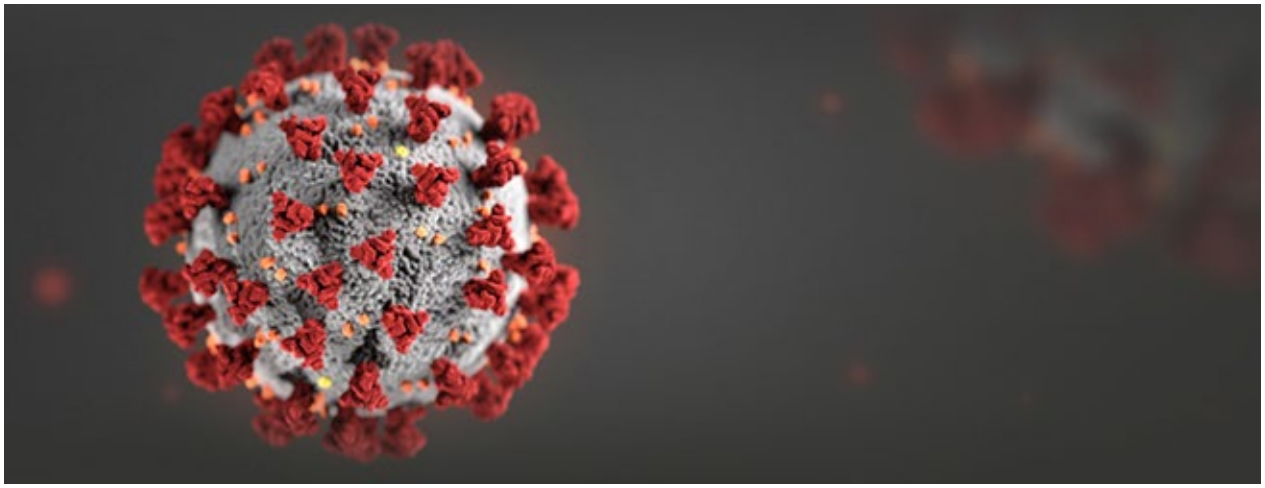
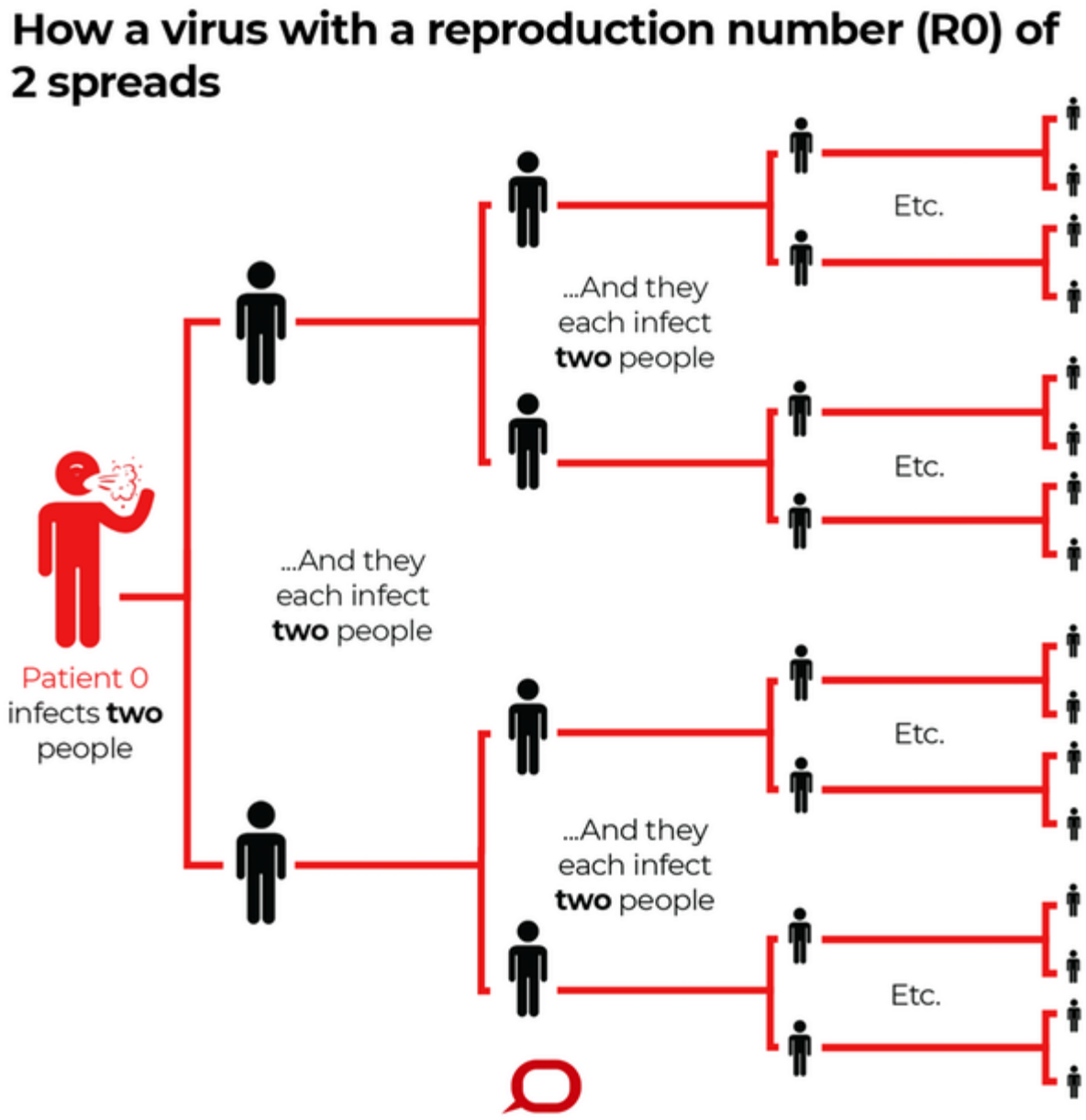
COVID-19 - Response and Effect by Countries

In this study we are going to find the effect of response by various countries in reducing the spread of virus



How does the virus spread

COVID-19 is spread from person to person through coughing or sneezing. Virus-carrying airborne droplets can remain in the air or on surfaces even after the ill person is no longer near.



In [1]:
```
import pandas
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import warnings
warnings.filterwarnings('ignore')
```

In [2]:
```
cv_df_raw = pandas.read_csv("COVID19_Cases.csv", low_memory=False)
```

Data Source:

The data for this project was taken from https://data.world/ and the dataset was https://data.world/covid-19-data-resource-hub/covid-19-case-counts/workspace/file?filename=COVID-19+Cases.csv

Columns	Columns2
case_type	iso2
people_total_tested_count	iso3
cases	fips
difference	lat
date	long
combined_key	population_count
Country_Region	people_hospitalized_cumulative_count
province_state	data_source
admin2	prep_flow_runtime

In [3]:
```
# Sample data
cv_df_raw.head(2)
```

Out[3]:

	Case_Type	People_Total_Tested_Count	Cases	Difference	Date	Combined_Key	Country_Reg
0	Confirmed	NaN	0	0	2/3/2020	Switzerland	Switzerl
1	Confirmed	NaN	23	0	4/21/2020	Antigua and Barbuda	Antigua Barb

In [4]:
```
cv_df_all_countries = cv_df_raw.copy()

# Prepare data for analysis
cv_df_all_countries = cv_df_all_countries.drop(columns=["Difference", "Province_State", "Admin2", "iso2", "iso3", "Combined_Key", "Prep_Flow_Runtime", "Lat", "Long", "FIPS", "People_Total_Tested_Count", "Population_Count", "People_Hospitalized_Cumulative_Count", "Data_Source", "Date"])
cv_df_all_countries = cv_df_all_countries[(cv_df_all_countries["Case_Type"] == "Confirmed")]
cv_df_all_countries_summary = cv_df_all_countries.groupby(["Country_Region"])["Cases"].sum().rename("Total_Cases").reset_index()

# Filter to reduce noise
cv_df_all_countries_summary = cv_df_all_countries_summary[(cv_df_all_countries_summary["Total_Cases"] > 500000)]
```

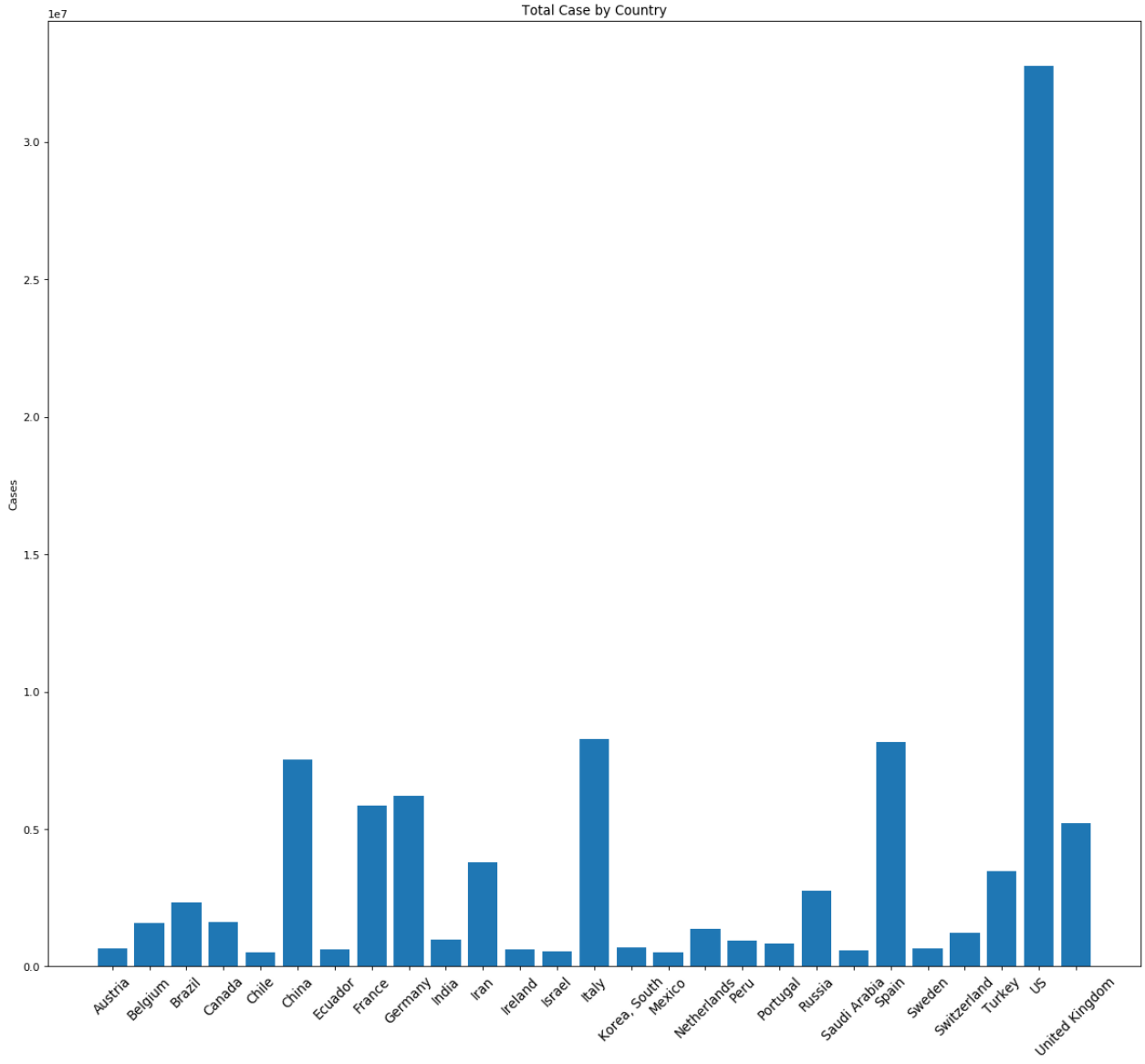
In [5]:
```
cv_df_all_countries.describe()
```

Out[5]:

	Cases

count	387200.000000
mean	286.173314
std	4611.900845
min	0.000000
25%	0.000000
50%	0.000000
75%	7.000000
max	224350.000000

In [6]:
```
fig1, ax1 = plt.subplots(1,1, figsize=(18, 16), dpi= 80, facecolor='w', ed
gecolor='k')

ax1.bar(cv_df_all_countries_summary["Country_Region"], cv_df_all_countries
_summary["Total_Cases"])
plt.xticks(rotation=45, fontsize=12)

plt.ylabel('Cases')
plt.title('Total Case by Country')
plt.show()
```

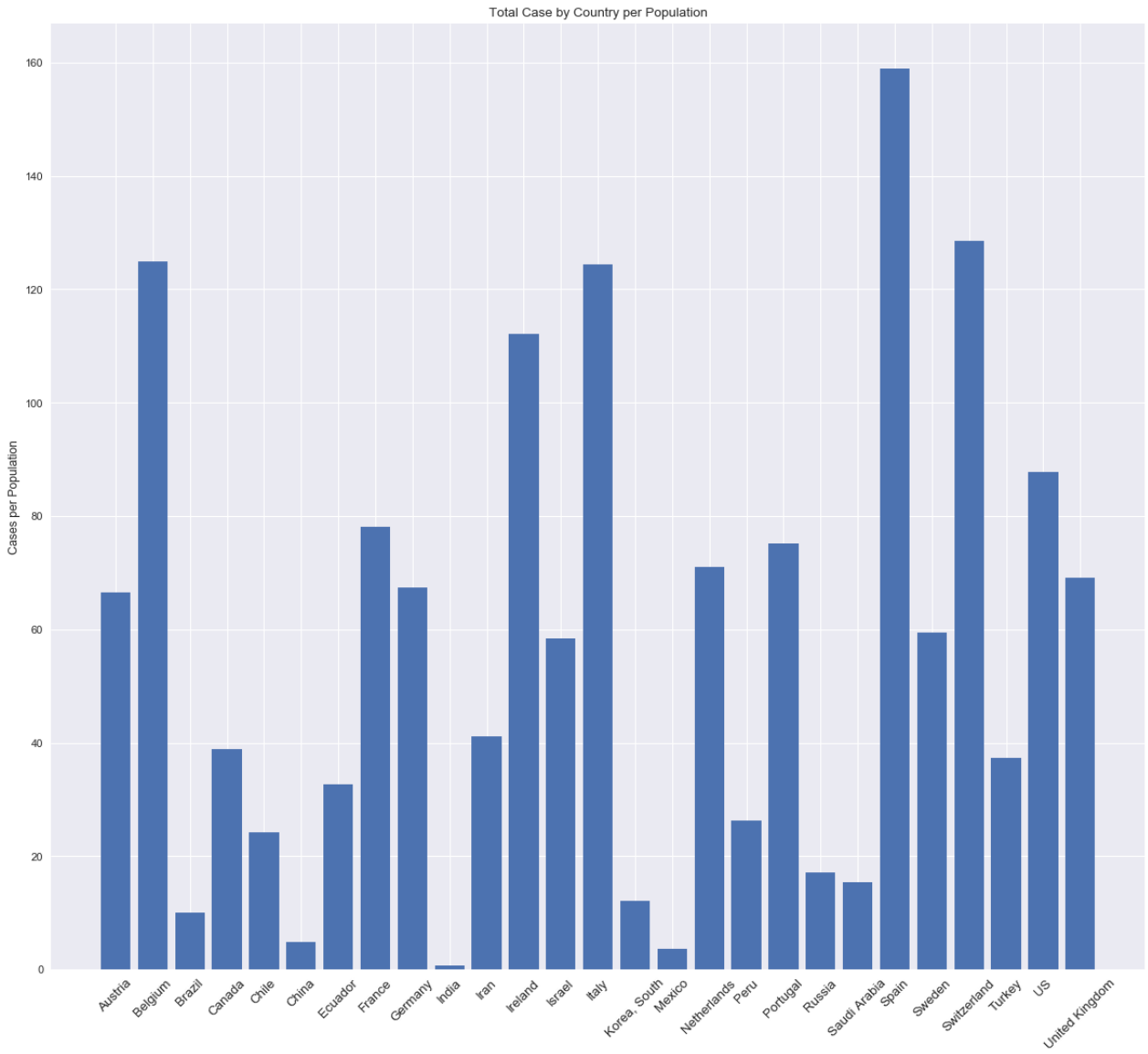


From the above graph we see the number of total cases reported is very high for US. High cases were also reported in Italy, Spain, China, UK etc. This could be misleading becuase it does not consider the overall population. So let us considering the countries population.

In [7]:
```
cv_df_1 = cv_df_raw.copy()
cv_df_1 = cv_df_1.drop(columns=["Difference", "Province_State", "Admin2",
"iso2", "iso3", "Combined_Key", "Prep_Flow_Runtime", "Lat", "Long", "FIPS"
, "People_Total_Tested_Count", "People_Hospitalized_Cumulative_Count", "Da
ta_Source", "Date"])
cv_df_1 = cv_df_1[(cv_df_1["Case_Type"] == "Confirmed")]
cv_df_1_summary = cv_df_1.groupby(["Country_Region"])["Cases", "Population
_Count"].sum()
cv_df_1_summary = cv_df_1_summary.reset_index()
cv_df_1_summary["Cases_per_Population"] = ((cv_df_1_summary["Cases"] / cv_
df_1_summary["Population_Count"]) * 100000)
cv_df_1_summary = cv_df_1_summary[(cv_df_1_summary["Cases"] > 500000)]
```

In [8]:
```
plt.style.use("seaborn")
```

```
fig1, ax1 = plt.subplots(1,1, figsize=(18, 16), dpi= 80, facecolor='w', ed
gecolor='k')
ax1.bar(cv_df_1_summary["Country_Region"], cv_df_1_summary["Cases_per_Popu
lation"])
plt.xticks(rotation=45, fontsize=12)

plt.ylabel('Cases per Population')
plt.title('Total Case by Country per Population')
# plt.grid(True)
plt.show()
```

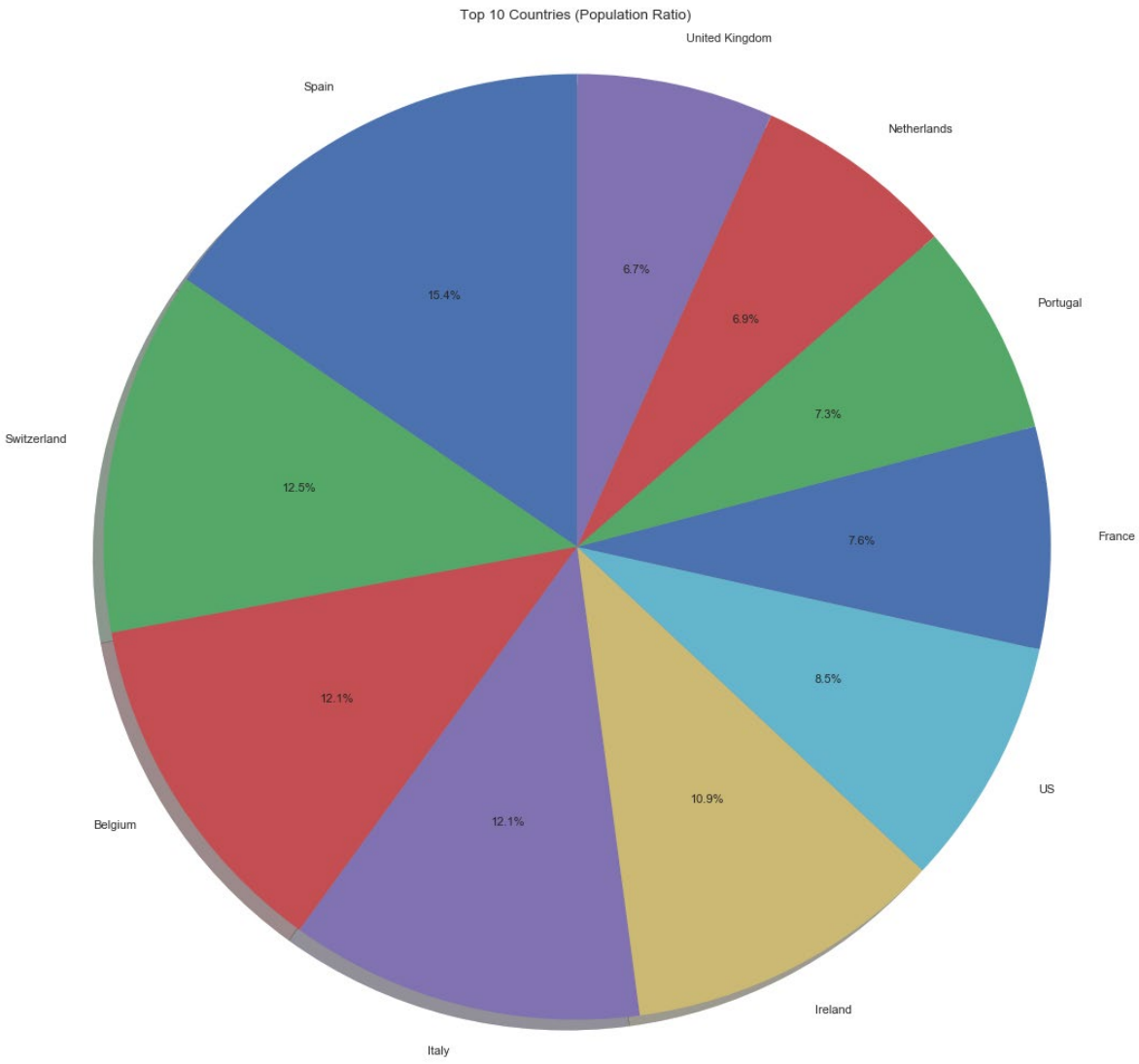


The above chart shows cases per total population in the country. Here we see Spain leads the way followed by many other European countries. US is in the sixth place.

In [9]:
```
cv_df_1_summary = cv_df_1_summary.sort_values("Cases_per_Population", asce
nding=False).head(10)
```

In [10]:
```
fig1, ax1 = plt.subplots(1,1, figsize=(18, 16), dpi= 80, facecolor='w', ed
gecolor='k')
```

```
ax1.pie(cv_df_1_summary["Cases_per_Population"], labels=cv_df_1_summary["C
ountry_Region"], autopct='%1.1f%%', shadow=True, startangle=90)
ax1.axis('equal')  # Equal aspect ratio ensures that pie is drawn as a cir
cle.
plt.title('Top 10 Countries (Population Ratio)')
plt.show()
```



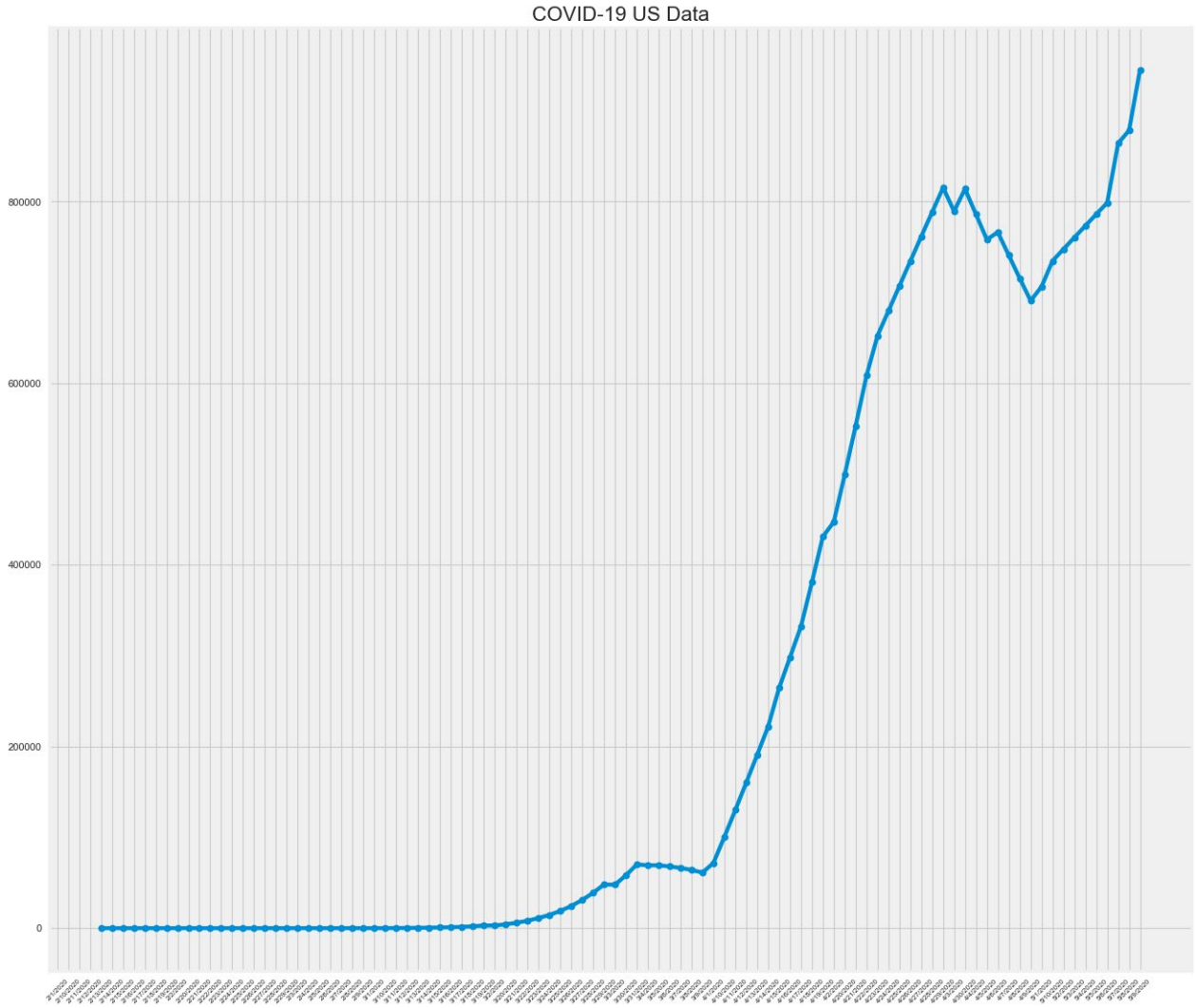
The above pie chart shows the number of cases per country. The covid cases is clear here.

United States

The response to COVID-19 by United States was largely decentralised with states imposing measures based on the spread in that states. The US response has been mixed depending on the state. Amoung the state wide measures, school closing, lockdown, closure of non-essential business etc are some mitigation measures.

In [11]:
```
cv_df_tl = cv_df_raw.copy()
cv_df_tl = cv_df_tl.drop(columns=["Difference", "Province_State", "Admin2"
, "iso2",       "iso3", "Combined_Key", "Prep_Flow_Runtime", "Lat", "Long"
, "FIPS", "People_Total_Tested_Count", "Population_Count", "People_Hospita
lized_Cumulative_Count", "Data_Source"])
cv_df_tl_us = cv_df_tl[(cv_df_tl["Case_Type"] == "Confirmed") & (cv_df_tl[
"Country_Region"] == "US")]

cv_df_tl_us = cv_df_tl_us.sort_values("Date", ascending=True)
cv_df_tl_d_us = cv_df_tl_us.groupby(["Country_Region", "Date"])["Cases"].s
um()
cv_df_tl_d_us = cv_df_tl_d_us.reset_index()

cv_df_tl_d_us["avgcases"] = cv_df_tl_d_us["Cases"].rolling(15).mean()
```

In [12]:
```
plt.style.use("fivethirtyeight")
fig1, ax1 = plt.subplots(1,1, figsize=(18, 16), dpi= 80, facecolor='w', ed
gecolor='k')
ax1.plot_date(cv_df_tl_d_us["Date"], cv_df_tl_d_us["avgcases"], linestyle=
"solid")
plt.title('COVID-19 US Data')
plt.xticks(rotation=45, fontsize=7)
plt.show()
```



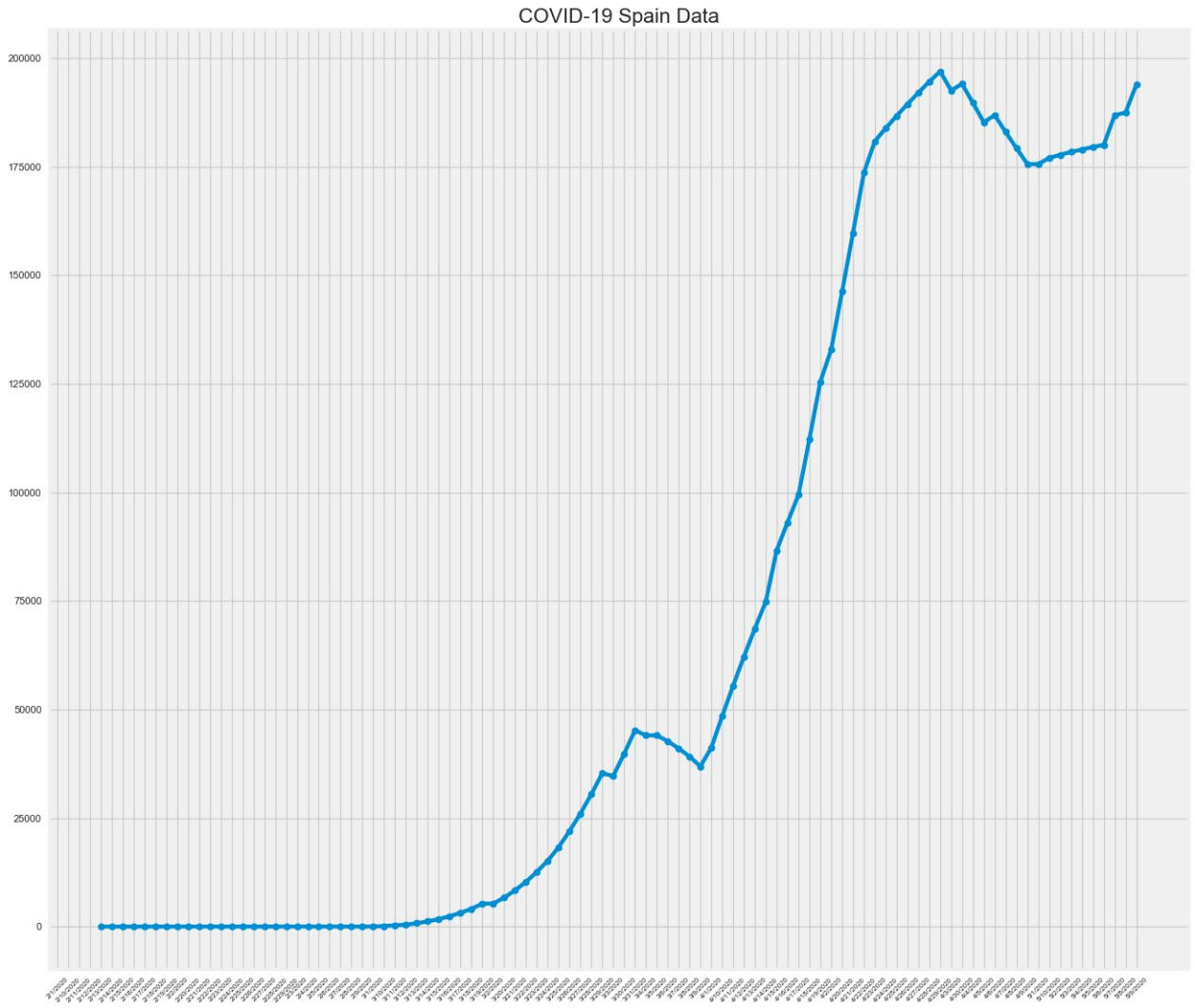
Spain

Sweden asked its citizens to practice social distancing on a mostly voluntary basis. Swedish authorities imposed some restrictions designed to flatten the curve: no public gatherings of more than 50 people, no bar service, distance learning in high schools and universities, and so on.

In [13]:
```
cv_df_tl_spain = cv_df_tl[(cv_df_tl["Case_Type"] == "Confirmed") & (cv_df_
tl["Country_Region"] == "Spain")]

cv_df_tl_spain = cv_df_tl_spain.sort_values("Date", ascending=True)

cv_df_tl_d_spain = cv_df_tl_spain.groupby(["Country_Region", "Date"])["Cas
es"].sum()
cv_df_tl_d_spain = cv_df_tl_d_spain.reset_index()

cv_df_tl_d_spain["avgcases"] = cv_df_tl_d_spain["Cases"].rolling(15).mean(
)
```

In [14]:
```
plt.style.use("fivethirtyeight")
fig1, ax1 = plt.subplots(1,1, figsize=(18, 16), dpi= 80, facecolor='w', ed
gecolor='k')
```

```
ax1.plot_date(cv_df_tl_d_spain["Date"], cv_df_tl_d_spain["avgcases"], line
style="solid")
plt.title('COVID-19 Spain Data')
plt.xticks(rotation=45, fontsize=7)
plt.show()
```



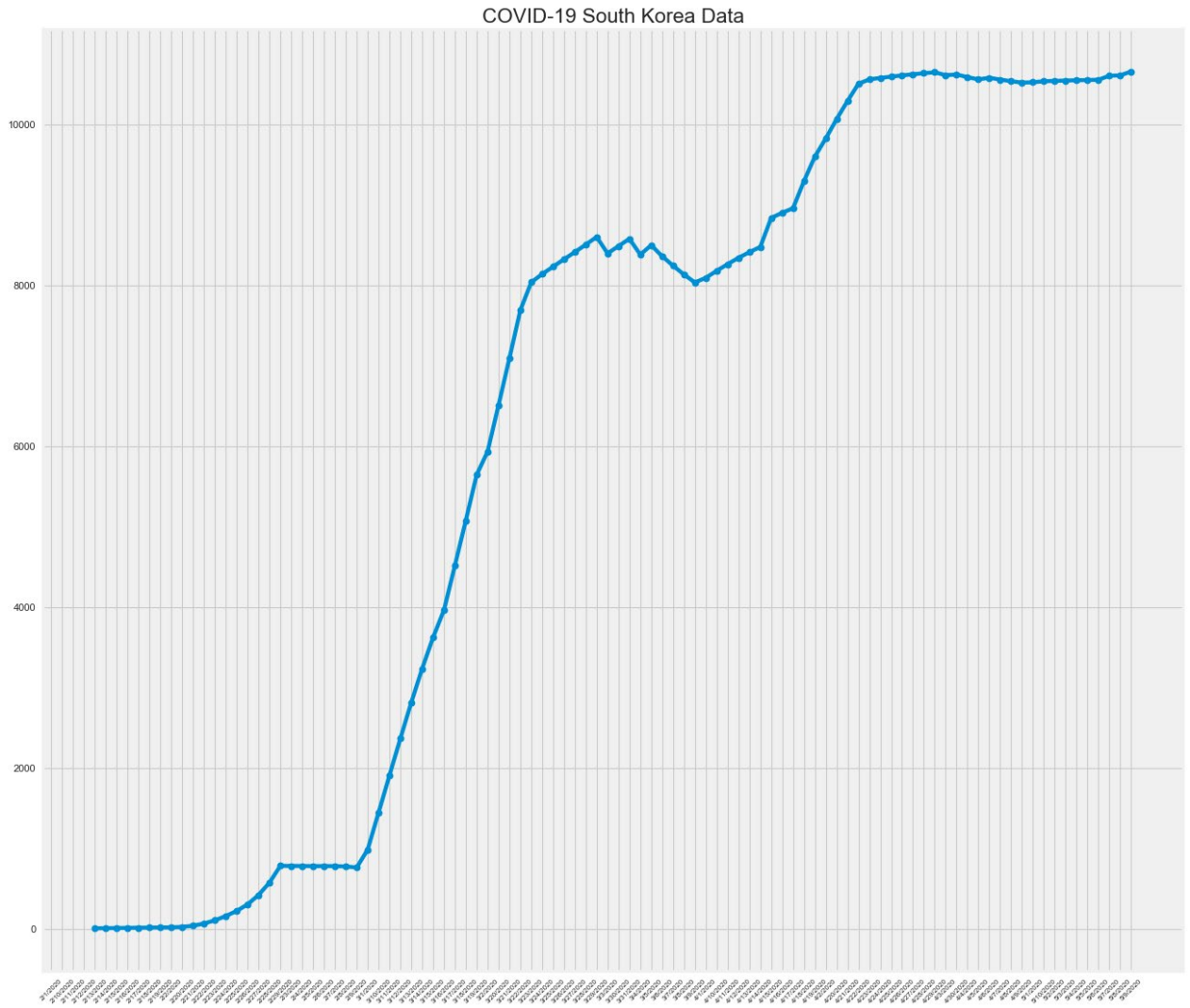
South Korea

Because the government's response to SARS had been sharply criticized, it ramped up its disease control infrastructure prior to the coronavirus. When the virus was reported in China, South Korea moved quickly to develop a test. South Korea's response has been based on massive testing, contact tracing, and quarantine of exposed individuals. The country has the highest per capita testing rate in the world.

In [15]:
```
cv_df_tl_skorea = cv_df_tl[(cv_df_tl["Case_Type"] == "Confirmed") & (cv_df
_tl["Country_Region"] == "Korea, South")]

cv_df_tl_skorea = cv_df_tl_skorea.sort_values("Date", ascending=True)

cv_df_tl_d_skorea = cv_df_tl_skorea.groupby(["Country_Region", "Date"])["C
ases"].sum()
cv_df_tl_d_skorea = cv_df_tl_d_skorea.reset_index()
```

```
cv_df_tl_d_skorea["avgcases"] = cv_df_tl_d_skorea["Cases"].rolling(15).mean()
```

In [16]:
```
plt.style.use("fivethirtyeight")
fig1, ax1 = plt.subplots(1,1, figsize=(18, 16), dpi= 80, facecolor='w', edgecolor='k')
ax1.plot_date(cv_df_tl_d_skorea["Date"], cv_df_tl_d_skorea["avgcases"], linestyle="solid")
plt.title('COVID-19 South Korea Data')
plt.xticks(rotation=45, fontsize=7)
plt.show()
```

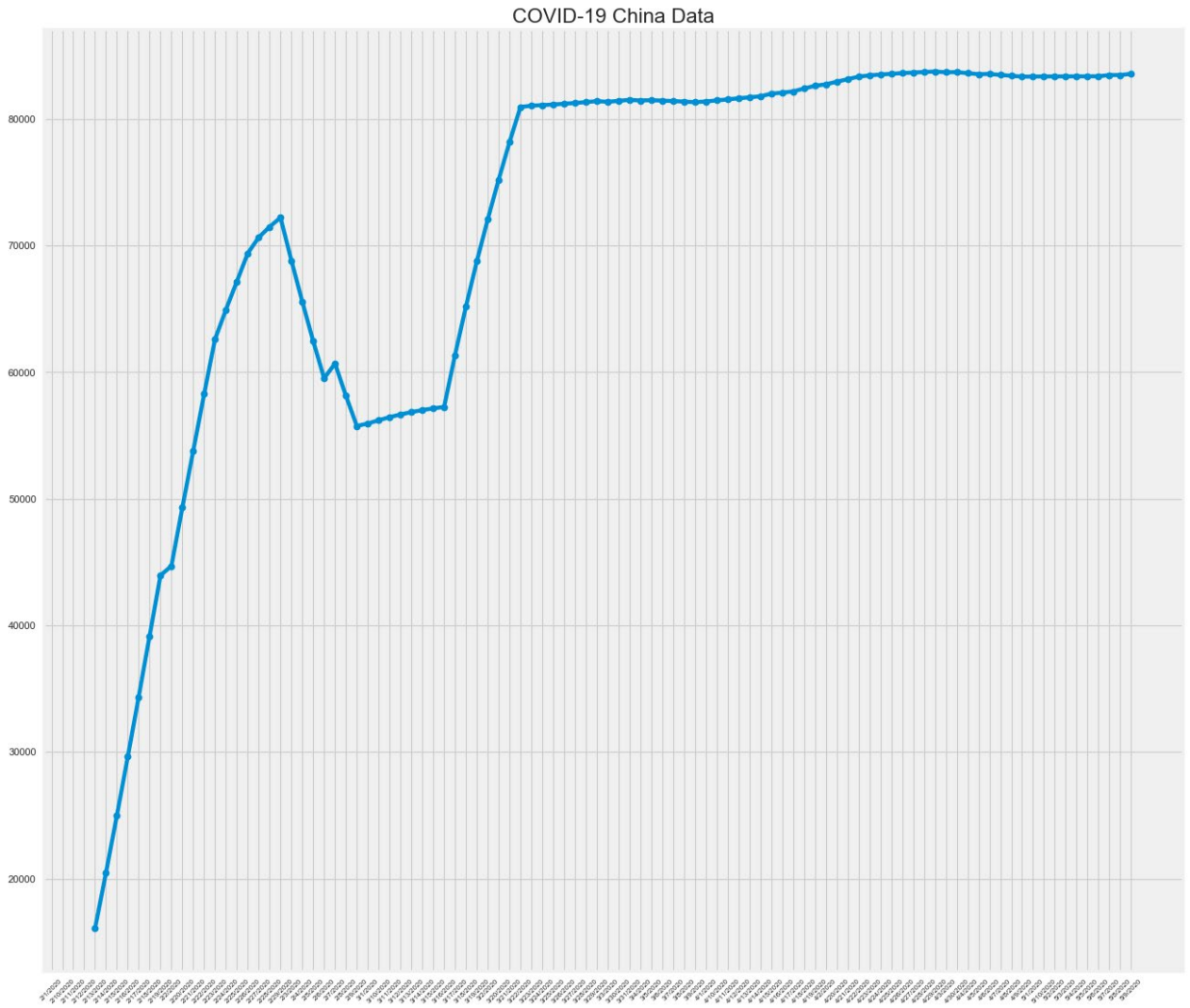


China

In mid-January, Chinese authorities introduced unprecedented measures to contain the virus, stopping movement in and out of Wuhan, the centre of the epidemic, and 15 other cities in Hubei province - home to more than 60 million people. Flights and trains were suspended, and roads were blocked. Soon after, people in many Chinese cities were told to stay at home and venture out only to get food or medical help. Some 760 million people, roughly half the country's population, were confined to their homes

In [17]:
```
cv_df_tl_china = cv_df_tl[(cv_df_tl["Case_Type"] == "Confirmed") & (cv_df_
tl["Country_Region"] == "China")]

cv_df_tl_china = cv_df_tl_china.sort_values("Date", ascending=True)

cv_df_tl_d_china = cv_df_tl_china.groupby(["Country_Region", "Date"])["Cas
es"].sum()
cv_df_tl_d_china = cv_df_tl_d_china.reset_index()

cv_df_tl_d_china["avgcases"] = cv_df_tl_d_china["Cases"].rolling(15).mean(
)
```

In [18]:
```
plt.style.use("fivethirtyeight")
fig1, ax1 = plt.subplots(1,1, figsize=(18, 16), dpi= 80, facecolor='w', ed
gecolor='k')
ax1.plot_date(cv_df_tl_d_china["Date"], cv_df_tl_d_china["avgcases"], line
style="solid")
plt.title('COVID-19 China Data')
plt.xticks(rotation=45, fontsize=7)
plt.show()
```



Conclusion

Country	Response Type	Cases
US	Decentralised	
Spain	Herd Immunity	
South Korea	Test/Trace	
China	Containment