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Gun ownership, poverty, and mental health associations with crime: A cross-state comparison

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Abstract

Purpose: To investigate the effect of gun ownership, poverty, and mental health disorder on crime across states within the United States.

Methods: We use state-reported rates of gun ownership, depression, and income inequality and compared them to crime and adult correctional systems data provided by the Federal Bureau of Investigation and the Bureau of Justice Statistics, respectively, to examine the potential effect of each on community violence through bivariate and multivariate analysis.

Results: No significant relationship between any of these independent variables and property crimes such as larceny or theft, a relationship to community supervision, and a punishment typically associated with lower level crimes. However, we and our multivariate model did find that gun ownership was a significant predictor of homicide and manslaughter, aggravated assault, and incarceration rates.

Conclusions: At the state level, gun ownership is correlated with violent crimes and income inequality with homicides specifically and we find support for the facilitation hypothesis. Future

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public policies which target these issues appear likely to bear fruit toward the goal of reducing crime. **[AQ: 1]**

Keywords

Crime, facilitation, guns, poverty, violence **[AQ: 2]**

Violent crime is a salient social issue that generally signifies undercurrents of immorality within a society, but the specific mechanisms involved in motivating individuals to commit violent crimes have not yet been well established by the scientific community. Some studies have suggested that access to guns may predict violent outcomes (Alzheimer, 2010; Cook and Ludwig, 2006; Moore and Bergner, 2016). Others point to poverty and income inequality as the main indicator of criminal activity (Brown and Males, 2011; Hannon and DeFina, 2005). There is also a common belief within the field of criminology that most perpetrators of violent crime have also been victims of criminal abuse (Crocker, 1998; Smith, 2005). Others have further suggested that mental health disorders are a significant indicator of criminality (Sesar et al., 2015).

This study examined these various social factors and their potential statistical association to several outcomes related to violent crime—murder/manslaughter rate, aggravated assault rate, larceny theft rate, community supervision, and incarceration—to determine which predictors are most strongly linked with crime in the United States. We used state-reported rates of gun ownership, depression, and income inequality and compared them to crime and adult correctional systems data provided by the Federal Bureau of Investigation (FBI) and the Bureau of Justice Statistics, respectively, to examine the potential effect of each on community violence.

Guns

One of the most hotly contested debates in criminal theory focuses on the relationship between gun ownership and crime rates. While some suggest that access to firearms increases the risk of crime (Alzheimer, 2010; Cook and Ludwig, 2006; Moore and Bergner, 2016), others have contested that it actually reduces the risk by empowering potential victims (Kleck, 1997; Lott, 2000). Part of the difficulty in reaching a consensus is due to the difficult nature of studying this link. Official gun ownership statistics may be underreported because the statistics for violent crimes committed are known to be heavily influenced by different reporting and recording practices (Van Dijk, 2008). While much of this research is therefore conducted on a limited basis, one study accounting for data from over 1000 US counties found that the rates of homicide, rape, assault, and robbery increased as firearm prevalence increased (Moore and Bergner, 2016). But considerable variation may be found within a survey population, as another US study comparing data from urban, suburban, and rural counties found a relationship between gun ownership and homicide rates in metro areas but not in other environments (Moore, 2017). This suggests the possibility that the relationship between guns and crime is dependent upon other societal or contextual factors. **[AQ: 3][AQ: 4]**

[AQ: 5]

Income inequality

While it is a common tendency within the public sphere to place blame upon the individuals who commit crimes, many scholars have pointed to poverty as a significant predictor of crime (Brown and Males, 2011; Hannon and DeFina, 2005). This relationship has been supported across several different constructions of poverty, including income inequality (Coccia, 2017), educational status (Rossegger et al., 2009), and unemployment (Andresen, 2013). However, others have stated that there is a lack of evidence to suggest that poverty is a sufficient condition that can cause individuals to commit an act of violence (Von Hippel, 2002). In one study of poverty clusters, or contiguous areas containing high rates of poverty, there was little evidence to suggest that violent crime rates were higher within clusters than in surrounding areas of the city (Stretesky et al., 2006). Regardless, there is a well-established link between poverty and feelings of social alienation (Sampson et al., 1997; Sen, 2008), and social deprivation has been found to have a strong correlation to violence (Wu, 2003).

Depression

Similar to the question of what causes violence, the specific causes of mental disorders such as depression are not well understood. However, cases are often linked to traumatic events such as personal conflict or loss, major life events such as divorce and unemployment, and exposure to abuse. In addition to the established link between social deprivation and violence, victims of violence are significantly more likely to experience severe psychopathological symptoms and related behaviors such as substance misuse (Walsh et al., 2003). It is possible that this can also lead victims to become perpetrators in what is known as the “cycle of violence” (Kaufman and Widom, 1999; White and Widom, 2003). The cycle of violence holds that those who are frequently exposed to violence, particularly at a young age, may be more likely to act with aggression toward perceived threats (Garbarino et al., 1992). As such, living in areas with high levels of violence is hypothesized to lead to high levels of stress.

One study found that those living in violent crime hot spots were far more likely to report symptoms of depression and post-traumatic stress disorder (PTSD) than those in cold spots (Weisburd et al., 2018), and the prevalence of depression in those who have been experienced the violence of prison life has long been theorized (Cooper, 1974). Therefore, it is also possible that those who are exposed to the conditions that foster mental disorders such as depression are also more susceptible to the conditions necessary for violence. Nonetheless, it is important to note that the etiology of mental disorders is complex, and, in fact, most cases of depression do not result specifically from exposure to violent crime.

Mental health is also important to understand at the community level in one other aspect. Specifically, one predictor of community-level violent crime is community-level mental health (Grinshteyn et al., 2018). Such relationships can be bidirectional. For instance, some evidence suggests that certain types of mental health disorders, particularly psychosis (Yee et al., 2020), but also depression when mixed with psychopathic traits (Ferguson, 2011) are associated with higher rates of violent behavior. Community

mental health rates and their relation with violent crime are likely complex and bidirectional . . . in some cases, mental health may be a risk factor for crime, but also community crime rates likely increase rates of poor mental health.

Incarceration and community supervision

The degree to which a community is impacted by crime can be understood in several ways. The first is to examine this through the lens of experiencing of crime, such as per capita rates of murder, assault, larceny, and so on. The other involves examining the degree to which members of the community experience criminal sanctions such as incarceration and community supervision (probation, parole). Incarceration and community supervision rates are complex phenomena, reflecting both actual prevalence of crime, as well as community standards on how such crimes are to be addressed (Mears, 2006). Thus, as an outcome, they function in a different context than do pure rates of victimization.

Present study

This study sought to understand the interaction between these three key variables: gun ownership, income inequality, and depression as they relate to violent crime at the state level. It was hypothesized that, in multivariate analyses, higher gun ownership, higher income inequality and higher depression would all be associated with higher levels of violent crime.

Methods

Measures

Information on the source of all data is presented below. Gun ownership and lifetime prevalence of depression are reported as percentages, and income inequality is presented as Gini coefficients. The remaining estimates represent the number of crime incidents recorded per state per 100,000 people in the year end 2013. Table 1 includes basic information on all scales included in the current analysis. All measures comprised continuous scales unless otherwise indicated.

Larceny/theft, murder/manslaughter, and aggravated assault. Each of these variables was recorded by the Uniform Crime Reporting division of the FBI (Uniform Crime Reports, 2019). In 1929, the International Association of Chiefs of Police met to determine how to develop trustworthy crime statistics for the United States, and in 1930, the FBI began collecting, publishing, and archiving data in what is now known as the Uniform Crime Reports. It is used to attempt to assist in criminal justice management at a local, state, and federal level and is the United States' leading criminal indicator of crime and criminal justice research.

Community supervision and incarceration. These variables were recorded by the Bureau of Justice Statistics in its annual report entitled Correctional Populations in the United

Table 1. National descriptives for year 2013.

	N	M	SD	Min	25th p	Median	75th p	Max
% Gun owners	51	32.95	13.44	5.20	25.90	32.20	42.80	61.70
% Lifetime depression	51	19.05	2.96	11.40	17.30	18.70	21.30	26.60
Gini inequality index	51	.47	.02	.42	.45	.47	.48	.53
Community supervision	50	1770.80	1009.42	590.00	1180.00	1550.00	2210.00	7120.00
Incarceration	51	787.65	260.83	350.00	550.00	780.00	950.00	1420.00
Murder—manslaughter	51	4.31	2.51	1.30	2.30	4.10	5.40	15.90
Aggravated assault	51	229.99	105.18	68.30	149.80	216.50	285.20	590.80
Larceny—theft	51	1954.56	441.25	1324.20	1626.10	1915.00	2284.20	3781.60

Min: minimum; p: percentile; Max: maximum.

States (Glaze and Kaeble, 2014). This report presented statistics from the adult correctional system at year end 2013, including offenders supervised in the community on probation or parole (community supervision) and those incarcerated in prison or local jail (incarceration). By way of comparison between these two measures nationally, almost 1 in 35 adults (2.8%) in the United States was under some form of correctional supervision at year end 2013, and almost 1 in 51 adults was on probation or parole at year end 2013 (2.0%). **[AQ: 6]**

Gun ownership. National data on gun ownership was previously collected by another research group based out of Columbia University (Kalesan et al., 2016). This team collected the data from a survey by YouGov (<http://www.yougov.com>) of individuals aged 18 years or older in the United States in 2013. YouGov is a nonpartisan research firm that recruits its panel online through a polling website and develops nationally representative surveys used widely for research. Their survey ($n=4622$) was released to invitees in all 50 states. These data were developed using propensity score matching and weighted sampling with replacements resulting in a nationally representative population of 4000 participants who were asked six questions regarding gun ownership. These were whether the respondent was a gun owner, the gun was gifted, bought before year 2000, bought after 2000, the gun was used for hunting, whether the owner attended gun safety classes, and whether the owner advocated responsible gun ownership (Kalesan et al, 2016, 2018). Individual responses were not mutually exclusive. The respondent was categorized as “gun owner” if they answered in the affirmative to any of the six queries. **[AQ: 7]**

Mental health prevalence of diagnosed depression. Mental health prevalence was indicated by data drawn from the Behavioral Risk Factor Surveillance System (“BRFSS”). This particular information was contained within the Prevalence and Trends Data subsection of the Centers for Disease Control (CDC)’s reporting of lifetime prevalence of depression. The BRFSS is the nation’s premier system of health-related telephone surveys that collect state data about US residents regarding their health-related risk behaviors, chronic health conditions, and use of preventive services (CDC, 2014). Data were collected from all 50 states, Washington DC, and three US territories and is the largest survey of its kind in the health care industry with more than 400,000 adult interviews each year. BRFSS

data are utilized to determine policy for health promotion activities. The question used to gain a response designed to estimate prevalence of depression was “Has your doctor or medical professional ever told you that you have a form of depression?.” This variable was recorded with a dichotomous level of measurement. The wording of the questions in any part of the BRFSS is determined at the annual BRFSS meeting in March, where BRFSS State Coordinators vote to adopt questions submitted by CDC programs.

Income inequality. Income inequality was measured with the Gini coefficient. The Gini coefficient is a measure of statistical dispersion intended to represent the income or wealth distribution of a nation or state’s residents and is the most commonly used measurement of inequality. The Gini coefficient measures the inequality among values of a frequency distribution (e.g., levels of income). A Gini coefficient of zero expresses perfect equality, where all values are the same (e.g., where everyone has the same income), and a coefficient of 1 (or 100%) expresses maximal inequality among values (e.g. for a large number of people, where only one person has all the income or consumption, and all others have none, the Gini coefficient will be very nearly one). (Gini Coefficient as a Measure For Household Income Distribution Inequality For U.S. States In 2013, 2014)

Data for this variable were derived from the US Census Report for year 2013 (Gini Index of Income Inequality, 2014) The Census Bureau’s Population Estimates Program generates and publishes the official estimates of the population for the nation, states, counties, cities, and towns and estimates of housing units for states and counties.

Analysis

Using univariable and multivariable linear regression models, we examined potential statistical associations between various social indicators (gun ownership, depression prevalence, and income inequality) and multiple crime-related outcomes (murder/manslaughter rate, aggravated assault rate, larceny theft rate, community supervision, and incarceration) to determine which predictors were most strongly associated with crime across states. Bivariate scatterplots were used to assess for linear relationships and to identify outliers that could exercise undue leverage on model estimates, and variance inflation factors (VIFs) were used to identify potentially problematic multicollinearity. Residuals plots were inspected for normality, and robust standard errors were estimated to mitigate effects of heteroscedasticity.

Results

Bivariate statistical associations between social predictors and crime-related outcomes are presented in Figures 1 to 5, and multivariable associations are presented in Table 2. To mitigate leverage on model estimates, one to two outlier states were excluded from each model (i.e. Larceny Theft and Aggravated Assault: District of Columbia, Murder-Manslaughter: District of Columbia and Louisiana, Community Supervision: Georgia, and Incarceration: Delaware). Oklahoma was also excluded from models predicting community supervision because no data were available for this state in 2013. Residuals from each multivariable model were sufficiently normal for all crime-related outcomes

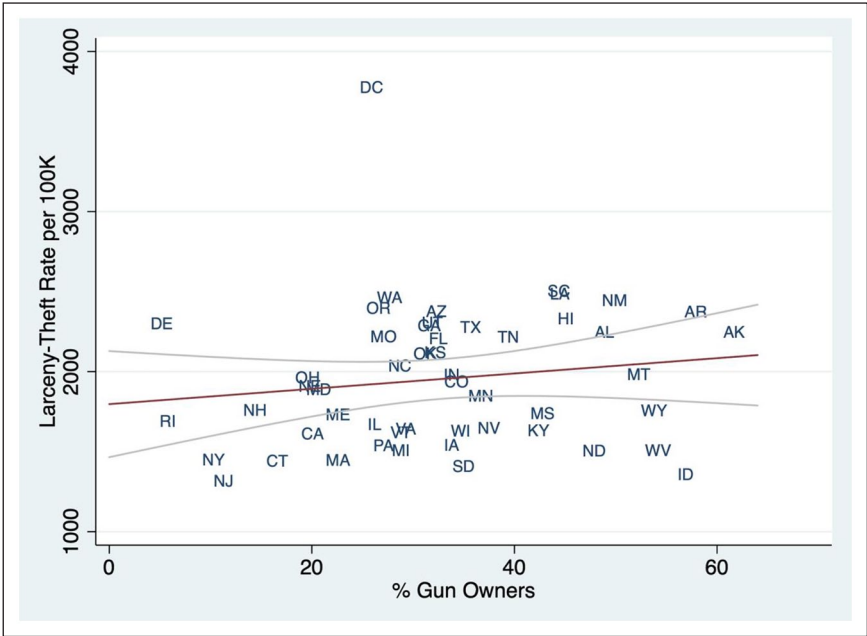


Figure 1. Bivariate association between gun ownership and larceny theft. [AQ: 9]

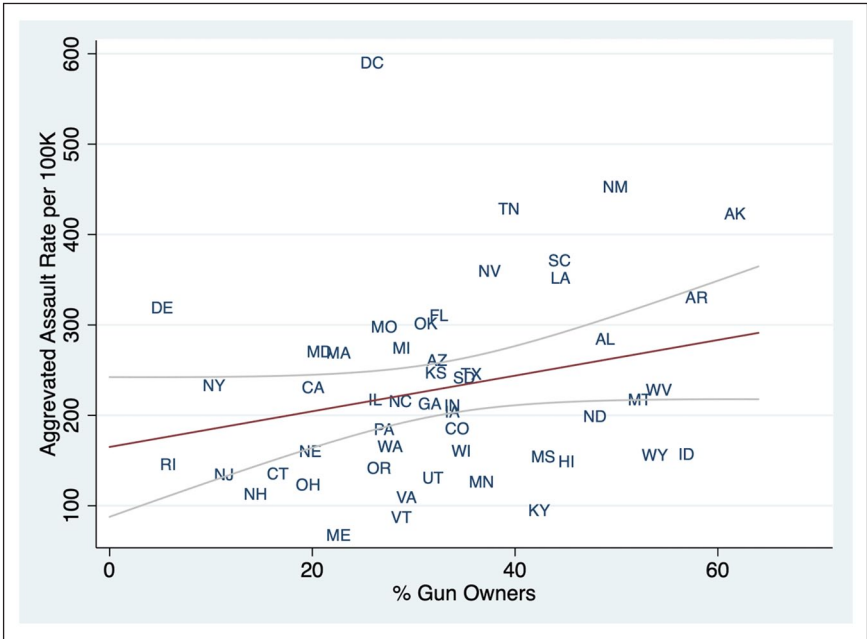


Figure 2. Bivariate association between gun ownership and aggravated assault.

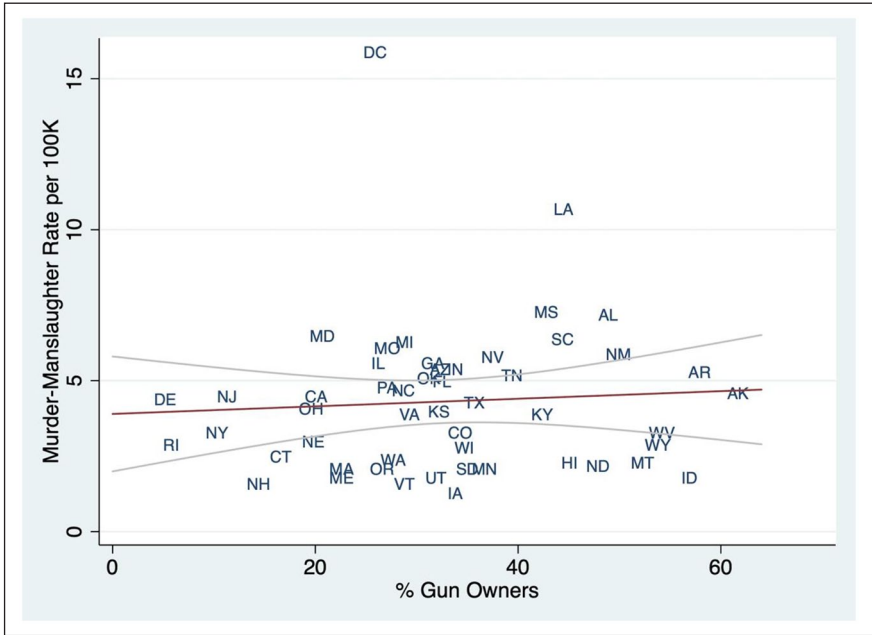


Figure 3. Bivariate association between gun ownership and murder-manslaughter.

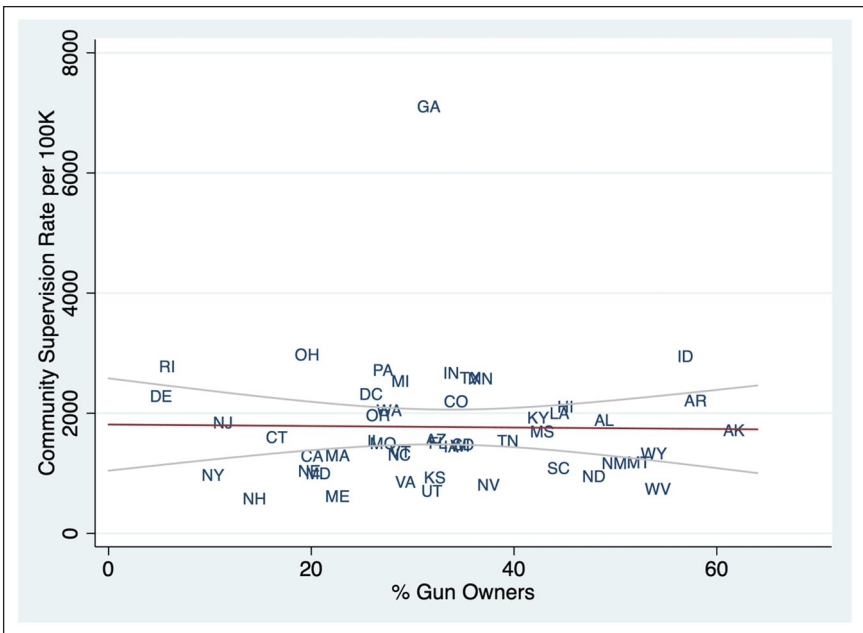


Figure 4. Bivariate association between gun ownership and community supervision.

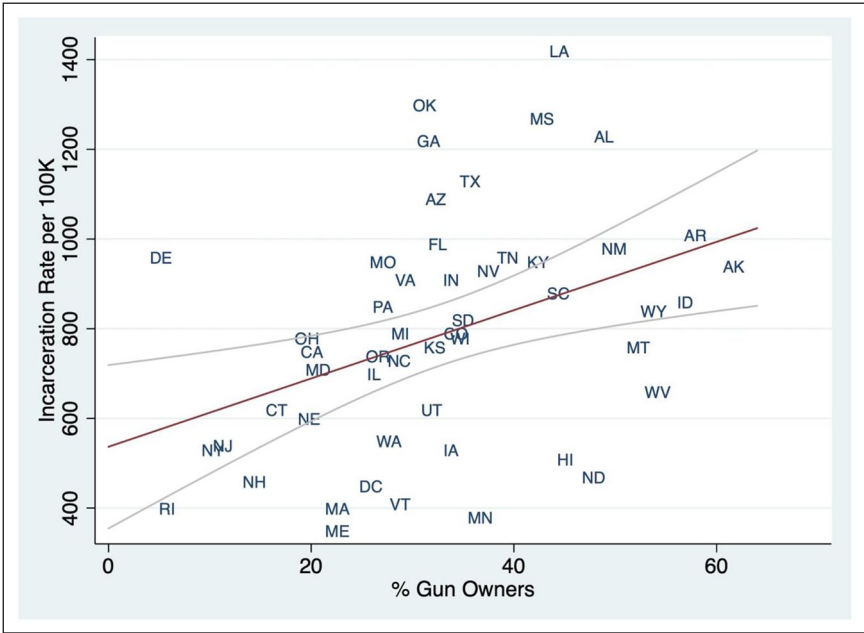


Figure 5. Bivariate association between gun ownership and incarceration.

except community supervision (in which no statistically significant effects were observed), and VIFs from each model indicated no problematic multicollinearity (max (VIF)= 1.16).

With respect to murder/manslaughter (Table 3), the multivariable model was significant with moderate explanatory power ($R^2=.214$), explaining 21% of the variance in state-level rates of murder/manslaughter. The strongest effect observed was for income inequality ($\beta=.456$), followed by gun ownership ($\beta=.284$), and both were statistically significant. The effect of depression prevalence ($\beta=-.109$) was weaker and not statistically significant.

With respect to aggravated assault (Table 4), the multivariable model was significant with mild to moderate explanatory power ($R^2=.193$), explaining 19% of the variance in state-level rates of incarceration. Gun ownership ($\beta=.428$) was the most predictive and the only statistically significant relationship observed. The effects of income inequality ($\beta=.264$) and depression prevalence ($\beta=-.119$) were weaker and not statistically significant.

With respect to larceny/theft (Table 5), the multivariable model was significant with weak explanatory power ($R^2=.09$), and none of the predictors were statistically significant. Gun ownership ($\beta=.237$) had the strongest effect, followed by depression prevalence ($\beta=.185$) and income inequality ($\beta=.046$).

With regard to community supervision (Table 6), the predictive power of the multivariable model was weak ($R^2=.02$), and none of the predictors were statistically

Table 2. [AQ: 8] Unstandardized and standardized effects of social indicators on crime.

Bivariable associations					
	Larceny— <i>theft</i> ^a	Aggravated assault ^a	Murder— <i>manslaughter</i> ^{a,b}	Community supervision ^{c,d}	Incarceration ^e
	<i>b</i> (SE), β	<i>b</i> (SE), β	<i>b</i> (SE), β	<i>b</i> (SE), β	<i>b</i> (SE), β
% Gun owners	6.277 (4.031), .236	2.273* (1.040), .332	.014 (.016), .110	-.408 (7.661), -.009	8.934* (2.073), .442
% Depression	23.885 (18.578), .198	-3.670 (4.066), -.119	-.079 (.079), -.142	14.056 (28.950), .063	-2.584 (12.457), -.029
Inequality index	-979.962 (2669.812), -.054	646.910 (842.837), .139	31.233* (12.804), .366	3583.832 (3731.913), .121	1283.763 (1951.058), .108
Multivariable associations					
	Larceny— <i>theft</i> ^a	Aggravated assault ^a	Murder— <i>manslaughter</i> ^{a,b}	Community supervision ^{c,d}	Incarceration ^e
	<i>b</i> (SE), β	<i>b</i> (SE), β	<i>b</i> (SE), β	<i>b</i> (SE), β	<i>b</i> (SE), β
% Gun owners	6.305 (4.440), .237	2.928* (1.158), .428	.035* (.017), .284	1.466 (8.585), .031	11.301* (2.367), .559
% Depression	22.377 (18.051), .185	-3.707 (3.824), -.119	-.060 (.069), -.109	15.314 (29.831), .069	-3.084 (11.596), -.035
Inequality index	842.068 (2733.032), .046	1233.589 (757.246), .264	38.893* (11.855), .456	4000.125 (3968.514), .135	3711.277 (2003.452), .312

Excludes DC^a, LA^b, GA^c, OK^d, DE^e.
 * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 3. Predictors of murder/manslaughter.

	<i>b</i>	β	<i>SE</i>	<i>t</i>	<i>p</i> value	95% CI-LB	95% CI-UB
Gun ownership	0.035	.284	0.017	2.01	.050	-0.000	0.070
Depression prevalence	-0.060	-.109	0.069	-0.870	.388	-0.200	0.079
Income inequality	38.893	.456	11.855	3.28	.002	15.02	62.77

CI, confidence interval; LB, lower bound; UB, upper bound.

Table 4. Predictors of aggravated assault.

	<i>b</i>	β	<i>SE</i>	<i>t</i>	<i>p</i> value	95% CI-LB	95% CI-UB
Gun ownership	2.928	.428	1.158	2.53	.015	0.597	5.258
Depression prevalence	-3.707	-.119	3.824	-0.97	.337	-11.405	3.990
Income inequality	1233.589	.264	757.246	1.63	.110	-290.667	2757.845

CI, confidence interval; LB, lower bound; UB, upper bound.

Table 5. Predictors of larceny/theft.

	<i>b</i>	β	<i>SE</i>	<i>t</i>	<i>p</i> value	95% CI-LB	95% CI-UB
Gun ownership	6.305	.237	4.440	1.42	.162	-2.631	15.241
Depression prevalence	22.378	.185	18.052	1.24	.221	-13.958	58.713
Income inequality	842.068	.046	2733.032	0.31	.759	-4659.241	6343.377

CI, confidence interval; LB, lower bound; UB, upper bound.

Table 6. Predictors of community supervision.

	<i>b</i>	β	<i>SE</i>	<i>t</i>	<i>p</i> value	95% CI-LB	95% CI-UB
Gun ownership	1.466	.031	8.585	0.170	.865	-15.825	18.758
Depression prevalence	15.314	.068	29.831	0.510	.610	-44.768	75.396
Income inequality	4000.125	.135	3968.514	1.01	.319	-3992.872	11993.120

CI, confidence interval; LB, lower bound; UB, upper bound.

significant. The strongest relationship was observed for income inequality ($\beta = .135$) followed by depression prevalence ($\beta = .068$) and gun ownership ($\beta = .031$)

With respect to Incarceration (Table 7), the multivariable model was significant with modest explanatory power ($R^2 = .282$), explaining 28% of the variance in state-level rates of incarceration. Gun Ownership ($\beta = .559$) was the most predictive, followed by Income Inequality ($\beta = .312$) and Depression Prevalence ($\beta = -.035$), but only Gun Ownership was statistically significant.

Table 7. Predictors of incarceration.

	<i>b</i>	β	<i>SE</i>	<i>t</i>	<i>p</i> value	95% CI-LB	95% CI-UB
Gun ownership	11.301	.559	2.367	4.77	<.001	6.537	16.066
Depression prevalence	-3.084	-.035	11.596	-0.27	.791	-26.426	20.257
Income inequality	3711.277	.312	2003.452	1.85	.070	-321.463	7744.017

CI, confidence interval; LB, lower bound; UB, upper bound. Gini coefficient becomes one only in a large population where one person has all the income. In the special case of just two people, where one has no income and the other has all the income, the Gini coefficient is 0.5. For five people, where four have no income and the fifth has all the income, the Gini coefficient is 0.8. see FAO, United Nations—Inequality Analysis, The Gini Index Module (PDF format), fao.org.

Discussion

This study aimed to further examine the possible relationship between gun ownership, income inequality (as measured by the Gini index), and depression and violent crime within the United States. Our model found no significant relationship between any of these factors and property crimes such as larceny or theft, nor did it find a relationship to community supervision, a punishment typically associated with lower level crimes. However, our model did find that gun ownership was a significant predictor of homicide and manslaughter, aggravated assault, and incarceration rates. This finding is supportive of the facilitation hypothesis, which states that because firearms enhance the power of an aggressor, they reduce the necessity of a physical attack and encourage those who may not otherwise resort to violence (Altheimer, 2010). This hypothesis stands as a possible explanation for the prevalence of homicide in the United States as compared to other industrialized nations, most of which have far lower homicide rates (but not necessarily lower assault rates).

While our model did not suggest that income inequality was a predictor of most of the chosen indicators, it did find that income inequality was the strongest predictor of murder/manslaughter rates. This supports the findings of a previous study on poverty clustering by Stretesky et al. (2006). Their study did not find evidence of a relationship between crime rates and high poverty areas in general, but there was a positive correlation between homicide rates and poverty rates when compared across different cities. This suggests that the socioeconomic environment does have an influence on the conditions that affect violence.

Importantly, no significant relationship was found between depression and any of the indicators used in this study. Thus, although data suggest that those experiencing severe mental illnesses such as schizophrenia have a 3× to 4× elevated risk of violence, depression alone may not be a specific predictor at the state level. Future studies should take a closer look at chronic mental illnesses and whether these more closely track with crime than does depression.

International context

The current analyses examine predictors of crime across states in the United States, with firearm ownership a key predictor of several outcomes, along with income inequality as

a predictor of murder/manslaughter. However, other countries such as the United Kingdom have comparatively lower levels of gun crime. Thus, the application of some of our findings may be less clear to other nations or, to put it more bluntly, why should a country like the United Kingdom care about gun crimes in the United States?

There are several ways in which our data are important in an international context. First, aside from gun ownership, our other predictors are important in an international context. For instance, our observation that income inequality is associated with homicides is consistent with other data in cross-national comparisons (Ferguson and Smith, 2021). Thus, across contexts, income inequality appears to be a robust predictor of homicides both across US states and cross-nationally, suggesting that this factor may be particularly important when considering policy as relates to violent crime. By contrast, in the same paper, gun ownership was not a significant predictor of homicides, in contrast to our own article.

The United States has a very high rate of gun ownership, particularly for a highly developed nation, although its homicide rate is lower than many other countries in the developing world where gun ownership laws may technically be stricter, though flouted by criminal enterprises. This difference in outcome between US states and internationally suggests that the involvement of guns in homicides as a matter of policy is a complex one. Some countries with comparatively high gun ownership (e.g. Switzerland) may experience low homicide rates, whereas some countries with relatively low gun ownership rates (e.g. Mexico) have much higher homicide rates than the United States. Thus, gun ownership is important, but only in combination with an understanding of other societal factors and the degree to which it permeates in criminal organizations as compared to private ownership.

This returns us necessarily to the facilitation hypothesis. We can see in international context that gun ownership is a poor predictor of violent crime compared to economic factors. Yet, for the United States, gun ownership is a fairly robust predictor. It is also important to understand here that the United States has an unusually high homicide rate compared to other developed nations such as the United Kingdom, France, New Zealand, Australia, and Belgium but, in fact, has a *lower* assault rate than all of those mentioned nations (United Nations Office on Drugs and Crime, 2021). These data combined suggest that, in the US context, that private gun ownership is facilitating the conversion of some assaults into homicide, a process more difficult in other developed nations where gun ownership is lower. However, the facilitation effect is less critical in less developed nations where comparative absence of private gun ownership is not a protective factor for homicides and other violent crime. Nonetheless, the specific involvement of firearms in violent crime is likely to be debated for some time (e.g. Kleck and Patterson, 1993; Zimring, 2004).

Community mental health was, surprisingly, not a predictor of any of our outcomes. There are two possibilities to explain this. First, it may be that depression as an index of mental health is less critical than other disorders such as psychosis. This may make sense, given that psychosis, on its own, is associated with a several times increase in the risk of violent crime, but depression is associated with crime only in combination with other factors such as antisocial traits. The other possibility is, quite simply, that mental health is a weaker predictor of violent crime than we had hypothesized. Given that mental health is often discussed as a policy outlet for violent crime, a clearer understanding of this would be critical cross-nationally.

Conclusion

In conclusion, our analyses suggest that, at least at the state level, gun ownership is correlated with violent crimes and income inequality with homicides specifically. Future public policies which target these issues appear likely to bear fruit toward the goal of reducing crime. It is possible that income inequality may, in fact, be easier to target, given constitutional protections for gun ownership and lack of consensus at the cultural level about the degree of gun restriction likely needed to reduce violent crime. We hope that our analyses provide useful data for policy makers.

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