

# Racial Involvement among Victims and Perpetrators of Firearm Shootings in the United States: A Business Intelligence (Power BI) Analytics Approach

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**ABSTRACT:** Firearm violence remains a major public health and peacebuilding concern in the United States. Using incident data from the U.S. Government open data portal ([data.gov](https://data.gov)) and national mortality statistics, this study applies an extract–transform–load workflow and interactive dashboards in Microsoft Power BI to describe racial patterns among victims and alleged perpetrators in 2021. Descriptive analytics indicate concentration of both victimisation and perpetration among Black populations in the incident-level dataset, while Asian Pacific Islander and Icelandic categories are the least represented. Perpetrator involvement peaks in the 25–44 age band, followed by 18–24. Interpreted through Critical Race Theory and peace and conflict lenses, the observed patterns are discussed as products of historically structured inequality, spatial segregation, and differential exposure to risk, rather than as products of demographic essentialism. The study illustrates the value of transparent dashboards for evidence-informed policy while noting limits in population adjustment and victim–perpetrator linkage within public datasets.

**Keywords:** firearm violence, racial disparities, victims, perpetrators, Power BI, Critical Race Theory, structural violence, United States, 2021

## I. INTRODUCTION

In 2021, the United States recorded 48,830 firearm-related deaths, the highest annual count in the available series, reflecting a marked increase since the pre-pandemic period [1]–[3]. Although firearm mortality includes suicides and interpersonal homicides, the overall scale of gun deaths has renewed questions about prevention, equity, and institutional legitimacy. Within peace and conflict scholarship, persistent firearm harm in specific communities can be understood as chronic internal insecurity that erodes trust, constrains wellbeing, and reinforces social fragmentation.

A central concern in both public health and conflict analysis is whether victimisation and perpetration patterns are socially structured, including along racial lines. Prior scholarship documents substantial disparities in exposure to firearm violence by race and ethnicity, shaped by place-based disadvantage and policy environments [10]–[14]. Yet, national public datasets rarely provide matched victim–perpetrator race matrices, limiting empirical clarity on relational patterns. This study contributes a descriptive, dashboard-driven assessment of racial involvement among victims and perpetrators in 2021, using a Business Intelligence approach to enable transparent exploration of trends.

### A. Aim and objectives

The study examines racial involvement among victims and perpetrators of firearm shootings in the United States during 2021. Objectives are to (i) describe the distribution of victims and perpetrators by race and age group, (ii) explore indicative victim–perpetrator race pairing patterns where incident records permit, and (iii) visualise geographic concentration patterns to inform place-based interpretation and policy dialogue.

## II. CONCEPTUAL AND EMPIRICAL BACKGROUND

### A. Mass shooting definition and measurement considerations

Definitions of mass shootings vary across institutions and datasets. A commonly used operational definition is an incident with at least four persons shot, injured, or killed, excluding the shooter. The Gun Violence Archive tracks mass shootings using a similar threshold, and distinguishes mass murder as four or more victims killed (excluding the perpetrator) [5]. These definitional differences matter because incident intent and context can vary across public shootings, domestic incidents, workplace events, drive-by shootings, and other categories.

Psychosocial investigations suggest that many mass public shooters experience acute crises and often communicate intent before attacks, with perpetrators frequently having insider relationships to targeted institutions [4], [6]. These insights support the value of combining individual-level risk understanding with structural and spatial analysis, recognising that prevention requires both upstream and situational strategies.

### *B. Prior scholarship on racial disparities in firearm violence*

Research consistently documents racial and ethnic disparities in exposure to firearm violence. Martin et al. show that neighbourhood firearm violence disproportionately affects children from certain racial and ethnic groups, underscoring the structural context of victimisation [10]. Rees et al. provide three-decade evidence of persistent disparities in firearm fatalities by race and ethnicity [11]. Smart et al. demonstrate that firearm laws can have differential effects across racial and ethnic populations, highlighting a policy dimension to disparities [12]. Ward et al. document differences in perceived gun-related safety by race and ownership status, reflecting unequal exposure and institutional trust [13].

Advocacy-oriented syntheses similarly frame gun violence as a racial justice issue, linking homicide burdens to legacies of segregation, disinvestment, and unequal protection [14]. This literature motivates an analysis that treats race as a social and political category interacting with place, opportunity structures, and state responses, rather than as an intrinsic characteristic.

### *C. Sources of violence typology*

To situate firearm harm within broader peace and development discourse, the study adopts a non-mutually exclusive typology of violence sources. Consistent with Gandhi's emphasis on the interdependence of social, political, and moral life [7], the typology distinguishes natural, social, political, commercial, and technological sources as interacting drivers of conflict and harm.

**Table 1: Sources or roots of violence and illustrative impacts**

| Source or root | Illustrative impacts (examples)                                                                                                |
|----------------|--------------------------------------------------------------------------------------------------------------------------------|
| Natural        | Climate change, drought, famine, and extreme events can elevate conflict risk [8].                                             |
| Social         | Racism, caste systems, gangs, firearms, mental health stressors, trafficking, drugs, and inequality [9].                       |
| Political      | Authoritarianism, weak governance, and hybrid political–religious orders that amplify the risks of coercion and atrocity [15]. |
| Commercial     | Harmful production and consumption systems, unsafe products, and waste externalities that shape violence risk [16].            |
| Technological  | Technologies that intensify harm or mobilise violent extremism, including digital communications [17].                         |

Social violence is often the most persistent because it is normalised through traditions, institutional practices, and unequal power. Transforming neighbourhoods affected by gun violence, therefore, requires sustained investment in social cohesion, institutional legitimacy, and conflict prevention capabilities, rather than episodic responses.

## **III. METHODOLOGY**

### *A. Research philosophy*

A positivist orientation informs the study, which prioritises observable, measurable patterns in publicly available data. The goal is descriptive inference: to map distributions and concentrations of victimisation and perpetration across demographic categories, while avoiding causal claims that the dataset cannot support.

### *B. Research design and data sources*

A quantitative, cross-sectional design was adopted using secondary data for 2021. The study triangulates national firearm mortality statistics from the CDC [1], contextual information from FBI active shooter reports [18], and incident-level shooting records from data.gov [20]. Data were extracted, cleaned, transformed, and loaded into Microsoft Power BI for descriptive analysis and interactive dashboard reporting.

### *C. Inclusions, exclusions, and analytical strategy*

Self-inflicted deaths were excluded from victim–perpetrator relational analysis; records without clear role classification were excluded from race-pairing cross-tabulations; and records lacking geographic identifiers were excluded from descriptive spatial discussion. The analytical workflow covered (i) demographic distributions by race and age group, (ii) indicative victim–perpetrator race pairing where recorded, and (iii) mapping of incidents to describe geographic clustering. Inferential testing is not presented here due to limitations in publicly available matched datasets.

#### IV. THEORETICAL FRAMEWORK

##### A. Critical Race Theory

Critical Race Theory (CRT) frames racial disparities as products of historically structured inequality reproduced through institutions and policy. Applied to firearm violence, CRT supports the interpretation of concentration patterns as reflecting differential exposure to risk and protection, rather than demographic determinism.

##### B. Structural violence and socio-spatial conflict

Galtung's structural violence theory distinguishes direct harm from the systemic denial of life chances through unequal social arrangements. Urban conflict and racialised space perspectives further explain how segregation and concentrated disadvantage shape violence hotspots and proximity-based victim–perpetrator pairing patterns. Together, these frameworks position firearm violence as both a symptom and a reinforcing mechanism of structural harm.

#### V. RESULTS

##### A. National context

In 2021, the CDC recorded 48,830 firearm deaths, including 20,958 homicides and 26,328 suicides [1]. Homicides, therefore, constituted 42.9% of firearm deaths, providing a national context for incident-level patterns examined in this study.

##### B. Demographic concentration

Power BI dashboard aggregation indicates that perpetrator involvement is highest in the 25–44 age group, followed by the 18–24 age group. Where sex is recorded, males dominate perpetrator classification. These results are consistent with scholarship linking violence risk to young-adult exposure in settings characterised by structural stressors and constrained opportunities.

##### C. Racial distributions and visual outputs

In the incident-level dataset, Black populations record the highest counts of both victims and perpetrators, followed by White, Hispanic, and Black Hispanic categories. In contrast, the Asian Pacific Islander and Icelandic categories are the least represented. Because these are raw counts without population adjustment, they should be interpreted as descriptive concentration rather than per-capita risk.

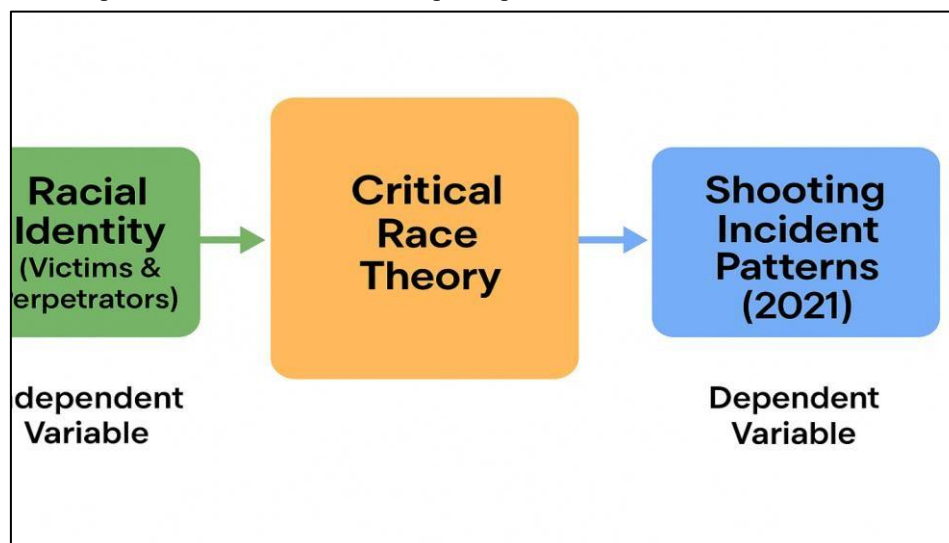


Fig. 1: Conceptual framework linking racialised exposure, victim–perpetrator dynamics and welfare outcomes (authors' synthesis).

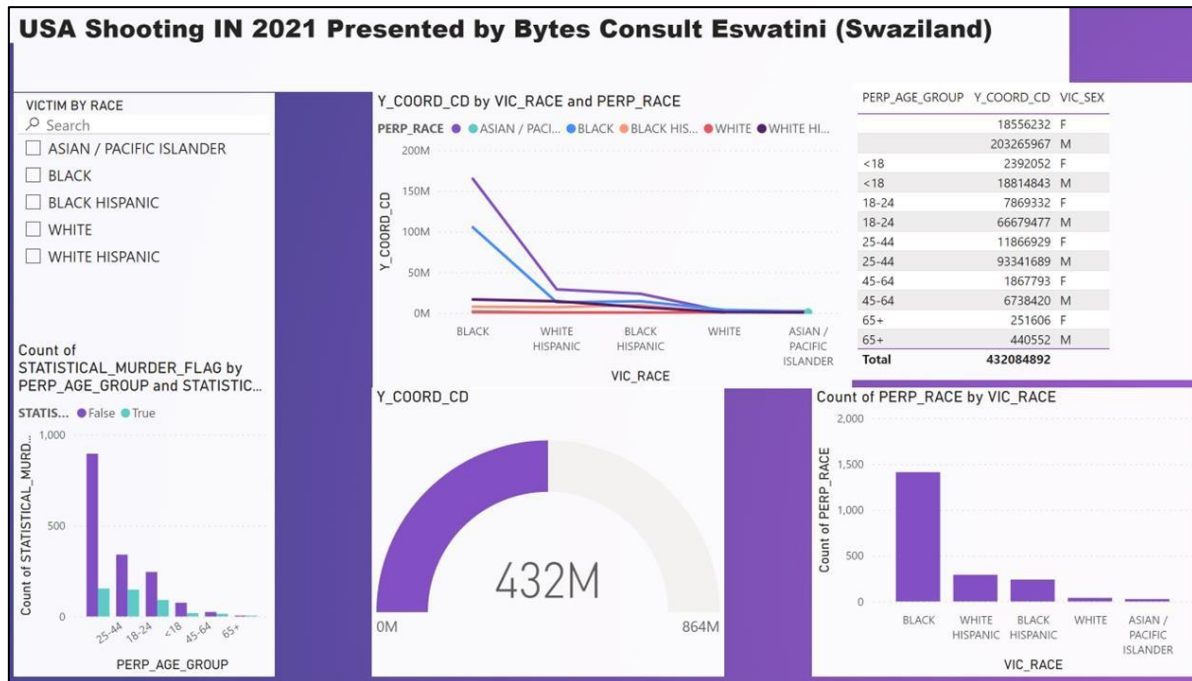


Fig. 2: Dashboard overview of shootings included in the incident-level dataset (Power BI output).

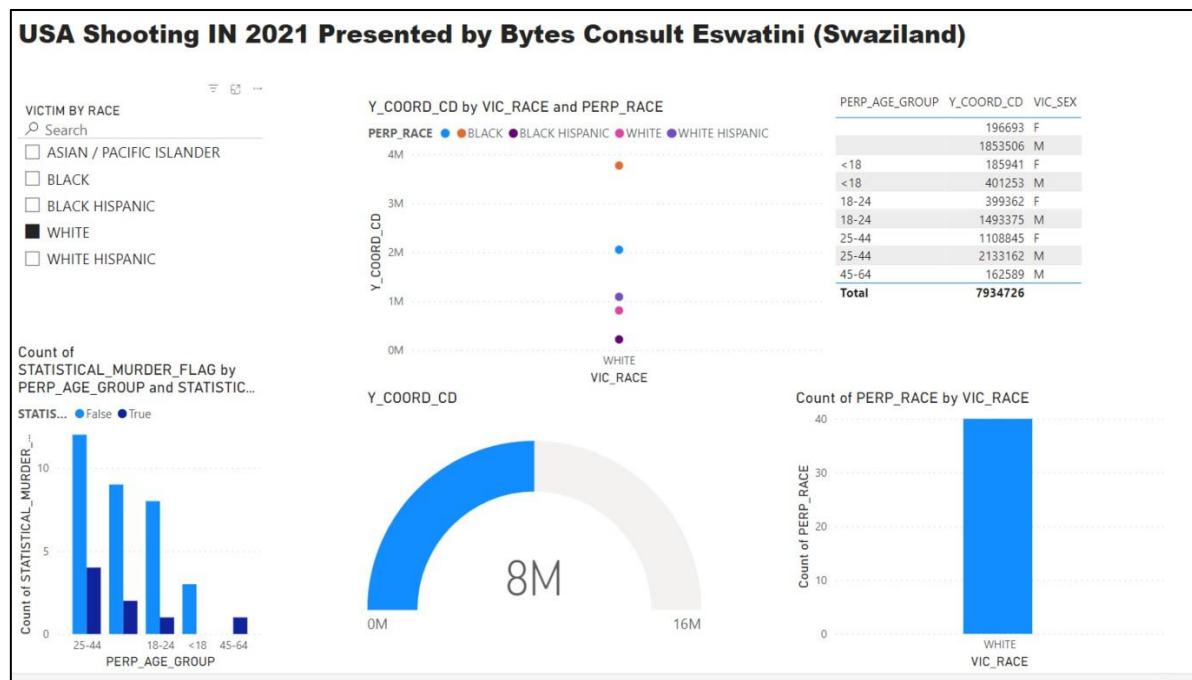


Fig. 3: White victims and perpetrators: descriptive counts and relative positioning (Power BI output).

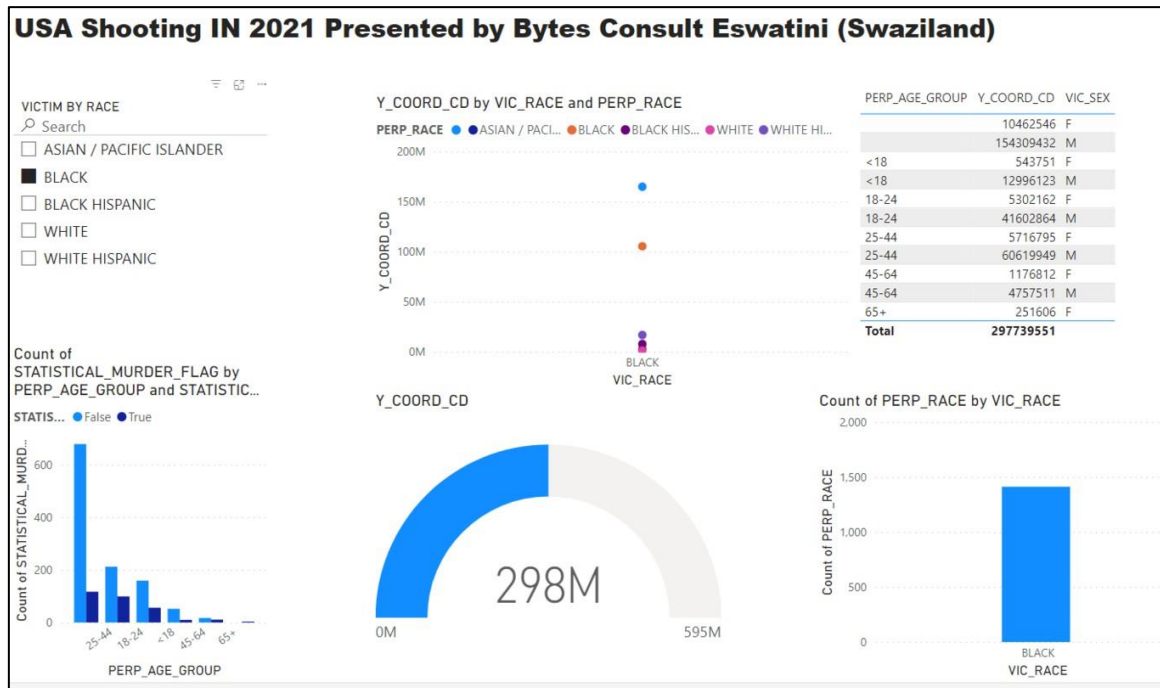


Fig. 4: Black victims and perpetrators: highest recorded counts within the dataset (Power BI output).

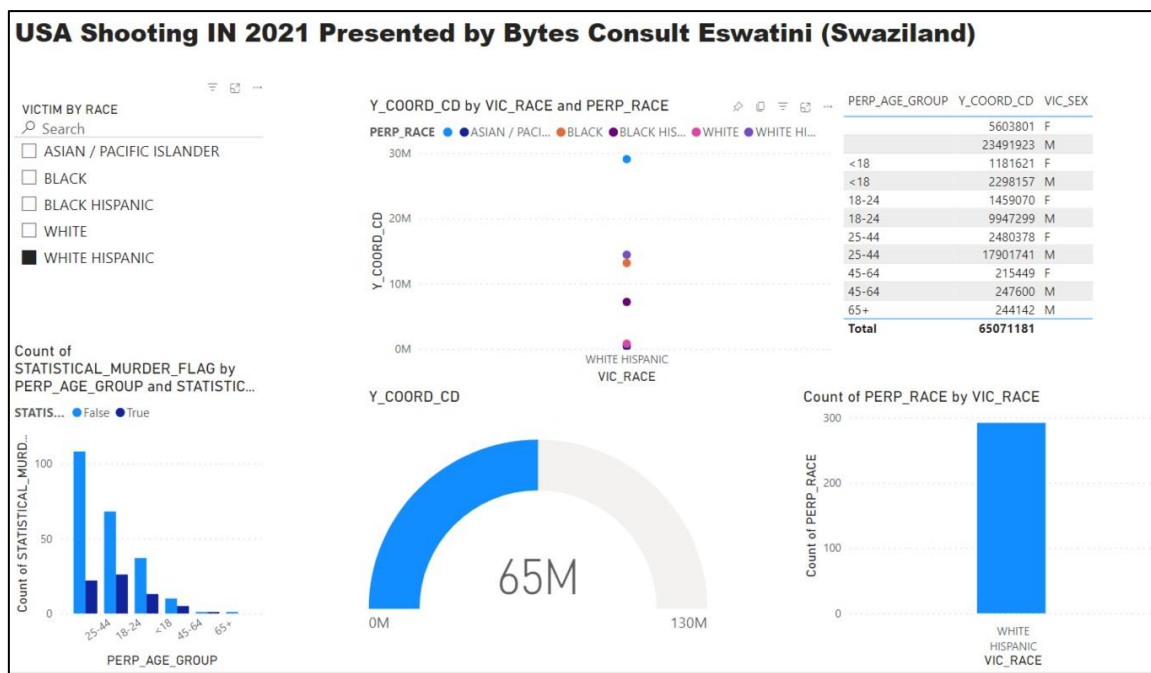


Fig. 5: White Hispanic victims and perpetrators: second-highest recorded counts (Power BI output).

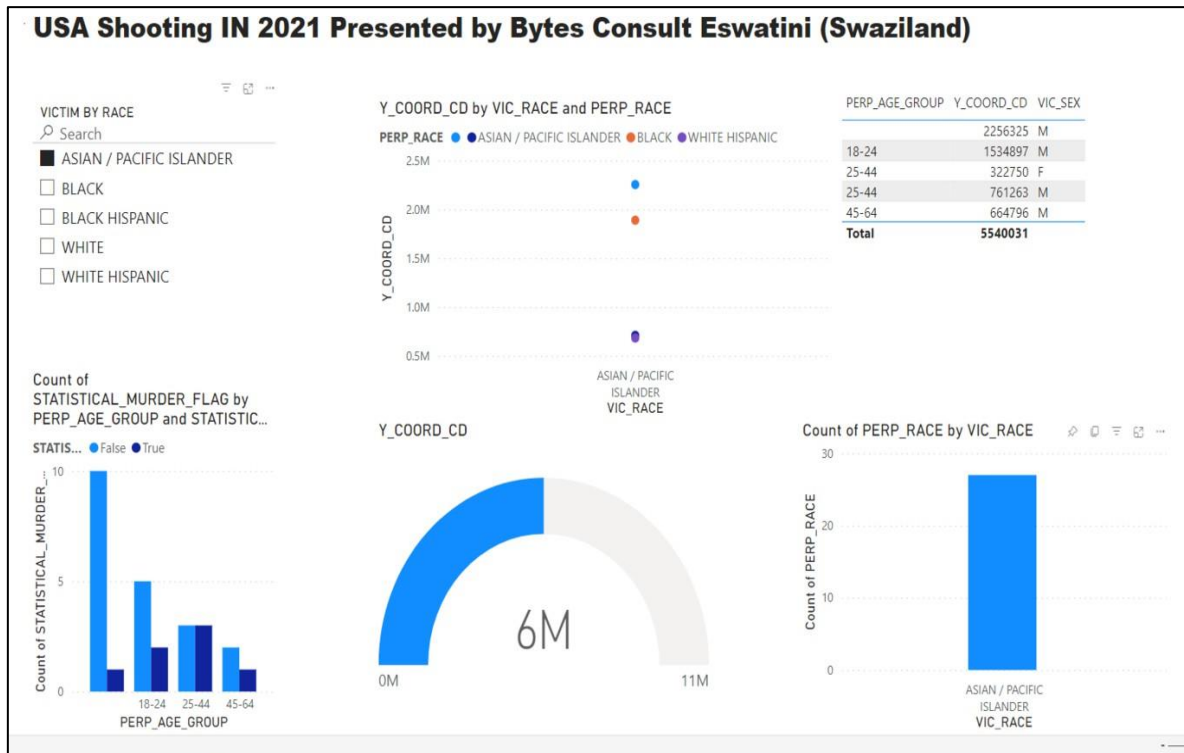


Fig. 6: Asian Pacific Islander and Icelandic categories: lowest recorded counts (Power BI output).

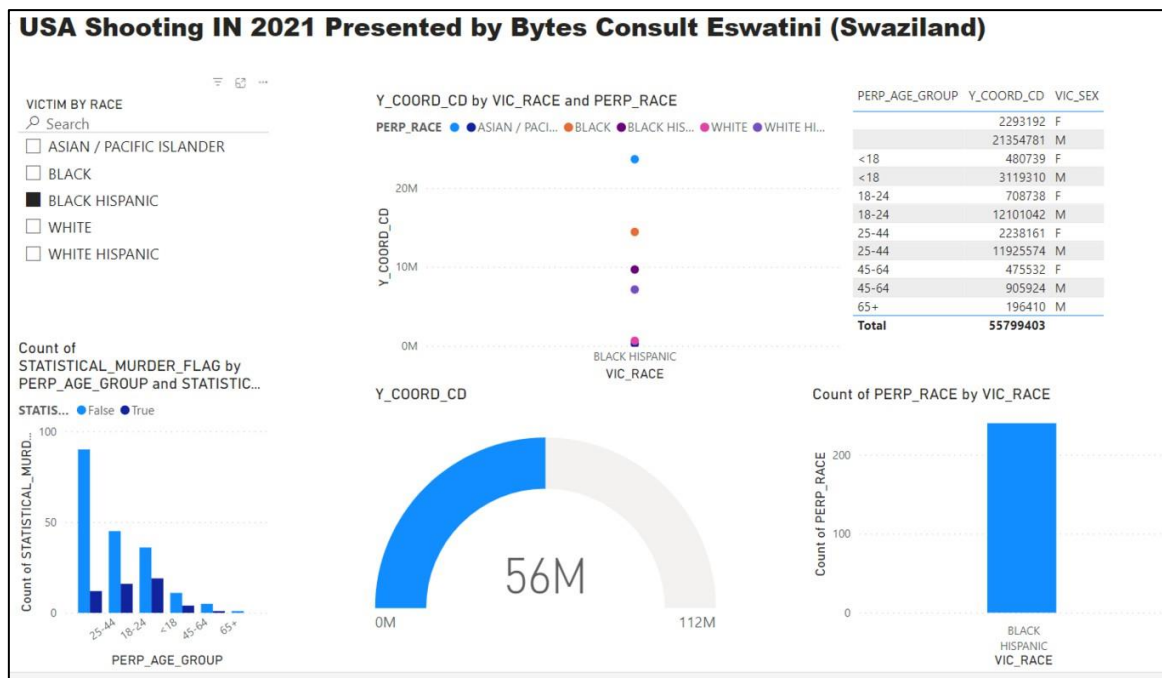


Fig. 7: Black Hispanic victims and perpetrators: third-highest recorded counts (Power BI output).

#### D. Victim-perpetrator pairing and geography

Cross-tabulation patterns suggest prominent intra-racial pairing, consistent with proximity within segregated social networks and bounded community ecosystems. Geospatial visualisation also indicates clustering, and the FBI reporting documents 61 active shooter incidents in 2021, reinforcing the observation that high-intensity events concentrate geographically [18].

## VI. DISCUSSION

Interpreted through CRT and structural violence theory, the observed concentration patterns are more plausibly linked to unequal exposure, accumulated disadvantage, and differential protection than to demographic

essentialism. Business Intelligence dashboards add value by making descriptive evidence transparent and interactive, but do not remove the need for population adjustment and matched relational data when making claims about disparities.

## VII. POLICY IMPLICATIONS

1. Prioritise structural prevention, including education investment, youth employment pathways, housing stability, and trauma-informed services in high-burden communities.
2. Adopt place-based intervention models such as focused deterrence, violence interruption, and restorative justice, aligned with local context and safeguards against over-policing.
3. Strengthen institutional legitimacy through procedural justice, transparent accountability, and community oversight mechanisms.
4. Improve data infrastructure by establishing standardised, anonymised systems that strengthen victim–perpetrator linkage while protecting privacy.

## VIII. 8. CONCLUSION

Using a Power BI ETL workflow and interactive dashboards, this study provides a descriptive assessment of racial involvement among victims and perpetrators of firearm shootings in 2021. The findings underscore demographic and spatial concentration patterns that are best interpreted as products of structural and socio-spatial inequality. More integrated data systems and sustained prevention investments are central to equitable and effective responses.

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