

NYC Crime activity trend analysis

Due to the ever fluctuating rate of crime in New York City, city agencies are expanding their focus by studying crime trends and monitoring community complaints, such as those to 311, that shed deeper insight into the geneses of crime. The common threads appear to be two entities of crime increase: location and randomness. Historical time series and graphical analysis are powerful tools which will put the theory to the ultimate test.

According to (Eterno, 2020) as the violent crime wave continues, most of the incidents are occurring in a small fraction of the city's neighborhoods. Crime in New York reached historic lows over the past three decades before numbers started to go up in 2020, a spate that has continued over the last two years and mirrors what is being felt in big cities around the country. The number of major crimes reported in February 2022 9,138 represents a 19.7% increase from 2020 and a nearly 47% increase from 2019, city data shows. It is often the case the public is misled by those at the highest level of government through distortion and suppression of the facts when New Yorkers deserve the truth. To combat gun violence, the city aims to bolster the NYPD's efforts to fight crime with targeted, precision policing, focusing on the 30 precincts where 80% of the violence occurs while expanding the anti-violence Crisis Management System (CMS) to address the symptoms of gun violence.

The primary objective of city officials is long-term goals to grow economic opportunities, improve child education and provide more access to mental health resources while addressing the gun crisis. (Zimring, 2013) There exists a really fine line between proactive policing, precision policing and not marginalizing people that are already marginalized. High crime areas have already suffered the most both in economic opportunity and increases in crime during the Covid-19 pandemic. To combat the violence, the joint initiative involves the deployment of up to 30 inter-agency collaborative teams that bring together the Department of Homeless Services (DHS), the Department of Health and Mental Hygiene (DOHMH), the NYPD and community-based providers in "high-need" locations, the plan states. Through time-series analysis and graphical analysis of hot spots for crime, it will be possible to identify where and which places need the most attention and to see if there are any patterns.

LITERATURE REVIEW

New York City's historic crime fluctuation over the past quarter of a century has been identified as an investigative phenomena. New York City's dramatic crime decline is a real brain teaser according to crime analytics experts. No one predicted it and, as of yet, no one has explained it, at least to the satisfaction of most social scientists who study crime trends.

Three strategic lessons emerge from the contributions to this volume on New York's crime drop. One of the major improvements that future research should utilize is crime data from New York in a comparative trend analysis manner (Rosenfeld, 2020). A time series might be able to detect the impact of an abrupt change even from a short series. It is important to display for example trends in the violent crime per 100,000 populations. This of course being for example the sum of homicide, assault, burglary, etc). If it contributed to the crime decline, we would expect the lines

for the crime rates to drop in a specific time frame, similarly rate of decline to sharpen. This is why it is important to analyze New York's crime drop across multiple spatial units, down to the street segment, including different precincts. In this literature review, the contributors to Understanding New York's Crime Drop aim to provoke expanded and sustained attention to crime trends in New York and elsewhere.

The contributing factors and comparison of crime decline

During the 1990s, crime rates in New York City dropped dramatically, even more than in the United States as a whole (Eterno, 2020). Violent crime declined by more than 56 percent in the City, compared to about 28 percent in the nation as whole. Property crimes tumbled by about 65 percent, but fell only 26 percent nationally. Many attribute New York's crime reduction to specific "get-tough" policies carried out by former Mayor Rudolph Giuliani's administration. The most prominent of his policy changes was the aggressive policing of lower-level crimes, a policy which has been dubbed the "broken windows" approach to law enforcement (Monkkonen, 2001). In this view, small disorders lead to larger ones and perhaps even to crime. As Mr. Giuliani told the press in 1998, *"Obviously murder and graffiti are two vastly different crimes. But they are part of the same continuum, and a climate that tolerates one is more likely to tolerate the other."* We see a correlation between the trend and cyclic analysis of New York City crime fluctuations alongside historic events that took place in that specific year/time period. Time series analysis will help to establish correlations/trend analysis between time periods, specific zones of New York City and events. But it will also shed some light on possible irregularities or manipulations of the data (Block, 2002).

Reliability of sources and erroneous data detection

Both government agencies and private companies keep vast databases containing very sensitive and very personal information about tens or hundreds of millions of subjects. For example, well known that NYC Open Data provides the core of the Data as it pertains to NYC crime statistics. Crime Analysts often take this data as a credible source and trust all values being given. A list of every shooting incident that occurred in NYC going back to 2006 through the end of the previous calendar year is provided. These databases are used to make many critical decisions affecting peoples' lives. (Zimring, 2013). Someone can be arrested and detained based on the data stored in them. Yet the sheer size of these databases, as well as the procedures used to collect, process and maintain the data in them, ensure that they will contain many inaccuracies. There are also documented problems with credit databases. However, it also pointed out that the negative effects fell disproportionately on those who were most vulnerable, in that "individuals with relatively low credit history scores or those with thin files are more likely to experience significant effects when a data problem arises." The errors in these massive databases, whether in the public or in the private sector, can be quite damaging. Inaccurate data can arise from simple data entry errors, from sloppy data collection at the source, or from the misunderstanding or misinterpretation of information, either at its origin or where it is used. Some of this is inevitable, given the volume of data involved; but those who collect and maintain the data contribute to it with their poor or nonexistent auditing and control

procedures.(Rosenfeld, 2020). We could observe the specific date and time of several kinds of offenses including Criminal Mischief, Grand Larceny and Harassment and draw conclusions of how accurate the data is.

We compare this data alongside literature and historical events to prove if New York City crime is getting better or worse over time. It will also allow us to see possible correlations between certain similar crimes. For example, over the 1990s, misdemeanor arrests increased 70 percent in New York City. When arrests for misdemeanors had risen by 10 percent, indicating increased use of the "broken windows" method, robberies dropped 2.5 to 3.2 percent, and motor vehicle theft declined by 1.6 to 2.1 percent(Block, 2002) . But this decline was not the result of more of those involved in misdemeanors being incapacitated from further crimes by being in prison: prison stays for misdemeanors are short and only 9.4 percent of misdemeanor arrests result in a jail sentence(Silverman,2020). Furthermore, an increase in misdemeanor arrests has no impact on the number of murder, assault, and burglary cases, the authors finds.

Conclusion

The reviewed literature suggests it is vital to also gain knowledge about all crime types such as urban homicide, assault and robbery. Crime analysts have completed unprecedented investigations covering two centuries of murder in America's biggest city, combining newly assembled statistical evidence with many other documentary sources to tease out the story behind the figures(Monkkonen,2001).As we generally believe, the last part of the twentieth century was unusually violent, but there have been other high-violence eras as well: the late 1920s and the mid-nineteenth century, the latter because the absence of high-quality weapons and ammunition makes that era's stabbings and beatings seem almost more vicious. If we look back at a time in NYC when guns were rarer, when poverty was more widespread, and when racial discrimination was more intense, and to ask what difference these things made. With many vivid case studies for illustration, we see that crucial factors in killing through the years are: the weapons of choice, the sex and age of offenders and victims, the circumstances and settings in which homicide tends to occur, and the race and ethnicity of murderers and their victims. New York and, by extension, the United States have had consistently higher violence levels than London and Liverpool if we compare on a larger scale.(Oneil, 2009). No single factor shaped this excessive violence, but exploring the variables of age, ethnicity, weapons, and demography over the long term can lead to hope of changing old patterns. If future studies use the same validated analysis, it can be more easy to decipher trends and irregularities in the data.

2.1 STRATEGY CHOICE

For this research, several publications including Block's(2002) seasonal analysis publication and Rosenfeld's (2020) Understanding New York's Crime Drop together with Hyndman Forecasting: Principles and Practice (3rd ed) (2021) time series model will be used to explore the trends in NYC Crime data and possible ways to improve quality/validity of data presented to the New York City general public.

2.2 RESEARCH QUESTION

An exploration of improving the quality and validity of NYC Crime Data through time series and graphical analysis. A case study of NYC violence fluctuation and expanded analysis.

2.3 RESEARCH OBJECTIVES

To investigate the data which contain information about felony, misdemeanor and infractions across the five boroughs of New York.

To explore publications on criminal and justice system data, including incidents of crime and arrests and dispositions.

To study the strategies performed by the public and policy makers with information detailing how the criminal justice system is operating in our communities. .

To bring the appropriate research methods into practice by collecting primary data through NYC Open Data website and to recommend suitable measures to fill the gaps for utmost credible information to the public .

3.1 Philosophy of Research

According to O'neil(2009, pp.101) crime prediction is one of the most important topics in recent years that aim to protect people's lives. These analytical studies for criminal hotspots are frequently demanded by law enforcement agencies hence, there is a huge requirement and demand for enhanced geographic information systems and innovative spatial data mining techniques in order to enhance crime detections and better protect their communities.

New York City law enforcement use seven Index crime categories as indicators of overall crime trends: murder, rape, robbery and aggravated assault, which are classified as violent crimes; and the property crimes of burglary, larceny and motor vehicle theft. These categories are to allow for uniform crime reporting across all 50 states. Police departments and sheriffs' offices report these data to the state.Statewide and regional data are presented for the most recent 10 years. Index crimes by county and agency and crime rates by county are presented for the most recent five years. The overall crime rate of a county is calculated by dividing the total number of

Index crimes submitted by police agencies in each county by the county's population and multiplying the result by 100,000. The U.S. Census Bureau is the source of county population data. The same formula is used to calculate the violent crime rate and property crime rate for each county.

Monkkonen(2001, pp.67) stated that New York State provides funding, training and technical support to 20 police agencies and their law enforcement partners in 17 counties through the Gun Involved Violence Elimination (GIVE) initiative, which aims to reduce shootings and save lives in communities with high rates of violent and firearm-related crime..

The usual seasonal pattern is for the high-crime months to occur in the summer and the low-crime months in the winter. There are several significant exceptions to this pattern, such as robbery and personal larceny with contact, which peak in December. Crimes with the same amount of seasonality may have very different month-to-month patterns. However, in this research, we see that individual behavior patterns change with the seasons and with them the opportunity for crime to occur. For example, people spend more time outside in the warmer weather, increasing the number of potential targets for street crime. Doors and windows in homes are more apt to be open or left unlocked at these times and thus provide easier access to intruders. More household articles are likely to be left outside, serving as invitations to theft. Patterns of economic activity may also be related to ebbs and flows of crime, especially the purchase of retail goods and services. The data in this report attempt to describe seasonal patterns in crime and to speculate on the reasons behind them.

On the other side, the Bureau of Justice Statistics states "there is reason to believe that crime is actually seasonal. In a study of violent and property crime victimization in the United States from 1993 to 2010, it was determined that at certain times each year, we can anticipate seeing a rise and decline in some forms of crime." (Ethier, 2010). Therefore, this research approach appreciates the value of determining why these crime patterns exist, be it holiday travel, work-life stressors, changes in temperature causing behavioral changes, etc., these trends are critical to be mindful of. Though these trends are a reflection of activity across the United States, it is important to realize how they can impact us at a local level. And part of that is knowing how to decipher valid information from exaggeration.

3.2 Research Approach

There are two basic research approaches applied geospatial and time series analysis. According to Block(2002, pp.108) seasonal crime patterns have been a topic of sustained criminological research for more than a century. Results in the area are often conflicting, however, and no firm consensus exists on many points. The current study uses a long time series and a large areal sample to obtain more detailed seasonality estimates than have been available in the past. The findings show that all major crime rates exhibit seasonal behavior, and that most follow similar cycles. The existence of seasonal patterns is not explainable by monthly temperature differences between areas, but seasonality and temperature variations do interact

with each other. These findings imply that seasonal fluctuations have both environmental and social components, which can combine to create different patterns from one location to another.

However, in research, Eterno(2020, pp.99) states it is also important to analyze by location with geospatial maps. Rates of violent crime in the United States have declined significantly over the past two decades, but disparities persist. Exposure to violent crime damages the health and development of victims, family members, and entire communities. Low-income people and racial and ethnic minorities are disproportionately affected. Violent crime is geographically concentrated in particular neighborhoods and in more localized areas known as hot spots; evidence suggests that problem-oriented policing of hot spots can be effective. Strong social organization, youth job opportunities, immigration, and residential stability are among several neighborhood characteristics associated with lower crime rates.

3.3 Research Strategy

Zimring (2013 p. 210) stated that the, “Research strategy is the general plan of how the researcher will go about answering the research question. It will contain clear objectives, specify the sources from which you intend to collect data and consider the constraints you will inevitably have”. The strategy chosen to conduct this research is based on a combination of seasonal, cyclical and geospatial analysis. Variations in levels of violent crime are linked to complex characteristics of neighborhoods, including disadvantage, segregation, land use, social control, social capital, and social trust, as well as the characteristics of nearby neighborhoods. Identifying the root causes of violent crime can also point to promising strategies to reduce its incidence and impact.

In order to achieve the study objectives, the methodology passes through several stages until the final results are reached, starting with the visualization analysis of Spatio-temporal New York crime data which is important in decision-making

3.4 Data Collection Method and Procedure

As it has been mentioned earlier, a quantitative approach will be used whereby crime statistics will be pulled, organized, tidy and compared. This very method permits the highest quality of analysis as well as a geographical understanding of where and why the crimes have increased or decreased.

In addition to the statistical analysis of the crime figures. A shiny app in R will demonstrate the figures visually. This way a better understanding of proportion and dispersion of NYC Crime data could be portrayed.