DIY Project for Data Mining and Analytics- DIY 2

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SEMESTER III

Importing Libraries

In [2]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

> Interactive visualization libraries

In [3]:
```
import plotly.express as px
import plotly.graph_objs as go
from plotly.subplots import make_subplots
from plotly.offline import init_notebook_mode,download_plotlyjs,plot,iplot
```

In [4]:
```
init_notebook_mode(connected=True)
```

```
import cufflinks as cf
cf.go_offline()
```

> Avoid warnings

In [5]:
```
import warnings
warnings.filterwarnings(action='ignore')
```

Importing the Data

In [6]:
```
df=pd.read_csv('covid_19_data (1).csv')
```

In [7]:
```
df.head(2)
```

Out[7]:

	SNo	ObservationDate	Province/State	Country/Region	Last Update	Confirmed	Deaths	Recovered
0	1	1/22/2020	Anhui	Mainland China	1/22/2020 17:00	1	0	0
1	2	1/22/2020	Beijing	Mainland China	1/22/2020 17:00	14	0	0

> Converting String into Date dtype

In [8]:
```
df['ObservationDate'] = pd.to_datetime(df['ObservationDate'])
```

In [9]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 8509 entries, 0 to 8508
Data columns (total 8 columns):
 #   Column           Non-Null Count  Dtype
---  ------           --------------  -----
 0   SNo              8509 non-null   int64
 1   ObservationDate  8509 non-null   datetime64[ns]
 2   Province/State   4761 non-null   object
 3   Country/Region   8509 non-null   object
 4   Last Update      8509 non-null   object
 5   Confirmed        8509 non-null   int64
 6   Deaths           8509 non-null   int64
 7   Recovered        8509 non-null   int64
dtypes: datetime64[ns](1), int64(4), object(3)
memory usage: 531.9+ KB
```

In [10]:
```
df.describe()
```

Out[10]:

	SNo	Confirmed	Deaths	Recovered
count	8509.000000	8509.000000	8509.000000	8509.000000
mean	4255.000000	704.421201	25.542955	245.788342
std	2456.481054	5111.664699	252.402842	2774.093868
min	1.000000	0.000000	0.000000	0.000000
25%	2128.000000	2.000000	0.000000	0.000000
50%	4255.000000	18.000000	0.000000	0.000000
75%	6382.000000	140.000000	1.000000	10.000000
max	8509.000000	69176.000000	6820.000000	60324.000000

In [11]:
```
df.shape
```

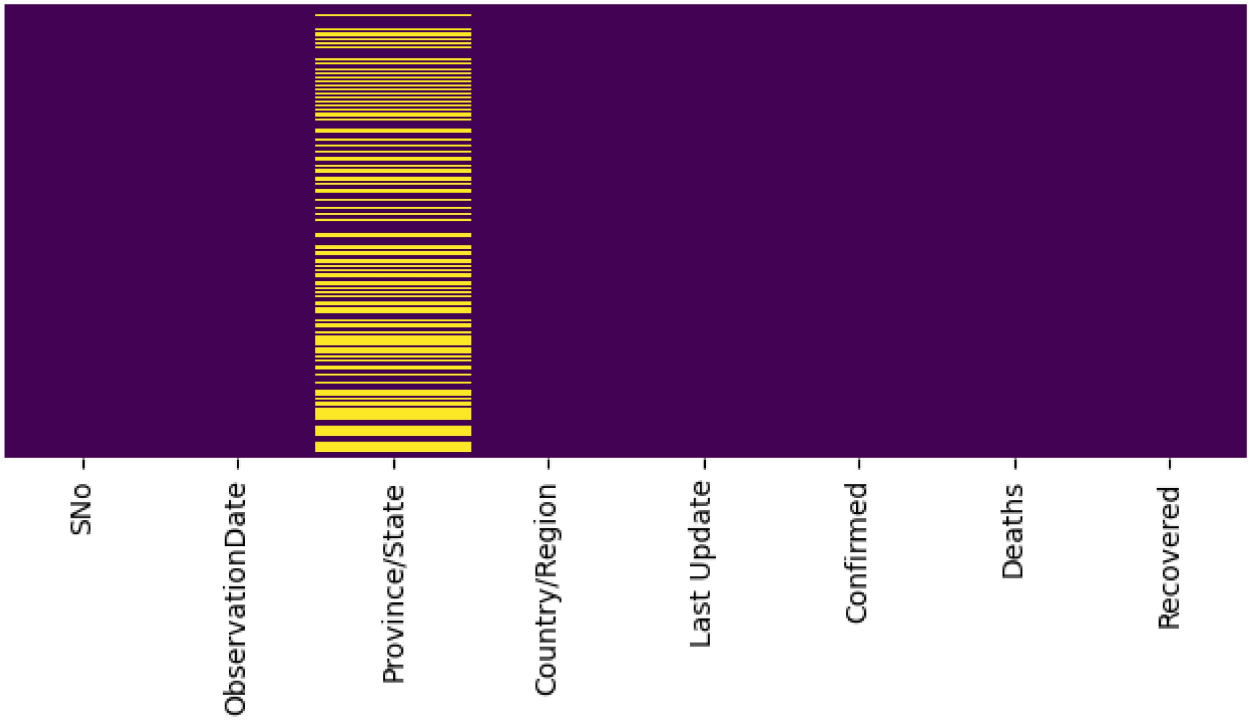
Out[11]:
```
(8509, 8)
```

In [12]:
```
np.sum(df.isnull())
```

Out[12]:
```
SNo                  0
ObservationDate      0
Province/State    3748
Country/Region       0
Last Update          0
Confirmed            0
Deaths               0
Recovered            0
dtype: int64
```

Null Values

In [13]:
```
plt.figure(figsize=(8,3),dpi=100)
sns.heatmap(df.isnull(),cbar=False,cmap='viridis',yticklabels=False);
```



> Fixing te null values according to the country column

In [14]:
```
df[df['Province/State'].isnull()==True]['Country/Region'].value_counts().head(30)
```

Out[14]:
```
Japan                  63
South Korea            63
Thailand               63
Singapore              62
Vietnam                62
Malaysia               61
Nepal                  60
Cambodia               58
Sri Lanka              58
Finland                56
Philippines            56
United Arab Emirates   56
India                  55
Sweden                 54
Russia                 54
Italy                  54
Spain                  53
Germany                53
Belgium                50
France                 49
UK                     43
Egypt                  40
Iran                   35
Lebanon                32
Kuwait                 30
Oman                   30
Afghanistan            30
Bahrain                30
Iraq                   30
Algeria                29
Name: Country/Region, dtype: int64
```

> Applying function

In [15]:
```
def fillnull(cols):
    state=cols[0]
    country=cols[1]
    if pd.isnull(state):
        return country
    else:
        return state
```

In [16]:
```
df['Province/State']=df[['Province/State','Country/Region']].apply(fillnull,axis=1)
```

In [17]:
```
df.head(2 )
```

Out[17]:

	SNo	ObservationDate	Province/State	Country/Region	Last Update	Confirmed	Deaths	Recovered
0	1	2020-01-22	Anhui	Mainland China	1/22/2020 17:00	1	0	0
1	2	2020-01-22	Beijing	Mainland China	1/22/2020 17:00	14	0	0

In [18]:
```
df[['Deaths','Recovered']]
```

Out[18]:

	Deaths	Recovered
0	0	0
1	0	0
2	0	0
3	0	0
4	0	0
...	...	...
8504	0	0
8505	0	0
8506	3	73
8507	2	172
8508	1	1221

8509 rows × 2 columns

EDA (Exploratory Data Analysis)

In [19]:
```
df
```

Out[19]:

	SNo	ObservationDate	Province/State	Country/Region	Last Update	Confirmed	Deaths	Recovered
0	1	2020-01-22	Anhui	Mainland China	1/22/2020 17:00	1	0	0
1	2	2020-01-22	Beijing	Mainland China	1/22/2020 17:00	14	0	0
2	3	2020-01-22	Chongqing	Mainland China	1/22/2020 17:00	6	0	0
3	4	2020-01-22	Fujian	Mainland China	1/22/2020 17:00	1	0	0
4	5	2020-01-22	Gansu	Mainland China	1/22/2020 17:00	0	0	0
...	...	...	...	...	...	...	...	...
8504	8505	2020-03-24	Wuhan Evacuee	US	3/24/2020 23:41	4	0	0
8505	8506	2020-03-24	Wyoming	US	3/24/2020 23:41	29	0	0
8506	8507	2020-03-24	Xinjiang	Mainland China	3/24/2020 23:41	76	3	73
8507	8508	2020-03-24	Yunnan	Mainland China	3/24/2020 23:41	176	2	172
8508	8509	2020-03-24	Zhejiang	Mainland China	3/24/2020 23:41	1240	1	1221

8509 rows × 8 columns

In [20]:
```
# color pallette
cnf, dth, rec, act = '#393e46', '#ff2e63', '#21bf73', '#fe9801'
```

In [21]:
```
df[['ObservationDate','Deaths', 'Recovered', 'Confirmed']]
```

Out[21]:

	ObservationDate	Deaths	Recovered	Confirmed
0	2020-01-22	0	0	1
1	2020-01-22	0	0	14
2	2020-01-22	0	0	6
3	2020-01-22	0	0	1
4	2020-01-22	0	0	0
...	...	...	...	...
8504	2020-03-24	0	0	4
8505	2020-03-24	0	0	29
8506	2020-03-24	3	73	76
8507	2020-03-24	2	172	176
8508	2020-03-24	1	1221	1240

8509 rows × 4 columns

EDA (Exploaratory Data Analysis)

> Confirmed Cases + Recoverd Cases + Death Cases

In [22]:

```
temp = df[['ObservationDate','Deaths', 'Recovered', 'Confirmed']]
temp = temp.melt(id_vars='ObservationDate', value_vars=['Confirmed','Recovered','Deaths'])
fig = px.treemap(temp, path=["variable"], values="value", height=225,
                 color_discrete_sequence=[act, rec, dth])
fig.data[0].textinfo = 'label+text+value'
fig.show()
```

Confirmed
5,993,920

Gegrophical Maps

> GroupBy According to Countrry to get the Confirmed Cases in gegrophical Map

In [23]:
```
Country_wise=df.groupby('Country/Region').sum()
```

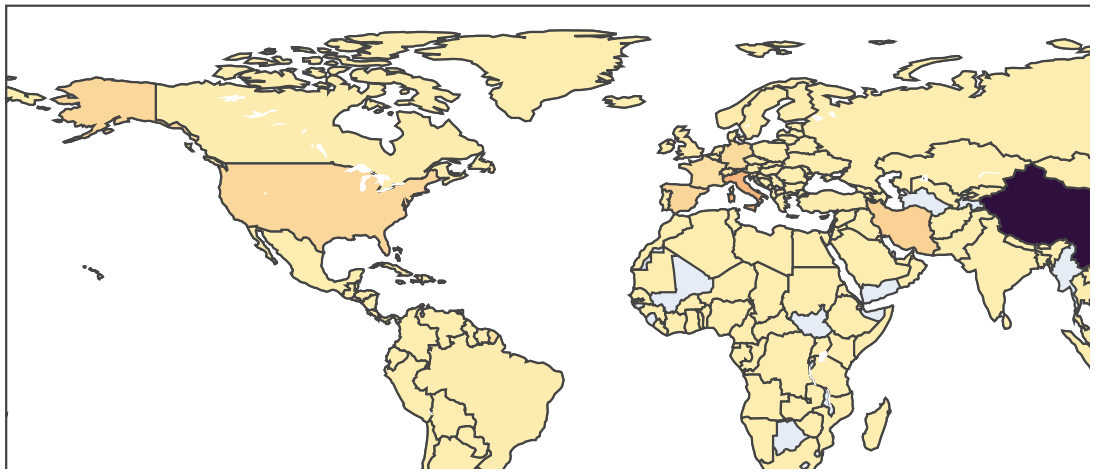
In [24]:
```
Country_wise.reset_index(inplace=True)
```

In [25]:
```
def plot_map(df, col, pal):
    df = df[df[col]>0]
    fig = px.choropleth(df, locations="Country/Region", locationmode='country names',
                  color=col, hover_name="Country/Region",
                  title=col+' Cases According To the Country in 2019', hover_data=[col], color_continuous_scale=pal)
#     fig.update_layout(coloraxis_showscale=False)
    fig.show()
```

Confirmed Cases Map

In [26]:
```
plot_map(Country_wise, 'Confirmed', 'matter')
```

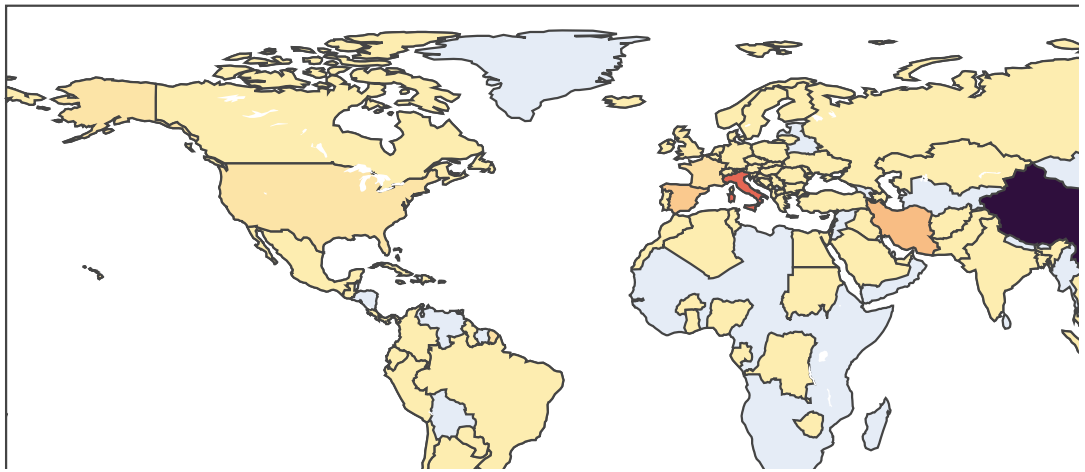
Confirmed Cases According To the Country in 2019



Death Cases Map

In [27]:
```
plot_map(Country_wise, 'Deaths', 'matter')
```

Deaths Cases According To the Country in 2019



Recovered Cases Map

In [28]:
```
plot_map(Country_wise,'Recovered','matter')
```

Recovered Cases According To the Country in 2019

Cases Over Time

> Timestamp Animation of Cases found according to Time in particular country

In [29]:
```
fig = px.choropleth(df, locations="Country/Region",
                    color=np.log(df["Confirmed"]),
                    locationmode='country names', hover_name="Country/Region",
```

```
                    animation_frame=df["ObservationDate"].dt.strftime('%m-%d-%Y'),
                    title='Cases over time', color_continuous_scale=px.colors.sequential.matter)
fig.update(layout_coloraxis_showscale=False)
fig.show()
```

Cases over time

> Area Plots According to the Time

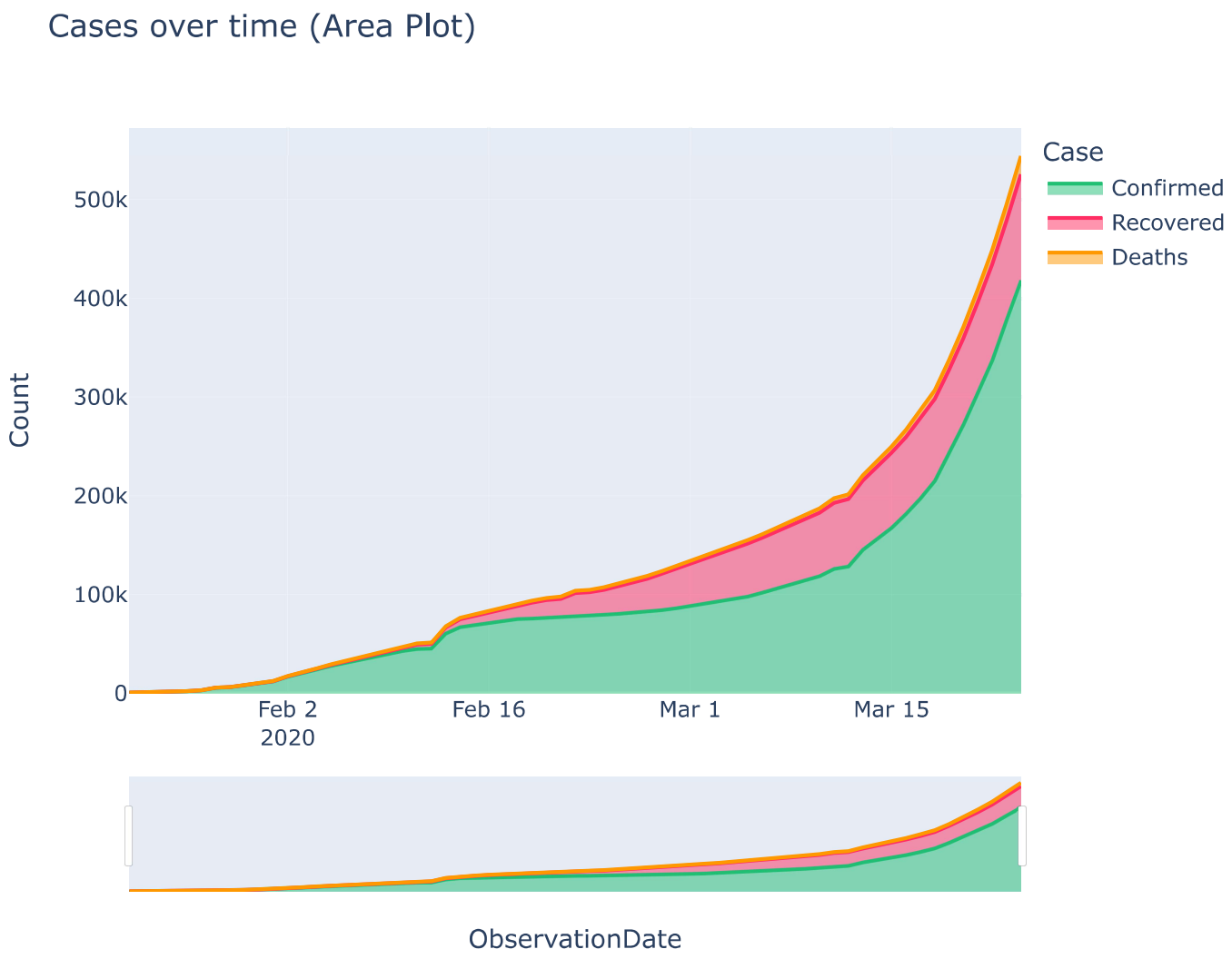
In [30]:
```
def plot_daywise(col, hue):
    fig = px.bar(df, x="ObservationDate", y=col, width=700, color_discrete_sequence=[hue])
```

```
    fig.update_layout(title=col, xaxis_title="", yaxis_title="")
    fig.show()
```

In [31]:
```
def plot_daywise_line(col, hue):
    fig = px.line(day_wise, x="Date", y=col, width=700, color_discrete_sequence=[hue])
    fig.update_layout(title=col, xaxis_title="", yaxis_title="")
    fig.show()
```

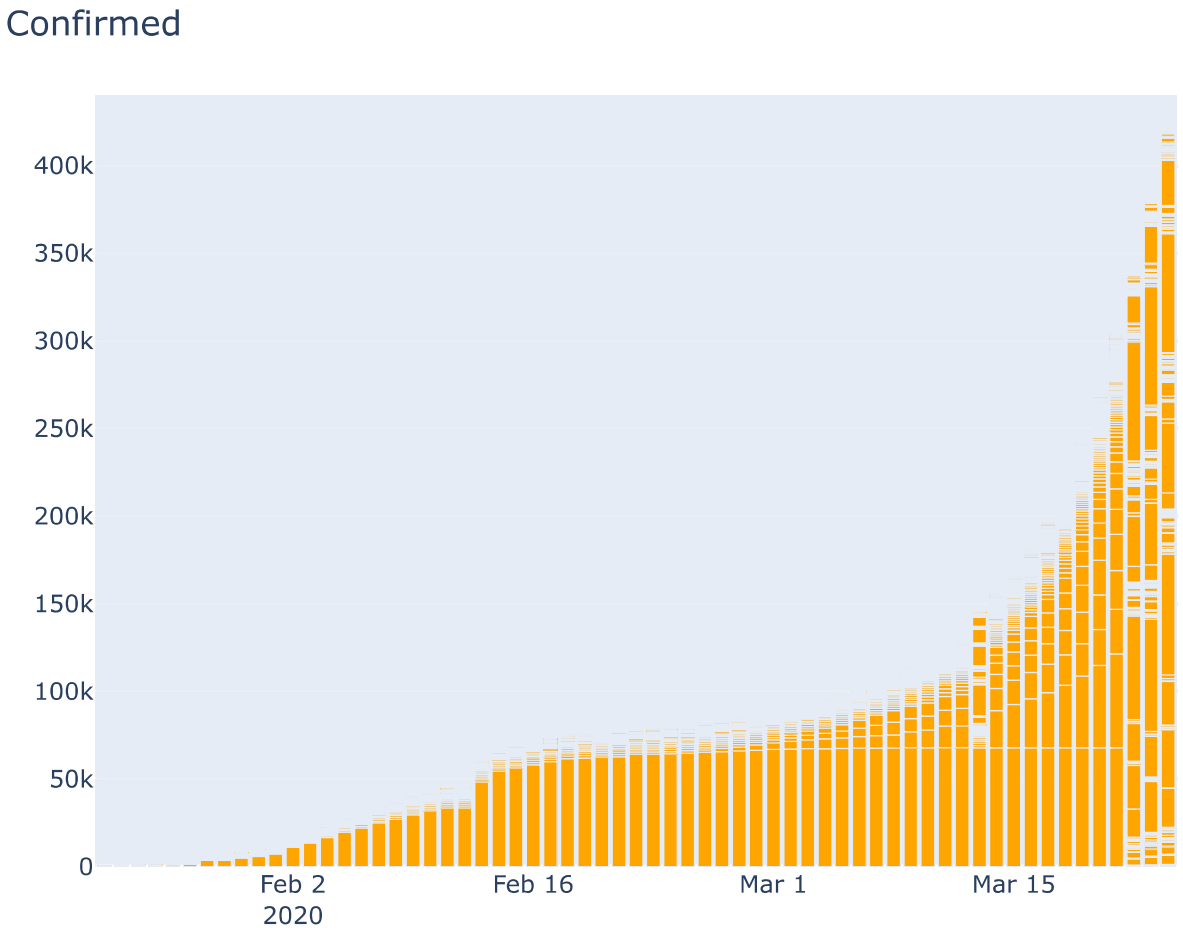
In [32]:
```
temp = df.groupby('ObservationDate')['Confirmed','Recovered', 'Deaths'].sum().reset_index()
temp = temp.melt(id_vars="ObservationDate", value_vars=['Confirmed','Recovered', 'Deaths'],
                 var_name='Case', value_name='Count')
temp.head()

fig = px.area(temp, x="ObservationDate", y="Count", color='Case', height=600, width=700,
              title='Cases over time (Area Plot)', color_discrete_sequence = [rec, dth, act])
fig.update_layout(xaxis_rangeslider_visible=True)
fig.show()
```



> Daywise Occurence of Confirmed Cases

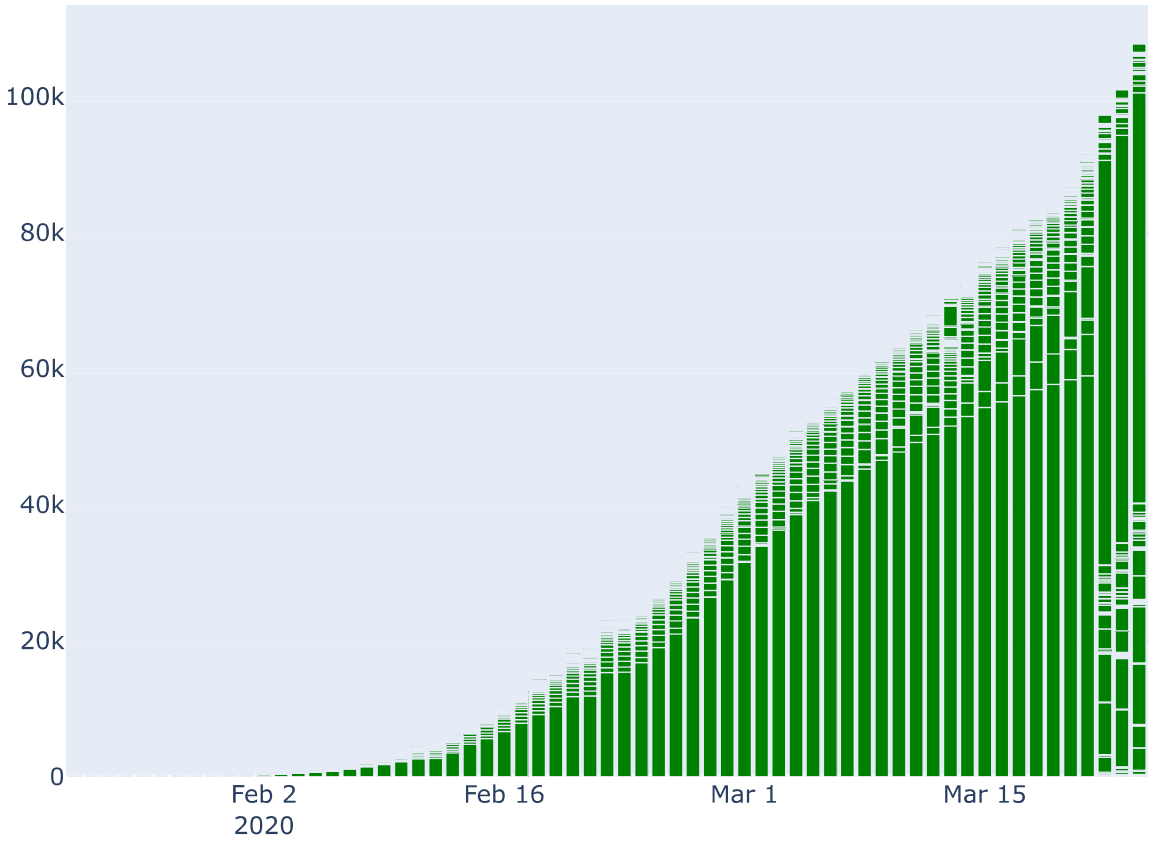
In [33]:
```
plot_daywise('Confirmed', 'orange')
```



> Daywise Occurence of Recovered Cases

In [34]:
```
plot_daywise('Recovered', 'green')
```

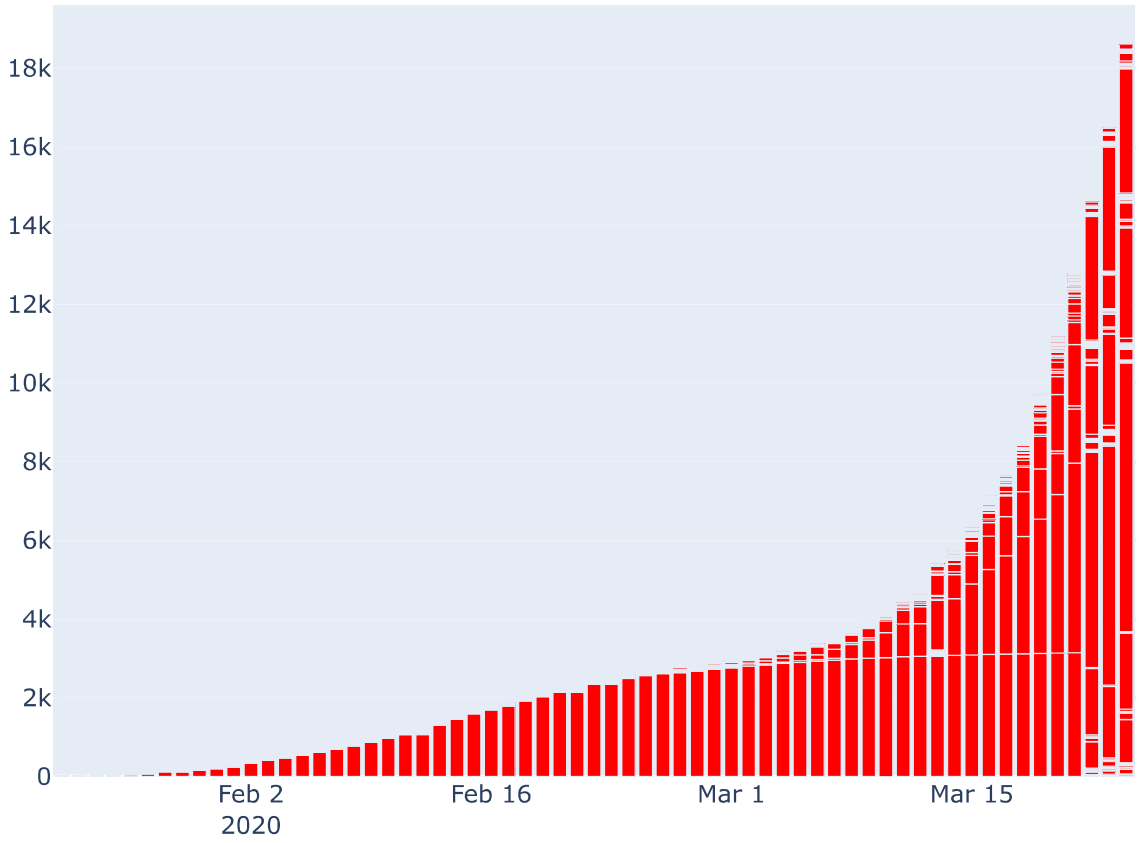
Recovered



> Daywise Occurence of Death Cases

In [35]:
```
plot_daywise('Deaths', 'red')
```

Deaths

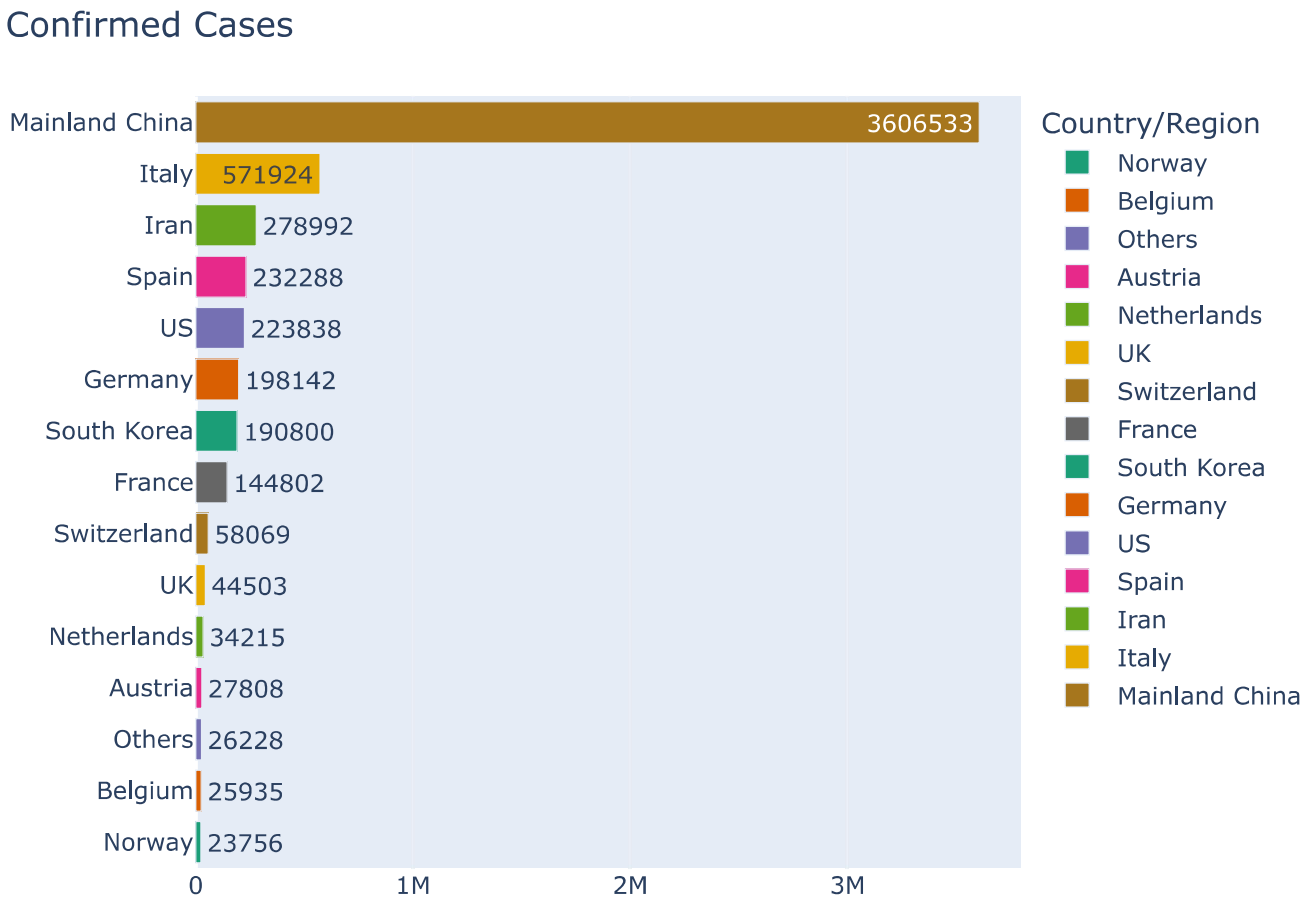


Top 15 Countries

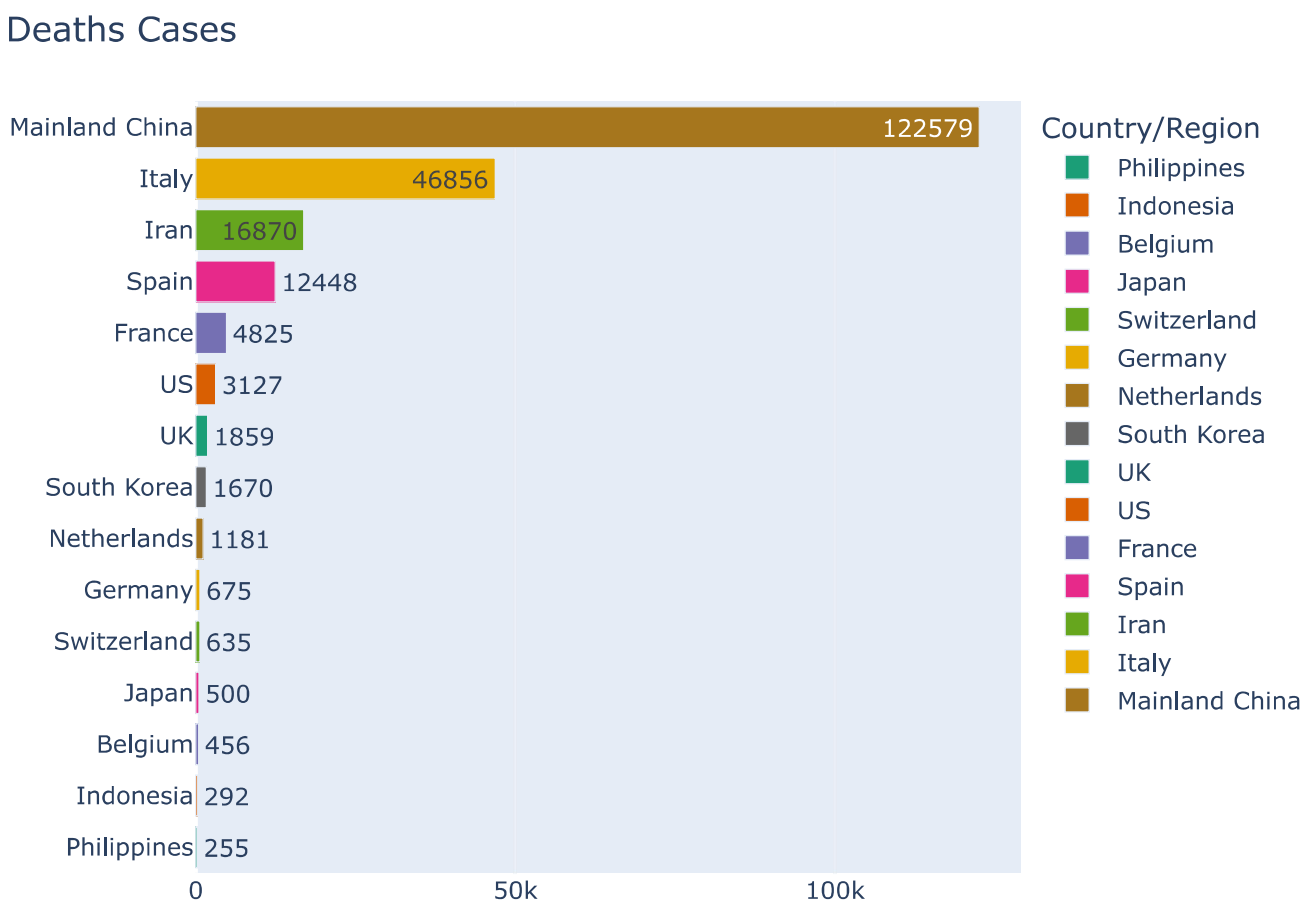
In [36]:
```
def plot_hbar(df, col, n, hover_data=[]):
    fig = px.bar(df.sort_values(col).tail(n),
                 x=col, y="Country/Region", color='Country/Region',
                 text=col, orientation='h', width=700, hover_data=hover_data,
                 color_discrete_sequence = px.colors.qualitative.Dark2)
    fig.update_layout(title=col+' Cases', xaxis_title="", yaxis_title="",
                      yaxis_categoryorder = 'total ascending',
```

```
                      uniformtext_minsize=8, uniformtext_mode='hide')
    fig.show()
```

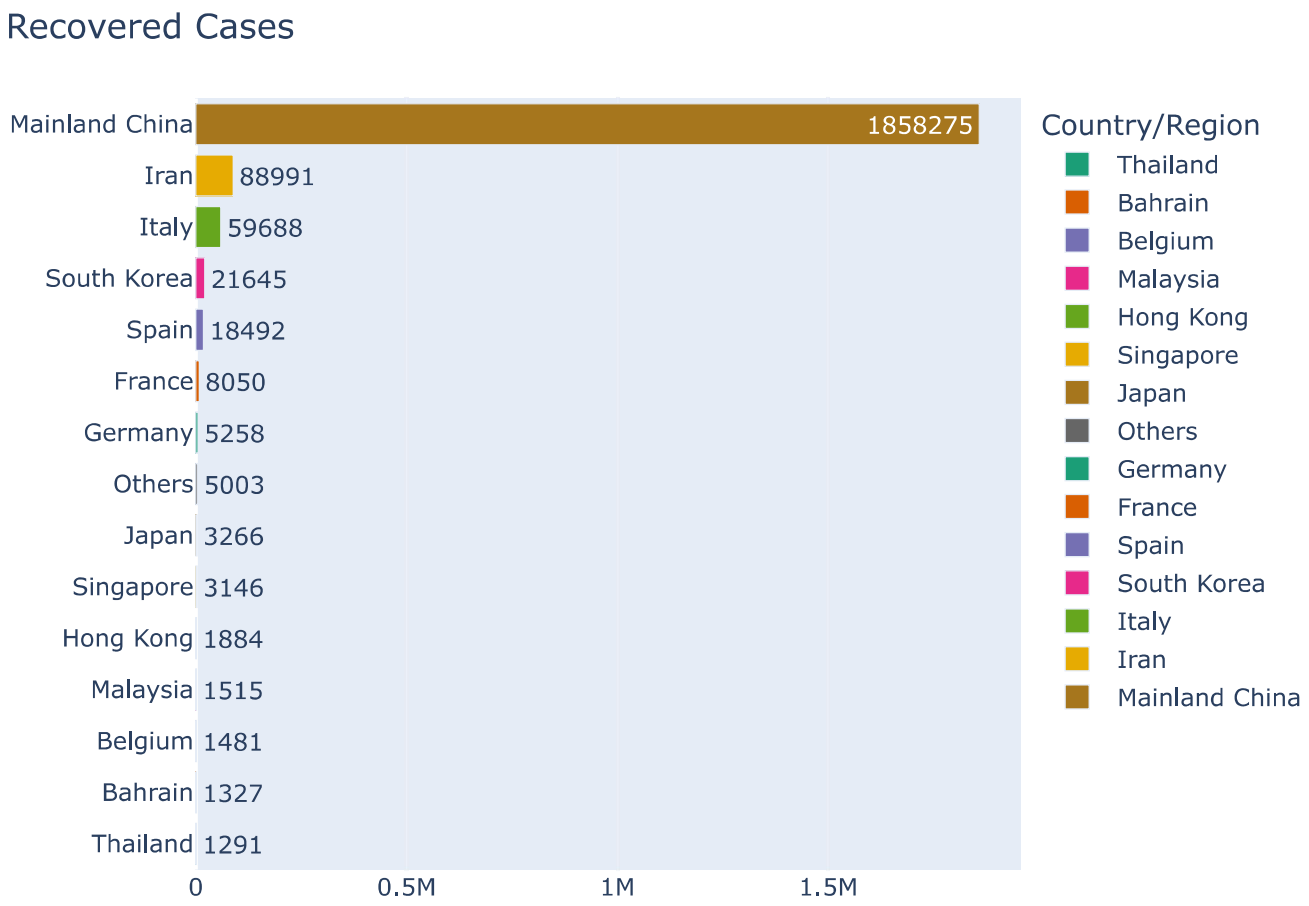
In [37]:
```
plot_hbar(Country_wise, 'Confirmed', 15)
```



In [38]:
```
plot_hbar(Country_wise, 'Deaths', 15)
```



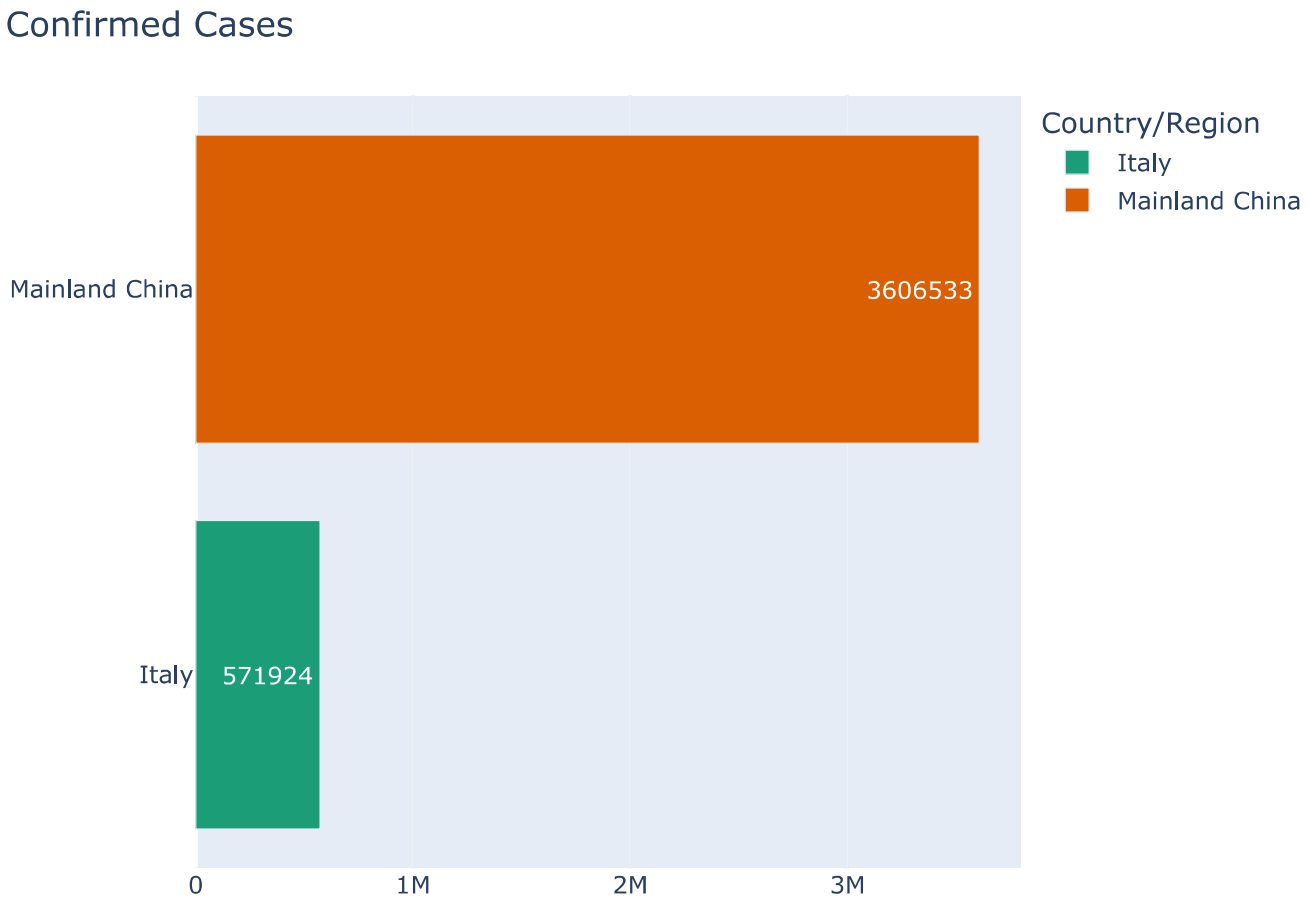
In [39]:
```
plot_hbar(Country_wise, 'Recovered', 15)
```



Solutions

> **Q1) Which is the highest affected area and what is the number. Group from the model, the second highest affected area along with number.**

In [40]:
```
plot_hbar(Country_wise, 'Confirmed', 2)
```



Q2) What is the mortality Vs. recovery ratio.

creating new columns to get the mortality and recovery value for each country

In [41]:
```
def plot_hbar(df, col, n, hover_data=[]):
    fig = px.bar(df.sort_values(col).tail(n),
                 x=col, y="Country/Region", color='Country/Region',
                 text=col, orientation='h', width=700, hover_data=hover_data,
                 color_discrete_sequence = px.colors.qualitative.Dark2)
```

```
    fig.update_layout(title=col+' Ratio', xaxis_title="", yaxis_title="",
                      yaxis_categoryorder = 'total ascending',
                      uniformtext_minsize=8, uniformtext_mode='hide')
    fig.show()
```

In [42]:
```
Country_wise['Mortality']=Country_wise['Deaths']/Country_wise['Confirmed']
```

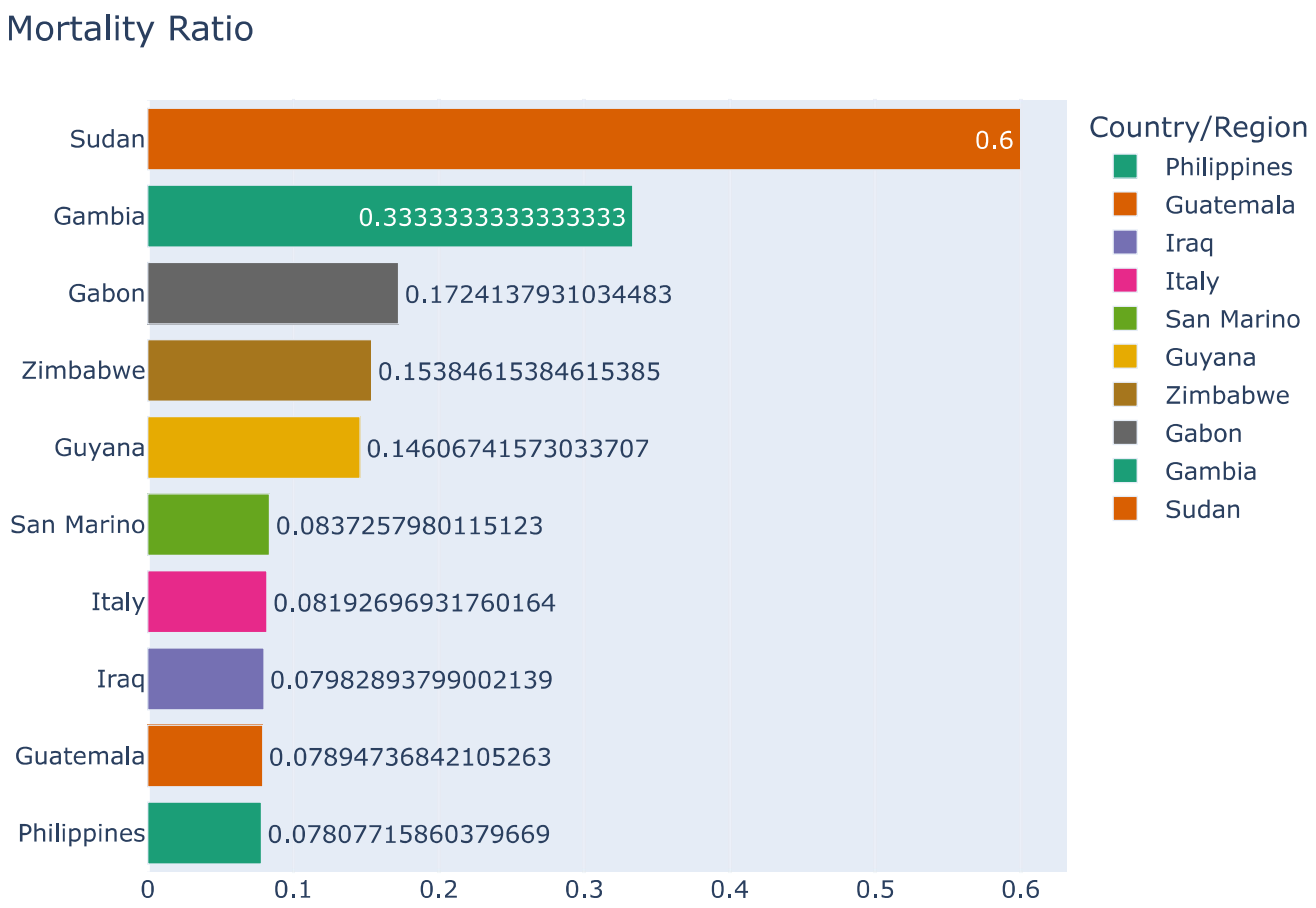
In [ ]:
```

```

In [43]:
```
Country_wise['Recovery']=Country_wise['Recovered']/Country_wise['Confirmed']
```

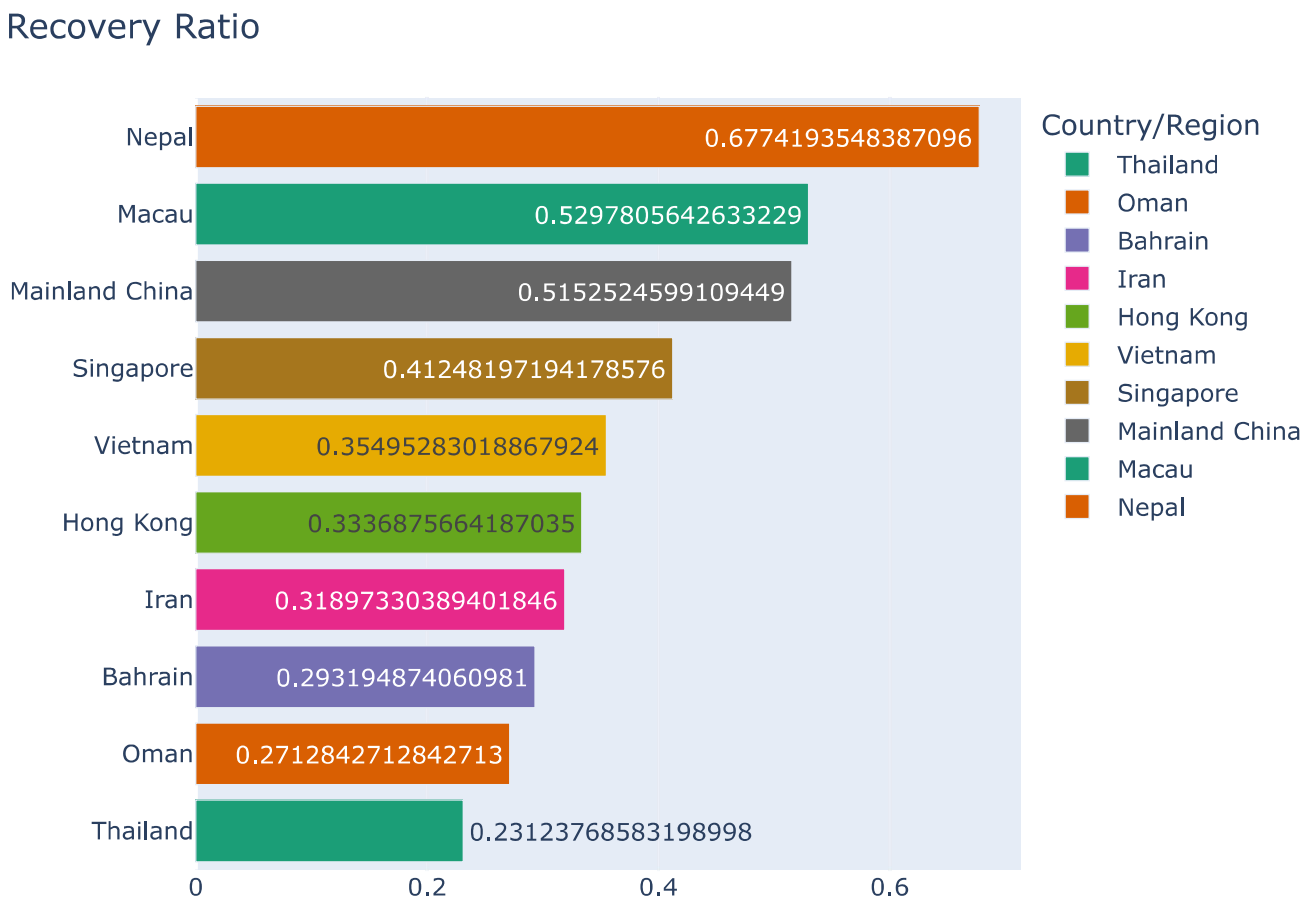
> Mortality Ratio

In [44]:
```
plot_hbar(Country_wise,'Mortality',10)
```



Recovery Ratio

In [45]:
```
plot_hbar(Country_wise,'Recovery',10)
```



Q3) Is there any general tendency towards particular age, gender or random?

For this have to deal with the 2nd Data File

In [46]:
```
df2=pd.read_csv('COVID19_line_list_data_modified (1).csv')
```

In [47]:
```
df2.head(2)
```

Out[47]:

	id	case_in_country	reporting date	Unnamed: 3	summary	location	country	gender	age	symptom_onset	If_onset_approximated	hosp_v
0	1	NaN	1/20/2020	NaN	First confirmed imported COVID-19 pneumonia pa...	Shenzhen, Guangdong	China	male	66.0	1/3/2020	0.0	1
1	2	NaN	1/20/2020	NaN	First confirmed imported COVID-19 pneumonia pa...	Shanghai	China	female	56.0	1/15/2020	0.0	1

In [48]:
```
df2.shape
```

Out[48]:
```
(1085, 19)
```

In [49]:
```
np.sum(df2.isnull())
```

Out[49]:
```
id                        0
case_in_country         197
reporting date            1
Unnamed: 3             1085
summary                   5
location                  0
country                   0
gender                  183
age                     242
symptom_onset           522
If_onset_approximated   525
hosp_visit_date         578
exposure_start          957
exposure_end            744
visiting Wuhan            0
from Wuhan                4
death                     0
recovered                 0
symptom                 815
dtype: int64
```

Data Preprocessing

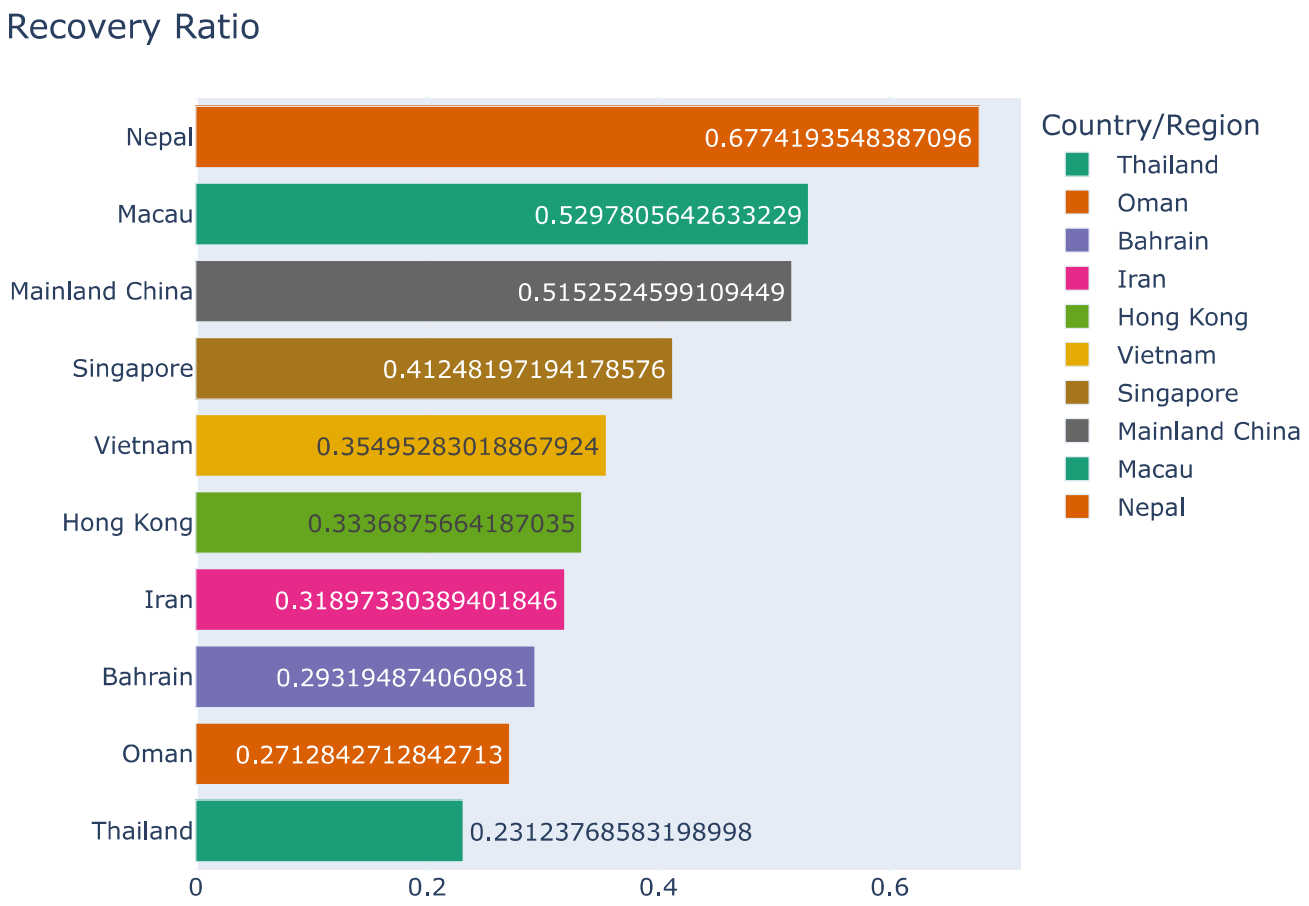
In [50]:
```
df2.drop((['If_onset_approximated','Unnamed: 3','summary','symptom','hosp_visit_date','exposure_start','exposure_end','
```

In [51]:
```
df2.dropna(inplace=True)
```

In [52]:
```
df2.shape
```

Out[52]:
```
(825, 8)
```

In [53]:
```
plot_hbar(Country_wise,'Recovery',10)
```



> Creating dummies

Q3) Is there any general tendency towards particular age, gender or random?

In [54]:
```
Sex=pd.get_dummies(df2['gender'],drop_first=False)
```

In [55]:
```
df2=pd.concat((df2,Sex),axis=1)
```

In [56]:
```
df2['reporting date'] = pd.to_datetime(df2['reporting date'])
```

In [57]:
```
temp = df2[['reporting date','female','male']]
temp = temp.melt(id_vars='reporting date', value_vars=['female','male'])
fig = px.treemap(temp, path=["variable"], values="value", height=300, title='Gender Count',
                 color_discrete_sequence=['black','pink'])
fig.data[0].textinfo = 'label+text+value'
fig.show()
```

Creating new age count dataframe for age representation

In [58]:
```
age_count=df2['age'].value_counts()
```

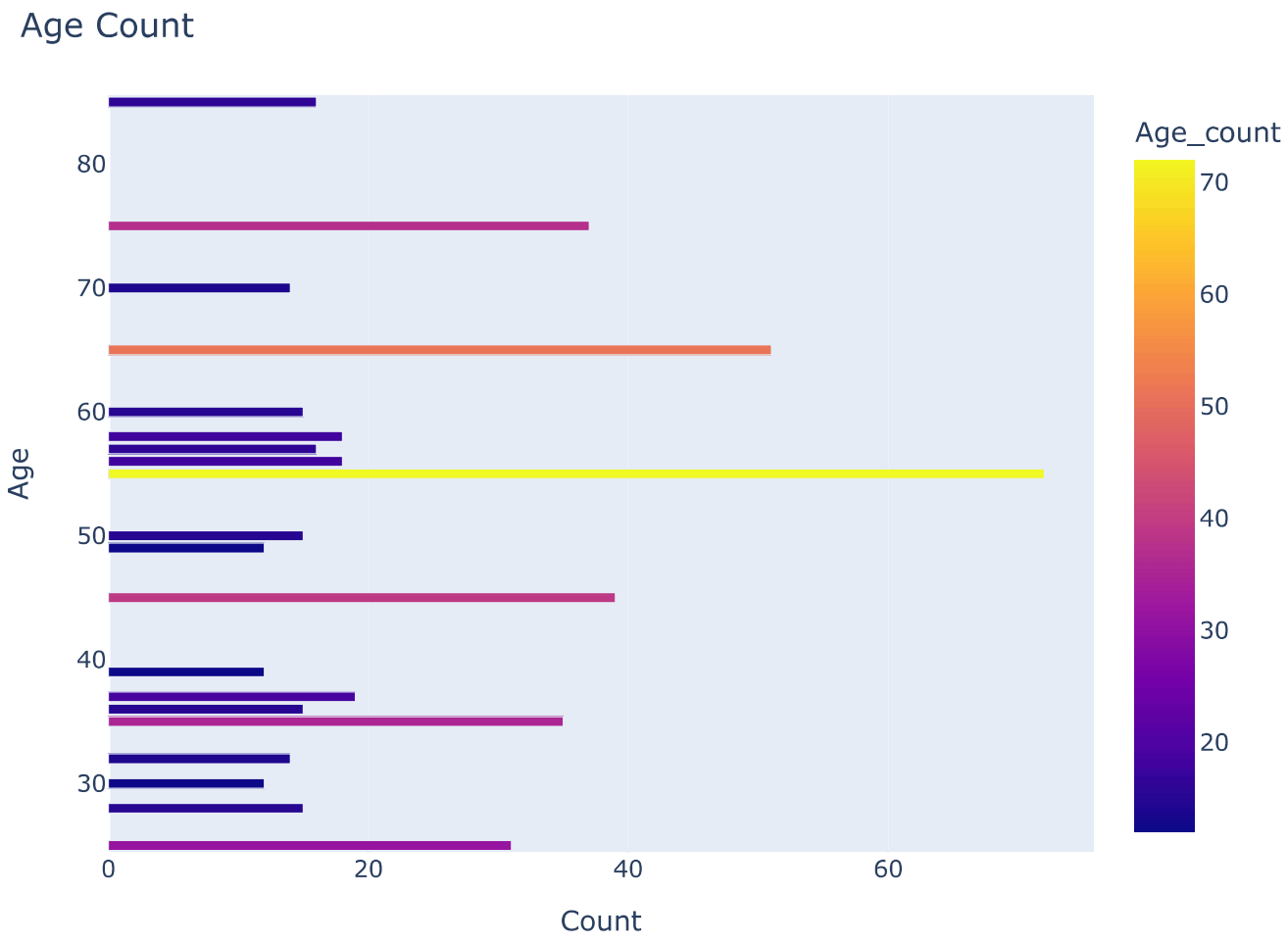
In [59]:
```
df3=pd.DataFrame(age_count)
```

In [60]:
```
df3.reset_index(inplace=True)
df3['Age']=df3['index']
df3['Age_count']=df3['age']
df3.drop(['index','age'],inplace=True,axis=1)
```

In [61]:
```
def plot_hbar(df, col, n, hover_data=[]):
    fig = px.bar(df.sort_values(col).tail(n),
                 x=col, y="Age", color='Age_count',
```

```
                text=col, orientation='h', width=700, hover_data=hover_data,
                color_discrete_sequence = px.colors.qualitative.Dark2)
    fig.update_layout(title='Age Count', xaxis_title="Count", yaxis_title="Age",
                      uniformtext_minsize=8, uniformtext_mode='hide')
    fig.show()
```

In [62]:
```
plot_hbar(df3,'Age_count',20)
```



Q4) What is the mortality rate among different age groups?

> Age_group according to age

In [63]:
```
df2.loc[df2['age']<=19, 'age_group'] = 'teenage'
df2.loc[df2['age'].between(20,24), 'age_group'] = 'yadult'
df2.loc[df2['age'].between(25,39), 'age_group'] = 'adult'
df2.loc[df2['age']>39, 'age_group'] = 'older_adult'
```

In [64]:
```
df2.age_group
```

Out[64]:
```
0       older_adult
1       older_adult
2       older_adult
3       older_adult
4       older_adult
           ...
1027    older_adult
1029          adult
1030          adult
1052    older_adult
1084    older_adult
Name: age_group, Length: 825, dtype: object
```

In [65]:
```
df2.head(10)
```

Out[65]:

	reporting date	location	country	gender	age	visiting Wuhan	death	recovered	female	male	age_group
0	2020-01-20	Shenzhen, Guangdong	China	male	66.0	1	0	0	0	1	older_adult
1	2020-01-20	Shanghai	China	female	56.0	0	0	0	1	0	older_adult
2	2020-01-21	Zhejiang	China	male	46.0	0	0	0	0	1	older_adult
3	2020-01-21	Tianjin	China	female	60.0	1	0	0	1	0	older_adult
4	2020-01-21	Tianjin	China	male	58.0	0	0	0	0	1	older_adult
5	2020-01-21	Chongqing	China	female	44.0	0	0	0	1	0	older_adult
6	2020-01-21	Sichuan	China	male	34.0	0	0	0	0	1	adult
7	2020-01-21	Beijing	China	male	37.0	1	0	0	0	1	adult
8	2020-01-21	Beijing	China	male	39.0	1	0	0	0	1	adult
9	2020-01-21	Beijing	China	male	56.0	1	0	0	0	1	older_adult

> Total numbers of Deaths

In [66]:
```
T_deaths = df.Deaths.count()
```

In [67]:
```
T_deaths
```

Out[67]:
```
8509
```

> Total numbers of Population

In [68]:
```
T_population = df2.gender.count()
```

In [69]:
```
T_population
```

Out[69]:
```
825
```

> Mortality Rate

In [70]:
```
Mortality_rate = ((T_deaths)/ (T_population)) * 100
```

In [71]:
```
Mortality_rate
```

Out[71]:
```
1031.3939393939395
```

In [ ]:
```

```

4) Develop a simple User Interface including all the queries and processes above to make it a functional system.

In [72]:
```
result = pd.concat([df, df2], axis=1)
result
```

Out[72]:

	SNo	ObservationDate	Province/State	Country/Region	Last Update	Confirmed	Deaths	Recovered	reporting date	location	country	g
0	1	2020-01-22	Anhui	Mainland China	1/22/2020 17:00	1	0	0	2020-01-20	Shenzhen, Guangdong	China	
1	2	2020-01-22	Beijing	Mainland China	1/22/2020 17:00	14	0	0	2020-01-20	Shanghai	China	f
2	3	2020-01-22	Chongqing	Mainland China	1/22/2020 17:00	6	0	0	2020-01-21	Zhejiang	China	
3	4	2020-01-22	Fujian	Mainland China	1/22/2020 17:00	1	0	0	2020-01-21	Tianjin	China	f
4	5	2020-01-22	Gansu	Mainland China	1/22/2020 17:00	0	0	0	2020-01-21	Tianjin	China	
...	...	...	...	...	...	...	...	...	...	...	...	
8504	8505	2020-03-24	Wuhan Evacuee	US	3/24/2020 23:41	4	0	0	NaT	NaN	NaN	
8505	8506	2020-03-24	Wyoming	US	3/24/2020 23:41	29	0	0	NaT	NaN	NaN	
8506	8507	2020-03-24	Xinjiang	Mainland China	3/24/2020 23:41	76	3	73	NaT	NaN	NaN	
8507	8508	2020-03-24	Yunnan	Mainland China	3/24/2020 23:41	176	2	172	NaT	NaN	NaN	
8508	8509	2020-03-24	Zhejiang	Mainland China	3/24/2020 23:41	1240	1	1221	NaT	NaN	NaN	

8509 rows × 19 columns

In [75]:
```
from pandasgui import show
gui = show(result)
```

In [ ]:

In [ ]: