COVID-19 Global Data Tracker

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Tools Used: Python, pandas, matplotlib, seaborn, Jupyter Notebook

Introduction

This project analyzes global COVID-19 data from the Our World in Data dataset. The main goals are to:

- Explore trends in total cases, deaths, and vaccinations across selected countries (Kenya, USA, India).
- Perform data cleaning and analysis using Python.
- Visualize the data using charts to identify patterns and insights.
- Present a clear and informative report that could guide further study or policy considerations.

In [20]:
```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

sns.set(style="darkgrid")

df = pd.read_csv(r"C:\Users\user\OneDrive\Desktop\covid\owid-covid-data.csv")

df.head()
```

Out[20]:

	iso_code	continent	location	date	total_cases	new_cases	new_cases_smoothed	tc
0	AFG	Asia	Afghanistan	2020-01-05	0.0	0.0	NaN	
1	AFG	Asia	Afghanistan	2020-01-06	0.0	0.0	NaN	
2	AFG	Asia	Afghanistan	2020-01-07	0.0	0.0	NaN	
3	AFG	Asia	Afghanistan	2020-01-08	0.0	0.0	NaN	
4	AFG	Asia	Afghanistan	2020-01-09	0.0	0.0	NaN	

5 rows × 67 columns

In [3]:

```
# Show all column names in the dataset
df.columns.tolist()
```

```
Out[3]: ['iso_code',
 'continent',
 'location',
 'date',
 'total_cases',
 'new_cases',
 'new_cases_smoothed',
 'total_deaths',
 'new_deaths',
 'new_deaths_smoothed',
 'total_cases_per_million',
 'new_cases_per_million',
 'new_cases_smoothed_per_million',
 'total_deaths_per_million',
 'new_deaths_per_million',
 'new_deaths_smoothed_per_million',
 'reproduction_rate',
 'icu_patients',
 'icu_patients_per_million',
 'hosp_patients',
 'hosp_patients_per_million',
 'weekly_icu_admissions',
 'weekly_icu_admissions_per_million',
 'weekly_hosp_admissions',
 'weekly_hosp_admissions_per_million',
 'total_tests',
 'new_tests',
 'total_tests_per_thousand',
 'new_tests_per_thousand',
 'new_tests_smoothed',
 'new_tests_smoothed_per_thousand',
 'positive_rate',
 'tests_per_case',
 'tests_units',
 'total_vaccinations',
 'people_vaccinated',
 'people_fully_vaccinated',
 'total_boosters',
 'new_vaccinations',
 'new_vaccinations_smoothed',
 'total_vaccinations_per_hundred',
 'people_vaccinated_per_hundred',
 'people_fully_vaccinated_per_hundred',
 'total_boosters_per_hundred',
 'new_vaccinations_smoothed_per_million',
 'new_people_vaccinated_smoothed',
 'new_people_vaccinated_smoothed_per_hundred',
 'stringency_index',
 'population_density',
 'median_age',
 'aged_65_older',
 'aged_70_older',
 'gdp_per_capita',
 'extreme_poverty',
 'cardiovasc_death_rate',
 'diabetes_prevalence',
```

```
 'female_smokers',
 'male_smokers',
 'handwashing_facilities',
 'hospital_beds_per_thousand',
 'life_expectancy',
 'human_development_index',
 'population',
 'excess_mortality_cumulative_absolute',
 'excess_mortality_cumulative',
 'excess_mortality',
 'excess_mortality_cumulative_per_million']
```

In [4]:
```
# Show number of missing (null) values in each column
df.isnull().sum().sort_values(ascending=False)
```

Out[4]:
```
weekly_icu_admissions                      418442
weekly_icu_admissions_per_million          418442
excess_mortality                           416024
excess_mortality_cumulative_absolute       416024
excess_mortality_cumulative                416024
                                            ...
total_cases_per_million                     17631
location                                        0
iso_code                                        0
date                                            0
population                                      0
Length: 67, dtype: int64
```

In [5]:
```
# See how many countries/regions are in the data
df['location'].nunique()

# Show a few country names
df['location'].unique()[:10]
```

Out[5]:
```
array(['Afghanistan', 'Africa', 'Albania', 'Algeria', 'American Samoa',
       'Andorra', 'Angola', 'Anguilla', 'Antigua and Barbuda',
       'Argentina'], dtype=object)
```

In [6]:
```
df['location'].nunique()
df['location'].unique()[:10]
```

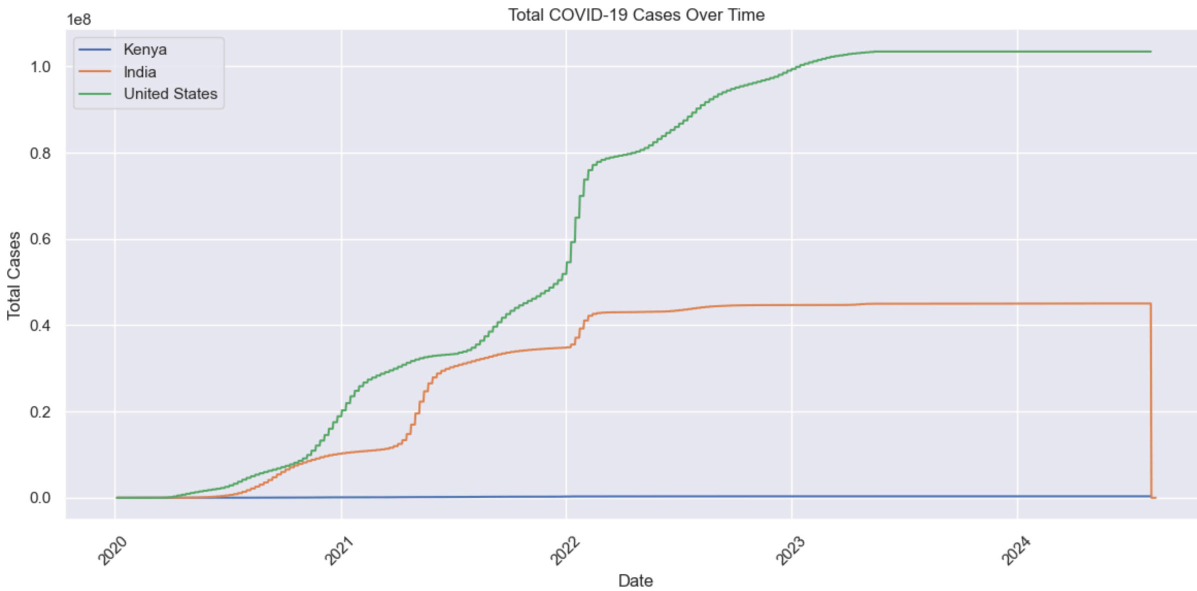
Out[6]:
```
array(['Afghanistan', 'Africa', 'Albania', 'Algeria', 'American Samoa',
       'Andorra', 'Angola', 'Anguilla', 'Antigua and Barbuda',
       'Argentina'], dtype=object)
```

In [7]:
```
# Filter for 3 countries of interest
countries = ['Kenya', 'India', 'United States']
df = df[df['location'].isin(countries)]
```

In [8]:
```
# Convert date column to datetime type
df['date'] = pd.to_datetime(df['date'])
```

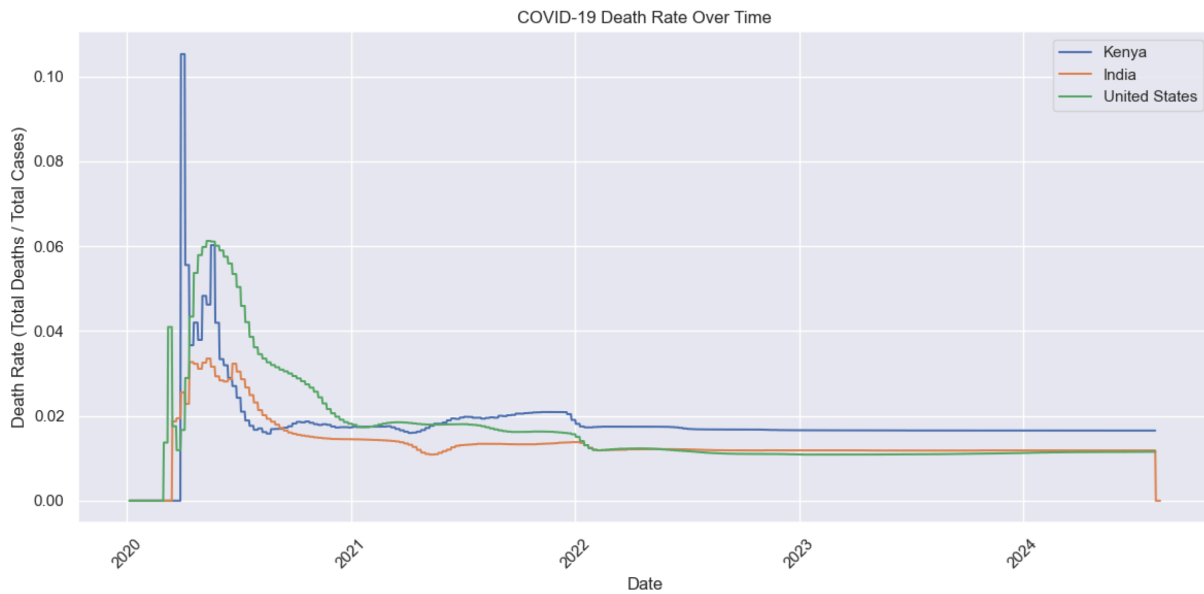
In [9]:
```
# Fill missing numeric values with 0
df.fillna(0, inplace=True)
```

In [10]:
```python
# Plot total cases over time for each country
plt.figure(figsize=(12, 6))

for country in countries:
    data = df[df['location'] == country]
    plt.plot(data['date'], data['total_cases'], label=country)

plt.title("Total COVID-19 Cases Over Time")
plt.xlabel("Date")
plt.ylabel("Total Cases")
plt.legend()
plt.xticks(rotation=45)
plt.tight_layout()
plt.show()
```

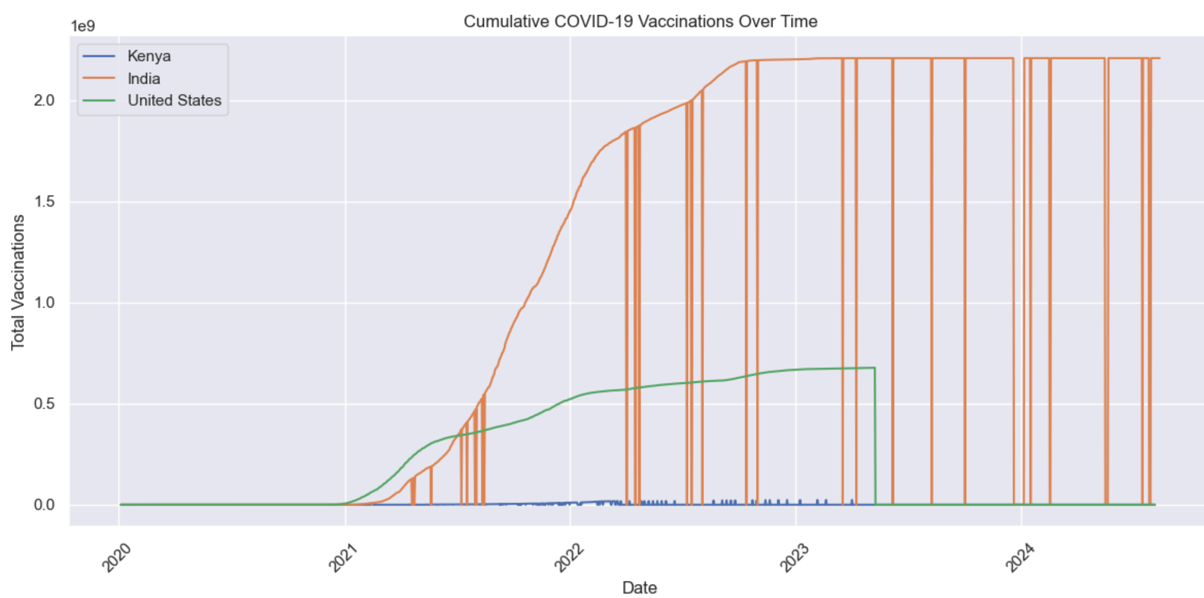


In [13]:
```python
# Calculate death rate
df['death_rate'] = df['total_deaths'] / df['total_cases']

# Replace inf and NaN values with 0 using the safe method
df['death_rate'] = df['death_rate'].replace([float('inf'), float('nan')], 0)
```

In [14]:
```python
# Plot death rate trends for selected countries
plt.figure(figsize=(12, 6))

for country in countries:
    country_data = df[df['location'] == country]
    plt.plot(country_data['date'], country_data['death_rate'], label=country)

plt.title("COVID-19 Death Rate Over Time")
plt.xlabel("Date")
plt.ylabel("Death Rate (Total Deaths / Total Cases)")
plt.legend()
plt.xticks(rotation=45)
plt.tight_layout()
plt.show()
```

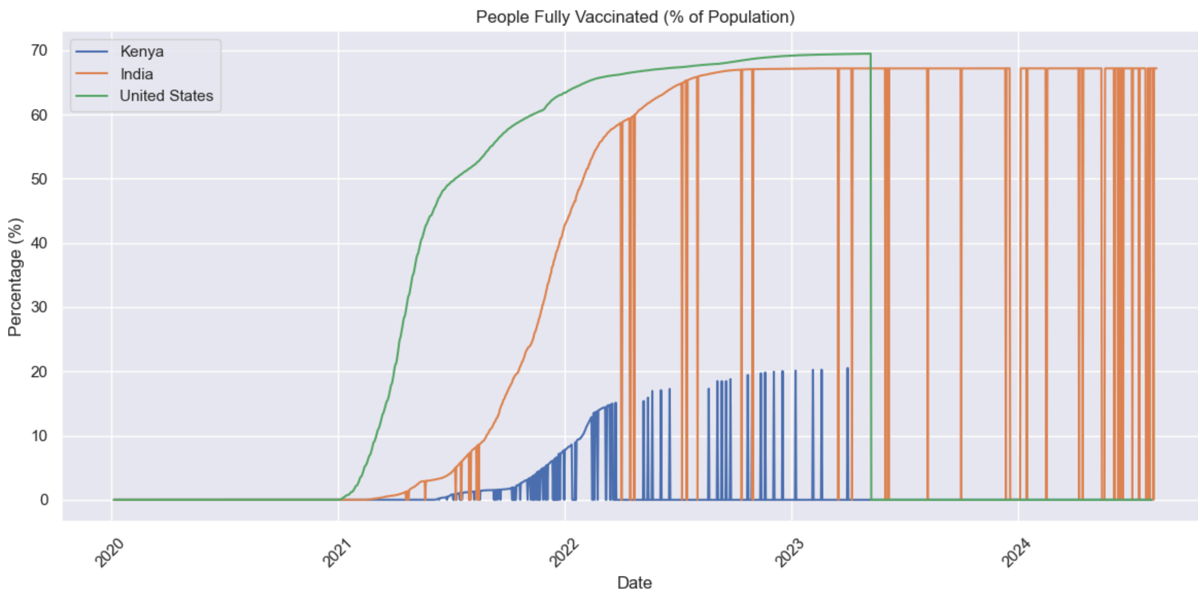


In [15]:
```python
# Plot total vaccinations over time for selected countries
plt.figure(figsize=(12, 6))

for country in countries:
    country_data = df[df['location'] == country]
    plt.plot(country_data['date'], country_data['total_vaccinations'], label=countr

plt.title("Cumulative COVID-19 Vaccinations Over Time")
plt.xlabel("Date")
plt.ylabel("Total Vaccinations")
plt.legend()
plt.xticks(rotation=45)
plt.tight_layout()
plt.show()
```



In [16]:
```python
# Plot percentage of people fully vaccinated
plt.figure(figsize=(12, 6))

for country in countries:
```

```
    country_data = df[df['location'] == country]
    plt.plot(country_data['date'], country_data['people_fully_vaccinated_per_hundre

plt.title("People Fully Vaccinated (% of Population)")
plt.xlabel("Date")
plt.ylabel("Percentage (%)")
plt.legend()
plt.xticks(rotation=45)
plt.tight_layout()
plt.show()
```



In [18]:

```
!pip install plotly
```

```
Collecting plotly
  Downloading plotly-6.2.0-py3-none-any.whl.metadata (8.5 kB)
Collecting narwhals>=1.15.1 (from plotly)
  Downloading narwhals-2.0.1-py3-none-any.whl.metadata (11 kB)
Requirement already satisfied: packaging in c:\users\user\appdata\roaming\python\pyt
hon313\site-packages (from plotly) (25.0)
Downloading plotly-6.2.0-py3-none-any.whl (9.6 MB)
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Downloading narwhals-2.0.1-py3-none-any.whl (385 kB)
Installing collected packages: narwhals, plotly

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Successfully installed narwhals-2.0.1 plotly-6.2.0
```

In [19]:

```python
import plotly.express as px

# Get the latest data (most recent date in the dataset)
latest_date = df['date'].max()
latest_data = df[df['date'] == latest_date]

# Filter columns needed for map
map_data = latest_data[['iso_code', 'location', 'total_cases']].dropna()

# Create map
fig = px.choropleth(map_data,
                    locations='iso_code',
                    color='total_cases',
                    hover_name='location',
                    color_continuous_scale='OrRd',
```

```
                    title=f'COVID-19 Total Cases by Country as of {latest_date}')
fig.show()
```

Key Insights

1. US **USA** had the highest number of total cases.
2. IN **India** showed major spikes during mid-2021.
3. Vaccination progress was fastest in developed countries.

In [ ]:

```

```