

Data Analytics on NSW Crime Dataset

Executive Summary

This report provides an insight on the current pattern as well as a prediction of the offence count index in NSW. During the analysis, we discovered several relations between offence count and different factors, then provide analysis and prediction based on these factors. The outcome shows that there are seasonal patterns for the offence count as a whole as well as in some specific offence categories. Our prediction indicates that there is a high possibility that the offence count will drop slightly in the coming year considering factors including employment rate and CPI for food and non-alcoholic beverages.

Data Preprocessing

The objective for data pre-processing is to transfer the provided dataset and pivot the year from row to column so that Tableau will be able to recognize it as a dimension. For this, we are using Tableau Prep Builder 2019.

First, we check the original data:

1	LGA	Offence category	Subcategory	Jan 1995	Feb 1995	Mar 1995
2	Albury	Homicide	Murder *	0	0	0
3	Albury	Homicide	Attempted murder	0	0	0
4	Albury	Homicide	Murder accessory, conspiracy	0	0	0
5	Albury	Homicide	Manslaughter *	0	0	0
6	Albury	Assault	Domestic violence related assault	7	7	7
7	Albury	Assault	Non-domestic violence related assault	29	20	21
8	Albury	Assault	Assault Police	12	3	2
9	Albury	Sexual offences	Sexual assault	4	3	1
10	Albury	Sexual offences	Indecent assault, act of indecency and other sexual offences	2	6	2
11	Albury	Abduction and kidnapping		0	0	1
12	Albury	Robbery	Robbery without a weapon	0	1	0
13	Albury	Robbery	Robbery with a firearm	0	0	0
14	Albury	Robbery	Robbery with a weapon not a firearm	1	0	0
15	Albury	Blackmail and extortion		0	0	0
16	Albury	Intimidation, stalking and harassment		0	0	0
17	Albury	Other offences against the person		1	0	0
18	Albury	Theft	Break and enter dwelling	35	29	20
19	Albury	Theft	Break and enter non-dwelling	28	22	22

Figure1. Original dataset

As you can see, the data has offence count for each year as columns. This creates an issue that visualization tools such as Tableau will not be able to recognize year as a dimension. What we will have to do is to pivot the year and count and put year into one column with the header "date" and counts into column with header "count".

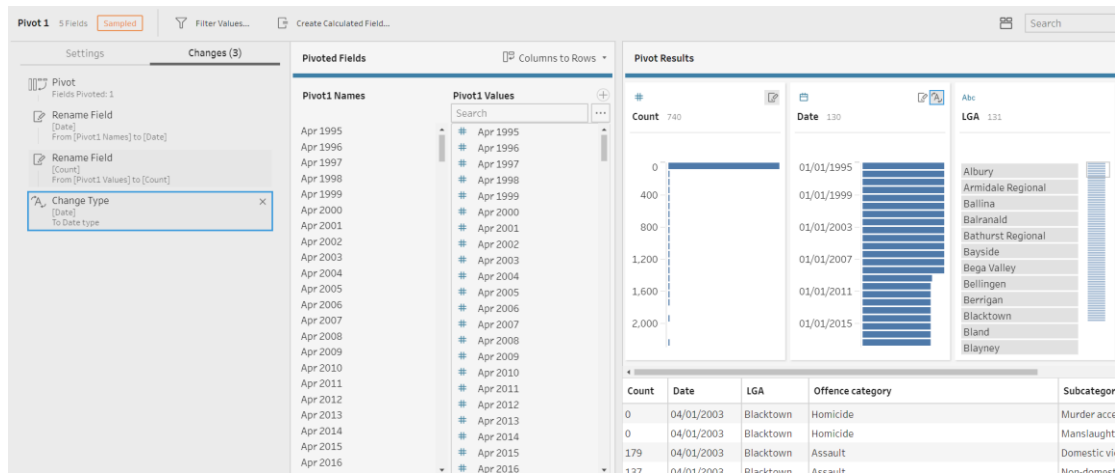


Figure 2. Pivot operation

We also identified that some of the category does not have a subcategory creating a lot of empty subcategory cell. After reviewing our requirements, we decided that we don't have to deal with it. However, one thing we also do is to set the data type of Date from string to date. Here is the result:

Count	Date	LGA	Offence category	Subcategory
0	04/01/1995	Albury	Homicide	Murder *
0	04/01/1995	Albury	Homicide	Attempted murder
0	04/01/1995	Albury	Homicide	Murder accessory, conspiracy
0	04/01/1995	Albury	Homicide	Manslaughter *
2	04/01/1995	Albury	Assault	Domestic violence related assault
16	04/01/1995	Albury	Assault	Non-domestic violence related assault
4	04/01/1995	Albury	Assault	Assault Police
1	04/01/1995	Albury	Sexual offences	Sexual assault
3	04/01/1995	Albury	Sexual offences	Indecent assault, act of indecency and other sexual off
0	04/01/1995	Albury	Abduction and kidnapping	null
3	04/01/1995	Albury	Robbery	Robbery without a weapon
0	04/01/1995	Albury	Robbery	Robbery with a firearm
0	04/01/1995	Albury	Robbery	Robbery with a weapon not a firearm
0	04/01/1995	Albury	Blackmail and extortion	null
0	04/01/1995	Albury	Intimidation, stalking and harassment	null
0	04/01/1995	Albury	Other offences against the person	null
32	04/01/1995	Albury	Theft	Break and enter dwelling
30	04/01/1995	Albury	Theft	Break and enter non-dwelling
4	04/01/1995	Albury	Theft	Receiving or handling stolen goods

Figure 3. Preprocessed dataset

Up to this point, pre-processed dataset is ready for data analysis.

Suburbs Crime Pattern

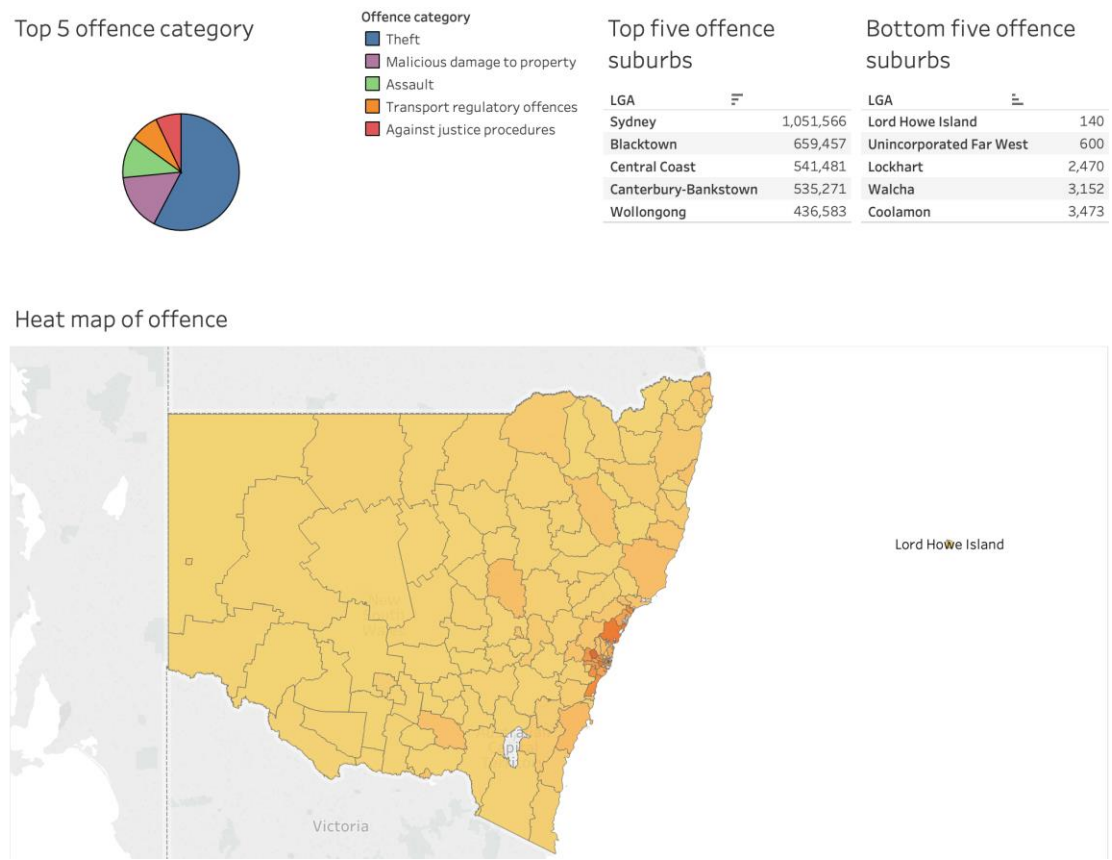


Figure 4. Dashboard for top five offence category

Theft offence

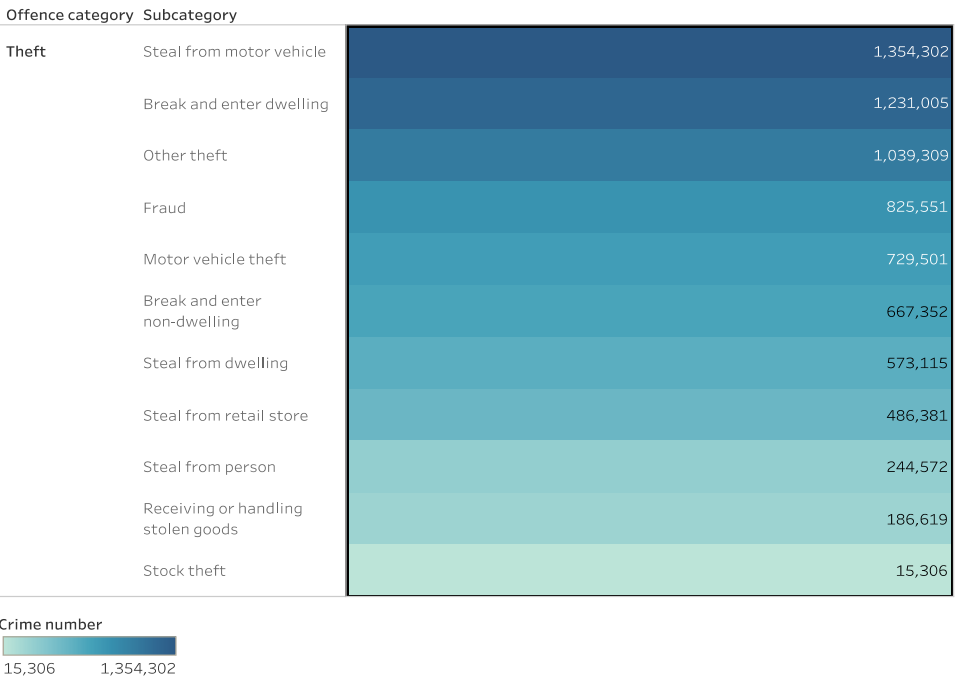


Figure 5. Theft offence rating

Top five offence suburbs

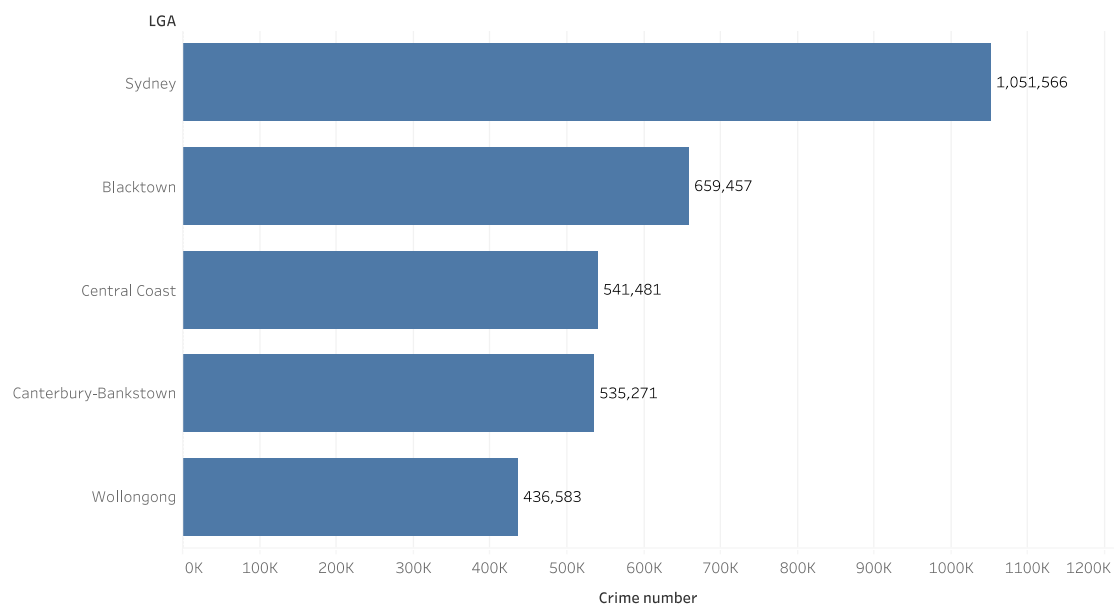


Figure 6. Top five offence suburbs

The pie chart in figure 4 shows that theft is the most prominent crime in NSW followed by malicious damage to property and assault. The number of thefts is almost four times that of other crime types. In addition, top five offence categories will be used in finding top and bottom five suburbs. According to figure 5, stealing from motor vehicle is the top category while there are only 15,306 stock theft instances.

Figure 6 shows that the top five offence suburbs are Sydney, Blacktown, Central Coast, Canterbury-Bankstown, and Wollongong. The bottom five offence suburbs are Lord Howe Island, Unincorporated Far West, Lockhart, Walcha and Coolamon. The heat map shows that the areas with most criminal activity are usually coastal cities. By contrast, the far east region in NSW appears to have far lower crime rate. This phenomenon may directly attribute to the population density in NSW. Coastal cities such as Sydney and Central Coast tend to suffer more crimes than cities with much less population.

Top five offence category in top five suburbs

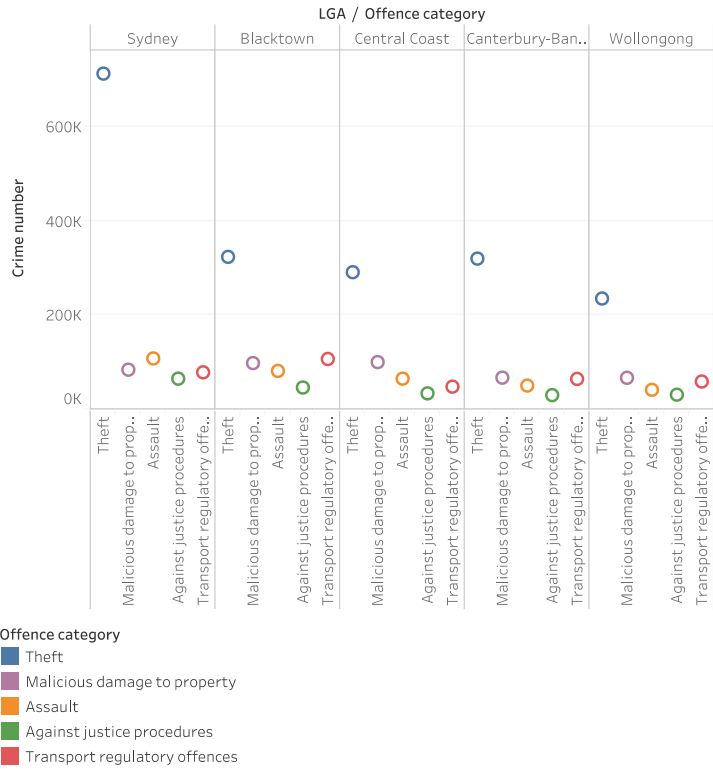


Figure 7. Top five offence category in top five suburbs

Top five offence category in bottom five suburbs

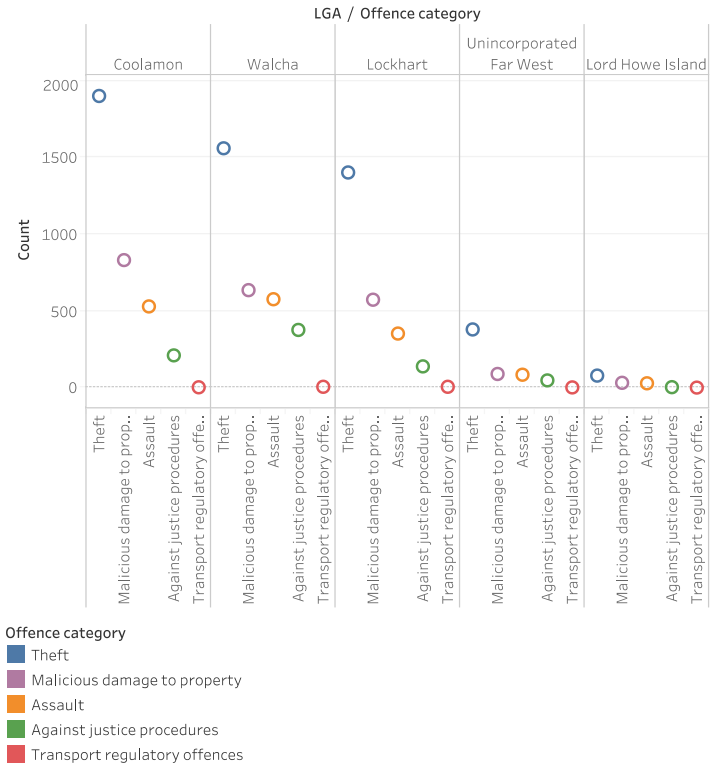


Figure 8. Top five offence category in bottom five suburbs

With reference to figure 7 and figure 8, theft is the most common crime type in all top 5 and lowest 5 places. Moreover, the number of theft instances in the top 5 areas are

significantly higher than the remaining 4 crimes combined. In addition, the crime feature also varies from one place to another when looking at the remaining 4 crime categories. To illustrate, while Central Coast, Coolamon, Walcha and Lockhart encounters serious social safety problems resulting from malicious damage to property, Blacktown suffers more from transport regulatory offence.

In brief, it can be inferred that the top 5 places based on number of crime accounts for a significant portion of the total crime in NSW. Theft is the top crime faced by all top 5 and lowest 5 areas. Intuitively, the top 5 crime prone cities are clustered in the coastal area, in a sharp contrast to those in the far east region with far lower crime commitment.

Seasonal and Holiday Pattern

Overall Pattern

Month	Avg	Highest	Max Year	Lowest	Min Year	Median
Jan	60,835.22	70,808	2001	43,932	1995	60,986
Mar	59993.09	67510	2001	44355	1995	60610
Dec	59492.26	65283	2000	47807	1995	59774
Oct	59182.74	68707	2001	48873	1995	58154
Nov	58000.48	65736	2000	46307	1995	58330
May	57409.39	66308	2001	42165	1995	57915
Aug	56548.83	67846	2001	45077	1995	56259
Sep	56266.7	65309	2001	45405	1995	55469
Apr	55798.57	63103	2002	40754	1995	55717
Jul	55770.35	66909	2001	42970	1995	55272
Jun	55175.96	65711	2001	41592	1995	54928
Feb	54819.3	63909	2001	39933	1995	54258

Figure 9. Monthly Crime Count Overall Statistics

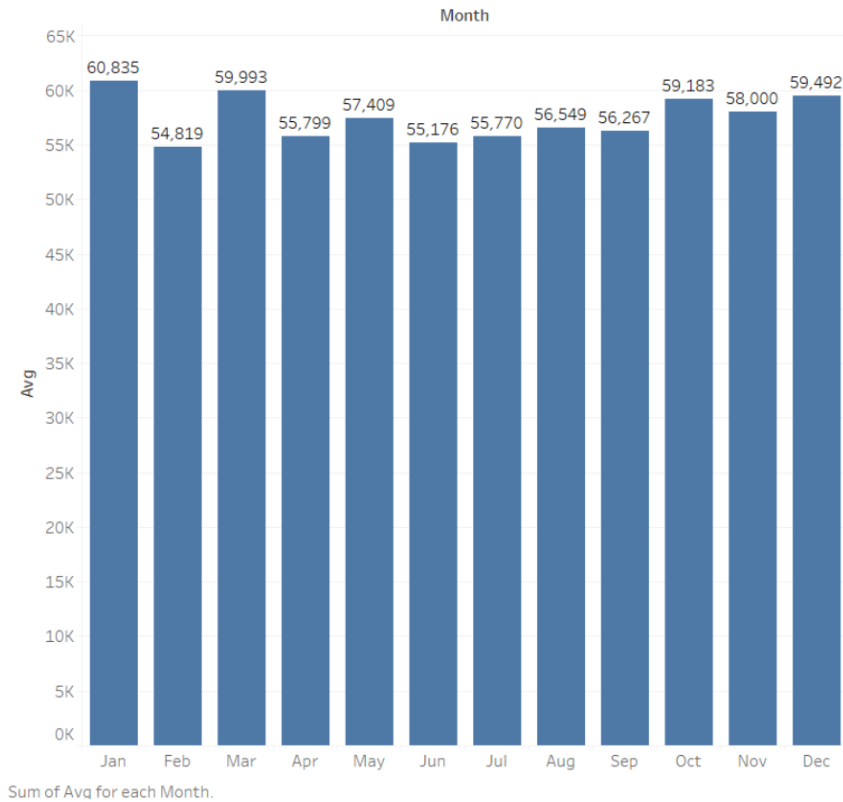


Figure 10. Monthly Crime Count Statistics

The all year monthly criminal activity statistics for all categories reveals that the number of crime peaks in January, March, December October and diminishes as the winter approaches (figure 9 and 10). It can be inferred that crime is highly related to season because the top 5 months with highest number of crime commitment are clustered in summer. By contrast, the number crime activity falls during autumn (March, April and May) and winter (June, July and August). Intuitively, between 2000 and 2002, the total number of criminal cases reached peak in every single month, in a sharp comparison to those recorded in 1995, when the monthly average reached record low throughout the 23 observation years.

The limitation of deriving overall crime seasonal pattern is the fact that average figure may distort the true picture of seasonal pattern. Therefore, further investigations are performed to determine the relationship between crime frequency and season on yearly basis.

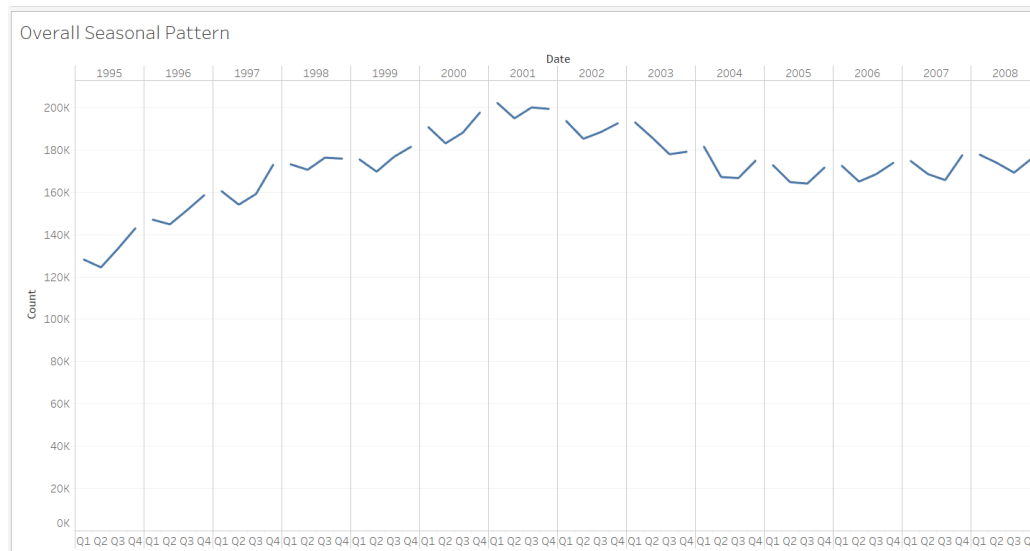


Figure 11. Overall Seasonal Pattern (1995-2008)

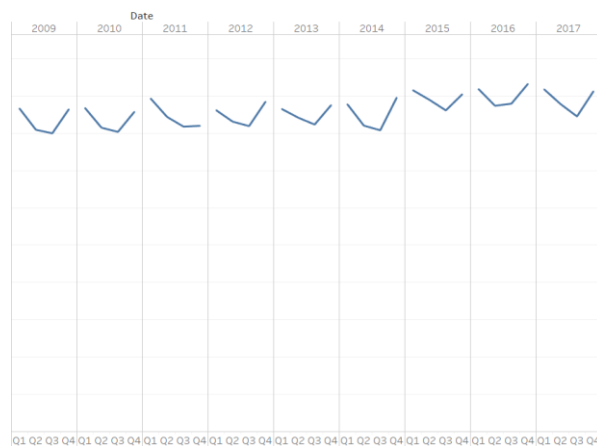


Figure 12. Overall Seasonal Pattern (2009-2017)

Refer to figure 11 and 12, the quarterly criminal activity pattern is concave, demonstrating that the number of crimes peaked in summer and spring, fell dramatically during autumn and bottomed in winter. The reason may directly attribute to the holiday celebrated in each season. For example, in summer, the local celebrates Christmas, the New Year and the National Holiday. Undoubtedly, during the holiday season, cities and towns are bustling with people, offering more opportunities for criminals to conduct crime. In addition, during summer students usually have 3 months vacations. The implication of school summer vacation can be two folded: it is plausible to argue that more students becomes either perpetrator or victim, leading to increased criminal activities.

However, as a major holiday in Australia, Easter does not associate with surging number of crimes. This is supported by the fact that April on average ranks 8 out of 12 in terms of crime records.

Autumn and winter, by comparison, does not have important holiday. A lack of holiday may partially explain a lower number of crimes during autumn and winter.

In brief, the overall pattern shows that in summer and spring, more crimes are expected to take place while the number of crimes slacks off in both autumn and winter. However, in order to derive a more in-depth insights of the seasonal and holiday pattern, ad hoc visualization and analysis regarding specific crime category or subcategory will be considered.

Olympic Games and Theft

Apart from holiday patterns, it is also worthwhile to explore the theft monthly pattern back in 2000, when Sydney Olympic Game was hosted from 15TH September to 1st October. During the Olympic Game tournament, we are interested in how the event will impact the level of theft in Sydney, especially theft from motor vehicle. The corresponding visualization is provided below :

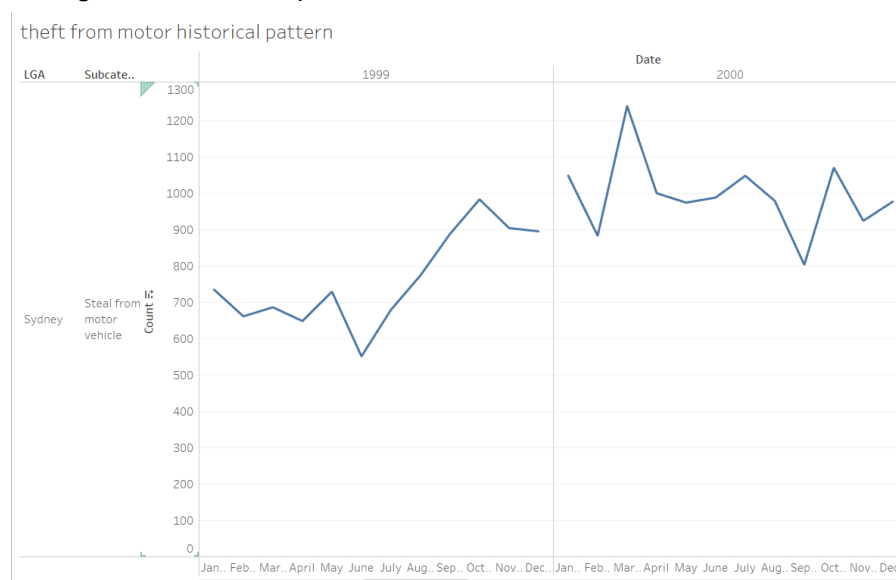


Figure 13. Theft from motor monthly pattern in 1999 and 2000

theft from motor historical pattern

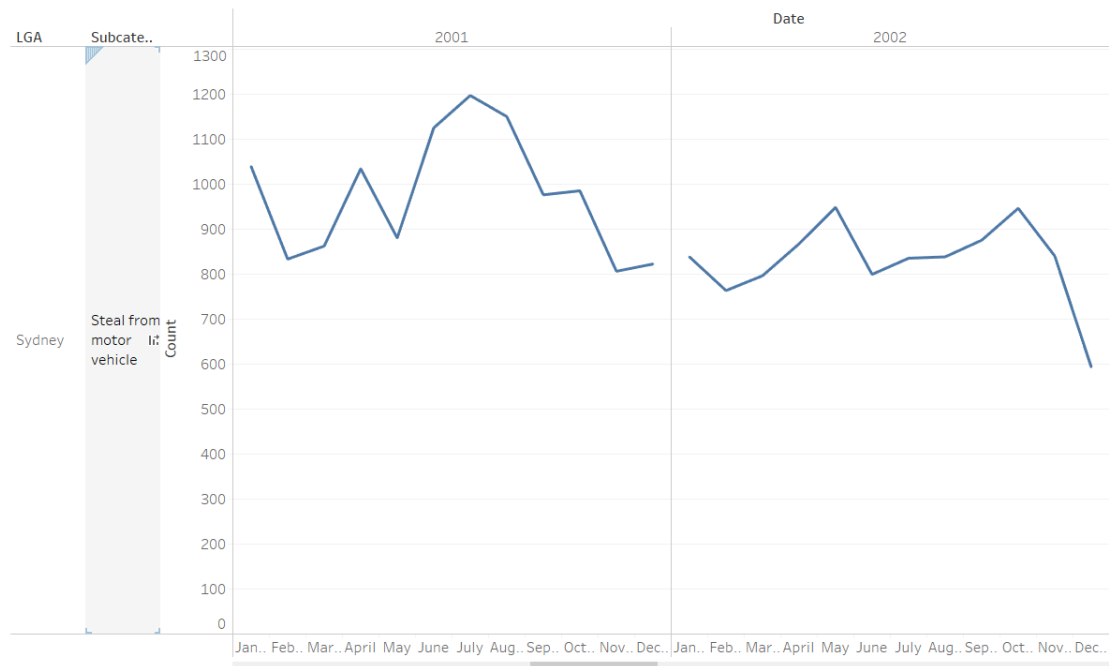


Figure 14. Theft from motor monthly pattern in 2001 and 2002

Based on the line charts, it can be observed that the number of thefts from motor vehicle in September was lowest in 2000. In addition, in 1999, 2001 and 2002, there was no consistent pattern to justify that September was the month when theft from motor vehicle reached a record low throughout the year. Therefore, it can be concluded that the host of Olympic Games significantly impact the number of theft from motor vehicle. This pattern may stem from the government commitment on securing social safety during the Olympic Games. Since government tends to send far more police force during Olympic Games. As the arguments develops, more police force on patrol means it is more likely thief will be caught on the street. It would deter thieves from conducting theft until the tournament ends. This may also explain why the number of theft from motor vehicles embraced a moderate increase right after the tournament in October 2000.

Top 5 areas seasonal pattern

Based on the result in previous section, Sydney, Central Coast, Canterbury-Bankstown, Blacktown and Wollongong are the top 5 areas with highest crime rate, the corresponding top 3 crime categories seasonal pattern in each place is presented below:

To begin with, there is no obvious seasonal pattern for malicious damage to property in all 5 places, given the flat quarterly pattern. In addition, assault in Blacktown and Sydney follows a slight concave pattern, yet not significant, indicating the trend that there are marginally more assaults in spring and

summer in both places. Yet in neither Bankstown nor Wollongong, no assault seasonable pattern has been observed. Moreover, only Sydney shows a strong seasonal pattern on theft. It turns out that in Sydney, the frequency of theft is in good part determined by the season. This has been proven by the finding that Sydney has the highest number of theft in first quarter (January, February and March), reaches bottom in third quarter (July, August and September) and bounces back in the last quarter (October, November and December).

Top5 towns quaterly pattern

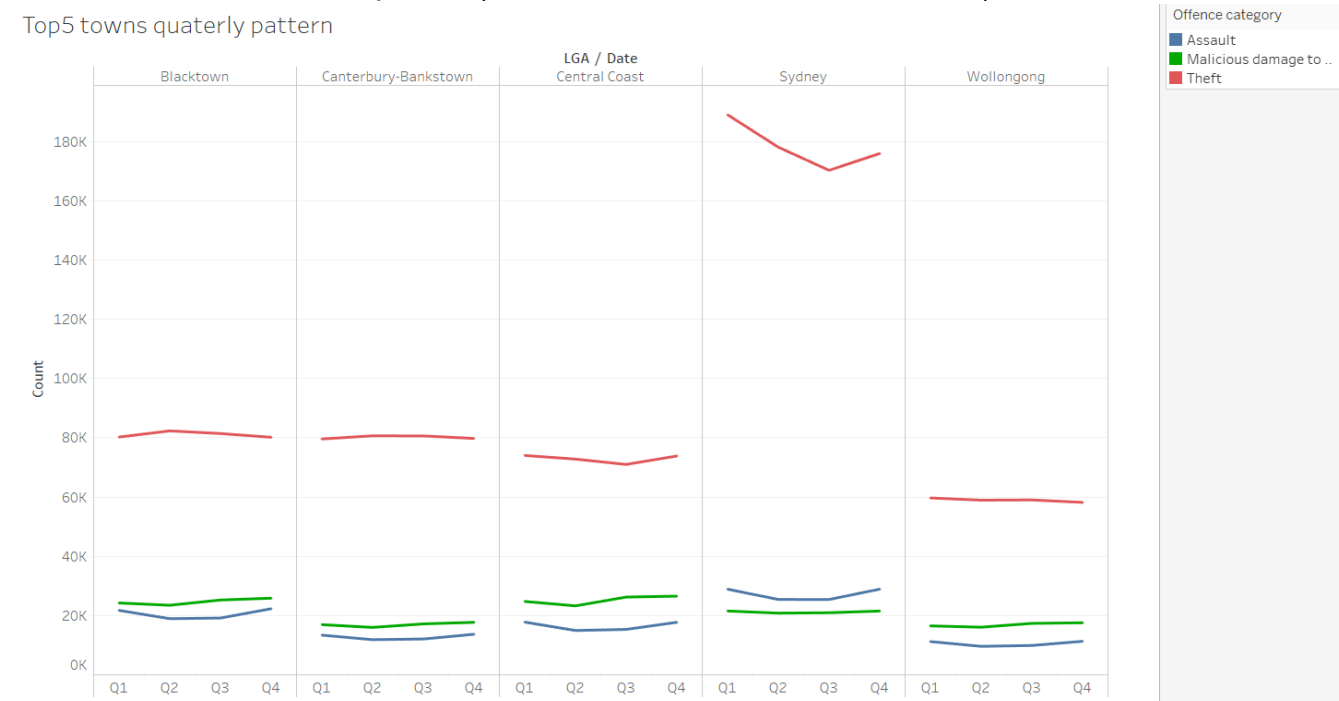


Figure 15. Quarterly pattern on top 3 crime categories, grouped by top 5 towns

Liquor Offences and Sexual Offences

There are also seasonal patterns on liquor offences and sexual offences between 2000 and 2017. Even though few outliers have been found in both crime category, most line are either 'V' or 'U' shaped, indicating a strong and consistent seasonal pattern. This pattern is aligned with the crime overall seasonal pattern (significantly higher in spring and summer, lower in autumn and winter).

The reason for discussing the pattern of liquor offences and sexual offences together is because these two categories of crime is highly correlated. In many cases, sexual offences are triggered by liquor offences or excessive alcohol consumption. In addition, in summer female victims tend to wear less than autumn and winter, so it is reasonable that the number of sexual offences will rise. (figure 16 and 17)

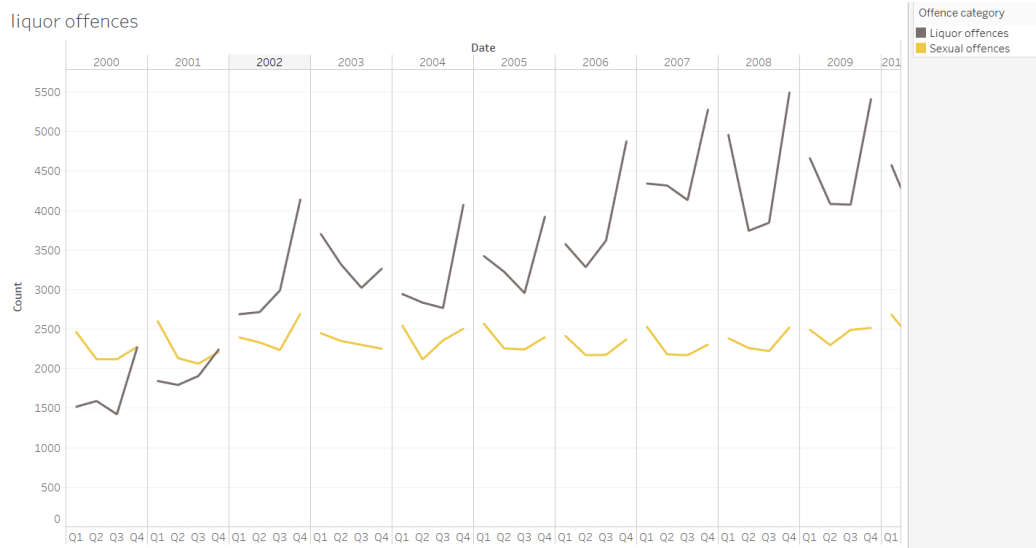


Figure 16. Liquor offences and sexual offences quarterly pattern (2000-2009)

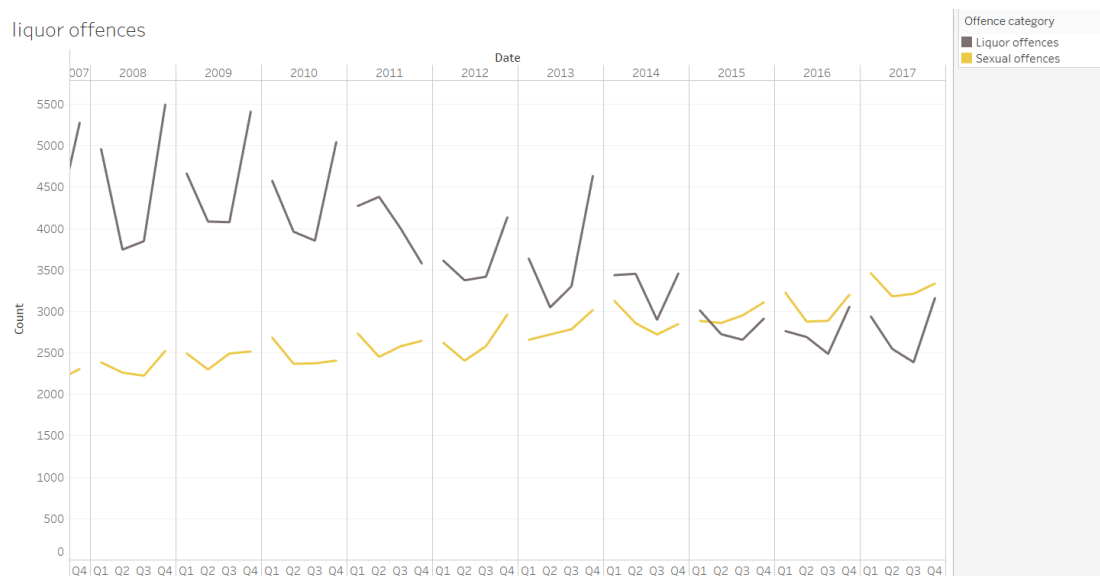


Figure 17. Liquor offences and sexual offences quarterly pattern (2008-2017)

Drug offence and theft

During the data exploration, it turns out that the number of theft peaked around 2000 and then dramatically fell afterward. With reference to Weatherburn and Holmes (2013), one of the reasons of surge in theft around 2000 is the shortage of heroin. Empirically speaking, price of heroin and other drugs rose due to a deficiency of drug supply in Australia. People with drug addiction were forced to commit theft in order to afford drugs. To justify this explanation, the visualization is given to see if there is a strong relationship between drug offences and theft. The pattern reveals that drug offences does not correlate to season. In addition, there was no significant change in terms of drug offences around 2000, when the number of theft reached record high. One plausible reason is that a shortage of drug in 2000 may not lead to more drug offences since less drugs were available at that time. Furthermore, many other factors may also impact the level of theft, for example, cost and consequence of

crime, unemployment rate, food and necessity CPI as well as average weekly wage. More detailed analysis of these factors and the corresponding prediction based on these factors will be mentioned in the next section.

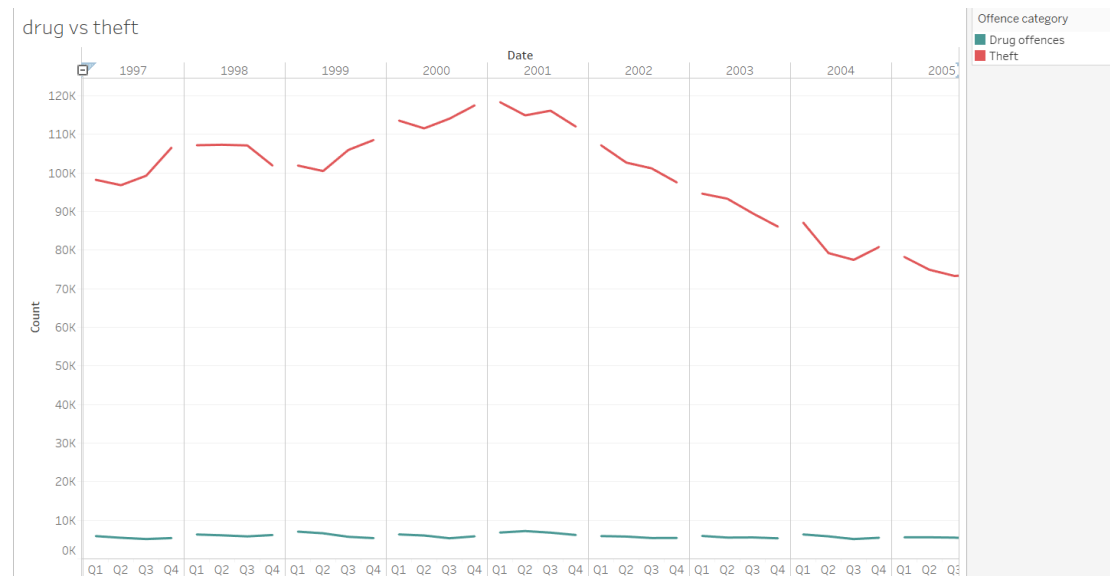


Figure 18. Theft and drug offences quarterly pattern 1997 - 2005

Prediction

Overall Crime Trending

Wage unemployment food price and crime

	Year of Date					
	2012	2013	2014	2015	2016	2017
Avg. Avg Weekly Wage	1,452	1,495	1,550	1,595	1,635	1,679
Avg. CPI of Food and non-alcoholic beverages	99.90	100.50	103.30	104.70	105.90	107.20
Avg. Employment Rate (15-64)	71	71	71	73	72	74
Count	679,280	681,022	680,226	714,103	720,635	710,621

Figure 19. Summary of crime and other relevant factors

It is argued that poverty, employment rate can lead crime (Weatherburn, 2001). As shown in the table above, wage level is the main factor affecting crime while employment rate and CPI are secondary factors. The figure shows that red line is Crime number, and the rate of wage increase is the blue line. It obviously that the number of crimes will grow if wage increased fast. The growth rate of wage has been gradually declining since 2014, but it has been on an upward trend since 2016, and it is likely to keep increasing in 2018. With the increase of wage, the crime may decline in next year.

rate of wage increase and number of crime

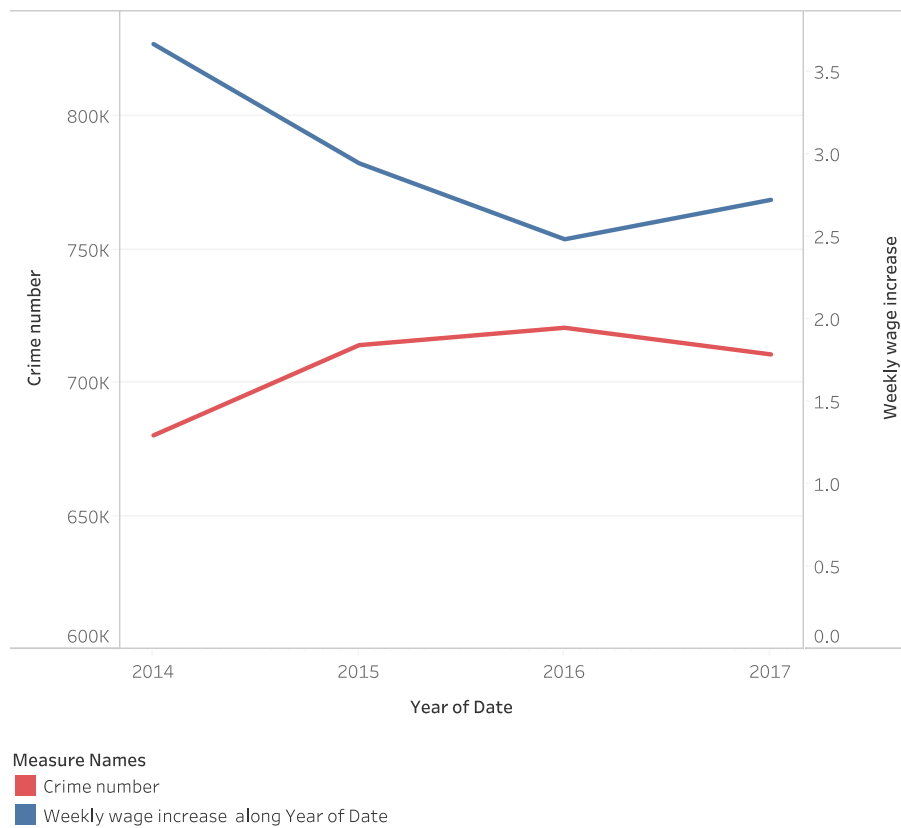


Figure 20. Crime number and weekly wage increase

Transport Regulatory Trending

The top half of the Transport table represents the number of crimes over the years. It is easy to see that the overall trend is increasing. The opal transport system was introduced in 2012. There is a significant increase in this period. (Nithghbourhood) This is likely to lead a lot of fare evasion because of the system failure. In addition, graph below shows that the rate of increase of transport regulatory offence has been more than 0 percent every year since 2007, it's likely to be more than 0 percent in the future. The number of transport regulatory offence will grow.

Transport regulatory offence

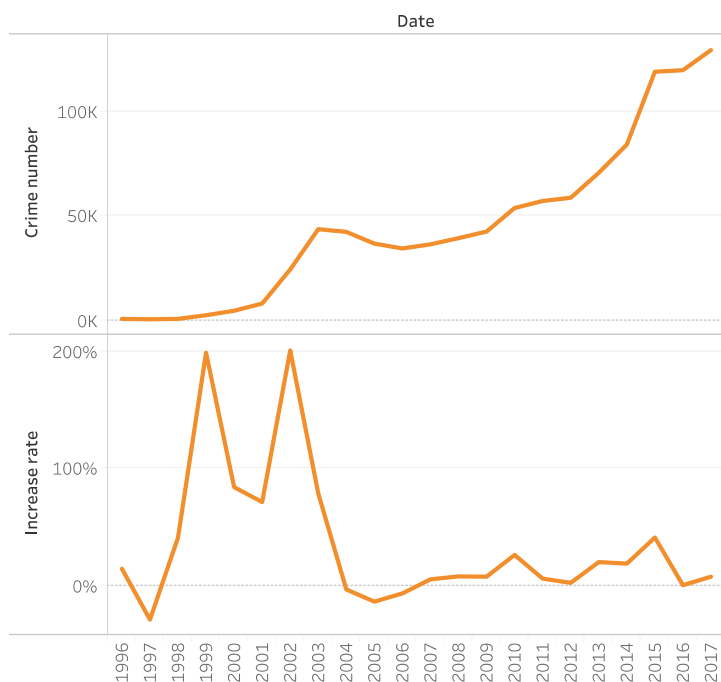


Figure 20. Transport regulatory offence and the corresponding annual increase rate

Sexual Offence Trending

For sexual offences rate, the overall trend seems that it will be rising in the coming years, as indicated in Figure 21.

Sexual Offence Over Time

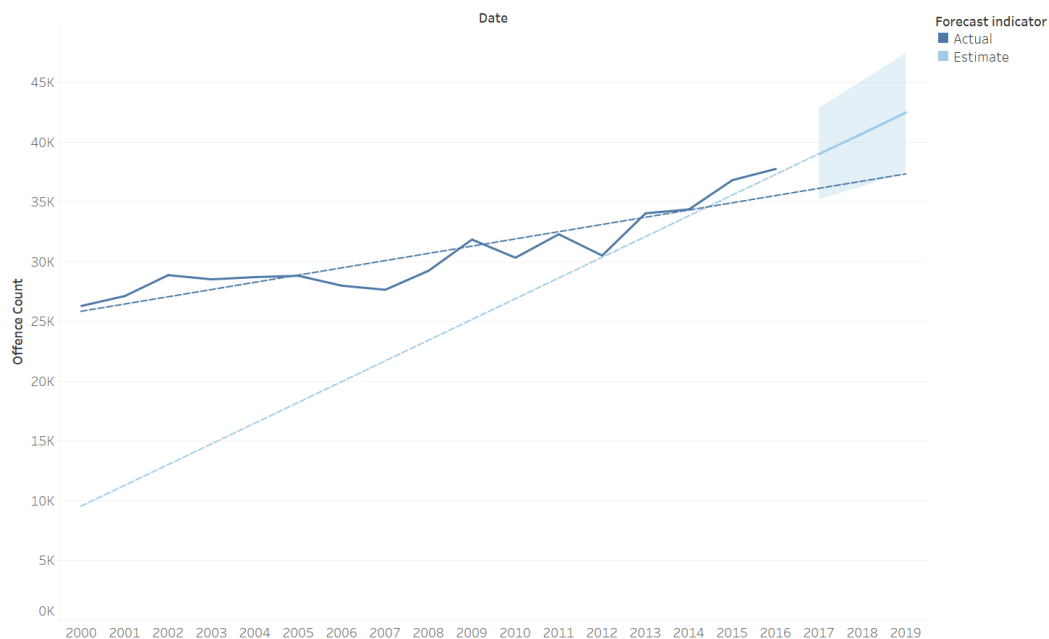


Figure 21. Sexual Offences count over time with estimation

Further drill down shows that both sub-categories for sexual offences have the tendency of raising.

Sexual Offence Over Time By Sub-category

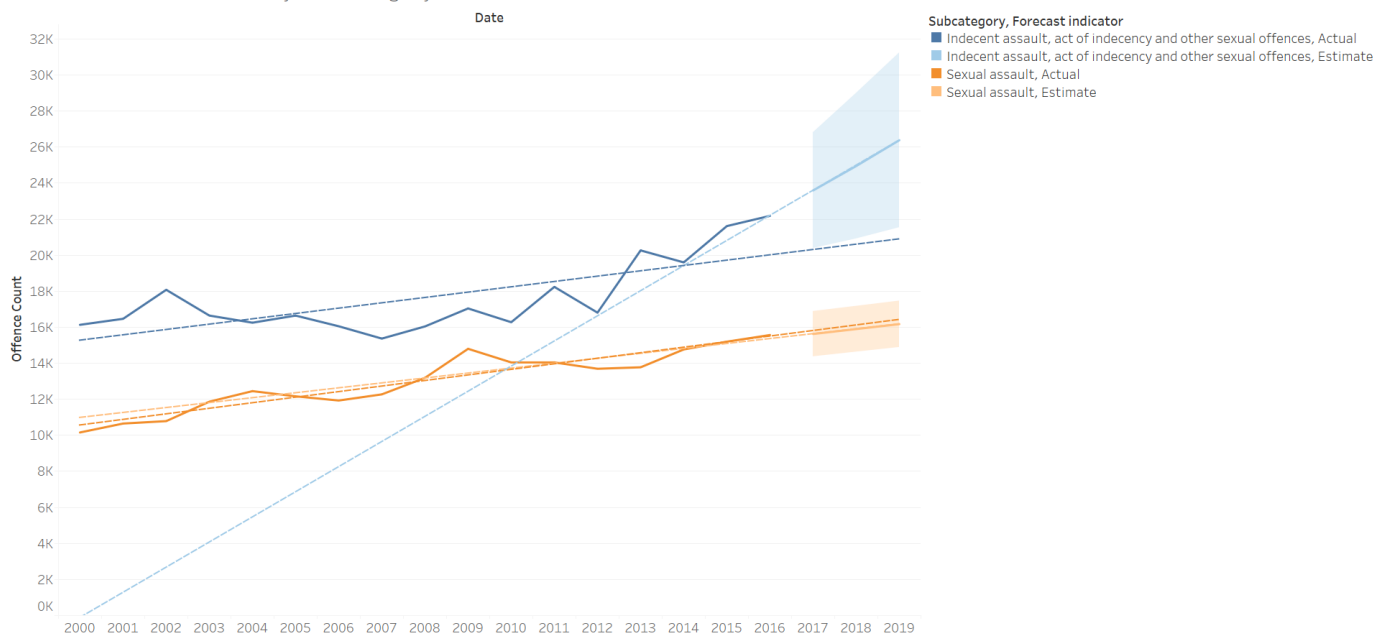


Figure 22. Sexual Offences count over time by Sub-category with estimation

During the analysis of other factors, we found some interesting relation between the CPI for Alcohol and Tobacco.

Year by Year Growth Rate for Sexual Offence Count and CPI of Alcohol and Tobacco



Figure 23. year by year growth rate for sexual offence count and CPI of alcohol and tobacco

From Figure 23, we found that while the growth rate of CPI for alcohol and tobacco

increase, growth rate for sexual offence count actually decreases. According to Mann, R and Hollin, C's research in 2007, under the influence of alcohol and drug is one of the most related reason for sexual offences with a Kappa score of 0.94. Our assumptions is that while the growth rate CPI for alcohol outrun the growth rate of wage, which means that alcohol is getting expensive, people stop consuming that much alcohol which leads to decrease in the growth rate in sexual offences. To verify this, we tried to eliminate the influence of wage increase by subtracting wage growth rate from CPI growth rate for alcohol and tobacco, which generates Figure 24

Year by Year Growth Rate for Sexual Offence Count and CPI of Alcohol and Tobacco Minus Growth Rate for Weekly Wage



Figure 24 Year by year growth rate for sexual offence count and CPI of alcohol and tobacco minus growth rate for weekly wage

From Figure 24, it's obvious that while the subtracted growth rate for CPI of alcohol and tobacco and average weekly wage starts dropping, growth rate for sexual offences raises. In 2010, while subtracted growth rate reaches its peak on above 0.037, sexual offences count growth rate drops to almost -5%. Whereas in 2013, when growth rate for CPI almost matches growth rate for wages, growth rate for sexual offence reached its highest peak over the period, standing on 11.5%, and then drops to around 1% the next year where subtraction growth rate increases from around 0.003 to 0.025. As the subtracted growth rate is still above 0 and raising, we believe that this will cause the offence count growth rate to be above 0% which means the offence count will still be rising.

The average offence rate per capita in the recent years are also raising at a rather high rate, as shown in Figure 25.

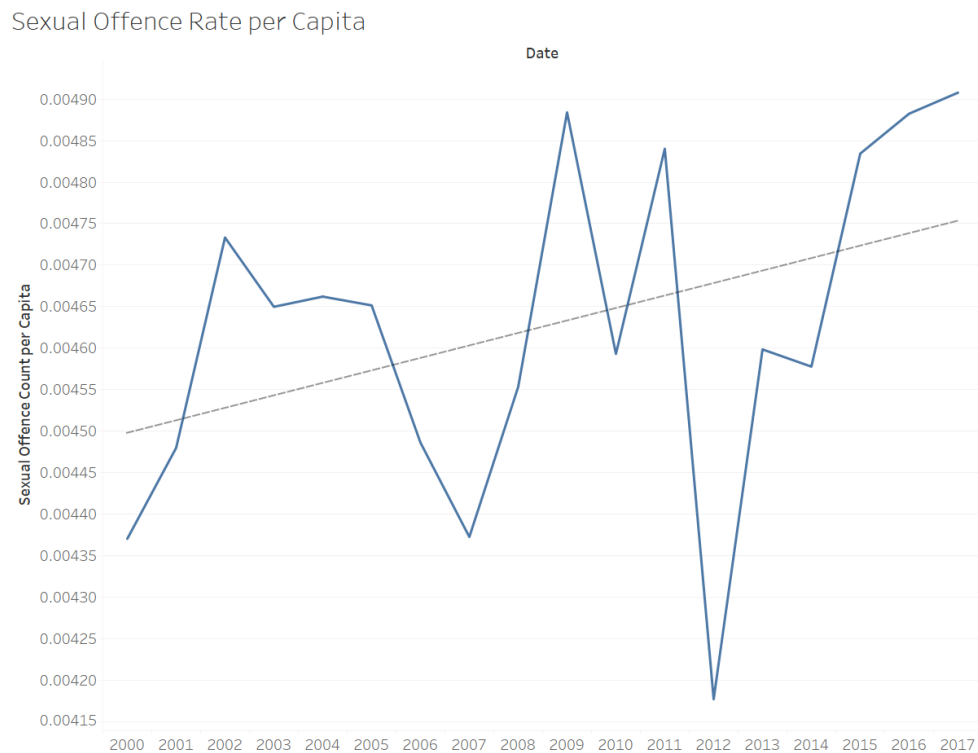


Figure 25 Sexual offence count per capita

With reference to Figure 25, offence count per capita has raised from 0.0041770, the lowest point in 17 years period, to over 0.00490, which is the highest recorded number we saw so far. The raise is in a pretty steep rate, a 17.493 percent growth in just 5 years. Although we can see the growth rate is slowing down, we are still estimating the count per capita to still go up in the coming year.

Considering all the above, it can be concluded that offence count as well as offence count per capita will still be going up in the coming year if no further action has been taken by the NSW police force.

Theft trend prediction

With reference to Weatherburn from NSW Bureau of Crime Statistics and Research (2001), a wide range of factors contribute to crime, ranging from economic stress, weak parent-child attachment, family factors, school performance and intelligence, truancy, poverty and unemployment to substance abuse. Similarly, Weatherburn and Holmes (2013) argue that a significant fall in theft from 2001 to 2013 is directly attributed to falling drug use and improved living standard. This finding is aligned with the empirical economic theory that the level of crime falls as the benefits gained from legal activity increase. Therefore, in order to predict the trending of theft in the near

future, drug use, weekly wage, CPI for different goods, percentage of single parent family, number of domestic violence and unemployment ought to be considered. The CPI data by capital city is published by Australia Bureau of Statistics, drug offence and domestic violence are collected from the NSW dataset, unemployment rate is gathered from ABS Labor Force Survey, NSW average weekly wage and NSW single parent family percentage is obtained from Australia Bureau of Statistics. The consolidated table is provided below:

Year	Theft	Drug	% Wage Increase	% Food CPI Increase	Wage to Food	% Alcohol and Tobacco CPI Increase	Wage to Alc and Tob	NSW Single Parent Family %	NSW Domestic Violence Instance	Unemployment
2013	253,057	45,281	3.00%	0.60%	5.00	4.00%	75.00%	N/A	28,431	5.70%
2014	242,931	52,204	3.67%	2.70%	1.36	6.60%	55.61%	N/A	29,193	6.10%
2015	237,322	58,723	2.94%	1.36%	2.16	4.82%	61.00%	N/A	29,109	6%
2016	234,359	60,286	2.48%	1.15%	2.16	5.66%	43.82%	16.30%	29,145	5.70%
2017	222,647	58,394	2.72%	1.23%	2.21	6.35%	42.83%	16.26%	28,356	5.60%

Figure 26 Theft and relevant factors summary

To begin with, although it is mentioned in the last paragraph that drug abuse in one of the factors impact crime in NSW, Australia, there is no clear correlation between theft and drug offence. Thus, number of drug offence per se may not be an accurate indicator of theft. The wage to food column measures the division between % wage increase and % food CPI increase. The higher the number, the more purchasing power people have for food and non-alcohol drink. The historical trend in the past 5 years shows that although the ratio experienced fluctuation in 2013 and 2014, it had been flattened out in the last 3 years around 2. Therefore, it can be inferred that in the next few years, the wage to food ratio is expected to remain stable with minor fluctuation.

When it comes to wage to alcohol and tobacco ratio, it can be observed that there is a sharp fall in the ratio, indicating that the increase in alcohol and tobacco is higher than those of wage. In other words, the increase in alcohol price outpaces the increase in average weekly wage. The trend denotes alcohol and tobacco consumers' purchasing power on alcohol and tobacco is falling. Thus, based on this trend, theft crime rate is likely to go up because criminals may commit more thefts in order to afford alcohol and tobacco.

Family factors is divided into two dimensions, namely percentage of single parent family and number of domestic violence instance in NSW. Due to the data availability for single parent family percentage, only 2016 and 2017 data is available. However, 2018 and 2019 data are available for use from Australia Bureau of Statistics, which is 16.23% and 16.2% respectively. Overall percentage of single parent family in NSW remained constant at around 16% with a marginal declining trend in the past 5 years, so it is highly likely that in the future the percentage will stay at the same level. A stable percentage of single parent family indicates the number of thefts in NSW in the next

few years is unlikely to increase. With regard to number of domestic violence, it peaked at 2014 followed by a slight decline. It can be concluded that the number domestic violence is stable, so it may not force theft rate to go up or down. In brief, the historical patterns on family factors demonstrates that the number of theft instance will remain stable in the next few years.

Lastly, the unemployment fell from 6.1% to 5.6% in the past 4 years. The falling unemployment exert a positive impact on theft since landing a job secures a sustainable source of income, so people are reluctant to commit theft. Unemployment patterns shows a likely drop in theft crime instance in the near future.

To conclude, only the historical pattern of alcohol and tobacco ratio suggests a future increase in theft, evidence and trends derived from other factors indicates theft is highly unlikely to thrive in the short-run. Therefore, by considering all factors described above, the number of thefts may neither stay at the same level or witness a marginal decline in next year.

Fraud Trend Prediction

According to Macdonald and Fitzgerald (2014) from NSW Bureau of Crime Statistics and Research, fraud case in NSW can be divided into different categories. Among these categories, it is card fraud that stands out in terms of number of occurrence (35%), followed by fuel drive-offs (30%). Other fraud, such as identity theft, embezzlement and cheque fraud merely account for 5%,4%,3% of the total fraud instance. Thus, if factors and evidence related to card fraud and fuel drive-offs can be fully understood, the future movement of fraud can be accurately captured.

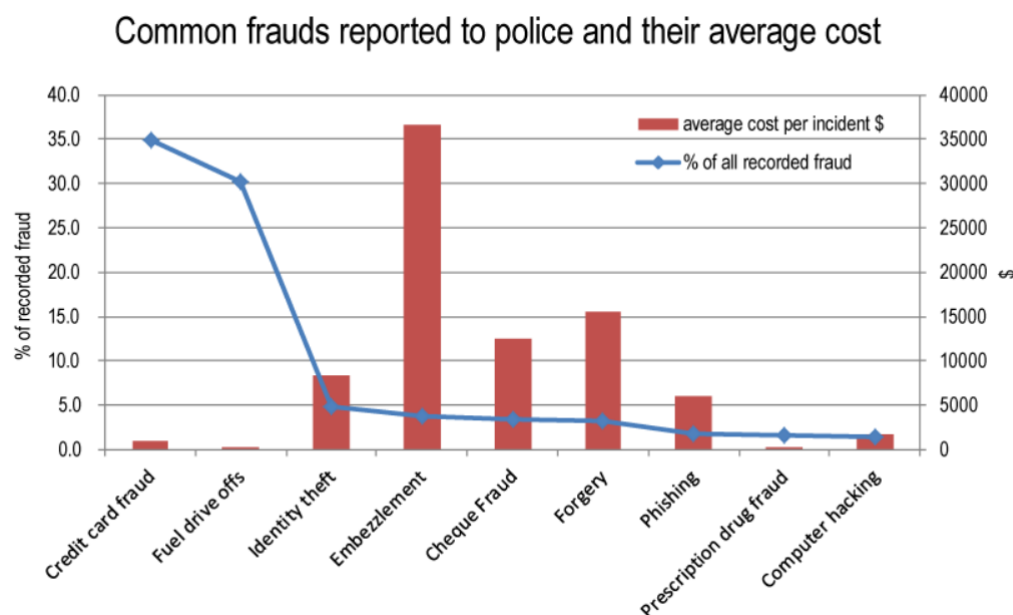
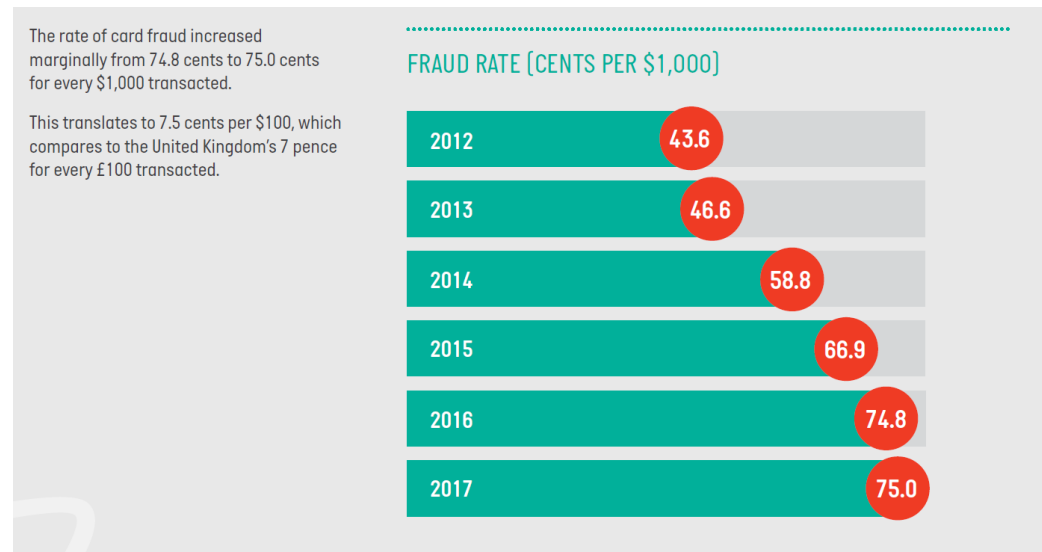


Figure 26 Common frauds reported to police and their average cost, (Macdonald and Fitzgerald ,2014)

Australian Payment Network (2018) points out the increase rate of card fraud is 5% in 2017, in a sharp comparison to those in 2016 and 2015 (16% and 19% respectively). Australian Payment Network argues the advancement in chip technology enhances the security level for in-person transactions. As a response, counterfeit/skimmed fraud



fell by 47.8% from \$59.2 million in 2016 to \$30.9% in 2017 while card-not-present fraud accounts for 84.8% of all the card fraud in 2017 with a 13.9% surge.

CNP FRAUD GROWTH RATE

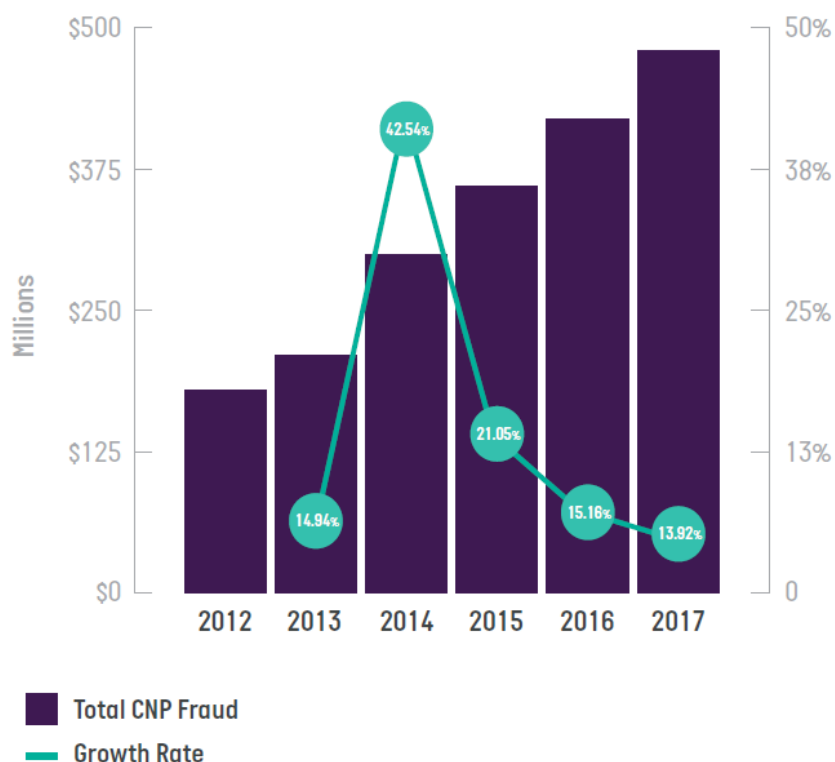


Figure 27 Fraud rate and CNP fraud growth rate, (Macdonald and Fitzgerald ,2014)

The bar chart provides information about historical data on fraud rate. Although the increasing trend continues, the rate of increase has been dramatically slacked off (only 0.2% increase in 2017).

Australian Payment Network predicts that card-not-present (CNP) fraud will increase in the future but at a relatively slower pace due to improved security prevention measures. Therefore, it can be inferred that the overall card fraud is expected to increase at a rate slightly less than 13.92%.

With reference to Moffatt and Fitzgerald (2006) from NSW Bureau of Crime Statistics and Research, there is a strong relationship between petrol theft and petrol price. Specifically, NSW Bureau of Crime Statistics and Research predicts that for every 10 cents increase in the price of a liter of petrol, there will be 120 more fuel drive-offs per month. Therefore, the NSW average petrol price is gathered from Australia Institute of Petroleum and the visualization is provided below:



Figure 28. NSW petrol avg price (Australia Institute of Petroleum,2019)

In 2018, there is \$15.31 increase. If the research finding by NSW Bureau of Crime Statistics and Research is accurate, an \$15.31 increase will lead to 18,372 more fuel drive-offs in 2018.

To sum up, both card fraud and fuel drive-offs show upward trends in 2018. Since card fraud and fuel drive-offs accounts for 65% of total fraud instance, it is plausible to predict that in 2018 the number of frauds will embrace a moderate increase.

Conclusion

In this report, we reviewed our data-preprocessing process, summarized suburb and seasonal patterns, then made a prediction on the future state of offence counts.

During the analysis, we have concluded that the most seen crime category is theft, followed by malicious damage to property, assault, transport regulatory offences and against justice procedure. The most “dangerous” suburb in NSW is Sydney, while black town in the second place.

Regarding the seasonal pattern, we managed to identify that the season where most of the offences happened is in spring and summer, while offence count in winter and autumn is significantly lower. Liquor offence is found to be significantly influenced by season. The cause for this seasonal pattern is believed to be most of the holidays are celebrated during spring and summer, while special events such as the Olympic Games would also have a great impact.

In the last session, we conducted a prediction on the overall offence count and concluded that the offence count is going to decrease, due to the fact that the CPI for food and non-alcoholic beverages is maintaining a low level and unemployment rate is decreasing these years. We also did detailed analysis and prediction on some of the significant categories these years and found that both sexual offences and transport regulatory offences are going to rise while theft will decrease slightly. One of the indexes that come into our attention is offence count for fraud, which is a subcategory of theft. The offence count for fraud is rising at an alarming rate and is expected to keep increasing in the coming years yet at a moderate pace.

References

- AIP Annual Retail Price Data. (2019). Retrieved from <https://www.aip.com.au/aip-annual-retail-price-data>
- Australian Bureau of Statistics. (2019). *CPI: Groups, Index Numbers by Capital City*.
- Australian Bureau of Statistics. (2019). 3236.0 - Household and Family Projections, Australia, 2016 to 2041. Retrieved from <https://www.abs.gov.au/ausstats/abs@.nsf/mf/3236.0>
- Australian Bureau of Statistics. (2019). 6202.0 - *Labour Force, Australia, Mar 2019*. Australian Bureau of Statistics.
- Australian Bureau of Statistics. (2019). 6302.0 - Average Weekly Earnings, Australia, Nov 2018. Retrieved from <https://www.abs.gov.au/ausstats/abs@.nsf/mf/6302.0>
- Australian Payments Network. (2018). *AUSTRALIAN PAYMENT CARD FRAUD 2018*. Retrieved from <https://www.auspaynet.com.au/sites/default/files/2018-08/AustralianPaymentCardFraud-2018-Report.pdf>
- Macdonald, W., & Fitzgerald, J. (2014). <https://www.bocsar.nsw.gov.au/Documents/CJB/cjb180.pdf>. NSW Bureau of Crime Statistics and Research. Retrieved from <https://www.bocsar.nsw.gov.au/Documents/CJB/cjb180.pdf>
- Mann, R., & Hollin, C. (2007). Sexual offenders' explanations for their offending. *Journal Of Sexual Aggression*, 13(1), 3-9. doi: 10.1080/13552600701365621
- Moffatt, S., & Fitzgerald, J. (2006). *The relationship between petrol theft and petrol prices*. NSW Bureau of Crime Statistics and Research. Retrieved from <https://www.bocsar.nsw.gov.au/Documents/CJB/cjb101.pdf>
- Neighbourhood.(n.d.). Fare Game. Retrieved from <https://neighbourhoodpaper.com/tag/public-transport-regulatory-offences/>
- Weatherburn, D. (2001). *What Causes Crime?*. NSW Bureau of Crime Statistics and Research. Retrieved from <https://www.bocsar.nsw.gov.au/Documents/CJB/cjb54.pdf>
- Weatherburn, D., & Holmes, J. (2013). *The decline in robbery and theft: Inter-state comparisons*. NSW Bureau of Crime Statistics and Research. Retrieved from <https://www.bocsar.nsw.gov.au/Documents/BB/bb89.pdf>