

Correlation Analysis of Gun Violence in the United States from Economic Perspective

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Abstract. Due to the increasing number of serious gun violence in the United States and the growing frequency of gun violence incidents, it is necessary to put ahead significant options and opinions for this problem to interpret applicable data to locate positive rules. In this paper, a study was conducted to discover the relationship between gun violence incidents from economy-related factors. This paper introduces population as an intermediate variable to show their connection. For this purpose, ten data units were set up, and all the unique data units were transformed into MS Excel form for classification and sorting to standardize and unify the data by way of states' names or years. After that, this study carried out a correlation analysis for ten data features to measure the strength of the relationship between variables and calculate the strength of the relationship. After subcategories of gun violence have been recognized and their correlation has been separately demonstrated, the data can be sorted into a single spreadsheet to test whether the individual feature have a relationship throughout time or state. The analysis outcomes indicate a correlation between economic factors and gun violence, and the extra unstable the regional economic situation, the greater the incidence of gun violence.

Keywords: Gun Violence, Correlation Analysis, Economy.

1. Introduction

As cited in the constitution, firearms possession, “the proper of the humans to hold and endure Arms shall now not be infringed,” is a legislative right in the US that cannot be modified ever when considering that it has been made. However, the firearm issue, or gun violence issue, is becoming severe, and the incidents are on the rise. In 12 months, 2021, there have been about 40,000 Americans killed with the use of guns, and in a current study, it mentioned that weapons overtake car crashes as the main reason for US trauma-related deaths [1]. The complete wide variety of gun-related incidents, at the identical time, doubled over the final seven years. In such a case, it is critical to apprehend the information at the back of these figures and perhaps grant insights and small print on viable solutions.

Initial attempts centered on figuring out the reason for gun violence in the US. In their study, Interventions aimed at decreasing gun violence have to be centered in the direction of the most frequent threat elements referred to in the literature, such as access, violent behavioral inclinations due to previous publicity or substance abuse, and intellectual sickness, which includes suicidal ideation [2]. Another strategy used to be to discover poverty and income as two predictors of murder and violent crimes, and their findings understand the profound results of income inequality and social capital when controlling for different elements such as poverty and firearm availability, on firearm violent crime point out that insurance policies that tackle these broader, macro-social forces warrant serious consideration [3]. Further, research decides the firearm violence publicity and suicidal ideation amongst younger adults experiencing homelessness [4]. Their findings propose that an excessive proportion of YAEH (Young Adults Experiencing Homelessness) had been uncovered to firearm violence. Cross-sector, multiagency collaborations are warranted to minimize firearm violence publicity amongst this inclined population. However, not so many economic factors were being considered as major causes of the gun violence issue, thereby inquiring attention in such field.

There remains a need for exploring the gun violence issue with factors related to the population and economy, or economic performance, of the US. This study aims first to identify gun-related death and mass shooting as indications of gun violence and then determine the correlation between guns and gun-related death. This study hypothesizes that the population is an intermediary between the gun-related death rate and the economy. It is assumed that there are correlations between other economic indicators with either gun-related death or mass shooting.

Then this study examines further a comprehensive relationship between firearm death, mass shootings, Gini coefficient, labor participation rate, and homelessness, which are the economic-related factors that are not being explored and which our work focused on.

2. Method

2.1 Data description and preprocessing

In this study, we used ten datasets from Statista [5], one of the biggest global data platforms, to testify to the relationship between gun-related death and population, and between population and economic indicators. Meanwhile, we use the datasets to testify the relationship directly between economic indicators and mass shootings. All features being tested in this article are listed in Table 1. The original datasets were separated so we preprocessed all the datasets we found and gathered all related datasets into two MS Excel spreadsheets. To preprocess the data, we first collected all the spreadsheets. We sorted them by either state's name or year, in ascending order, while deleting unnecessary data, data that came with the datasets from Statista but had no correlation with our study, for example, the population in 2010.

Another essential step for data processing was to match all the names of states or years and combined those datasets from over ten separate datasets into one single spreadsheet. In this spreadsheet, we were then able to standardize and unify those features based on the states' names or years, as shown in Table 2 and Table 3. After observing the datasets, data between the year 2006 and 2020 are mostly intact, missing only two data which can cause no impact on the correlation analysis over 15 years period. Also, it needed to be addressed that the population in different states in the year 2020 wasn't available, but since there were minor changes within a year, it did not affect the result.

Table.1. Definitions of all the features used in the article

Feature name	Description
Death rate	It is the ratio of deaths to the population of a particular area or during a particular period of time.
Homicide rate	Homicide rate is the ratio of people affected by killings of one person by another with intent to cause death or serious injury, by any means.
Population density	It is a measurement of population per unit area, it refers to the number of people living in an area per square kilometer.
Median income	The median income is the income amount that divides a population into two equal groups, half having an income above that amount, and half below.
Poverty rate	It is the ratio of the number of people (in a given age group) whose income falls below the poverty line.
Unemployment	It is people above a specified age not being in paid employment or self-employment but currently available for work during the reference period.
Homelessness	Homelessness is the condition of lacking stable, safe, and adequate housing.
Gini coefficient	Gini coefficient is a measure of statistical dispersion intended to represent the income inequality or the wealth inequality within a nation or a social group.
Labor participation rate	The labor participation rate is the measure to evaluate working-age population in an economy.

Firearm death	Firearm deaths include all deaths involving guns, such as homicide, suicide, and accidents.
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Table.2. Dataset sorted by year

year	Poverty Rate	Mass Shooting	GINI	Firearm Death	Unemployment Rate	Homelessness	Labor Participation Rate	Gun Ownership	Homicides Num (Firearms)	Homicide by Firearm Rate
2006	12.30	3	0.47	30,896	4.62	-	66.20	43	10,225	3.42
2007	12.50	4	0.46	31,224	4.62	647,258	66	42	10,129	3.36
2008	13.20	3	0.47	31,593	5.78	639,784	66	42	9,528	3.13
2009	14.30	4	0.47	31,347	9.25	630,227	65.40	40	9,199	3
2010	15.10	1	0.47	31,672	9.63	637,077	64.70	39	8,874	2.87
2011	15	3	0.48	32,351	8.95	623,788	64.10	45	8,653	2.78
2012	15	7	0.48	33,563	8.07	621,553	63.70	43	8,897	2.82
2013	14.80	5	0.48	33,636	7.38	590,364	63.20	37	8,454	2.67
2014	14.80	4	0.48	33,594	6.17	576,450	62.70	42	7,803	2.45
2015	13.50	7	0.48	36,252	5.28	564,708	62.70	41	9,143	2.85
2016	12.70	6	0.48	38,658	4.87	549,928	62.80	39	10,403	3.22
2017	12.30	11	0.48	39,773	4.36	553,742	62.90	42	11,020	3.39
2018	11.80	12	0.49	39,740	3.90	552,830	62.90	43	10,484	3.21
2019	10.50	10	0.48	39,707	3.67	567,715	63.10	37	10,537	3.21
2020	11.40	2	0.49	-	8.31	580,466	61.70	42	13,620	4.13

2.2 Proposed approach – Pearson Correlation Analysis

Correlation analysis, also known as bivariate analysis, is primarily concerned with determining whether a relationship exists between variables and then determining the magnitude and action of that relationship [6]. In this study, Pearson correlation analysis [7, 8] was considered to find the relationship between variables. To define the correlation between economic indicators and gun violence issues, we need first to determine the sub-categories of gun violence to testify the correlation separately. After putting data into a single spreadsheet, the Table 3 shows that all data were sorted by states' names or year sequences. Therefore, it was easy to test the correlation of a single feature across time or states.

Table.3. Dataset sorted by States (part)

States	Poverty rate 2020	median income 2020	Population 2021	Pop Density 2021	Death Rate	Number of Deaths
Alabama	14.90	54,393	4934193	97.7332	21.4	1046
Alaska	13.30	74,476	724357	1.2631	23	177
Arizona	10.80	66,628	7520103	67.2641	15.2	1094
Arkansas	14.20	50,540	3033946	58.461	17.7	541
California	11	77,358	39613493	254.6179	7.9	3184

2.3 Measurements for gun violence based on gun-related death and mass shootings

To determine the relationship between gun violence and the economy, as proven in the figure, we first use two indicators to measure gun violence: gun-related death and mass shootings.

We used the gun-related death rate and the gun-related homicide rate for the subsequent specific analysis in phrases of gun-related death. The gun-related death rate index is substantially affected via population, so we take the population as an intermediate variable to determine the relationship

between death rate and economic indicator-household median income. Considering the massive populace hole and massive financial hole in distinctive states of the United States, we analyze the mortality indications via States. We use the household medium earnings to measure the monetary scenario of every state, to higher find out the relationship between economy and population, and to clarify the relationship between economic indicators and gun-related mortality. Regarding the homicide rate, we decided to use the poverty and unemployment rates to determine the relationship between gun-related death and economic indicators.

In mass shootings, we studied the relationship between mass shootings and three economic indicators: homelessness, Gini coefficient [9, 10], and labor participation in the previous years. We explored the relationship between these three and firearm death in the latest years. The structure can be seen in Figure 1.

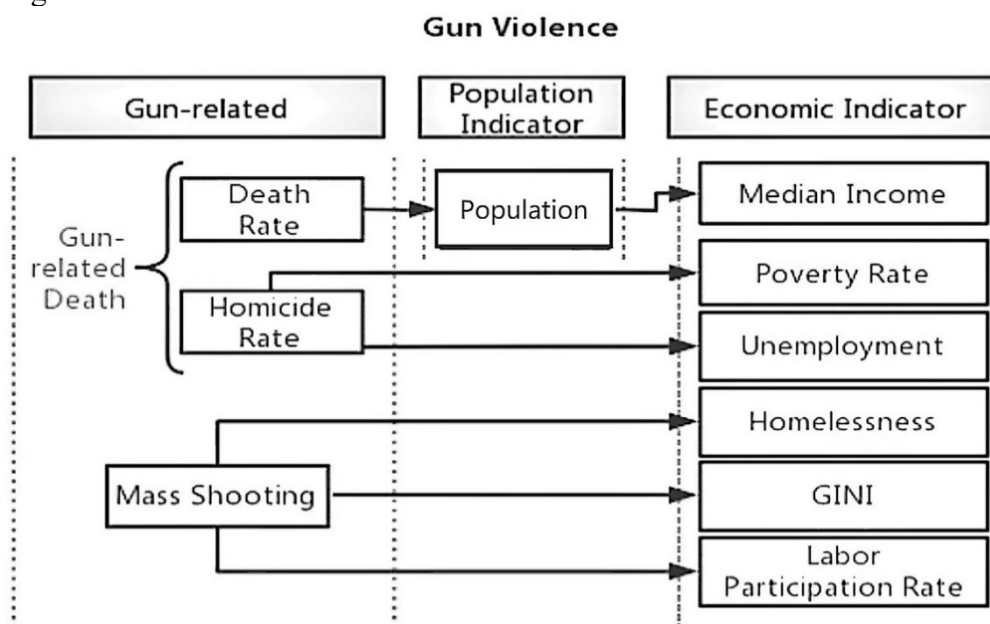


Figure 1. Gun violence analysis structure

3. Results and discussion

Through the analysis of various indicators, we figured out that most of the results can correlate economic conditions with gun violence. In the first group of study which the dataset was sorted by the states, the results showed that population and registered gun numbers in a state are positively correlated with Death numbers caused by guns in that state, which can be observed in Table 4. In terms of gun-related death rate, it is positively correlated with gun ownership while negatively correlated with population density in a state.

Table.4. Correlation between guns, population, and gun-related death

Pearson Correlation			
		Death Rate	Number of Deaths
Pop Density	Coefficient	-0.595**	-0.026
	p value	0.000	0.859
Gun Ownership	Coefficient	0.821**	-0.034
	p value	0.000	0.813
Registered Guns	Coefficient	0.039	0.840**
	p value	0.789	0.000

Pop2021	Coefficient	-0.221	0.862**
	p value	0.123	0.000
* p<0.05 ** p<0.01			

However, in the analysis of median income, there was no apparent correlation between the population indicators or the gun-related death rate, shown in Table 5.

Table.5. Correlation between population and the household median income

Pearson Correlation		
	Population 2021	Pop Density 2021
poverty rate 2020	0.132	-0.141
median income 2020	0.053	0.083
* p<0.05 ** p<0.01		

In terms of mass shootings, it is strongly negatively correlated with the homelessness rate and unemployment rate. Regarding firearm death number, it is strongly positively correlated with the GINI coefficient while strongly negatively correlated with homelessness and labor participation rate. For the category of numbers of homicides by firearms, it is positively correlated with both the poverty rate and unemployment rate. In the case of homicide by firearm rate is strongly negatively correlated with the poverty rate. All results can be found in Table 6.

Table.6. Correlation analysis of all other economic indicators

Pearson Correlation					
		Mass Shooting	Firearm Death	Num of Homicides by Firearms	Homicide by Firearm Rate
Poverty Rate	Coefficient	-0.452	-0.343	0.602*	-0.775**
	p value	0.091	0.230	0.018	0.001
GINI	Coefficient	0.452	0.827**	-0.020	0.134
	p value	0.091	0.000	0.944	0.634
Gun Ownership	Coefficient	-0.083	-0.252	-0.007	0.122
	p value	0.768	0.384	0.980	0.665
Homelessness	Coefficient	-0.703**	-0.929**	0.397	-0.117
	p value	0.005	0.000	0.160	0.690
Labor Participation Rate	Coefficient	-0.429	-0.904**	0.073	-0.062
	p value	0.110	0.000	0.796	0.827
Unemployment	Coefficient	-0.649**	-0.425	0.620*	-0.233
	p value	0.009	0.130	0.014	0.402
* p<0.05 ** p<0.01					

Homelessness was the only indicator that seemed counterintuitive in that the higher the homelessness rate, the worse the economic performance. The results returned that, on the contrary, the more the homeless people, the less likely mass shooting events or, the lower firearm death number.

These results suggested that other factors should play a role in such correlation and needed to be further testified.

However, several significant indicators suggest that mass shootings will be more likely to occur as economic conditions deteriorate. Based on the performance of gun-related death and mass shooting, it can be concluded that there is a negative correlation between the change in economic conditions and gun violence, and gun violence will occur more frequently when economic conditions worsen. In conclusion, the more uncoordinated and unstable the economic development, the more gun violence will appear in a certain period.

4. Conclusions

This study recommends hyperlinking the gun violence issue with economic indicators and discovering its associated situation. Among them, population-associated indications in this relationship were tested. This study listed several necessary indicators underneath gun violence, population, and economy and analyzed their correlation thru SPSS. It can be trusted that gun violence is indeed associated with economic indicators. Although now, not all indicators are related, some are still surprisingly relevant. It can be determined that among the indicators, the Gini coefficient, the number of homeless people, labor participation rate have an assignable relationship with mass shooting; Gun-related death rate and gun ownership, pop density has a strong relationship; Homicide has a sturdy relationship with poverty rate and so on. In general, the more uncoordinated and unstable the economic development, the more gun violence will occur in a certain period. Further studies will be conducted to discover the root reasons for gun violence and whether the economic situation is an adequate and fundamental circumstance for gun violence on the groundwork of relevance.

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