various sources have been explored to obtain credible data. The data for crime has been collected from police data NZ. This then allowed us to further look into specific types of property related crime, these being the three specific categories of: 1) robbery; 2) theft of property and 3) unlawful entry with intent to commit burglary. For our study, the

crime statistics we elected to use were for individuals that have been charged with a crime, this in fact differs from the legal standpoint of when someone has been convicted of a crime. This assisted us in establishing a defined boundary of what sort of data we were exploring for as a team when it came to collecting data on crime rates in both Christchurch and Wellington. The unemployment data and household cost of living index were collected from infometric NZ , greater Christchurch NZ , and figure NZ. The data for all the factors was collected over a five year timeframe beginning from 01 July 2017 through to 30 June 2022. With the Covid timeline data has been collected from covid19.govt.nz.

Limitations and challenges:

Initially, we considered studying if mental health and drug addiction influence the crime rate. However, collecting quantitative data related to mental health and drug addiction is very challenging. The data associated with these two factors are qualitative, and poorly recorded, and have a higher degree of variation between district health boards. This may be due to mental health and drug addiction data being confidential and therefore privacy concerns may arise around aspects such as individuals' vulnerabilities, and sensitivities. In addition, at the time of data collection, data associated with mental health was not available for the last year spanning from 01 July 2021 to 30 June 2022. Notably, academic research by Ghiasi et al., 2022 suggests criminal activity may not in fact be directly related to psychiatric illness. Therefore, we ultimately elected to exclude these two possible factors from our research investigation.

Analysis Methods and Implementation
The initial analysis looks at whether a linear relationship exists between the crime rate, unemployment rate and the cost of living. This was achieved by constructing a correlation coefficient and linear regression model for both factors. Further analysis was then performed using both a time series analysis and change point analysis to see if there appears to be a noticeable difference in terms of crime rates when looking at both the 2020 and 2021 lockdowns respectively. Both lockdowns were implemented by the NZ government with the primary aim of them being to reduce the spread of covid amongst citizens

Results:
Initial Exploratory Analysis
Correlation and Linear Regression Model

The crime numbers of different subcategories of crime were compared with the cost of living and unemployment rate. A linear regression model and correlation were used to analyze the relationship between the response variable (crime rate) and multiple variables (time, cost of

living index and unemployment rate) and their interactions. The association between crime rate and cost of living and unemployment rate showed nonlinearity. Shapiro-Wilk normality test showed that the data from each of the two variables (x, y) follow a normal distribution without producing statistically significant results. Correlation tests between crime numbers and unemployment rate/cost of living Index variables, both gave P-values greater than 0.05 (these being 0.803 for unemployment, and 0.338 for the cost of living). Where a P-value is more than 0.05 it shows a very weak correlation between the crime rate and tested factors.

When looking at the two urban areas as per Figure 1 below we can see that total crime numbers vary when looking at the specific type of crime committed. For example the Canterbury metropolitan area can be seen to have a higher maximum point in terms of the robberies committed when compared to the Wellington metropolitan area over the 5 year timeframe. Interestingly both districts appear to follow similar graphical patterns when looking at the crime types of theft and unlawful entry respectively. It is also obvious that general theft was the most commonly committed offence in both districts relative to the two other types of crime types. (Figure 1).
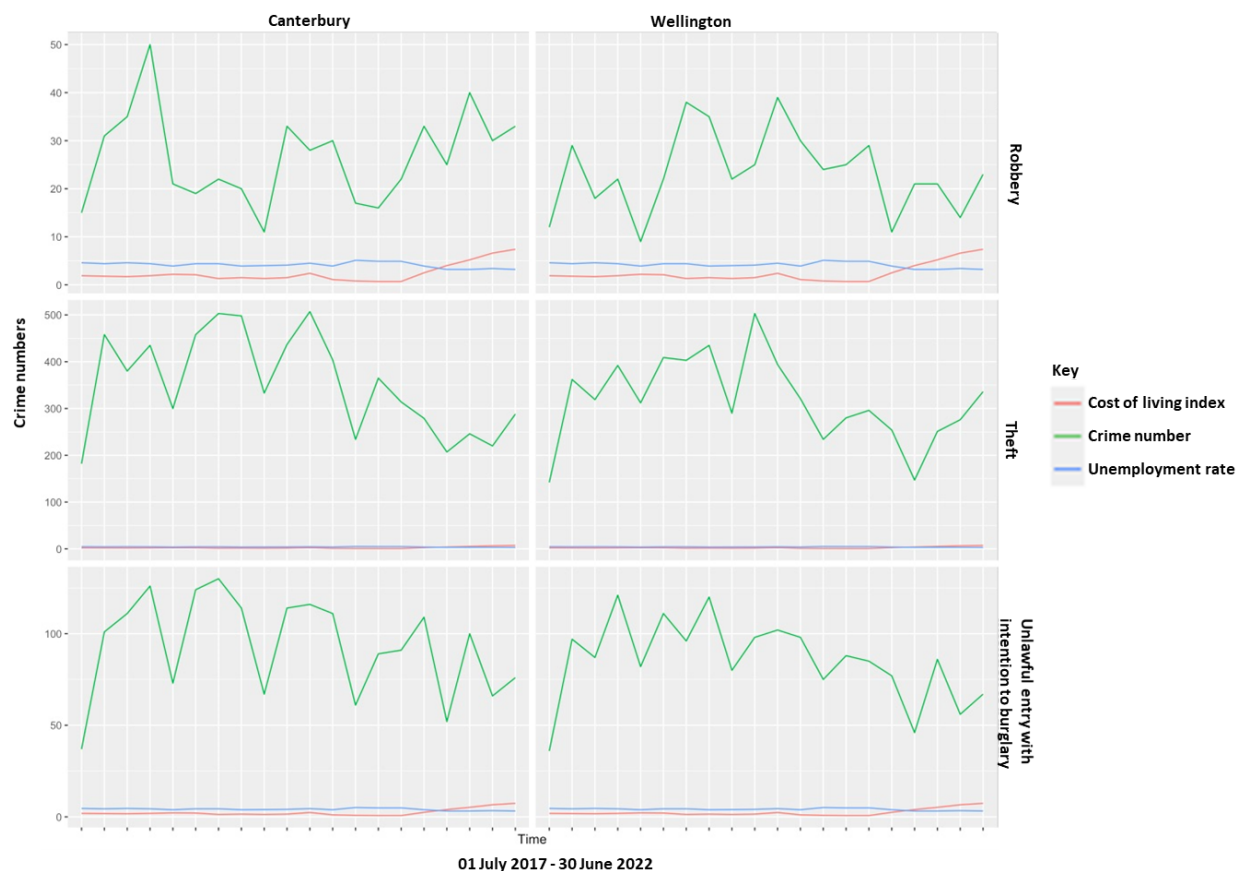
Figure 1: Comparison of crime numbers, cost of living index, unemployment rate by crime type (robbery, extortion and related offenses, theft and related offenses and unlawful entry with intention to burglary) and city (Canterbury and Wellington).

–Time Series

The collected datasets were recorded on a quarterly basis (Q) from Q3 2017 (being 01 July) to Q2 2022 (being 30 June). The time series analysis allowed us to identify if there were any trends or patterns associated with crime type, and crime rate among both districts. Time series analysis also allowed us to make predictions based on the historical data. This analysis showed a seasonal crime pattern with Q3 has the lowest crime rate in each year (Figure 2). The prediction of the crime rate for 2023 and 2024 quarters based on this historical data appears to follow the same trend with decreased crime rate in Q3..
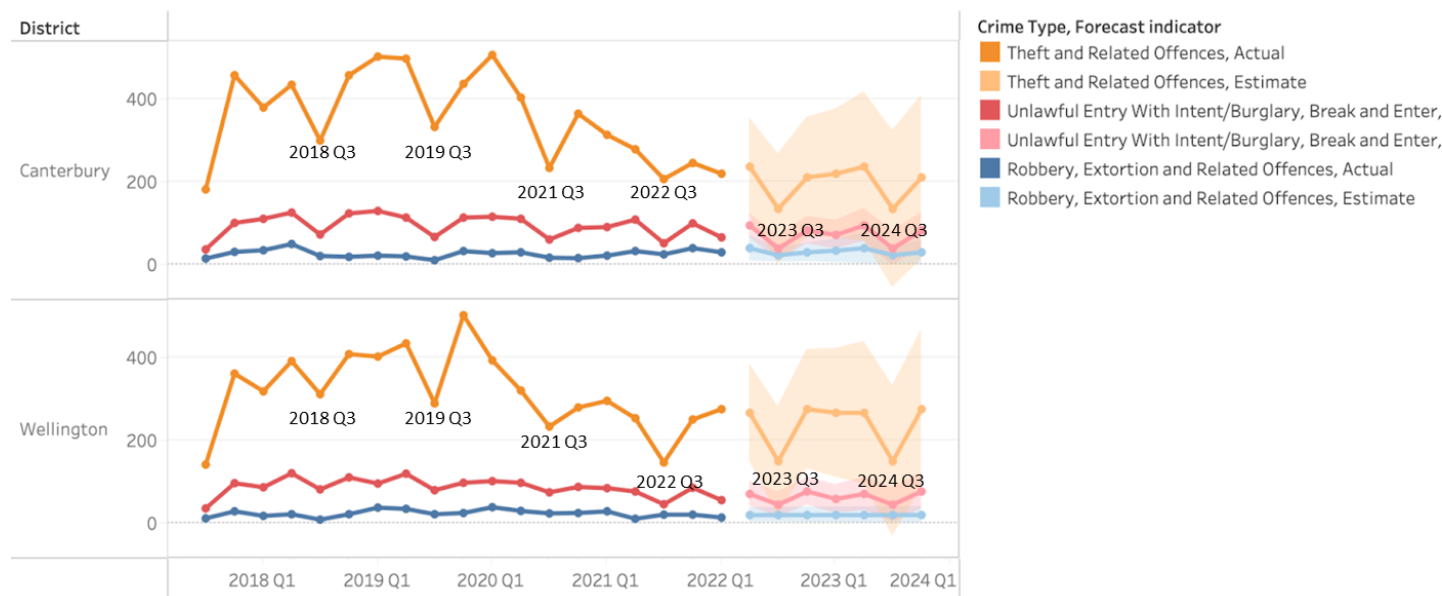

Figure 2: Time series analysis showing crime rate among different types of crime in Canterbury and Wellington.

Change Point Analysis

There were two covid-19 lockdown periods in NZ during the most recent three years. The first lockdown was imposed on NZ citizens from March 2020 to May 2020 and the second lockdown was imposed from August 2021 to September 2021. The change point analysis was performed to identify if the crime rate was impacted by the covid-19 lockdowns. By using R package strucchange, four change points were identified. For Christchurch, two identified points are

matched with the covid lockdown periods and three matched points were made for Wellington. This indicates that there were indeed changes in terms of the total crime numbers, likely due to the 2020 and 2021 lockdowns. This analysis clearly showed that the crime rate for theft significantly declined during both covid-19 lockdown periods (Figure 3A).
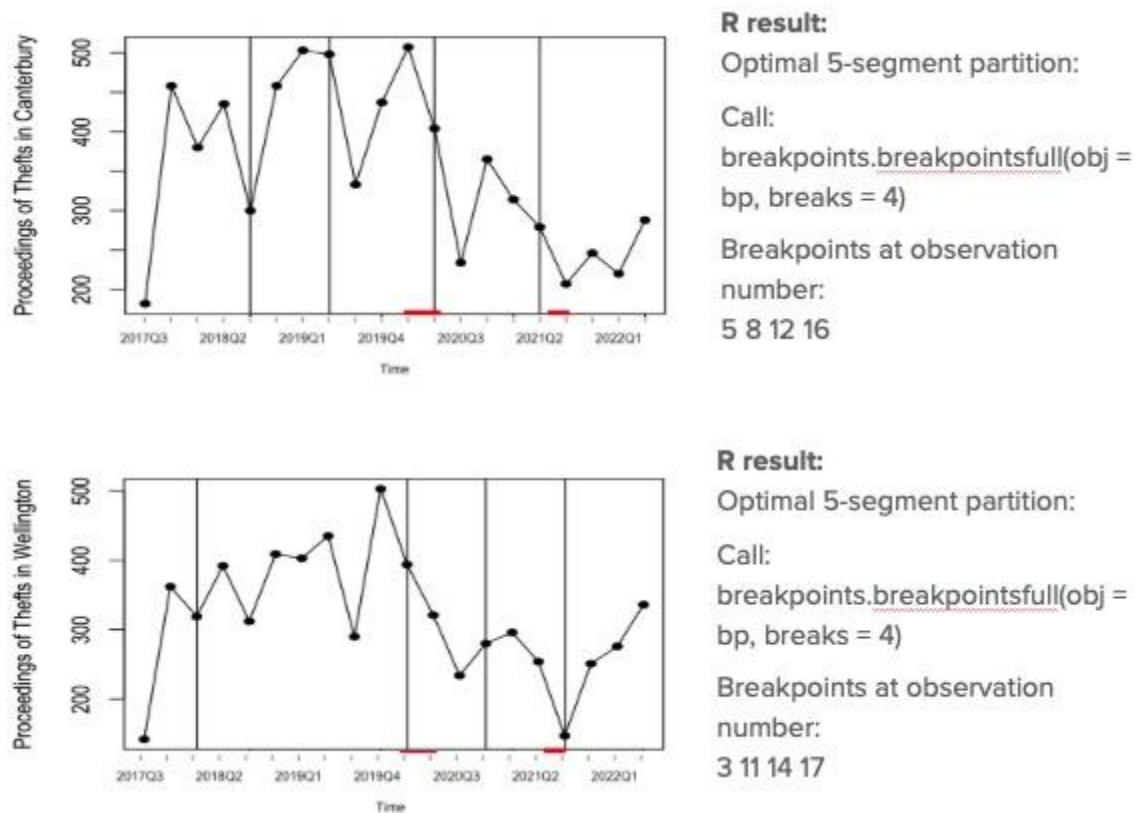

R result:

Optimal 5-segment partition:

Call:
breakpoints.breakpointsfull(obj = bp, breaks = 4)

Breakpoints at observation number:

5 8 12 16

R result:

Optimal 5-segment partition:

Call:
breakpoints.breakpointsfull(obj = bp, breaks = 4)

Breakpoints at observation number:

3 11 14 17

Figure 3 A: Change point analysis of theft rate in Canterbury and Wellington from quarter 3 2017 to quarter 2 2022. The red lines on the X-axis indicate the covid-19 lockdowns.
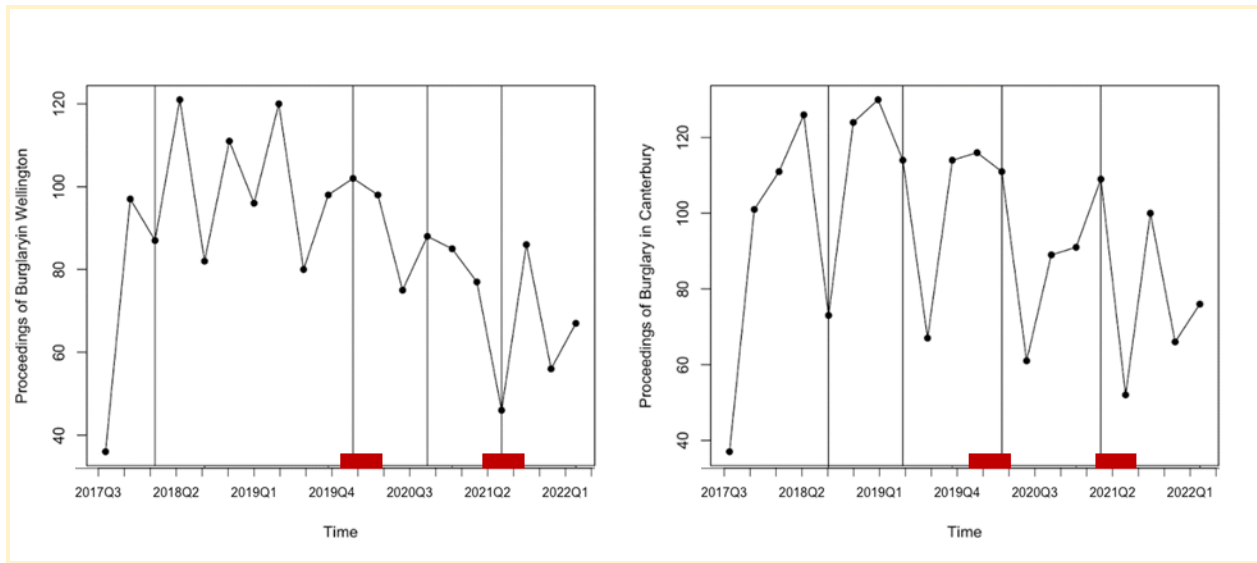
Figure 3 B: Change point analysis of burglary rate in Canterbury and Wellington from quarter 3 2017 to quarter 2 2022. The red lines on the X-axis indicate the covid-19 lockdowns.
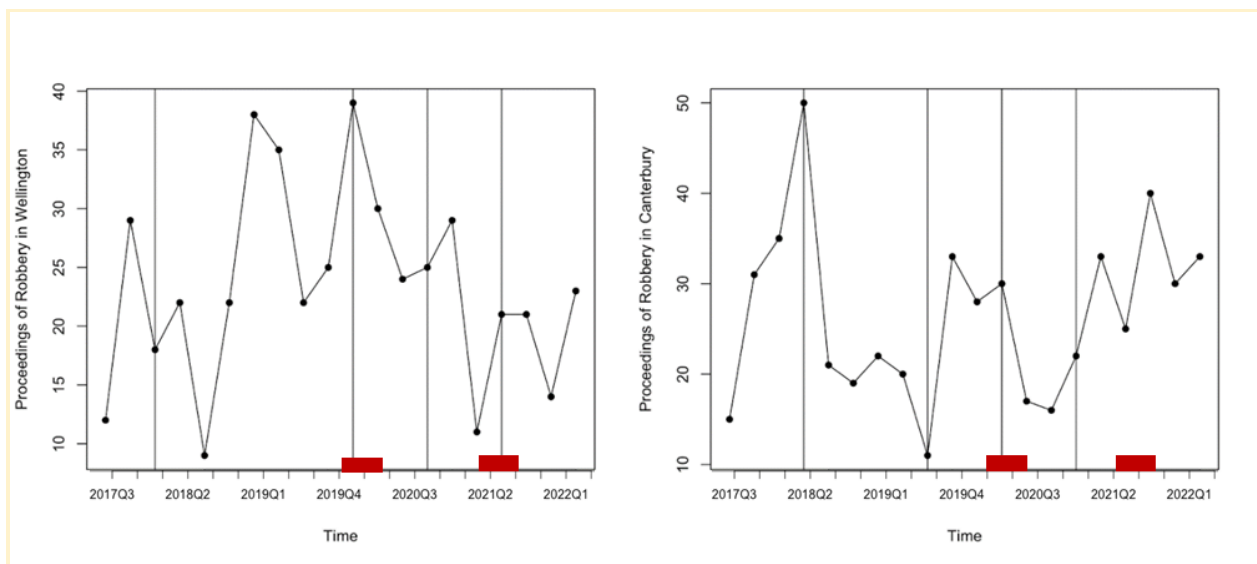

Figure 3 C: Change point analysis of robbery rate in Canterbury and Wellington from quarter 3 2017 to quarter 2 2022. The red lines on the X-axis indicate the covid-19 lockdowns.

However, relative to the theft trend in Figure 3A (over both covid -19 lockdown periods), the frequency of crime rate for the other two types of factors, being burglary and robbery, were less conclusive. This is because in 2021 (i.e. lockdown 2) they appear to go back up somewhat

(Figuire 3B and 3C) whereas Figure 3A shows how the frequency of theft decreased over both lockdown periods.

Conclusion

Our research indicates that the crime rate is not significantly influenced by the unemployment rate and cost of living in both Christchurch (Canterbury metropolitan area) and Wellington. As to whether these results can be generalised to other metropolitan areas like Auckland or Hamilton remains to be seen. Perhaps the findings of this study could be used as the framework to explore other factors that may influence crime rates in other parts of NZ. It is certainly possible that the drivers of crime for an individual may be more linked to subjective individual circumstances, such as the individual's socioeconomic status. The recent cost of living situation in NZ is widely believed to have been influenced (at least somewhat) by the recent Covid 19 pandemic, as well as due to other aspects such as the government's response in terms of general economic support packages. Perhaps those that were made redundant as a result of the economic uncertainty caused by covid did not tend to turn towards engaging in criminal activity like robbery or theft (as much as what we initially thought at the beginning of this research). Instead these people may have sought other alternative courses of employment in order to ensure sufficient income levels needed to support themselves and/or their family as well as adjusting their discretionary spending habits accordingly. In addition, crime rate appeared to decline during Q3 of every year (i.e. July to September). This may be due to Q3 coinciding with the winter months which are often cold in a country like NZ. Notably Jacod et al (2007) demonstrated that an increase in outside temperatures may be associated with a rise in certain crime types in a US setting

Interestingly, our study showed that the crime rate, particularly theft, appeared to significantly decline during both covid-19 lockdowns in both Christchurch and Wellington. Of course during this time the government severely restricted many people's movement through social distancing and lockdown to minimise the potential spread of covid-19. Theft numbers also appeared to increase somewhat after each respective lockdown period had ended. This suggests that theft is associated with the people's mobility levels. Because lockdown consigned everyone to remain primarily within their houses it would have decreased mobility. In addition to this if people were seen wondering around the streets over the strict lockdown periods it was

generally far more noticeable and may have also acted as a deterrent to commit crime. Surprisingly, unlawful entry with intention to burglary and robbery increased somewhat during the second lockdown in 2021. This shows that perhaps people were less inclined to follow government instructions and stay in one place the second time around, and were confident enough that perhaps law enforcement were more pre occupied with other matters during this time period and thus would not be caught or apprehended. We also acknowledge that there may be other types of crimes such as homicide, domestic violence and cyber-fraud that may have increased during the lockdowns. Studying these factors on a national level might provide deeper insight regarding the broader impacts of covid-19 on overall crime in the country.

References

Cheung, L., & Gunby, P. (2022). Crime and mobility during the COVID-19 lockdown: A preliminary empirical exploration. *New Zealand Economic Papers*, *56*(1), 106-113. https://doi.org/10.1080/00779954.2020.1870535

'Crime Crisis'(2022, July 18). Escalating crime in Auckland will dash hope of pandemic recovery, inner city business owners say. *NZ Herald*. https://www.nzherald.co.nz/nz/crime-crisis-escalating-crime-in-auckland-will-dash-hope-of-pandemic-recovery-inner-city-business-owners-say/

DiCristina, B. (2016). Criminology and the "Essence" of Crime: The Views of Garofalo, Durkheim, and Bonger. *International Criminal Justice Review*, *26*(4), 297–315. https://doi.org/10.1177/1057567716660359

den Heyer, G. (2021). Police strategy development: The New Zealand police prevention strategy. *Police Practice and Research*, 22(1), 127-140. https://doi.org/10.1080/15614263.2020.1786688

Edmark, K. (2005). Unemployment and crime: Is there a connection?. *Scandinavian Journal of Economics*, *107*(2), 353-373. https://doi.org/10.1111/j.1467-9442.2005.00412.x

Ghiasi N, Azhar Y, Singh J. (2022). Psychiatric Illness And Criminality. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK537064/

Horrocks, J., & Menclova, A. K. (2011). The effects of weather on crime. *New Zealand Economic Papers*, *45*(3), 231-254. https://doi.org/10.1080/00779954.2011.572544

Jacob, B., Lefgren, L., & Moretti, E. (2007). The dynamics of criminal behavior evidence from weather shocks. *Journal of Human resources*, *42*(3), 489-527.

NZ's reputation among world's best. (2011, September 28). *NZ Herald*. https://www.nzherald.co.nz/business/nzs-reputation-among-worlds-best/

Pearson, A. L., & Breetzke, G. D. (2014). The association between the fear of crime, and mental and physical wellbeing in New Zealand. *Social Indicators Research*, *119*(1), 281-294. https://doi.org/10.1007/s11205-013-0489-2

Tang, C. F., & Lean, H. H. (2007). Will inflation increase crime rate? New evidence from bounds and modified Wald tests. *Global Crime*, *8*(4), 311-323.https://doi.org/10.1080/17440570701739694

Thotakura, Dr. (2011). Crime: A Conceptual Understanding. *Indian Journal of Applied Research*. 4. 196-198. DOI:10.15373/2249555X/MAR2014/58

Open data sources used

https://www.police.govt.nz/about-us/publications-statistics/data-and-statistics/policedatanz

https://www.stats.govt.nz/

https://www.infometrics.co.nz/

https://greaterchristchurch.org.nz/

https://figure.nz/