

Understanding Violence in Chicago: A Demographic Analysis of Offenders and Victims

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Abstract— This research paper explores the dynamics of violence reduction in Chicago by analyzing a dataset spanning from 1991 to 2023. Focused on victim demographics, the study investigates the impact of offender age on domestic violence, differences in victimization rates among racial groups, and the correlation between offender age and the severity of crimes. Through a comprehensive methodology, literature review, and statistical analysis, the paper aims to contribute valuable insights for shaping violence reduction strategies.

I. INTRODUCTION (1.1 BACKGROUND:)

Violent crimes, particularly those involving firearms, pose significant challenges to public safety in urban areas. Chicago has experienced fluctuating rates of violence over the past decades. Understanding the demographics of both offenders and victims is crucial for informed targeted interventions.

1.2 Objectives:

This paper seeks to answer three research questions:
Does the age group of offenders impact the likelihood of domestic violence?[4]
Are there significant differences in the number of victims across racial groups?[4]
Is there a correlation between the age of offenders and the severity of crimes?[4]

II. LITERATURE SURVEY

This literature survey delves into three pivotal studies: [1] "Living in Violence: Neighborhood Domestic Violence and Small for Gestational Age Births," examining the impact of domestic violence on birth outcomes; [2] "From Childhood Victim to Adult Criminal," which explores racial/ethnic variations in victimization-offending patterns during early adulthood; and [3] "Understanding the Associations Between Psychosocial Factors and Severity of Crime in Juvenile Delinquency," a cross-sectional analysis by Taşkıran, Mutluer, and Tufan. Collectively, these works illuminate the intricate relationship between environmental, racial, and psychosocial factors in shaping criminal behavior across various age groups. Our research builds upon these foundations, offering a nuanced investigation into age-specific crime severity, contributing to a holistic understanding of factors influencing criminal outcomes and providing valuable insights for targeted violence reduction strategies.

III. METHODOLOGY(3.1 DATA COLLECTION:)

The dataset, obtained from the city of Chicago catalog from DATA.GOV website; encompasses various crime types, ages, and victim characteristics. It provides a detailed

snapshot of violent incidents, with a specific focus on index crimes involving bodily harm or the threat of bodily harm.[1]

3.2 AWS Work & SQL Work

Using AWS Glue Data Brew, Studied about the dataset Summary and Stats. For example, fig1 explains about Time_Period column details like distinct values, Total records of this column.

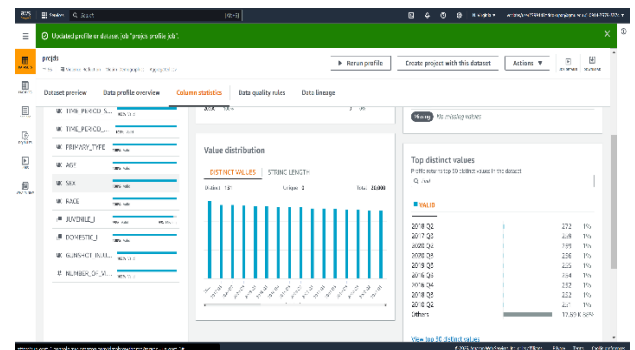


Figure 1

- Using AWS RDS instance, connected to MYSQL server.

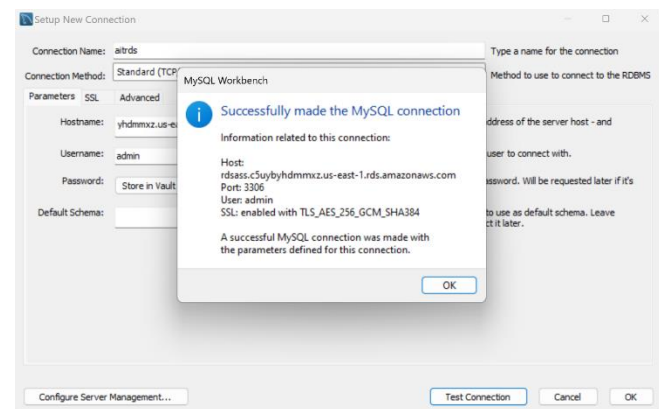


Figure 2

- Created the new database schema and imported the dataset and did some analysis on the dataset, figure 3 shows example query, Identified the top 5 racial groups with the highest average number of victims (Ratio Analysis)

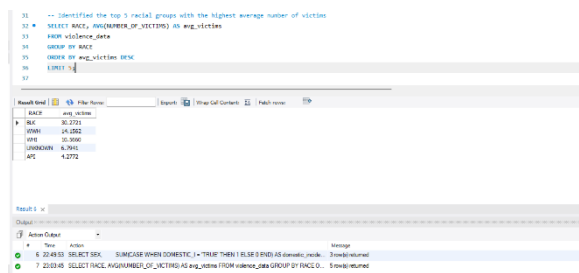


Figure 3

3.3 Approach to Research Questions (Python & R Work):

- For Question 1, domestic violence incidents were isolated, and the proportion within each age group was calculated. Using Python, grouped data by age, calculated mean domestic violence impact, and depicted results in a bar plot, offering insights into age-related domestic violence trends. (Interval Analysis)
- Question 2 was addressed by grouping data by race and calculating average victim numbers, followed by statistical tests for significance. Using R, the approach involves sorting racial groups, creating a bar plot with ggplot, mapping abbreviations to full forms for clarity, and using distinct fill colours for each racial group. (Nominal Analysis)
- Question 3 using python, Grouped data by age and crime type, calculated mean victim counts, and visualized correlations in a heatmap, revealing age-specific crime severity patterns. (Ordinal Analysis)

IV. RESULTS(4.1 AGE AND DOMESTIC VIOLENCE:)

Analysis reveals a notable correlation between offender age and domestic violence incidents. Younger age groups tend to be more involved in such incidents, providing insights for targeted prevention efforts.

Visualization:

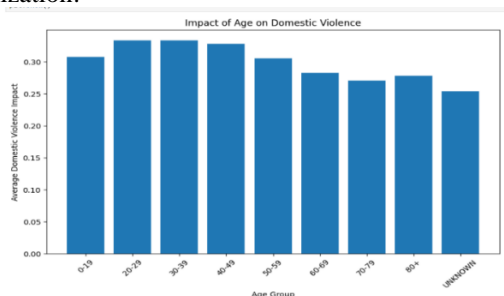


Figure 4

Interpretation:

The Plot (Fig 4) shows Age group 20-29 and Age group 30-39 are having the more impact on domestic violence compared to other age groups.

4.2 Racial Disparities in Victimization:

Significant differences in victimization rates are identified among racial groups, emphasizing the need for equitable interventions to address community-specific challenges.

Visualization:

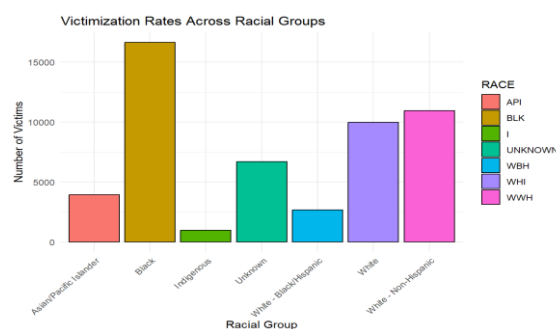


Figure 5

Interpretation:

The plot (Fig 5) shows BLK Racial group has the highest victimization rates and I Racial group has the lowest victimization rates.

4.3 Age and Crime Severity:

The heatmap analysis suggests correlations between offender age and the severity of crimes, revealing patterns that could inform law enforcement strategies.

Visualization:

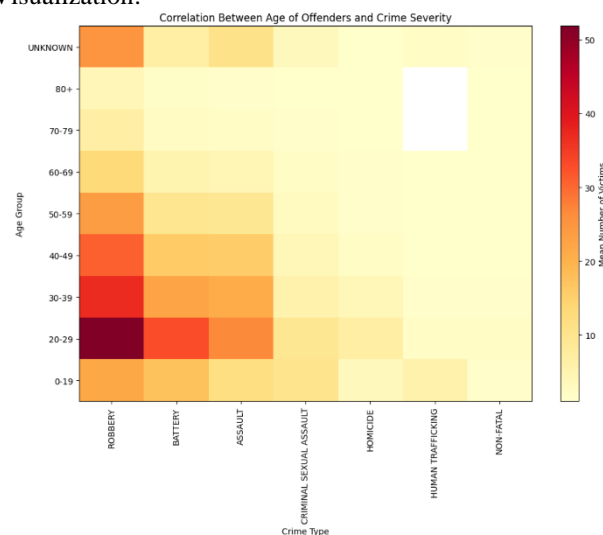


Figure 6

Interpretation:

The Plot (Fig 6) shows Age group 20-29 has the greater number of victims in Assault, Criminal Sexual Assault, Robbery crime types. Furthermore, Age group 70-79 and Age group 80+ shows the least number of victims present in all crime types.

V. DISCUSSION(5.1 IMPLICATIONS:)

The findings underscore the importance of age-targeted interventions in violence reduction strategies.

5.2 Limitations:

While the dataset provides valuable insights, limitations include potential biases, missing data, and the need for further contextual information for a more nuanced interpretation.

VI. CONCLUSION

This research provides vital insights into Chicago's violence demographics, revealing correlations between offender age and domestic violence, racial disparities in victimization rates, and age-specific crime severity patterns. These findings emphasize the need for targeted prevention efforts and equitable interventions, offering valuable contributions to violence reduction strategies in urban areas.

VII. FUTURE RESEARCH

Future research avenues may include deeper investigations into the socio-economic factors influencing violence, and the integration of additional datasets for a comprehensive analysis.

VIII. REFERENCES

- [1] Felker-Kantor, Erica; Wallace, Maeve; Theall, Katherine. (2017). "Living in violence: Neighborhood domestic violence and small for gestational age births". <https://wrlc-gm.primo.exlibrisgroup.com/discovery/fulldisplay?docid=c di pubmedcentral primary oai pubmedcentral nih gov 55 22620&context=PC&vid=01WRLC GML:01WRLC GML &lang=en&search scope=MyInst and CI&adaptor=Primo %20Central&tab=Everything&query=any,contains,Age%20 and%20domestic%20violence%20in%20crime&offset=0>
- [2] Celia C. Lo, William Ash-Houchen, Heather M. Gerling & Tyrone C. Cheng. (2020). "From Childhood Victim to Adult Criminal: Racial/Ethnic Differences in Patterns of Victimization–Offending among Americans in Early Adulthood".<https://www.tandfonline-com.mutex.gmu.edu/doi/pdf/10.1080/15564886.2020.17505 17?needAccess=true>
- [3] Taşkıran, Sarper ; Mutluer, Tuba ; Tufan, Ali Evren ; Semerci, Bengi Neuropsychiatric disease and treatment. (2017). "Understanding the associations between psychosocial factors and severity of crime in juvenile delinquency: a cross-sectional study". https://wrlc-gm.primo.exlibrisgroup.com/discovery/fulldisplay?docid=c di_proquest_journals_2231011624&context=PC&vid=01WRLC GML:01WRLC GML&lang=en&search scope=MyInst and CI&adaptor=Primo%20Central&tab=Everything&query=any,contains,Understanding%20the%20associations %20between%20psychosocial%20factors%20and%20severi ty%20of%20crime%20in%20juvenile%20delinquency:%20 a%20cross-sectional%20study%20%20Ta%C5%9Fk%C4%B1ran,%20 Sarper%20;%20Mutluer,%20Tuba%20;%20Tufan,%20Ali %20Evren%20;%20Semerci,%20Bengi&offset=0
- [4] JONATHAN, L. (2001). " *VIOLENCE REDUCTION - VICTIM DEMOGRAPHICS – AGGREGATED*".DATA.GOV. <HTTPS://CATALOG.DATA.GOV/DATASET/VIOLENCE-REDUCTION-VICTIM-DEMOGRAPHICS-AGGREGATED>

IX. DOMAIN SPECIFIC TERMINOLOGY:

1. Violent Crimes: Criminal activities involving physical harm or the threat of bodily harm, often characterized using firearms.
2. Domestic Violence: Aggressive behaviours occurring within familial or household relationships, potentially resulting in bodily harm.
3. Racial Disparities: Inequitable differences or imbalances in outcomes, such as victimization rates, among different racial or ethnic groups.
4. Correlation Analysis: Statistical examination of relationships between variables, such as offender age and crime severity.
5. Interval Analysis: Statistical approach involving the grouping of data into intervals, often used to analyze age-related trends in domestic violence.
6. Nominal Analysis: Statistical examination of categorical data, as in the grouping of racial data for victimization rates.
7. Ordinal Analysis: Statistical analysis considering the order or ranking of data, used in assessing age-specific crime severity patterns.
8. Heatmap Analysis: Visual representation of data using colours to indicate the magnitude of values, applied to display correlations between offender age and crime severity.
9. Socio-economic Factors: Elements related to social and economic conditions influencing criminal behaviour and violence patterns.
10. Longitudinal Analysis: Examination of data trends and patterns over an extended period, allowing for a dynamic understanding of violence.
11. Geospatial Analysis: Study of spatial patterns and relationships, often applied to identify specific regions or neighbourhoods with heightened violence.
12. Equitable Interventions: Strategies aimed at ensuring fairness and justice in addressing community-specific challenges.
13. Evidence-Based Policies: Decision-making and policy formulation grounded in empirical research and data-driven insights.
14. Contextual Nuances: Specific details and circumstances surrounding criminal behavior, often requiring additional contextual information for a nuanced interpretation.