TotalDeaths_2020

August 9, 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 to present 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, https://data.cdc.gov/NCHS/Weekly-Counts-of-Death-by-Jurisdiction-and-Select-/u6jv-9ijr?fbclid=IwAR3oPM9rkxOVoZ4PRdfaGAvzLJy7kSPU3ymb1metm1R2vvAl6dAPE53OaKU

[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
```

1.2 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)
```

1.3 Data cleanup

1.3.1 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]:
```
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    153
dtype: int64
```

Lets look at these null values.

[6]:
```
data[data.isna().any(axis=1)]["Jurisdiction"].unique()
```

[6]:
```
array(['North Carolina'], 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  359784.000000     359784.000000
mean     2017.799463        157.924177
std         1.894070        683.109181
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
29528  United States  2015  Alzheimer disease and dementia              6187
29529  United States  2015  Alzheimer disease and dementia              6187
29530  United States  2016  Alzheimer disease and dementia              5155
29531  United States  2016  Alzheimer disease and dementia              5155
29532  United States  2017  Alzheimer disease and dementia              5844
```

```
Jurisdiction        8866
Year                8866
Cause Group         8866
Number of Deaths    8866
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. We are dropping these because if we don't, they will be duplicated.

[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.

1.4 Dataset Analyses

Dataset: Weekly_counts_of_death_by_jurisdiction_and_cause_of_death analyses

1.4.1 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.

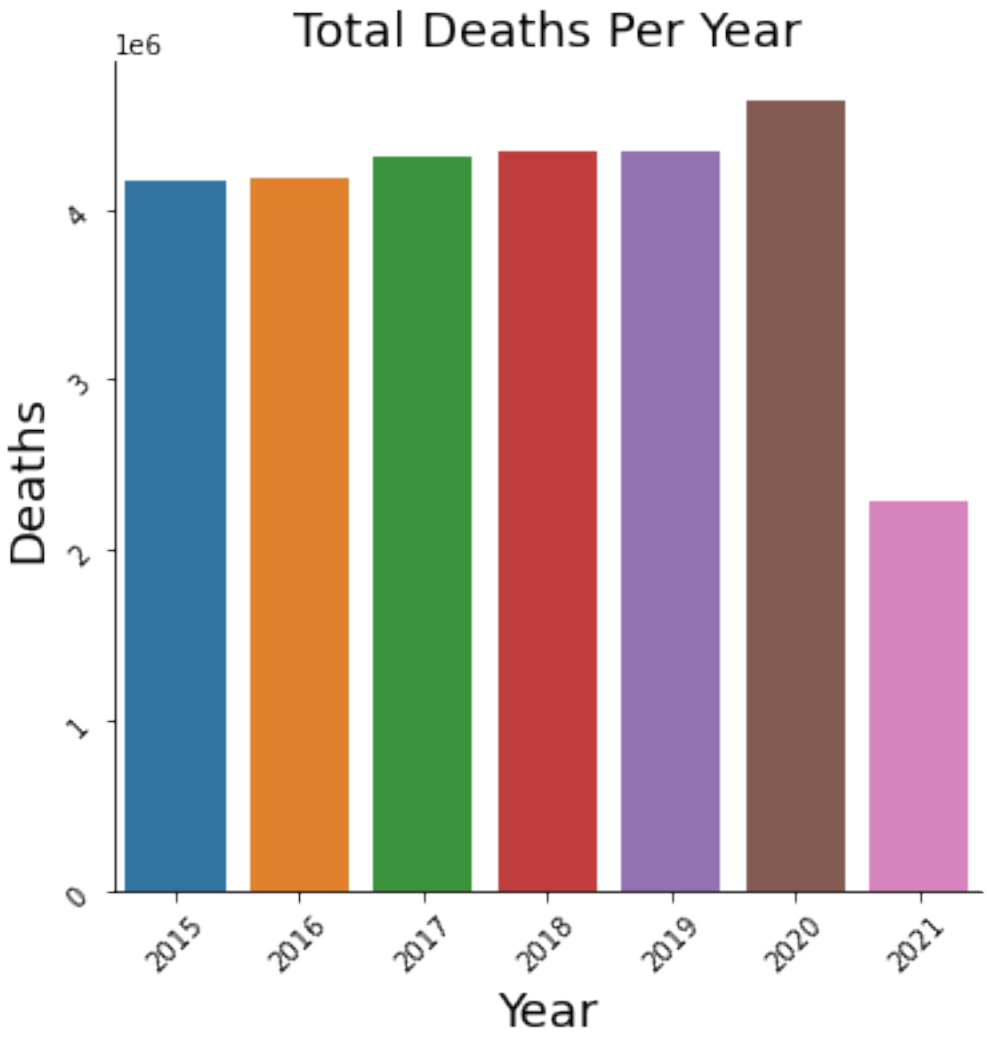
[16]:
```
sum_years = data.groupby([data.Year]).sum()

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	4169642	0.14754
1	2016	4185802	0.14811
2	2017	4301084	0.15219
3	2018	4343762	0.15370
4	2019	4341442	0.15362
5	2020	4636278	0.16405
6	2021	2283113	0.08079



1.4.2 Deaths by cause and year

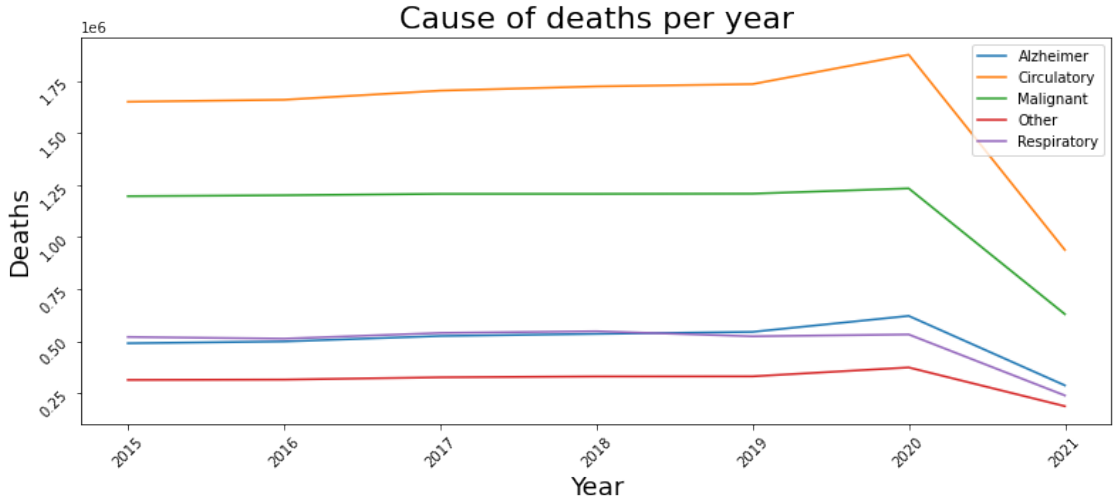
Lets analyze deaths by cause and year. We will seperate each year by cause, create a dataframe and plot the results.

[18]:
```
# 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	1649122	1196044	314026	520320
1	2016	498712	1658800	1200410	315756	512124
2	2017	525012	1702588	1207174	326626	539684
3	2018	535206	1722914	1207218	330710	547714
4	2019	544754	1733834	1208100	331254	523500
5	2020	621426	1875180	1233371	373981	532320
6	2021	287888	937930	629774	187997	239524



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.

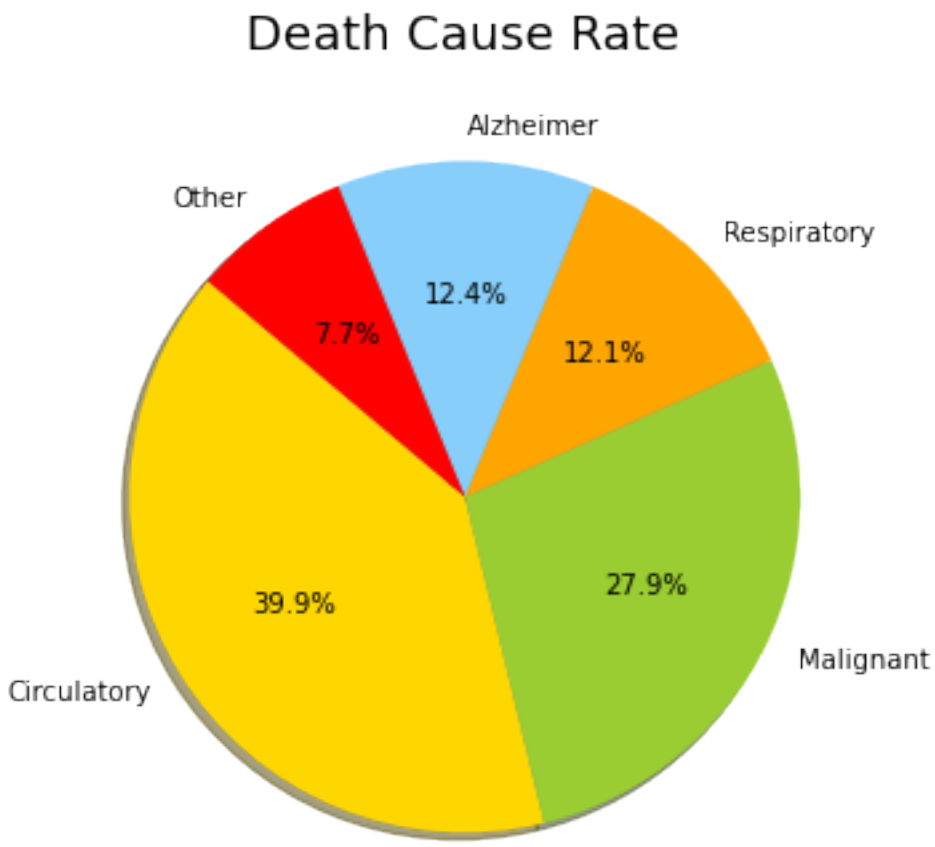
1.4.3 Total deaths by cause

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	11280368	0.3991
1	Malignant	7882091	0.2789
2	Respiratory	3415186	0.1208
3	Alzheimer	3503128	0.1240
4	Other	2180350	0.0772



The pie plot above shows the total percentage of deaths per cause. 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%.

1.4.4 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)]
rateCause_2021 = ['2021', round(deathsAlzheimer_2021/sum_2021, 4),␣
 ↪round(deathsMalignant_2021/sum_2021, 4),
                   round(deathsRespiratory_2021/sum_2021, 4),␣
 ↪round(deathsCirculatory_2021/sum_2021, 4),
                   round(deathsOther_2021/sum_2021, 4)]

df_rateCause = pd.DataFrame([rateCause_2015, rateCause_2016, rateCause_2017,␣
 ↪rateCause_2018, rateCause_2019, rateCause_2020, rateCause_2021])
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
6	2021	0.1261	0.2758	0.1049	0.4108	0.0823

1.4.5 Death trends per cause

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

[21]:
```
df_deathsCausePerYear
```

[21]:

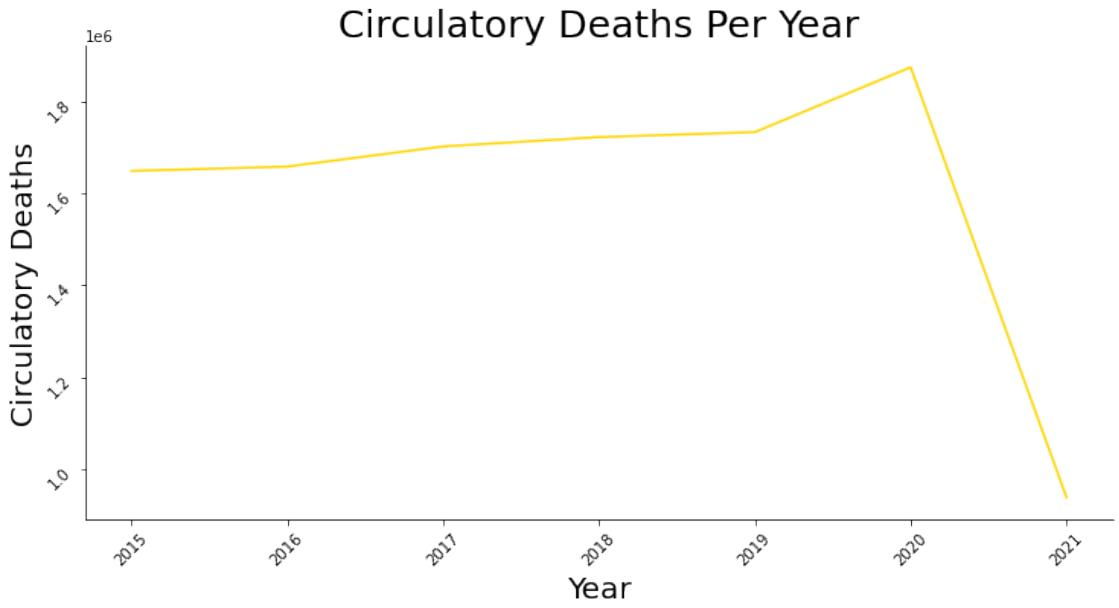
	Year	Alzheimer	Circulatory	Malignant	Other	Respiratory
0	2015	490130	1649122	1196044	314026	520320
1	2016	498712	1658800	1200410	315756	512124
2	2017	525012	1702588	1207174	326626	539684
3	2018	535206	1722914	1207218	330710	547714
4	2019	544754	1733834	1208100	331254	523500
5	2020	621426	1875180	1233371	373981	532320
6	2021	287888	937930	629774	187997	239524

[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)
```

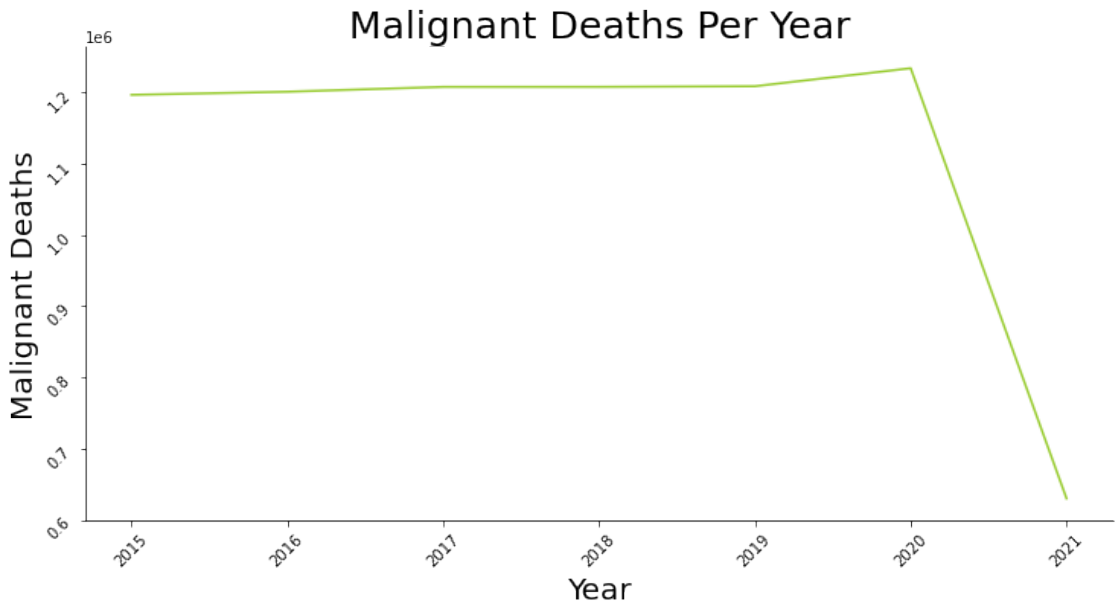
```
plt.show()

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      1649122
```

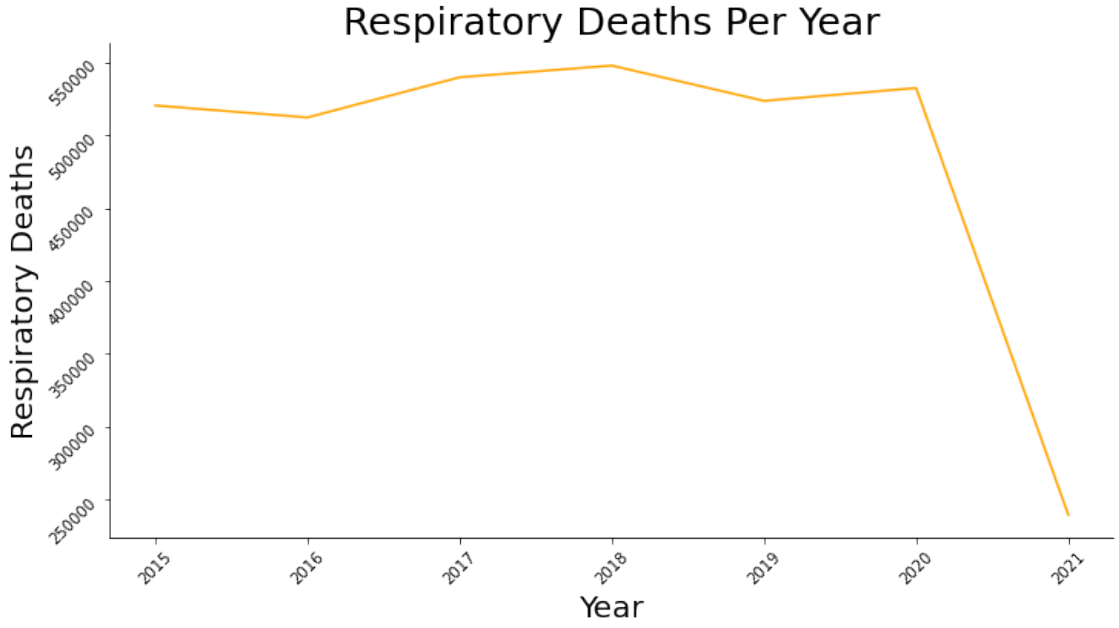
2016	1658800
2017	1702588
2018	1722914
2019	1733834
2020	1875180
2021	937930



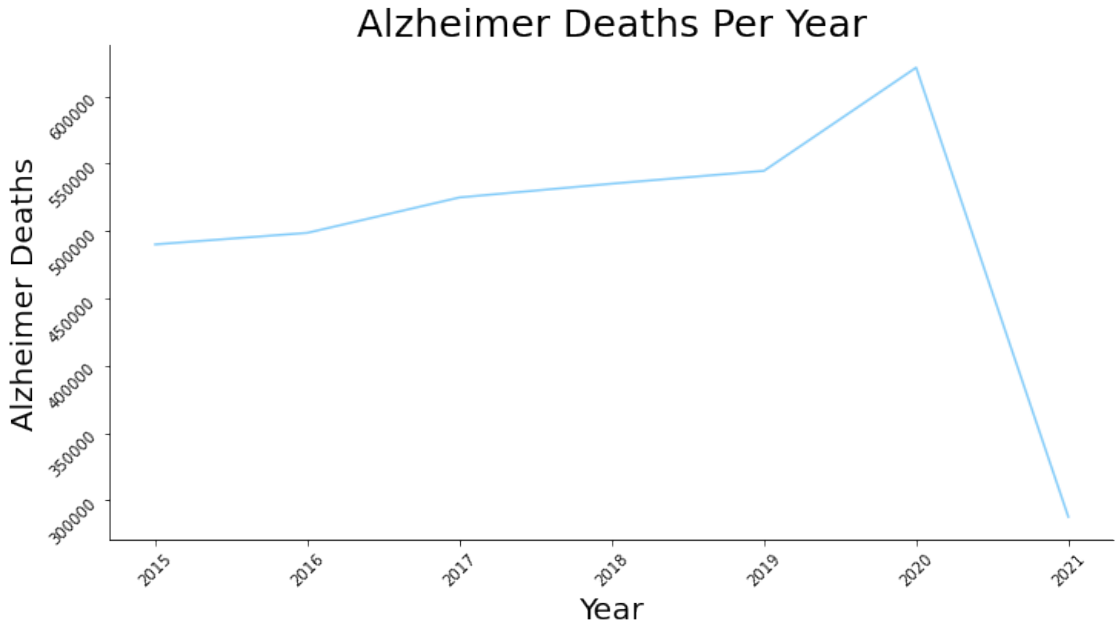
Year	Malignant
2015	1196044
2016	1200410
2017	1207174
2018	1207218
2019	1208100
2020	1233371
2021	629774



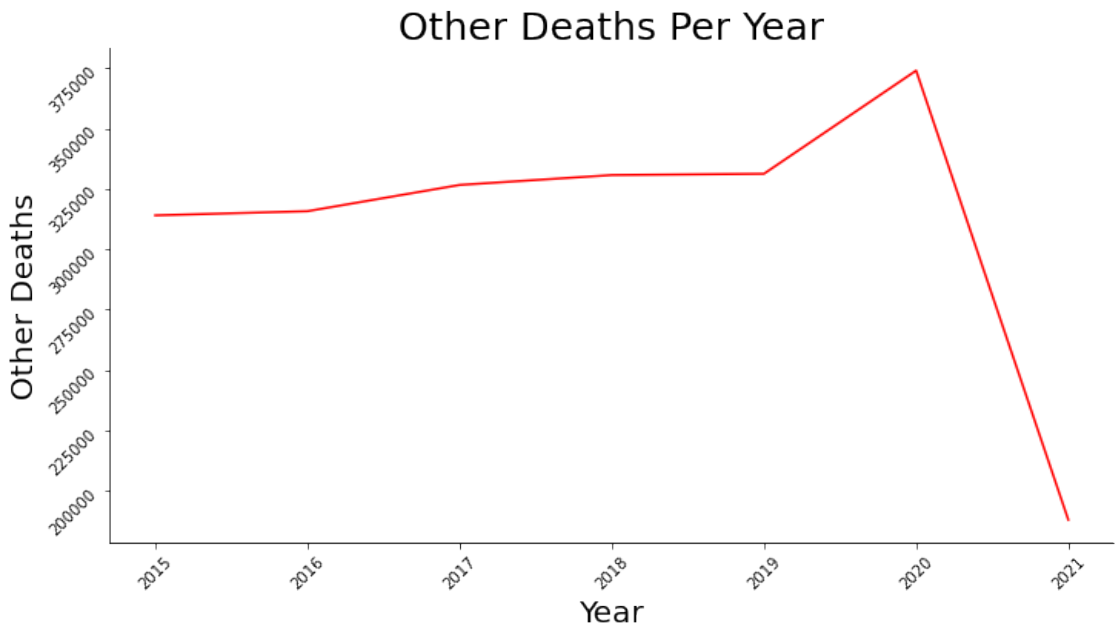
Year	Respiratory
2015	520320
2016	512124
2017	539684
2018	547714
2019	523500
2020	532320
2021	239524



Year	Alzheimer
2015	490130
2016	498712
2017	525012
2018	535206
2019	544754
2020	621426
2021	287888



Year	Other
2015	314026
2016	315756
2017	326626
2018	330710
2019	331254
2020	373981
2021	187997



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.

1.4.6 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]:

Year	Jurisdiction	NumberOfDeaths
2015	Alabama	77032
	Alaska	2254
	Arizona	79724
	Arkansas	47900
	California	411494
…		…
2021	Virginia	59414
	Washington	46828
	West Virginia	11135
	Wisconsin	41140
	Wyoming	1649

[371 rows x 1 columns]

1.4.7 Total deaths by jurisdiction

Now, lets get the total deaths by jurisdiction for all 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())
```

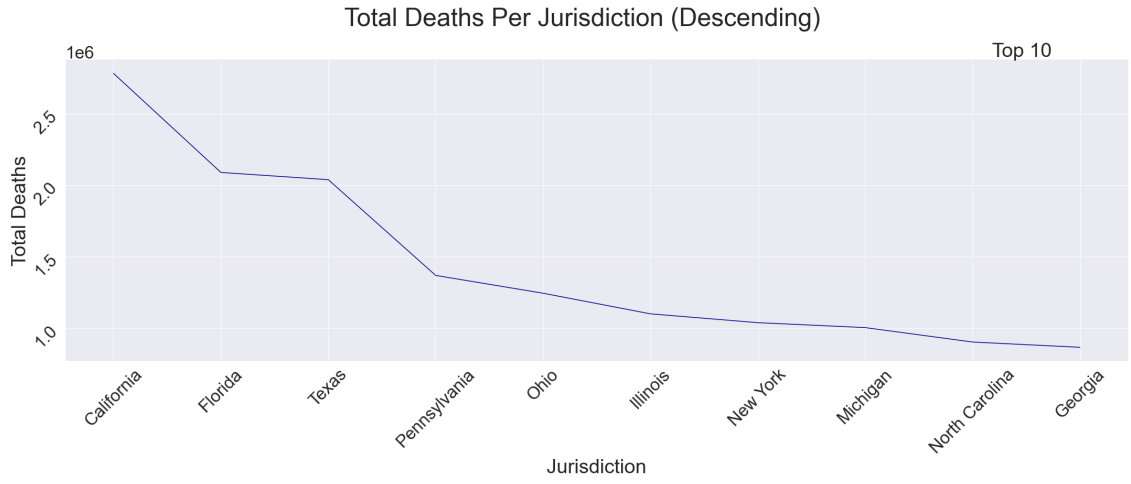
	Jurisdiction	NumberOfDeaths
0	Alabama	540055
1	Alaska	14674
2	Arizona	570474
3	Arkansas	324371
4	California	2786428

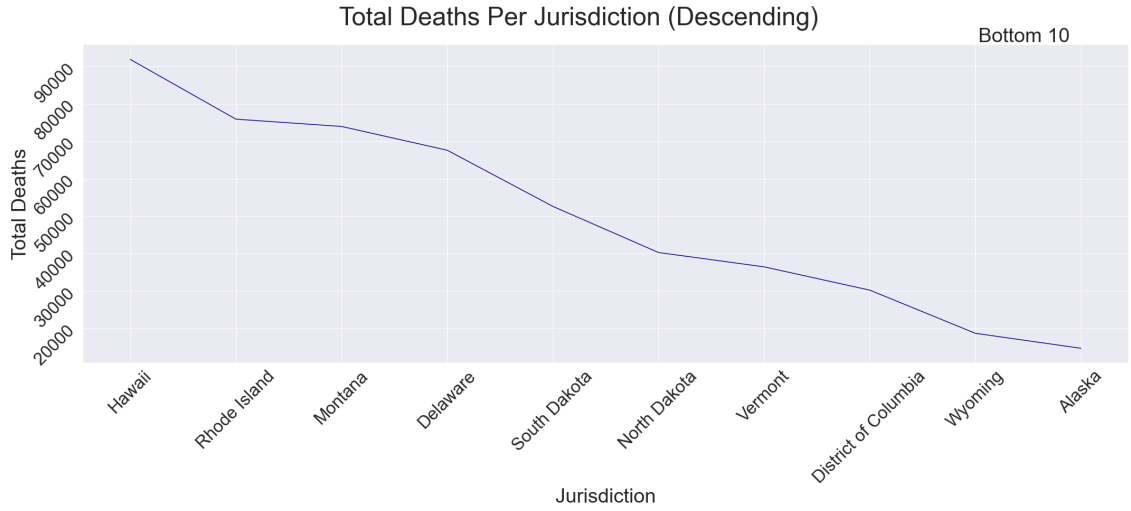
	Jurisdiction	NumberOfDeaths
0	California	2786428
1	Florida	2091816
2	Texas	2041081
3	Pennsylvania	1369605
4	Ohio	1244729

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()
```





1.4.8 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())
```

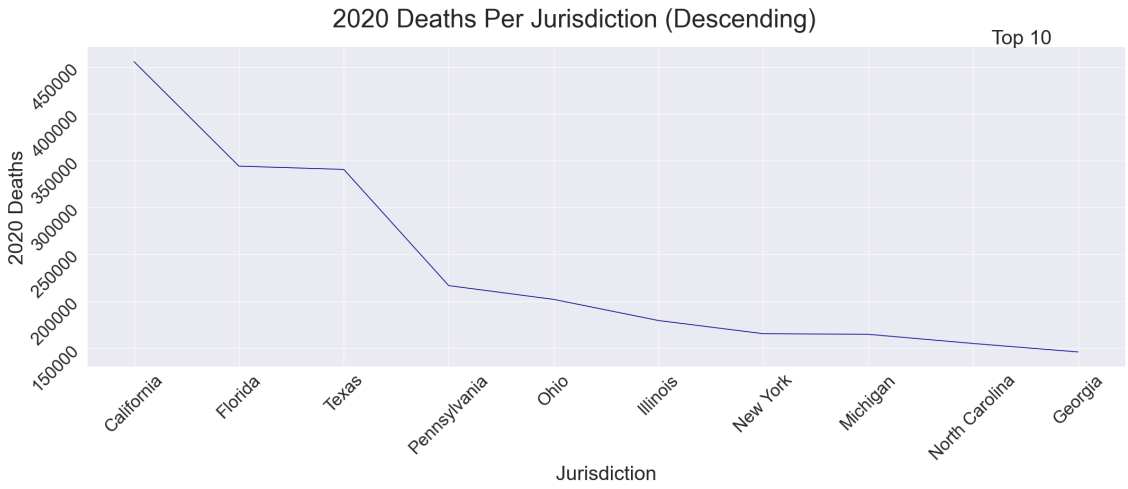
```
   Jurisdiction  NumberOfDeaths
0    California          455765
1       Florida          344198
2         Texas          340650
3  Pennsylvania          216632
4          Ohio          201921
```

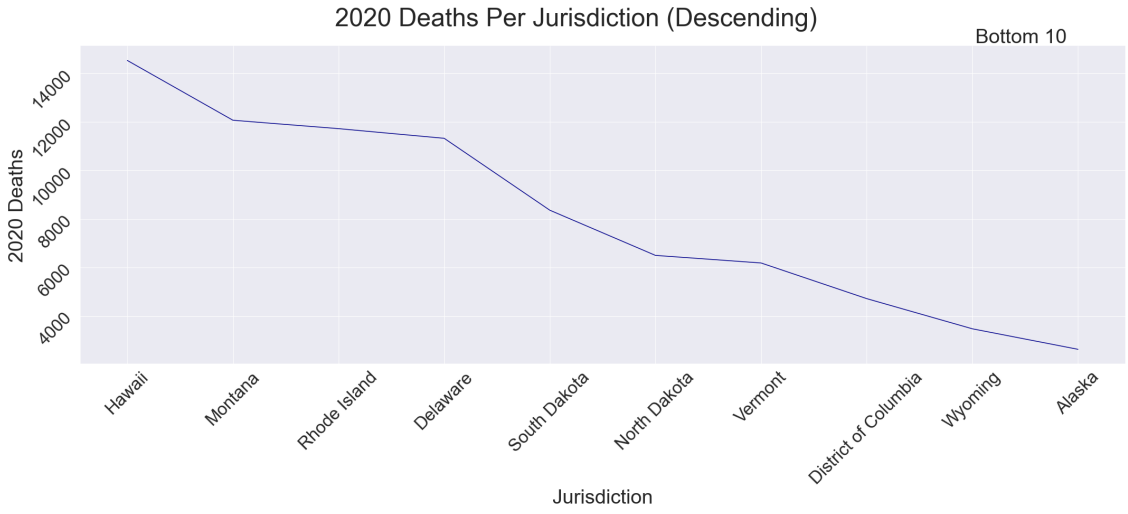
```
            Jurisdiction  NumberOfDeaths
48          North Dakota            6492
49               Vermont            6180
50  District of Columbia            4712
51               Wyoming            3470
52                Alaska            2626
```

1.4.9 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()
```





1.5 Conclusion

- Total deaths from 2015 to present gradually rise. One thought to why this is true is because population increases every year. Population has not been taken into consideration in this analysis.
- Every year in this analysis has about the same proportion death rate per cause.
- Circulatory is the leader in cause of deaths, followed by malignant, followed by alzheimer's, followed by respiratory, followed by other causes of death and this has been the order for every year analyzed in this analyses.

[ ]: