3.Exploring the data

3-1- How many crimes happend this year?

The number of crimes in 2023 : 29758

And the number of crimes for the same period last year was :28641

And the number of crimes for the same period last 2 year was :30440

3-2- What Is the Trend in Crime Rates Over the Years? Is the number of crimes decreasing?

The overall trend shows a decrease in the number of crimes over the years, with some fluctuations in between.The highest number of crimes was recorded in 2003, and there has been a general decline since then, reaching its lowest in 2021. However, there are years, like between 2011 and 2019, where we see some increase before it starts decreasing again.These fluctuations and potential causes need to be explored further.

• *From 2003 to 2009*, there was a consistant decrease in the average daily crimes.  
• *From 2011 to 2019*, there was a trend of increasing average daily crimes.  
• *Starting in 2019* , there was another decrease in the average number of daily crimes, which continued through 2021. This decrease might be associated with the COVID-19 pandemic.  
• *Rebound in 2022*, there was a slight increase in the average daily crime rate. This could indicate a potential rebound in criminal activity,

But further analysis would be needed to understand the underlying causes. During the period from 2003 to 2021, several significant events and factors potentially influencing crime rates  
in Vancouver include:  
• 2010 Winter Olympics  
• Global Economic Recession (2008)  
• Drug Trade and Addiction Challenges  
• Social and Demographic Changes  
A comprehensive analysis would require further access to data and a deeper examination

>> Both metrics (Crimes and crimes per capita )exhibit similar trends, indicating that the changes in crime rates are not solely due to population changes. The crimes per capita metric adjusts for population size, suggesting that the actual rate of crime (relative to population size)has also decreased over time, particularly after 2003.

The crime growth rate has fluctuated over the years. The most remarkable decline happened in 2020, witnessing a 23% drop. This significant decrease could likely be attributed to the effects of the COVID-19 pandemic. Factors such as lockdowns or other restrictions might have played a role in deterring criminal activities. In 2022, there was a 6.5% increase, possibly signaling a return to pre-pandemic crime levels or patterns.

Let's see which crime types decreased more in 2020.

| **crime\_type\_category** | **no\_of\_crimes\_2020** | **no\_of\_crimes\_2019** | **percent\_changed** |
| --- | --- | --- | --- |
| **4** | Theft | 11487 | 15921 | -27.850009 |
| **5** | Vehicle Collision | 851 | 1137 | -25.153914 |
| **0** | Break and Enter | 4871 | 4759 | 2.353436 |
| **2** | Mischief | 6109 | 5832 | 4.749657 |
| **3** | Offence Against a Person | 2011 | 1896 | 6.065401 |
| **1** | Homicide | 18 | 12 | 50.000000 |

Theft and Vehicle Collision saw the largest declines in 2020, with decreases of 27% and 25%, respectively, compared to the previous year

The daily average of crimes reported this year, up to the time this report was generated, has surpassed that of the prior year. As follows : YEARcrime\_per\_day02003157.8212004155.0422005142.5132006131.0842007116.4052008109.126200999.657201093.598201189.679201292.7210201393.76112014104.05122015106.69132016116.91142017114.76152018117.90162019127.6117202097.7718202183.4019202288.8120202395.07

3-3- Does Population Growth Correlate with Crime Rate? And How Does CPI Influence This?

>>Correlation between Crime Rate and CPI (Consumer Price Index):

There is a moderate to strong negative correlation between crimes per capita and the CPI index, as indicated by acorrelation coefficient of -0.75. This suggests that higher economic health (reflected by a higher CPI index) is associated with lower crimes per capita.

>>Correlation between Crime Rate and Population Growth:

The correlation between crime rate and population growth is very weak, as indicated by correlation coefficients of 0.09 for crimes per capita.

These findings suggest that population growth has a minimal linear relationship with crime rates.

In summary, the analysis indicates that economic factors (as reflected by the CPI) have a more noticeable

correlation with crime rates compared to population growth, which shows a very weak association with crime rates.

3-4- How Has Crime Trended Over the Years by Crime Type?

Theft, despite its fluctuations, remains one of the most common crimes throughout the years.

-Homicide cases, although grave in nature, are relatively low and do not show a consistent upward or downward trend.

-The year 2020, likely influenced by the global pandemic and related restrictions, shows particular declines in several crime categories, most notably in theft and Vehicle Collision.

From 2003 to 2023, 'Theft' was the most frequent crime category averaging around 14,343 cases annually, while 'Homicide' was the least common with about 15 cases per year.

3-5- Is There any Seasonality?

3-5-1- Which Months Witness Higher/Lower Crime Rates

First, let's examine the average number of crimes per month over the years.

August appears to have the highest number of crimes, while February has the fewest.February typically has fewer days than other months, which can impact monthly crime statistics.

First, let's examine the average number of crimes per month over the years.

August appears to have the highest number of crimes, while February has the fewest.February typically has fewer days than other months, which can impact monthly crime statistics

Now, let's dig deeper to spot patterns in the monthly crime rates over the years.

Crime rates generally peak during the warmer months of May to August, suggesting a potential link between crimerates and warmer weather and more outdoor activities. February often sees a decrease, possibly due to its shorter duration.Data for late 2023 appears incomplete.

3-5-2- Which days seems to be more safe/dangerous ?

-The distribution appears to be normal, based on visual inspection, with a mean of 112 crimes per day.

-Half of the days had between 91 and 129 crimes.

-The peak day witnessed a significantly higher 678 crimes.

Let's investigate the specific date with such a high number of crimes! 🕵‍♂️

holiday weekday

10952 not\_holiday 2

On June 6, 2011, we observed 678 crimes, which is 500% above the average of 112 crimes per day.

To investigate the possible reasons for this extreme variation, I conducted a search for significant events or

factors that may have contributed to this specific day in Vancouver's history.

According to the

[Stanley Cup Riot Prosecutions Report (PDF)](https://www2.gov.bc.ca/assets/gov/law-crime-and-justice/criminal-justice/prosecution-service/reports-publications/stanley-cup-riot-prosecutions.pdf)

in June 2011, a riot erupted in Vancouver during the Stanley Cup finals.

The trouble began when it seemed the home team wouldn't win the championship. Disappointed fans turned to rioting and in five hours of rioting, members of the crowd committed multiple criminal offenses, including arson, break and enter,theft, mischief, and assault.

Approximately 55,000 people watched the game at a public viewing area on West Georgia Street, with an additional 100,000 people in the streets surrounding these viewing areas.

Here's a breakdown of the crime types that occurred on that day....

crime\_type\_category

Mischief 373

Break and Enter 187

Theft 81

Offence Against a Person 6

Vehicle Collision 2

Name: TYPE, dtype: int64

... and the neighborhoods most affected.

NEIGHBOURHOOD

Central Business District 581

Strathcona 20

Mount Pleasant 14

West End 13

Fairview 9

Dunbar-Southlands 6

Grandview-Woodland 4

Renfrew-Collingwood 4

Riley Park 4

Hastings-Sunrise 3

Kensington-Cedar Cottage 3

Victoria-Fraserview 3

Kitsilano 3

Sunset 3

Marpole 2

South Cambie 2

Arbutus Ridge 1

Oakridge 1

Killarney 1

Kerrisdale 1

West Point Grey 1

Name: TYPE, dtype: int64

**Now let's move forward and see which days seems to be more dangerous/safe! will consider June 15, 2011, as an anomaly and remove it from the analysis.**

Some days stand out in terms of safety and danger:

-Christmas Day, with only 71 crimes, which is 36% below the average of 112, seems to be the safest day in Vancouver.

-September 1st (Labour Day), recording 134 crimes, Halloween on October 31st with 131 crimes, and New Year's Day

with 130 crimes, are days with high crime rates. These figures are 18% above the average.

-Summer seems to be more busy specially the first two weeks of the month.

-In many months, the first half, tends to experience a higher crime rate compared to the latter half.

This trend might be influenced by factors like payday cycles, social events, or other external influences, which would

require further investigation to pinpoint.

-Across all months, the first day consistently registers crime rates ranging from 120 to 134 incidents, which is above the average.

3-5-3- Is there an evident monthly crime pattern by day of the week?

Crime rates peak during Fridays and Saturdays across all months, with both days consistently seeing higher numbers. In contrast, Wednesdays and Thursdays tend to have the lowest crime rates.

This trend underscores distinct variations in criminal activities depending on the day of the week.

3-5-4- What are the peak and off-peak crime periods during the week, and how do they vary by day?

At midnight (0 hour), there's a notable spike in the average number of crimes.

This surge, identified as an outlier in our boxplot analysis and could possibly be due to data entry errors,

where incidents around midnight are systematically recorded precisely at 12.

To provide a clearer analysis and avoid potential discrepancies related to hourly data, I've opted to use time categories instead.

**Shifting the Lense: Analysis by Time Category**

Crimes mostly occur in the evenings. On Saturdays and Sundays, crimes tend to occur at midnight,

while Friday afternoons also see a high number of crimes.

The night and early morning hours have the lowest number of crimes.

Let's see what type of crime occurs at the weekend's midnights the most?  
And take a look at Friday's evenings. what typically happens during Friday evenings?

The most frequently occurring crime during weekend midnight hours is offense against a person.

This trend may be attributed to an increase in nightlife activities, a rise in alcohol and drug consumption,

as well as reduced police presence. Further investigation is needed to better understand the underlying causes

On Friday afternoon and evenings, theft is the most commonly occurring crime.

3-6- Delving into Crime Types:

- 3-6-1-What is the top crime type for each year?

>> The crime types Theft from Vehicle and Other Theft consistently exhibit the highest number of incidents across the years

- What are the top 3 crime types this year and over the years?

**Now let's see whcich crime type has the most percentage changes over the years :**

Most crime types have seen a reduction, with 'Theft of Vehicle' and 'Break and Enter Residential/Other' witnessing the most significant declines. Only 'Theft of Bicycle' registered an increase in the number of cases.

Over the years, advances in technology have made it more challenging for criminals to break into houses and steal vehicles. Modern vehicles, for instance, come equipped with advanced security systems, GPS tracking, immobilizers, and smart key access, making them harder to steal. Similarly, residential areas might have adopted better security systems,surveillance cameras, and stronger locks, deterring potential burglars.Community Policing and Neighborhood Watch Programs: An active community policing initiative and the establishment ofneighborhood watch programs can significantly deter crimes in residential areas. When residents actively report suspicious activities and collaborate with the police, it can lead to a reduction in criminal activities like break-ins.

It's interesting to note that while severe crimes such as homicide have seen a reduction of 35.29% (from 17 cases to 11 cases)

and vehicle collisions with fatalities have decreased by 24% (from 25 cases to 19 cases), some less severe crimes like

'Theft of Bicycle' have seen an increase of 7.68% (from 1419 cases to 1528 cases). This contrast can be a point of interest

for further studies to understand the varying dynamics affecting different crime categories.

3-6- How Do Crime Patterns Vary Across Different Neighborhoods?

-Dangerous Hotspots: Average Annual Crime Rates by Neighbourhood

The Central Business District consistently ranks as the top neighbourhood with the highest number of reported crimes.Given its status as a commercial and cultural hub, it's expected towitness a higher frequency of crimes.

Quiet Neighborhoods: Arbutus Ridge, Musqueam, and Stanley Park have among the lowest average daily crime rates, hovering around1 to 2 crimes per day.

These neighborhoods might be more residential or recreational, leading to fewer incidents.

Active Residential Areas: Neighborhoods like Fairview, Grandview-Woodland, Mount Pleasant, and Renfrew-Collingwood see higher averagesranging from 6 to 7 crimes per day, indicating these could be densely populated or have a mix of commercialand residential zones.

West End's Distinction: The West End stands out with an average of nearly 10 crimes a day, making it second only to the CBD.Given itsvibrant mix of residential, commercial, and recreational spots, it's a hotspot of activity.

Stable Middle Ground: Neighborhoods such as Hastings-Sunrise, Kensington-Cedar Cottage, Kitsilano, and Sunset maintain a steady middleground with averages between 3 to 6 crimes daily

3-7-2-Which Crime Type Occurs Most Frequently in Central Business District?

The Central Business District, has significant safety concerns, especially during the late-night hours and on weekends.

The hours from 6 PM to 8 PM, particularly from Tuesday to Friday, register high crime rates.

n summary, despite some years of decline and fluctuation, the long-term view from 2003 to 2023 indicates an overall positive trend in bicycle thefts, with the highest numbers recorded around 2015. Following this peak, there has been adecline. Let's delve deeper to see what could be the reasons behind this trend.

Bicycle thefts in Vancouver dropped by about 50% from 3,064 cases in 2015 to 1,528 in 2022.I looked into this decrease and learned about Project 529, a bike registration program that started in 2015.This big drop shows that Project 529 might be really helping to stop bike thefts.

Now let's examine which neighbourhoods were most affected in 2023?

NEIGHBOURHOOD

Central Business District 229

Fairview 143

West End 120

Mount Pleasant 106

Kitsilano 84

Grandview-Woodland 50

Strathcona 44

Kensington-Cedar Cottage 39

Renfrew-Collingwood 23

Riley Park 20

Stanley Park 20

Marpole 18

Sunset 12

South Cambie 12

West Point Grey 11

Oakridge 9

Hastings-Sunrise 9

Killarney 8

Arbutus Ridge 8

Shaughnessy 6

Kerrisdale 4

Dunbar-Southlands 3

Victoria-Fraserview 1

dtype: int64

What times do these incidents occur most frequently?

Out[193]:

time\_category

3-Afternoon 237

4-Evening 229

2-Late Morning 184

6-Midnight 145

1-Early Morning 110

5-Night 74

dtype: int64

The comparison of crime types between 2022 and the same period in 2023 shows varied trends:Other Theft and Mischief have notably increased, with 1,458 and 482 more incidents, respectively.Significant decreases are seen in Theft of Bicycle (-429), Break and Enter Commercial (-188), and Theft of Vehicle (-163).Theft from Vehicle and Break and Enter Residential/Other show marginal declines.Homicide incidents slightly increased, while Vehicle Collision or Pedestrian Struck categories show minor changes.This data indicates a shift in crime patterns, with increases in some types of property crimes and decreases in others