

Modification of Firearm Law-Firearm Injury Association by Economic Disadvantage

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Abstract

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Introduction: To assess whether the association between firearm law restrictiveness and firearm-related events in the US is modified by community distress and economic connectedness (EC).

Methods: National cross-sectional study of firearm incidents (interpersonal and unintentional firearm events) occurring between 1/2015-12/2021 using the Gun Violence Archive (GVA).

Exposures were community distress (Distressed Communities Index, DCI), EC, and year-state-level firearm restrictiveness. Primary outcome was mean annual urban firearm incidence rate per ZIP Code Tabulation Area. Data analyses took place in 2022.

Results: 266,020 firearm incidents were included. The mean rate was higher with each DCI tertile, with a RR of 3.18 (95% CI: 3.06, 3.30) in high versus low distress communities. Low EC was associated with over 1.8 times greater rate of firearm-related injury. The association between restrictive laws and lower incidence rates was strongest in low and medium distress and high EC communities.

Conclusions: Stricter firearm laws are associated with lower rate of firearm incidents. The magnitude of this association is smallest for communities experiencing the greatest economic disadvantage.

Introduction

Firearm-related mortality in the United States (US) has recently risen with over 48,000 firearm-related deaths reported to the Centers for Disease Control and Prevention (CDC) in 2021, representing a 34.7% increase since 2015.¹ While the magnitude of firearm mortality alone is cause for concern, estimations show that for every person killed by a firearm in the US, two more are injured, though few sources of reliable and timely data exist to track nonfatal firearm-related injury.² Given the physical and emotional impact of firearm-related injury, a public health framework to firearms research is vital to understanding and addressing underlying causes of firearm-related injury and death.³

Community-level economic disadvantage and inequality have been shown to be strongly associated with an increased incidence of firearm-related harm within a community.^{4,5} Furthermore, it has been shown that patients in highly vulnerable communities sustain more lethal and severe injuries, further exacerbating disparities and the community-level impact of firearm violence.^{6,7} While prior work has demonstrated that some laws restricting access to firearms are associated with lower rates of firearm-related injury, this association in communities of varying socioeconomic status (SES) is not well-understood.^{8,9}

In this study, national data on firearm-related injury and deaths was used to evaluate the association of firearm law restrictiveness with the rate of firearm-related incidents (interpersonal and unintentional firearm events), and the modification of that association by community-level distress and economic connectedness (EC). It was hypothesized that restrictive firearm laws would be associated with the largest reduction in firearm incidents in communities with greatest economic disadvantage.

Methods

Study Sample

Firearm incidents occurring in the US between January 1, 2015 and December 31, 2021 were identified using the Gun Violence Archive (GVA), made available by the Boston University RISE Lab.^{10,11} The GVA collects daily data from over 7,500 commercial, government, law enforcement, and media sources, and has shown >0.95 correlation with CDC-reported firearm deaths due to interpersonal violence.¹² The GVA methodology scrapes these sources for interpersonal and unintentional events involving a firearm, referred to here to as ‘firearm incidents’. In the absence of another comprehensive database, the GVA has been used to generate national estimations of firearm-related incidents in the US and to identify intervenable environmental risk factors.^{13,14}

Each firearm incident was assigned to a 2020 ZIP Code Tabulation Area (ZCTA) through a spatial join in a Geographic Information System.^{15,16} ZCTAs are generalized areal representations of United States Postal Service ZIP Code service areas, created by the Census Bureau. Incidents were further stratified as metro/micropolitan or rural using Rural-Urban Commuting Area Codes (RUCA) codes based on 2010 census data, as well as the 2006-2010 American Community Survey.¹⁷ RUCA codes were not calculated for ZIP codes with populations of zero or with no rural-urban identifier. Initial data exploration showed a small proportion of incidents in rural ZIP codes, leading to unreliable results; as such, subsequent results were limited to urban incidents.

Measures: Primary Exposure

Firearm law restrictiveness was measured using the Giffords Law Center Gun Law Scorecard. The Giffords Gun Law Scorecard is a national ranking of states published each year by the Giffords Law Center.¹⁸ The ranking system provides each state a score based on review of firearm laws and policies within the state, and this score is translated into a scorecard grade (A, A-, B+, B, B-, C+, C, C-, D+, D, D-, F). These grades were collapsed into 3 categories for analysis: A, B/C, D/F, which approximately corresponded to states in the top quartile, middle two quartiles, and bottom quartile, respectively, based on the annual Giffords proprietary numerical gun law ratings. Giffords grades were assigned to all 50 states (excluding the District of Colombia). Giffords state ranking data was consolidated into one dataset comprising of grades for each state for each year from 2015-2020.

Measures: Effect Modifiers

The effect modifiers examined were community distress (using the Distressed Communities Index (DCI)) and EC (using the Social Capital Atlas (SCA)). The DCI was created by the Economic Innovation Group to identify geographic trends in economic inequality using the US Census Bureau's American Community Survey 5-Year Estimates and Business Patterns dataset for 2016-2020. The DCI is a composite measure integrating percent high school diplomacy, housing vacancy rate, percent of adults not working, poverty rate, median income ratio, change in employment, and change in number of business establishments over the period.¹⁹ The DCI ranges from 0 to 100, with higher values indicating higher levels of community distress. The DCI is not available for ZIP codes with fewer than 500 residents; these zip codes were excluded

from analysis. The cohort was grouped into three tertiles for analysis, represented by a DCI of 0-33.33 (Low DCI), 33.34-66.66 (Med DCI), and 66.67-100 (High DCI).

EC was determined using the SCA, which explores social capital as a function of income segregation, friending bias, and class mobility, based on data from active Facebook users aged 25-44 with valid US ZIP code information.²⁰ The SCA dataset is composed of two pre-defined EC variables: 1) mean EC among low SES individuals in a ZIP code, and 2) mean EC among high SES individuals in the same ZIP code. EC was not calculated in ZIP codes where there were not at least 100 individuals with low SES and 100 individuals with high SES on Facebook.²¹ An EC score of 1 indicates an equal proportion of high and low SES Facebook friends for people in each group, while a score of 0 or 2 indicates either no friends are or all friends are of high SES, respectively. A binary EC variable was created for each EC variable by grouping ZIP codes as upper 50% of EC scores or lower 50% of EC scores using the median EC score across all US ZIP codes in the SCA data as the cut point. The DCI, SCA, and RUCA data were linked to the GVA data by ZIP code. Giffords state rankings were linked to the GVA data by state and year. Observations with no identified ZIP code were excluded.

Measures: Primary Outcome Variables

The primary outcomes of this study were firearm-related incident rates documented in the GVA per 10,000 persons per year per ZIP code. GVA data is incident driven, with a victim coded as either assaulted, injured, or killed, preventing double counting. Data were not available on age, gender, or race. Rates were calculated using Census data on the population of each ZIP code.¹⁵

Statistical Analysis

Three analytic models were created to evaluate modification of the firearm law-firearm incident association by DCI, EC among low SES, and EC among high SES zip codes. Because the outcome variable was over-dispersed count data with multiple levels, a negative binomial version of a generalized linear mixed model was fit, using the ZIP code populations as an offset. Random intercepts were included in the model to account for the clustering at both the state level and across years. To examine whether the association of state firearm laws (measured by Giffords grades) and rates of firearm incidents were modified by each of the two primary exposures (e.g., DCI and EC), an interaction term was included in each of the models. Two-way ANOVA tests were performed for each model to determine if interaction terms were significant at the 0.05 level.

Coefficients were exponentiated and linear combinations were calculated to produce rate ratios (RR) of interest and 95% confidence intervals. All data cleaning and analyses were run in RStudio 4.2.2.

The study used public available, deidentified data and was exempt from institutional review board approval.

Results

During the 7-year study period, 273,812 firearm incidents were reported in the GVA, of which, 97.2% (n=266,020) occurred in urban areas with similar rural-urban distribution across years. At least one incident occurred in 37.9% (n=15,802) of US ZIP codes during the study period (Table

1). Across all years, the greatest proportion of unique ZIP codes with firearm incidents were in states with a Giffords score of D/F (59.8%, n=9,452) (Table1). The numbers of unique ZIP codes were evenly distributed across DCI categories, with 31.4% (n=4,969) in the Low Distress tertile, 30.4% (n=4,811) in the Medium Distress tertile, and 34.4% (n=5,430) in the High Distress tertile (Table 1). Among both low SES and high SES communities, a higher proportion of ZIP codes with firearm incidents were in lower EC score areas than higher EC score areas (Table 1).

Firearm incidence rates were higher with decreasing Giffords Score, with grade D/F communities experiencing 1.20 times higher risk of firearm violence than grade A/B communities (95% CI 1.12, 1.28). The mean rate of firearm-related incidents increased stepwise with each DCI tertile, with a RR of 3.18 (95% CI: 3.06, 3.30) in high relative to low distress communities (Table 2) (Figure 1). Low EC was associated with a greater risk of firearm incidents among both low and high SES communities (RRs 2.04 (95% CI: 1.97, 2.11) and 1.85 (95% CI: 1.79, 1.92), respectively) (Table 2 and Figures 2 and 3).

A two-way ANOVA test showed statistically significant modification ($p < 0.001$) of the association between firearm incidents rates and firearm laws by DCI (Table 3 and Figure 1). The association between firearm law restrictiveness and lower firearm incidents rates was smallest in the highest distress and least economically connected areas. Specifically, low and medium distress communities in areas with the most restrictive compared to most permissive firearm laws had a 15% (95% CI: 0.77, 0.93) and 24% (95% CI: 0.67, 0.84) lower rate of firearm incidents, respectively, whereas in high DCI communities the association with such laws was smaller, with

an 11% lower rate of firearm incidents in areas with the most firearm restrictive laws (95% CI: 0.81, 0.96) (Table 3). Graphically, this represented a trend towards higher rates of firearm incidents in more permissive states in low and medium distress communities, with the strongest trend observed in medium distress areas (Figure 1). This trend was less apparent in high distress areas indicating a more limited association of restrictive laws in these communities.

Similar effect modification of the firearm incident-firearm law association was seen when examining the effect of EC, although the interaction term was only statistically significant in the high SES model (two- way ANOVA p-value <0.001). Within the High SES model of EC, there was a 24% lower rate of firearm incidents observed in high EC areas with restrictive firearm laws, but only an 11% lower rate in low EC areas (Table 4). In the Low SES model, there was little difference in the magnitude of the association of firearm laws based on high vs low EC. Once again, there appeared to be a stepwise trend towards higher rates of firearm incidents with greater firearm permissiveness in high EC areas, but less so in low EC areas, regardless of SES (Figure 2).

Discussion

This study modeled firearm-related incidents in the US between 2015 and 2021, accounting for ZIP code level clustering and incorporating previously unexamined exposures of economic connectedness. With >97% of incidents occurring in urban areas and two thirds of incidents occurring in high distress communities, these findings reinforce knowledge that urban, economically stressed areas are most exposed to interpersonal and unintentional firearm events.⁴

⁶ At the ZIP code level, higher economic distress and low economic connectedness had the

strongest associations with firearm incidents. High economic distress and low economic connectedness in low SES areas showed the strongest associations, with the most distressed tertile and Low EC variables demonstrating over 300% and 200% higher firearm incidents relative to their reference groups, respectively. Areas with restrictive firearm laws were associated with a 20% lower rate of firearm incidents when compared to those in more lenient states. Most consequentially, these models showed restrictive firearm laws had the weakest association with lower rates of firearm incidents in the most distressed, least economically connected communities.

The largest proportion of firearm-related events occurred in states with the least restrictive firearm laws. This is consistent with prior studies, which have demonstrated an association between firearm laws and lower rates of firearm fatalities within a state.²²⁻²⁴ Modest differences were observed in the IRR of firearm incidents in the less versus most restrictive states, with less restrictive states experiencing a 7-20% higher rate of firearm-related incidents. Given the overall high rate of incidents in high distress communities, it is possible that any beneficial association of firearm laws may be outweighed by the negative associations with economic distress. This was shown in stratified analyses. Higher rates of firearm incidents were observed in a stepwise fashion with more permissive firearm laws among low and medium distress ZIP codes; however, in ZIP codes of the highest DCI tertile, this association was weaker.

These results may contextualize the recent analysis by the RAND Gun Policy in America initiative, which examined the evidence for the effectiveness of various firearm policies.²³ RAND's work demonstrated that while few policies are supported by adequate research, certain

laws do appear to be effective. Specifically, prior work has suggested the effectiveness of background check, licensed dealer, permit, relinquishment, may-issue, gun show, record-keeping, and straw purchase laws.²⁵ Liu et al demonstrated that permit requirements and violence prohibition laws were associated with within-state, interstate, and overall decreases in firearm-related deaths.²⁶ These findings suggest that the effectiveness of individual laws may vary within a state based on social determinants of health, such as SES-related factors, and that some laws may have differential levels of effect in communities with different levels of distress.

Another potential explanation for this phenomenon is the illegal flow of firearms across state lines, which impacts the effectiveness of firearm legislation in restrictive states when neighbored by states with more permissive laws.²⁷ A 2019 Bureau of Justice survey of prison inmates showed that of those possessing a firearm during their offense, over half had either found, stolen, or obtained the firearm from underground sales, and a fourth of respondents reported receiving the firearm as a gift.²⁸ Only 7% of those surveyed reported purchasing it under their own name from a licensed dealer. This is consistent with prior work, which have illustrated “policy spillover” effects, wherein states with strong regulation shift the market towards states with weaker firearm regulation, resulting in a greater proportion of firearms used in violent crime being traced back to states with weaker laws, regardless of where the victimization took place.^{29,30}

Firearm-related incidents not only occurred disproportionately in highly distressed and economically disconnected areas, but those rates increased with increasing DCI. This echoes prior research on firearm mortality that has been done at the state and county level and expands

this knowledge to the national level.^{4,5} Previous models have shown that income inequality, rather than low income alone, is strongly associated with increased rates of firearm homicide, demonstrating the power of economic isolation.^{4,31} This study further found that low EC was similarly associated with a higher risk of the occurrence of firearm-related events. These findings reinforce existing knowledge that high family and institutional social capital is associated with markedly lower homicide rates in an area, using a new measure of socioeconomic connection.^{12,13}

Limitations

Several limitations of this study should be considered during interpretation of its results. First, the GVA is not a government-regulated data source and prior work has noted gaps in self-inflicted injuries, rural, and unreported injuries. Additionally, no data on individual characteristics were collected from the GVA for this study. Second, the use of Giffords score does not allow for examination of specific firearm policies, thus associations with the effectiveness of certain laws cannot be drawn. Third, a lag period between measures of SES and firearm incidents was not accounted for, which limits the causal assumptions that may be drawn from these associations. Prior work has shown that use of historical income inequality data may provide a stronger association with current health outcomes in an area, which suggests that this study potentially underestimates the links between economic deprivation and firearm incidents.³² Fourth, analysis was limited to data at the ZIP code- and state-level, which precludes evaluation of more granular patterns of association. These associations may differ if examined at the census block or tract-level, or by other, more socially meaningful boundaries.

Finally, this study focused on indicators of economic distress and connection as proxies for SES; however, no single indicator can appropriately describe how the social determinants of health interact to contribute to firearm-related injuries. Social and economic factors function as a complex interconnected system that shape health outcomes.³³ Many of these measures mediate one another reciprocally in feedback loops (i.e. the seven indicators in the DCI may drive economic connectedness and vice versa), and no one measure of SES can be solely responsible for high levels of firearm violence in a community.¹³ The DCI was intentionally selected as one measure of socioeconomic deprivation based on its inclusion of key economic indices; however, it does not include measures of race/ethnicity, insurance, or language barriers.³⁴ While these are critical social determinants of health, some of these indicators – particularly race and ethnicity – variably correlate with socioeconomic disadvantage and often relate back to persistent racist structures. Examining race alone in the context of poverty would fail to appropriately acknowledge and account for the legacies of racial segregation and redlining that drive these associations.

This work demonstrates potential limitations of current firearm legislation in alleviating the burden of firearm-related injury on populations that experiences it most. Future research must seek to better understand the mechanism by which economic disadvantage translates to firearm violence to inform protective public health strategies. A strengths-based approach may be instrumental. For example, a 2020 study examined census blocks in Florida with high area disadvantage but low counts of firearm injuries, discovering that these block groups were often in proximity to employment opportunities and projects aimed at reducing community socioeconomic stressors.⁴ Other tactics include evidence-based state-level approaches, such as expansion of tax credits, economic security programs, and Medicaid, as well as supporting community-level strategies, such as violence intervention programs, expanded

employment services, and reinvestment in the built environment.³⁵⁻³⁷ Effective interventions that reduce firearm violence will require a comprehensive approach that addresses both access to firearms, as well as structural poverty and racism.

Conclusions

Firearm events and their long-term health impacts persist as a public health crisis, disproportionately affecting systematically marginalized and under-resourced communities. This study demonstrates that while stricter firearm laws are associated with lower rates of interpersonal and unintentional firearm events within economically advantaged areas, the current laws alone may not be enough to support communities experiencing the greatest economic deprivations. Understanding the limits of legislative approaches will be critical to designing effective firearm injury reduction strategies for vulnerable populations.

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Figure Legend

Figure 1. Mean firearm incidence rates by Giffords grade and DCI among urban zip codes across all years.

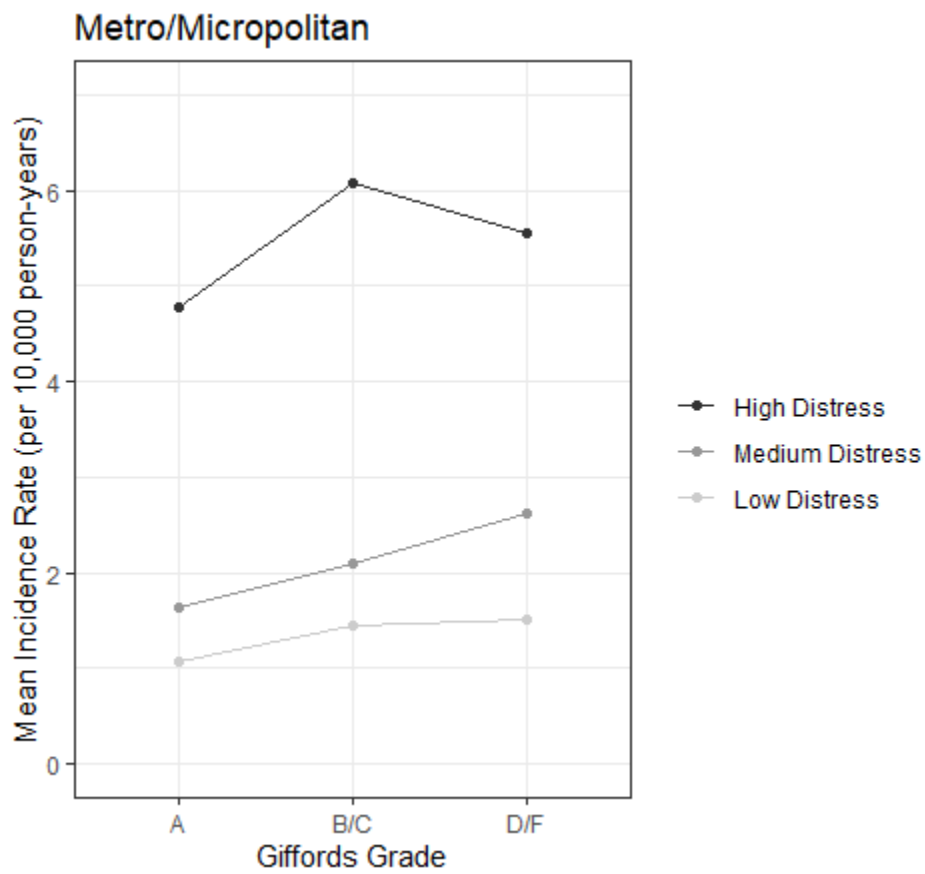
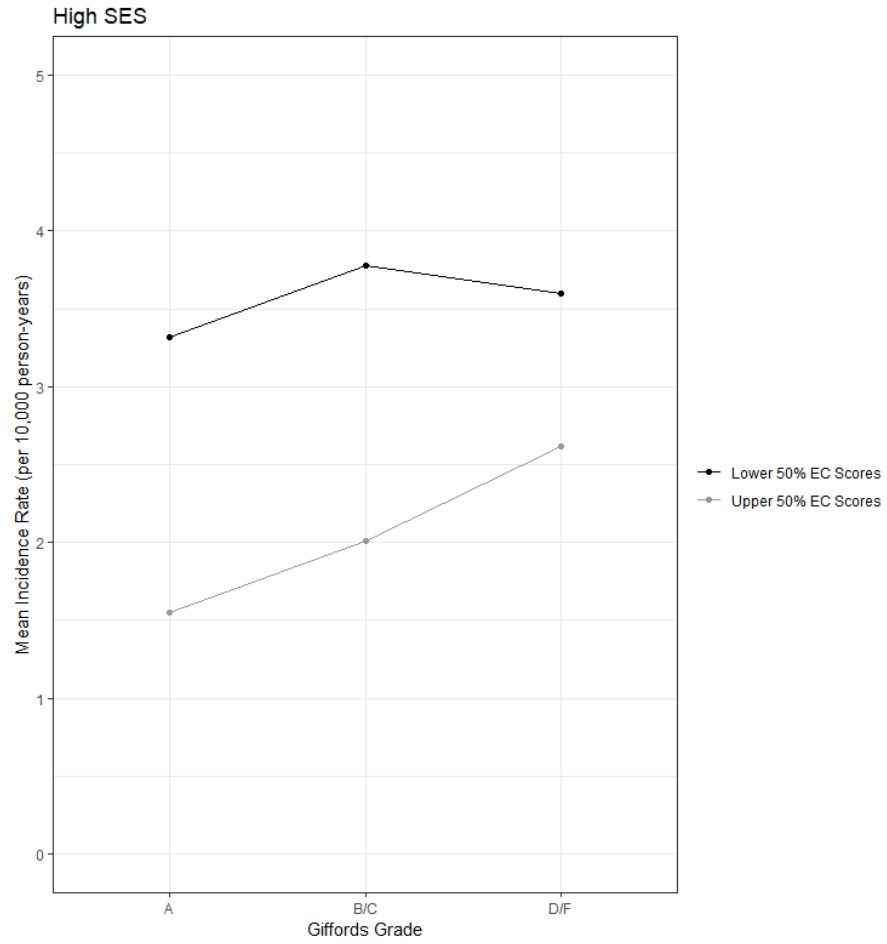
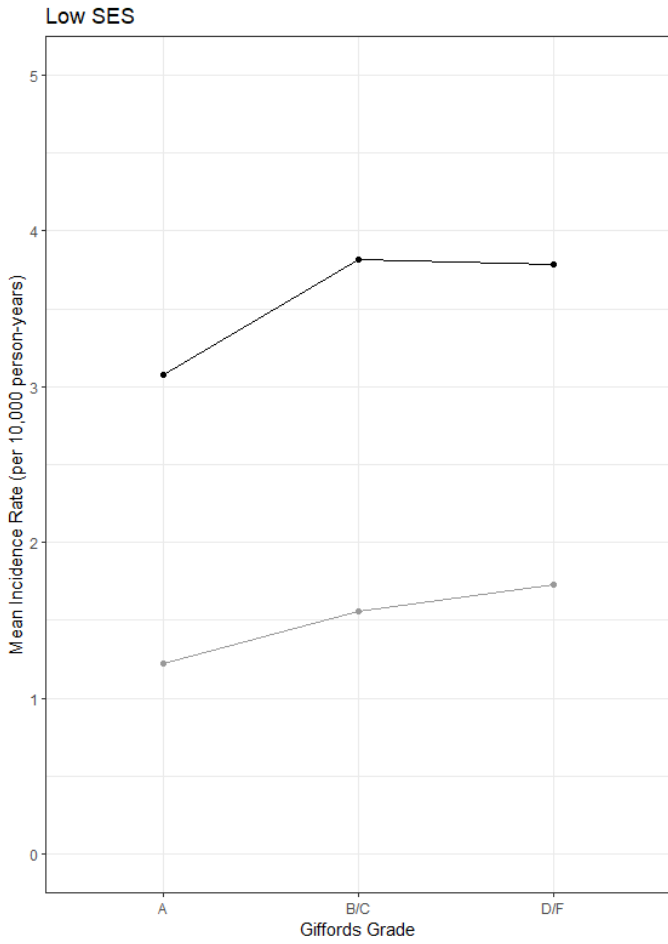


Figure 2. Mean firearm incidence rates by Giffords grades and EC (among low and high SES) among urban ZIP codes across all years.



Tables

Table 1. Number of ZIP codes with firearm incidents by year.

Variable	2015 (N=7,583)	2016 (N=7,892)	2017 (N=8,182)	2018 (N=7,962)	2019 (N=7,854)	2020 (N=8,295)	Overall ^a (N=15,802)
Urbanicity							
Small Town & Rural	722 (9.5%)	737 (9.3%)	725 (8.9%)	747 (9.4%)	695 (8.8%)	812 (9.8%)	2574 (16.3%)
Metro/Micropolitan	6859 (90.5%)	7153 (90.6%)	7456 (91.1%)	7215 (90.6%)	7158 (91.1%)	7482 (90.2%)	13224 (83.7%)
Missing	2 (0.0%)	2 (0.0%)	1 (0.0%)	0 (0%)	1 (0.0%)	1 (0.0%)	4 (0.02%)
Giffords Grade							
A	1461 (19.3%)	1478 (18.7%)	1544 (18.9%)	1508 (18.9%)	1711 (21.8%)	1853 (22.3%)	3246 (20.5%)
B/C	1312 (17.3%)	1535 (19.5%)	1571 (19.2%)	2136 (26.8%)	1943 (24.7%)	2263 (27.3%)	4539 (28.7%)
D/F	4793 (63.2%)	4860 (61.6%)	5049 (61.7%)	4299 (54.0%)	4182 (53.2%)	4158 (50.1%)	9452 (59.8%)
Missing	17 (0.2%)	19 (0.2%)	18 (0.2%)	19 (0.2%)	18 (0.2%)	21 (0.3%)	27 (0.2%)
DCI							
Low Distress	2012 (26.5%)	2161 (27.4%)	2274 (27.8%)	2157 (27.1%)	2117 (27.0%)	2288 (27.6%)	4969 (31.4%)
Medium Distress	2459 (32.4%)	2487 (31.5%)	2642 (32.3%)	2540 (31.9%)	2478 (31.6%)	2653 (32.0%)	4811 (30.4%)
High Distress	2970 (39.2%)	3104 (39.3%)	3137 (38.3%)	3129 (39.3%)	3122 (39.8%)	3208 (38.7%)	5430 (34.4%)
Missing	142 (1.9%)	140 (1.8%)	129 (1.6%)	136 (1.7%)	137 (1.7%)	146 (1.8%)	617 (3.9%)
EC among low SES							
Upper 50% EC Scores	2438 (32.2%)	2502 (31.7%)	2648 (32.4%)	2528 (31.8%)	2431 (31.0%)	2640 (31.8%)	5879 (37.2%)
Lower 50% EC Scores	4652 (61.3%)	4864 (61.6%)	5018 (61.3%)	4922 (61.8%)	4914 (62.6%)	5085 (61.3%)	7724 (48.9%)
Missing	493 (6.5%)	526 (6.7%)	516 (6.3%)	512 (6.4%)	509 (6.5%)	570 (6.9%)	2199 (13.9%)
EC among high SES							
Upper 50% EC Scores	3129 (41.3%)	3253 (41.2%)	3426 (41.9%)	3277 (41.2%)	3226 (41.1%)	3433 (41.4%)	6458 (40.9%)
Lower 50% EC Scores	3961 (52.2%)	4113 (52.1%)	4240 (51.8%)	4173 (52.4%)	4119 (52.4%)	4292 (51.7%)	7145 (45.2%)
Missing	493 (6.5%)	526 (6.7%)	516 (6.3%)	512 (6.4%)	509 (6.5%)	570 (6.9%)	2199 (13.9%)

a. The “overall” column is the total number of unique ZIP codes with at least one firearm incident across all years.

Table 2. Mean firearm incidence rates per 10,000 (standard deviation) and year-adjusted rate ratios (95% confidence intervals)

Variable	2015 (N=39,043)	2016 (N=44,385)	2017 (N=45,792)	2018 (N=42,603)	2019 (N=44,605)	2020 (N=57,384)	Overall (N=273,812)	Rate Ratio (95% CI)
Urbanicity								
Metro/Micropolitan	2.88 (4.90)	3.14 (5.49)	3.22 (11.42)	3.09 (5.13)	3.15 (5.27)	3.76 (6.75)	3.21 (6.94)	ref
Small Town & Rural	4.51 (5.15)	4.37 (5.04)	4.73 (5.77)	4.57 (5.79)	4.59 (5.56)	4.41 (5.42)	4.53 (5.46)	1.76 (1.67, 1.85)
Giffords Grade								
A	2.31 (4.23)	2.62 (3.67)	2.26 (3.77)	2.33 (4.02)	2.76 (5.49)	3.38 (7.17)	2.59 (5.02)	ref
B/C	3.13 (5.63)	3.39 (6.97)	3.21 (5.71)	2.94 (5.27)	2.70 (4.03)	3.41 (5.62)	3.12 (5.54)	1.07 (1.02, 1.14)
D/F	3.23 (4.92)	3.50 (5.34)	3.57 (13.53)	3.66 (5.49)	3.73 (5.68)	4.22 (6.84)	3.66 (7.75)	1.20 (1.12, 1.28)
DCI ^a								
Low Distress	1.41 (2.47)	1.53 (3.07)	1.52 (4.82)	1.45 (2.61)	1.44 (2.41)	1.63 (2.87)	1.5 (3.18)	ref
Medium Distress	2.19 (3.14)	2.38 (3.80)	2.66 (16.94)	2.3 (3.82)	2.4 (3.94)	2.73 (5.18)	2.45 (7.96)	1.67 (1.60, 1.73)
High Distress	4.83 (6.59)	5.15 (7.08)	5.25 (7.00)	5.19 (6.68)	5.2 (6.84)	6.3 (8.55)	5.33 (7.18)	3.18 (3.06, 3.30)
EC among low SES ^b								
Upper 50% EC scores	1.54 (2.32)	1.68 (3.16)	1.61 (4.43)	1.63 (3.05)	1.60 (2.41)	1.85 (3.69)	1.65 (3.28)	ref
Lower 50% EC scores	3.23 (4.97)	3.49 (5.65)	3.56 (5.59)	3.44 (5.15)	3.52 (5.35)	4.26 (6.82)	3.59 (5.64)	2.04 (1.97, 2.11)
EC among High SES ^c								
Upper 50% EC scores	1.98 (3.46)	2.15 (4.31)	2.14 (5.13)	2.10 (4.06)	2.15 (4.21)	2.56 (5.17)	2.18 (4.45)	ref
Lower 50% EC scores	3.18 (4.84)	3.45(5.45)	3.49 (5.36)	3.40 (4.95)	3.46 (4.94)	4.14 (6.59)	3.53 (5.41)	1.85 (1.79, 1.92)

- a. *Distressed Communities Index (scores range from 0-100). Low Distress: DCI scores: ≤ 33.33 , Medium Distress: DCI scores $> 33.3, \leq 66.6$, High Distress: DCI scores: > 66.6*
- b. *Economic Connectedness scores among low SES individuals, defined as “two times the share of high-SES friends among low-SES individuals, averaged over all low SES individuals in the ZIP code. Median score (0.88) is based on all US ZIP codes in the Social Capital Index.*
- c. *Economic Connectedness scores among high SES individuals, defined as “two times the share of high-SES friends among high-SES individuals, averaged over all high SES individuals in the ZIP code. Median score (1.32) is based on all US ZIP codes in the Social Capital Index.*

Table 3. Firearm incident rate ratios in urban ZIP codes among Low, Medium and High DCI communities.

Comparisons	Urban RR (95% CI)
Low DCI	
Giffords D/F	ref
Giffords B/C	0.90 (0.85, 0.95)
Giffords A	0.85 (0.77, 0.93)
Medium DCI	
Giffords D/F	ref
Giffords B/C	0.84 (0.80, 0.89)
Giffords A	0.76 (0.67, 0.84)
High DCI	
Giffords D/F	ref
Giffords B/C	0.94 (0.90, 0.99)
Giffords A	0.89 (0.81, 0.96)

Low DCI: ≤ 33.33 , Med DCI: $> 33.3, \leq 66.6$, High DCI: > 66.6 .

Table 4. Firearm incident rate ratios among urban ZIP codes by EC among low/high SES ZIP codes.

Comparisons	Low SES RR (95% CI)	High SES RR (95% CI)
Low EC:		
Giffords D/F	ref	ref
Giffords B/C	0.89 (0.85, 0.92)	0.91 (0.87, 0.95)
Giffords A	0.83 (0.76, 0.89)	0.89 (0.82, 0.97)
High EC		
Giffords D/F	ref	ref
Giffords B/C	0.91 (0.85, 0.96)	0.85 (0.81, 0.90)
Giffords A	0.86 (0.79, 0.95)	0.76 (0.70, 0.82)

Low EC: lower 50% of EC scores; High EC: upper 50% of EC scores. Median EC score across all ZIP codes for low SES: 0.88. Median EC score for high SES: 1.32.

Estimates are adjusted for year and account for the correlation of incidents across years within the same ZIP code and clustering at the state level.