ECON 494 - Spatial Data Science
-
2024 Spring Term
Final Report

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1. Introduction

In this term project report , we analyzed the Armed Conflict Location & Event Data Project (ACLED) dataset focusing on the country of Brazil. Our objective is to analyze and understand the rate of crime and the effect of drug use and trafficking on the country's public events and armed conflicts. We utilized various data analysis methods including EDA and vectorization, created graphs and maps using R Studio, and used detailed event descriptions from the ACLED dataset.
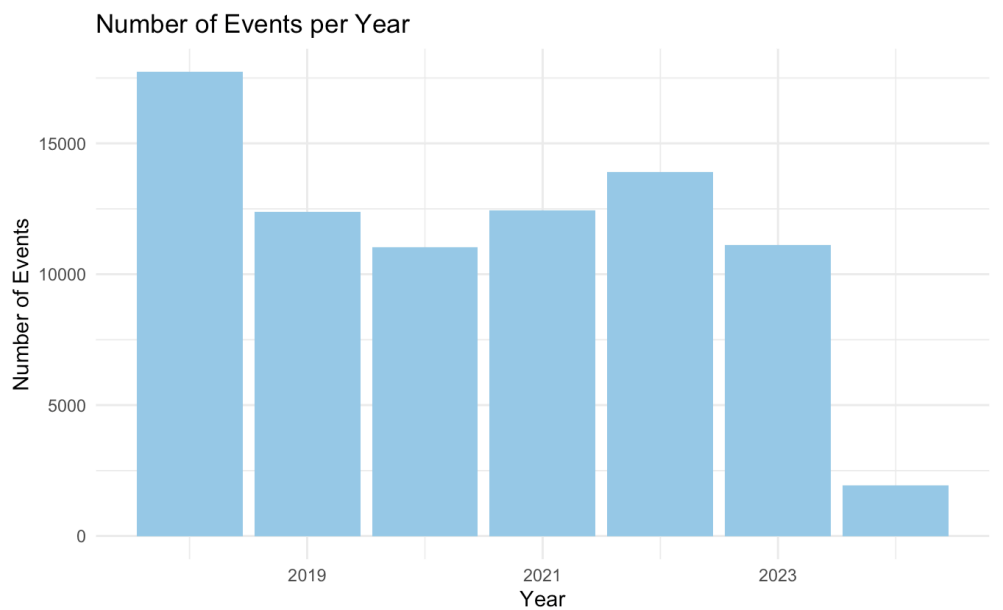
2. Methodology

Our methodology involved many different and diverse steps for achieving our aim and creating a detailed presentation and final report. For the data collection part, we obtained the ACLED dataset on the country of Brazil using our API key. The dataset consists of 18,000 lines of data and information, explaining different types of public events, armed conflicts, riots and protests as well as the actors involved, locations, reasons, and casualties that were caused by these unfortunate events.

For the data cleaning, we first preprocessed the data to handle missing values, and irrelevant information. This cleaning procedure especially helped us when we continued with our analysis part. We first conducted exploratory data analysis on the dataset to get insights about the data and learned what we should focus on. Later, after the creation of numerical data and plots, we continued with the visualization of the data. We mainly used R Studio to uncover patterns and trends, as well as to create graphs and maps.

After the findings, we interpreted the findings and the results in the context of Brazil's socio-political landscape, focusing on drug-related and non-drug-related events. The full information regarding the findings and the actors in play can be found on the respected part below.
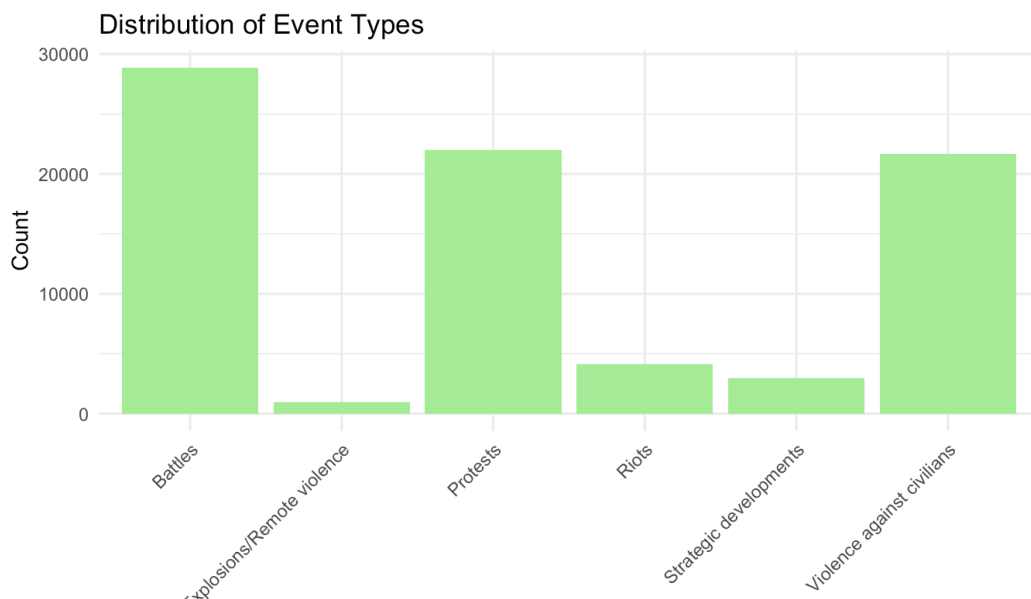
3. Information About Events

The ACLED dataset that we have examined has shown us different kinds of public events that are taking place in Brazil, such as protests, conflicts between the government and gangs, and violence against people. From 2019 to 2024, the number of events changed between 17,000 and 12,000. The first part of the 2020s had the greatest number of occurrences.
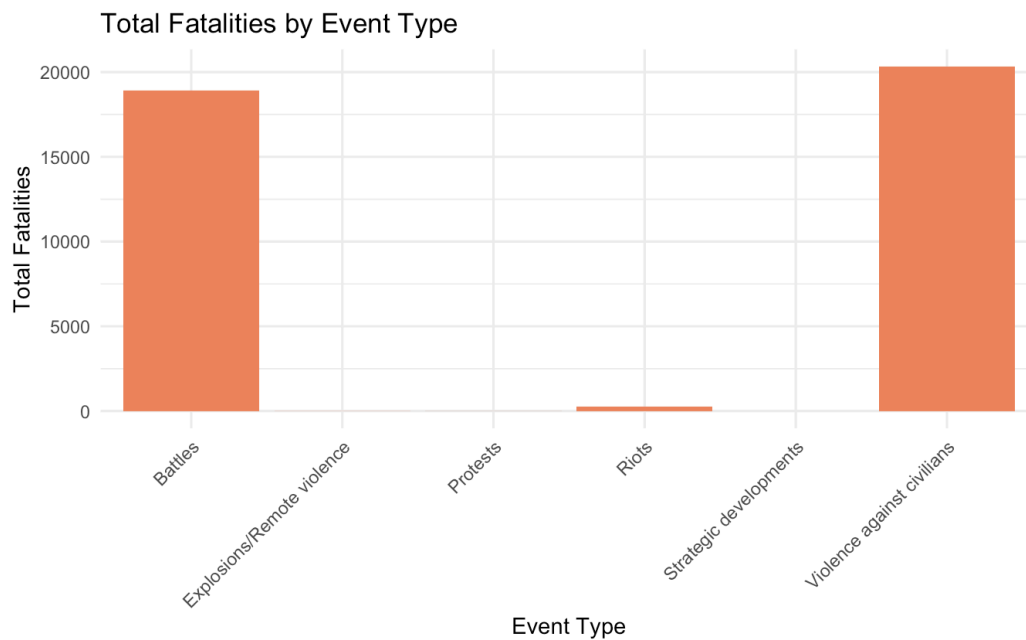
Figure 1: Number of events per year

The figure 1 is the histogram showing frequency of events. In 2020, we see a decrease because of pandemics. The fall in 2024 is caused by the fact that the ACLED database only considers events until the point when the report is accessed.

Figure 2: Distribution of events

Figure 2 indicates events mainly consist of battles, crimes(at individual scale) and protests. In this study we try to understand the correlation of these events with fatalities and drugs.

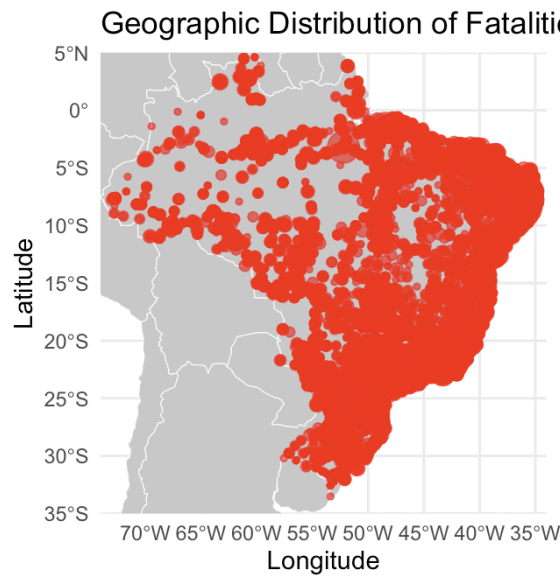**Total Fatalities by Event Type**

Figure 3: Total Fatalities

Figure 3 indicates that crimes against individuals have the most fatalities per event following the battles. Although protests are the second most common event type, its fatality is quite low, almost near to zero, indicating that this event type is peaceful.
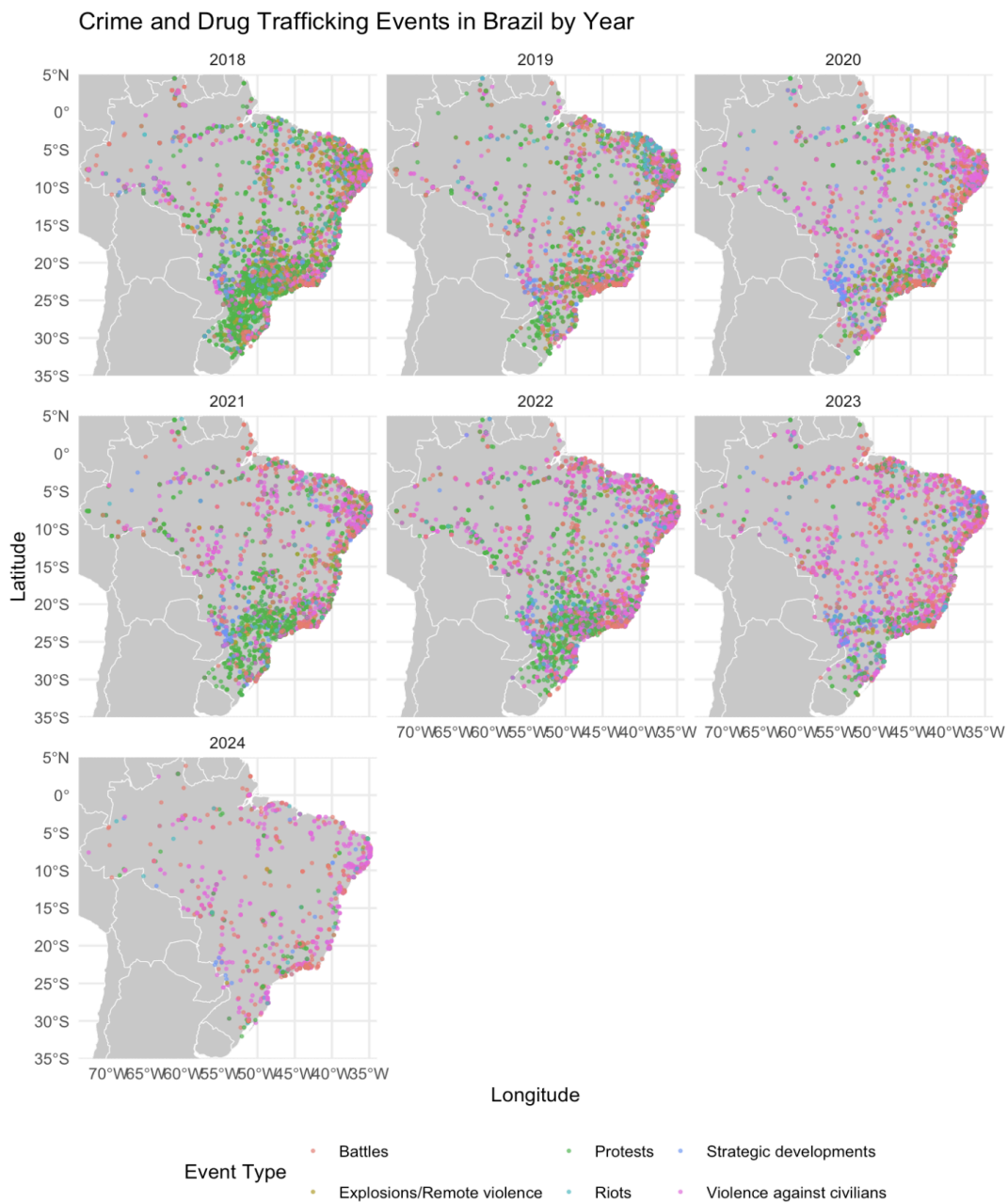
4. Geographic Information

We focused on five different states in Brazil: São Paulo, Rio de Janeiro, Brasilia, Bahia, and Minas Gerais. The data indicated that fatalities were primarily concentrated on the eastern coastline, where the largest cities are located, as can be seen in figure 4.

Figure 4: Distribution of Fatalities

5. ACLED Data by Years

In this part, we have made the analysis of ACLED data over the years to show increasing trends in crime and drug issues. Hotspots were identified, particularly in the southeast region, correlating with higher population densities. The event types and their respective distributions are also given on the maps, as further can be seen on the figure 5, where we plotted each year and their event types, each with their respective colors.

Crime and Drug Trafficking Events in Brazil by Year

Event Type
- Battles
- Explosions/Remote violence
- Protests
- Riots
- Strategic developments
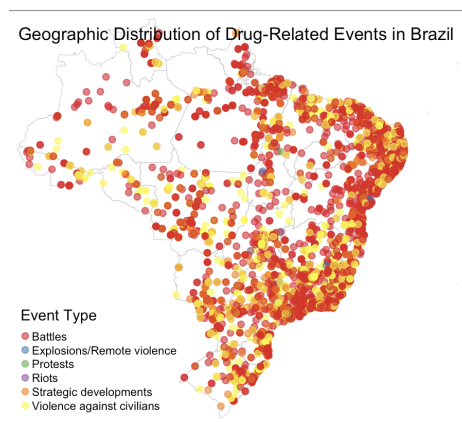- Violence against civilians

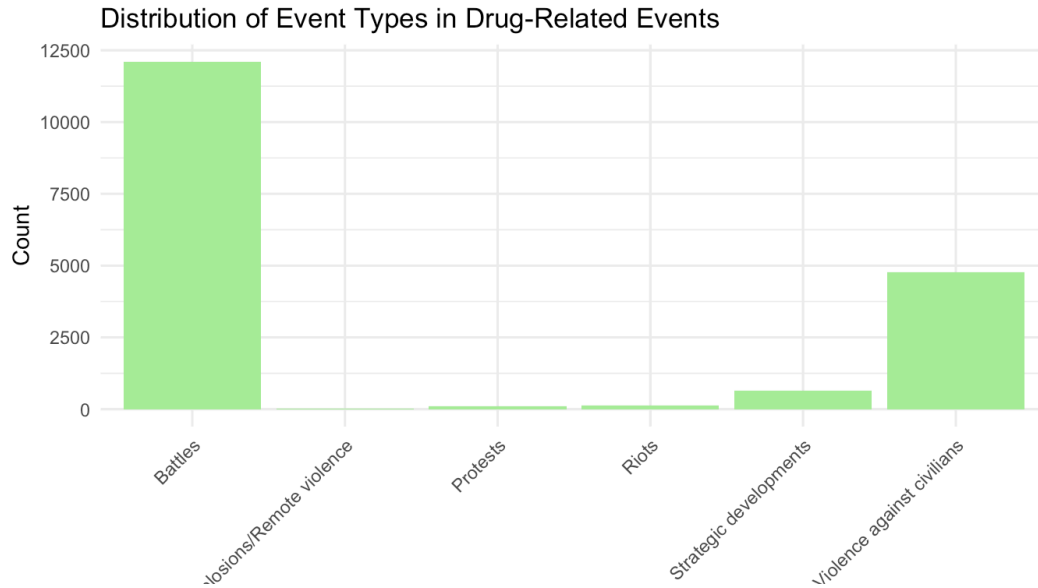*Figure 5: Events in Brazil per year*

Figure 6: Gif of the timeline

The figure 6 shows the entries in the graph 5 in a moving manner, to increase the visuality of the data.

6. Drug Related Problems

Drug-related events consist for more than 55% of the total events from 2019 to 2024. These events involved battles between gangs and militia, as well as violence against civilians.
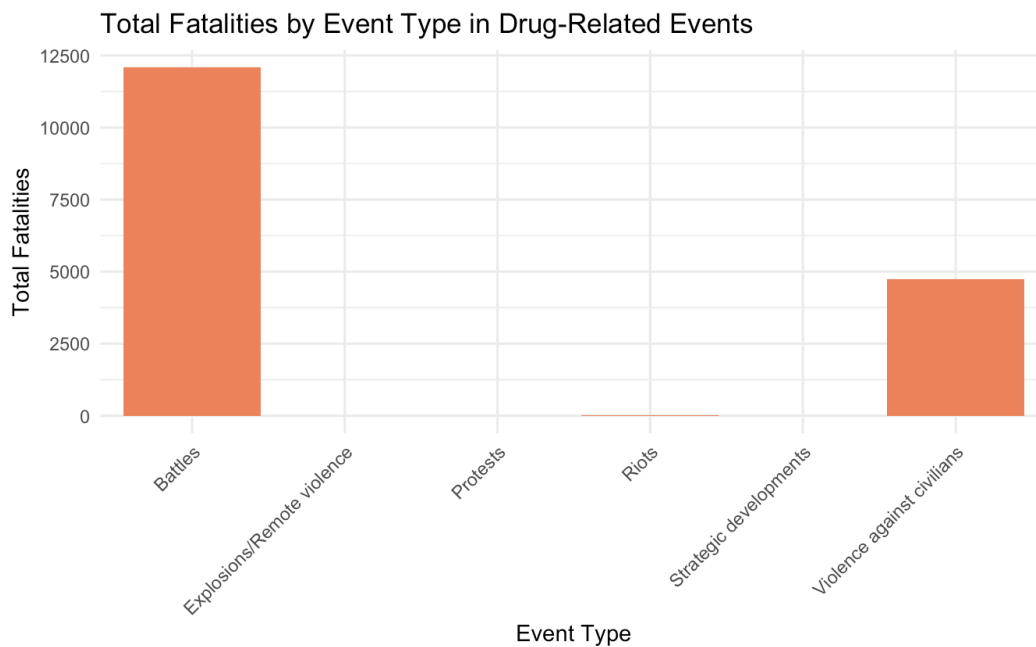

Figure 7: Distribution of drug related events

Figure 8: Distribution of event types

Figure 8 gives more information about what kind of events are happening when drug consuming or the trafficking of drugs are involved. As the figure also states, they are mainly battles between governmental officials and unknown gangs, or violence against innocent civilians.
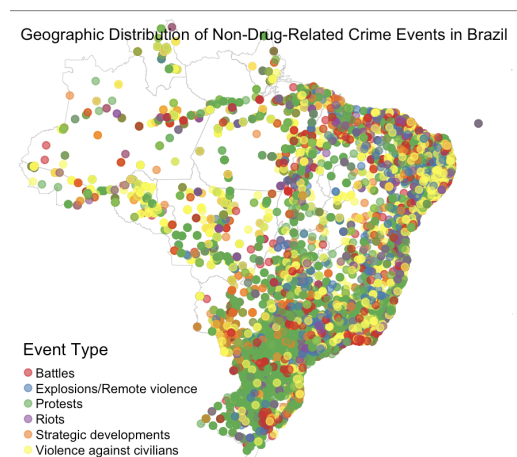

Figure 9: Fatality count in drug related events

As figure 9 also states, since battles and violence against civilian types of events hold the majority in all events, their fatality counts are also the highest among all.
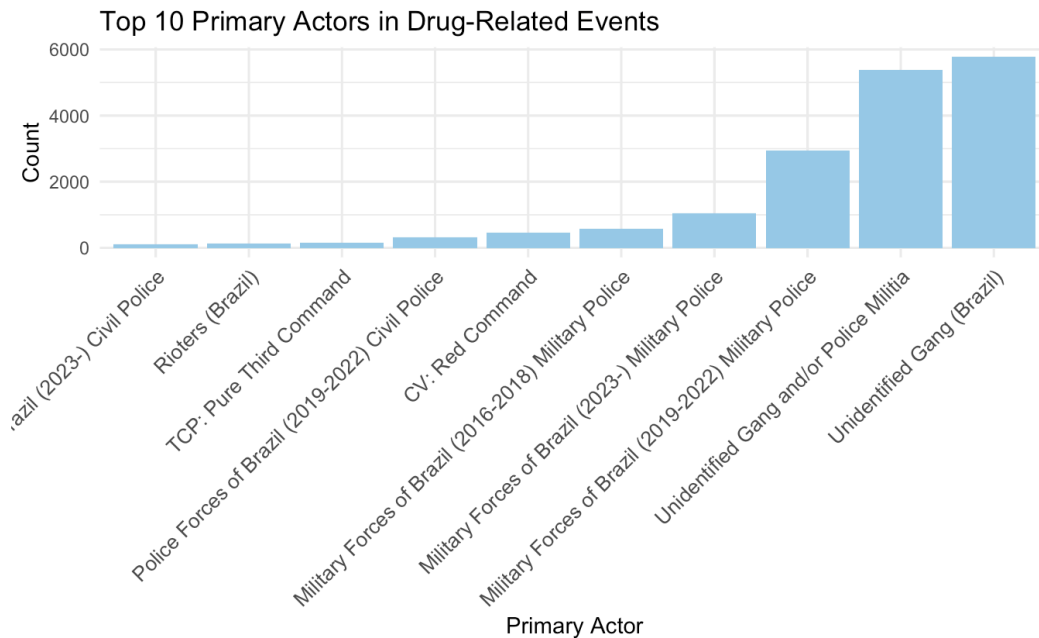
7. Non-Drug Related Problems

When we filtered out the drug-related events, protests, riots, and violence against civilians left as the most common event types. These events reflect broader socio-economic challenges and public dissatisfaction. Unlike drug related events' battles however, these riots and protests are mainly peaceful.

Figure 10: Distribution of non-drug related events

8. Actors

The most frequent actors involved in the events were unidentified gangs, the military police or the other governmental agencies and teams, and the Red Command (CV), one of the largest criminal organizations in Brazil. Although on many occasions, the identities of these criminals could not be identified, they are believed to be a part of the CV, as can be seen on figure 11.
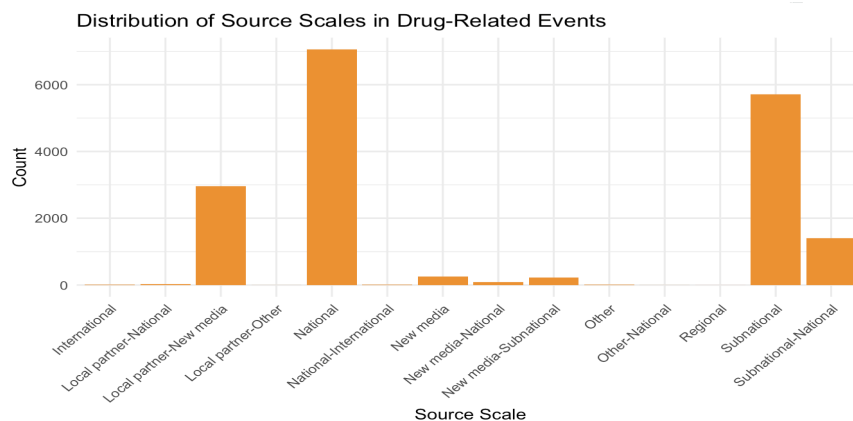
Figure 11: Main actors in the events

It is worth mentioning that most of the events are reported by unidentified gangs which indicate the police and or media cannot even track and get the intelligence on who they are fighting against.

9. Sources

The figure 12 shows and states the main sources, whom the ACLED mainly got the information about the armed conflicts.

Figure 12: Sources

As the sources that the ACLED uses are mainly from national sources, it may be wise to doubt and contemplate on the correctness of information that the national sources provide to further understand the effect of drug trafficking and crime rates.

10. Conclusion

The analysis that we have done on our term project highlights the significant impact of drug trafficking on crime rates in Brazil. Cities like São Paulo, Rio de Janeiro, and Brasilia are main places for these kinds of events.

For example in São Paulo, the presence of organized crime gangs such as the Primeiro Comando da Capital (PCC) has shown violence and criminal activities, including homicides, robberies, and kidnappings, which we have classified as violence against civilians. Similarly, in Rio de Janeiro, the rivalry between different drug factions and the pervasive influence of gangs like Comando Vermelho (CV), Red Command, have led to frequent armed confrontations, impacting both criminal statistics and civilian lives.

The involvement of civilians in these conflicts underscores the broader societal impact, as the conflicts lead to a further decrease in the capital of the country due to the extensive use of both human and machine power to try to control the gangs and territories.

11. Recommendation

As we came to the end of our project report, we wanted to give some additional recommendations for future studies, as we believe they should incorporate a wider range of data sources and cover a longer timeframe to enhance the robustness of the analysis. Additionally, using data from multiple states and countries can provide a more comprehensive view of the trafficking and crime dynamics.

12. References

Acled (armed conflict location and event data): Bringing clarity to crisis. ACLED. (2024, May 16). https://acleddata.com/#/dashboard