In [28]:

```python
import plotly.graph_objects as go
import plotly.express as px
import plotly.io as pio
pio.templates.default = "plotly_dark"
from plotly.subplots import make_subplots
import folium
from folium import plugins
from tqdm.notebook import tqdm as tqdm
import matplotlib.pyplot as plt
from matplotlib import ticker
import numpy as np
import pandas as pd
```

In [29]:

```python
TodaysData_Country = pd.read_csv('https://raw.githubusercontent.com/CSSEGISandData/COVID-19/web-data/data/cases_country.csv')
TodaysData_Country.head()
```

Out[29]:

	Country_Region	Last_Update	Lat	Long_	Confirmed	Deaths	Recovered	Active
0	Australia	2020-06-01 02:32:46	-25.0000	133.0000	7202.0	103.0	6618.0	481.0
1	Austria	2020-06-01 02:32:46	47.5162	14.5501	16731.0	668.0	15593.0	470.0
2	Canada	2020-06-01 02:32:46	60.0010	-95.0010	92479.0	7374.0	49213.0	35892.0
3	China	2020-06-01 02:32:46	30.5928	114.3055	84146.0	4638.0	79389.0	119.0
4	Denmark	2020-06-01 02:32:46	56.2639	9.5018	11869.0	574.0	10560.0	735.0

In [30]:

```
ColumnToClean = ['Confirmed', 'Deaths', 'Recovered', 'Active']
# filling missing values
TodaysData_Country[['Country_Region']] = TodaysData_Country[['Country_Region']].fillna(
'')
TodaysData_Country[ColumnToClean] = TodaysData_Country[ColumnToClean].fillna(0)
TodaysData_Country.loc[TodaysData_Country['Country_Region'] == "United Kingdom", "Count
ry_Region"] = "UK"
TodaysData_Country.head()
```

Out[30]:

	Country_Region	Last_Update	Lat	Long_	Confirmed	Deaths	Recovered	Active
0	Australia	2020-06-01 02:32:46	-25.0000	133.0000	7202.0	103.0	6618.0	481.0
1	Austria	2020-06-01 02:32:46	47.5162	14.5501	16731.0	668.0	15593.0	470.0
2	Canada	2020-06-01 02:32:46	60.0010	-95.0010	92479.0	7374.0	49213.0	35892.0
3	China	2020-06-01 02:32:46	30.5928	114.3055	84146.0	4638.0	79389.0	119.0
4	Denmark	2020-06-01 02:32:46	56.2639	9.5018	11869.0	574.0	10560.0	735.0

In [31]:

```
# Top 10 Countries
Top10_Countries_death = TodaysData_Country.drop(['Last_Update', 'Lat','Long_','Incident_Rate','People_Tested','People_Hospitalized','Mortality_Rate','UID','ISO3'], axis=1)
Top10_Countries_death = Top10_Countries_death.nlargest(10, 'Deaths')
Top10_Countries_death.head(10)
```

Out[31]:

	Country_Region	Confirmed	Deaths	Recovered	Active
17	US	1790172.0	104381.0	444758.0	1295795.0
16	UK	276156.0	38571.0	1190.0	236395.0
10	Italy	232997.0	33415.0	157507.0	42075.0
21	Brazil	514849.0	29314.0	206555.0	278980.0
6	France	189009.0	28805.0	68473.0	91731.0
18	Spain	239479.0	27127.0	150376.0	61976.0
19	Mexico	90664.0	9930.0	63772.0	16962.0
39	Belgium	58381.0	9467.0	15887.0	33027.0
7	Germany	183410.0	8540.0	165352.0	9518.0
94	Iran	151466.0	7797.0	118848.0	24821.0

In [32]:

```
Top10_Countries_Confirmed = TodaysData_Country.drop(['Last_Update', 'Lat','Long_','Incident_Rate','People_Tested','People_Hospitalized','Mortality_Rate','UID','ISO3'], axis=1)
Top10_Countries_Confirmed = Top10_Countries_Confirmed.nlargest(10, 'Confirmed')
Top10_Countries_Confirmed.head(10)
```

Out[32]:

	Country_Region	Confirmed	Deaths	Recovered	Active
17	US	1790172.0	104381.0	444758.0	1295795.0
21	Brazil	514849.0	29314.0	206555.0	278980.0
13	Russia	405843.0	4693.0	171883.0	229267.0
16	UK	276156.0	38571.0	1190.0	236395.0
18	Spain	239479.0	27127.0	150376.0	61976.0
10	Italy	232997.0	33415.0	157507.0	42075.0
92	India	190609.0	5408.0	91852.0	93349.0
6	France	189009.0	28805.0	68473.0	91731.0
7	Germany	183410.0	8540.0	165352.0	9518.0
22	Peru	164476.0	4506.0	67208.0	92762.0

In [33]:

```
Top10_Countries_Recovered = TodaysData_Country.drop(['Last_Update', 'Lat','Long_','Inci
dent_Rate','People_Tested','People_Hospitalized','Mortality_Rate','UID','ISO3'], axis=1
)
Top10_Countries_Recovered = Top10_Countries_Recovered.nlargest(10, 'Recovered')
Top10_Countries_Recovered.head(10)
```

Out[33]:

	Country_Region	Confirmed	Deaths	Recovered	Active
17	US	1790172.0	104381.0	444758.0	1295795.0
21	Brazil	514849.0	29314.0	206555.0	278980.0
13	Russia	405843.0	4693.0	171883.0	229267.0
7	Germany	183410.0	8540.0	165352.0	9518.0
10	Italy	232997.0	33415.0	157507.0	42075.0
18	Spain	239479.0	27127.0	150376.0	61976.0
175	Turkey	163942.0	4540.0	127973.0	31429.0
94	Iran	151466.0	7797.0	118848.0	24821.0
92	India	190609.0	5408.0	91852.0	93349.0
3	China	84146.0	4638.0	79389.0	119.0

In [34]:

```
Top10_Countries_Active = TodaysData_Country.drop(['Last_Update', 'Lat','Long_','Incident_Rate','People_Tested','People_Hospitalized','Mortality_Rate','UID','ISO3'], axis=1)
Top10_Countries_Active = Top10_Countries_Active.nlargest(10, 'Active')
Top10_Countries_Active.head(10)
```

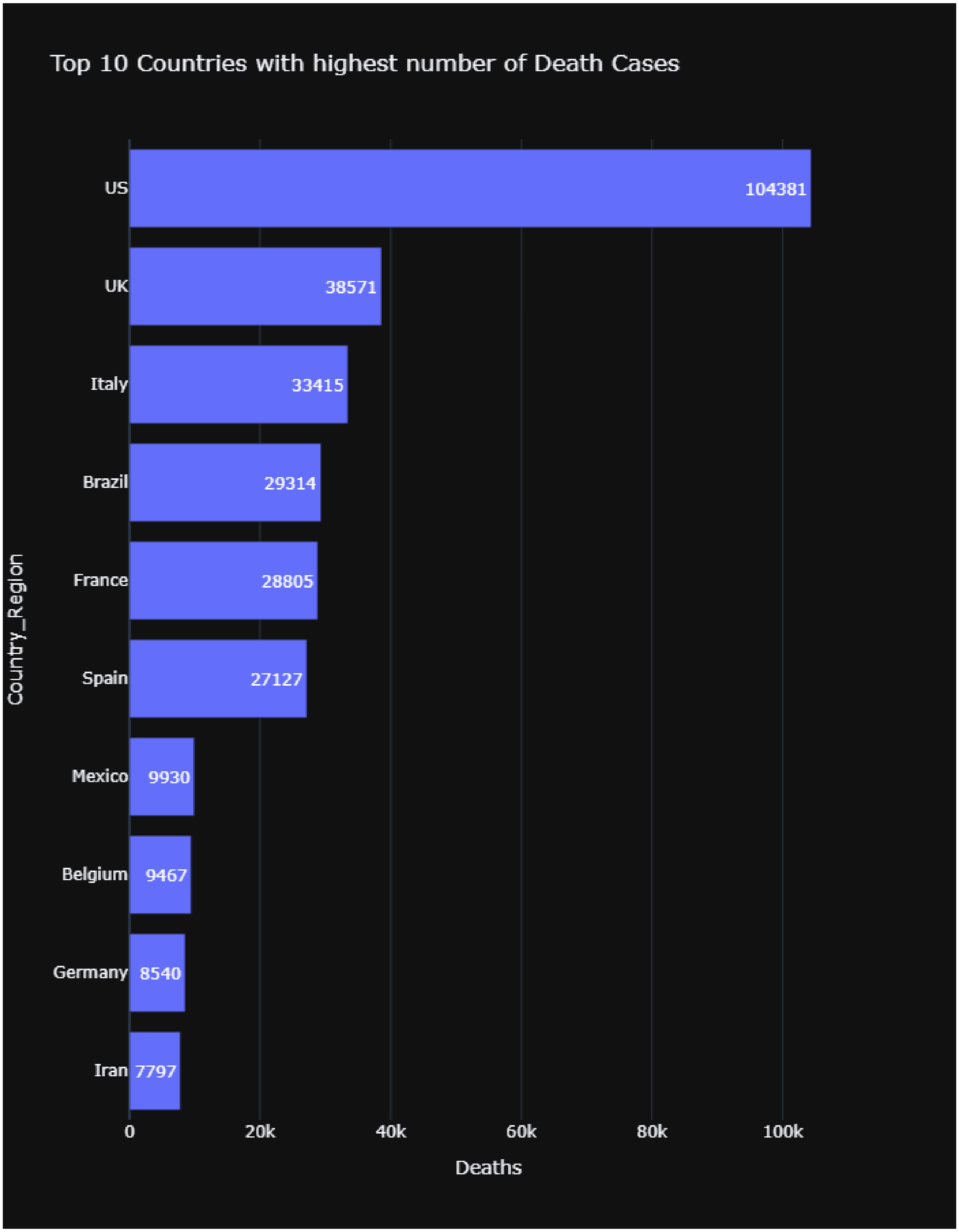
Out[34]:

	Country_Region	Confirmed	Deaths	Recovered	Active
17	US	1790172.0	104381.0	444758.0	1295795.0
21	Brazil	514849.0	29314.0	206555.0	278980.0
16	UK	276156.0	38571.0	1190.0	236395.0
13	Russia	405843.0	4693.0	171883.0	229267.0
92	India	190609.0	5408.0	91852.0	93349.0
22	Peru	164476.0	4506.0	67208.0	92762.0
6	France	189009.0	28805.0	68473.0	91731.0
18	Spain	239479.0	27127.0	150376.0	61976.0
20	Chile	99688.0	1054.0	42727.0	55907.0
137	Pakistan	69496.0	1483.0	25271.0	42742.0

In [35]:

```
fig = px.bar(Top10_Countries_death.sort_values('Deaths',ascending=False)[:20][::-1],x=
'Deaths',y='Country_Region',title='Top 10 Countries with highest number of Death Cases'
,text='Deaths', height=900, orientation='h')

#image_bytes = fig.to_image(format='png', , width=1200, height=700, scale=1) # you can
 use other formats as well (like 'svg','jpeg','pdf')
img_bytes = fig.to_image(format="png")
#instead of using fig.show()
from IPython.display import Image
Image(img_bytes)
#fig.show()
```

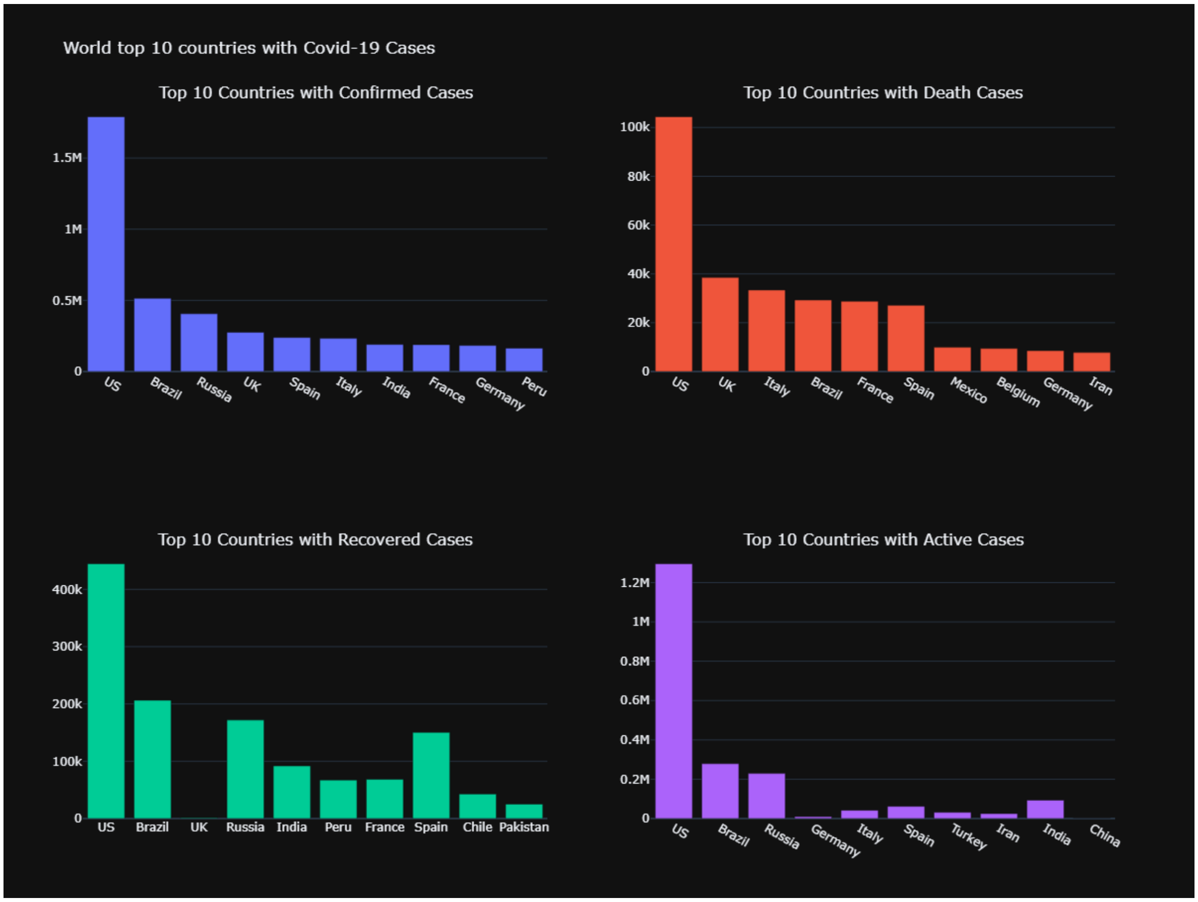
```
Out[35]:
```


Top 10 Countries with highest number of Death Cases
US
104381
UK
38571
Italy
33415
Brazil
29314
France
28805
Spain
27127
Mexico
9930
Belgium
9467
Germany
8540
Iran
7797
Country_Region
0
20k
40k
60k
80k
100k
Deaths

In [53]:

```
fig = make_subplots(
    rows=2, cols=2,
    specs=[[{"type": "bar"}, {"type": "bar"}],
           [{"type": "bar"}, {"type": "bar"}]],
    subplot_titles=("Top 10 Countries with Confirmed Cases","Top 10 Countries with Deat
h Cases", "Top 10 Countries with Recovered Cases", "Top 10 Countries with Active Cases"
)
)

fig.add_trace(go.Bar(name='Confirmed',text='Confirmed', x=Top10_Countries_Confirmed['Co
untry_Region'], y=Top10_Countries_Confirmed['Confirmed']),
              row=1, col=1)


fig.add_trace(go.Bar(name='Deaths',text='Deaths', x=Top10_Countries_death['Country_Regi
on'], y=Top10_Countries_death['Deaths']),
              row=1, col=2)

fig.add_trace(go.Bar(name='Recovered', text='Recovered',x=Top10_Countries_Active['Count
ry_Region'], y=Top10_Countries_Active['Recovered']),
              row=2, col=1)

fig.add_trace(go.Bar(name='Active',text='Active', x=Top10_Countries_Recovered['Country_
Region'], y=Top10_Countries_Recovered['Active']),
              row=2, col=2)

fig.update_layout(height=900,width=1200,title_text="World top 10 countries with Covid-1
9 Cases", showlegend=False)

#fig.show()

img_bytes = fig.to_image(format="png")
#instead of using fig.show()
from IPython.display import Image
Image(img_bytes)
```

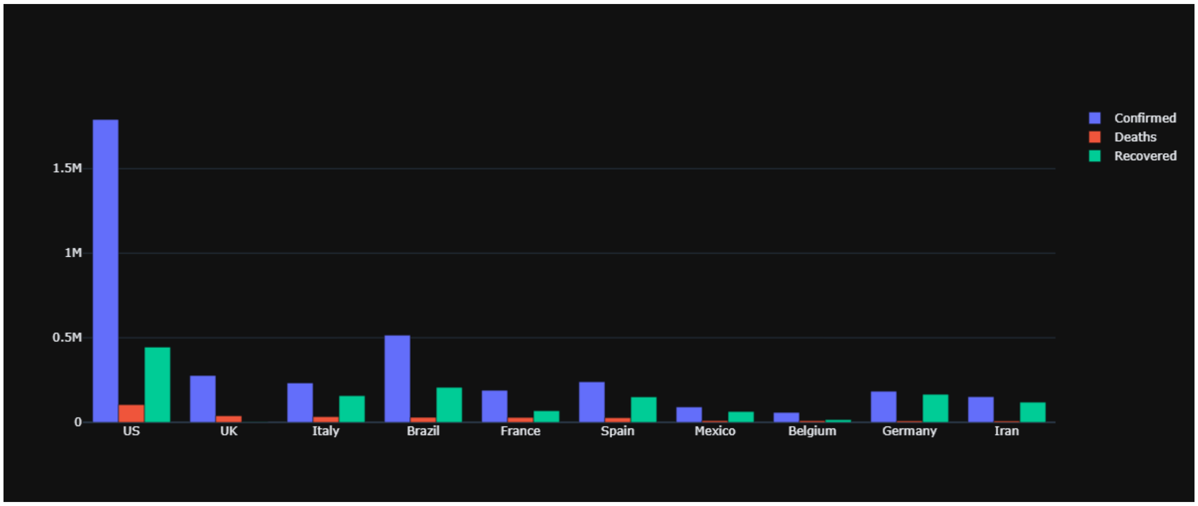
Out[53]:


World top 10 countries with Covid-19 Cases
Top 10 Countries with Confirmed Cases
1.5M
1M
0.5M
0
US
Brazil
Russia
UK
Spain
Italy
India
France
Germany
Peru
Top 10 Countries with Death Cases
100k
80k
60k
40k
20k
0
US
UK
Italy
Brazil
France
Spain
Mexico
Belgium
Germany
Iran
Top 10 Countries with Recovered Cases
400k
300k
200k
100k
0
US
Brazil
UK
Russia
India
Peru
France
Spain
Chile
Pakistan
Top 10 Countries with Active Cases
1.2M
1M
0.8M
0.6M
0.4M
0.2M
0
US
Brazil
Russia
Germany
Italy
Spain
Turkey
Iran
India
China

In [52]:

```
fig = go.Figure(data=[
    go.Bar(name='Confirmed', x=Top10_Countries_death['Country_Region'], y=Top10_Countries_death['Confirmed']),
     go.Bar(name='Deaths', x=Top10_Countries_death['Country_Region'], y=Top10_Countries_death['Deaths']),
     go.Bar(name='Recovered', x=Top10_Countries_death['Country_Region'], y=Top10_Countries_death['Recovered']),
])
# Change the bar mode
fig.update_layout(barmode='group', width= 1200)
#fig.show()
img_bytes = fig.to_image(format="png")
#instead of using fig.show()
from IPython.display import Image
Image(img_bytes)
```

Out[52]:



In [38]:

```
cleaned_data = pd.read_csv('https://raw.githubusercontent.com/CSSEGISandData/COVID-19/web-data/data/cases_time.csv')

cleaned_data.head()
```

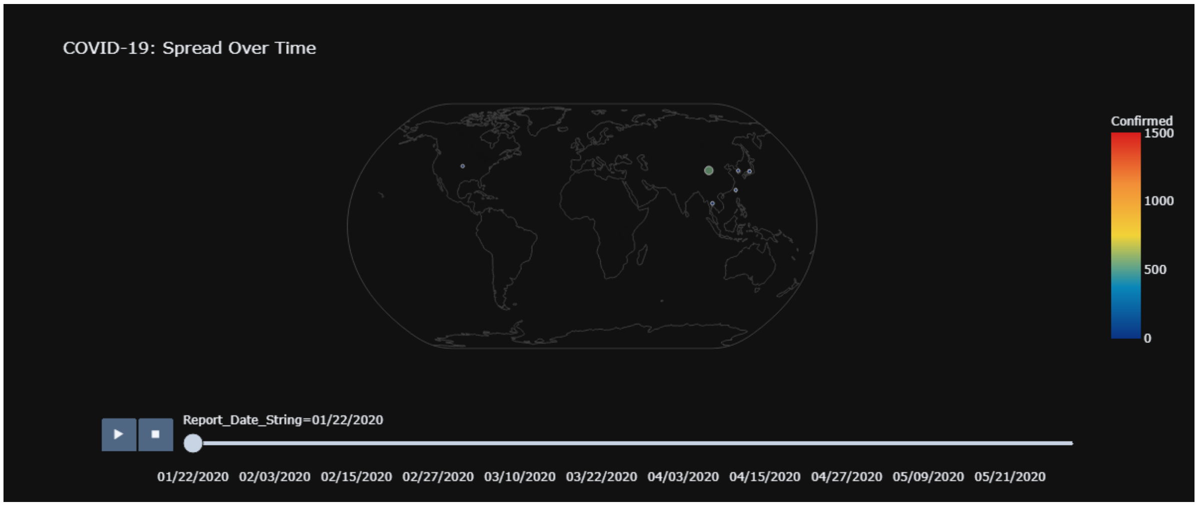
Out[38]:

	Country_Region	Last_Update	Confirmed	Deaths	Recovered	Active	Delta_Confirmed	D
0	Afghanistan	1/22/20	0	0	NaN	NaN	0.0	
1	Afghanistan	1/23/20	0	0	NaN	NaN	0.0	
2	Afghanistan	1/24/20	0	0	NaN	NaN	0.0	
3	Afghanistan	1/25/20	0	0	NaN	NaN	0.0	
4	Afghanistan	1/26/20	0	0	NaN	NaN	0.0	

In [51]:

```
formated_gdf = cleaned_data.groupby(['Report_Date_String', 'Country_Region'])['Confirme
d'].max()
formated_gdf = formated_gdf.reset_index()
formated_gdf['Report_Date_String'] = pd.to_datetime(formated_gdf['Report_Date_String'])
formated_gdf['Report_Date_String'] = formated_gdf['Report_Date_String'].dt.strftime('%
m/%d/%Y')
formated_gdf['size'] = formated_gdf['Confirmed'].pow(0.3)

fig = px.scatter_geo(formated_gdf, locations="Country_Region", locationmode='country na
mes',
                     color="Confirmed", size='size', hover_name="Country_Region",
                     range_color= [0, 1500],
                     projection="natural earth", animation_frame="Report_Date_String",
                     title='COVID-19: Spread Over Time', color_continuous_scale="portla
nd" ,width=1200)
# fig.update(layout_coloraxis_showscale=False)
img_bytes = fig.to_image(format="png")
#instead of using fig.show()
from IPython.display import Image
Image(img_bytes)
#fig.show()
```

Out[51]:



In [39]:

```
owid_covid_data = pd.read_csv('https://raw.githubusercontent.com/owid/covid-19-data/mas
ter/public/data/owid-covid-data.csv')
owid_covid_data_Selected = owid_covid_data[['date','new_cases','new_deaths']]
#Set 0 for NAN
#ColumnNan = ['new_cases','new_deaths']
#owid_covid_data_Selected[ColumnNan] = owid_covid_data_Selected[ColumnNan].fillna(0)
owid_covid_data_Selected.tail()
#owid_covid_data.head()
# W weekly frequency
```

Out[39]:

	date	new_cases	new_deaths
20971	2020-02-28	0	0
20972	2020-02-29	0	2
20973	2020-03-01	0	0
20974	2020-03-02	0	0
20975	2020-03-10	-9	1

In [16]:

```
owid_covid_newcases = owid_covid_data_Selected.groupby(['date'])['new_cases'].sum()
owid_covid_newcases = owid_covid_newcases.reset_index()
owid_covid_newcases['date'] = pd.to_datetime(owid_covid_newcases['date'])
owid_covid_newcases['date'] = owid_covid_newcases['date'].dt.strftime('%m/%d/%Y')
owid_covid_newcases.head()

owid_covid_newdeaths = owid_covid_data_Selected.groupby(['date'])['new_deaths'].sum()
owid_covid_newdeaths = owid_covid_newdeaths.reset_index()
owid_covid_newdeaths['date'] = pd.to_datetime(owid_covid_newdeaths['date'])
owid_covid_newdeaths['date'] = owid_covid_newdeaths['date'].dt.strftime('%m/%d/%Y')
owid_covid_newdeaths.head()
```

Out[16]:

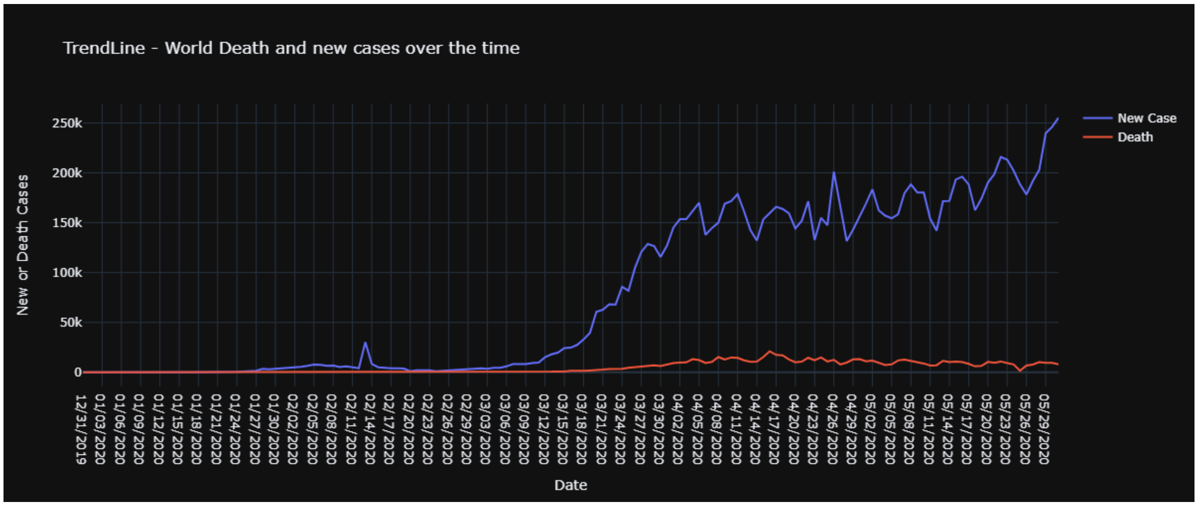
	date	new_deaths
0	12/31/2019	0
1	01/01/2020	0
2	01/02/2020	0
3	01/03/2020	0
4	01/04/2020	0

In [50]:

```python
fig = go.Figure(data=[
    go.Line(x=owid_covid_newcases['date'], y=owid_covid_newcases['new_cases'],mode='lines',name='New Case'),
     go.Line(x=owid_covid_newdeaths['date'], y=owid_covid_newdeaths['new_deaths'],mode='lines',name='Death'),
])

fig.update_layout(
    title="TrendLine - World Death and new cases over the time",
    yaxis_title="New or Death Cases",
    xaxis_title="Date",
    showlegend=True,
    width=1200
)
#fig.show()
img_bytes = fig.to_image(format="png")
#instead of using fig.show()
from IPython.display import Image
Image(img_bytes)
```

```
C:\Users\shyju_sasimohanan\Anaconda3\lib\site-packages\plotly\graph_objs\_deprecations.py:385: DeprecationWarning:

plotly.graph_objs.Line is deprecated.
Please replace it with one of the following more specific types
  - plotly.graph_objs.scatter.Line
  - plotly.graph_objs.layout.shape.Line
  - etc.
```

Out[50]:



In [43]:

```
Top10_Countries = Top10_Countries_death[['Country_Region']]
Top10_Countries.loc[Top10_Countries['Country_Region'] == "UK", "Country_Region"] = "Uni
ted Kingdom"
Top10_Countries.loc[Top10_Countries['Country_Region'] == "US", "Country_Region"] = "Uni
ted States"
filter_list = Top10_Countries['Country_Region']. values. tolist()
owid_Top10_Countries = owid_covid_data.loc[owid_covid_data['location'].isin(filter_list
)]

Top10_gdp_per_capita =  owid_Top10_Countries.groupby(['location'])['gdp_per_capita'].ma
x().to_frame(name = 'gdp_per_capita').reset_index()
Top10_cvd_death_rate =  owid_Top10_Countries.groupby(['location'])['cvd_death_rate'].ma
x().to_frame(name = 'cvd_death_rate').reset_index()
Top10_diabetes_prevalence =  owid_Top10_Countries.groupby(['location'])['diabetes_preva
lence'].max().to_frame(name = 'diabetes_prevalence').reset_index()
Top10_female_smokers =  owid_Top10_Countries.groupby(['location'])['female_smokers'].ma
x().to_frame(name = 'female_smokers').reset_index()
Top10_male_smokers =  owid_Top10_Countries.groupby(['location'])['male_smokers'].max().
to_frame(name = 'male_smokers').reset_index()
Top10_hospital_beds_per_100k =  owid_Top10_Countries.groupby(['location'])['hospital_be
ds_per_100k'].max().to_frame(name = 'hospital_beds_per_100k').reset_index()

Top10_cvd_death_rate.head()
```

```
C:\Users\shyju_sasimohanan\Anaconda3\lib\site-packages\pandas\core\indexin
g.py:670: SettingWithCopyWarning:


A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-doc
s/stable/user_guide/indexing.html#returning-a-view-versus-a-copy

C:\Users\shyju_sasimohanan\Anaconda3\lib\site-packages\ipykernel_launcher.
py:2: SettingWithCopyWarning:


A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-doc
s/stable/user_guide/indexing.html#returning-a-view-versus-a-copy

C:\Users\shyju_sasimohanan\Anaconda3\lib\site-packages\ipykernel_launcher.
py:3: SettingWithCopyWarning:


A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-doc
s/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
```

Out[43]:

	location	cvd_death_rate
0	Belgium	114.898
1	Brazil	177.961
2	France	86.060
3	Germany	156.139
4	Iran	270.308

In [44]:

```
Bottom10_Countries_death = TodaysData_Country.drop(['Last_Update', 'Lat','Long_','Incident_Rate','People_Tested','People_Hospitalized','Mortality_Rate','UID','ISO3'], axis=1)
Bottom10_Countries_death = Bottom10_Countries_death.loc[(Bottom10_Countries_death['Deaths'] >= 1)].nsmallest(10, 'Deaths')
Bottom10_Countries_death.head(10)
Bottom10_Countries = Bottom10_Countries_death[['Country_Region']]
Bottom10_Countries.loc[Bottom10_Countries['Country_Region'] == "UK", "Country_Region"] = "United Kingdom"
Bottom10_Countries.loc[Bottom10_Countries['Country_Region'] == "US", "Country_Region"] = "United States"
filter_list = Bottom10_Countries['Country_Region']. values. tolist()
owid_Bottom10_Countries = owid_covid_data.loc[owid_covid_data['location'].isin(filter_list)]

Bottom10_gdp_per_capita =  owid_Bottom10_Countries.groupby(['location'])['gdp_per_capita'].max().to_frame(name = 'gdp_per_capita').reset_index()
Bottom10_cvd_death_rate =  owid_Bottom10_Countries.groupby(['location'])['cvd_death_rate'].max().to_frame(name = 'cvd_death_rate').reset_index()
Bottom10_diabetes_prevalence =  owid_Bottom10_Countries.groupby(['location'])['diabetes_prevalence'].max().to_frame(name = 'diabetes_prevalence').reset_index()
Bottom10_female_smokers =  owid_Bottom10_Countries.groupby(['location'])['female_smokers'].max().to_frame(name = 'female_smokers').reset_index()
Bottom10_male_smokers =  owid_Bottom10_Countries.groupby(['location'])['male_smokers'].max().to_frame(name = 'male_smokers').reset_index()
Bottom10_hospital_beds_per_100k =  owid_Bottom10_Countries.groupby(['location'])['hospital_beds_per_100k'].max().to_frame(name = 'hospital_beds_per_100k').reset_index()
Bottom10_gdp_per_capita.head(10)
```

```
C:\Users\shyju_sasimohanan\Anaconda3\lib\site-packages\pandas\core\indexin
g.py:670: SettingWithCopyWarning:


A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-doc
s/stable/user_guide/indexing.html#returning-a-view-versus-a-copy

C:\Users\shyju_sasimohanan\Anaconda3\lib\site-packages\ipykernel_launcher.
py:5: SettingWithCopyWarning:


A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-doc
s/stable/user_guide/indexing.html#returning-a-view-versus-a-copy

C:\Users\shyju_sasimohanan\Anaconda3\lib\site-packages\ipykernel_launcher.
py:6: SettingWithCopyWarning:


A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-doc
s/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
```

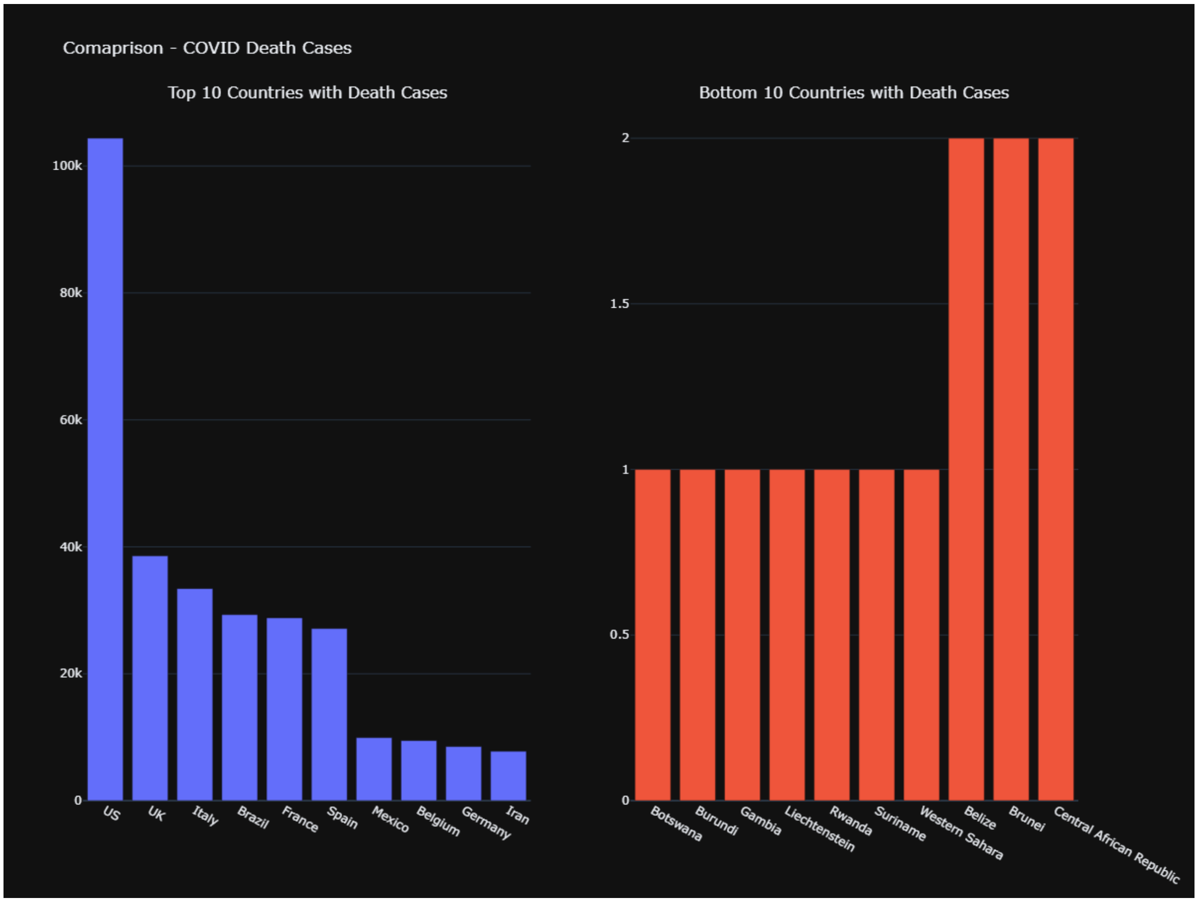
Out[44]:

	location	gdp_per_capita
0	Belize	7824.362
1	Botswana	15807.374
2	Brunei	71809.251
3	Burundi	702.225
4	Central African Republic	661.240
5	Gambia	1561.767
6	Liechtenstein	NaN
7	Rwanda	1854.211
8	Suriname	13767.119
9	Western Sahara	NaN

In [48]:

```
fig = make_subplots(
    rows=1, cols=2,
    specs=[[{"type": "bar"}, {"type": "bar"}]],
    subplot_titles=("Top 10 Countries with Death Cases","Bottom 10 Countries with Death Cases")
)

fig.add_trace(go.Bar(name='Deaths',text='Deaths', x=Top10_Countries_death['Country_Region'], y=Top10_Countries_death['Deaths']),
              row=1, col=1)

fig.add_trace(go.Bar(name='Deaths',text='Deaths', x=Bottom10_Countries_death['Country_Region'], y=Bottom10_Countries_death['Deaths']),
              row=1, col=2)
fig.update_layout(height=900,width=1200,title_text="Comaprison - COVID Death Cases", showlegend=False)

#fig.show()
img_bytes = fig.to_image(format="png")
#instead of using fig.show()
from IPython.display import Image
Image(img_bytes)
```

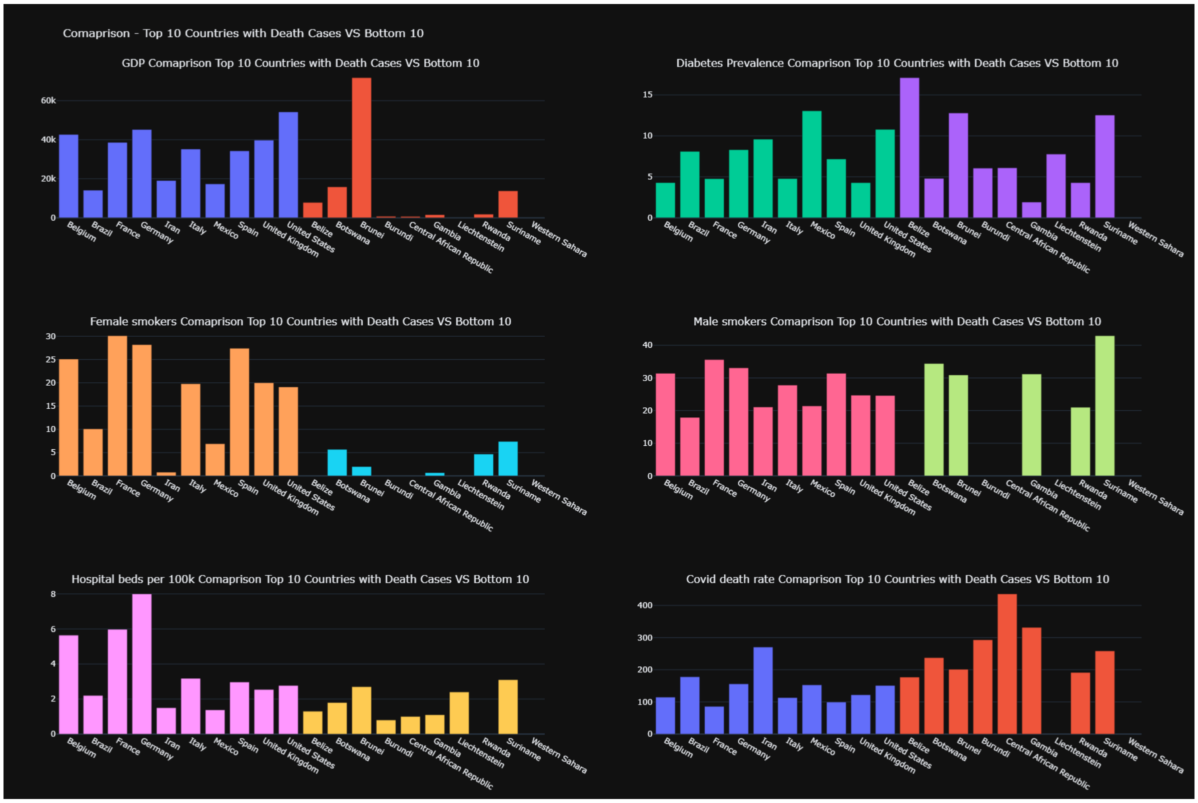
Out[48]:



In [46]:

```
fig = make_subplots(
    rows=3, cols=2,
    specs=[[{"type": "bar"}, {"type": "bar"}],
           [{"type": "bar"}, {"type": "bar"}],
            [{"type": "bar"}, {"type": "bar"}]],
    subplot_titles=("GDP Comaprison Top 10 Countries with Death Cases VS Bottom 10","Diabetes Prevalence Comaprison Top 10 Countries with Death Cases VS Bottom 10", "Female smokers Comaprison Top 10 Countries with Death Cases VS Bottom 10", "Male smokers Comaprison Top 10 Countries with Death Cases VS Bottom 10","Hospital beds per 100k Comaprison Top 10 Countries with Death Cases VS Bottom 10", "Covid death rate Comaprison Top 10 Countries with Death Cases VS Bottom 10")
)

fig.add_trace(go.Bar(name='gdp_per_capita',text='gdp_per_capita', x=Top10_gdp_per_capita['location'], y=Top10_gdp_per_capita['gdp_per_capita']),
              row=1, col=1)

fig.add_trace(go.Bar(name='gdp_per_capita',text='gdp_per_capita', x=Bottom10_gdp_per_capita['location'], y=Bottom10_gdp_per_capita['gdp_per_capita']),
              row=1, col=1)

fig.add_trace(go.Bar(name='diabetes_prevalence',text='diabetes_prevalence', x=Top10_diabetes_prevalence['location'], y=Top10_diabetes_prevalence['diabetes_prevalence']),
              row=1, col=2)

fig.add_trace(go.Bar(name='diabetes_prevalence', text='diabetes_prevalence',x=Bottom10_diabetes_prevalence['location'], y=Bottom10_diabetes_prevalence['diabetes_prevalence']),
              row=1, col=2)




fig.add_trace(go.Bar(name='female_smokers',text='female_smokers', x=Top10_female_smokers['location'], y=Top10_female_smokers['female_smokers']),
              row=2, col=1)

fig.add_trace(go.Bar(name='female_smokers',text='female_smokers', x=Bottom10_female_smokers['location'], y=Bottom10_female_smokers['female_smokers']),
              row=2, col=1)

fig.add_trace(go.Bar(name='male_smokers',text='male_smokers', x=Top10_male_smokers['location'], y=Top10_male_smokers['male_smokers']),
              row=2, col=2)

fig.add_trace(go.Bar(name='male_smokers', text='male_smokers',x=Bottom10_male_smokers['location'], y=Bottom10_male_smokers['male_smokers']),
              row=2, col=2)




fig.add_trace(go.Bar(name='hospital_beds_per_100k',text='hospital_beds_per_100k', x=Top
10_hospital_beds_per_100k['location'], y=Top10_hospital_beds_per_100k['hospital_beds_pe
r_100k']),
              row=3, col=1)

fig.add_trace(go.Bar(name='hospital_beds_per_100k',text='hospital_beds_per_100k', x=Bot
tom10_hospital_beds_per_100k['location'], y=Bottom10_hospital_beds_per_100k['hospital_b
eds_per_100k']),
              row=3, col=1)

fig.add_trace(go.Bar(name='cvd_death_rate',text='cvd_death_rate', x=Top10_cvd_death_rat
e['location'], y=Top10_cvd_death_rate['cvd_death_rate']),
              row=3, col=2)

fig.add_trace(go.Bar(name='cvd_death_rate', text='cvd_death_rate',x=Bottom10_cvd_death_
rate['location'], y=Bottom10_cvd_death_rate['cvd_death_rate']),
              row=3, col=2)


fig.update_layout(height=1200,width=1800, title_text="Comaprison - Top 10 Countries wit
h Death Cases VS Bottom 10", showlegend=False)

#fig.show()

img_bytes = fig.to_image(format="png")
#instead of using fig.show()
from IPython.display import Image
Image(img_bytes)
```

Out[46]:



In [47]:

```
owid_covid_data.iloc[:,:].corr().style.background_gradient(cmap='Blues').format("{:.3f}
")
```

Out[47]:

	total_cases	new_cases	total_deaths	new_deaths	total_c
total_cases	1.000	0.914	0.990	0.798	
new_cases	0.914	1.000	0.893	0.930	
total_deaths	0.990	0.893	1.000	0.796	
new_deaths	0.798	0.930	0.796	1.000	
total_cases_per_million	0.060	0.039	0.069	0.042	
new_cases_per_million	0.027	0.045	0.022	0.038	
total_deaths_per_million	0.087	0.048	0.135	0.081	
new_deaths_per_million	0.042	0.054	0.056	0.101	
total_tests	0.901	0.707	0.811	0.561	
new_tests	0.876	0.811	0.770	0.641	
total_tests_per_thousand	0.112	0.042	0.115	0.026	
new_tests_per_thousand	0.131	0.094	0.130	0.067	
new_tests_smoothed	0.889	0.804	0.773	0.636	
new_tests_smoothed_per_thousand	0.147	0.097	0.147	0.070	
stringency_index	0.092	0.110	0.093	0.103	
population	0.561	0.642	0.547	0.603	
population_density	-0.017	-0.020	-0.017	-0.020	
median_age	0.028	0.023	0.038	0.034	
aged_65_older	0.029	0.021	0.044	0.040	
aged_70_older	0.028	0.020	0.044	0.040	
gdp_per_capita	0.017	0.014	0.019	0.018	
extreme_poverty	-0.026	-0.028	-0.027	-0.029	
cvd_death_rate	-0.035	-0.033	-0.048	-0.050	
diabetes_prevalence	0.013	0.018	-0.000	0.004	
female_smokers	0.005	-0.001	0.017	0.013	
male_smokers	-0.003	-0.005	-0.010	-0.015	
handwashing_facilities	0.015	0.019	0.015	0.018	
hospital_beds_per_100k	-0.005	-0.010	-0.007	-0.011	