American Journal of Criminal Justice
https://doi.org/10.1007/s12103-024-09769-5

Time *in* Crime: An Added Dimension to the Study of Crime Guns

Rick Dierenfeldt[1] · Grant Drawve[2] · Joshua May[3] · Ellee Jackson[1]

Accepted: 17 June 2024

Abstract
A growing body of literature has explored the 'life course' of crime guns, with particular focus on the time between initial point of sale of firearms and their eventual recovery by police following a crime. We contend that this examination is incomplete, with limited consideration given to the period between a firearm's first known use in a criminal offense and its recovery by police—which we refer to as time in crime. Increased understanding of this time frame is important given that crime guns are frequently recirculated among criminally involved groups and the recent finding that time in circulation following first known use in a crime is a significant predictor of multiple uses of crime guns. We add to the literature through application of negative binomial regression to a sample of 310 crime guns used in offenses in a city in the Southeastern United States to examine how neighborhood context and initial incident characteristics influence the number of days that firearms remain in circulation after their first known use in a crime. We find that increased levels of concentrated disadvantage and gang involvement during the original incident correspond with significant increases in time in crime, while increased levels of residential stability and the ability of police to identify suspects are linked with more rapid recovery of crime guns. Notably, these findings hold even after inclusion of popular time to crime covariates, including firearm quality, caliber, and status as a stolen gun.

Keywords Crime guns · NIBIN · Gun crime · Neighborhoods · Gangs

✉ Rick Dierenfeldt
vjz511@utc.edu

[1] Department of Social, Cultural, and Justice Studies, University of Tennessee at Chattanooga, 308 Brock Hall, Dept. 2102, 615 McCallie Ave, Chattanooga, TN 37403, USA

[2] Department of Sociology and Criminology, University of Arkansas, 525 Old Main, Fayetteville, AR 72701, USA

[3] Chattanooga Police Department, 3410 Amnicola Hwy, Chattanooga, TN 37406, USA

Published online: 01 July 2024

Introduction

Gun crime continues to represent a substantial threat to public safety in the United States. Firearms are disproportionately involved in most crimes of violence, particularly murder (Collins et al., 2017; Cook & Pollack, 2017; Goldsmith et al., 2022; Johnson et al., 2021), and firearm-related offending is more pronounced in the United States than any other industrialized nation (Carson et at., 2022). The use of firearms in crimes has long been politicized in the US, even amongst researchers (Cook et al., 2015a, b; Goldsmith et al., 2022; Wachtel, 1998). The recent reversal of a long-trending decrease in gun crime has only amplified these debates. Between 2019 and 2020, the U.S. observed a 35% spike in firearm-involved murders (CDC, 2022), while overall gun violence hit a twenty-five-year peak (Gramlich., 2022). Understandably, discussions on gun crime frequently turn toward gun control. After all, as noted by Cook et al., (2015a, 2015b, p. 721), "reducing gun involvement in criminal violence would greatly reduce the social costs of the problem, even if the overall volume of interpersonal violence were unchanged."

Arguments related to a market-based approach that restricts lawful access to guns, however, are often "based on speculation, not on evidence from research" (Wellford et al., 2005, p. 8). Indeed, some studies suggest that illegal, rather than legal, firearm availability corresponds with higher frequency of gun crime (Dierenfeldt et al., 2017; Semenza et al., 2023). Furthermore, the spatial relationship between legal firearm dealers and shooting incidents could be limited to those neighborhoods and communities experiencing the most extreme levels of structural deprivation (Semenza et al., 2022).

In contrast, focusing on the 'life course' of crime guns could promote policy initiatives that are more empirically grounded. In this vein, a growing body of literature has focused on a gun's 'time to crime,' which is conceptualized as the period between a firearm's first sale at retail and its subsequent recovery from a crime (ATF, 2002; Pierce et al., 2004). These efforts have produced an impressive body of knowledge concerning the diversion of new firearms from retail to secondary and illicit markets, while demonstrating the disproportionate involvement of new guns in crime and describing the extent to which guns are trafficked within and between states (Braga et al., 2021; Collins et al., 2017; Cook & Braga, 2001; Hureau & Braga, 2018; Wintemute et al., 2005).

Information on the life course of guns, however, remains incomplete (Collins et al., 2017; Cook et al., 2019; Wachtel, 1998; Wellford et al., 2005). In particular, while the literature has described the period between initial point of sale and recovery of crime guns by police (time *to* crime), it has failed to the fully explore the period during which firearms are used in criminal acts—which we refer to as time *in* crime. The need for this exploration is evidenced by the fact that firearms are recovered from only a fraction of gun crimes (Collins et al., 2017). Furthermore, criminally-involved groups frequently circulate crime guns between their members, allowing for their continued use (Cook et al., (2007, 2015a, 2015b). We contend that examination of crime guns' time *in* crime could yield an additional

layer of understanding of gun crime, while promoting the development law enforcement strategies that complement existing efforts centered around analysis of time to crime.

Review of the Literature

The literature consistently demonstrates that gun violence is highly concentrated among a small group of people and places (Braga et al., 2021; Cohen & Ludwig., 2004; Drawve et al., 2016; Levine et al., 2021; Papachristos et al., 2015; Roberto et al., 2018; Wyant et al., 2012; Xu & Griffiths, 2017). Offenders frequently cite self-protection as a driving force behind acquisition of guns, followed by social status enhancement and use in predatory crimes (Braga et al., 2021; Goldsmith et al., 2022; Kennedy et al., 1996). Thus, guns confer symbolic status (Goldsmith et al., 2022; Katz, 1988) that goes beyond their obvious instrumental value (e.g., Kleck & McElrath, 1991).

In line with these observations, gun crime continues to be driven by gangs and criminally involved youth, especially in structurally disadvantaged and residentially segregated communities of color (Blumstein, 2000; Braga, 2003; Braga et al., 2008; Cook & Laub, 1998; Glaeser & Vigdor, 2001; Johnson et al., 2021; Kennedy et al., 1997; Thomas et al., 2021). As noted by Papachristos et al. (2012), for example, the gun violence spike that occurred in Boston during the mid-2000s was driven by gang activity and represented a problem of high-risk places and people. For context, about 5 percent of the street faces and intersections in Boston generated approximately 74% of the shootings that occurred in the city between 1980 and 2008 (Braga et al., 2010). Similarly, in their study of non-fatal gunshot injuries in Chicago that occurred between 2006 and 2012, Papachristos et al. (2015) found that 25% of all gunshot victimization occurred in 6% of all beats, while 70% of all non-fatal shooting incidents occurred in networks comprising less than 6% of the total population; thus, indicating a subset of risky places and people.

The results of these studies are consistent with structural perspectives (e.g., Bursik & Grasmick, 1993; Sampson & Groves, 1989; Shaw & McKay, 1942) that suggest crime is more both more likely and frequent in neighborhoods marked by increased structural and physical deterioration, heightened levels of residential turnover, larger proportions of crime-prone youth, and diminished levels of informal social control that inhibit opportunities for offending. The same relationships have emerged in studies of gun crime (e.g., Burgason et al., 2014; Dierenfeldt et al., 2021; Semenza et al., 2022; Thomas et al., 2021). They also, however, lead to questions concerning how offenders obtain the firearms used in their respective crimes, a topic of extensive interest among researchers who have explored the crime guns' time to crime.

Extant literature has discussed the development of violent subcultures in the presence of chronic, structural deprivation (Anderson, 1994, 1999; Krivo & Peterson, 2000; Parker & McCall, 1999; Peterson & Krivo, 1993; Wilson, 1987). These subcultures mediate human behavior in situations of survival and conflict resolution (e.g., Copes et al., 2013). Following the decline of inner-city communities of color,

many urban neighborhoods exhibited the characteristics that facilitated subcultural violence. That is, legitimate avenues of gaining status through political, economic, or residential means were largely absent. Moreover, a shared perception that police were not dependable, or only served the White middle- and upper-classes, prompted a form of self-help social control that manifested in the form of violence and aggression (Anderson, 1994, 1999; Black, 1983).

Anderson (1994, 1999) explains how violence permeates in the community in response to weakened confidence in formal institutions (e.g., law enforcement). Specifically, Anderson (1994, 1999) discusses how street code adherents tend to perceive the police as illegitimate or discriminatory towards people of color, and thus, handle disputes without the assistance of law enforcement. This is not surprising, however, as individuals who adhere to the street code have been socialized to either engage in retaliatory violence in the event of victimization (Gau & Brunson, 2015; Haas et al., 2014; Jacobs & Wright, 2006; Rosenfeld et al., 2003) or engage in preemptive violence in order to insulate themselves from victimization (McNeeley & Wilcox, 2015a, 2015b; McNeeley & Yuan, 2016; Stewart et al., 2006). Similarly, reporting their victimization, or "snitching," could put an individual at an increased risk for revictimization (Anderson, 1994, 1999; Baron et al., 2001; Clayman & Skinns, 2012; Kubrin & Weitzer, 2003; Rosenfeld et al., 2003). It is important to note, however, that studies have shown that a vital aspect of maintaining order in the community revolves around residents reporting victimization, as it directly relates to whether crime is brought to the attention of law enforcement (Bennett & Wiegand, 1994). Research has also illustrated that the reluctance of reporting victimization may result in an inability of officers to arrest the offender and, in turn, higher levels of violence in the community (Kirk & Papachristos, 2011; Skogan., 1984).

In line with Anderson's (1994, 1999) assertions, a lack of reporting among these populations may be attributed to perceptions of procedural injustice (see Fagan, 2008; Goudriaan et al., 2004), perceived unfairness in police performance (Conaway & Lohr, 1994; Zhang et al., 2007), or repeat victimizations (Zaykowski, 2011). In other words, individuals who do not believe that the police can keep them safe (e.g., code of the street adherents) could be less likely to report and, thus, more likely to engage in violence. Braga (2021, p. 4) links the "broader neighborhood context" to significantly influencing the likelihood of homicide clearance when the incident occurs in disadvantaged neighborhoods where residents view the criminal-justice system as illegitimate or unresponsive.

Sources of Crime Guns

As noted by Braga (2017), nearly all guns in the US were originally legally purchased. Yet the majority of guns used in crimes are illegally obtained (Braga & Cook, 2016; Braga et al., 2012; Collins et al., 2017; Kennedy et al., 1996; Reiss & Roth, 1993; Vittes et al., 2012; Wright & Rossi, 1994). Most offenders obtain their guns through either social connections (e.g., friends and family) or street sources such as fences, drug dealers, illicit gun brokers, and gangs (Braga et al., 2021; Collins et al., 2017; Cook et al., 2015a, 2015b; Kennedy et al., 1996).

In this vein, gangs represent a salient problem (Braga et al., 2021; Kennedy et al., 1996). The work of Cook et al. (2007) suggests that gang leaders often loan or rent out guns to their members. As a result, many crime guns remain in circulation for several years and change hands with relative frequency (Cook et al., (2007, 2015a, 2015b; Goldsmith et al., 2022; Wintemute et al., 2004). This problem may be exacerbated in response to market friction, whereby the influx of new guns is disrupted, and the market thins (Cook et al., 2007). Under these conditions, some would-be offenders experience difficulty in obtaining firearms, while gang members maintain ready access (Cook et al., (2007, 2015a, 2015b; Hureau & Braga, 2018). This phenomenon extends beyond Chicago to New York, where Braga et al.'s (2021) respondents noted that while it was relatively difficult to obtain a gun, this hinged to great extent on gang membership. Gang members had an easier time obtaining guns from their networks because they have "established supply lines" (Braga et al., 2021, p. 604). Disrupting the supply of firearms to would-be offenders has therefore become a focal point of both research and law enforcement (Collins et al., 2017; Cook et al., 2011; Kleck & Wang, 2009).

Disruption Strategies

Approaches to limiting offender access to firearms have been wide-ranging. In terms of supply-side efforts, Braga (2017, p.77) suggested that making guns more expensive might force criminals to "economize on gun possession and use" and that "as guns become more scarce and valuable, they will be slower to buy and quicker to sell." There is, however, limited evidence of the effectiveness of such strategies (e.g., Wellford et al., 2005). In contrast, directed patrols that focus on illegally carried firearms in high crime areas have achieved greater levels of success. These efforts have resulted in increased gun seizures and decreased gun crime in Kansas City (Sherman & Rogan, 1995; Sherman et al., 1995), Indianapolis (McCarrell et al., 2001), and Pittsburgh (Cohen & Ludwig., 2004).

A promising approach involves the use of trace programs to develop an understanding of the structure of illegal gun markets and, in turn, effective policy and practice (Braga et al., 2012, 2021; Kennedy et al., 1996). The use of gun trace programs has been used to identify and apprehend 'scofflaw' retail dealers, resulting in a decrease in the proportion of new guns used in crimes in Detroit, Chicago, and Milwaukee (Webster et al., 2006). Gun trace programs have also been used to illustrate the extent to which firearms are trafficked from the southeastern U.S. to illicit markets in the Mid-Atlantic and New England via the I-95 'Iron Pipeline' (Braga et al., 2021; Cook & Braga, 2001; Kennedy et al., 1996).

Boston's Operation Ceasefire, for example, was a collaborative effort between practitioners and researchers that focused on chronic offenders and prolific illicit firearm traffickers who supplied guns to criminally involved youth (Braga & Pierce, 2005; Kennedy et al., 1996). These efforts were successful in reducing gun crime, but traffickers began substituting older pistols purchased through secondary market transactions in order to avoid detection by law enforcement (Braga & Hureau, 2015; Braga & Pierce, 2005). In fact, Braga (2017) noted that the share of fast 'time

to crime' guns recovered by the Boston Police Department dropped from 53.8% to 18.4% in response to Operation Ceasefire (three years or less; see ATF, 2002). Furthermore, gangs and their members began to hold existing crime guns for longer periods of time (Braga et al., 2001); a finding in line with the hypothesized effects of market friction advanced by Cook et al., (2007, 2015a, 2015b). In other words, despite the offender preference for 'new in the box' guns as a matter of avoiding being caught with a firearm that has already been involved in a crime (Kennedy et al., 1996; Wintemute et al., 2004), crime guns remained in circulation and use for longer periods of time. The importance of this point should not be understated given the recent finding by Scott et al. (2023) that time in circulation following a firearm's first known use in a crime is a statistically significant correlate of whether it will be used in multiple offenses.

The Current Study

A growing body of literature has focused on the period between the original point of sale of firearms and their subsequent recovery from a crime, a period referred to as 'time to crime' (ATF, 2002; Pierce et al., 2004). These efforts have provided vital information concerning the movement of new firearms from retail to illicit markets and circulation of crime guns among criminally involved groups, as well as contributed to the development of disruption strategies and meaningful reductions in gun crime (e.g., Braga et al., 2012, 2021; Cook et al., (2007, 2015a, 2015b). We contend, however, that descriptions of the 'life course' of crime guns must extend beyond time *to* crime to time *in* crime. Numerous community- and offense-level factors might be expected to influence the period of time that criminally involved persons and groups retain possession and control of guns following their first known use in a crime, as well as the expedience with which police are able to locate and seize these crime guns. The present study contributes to the literature through examination of the simultaneous influence of neighborhood and incident characteristics on the number of days that crime guns remain in circulation following the date on which were first known to have been used in a criminal offense.

Prior works have consistently described a positive and statistically significant relationship between neighborhood levels of concentrated disadvantage and the likelihood and frequency of violent crime, particularly offenses involving firearms (e.g., Burgason et al., 2014; Dierenfeldt et al., 2017; Semenza et al., 2022). Within these contexts, gun crime and control of crime guns appears to be largely driven by street gangs (Braga et al., 2008; Johnson et al., 2021; Thomas et al., 2021), and cooperation with police by victims and witnesses in much less common (e.g., Kwak et al., 2019). These factors would be expected to inhibit the ability of police to quickly locate and seize guns that have been used in crimes. In accordance with these studies, the following is hypothesized:

H1: Neighborhood levels of concentrated disadvantage will share a direct, positive correlation with time in crime.

The literature has established a clear connection between the presence of gangs within communities and increased levels of gun violence (Huebner et al., 2016). Furthermore, the works of Cook et al., (2007, 2015a, 2015b) and Braga et al. (2001; 2017) suggest that street gangs frequently retain and recirculate gun between members, even after their use in a crime and despite offender preference 'new in the box' firearms (Kennedy et al., 1996; Wintemute et al., 2004). Indeed, Scott et al. (2023) reported that the strongest covariate of repeat use of crime guns was whether the original incident was gang-involved. The degree to which gang involvement in gun crimes influences the probability that the firearms used in those crimes will be used in additional offenses remains an empirical question. Based on prior studies of the relationship between gangs and increased levels of gun violence (Huebner et al., 2016), the following is hypothesized:

H2: Crime guns will, on average, exhibit a longer time in crime if their first known use in an offense was gang-involved.

Data, Measures, and Methods

We examine data gleaned from the National Integrated Ballistic Information Network (NIBIN) lead logs provided by the Chattanooga Police Department. NIBIN was developed in 1997 by the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF). NIBIN is used during criminal investigations by comparing images of ballistic evidence from shooting scenes and recovered firearms for possible leads (ATF, 2023). In short, NIBIN allows for linking of the same firearm based on collected evidence across law enforcement partners (i.e., cross-referencing). All analyses are limited to crime guns that are recovered and associated with 'cleared' offenses that occurred between 6/23/2013 and 10/31/2020 (n = 310).[1]To determine the extent that time in crime is correlated with the structural characteristics of the offense in which each crime gun was initially used, we geocoded the addresses of the initial crime events to census tracts located within Chattanooga (n = 29).[2]This approach allows for incorporation of relevant sociodemographic data for census tracts included in the 2013–2017 American Community Survey (ACS) 5-year summary file. All research protocols were reviewed and approved by the UTC Institutional Review Board

[1] Classification as a 'Cleared' case within the CPD NIBIN lead logs requires, at the very least, that the crime gun has been recovered by police. We acknowledge that this represents a limitation in terms of generalizability. The NIBIN lead logs listed 277 crime guns associated with 'active' investigations during the same observation period. However, data for these crime guns were systematically missing or incomplete for several key measures. Additionally, this is limited to known uses of the firearm in Chattanooga to be part of the current study. For context, the CPD responds to 1,584 shots-fired calls annually, which translates to more than 4 shootings per day.

[2] There are 56 census tracts located in Chattanooga. Given that all 310 crime guns were used in offenses located in only 29 of these census tracts, the extent to which gun violence is concentrated in the city of Chattanooga is apparent. Indeed, the 310 crime guns examined here were used in approximately 1,100 gun crimes within the 29 census tracts included in our analyses. Tracts were selected over block groups given the distribution of crime guns across block groups reduced aggregate counts to a point that regression was untenable (i.e., nesting).

(IRB# 20–171) in connection with a Department of Justice grant awarded to the Chattanooga Police Department through the Edward Byrne Memorial Justice Assistance Grant Program (2020-DG-BX-0008).[3]

Dependent Variable

For the purposes of this study, time in crime is operationalized as the total number days between the date on which a firearm was first *known* to have been used in a criminal offense and the date it was recovered by police. Each crime gun is also geocoded to the census tract in which it was first known to have been used in a crime. Descriptive analysis allows for meaningful differentiation between time to crime and time *in* crime. The crime guns in our sample had an average time to crime of 2,082.44 days (5.71 years) and median of 2,395.61 days (6.56 years), with a minimum of 3 days and a maximum of 11,076 days (30.35 years). A total of 47.5% of the crime guns in our sample were considered 'fast' time to crime firearms, meaning there was less than 3 years between the original point of sale and recovery by police following a crime. In contrast, average time *in* crime was 156.19 days, with a median of 293.27 days, minimum of 0 days, and maximum of 2,400 days (6.58 years).

Further, the correlation between time to crime and time *in* crime is weak ($r = 0.166$, $p \leq 0.01$). Inspection of individual crime gun records can also be used to illustrate these differences. Gun 170021, a Sig Sauer P229 0.40 caliber pistol, had a time to crime of 2,639 days, meaning the time from point of sale to its recovery following a crime was 7.23 years. By comparison, its time *in* crime was only 2 days. Between 1/20/2017 and 1/22/2017, this particular firearm was used in a total of 3 shootings at different locations across two different cities. Consistent with prior studies of illicit firearm networks, the gun was gang-controlled and used by multiple suspects. Similarly, Gun 170029, a Glock 22 0.40 caliber pistol, had a time to crime of 4,432 days (12.14 years), but a time *in* crime of only 241 days during which it was involved in a total of 8 offenses and used by multiple gang members.

Independent Variables

Concentrated disadvantage is operationalized through several indicators of socioeconomic deprivation available in the 2013–2017 ACS 5-year summary file. Consistent with prior works, these include tract-level measures of the percent of the population living below the federally established poverty line, percent of the population that is unemployed, percent of the population that is Black, percent of the households

[3] This project was supported by Grant No. 2020-DG-BX-0008 awarded by the Bureau of Justice Assistance. The Bureau of Justice Assistance is a component of the Department of Justice's Office of Justice Programs, which also includes the Bureau of Justice Statistics, the National Institute of Justice, the Office of Juvenile Justice and Delinquency Prevention, the Office for Victims of Crime, and the SMART Office. Points of view or opinions in this document are those of the author and do not necessarily represent the official position or policies of the U.S. Department of Justice.

headed by a single female with children, percent of the population over the age of 25 that has not earned a high school diploma or GED, and the percent of households that participate in the Supplemental Nutrition Assistance Program (SNAP). The results of obliquely rotated factor analysis indicate that each of these measures converges on a single dimension with an Eigenvalue of 4.263 and factor loadings of 0.730 or higher. We therefore retain them as a summary index of concentrated disadvantage constructed as the average of standardized values ($\alpha = 0.916$).

We draw several tract-level controls from the 5-year ACS summary file. Ethnic heterogeneity is operationalized through two measures maintained in the ACS, the percent of the population that identifies as Hispanic and the percent of the population that is foreign-born. Again, obliquely rotated factor analysis indicates that these measures form a latent construct with an Eigenvalue of 1.815 and factor loadings of 0.953. They are therefore retained as a summary index of ethnic heterogeneity constructed as the average of standardized values ($\alpha = 0.898$). Given the direct impact of residential stability and community investment on crime described in the literature (e.g., Kasarda & Janowitz, 1974; Sampson & Groves, 1989), we also include measures of the percent of the population that has lived in the same home for 1 year or more and the percent of homes that are owner occupied.[4] We account for age structure, frequently used to control for the proportion of residents in their peak offending years, through the percent of the population between the ages of 15 and 24. Controls for income inequality and exposure are adopted through the use of the Gini Index of Income Inequality and total tract population.

Consistent with Scott et al. (2023), we also utilize several incident-level measures included in the CPD NIBIN lead logs. Specifically, characteristics of the original crime event linked to each crime gun are geocoded to their corresponding census tract. Gang involvement is operationalized as a dichotomous indicator with a value of (1) assigned in instances where either the suspect or victim associated with the original incident linked to the crime gun was gang-involved and a value (0) if they were not gang-involved. The CPD Crime Gun Intelligence Center uses a triangulated approach to establish gang involvement. The unit maintains an actively updated gang validation list that is then compared to the Tennessee Department of Corrections crime portal, which maintains its own validated gang list. This information is then compared to social media sites for mentions of shooting victims/suspects and their affiliations. Finally, this information is compared to statements provided by shooting witnesses, victims, and suspects. Suspect identification is treated as a binary measure indicating whether or not the suspect(s) in the original incident associated with each crime gun was identified (1 = yes; 0 = no). We also control for offense severity through a dichotomous indicator of whether the original incident involved a homicide or aggravated assault (1 = yes; 0 = no), as well as whether or not the original incident involved multiple victims (1 = yes, 0 = no). Collinearity diagnostics suggest no issues related to multi-collinearity, as all VIFs are below 2.283, well below the standard threshold of 4.0 and conservative threshold of 2.5 (Allison, 1999).

[4] Measures of home ownership and residential stability are often retained in summary indexes. In the present study, this measure lacked internal consistency ($\alpha = .355$), prompting their inclusion as distinct variables.

Analytic Approach

We utilize negative binomial regression to examine the factors that influence the total number of days a crime gun remains in circulation following its first known use in a criminal offense—a duration we refer to as time in crime.[5]Consistent with recommendations of Osgood (2000) and Osgood and Chambers (2000), operationalization of the dependent variable as a count in days requires the use of a Poisson-based estimator. Although a standard Poisson model assumes equidispersion between the mean and variance of the dependent variable, preliminary analysis indicated that our outcome measure was overdispersed, whereby the variance greatly exceeded the mean. This result, coupled with post-Poisson goodness of fit tests (Long & Freese, 2006), prompted selection of a negative binomial estimator that allows for introduction of an error term. We also use robust standard errors to allay concerns of potential non-independence in the data.

Results

Descriptive statistics are variables included in the negative binomial regression are displayed in Table 1. The average total population (exposure variable) was just over 3,882 but varied widely (SD = 1,259.118) between 1,194 and 6,564 residents per census tract. Of the variables included in the summary measure of concentrated disadvantage, an average of 31.31% of the population was living below the federally established poverty line (SD = 14.395), 7.44% were unemployed (SD = 4.135), 62.64% were Black (SD = 25.372), 52.99% of households were headed by a single female with children (SD = 25.155), 20.51% of residents over the age of 25 had failed to earn a high school diploma or GED (SD = 9.857), and 32.12% of households received federal assistance in the form of SNAP (SD = 14.668). In terms of measuring measures comprising the ethnic heterogeneity index, an average of 5.49% of the population identified as Hispanic (SD = 7.501) and 4.14% identified as foreign-born (SD = 3.888). An average of 13% of the population was between the ages of 15 and 24 (SD = 3.406), while the average Gini coefficient of income inequality was 0.467 (SD = 0.059). The average census tract exhibited relatively high levels of residential stability, with 85.14% of residents living in the same homes for at least 1 year (SD = 6.963). In contrast, the average level of community investment, measured here as the percentage of homes that were owner occupied, was relatively low. On average, 44.95% of homes were owner occupied (SD = 15.675), but this figure ranged from 1.17% to 68.22%.

In line with the gun violence literature (e.g., Braga et al., 2008; Huebner et al., 2016), gun crime in Chattanooga appears largely driven by gang violence, with 62.9% of the original incidents included in the CPD lead logs involving a suspect and/or victim who was identified as a gang member. Police were able to identify the suspect(s)

[5] Hierarchical linear models (HLM) were first attempted. However, reliability estimates failed to meet the minimum threshold of .200, indicating that multi-level modeling was inappropriate.

Table 1 Neighborhood & Incident Descriptives Based on First Known Incident (N = 310)

Variable	M / %	SD	Min	Max
Total Population	3882.423	1359.117	1194	6564
Total Population (Ln)	8.197	.380	7.09	8.79
Concentrated Disadvantage				
% Poverty	31.309	14.395	5.28	64.18
% Unemployed	7.443	4.135	.10	15.34
% Black	62.637	25.372	4.67	94.41
% FHH	52.986	25.155	.00	89.34
% Low Ed	20.514	9.857	4.47	42.23
% Snap	32.116	14.668	4.02	64.44
Ethnic Heterogeneity				
% Hispanic	5.488	7.501	.00	27.97
% Foreign Born	4.141	3.888	.39	16.92
GINI Index	.467	.059	.349	.656
Residential Stability	85.137	6.963	60.69	95.74
Community Investment	44.954	15.675	1.17	68.22
% Population Aged 15–24	13.004	3.406	5.90	22.83
Gang Involvement	.629	-	0	1
Suspect Identification	.484	-	0	1
Homicide or Agg. Assault	.510	-	0	1
Multiple Victims	.294	-	0	1
Time in Crime	158.541	291.651	0	2400

in 48.4% of the original incidents linked with the 310 crime guns in our sample, while 51% of those incidents involved a homicide or aggravated assault, and 29.4% involved multiple victims. The average crime gun remained in circulation for 158.54 days—or just over 5 months—following its first *known* use in a crime (SD = 291.651).

Negative Binomial Regression

Results from the negative binomial regression are displayed in Table 2. Consistent with Hypothesis 1, the correlation between concentrated disadvantage and time in crime is positive and statistically significant (b = 0.403, $p \leq 0.05$). Specifically, for each standard deviation increase in our summary index of overlapping indicators of structural deprivation, there is a 40.2% increase in the number of days a firearm remains in circulation following its first known use in a crime. Tract-level controls for community investment and residential instability also emerge as significant covariates of time in crime. Each standard deviation increase in residential stability, measured here as the percentage of residents who have resided in the same home for at least 12 months, corresponds with a 25.0% decrease in time in crime (b = -0.041, $p \leq 0.01$). In contrast, for every standard deviation increase in the percentage of homes that are owner occupied, there is a 32.0% increase in time in crime, though this relationship achieves only marginal statistical significance (b = 0.018, p = 0.060).

Table 2 Negative Binomial Regression of Time in Crime (N = 310)

	b	rse	z
Concentrated Disadvantage	.403*	.184	2.19
Ethnic Heterogeneity	-.043	.135	0.32
Gini Index	.644	1.848	0.24
Residential Stability	-.041**	.015	-2.76
Community Investment	.018†	.009	1.88
Percent of the Population Aged 15–24	.007	.030	0.24
Gang Involvement	.883***	.243	3.63
Suspect Identification	-.914***	.242	-3.77
Homicide or Aggravated Assault	.426†	.230	1.85
Multiple Victims	.196	.220	0.89

$^{\dagger}p \leq .10$ $^{*}p \leq .05$ $^{**}p \leq .01$ $^{***}p \leq .001$

Of the four incident-level independent variables included in our analysis, three share statistically significant correlations with the number of days a firearm remains in circulation following its first known use in a crime. In support of Hypothesis 2, the average increase in time in crime is 141.8% if the original incident involved a suspect or victim who was a known gang member (b = 0.883, $p \leq 0.001$). In contrast, if police are able to identify the suspect(s) in the first known incident in which a crime gun is used, there is an average corresponding 59.9% decrease in the number of days those firearms remain in circulation following the offense (b = -0.914, $p \leq 0.001$). Finally, offense severity does appear to impact time in crime. Specifically, if the original incident in which a crime gun is used involves a murder or aggravated assault, there is an associated average increase of 53.1% in time in crime, though this correlation achieves only marginal statistical significance (b = 0.426, p = 0.064).

As a robustness check of our findings, we also perform additional negative binomial analysis of a subsample of 285 crime guns for which data were available on manufacturer, caliber, and whether or not the firearm had been reported stolen. Consistent with the coding adopted by Braga et al. (2021), firearms produced by low quality manufacturers or 'junk gun' companies (e.g., Hi Point, Keltec, Lorcin, etc.) were coded as 1, while those produced by reputable companies (e.g., Beretta, Ruger, Glock, Smith and Wesson, Springfield, etc.) were coded as 0. Of the crime guns included in the sample, 35.44% were 'junk guns' while 64.56% were produced by quality manufacturers. In terms of caliber, 48.07% of the firearms in the subsample were 9 mm, 29.47% were 0.40 caliber, 9.12% were 0.45 caliber, 5.61% were 0.380 caliber, and 7.72% were other. Each caliber was coded as a dichotomous measure with 9 mm treated as the reference group. Finally, of the 285 firearms in the subsample, 14.39% (n = 41) had been reported stolen (1 = yes, 0 = no). As can be seen in Table 3, results are generally robust to the addition of controls for manufacturer, caliber, and illicit status as a stolen firearm. Moreover, none of the additional controls emerge as a statistically significant covariate of time in crime.

Table 3 Robustness Check Accounting for Quality, Caliber, Status as Stolen Firearm (N = 285)

	b	rse	z
Concentrated Disadvantage	.468**	.175	2.68
Ethnic Heterogeneity	.081	.124	0.65
Gini Index	.782	2.052	0.38
Residential Stability	-.032†	.017	-1.91
Community Investment	.016†	.009	1.80
Percent of the Population Aged 15–24	-.009	.031	-0.30
Gang Involvement	.998***	.254	3.94
Suspect Identification	-.856***	.267	-3.20
Homicide or Aggravated Assault	.442†	.246	1.79
Multiple Victims	.211	.249	0.85
Junk Gun	-.019	.223	-0.08
Stolen	.316	.318	0.99
.40 Caliber	.151	.267	0.56
.45 Caliber	.177	.382	0.46
.380 Caliber	-.181	.465	-0.39
Other Caliber	.599	.420	1.43

$^{\dagger}p \leq .10$ $^{*}p \leq .05$ $^{**}p \leq .01$ $^{***}p \leq .001$

Discussion and Conclusions

The purpose of this study was to add to the growing body of literature focusing on the 'life course' of crime guns, with a particular emphasis on the factors that influence the duration that a firearm remains in circulation following its first known use in a crime. Prior works have developed our understanding of crime guns' time to crime, the period between a firearm's original point of sale and its recovery following a crime. As our findings suggest, however, time *in* crime is an understudied but important topic worthy of further consideration. In this respect, several of our findings merit further discussion.

First, our results demonstrate that time to crime and time in crime are weakly correlated with one another, suggesting the need to explore them as related but distinct concepts. For instance, although time to crime provides police with valuable insights concerning the movement of firearms into illicit markets and criminal activity, exploration of the factors that influence the duration that crime guns remain in circulation following their first known use in an offense is needed. Considered in tandem with the finding by Scott et al. (2023) that time in crime is associated with an increase in the odds of repeated use of crime guns, this information allows police to prioritize the location and seizure of crime guns associated with offenses that exhibit specific characteristics and occur in certain structural contexts (e.g., gang-involved gun crime in structurally deteriorated communities).

Consistent with structural perspectives on crime (e.g., Bursik & Grasmick, 1993; Sampson & Groves, 1989) and prior works exploring the impact of community characteristics on gun crime (e.g., Dierenfeldt et al., 2017; Semenza et al., 2022), we find that crime guns associated with incidents that occur in neighborhoods exhibiting

relatively higher levels of concentrated disadvantage tend to maintain a lengthier time in crime. This finding was expected given that neighborhoods, particularly communities of color, disproportionately affected by poverty, unemployment, family disruption, and low educational attainment frequently exhibit lower levels of informal social control coupled with decreased confidence in and cooperation with police (e.g., Anderson, 1999). Although expected, this finding is also concerning given the concentration of firearm-related victimization in structurally disadvantaged communities. Simply stated, if the crime guns associated with these offenses are not quickly located and seized, their repeat use in the same or other disadvantaged neighborhoods becomes more likely (Scott et al., 2023).

Our findings related to residential stability and community investment are somewhat less straightforward. Although the inverse relationship between residential stability and time in crime was both anticipated and consistent with structural explanations of crime, the average time in crime increased with the percentage of homes that were owner occupied. The extant literature notes that crimes of violence, particularly those involving firearms, are more likely and frequent in public spaces (Anderson, 1999; Burgason et al., 2014; Dierenfeldt et al., 2021). However, public displays of gun violence also increase the number of witnesses, which might be expected to increase the likelihood of detection and apprehension by police—effectively limiting the time that a firearm remains in circulation after a crime. Our finding may, therefore, indicate an artifact of the nature of violence in neighborhoods where private spaces (i.e., owner-occupied, single-family dwellings) are more common.

An alternative explanation rests in the nature of the census tracts included in our sample. As noted in our methodology, all of the crime guns examined here are associated with gun crimes that occurred in 29 of the 56 census tracts located in Chattanooga. The city has experienced rapid and large-scale population shifts in the last three decades, beginning with a downtown revitalization project that began in the 1980s in response to the adverse of effects of deindustrialization and population decline. The displacement and relocation of economically disadvantaged residents, including those dependent on subsidized housing, has been common over this period. Our findings in relation to the influence of owner-occupied homes may be a byproduct of this process, as successively poorer groups of residents were filtered into residential and mixed-use neighborhoods typified by owner-occupied but aging homes—a process that has been prominently featured in neighborhood-level research since the 1970s (Bradford & Rubinowitz, 1975; Bursik, 1986; Reiss, 1986; Skogan, 1984).

In contrast, the impact of gang involvement, suspect identification, and offense severity are much as expected. Gun crime across the United States is largely driven by gang violence (Braga et al., 2008; Johnson et al., 2021) and Chattanooga is no exception. Approximately 63% of the crime guns included in our sample were associated with initial incidents in which the offender and/or victim was gang-involved, and these guns remained, on average, in circulation for significantly longer periods before they were recovered by police. Our findings provide support for the finding of Cook et al., (2007, 2015a, 2015b) that crime guns used by gangs tend to be recirculated among members following their use in a crime, effectively lengthening their time in crime.

Similarly, we find that if the original incident associated with a crime gun was a homicide or aggravated assault, the average time in crime increased by more than 53%. We posit two possible explanations for this result. First, offenders may be quick to create separation between themselves and the firearms used in a homicide or aggravated assault, either through transfer of that weapon to another person or simply by disposing of it. Second, witnesses to such murders and serious assaults involving guns may be more fearful of reprisal if they cooperate with police. In either case, time in crime would be expected to increase.

Finally, our study demonstrates the importance of early identification of suspects involved in firearm-related offending. Suspects were identified in only 48.4% of the original incidents associated with the crime guns in our sample, and the ability of police to do so shortened the time in crime of the firearms used it these offenses by an average of approximately 60%. This underscores the importance of police building community trust and relationships. This is not a quick and simple task and will take time in encouraging cooperation with police and simply contacting police when witnessing a crime (e.g., see Brantingham & Uchida, 2021; Brunson & Wade, 2019; O'Neill et al., 2021).

Although this study represents a substantive contribution to the growing body of literature describing the 'life course' of crime guns, we must also acknowledge and discuss several noteworthy limitations. First, reliance on the NIBIN lead log is problematic given that it is a subset of gun violence comprised only of gun crimes that are *known* to police—meaning there is physical evidence linking the crime gun to a specific offense (i.e., shell-casing to connect to a specific firearm). These issues are compounded by the cross-sectional nature of our methodology and omitted variable bias. We were not, for example, able to control for the potential impact of suspect or victim characteristics in the form of sex, age, and race as a consequence of incomplete records provided by the partnering police department. Similarly, although we attempted to account for increased pressure likely placed on police to clear crimes that were particularly violent (e.g., homicides and aggravated assaults) and/or involved multiple victims, we were unable to control for resource distribution in terms of neighborhood-level patrol deployment or the number of investigators and personnel-hours assigned to each case. Each of these factors might factors might be reasonably expected to influence the ability of police officers and investigators to identify and seize suspects and crime guns, thereby impacting the duration that firearms remain in circulation following their first known use in a crime.

The same can be said for the importance of cooperation from victims and witnesses. Prior works (e.g., Anderson, 1999; Kwak et al., 2019) have repeatedly described increased levels of legal cynicism and lack of reporting/cooperation by crime victims and witnesses in neighborhoods marked by heightened levels of structural deprivation, violence, and gang activity, particularly if those communities are primarily occupied by people of color. Although our analysis accounts for relative levels of structural disadvantage, we lack direct measures of street culture and legal cynicism, which might be expected to influence both the reporting of firearm-related incidents and crime guns' time in crime. Moreover, no information is listed in the NIBIN lead logs related to levels of witness and victim cooperation at the incident level.

Despite these limitations, our study maintains relevant implications for practice and future research. The work of Scott et al. (2023) clearly illustrates the odds that crime guns will be used in multiple offenses increase with time in circulation following use in their first known offense. Considered in tandem with this finding, and in recognition of the fact that law enforcement agencies work with finite resources, our own results suggest that police could prioritize or triage gun crimes exhibiting certain characteristics as a matter of limiting the duration that crime guns remain in circulation within the community. High profile gun crimes, including those that are either particularly violent or involve multiple victims, likely come with increased pressure on police to close as quickly as possible. As a consequence, a disproportionate number of resources are likely devoted to such incidents.

With respect to time in crime, however, our findings suggest that gang-involvement and suspect identification are more critical. Given that these factors retained their significance even after for controlling for the effects of offense severity, number of victims, and crime gun characteristics (e.g., quality, caliber, status as a stolen firearm), police should feel encouraged to prioritize gang-involved gun offenses and suspect identification in *all* gun crimes—even those that might appear more mundane (e.g., shots fired, property damage). In doing so, they may recover crime guns more quickly, effectively limiting their time in crime, and reducing the existing stockpiles of illicit firearms available to criminally involved groups (Braga et al., 2001; Cook et al., 2007).

At the same time, resources have been made available through the Crime Gun Intelligence Center (CGIC) program (see e.g., Flippin et al., 2021; Hipple, 2022; Katz et al., 2021; Novak & King, 2020). The purpose of these centers is to better allow for the flow of information across agencies by linking crimes, identifying source of crime guns, and to identify perpetrators to prevent violent crime. In short, CGICs seek to identify perpetrators and increase prosecution of firearm related crimes. CGICs utilize a multistakeholder group to collaborate and approach crime reduction including, ATF, local law enforcement agencies, crime lab, prosecutor's office, and many other agencies/organizations. These types of centers, along with specialized policing units (e.g., gang unit), could assist in reducing violent crimes at the local level.

At the neighborhood level, our findings also suggest the need for innovation and enhanced efforts related to outreach and relationship building, particularly in communities that experience overlapping forms of structural deprivation. The same neighborhoods tend to experience higher levels of legal cynicism defined by attenuated cooperation with police that may be driven by low confidence in law enforcement and fear of retaliation from violent offenders (Anderson, 1999; Kwak et al., 2019). Building trust within these communities is a necessary but daunting task—one that will require generations of sustained effort. Such efforts must therefore be coupled with mechanisms for crime reporting that provide both anonymity and ease of use, such as reporting apps and tip lines. In fact, police may find that residents to be less conflicted about reporting the location of crime guns than they are suspects.

In terms of research, the present study illustrates the need to further partition and explore the 'life course' of crime guns, moving beyond the broad concept of time to crime. Time in crime and repeat use of crime guns represent starting points in this endeavor. In particular, we encourage future studies to examine temporal and spatial aspects of the movement of crime guns between their initial use, their use in subsequent

offenses, and their recovery by police. This approach would not only inform investigative and patrol procedures, but also allow for the incorporation of concepts associated with environmental criminology, such as crime generators and attractors (Brantingham & Brantingham, 1995) and risky facilities (Eck et al., 2007). Moreover, it would facilitate a more robust understanding of temporal and spatial movement of crime guns and importance of place against the backdrop of neighborhood context (Tillyer et al., 2021).

Funding This project was supported by Grant No. 2020-DG-BX-0008 awarded by the Bureau of Justice Assistance. The Bureau of Justice Assistance is a component of the Department of Justice's Office of Justice Programs, which also includes the Bureau of Justice Statistics, the National Institute of Justice, the Office of Juvenile Justice and Delinquency Prevention, the Office for Victims of Crime, and the SMART Office. Points of view or opinions in this document are those of the author and do not necessarily represent the official position or policies of the U.S. Department of Justice.

References

Allison, P. (1999). *Multiple regression: A primer.* Thousand Oaks, CA: Pine Forge.

Anderson, E. J. (1994). The code of the street. *Atlantic Monthly, 273*, 81–94.

Anderson, E. (1999). *Code of the street: Decency, violence, and the moral life of the inner city.* New York, NY: W. W. Norton.

Baron, S. W., Kennedy, L. W., & Forde, D. R. (2001). Male street youths' conflict: The role of background, subcultural and situational factors. *Justice Quarterly, 18*, 759–789.

Bennett, R. R., & Wiegand, R. B. (1994). Observations on crime reporting in a developing nation. *Criminology, 32*, 135–148.

Black, D. (1983). Crime as social control. *American Sociological Review, 48*(1), 34–45.

Blumstein, A. (2000). Disaggregating the violence trends. In A. Blumstein & J. Wallman (Eds.), *The crime drop in America* (pp. 13–44). Cambridge University Press.

Bradford, C. P., & Rubinowitz, L. S. (1975). The urban-suburban investment-disinvestment process: Consequences for older neighborhoods. *The Annals of the American Academy of Political and Social Science, 422*(1), 77–86.

Braga, A. A. (2003). Serious youth gun offenders and the epidemic of youth violence in Boston. *Journal of Quantitative Criminology, 19*(1), 33–54.

Braga, A. A. (2017). Long-term trends in the sources of Boston crime guns. *The Russell Sage Foundation Journal of the Social Sciences, 3*(5), 76–95.

Braga, A. A., & Cook, P. J. (2016). The criminal records of gun offenders. *Georgetown Journal of Law and Public Policy, 15*(1), 1–16.

Braga, A. A., & Hureau, D. M. (2015). Strong gun laws are not enough: The need for improved enforcement of secondhand gun transfer laws in Massachusetts. *Preventive Medicine, 79*, 37–42.

Braga, A. A., & Pierce, G. L. (2005). Disrupting illegal firearms markets in Boston: The effects of operation ceasefire on the supply of new handguns to criminals. *Criminology and Public Policy, 4*(4), 717–748.

Braga, A. A., Kennedy, D. M., Waring, E., & Piehl, A. M. (2001). Problem-oriented policing, deterrence, and youth violence: An evaluation of Boston's operation ceasefire. *Journal of Research in Crime and Delinquency, 38*(3), 195–225.

Braga, A. A., Hureau, D. M., & Winship, C. (2008). Losing faith? Police, black churches, and the resurgence of youth violence in Boston. *Ohio State Journal of Criminal Law, 6*(1), 141–172.

Braga, A. A., Papachristos, A. V., & Hureau, D. M. (2010). The concentration and stability of gun violence at micro places in Boston, 1980–2008. *Journal of Quantitative Criminology, 26*(1), 33–53.

Braga, A. A., Wintemute, G. J., Pierce, G. L., Cook, P. J., & Ridgeway, G. (2012). Interpreting the empirical evidence on illegal gun market dynamics. *Journal of Urban Health, 89*(5), 559–793.

Braga, A. A., Brunson, R. K., Cook, P. J., Turchan, B., & Wade, B. (2021). Underground gun markets and the flow of illegal guns into the Bronx and Brooklyn: A mixed methods analysis. *Journal of Urban Health, 98*, 596–608.

Braga, A. A. (2021). Improving police clearance rates of shootings: A review of the evidence. Manhattan-Institute. https://media4.manhattan-institute.org/sites/default/files/improving-police-clearance-rates-shootings-review-evidence-AB.pdf

Brantingham, P. L., & Brantingham, P. J. (1995). Criminality of place: Crime generators and crime attractors. *European Journal on Criminal Policy and Research, 3*(5), 5–26.

Brantingham, P. J., & Uchida, C. D. (2021). Public cooperation and the police: Do calls-for-service increase after homicides? *Journal of Criminal Justice, 73*, 101785.

Brunson, R. K., & Wade, B. A. (2019). "Oh hell no, we don't talk to police:" Insights on the lack of cooperation in police investigations of urban gun violence. *Criminology & Public Policy, 18*(3), 623–648.

Bureau of Alcohol, Tobacco and Firearms (ATF). (2002). *Crime gun trace analysis: National Report*. Bureau of Alcohol, Tobacco and Firearms.

Bureau of Alcohol, Tobacco and Firearms (ATF). (2023). *National Integrated Ballistic Information Network (NIBIN)*. Washington, D.C.: www.atf.gov/resource-center/docs/undefined/nibinfactsheetfy23-508pdf/download

Burgason, K. A., Thomas, S. A., & Berthelot, E. R. (2014). The nature of violence: A multilevel analysis of gun use and victim injury in violent interpersonal encounters. *Journal of Interpersonal Violence, 29*(3), 371–393.

Bursik, R. J. (1986). Ecological stability and the dynamics of delinquency. In A. J. Reiss & M. Tonry (Eds.), *Communities and Crime* (pp. 35–86). The University of Chicago Press.

Bursik, R. J., & Grasmick, H. G. (1993). *Neighborhoods and crime: The dimension of effective community control*. Lexington.

Carson, J. V., Dierenfeldt, R., & Fisher, D. (2022). Country-level firearm availability and terrorism: A new approach to examining the gun-crime relationship. *Journal of Research in Crime and Delinquency, 59*(4), 449–486.

Centers for Disease Control and Prevention (CDC). (2022). *Firearm deaths grow, disparities widen*. Centers for Disease Control and Prevention. Retrieved November 17, 2022, from https://www.cdc.gov/vitalsigns/firearm-deaths/index.html

Clayman, S., & Skinns, L. (2012). To snitch or not to snitch? An exploratory study of the factors influencing whether young people actively cooperate with the police. *Policing and Society, 22*, 460–480.

Cohen, J., & Ludwig, J. (2004). Policing crime guns. In J., Ludwig, & P. J. Cook (Eds.), *Evaluating gun policy: Effects on crime and violence (pp. 217–250).* Brookings Institution Press.

Collins, M. E., Parker, S. T., Scott, T. L., & Wellford, C. F. (2017). A comparative analysis of crime guns. *The Russell Sage Foundation Journal of Social Sciences, 3*(5), 96–127.

Conaway, M. R., & Lohr, S. L. (1994). A longitudinal analysis of factors associated with reporting violent crimes to the police. *Journal of Quantitative Criminology, 10*, 23–39.

Cook, P. J., & Braga, A. A. (2001). Comprehensive firearms tracing: Strategic and investigative uses of new data on firearms markets. *Arizona Law Review, 43*, 277–309.

Cook, P. J., & Laub, J. H. (1998). The unprecedented epidemic in youth violence. In M. Tonry & M. H. Moore (Eds.), *Youth violence, crime and justice: A review of research* (pp. 27–64). University of Chicago Press.

Cook, P. J., & Pollack, H. A. (2017). Reducing access to guns by violent offenders. *The Russell Sage Foundation Journal of the Social Sciences, 3*(5), 1–36.

Cook, P. J., Ludwig, J., Venkatesh, S., & Braga, A. A. (2007). Underground gun markets. *Economic Journal, 117*(524), 558–588.

Cook, P. J., Harris, R. J., Ludwig, J., & Pollack, H. A. (2015a). Some sources of crime guns in Chicago: Dirty dealers, straw purchasers, and traffickers. *Journal of Criminal Law & Criminology, 104*(4), 717–760.

Cook, P. J., Parker, S. T., & Pollack, H. A. (2015b). Sources of guns to dangerous people: What we learn by asking them. *Preventive Medicine, 79*(1), 28–36.

Cook, P. J., Braga, A. A., & Moore, M. H. (2011). Gun control. In J. Q. Wilson & J. Petersilia (Eds.), *Crime and Public Policy (pp. 257–292)*. Oxford University Press.

Cook, P. J., Pollack, H. A., & White, K. (2019). The last link: from gun acquisition to criminal use. *Journal of Urban Health*, *96*(5), 784–791. https://doi.org/10.1007/s11524-019-00358-0

Copes, H., Hochstetler, A., & Forsyth, C. J. (2013). Peaceful warriors: Codes for violence among adult male bar fighters. *Criminology, 51*(3), 761–794.

Dierenfeldt, R., Brown, T. C., & Roles, R. A. (2017). Reconsidering the structural covariates of gun crime: An examination of direct and moderated effects. *Deviant Behavior, 38*(2), 208–225.

Dierenfeldt, R., Thomas, S. A., Brown, T. C., & Walker, J. T. (2021). Street culture and gun violence: Exploring the reputation-victimization paradox. *Journal of Interpersonal Violence, 36*(1–2), 552–578.

Drawve, G., Moak, S. C., & Berthelot, E. R. (2016). Predictability of gun crimes: A comparison of hot spot and risk terrain modelling techniques. *Policing & Society, 26*(3), 312–331.

Eck, J. E., Clarke, R. V., & Guerette, R. T. (2007). Risky facilities: Crime concentrations in homogeneous sets of establishments and facilities. *Crime Prevention Studies, 21*, 225–264.

Fagan, J. (2008). Legitimacy and criminal justice. *Ohio State Journal of Criminal Law, 6*, 123–140.

Flippin, M. R., Katz, C. M., & King, W. R. (2021). Examining the impact of a crime gun intelligence center. *Journal of Forensic Sciences, 67*(2), 543–549.

Gau, J. M., & Brunson, R. K. (2015). Procedural injustice, lost legitimacy, and self-help: Young males' adaptions to perceived unfairness in urban policing tactics. *Journal of Contemporary Criminal Justice, 31*, 132–150.

Glaeser, E. L., & Vigdor, J. L. (2001). *Racial segregation in the 2000 census: Promising news*. Brookings Institution Center on Urban and Metropolitan Policy. Retrieved from: https://www.brookings.edu/wp-content/uploads/2016/06/glaeser.pdf

Goldsmith, A., Halsey, M., & Bright, D. (2022). Taking crime guns seriously: A socio-material perspective. *Criminology & Criminal Justice, 22*(3), 467–479.

Goudriaan, H., Lynch, J. P., & Nieuwbeerta, P. (2004). Reporting to the police in western nations: A theoretical analysis of the effects of social context. *Justice Quarterly, 21*, 932–969.

Gramlich, J. (2022). *What the data says about gun deaths in the U.S.* Pew Research Center. Retrieved November 17, 2022, from https://www.pewresearch.org/fact-tank/2022/02/03/what-the-data-says-about-gun-deaths-in-the-u-s/

Haas, N. E., Keijser, J. W., & Bruinsma, G. J. N. (2014). Public support for vigilantism, confidence in police and police responsiveness. *Policing and Society, 24*, 224–241.

Hipple, N. (2022). Indianapolis crime gun intelligence center: Disrupting the cycle of violence in our community. Final Report, Bureau of Justice Assistance, U.S. Department of Justice. https://crimegunintelcenters.org/wp-content/uploads/2023/04/Indy-CGIC-Final-Report.pdf

Huebner, B. M., Martin, K., Moule, R. K., Pyrooz, D., & Decker, S. H. (2016). Dangerous places: Gang members and neighbourhood levels of gun assault. *Justice Quarterly, 33*(5), 836–862.

Hureau, D. M., & Braga, A. A. (2018). The trade in tools: The market for illicit guns in high-risk networks. *Criminology, 56*(3), 59–92.

Jacobs, B. A., & Wright, R. (2006). *Street Justice: Retaliation in the criminal underworld*. Cambridge University Press.

Johnson, B. T., Sisti, A., Berstein, M., Chen, K., Hennessy, E. A., Acabchuk, R. L., & Matos, M. (2021). Community-level factors and incidence of gun violence in the United States, 2014–2017. *Social Science & Medicine, 280*, 1–10.

Kasarda, J. D., & Janowitz, M. (1974). Community attachment in mass society. *American Sociological Review, 39*(3), 328–339.

Katz, J. (1988). *Seductions of crime*. Basic Books.

Katz, C. M., Flippin, M., Huff, J., & King, W. (2021). *Evaluation of the Phoenix crime gun intelligence center*. Center for Violence Prevention & Community Safety, Arizona State University.

Kennedy, D. M., Piehl, A. M., & Braga, A. A. (1996). Youth violence in Boston: Gun markets, serious youth offenders, and a useful reduction strategy. *Law and Contemporary Problems, 59*(1), 147–196.

Kennedy, D. M., Braga, A. A., & Piehl, A. M. (1997). The (un)known universe: Mapping gangs and gang violence in Boston. In D. Weisburd & J. McEwen (Eds.), *Crime Mapping and Crime Prevention*, *Crime Prevention Studies* (pp. 327–370). Monsey, N.Y.: Criminal Justice Press.

Kirk, D. S., & Papachristos, A. V. (2011). Cultural mechanisms and persistence of neighborhood violence. *American Journal of Sociology, 116*, 1190–1233.

Kleck, G., & McElrath, K. (1991). The effects of weaponry on human violence. *Social Forces, 69*(3), 669–692.

Kleck, G., & Wang, S. K. (2009). The myth of big-time gun trafficking and the overinterpretation of gun trace data. *UCLA Law Review, 56*, 1233–1294.

Krivo, L. J., & Peterson, R. D. (2000). The structural context of homicide: Accounting for racial differences in process. *American Sociological Review, 65*, 547–559.

Kubrin, C. E., & Weitzer, R. (2003). Retaliatory homicide: Concentrated disadvantage and neighborhood culture. *Social Problems, 50*, 157–180.

Kwak, H., Dierenfeldt, R., & McNeeley, S. (2019). The code of the street and cooperation with the police: Do codes of violence, procedural injustice, and police ineffectiveness discourage reporting violent victimization to the police? *Journal of Criminal Justice, 60*, 25–34.

Levine, N., Drake, S. A., Reynolds, T. F., Yang, Y., Wolf, D. A., Persse, D., Wade, C. E., & Holcomb, J. B. (2021). Spatial correlates of gun deaths in Harris County. *Texas. Homicide Studies, 25*(1), 37–60.

Long, J. S., & Freese, J. (2006). *Regression models for categorical dependent variables using STATA*. Stata Press.

McCarrell, E. F., Chermak, S., Weiss, A., & Wilson, J. (2001). Reducing firearms violence through directed police patrol. *Criminology and Public Policy, 1*(1), 119–148.

McNeeley, S., & Yuan, Y. (2017). A multilevel examination of the code of the street's relationship with fear of crime. *Crime & Delinquency, 63*(9), 1146–1167.

McNeeley, S., & Wilcox, P. (2015a). Street codes, routine activities, neighborhood context and victimization. *British Journal of Criminology, 55*, 921–943.

McNeeley, S., & Wilcox, P. (2015b). The code of the street and violent versus property crime victimization. *Violence and Victims, 30*, 1049–1067.

Novak, K. J. & King, W. R. (2020). Evaluation of the Kansas City crime gun intelligence center. Final Report, Bureau of Justice Assistance. https://crimegunintelcenters.org/wp-content/uploads/2020/10/KC-CGIC-Final-Report-2020.pdf

O'Neill, K. M., Salazar, M. C., Vega, C., Campbell, A., Anderson, E., & Dodington, J. (2021). "The cops didn't make it any better:" Perspectives on police and guns among survivors of gun violence. *Social Science & Medicine, 284*, 114197.

Osgood, O. (2000). Poisson-based regression analysis of aggregate crime rates. *Journal of Quantitative Criminology, 16*, 21–43.

Osgood, O., & Chambers, J. M. (2000). Social disorganization outside the metropolis: An analysis of rural youth violence. *Criminology, 38*(1), 81–116.

Papachristos, A. V., Braga, A. A., & Hureau, D. M. (2012). Social networks and the risk of gunshot injury. *Journal of Urban Health, 89*, 992–1003.

Papachristos, A. V., Wildeman, C., & Roberto, E. (2015). Tragic, but not random: The social contagion of nonfatal gunshot injuries. *Social Science & Medicine, 125*, 139–150.

Parker, K. F., & McCall, P. L. (1999). Structural conditions and racial homicide patterns: A look at the multiple disadvantages in urban areas. *Criminology, 37*(3), 447–478.

Peterson, R. D., & Krivo, L. J. (1993). Racial segregation and black urban homicide. *Social Forces, 71*, 1001–1026.

Pierce, G. L., Braga, A. A., Hyatt, R. R., & Koper, C. S. (2004). The characteristics and dynamics of illegal firearms markets: Implications for a supply-side enforcement strategy. *Justice Quarterly, 21*(2), 391–422.

Reiss, A. J. (1986). Why are communities important in understanding crime? In A. J. Reiss & M. Tonry (Eds.), *Communities and Crime* (pp. 1–33). The University of Chicago Press.

Reiss, A. J., & Roth, J. A. (1993). *Understanding and preventing violence*. National Academies Press.

Roberto, E., Braga, A. A., & Papachristos, A. V. (2018). Closer to guns: The role of street gangs in facilitating access to illegal firearms. *Journal of Urban Health, 95*(3), 372–382.

Rosenfeld, R., Jacobs, B. A., & Wright, R. (2003). Snitching and the code of the street. *British Journal of Criminology, 43*, 291–309.

Sampson, R. J., & Groves, W. B. (1989). Community structure and crime: Testing social-disorganization theory. *The American Journal of Sociology, 94*(4), 774–802.

Scott, S., Dierenfeldt, R., Drawve, G., Rosenberger, J., Crittenden, C., & May, J. (2023). Analysis of the factors influencing multiple uses of crime guns: An exploratory study. *Journal of Criminal Justice, 86*, 102049.

Semenza, D. C., Griffiths, E., Xu, J., & Stansfield, R. (2022). Firearm dealers and local gun violence: A street network analysis of shootings and concentrated disadvantage in Atlanta. *Journal of Research in Crime and Delinquency, 59*(5), 627–658.

Semenza, D. C., Stansfield, R., Steidley, T., & Mancik, A. M. (2023). Firearm availability, homicide, and the context of structural disadvantage. *Homicide Studies, 27*(2), 208–228.

Shaw, C. R., & McKay, H. D. (1942). *Juvenile delinquency and urban areas: A study of rates of delinquency in relation to differential characteristics of local communities in American cities*. The University of Chicago Press.

Sherman, L. W., Shaw, J. W., & Rogan, D. P. (1995). *The Kansas City gun experiment*. NCJ 150855. National Institute of Justice.US Department of Justice.

Sherman, L. W., & Rogan, D. P. (1995). Effects of handgun seizures on gun violence: 'Hot spots' patrol in Kansas City. *Justice Quarterly, 12*(4), 673–693.
Skogan, W. G. (1984). Reporting crimes to the police: The status of world research. *Journal of Research in Crime and Delinquency, 21*(2), 113–137.
Stewart, E. A., Schreck, C. J., & Simons, R. L. (2006). "I ain't gonna let no one disrespect me" does the code of the street reduce or increase violent victimization among African American adolescents? Journal of research in Crime and Delinquency, 43(4), 427–458.
Thomas, S. A., Harris, C. T., & Drawve, G. (2021). Exploring the influence of elements of the social and physical environment on neighborhood gun crime. *American Journal of Criminal Justice, 47*, 370–398.
Tillyer, M. S., Wilcox, P., & Walter, R. J. (2021). Crime generators in context: Examining 'place in neighborhood' propositions. *Journal of Quantitative Criminology, 37*, 517–546.
Vittes, K. A., Vernick, J. S., & Webster, D. W. (2012). Legal status and source of offenders' firearms in states with the least stringent criteria for gun ownership. *Injury Prevention, 19*(1), 26–31.
Wachtel, J. (1998). Sources of crime guns in Los Angeles, California. *Policing: An International Journal of Police Strategies and Management, 21*(2), 220–239.
Webster, D. W., Vernick, J. S., & Bulzacchelli, M. T. (2006). Effects of a gun dealer's change in sales practices on the supply of guns to criminals. *Journal of Urban Health, 83*(5), 778–787.
Wellford, C. F., Pepper, J. V., & Petrie, C. V. (2005). *Firearms and violence: A critical review. Committee to Improve Research and Information on Firearms*. National Academies Press.
Wilson, W. J. (1987). *The truly disadvantaged: The inner city, the underclass, and public policy*. University of Chicago Press.
Wintemute, G. J., Romero, M. P., Wright, M. A., & Grassel, K. M. (2004). The life cycle of crime guns: A description based on guns recovered from young people in California. *Annals of Emergency Medicine, 43*(6), 733–742.
Wintemute, G. J., Cook, P. J., & Wright, M. A. (2005). Risk factors among handgun retailers for frequent and disproportionate sales of guns used in violent and firearm related crimes. *Injury Prevention, 11*(6), 357–363.
Wright, J.D., & Rossi, P.H. (1994). *Armed and considered dangerous: A survey of felons and their firearms.* Hawthorne, NY: Aldine de Gruyter.
Wyant, B. R., Taylor, R. B., Ratcliffe, J. H., & Wood, J. (2012). Deterrence, firearm arrests, and subsequent shootings: A micro-level spatial-temporal analysis. *Justice Quarterly, 29*(4), 524–545.
Xu, J., & Griffiths, E. (2017). Shooting on the street: Measuring the spatial influence of physical features on gun violence in a bounded street network. *Journal of Quantitative Criminology, 33*, 237–253.
Zaykowski, H. (2011). Reconceptualizing victimization and victimization responses. *Crime and Delinquency, 61*, 271–296.
Zhang, L., Messner, S. F., & Liu, K. (2007). An exploration of the determinants of reporting crime to the police in the city of Tianjin, China. *Criminology, 45*, 959–984.

Rick Dierenfeldt is a UC Foundation Associate Professor of Criminal Justice in the Department of Social, Cultural, and Justice Studies at the University of Tennessee at Chattanooga. His research interests include gun crime and drug offending, as well as policy evaluation in the fields of policing and corrections. His most recent publications have appeared in such outlets as *Police Quarterly, Journal of Research in Crime and Delinquency, Victims and Offenders, and Journal of Criminal Justice*.

Grant Drawve is an Associate Professor in the Department of Sociology and Criminology and Associate Director of the Crime and Security Data Analytics Lab (CASDAL) at the University of Arkansas. Before joining UA, Grant was a Post-Doc at Rutgers University with a dual appointment between the School of Criminal Justice and Department of Psychology. His background focuses on the spatio-temporal patterns of crime and public health related issues. His research interest include: crime analysis, environmental criminology, neighborhoods and crime, secondary data analysis, recidivism, and public health.

Joshua May is a Sergeant of the Organize Crime Unit/Gun Team and Coordinator of the Crime Gun Intelligence Center of the Chattanooga Police Department.

Ellee Jackson holds a Bachelor of Science in criminal justice from the University of Tennessee at Chattanooga and is currently enrolled in the MSCJ program in the Department of Social, Cultural, and Justice Studies at the University of Tennessee at Chattanooga. Her research interests include gun crime, policing, and wrongful convictions.