Replication of *Firearms and accidental deaths: Evidence from the aftermath of the Sandy Hook school shooting*

Hannah Valencia

4/13/2020

Abstract

Levine and McKnight (2017) show that in the 5-month period following the Sandy Hook school shooting in December 2012, a large spike in gun sales contributed to an increase in accidental firearm deaths.

Introduction

This replication paper takes a look at gun sales, background checks, and google search data in the aftermath of the Sandy Hook school shooting that took place on December 14th, 2012. It is hard for one to not know about the atrocities that took place in Newtown, Connecticut that day, as innocent school children and their teachers were murdered at school. Since then, many reforms have been put in place for gun control and school safety alike. In the immediate aftermath, however, gun sales spiked and google searches about buying and cleaning guns soared. People knew that the number of background checks were going to increase to prevent further events like this from happening. This paper analyzes, specifically, whether there was an increase in the number of accidental gun deaths in the five-month period following this event, which could then be attributed to the increase in gun sales. The authors also took a look at accidental firearm deaths by state, so that they could see whether states with a larger increase in firearm sales also had an increase in the accidental deaths. To run this analysis, they calculated death rates among children and among adults and ran regressions, controlling for trends and seasonal patterns. In the end, the authors concluded that "an additional 60 deaths overall, including 20 children, resulted from unintentional shootings in the immediate aftermath of Sandy Hook" (Levine et al. 1).

Within this replication, I have made three graphs and a table. The first graph details the change in Google searches about cleaning and buying goods in the years leading up to and following Sandy Hook. There is an obvious spike in the data in the post-Sandy Hook window. The second graph looks at "seasonally adjusted, detrended monthly firearm sales and accidental firearm death rates" among children under the age of 15. And finally the third graph shows a map of the US, with each state colored by the amount increase in firearm sales per 100,000 population in the post-Sandy Hook period (December 2012 - April 2013). To create these graphics, I used datasets that were built using R, CDC NCHS data, Stata, and data obtained through Harvard's Dataverse. All the data used to produce this replication can be found on my GitHub repository.[1]

Literature Review

In the aftermath of the Sandy Hook Elementary School shooting, President Barack Obama took a stance against guns, calling for stricter gun control legislation. After announcing this, Americans became more interested in owning guns, and Levine and McKnight have estimated an additional 3 million guns were sold in the 5-month period following the shooting. Whether people be buying new guns, or revisiting and cleaning ones that have owned for years, the greater exposure to guns following the shooting may have likely driven an increase in the number of accidental deaths caused by firearms, especially amongst children. When former

[1] My GitHub repo can be found following this url: https://github.com/h-valencia/1006-milestone-4

President Obama spoke about the new gun control legislation in mid-January and mid-February of 2013, search activity about guns spiked immediately. In specific states and areas where gun sales spiked, it was found that the number of accidental deaths also spiked. Although this correlation does not a cause and effect relationship, it should be noted.

Within the models created, there are multiple caveats to consider. Many of the models were created using the CDC National Center for Health Statistics's Vital Statistics mortality data, which are known to underestimate accidental firearm deaths. Another consideration that should be made is that this data only accounts for accidental firearm discharges that resulted in death, it does not include any cases where victims survived, therefore providing a lower bound on the issue at hand. The restrictions imposed on the cause of death we are interested in also limits the data to omit any suicides or homicides due to firearm exposure during this time period. The paper in consideration also only displays short-term implications of increased gun exposure, not long term effects.

In an effort to mitigate the likelihood of school shootings, one proposal has been to arm teachers with guns, giving them a way to protect themselves and their students. There have been, however, instances where teachers then use these weapons against themselves or their students, albeit this does not occur frequently (Buck et al.).

Appendix

Figure 1

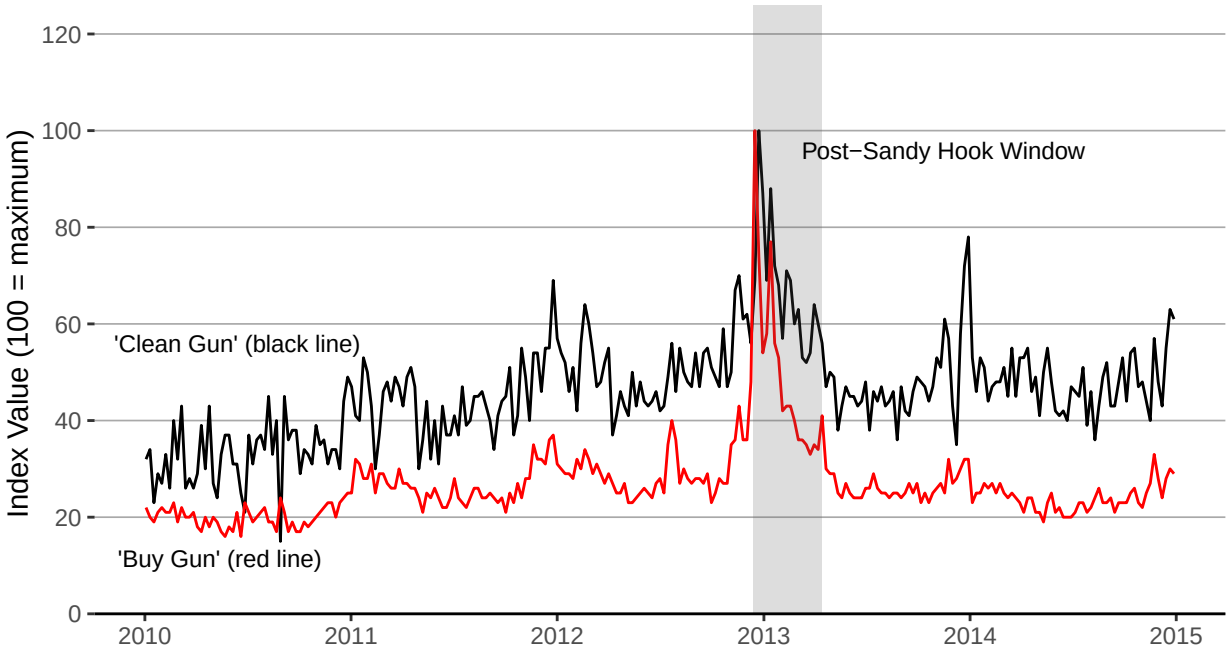

Fig. 1. Relative frequency of weekly Google searches that included the terms ...clean gun... and ...buy gun... between 2010 and 2014. This graph uses data from Google Trends (http://trends.google.com/) to track weekly patterns in search activity that included each set of words. The week with maximum search volume is indexed to equal 100 and values below 100 reflect relative search activity in proportion to the week with the maximum value.

Figure 2

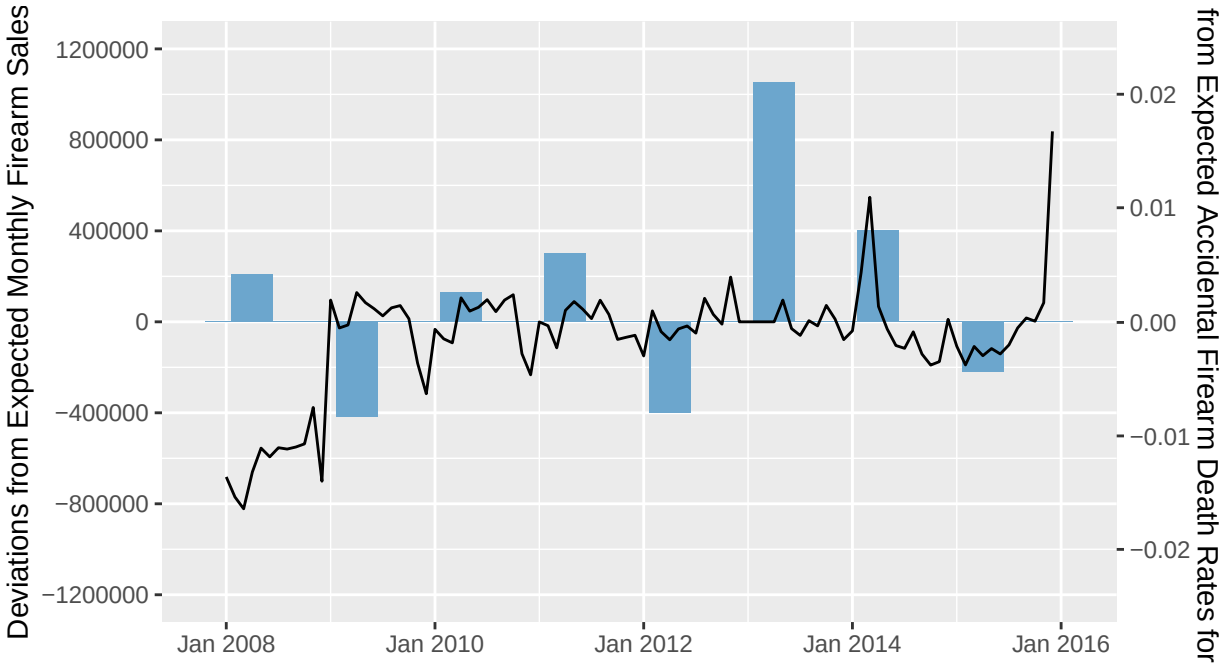

Fig. 2. Seasonally adjusted, detrended monthly firearm sales and accidental firearm death rates per 100,000 children (ages 0 to 14) between December and April. Firearm sales data are proxied by NICS data on background checks conducted when a firearm is purchased from a registered dealer. The accidental firearm death rate is calculated from Vital Statistics mortality data and SEER population data. The post...Sandy Hook window is defined to be December 2012 through April 2013

Figure 3

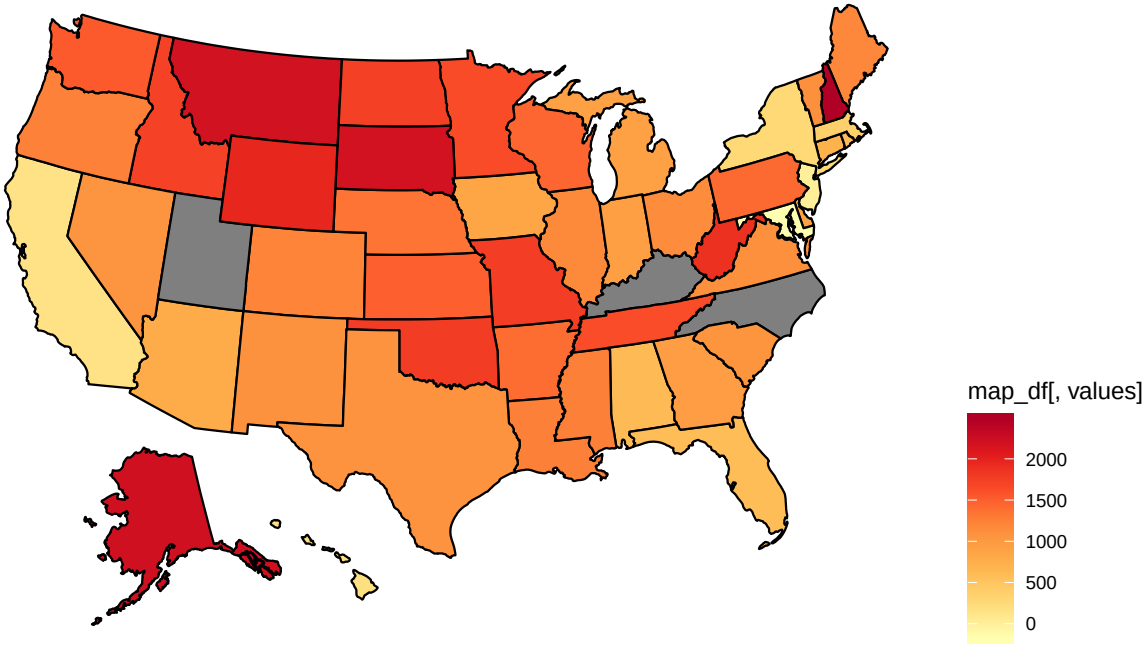

Fig. 3. Variation across states in the increase in firearm sales per 100,000 population in the post...Sandy Hook period. The spike in sales in each state is estimated as the seasonally adjusted and detrended increase in background checks in the months within the Sandy Hook window. The legend numbers represent the increase in firearm sales per 100,000 population.

For this milestone, I have been able to replicate Figures 1 and 3 of the paper. I have not yet been able to recreate the table or Figures 2 and 4. The datasets for these figures and tables requires compiling data from the CDC website. To do this, I need to download nine .zip files but when unzipped, each file becomes over 1GB in size. This has overwhelmed my storage, and when trying to do this my computer's disk space filled up. In addition, the files are in an extremely unusual format that needs to somehow be changed into a different format before it can be processed, which I have not yet found out how to do. I have been in contact with the author and my next step is to ask for the compiled dataset or try to compile my own through the CDC Wonder website.

I had a lot of trouble trying to knit as a pdf. The bibliography would not save as just a .bib file. Warnings started coming out of nowhere I have attached the html which is much nicer.

Extension

To test the merits of this paper, I intend to analyze the data from the map above and change the regression model used to create this increase in firearm sales map. I intend to add an interaction term between the month and the number of sales, to see if that changes the coefficient that was used to create these statistics. I also would like to try to extend the time window of the map and the regression to see if these "increase in sales" could be extended throughout the year before Sandy Hook as well, suggesting that the event may not have been the catalyst for the increase.

This is a PDF document for my Gov 1006 final project Milestone 5. I have a GitHub repo with all relevant materials for this milestone.[2]

[2]My GitHub repo can be found following this url: https://github.com/h-valencia/1006-milestone-4

References

(Wickham et al. 2019) (Xie 2020) (Xie 2015) (Xie 2014) (**???**) (Wickham and Miller 2019) (Levine and McKnight 2017) (CDC, n.d.)

CDC. n.d. "Vital Statistics Multiple Mortality Cause Files." *CDC National Center for Health Statistics*. Centers for Disease Control; Prevention.

Levine, Phillip B, and Robin McKnight. 2017. "Firearms and Accidental Deaths: Evidence from the Aftermath of the Sandy Hook School Shooting." *Science* 358 (6368). American Association for the Advancement of Science: 1324–8.

Wickham, Hadley, Winston Chang, Lionel Henry, Thomas Lin Pedersen, Kohske Takahashi, Claus Wilke, Kara Woo, and Hiroaki Yutani. 2019. *Ggplot2: Create Elegant Data Visualisations Using the Grammar of Graphics*. https://CRAN.R-project.org/package=ggplot2.

Wickham, Hadley, and Evan Miller. 2019. *Haven: Import and Export 'Spss', 'Stata' and 'Sas' Files*. https://CRAN.R-project.org/package=haven.

Xie, Yihui. 2014. "Knitr: A Comprehensive Tool for Reproducible Research in R." In *Implementing Reproducible Computational Research*, edited by Victoria Stodden, Friedrich Leisch, and Roger D. Peng. Chapman; Hall/CRC. http://www.crcpress.com/product/isbn/9781466561595.

———. 2015. *Dynamic Documents with R and Knitr*. 2nd ed. Boca Raton, Florida: Chapman; Hall/CRC. https://yihui.org/knitr/.

———. 2020. *Knitr: A General-Purpose Package for Dynamic Report Generation in R*. https://CRAN.R-project.org/package=knitr.