

Redesigned Data Products for Gun Violence in the US Version 1.0

Introduction

In the problem statement, I talked about the major points of the article *Gun Violence in the US*, also analyzed and criticized the seventeenth data products. In this paper, I will redraw several data products that I find interesting, convincing and/or counterintuitive. Note that the data sources are primarily based on the original sources from the article, some supplemental resources will be provided for analysis in need.

Outline

Firstly, I will present three general visualization lessons I learned from the process of exploring, accessing, and redesign the data products. In each lesson, I will give one to two aspects that are interesting but different from the original data products. Then I will provide the reasoning behind the redesign purpose, and discuss how to transform data. At end of each lesson, both original and redesigned data products will be included for comparative and contrast analysis. Finally, a summary of each finding will be given.

Lesson 1: Definition really matters: key words should be well defined.

1.1 Which countries belong to **developed** countries? Data product #1 (figure 1)

The purpose of this article tries to seek difference between US and other developed countries. However, the author did not give us the meaning of developed countries, so the selections of countries make audience really confuse and raise questions about data accuracy. For example, the data product #1 selected 14 developed countries and said to be based on the Human Development Index (HDI). Per the Human Development Reports, there are 51 countries belonged to category of “very high human development countries”, which included the US (1). The selection of 14 countries seemed very randomly and without any support. So, I adjust the selection which includes total 51 “very high human development countries” countries and the result is in figure 2.

From the new graph, it's confident to say that the US is not that far away from other developed countries regarding to the firearm homicides. The US is not an outlier. Additionally, I develop another graph containing countries which are OECD club members (figure 3) – another indicator for developed countries. Similarly, the US has larger but comparable gun-related homicides. All in all, the definition of data does affect the data selection and visualization result. A clear definition should be included to make the graph more convincing.

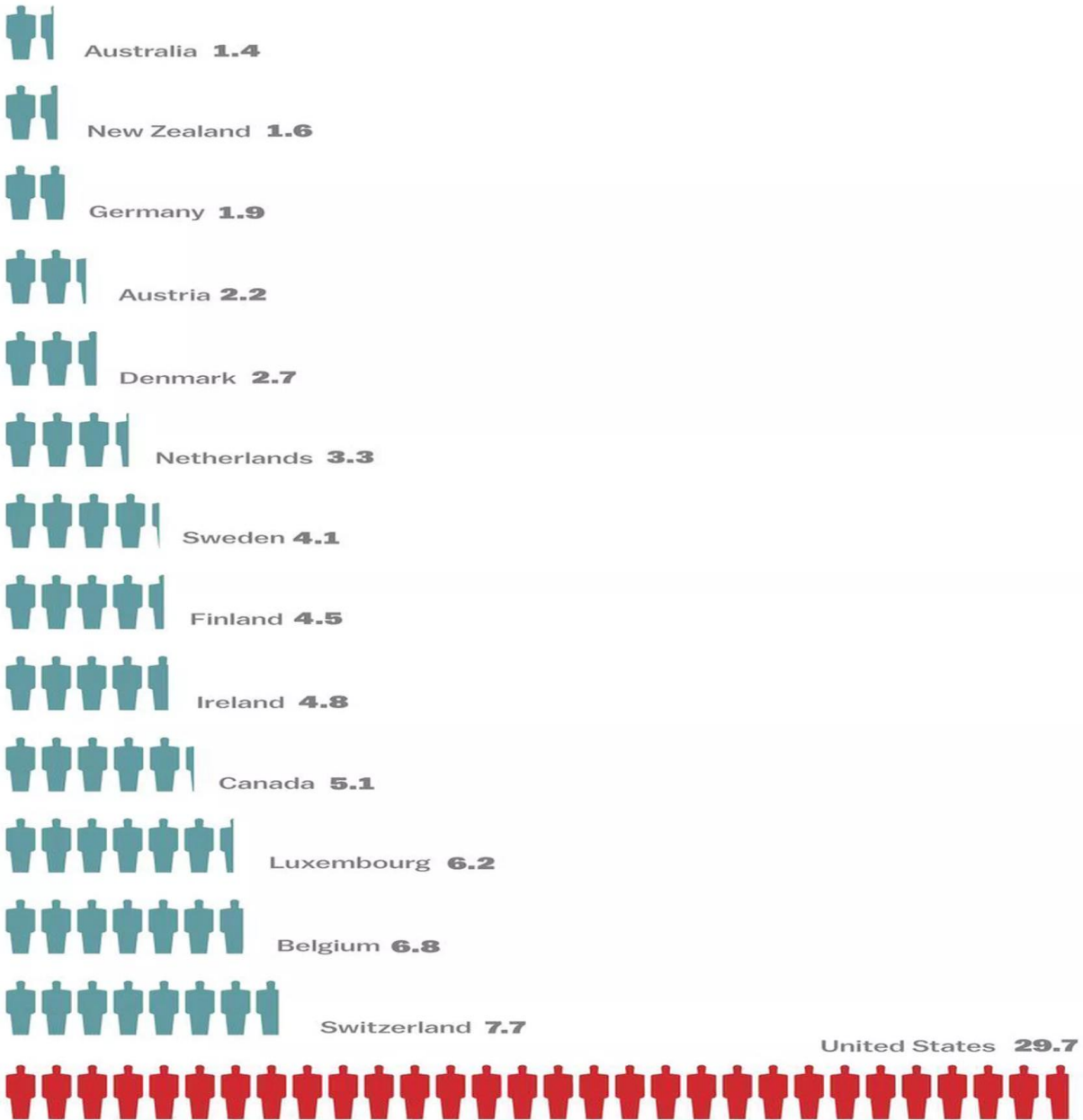
Further explore dataset:

Beside to considering of developed countries data selection, I design a graph with variables between percentage (%) of firearm homicides and the 14 original selected countries (figure 4).

Choosing percentage of firearm homicides caused measures distributions of homicides method per country and the result indicated that the America is not the # 1 country to use gun for homicides.

Homicides by firearm per 1 million people

In advanced countries according to the Human Development Index. Numbers are for 2012.

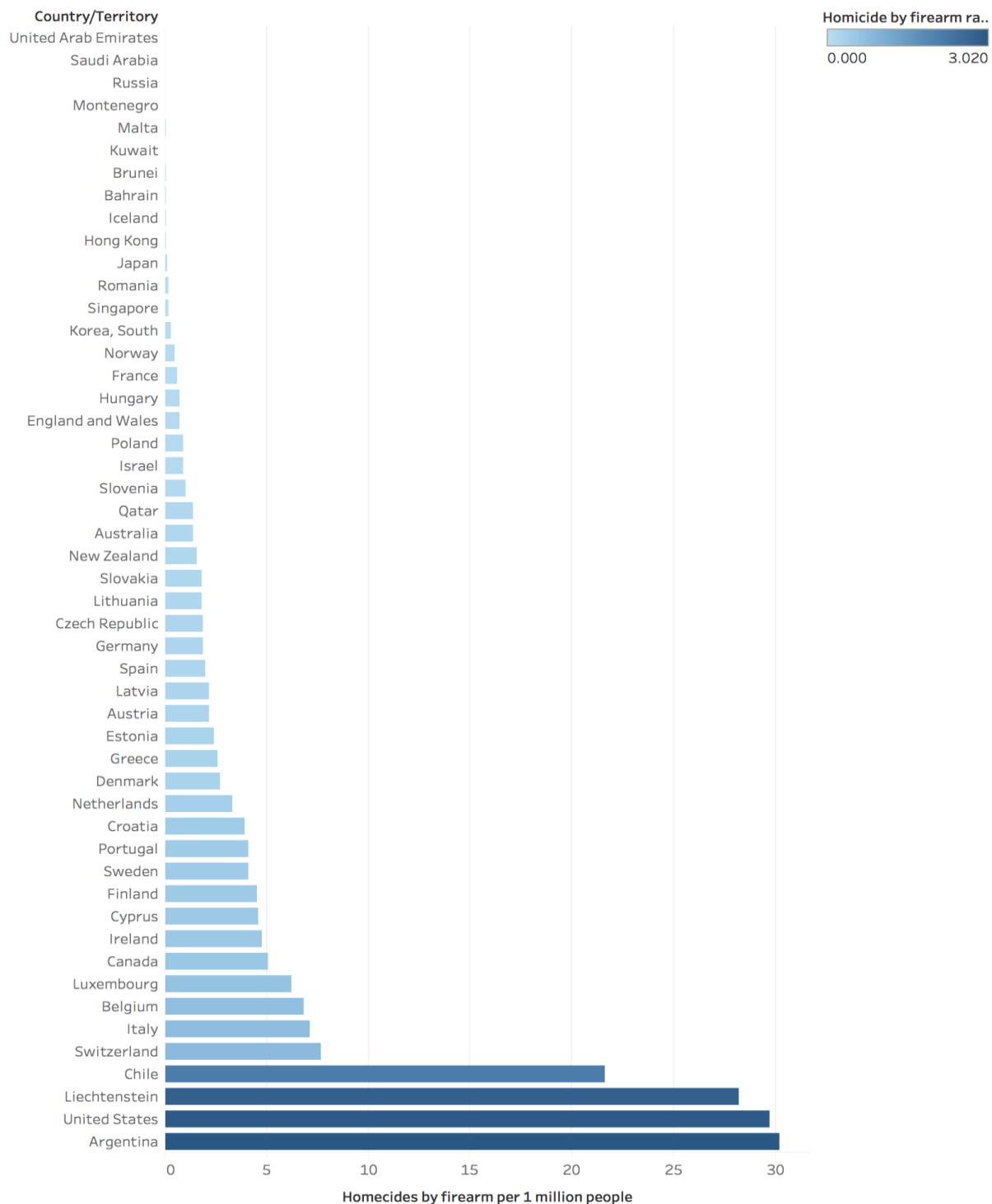


SOURCE: UNODC, Small Arms Survey, via The Guardian.

Vox

Figure 1: Homicides by firearm per 1 million people

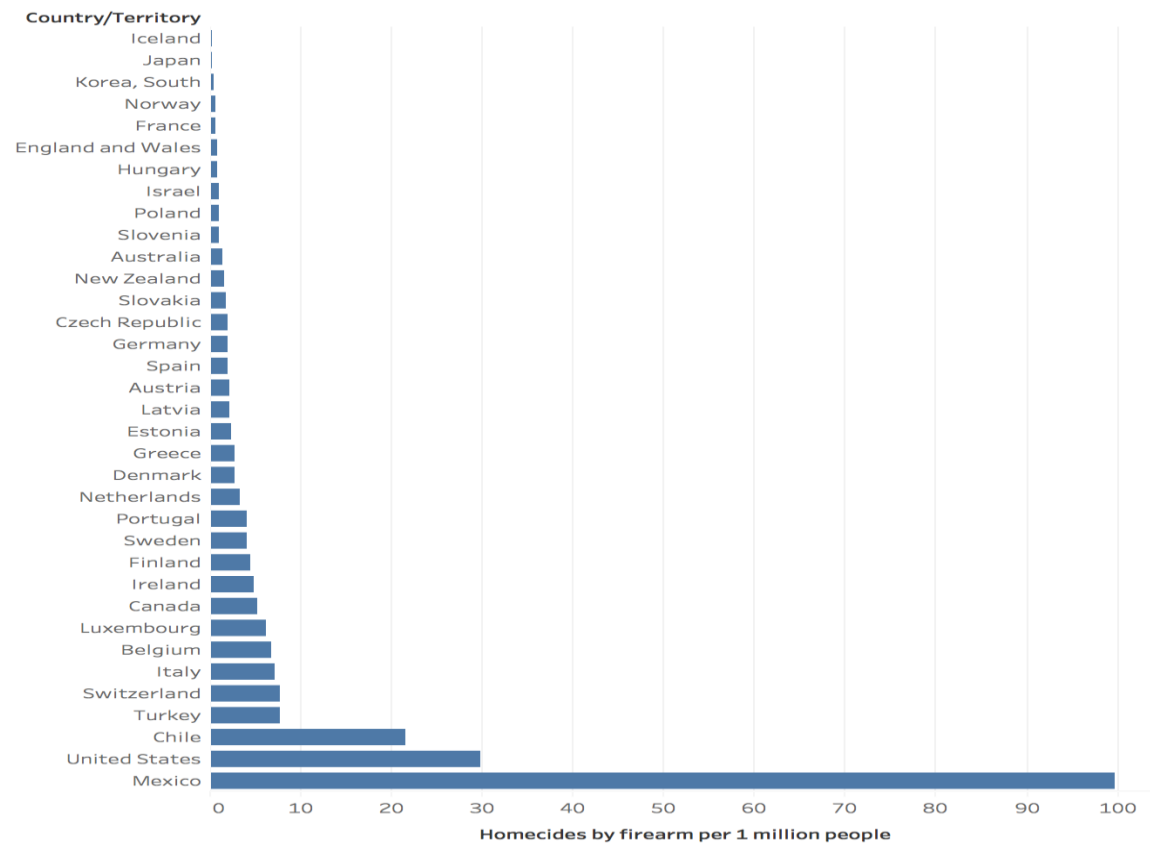
firearm rate per 1M HDI Highest Country



Homecides by firearm per 1 million people as an attribute for each Country/Territory. Color shows Homicide by firearm rate per 100,000 pop as an attribute. The view is filtered on Country/Territory, which keeps 50 of 185 members.

Figure 2: Homicides by firearm per 1 million people; Source: the Guardian

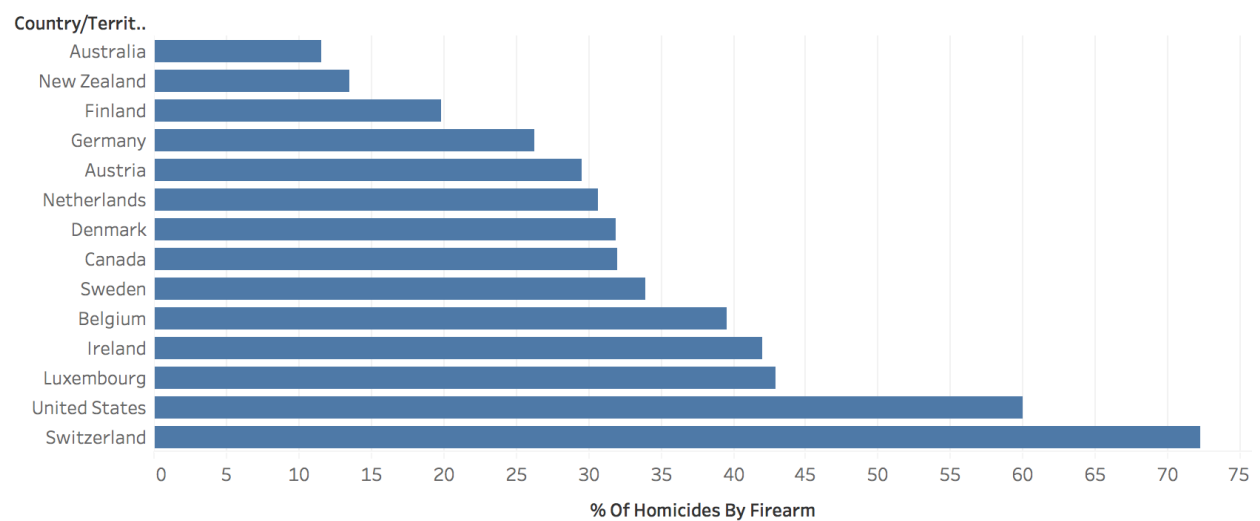
firearm rate with all OECD



Sum of Homicides by firearm per 1 million people for each Country/Territory. The view is filtered on Country/Territory, which keeps 35 of 185 members.

Figure 3: Homicides by firearm per 1 million people with OECD countries via The Guardian

% of homicide by firearm



% Of Homicides By Firearm as an attribute for each Country/Territory. The view is filtered on Country/Territory, which keeps 14 of 185 members.

Figure 4: % of Homicides by Firearm; Source: The Guardian

1.2 Mass shooting: a media word with multiple definitions

“Mass shooting” is a popular media word with the rise of public shooting since 2012. However, there is no official definition of mass shooting. The most related one is “mass murderer”, defined as “someone who kills four or more people in a single incident (not including himself), typically in a single location” by FBI (Krouse and Richardson, 2015). FBI’s definition has huge difference from the Gun Violence Archive and Mass Shooting Tracker—the original data sources in the article: the Gun Violence Archive collected mass shooting data as “an incident in which four or more victims (excluding the shooter) are injured or killed” (Lopez 2018), and Mass Shooting Tracker had a more general criterion that four or more victims include the shooter (2018). Multiple definitions of mass shooting do complicate the understanding of mass shooting trends and influence on gun policy. A research paper conducted by RAND cooperation, collected the resources that had different methodologies to define mass shooting and showed the number of mass shootings in 2015 based on the variations (Table 1).

Variation in How Mass Shootings Are Defined and Counted

Source	Casualty Threshold (for injuries or deaths by firearm)	Location of Incident	Motivation of Shooter	Number of U.S. Mass Shootings in 2015
<i>Mother Jones</i> (see Follman, Aronsen, and Pan, 2017)	Three fatal injuries (excluding shooter)*	Public	Indiscriminate (excludes crimes of armed robbery, gang violence, or domestic violence)	7
Gun Violence Archive (undated-a)	Four fatal or nonfatal injuries (excluding shooter)	Any	Any	332
Mass Shooting Tracker (undated)	Four fatal or nonfatal injuries (including shooter)	Any	Any	371
Mass Shootings in America database (Stanford Geospatial Center, undated)	Three fatal or nonfatal injuries (excluding shooter)	Any	Not identifiably related to gangs, drugs, or organized crime	65
Supplementary Homicide Reports (FBI) (see Puzzanchera, Chamberlin, and Kang, 2017)	The FBI’s Supplementary Homicide Reports do not define <i>mass shooting</i> but do provide information on the number of victims, and the reports have been used by researchers in conjunction with news reports or other data sources.			

* Before January 2013, the casualty threshold for *Mother Jones* was four fatal injuries (excluding the shooter).

Table 1: Variation in How Mass Shootings Are Defined and Counted

Source: *Mass Shootings: Definitions and Trends*

The table demonstrated big comparison in counting mass shooting based on different methods. For the project of the US Gun Violence, source from Stanford Geospatial Center would be the best match because it distinguished from gangs, drugs, or organized crime mass shootings, and those shootings probably need different solutions from the policies we discussed in the article. On the

contrast, the original datasets are exaggerated in mass shooting: among 371 mass shootings in 2015, only 67 were not related to gangs, drugs, or organized crime.

Further action:

Gun-policy makers always want to know the trend of mass shooting. Multiple sources can be used to explore the mass shooting trends and compare the difference in the future.

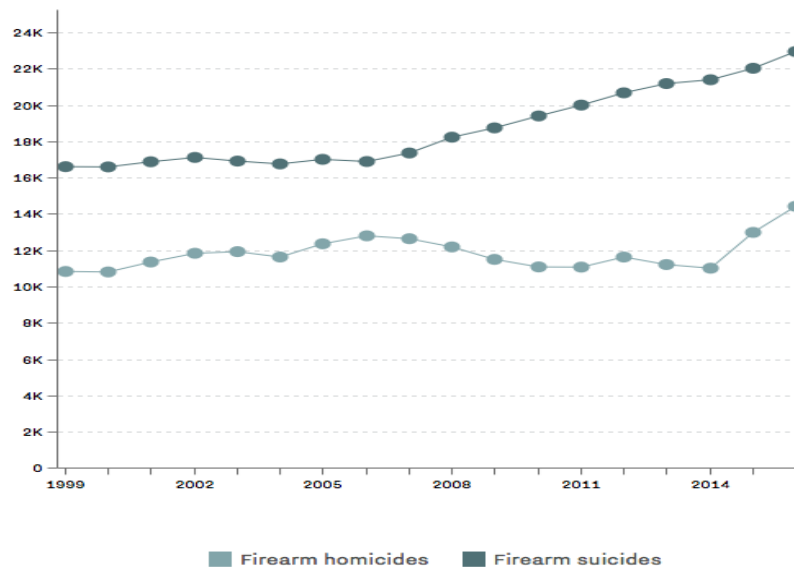
Finding 1 conclusion: the US is not an outlier for firearm homicides compared with other clear defined “developed” countries, furthermore, there were less mass shootings in 2015 if we isolated the mass shooting related to gang, drug, or organized crime, which clearly was not a concern in the Vox article.

Lesson 2: Think hard about causal relationship, looking bigger picture

More gun deaths are suicides? (Data product #10)

A good visualization product should fully support the claim, while a misleading or ineffective visualization makes poor claim. This is especially true when analyzing a causal relationship. Take data product #10 as an example, this line graph demonstrated the yearly difference between the numbers of firearm suicides versus homicides, leading a claim that most firearm deaths are suicides (figure 5). By looking figure 5 itself, the argument seemed persuasive that gun-related suicides were increasingly growing compared with gun-related homicides. However, this graph did not explain the reason of increasing trend of firearms suicides. And comparisons between suicides with homicides were not unparalleled. If we redesign the graph by adding a line containing yearly number of total suicides data from same resources, we can see the increasing trend is not as obvious as the original one (figure 6). The firearm suicides growing trend is just a part of total growing trend of suicides. Firearm suicides versus total suicides are more paralleled comparable.

Firearm suicides versus homicides



Source: [Centers for Disease Control and Prevention](#)

Vox

Figure 5: Firearm suicides versus homicides

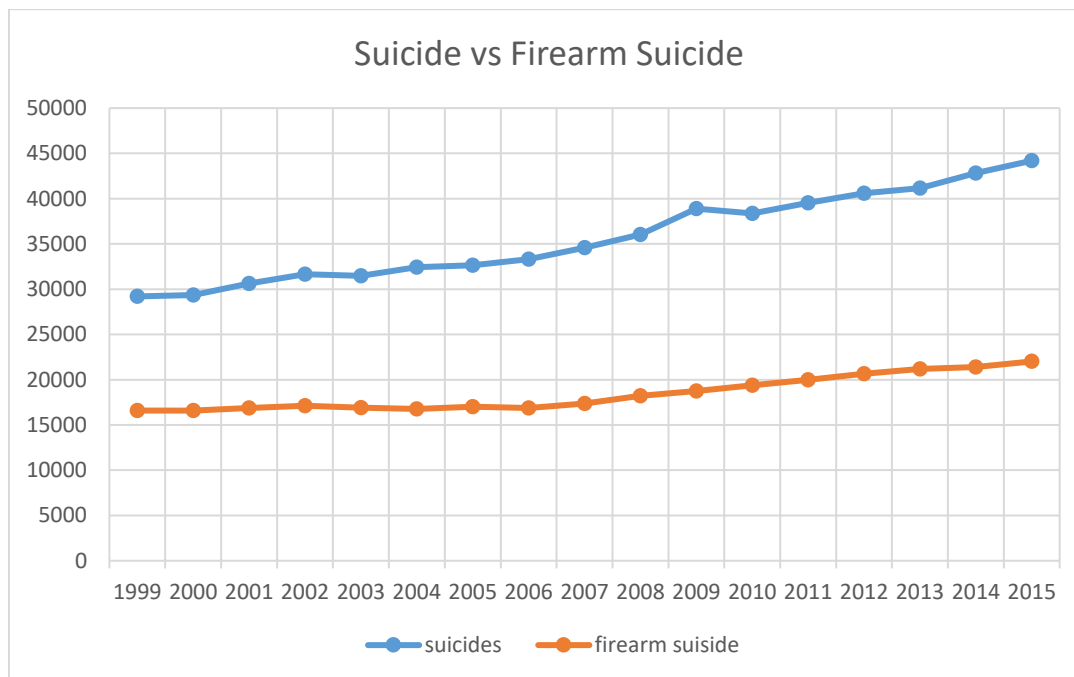


Figure 6: Suicide vs Firearm Suicide, source: Centers for Disease Control and Prevention.

Further explore data:

A publication of National Center for Health Statistics looked the method of suicide death in year 1999 and 2014, concluded that the percentage of firearm suicides actually declined from 1999 through 2014 for both female and male group (figure 7).

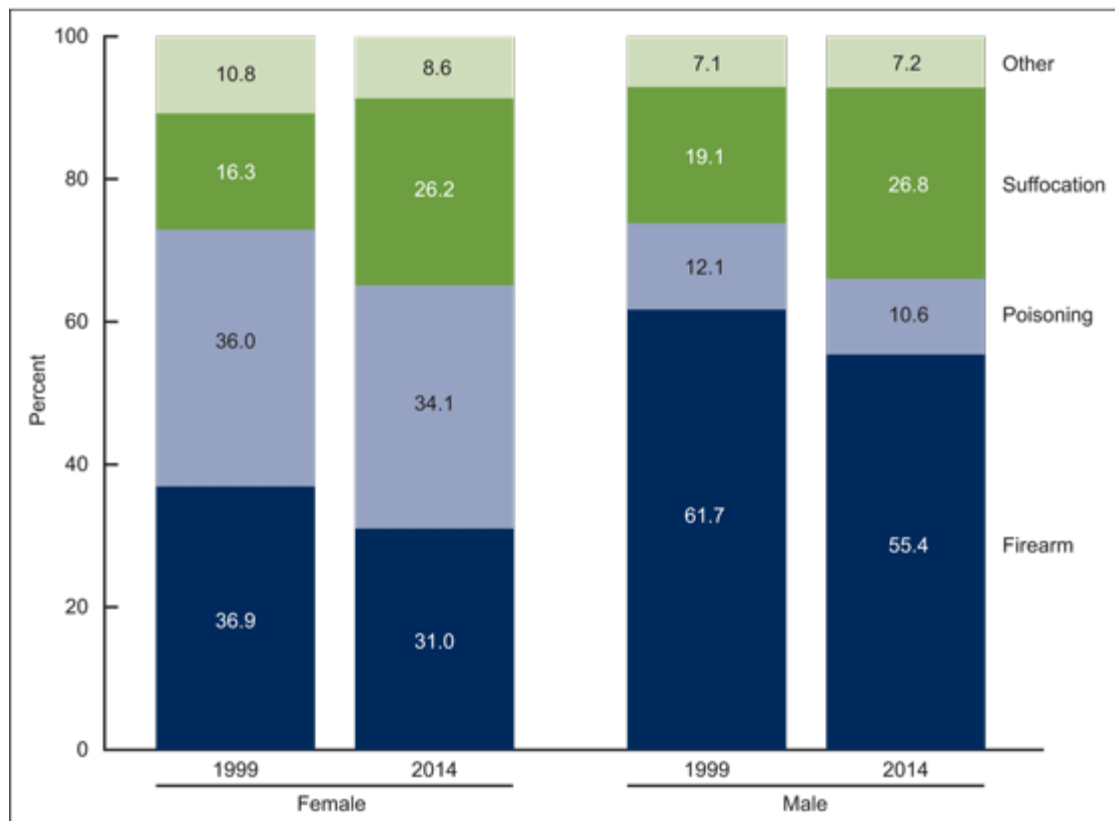


Figure 7: Suicide Death in Year 1999 vs 2014

Finding 2 conclusion: There is an increasing trend in the number of firearm suicides, which is part of trend for overall suicide growth. Compared with the year 1999, the suicide death by method of firearms indeed declined.

Lesson 3: Look carefully about cross section data

States with tighter gun control laws have fewer gun-related death? (Data product #8)

The advantage of choropleth map is to divide states with cross section data, as data product #8 showed (figure 7). However, the map did not show the changes over years, which played critical role in accessing the effect on gun control laws. Therefore, I redesigned the map to show changes: firstly, I updated the data sources for both gun control laws (since year 2014) and firearm death per state (year 2014-2016); secondly, I mapped the updated data with two groups (1: means at least 1 gun control law since 2014) for the year 2014 to 2016; lastly, I calculated the changes between 2016 and 2015, 2015 and 2014 among states. The results are listed below (figure 8,9).

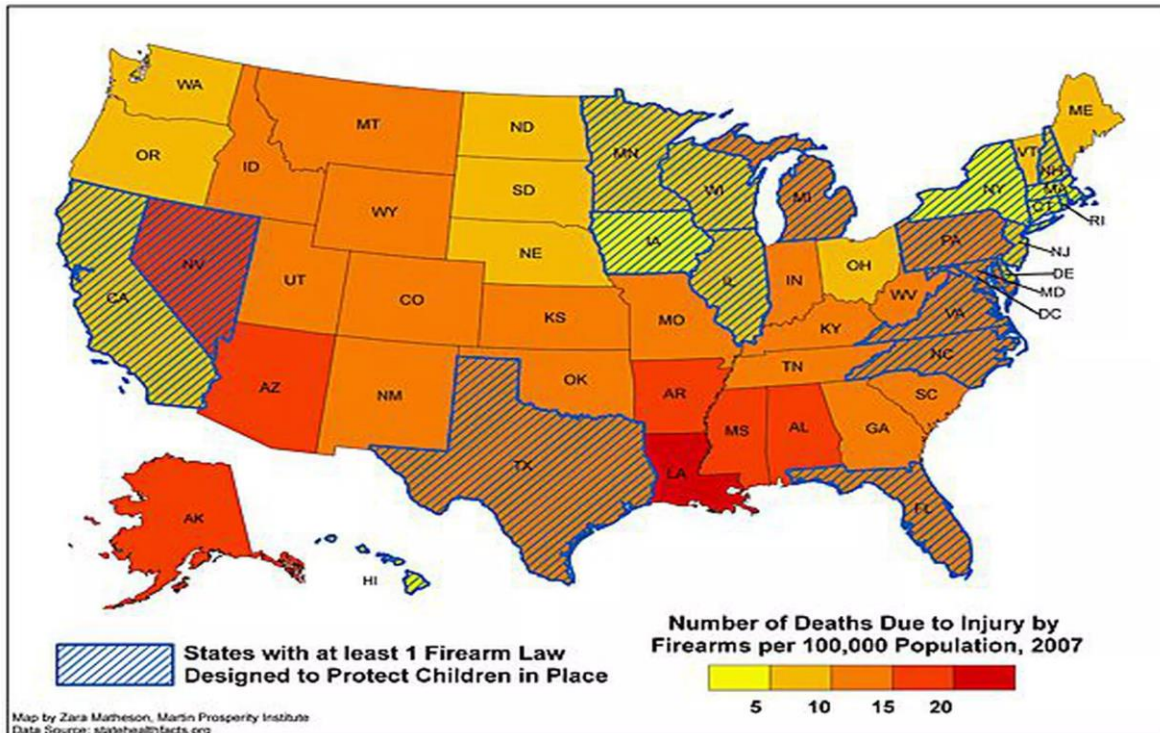


Figure 7: Number of Deaths Due to Firearms in 2007

Data of year 2,014

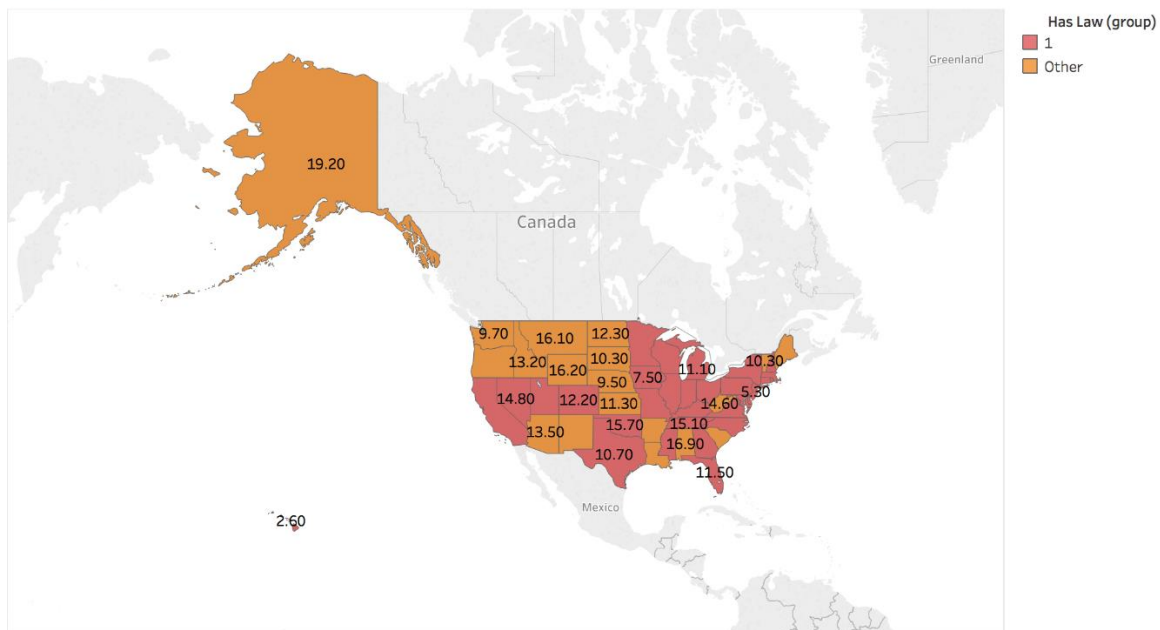


Figure 8A: Number of Deaths Due to Firearms in 2014; Source: CDC.

Data of year 2,015

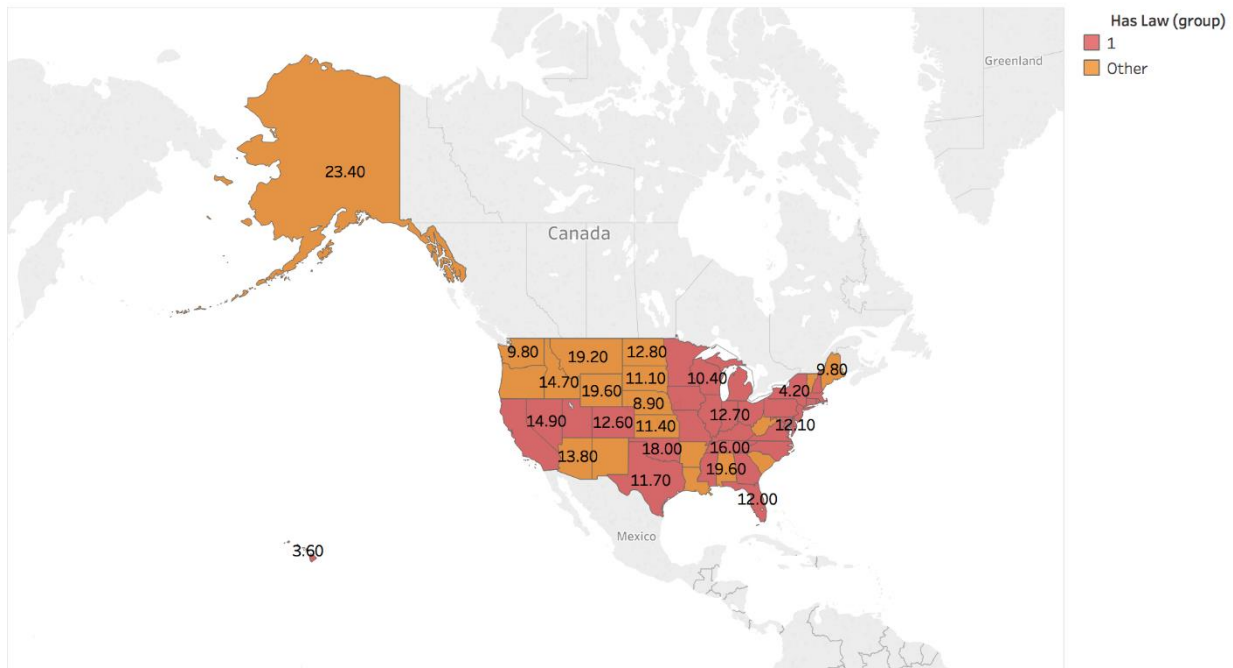


Figure 8B: Number of Deaths Due to Firearms in 2015; Source: CDC.

Data of year 2,016

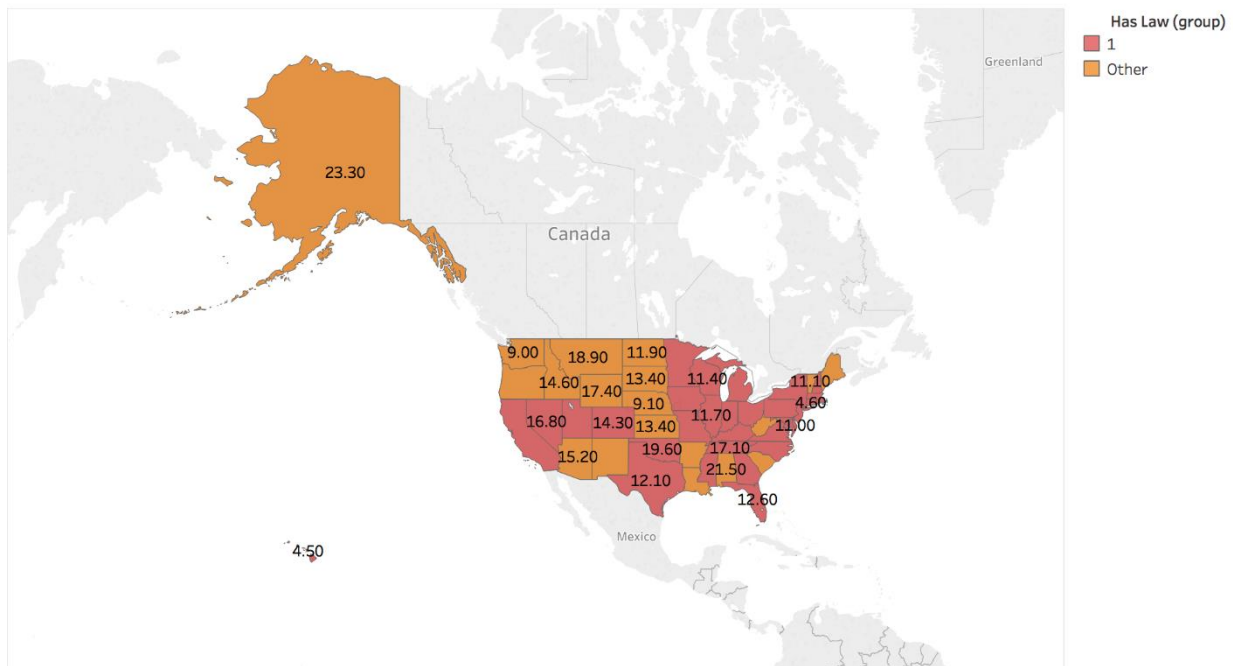
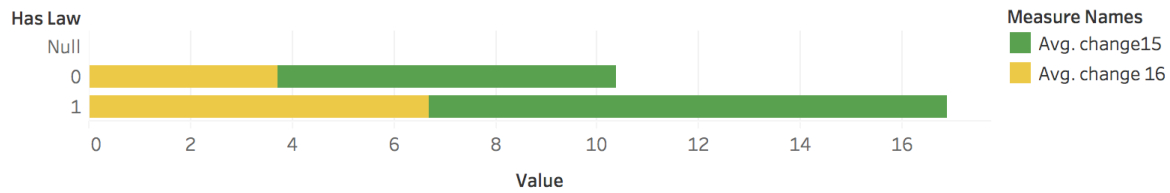


Figure 8C: Number of Deaths Due to Firearms in 2016; Source: CDC.

Sheet 6



Avg. change15 and Avg. change 16 for each Has Law. Color shows details about Avg. change15 and Avg. change 16.

Figure 9: The average rate change in number of gun-related deaths between two law groups

The updated data contained more states joining to have at least one gun-control law, and there were raising trend in the number of firearm deaths per state per year. More interestingly, figure 9 indicated that there were much more average percentage increase in number of death between years in the group of states with gun-control laws versus without gun-control laws.

Finding 3 conclusion: There are more states joining to have at least one law related to gun-control policy in 2014, however, the average rate of change in number of firearm death for the states with gun-control laws was higher than those without gun laws.

References

Human Development Reports. Accessed from <http://hdr.undp.org/en/composite/HDI>.

Krouse, William J., and Daniel J. Richardson, *Mass Murder with Firearms: Incidents and Victims, 1999–2013*, Washington, D.C.: Congressional Research Service, R44126, 2015.

OECD. Accessed from <http://www.oecd.org/about/membersandpartners/>

Lopez, German, America's unique gun violence problem, explained in 17 maps and charts. Vox 2018.

Mass Shooting Tracker, homepage, undated. As of October 20, 2016: <https://www.massshootingtracker.org>

Gun Violence Archive, homepage, undated-a. As of October 20, 2016: <http://www.gunviolencearchive.org/>