Story3

March 4, 2024

#

Data 608

##

Story 3

###

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0.0.1 Import the required libraries

[1]:
```
import pandas as pd
from matplotlib import pyplot as plt
import seaborn as sns
import warnings
import numpy as np
warnings.filterwarnings('ignore', category=DeprecationWarning)
```

0.1 Download the dataset using an api

[2]:
```
df = pd.read_csv("https://data.cdc.gov/resource/489q-934x.csv")
df.head(3)
```

[2]:
```
  year_and_quarter                    time_period     cause_of_death  \
0          2021 Q1  12 months ending with quarter         All causes
1          2021 Q1  12 months ending with quarter  Alzheimer disease
2          2021 Q1  12 months ending with quarter           COVID-19

      rate_type                unit  rate_overall  rate_sex_female  \
0  Age-adjusted  Deaths per 100,000         866.3            716.3
1  Age-adjusted  Deaths per 100,000          32.1             36.8
2  Age-adjusted  Deaths per 100,000         120.7             94.0

   rate_sex_male  rate_age_1_4  rate_age_5_14  …  rate_south_dakota  \
0         1040.4           NaN            NaN  …              882.7
1           24.8           NaN            NaN  …               37.4
2          153.9           NaN            NaN  …              145.8
```

```
   rate_tennessee  rate_texas  rate_utah  rate_virginia  rate_vermont  \
0          1056.8       922.0      771.2          824.8         737.9
1            42.8        44.9       41.1           28.3          34.3
2           122.5       162.3       68.7           92.0          21.5

   rate_washington  rate_wisconsin  rate_west_virginia  rate_wyoming
0            714.8           825.8              1096.9         854.0
1             42.0            31.7                35.2          32.1
2             46.5            86.1                94.2          84.0

[3 rows x 69 columns]
```

0.2 Filter the data for Firearm-related injury

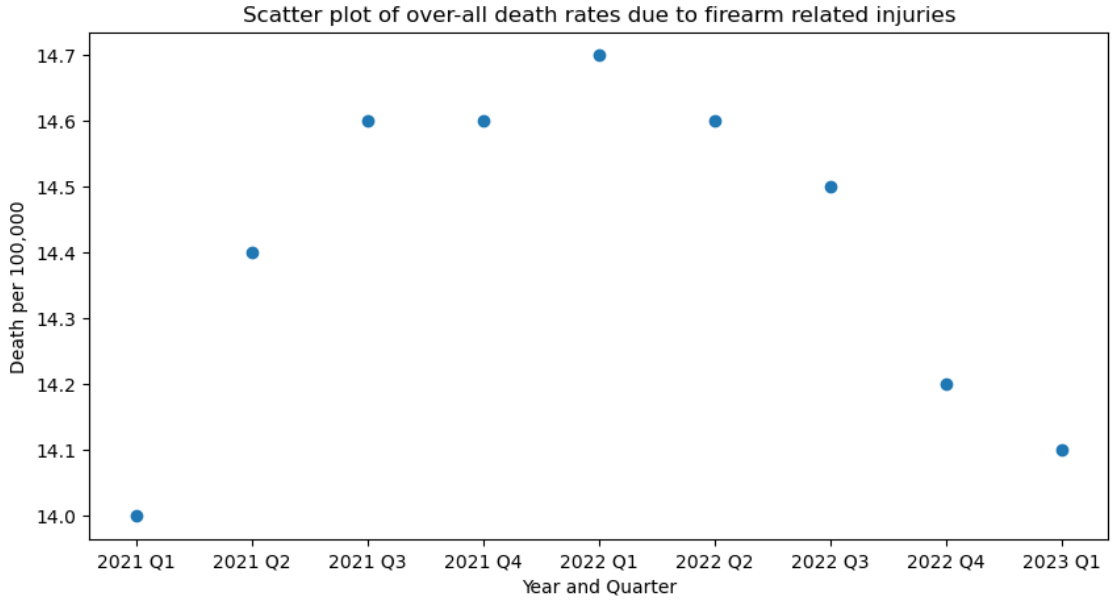
[3]:
```
df_firearm_death = df[(df["cause_of_death"]=="Firearm-related injury") &␣
↪(df["rate_type"]=="Age-adjusted") & (df["time_period"]=="12 months ending␣
↪with quarter")]
df_firearm_death.head()
```

[3]:
```
    year_and_quarter                   time_period          cause_of_death  \
9          2021 Q1  12 months ending with quarter  Firearm-related injury
53         2021 Q2  12 months ending with quarter  Firearm-related injury
97         2021 Q3  12 months ending with quarter  Firearm-related injury
141        2021 Q4  12 months ending with quarter  Firearm-related injury
185        2022 Q1  12 months ending with quarter  Firearm-related injury

       rate_type                unit  rate_overall  rate_sex_female  \
9    Age-adjusted  Deaths per 100,000          14.0              4.0
53   Age-adjusted  Deaths per 100,000          14.4              4.1
97   Age-adjusted  Deaths per 100,000          14.6              4.1
141  Age-adjusted  Deaths per 100,000          14.6              4.2
185  Age-adjusted  Deaths per 100,000          14.7              4.2

     rate_sex_male  rate_age_1_4  rate_age_5_14  …  rate_south_dakota  \
9             24.4           NaN            NaN  …               15.5
53            24.9           NaN            NaN  …               15.5
97            25.2           NaN            NaN  …               13.8
141           25.3           NaN            NaN  …               14.3
185           25.5           NaN            NaN  …               14.8

     rate_tennessee  rate_texas  rate_utah  rate_virginia  rate_vermont  \
9              22.3        14.5       13.9           13.2          12.0
53             22.7        15.1       14.1           13.7          11.2
97             23.0        15.3       14.7           13.6          11.9
141            22.8        15.6       13.9           14.3          11.9
185            22.5        15.9       13.2           14.9          11.8
```

	rate_washington	rate_wisconsin	rate_west_virginia	rate_wyoming
9	10.7	12.3	17.4	25.0
53	10.5	12.9	17.5	24.6
97	10.9	13.2	17.7	23.7
141	11.2	13.5	17.3	26.1
185	11.8	14.5	16.8	25.8

[5 rows x 69 columns]

[4]:
```
plt.figure(figsize=(10, 5))
plt.scatter(df_firearm_death.year_and_quarter, df_firearm_death.rate_overall)
plt.title("Scatter plot of over-all death rates due to firearm related␣
 ↪injuries")
plt.xlabel("Year and Quarter")
plt.ylabel("Death per 100,000")
plt.show()
```



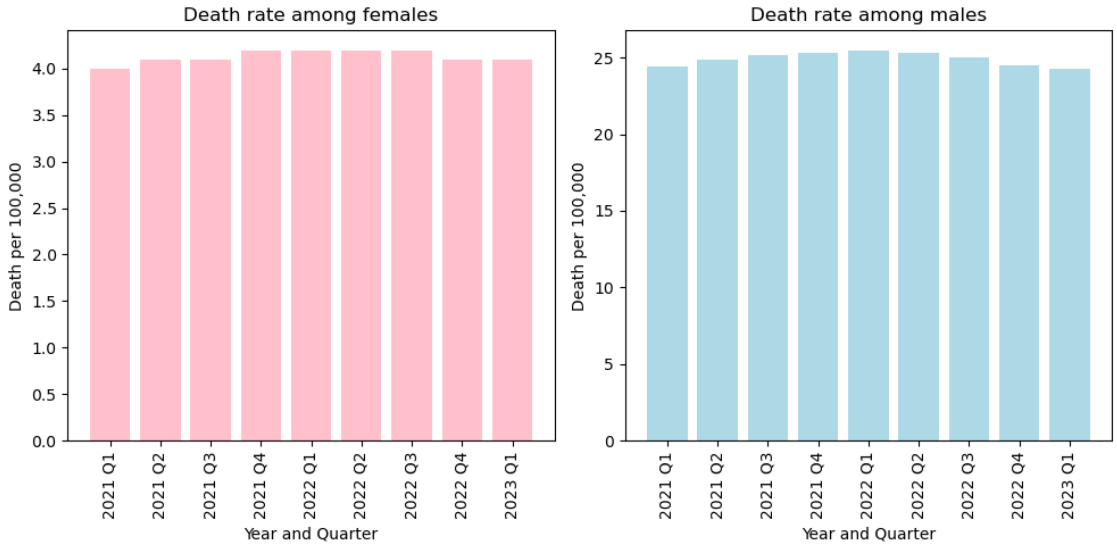
0.3 Barplot of death rates due to fire arm injuries among males and females

[5]:
```
df_death_f = df_firearm_death[['year_and_quarter','rate_sex_female']]
df_death_f["Sex"] =len(df_death_f['rate_sex_female'])*['female']
df_death_f.columns = ['year_and_quarter', 'death_rate', 'sex']
df_death_m = df_firearm_death[['year_and_quarter','rate_sex_male']]
df_death_m["Sex"] =len(df_death_m['rate_sex_male'])*['male']
df_death_m.columns = ['year_and_quarter', 'death_rate', 'sex']
df_death_mf = pd.concat([df_death_m, df_death_f], axis=0)
```

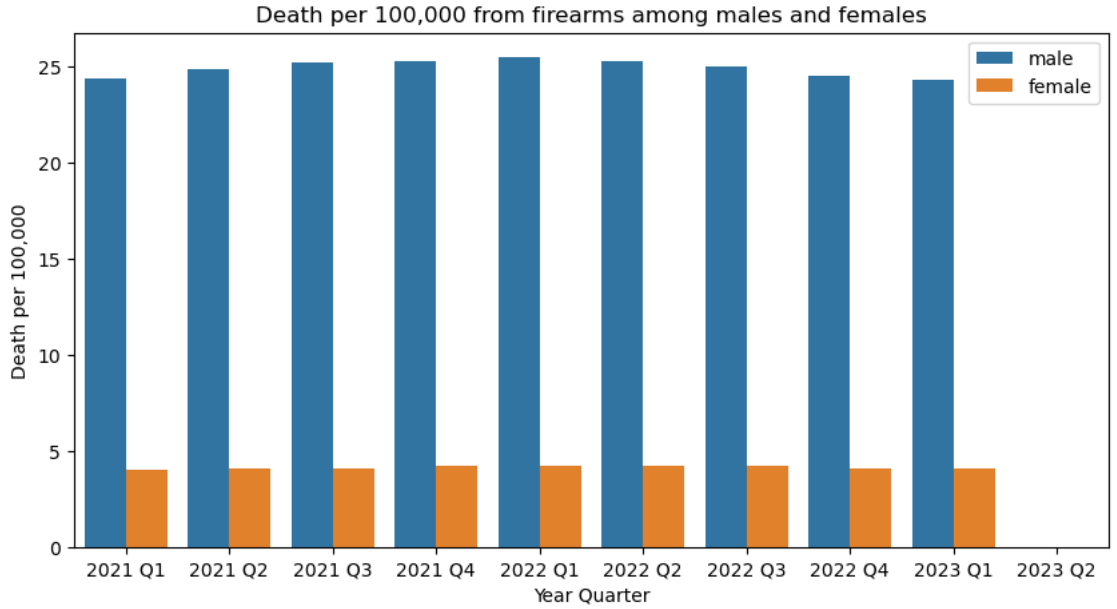
```
df_death_mf.index= np.arange(0, len(df_death_mf.sex))
```

```
C:\Users\mnasm\AppData\Local\Temp\ipykernel_18728\3775156849.py:2:
SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-
docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  df_death_f["Sex"] =len(df_death_f['rate_sex_female'])*['female']
C:\Users\mnasm\AppData\Local\Temp\ipykernel_18728\3775156849.py:5:
SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-
docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  df_death_m["Sex"] =len(df_death_m['rate_sex_male'])*['male']
```

[6]:
```
plt.figure(figsize=(10, 5))

# Plotting the bar plot of death rate of females from firearm injuries
plt.subplot(1, 2, 1)
plt.bar(df_firearm_death['year_and_quarter'],␣
  ↪df_firearm_death['rate_sex_female'], color='pink')
plt.title('Death rate among females')
plt.xlabel('Year and Quarter')
plt.ylabel('Death per 100,000')
plt.xticks(rotation=90)

# Plotting the bar plot of death rate of males from fire arm injuries
plt.subplot(1, 2, 2)
plt.bar(df_firearm_death['year_and_quarter'],df_firearm_death['rate_sex_male'],␣
  ↪color='lightblue')
plt.title('Death rate among males')
plt.xlabel('Year and Quarter')
plt.ylabel('Death per 100,000')
plt.xticks(rotation=90)
plt.tight_layout()
plt.show()
```



[7]:
```
plt.figure(figsize=(10, 5))
sns.barplot(data=df_death_mf, x='year_and_quarter', y='death_rate', hue='sex',␣
 ↪errorbar=None,  estimator='mean')
plt.xlabel("Year Quarter")
plt.ylabel('Death per 100,000')
plt.title("Death per 100,000 from firearms among males and females")
plt.legend(loc = 'upper right')
plt.show()
```



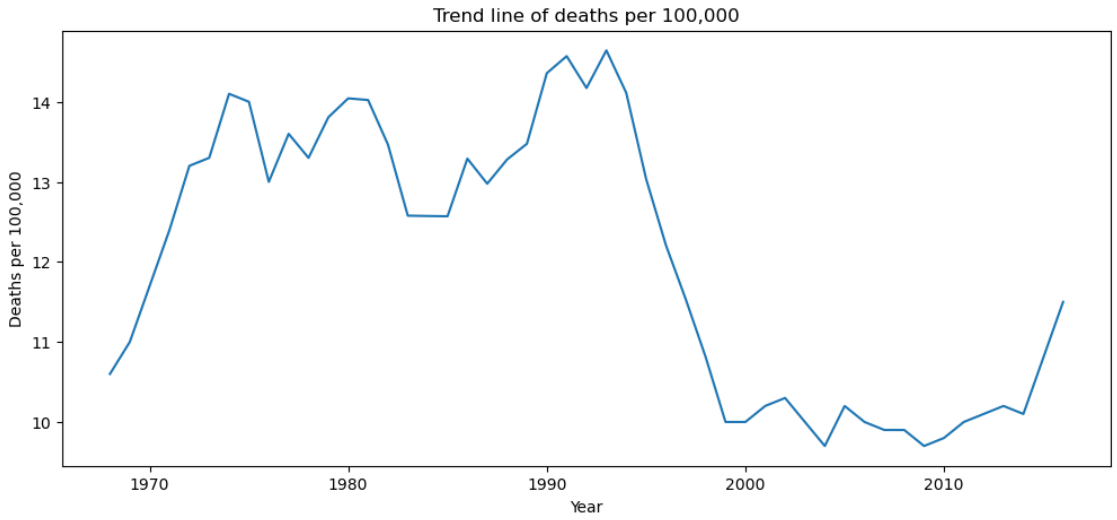
[8]:
```
df2 = pd.read_table("C:/Users/mnasm/Downloads/Compressed_Mortality_1968-1978.
 ↪txt")
df2 = df2.iloc[0:44, :]
df2=df2[df2["Notes"]=='Total']
df2 = df2.drop(["Notes","Year Code", "Cause of death", "Cause of death Code"],␣
 ↪axis=1)
df2= df2.drop(['Deaths', "Population"], axis=1)
df2.columns=["Year", "Death per 100000"]
```

[9]:
```
df3 = pd.read_table("C:/Users/mnasm/Downloads/Compressed_Mortality_1979-1998.
 ↪txt")
df3=df3.iloc[0:313]
df3 = df3[df3["Notes"]!="Total"]
df3= df3.drop(["Notes", "Cause of death", "Cause of death Code", "Year Code"],␣
 ↪axis=1)
year = np.arange(1979.0, 1999.0)
death_rate = []
for y in year:
    pop=df3[df3["Year"]==y]["Population"].mean()
    deaths = df3[df3["Year"]==y]["Deaths"].sum()
    death_rate.append(deaths/pop*100000)
data = {
    "Year": year,
    "Death per 100000":death_rate
}
df3 = pd.DataFrame(data)
```

[10]:
```
df4 = pd.read_table("C:/Users/mnasm/Downloads/Compressed_Mortality_1999-2016.
 ↪txt")
df4 = df4.iloc[0:162, :]
df4 = df4.drop(["Notes", "Year Code", "Cause of death", "Cause of death␣
 ↪Code","Crude Rate", "Deaths", "Population"], axis=1)
df4 = df4.groupby("Year").sum()
df4['Year']=df4.index
df4.index = np.arange(0,len(df4))
df4.columns = ["Death per 100000", 'Year']
```

[11]:
```
df = pd.concat([df2, df3,df4], axis=0)
df.index = np.arange(0, len(df))
```

[12]:
```
plt.figure(figsize=[12, 5])
plt.plot(df.Year, df["Death per 100000"])
plt.title("Trend line of deaths per 100,000")
plt.xlabel("Year")
plt.ylabel("Deaths per 100,000")
plt.show()
```



It can be seen that the deaths per 100,000 decreases as the law becomes stricter and then after 2010 the deaths per 100,000 seems to be increasing after some relaxation in firearm deals.

[13]:
```
laws = ["GCA","FOPA",  "UFA", "BHVPA", "PLCAA"]
years = [1968, 1986, 1988, 1993, 2005]
likert_data ={
    "Year":years,
    "laws":laws
}
likert_df = pd.DataFrame(likert_data)
likert_df
```

[13]:

	Year	laws
0	1968	GCA
1	1986	FOPA
2	1988	UFA
3	1993	BHVPA
4	2005	PLCAA

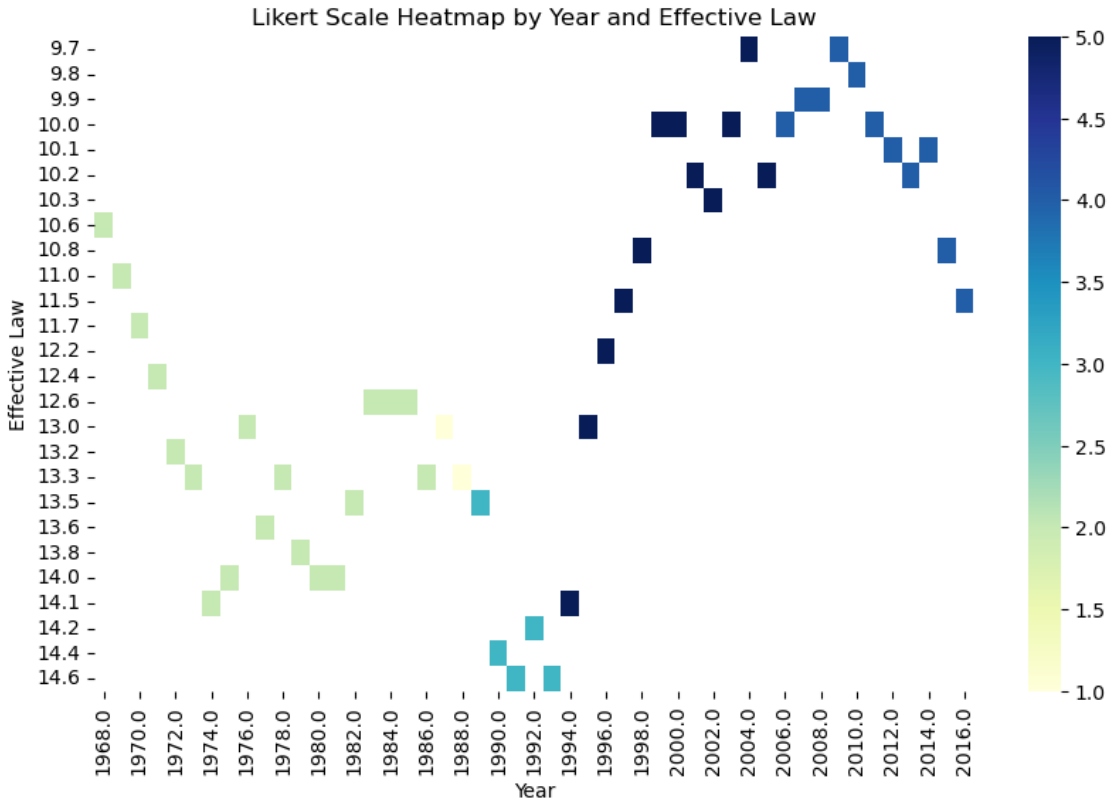
Here: GCA : Gun Control Act of 1968 FOPA: Firearm Owners Protection Act 1986 UFA : Undetectable Firearms Act 1988 BHVPA: Brady Handgun Violence Prevention Act 1993 PLCAA: Protection of Lawful Commerce in Arms Act 2005 FOPA was a little relaxed than the GCA similarly PLCAA was milder than BHVPA. If we arrange these laws from most relaxed to strictest, we have FOPA<GCA<UFA<PLCAA<BHVPA Based on it, we develop a likert scale as follows:

[14]:
```
Laws = []
lik_scale=[]
for i in range(len(df)):
    if (df.Year[i] <= 1986):
        Laws.append(laws[0])
```

```
        lik_scale.append(2)
    elif (df.Year[i] > 1986) & (df.Year[i] <= 1988):
        Laws.append(laws[1])
        lik_scale.append(1)
    elif (df.Year[i] > 1988) & (df.Year[i] <= 1993):
        Laws.append(laws[2])
        lik_scale.append(3)
    elif (df.Year[i] > 1993) & (df.Year[i] <= 2005):
        Laws.append(laws[3])
        lik_scale.append(5)
    elif (df.Year[i] > 2005):
        Laws.append(laws[4])
        lik_scale.append(4)
```

[15]:
```
df["Effective_Law"]= Laws
df["Likert_scale"]=lik_scale
df["Death per 100000"]=round(df["Death per 100000"], 1)
```

[16]:
```
# Pivot the DataFrame for heatmap
heatmap_data = df.pivot_table("Likert_scale", "Death per 100000","Year")

# Plotting the heatmap
plt.figure(figsize=(10, 6))
sns.heatmap(heatmap_data, cmap="YlGnBu", annot=False)
plt.title('Likert Scale Heatmap by Year and Effective Law')
plt.xlabel('Year')
plt.ylabel('Effective Law')
plt.show()
```



It can be seen: as the law becomes stricter the deaths per 100,000 comes down. It should be noted that the deaths per 100,000 also depend on the population as the population grows, the rate is also expected to grow.According to the left scale, as we go up the rate of deaths per 100,000 comes down. Right scale shows the as the color becomes darker, the law becomes stricter.