

Impact of the Implementation of Gun Laws on Violent Crimes

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Throughout the history of the United States, gun use has been a problematic issue. The resulting consequence of unmonitored gun use has led to high levels of violence (Center for Disease Control and Prevention, 2020; Kalesan et al., 2016). However, over the course of the last few decades, policy changes have been implemented in the law that regulates gun use in various states. These changes have not been consistent as laws vary from state to state to reflect each particular region's ideals. A cultural emphasis on the ownership of a gun is seen as a rite of passage for many in the southern part of the United States (Yamane, 2017). The West South Central region encompasses some of the states with the highest levels of gun violence (Center for Disease Control and Prevention, 2020; Kalesan et al., 2016). The states that are a part of this region are namely Arkansas, Louisiana, Oklahoma and Texas. It has been found that nearly 30-60% of all individuals in these states own a gun, thus drastically increasing the amount of violent crimes present in these areas (Center for Disease Control and Prevention, 2020; Kalesan et al., 2016). For this reason, the emphasis of this visualization assignment will be placed upon these four states. The question used for all further analyses is the following: does the presence of gun laws impact the number of violent crimes in the West South Central part of the United States?

Data Set

The data for this visualization is collected from a library of datasets available for R (Arel-Bundock, n.d.). The original data is collected by the Centre for Disease Control and Prevention (2020) and Kalesan et al. (2016). This data set investigates gun violence and its associated factors in 50 U.S. states, plus the District of Columbia, between the years of 1977–1999. It examines various types of crimes, ethnicities, population incomes, densities, and the absence or presence of laws for each state. For the purposes of this assignment, only the variables of violent

crime rate, absence or presence of gun laws, year, and state are being examined. This data frame is further narrowed down significantly as only the information from four states is being considered; Arkansas, Louisiana, Oklahoma and Texas. To alter this data frame in a way that specifically answers the research question, only the years in which the law was first present and the year prior to that are being examined. Thus, two years are being examined for each state; one year right before the law was introduced and the year it was initially introduced. These two years will be used to analyze the effects the implementation of the law had in these states.

Variables

Presently, four variables will be examined; violent crime rate, absence or presence of gun laws, year, and state. The variable of *year* and *state* do not have any additional numerical descriptives as they do not hold any implications for the nature of this study.

Violent Crime Rate

The variable *violent* examines the number of violent crimes incidents per 100,000 members of the population. The following report strictly examines the violent crime rate over the years as opposed to other death rates resulting from gun violence since these crimes are the most representative and all-encompassing when looking at the impact of guns. Additionally, the variable of *violent* is found to be continuous. Running a description of the numerical data produces results that show a mean of 690.11 and a standard deviation of 177.37 ($M = 690.11$, $SD = 177.37$). It also produces a right (positive) skew of 0.77 and a kurtosis of -1.31.

Absence or Presence of Gun Laws

The variable of *law* examines whether a gun law is absent or present within a particular year. By looking at when the law is present and when it is absent, we can examine whether the amount of violence in each state was altered by the law. This categorical variable consists of two

levels; *yes* and *no*. Running a summary analysis on this produces the frequency of four *no* responses and four *yes* responses.

Goals of Visualization

This visualization strives to focus on the West South Central region of the United States due to its significantly high gun violence rate. The goal of this visualization is to clearly display the influence that the absence or presence of gun laws has on violent crime deaths. Additionally, this visualization will look at how the law impacts gun violence deaths on average. By examining the mean number of violent crime deaths in each law condition, the overall impact can be assessed.

Outcomes of Visualization

Relationship between Violence and Law

The first graph provides a clear outlook into the West South Central region of the United States (see “Relationship between Violence and Law”). “Relationship between Violence and Law” looks at the varying violent crime rates in four states. In particular, this graph showcases the decrease in deaths due to violent crime after gun laws were introduced in Arkansas, Oklahoma and Texas. Surprisingly, the visualization revealed that the deaths in Louisiana increased after gun laws were introduced. This is significant as it shows that within only a year of its implementation, gun laws have drastically reduced gun violence in most of the states being observed. The outlier here, Louisiana, shows how sometimes a change in policy can be counterintuitive.

Mean of Laws

The second visualization of the data depicts the mean number of deaths in the four states when gun laws were present and when gun laws were absent (see “Mean of Laws”). This

visualization is imperative to include for the purposes of this assignment as it shows the overall impact that policy changes bring. When looking at states individually, one may look at the outlier and misperceive the data, consequently undervaluing the impact that gun laws have. This is problematic because it may lead to the unreasonable generalization of increased violence as a result of gun laws. By strictly examining the mean number of deaths in relation to the law, the impact of the number of deaths in the West South Central region of the United States can be distinguished. In the presence of gun laws, the violent crime rate is found to have a mean of 703.18 ($M = 703.18$) while the absence has a much lower mean of 677.05 ($M = 677.05$). This illustration demonstrates that overall, the introduction of gun laws leads to lower rates of death.

Discussion

The present study set out to look at the influence gun laws have on violent crimes. Through the visualizations presented, the objective of this study has been accomplished. It is evident from the two visualizations created that a relationship does exist between gun laws and violent crimes. In general, the addition of gun laws to a community reduces the level of violent crimes present. This can be evidenced by the fact that in the “Relationship between Violence and Law” graph, most states had a propensity to show a decrease after the introduction of gun laws. Additionally, the mean number of deaths resulting from gun violence decreased following the introduction of gun laws, which is observed by the “Mean of Laws” bar graph. Both these visualizations hold the implication that even within a region with the highest level of gun ownership, policy changes can drastically impact the number of lives saved each year.

Limitations

Though this study was successful at clarifying the impact of gun laws in the West South Central region, many limitations are still present. A major limitation of our data resides within

the research question; only the West South Central region of the United States is being examined. Due to this, all but 4 states are excluded, meaning that data from 47 states is not considered. Therefore, the findings of this visualization cannot be generalized to the entirety of the United States; the impact of gun laws may differ throughout other regions of the country. Moreover, another limitation is that only two years were considered for each of the four states. This is found to be a limitation as effective change is gradual. By only examining the first year that proceeds the implementation of the law, a representative image of the real impact the law had on gun violence over time may not be seen. Another limitation regarding the years examined is that not all the states implemented policy change in the same year. This is a limitation because within each state, during their respective period of time, confounding social and political factors may influence the increase or decrease of gun violence after the implementation of gun laws. An additional way that social factors may influence data is that there can be changes within society values. In general, gun violence may increase in an area over time as a result of heightened drug use, gang violence, and declining socioeconomic conditions. Despite the policy change, these factors will still be in place, which will cause people to continue using the guns they already own, thus this will not change the levels of gun violence. A final major limitation within this study exists within the original data set. The variable of *violent* was chosen as it was believed to encompass a large variety of different gun crimes. However, no real definition of what entails a violent crime using a gun was provided by the researchers. This may lead to a discrepancy in the analysis of what the data represents because gun violence may not be accurately depicted. The researchers may have classified some crimes as being “violent” when they may be better suited to other categories. Two other classifications of crime were provided in this data set, namely *murder* and *robbery*. It is unclear what differentiates these from other forms of violent crimes

using guns. This inconsistency also means that crimes may have been classified differently from year to year. Overall, future research should address these limitations. By conducting a more clear and concise study that can be generalized to the entirety of the United States, a more suitable result may be found.

References

- Arel-Bundock, V. (n.d.). *Available datasets*. Vincent Arel-Bundock's Github projects.
<https://vincentarelbundock.github.io/Rdatasets/articles/data.html>
- Center for Disease Control and Prevention. (2020, April 29). *Stats of the states - Firearm mortality*. Centers for Disease Control and Prevention.
https://www.cdc.gov/nchs/pressroom/sosmap/firearm_mortality/firearm.htm
- Kalesan, B., Villarreal, M. D., Keyes, K. M., & Galea, S. (2016). Gun ownership and social gun culture. *Injury Prevention*, 22(3), 216-220. <https://doi.org/10.1136/injuryprev-2015-041586>
- Yamane, D. (2017) The sociology of U.S. gun culture. *Sociology Compass*, 11(e12497.), 1-10.
<https://doi.org/10.1111/soc4.12497>

R Code with Comments and Output

```

#Open up libraries needed for visualization.
library(tidyverse)
library(psych)
library(ggplot2)

#Open the data file and assign to "gunsdata".
gunsdata <- read_csv("gunsdata.csv")

## Warning: Missing column names filled in: 'X1' [1]

## Parsed with column specification:
## cols(
##   X1 = col_double(),
##   year = col_double(),
##   violent = col_double(),
##   murder = col_double(),
##   robbery = col_double(),
##   prisoners = col_double(),
##   afam = col_double(),
##   cauc = col_double(),
##   male = col_double(),
##   population = col_double(),
##   income = col_double(),
##   density = col_double(),
##   state = col_character(),
##   law = col_character()
## )

#Create a new data frame with only the selected columns. Assign to "guns.data".
library(dplyr)
guns.data <- select(gunsdata, state, law, violent, year)

#Select each southern state in the year before and the year when the gun law was introduced.
Arkansas <- subset(guns.data, state=="Arkansas" & (year=="1995" | year=="1996"))

Louisiana <- subset(guns.data, state=="Louisiana" & (year=="1991" | year=="1992"))

Oklahoma <- subset(guns.data, state=="Oklahoma" & (year=="1995" | year=="1996"))

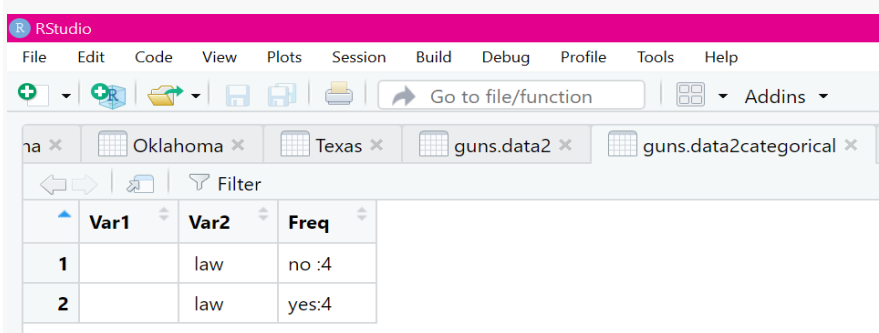
Texas <- subset(guns.data, state=="Texas" & (year=="1996" | year=="1997"))

```

```
#Combine states together into new data frame "guns.data2".
guns.data2 <- rbind.data.frame(Arkansas, Louisiana, Oklahoma, Texas)

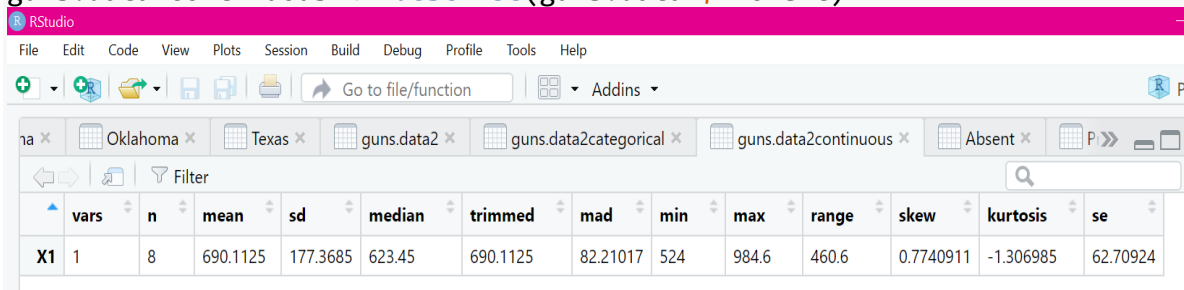
#Mutate data variable "law" to ensure that no Law means "no" and yes Law means "yes".
guns.data2 <- mutate(guns.data2,
                      law = as.character(law),
                      law = fct_recode(law,
                                       "no" = "no",
                                       "yes" = "yes"))

#Find numerical descriptives for categorical data.
guns.data2categorical <- summary(select(guns.data2,law))
```



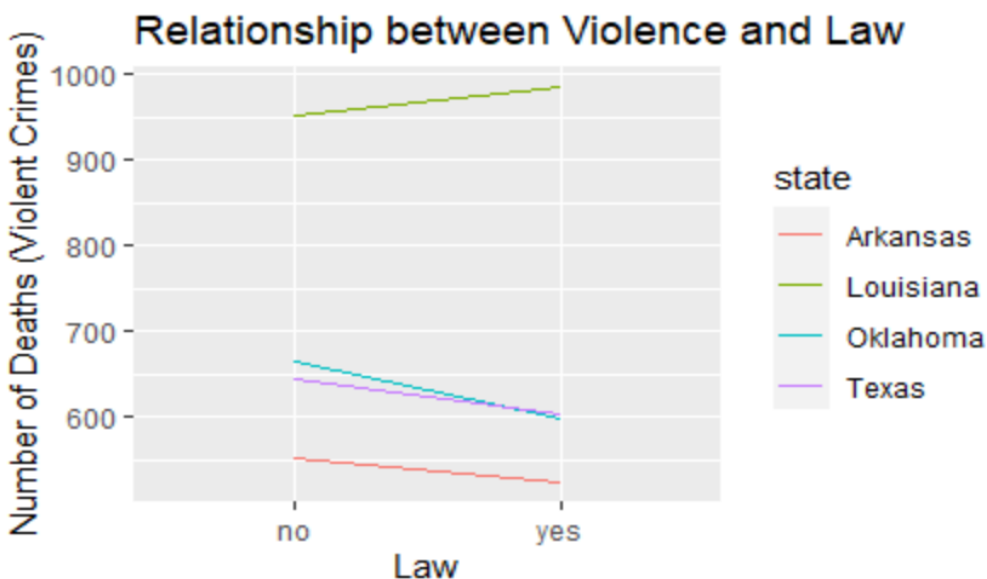
Var1	Var2	Freq
1	law	no :4
2	law	yes:4

```
#Find numerical descriptives for continuous data.
guns.data2continuous <- describe(guns.data2$violent)
```



vars	n	mean	sd	median	trimmed	mad	min	max	range	skew	kurtosis	se
X1 1	8	690.1125	177.3685	623.45	690.1125	82.21017	524	984.6	460.6	0.7740911	-1.306985	62.70924

```
#Create linear plot of "law" and "violent". Fill graph with variable of "state".
ggplot(data = guns.data2, mapping = aes(x = law,y = violent, colour = state,
group = state)) +
  geom_line() +
  labs(title = "Relationship between Violence and Law",
       x = "Law", y = "Number of Deaths (Violent Crimes)",
       fill = "State")
```



#Determine the mean of “no” for “law” and assign to “Absent”.

```
Absent <- mean((subset(guns.data2, law == "no"))$violent)
```

#Determine the mean of “yes” for “law” and assign to “Present”.

```
Present <- mean((subset(guns.data2, law == "yes"))$violent)
```

#Combine mean values into data frame “law.means”.

```
law.means <- data.frame(Absent, Present)
```

The screenshot shows the RStudio interface with the 'law.means' data frame loaded in the Environment pane. The data frame has two columns: 'Absent' and 'Present'.

	Absent	Present
1	703.175	677.05

#Transform the two columns in data frame “law.means” to make it into one singular column with the means. Assign to “law.means2”.

```
law.means2 <- gather_(law.means,
  key_col = "law",
  value_col = "means",
  gather_cols = c("Absent", "Present"))
```

RStudio

File Edit Code View Plots Session Build Debug Profile Tools Help

Go to file/function Addins

exas x guns.data2 x guns.data2categorical x guns.data2continuous x Absent x Present x law.means2 x

Filter

	law	means
1	Absent	703.175
2	Present	677.050

#Create a bar plot of "law.means2". Include "law" as x-axis and "means" as y-axis.

```
ggplot(law.means2, aes(x = law, y = means, fill = law)) +
  geom_bar(stat = "identity",
           position = position_dodge()) +
  ggtitle("Mean of Laws") +
  scale_x_discrete(name = "Law") +
  scale_y_continuous(name = "Means")
```

