TotalDeaths_2020

July 18, 2021

1 Total Deaths 2020

1.0.1 In this analysis, we will analyze the following:

- How different the number of deaths were in the United States for the years 2015 through 2020 and compare them.
- The total number of deaths per jurisdiction, per cause, per year.

1.1 Import libraries

We first need to import Python libraries that will be used with our data analyses and load in the deaths by jurisdiction and cause csv file directly from the source.

[1]:
```
import seaborn as sns
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import re
from IPython.display import display
import statsmodels.api as sm
import statsmodels.formula.api as smf

%matplotlib inline
```

2 Read in .csv file

[2]:
```
data = pd.read_csv("https://data.cdc.gov/api/views/u6jv-9ijr/rows.csv?
 ↪accessType=DOWNLOAD&bom=true&format=true")
```

[3]:
```
data.head()
```

[3]:
```
  Jurisdiction Week Ending Date State Abbreviation  Year  Week  \
0      Alabama       2015-01-10                 AL  2015     1
1      Alabama       2015-01-10                 AL  2015     1
2      Alabama       2016-01-09                 AL  2016     1
3      Alabama       2016-01-09                 AL  2016     1
4      Alabama       2017-01-07                 AL  2017     1
```

```
                      Cause Group  Number of Deaths  \
0  Alzheimer disease and dementia             120.0
1  Alzheimer disease and dementia             120.0
2  Alzheimer disease and dementia              76.0
3  Alzheimer disease and dementia              76.0
4  Alzheimer disease and dementia              96.0

                   Cause Subgroup Time Period Suppress Note  \
0  Alzheimer disease and dementia   2015-2019      NaN  NaN
1  Alzheimer disease and dementia   2015-2019      NaN  NaN
2  Alzheimer disease and dementia   2015-2019      NaN  NaN
3  Alzheimer disease and dementia   2015-2019      NaN  NaN
4  Alzheimer disease and dementia   2015-2019      NaN  NaN

   Average Number of Deaths in Time Period  Difference from 2015-2019 to 2020  \
0                                      103                                NaN
1                                      103                                NaN
2                                      103                                NaN
3                                      103                                NaN
4                                      103                                NaN

   Percent Difference from 2015-2019 to 2020                  Type
0                                        NaN  Predicted (weighted)
1                                        NaN            Unweighted
2                                        NaN  Predicted (weighted)
3                                        NaN            Unweighted
4                                        NaN  Predicted (weighted)
```

2.1 Data cleanup

2.1.1 Drop uneeded columns

Lets drop all of the columns that will not be needed in our data analyses. We are interested in Jurisdiction, Year, and Cause Group so we will drop every other column.

[4]:

```python
data.drop('Week Ending Date', axis = 1, inplace = True)
data.drop('State Abbreviation', axis = 1, inplace = True)
data.drop('Week', axis = 1, inplace = True)
data.drop('Cause Subgroup', axis = 1, inplace = True)
data.drop('Time Period', axis = 1, inplace = True)
data.drop('Suppress', axis = 1, inplace = True)
data.drop('Note', axis = 1, inplace = True)
data.drop('Average Number of Deaths in Time Period', axis = 1, inplace = True)
data.drop('Difference from 2015-2019 to 2020', axis = 1, inplace = True)
data.drop('Percent Difference from 2015-2019 to 2020', axis = 1, inplace = True)
data.drop('Type', axis = 1, inplace = True)
```

We will check for missing values and handle them.

[5]:

```
data.isnull().sum()
```

[5]:

```
Jurisdiction          0
Year                  0
Cause Group           0
Number of Deaths    134
dtype: int64
```

Lets look at these null values.

[6]:

```
data[data.isna().any(axis=1)]["Jurisdiction"].unique()
```

[6]:

```
array(['Connecticut', 'North Carolina', 'Delaware'], dtype=object)
```

Lets replace these null values with the median from every year for every cause of death and check for null values again.

[7]:

```
data["Number of Deaths"] = data.groupby(["Jurisdiction", "Year", "Cause␣
 ↪Group"]).transform(lambda x: x.fillna(int(x.median())))
```

[8]:

```
data.isna().sum()
```

[8]:

```
Jurisdiction        0
Year                0
Cause Group         0
Number of Deaths    0
dtype: int64
```

Lets check the data types.

[9]:

```
data.dtypes
```

[9]:

```
Jurisdiction         object
Year                  int64
Cause Group          object
Number of Deaths    float64
dtype: object
```

'Number of Deaths' is of type float and should be of type int so lets change it and check the data types again.

[10]:

```
data = data.astype({'Number of Deaths':'int'})
data.dtypes
```

[10]:

```
Jurisdiction        object
Year                 int64
Cause Group         object
Number of Deaths     int64
dtype: object
```

Lets check for strange values.

```
[11]: data.describe()
```

```
[11]:                 Year  Number of Deaths
      count  356518.000000     356518.000000
      mean     2017.770143        157.986413
      std         1.877661        683.299929
      min      2015.000000         11.000000
      25%      2016.000000         23.000000
      50%      2018.000000         44.000000
      75%      2019.000000         95.000000
      max      2021.000000      12433.000000
```

Lets see how many rows have a jurisdiction that is 'United States'.

```
[12]: display(data[data['Jurisdiction'] == 'United States'].head())
      display(data[data['Jurisdiction'] == 'United States'].count())
```

```
        Jurisdiction  Year                     Cause Group  Number of Deaths
29278  United States  2015  Alzheimer disease and dementia              6187
29279  United States  2015  Alzheimer disease and dementia              6187
29280  United States  2016  Alzheimer disease and dementia              5155
29281  United States  2016  Alzheimer disease and dementia              5155
29282  United States  2017  Alzheimer disease and dementia              5844
```

```
Jurisdiction        8788
Year                8788
Cause Group         8788
Number of Deaths    8788
dtype: int64
```

We need specific jurisdictions so lets drop all of the rows that contain 'United States' in the 'Jurisdiction' column and check if they are gone.

```
[13]: index = data[(data['Jurisdiction'] == 'United States')].index
      data.drop(index, inplace = True)
      display(data[data['Jurisdiction'] == 'United States'].count())
```

```
Jurisdiction        0
Year                0
Cause Group         0
Number of Deaths    0
dtype: int64
```

Before we analyze this data, Python likes it better when variables do not have spaces, so lets get rid of the spaces.

```
[14]: data.columns = ['Jurisdiction', 'Year', 'CauseGroup', 'NumberOfDeaths']
      data.head()
```

```
[14]:   Jurisdiction  Year                       CauseGroup  NumberOfDeaths
      0      Alabama  2015  Alzheimer disease and dementia             120
      1      Alabama  2015  Alzheimer disease and dementia             120
      2      Alabama  2016  Alzheimer disease and dementia              76
      3      Alabama  2016  Alzheimer disease and dementia              76
      4      Alabama  2017  Alzheimer disease and dementia              96
```

Since the data looks good, we can now start analyzing the dataset.

2.2 Dataset Analyses

Dataset: Weekly_counts_of_death_by_jurisdiction_and_cause_of_death analyses

2.2.1 Seperate data by year

The data needs to be seperated by year so we can analyze deaths per year. We will create a new dataframe for every year in the data called 'df_year' replacing year with the actual year.

```
[15]: for year in data['Year'].unique():
          globals()['df_%s' % year] = data[data.Year == year].reset_index(drop = True)
```

Lets sum the total number of deaths for all years and total number of deaths per year. We will store the values for total deaths in a variable called 'totalDeaths_all' and store each years total deaths in a seperate variable called 'sum_year' replacing year with the actual year.

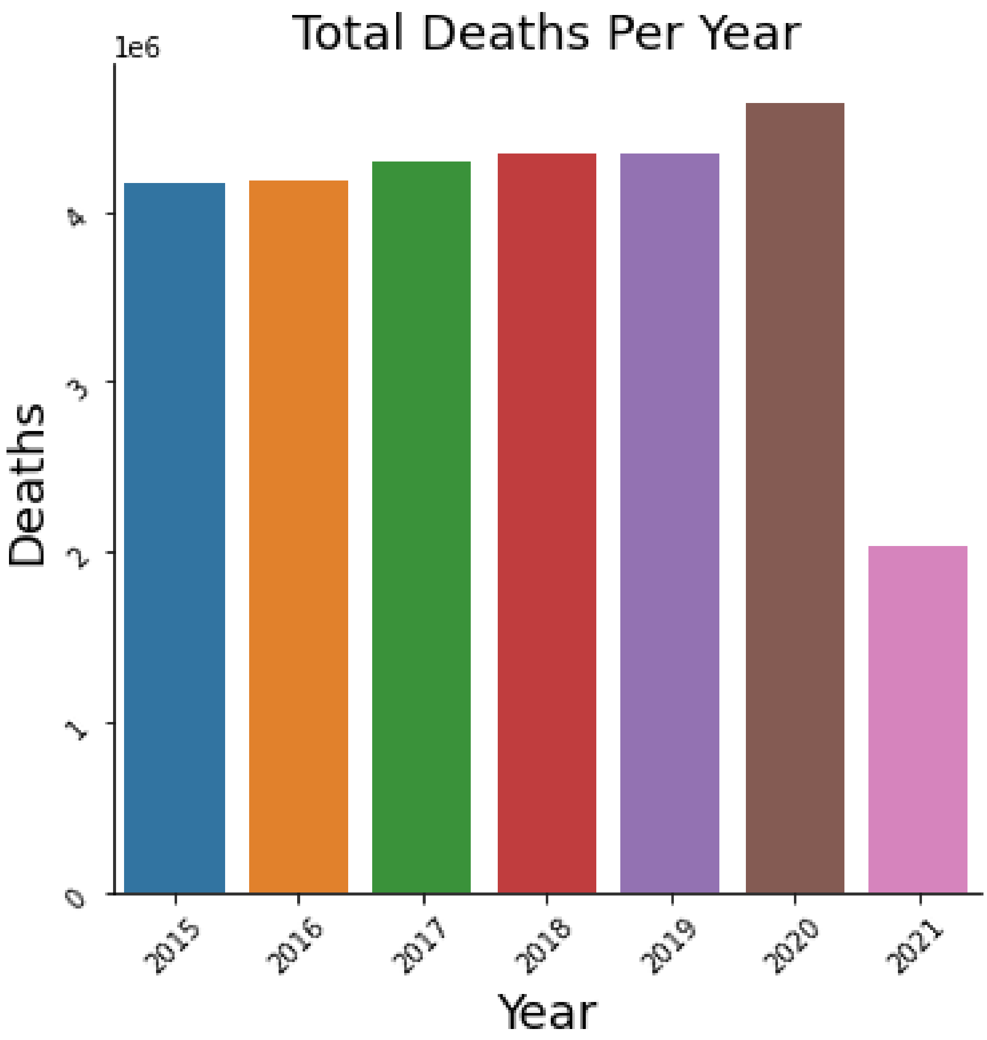
```
[16]: sum_years = data.groupby([data.Year]).sum()

      totalDeaths_all = int(sum(sum_years['NumberOfDeaths']))

      i = 0
      for year in sum_years.index:
          globals()['sum_%s' % year] = int(sum_years.iloc[i])
          i+=1
```

We will now create a dataframe of years and deaths to analyze and compare and visualize it with a bar plot.

```
[17]: years = data['Year'].unique()

      years_total = []
      for year in years:
          years_total.append(str(year))
      years_total.append('Total')

      deaths = [item for item in sum_years['NumberOfDeaths']]
      deaths.append(totalDeaths_all)

      rate = []
```

```
for i in range(len(deaths)-1):
    rate.append(round(deaths[i]/totalDeaths_all, 5))

rateSum = sum(rate)
rate.append(rateSum)

df_deaths = np.array([years_total, deaths, rate]).T
df_deaths = pd.DataFrame(df_deaths)
df_deaths.columns = ['Year', 'Deaths', 'Rate']

df_ndeaths = df_deaths

df_ndeaths.drop(df_ndeaths.tail(1).index,inplace=True) # drop first n rows

df_ndeaths = df_ndeaths.astype({'Year':'int', 'Deaths':'int', 'Rate':'float'})

display(df_ndeaths)

sns.catplot(x = 'Year', y = 'Deaths', kind = 'bar', data = df_ndeaths)
plt.title("Total Deaths Per Year", size=18)
plt.xlabel("Year", size=18)
plt.ylabel("Deaths", size=18)
plt.xticks(rotation=45)
plt.yticks(rotation=45)
plt.show()
```

```
   Year   Deaths     Rate
0  2015  4169618  0.14884
1  2016  4185822  0.14942
2  2017  4301084  0.15353
3  2018  4343758  0.15506
4  2019  4341440  0.15497
5  2020  4637121  0.16553
6  2021  2035063  0.07264
```



2.2.2 Deaths by cause and year

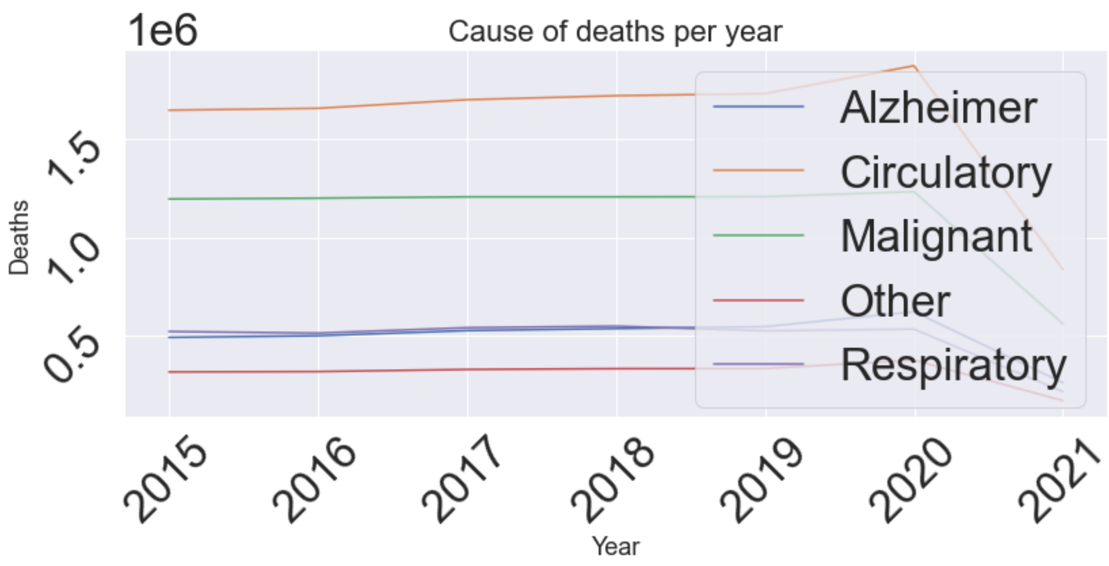
Lets analyze deaths by cause and year. We will seperate each year by cause, create a dataframe and plot the results.

[29]:
```
# Get Alzheimer deaths per year and store in a variable called␣
 ↪'deathsAlzheimer_year' where year is the actual year
for year in data['Year'].unique():
    globals()['deathsAlzheimer_%s' % year] = int(data.query(f"CauseGroup ==␣
 ↪'Alzheimer disease and dementia' and Year == {year}")['NumberOfDeaths'].
 ↪sum())

# Get Malignant deaths per year and store in a variable called␣
 ↪'deathsMalignant_year' where year is the actual year                    ␣
 ↪
```

```
for year in data['Year'].unique():
    globals()['deathsMalignant_%s' % year] = int(data.query(f"CauseGroup ==␣
 ↪'Malignant neoplasms' and Year == {year}")['NumberOfDeaths'].sum())

# Get Respiratory deaths per year and store in a variable called␣
 ↪'deathsRespiratory_year' where year is the actual year                     ␣
 ↪
for year in data['Year'].unique():
    globals()['deathsRespiratory_%s' % year] = int(data.query(f"CauseGroup ==␣
 ↪'Respiratory diseases' and Year == {year}")['NumberOfDeaths'].sum())

# Get Circulatory deaths per year and store in a variable called␣
 ↪'deathsCirculatory_year' where year is the actual year                     ␣
 ↪
for year in data['Year'].unique():
    globals()['deathsCirculatory_%s' % year] = int(data.query(f"CauseGroup ==␣
 ↪'Circulatory diseases' and Year == {year}")['NumberOfDeaths'].sum())

# Get Other deaths per year and store in a variable called 'deathsOther_year'␣
 ↪where year is the actual year                                              ␣
 ↪
for year in data['Year'].unique():
    globals()['deathsOther_%s' % year] = int(data.query(f"CauseGroup == 'Other␣
 ↪select causes' and Year == {year}")['NumberOfDeaths'].sum())

yearCauseDeaths = data.groupby([data.Year, data.CauseGroup]).sum().reset_index()

myDict = {}
for i in range(len(yearCauseDeaths)):
    if myDict == {}:
        myDict = {yearCauseDeaths.iloc[i,0]:[yearCauseDeaths.iloc[i,-1]]}
    else:
        if yearCauseDeaths.iloc[i,0] in myDict.keys():
            myDict[yearCauseDeaths.iloc[i,0]].append(yearCauseDeaths.iloc[i,-1])
        else:
            myDict.update({yearCauseDeaths.iloc[i,0]:[yearCauseDeaths.
 ↪iloc[i,-1]]})

colNames = yearCauseDeaths["CauseGroup"].unique()
col_names = []

for item in colNames:
    col_names.append(item.split(" ")[0])

df_deathsCausePerYear = pd.DataFrame(myDict.values(), columns = col_names)
df_deathsCausePerYear
```

```
years = myDict.keys()

df_deathsCausePerYear.insert(0, "Year", years)

display(df_deathsCausePerYear)

fig = plt.gcf()
fig.set_size_inches(13, 5)
plt.plot(df_deathsCausePerYear.Year, "Alzheimer", data = df_deathsCausePerYear)
plt.plot(df_deathsCausePerYear.Year, "Circulatory", data =␣
 ↪df_deathsCausePerYear)
plt.plot(df_deathsCausePerYear.Year, "Malignant", data = df_deathsCausePerYear)
plt.plot(df_deathsCausePerYear.Year, "Other", data = df_deathsCausePerYear)
plt.plot(df_deathsCausePerYear.Year, "Respiratory", data =␣
 ↪df_deathsCausePerYear)
plt.title("Cause of deaths per year", size = 22)
plt.xlabel("Year", size = 18)
plt.ylabel("Deaths", size = 18)
plt.xticks(rotation = 45)
plt.yticks(rotation = 45)
plt.legend()
plt.show()
```

```
   Year  Alzheimer  Circulatory  Malignant   Other  Respiratory
0  2015     490130      1649144    1196044  314026       520274
1  2016     498712      1658822    1200410  315756       512122
2  2017     525012      1702588    1207174  326626       539684
3  2018     535206      1722912    1207218  330710       547712
4  2019     544754      1733832    1208100  331254       523500
5  2020     621421      1875620    1233553  374082       532445
6  2021     258620       836478     559593  167456       212916
```



From the results of Deaths Per Cause Per Year, we can see that the number of deaths increase every year in every cause except respiratory. Respiratory deaths are the only cause that the number of deaths decrease and increase but it stays consistent. We can visualize that circulatory deaths are the number one cause of deaths every year followed by malignant and then alzheimer and respiratory are about the same.

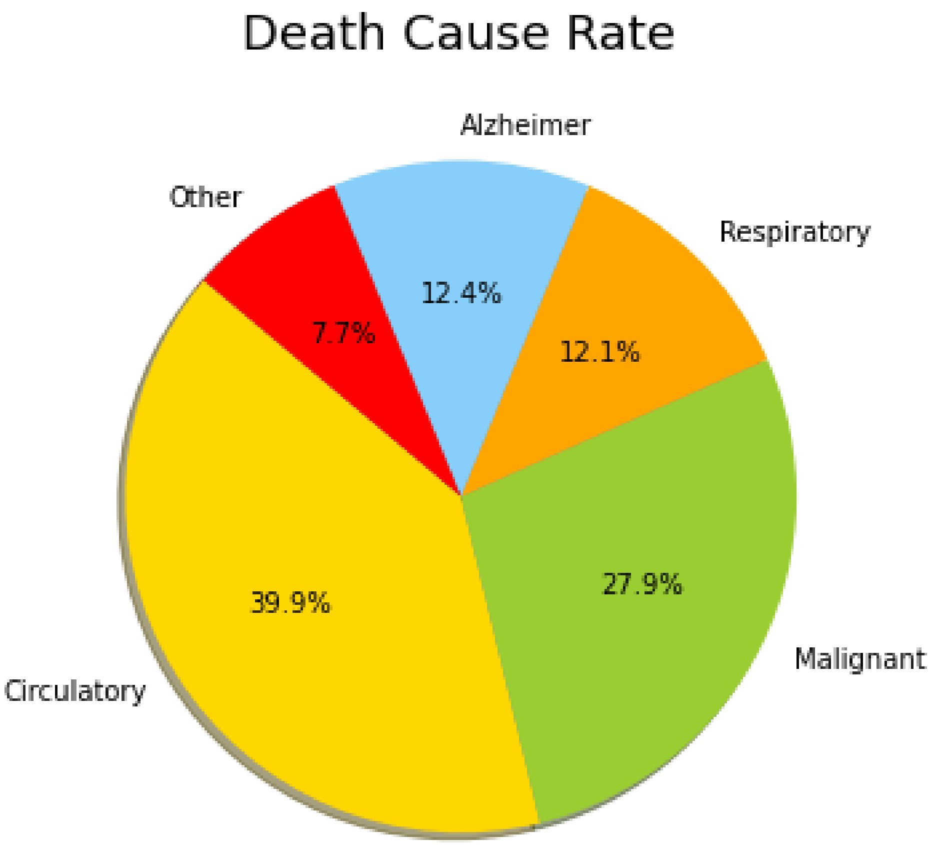
2.2.3 Total deaths by cause

Now, lets analyze deaths by cause, create a dataframe and plot the results in a pie plot.

[19]:
```
deaths_alzheimer = int(data.loc[data['CauseGroup'] == 'Alzheimer disease and␣
 ↪dementia', 'NumberOfDeaths'].sum())
deaths_malignant = int(data.loc[data['CauseGroup'] == 'Malignant neoplasms',␣
 ↪'NumberOfDeaths'].sum())
deaths_respiratory = int(data.loc[data['CauseGroup'] == 'Respiratory diseases',␣
 ↪'NumberOfDeaths'].sum())
deaths_circulatory = int(data.loc[data['CauseGroup'] == 'Circulatory diseases',␣
 ↪'NumberOfDeaths'].sum())
deaths_other = int(data.loc[data['CauseGroup'] == 'Other select causes',␣
 ↪'NumberOfDeaths'].sum())

array_circulatory = ['Circulatory', deaths_circulatory,␣
 ↪round(deaths_circulatory/totalDeaths_all, 4)]
array_malignant = ['Malignant', deaths_malignant, round(deaths_malignant/
 ↪totalDeaths_all, 4)]
array_respiratory = ['Respiratory', deaths_respiratory,␣
 ↪round(deaths_respiratory/totalDeaths_all, 4)]
```

```
array_alzheimer = ['Alzheimer', deaths_alzheimer, round(deaths_alzheimer/
 ↪totalDeaths_all, 4)]
array_other = ['Other', deaths_other, round(deaths_other/totalDeaths_all, 4)]

df_cause = pd.DataFrame([array_circulatory, array_malignant, array_respiratory,␣
 ↪array_alzheimer, array_other])

df_cause.columns = ['Cause', 'Deaths', 'Rate']

display(df_cause)

fig, ax = plt.subplots(figsize = (5, 6), subplot_kw = dict(aspect = "equal"))

labels = df_cause['Cause']
sizes = df_cause['Rate']
colors = ['gold', 'yellowgreen', 'orange', 'lightskyblue', 'red']

# Plot
plt.pie(sizes, labels = labels, colors = colors,
autopct='%1.1f%%', shadow = True, startangle=140)

plt.axis('equal')
plt.title('Death Cause Rate', size=18)
plt.show()
```

```
         Cause    Deaths    Rate
0  Circulatory  11179396  0.3991
1    Malignant   7812092  0.2789
2  Respiratory   3388653  0.1210
3    Alzheimer   3473855  0.1240
4        Other   2159910  0.0771
```



The pie plot above shows the total percentage of deaths per cause for years 2015-2020. The visualization of the pie plot also shows circulatory deaths as the number one cause of deaths at about 39% and malignant deaths at 28% which with both of these together adds up to almost 70%.

2.2.4 Death rate by cause and year

[20]:
```
rateCause_2015 = ['2015', round(deathsAlzheimer_2015/sum_2015, 4),␣
 ↪round(deathsMalignant_2015/sum_2015, 4),
                    round(deathsRespiratory_2015/sum_2015, 4),␣
 ↪round(deathsCirculatory_2015/sum_2015, 4),
                    round(deathsOther_2015/sum_2015, 4)]
rateCause_2016 = ['2016', round(deathsAlzheimer_2016/sum_2016, 4),␣
 ↪round(deathsMalignant_2016/sum_2016, 4),
                    round(deathsRespiratory_2016/sum_2016, 4),␣
 ↪round(deathsCirculatory_2016/sum_2016, 4),
                    round(deathsOther_2016/sum_2016, 4)]
```

```
rateCause_2017 = ['2017', round(deathsAlzheimer_2017/sum_2017, 4),␣
 ↪round(deathsMalignant_2017/sum_2017, 4),
                  round(deathsRespiratory_2017/sum_2017, 4),␣
 ↪round(deathsCirculatory_2017/sum_2017, 4),
                  round(deathsOther_2017/sum_2017, 4)]
rateCause_2018 = ['2018', round(deathsAlzheimer_2018/sum_2018, 4),␣
 ↪round(deathsMalignant_2018/sum_2018, 4),
                  round(deathsRespiratory_2018/sum_2018, 4),␣
 ↪round(deathsCirculatory_2018/sum_2018, 4),
                  round(deathsOther_2018/sum_2018, 4)]
rateCause_2019 = ['2019', round(deathsAlzheimer_2019/sum_2019, 4),␣
 ↪round(deathsMalignant_2019/sum_2019, 4),
                  round(deathsRespiratory_2019/sum_2019, 4),␣
 ↪round(deathsCirculatory_2019/sum_2019, 4),
                  round(deathsOther_2019/sum_2019, 4)]
rateCause_2020 = ['2020', round(deathsAlzheimer_2020/sum_2020, 4),␣
 ↪round(deathsMalignant_2020/sum_2020, 4),
                  round(deathsRespiratory_2020/sum_2020, 4),␣
 ↪round(deathsCirculatory_2020/sum_2020, 4),
                  round(deathsOther_2020/sum_2020, 4)]

df_rateCause = pd.DataFrame([rateCause_2015, rateCause_2016, rateCause_2017,␣
 ↪rateCause_2018, rateCause_2019, rateCause_2020])
df_rateCause.columns = ['Year', 'Alzheimer', 'Malignant', 'Respiratory',␣
 ↪'Circulatory', 'Other']

display(df_rateCause)
```

```
   Year  Alzheimer  Malignant  Respiratory  Circulatory   Other
0  2015     0.1175     0.2868       0.1248       0.3955  0.0753
1  2016     0.1191     0.2868       0.1223       0.3963  0.0754
2  2017     0.1221     0.2807       0.1255       0.3959  0.0759
3  2018     0.1232     0.2779       0.1261       0.3966  0.0761
4  2019     0.1255     0.2783       0.1206       0.3994  0.0763
5  2020     0.1340     0.2660       0.1148       0.4045  0.0807
```

2.2.5 Death trends per cause

Lets analyze the death trends per cause and plot them seperately.

```
[21]: df_deathsCausePerYear
```

```
[21]:    Year  Alzheimer  Circulatory  Malignant   Other  Respiratory
      0  2015     490130      1649144    1196044  314026       520274
      1  2016     498712      1658822    1200410  315756       512122
      2  2017     525012      1702588    1207174  326626       539684
      3  2018     535206      1722912    1207218  330710       547712
```

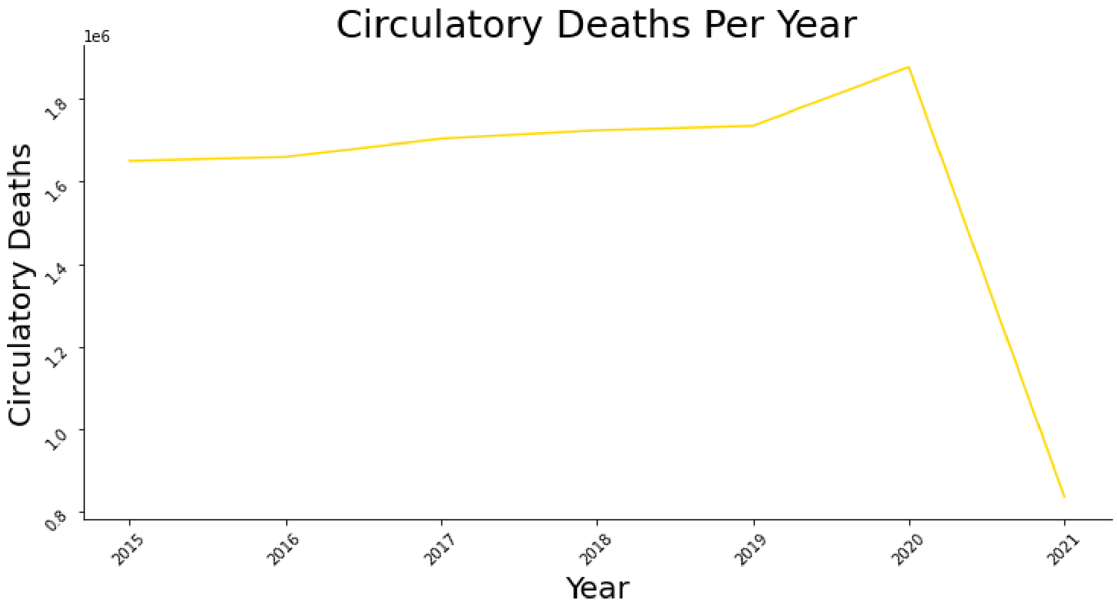
```
4  2019     544754      1733832     1208100  331254        523500
5  2020     621421      1875620     1233553  374082        532445
6  2021     258620       836478      559593  167456        212916
```

[22]:

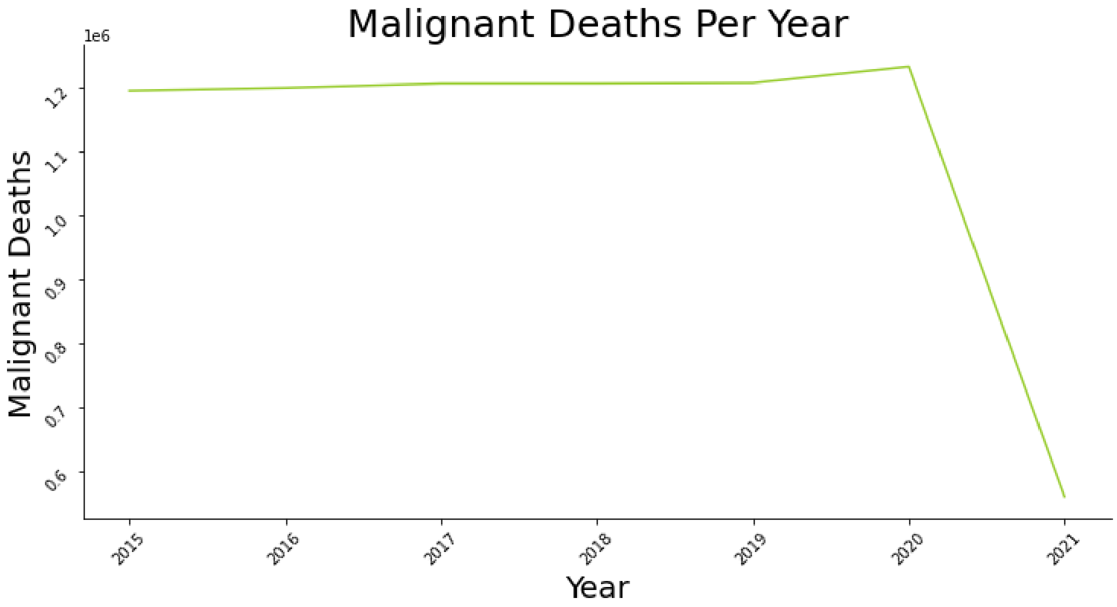
```
data_circulatory = pd.DataFrame([df_deathsCausePerYear['Year'],␣
 ↪df_deathsCausePerYear['Circulatory']])
data_circulatory = data_circulatory.transpose().set_index('Year')
display(data_circulatory)
# Draw Plot
sns.relplot(x=data_circulatory.index, y='Circulatory', kind='line', height=5,␣
 ↪aspect=2, color='gold', data=data_circulatory)
plt.title("Circulatory Deaths Per Year", size=25)
plt.xlabel("Year", size=20)
plt.ylabel("Circulatory Deaths", size=20)
plt.xticks(rotation=45)
plt.yticks(rotation=45)
plt.show()

data_malignant = pd.DataFrame([df_deathsCausePerYear['Year'],␣
 ↪df_deathsCausePerYear['Malignant']])
data_malignant = data_malignant.transpose().set_index('Year')
display(data_malignant)
# Draw Plot
sns.relplot(x=data_malignant.index, y='Malignant', kind = 'line', height=5,␣
 ↪aspect=2, color='yellowgreen', data=data_malignant)
plt.title("Malignant Deaths Per Year", size=25)
plt.xlabel("Year", size=20)
plt.ylabel("Malignant Deaths", size=20)
plt.xticks(rotation=45)
plt.yticks(rotation=45)
plt.show()

data_respiratory = pd.DataFrame([df_deathsCausePerYear['Year'],␣
 ↪df_deathsCausePerYear['Respiratory']])
data_respiratory = data_respiratory.transpose().set_index('Year')
display(data_respiratory)
# Draw Plot
sns.relplot(x=data_respiratory.index, y='Respiratory', kind = 'line', height=5,␣
 ↪aspect=2, color='orange', data=data_respiratory)
plt.title("Respiratory Deaths Per Year", size=25)
plt.xlabel("Year", size=20)
plt.ylabel("Respiratory Deaths", size=20)
plt.xticks(rotation=45)
plt.yticks(rotation=45)
plt.show()
```

```
data_alzheimer = pd.DataFrame([df_deathsCausePerYear['Year'],␣
 ↪df_deathsCausePerYear['Alzheimer']])
data_alzheimer = data_alzheimer.transpose().set_index('Year')
display(data_alzheimer)
# Draw Plot
sns.relplot(x=data_alzheimer.index, y='Alzheimer', kind = 'line', height=5,␣
 ↪aspect=2, color='lightskyblue', data=data_alzheimer)
plt.title("Alzheimer Deaths Per Year", size=25)
plt.xlabel("Year", size=20)
plt.ylabel("Alzheimer Deaths", size=20)
plt.xticks(rotation=45)
plt.yticks(rotation=45)
plt.show()

data_other = pd.DataFrame([df_deathsCausePerYear['Year'],␣
 ↪df_deathsCausePerYear['Other']])
data_other = data_other.transpose().set_index('Year')
display(data_other)
# Draw Plot
sns.relplot(x=data_other.index, y='Other', kind = 'line', height=5, aspect=2,␣
 ↪color='red', data=data_other)
plt.title("Other Deaths Per Year", size=25)
plt.xlabel("Year", size=20)
plt.ylabel("Other Deaths", size=20)
plt.xticks(rotation=45)
plt.yticks(rotation=45)
plt.show()
```

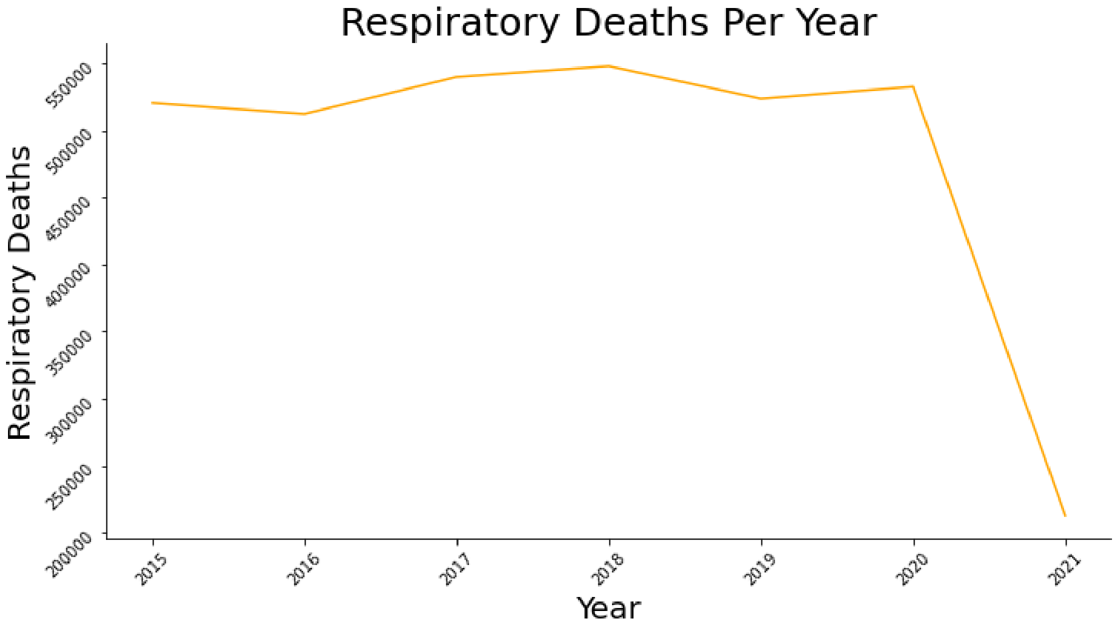
```
      Circulatory
Year
2015      1649144
2016      1658822
2017      1702588
2018      1722912
2019      1733832
2020      1875620
2021       836478
```



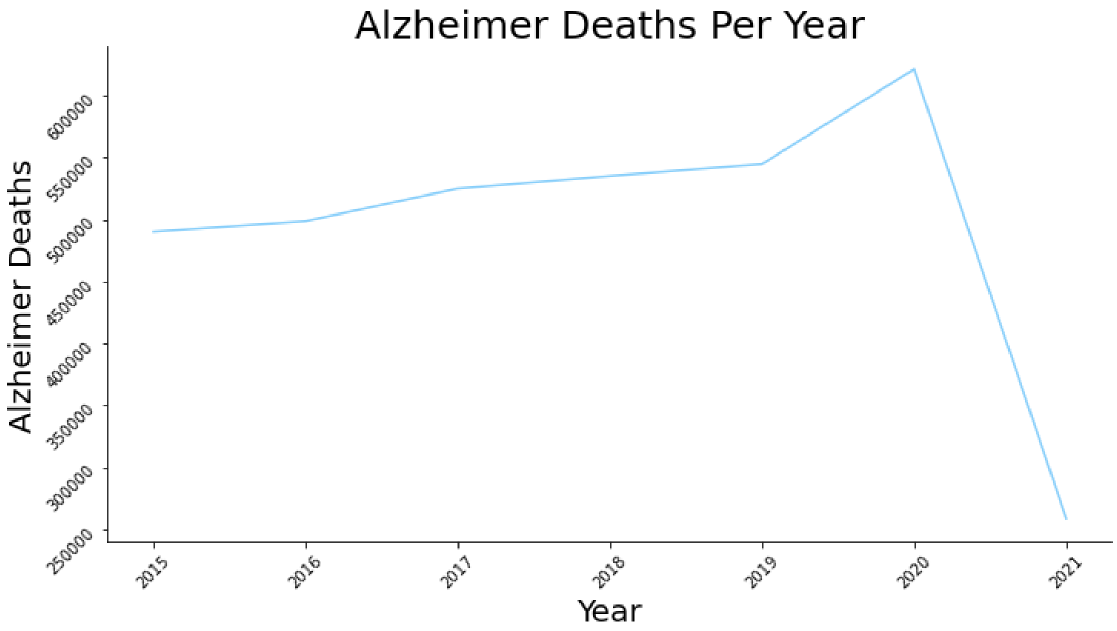
```
       Malignant
Year
2015     1196044
2016     1200410
2017     1207174
2018     1207218
2019     1208100
2020     1233553
2021      559593
```



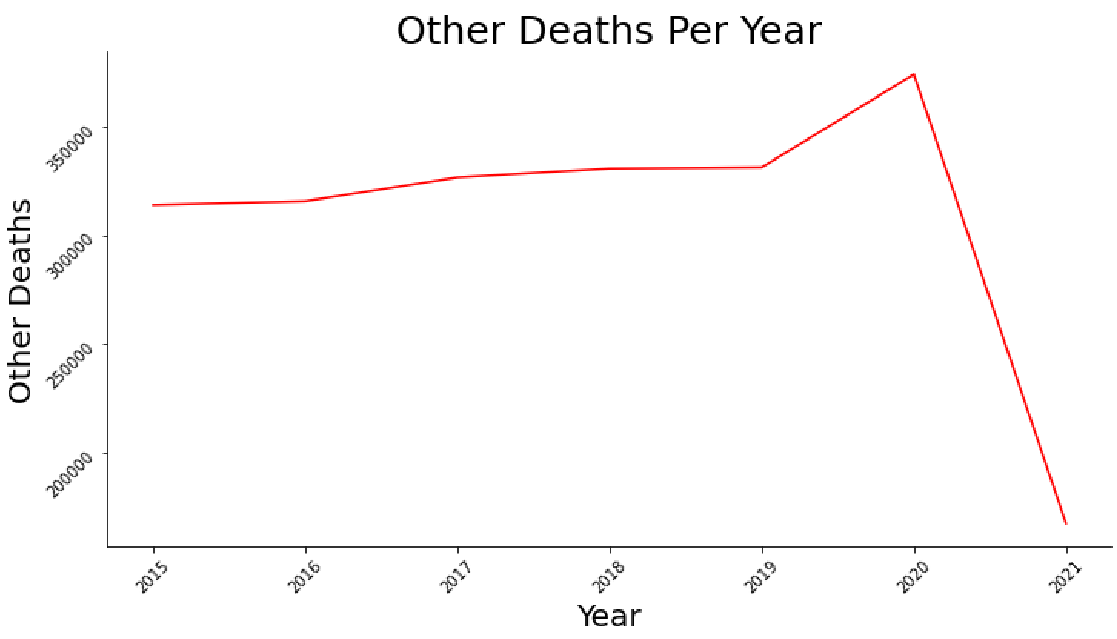
```
      Respiratory
Year
2015       520274
2016       512122
2017       539684
2018       547712
2019       523500
2020       532445
2021       212916
```



```
      Alzheimer
Year
2015     490130
2016     498712
2017     525012
2018     535206
2019     544754
2020     621421
2021     258620
```



```
        Other
Year
2015   314026
2016   315756
2017   326626
2018   330710
2019   331254
2020   374082
2021   167456
```



According to the visualizations above, you can see the death trends of every category increase every year except respiratory. This is interesting because in the year 2020, most of the country had lockdown restrictions for the COVID-19 pandemic.

2.2.6 Total deaths by year and jurisdiction

Lets use Pandas groupby function to get the total deaths by year and jurisdiction.

[23]:
```
yearJurisdiction_df = data.groupby(['Year', 'Jurisdiction']).sum()
yearJurisdiction_df
```

[23]:
```
                       NumberOfDeaths
Year Jurisdiction
2015 Alabama                    77032
     Alaska                      2254
     Arizona                    79724
     Arkansas                   47900
     California                411494
…                                 …
2021 Virginia                   53252
     Washington                 41044
     West Virginia               9254
     Wisconsin                  36857
     Wyoming                     1471

[371 rows x 1 columns]
```

2.2.7 Total deaths by jurisdiction

Now, lets get the total deaths by jurisdiction for all 6 years without the year and sort them. We will drop year index.

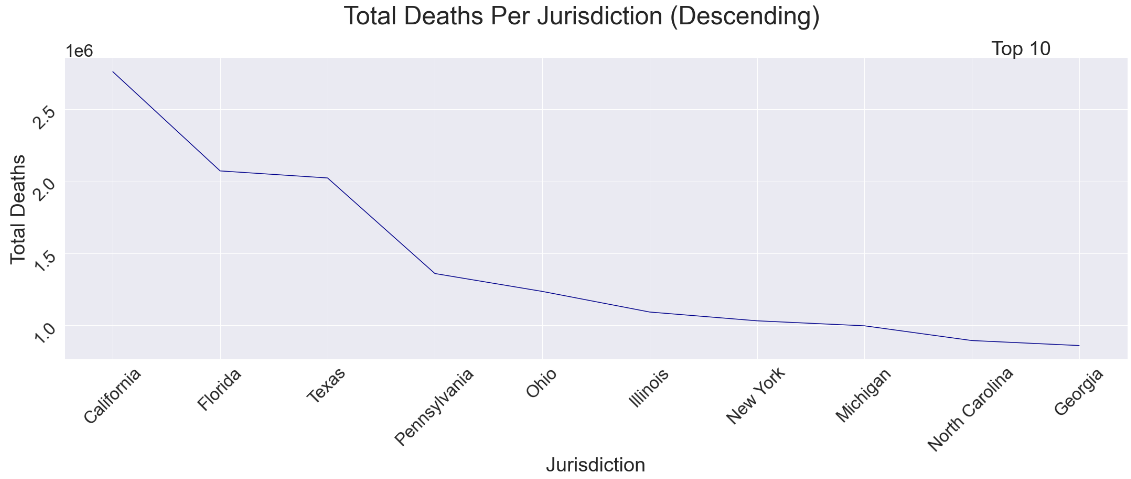
```
[24]: jurisdiction_deaths = data.groupby('Jurisdiction', as_index=False).sum()
      jurisdiction_deaths.drop('Year', axis = 1, inplace = True)
      display(jurisdiction_deaths.head())

      jurisdiction_deaths_sorted = jurisdiction_deaths.sort_values('NumberOfDeaths',␣
       ↪ascending=False).reset_index(drop=True)
      display(jurisdiction_deaths_sorted.head())
```

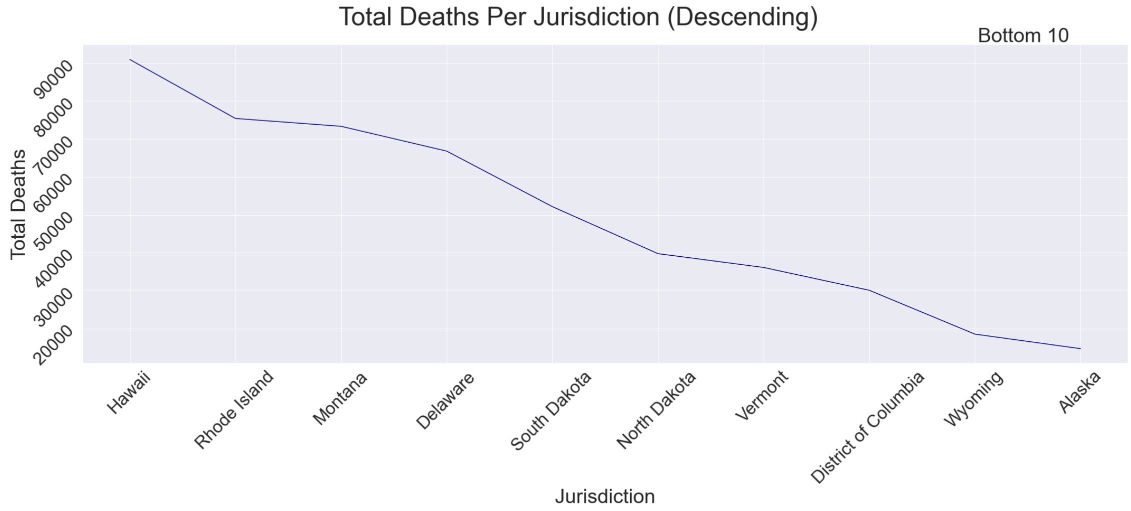
```
  Jurisdiction  NumberOfDeaths
0      Alabama          535321
1       Alaska           14676
2      Arizona          565455
3     Arkansas          321691
4   California         2763202
```

```
   Jurisdiction  NumberOfDeaths
0    California         2763202
1       Florida         2072697
2         Texas         2023671
3  Pennsylvania         1358740
4          Ohio         1234320
```

Lets plot the results in a line plot. We will plot the top 10 and then the bottom 10.

```
[25]: sns.set(font_scale = 3)
      sns.relplot(x='Jurisdiction', y='NumberOfDeaths', kind = 'line', height=10,␣
       ↪aspect=3, color='darkblue', data=jurisdiction_deaths_sorted.head(10))
      plt.suptitle("Total Deaths Per Jurisdiction (Descending)", size=48, y=1.05)
      plt.title("Top 10", size=38, x=0.9)
      plt.xlabel("Jurisdiction", size=38)
      plt.ylabel("Total Deaths", size=38)
      plt.xticks(rotation=45)
      plt.yticks(rotation=45)
      plt.show()

      sns.set(font_scale = 3)
      sns.relplot(x='Jurisdiction', y='NumberOfDeaths', kind = 'line', height=10,␣
       ↪aspect=3, color='darkblue', data=jurisdiction_deaths_sorted.tail(10))
      plt.suptitle("Total Deaths Per Jurisdiction (Descending)", size=48, y=1.05)
      plt.title("Bottom 10", size=38, x=0.9)
      plt.xlabel("Jurisdiction", size=38)
      plt.ylabel("Total Deaths", size=38)
      plt.xticks(rotation=45)
      plt.yticks(rotation=45)
plt.show()
```





2.2.8 2020 deaths by jurisdiction sorted from most to least

Now, lets sort the deaths from most to least for the year 2020.

[26]:

```
jurisdiction_deaths2020_sorted = yearJurisdiction_df.copy()
jurisdiction_deaths2020_sorted = jurisdiction_deaths2020_sorted.loc[(2020)].
 ↪sort_values('NumberOfDeaths', ascending=False).reset_index()

# Display the head
display(jurisdiction_deaths2020_sorted.head())

# Display the tail.
```

```
display(jurisdiction_deaths2020_sorted.tail())
```

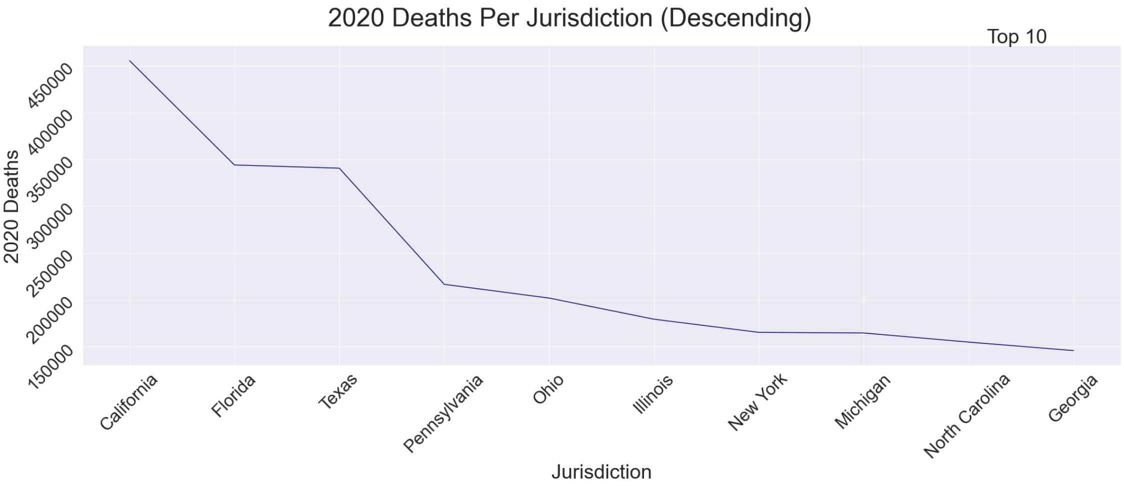
```
   Jurisdiction  NumberOfDeaths
0    California          455788
1       Florida          344224
2         Texas          340776
3  Pennsylvania          216650
4          Ohio          201957

             Jurisdiction  NumberOfDeaths
48           North Dakota            6492
49                Vermont            6166
50   District of Columbia            4714
51                Wyoming            3472
52                 Alaska            2626
```

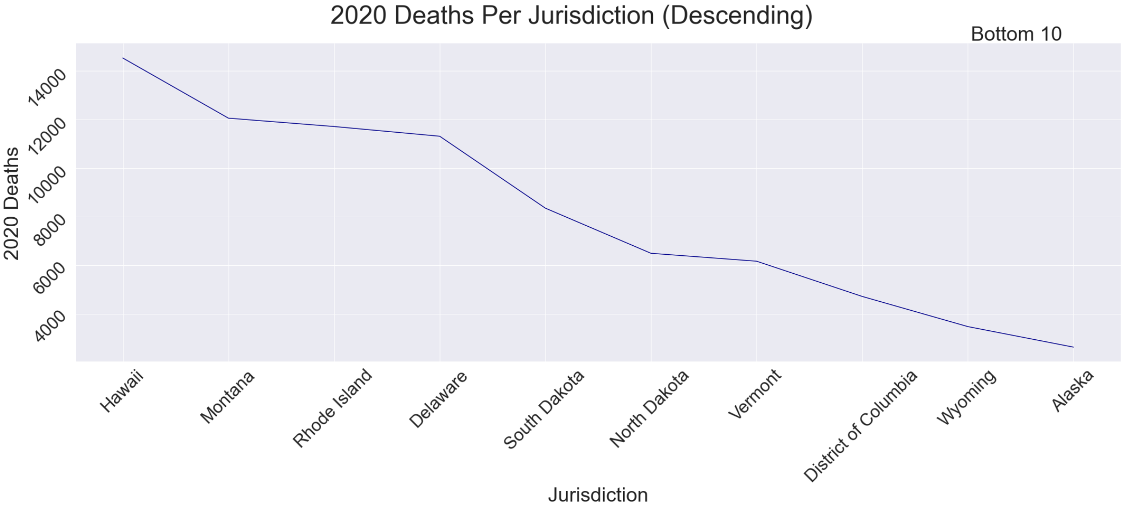
2.3 Plot the Results

Lets plot the results for the year 2020 from most deaths to least deaths in 2 seperate plots. First, we will plot the top 10 and then we will plot the bottom 10.

[27]:

```
sns.set(font_scale = 3)
sns.relplot(x='Jurisdiction', y='NumberOfDeaths', kind = 'line', height=10,␣
 ↪aspect=3, color='darkblue', data=jurisdiction_deaths2020_sorted.head(10))
plt.suptitle("2020 Deaths Per Jurisdiction (Descending)", size=48, y=1.05)
plt.title("Top 10", size=38, x=0.9)
plt.xlabel("Jurisdiction", size=38)
plt.ylabel("2020 Deaths", size=38)
plt.xticks(rotation=45)
plt.yticks(rotation=45)
plt.show()

sns.set(font_scale = 3)
sns.relplot(x='Jurisdiction', y='NumberOfDeaths', kind = 'line', height=10,␣
 ↪aspect=3, color='darkblue', data=jurisdiction_deaths2020_sorted.tail(10))
plt.suptitle("2020 Deaths Per Jurisdiction (Descending)", size=48, y=1.05)
plt.title("Bottom 10", size=38, x=0.9)
plt.xlabel("Jurisdiction", size=38)
plt.ylabel("2020 Deaths", size=38)
plt.xticks(rotation=45)
plt.yticks(rotation=45)
plt.show()
```


2020 Deaths Per Jurisdiction (Descending)
Top 10
2020 Deaths
450000
400000
350000
300000
250000
200000
150000
California
Florida
Texas
Pennsylvania
Ohio
Illinois
New York
Michigan
North Carolina
Georgia
Jurisdiction


2020 Deaths Per Jurisdiction (Descending)
Bottom 10
2020 Deaths
14000
12000
10000
8000
6000
4000
Hawaii
Montana
Rhode Island
Delaware
South Dakota
North Dakota
Vermont
District of Columbia
Wyoming
Alaska
Jurisdiction

```
[ ]:
```