

Drug Abuse Analysis

A Data Exploration Report on Drug Abuse in Victoria.



1. Introduction

A day in this world does not go-by without seeing a crime of some sort. And law enforcement agencies around the world have been finding ways to tackle this. Victorian Police is one such agency responsible for law enforcement in the Victorian state of Australia. This report intends to explore the crime statistics data of Victoria and provide insights and any possible solution for tackling **Drug offences**. The report has been split into multiple logical sections, Section-2 describes the the wrangling and cleaning activities that has been used. Section-3 looks into the Data exploration process and checking activities, where major discoveries related to general crime and drug abuse trends in the data shall be discussed. At the end in Section-4, we conclude with a summary that explains what was learnt from the data.

2. Data Wrangling

Data Sources:

1. **Crime Statistics Agency Data Tables - Crime by location(Crime Statistics Agency Victoria)**: This data is published by the Crime Statistics Agency independent of the Victorian Police and data was last updated on 02/01/2018. It involves multiple datasets that provide records on the rate and number of crime incidents that happened between 2008 to 2017.

Data File Format : .xlsx

Number of datasets : 7

Number of records : 273675

2. **www.havocscope.com** : This data provides information on prices of illicit drugs on the black market. Also prices of various other global market products and services. This data was used to obtain country-wide prices of drugs such as Cocaine, Heroin, Meth and Marijuana.

Data File Format : Web Page

Number of datasets : NA

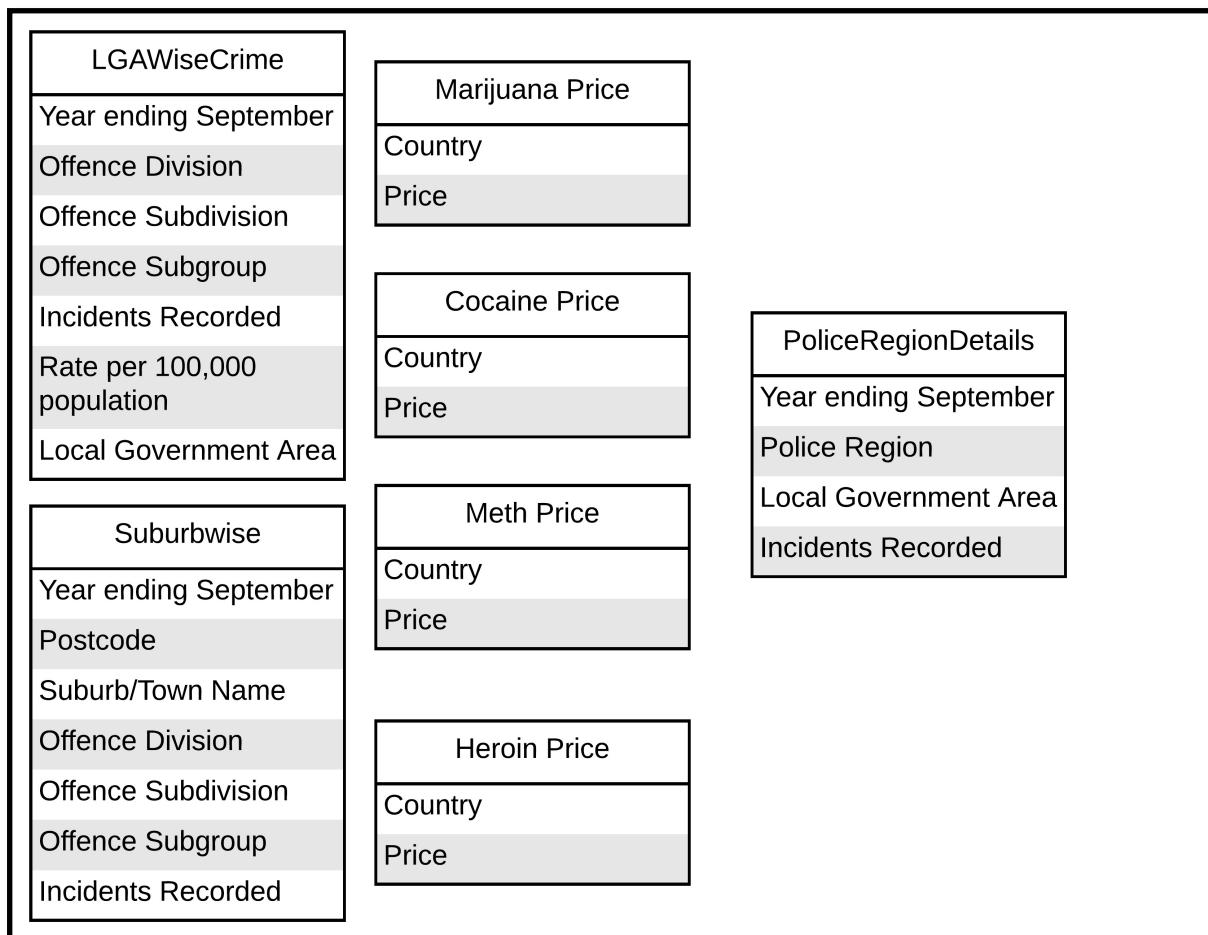


Fig 1 : Datasets and its columns used in the exploration

In Fig 1, The tables *LGAWiseCrime*, *Suburbwise* and *PoliceRegionDetails* are obtained from Crime Statistics Agency, meanwhile the tables ‘Marijuana Price’, ‘Cocaine Price’, ‘Meth Price’ and ‘Heroin Price’ are obtained as per Fig 2. The major attributes involved in the exploration are explained below:

Data attribute	Data Attribute Description
Year ending September	2008 to 2017
Offence Division	Crime against the person, Property and deception offences, Drug offences, Justice procedures offences, Other offences.
Offence Subdivision	A10, A20 to A80, B10, B20, to B60, C10, C20, C30, C90, D10, D20, D30, D40, E10, E20, F10, F20, F90. Offence subdivision classification by Crime Statistics agency.
Offence Subgroup	A11,A12,A13, A14, A15, A21, A22, A23....
Local Government Area	City council where the incident was reported.

The Fig 2, describes how the data was taken from multiple webpages and stored into csv.

Python Packages such as **re**, **urllib**, **pandas** and **BeautifulSoup** were used for cleaning and extracting the data (Refer Fig 18 in Appendix).

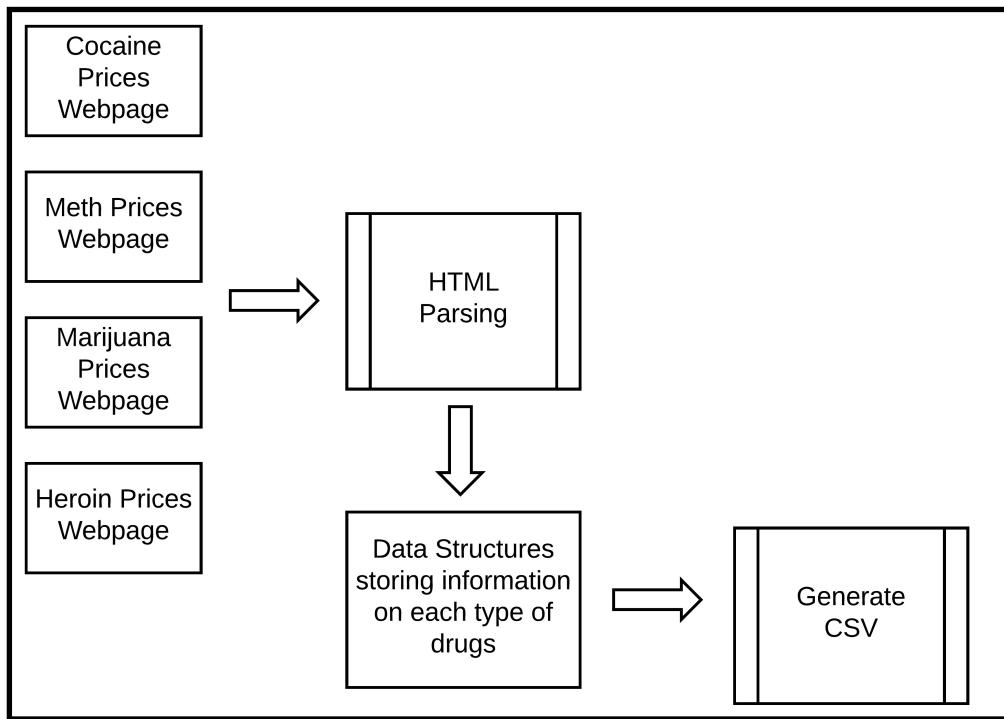


Fig 2: Process for extracting data from the webpages and writing into CSV.

Wrangling activities involved:

1. Parsing www.havocscope.com (Havocscope Black Market) for Illicit drugs prices worldwide.

Number of webpages parsed: 4

The tables from Fig 1, *Cocaine Price*, *Marijuana Price*, *Meth Price* and *Heroin Price* are hence generated.

2. The values in the attributes, *Incidents Recorded* and *Rate per 100,000 population* were checked for null/missing values and outliers.

Null/Missing Values : 0

3. Data Exploration and Checking

From Fig 3 below, we can conclude that the future of Victoria in terms of crime does not look good. This forecast is done based on the crime incidents reported from the year 2008 to 2017.

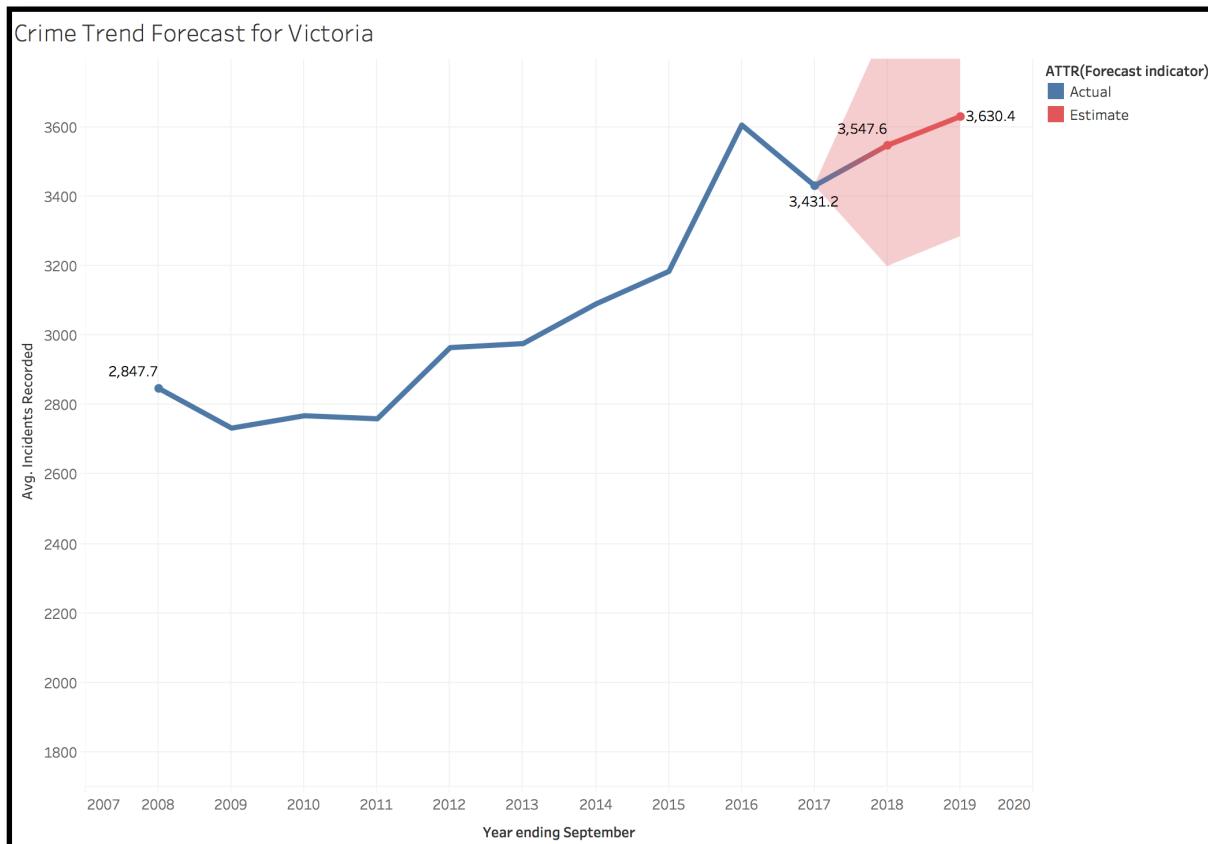


Fig 3: Trend Forecast for Crime in Victoria for the year 2018 and 2019

According to the forecast, crime wave in Victoria is estimated to hit approximately and average of **3547.6** incidents in **2018** and an average of **3630.4** incidents in **2019**. Further exploration shall be done on the different classifications of crime. The crimes are classified as following:

1. Division A - Crime against the person :
2. Division B - Property and deception offences
3. Division C - Drug Offences
4. Division D - Public order and security offences
5. Division E - Justice procedures offences
6. Division F - Other Offences

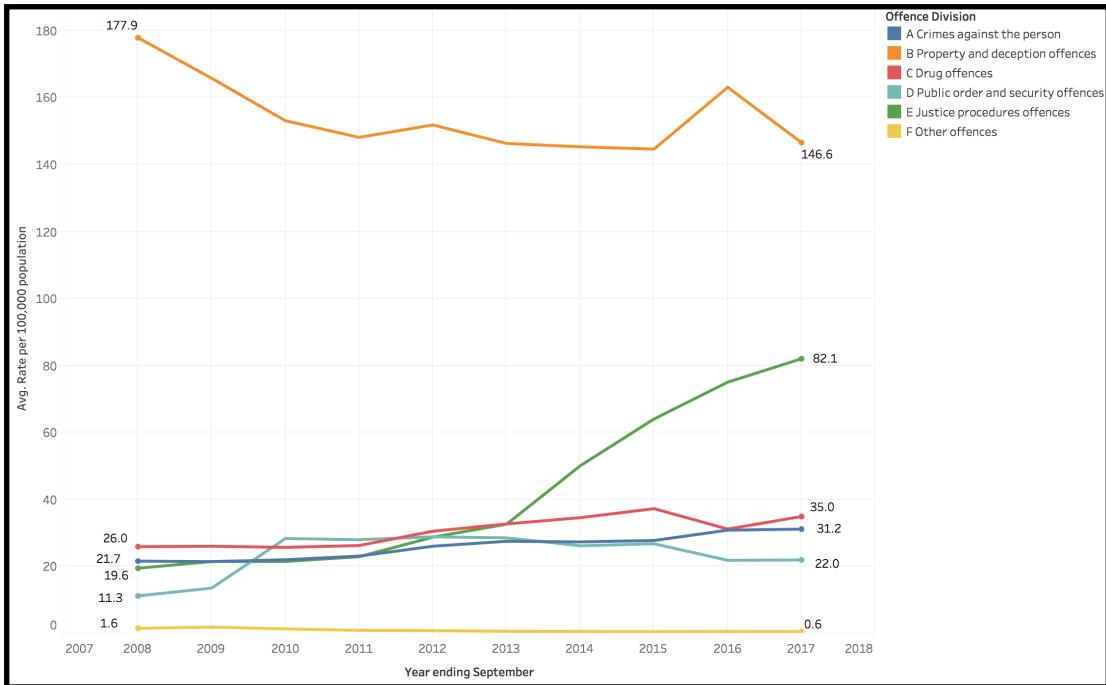


Fig 4: Trends of different classification of crime in Victoria from 2008 to 2017. Year VS Average Rate per 100,000 population. Classifications made by Crime Statistics Agency.

Division	Crime Classification	Number of Incidents recorded in 2008	Number of Incidents recorded in 2017	% change in Incident Recorded from 2008 to 2017 (approx)	Change state
A	Crimes against the person	35,315	61,547	74	Increase
B	Property and deception offences	2,52,497	2,43,787	3.5	Decrease
C	Drug offences	9,564	15,084	57.7	Increase
D	Public order and security offences	9,503	24,408	156.8	Increase
E	Justice procedure offences	10,277	45,492	342.658	Increase
F	Other offences	1,788	835	53.3	Decrease

Fig 5: Summary of various categories of crime incidents reported in Victoria.

Fig 4, shows us how the trends for each classification of crime varying across years, starting from 2008 based on average rate per 100,000 population. Based on Fig 4, we build a table (Fig 5) that summarises the percentage change in number of crime incidents reported in Victoria, between 2008 and 2017. It is found that there has been increase in Division A (Crime against the person), Division C (Drug offences), Division D (Public order and security offences) and Division E (Justice procedure offences) crimes.

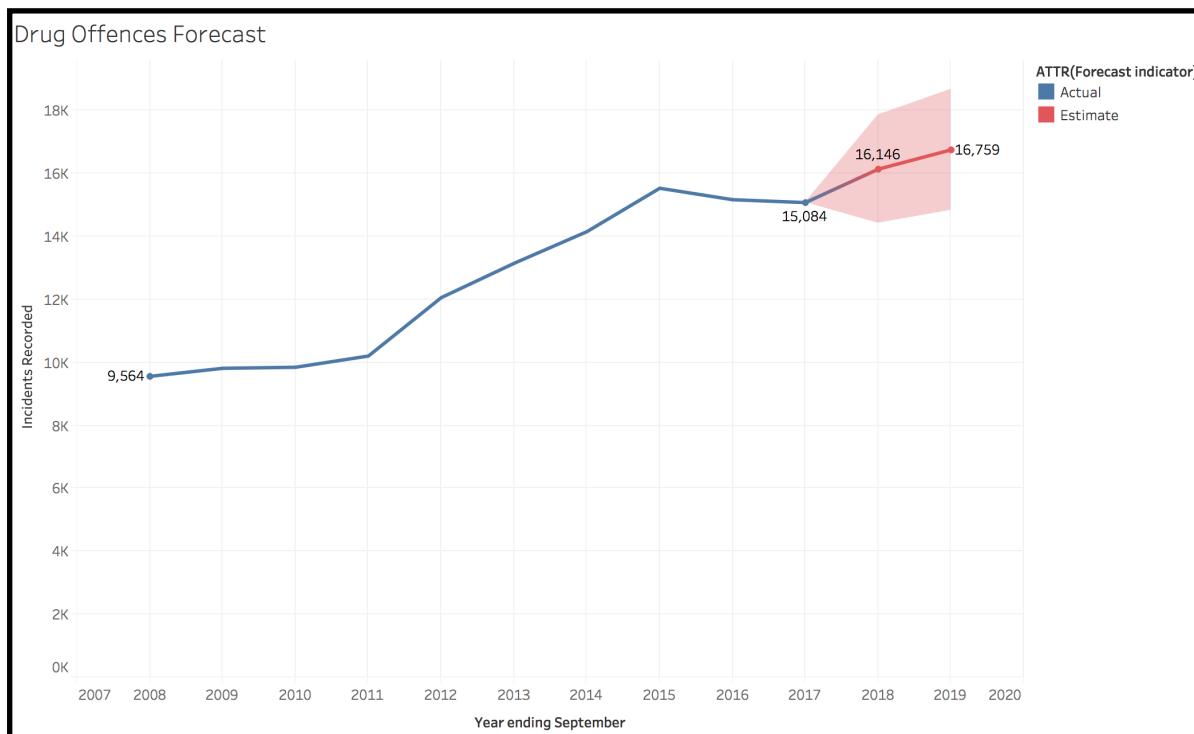


Fig 6: Forecast of Drug offences in Victoria for 2018 and 2019 based on number of incidents reported between 2008 and 2017. Forecast shows 16,146 incidents for 2018 and 16,759 for 2019.

Fig 6, identifies the risk that Victoria will have to be ready for. To validate this forecast we shall look into the demand for each type of drug in Australia. From Fig 7 and Fig 8 below, we shall compare the top 10 prices of drugs worldwide. The data seems to reveal extremely shocking details regarding Australia's demand for major drugs such as Cocaine, Heroin, Meth and Marijuana.

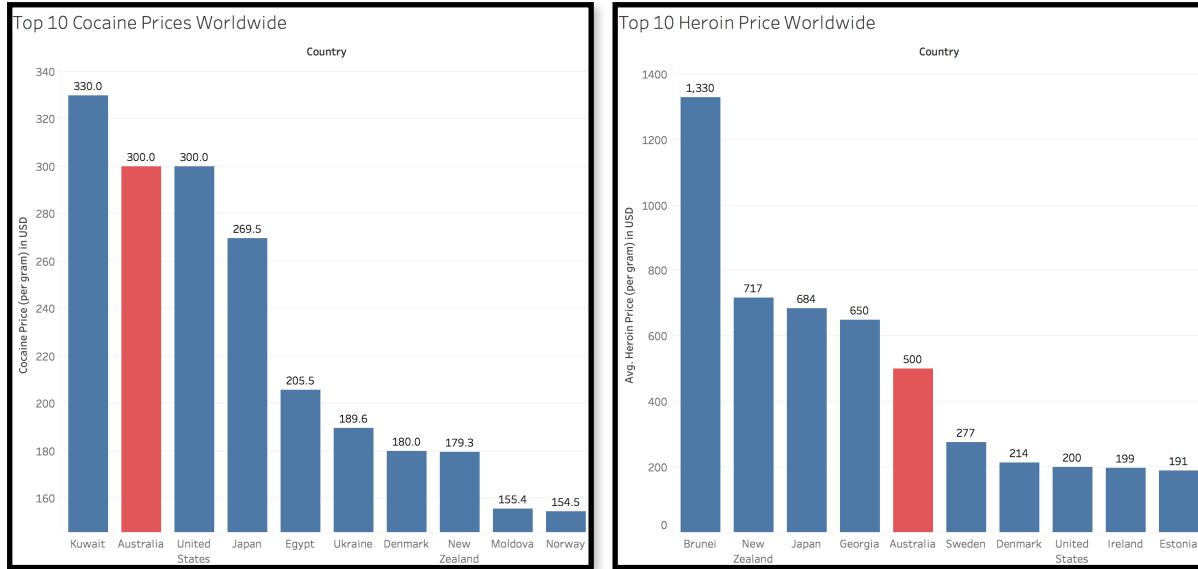


Fig 7: Top 10 countries with the highest price for Cocaine(Left). Top 10 countries with the highest price for Heroin(Right). The Red bar in both the graph identifies Australia.

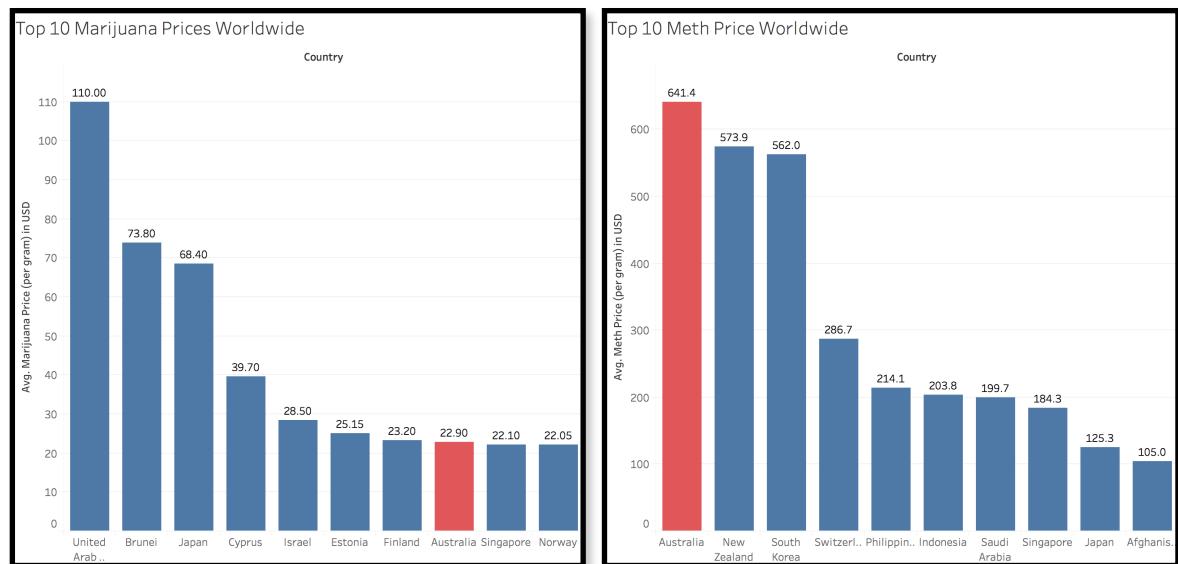


Fig 8: Top 10 countries with the highest price for Marijuana(Left)(Silvester, J.). Top 10 countries with the highest price for Meth(Right).

It is shocking to know that Australia lies in the top 10 highest prices for drugs like Cocaine, Heroin, Marijuana and Meth, which only shows the growing demand for these drugs. Fig 8(Right) reveals that Australia has become a Meth addicted country and requires attention in terms for Drug usage control. Comparing forecast in Fig 6, the prices in Fig 7 and Fig 8, we can confirm that Australia, especially Victoria will turn into a drug addicted community unless necessary actions are taken. To fight this trend one must identify the reasons and locations where such offences are identified most. Hence we shall dig in further into subdivisions of *Drug Offences* in Victoria.

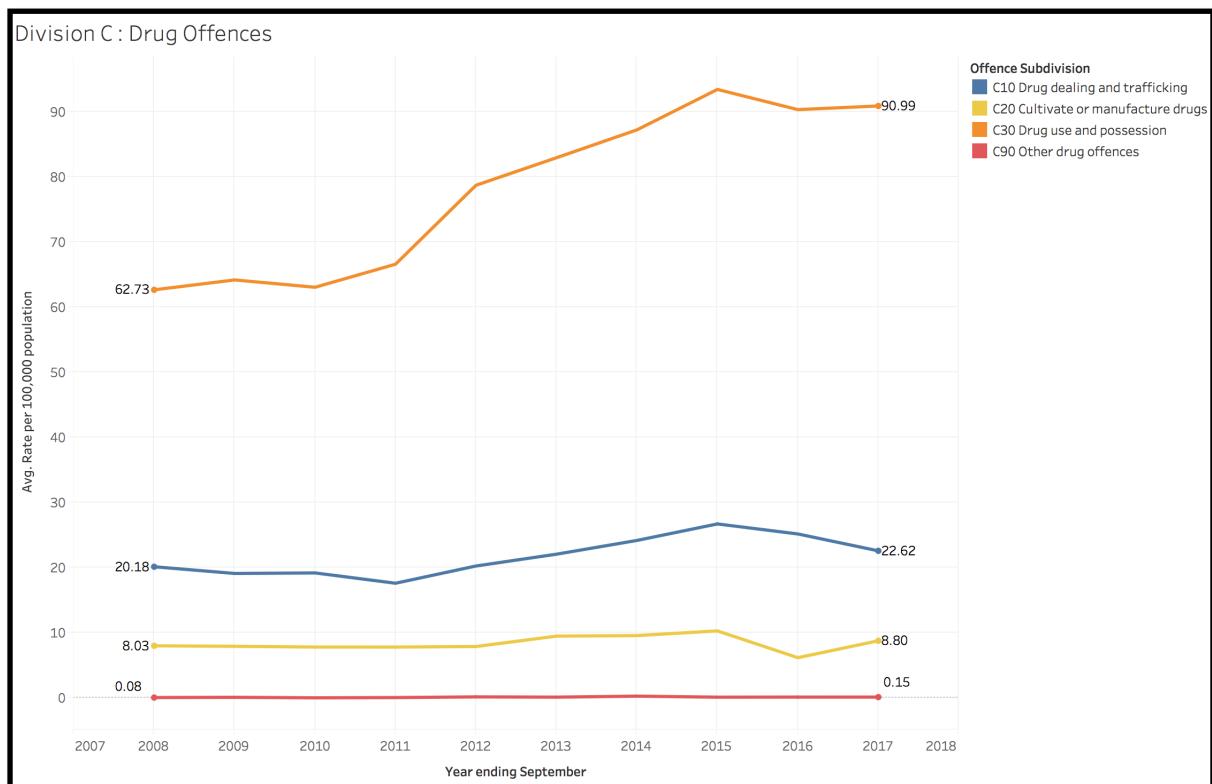


Fig 9: Trends of different subdivisions of *Drug Offences* in Victoria from 2008 to 2017. Year VS Average Rate per 100,000 population.

The Fig 9, shows a major increase in all the subdivisions of *Drug Offences*, although what interests us the most is *C30 Drug Use and Possession* and *C20 Cultivate and manufacture drugs*. *C30* and *C20* subdivisions help identify the Local Government Areas where these incidents have been reported and hence identify regions that require attention by the Victorian Police.

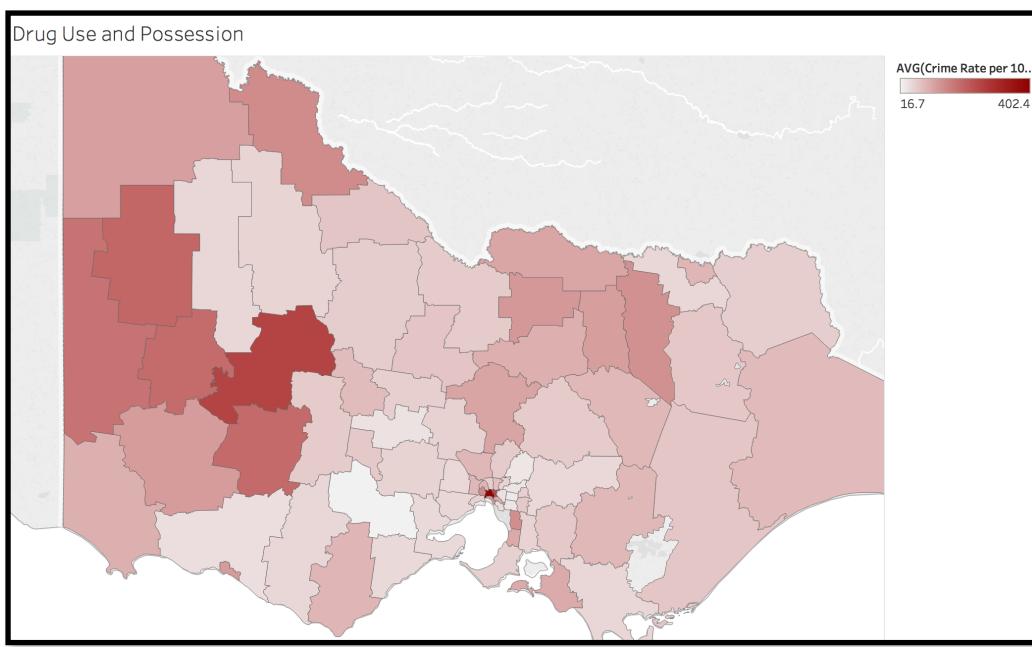


Fig 10: Average Rate per 100,000 population for *C30 Drug use and possession* crime in Victoria mapped based on Local Government Area (LGA). We see a clear concentration of drug use and possession in the Melbourne CBD and Northern Grampians.

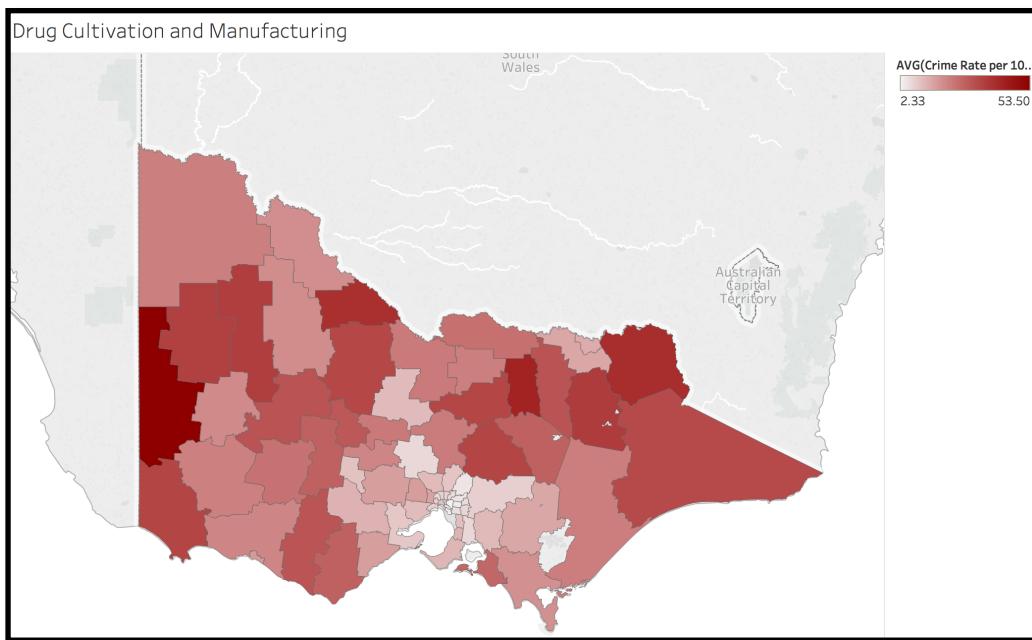


Fig 11: Average Rate per 100,000 population for *C20 Cultivate and manufacture drugs* subdivision in Victoria mapped based on Local Government Area (LGA). Unlike Fig 8 where the concentration is towards CBD, here, the concentration is outward towards the borders of Victoria.

Most interesting to notice, is the change of pattern between “*C30 Drug use and possession*” (Fig 8) to “*C20 Cultivate and manufacture drugs*”(Fig 9). This rises questions as to why comparatively, “*Drug Cultivation and Manufacturing*” is more towards the borders than “*Drug Use and Possession*”.

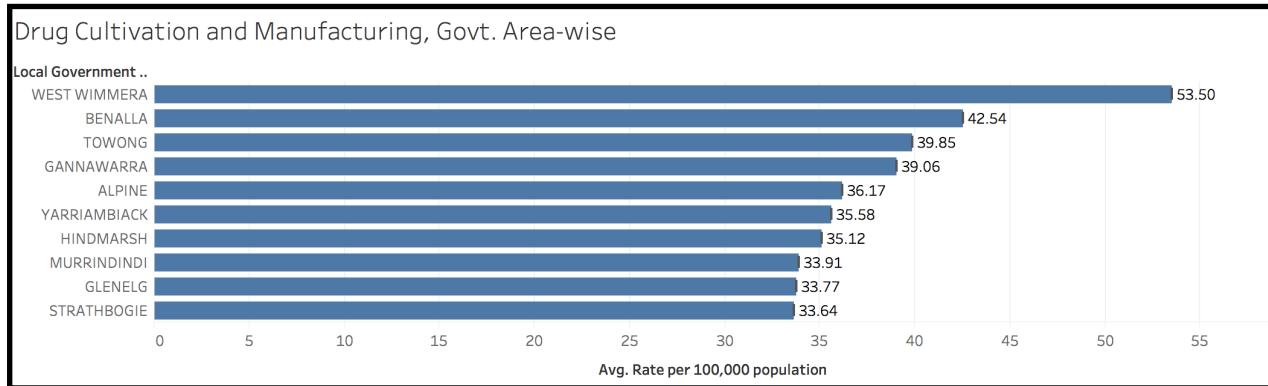


Fig 12: Local Government Area-wise *C20 Cultivate and manufacture drugs* rate per 100,000 population.

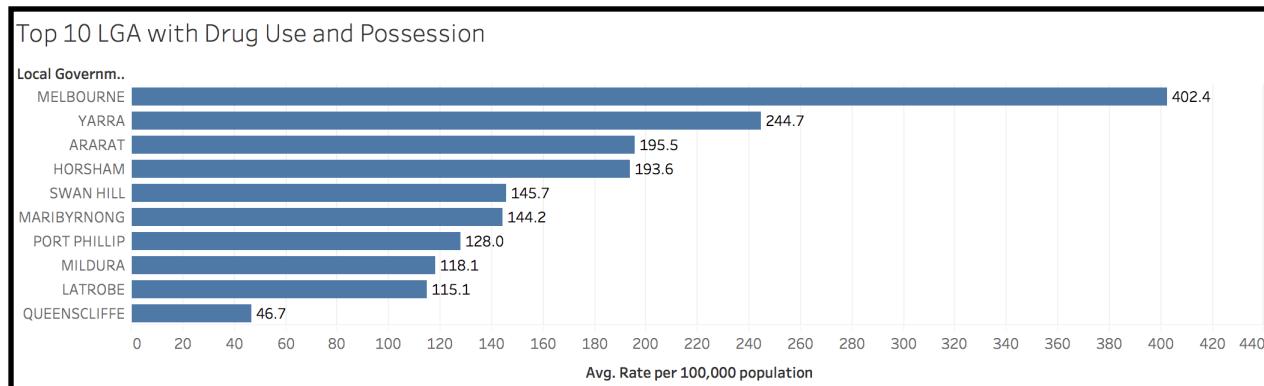


Fig 13: Local Government Area-wise *C30 Drug use and possession* rate per 100,000 population.

Although there has been Subdivision *C20 Cultivate and manufacture drugs* crimes recorded, from Fig 7 and Fig 8, it can be concluded that **Victoria is generally a Drug consumer rather than a producer**. Hence we shall concentrate more on *C30 Drug use and possession* crimes. If we look into the trend of Drug use and possession for each of the top 5 LGAs we can identify which one of them have been showing lower drug possession and usage. We can also look at some of the steps taken by each of these promising LGAs to reduce Drug abuse.

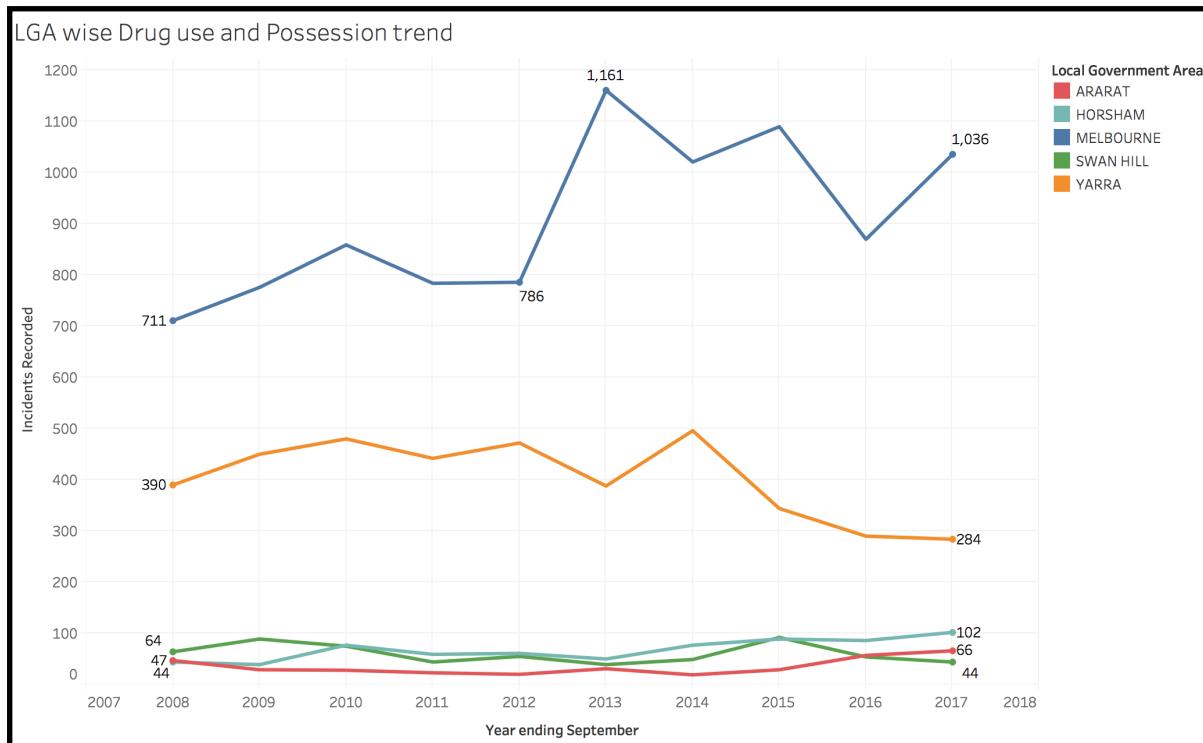


Fig 14: Year-wise *Drug use and possession* trend based on number of Incidents Recorded.

There seems to be a spike from 786 incidents to 1,161 incidents from 2012 to 2013.

Some of the questions that arise from the above analysis are:

1. Why is there a surge in *Drug use and possession* incidents recorded from **786** to **1,161** between **2012** and **2013** ?
2. Yarra and Swan hill has shown a **major drop** in the *Drug use and possession* incidents recorded especially between **2014** and **2017**. Have these LGAs taken measure to do so ? If yes, what were they and can they be implemented in other LGAs as well ?

4. Conclusion

The above given exploration gives us an insight into the illicit drug abuse scenario in Victoria. This report intend to highlight that Victoria is a drug consumer rather than a producer and help provide possible solutions to reduce drug offences. The questions that arises from this exploration will give us some possible measures that can be taken by the local governments that will help fight drug possession and usage.

Based on the exploratory analysis performed above, we come up with the following Drug offence reduction strategies:

1. Localising the Policing resources to regions which shows higher concentration of drug crimes(Refer Fig 10).
2. Awareness programs in LGAs that shows the highest Drug offence(Refer Fig 10).
3. Stricter policing and detection strategies in regions identified with higher Drug cultivation and manufacturing offences(Refer Fig 11).

5. Reflection

This report is a product of the inquisitiveness that built in me as a result of multiple news articles reporting the crime wave, the drug busts and drug abuse offences in Victoria.

The collage consists of six news snippets arranged in a grid-like structure. The top row contains three snippets, and the bottom row contains three snippets. Each snippet includes a small image, the author's name, the publication date, and social media sharing icons.

- Broadcaster Neil Mitchell calls for action on Melbourne crime wave**
The Australian - 12:00AM March 8, 2018
- LAW & ORDER Police and border officials seize millions in drugs in Melbourne**
David Hurley and AAP, Herald Sun November 30, 2017 8:51am
- Report finds Australian's taking more drugs than ever**
VIC NEWS Melbourne ice busts: Guns, drugs seized in 10 city raids, 14 arrested
CASSIE ZERVO and DAVID HURLEY, Herald Sun April 17, 2018 10:06pm
- VIC NEWS 50 arrested in Richmond in a bid to clean up the suburb's drug scourge**
Genevieve Alison, Herald Sun April 24, 2018 5:59pm
- LAW & ORDER Rowville man and woman arrested and charged after police raid**
Chanel Kinniburgh, Herald Sun February 21, 2018 9:17pm
- MORE than 50 people were arrested on the streets of Richmond over the weekend in a bid to clean up the suburb's drug scourge.**
Operation Chaplin was launched in April and saw police from Fitzroy, Collingwood and Richmond join forces with Yarra Crime detectives to charge 33 people with drug-related offences including trafficking and possession.
The ongoing investigation will focus on drug dealing, property crime and crimes against the person on Richmond streets.

Working on this report involved a lot of research about crime in Victoria, collection of a lot of newspaper articles, and listening to radio broadcasts. To perform exploratory analysis on drug abuse in Victoria I first had to narrow down on the initial data to use. I realised that, the only way illicit drugs are tracked is by exploring the crime data and searching for drug related offences. So I looked up for crime data for Victoria and made a preliminary data type

analysis using **R** and **Rstudio**. I used RStudio for performing data checking activities and aggregation.

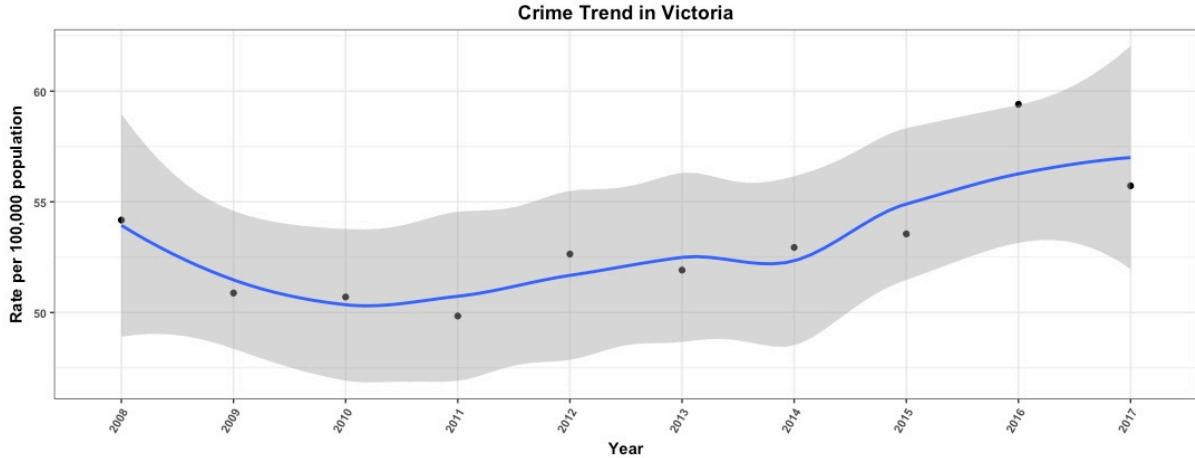


Fig 15: Basic Crime trend in Victoria using RStudio as a part of preliminary data checking (smoothing method: loess)

```
distributionGraph <- function(groupedDF, xaxis, yaxis, Title, Xlab, Ylab, ylim){  
  
  ggplot(groupedDF, aes(xaxis, yaxis, label = yaxis)) +  
    geom_bar(stat = "identity", fill = "steelblue", width = 0.5) +  
    geom_text(vjust = -0.5, color = "black") +  
    theme_bw() +  
    labs(title = Title, x = Xlab, y = Ylab) +  
    theme(title = element_text(face = "bold", color = "black"),  
          axis.title = element_text(face = "bold", color = "black"),  
          axis.text.x = element_text(face = "bold", size = 9, angle = 60, hjust = 1),  
          axis.text.y = element_text(face = "bold", size = 8),  
          plot.title = element_text(hjust = 0.5)) +  
    scale_x_discrete(limits=xaxis,labels=xaxis)  
}
```

Fig 16: Generic bar graph code in R

When I started researching on the drug crimes, I understood it is important for finding out the types and prices of illicit drugs present in the drug market in order to find out consumption and production pattern of drugs in Australia. For the drug prices, various black market websites were parsed (Refer Fig 18 in Appendix). This helped me figure out that Australia lies in the top 10 of the highest prices for every major drug which implies that Australia has a higher demand for drugs. Later I dived into Victoria to identify its drug use pattern. For this I used **Tableau**, to create **bar graphs**, **trends graphs** and **choropleth maps**. Forecasting in Tableau was used to estimate whether there would be an increase or decrease in the trend graphs. While working on this project, I learnt various ways to explore the selected data and come up with an appropriate solution. Overall, this project helped me understand the significance of data exploration and methods to identify problems.

6. Future Scope

The data can be used to identify trends and patterns in other divisions and subdivisions of crime as well. For instance, we can explore the following as well:

1. Why has there been a sudden surge in Disorderly and Offensive conduct between 2008 and 2010 (Refer Fig 17 in Appendix)? Whether this has anything to do with the number of liquor licenses given ?
2. Why has there been sudden surges in Justice Procedure offences between 2013 and 2016 (Refer Fig 4)?

And many more...

7. References

Havocscope Black Market. (2017). Retrieved 2018, from <https://www.havocscope.com/>

Crime Statistics Agency Victoria, & State Government of Victoria. (2018, March 29). How the data is collected and processed. Retrieved from <https://www.crimestatistics.vic.gov.au/about-the-data/how-the-data-is-collected-and-processed>

Silvester, J. (2017, June 19). How Victoria became Australia's pot capital. Retrieved from <https://www.theage.com.au/national/victoria/police-blitz-cannabis-crop-houses-admit-melbourne-is-australias-pot-capital-20170615-gwrsac.html>

8. Appendix

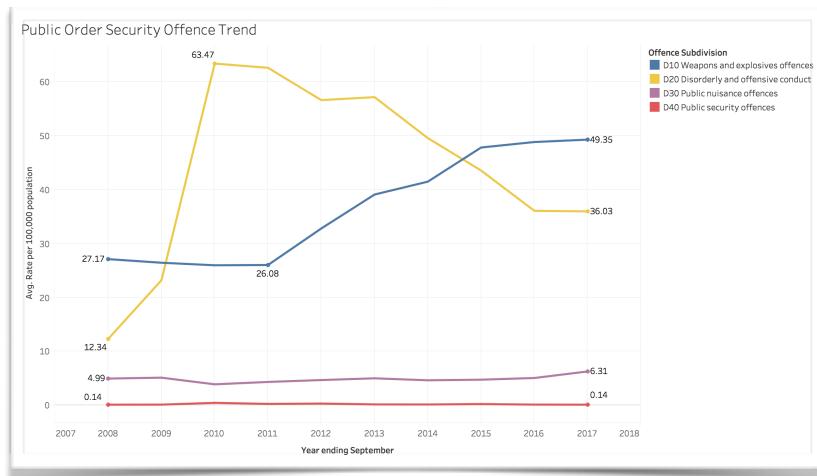


Fig 17: Public Order Security Offence Trend.

```

import urllib
from bs4 import BeautifulSoup
import re
import pandas as pd

Cocaine_price_page = "https://www.havocscope.com/black-market-prices/cocaine-prices/"
Heroin_price_page = "https://www.havocscope.com/black-market-prices/heroin-prices/"
meth_price_page = "https://www.havocscope.com/black-market-prices/meth-prices/"
marijuana_price_page = "https://www.havocscope.com/black-market-prices/marijuana-prices/"

def extractDrugPrice(drugType, drugName):

    page = urllib.request.urlopen(drugType)
    soup = BeautifulSoup(page, 'html.parser')
    rankings = soup.find('ol', attrs={'class': 'ranking'})
    rankingsListHTML = list(rankings)
    rankings = []

    for i in range(len(rankingsListHTML)):
        if rankingsListHTML[i] != '\n':
            xmlTag = re.search('/>(.*)</a><span>(.*)</span></li>', str(rankingsListHTML[i]))
            rankings.append([xmlTag.group(1), xmlTag.group(2)])

    for i in range(len(rankings)):
        if rankings[i][1].split(' ')[0] == '':
            rankings[i][1] = str(rankings[i][1].split(' ')[1])
            rankings[i][1] = rankings[i][1][1:]
        else:
            rankings[i][1] = rankings[i][1].split(' ')[0]
            rankings[i][1] = rankings[i][1][1:]

    priceColumnName = str(drugName + ' Price')
    df = pd.DataFrame(rankings, columns=['Country', priceColumnName])

    fileName = priceColumnName + '.csv'
    df.to_csv(fileName)

```

Fig 18: Python code for parsing drug prices off multiple webpages