Counts of Crimes and Their Subtypes in Toronto from 2014 to 2023*

Details and Trends

Justin (Jiazhou) Bi

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This report analyzes crime trends and subtypes in Toronto from 2014 to 2023, highlighting fluctuations and speculating possible socio-economic, technological, and pandemic-related factors influencing criminal activity. Using data from Toronto Open Data, the study aggregates and examines reported crimes in categories such as property crimes, violent offenses, and cybercrime. The results show a significant increase in reported crimes, from 113,426 in 2014 to 169,620 in 2023. A notable drop in crime during 2020 and 2021 corresponds with COVID-19 lockdowns, which reduced certain physical crimes while increasing cybercrimes like fraud. Despite the overall rise in crime, clearance rates for crimes like fraud and theft significantly declined, underscoring challenges for law enforcement.

1 Introduction

Crime is defined as "an action or omission which constitutes an offense and is punishable by law." (Murray (1992)) However, this seemingly straightforward definition can misguide us to think that crime is a simple and clear concept with specific defining criteria, a swift process of judgment, and pre-defined punishment. Crime is a complete concept that affects every aspect of all individuals, communities, and societies. Crimes can reshape the power dynamics of our social structure, influence our public policies, and even change our day-to-day interactions with others. As a result, understanding the trends in crimes and the variations in their subtypes is crucial for policymakers, law enforcement, and every member of our society to devise better strategies to prevent crimes from happening. Therefore, this report aims to explore and examine the current of reported crimes in Toronto from 2014 to 2023, discover and highlight some fluctuations, and propose some potential underlying factors that might have

*Inspired and instructed by: https://github.com/RohanAlexander/marriage. All the project related files can be found at: https://github.com/Jiazhou-Bi/reported-crime/tree/master.

contributed to these trends. The raw data being used in the report is available from Toronto Open Data. (Gelfand (2022)) For the data analysis, I have used pandas (McKinney (2010)). For data visualization, I have used Seaborn. (Waskom (2021)) All the tables were generated by using Plotly. (Inc. (2015))

This analysis can be helpful by providing valuable insights into current crime activity trends. Certain crimes, such as violent offenses, theft, and property crimes, are believed to be highly correlated with broader socio-economic conditions. (Lofstrom and Raphael (2016)) Meanwhile, with new technology emerging, other types of criminal activity, such as technology-facilitated fraud, are becoming more prominent. According to RCMP's report, Canadian victims have lost 530 million dollars due to fraud. Thus, examining various types of crime can assist us to better understand these crimes and devise better strategies to better protect our safety and properties.

On the other hand, between 2014 and 2023, the world experienced significant transformations that may impact crime rates. In particular, the COVID-19 pandemic, which began in 2020 and ended in early 2022, has disrupted our daily routines and led to shifts in criminal behaviour. Lockdowns and other public health measures reduced opportunities for certain types of crime, such as burglaries and public disturbances, while simultaneously leading to increases in domestic violence and cybercrime. Additionally, economic hardship caused by the pandemic, including rising unemployment rates and financial instability, may have driven a surge in financially motivated crimes, such as fraud and theft.

This report will delve into crime statistics from 2014 to 2023 in Toronto. I will closely examine all the reported crime categories and specific subtypes of crimes. By analyzing these trends, I aim to clarify how crime has evolved over the last decade and identify possible socio-economic, technological, and legal factors that have driven these changes. Through this analysis, we can gain valuable insights into how best to address the challenges posed by both traditional and emerging forms of crime in the future.

2 Data

The dataset used here is downloaded from the Toronto Open Data website via Gelfand (2022). This dataset contains all the reported crimes that happened in Toronto from 2014 to 2023. This dataset is grouped by the year of the reported crime, its category and belonging subtype, and the count of the subtype being reported and cleared for that year for each division. Because I am examining the crime pattern in the city, I have dropped the division information and aggregated the existing data according to their subtype and the year of the crime being reported. In the following subsections, I will review all the variables used in this report and provide some basic descriptive statistics. The first five rows of the cleaned data used for analysis are attached (Table 1).

Table 1: Example of Cleaned Data

	Year	Category	Subtype	Count	Cleared	ClearRate
1	2022	Crimes Against Property	Auto Theft	79	0	0.0
2	2023	Crimes Against Property	Break & Enter-House	1	0	0.0
3	2014	Crimes Against Property	Auto Theft	7	0	0.0
4	2021	Crimes Against the Person	Sexual Violation	1	0	0.0
5	2020	Crimes Against Property	Break & Enter-Apartment	2	0	0.0

2.1 Report Year

The report year variable is the number of crimes being reported. In this dataset, the data spans from 2014 to 2023, encompassing ten years. No month or date information was given; thus, there are only ten different values for this variable in chronological order.

2.2 Category

The category includes information about the nature of the crime. There are six crime categories: Crimes Against Property, Crimes Against the Person, Other Federal Statute Violations, Other Criminal Code Violations, Controlled Drugs and Substances Act, and Criminal Code Traffic. They are listed in the table below (Table 2).

Table 2: Six Crime Categories

	Categories
1	Crimes Against Property
2	Crimes Against the Person
3	Other Federal Statute Violations
4	Other Criminal Code Violations
5	Controlled Drugs and Substances Act
6	Criminal Code Traffic

2.3 Subtype

There exist multiple subtypes under each crime category. The following is an exhaustive table (Table 3) of all crimes' subtypes and their respective category.

Table 3: Crime Categories and Subtypes

	Category	Subtype
1	Controlled Drugs and Substances Act	Other
2	Crimes Against Property	Auto Theft
3	Crimes Against Property	Break & Enter-Apartment
4	Crimes Against Property	Break & Enter-Commercial
5	Crimes Against Property	Break & Enter-House
6	Crimes Against Property	Break & Enter-Other
7	Crimes Against Property	Fraud
8	Crimes Against Property	Other
9	Crimes Against Property	Theft Over $5000
10	Crimes Against Property	Theft Under $5000
11	Crimes Against the Person	Assault
12	Crimes Against the Person	Attempt Murder
13	Crimes Against the Person	Other
14	Crimes Against the Person	Robbery-Financial
15	Crimes Against the Person	Robbery-Other
16	Crimes Against the Person	Sexual Violation
17	Criminal Code Traffic	Other
18	Other Criminal Code Violations	Other
19	Other Criminal Code Violations	Other Criminal Violations - Offensive Weapons
20	Other Federal Statute Violations	Other

2.4 Count

In the original table, this value is grouped by the subtype of the crime, the division, and the year when the crime was reported. The original count indicates the number of a specific subtype of crime reported within a particular division for the year. However, as mentioned before, because I am only interested in all the crimes in the City of Toronto, I have dropped the division information and aggregated the count from all the divisions to a single value. Therefore, for each subtype of the crimes, a total count of that subtype is reported in a single year.

2.5 Count_Cleared

These are the counts of crimes identified as cleared. In plain words, these are crimes that are dealt/solved. I have taken the same approach for this column as the previous one. After cleaning the data,f, or each subtype of the crimes, there is a total count of that subtype being reported that is also cleared in a single year.

2.6 Case_Clearing_Rate

This column was not included in the raw dataset but was created by dividing the cleared crimes by total crimes. A higher case-clearing rate for a particular subtype of crime usually suggests a higher effectiveness of law enforcement in dealing with this subtype of crime. The value is ranged from 0 to 100%.

3 Results

3.1 Trend of Reported Cases by Year

During this ten-year-period (2014 - 2023), the overall cases reported in Toronto have increased significantly, from 113,426 in 2014 to 169,620 in 2023. Meanwhile, a noticeable decrease in reported crime counts dropped in 2020 (118,568 cases) and 2021 (120,397 cases) compared to 2019 (144,529 cases). Table 4 below shows the aggregated counts of reported crimes, grouped by their reported years.

Table 4: Counts of Reported Crimes by Year

	Year	Count
1	2014	113426
2	2015	117368
3	2016	122629
4	2017	129965
5	2018	143184
6	2019	144529
7	2020	118568
8	2021	120397
9	2022	141136
10	2023	169620

The Figure 1 below depicts the changing pattern of reported crimes per year.

3.2 Trend of Reported Cases per Category by Year

Among all the six categories, crimes against property have a significantly higher count than all the other categories. In 2023, 119,629 crimes against property were reported, compared to the second highest count, crimes against the person, with 29,892 cases. Below is a table of the count of reported crimes for each category for 2014, 2020, and 2023, as well as a line chart for

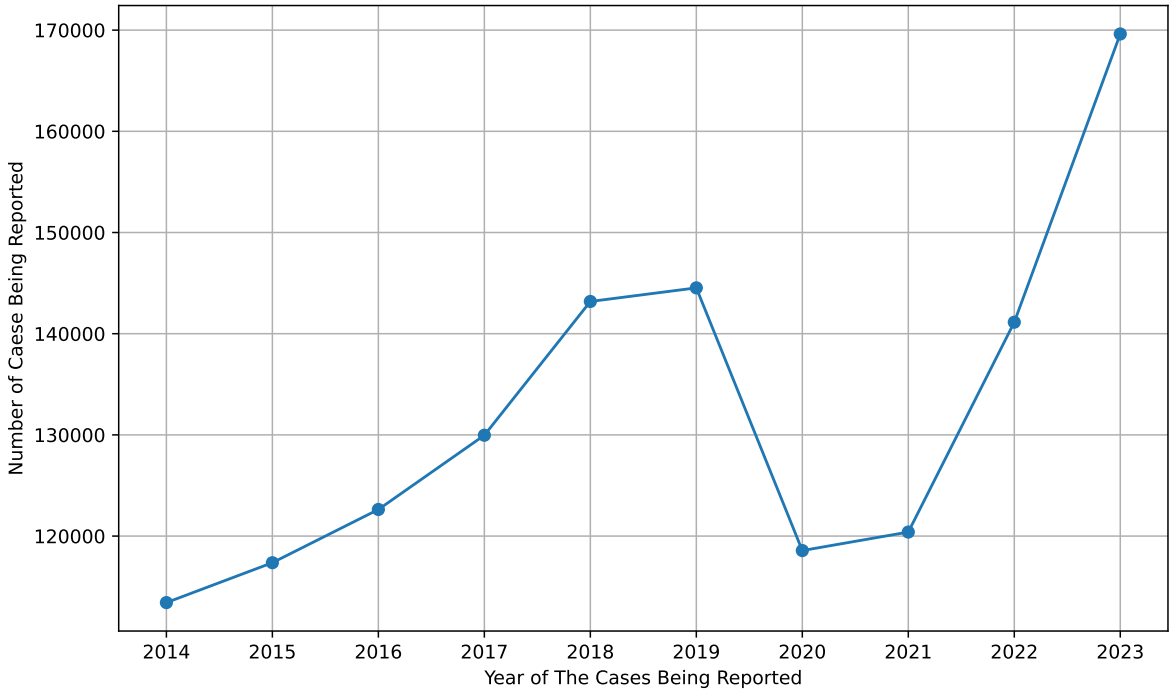

Figure 1: Trend of Counts of Reported Crimes by Year

the fluctuating trend. The Table 5 below shows the reported cases for each category for 2014, 2020, and 2023, respectively.

Table 5: Trend of Reported Cases per Category in 2014, 2020, and 2023

	Year	Category	Count
1	2014	Controlled Drugs and Substances Act	4648
2	2014	Crimes Against Property	68793
3	2014	Crimes Against the Person	25339
4	2014	Criminal Code Traffic	1938
5	2014	Other Criminal Code Violations	12298
6	2014	Other Federal Statute Violations	410
7	2020	Controlled Drugs and Substances Act	1420
8	2020	Crimes Against Property	77662
9	2020	Crimes Against the Person	24436
10	2020	Criminal Code Traffic	1782
11	2020	Other Criminal Code Violations	13090
12	2020	Other Federal Statute Violations	178
13	2023	Controlled Drugs and Substances Act	989

Table 5: Trend of Reported Cases per Category in 2014, 2020, and 2023

	Year	Category	Count
14	2023	Crimes Against Property	119629
15	2023	Crimes Against the Person	29892
16	2023	Criminal Code Traffic	2418
17	2023	Other Criminal Code Violations	16574
18	2023	Other Federal Statute Violations	118

The following is Figure 2, which shows how the counts of reported crimes varied for each category from 2014 to 2023.

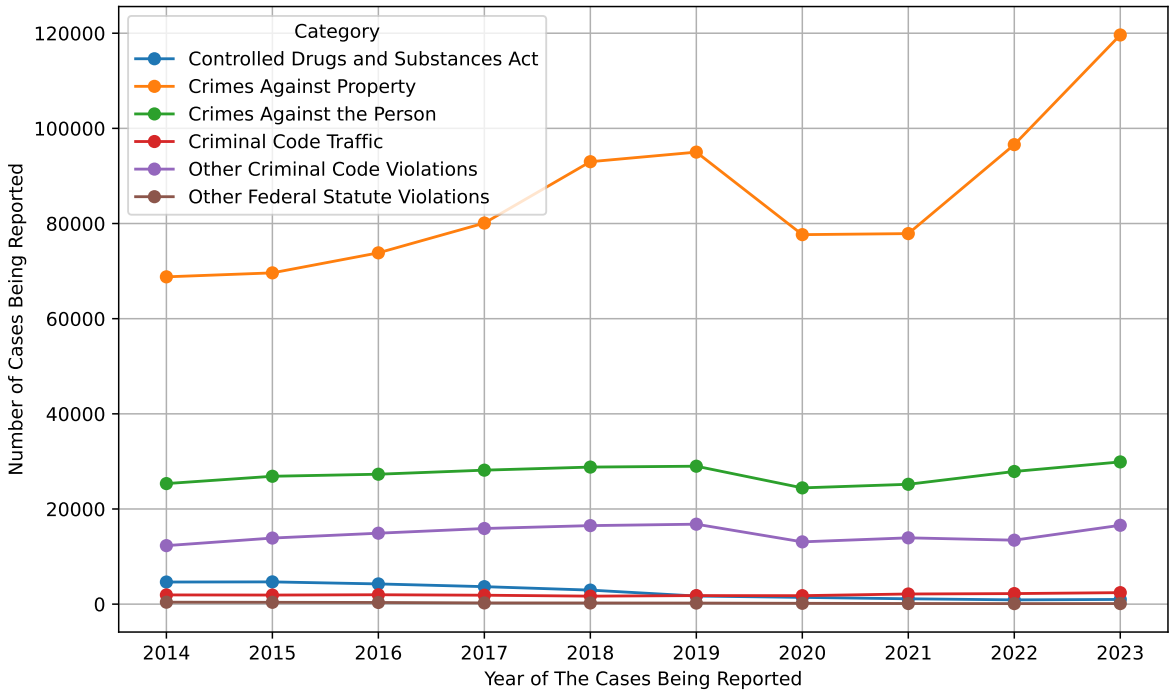

Figure 2: Trend of Reported Cases per Category in 2014, 2020, and 2023

3.3 Subtype of Crimes Against Property by Year and Their Gorwth Rates

The overall pattern for each subtype of crimes under crimes against property is comparable to the overall reported crime pattern, with an increase from 2014 to 2023, despite a significant drop in 2020 and 2021. Among all the subtypes within crimes against property, the most

commonly reported crime is theft under $5,000. The nominal growth rate between 2014 and 2023 for each subtype is also calculated and attached here in Table 6.

Table 6: Growth Rate of Each Crime Against Property Subtype from 2014 to 2023

	Subtype	2014	2023	Growth Rate
1	Auto Theft	3702	12356	233.77%
2	Break & Enter-Apartment	1885	1820	-3.45%
3	Break & Enter-Commercial	1933	3111	60.94%
4	Break & Enter-House	2951	2113	-28.4%
5	Break & Enter-Other	462	631	36.58%
6	Fraud	6729	15118	124.67%
7	Other	11892	16957	42.59%
8	Theft Over $5000	1025	1758	71.51%
9	Theft Under $5000	38214	65765	72.1%

Figure 3 here shows the number of reported cases for each subtype of crime against property for 2014 and 2023, side by side, respectively.

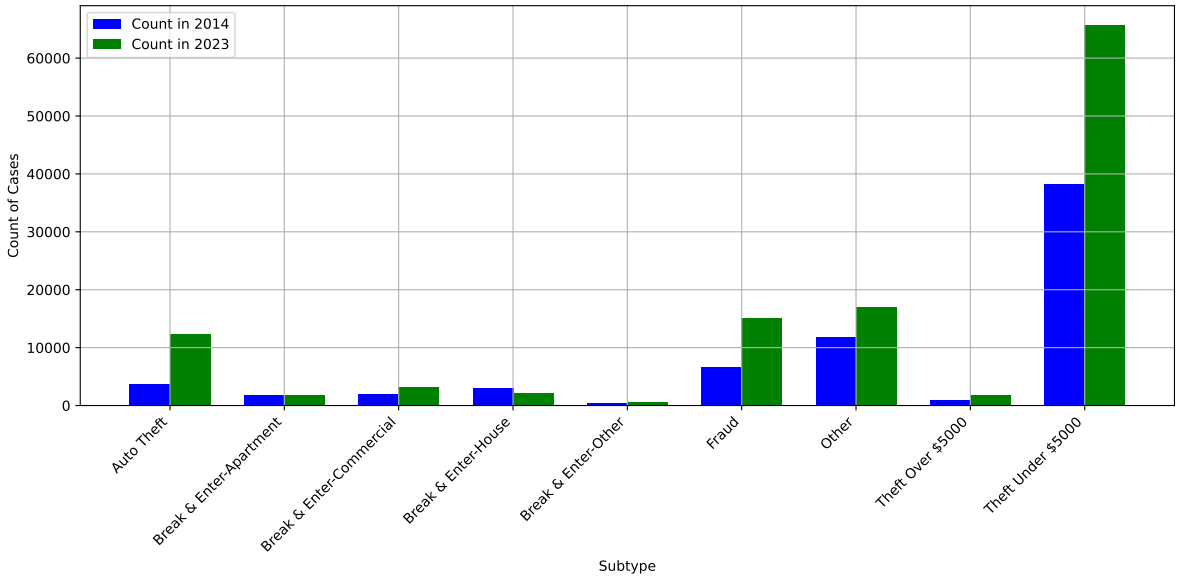

Figure 3: Comparison of Reported Subtypes of Crime Against Property Cases (2014 vs 2023)

3.4 Crime Subtype Clear Rate from 2014 to 2023 and Its Trend

The crime-clearing rate has dropped for all subtypes of crimes against the property from 2014 to 2023, ranging from a 10.25% decrease for a break and entry to the apartment to an 87.02% decrease for fraud. The clearing rate for 2014 and 2023 and the change in clear rate for each subtype of crime against property are listed below in Table 7.

Table 7: Case Clear Rate and Change from 2014 to 2023 for Crime Against Property Subtypes

	Subtype	2014	2023	Clear Rate Change
1	Auto Theft	0.226683	0.058846	-74.04%
2	Break & Enter-Apartment	0.303081	0.271921	-10.28%
3	Break & Enter-Commercial	0.310838	0.219476	-29.39%
4	Break & Enter-House	0.275475	0.231525	-15.95%
5	Break & Enter-Other	0.313288	0.244557	-21.94%
6	Fraud	0.385541	0.049910	-87.05%
7	Other	0.366371	0.226211	-38.26%
8	Theft Over $5000	0.282292	0.097614	-65.42%
9	Theft Under $5000	0.287080	0.120811	-57.92%

Figure 4 shows the trend of the change in case clearing rate of each subtype of crime against property from 2014 to 2023.

4 Discussion

The discussion section contains some speculation for the possible causes of the observed results, as well as some weaknesses and next steps of this study.

4.1 Trends in Crime and the Socio-Economic Influence

From 2014 to 2023, Toronto experienced significant changes in crime rates, reflecting broader socio-economic trends and specific local conditions. The steady increase in total crime, with a substantial rise from 113,426 cases in 2014 to 169,620 in 2023, partly reflects population growth and the increased digitalization of society. Crimes like theft and property-related offenses are strongly influenced by socio-economic conditions, including unemployment rates and economic hardship, especially during events like the COVID-19 pandemic. Financial instability likely contributed to the rise in financially motivated crimes such as fraud, which saw a sharp increase (124.67% growth rate) during this period, as indicated in Table 6.

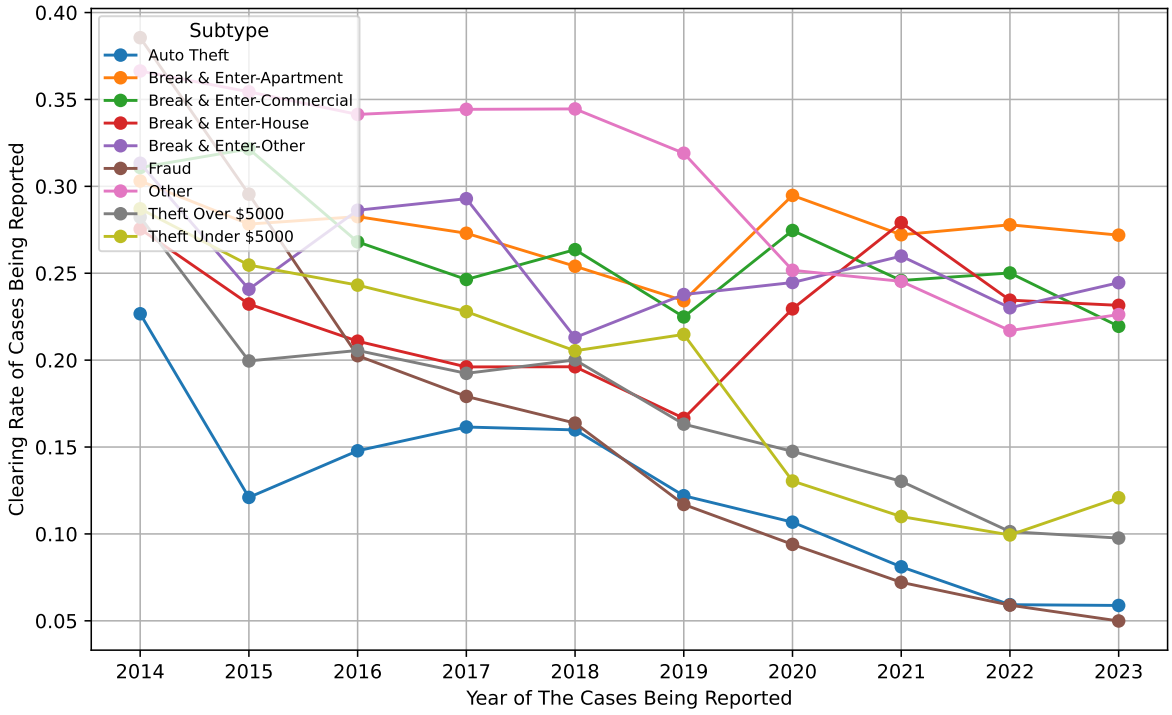

Figure 4: Trends of Case Clear Rate Change from 2014 to 2023 for Crime Against Property Subtypes

4.2 Impact of the COVID-19 Pandemic

The effects of the COVID-19 pandemic are reflected in the 2020 and 2021 data. The lockdowns, which reduced public interactions, led to a noticeable decline in traditional crimes like burglaries but fueled an increase in cybercrime and domestic violence. Notably, the pandemic likely caused a shift in crime patterns, with the overall decrease in reported crimes in 2020 (118,568 cases) reflecting fewer opportunities for certain physical crimes. However, fraud, particularly technology-facilitated fraud, continued to rise, highlighting the changing nature of crime in a digital era.

4.3 Crime Subtypes and Clear Rates

Despite the overall increase in reported crime, the clearing rate for most crime subtypes has declined substantially, with fraud experiencing a significant drop, from 38.55% in 2014 to just 4.99% in 2023. This drop might reflect the increasing complexity of investigating technology-facilitated crimes, where criminals are often harder to identify and prosecute. The decrease in clear rates across all subtypes could suggest that law enforcement resources may struggle to keep pace with the rising volume and sophistication of crimes, particularly in property and financial crimes.

4.4 Weaknesses and next steps

One limitation of the analysis is the aggregation of crime data across various divisions, which might obscure regional differences within Toronto. Future research could benefit from a more granular analysis at the division level to capture localized crime trends and their underlying causes. Furthermore, while this report focuses on quantitative data, a qualitative approach examining the socio-economic drivers in more detail could provide deeper insights into the rise in specific crime subtypes, especially tech-related fraud. Another significant weakness is that this dataset only includes reported crimes. Many crimes, such as domestic violence, may go unreported due to fear, shame, or a lack of trust in law enforcement. This underreporting skews the data and limits the ability to understand the prevalence of such crimes fully. A more comprehensive approach would require gathering data from additional sources, such as surveys on victimization, to capture the full scope of criminal activity in Toronto. Moving forward, addressing the root causes of crime, particularly economic hardship and digital vulnerabilities, will be crucial in reducing crime rates and improving law enforcement's ability to clear cases. Enhanced training for officers handling digital crimes and investing in technologies to track and combat cybercrimes could improve clearance rates, particularly for fraud cases.

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