

Crime Analysis Dashboard

Chicago crime data 2023



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Abstract: Crime rates all over the globe are on the rise, and Chicago, a city in the United States (USA), has long been suffering from the negative impacts of crime. The law enforcement department can better regulate criminal activity in Chicago with the support of crime dashboards that can accurately display the city's crime patterns. The residents of Chicago can also use it to better comprehend the condition of the city and can take necessary steps to safeguard their families, belongings, and themselves. The health system can also use this to preserve the well-being of individuals. Literature has already been reported about these types of crime dashboards and those dashboards appear a little complicated, particularly it seems complex for those without analytical skills. So, a dashboard to visualize basic crime data of Chicago seems urgent, and based on this a study was conducted with the aim "to utilize crime data of Chicago from a publicly accessible platform to develop a robust and intuitive crime data dashboard using the R Shiny app to visualize crime trends and patterns in Chicago to assist law enforcement authorities and other stakeholders in making appropriate legal and other decisions to mitigate the crime rates and to improve the quality of life of the individuals residing in Chicago". For this, secondary data analysis was carried out using crime data from the Chicago data portal that comprises data from 2001 to 2023. From this, data from the year 2023 was only selected as it was the most recently updated data. Data was imported to R software and the R Shiny app was used to create a crime dashboard for data visualization. Five menu items such as "monthly crime frequency, crime frequency by location, time-based crime heat map, crime type over the months, and crime map by date" were created in the sidebar, and appropriate tab items were also added for data visualization as per the need. The "Monthly crime frequency" menu option reflects that; theft was the most reported crime in all 12 months in 2023. The month of August had the highest rates of theft ($n=9895$) and it is reflected in the "crime type over the month" option also. Crime frequency by location menu also shows theft as the most frequent crime in the majority of the locations and it was followed by battery. Time-based crime heat map shows that theft is the most frequent crime and it occurs more at midnight (0 hours) and after 15 hours. The "crime map by date" menu also shows a considerable number of crimes per day. This study provides insights to mitigate crimes including theft. This study and crime dashboard can help the law enforcement authority to plan strategies to mitigate crime and also this can be used in the future with more innovative features to predict crime in the city.

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1. Introduction

1.1 Background information:

Criminality can be described as a detrimental occurrence in both underdeveloped nations and developed nations globally (Safat et al., 2021). The incidence of different types of crimes is increasing across the globe (Fajnzylber et al., 2002). Crimes and different violations should be controlled because they pose a hazard to justice (Safat et al., 2021). The United States (US) reported a decline in crime rates but large cities including Chicago continue to face higher rates of violent crimes (Singleton et al., 2023). Chicago, a vital international metropolis renowned for its varied neighbourhoods as well as active cultural fabric, is facing concerns associated with ongoing crime problems in the city in spite of substantial efforts to prevent them in recent decades (Mansourihanis et al., 2024). For example, Dabrowski and Klingner (2024) mentioned that, in 2023, there were 617 homicides which seems very high compared to other neighbouring cities such as New York and Los Angeles (Figure 1). This trend has been similar since 2012 (Figure 1) and the murder rate

in Chicago (per lakh) was ranked second among the big cities in the nation (Dabrowski & Klingner, 2024). Similarly, there are many crimes in Chicago and the crime incidence in

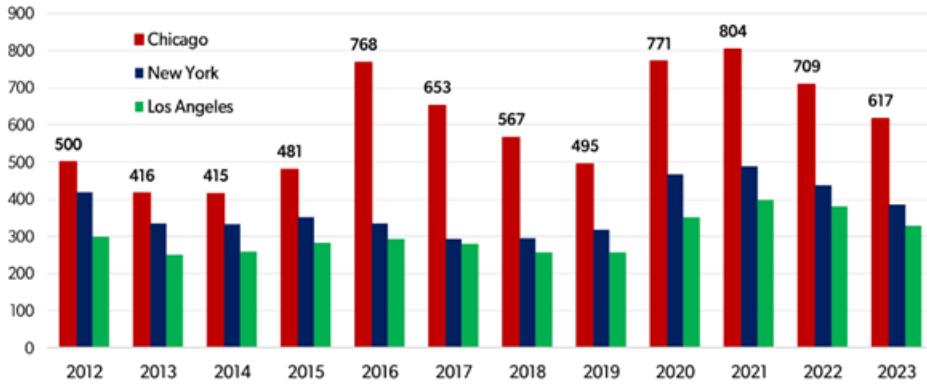


Figure 1: Homicides in Chicago and neighbouring cities: Image source (Dabrowski & Klingner, 2024).

Chicago is causing concerns in the life of the residents. For example, the literature mentions that neighbourhood crime in Chicago is connected to obstacles in access to resources that are necessary to promote the health of the individuals (Tung et al., 2018). In addition to that, a study identified that children living in violent environments in Chicago are less likely to get good academic records compared to their classmates from safer areas as they advance in their school (Burdick-Will, 2016). So, crime and related concerns in Chicago need to be mitigated through innovative strategies.

1.2 Rationale:

Multiple social issues, such as concerns about the safety of the public and issues in urban dwellers' quality of life are some impacts of crime (Ha et al., 2024) and they can be similar in the context of Chicago. As Chicago has been facing the detrimental impacts of crime for decades, Chicagoans need robust data to recognize the extent of crime in their settings (Horstman, 2024). Designing a user-friendly crime dashboard for Chicago seems essential. This can provide timely information to help law enforcement agencies to accurately communicate different vital information regarding crime in Chicago and enables data-driven robust decision-making and also helps to provide needed information to the public (Roberts, 2023). Traditional regulating methods alone in the city might not be adequate to handle new challenges as criminal activity seems as increasing in the context of Chicago. So, data-driven decision-making can help law enforcement authorities to plan strategies based on robust evidence. Inaddition to this, a crime dashboard prepared in the context of Chicago can help the healthcare system to make vital decisions because crime is also considered as a public health concern. For example, Crime in the neighbourhood can affect the mental health of individuals. Witnessing or being a victim of a particular crime can lead to the development of “post-traumatic stress disorders” in individuals (Baranyi et

al., 2021). In addition to that, a crime dashboard can also help the residents in Chicago to take measures to protect themselves, their families, and their properties/belongings. The US is facing hurdles in getting high-quality, timely, responsive, relevant as well comparable criminal justice data (NCSL, 2023). So, in this context, a secondary data analysis was conducted to achieve the following aim and objectives.

1.3 Aim and Objectives

This research project aimed to utilise crime data of Chicago from a publicly accessible platform to develop a robust and intuitive crime data dashboard using the R Shiny app to visualize crime trends and patterns in Chicago to assist law enforcement authorities and other stakeholders in making appropriate legal decisions to mitigate the crime rates and to improve the quality of life of the individuals residing in Chicago. The following objectives were considered to accomplish this aim

- To identify and gather Chicago's crime data from a publicly accessible and credible platform.
- To analyse the extracted data using R software and design a robust and intuitive crime data dashboard for Chicago using R shiny app.
- To visualise Chicago's crime trends and patterns through different data visualisation methods including bar charts, line graphs, interactive maps, and heat maps.

2. Second Section

2.1 Literature review and research gaps:

This literature review session will discuss the crime dashboards created in global and Chicago contexts and will mention the literature gaps.

2.1.1 Crime dashboards in the global and USA context:

A study conducted in Tornado (Liu, 2020), Canada identified the increase in crime trends in the city, and based on that concern, the authors developed a geo-spatially enabled crime data dashboard for visualising the crime data of Tornado. This aforesaid study by Liu (2020) also intended to establish a dashboard for analysis, and prediction, and to investigate related design and execution challenges. For this, the author prepared a prototype and it was implemented to understand data regarding temporal and spatial patterns of crime, crime clusters and to analyze the association between crime and other variables. Senior et al. (2023) developed a dashboard using clinical as well as non-clinical data for pattern analysis of gun violence in the context of the USA. They used Tableau software (2021.4 version) to establish a dashboard and recognized 1152 victims of gun violence to help in clinical decisions (Senior et al., 2023). This dashboard's main weakness is the lack of actual

data about those who commit the crime. So, this dashboard looks to be unsuccessful in inappropriately assisting law enforcement authorities in addressing crime scenarios and it appears as only helpful for health authorities. In Malaysia, Mahadi et al. 2023 developed an interactive dashboard by merging the Agile and also OSEMN methodologies for the crackdown. The dashboard's particular design appears to use feature visualisation and user-educational pertinent articles (Mahadi et al., 2023). So, from all this literature, it is clear that the dashboard is used in multiple countries to provide a robust visualisation of crime data for making strong decisions from law enforcement and to aware public. This reflects the scope of establishing dashboards to reduce crime rates in any context.

2.1.2 Crime dashboards in the context of Chicago and existing gaps:

Chicago has been facing crime-related concerns for many years (Mansourihanis et al., 2024). In 2024, Odooh et al. (2024) created a crime dashboard for a statistical exploration of the crimes in Chicago city. This research utilised a “Power BI dashboard” for data visualisation and identified disparity in crime incidents by time, area as well as type. Through their dashboard, the authors of this particular research gave a strong image of the existing stage of urban safety, but it still seems to be so intricate that not all users, including stakeholders, can completely comprehend it (Odooh et al., 2024). So, it reflects the need for a robust dashboard with simple data visualisation that can help the stakeholders to precisely identify the current crime situation in Chicago. Kumar et al. (2020) used the R shiny app and Google Maps (API) to create a crime dashboard to display crime trends and patterns in Chicago. Despite providing a solid foundation, this aforementioned study also appears complex when viewed through the perspective of a layperson lacking analytical abilities. Therefore, it looks imperative to develop a robust dashboard that visualises basic crime data in the context of Chicago. This will enable the public to be aware of crime incidents in their area and to take precautions against them. It can also support law enforcement authorities in identifying the types of crimes including most reported types of crime and vulnerable locations where focused interventions can be taken to save the lives and property of those individuals who live in Chicago. So, a robust dashboard was created based on this vital need and research gaps, and the coming sections will discuss it.

2.2 Methodology:

Study setting: Chicago (Figure 2) is the setting of this project because data from this particular city was chosen for this project. Chicago is located in Illinois state and according to the US Census Bureau, the population of this city is 2,664,452 (US census Bureau, 2023; World population review, 2024). **Database and research design:** Secondary data analysis was conducted using crime data from the Chicago data portal (Chicago Data Portal, 2024). This portal includes data from 2001 to the present and it was in Excel format (CSV). For our study purpose, we solely considered data from 2023 because it is the most recent completed data. This data consists of details about different types of crime reported in Chicago such as theft, robbery, homicide, rape, etc. In this data set, a unique



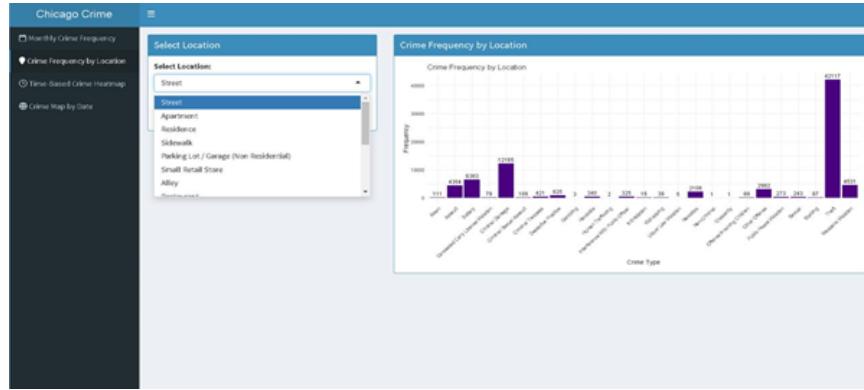
Figure 2: Chicago city map: Source (Maps Chicago, 2024)

ID number and case number are given for each crime incident. This crime data recorded 31 different types of crime incidents that occurred in Chicago in the year 2023 and used two robust fields to precisely provide information about each crime incident. Each type of crime is described in the first field, "Primary type," while the second field, "description," gives an abridged description of each reported crime. Then, this data comprises information about the exact site of the crime, such as the street, apartment, store, etc., as well as whether or not an arrest was made for each crime incident in the city. This data also encompasses information regarding district, beat, ward, community area, and geographical coordinates.

Data preprocessing: After downloading and importing raw data from the online platform to R, the next step was data preprocessing. It was done because raw data might contain errors such as a lack of headers, incorrect labels, incorrect data types, and unanticipated character encoding (de Jonge, 2013). So, data cleaning was done using the "dplyr" R-package.

R shiny app: Interactive dashboard creation and Features of the developed dashboard: R Shiny, a type of R framework offered by RStudio, makes it extremely simple to utilize R to build interactive web applications and it enables the creation of an extremely comprehensive level of data reports as well as visualizations that help different users explore the available data (Kumar et al., 2022). Shiny permits the immediate construction of statistical applications as well as visualizations which can then be quickly posted online (Ellis & Merdian, 2015). Shiny app contains three components such as the user interface (ui.R) the server Function (server.R) and the Shiny app functions. The dashboard includes three parts such as header, sidebar, and body. As a first step, we have given a title for our dashboard in the header portion of the dashboard and the title is "Crime Chicago". Then, menu items or contents were added to the sidebar. Each menu item can help to display different contents in the main body of the dashboard and it helps users to visualize the crime data of Chicago (2023) as per their requirements. Five menu items were given in this study to visualize the Chicago crime data. It includes "monthly crime frequency, crime frequency by location, time-based crime heat map, crime type over the year, and crime

map by date". When a user clicks on the menu item provided in the sidebar, the tab item will be displayed clearly with multiple options. Then the user can choose the essential data that needs to be displayed in the dashboard's body part. For example, users can view a list of multiple crime locations by clicking the "crime frequency by location" menu item in the sidebar. From there, they can select any location to view the graphical representations of the frequency of various types of crime in that location (Figures 3 and 4). This can help law enforcement authorities and the residents/public to get a clear picture of crime in each location of Chicago. The crime map by date menu item can provide a robust interactive map of each date in the year 2023 in all locations of Chicago (Figure 5). Similarly, the other menu items also have such options.



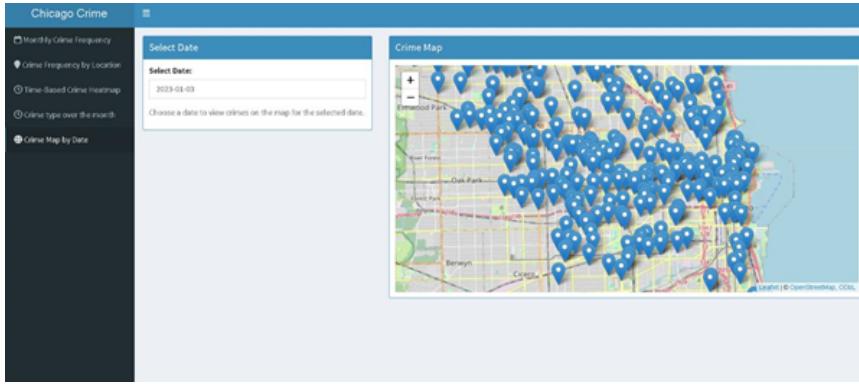


Figure 5: Crime map by date

Ethical considerations: This research did not collect any direct information from individuals and only used publicly available data from a credible source. So, no informed consent was obtained from any individuals. Similarly, no Institutional review board permission was obtained due to the lack of ethical issues in the data.

Gantt chart of activities:

Activities	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
Proposal preparation and presentation								
Literature search and review								
Data identification and cleaning								
Dashboard creation in R shiny app								
Preparation and submission of report								

2.3 Results:

We have developed a Crime dashboard in the context of Chicago based on the data from the Chicago data portal (Chicago Data Portal, 2024). This result session discusses the main findings of the visualisation process. As mentioned above, R shiny has mainly three elements or parts. The first one is the header, the second is the sidebar and the final one is the body. Sidebar includes 5 main menu items that can help to visualise the Chicago crime data. The following section will discuss the 5 menu items and related results.

2.3.1 Monthly crime frequency

Users can identify the monthly crime frequency in Chicago (for all twelve months) by selecting the “monthly crime frequency” menu option from the sidebar. This allows the

users to see the frequency of crime in all twelve months. The theft was the most reported crime in all 12 months in 2013. The months of August had the highest rates of theft ($n=9895$) (Figure 6) followed by October ($n=9642$), July ($n=9463$), September ($n=9072$), and June ($n=9028$). The frequency of theft was low in February ($n=7114$) (figure 7) followed by March ($n=8044$) and April ($n=8007$). The frequency of theft in other months includes 8686 in January, 8553 in May, 8777 in November, and 8889 in December.

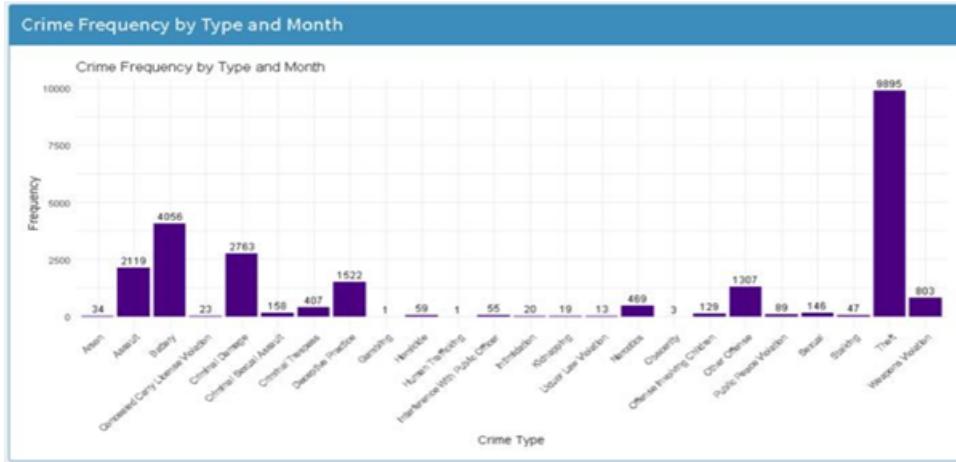


Figure 6: Crime rates in August

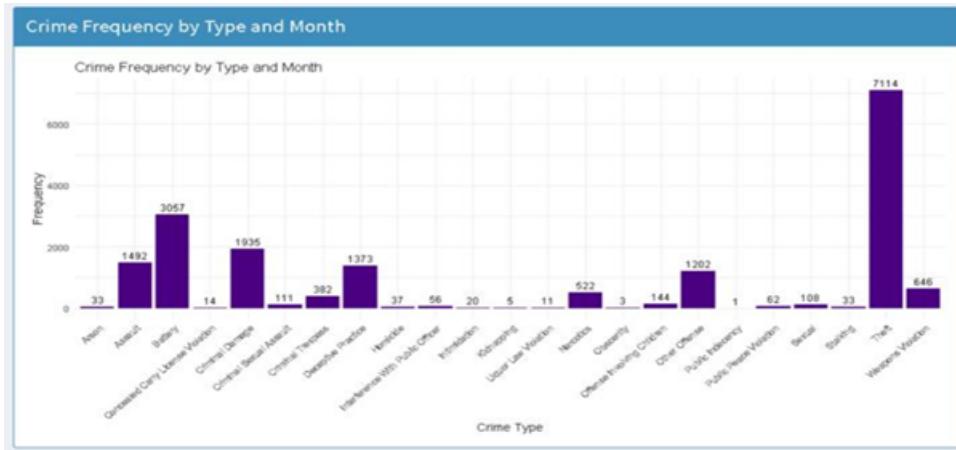


Figure 7: Crime rates in February

Gambling was the least frequent crime in January ($n=1$), March ($n=1$), July ($n=2$), August ($n=1$), and December ($n=1$). Obscenity was rarely reported and it was the least common crime during November ($n=1$), September ($n=2$), and April ($n=3$) months. Similarly, non-criminal actions were identified as the least reported crimes during months such as November ($n=1$), June ($n=10$ and May ($n=1$)). In February 2023, the least reported

crime was public indecency ($n=1$), and in October, August, and June, whereas human trafficking was the least reported crime ($n: 2, 1$, and 1 respectively). Bar diagrams of Crime rates for all months are included in Appendix 1.

2.3.2 Crime frequency by location

The dashboard provides information on crime frequency by location by clicking on the “crime frequency by location” menu item in the sidebar. The dashboard provides the frequency of different types of crime in 10 different locations and the results are the following

Location 1: Street: As illustrated in Figure 8, the most frequent type of crime on Chicago streets in 2023 was theft ($n=42117$), followed by criminal damage ($n=12165$), battery ($n=6383$), weapon violation ($n=4531$), assault ($n=4354$), and other crimes. Obscenity ($n=1$), non-criminal activities ($n=1$), human trafficking ($n=2$), and gambling ($n=3$) were the least reported crimes on the streets. Compared to other locations, theft is more in the streets.

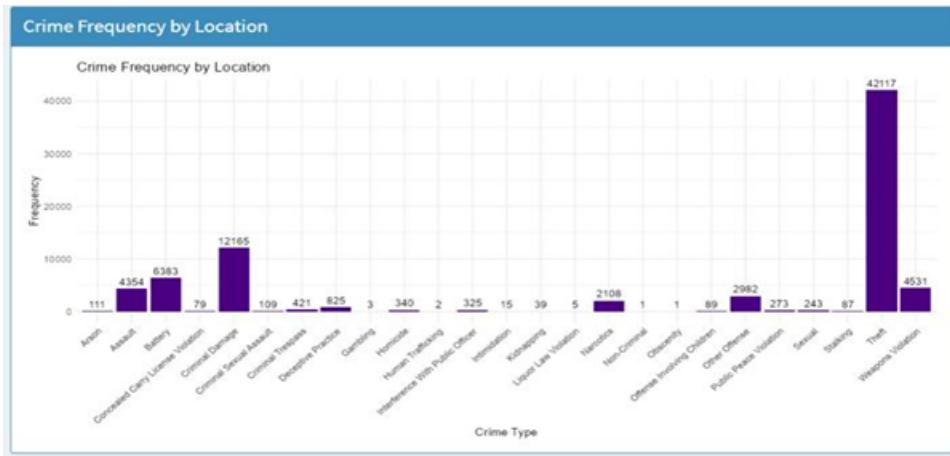


Figure 8: Crime frequency in streets

Location 1: Apartment: Analysis revealed that the most frequent crime in apartments was the battery ($n=14522$) and that was followed by theft ($n=10587$), assault ($n=5658$), other offenses ($n=5205$), criminal damage ($n=5136$), deceptive practice ($n=4607$) and other crimes mentioned in figure 4. Battery seems very high in this location compared to others (Figure 9) The least reported crimes in apartments include human trafficking ($n=1$), concealed carry law violation ($n=1$), and liquor law violation ($n=2$).

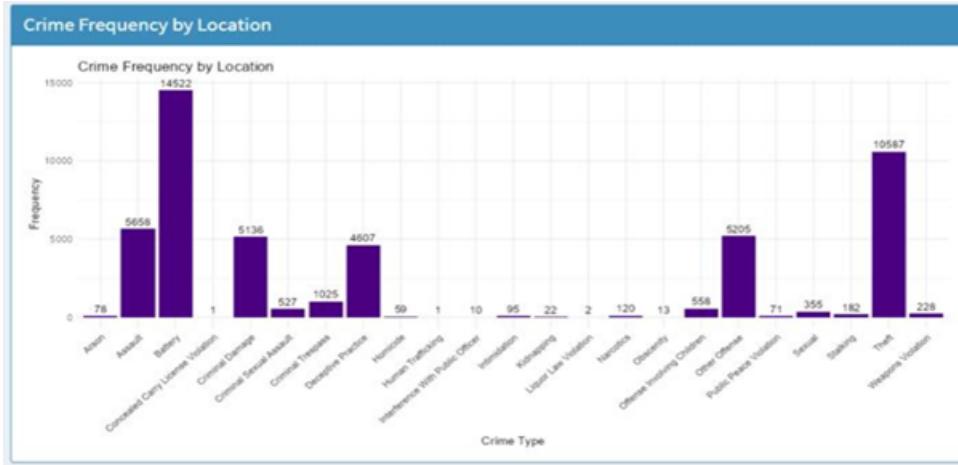


Figure 9: Crime frequency in apartments

Location 3: Residence: By clicking the residence option, the users can understand that similar to the apartments, residents also have the battery as the most frequently reported crime ($n=6886$). The theft also occurred with considerable frequency in residences ($n=6672$) followed by deceptive practices ($n=4288$), other offenses ($n=4190$), criminal damage ($n=3787$), and other crimes. Human trafficking ($n=1$) and violations of the alcohol law ($n=2$) were crimes with low frequency.

Location 5: Sidewalk: Theft was the most reported crime in this location ($n=3933$) followed by battery ($n=3882$), assault ($n=1736$), narcotics ($n=1149$), and others. The least reported was noncriminal activities ($n=1$).

Location 6: Parking lodge/Garage (non-residential): Theft was the most frequent crime reported in this location ($n=5647$) followed by criminal damages ($n=2139$) and others. Intimidation ($n=1$) and concealed carry license violation ($n=2$) were very less in this location.

Location 7: Small retail stores: In 2023, theft was the most frequently occurred crime in small retail stores of Chicago ($n=5113$), and it was followed by assault ($n=597$) and Battery ($n=423$). The least reported crime was obscenity ($n=1$) followed by public indecency ($n=2$) and liquor law violation ($n=2$).

Location 8: Alleys: In Alley also, theft was the most reported crime ($n=2011$) followed by weapons violation ($n=1130$). The least reported crime was gambling ($n=1$).

Location 9: Restaurants: In restaurants also, theft was the most reported crime ($n=2437$) followed by Battery ($n=834$) and assault ($n=711$). The least reported crime was kidnapping ($n=1$) and concealed carry license violation ($n=1$).

Location 10: Department stores: In department stores, theft was more frequent in 2023 ($n=336$) followed by 190 assaults. Offense involving children and public indecency were the less frequent crimes ($n=1$).

Location 11: Others: Theft was more frequent in other locations ($n=1534$) followed by deceptive practices ($n=786$). Least frequent crimes were obscenity and kidnapping (both $n=1$)

Location 12: Commercial/business office: Theft was more frequent in these locations ($n=1353$) followed by deceptive practices ($n=610$). Least frequent crimes were kidnapping ($n=1$), concealed carry licence violation ($n=1$) and inference with public officer ($n=1$).

Location 13: Vehicle/ non-commercial: 1960 theft were reported in this location and criminal damage was the next frequent crime ($n=529$). Intimidation was the less common crime in this location ($n=1$).

Location 14: Residence/porch hallway: 1940 theft was identified from this location and it was followed by battery ($n=419$). Interference with public officers ($n=1$) and public peace violation ($n=1$) were the less frequent crimes in this location.

Location 15: Gas station: Here also, theft ($n=1205$) was the most frequent crime followed by battery ($n=456$). Offenses involving children, intimidation, and stalking (all $n=1$) were the less frequent crimes.

Location 16: Residence: Yard (front/back): Theft was the most reported crime ($n=1110$) followed by criminal damage ($n=389$). The least reported crimes were intimidation and kidnapping (both :1 in number). The theft was less in this location compared to other locations mentioned above (Figure 10). The remaining Bar diagram of the crime locations is presented in Appendix 2.

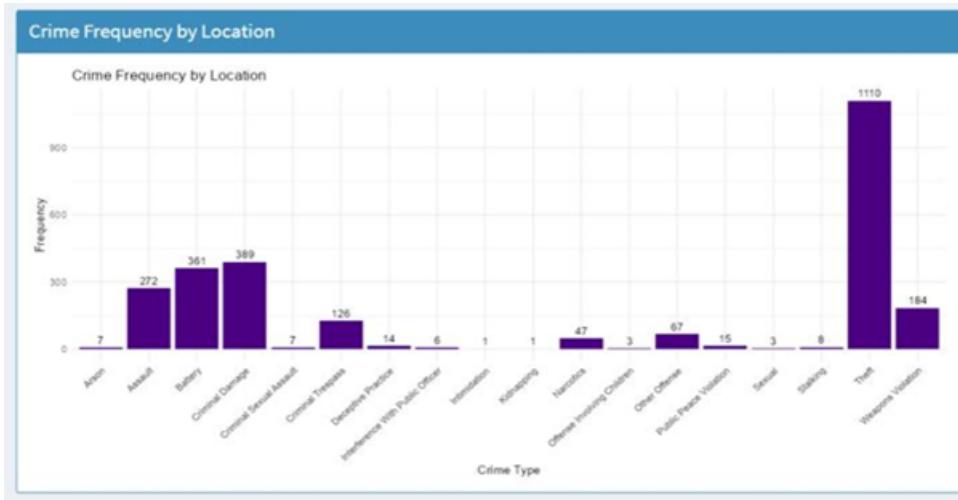


Figure 10: Crime frequency in Residence: Yard (front/back)

2.3.3 Time-based crime heat map:

Time-based crime heat map (figure 11) was developed to understand the crime frequency based on the time of day/hour of the day. The darkened portion indicates a high frequency and here it is evident that theft is the most frequent crime which occurs most at midnight (0 hours (midnight)). Then after 15 hours after it seems high. This reflects the need for security during these times.

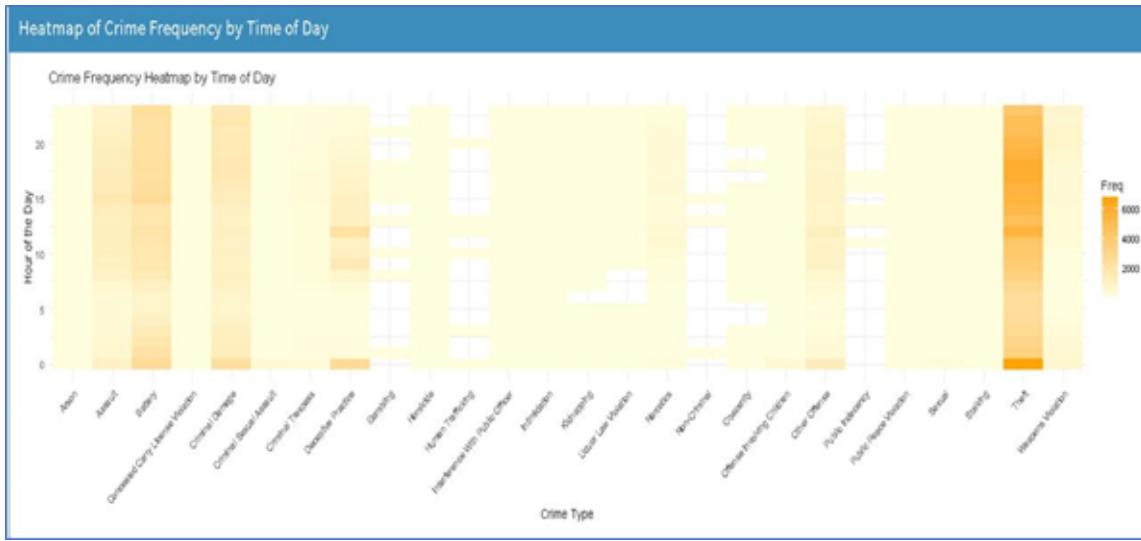


Figure 11: Heat map of crimes in 2023

2.3.4 Crime type over the year:

A line graph was plotted to illustrate the trend as well as changes in theft, battery, and other crime frequency across months. From this, users will gain insight into Chicago's theft patterns over the course of 12 months. As depicted in Figure 12, theft was less common in February 2023 and more common in August 2023. Since theft was identified as the most frequently reported crime for all 12 months in the year 2023, it is imperative to identify this monthly pattern to take targeted interventions.



Figure 12: Theft pattern over the months in Chicago

Battery, weapons damage, criminal sexual assault, and criminal damage were high in July, while assault and public peace violations were high in August. Other offenses,

interference with public officers and criminal trespass seem as high in March. Narcotics use was high in February while Offense involving children seemed high in January. Sexual crimes seemed high in September while homicide was high in June. The frequency of Battery is presented in Figure 13 and details (line graphs) of other crimes are presented in Appendix 3.



Figure 13: Battery pattern over the months in Chicago

2.3.5 Crime map by date:

The leaflet package of R was used to create interactive maps by dates. It displays the crime markers based on coordinates (geographical coordinates: latitude and longitude). This can help users to identify the types of crimes that occurred on each date in particular locations. For example, figures 14,15, and 16 display the crime maps of 2023-09-11, 2023-01-03, and 2023-12-05 respectively and it shows a considerable number of crimes per day.

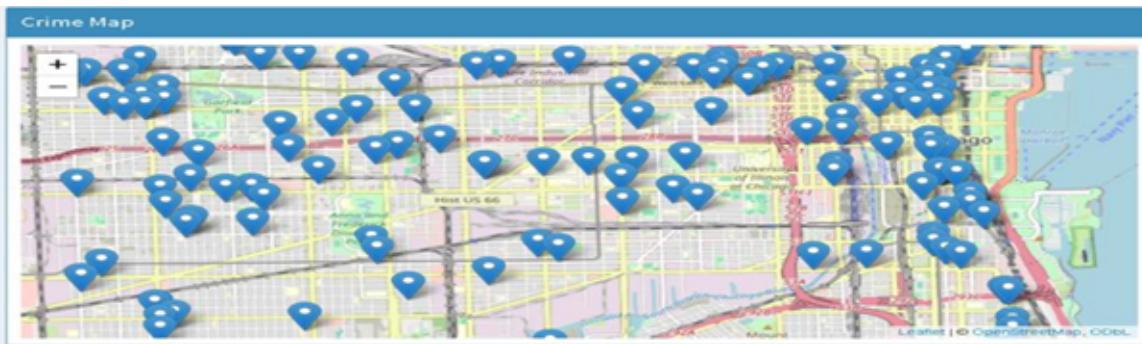


Figure 14: Crime map of 2023-09-11

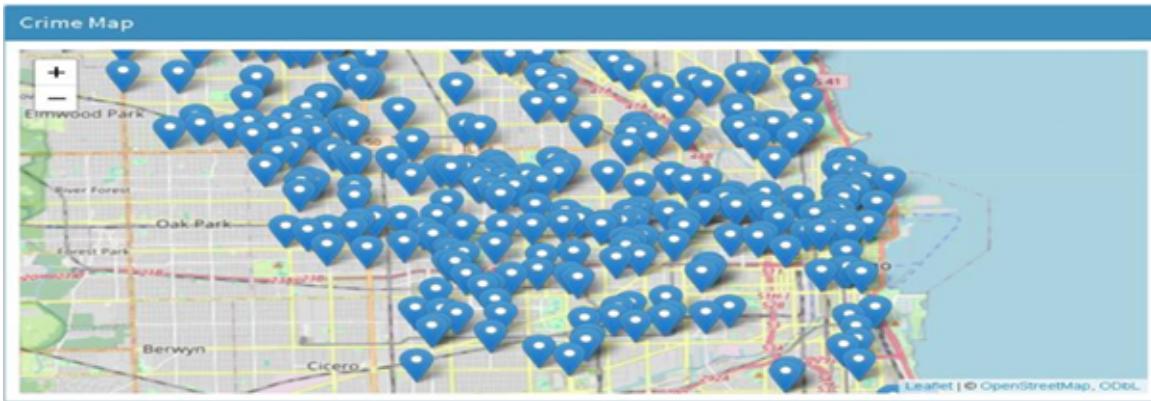


Figure 15: Crime map of 2023-01-03



Figure 16: Crime map of 2023-12-05

2.4 Discussion:

This study created a crime data dashboard for Chicago using the R shiny application to help law enforcement authorities identify the crime pattern of the city. This dashboard can help the legislators to make robust decisions. Access to trustworthy, understandable, and analogous data is indispensable for legislators to make an array of budgetary as well as policy decisions. However, the disjointed character of the criminal justice system in many of the state authorities makes it problematic to gather such robust data (NCSL, 2023). However, our dashboard has data from a credible source that can help legislators understand the crime pattern of Chicago without any hurdles. This study and related dashboard revealed that theft was the most frequently reported crime in Chicago and so it reflects the trustworthiness of this dashboard since all data told almost the same story without any mistake. This can prevent the hurdles faced by law authorities to get good-quality data. NCSL (2023) mentioned that, due to multiple factors, including disparities in the types of data that were gathered by local-level authorities, different

descriptions of significant terminology, and technological hindrances that prevent the well-organized release or sharing of data, states frequently have a deficiency in uniform, as well as comparable criminal justice statistics. Such hindrances can be mitigated through the robust data visualisation pattern of our crime dashboard.

This study revealed the increase in theft from midnight and evening to nighttime. In support of our findings, a study conducted in China also identified a high rate of theft at night time (He et al., 2020). Another study conducted in the US (Lauritsen et al., 2013) also identified a considerable rate of theft in the study area and this also supports the findings of our study. So, this reflects the consistency of our findings

Implications and recommendations: The implications of this study are the following

- The Chicago law enforcement authority/lawmakers can utilise our dashboard to plan targeted interventions to safeguard the lives and belongings of city dwellers by acquiring a basic understanding of the frequency, nature, location, and other pertinent facts related to crimes.
- Health system can also use the dashboard to identify risks for injuries from different crimes and can take precautions.
- The dashboard offers all residents of Chicago precise data about the city's crime incidents, enabling them to make significant decisions to protect their belongings, family, pets, and themselves.

Some recommendations based on the findings are the following

- Add real-time data in the future to get updates about the criminal activities happening in every location of Chicago to get quick action against that to save the lives of the people
- Add details of each crime's victims in the future in the dashboard to help the law enforcement authority and health system recognize vulnerable individuals for crimes. Also, year-wise data to understand the trends needs to be there in the future.
- Use prediction models to predict the crimes in each location of Chicago to take precautionary actions to prevent crimes
- Multidisciplinary collaboration between data scientists, law authorities, government, and health system is necessary to update the dashboard with unbiased as well as accurate data to help in making accurate decisions.
- Stakeholders, law enforcement authorities, and policy makers can use our crime dashboard in combination with other cutting-edge technology to predict crime incidences around all locations of Chicago. This can help mitigate the occurrence of crimes in the city
- Other countries can adopt this dashboard model to establish crime dashboards to help law enforcement authorities control criminal activities.

- As theft is very high in Chicago, especially during midnight, local government and law enforcement authorities should inform the public to use household security systems (cameras, sensor lights, and alarm systems) and to lock all doors and windows appropriately. In addition to this, anti-theft devices need to be installed in the vehicles. Give a contact number to the public to report any suspicious activity in the community.
- Midnight and night surveillance should be there to prevent theft and other crimes. Use proper monitoring systems in all areas to prevent all crimes.
- Provide awareness sessions to residents to safeguard their lives and properties.

Strengths and limitations: The main strength of this study is the creation of a crime dashboard in the R shiny application. This is a strength because R shiny is an R framework that can assist in creating “interactive web applications with R” and its functionality is considered remarkable (Kumar et al., 2022). Another strength of this project is the creation of a simple and user-friendly dashboard/interface that can help law enforcement authorities as well as the general public get an idea about crime patterns in Chicago city. In addition to this, this dashboard’s replicability is one of its key strengths because R Shiny is a robust and free framework, that can be used in a variety of contexts, including other countries to help law enforcement, and general public, and even the health system to improve safety of citizens. This study has certain limitations also. One main limitation of this study is the use of a limited number of variables to create the dashboard. This was done to make it more user-friendly. However, there is a need for more variables in the future that can provide more information about the demographics (age, gender, and other information) of victims and those who commit crimes. In addition to that, for better comprehension, this study only used data of only one year (2023); nevertheless, one limitation of this approach is its incapability to examine the crime patterns over the years in Chicago, which indicates the need for future updates.

3. Conclusion

Individuals in Chicago have been facing the repercussions of crime for years and it can impact their quality of life. We have created a dashboard that can visualize basic data that is understandable to the public, law enforcement authorities, and also the healthcare system to take proper action. It is clear from the analysis that, theft is the most frequently reported crime for all 12 months in the year 2023 and the most frequently reported crime in the majority of the locations. Other crimes such as battery, criminal damage, deceptive practices, and criminal damage also seem high. The dashboard reflects the criminal activities in Chicago and it calls for urgent action to save the lives and belongings of the individuals. Law enforcement authorities can take proper action in each location with the help of this crime dashboard to mitigate the crime and its repercussions and can save the

lives of all those who are residing in Chicago. This crime dashboard seems much innovative and useful and this can be replicated in other contexts/countries to identify the crime pattern and to identify needed interventions to mitigate this. Crime-predictive features can be added in the future to prevent crime and to take necessary steps.

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4. Appendixes:

4.1 Appendix 1: Monthly crime rates

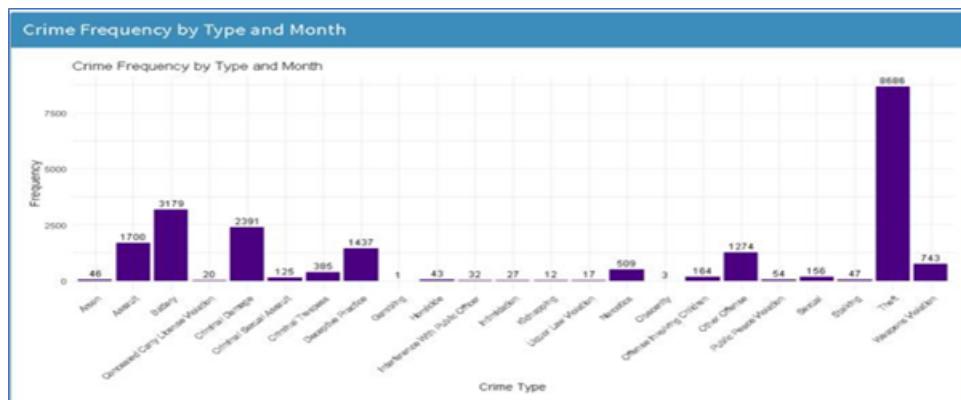


Figure A1.1: Crime rates in January

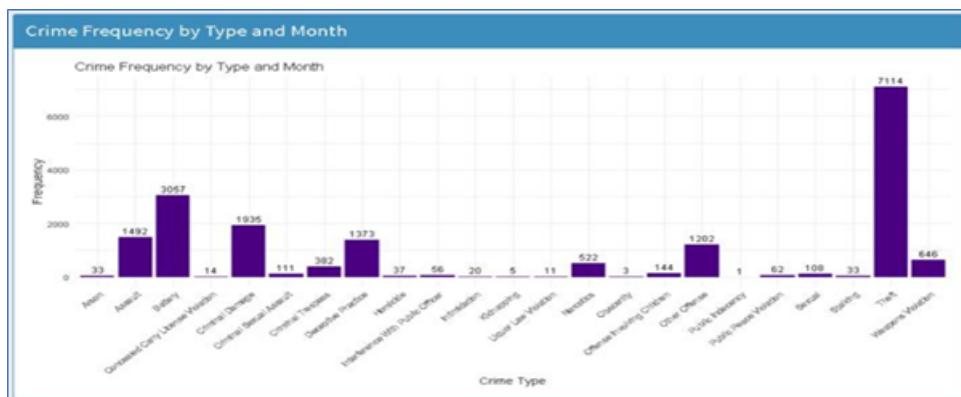


Figure A1.2: Crime rates in February

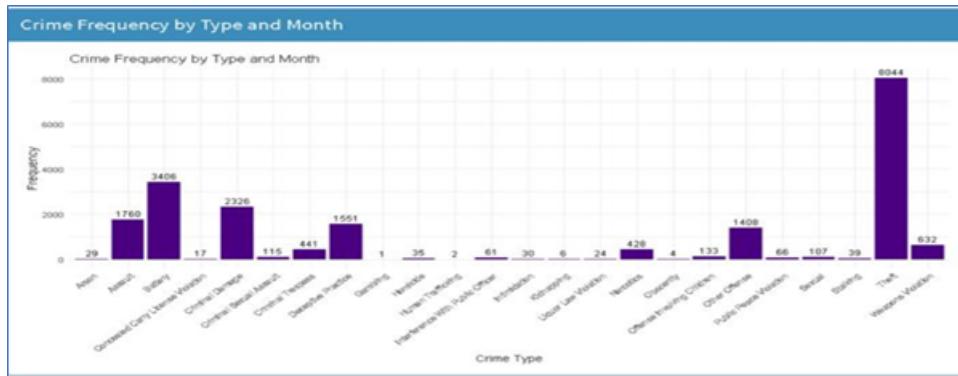


Figure A1.3: Crime rates in March

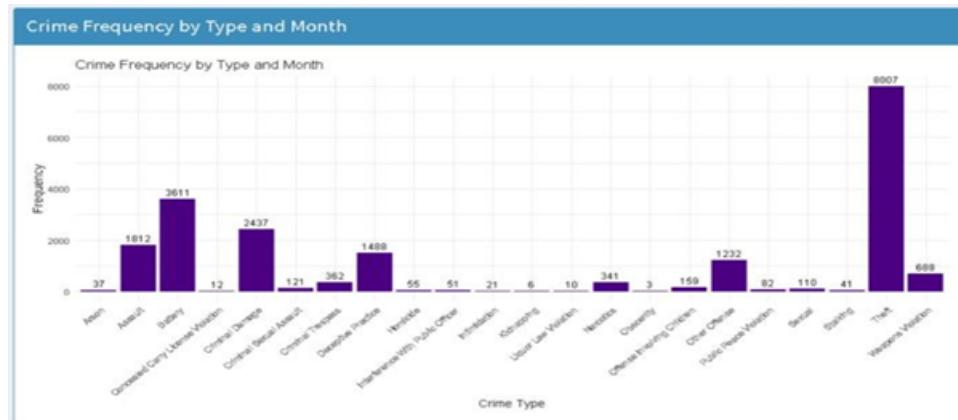


Figure A1.4: Crime rates in April

V

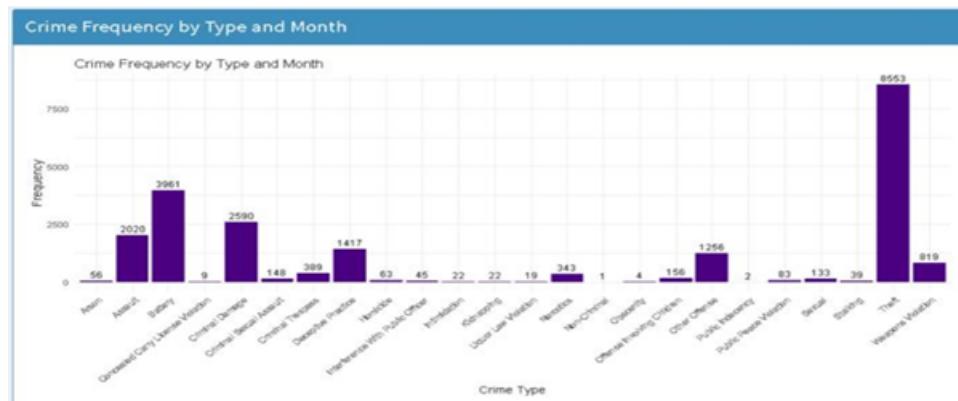


Figure A1.5: Crime rates in May

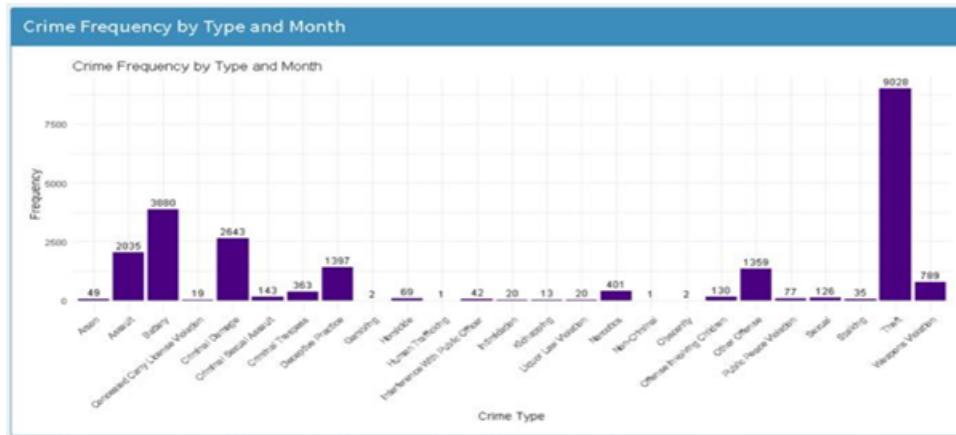


Figure A1.6: Crime rates in June

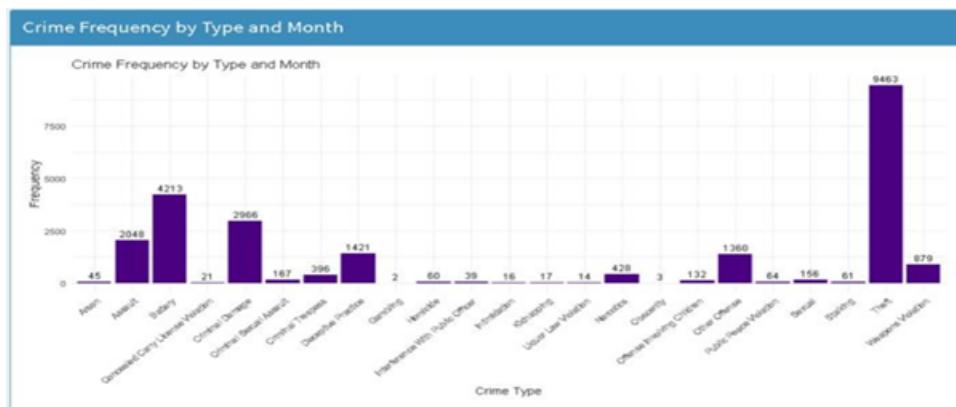


Figure A1.7: Crime rates in July

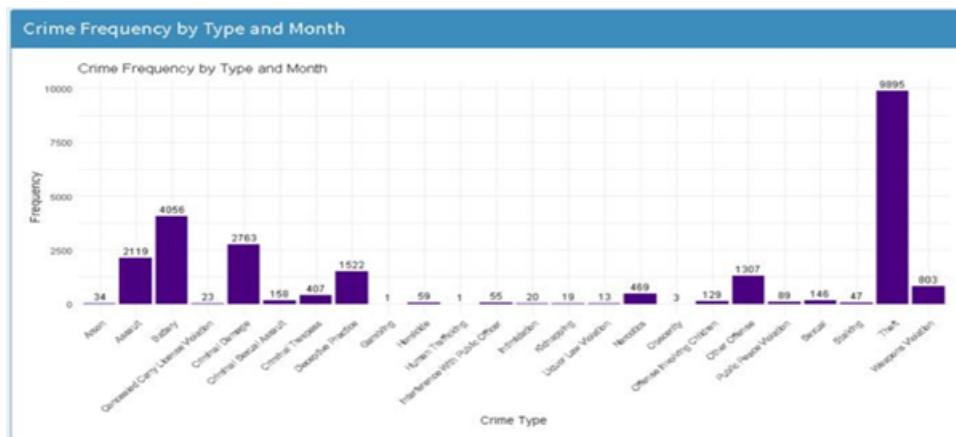


Figure A1.8: Crime rates in August

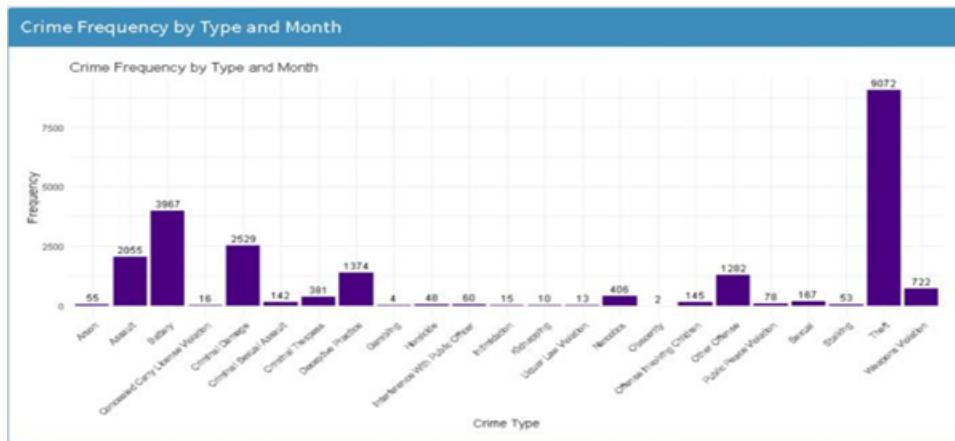


Figure A1.9: Crime rates in September

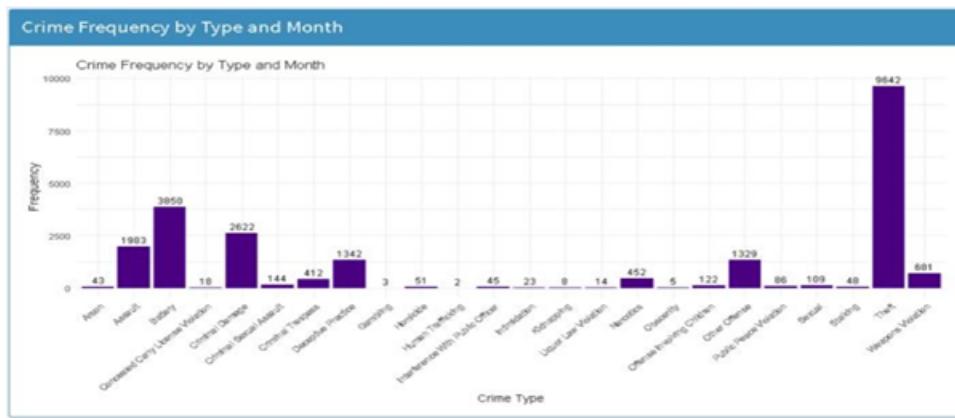


Figure A1.10: Crime rates in October

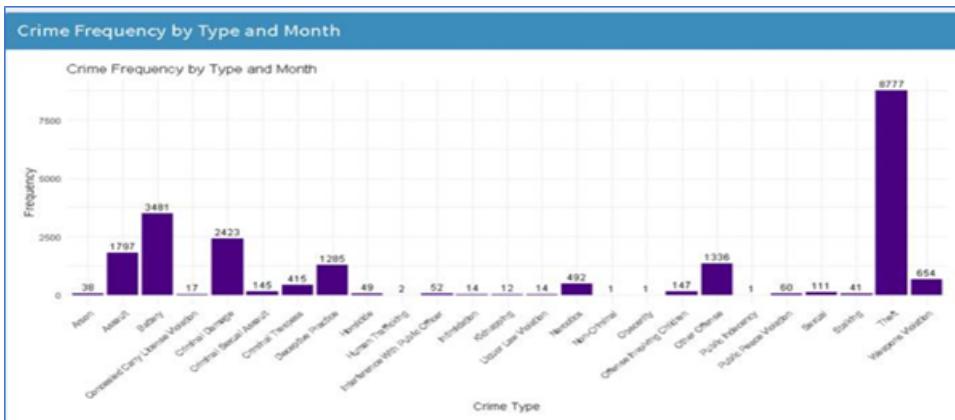


Figure A1.11: Crime rates in November

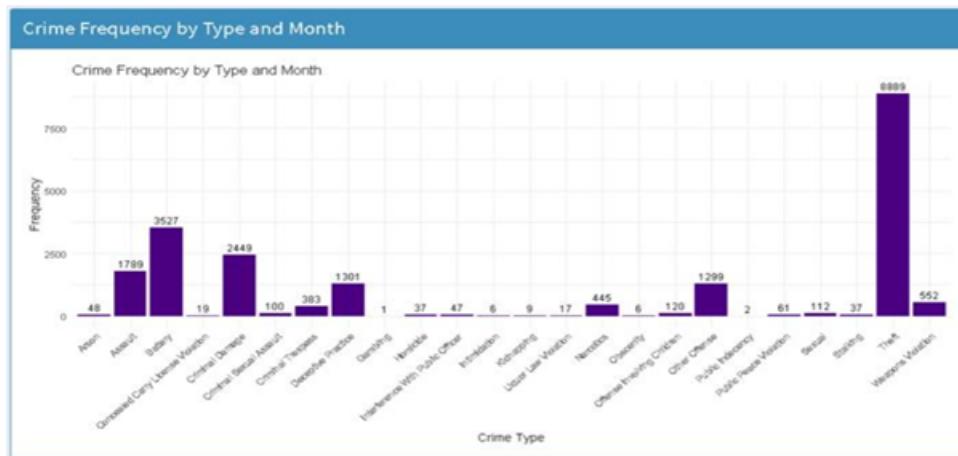


Figure A1.12: Crime rates in December

4.2 Appendix 2: Monthly crime rates

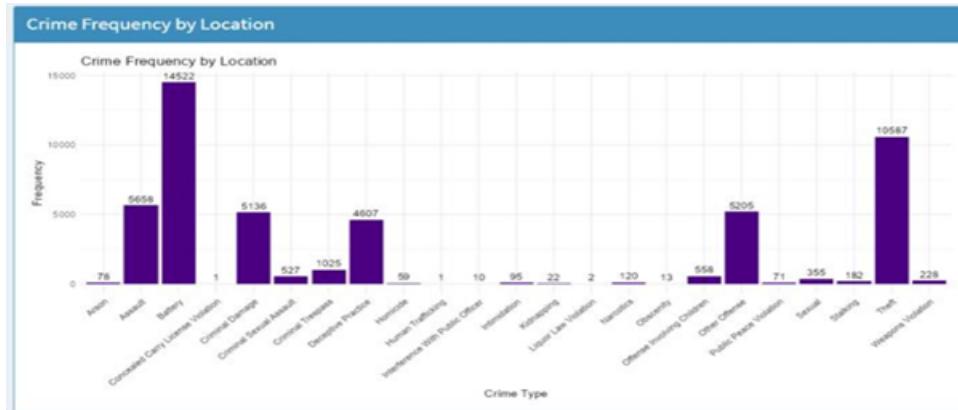


Figure A2.1: Crime frequency in apartments

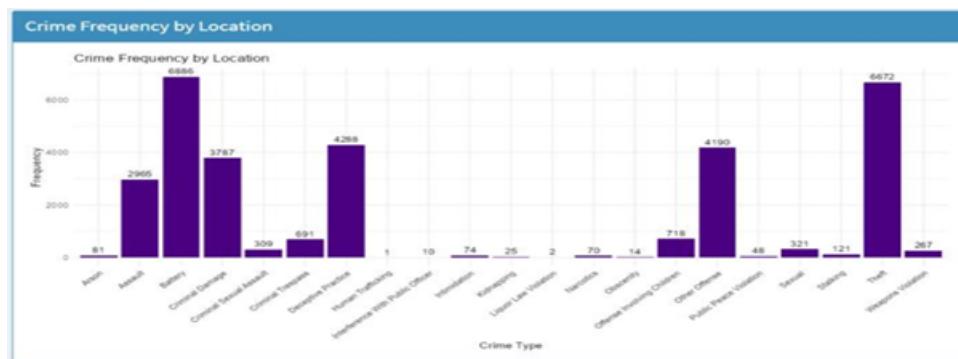


Figure A2.2: Crime frequency in residence

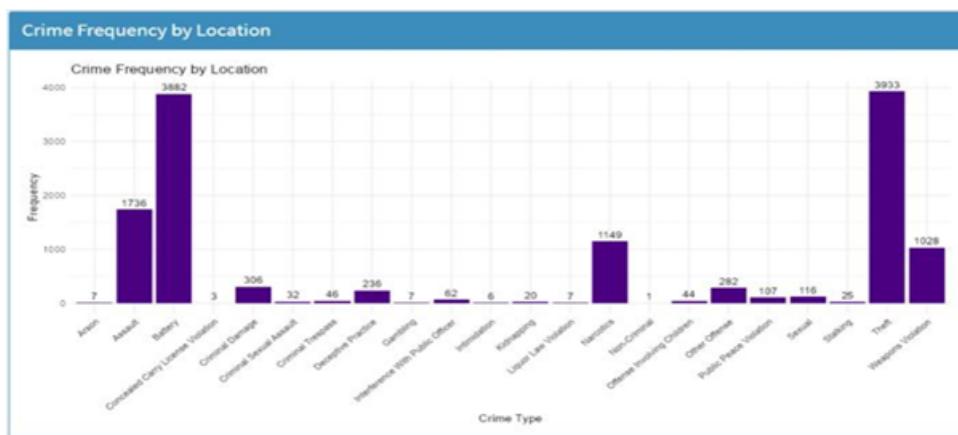


Figure A2.3: Crime frequency on the sidewalk

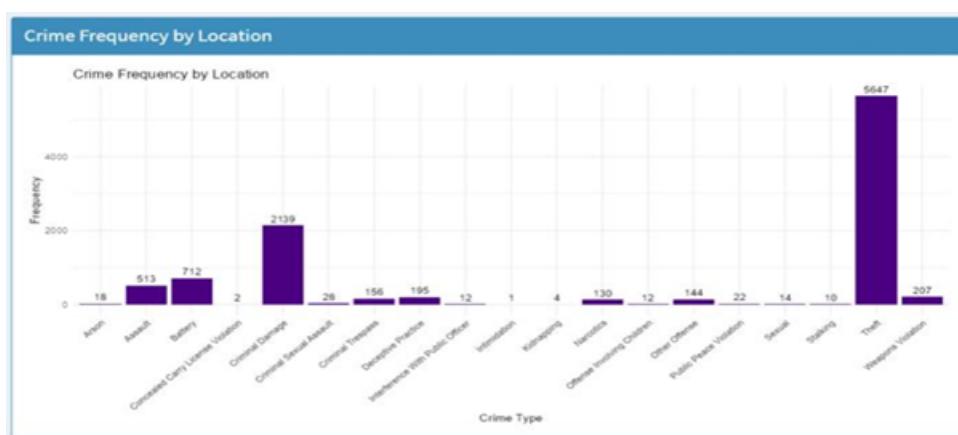


Figure A2.4: Crime frequency in Parking lodge/Garage (non-residential)

V

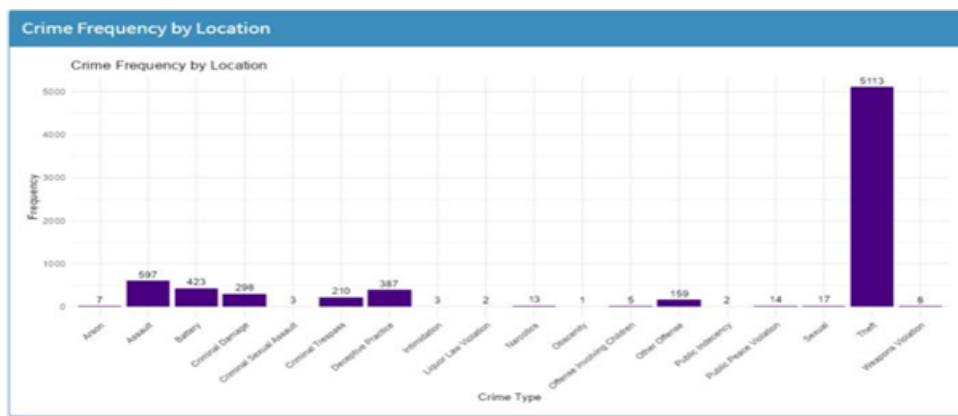


Figure A2.5: Crime frequency in small retail stores

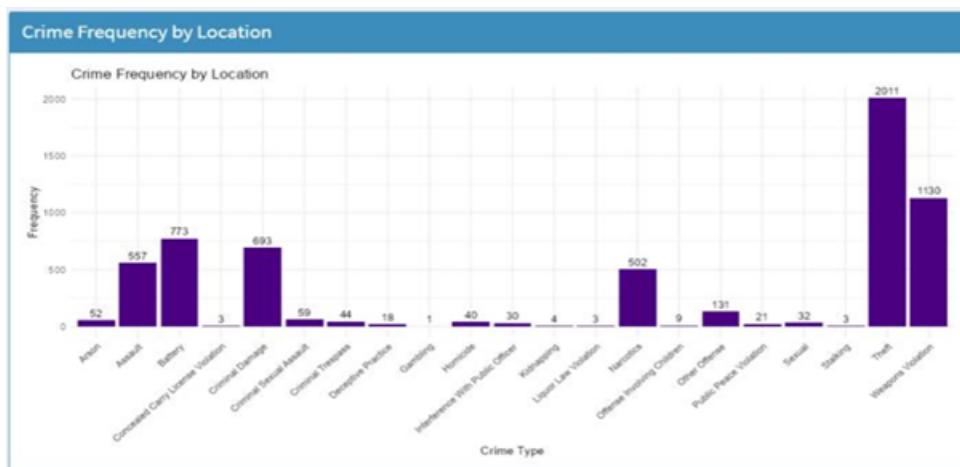


Figure A2.6: Crime Frequency in Alleys

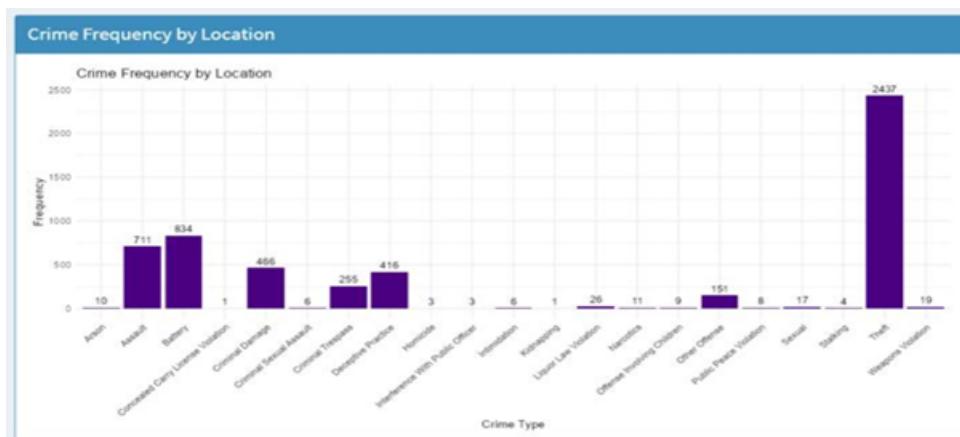


Figure A2.7: Crime Frequency in Restaurants

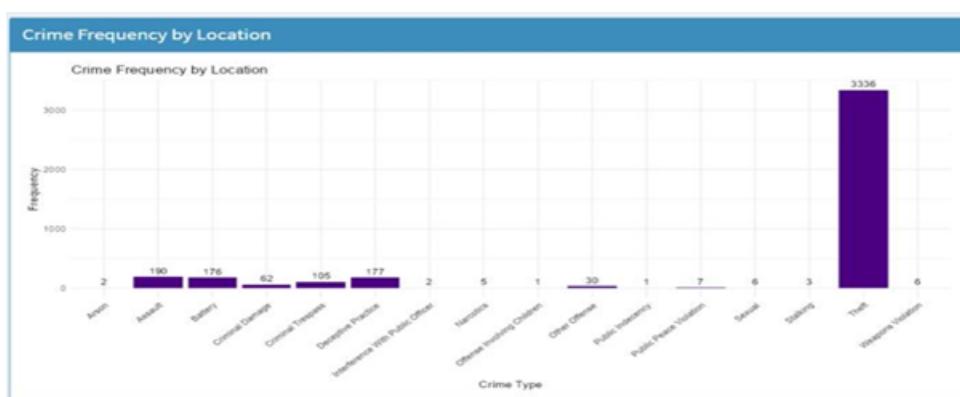


Figure A2.8: Crime Frequency in Department Store

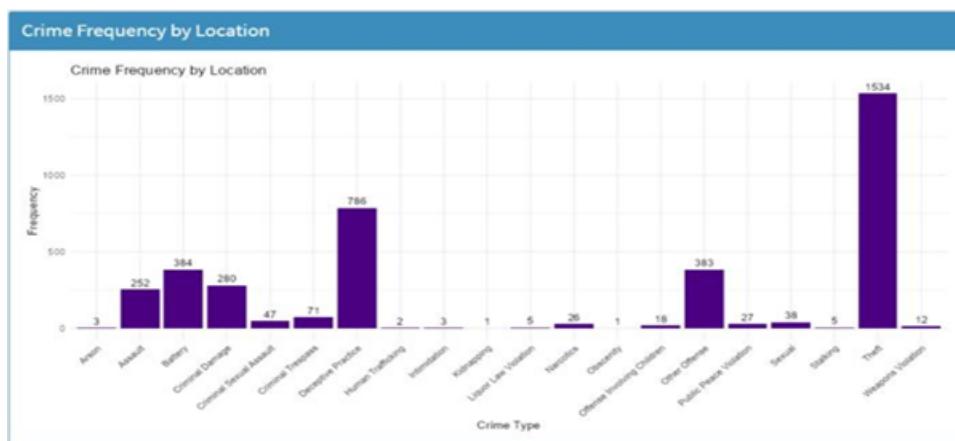


Figure A2.9: Crime Frequency in Others

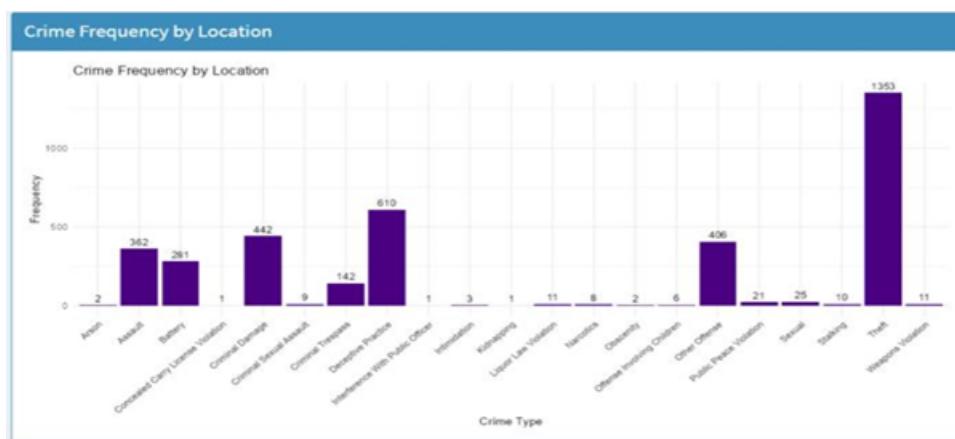


Figure A2.10: Crime Frequency in commercial/business office

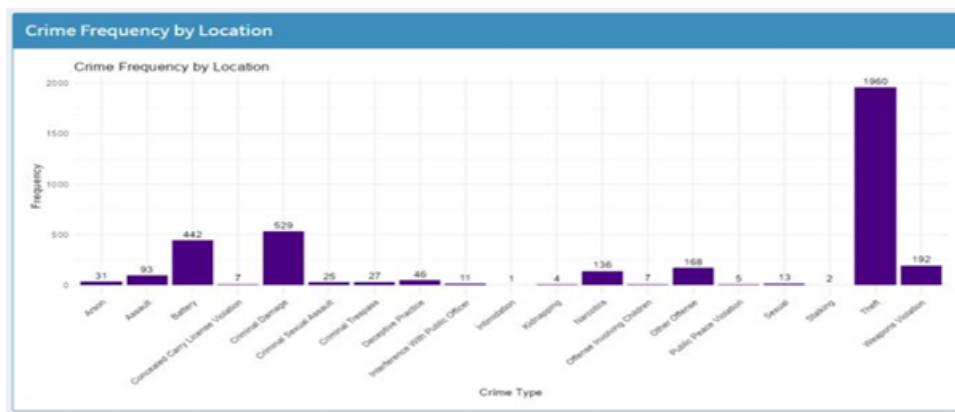


Figure A2.11: Crime Frequency in Vehicle/non-commercial

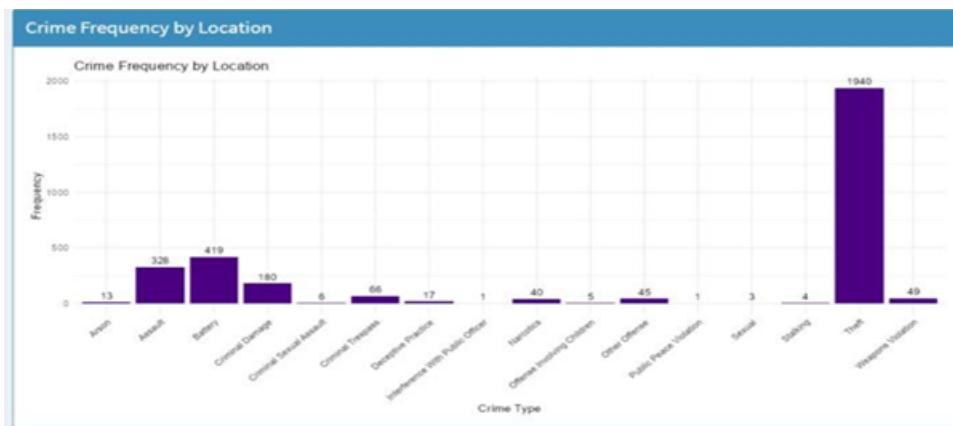


Figure A2.12: Crime Frequency in Residence -porch/Hallway

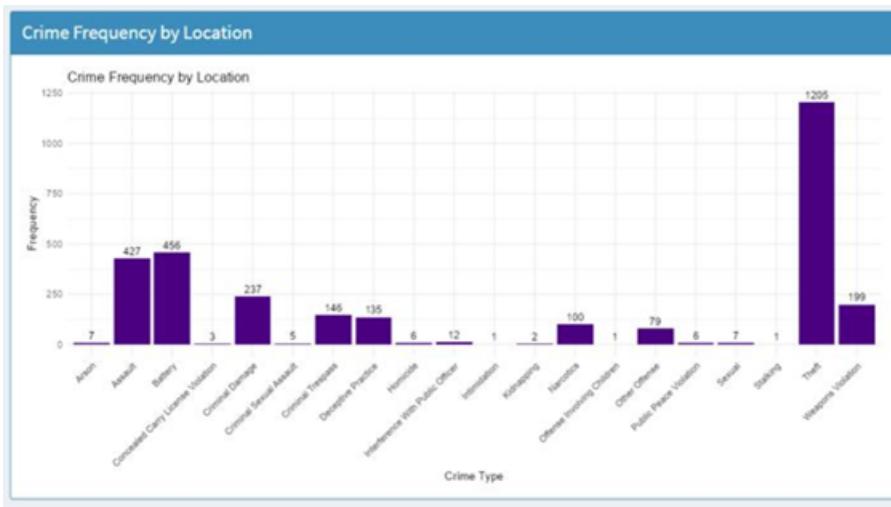


Figure A2.13: Crime Frequency in Gas Station

4.3 Appendix 3: Crime type over the year (remaining images)

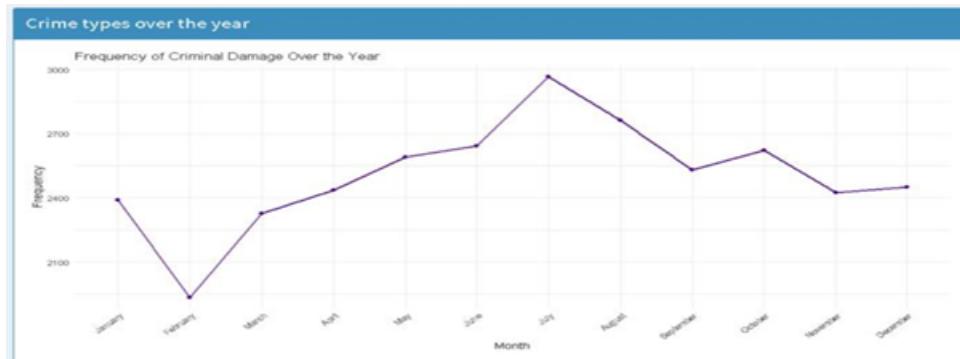


Figure A3.1: Criminal damage pattern over the months in Chicago



Figure A3.2: Assault pattern over the months in Chicago



Figure A3.3: Deceptive practice over the months in Chicago



Figure A3.4: Other offenses over the months in Chicago

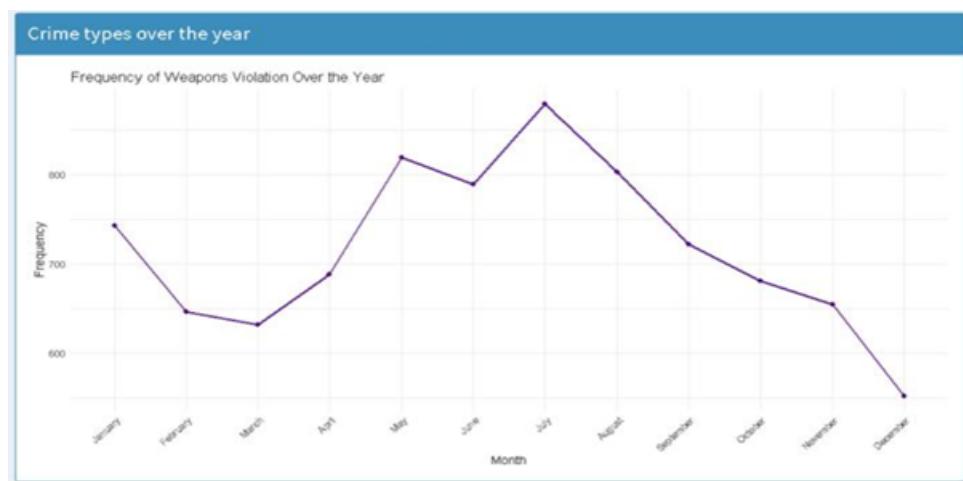


Figure A3.5: Weapons violation over the months in Chicago



Figure A3.6: Narcotics crimes over the months in Chicago

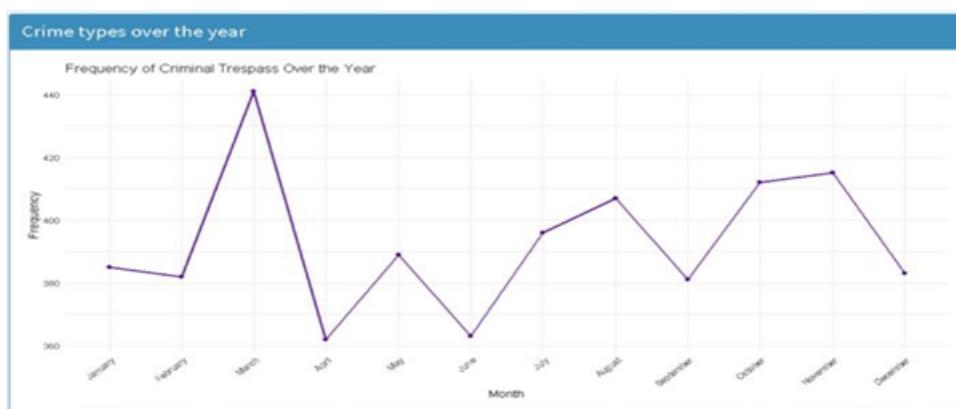


Figure A3.7: Criminal Trespass over the months in Chicago

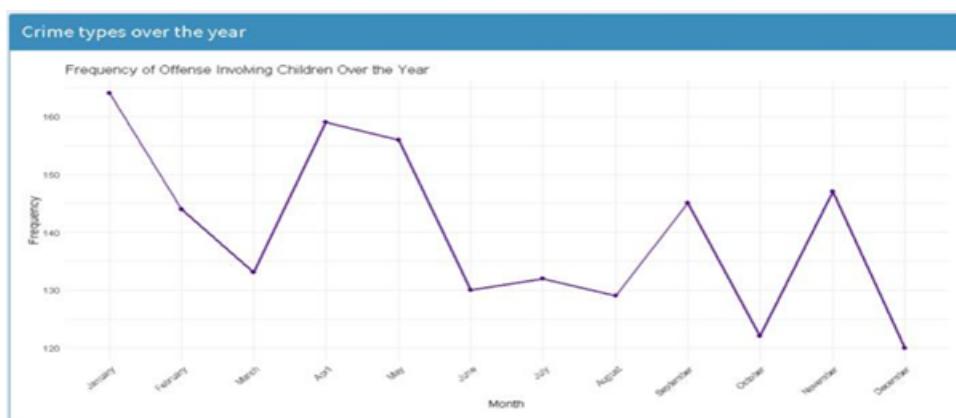


Figure A3.8: Offense involving children over the months in Chicago

Figure A3.9: Criminal sexual assault over the months in Chicago



Figure A3.10: Sexual crimes over the months in Chicago



Figure A3.11: Public peace violation over the months in Chicago



Figure A3.12: Homicides over the months in Chicago

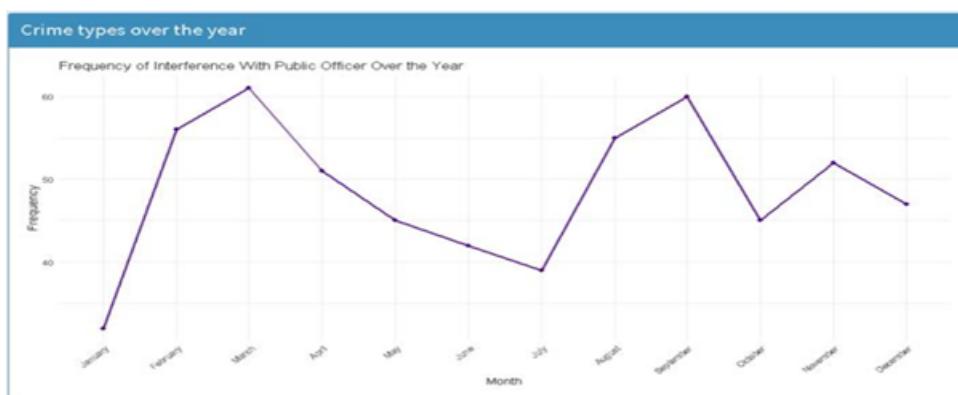


Figure A3.13: Interference with public officers over the months in Chicago