ANALYZING CRIME TRENDS IN THE UNITED STATES (1980–2014)

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Contenido

ABSTRACT

Understanding crime trends is essential for the formulation of public policies, strengthening community safety, and improving policing strategies. This article analyzes crime data in the United States between 1980 and 2014 using a dataset with over 638,000 records. The project focuses on identifying regional patterns, evaluating the effectiveness of case resolution, and observing dynamics between victims and perpetrators. Using key performance indicators (KPIs) and interactive visualizations, the study offers a comprehensive view of national crime trends and highlights the importance of data-driven decision-making within the criminal justice system.

1. INTRODUCTION

Crime is a complex social phenomenon that directly impacts people's quality of life, the stability of communities, and public trust in institutions. Over time, countries have developed various strategies to combat crime, but the effectiveness of these policies largely depends on a deep and updated understanding of how, where, and why crimes occur. In this context, the analysis of historical data becomes an essential tool to understand criminal patterns, evaluate the performance of security agencies, and design more effective public policies.

This study focuses on analyzing an extensive dataset containing records of crimes that occurred in the United States between 1980 and 2014. The database includes more than 638,000 records and provides a detailed view of each reported incident, including information on location, type of crime, year, characteristics of victims and perpetrators, weapons used, and the case status (solved or unsolved). Although some fields contain unknown values, the richness and volume of information allow for substantial analysis of criminal trends over more than three decades.

The importance of this study lies in its ability to provide a global and regional view of criminal behavior in the United States while also allowing the identification of relational patterns between victims and offenders and evaluating the justice system's effectiveness in solving cases. Additionally, the analysis seeks to answer key questions such as: Which states have the most crimes? How has violent crime evolved? Are there common characteristics among those involved in crimes? And how effective has law enforcement been in solving them?

In an era where decision-making must be evidence-based, the use of business intelligence tools like Power BI, along with key performance indicators (KPIs), allows not only for data exploration but also for clear and visual communication of findings.

Thus, this study not only aims to provide a diagnosis but also to serve as a basis for reflection, debate, and action regarding public safety in the United States.

The main attributes of the dataset used in this study include:

- **Geographical data**: City, State
- **Temporal data**: Year of the crime
- **Demographic data**: Sex, age, race, and ethnicity of victims and perpetrators
- **Crime specifics**: Type of crime, weapon used, relationship between victim and perpetrator
- **Case status**: Solved or unsolved

It is worth noting that many variables have unknown or missing values, especially regarding the personal profiles of those involved. Even so, the dataset provides a solid foundation for analysis.

2. METHODOLOGY

2.1. Objectives

The analysis was developed around three main goals:

1. Analyze crime trends over time and across different regions of the U.S.
2. Identify states with the highest and lowest crime rates.
3. Evaluate the effectiveness of policing strategies by analyzing case resolution.

Based on these goals, three KPIs were defined to guide and quantify the analysis:

- **Violent crime rate**: Percentage of cases classified as intentional homicide (excluding negligent manslaughter).
- **Crime solving rate**: Level of effectiveness of police agencies in closing cases.
- **Crime growth rate**: Evaluation of the increase or decrease in criminal incidents over time.

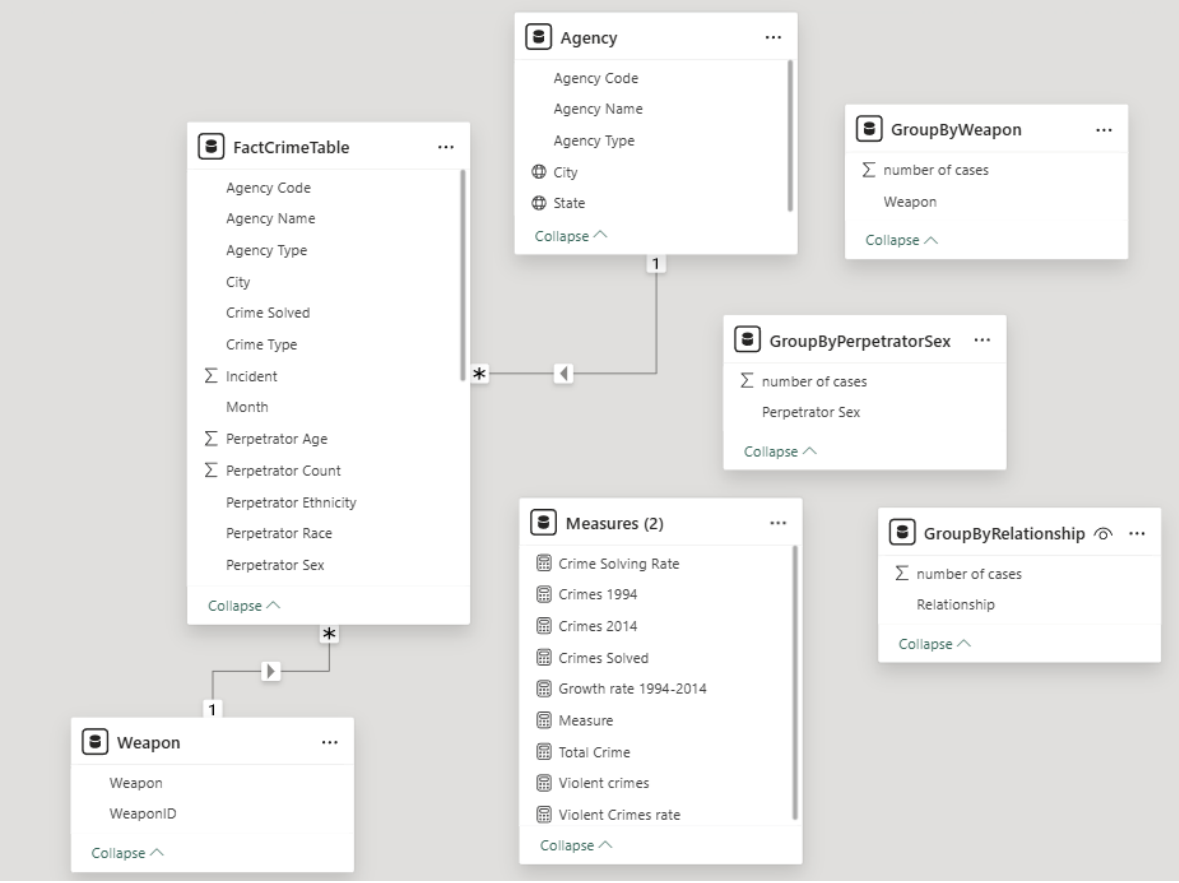
To turn the data into actionable insights, the following visualization strategies were used:

- **Maps** to show the geographic distribution of crime volume.

- **KPI cards** to present key indicators visually and quickly.
- **Bar charts** to compare values between different states or crime types.
- **Trend lines** to observe the yearly evolution of crimes.

The analysis was carried out using Power BI, with measures created in DAX (Data Analysis Expressions) to calculate the indicators and apply filters in the visuals. Three dashboards were created: one executive summary showing key points such as KPIs, the sex distribution of victims and perpetrators, the number of crimes by weapon used, and crimes by type of relationship between victim and perpetrator. The other two dashboards provide more detailed views, allowing deeper exploration of crimes by state and year, as well as victim profiles and yearly crime resolution figures.

2.2. Data Model



This data model focuses on criminal incidents and includes entities related to the events themselves, as well as the physical characteristics of victims and perpetrators. However, it does not contain distinct entities for individual victims or perpetrators because the dataset does not specify whether individuals are repeated across

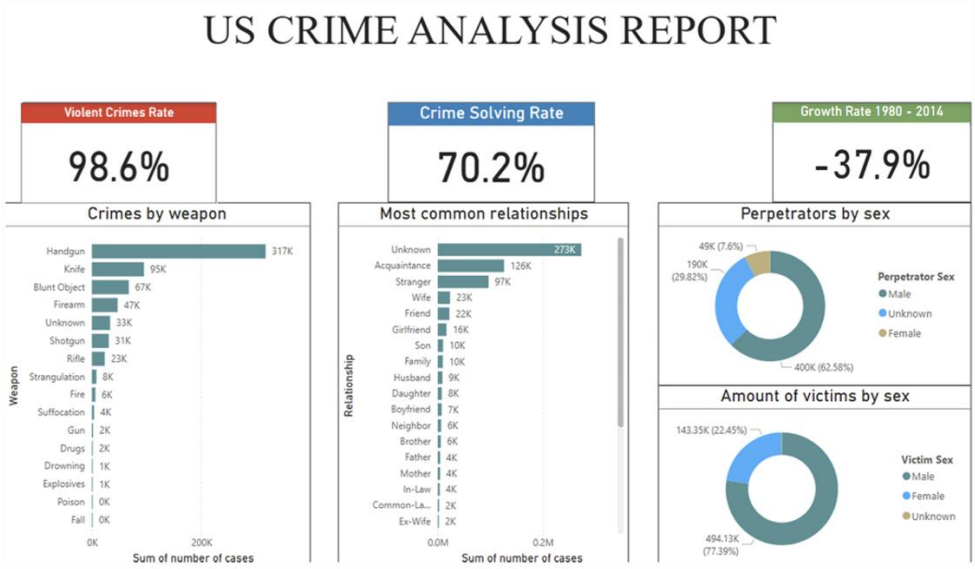
different incidents. Therefore, it is not possible to reliably identify or track unique persons across cases.

Instead, the data captures physical attributes such as age, sex, and race for victims and perpetrators at the incident level. These characteristics are treated as attributes of each crime event, rather than being stored in separate tables or entities. This approach avoids the risk of incorrect assumptions about identity or duplication.

As a result, the model is centered around crime incidents, with additional fields capturing contextual and demographic information for analysis, rather than aiming to model individual persons.

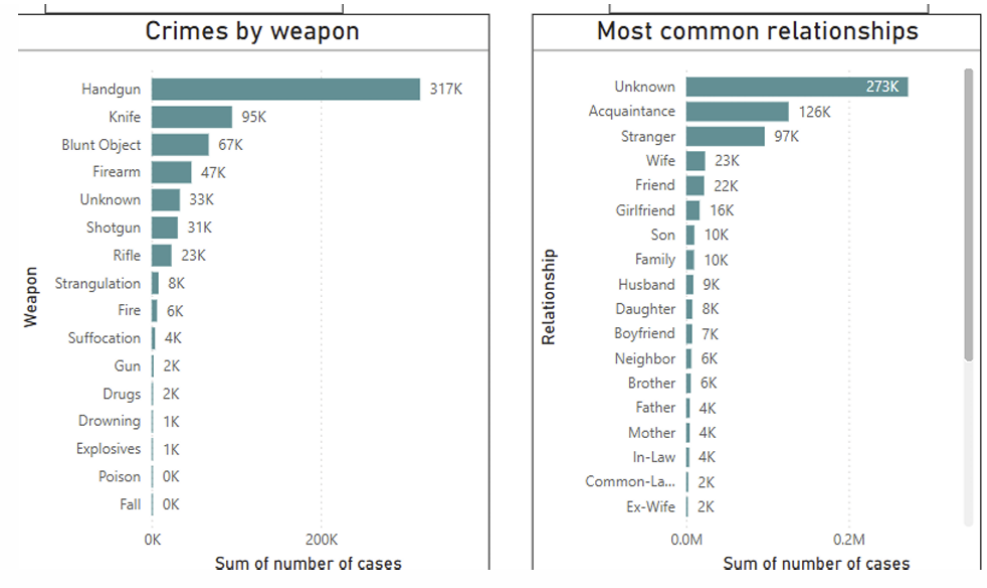
3. RESULTS AND INTERPRETATION

3.1. Executive Dashboard



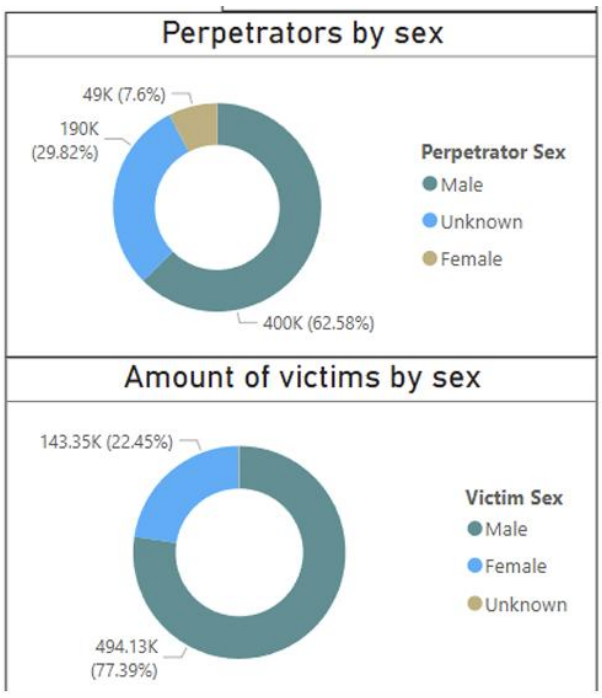
It consists of three KPIs at the top, two bar charts, and two donut charts.
The violent crime rate shows that 98.6% of crimes are classified as intentional homicides, with the rest as involuntary or negligent manslaughter. In the center is the crime solving rate; out of 638,000 records, 70.2% were solved. On the right, the crime growth rate is shown as negative meaning crime has decreased by 37.9% from 1980 to 2014, a positive indicator.

3.2. Bar Charts



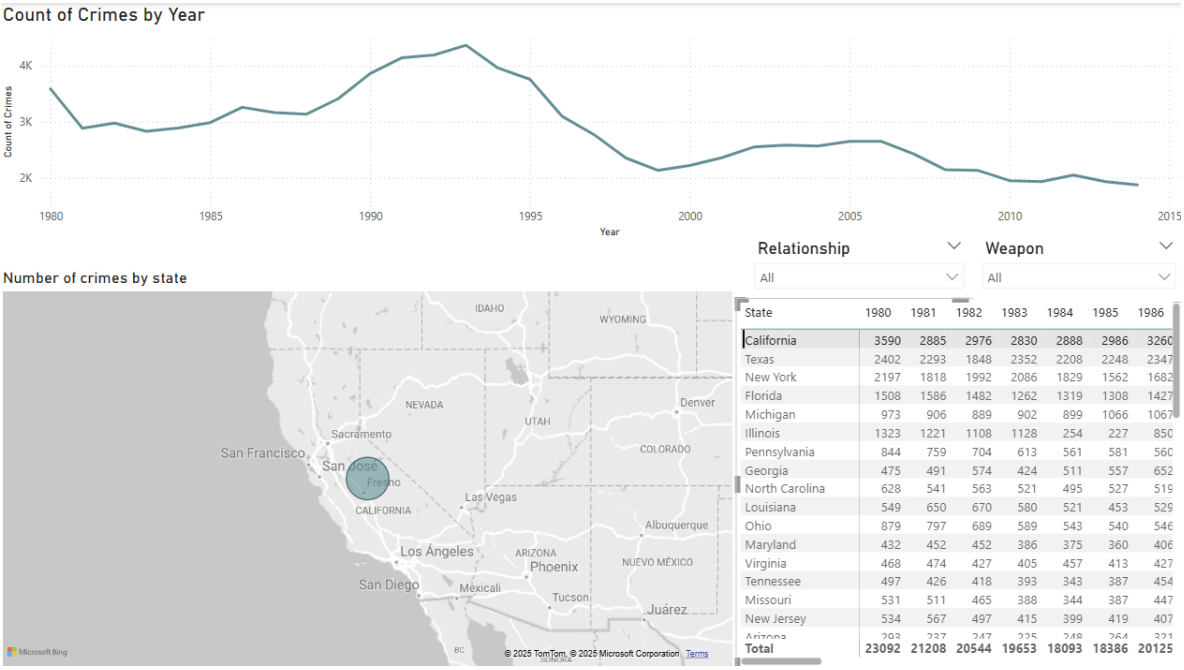
On the left is the chart showing the number of crimes by weapon type. There are 16 types in total, with the most significant being handgun, knife, blunt object, firearm, unknown, shotgun, and rifle.
To the right is the bar chart showing the number of crimes by the type of relationship between victim and perpetrator. It reveals that in many cases (273,000), the relationship is unknown, followed by acquaintance, stranger, wife, and friend.

3.3. Donut charts



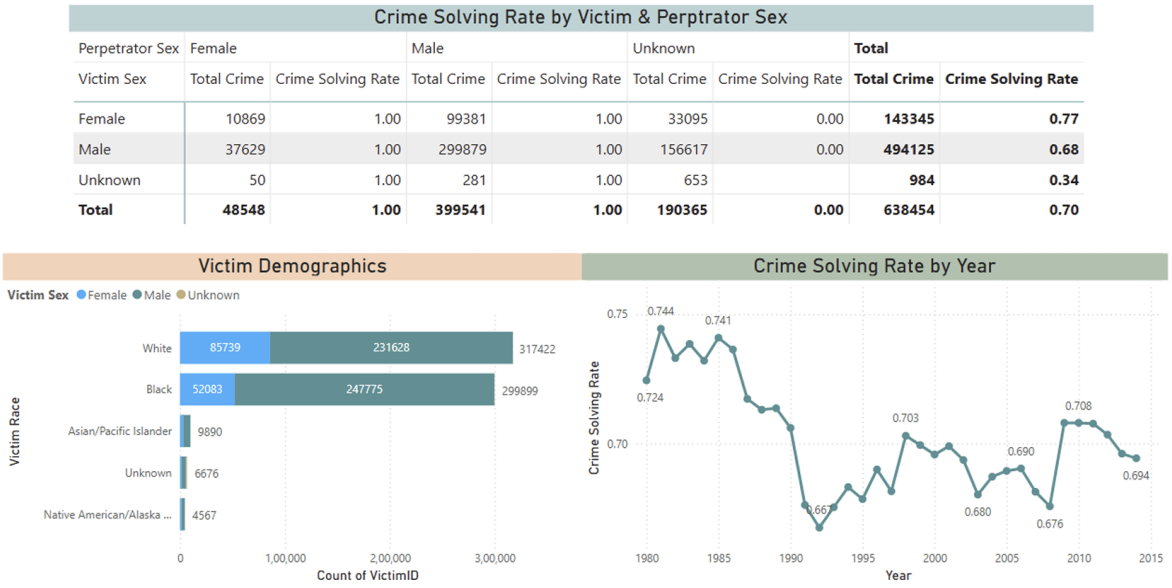
The charts in both cases show a clear predominance of males. Among perpetrators, 62.58% are male, only 7.6% are female, and 29.82% are unknown. Among victims, 77.39% are male and 22.45% are female. This pattern reveals a high exposure of men both as perpetrators and victims, raising questions about the context of such events, especially in crimes related to conflicts among men or urban violence. The lower percentage of unknowns among victims suggests better documentation in comparison to perpetrator data.

3.4. Crime by year and state dashboard



This dashboard provides a comprehensive overview of crime trends over time and across U.S. states. The line chart reveals a clear temporal pattern in criminal activity, it reaches the highest peak in 1993 before entering a steady decline. This visualization allows users to contextualize crime fluctuations with potential socio-economic or policy-driven events. Complementing the trend line, the map visualization highlights the number of crimes by state, with California prominently marked as the state with the highest reported crime counts throughout the period (99,783 records). Additionally, there are two filters, one by relationship and another one by weapon type, enhancing the granularity and interactivity of the analysis. This dashboard effectively combines temporal and spatial data, aiding in identifying patterns and regional disparities in criminal activity.

3.5. Victim profiles and crime solving rate dashbboard



Crime Solving Rate by Victim & Perptrator Sex

Perpetrator Sex	Female		Male		Unknown		**Total**	
Victim Sex	Total Crime	Crime Solving Rate	Total Crime	Crime Solving Rate	Total Crime	Crime Solving Rate	**Total Crime**	**Crime Solving Rate**
Female	10869	1.00	99381	1.00	33095	0.00	**143345**	**0.77**
Male	37629	1.00	299879	1.00	156617	0.00	**494125**	**0.68**
Unknown	50	1.00	281	1.00	653		**984**	**0.34**
Total	**48548**	**1.00**	**399541**	**1.00**	**190365**	**0.00**	**638454**	**0.70**

Here it is explored the crime resolution efficiency and victim demographics. The top table displays crime solving rates segmented by the sex of both victims and perpetrators, showing that cases with known perpetrators (especially female) tend to have a 100% solving rate, while those involving unknown perpetrators have a 0% rate. Notably, the overall crime solving rate is approximately 70%, though disparities are evident when filtered by gender. The Victim Demographics bar chart reveals that the majority of victims are White and male, with Black individuals also significantly represented, raising questions of racial and gender-based vulnerability. Finally, the Crime Solving Rate by Year line chart illustrates a decline in resolution rates since the early 1980s, with a notable drop in the mid-1990s, suggesting potential changes in law enforcement efficiency or case complexity over time. This dashboard offers critical insights into justice system performance and the demographic distribution of crime victims.

4. CONCLUSIONS

This project demonstrates the value of data analysis in understanding national crime patterns. From identifying critical regions to tracking historical changes, the findings can guide strategic decisions in public safety, social policies, and community development.

The analysis showed that certain states consistently reported high crime levels, especially those with dense populations. Conversely, smaller or less populated states had lower crime rates.

The trend lines revealed a sharp rise in violent crimes during the 1990s, peaking in 1993, followed by a steady decline in crime numbers.

In cases with available data, many violent crimes were committed by people close to the victim family members, acquaintances, or partners. This underscores the need to strengthen prevention efforts for domestic and relational violence.

The crime solving rate showed significant variation between states and over time. However, across all years, the rate remained above 60%, demonstrating a relatively effective law enforcement response.

In conclusion, this work illustrates how combining statistical metrics with interactive visual tools can deepen our understanding of crime in the United States and reinforce the role of data analytics in improving public safety.