A descriptive exploration of the geographic and sociodemographic concentration of firearm homicide in the United States, 2004–2018

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Abstract

This study examined the population-based incidence of firearm homicide in the United States to identify geographic concentrations and to determine whether such concentrations have changed over time. It further examined the simultaneous associations of urbanization, poverty, and ethnicity/race with firearm homicide incidence. Using county-level data from the National Vital Statistics System and the U.S. Census Bureau for the years 2004–2018, the findings show geographic patterns not commonly recognized, including several lengthy and continuous corridors with a high incidence of firearm homicide, traversing both metro and non-metro areas. While the data clearly show a strongly disproportionate concentration of firearm homicide incidence in a subset of the population defined by geography, they do not suggest increasing concentration over time. The study findings also generally indicate increasing firearm homicide incidence with increasing levels of surrounding poverty, a phenomenon observed for both metro and non-metro areas.

Keywords

Firearm; Homicide; Urbanization; Poverty; Public health

1. Introduction

Following a notable peak in 1993, the annual rate of firearm homicide in the United States steadily decreased throughout the remainder of the 1990s (Fowler et al., 2015; Centers for Disease Control and Prevention [CDC], 2020a). Annual rates remained relatively steady over the next decade and a half, although showed an increase during 2015–2016 to a level which has since persisted (CDC, 2020a). A series of reports from the CDC found that firearm homicides are disproportionately concentrated in large metro areas (Kegler et al., 2011; Kegler and Mercy, 2013; Kegler et al., 2018), consistent with findings of earlier studies (Branas et al., 2004; Hu et al., 2008; Nance et al., 2010). What is less clear is the extent to which general urban-rural differences in firearm homicide rates might obscure more specific geographic patterns. A recent study in California covering the period 2000–2015 found no significant differences in rates of firearm homicide between urban and rural counties by 2015, due largely to the decline in firearm homicides in metro areas (Pear et al., 2018).

How firearm homicide incidence might be associated with selected sociodemographic factors across different levels of urbanization is also of interest. Understanding where and under what conditions firearm homicides are most concentrated has important implications for the nature and types of prevention strategies needed.

To our knowledge, the present study is the first to utilize nationally comprehensive county-level data to characterize the population-based incidence of firearm homicide in the context of four primary questions: 1) at a high level of geographic resolution, where are firearm homicides concentrated?; 2) is there evidence that the incidence of firearm homicide has become more concentrated over time in terms of geographically-defined subsets of the population?; 3) are there geographic areas that have shown persistently high concentrations of firearm homicides or that have shown notable changes?; and 4) how are the factors of urbanization, poverty, and ethnicity/race simultaneously associated with the incidence of firearm homicide?

2. Methods

2.1. Data

To address the research questions posed, county-level counts of firearm homicide among U.S. residents, stratified by calendar year, decedent ethnicity/race (Hispanic, non-Hispanic White, non-Hispanic Black, non-Hispanic American Indian/Alaska Native [AI/AN], non-Hispanic Asian/Pacific Islander [A/PI]), and decedent age group (collectively covering decedents of all ages) were tabulated using comprehensive National Vital Statistics System mortality data for the years 2004–2018 (Murphy et al., 2021). These data are routinely collected and do not involve research on human subjects; data use permission was obtained through a study-specific agreement with the National Center for Health Statistics (NCHS). To determine population-based rates with numerators and denominators (resident population estimates) properly aligned, firearm homicide counts were tabulated by county of residence as opposed to county of occurrence.[1] Firearm homicides were identified based on

International Classification of Diseases 10th Revision (ICD-10) underlying-cause-of-death codes X93 – X95 and U01.4 (Miniño et al., 2006); excluded were approximately 300 records indicating firearm assault as a contributing but not the underlying cause of death. Records for approximately 0.4% of decedents did not include information on Hispanic ethnicity and/or age and were also excluded. The final study data set represented 184,171 firearm homicide victims over the fifteen-year study period. The county-level firearm homicide counts were augmented with NCHS / U.S. Census Bureau county-level bridged-race population estimates conforming to the same stratification scheme (NCHS, 2019), NCHS county-level urban/rural designations as of 2013 (Ingram and Franco, 2014), and annual county-level estimates of the percent of all residents living in poverty from the U.S. Census Bureau Small Area Income and Poverty Estimates Program (Elser et al., 2020).

For two small clusters of counties and county-equivalents (hence-forth referred to as counties) in Alaska and Virginia affected by geographic boundary changes during the analysis period, data were aggregated and treated as representing single county-level units. This resulted in a final count of 3138 consistently defined county-level geographic units covering the entirety of the U.S.

2.2. Data analysis

The first three research questions focus on geographic concentration of firearm homicides, and these questions are addressed in terms of crude rates as the most straightforward measure of per capita burden. To assess geographic concentration in the most general sense (question 1), the county-level data were initially aggregated across all years (2004–2018) and demographic groups in order to obtain the most statistically stable (reliable) estimates of county-level firearm homicide rates, in particular for less populous counties. The crude rate per 100,000 person-years was then calculated for each individual county. The extent to which firearm homicides were disproportionately concentrated among subsets of the population defined by geography was quantified as follows: 1) counties were sorted in descending order by rate of firearm homicide; 2) each county's fraction of the national firearm homicide total and its fraction of the U.S. population (in person-years) were calculated; and 3) cumulative fractions of firearm homicide and population share were tabulated from top to bottom of the sorted list. The resulting tabulation shows the long-term fraction of the U.S. population among which any given fraction of firearm homicides was most densely concentrated; while this approach will admit geographic clusters with high concentrations it will also admit isolated counties with high concentrations.

For purposes of mapping, counties were grouped into three tiers. The first tier consists of counties representing the most concentrated third of all firearm homicides nationally (i.e., those with the highest rates and collectively accounting for one-third of all U.S. firearm homicides). The second tier consists of counties representing the second most concentrated third, and the third tier consists of counties representing the least concentrated third. To preclude bias, all counties were included in the process of constructing these tiers, but only

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[1]County of occurrence coincided with county of residence (82%) or a directly neighboring county (11%) for 93% of victims.

counties with at least 20 firearm homicides are identified by tier in the resulting maps, for reasons pertaining both to statistical stability and disclosure prevention.

To assess the extent to which firearm homicides might have become more concentrated over time in terms of geographically-defined subsets of the population (question 2), the data were analyzed following the framework described above for three successive five-year periods (2004–2008, 2009–2013, and 2014–2018). Results for these sub-periods are described quantitatively but not mapped. This sub-period analysis also facilitates examination of whether the highest concentrations of firearm homicides persisted in certain areas over time, as well whether certain areas showed notable changes (question 3).

As with the initial analysis, the simultaneous associations of urbanization, poverty, and ethnicity/race with firearm homicide rates (question 4) were evaluated using fifteen-year data aggregates. In order to maximize the stability of rate estimates across combinations of these factors, the six-level NCHS county urbanization scheme was collapsed to three levels (large metro, small/medium metro, and non-metro) and the continuous county-level poverty variable was collapsed to representative and equidistant midpoints of nine successive intervals ($\leq$ 6.2%, 6.3%–8.7%, …, 21.3%–23.7%, $\geq$ 23.8%) selected to adequately reflect variation in poverty conditions. Data were then simultaneously stratified by the three indicated factors and collapsed across years. To compensate for possible interaction between age and one or more of these factors, rates for this part of the analysis were age-adjusted to the U.S. year 2000 standard population. For each of the urbanization categories, empirical rates by ethnicity/race were then plotted across poverty levels.

Data analysis was carried out using the Statistical Analysis System (SAS) Version 9.4®. Maps and plots were generated using the SAS/GRAPH GMAP and GPLOT procedures.

3.   Results

3.1.   Basic geographic patterns

Aggregating data across the entire fifteen-year study period revealed empirical geographic patterns that are not as clear for shorter periods. Such aggregation resulted in statistically stable rates for 919 individual counties, covering just under 82% of the U.S. resident population (on average across years). High concentrations of firearm homicides were present in both metro and non-metro areas. Fig. 1 shows the counties by concentration tier.

Very few counties in the west central and western U.S. were among those representing the most concentrated third of firearm homicides nationally. Those visible in Fig. 1 are Chaves County NM, Choctaw County OK, McCurtain County OK, and Wyandotte County KS (Kansas City KS).

Fig. 2 highlights selected regional breakouts. The region in the upper left of Fig. 2 includes states covering major metro areas of the northeastern seaboard. Progressing from south to north along the coastal area, counties among those representing the most concentrated third of firearm homicides nationally are Washington DC, Prince Georges County MD

(greater Washington DC area), Baltimore City MD, Philadelphia County PA (coextensive with Philadelphia), and Essex County NJ (Newark).

The region in the upper right of Fig. 2 includes states covering major metro areas of the north central U.S. Progressing from west to east, counties that are among those representing the most concentrated third of firearm homicides nationally are Jackson County MO (Kansas City), St. Louis City MO, St. Louis County MO and St. Clair County IL (greater St. Louis area), Pemiscot County MO, Milwaukee County WI (Milwaukee), Cook County IL and Lake County IN (Chicago and Gary), Marion County IN (coextensive with Indianapolis), Saginaw County MI (Saginaw), Genesee County MI (Flint), Wayne County MI (Detroit), Hamilton County OH (Cincinnati), and Mahoning County OH (Youngstown).

The region in the lower left of Fig. 2 includes states in the southeastern U.S. and documents several geographic expanses outside of major metro areas with high concentrations of firearm homicides. Most notably, between Lauderdale County TN (north of Memphis) and Orleans Parish LA (coextensive with New Orleans), there is a 400-mile corridor traversing many non-metro counties that are among those representing the most concentrated third of firearm homicides nationally. A similar corridor is visible through the Carolinas near the coast and another across central Alabama.

3.2. Disproportionate concentration of firearm homicides

One-third of all U.S. firearm homicide victims during the overall study period (2004–2018) were residents of counties representing just under 11% of the U.S. population (on average across years), and two-thirds of such victims were residents of counties representing approximately one-third of the U.S. population (Table 1). This strongly disproportionate concentration varied only modestly across successive study sub-periods.

3.3. Counties with persistently high firearm homicide concentrations

Disproportionate concentration of firearm homicides among a small fraction of the U.S. population does not necessarily imply that the same counties were persistently among those with the highest concentrations over time. It is therefore of interest to examine the extent to which high concentrations might have persisted in some areas. Across the successive sub-periods 2004–2008, 2009–2013, and 2014–2018, a group of 77 counties were consistently among those with the most concentrated levels of firearm homicide. Here, "consistently" means that a given county was among those having the highest concentrations (i.e., among the highest third) nationally during each of the three sub-periods, and moreover exhibited a statistically stable rate estimate (based on at least 20 firearm homicides) when considering the full fifteen-year study period. These 77 counties accounted for 27% - 28% of all firearm homicides nationally across the sub-periods, while representing just 8% of the U.S. population (on average across years). This group of counties encompasses many large cities, as well as many smaller cities and towns (Appendix Table A.1); nearly 40% of these counties (30 of 77) are non-metro counties. Of note, 15 of the 77 counties are in the state of Mississippi, and most of these (13 of 15) are classified as non-metro counties with current population sizes ranging from approximately 9000 to approximately 45,000 residents (CDC, 2020b).

3.4. Specific counties that improved or worsened

Statistically stable year-to-year firearm homicide rate estimates are generally available only for more populous counties. Several counties that exhibited prolonged declines or increases in firearm homicide rates are anecdotally noted here.

Among the more populous counties showing notable declines in firearm homicide rates are Alameda County CA (Oakland), Los Angeles County CA (Los Angeles), and Prince George's County MD (greater Washington DC area). Between 2006 and 2018 the annual rate in Alameda County decreased by well over half, gradually declining from 10.7 to 3.7 per 100,000 residents. Between 2005 and 2012 the annual rate in Los Angeles County decreased by over half, gradually declining from 8.9 to 4.1 per 100,000 residents, and subsequently remained relatively level. Over the ten-year period from 2005 to 2014 the annual rate in Prince George's County decreased by over two-thirds, declining from 15.4 to 4.7 per 100,000 residents, followed by a subsequent increase with annual rates ranging from 7.2 to 9.6 per 100,000 residents. Although the rate decrease observed for Prince George's County is substantial, the annual firearm homicide rate for the entire fifteen-year study period (9.3 per 100,000 person-years) nonetheless places it among those counties representing the most concentrated third of firearm homicides nationally.

Among the more populous counties with prolonged increases in firearm homicide rates are St. Louis County MO (distinct from the City of St. Louis) and Cuyahoga County OH (Cleveland). Between 2004 and 2018 the annual rate in St. Louis County nearly tripled, gradually increasing from 5.1 to 14.2 per 100,000 residents. Between 2004 and 2016, the annual rate in Cuyahoga County more than doubled, increasing from 4.8 to 11.6 per 100,000 residents, and subsequently decreased somewhat modestly in 2017 (to 11.3 per 100,000) and somewhat more notably in 2018 (to 10.0 per 100,000).

3.5. Associations with urbanization, poverty, and ethnicity/race

Level of urbanization, level of poverty, and ethnicity/race collectively showed clear associations with rates of firearm homicide. Considering these factors simultaneously, firearm homicide rates (here age-adjusted) in large metro counties (Fig. 3) were generally higher at higher levels of surrounding poverty for all ethnicity/race groups, reaching the highest levels for the non-Hispanic Black group.

Firearm homicide rates in small/medium metro counties (Fig. 4) exhibited a less consistent pattern. While not reaching the same levels observed for large metro counties, rates for the non-Hispanic Black group again increased the most notably with increasing levels of surrounding poverty but trailed off somewhat at the highest levels of poverty. For the non-Hispanic White and non-Hispanic AP/I groups, rates generally increased with increasing levels of surrounding poverty. For the Hispanic group, rates similarly tended to increase with higher levels of surrounding poverty but leveled off and ultimately decreased at the highest levels of poverty. For the non-Hispanic AI/AN group, rates varied across levels of surrounding poverty but were nearly the same at the lower and upper poverty extremes.

In non-metro counties (Fig. 5), firearm homicide rates followed a steady upward gradient for the non-Hispanic Black and non-Hispanic White groups, with rates for both groups peaking

at the highest level of surrounding poverty. Rates for the non-Hispanic AI/AN and Hispanic groups also increased with surrounding poverty levels but less consistently so; at the highest level of poverty the rate for the Hispanic group trailed off modestly.

4. Discussion

The findings of this study show high concentrations of firearm homicide present in both metro and non-metro areas. High concentrations are evident in multiple metro areas along the northeastern seaboard and in the north central U.S., and along several geographic corridors in the southeastern U.S. that traverse both metro and non-metro areas. Among the geographically comprehensive set of 3138 U.S. counties, a small subset representing just 8% of the U.S. population (on average across years) exhibited persistently high rates of firearm homicide throughout the study period, accounting for over one-fourth of all firearm homicides nationally.

The study findings also generally indicate a pattern of higher rates of firearm homicide with higher levels of surrounding poverty, in both metro and non-metro areas and across ethnicity/race groups. Non-Hispanic Blacks had the highest rates of firearm homicide across the poverty spectrum in both metro and non-metro counties; in non-metro counties rates for the non-Hispanic AI/AN group were consistently second highest.

The poverty gap between non-metro and metro areas in the U.S. has diminished over time, narrowing to an average of approximately 3% during the most recent decade (U.S. Department of Agriculture [USDA], 2020). This difference, however, varies by region, with the South having the largest poverty gap between non-metro and metro areas (approximately 6%) (USDA, 2020). Non-metro counties with the most pronounced and persistent poverty are also in the South, particularly along the Mississippi Delta (USDA, 2020) where rates of firearm homicide in many counties were also persistently high.

Poverty is associated with many risk factors for violence, including school dropout, residential and economic instability, high unemployment, and limited educational and economic opportunities (Galster et al., 2007; Shonkoff et al., 2012; Braveman and Gottlieb, 2014). A national cohort study of income inequality and firearm homicide at the county level found that higher inequality (based on the Gini Index) was associated with higher rates of firearm homicide among persons 14–39 years of age and that this association persisted for African Americans even when accounting for county-level factors including crime, deprivation, social capital, urbanization, and firearm ownership (Rowhani-Rahbar et al., 2019). Policies and programs addressing economic and social inequality are potential areas to study for the prevention of firearm violence. These include, for instance, policies that strengthen household financial security (e.g., tax credits, childcare subsidies, temporary assistance to families, livable wages) and that improve access to high-quality early childhood education (CDC, 2019; David-Ferdon et al., 2016). These types of supports have not been evaluated for their potential impact on firearm homicide specifically, but they have been shown to lift families out of poverty and have demonstrated impacts on school performance, school dropout, substance use, behavioral problems, and arrests for violent and nonviolent

offenses, convictions, and incarceration, well into adulthood (Milligan and Stabile, 2011; Love et al., 2005; Marr et al., 2015; Reynolds et al., 2001, 2007, 2011).

The disproportionate concentration of firearm homicides among a small fraction of the U.S. population geographically, as quantified by this study, likely understates the true degree of concentration because firearm homicides are often concentrated in areas much smaller than counties. Previous research shows that firearm violence is not widespread in communities but rather is limited to certain "hot spot" locations and within high-risk social networks (e.g., gangs) (Braga et al., 2009; Papachristos et al., 2015). For example, one study found that 74% of the gun violence in Boston over a 29-year period occurred in only 5% of the street blocks and intersections in the city (Braga et al., 2009). In another study of one Boston community, researchers found that 85% of injuries from firearm violence occurred within only one social network (Papachristos et al., 2012; Papachristos and Wildeman, 2014). Street outreach approaches and proactive policing strategies such as focused deterrence and directed police patrols are examples of prevention approaches that place an emphasis on high-risk populations and specific locations within communities. These approaches are associated with reductions in firearm-related assaults and other violent crimes committed with firearms, gang-related violence, and crime associated with drug markets (Braga et al., 2018; Butts et al., 2015; Koper and Mayo-Wilson, 2012).

Other prevention approaches focus on characteristics of communities that elevate the risk for violence and crime such as physical disorder, segregation of residential neighborhoods by income, economic instability, and density of alcohol outlets (Goin et al., 2018; Krivoa et al., 2015; Jay, 2020). Efforts to mitigate these community-level risk factors include, for example, the remediation of abandoned buildings and blighted areas; creating and maintaining green spaces; low-income housing tax credits; local investments and improvements in basic services and commercial activity (e.g., business improvement districts); and local policies to reduce alcohol-related crime and violence (David-Ferdon et al., 2016). These types of approaches are associated with reductions in some of the most serious violence in metro communities including gun assaults, youth homicide, and other violent crime (Bogar and Beyer, 2015; Branas et al., 2016; MacDonald et al., 2010; Moyer et al., 2019).

Finally, there are myriad policies at the federal, state, and local levels affecting supply, access to and ownership of, use, and secondary trading of firearms (RAND Corporation, 2018). There is some evidence demonstrating reductions in firearm homicide associated with certain policies such as dealer background checks (RAND Corporation, 2018) and those limiting access to firearms among persons under a restraining order for domestic violence (Zeoli et al., 2018), but many policies either lack conclusive evidence of effectiveness or have not been sufficiently evaluated with respect to various firearm-related outcomes (RAND Corporation, 2018; Santaella-Tenorio et al., 2016).

Much remains to be learned about how best to prevent firearm violence. This is especially true in non-metro areas where few prevention policies, programs, and practices have been implemented and evaluated. Some approaches with promising results for reducing firearm-related violence in metro areas might not be as well-suited for non-metro areas (e.g.,

abandoned building/vacant lot remediation) or might require resources that are in short supply in such areas (e.g., trained outreach workers, community and social service supports). This is an important area where more research is needed.

4.1. Limitations

Several study limitations are worth noting. First, combining data from multiple sources supports analysis with geographic resolution to the county level; finer geographic resolution might potentially have supported identification of even more focused geographic patterns in firearm homicides than those presented. Nonetheless, nationally comprehensive geographic analysis of firearm homicides across more than 3000 distinct geographic units resulted in the identification of certain patterns (e.g., lengthy and continuous corridors of high firearm homicide rates traversing both metro and non-metro areas) that are not frequently discussed. Second, determination of rates with numerators and denominators properly aligned required analysis by county of residence as opposed to county of occurrence. While the influence of this constraint has not been quantified, the relatively high level of geographic overlap or near-overlap (reported in the description of the data) suggests that qualitatively, the conclusions of this study would not have been appreciably impacted. Third, results related to urbanization, poverty, and ethnicity/race should be interpreted with the understanding that urbanization and poverty are contextual factors. That is, a single level of urbanization is used to characterize an entire county, and similarly an estimated poverty percentage is used to characterize the economic environment for an entire county. These factors do not necessarily reflect conditions closely affecting any particular group, nor do they necessarily describe the specific circumstances of firearm homicide victims or perpetrators. Still, the data provide valuable information even if only from an ecologic perspective. Fourth, rates should be interpreted with caution for Hispanic, non-Hispanic AI/AN, and non-Hispanic A/PI populations because they might be underestimated (Arias et al., 2016). Lastly, this study does not address firearm access or other behavioral, situational, and environmental factors that vary within and across states.

5. Conclusion

Preventing firearm homicide is a challenge for communities across the country. The findings of this study underscore the importance of characterizing patterns of firearm homicide both geographically and sociodemographically to better inform prevention efforts. While progress has been made in recent years to address firearm homicide in metro areas, important gaps remain in studying and identifying effective solutions for non-metro areas. Understanding the full extent and nature of the problem is a crucial step toward achieving measurable reductions in firearm homicide across the U.S.

Funding

Appendix A.: Appendix

Table A.1

U.S. counties with persistently high firearm homicide concentrations, 2004–2018.

State	County (or equivalent)	Classification	Average population 2004–2018	Annual firearm homicide rate per 100,000 2004–2018	Largest cities / towns
AL	Dallas	Micropolitan (non-metro)	42,518	22.7	Selma
	Jefferson	Large central metro	658,001	14.9	Birmingham
	Lowndes	Medium metro	11,170	18.5	Fort Deposit; Haynesville; Mosses
	Macon	Non-Core (non-metro)	20,711	25.8	Tuskegee
	Mobile	Medium metro	410,292	11.8	Mobile
	Montgomery	Medium metro	227,142	14.3	Montgomery
	Russell	Medium metro	54,654	11.3	Phenix City
AR	Crittenden	Large fringe metro	49,949	12.1	West Memphis
	Jefferson	Small metro	75,355	19.1	Pine Bluff
	Phillips	Micropolitan (non-metro)	21,203	24.5	Helena - West Helena
	Pulaski	Medium metro	383,627	11.8	Little Rock
	Union	Micropolitan (non-metro)	41,293	10.3	El Dorado
DC	District of Columbia	Large central metro	625,427	16.0	Washington DC
FL	Duval	Large central metro	878,746	10.0	Jacksonville
GA	Bibb	Small metro	154,486	10.6	Macon
	Burke	Medium metro	22,884	9.3	Waynesboro
	Chatham	Medium metro	268,337	10.4	Savannah
	Clayton	Large fringe metro	266,455	10.3	College Park; Forest Park; Riverdale
	DeKalb	Large fringe metro	706,903	10.3	Brookhaven; Decatur; Dunwoody; Tucker
	Fulton	Large central metro	937,949	10.0	Atlanta
IL	Cook	Large central metro	5,210,104	9.6	Chicago
	St. Clair	Large fringe metro	265,167	11.9	Belleville; Collinsville; East St. Louis; O'Fallon
IN	Lake	Large fringe metro	490,889	13.0	Gary; Hammond
	Marion	Large central metro	911,996	11.7	Indianapolis
KS	Wyandotte	Large fringe metro	159,089	15.3	Kansas City, KS
LA	Caddo Parish	Medium metro	251,636	11.6	Shreveport
	Concordia Parish	Micropolitan (non-metro)	20,288	10.8	Ferriday; Vidalia
	East Baton Rouge Parish	Medium metro	436,959	15.5	Baton Rouge
	Jefferson Parish	Large fringe metro	436,479	12.5	Kenner
	Madison Parish	Non-Core (non-metro)	12,023	12.8	Tallulah
	Orleans Parish	Large central metro	367,851	39.8	New Orleans

State	County (or equivalent)	Classification	Average population 2004–2018	Annual firearm homicide rate per 100,000 2004–2018	Largest cities / towns
	St. John the Baptist Parish	Large fringe metro	44,964	17.2	LaPlace
MD	Baltimore City	Large central metro	619,218	30.6	Baltimore
MI	Genesee	Medium metro	423,584	10.1	Flint
	Wayne	Large central metro	1,832,474	16.2	Detroit
MS	Bolivar	Micropolitan (non-metro)	34,241	13.0	Cleveland
	Claiborne	Micropolitan (non-metro)	9665	17.2	Port Gibson
	Coahoma	Micropolitan (non-metro)	25,698	25.2	Clarksdale
	Grenada	Micropolitan (non-metro)	21,761	15.6	Grenada
	Hinds	Medium metro	245,118	19.1	Jackson
	Holmes	Non-Core (non-metro)	19,037	20.0	Durant; Lexington; Tchula
	Jefferson Davis	Non-Core (non-metro)	12,188	19.7	Prentiss
	Leflore	Micropolitan (non-metro)	31,816	14.7	Greenwood
	Marion	Non-Core (non-metro)	26,013	10.8	Columbia
	Scott	Non-Core (non-metro)	28,278	11.1	Forest; Morton
	Sunflower	Micropolitan (non-metro)	28,942	11.3	Indianola
	Tunica	Large fringe metro	10,474	14.6	Tunica; North Tunica; Tunica Resorts
	Walthall	Non-Core (non-metro)	15,079	9.7	Tylertown
	Washington	Micropolitan (non-metro)	50,704	19.5	Greenville
	Wilkinson	Non-Core (non-metro)	9601	16.7	Centreville; Woodville
MO	Jackson	Large central metro	676,231	14.2	Kansas City, MO
	St. Louis City	Large central metro	317,575	30.8	St. Louis
NJ	Essex	Large central metro	787,134	12.6	Newark
NM	Chaves	Micropolitan (non-metro)	64,650	10.6	Roswell
NC	Columbus	Non-Core (non-metro)	56,558	11.8	Whiteville
	Edgecombe	Small metro	55,153	10.0	Rocky Mount
	Robeson	Micropolitan (non-metro)	132,348	18.3	Lumberton
	Scotland	Micropolitan (non-metro)	35,941	11.9	Laurinburg
	Vance	Micropolitan (non-metro)	44,694	14.6	Henderson
PA	Philadelphia County	Large central metro	1,535,620	17.1	Philadelphia
SC	Allendale	Non-Core (non-metro)	10,113	13.2	Allendale; Fairfax
	Charleston	Medium metro	362,520	8.7	Charleston; North Charleston; Mt. Pleasant
	Colleton	Non-Core (non-metro)	38,242	13.4	Walterboro
	Hampton	Non-Core (non-metro)	20,602	13.6	Estill; Hampton; Varnville
	Jasper	Small metro	25,208	16.4	Hardeeville; Ridgeland

State	County (or equivalent)	Classification	Average population 2004–2018	Annual firearm homicide rate per 100,000 2004–2018	Largest cities / towns
	Marion	Non-Core (non-metro)	32,793	8.7	Marion; Mullins
	Marlboro	Micropolitan (non-metro)	28,159	10.9	Bennettsville
	Orangeburg	Micropolitan (non-metro)	90,833	10.3	Orangeburg
TN	Shelby	Large central metro	928,810	14.9	Memphis
VA	Danville City	Micropolitan (non-metro)	43,032	14.7	Danville
	Hopewell City	Large fringe metro	22,373	9.8	Hopewell
	Newport News City	Large fringe metro	181,347	9.3	Newport News
	Norfolk City	Large central metro	243,804	10.7	Norfolk
	Petersburg City	Large fringe metro	32,076	23.7	Petersburg
	Portsmouth City	Large fringe metro	96,272	11.9	Portsmouth
	Richmond City	Large central metro	210,208	18.0	Richmond
WI	Milwaukee	Large central metro	946,050	9.4	Milwaukee

Data Sources: National Vital Statistics System Mortality Data (ICD-10 Underlying-Cause Codes X93–X95, U01.4).

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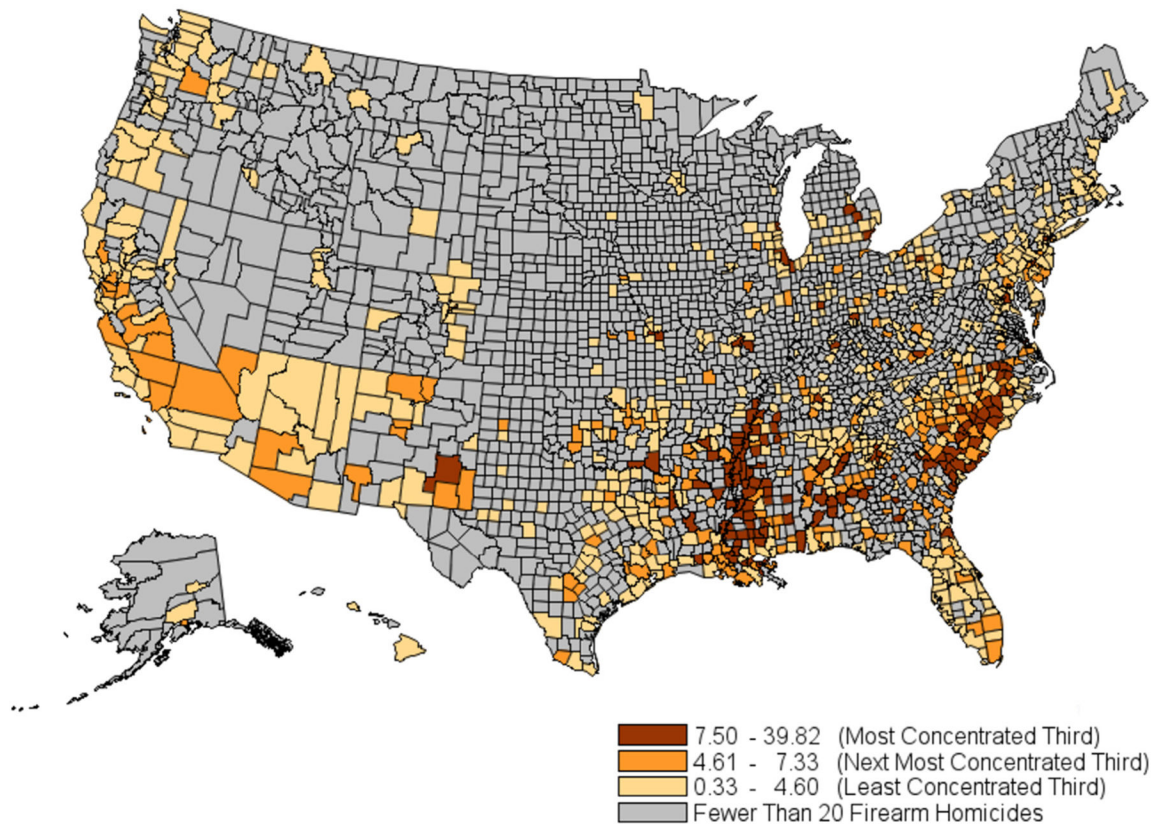
Fig. 1.
Firearm homicide rates per 100,000 person-years, U.S., 2004–2018. Data sources: National Vital Statistics System Mortality Data (ICD-10 Underlying Cause Codes X93–X95, U01.4); National Center for Health Statistics / U.S. Census Bureau Bridged-Race Population Estimates.
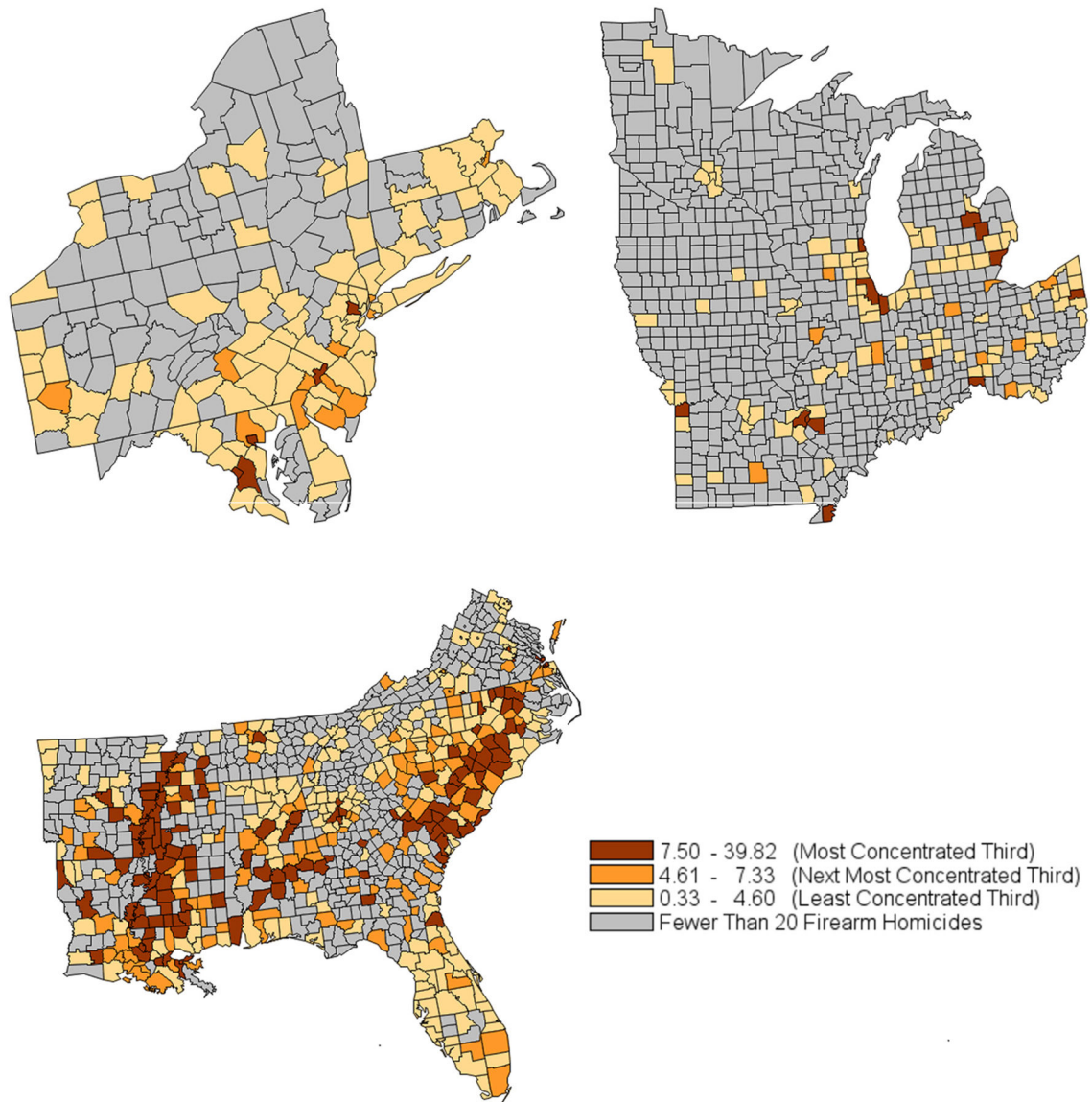
▉ 7.50 - 39.82	(Most Concentrated Third)
▉ 4.61 - 7.33	(Next Most Concentrated Third)
▉ 0.33 - 4.60	(Least Concentrated Third)
▉	Fewer Than 20 Firearm Homicides

Fig. 2.
Firearm homicide rates per 100,000 person-years, regional breakouts, 2004–2018. Data sources: National Vital Statistics System Mortality Data (ICD-10 Underlying Cause Codes X93–X95, U01.4); National Center for Health Statistics / U.S. Census Bureau Bridged-Race Population Estimates. Notes: The upper left region covers the Northeastern Seaboard (CT, DC, DE, MA, MD, NJ, NY, PA, RI). The upper right region represents the North Central U.S. (IA, IL, IN, MI, MN, MO, OH, WI). The lower left region represents the Southeastern U.S. (AL, AR, FL, GA, LA, MS, NC, SC, TN, VA).
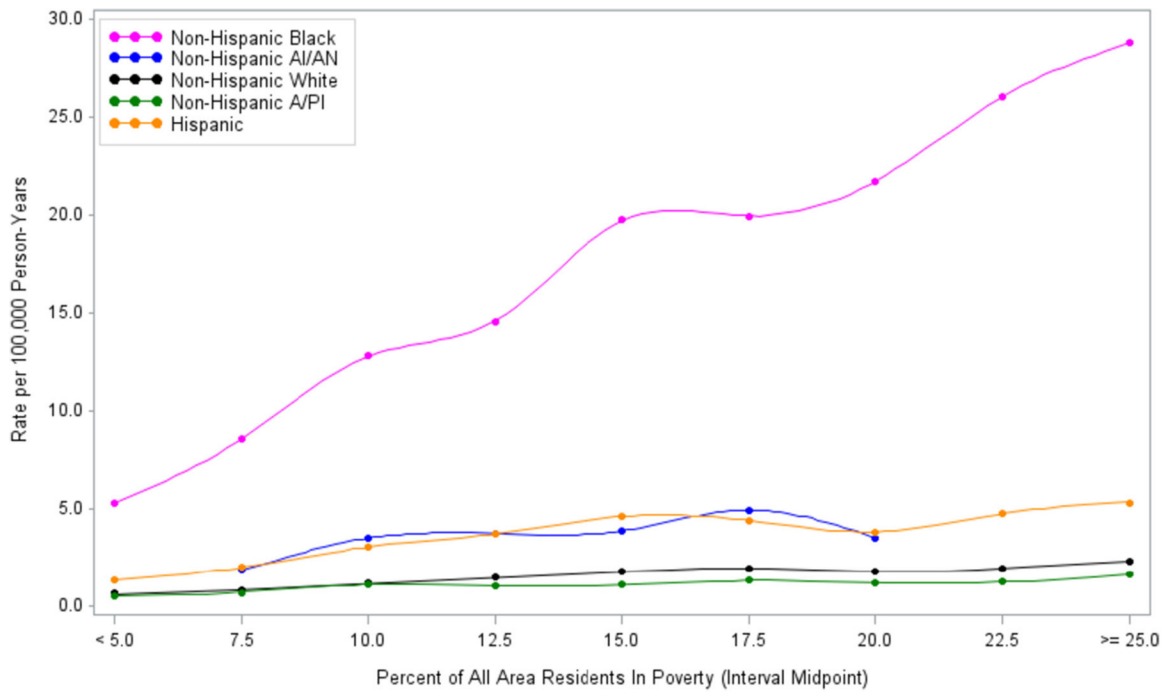
Fig. 3.
Age-adjusted firearm homicide rates – associations with poverty by ethnicity/race – large metro counties (part of a metropolitan statistical area with 1 million population), 2004–2018. Data sources: National Vital Statistics System Mortality Data (ICD-10 Underlying Cause Codes X93–X95, U01.4); National Center for Health Statistics / U.S. Census Bureau Bridged-Race Population Estimates; U.S. Census Bureau Small Area Income and Poverty Estimates Program. Note: Rates based on homicide counts <20 not displayed due to lack of statistical stability. Abbreviations: AI/AN - American Indian/Alaska Native; A/PI - Asian/ Pacific Islander.
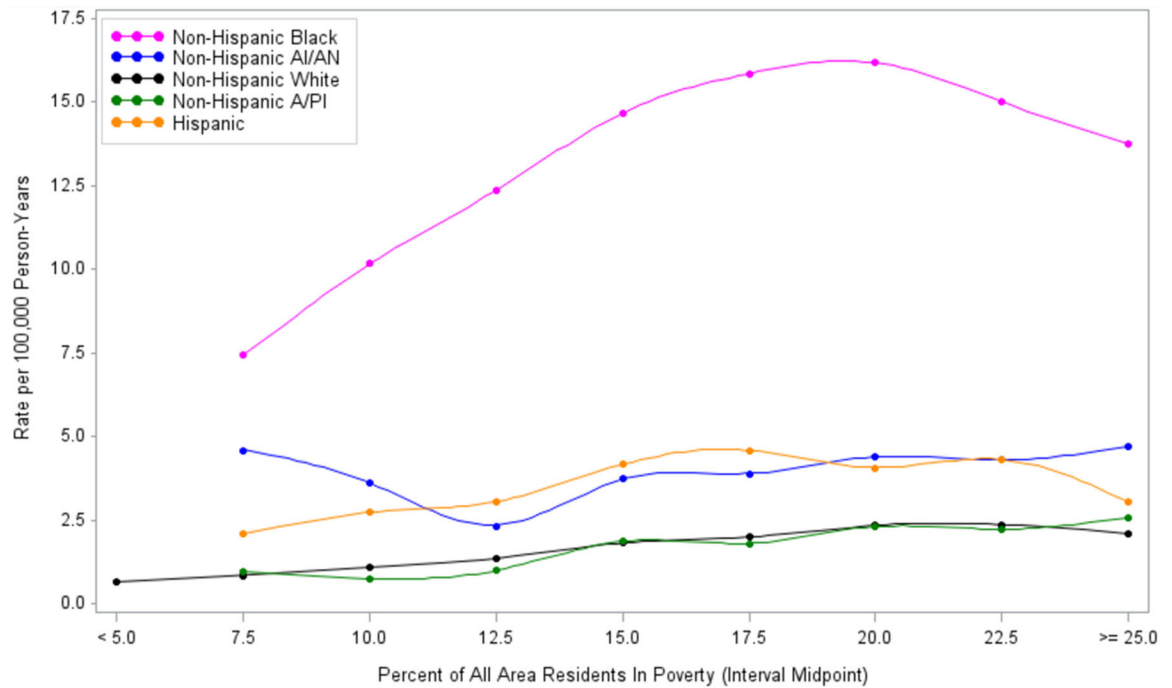
Fig. 4.
Age-adjusted firearm homicide rates – associations with poverty by ethnicity/race – small metro counties (part of a metropolitan statistical area with population < 250,000) and medium metro counties (part of a metropolitan statistical area with 250,000 population < 1 million), 2004–2018. Data sources: National Vital Statistics System Mortality Data (ICD-10 Underlying Cause Codes X93–X95, U01.4); National Center for Health Statistics / U.S. Census Bureau Bridged-Race Population Estimates; U.S. Census Bureau Small Area Income and Poverty Estimates Program. Note: Rates based on homicide counts <20 not displayed due to lack of statistical stability. Abbreviations: AI/AN - American Indian/Alaska Native; A/PI - Asian/Pacific Islander.
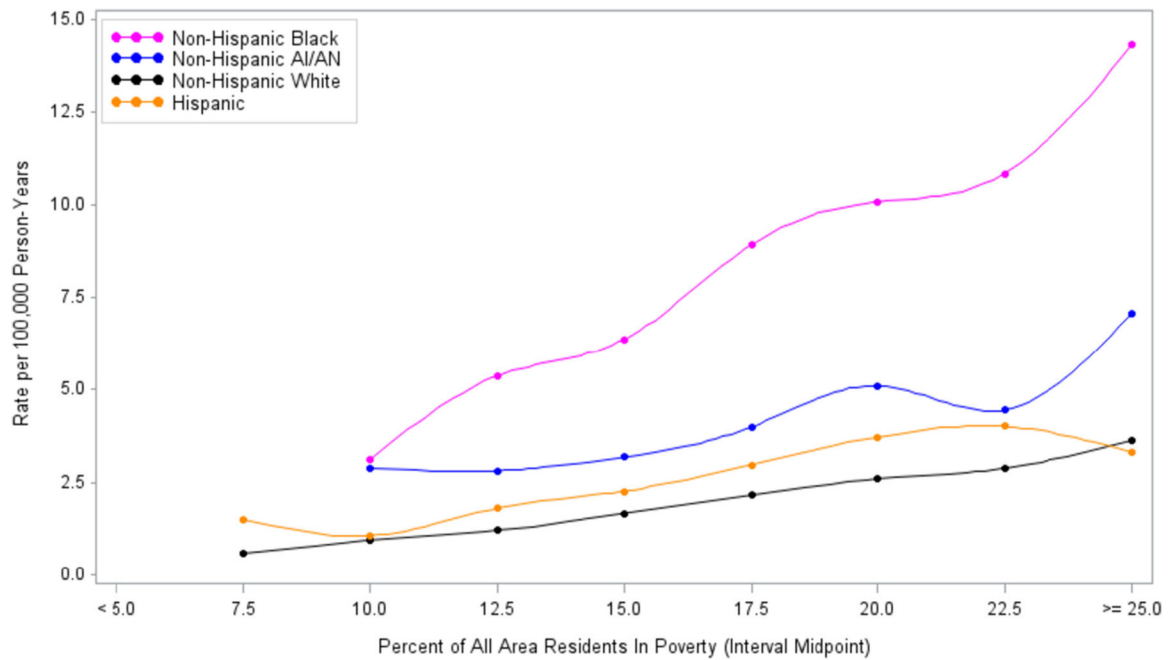
Fig. 5.
Age-adjusted firearm homicide rates – associations with poverty by ethnicity/race – micropolitan (non-metro) counties (part of a micropolitan statistical area having an urban cluster with 10,000 ≤ population < 50,000) and non-core (non-metro) counties (not part of a metropolitan or micropolitan statistical area), 2004–2018. Data sources: National Vital Statistics System Mortality Data (ICD-10 Underlying Cause Codes X93–X95, U01.4); National Center for Health Statistics / U. S. Census Bureau Bridged-Race Population Estimates; U.S. Census Bureau Small Area Income and Poverty Estimates Program. Notes: Rates based on homicide counts <20 not displayed due to lack of statistical stability. Non-Hispanic Asian/Pacific Islander trend not displayed due to sparse data. Abbreviation: AI/AN - American Indian/Alaska Native.

Table 1

U.S. population by firearm homicide concentration tier, overall study period and sub-periods.

Period / sub-period	Fraction of U.S. population in counties representing the most concentrated third of firearm homicides	Fraction of U.S. population in counties representing the next most concentrated third of firearm homicides	Fraction of U.S. population in counties representing the least concentrated third of firearm homicides
2004–2018	10.68%	22.73%	66.59%
2004–2008	10.41%	20.98%	68.61%
2009–2013	10.54%	22.10%	67.36%
2014–2018	9.92%	22.11%	67.97%

Data Sources: National Vital Statistics System Mortality Data (ICD-10 Underlying-Cause Codes X93–X95, U01.4).

National Center for Health Statistics / U.S. Census Bureau Bridged-Race Population Estimates.