Won't You Be My Neighbor?

Neighborhood Characteristics Associated with Mass Shootings in the US

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Acknowledgements

The authors would like to thank Cyrus J. Schleifer for statistical consultation and Steven Hewett for assistance with geocoding.

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Abstract

We measure the association between neighborhood characteristics and mass shootings building on existing research on neighborhoods and social and economic composition and crime. Using publicly available national data from the Gun Violence Archive (2014–2019), we geocoded and merged mass shooting incidents with US Census American Community Survey data. Our bivariate results suggest that census tracts with a mass shooting are more economically disadvantaged and have greater concentrations of Black and Hispanic residents. In multivariate models, the association with concentrated disadvantage is no longer significant and the likelihood of a mass shooting increases until the proportion of Black residents reaches 80 percent, at which point the likelihood decreases, controlling for other community characteristics. Further, as the proportion of Black residents and the level of disadvantage increase together, the odds of a mass shooting incident in that tract are reduced. To address and prevent mass shootings, an expanded theory of neighborhood crime that incorporates the unique nature of mass shootings needs to consider structural racism, racial dynamics, and protective factors in relationship to economic conditions.

Keywords: gun violence, mass shootings, community characteristics, crime

Declarations

Funding: No external funding was received for this research.

Conflicts of Interest/Competing Interests: Authors have no conflicts of interest or competing interests.

Availability of data and material: All data are publicly available.

Code availability: Coding of data are available upon request.

Introduction

Mass shootings in the US have risen in the last decade and have permeated everyday life, including, but not limited to active shooter drills at elementary schools, syllabus statements on active shooters in college and university courses, universal screening and baggage constraints at large cultural and sporting events, and workplace active shooter safety measures. While mass shootings comprise about 1% of firearm-related mortality (Rowhani-Rahbar, Zatzick, & Rivara, 2019), the spectacle of these incidents has garnered large-scale public and media attention to this unique manifestation of gun violence in America. We use the most common – but granted, somewhat arbitrary – definition of mass shootings from our comprehensive data source—gun incidents that have injured or killed four or more people, not including the shooter, at a single location in the same general timeframe. To give a sense of pervasiveness, 417 verified mass shooting incidents occurred in 2019 alone, resulting in more than 2,000 victims. In 2020, 611 mass shooting incidents occurred (Gun Violence Archive, n.d.).

Our paper investigates the neighborhood demographic and compositional characteristics associated with mass shootings by drawing upon the more expansive literature on other types of crime with potential relevance to mass shootings—violent crime, generally, and domestic violence and child maltreatment, specifically. These studies often find an association with race and ethnic and/or economic composition of neighborhoods and crime, but these associations have not been thoroughly investigated for associations with mass shootings. Most mass shootings do not occur at workplaces, schools, or concerts, but these types of mass shootings get the most media attention (Fox, Gerdes, Duwe, & Rocque, 2020). The majority occur in residential areas, often inside the home and involving domestic violence (Everytown for Gun Safety, 2018; Florida & Boone, 2018; Smart & Schell, 2021). In our study, we draw from

theories and research on neighborhoods and crime, more generally, and domestic violence and child maltreatment, more specifically, to examine the association between neighborhoods and mass shootings. We use publicly available census data merged with data compiled by the Gun Violence Archive and geo-coded to the census tract level. We are the first to take this approach to modeling the independent association of community characteristics on mass shootings, building off theories of neighborhoods and crime. Given the prevalence and potentially unique nature of mass shootings, we investigate whether these patterns of community-level associations resemble other forms of violent crime.

Gun Violence

The research on gun violence has focused mostly on the larger policy context in which guns are accessed and used. For example, levels of household gun ownership have been associated with both general firearm homicide and domestic firearm-related homicides at the state level (Kivisto, Magee, Phalen, & Ray, 2019; Siegel, Ross, & King, 2013). Similarly, right-to-carry laws show a significant association with increased violent crime at the state level (Donohue, Aneja, & Weber, 2019). Stand-your-ground laws show a significant relationship with increased rates of both total homicides and firearm homicides, in particular (Cheng & Hoekstra, 2013; Guettabi & Munasib, 2018; Humphreys, Gasparrini, & Wiebe, 2017; McClellan & Tekin, 2017). Research has also found that adolescents are less likely to carry guns in states with some background check laws after the availability of the National Instant Criminal Background Check System (NICS) (Timsina et al., 2020). Nonetheless, a recent review of this policy context and gun violence literature finds this research limited in its conclusions (Smart et al., 2020). Studies of gun violence that examine community characteristics generally focus on just one or a few specific areas, such as cities. For instance, a study of pediatric gun injury at one large trauma

center found that gun violence is concentrated in low-income neighborhoods surrounding this center (Bayouth, Lukens-Bull, Gurien, Tepas, & Crandall, 2019).

Mass Shootings

In this section, we describe studies on mass shootings, a particular variant of gun violence. Capellan and Gomez (2018) examined demographic and background characteristics, as well as motivations and pre-event behaviors, of mass public shooters from 1984 to 2015, where a mass public shooting is defined as an event where an offender has killed or attempted to kill four or more victims on a public stage. Most mass public shooters are single White males in their thirties, and about 40 percent had a known or suggested mental illness. Comparing the time periods of 1986-1999 to 2000-2015, the authors found that mass public shooters in the latter period were significantly less likely to be White compared to the end of the twentieth century and were over twice as likely to be Black. They were also less likely to be single or divorced and more likely to be employed. In terms of motivations and pre-event behaviors, the vast majority (over 85 percent) of mass public shooters had access to firearms (i.e., owned a gun, lived in a household with firearms, or were issued firearms due to military or law enforcement backgrounds), and the proportion increased significantly from the 1985-1999 time period to the 2000-2015 time period. Notably, these statistics do not include non-public violence, such as domestic violence, which is a significant portion of mass shootings, generally.

In terms of public policy and gun control legislation influences on mass shootings, a few recent studies have begun to explore this, but the research has some methodological flaws as outlined by Smart & Schell (2020), primarily due to low incidence rates and statistical sensitivity. One study examined the effect of large-capacity magazine bans on high-fatality mass shootings and found an association between these bans and reductions of high-fatality mass

shootings (Klarevas, Conner, & Hemenway, 2019). Another study examined the influence of mass shooting incidents on the enactment of gun control policies and found a positive association (Luca, Deepak, & Poliquin, 2020). This line of research is still in its nascent stage.

A few studies have examined mass shootings in relation to geographic characteristics. One study found that neither gun ownership rates, prevalence of depression, nor poverty had any significant associations with likelihood of a mass shooting at the state level (Lin, Fei, Barzman, & Hossain, 2018). At the county level, a longitudinal panel study found that mass shootings are more likely to occur in counties with high levels of both income and income inequality (Cabrera & Kwon, 2018). A descriptive analysis published in a media outlet found that communities with larger Black populations were more likely to have a mass shooting, defined as three or more victims (Florida & Boone, 2018). This analysis, though similar to our own, did not look at community characteristics in relation to one another. This is a notable gap in the literature, as social and demographic characteristic of communities – such as race and economic conditions – are often correlated with one another as well as violence (Sampson & Wilson, 1995). To our knowledge, no study has examined the independent contribution of neighborhood demographic and compositional characteristic to mass shooting incidents, nor included operationalized constructs of neighborhood disadvantage from established theories of other types of violent and domestic crime.

Race, Ethnicity, and Violent Crime

As noted above, there is limited research on mass shootings relative to the literature on violence, generally. We therefore turn to studies on the social characteristics of violence to make inferences about this specific form of gun violence. A Bureau of Justice Statistics comprehensive report on criminal victimization sheds some light on the variability of violent experiences by

class, race, and ethnicity (Morgan & Oudekerk, 2018). From 2014 to 2018, approximately the same period in which the current study takes place, non-fatal violent crime in America had risen by over 15 percent. Household income appears to be a significant determinant of violent crime, with victimization rates decreasing as income goes up. Households earning less than $25,000 per year, for example, experienced nearly two and a half more violent crimes than those earning between $50,000 and $99,000. Differences in violent crime victimization by race and ethnicity show less pronounced differences. In 2018, Black Americans were only slightly more likely than Whites to experience serious forms of violent crime (1.0 compared to 0.8 percent) and were less likely to experience violent crime, generally (20.4 compared to 24.7 percent). Notably, just over half of all violent victimizations are intrarracial (Morgan, 2017), meaning the offender and the victim are the same race or ethnicity. However, there are significant differences in rates of intrarracial victimization by race and ethnicity. Approximately 63 percent of violent victimizations for Blacks are committed by Black offenders, whereas 57 percent of violent victimizations for Whites are committed by White offenders, and only 40 percent of Hispanic violent victimizations are committed by someone of the same ethnicity (Morgan, 2017). (We use the term Hispanic throughout this paper because a primary source of data for our current study comes from the US Census, and this is the term they use to refer to ethnicity.) In other words, Blacks are more likely than other racial and ethnic groups to be victims of serious violent crime, but not of less serious violent crimes. And, while about half of violent crime occurs between races, victims who are Black are more likely to have the crime committed by someone of their same race.

Yet, when it comes to criminal justice involvement, prosecution, and punishment, racial and ethnic disparities are much starker than the crime victimization rates reveal. Racial and

ethnic disproportionalities in arrest, conviction, and incarceration rates are largely explained by differences in policing and sentencing strategies (Mauer, 2011; Rovner, 2014). Research has shown that Black and Hispanic communities are simultaneously overpoliced and underserved. Residents in these neighborhoods tend be subjected to racial profiling, resulting in disproportionately high arrest and incarceration rates (Mauer, 2011), yet these communities also receive inadequate attention relative to the amount of violence they experience (Butler, 2018; Rios, 2011; Weitzer, 2010). Recurring personal and secondhand experiences of being harassed and ignored increases legal cynicism in the community, whereby residents view the law (and its agents) as illegitimate, unresponsive, and ill-equipped to ensure public safety. Studies on legal cynicism have found that Blacks and Hispanics—despite having a lower tolerance for both violence and minor deviance (i.e., smoking cigarettes, using marijuana, drinking alcohol, and getting into fist fights) in their communities compared to Whites (Sampson & Bartusch, 1998)—are significantly more cynical about the law (Kirk & Matsuda, 2011). This cynicism results in a tendency to handle conflict within the community rather than rely on the police, which can lead to higher crime rates in predominantly Black and Hispanic communities (Kirk & Matsuda, 2011).

Social Disorganization and Crime in Communities

An established theory of crime among social scientists—social disorganization theory—emphasizes place and ecology over individual characteristics as factors associated with crime. The central tenet of this theory is that ecological characteristics of neighborhoods affect residents' ability to assert effective social control – a major inhibitor of crime. Disadvantaged neighborhoods and those with high rates of certain characteristics – such as residential instability, poverty, and racial/ethnic heterogeneity – are posited to have higher crime rates

(Sampson & Groves, 1989; Sampson, Raudenbush, & Earls, 1997). Socially organized communities, on the other hand, exhibit solidarity (shared norms and values), cohesion (strong bonds), and integration (regular and ongoing contact), which helps maintain the social order and reduce crime. A concept known as "collective efficacy" – developed as an extension of social disorganization theory – suggests that residents who do not share strong ties to one another are unable to effectively mobilize and control crime (Sampson, Raudenbush, & Earls, 1997). Regardless of theoretical orientation, hotspot analyses emerging in studies of crime increasingly recognize the importance of place as it pertains to predictions of crime (Weisburd, 2015). Hotspot analyses are usually concentrated to defined locations and limit the extent to which one can generalize to other locations.

Empirical tests of social disorganization and crime often support the theory. Sampson and Groves (1989) were the first to examine the mechanisms connecting structural factors of the community (i.e., ethnic heterogeneity, residential mobility, family disruption, and low economic status) with crime rates. They found that social organization – as measured by local friendship networks, control of peer groups, and organizational participation – explain rates of offending and victimization. Many later studies also found that socially disorganized neighborhoods are more likely to experience crime (for example, see Bursik & Grasmick, 1993; Sampson & Groves, 1989; Sampson & Lauritsen, 1994). Further, legal cynicism and dissatisfaction with the police are also higher in neighborhoods with concentrated disadvantage Thus, these beliefs may be more pervasive in some racial and ethnic groups, in part, due to their disproportionate representation in disadvantaged neighborhoods (Sampson & Bartusch, 1998; Semega, Kollar, Shrider, & Creamer, 2020). Social disorganization theory has yet to be tested for its relevance to mass shootings.

Income Inequality and Racial and Ethnic Heterogeneity and Crime

Understanding the relationship between mass shootings and measures of inequality and racial and ethnic diversity is also needed. Research on neighborhoods and crime has demonstrated that it is not enough to simply examine associations with racial/ethnic and economic concentration. Income inequality and racial and ethnic heterogeneity can also influence the likelihood of crime overall and violent crime, specifically. At the city metro level, both income inequality and racial/ethnic heterogeneity are associated with crime rates (Hipp & Kane, 2017). One study in a large urban area found that income inequality within and between census tracts has an independent association with violent crime separate from crime's association with income (Stucky, Payton, & Ottensmann, 2016). A study of census tracts in 19 cities found that measures of income inequality and racial/ethnic heterogeneity, as measured by the Gini coefficient and Herfindahl index, respectively, were positively associated with higher crime rates (Hipp, 2007). This study also found that relative deprivation (i.e., inequality within racial/ethnic groups) predicted higher crime rates. Further, racial and ethnic heterogeneity showed a positive relationship for crimes more likely to be committed by strangers, and the presence of homeowners was associated with lower neighborhood crime rates. Finally, a longitudinal study in an urban area found racial and ethnic heterogeneity is a strong predictor of violent crime and changes in it over time lead to associated changes in violent crime (Kubrin, 2000). Research has not yet examined if mass shootings, as one form of violent crime, have these same associations with income inequality and racial and ethnic heterogeneity.

Domestic Violence and Child Maltreatment

Domestic violence is a type of crime with relevance to the study of mass shootings, as a significant portion of multiple-death incidents are the result of intimate partner or familial

homicide (Everytown For Gun Safety, 2018; Smart & Schell, 2021). Pediatric fatality rates in domestic (versus public) mass shootings are particularly high, accounting for 44 percent of deaths and 46 percent of all injuries (Levy, Safcsak, Dent, & Cheatham, 2019). During the same period in which violent crime (excluding homicide) increased by 15 percent, intimate partner violence increased by nearly twice that amount. The majority of these incidents, like most violent crimes, were unreported to the police (Morgan & Oudekerk, 2018). Consistent with both individual- and aggregate-level findings that the poor are more likely to be victims of violent crimes (Hipp, 2007; Sampson, 2012), higher rates of domestic violence have been found in the most disadvantaged neighborhoods (Pinchevsky & Wright, 2012). Benson and colleagues (2003) hypothesize that the link between domestic violence and neighborhood disadvantage is a result of social isolation, a known risk factor for domestic violence. Further, because disadvantaged neighborhoods are characterized by weak ties, residents in these neighborhoods may be less inclined to intervene on behalf of victims.

Estimates from national surveys show higher rates of domestic violence among Blacks and American Indians compared to Whites (Smith et al., 2017). However, differences in neighborhood context are crucial for understanding this relationship. Rates of intimate partner violence for both Blacks and Whites are highest in the most disadvantaged communities. When neighborhood disadvantage is controlled for, differences in victimization rates by race and ethnicity are strongly reduced (Benson, Wooldredge, Thistlethwaite, & Fox, 2004). As such, research has established that structural ecological factors are strong predictors of domestic and violent crime and that community context plays a crucial role in understanding racial and ethnic variations in crime rates (Sampson, Wilson, & Katz, 2018). The fact remains that Blacks are significantly more likely to live in more disadvantaged communities than Whites (Semega,

Kollar, Shrider, & Creamer, 2020) and are, thus, more likely to be involved in various types of violence, including domestic violence.

Because familial homicides make up a non-legible proportion of mass shootings (Smart & Schell), we briefly turn attention to the research on community correlates of child maltreatment. Social disorganization and collective efficacy are often used to explain the relationship between child maltreatment and neighborhoods. This small body of research suggests an association between community characteristics and child maltreatment rates. Eckenrode et al. (2014) found that income inequality and child poverty were positively associated with child maltreatment rates at the county level. At smaller levels of geography, relationships between neighborhood poverty and child maltreatment have been observed, as well (Coulton, Korbin, Su, & Chow, 1995; Fong, 2019). Primary community characteristics associated with maltreatment include poverty rates, single parent families, residential instability, ratio of children to adults, and race and ethnicity. (See Casey Family Programs (2020) *Community Opportunity Map Indicators* for a compilation of these factors and literature review.)

The research on community level-correlates of maltreatment and racial and ethnic composition is quite limited, despite the fact that Black and American Indian children are overrepresented in reports of child maltreatment and foster care (US Department of Health & Human Services, 2019; US Department of Health & Human Services, 2020). The field continues to debate if these disparities are a product of disproportionate rates of poverty and poverty's association with child maltreatment or due to institutional racism in reporting and agency decision-making (Boyd, 2014). Only a few empirical studies have examined the independent contribution of the race and ethnic composition of neighborhoods on child maltreatment rates. One such study found that only when predominantly Black neighborhoods became even more

segregated do child maltreatment rates increase (Coulton, Richter, Korbin, Crampton, & Spilsbury, 2018). Another study, using spatial regression techniques, found a different pattern; Black, White, and Hispanic children were more likely to be reported for child maltreatment in racially diverse neighborhoods than racially homogenous neighborhoods. The authors state that "racial-ethnic diversity may be one of the more reliable neighborhood-level demographic indicators of child welfare risk across different racial/ethnic groups of children" (Klein & Merritt, 2014, p.95). Finally, a population-based study found that Black children were more than twice as likely to be referred for child maltreatment, substantiated as victims, and placed in foster care compared to their White counterparts. However, once socioeconomic status was controlled for, Black children had lower rates of reports, substantiations, and placement into foster care (Putnam-Hornstein, Needell, King, & Johnson-Motoyama, 2013). This brief review points to mixed findings reflecting complex ways in which race and ethnicity and community composition may be associated with child maltreatment.

The Current Study

Our study examines the community characteristics associated with mass shooting incidents, testing an established theory of crime and neighborhoods—social disorganization theory. This theory has not been tested for its application to mass shootings—a type of gun violence. With the unique ability to use geo-coded locations of every mass shooting in the US over approximately a five-year period, we investigate the relationship between mass shootings and social, economic, and demographic characteristics of small geographic areas. We operationalize constructs of social disorganization and concentrated disadvantage to include in our models.

Methods

Data

Data on mass shootings were retrieved from the Gun Violence Archive – a public data source compiled by an independent research organization that collects, validates, and categorizes gun violence incidents in the US (Gun Violence Archive, n.d.). These data derive from over 75,000 law enforcement, government, and media sources. All mass shooting incidents from January 1st, 2014 (when the data were first compiled) through April 30th, 2019 are included in this study. There were a total 1,774 mass shooting incidents in 1,551 tracts during this period. Google Maps was used to determine the latitude and longitude of street addresses, which were imported into ArcMap (ArcGIS Desktop 2019, version 10.7.1) and converted to a point shapefile (US Census, 2010). The shapefile was spatially joined to census tracts based on the 2010 U.S. Census to determine the number of recorded mass shooting incidents within each census tract (ArcGIS Pro 2021, version2.5.2). Stata 15 was used to merge this file with the 2017 American Community Survey (ACS) 5-year estimates (U.S. Census Bureau, 2017). These estimates include information on neighborhood demographics at the census tract level from 2013 to 2017. After combining mass shooting and census data, the total number of census tracts is 72,393. The current study includes tracts from all 50 states and DC with a population greater than zero (U.S. Census Bureau, 2016). Our analytical sample includes 69,309 tracts with population data available.

Measures

Mass Shootings

We use a definition of mass shootings as defined by the Gun Violence Archive, described as 4 or more victims injured or killed at the same approximate time and location. While

controversy exists over whether to define a mass shooting as involving only fatal victims or not and what the casualty threshold should be (see Smart et al., 2020), we rely on the definition from our dataset, which is not limited to fatalities, and is the most comprehensive data available. Our dependent variable is dichotomous and indicates whether a mass shooting incident occurred according to this definition within a census tract. All tracts are coded as "1" for the occurrence of a mass shooting and "0" for no mass shootings during the study period. During our study period, mass shootings occurred in 1,608 of the 69,309 tracts.[1]

Neighborhood Characteristics

We include variables that reflect community demographic composition and constructs that prior research has associated with crime. Racial and ethnic composition of the census tract is included using two separate measures. Racial composition is measured using variables for percent Asian, Black, White, and other race. Ethnicity is measured as the percentage of the tract population with Hispanic origin. The Herfindahl-Hirschman Index (HHI) is used as a measure of racial/ethnic diversity. It is calculated by creating mutually exclusive race and ethnicity variables, squaring the percent of the population in each category (i.e., Hispanic, Black, White, Asian, and other), and summing the resulting numbers. The HHI typically ranges from 0 to 10,000; however, for ease of interpretation, it has been rescaled to range from 0 to 1. This measure has been reverse-coded so that higher values correspond with greater levels of racial/ethnic heterogeneity. We also include a measure for the degree of income inequality in the census tract. The GINI Index is a measurement of income inequality summarizing the dispersion of income across the entire income distribution within a geographic area, and it ranges from 0 (complete equality) to 1 (complete inequality) (U.S. Census Bureau, 2016). We construct a latent

[1] There were only 260 tracts with two or more mass shootings during our multi-year study period, which is 0.38% of the tracts in the analytic sample.

factor score for concentrated disadvantage to use in our multivariate models, which is comprised of several variables: percent below poverty, percent female-headed households, percent on public assistance, percent unemployed, and percent of the population under 19 years old. Higher scores represent greater disadvantage. Finally, we include several other variables posited to affect community violence. The percent of the population between ages 15 to 29 reflects the onset and height of criminal activity and is, thus, used as a control variable (Rocque, Posick, & Hoyle, 2015). Residential instability was generated by summing the standardized values of two variables: the percentage of residents living in the same house as the previous year and the percentage of owner-occupied houses within each tract. This score was reverse coded so that higher values indicate instability rather than stability. Highly unstable neighborhoods reflect less social cohesion and social support and are a key component of testing social disorganization theory as it applies to mass shootings. We also control for the percentage of the population in urbanized areas (50,000 people or more), urban clusters (2,500 to 50,000 people), rural areas (which serves as our reference category), and for the total population, generally (logged for better model fit). Finally, because it is likely that mass shooting incidents would cluster on a national scale – as the frequency of these incidents relates to the size of the population, and more populous tracts tend to cluster together – we include a measure for the number of mass shootings per 1,000 residents in adjacent tracts to adjust for spatial influences on the likelihood of a mass shooting.[2]

[2] This "neighbors" variable is a polygon continuity measure that was created using the "edges and corners" function in ArcGIS Pro, which essentially includes information from any tract that is adjacent to and/or touching the focal tract. As a robustness check, we also created a measure for the average number of mass shootings per neighboring tract. The results for both sets of models were very similar.

Analytic Strategy

The unit of analysis for this study is the census tract, and as such, we use tract boundaries to represent neighborhoods. We first provide descriptive statistics for all included measures and their components for census tracts with and without a mass shooting during our study period. We test for significant differences in the means of each variable between the two samples by using a two-sample *t*-test. For our multivariate analysis, we use logistic regression to predict a binary outcome for mass shootings using various community characteristics. Our multivariate models unfold in a few steps. We first predict the likelihood of a mass shooting event using a suite of demographic and compositional variables, which serves as our base model. We then examine a polynomial model that includes a squared term for percent Black, as violent crime rates, including homicide, have previously been found to have a curvilinear relationship with the Black population (Messner, 1983; Stucky, 2011). Next, we examine whether the effect of percent Black on mass shootings is relative to the level of concentrated disadvantage by including an interaction term comprised of these two variables. Finally, we investigate the nature of this interaction further by splitting the base model into three levels of neighborhood disadvantage and running our base model within each. The most disadvantaged tracts are identified as those with values above the 75th percentile in concentrated disadvantage, while the most advantaged tracts have values below the 25th percentile. The remaining tracts (i.e., those between the 25th and 75th percentiles) represent the "average" level of disadvantage for comparison.

To test the robustness of our findings, we also estimated our models using the Firth method solution for logistic regression, which adjusts for low-frequency events (King and Zeng, 2001), such as tracts with mass shootings. Our results remained the same, as expected, since large samples are less affected by low-frequency outcomes. With all variance inflation factors

below 2, there is no evidence of multicollinearity in our models. All statistical analyses were performed in Stata 15.

Results

We first report on significant differences in means in our individual and composite variables of interest between census tracts with and without a mass shooting. Of the 69,309 census tracts in our sample, 1,774 mass shootings occurred in 1,544 census tracts. These results are presented in Table I. We found several significant differences in demographic and compositional characteristics of census tracts with and without a mass shooting when examined independently, including the racial and ethnic composition. Census tracts with a mass shooting had significantly higher percentages of Black, Hispanic, and "other" race residents, but lower percentages of Asians and Whites. The average concentrated disadvantage score was also significant, as were all its individual components. Census tracts with a mass shooting compared to those without were significantly more likely to have a higher percentage of residents in poverty (17% vs. 15%) and female-headed households (15% vs. 13%) and a lower percentage of residents on public assistance (55% vs. 58%). Indicators of poverty and use of public assistance showed different relationships with mass shootings, suggesting public assistance may be a protective factor. The number of young people in a census tract, as measured by the percent of the population under 19 years old, was significantly higher in tracts with a mass shooting. We found no significant differences between tracts with and without a mass shooting in degree of income inequality, as measured by the Gini index, nor degree of racial and ethnic heterogeneity, as measured by the HHI. The percent of the population between 15 and 29 years, an age where crime perpetration is high, was significantly higher in census tracts with a mass shooting compared to those without (21 vs. 20%), consistent with previous research on crime. Tracts with

a mass shooting had significantly lower percentages of owner-occupied housing (one component of residential instability) than tracts without a mass shooting (59 vs. 63%) but showed no significant mean differences for the other component of residential instability – the percent of population residing in the same house one year ago. We observed no significant differences for tracts with and without a mass shooting for urban areas and clusters, rural areas, or total population size. Finally, the rate of mass shootings in neighboring tracts was higher in tracts that experienced a mass shooting incident (.01 compared to .007 per 1,000 residents), and this difference was statistically significant. This finding demonstrates proximity to another mass shooting was a significant influence, and thus is important to control for when measuring the association with other characteristics. In summary, our bivariate statistics suggest that census tracts with a mass shooting tend to be the most disadvantaged economically and have higher percentages of Black and Hispanic residents.

Our multivariate results present a different and more complex pattern as it pertains to both race and ethnicity and concentrated disadvantage and their association with mass shootings (Table II). In our base model, predicting the likelihood of a mass shooting incident by each community characteristic, holding other variables constant, six variables were statistically significant. As the proportion of Asian residents in the census tract increases relative to the proportion of White residents, the likelihood of a mass shooting incident decreases (OR=.32, $p<.01$). In contrast, as the proportion of Black residents increases relative to Whites, the likelihood of a mass shooting incident in that tract increases, as well (OR=2.18, $p<.001$). Notably, none of the social disorganization indicators, including concentrated disadvantage, were associated with mass shooting incidents. Although gun violence is often thought to be an urban problem, the results here indicate that tracts urban tracts were significantly less likely to

experience a mass shooting compared to rural tracts (OR=.85, $p<.05$). Urban clusters, typically suburban areas, were also significantly less likely than rural areas to have a mass shooting (OR=.76, $p<.01$). However, as population size increases, the likelihood of a mass shooting increases with it. Finally, as expected, mass shootings in adjacent tracts had a strong influence on the likelihood of a mass shooting in the focal tract (OR=32.16, $p<.001$), indicating its importance to include as a control when isolating the independent influence of other community characteristics. In sum, racial composition of the census tract was a large and significant predictor of mass shootings after controlling for other socioeconomic and demographic characteristics, including concentrated disadvantage and degree of inequality and racial/ethnic diversity. Rural areas had higher likelihoods of mass shootings compared to urban areas and clusters, though tracts with larger populations, generally, were more likely to experience a mass shooting.

Some previous research has shown a curvilinear relationship between percent Black and crime rates. Child maltreatment rates also show mixed or non-linear associations with racial concentration. To investigate whether the relationship between percent Black and mass shootings is curvilinear, a quadratic measure was added to the base model. In this model, the squared term for percent Black was statistically significant and negative in direction (OR=.10, $p<.001$), indicating a curvilinear relationship with mass shootings. As percent Black residents in a tract increases, the likelihood of a mass shooting increases until it reaches a tipping point when the likelihood begins to decrease. We identify this tipping point using predictive margins and find that this statistical decline occurs in tracts where the proportion of Black residents is approximately 80%, holding all other variables equal. This relationship between percent Black and the likelihood of a mass shooting is plotted and presented in Figure I. However, because only

3.7% of the tracts in the model sample had more than 80% Black residents, this significant relationship applies to only a small proportion of tracts.

Four additional variables in these models were significant. The greater the proportion of Hispanic residents relative to White residents, the greater the odds of a mass shooting incident (OR=1.49, $p<.05$). Additionally, the degree of racial/ethnic heterogeneity, as measured by the Herfindahl-Hirschman Index, was significantly and negatively associated with mass shootings (OR=.51, $p<.01$). A standard deviation increase in racial/ethnic heterogeneity reduced the odds of a mass shooting incident by about 13%. Population size was also significantly and positively associated with the likelihood of a mass shooting, controlling for all other variables, including urban and rural. Finally, tracts encompassed by tracts with mass shootings were much more likely to experience a mass shooting incident (OR=48.96, $p<.001$).

In summary, the proportion of Black residents was significantly associated with an increase in mass shootings until this concentration is very high, and then the pattern begins to reverse. A larger composition of Hispanic residents compared to Whites was also associated with greater likelihood of mass shootings, while controlling for this curvilinear relationship with Blacks. Because the degree of racial/ethnic diversity in a tract, as measured by the HHI, showed a protective effect, this suggests that the presence of diverse races, other than Hispanics, as percent Black increases within a census tract, reduced the likelihood of a mass shooting. Interestingly, in none of these first two models did the measures of concentrated disadvantage or other indicators often associated with crime (population age, residential instability) have a significant association with mass shootings. The drivers of the association between community characteristics and mass shootings seem to primarily be racial composition variables and

relationships among them, as well as the mass shooting rate of the surrounding area, though population size plays a small role, as well.

In the third model, we removed the percent Black squared term and instead tested an interaction between percent Black residents and concentrated disadvantage. Though concentrated disadvantage was not significant in any of the previous models, we examined whether it had an observed additive impact with proportion of Black residents, which we found significant in our previous models. We found a significant relationship, but not necessarily in the expected direction. As the proportion of Black residents and the level of disadvantage increase together, the likelihood of a mass shooting incident in that tract is reduced (OR =.74, $p<.01$). In other words, as concentrated disadvantage increases, the effect of percent Black on the likelihood of a mass shootings was reduced.

We interrogated this relationship further by splitting the sample into three separate groups based on the level of concentrated disadvantage: above the 75th percentile (most disadvantaged), between the 25th and 75th percentile, and below the 25th percentile (most advantaged). Table III presents these results. The findings indicate that percent Black remained a consistent predictor of mass shootings at lower and average levels of concentrated disadvantage, and it was marginally significant in more advantaged areas (OR=4.04, $p<.10$). Increases in the proportion of Black residents relative to White residents was associated with a higher likelihood of a mass shooting in tracts that are the most disadvantaged (OR=2.43, p<.001) and tracts that are between the 25th and 75th percentile of concentrated disadvantage (OR=2.48, p<.001). The effect of percent Black is non-significant in the top quartile of advantaged areas. As such, although the effect size reduces as the level of disadvantage increases (as seen in both the model including the

interaction term and the models split by percentiles), the relationship between percent Black and mass shootings is not significant at the lowest levels of concentrated disadvantaged.

The size of the population was also significant and positive in the most disadvantaged areas. Two additional variables influenced the likelihood of a mass shooting in tracts that fall between the 25th and 75th percentile of disadvantage – percent Asian and the HHI. Similar to the base model, higher proportions of Asian residents relative to the proportion of White residents lowered the likelihood of a mass shooting incident (OR=.26, p<.05), and tracts that were more racially/ethnically heterogeneous were also less likely to experience a mass shooting incident (OR=.58, p<.05). Across all three groupings of concentrated disadvantage, mass shootings in adjacent tracts were significantly associated with a mass shooting. In fact, mass shooting rates in neighboring tracts were the only significant variable in the model for the most advantaged tracts. These models reveal that demographic characteristics were less influential on the likelihood of a mass shooting in areas with the lowest levels of concentrated disadvantage.

Discussion

We used publicly available data from the Gun Violence Archive over a recent five-year period, geocoded to the census tract and merged with census data, to measure the relationship between sociodemographic characteristics of communities and the likelihood of a mass shooting incident. Without controlling for other variables, we found several significant bivariate differences between communities, as measured at the tract level, with and without mass shootings. Tracts with mass shootings were significantly more likely to have a higher concentration of Black residents and "other race" and a lower concentration of Whites and Asians. Higher concentrations of Hispanic residents were also significantly and positively associated with mass shootings. We also found that mass shootings were significantly more

likely to occur in communities with greater concentrated disadvantage – including all of its individual components, with the exception of percent on public assistance. Tracts with mass shootings had a greater percent of the population in poverty, unemployed, in female-headed households, as well as children under 19. Tracts with mass shootings also had a lower percentage of owner-occupied housing, on average. There were no significant differences in the likelihood of a mass shooting incident between urban, rural, and suburban areas, debunking common perceptions.

However, these descriptive results mask important relationships between community characteristics. For instance, since Blacks and Hispanics are more likely to live in poor neighborhoods, it is possible that the effect of race and ethnicity on mass shootings could be explained by concentrated disadvantage. In our base multivariate model, we found the opposite pattern. The racial and ethnic composition of communities was the primary driver of the association with mass shootings – not concentrated disadvantage or other characteristics associated with crime, such as percent of population between ages 15 and 29 or residential instability. In addition, economic inequality and racial and ethnic heterogeneity had no significant association with mass shootings. However, as population size increased, the likelihood of a mass shooting also significantly increased slightly, regardless of urban or rural setting. Urban clusters (typically suburban areas) were significantly less likely than rural areas to have a mass shooting. Finally, we found that mass shootings – although considered to be rare events – tend to cluster spatially as mass shootings in neighboring tracts and the focal tract were significantly associated with one another. This finding showcases that it is critically important to control for geospatial influences, even low frequency events such as mass shootings.

We investigated the relationship between race and ethnicity and mass shootings further with two additional models. In our second model, we found the percent of Black residents in a census tract has a significant curvilinear relationship with mass shooting incidents. As percent Black increases, the likelihood of a mass shooting also increases until it reaches about 80 percent, at which point the likelihood of a mass shooting starts to decline. In addition, as shown in our third model, concentrated disadvantage significantly interacts with percent Black residents. As concentrated disadvantage increases, the strength of the relationship between percent Black and mass shootings decreases. Tested separately, the significant relationship between percent Black residents and mass shootings held across lower and middle levels of disadvantage but is not significant in the most advantaged communities. In fact, all community characteristics included in our models failed to significantly predict the likelihood of a mass shooting incident in the most advantaged areas. The only significant predictor in advantaged areas is the mass shooting rate in surrounding tracts. Further, urbanicity was not a significant predictor of mass shootings when the models are split by levels of concentrated disadvantage.

These results suggest that the Black racial composition of neighborhoods has a strong independent effect on the likelihood of mass shootings, but that this relationship is modified by levels of economic disadvantage or extreme concentrations of Black residents. In the most segregated Black neighborhoods, the likelihood of mass shootings is reduced. These results suggest that mass shootings do not follow the same patterns as other types of violent crime, including domestic violence and child maltreatment, or that studies of violent crime have failed to test these more nuanced relationships regarding degrees of racial segregation and interactions with concentrated disadvantage. Nonetheless, it appears that mass shootings are a unique variant of violent crime, driven by the racial composition of a community but also showing complex

interactions with social disadvantage and degree of concentrated segregation in Black communities. Unlike some other population-based studies of child maltreatment or domestic violence, the impact of race on mass shootings does not disappear once socioeconomic characteristics are taken into account. In addition, our base model shows that rural areas have a higher likelihood of mass shootings compared to both suburban (i.e., urban clusters) and urban areas. In more advantaged areas, urban clusters are also less likely than rural areas to have a mass shooting. These findings may appear to be counterintuitive, however, they make sense given the prevalence of guns and high rates of domestic violence in rural areas, which is a common type of mass shooting. Mass shootings do not appear to be a uniquely urban event.

As we compare to similar studies of mass shootings, our descriptive findings of both economic and racial and ethnic associations with mass shootings were similar to another descriptive report (i.e., Florida & Boone, 2018), lending validity to our results. When comparing our study to a similar multivariate analysis (i.e., Cabrera & Kwon, 2018), we did not find that levels of inequality or poverty rates predict mass shootings at the tract level as they did at the county level. Given the different levels of geography used in the analysis, direct comparisons between our study and this one should be limited. Nonetheless, affluence, as it interacts with other measures of inequality or racial segregation should not be overlooked as a contributing factor to this unique form of violent crime. Further, the pattern of mass shootings unveiled in the current study resembles other forms of violence in that mass shootings tend to cluster in the same geographic areas (for a review of spatial analyses on crime, see Tita & Radil, 2010). Although we believe this finding is, in large part, due to the spatial clustering of larger populations (more populous tracts tend to cluster together), we find it to be a significant predictor across all models, even while controlling for the size of the population.

In summary, this first empirical look at neighborhood characteristics associated with mass shootings presents a picture of neighborhood influence driven largely by racial composition and how it interacts with social disadvantage. Our findings on mass shootings – a specific and striking type of violent crime – advance the literature on the relationship between neighborhoods and crime and demonstrate similar, yet slightly different, patterns of neighborhood effects. Like other types of crime, including domestic violence and child maltreatment reviewed earlier, our analyses suggest that communities of color – and Black communities, in particular – are disproportionately impacted by mass shooting incidents, similar to the descriptive analysis that reported the same observation (Florida & Boone, 2018). However, the direct effects of concentrated disadvantage and residential instability were not significant in any of our models, except as the former interacts with race. In neighborhoods with the highest concentrations of Black residents and disadvantage, the likelihood of a mass shooting decreases. This finding may reflect the resource costs to obtain guns through legal or illegal means, the isolation of these communities as places where certain types of crime occur, or it may suggest some protective factors associated with higher concentrations of Black residents, especially in low-income neighborhoods. Nonetheless, we did not find that poverty and its correlates independently influence the likelihood of mass shootings in any of our multivariate models, which is different than social disorganization theory predicts.

Our results suggest that mass shootings require a different understanding of community impact. Despite being a unique, somewhat rare, and striking version of violent crime, mass shootings are a combination of different types of violent crimes (e.g., indiscriminate public violence, gang violence, domestic violence, etc.), and therefore, may not show the same pattern of results from research on a single type of violent crime or violent crime, in general. Existing

databases tracking mass shootings should begin to collect more data on the type and context of mass shootings to allow for more research and separate investigations into its community correlates. Our study clearly points to this need and makes a direct contribution to our understanding of the communities in which mass shootings occur and the ways in which community characteristics interact to predict them. It is the first of its kind.

Place-based data mirror current and historical conditions. The prominence of racial composition and mass shootings, particularly the proportion of Black residents in a community, likely reflects a spatial clustering of disadvantage stemming from long histories of structural racism, racial segregation, and social and economic disenfranchisement. Social disorganization theory points to the fact that there are social repercussions stemming from the concentration of race and poverty in the US, including a loss of informal social control, which works to prevent criminal behavior. By measuring racial and ethnic composition separate from economic conditions, we are able to examine the distinct contributions of each to this phenomenon of mass shootings. Our results, as applied to this particular type of violence, are not supported by theories stating that inequalities stemming from race are primarily reflections of economic disadvantage (Wilson, 2012). Our results show a pattern uniquely specific to neighborhoods with high concentrations of Black residents. However, some protective factors come into play when the neighborhood racial concentration is predominantly Black, suggesting that the association between racial composition and mass shootings is, in fact, nonlinear, and there may be some protective elements to high concentrations of Black residents. As such, the finding that areas with high concentrations of Black residents have the highest rates of mass shootings may be a reflection of institutionalized racial fear (Parker, MacDonald, Jennings, & Alpert, 2005; Stolzenberg, D'alessio, & Eitle, 2004). The literature on racial or group threat theory – which

posits increased social control in response to perceptions of threat based on the size of the minority population (King & Wheelock, 2007) – may help us understand these occurrences and the patterns we find in our analysis. Unfortunately, this literature would be most useful if we had a better sense of who was perpetrating these crimes, but the data we use only indicates the communities in which they occur. Alternatively, it could be that in predominantly Black neighborhoods, some mass shootings are unreported and underrecognized due to the systematic lack of policing and law enforcement in communities with high concentrations of Black residents (Wilson, 2012). Both explanations require further exploration in the context of mass shootings and the limitation of the application of social disorganization theory. Our findings call for an expanded theory of neighborhood crime to understand mass shootings that includes an examination of racial dynamics, independently, and in relation to economic conditions. And, we need to keep in mind this is as much, if not more, a rural phenomenon as it is an urban one, though size of the population matters.

Limitations

Our study has several limitations. First, census tracts are not neighborhood or community boundaries. They are the smallest geographic unit for which comprehensive local data are readily available, but analyses using smaller neighborhood boundaries would be more ideal. Second, while we use multiple years of data, our findings only represent correlational relationships. Third, data on victim or perpetrator characteristics were not available, so patterns of victimization and perpetration within neighborhoods are absent from this study. Fourth, we do not have direct measures of social disorganization (i.e., weak social ties, lack of collective efficacy) and instead, as others have done, rely on structural characteristics of the neighborhood that are posited to covary with the level of disorganization. Fifth, while mass shootings receive a

lot of attention, they are not a monolithic type of crime. Unfortunately, the available gun violence data do not allow us to identify the motivation for or type of each mass shooting incident (e.g., drive-by shooting, domestic violence, workplace, etc.). Finally, it is possible that the Gun Violence Archive may have missed some mass shootings that did not get recorded and this may be a source of unknown missing data. Given the rigorousness by which gun violence incidents are cataloged, we are confident in the quality of the data overall.

Conclusion

More detailed data should be collected on type of mass shooting, and future research should examine different patterns of community correlates by type of incident. Further, multi-level models should also explore the relationships between state policies on gun ownership and access, mass shootings, and neighborhood influences, now that this research has helped establish which community contextual factors are necessary to control for in a policy evaluation. An understanding of the underground market for gun ownership would also be useful. Nonetheless, our study makes the first contribution to understanding the neighborhood characteristics associated with the occurrence of a mass shooting. Future research should build off the findings presented here.

Gun violence in America is a major social problem, resulting in high rates of preventable deaths. While much research, with good reason, has focused on policies associated with access to guns in the US relative to other countries as a way to both explain and prevent gun violence, our research on mass shootings suggests that examining community contextual factors, such as poverty, inequality, racial and ethnic composition and heterogeneity, and social disadvantage, more generally, and their associations with mass shootings is critical to our understanding of this problem. In addition, explicitly testing and developing other theoretical frameworks explaining

violence in communities as it applies to mass shootings is necessary. Our research highlights that mass shootings disproportionately impact Black communities and may be yet another manifestation of persistent and structural inequality and racism leading to extreme disparities in injuries and mortality. To prevent mass shootings, we must focus on improving neighborhood conditions and address issues of institutional racism, racial segregation, and racial and economic relational dynamics.

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Table I. *Descriptive Statistics of Community Characteristics at the Census Tract Level*

VARIABLES	TRACTS WITH A MASS SHOOTING (N=1,544)			TRACTS WITHOUT A MASS SHOOTING (N=67,765)			
	Mean	SD	Min. - Max.	Mean	SD	Min. - Max.	t-test
Racial Composition							
Percent Asian	0.05	0.09	0.00 – 0.95	0.06	0.10	0.00 - 0.99	***
Percent Black	0.20	0.26	0.00 - 0.99	0.14	0.22	0.00 – 1.00	***
Percent Other Race	0.09	0.11	0.00 – 0.78	0.08	0.09	0.00 – 0.88	**
Percent White	0.67	0.28	0.00 - 1.00	0.72	0.25	0.00 – 1.00	***
Ethnic Composition							
Percent Hispanic	0.18	0.24	0.00 - 1.00	0.17	0.22	0.00 – 1.00	**
Herfindahl-Hirschman Index	0.38	0.20	0.00 - 0.77	0.38	0.20	0.00 – 0.79	
Concentrated Disadvantage	0.21	1.09	-2.26 - 6.70	0.00	1.00	-2.57 – 8.82	***
Percent Below Poverty	0.17	0.12	0.01 – 0.84	0.15	0.12	0.00 – 1.00	***
Percent Population on Public Assistance	0.55	0.23	0.00 – 1.00	0.58	0.24	0.00 – 1.00	***
Percent Female-Headed Households	0.15	0.09	0.00 – 0.62	0.13	0.08	0.00 – 0.93	***
Percent Unemployed	0.04	0.03	0.00 – 0.25	0.04	0.03	0.00 – 0.31	***
Percent Population Under Age 19	0.25	0.07	0.01 – 0.78	0.25	0.07	0.00 – 0.82	*
Gini Index	0.43	0.06	0.16 - 0.69	0.43	0.06	0.02 – 0.89	
Percent Population Aged 15 to 29	0.21	0.09	0.00 – 0.99	0.20	0.09	0.00 – 1.00	**
Residential Stability	-0.09	0.98	-5.81 – 1.71	0.00	0.99	-6.98 – 1.89	***
Percent Population in Same House 1 Year Ago	0.84	0.09	0.18 – 0.98	0.84	0.09	0.00 – 1.00	
Percent Owner-Occupied Housing	0.59	0.23	0.00 – 0.99	0.63	0.23	0.00 – 1.00	***
Urbanicity							
Percent Urbanized Areas Population	0.73	0.45	0.00 – 1.00	0.71	0.46	0.00 – 1.00	
Percent Urban Clusters Population	0.08	0.24	0.00 – 1.00	0.09	0.26	0.00 – 1.00	
Percent Rural Population	0.20	0.36	0.00 – 1.00	0.21	0.36	0.00 – 1.00	
Total Population (Logged)	8.30	0.49	6.46 – 10.05	8.29	0.49	1.10 – 11.09	
Adjacent Mass Shootings per 1,000 Residents	0.01	0.04	0.00 - 0.42	0.01	0.03	0.00 - 0.76	***

Note: Differences are significant at *p < .05; ** p < .01; ***p <.001

Table II. *Logistic Regression Analysis of Community Characteristics on Mass Shooting Incidents (N=69,309)*

VARIABLES	MODEL 1: BASE MODEL OR (SE)	MODEL 2: MODEL WITH PERCENT BLACK SQUARED OR (SE)	MODEL 3: MODEL WITH PERCENT BLACK * DISADVANTAGE INTERACTION OR (SE)
Racial Composition (ref. % White)			
Percent Asian	0.33 (0.12) **	0.57 (0.22)	0.38 (0.14) **
Percent Black	2.18 (0.33) ***	15.10 (7.26) ***	2.76 (0.45) ***
Percent Other	1.76 (0.64)	1.68 (0.60)	1.70 (0.62)
Ethnic Composition			
Percent Hispanic	1.37 (0.24)	1.49 (0.26) *	1.24 (0.22)
Herfindahl-Hirschman Index	0.98 (0.16)	0.51 (0.11) **	0.82 (0.14)
Concentrated Disadvantage	1.01 (0.04)	1.00 (0.04)	1.11 (0.05) *
Gini Index	1.74 (0.70)	1.68 (0.68)	1.70 (0.69)
Percent Population Aged 15 to 29	1.53 (0.59)	1.46 (0.56)	1.31 (0.51)
Residential Stability	1.00 (0.04)	1.00 (0.04)	1.00 (0.04)
Urbanicity (ref. % Rural pop)			
Percent Urbanized Areas Population	0.85 (0.07) *	0.88 (0.07)	0.87 (0.07)
Percent Urban Clusters Population	0.76 (0.10) *	0.79 (0.10)	0.77 (0.10) *
Total Population (Logged)	1.17 (0.06) **	1.16 (0.06) **	1.16 (0.06) **
Adjacent Mass Shootings per 1,000 Residents	32.16 (20.67) ***	48.96 (31.89) ***	49.44 (32.44) ***
Percent Black Squared		0.10 (0.06) ***	
Black * Disadvantage			0.74 (0.07) **

Note: OR = odds ratio; SE = standard error; Differences are significant at *p < .05; ** p < .01; ***p <.001

Table III. *Logistic Regression Analysis of Neighborhood Characteristics on Mass Shooting Incidents by Level of Disadvantage*

VARIABLES	TOP 25TH PERCENTILE DISADVANTAGE (POOR) OR (SE)	25TH TO 75TH PERCENTILE OR (SE)	TOP 25TH PERCENTILE ADVANTAGE (AFFLUENT) OR (SE)
Racial Composition (ref. % White)			
Percent Asian	0.47 (0.30)	0.26 (0.15) *	0.75 (0.61)
Percent Black	2.43 (0.57) ***	2.48 (0.61) ***	4.04 (3.01)
Percent Other	2.14 (1.00)	1.43 (0.90)	0.73 (1.30)
Ethnic Composition			
Percent Hispanic	1.46 (0.40)	1.46 (0.40)	0.69 (0.62)
Herfindahl-Hirschman Index	1.34 (0.36)	0.58 (0.16) *	1.07 (0.72)
Concentrated Disadvantage	1.02 (0.07)	1.15 (0.14)	1.09 (0.26)
Gini Index	1.89 (1.34)	1.16 (0.69)	3.28 (2.94)
Percent Population Ages 15 to 29	2.27 (1.26)	0.86 (0.57)	1.26 (1.31)
Residential Stability	1.08 (0.07)	0.98 (0.06)	0.94 (0.08)
Urbanicity (ref. % Rural pop)			
Percent Urbanized Areas Population	0.76 (0.14)	0.92 (0.10)	0.94 (0.16)
Percent Urban Clusters Population	0.73 (0.19)	0.79 (0.14)	0.65 (0.24)
Total Population (Logged)	1.27 (0.13) *	1.13 (0.09)	1.11 (0.14)
Adjacent Mass Shootings per 1,000 Residents	20.15 (15.56) ***	2956.82 (4615.11) ***	5998.509 (17781.30) **
Number of Observations	17,372	34,675	17,262

Note: OR = odds ratio; SE = standard error; Differences are significant at *p < .05; ** p < .01; ***p <.001

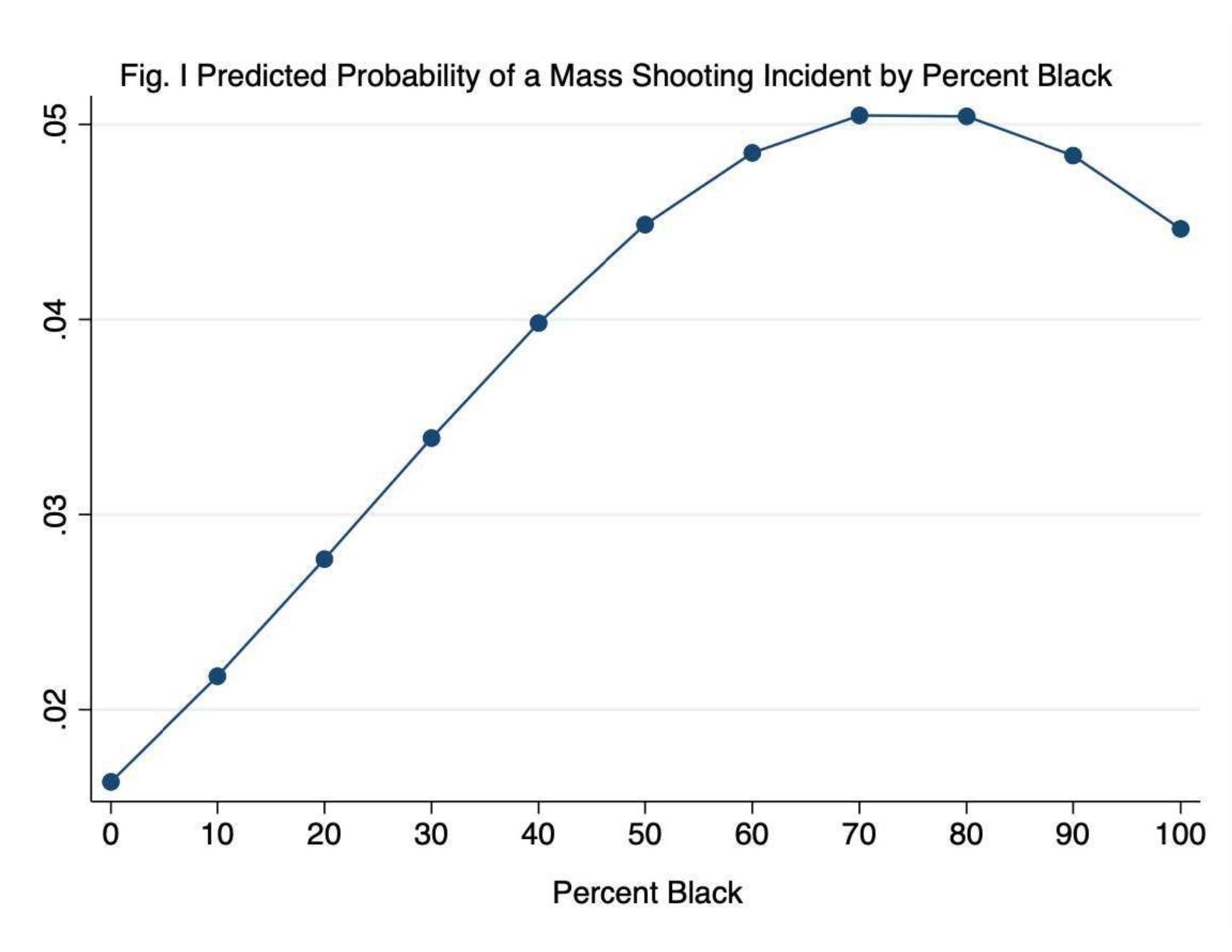
Fig. I Predicted Probability of a Mass Shooting Incident by Percent Black
.02
.03
.04
.05
0
10
20
30
40
50
60
70
80
90
100
Percent Black