7jx5nv7uf

December 22, 2024

[1]:
```
import pandas as pd
```

[2]:
```
import seaborn as sns
```

[3]:
```
from matplotlib.pyplot import show
```

[4]:
```
import matplotlib.pyplot as plt
```

[5]:
```
a=pd.read_csv("C:/Users/suraj/Documents/Python Classes/PV22/covid_19_data.csv")
```

[6]:
```
a.fillna(method='pad',inplace=True)
```

```
C:\Users\suraj\AppData\Local\Temp\ipykernel_15528\3562668113.py:1:
FutureWarning: DataFrame.fillna with 'method' is deprecated and will raise in a
future version. Use obj.ffill() or obj.bfill() instead.
  a.fillna(method='pad',inplace=True)
```

[7]:
```
a.isnull().sum()
```

[7]:
```
SNo                0
ObservationDate    0
Province/State     0
Country/Region     0
Last Update        0
Confirmed          0
Deaths             0
Recovered          0
dtype: int64
```

[9]:
```
# What is the total number of confirmed cases worldwide
a['Confirmed'].sum()
```

[9]:
```
26252051758.0
```

[10]:
```
# How many deaths have been reported globally
a['Deaths'].sum()
```

[10]:
```
624013017.0
```

[11]:
```
# What is the total number of recovered cases worldwide
a['Recovered'].sum()
```

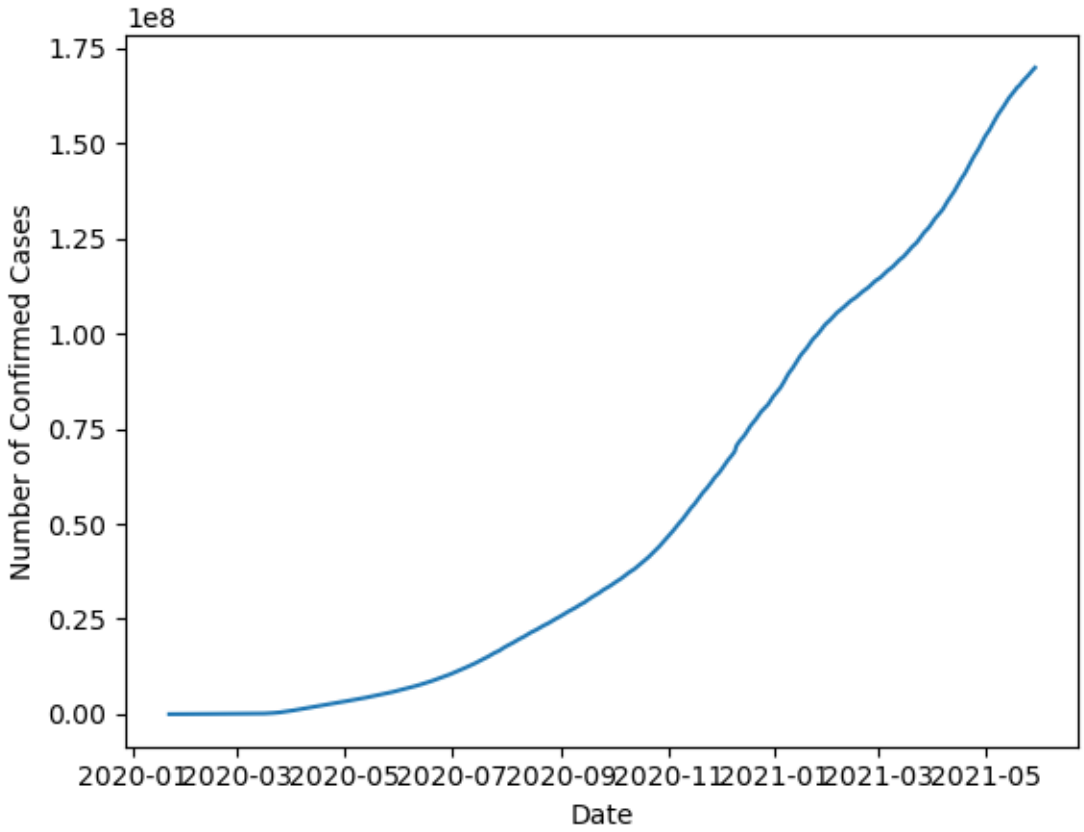
[11]: 15450237912.0

[12]:
```
# How many countries/regions are represented in the dataset
a['Country/Region'].nunique()
```

[12]: 229

[13]:
```
# What is the trend of confirmed cases over time globally
a['ObservationDate'] = pd.to_datetime(a['ObservationDate'])
global_trend = a.groupby('ObservationDate')['Confirmed'].sum().reset_index()
plt.plot(global_trend['ObservationDate'], global_trend['Confirmed'])
plt.xlabel('Date', fontsize=10)
plt.ylabel('Number of Confirmed Cases', fontsize=10)
```

[13]: Text(0, 0.5, 'Number of Confirmed Cases')



[14]:
```
# Which province/state has reported the highest number of confirmed cases
b = a.groupby('Province/State')['Confirmed'].sum().reset_index()
highest = b.loc[b['Confirmed'].idxmax()]
highest
```

[14]:
```
Province/State    Zuid-Holland
Confirmed          7745979414.0
Name: 735, dtype: object
```

[15]:
```
# Which country/region has the highest number of deaths
b = a.groupby('Country/Region')['Deaths'].sum().reset_index()
highest_deaths = b.loc[b['Deaths'].idxmax()]
highest_deaths
```

[15]:
```
Country/Region             US
Deaths             123303762.0
Name: 214, dtype: object
```

[16]:
```
# How does the number of confirmed cases vary across different provinces/states
b = a.groupby('Province/State')['Confirmed'].sum().reset_index()
b = b.sort_values(by='Confirmed', ascending=False)
b
```

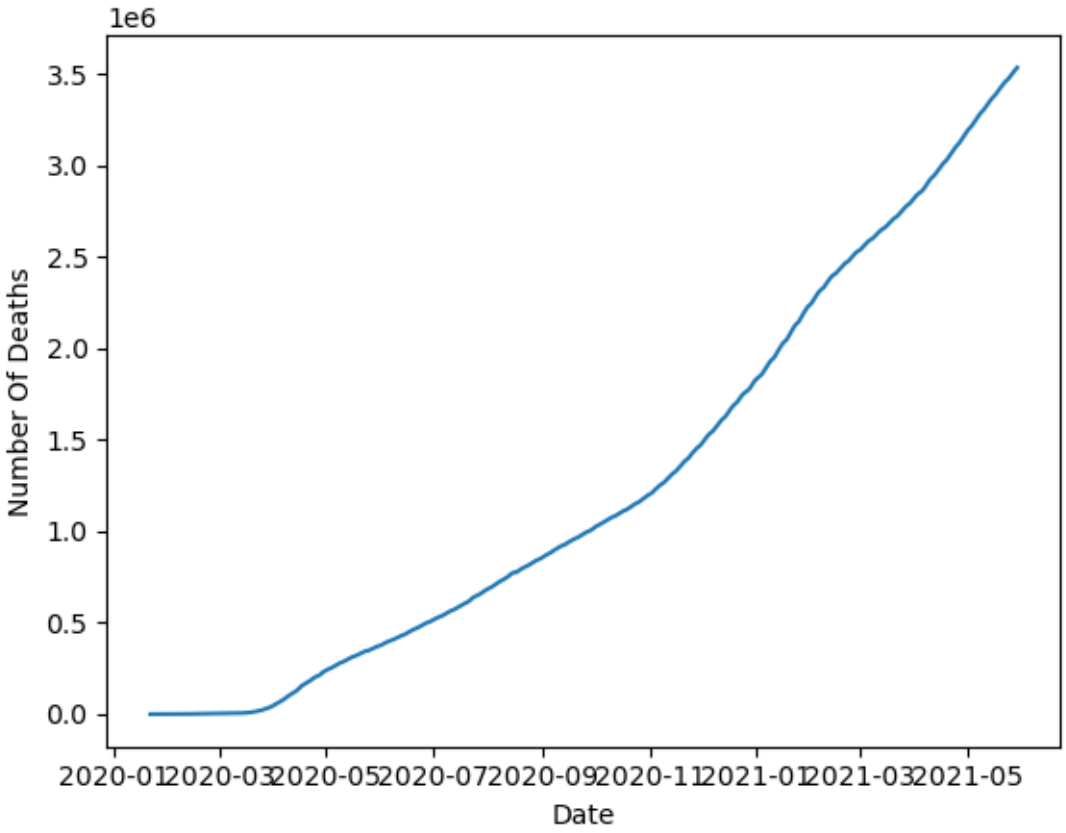
[16]:

	Province/State	Confirmed
735	Zuid-Holland	7.745979e+09
88	California	6.969008e+08
365	Maharashtra	6.811869e+08
171	England	6.662275e+08
630	Texas	5.520409e+08
..	…	…
278	Jervis Bay Territory	0.000000e+00
526	Recovered	0.000000e+00
173	External territories	0.000000e+00
404	Montgomery County, TX	0.000000e+00
17	American Samoa	0.000000e+00

[736 rows x 2 columns]

[17]:
```
# What is the trend of deaths over time globally
a['ObservationDate'] = pd.to_datetime(a['ObservationDate'])
global_trend = a.groupby('ObservationDate')['Deaths'].sum().reset_index()
plt.plot(global_trend['ObservationDate'], global_trend['Deaths'])
plt.xlabel('Date', fontsize=10)
plt.ylabel('Number Of Deaths', fontsize=10)
```

[17]:
```
Text(0, 0.5, 'Number Of Deaths')
```



[18]:
```
# Which country/region has the highest number of recovered cases
b = a.groupby('Country/Region')['Recovered'].sum().reset_index()
highest_recovered = b.loc[b['Recovered'].idxmax()]
highest_recovered
```

[18]:
```
Country/Region           India
Recovered          2900589824.0
Name: 96, dtype: object
```

[19]:
```
# How does the number of recovered cases vary across different countries/regions
b = a.groupby('Country/Region')['Recovered'].sum().reset_index()
b = b.sort_values(by='Recovered', ascending=False)
b
```

[19]:

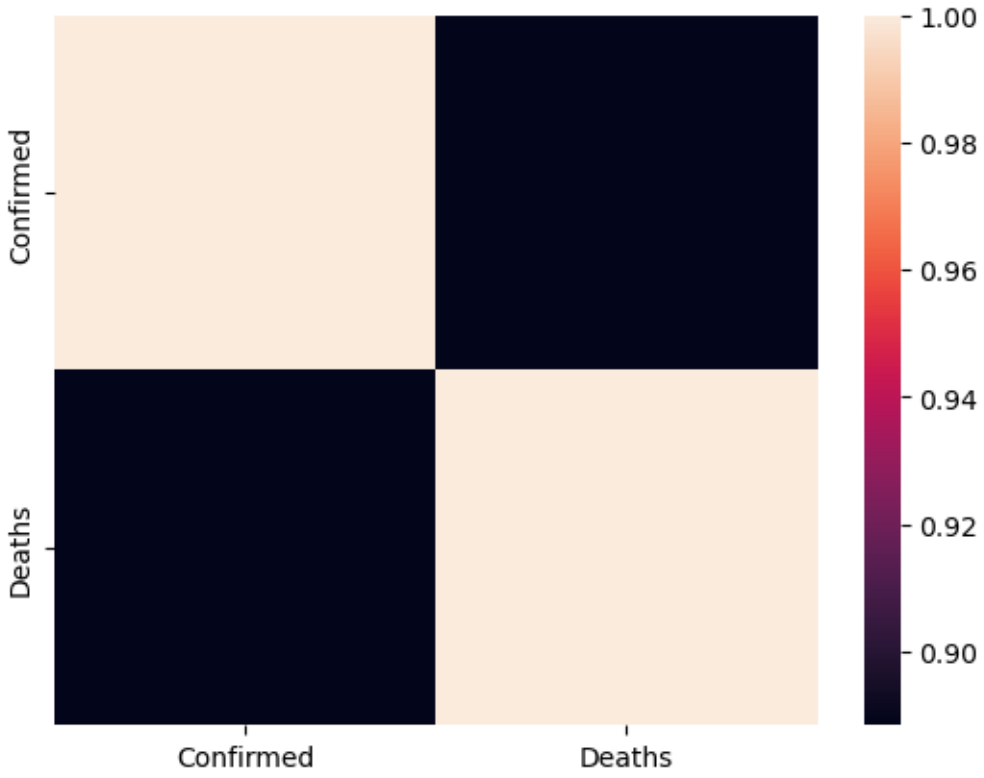
	Country/Region	Recovered
96	India	2.900590e+09
27	Brazil	2.313677e+09
172	Russia	7.907057e+08
212	Turkey	5.641706e+08
214	US	5.033710e+08

```
..                                 …           …
166                       Puerto Rico  0.000000e+00
168               Republic of Ireland  0.000000e+00
169             Republic of the Congo  0.000000e+00
170                           Reunion  0.000000e+00
228  occupied Palestinian territory  0.000000e+00

[229 rows x 2 columns]
```

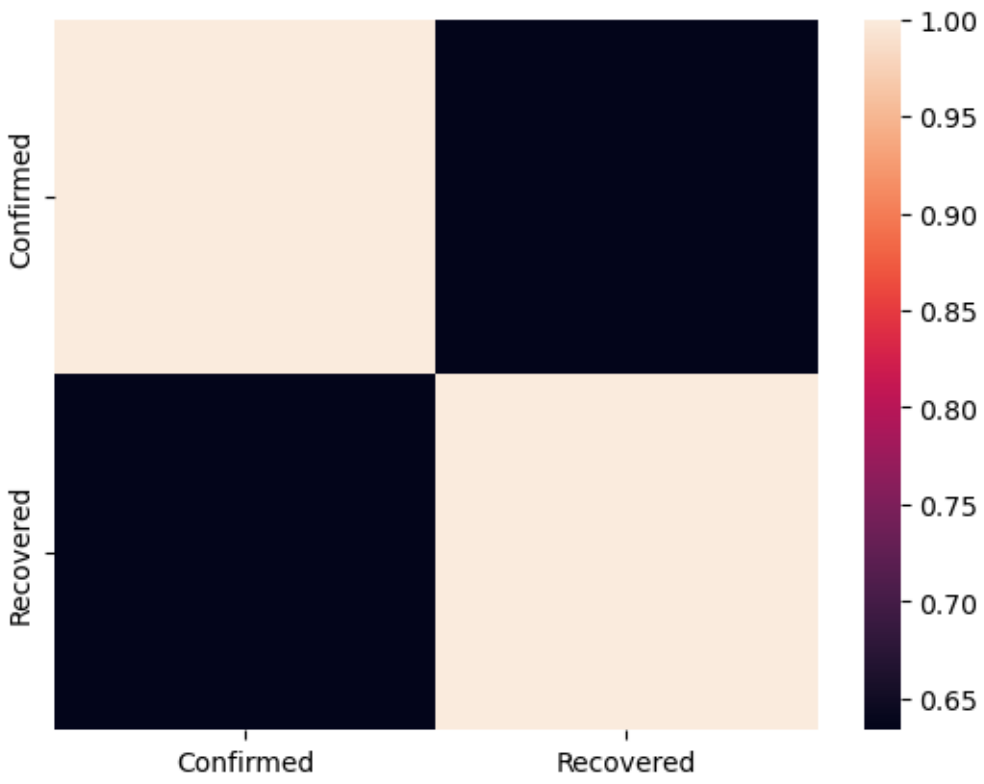
[20]:
```
# Is there a correlation between the number of confirmed cases and deaths
a[['Confirmed','Deaths']].corr()
sns.heatmap(a[['Confirmed','Deaths']].corr())
```

[20]: <Axes: >



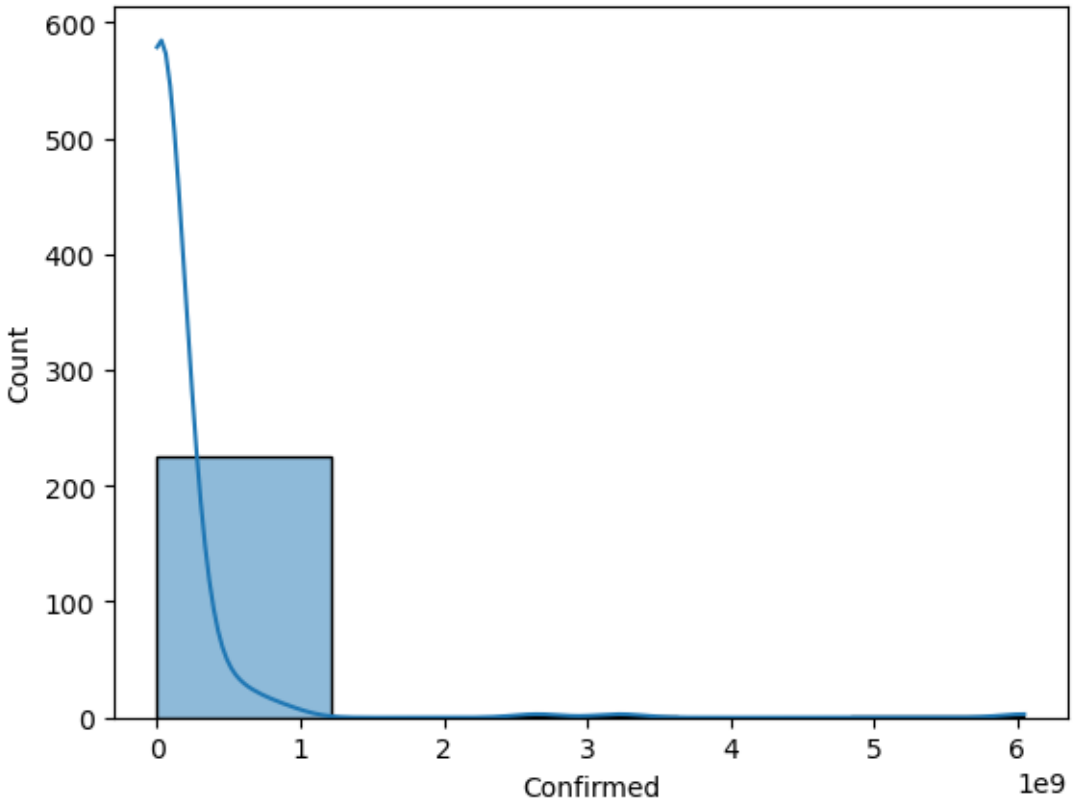
[21]:
```
# Is there a correlation between the number of confirmed cases and recovered␣
 ↪cases
a[['Confirmed','Recovered']].corr()
sns.heatmap(a[['Confirmed','Recovered']].corr())
```

[21]: <Axes: >



[91]:
```
# What is the distribution of confirmed cases by country/region
country_cases = a.groupby('Country/Region')['Confirmed'].sum().reset_index()
sns.histplot(data=country_cases, x='Confirmed', bins=5, kde=True)
```

[91]: <Axes: xlabel='Confirmed', ylabel='Count'>



[81]:
```
# How does the mortality rate vary across different countries/regions
country_data = a.groupby('Country/Region')[['Confirmed', 'Deaths']].sum().
 ↪reset_index()
country_data = country_data[country_data['Confirmed'] > 0]
country_data['Mortality Rate (%)'] = (country_data['Deaths'] /␣
 ↪country_data['Confirmed']) * 100
country_data_sorted = country_data.sort_values(by='Mortality Rate (%)',␣
 ↪ascending=False)
country_data_sorted.head(100)
```

[81]:

	Country/Region	Confirmed	Deaths	Mortality Rate (%)
225	Yemen	962066.0	237613.0	24.698202
123	MS Zaandam	3824.0	848.0	22.175732
220	Vanuatu	406.0	39.0	9.605911
137	Mexico	460463678.0	43005509.0	9.339609
197	Sudan	7632455.0	488709.0	6.403038
..	…	…	…	…
143	Morocco	104557135.0	1823724.0	1.744237
35	Cameroon	11346589.0	197906.0	1.744189
109	Kenya	27728648.0	482736.0	1.740929
12	Austria	97965875.0	1678309.0	1.713157

```
93       Hong Kong    2655935.0     45325.0            1.706555

[100 rows x 4 columns]
```

[89]:
```
# How does the recovery rate vary across different countries/regions
country_data = a.groupby('Country/Region')[['Confirmed', 'Recovered']].sum().
 ↪reset_index()
country_data = country_data[country_data['Confirmed'] > 0]
country_data['Recovery Rate (%)'] = (country_data['Recovered'] /␣
 ↪country_data['Confirmed']) * 100
country_data_sorted = country_data.sort_values(by='Recovery Rate (%)',␣
 ↪ascending=False)
country_data_sorted.head(100)
```

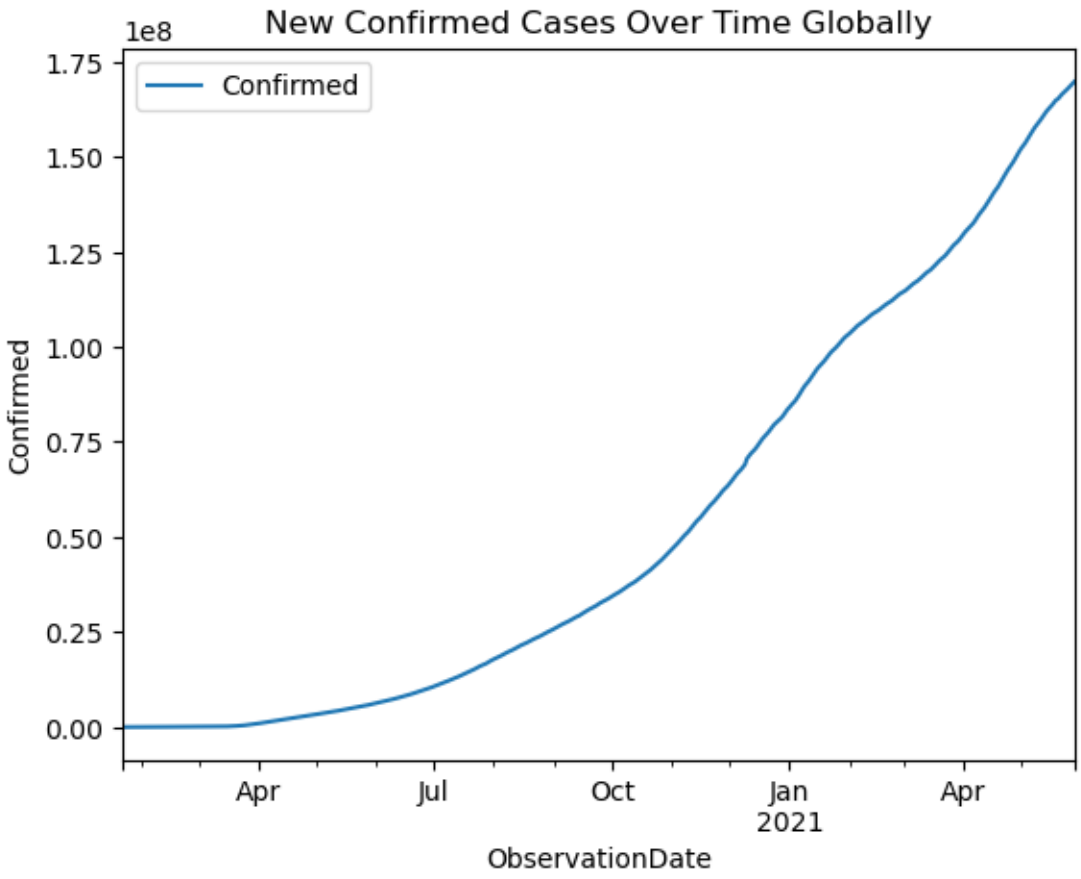
[89]:

	Country/Region	Confirmed	Recovered	Recovery Rate (%)
219	Uzbekistan	22207571.0	21035683.0	94.723025
78	Ghana	20784664.0	19586296.0	94.234364
55	Diamond Princess	306872.0	288580.0	94.039209
138	Micronesia	129.0	121.0	93.798450
95	Iceland	1729527.0	1621682.0	93.764480
..	…	…	…	…
97	Indonesia	265186050.0	226416174.0	85.380122
151	Nigeria	33407947.0	28514090.0	85.351219
150	Niger	1047041.0	892393.0	85.229996
172	Russia	930548849.0	790705716.0	84.971973
165	Portugal	141962632.0	120619045.0	84.965348

[100 rows x 4 columns]

[93]:
```
# What is the trend of new confirmed cases over time globally
a['ObservationDate'] = pd.to_datetime(a['ObservationDate'])
df_grouped = a.groupby('ObservationDate')['Confirmed'].sum().reset_index()
df_grouped.sort_values('ObservationDate')
df_grouped.plot(x='ObservationDate', y='Confirmed', title='New Confirmed Cases␣
 ↪Over Time Globally', xlabel='ObservationDate', ylabel='Confirmed')
```

[93]:
```
<Axes: title={'center': 'New Confirmed Cases Over Time Globally'},
xlabel='ObservationDate', ylabel='Confirmed'>
```



[95]:
```
# How does the fatality rate vary across different provinces/states
country_data = a.groupby('Province/State')[['Confirmed', 'Deaths']].sum().
 ↪reset_index()
country_data = country_data[country_data['Confirmed'] > 0]
country_data['Mortality Rate (%)'] = (country_data['Deaths'] /␣
 ↪country_data['Confirmed']) * 100
country_data_sorted = country_data.sort_values(by='Mortality Rate (%)',␣
 ↪ascending=False)
country_data_sorted.head(100)
```

[95]:

	Province/State	Confirmed	Deaths	Mortality Rate (%)
668	Unknown	8022663.0	4258506.0	53.080953
568	Santa Rosa County, FL	5.0	2.0	40.000000
338	Lee County, FL	6.0	2.0	33.333333
213	Grant County, WA	5.0	1.0	20.000000
52	Baja California	10661120.0	1808573.0	16.964193
..	…	…	…	…
492	Perm Krai	9426150.0	341592.0	3.623876
601	Sormland	3171168.0	114559.0	3.612518

```
171                England  666227518.0  24042130.0           3.608697
95                 Caqueta    4000046.0    144258.0           3.606409
287                  Junin   10474345.0    372782.0           3.559001

[100 rows x 4 columns]
```

[97]:
```
# How does the recovery rate vary across different provinces/states
country_data = a.groupby('Province/State')[['Confirmed', 'Recovered']].sum().
 ↪reset_index()
country_data = country_data[country_data['Confirmed'] > 0]
country_data['Recovery Rate (%)'] = (country_data['Recovered'] /␣
 ↪country_data['Confirmed']) * 100
country_data_sorted = country_data.sort_values(by='Recovery Rate (%)',␣
 ↪ascending=False)
country_data_sorted.head(100)
```

[97]:
```
                                  Province/State   Confirmed    Recovered  \
656                                           US         5.0        532.0
668                                      Unknown   8022663.0  619498477.0
527                        Repatriated Travellers      2431.0       2431.0
549  Saint Helena, Ascension and Tristan da Cunha       882.0        863.0
494                                        Piaui  46545813.0   45137476.0
..                                           …         …          …
81                          Bryansk Oblast         7290010.0    6680312.0
246                              Hong Kong         2657986.0    2434024.0
698                         Voronezh Oblast        14490195.0   13267047.0
178              Falkland Islands (Malvinas)        11512.0      10533.0
194                                   Fujian       217053.0     198430.0

     Recovery Rate (%)
656       10640.000000
668        7721.855910
527         100.000000
549          97.845805
494          96.974299
..                 …
81           91.636527
246          91.573996
698          91.558789
178          91.495830
194          91.420068

[100 rows x 4 columns]
```

[115]:
```
# What is the trend of Recovered cases over time globally
a['ObservationDate'] = pd.to_datetime(a['ObservationDate'])
global_trend = a.groupby('ObservationDate')['Recovered'].sum().reset_index()
```

```
plt.plot(global_trend['ObservationDate'], global_trend['Recovered'])
plt.title('Trend of Recovered Cases Over Time Globally')
plt.xlabel('Date', fontsize=10)
plt.ylabel('Number of Recovered Cases', fontsize=10)
```

[115]: Text(0, 0.5, 'Number of Recovered Cases')