

Story 3

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Story -3 : Do stricter gun laws reduce firearm gun deaths?

The CDC publishes firearm mortality for each State per 100,000 persons https://www.cdc.gov/nchs/pressroom/sosmap/firearm_mortality/firearm.htm. Each State' firearm control laws can be categorized as very strict to very lax. The purpose of this Story is to answer the question, " Do stricter firearm control laws help reduce firearm mortality?"

For this assignment you will need to:

- Access the firearm mortality data from the CDC using an available API (<https://open.cdc.gov/apis.html>)
- Create a 5 point Likert scale categorizing gun control laws from most lax to strictest and assign each state to the most appropriate Likert bin.
- Determine whether stricter gun control laws result in reduced gun violence deaths
- Present your story using heat maps

Load libraries required for this project

```
## -- Attaching core tidyverse packages ----- tidyverse 2.0.0 --
## v dplyr      1.1.4      v readr      2.1.5
## v forcats    1.0.0      v stringr   1.5.1
## v ggplot2    3.5.1      v tibble    3.2.1
## v lubridate  1.9.3      v tidyr     1.3.1
## v purrr      1.0.2
## -- Conflicts ----- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()     masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
##
## Attaching package: 'jsonlite'
##
##
## The following object is masked from 'package:purrr':
##
##   flatten
##
##
## Attaching package: 'plotly'
```

```
##
##
## The following object is masked from 'package:httr':
##
##   config
##
##
## The following object is masked from 'package:ggplot2':
##
##   last_plot
##
##
## The following object is masked from 'package:stats':
##
##   filter
##
##
## The following object is masked from 'package:graphics':
##
##   layout
##
##
## Attaching package: 'rvest'
##
##
## The following object is masked from 'package:readr':
##
##   guess_encoding
```

Loading firearm mortality dataset Data extracted from the CDC website

```
##   year_and_quarter      time_period
## 1      2022 Q1 12 months ending with quarter
## 2      2022 Q1 12 months ending with quarter
## 3      2022 Q1 12 months ending with quarter
## 4      2022 Q1 12 months ending with quarter
## 5      2022 Q1 12 months ending with quarter
## 6      2022 Q1 12 months ending with quarter
##           cause_of_death  rate_type      unit
## 1           All causes Age-adjusted Deaths per 100,000
## 2      Alzheimer disease Age-adjusted Deaths per 100,000
## 3           COVID-19 Age-adjusted Deaths per 100,000
## 4           Cancer Age-adjusted Deaths per 100,000
## 5 Chronic liver disease and cirrhosis Age-adjusted Deaths per 100,000
## 6 Chronic lower respiratory diseases Age-adjusted Deaths per 100,000
##   rate_overall rate_sex_female rate_sex_male rate_alaska rate_alabama
## 1      873.2      729.4      1038      944.5      1109.8
## 2       30.6        35       23.8       28.5       45.5
## 3        95       75.2      119.1      121.3      133.6
## 4      145.9      127.4      170.9       156      159.9
## 5       14.4       10.3       18.9       25.5       16.4
## 6       35.1       33.2       37.8       36.4       51.7
```

##	rate_arkansas	rate_arizona	rate_california	rate_colorado	rate_connecticut	
## 1	1097.1	882.5	719.5	808.2	725.9	
## 2	43.2	29.6	38.4	32.1	21.6	
## 3	123.6	113.9	62.4	89.9	50.9	
## 4	167.9	134.5	131.4	125	134.1	
## 5	17	21	15.4	19.7	12.5	
## 6	62.3	37	26.3	38.1	23.9	
##	rate_district_of_columbia	rate_delaware	rate_florida	rate_georgia	rate_hawaii	
## 1		844.4	868.3	828	973.6	647.1
## 2		10.7	30.1	19.3	43.4	23.6
## 3		54.8	78.4	106.6	116.4	43.9
## 4		143.8	155.4	141.3	150.4	126.7
## 5		9.1	11.5	13.4	13.7	9.7
## 6		17.7	36.5	32.1	41.1	17.9
##	rate_iowa	rate_idaho	rate_illinois	rate_indiana	rate_kansas	rate_kentucky
## 1	860.8	892.8	839.4	1011.9	938.4	1153.2
## 2	30.9	41.5	26.6	29.6	22.9	32.5
## 3	78.1	118.9	82.1	112.1	109.7	146.7
## 4	152	139.6	149.3	169	152.8	179.6
## 5	14.3	16.1	12.3	15.4	15.4	17.2
## 6	40.8	44.1	32.4	52.9	43.8	58.3
##	rate_louisiana	rate_massachusetts	rate_maryland	rate_maine	rate_michigan	
## 1	1084.4		717	800.3	910.3	956.2
## 2	42.8		17.5	15.9	28.1	34.1
## 3	108.8		46.7	66.9	70.9	115
## 4	161.9		136.1	139.2	161.2	159.6
## 5	12.1		11.1	9.3	17.8	15.1
## 6	39.6		26.8	24.1	43.1	39
##	rate_minnesota	rate_missouri	rate_mississippi	rate_montana		
## 1	771.6	986.6		1193.4	925.3	
## 2	34.1	33.5		51.8	24.4	
## 3	68	110.5		140.8	111.8	
## 4	143.6	162.4		184	142.9	
## 5	13.6	13.1		17.3	24.7	
## 6	30.1	46.7		59.9	39.6	
##	rate_north_carolina	rate_north_dakota	rate_nebraska	rate_new_hampshire		
## 1		952.8	810.5	839.4	791.9	
## 2		36	32.5	29.8	23.3	
## 3		98.3	80.2	73.8	56.5	
## 4		152.4	134.2	152.2	145.3	
## 5		15	17.8	15.2	14.5	
## 6		37.3	35.4	41	36	
##	rate_new_jersey	rate_new_mexico	rate_nevada	rate_new_york	rate_ohio	
## 1	723.5	1007.9	933.3	694.4	1019.8	
## 2	20.5	25.4	26.3	12.8	34	
## 3	62.9	138.3	134.8	63.4	128.1	
## 4	130.3	135.6	140.8	125.3	161.5	
## 5	8.9	41.8	17.6	8.3	14.1	
## 6	21.6	38.3	41.4	22.5	43	
##	rate_oklahoma	rate_oregon	rate_pennsylvania	rate_rhode_island		
## 1	1126.4	875.6	893.5	771		
## 2	37.1	40	22.5	28.3		
## 3	150.3	77.5	97.4	55.5		
## 4	176.7	153.7	151.8	139.1		

```

## 5      19.3      18      11      16.8
## 6      63.5      34.1      30.8      29.4
##   rate_south_carolina rate_south_dakota rate_tennessee rate_texas rate_utah
## 1           1022           871.4           1122.6           918.3           822.2
## 2           40.1           39.1           37.2           41.2           41
## 3           122.9           76.3           140.5           126.7           78.4
## 4           154.3           148.6           165.2           143.5           120.6
## 5           17.5           36.1           17.1           16.8           11.6
## 6           41.6           41.6           52           36.2           30.6
##   rate_virginia rate_vermont rate_washington rate_wisconsin rate_west_virginia
## 1           860.1           800.5           811.1           857.1           1239.9
## 2           26.1           36.2           46           33.6           35.4
## 3           80.8           32.9           66.6           77.7           154
## 4           149.8           155           148.5           146.7           183.8
## 5           11.7           12.6           15.5           12.5           17.9
## 6           31.3           32.4           29.5           33.2           59.9
##   rate_wyoming rate_age_1_4 rate_age_5_14 rate_age_15_24 rate_age_25_34
## 1           956.8           <NA>           <NA>           <NA>           <NA>
## 2           34.2           <NA>           <NA>           <NA>           <NA>
## 3           145.1           <NA>           <NA>           <NA>           <NA>
## 4           153.1           <NA>           <NA>           <NA>           <NA>
## 5           25           <NA>           <NA>           <NA>           <NA>
## 6           49.5           <NA>           <NA>           <NA>           <NA>
##   rate_age_35_44 rate_age_45_54 rate_age_55_64 rate_65_74 rate_age_75_84
## 1           <NA>           <NA>           <NA>           <NA>           <NA>
## 2           <NA>           <NA>           <NA>           <NA>           <NA>
## 3           <NA>           <NA>           <NA>           <NA>           <NA>
## 4           <NA>           <NA>           <NA>           <NA>           <NA>
## 5           <NA>           <NA>           <NA>           <NA>           <NA>
## 6           <NA>           <NA>           <NA>           <NA>           <NA>
##   rate_age_85_plus
## 1           <NA>
## 2           <NA>
## 3           <NA>
## 4           <NA>
## 5           <NA>
## 6           <NA>

```

Analyze and filter data for this scenario Filter data to obtain only the necessary columns for this analysis, I'm going to work with the last quarter of last year(2023) for this scenario

```

## # A tibble: 6 x 4
## # Groups:   year [1]
##   ID year state rate
##   <int> <chr> <chr> <dbl>
## 1     1 2023 AK     24
## 2     2 2023 AL     25.3
## 3     3 2023 AR     21.9
## 4     4 2023 AZ     19.1
## 5     5 2023 CA      8.2
## 6     6 2023 CO     17.3

```

Loading gun control laws dataset

Extracted from the law center score card, data scrapped from URL table

```
## # A tibble: 6 x 5
##   Gun Law Strength~1 State Grade Gun Death Rate~2
##   <chr>              <chr> <chr> <chr>
## 1 35               Alab~ F      4
## 2 40               Alas~ F      7
## 3 41               Ariz~ F     12
## 4 48               Arka~ F      8
## 5 1                Cali~ A     44
## 6 10              Colo~ A-    19
## # i abbreviated names:
## #   1: 'Gun Law Strength~1 (Ranked)',
## #   2: 'Gun Death Rate~2 (Ranked)'
## # i 1 more variable:
## #   'Gun Death Rate~2 (per 100K)' <chr>
```

Remove columns to keep only the columns need it for the analysis.

```
##   ID      State Grade
## 1  1    Alabama    F
## 2  2    Alaska    F
## 3  3    Arizona    F
## 4  4    Arkansas    F
## 5  5 California    A
## 6  6    Colorado  A-
```

Convert values of Grade column into integer.

```
##   ID      State Grade
## 1  1    Alabama    1
## 2  2    Alaska    1
## 3  3    Arizona    1
## 4  4    Arkansas    1
## 5  5    California    5
## 6  6    Colorado    5
## 7  7    Connecticut    5
## 8  8    Delaware    4
## 9  9    Florida    2
## 10 10    Georgia    1
## 11 11    Hawaii    5
## 12 12    Idaho    1
## 13 13    Illinois    5
## 14 14    Indiana    2
## 15 15    Iowa    1
## 16 16    Kansas    1
## 17 17    Kentucky    1
## 18 18    Louisiana    1
## 19 19    Maine    2
## 20 20    Maryland    5
## 21 21    Massachusetts    5
```

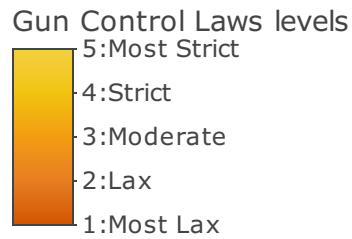
```
## 22 22      Michigan      4
## 23 23      Minnesota     4
## 24 24      Mississippi    1
## 25 25      Missouri       1
## 26 26      Montana        1
## 27 27      Nebraska       3
## 28 28      Nevada         4
## 29 29      New Hampshire   2
## 30 30      New Jersey      5
## 31 31      New Mexico      3
## 32 32      New York        5
## 33 33      North Carolina   3
## 34 34      North Dakota     1
## 35 35      Ohio            2
## 36 36      Oklahoma        1
## 37 37      Oregon          5
## 38 38      Pennsylvania     4
## 39 39      Rhode Island     4
## 40 40      South Carolina    2
## 41 41      South Dakota     1
## 42 42      Tennessee       1
## 43 43      Texas           1
## 44 44      Utah            1
## 45 45      Vermont         4
## 46 46      Virginia        4
## 47 47      Washington       5
## 48 48      West Virginia    1
## 49 49      Wisconsin       3
## 50 50      Wyoming         1
```

Merge both Datasets to create visualizations

```
## # A tibble: 51 x 5
## # Groups:   year [1]
##       ID year state rate grade
##   <int> <chr> <chr> <dbl> <dbl>
## 1     1   2023 AK      24      1
## 2     2   2023 AL     25.3     1
## 3     3   2023 AR     21.9     1
## 4     4   2023 AZ     19.1     1
## 5     5   2023 CA      8.2     5
## 6     6   2023 CO     17.3     5
## 7     7   2023 CT      6.2     5
## 8     8   2023 DC     33.1     5
## 9     9   2023 DE      12      4
## 10    10   2023 FL     14.4     2
## # i 41 more rows
```

First heatmap displays the gun control laws strength rating for each state with the mortality rate on it, with 1 as most lax to 5 as most strict.

Gun control laws strenght level and death rate by state



```
## Warning: package 'imager' was built under R version 4.4.1
```

```
## Loading required package: magrittr
```

```
##
```

```
## Attaching package: 'magrittr'
```

```
## The following object is masked from 'package:purrr':
```

```
##
```

```
##      set_names
```

```
## The following object is masked from 'package:tidyr':
```

```
##
```

```
##      extract
```

```
##
```

```
## Attaching package: 'imager'
```

```
## The following object is masked from 'package:magrittr':
```

```
##
```

```
##      add
```

```
## The following object is masked from 'package:plotly':
```

```
##
```

```
##      highlight
```

```
## The following object is masked from 'package:stringr':
##
##   boundary

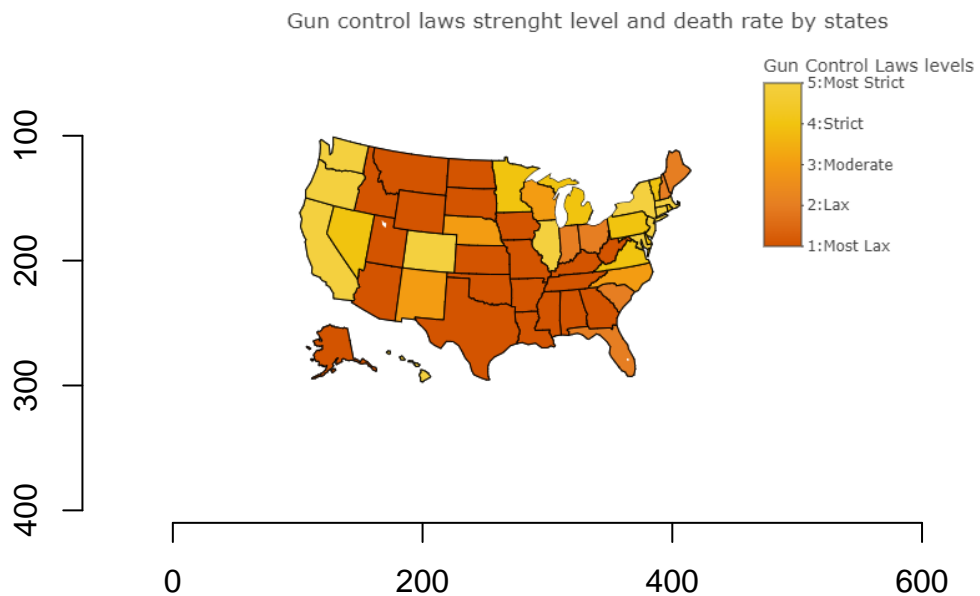
## The following object is masked from 'package:dplyr':
##
##   where

## The following object is masked from 'package:tidyr':
##
##   fill

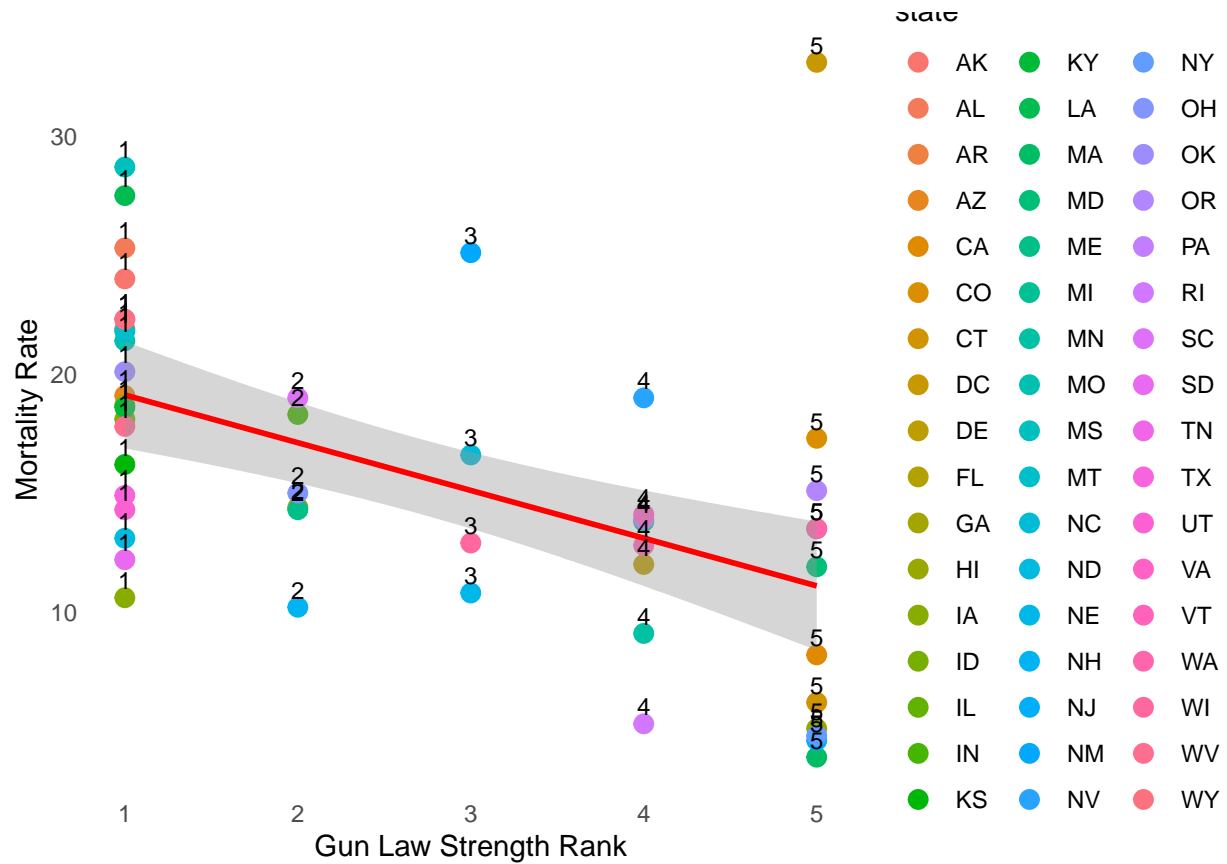
## The following objects are masked from 'package:stats':
##
##   convolve, spectrum

## The following object is masked from 'package:graphics':
##
##   frame

## The following object is masked from 'package:base':
##
##   save.image
```



```
## 'geom_smooth()' using formula = 'y ~ x'
```

Conclusion.

Do stricter firearm control laws help reduce firearm mortality?

Based on the visualization, the answer is yes, stricter firearms laws reduce firearm mortality, states with most strict firearms laws such as California, New Jersey, and Colorado tends to have a lower gun death rate(per 100k) than other states such as Alabama, Arizona, and Georgia with the most lax gun control laws with higher gun death rate(per 100k)