COVID19_Global_Tracker

May 18, 2025

[27]:

```
# Step 1: Data Collection, Data Loading & Exploration
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import plotly.express as px
import pandas as pd

# Show plots inside the notebook
%matplotlib inline

# Load the dataset
df = pd.read_csv("owid-covid-data.csv")

# Display shape and column names
print("Shape:", df.shape)
print("Columns:", df.columns.tolist())

# Preview the dataset
df.head()

# Step 2: Data overview and missing values
df.info()
df.describe()
df.isnull().sum()


# Step 3: Data Cleaning

# Filter selected countries and make a copy to avoid SettingWithCopyWarning
countries = ['Kenya', 'United States', 'India']
df_filtered = df[df['location'].isin(countries)].copy()

# Convert date to datetime format
df_filtered['date'] = pd.to_datetime(df_filtered['date'])

# Fill missing values for selected columns
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cols_to_fill = ['total_cases', 'total_deaths', 'new_cases', 'new_deaths',␣
 ↪'total_vaccinations']
df_filtered[cols_to_fill] = df_filtered[cols_to_fill].fillna(0)


# Step 4: Exploratory Data Analysis EDA
#- i. Total cases over time
plt.figure(figsize=(12,6))
for country in countries:
    country_data = df_filtered[df_filtered['location'] == country]
    plt.plot(country_data['date'], country_data['total_cases'], label=country)
plt.title("Total COVID-19 Cases Over Time")
plt.xlabel("Date")
plt.ylabel("Total Cases")
plt.legend()
plt.show()


#Step 6: Optional: Build a Choropleth Map
# Drop rows with missing iso_code or total_cases
df = df[['location', 'iso_code', 'date', 'total_cases']]
df = df.dropna(subset=['iso_code', 'total_cases'])

# Convert date to datetime
df['date'] = pd.to_datetime(df['date'])

# Get the latest date available in the dataset
latest_date = df['date'].max()
print("Latest Date in Dataset:", latest_date)

# Filter for the latest data only
latest_df = df[df['date'] == latest_date]

# Remove aggregates like 'World', 'Africa', etc. (optional but recommended)
latest_df = latest_df[latest_df['iso_code'].str.len() == 3]
# Plot Choropleth Map
fig = px.choropleth(
    latest_df,
    locations="iso_code",
    color="total_cases",
    hover_name="location",
    color_continuous_scale="Reds",
    title=f"Total COVID-19 Cases by Country as of {latest_date.date()}",
    projection="natural earth"
)

fig.show()
```

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# ii. Total deaths over time
plt.figure(figsize=(12,6))
for country in countries:
    country_data = df_filtered[df_filtered['location'] == country]
    plt.plot(country_data['date'], country_data['total_deaths'], label=country)
plt.title("Total COVID-19 Deaths Over Time")
plt.xlabel("Date")
plt.ylabel("Total Deaths")
plt.legend()
plt.show()

#  iii. Daily new cases
plt.figure(figsize=(12,6))
for country in countries:
    country_data = df_filtered[df_filtered['location'] == country]
    plt.plot(country_data['date'], country_data['new_cases'], label=country)
plt.title("Daily New COVID-19 Cases")
plt.xlabel("Date")
plt.ylabel("New Cases")
plt.legend()
plt.show()

# iv. Death rate per time
# Calculate death rate
df_filtered['death_rate'] = df_filtered['total_deaths'] /␣
 ↪df_filtered['total_cases']
df_filtered['death_rate'] = df_filtered['death_rate'].fillna(0)  # Handle NaNs

# Plot death rate over time
plt.figure(figsize=(12,6))
for country in countries:
    country_data = df_filtered[df_filtered['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")
plt.legend()
plt.show()

# v.  People vaccinated per time
#Check if available
print(df_filtered.columns)

# Column is available
if 'people_vaccinated_per_hundred' in df_filtered.columns:
    plt.figure(figsize=(12,6))
    for country in countries:
        country_data = df_filtered[df_filtered['location'] == country]
        plt.plot(country_data['date'],␣
 ↪country_data['people_vaccinated_per_hundred'], label=country)
    plt.title("Percentage of People Vaccinated Over Time")
    plt.xlabel("Date")
    plt.ylabel("% Vaccinated")
    plt.legend()
    plt.show()

# Step 5: Visualizing Vaccination Progress
plt.figure(figsize=(12,6))
for country in countries:
    country_data = df_filtered[df_filtered['location'] == country]
    plt.plot(country_data['date'], country_data['total_vaccinations'],␣
 ↪label=country)
plt.title("Total Vaccinations Over Time")
plt.xlabel("Date")
plt.ylabel("Total Vaccinations")
plt.legend()
plt.show()

# Step 6: Insights & Reporting
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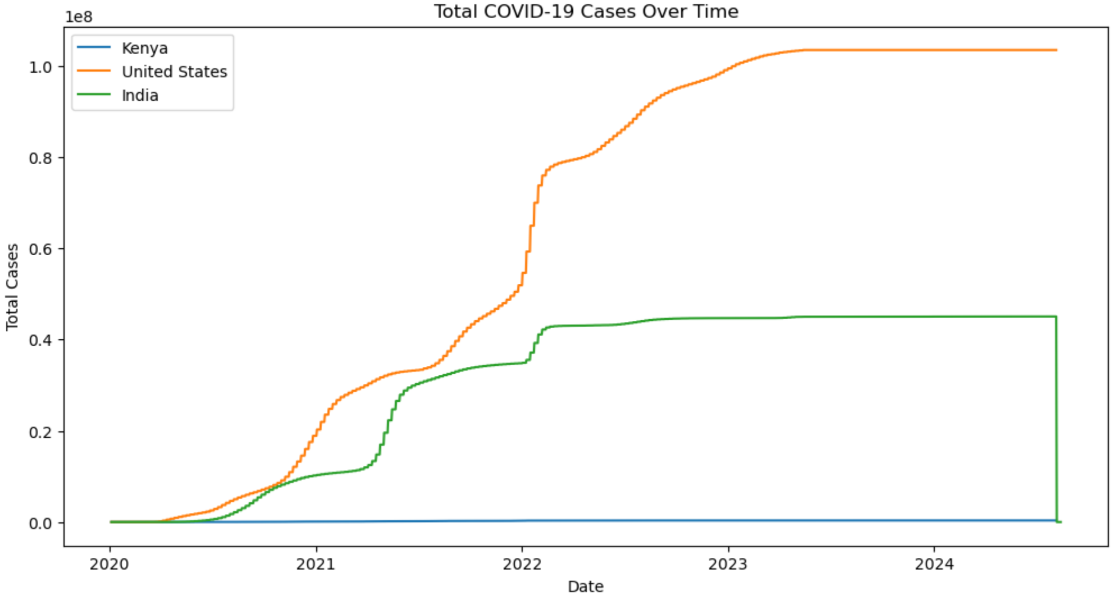
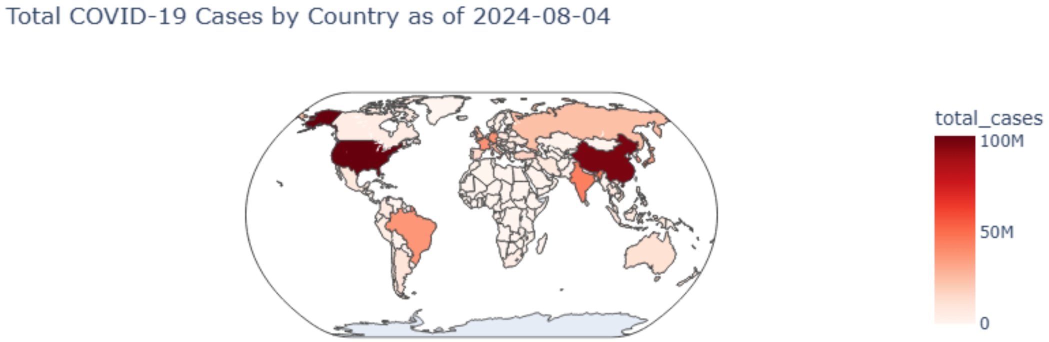
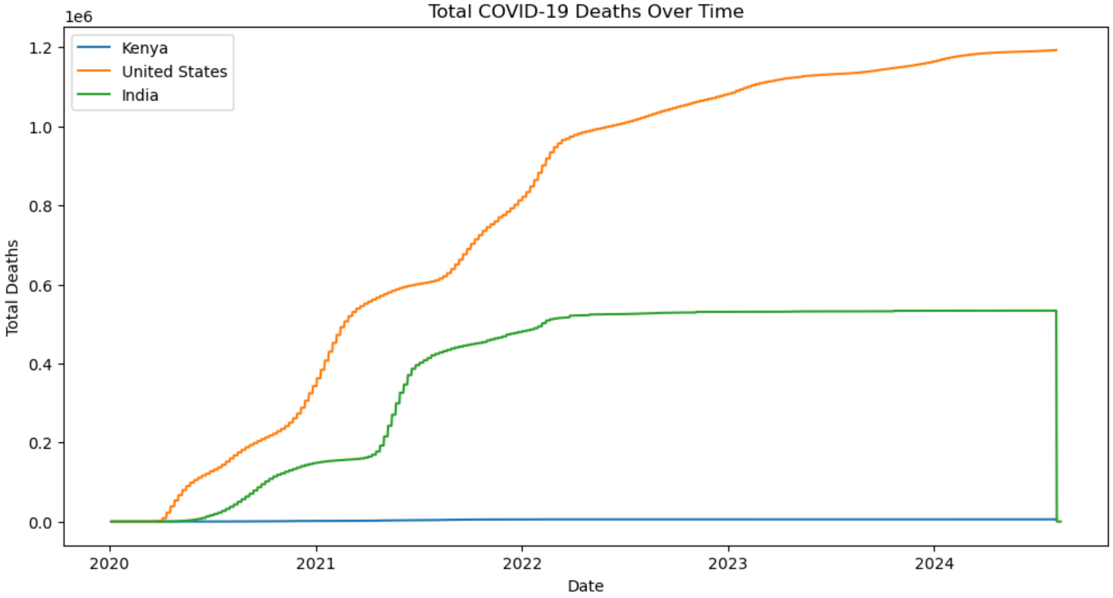
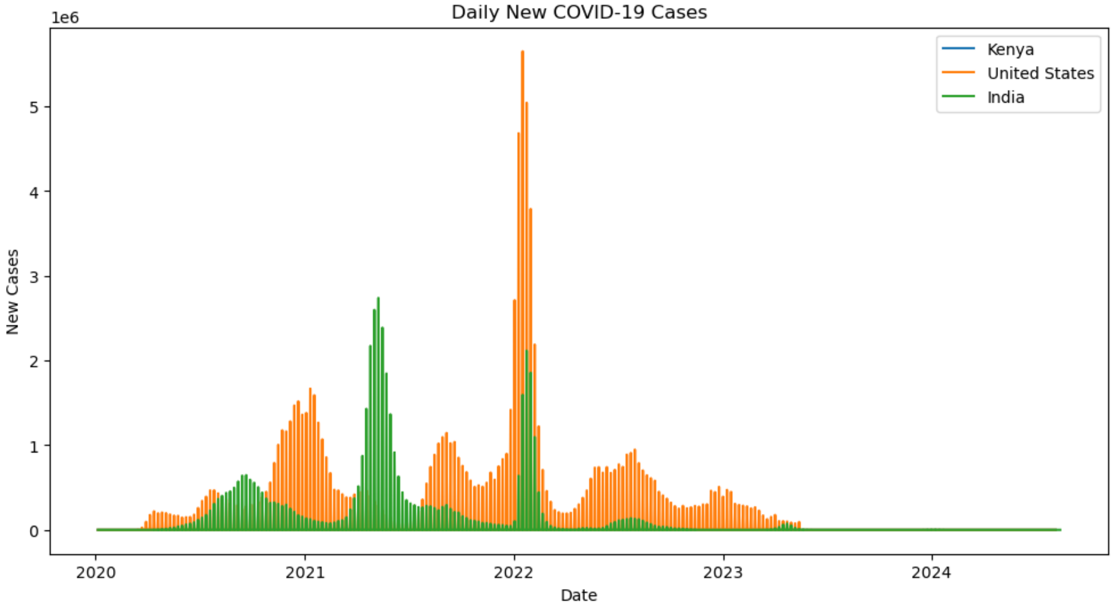
```
Shape: (429435, 67)
Columns: ['iso_code', 'continent', 'location', 'date', 'total_cases',
'new_cases', 'new_cases_smoothed', 'total_deaths', 'new_deaths',
'new_deaths_smoothed', 'total_cases_per_million', 'new_cases_per_million',
'new_cases_smoothed_per_million', 'total_deaths_per_million',
'new_deaths_per_million', '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']
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 429435 entries, 0 to 429434
Data columns (total 67 columns):
 #   Column                                      Non-Null Count   Dtype
---  ------                                      --------------   -----
 0   iso_code                                    429435 non-null  object
 1   continent                                   402910 non-null  object
 2   location                                    429435 non-null  object
 3   date                                        429435 non-null  object
 4   total_cases                                 411804 non-null  float64
 5   new_cases                                   410159 non-null  float64
 6   new_cases_smoothed                          408929 non-null  float64
 7   total_deaths                                411804 non-null  float64
 8   new_deaths                                  410608 non-null  float64
 9   new_deaths_smoothed                         409378 non-null  float64
 10  total_cases_per_million                     411804 non-null  float64
 11  new_cases_per_million                       410159 non-null  float64
 12  new_cases_smoothed_per_million              408929 non-null  float64
 13  total_deaths_per_million                    411804 non-null  float64
 14  new_deaths_per_million                      410608 non-null  float64
 15  new_deaths_smoothed_per_million             409378 non-null  float64
 16  reproduction_rate                           184817 non-null  float64
 17  icu_patients                                39116 non-null   float64
 18  icu_patients_per_million                    39116 non-null   float64
 19  hosp_patients                               40656 non-null   float64
 20  hosp_patients_per_million                   40656 non-null   float64
 21  weekly_icu_admissions                       10993 non-null   float64
 22  weekly_icu_admissions_per_million           10993 non-null   float64
 23  weekly_hosp_admissions                      24497 non-null   float64
 24  weekly_hosp_admissions_per_million          24497 non-null   float64
 25  total_tests                                 79387 non-null   float64
 26  new_tests                                   75403 non-null   float64
 27  total_tests_per_thousand                    79387 non-null   float64
 28  new_tests_per_thousand                      75403 non-null   float64
 29  new_tests_smoothed                          103965 non-null  float64
 30  new_tests_smoothed_per_thousand             103965 non-null  float64
 31  positive_rate                               95927 non-null   float64
 32  tests_per_case                              94348 non-null   float64
 33  tests_units                                 106788 non-null  object
 34  total_vaccinations                          85417 non-null   float64
 35  people_vaccinated                           81132 non-null   float64
 36  people_fully_vaccinated                     78061 non-null   float64
 37  total_boosters                              53600 non-null   float64
 38  new_vaccinations                            70971 non-null   float64
 39  new_vaccinations_smoothed                   195029 non-null  float64
 40  total_vaccinations_per_hundred              85417 non-null   float64
 41  people_vaccinated_per_hundred               81132 non-null   float64
 42  people_fully_vaccinated_per_hundred         78061 non-null   float64
 43  total_boosters_per_hundred                  53600 non-null   float64
 44  new_vaccinations_smoothed_per_million       195029 non-null  float64
 45  new_people_vaccinated_smoothed              192177 non-null  float64
 46  new_people_vaccinated_smoothed_per_hundred  192177 non-null  float64
 47  stringency_index                            196190 non-null  float64
 48  population_density                          360492 non-null  float64
 49  median_age                                  334663 non-null  float64
 50  aged_65_older                               323270 non-null  float64
 51  aged_70_older                               331315 non-null  float64
 52  gdp_per_capita                              328292 non-null  float64
 53  extreme_poverty                             211996 non-null  float64
 54  cardiovasc_death_rate                       328865 non-null  float64
 55  diabetes_prevalence                         345911 non-null  float64
 56  female_smokers                              247165 non-null  float64
 57  male_smokers                                243817 non-null  float64
 58  handwashing_facilities                      161741 non-null  float64
 59  hospital_beds_per_thousand                  290689 non-null  float64
 60  life_expectancy                             390299 non-null  float64
 61  human_development_index                     319127 non-null  float64
 62  population                                  429435 non-null  int64
 63  excess_mortality_cumulative_absolute        13411 non-null   float64
 64  excess_mortality_cumulative                 13411 non-null   float64
 65  excess_mortality                            13411 non-null   float64
 66  excess_mortality_cumulative_per_million     13411 non-null   float64
dtypes: float64(61), int64(1), object(5)
memory usage: 219.5+ MB
```

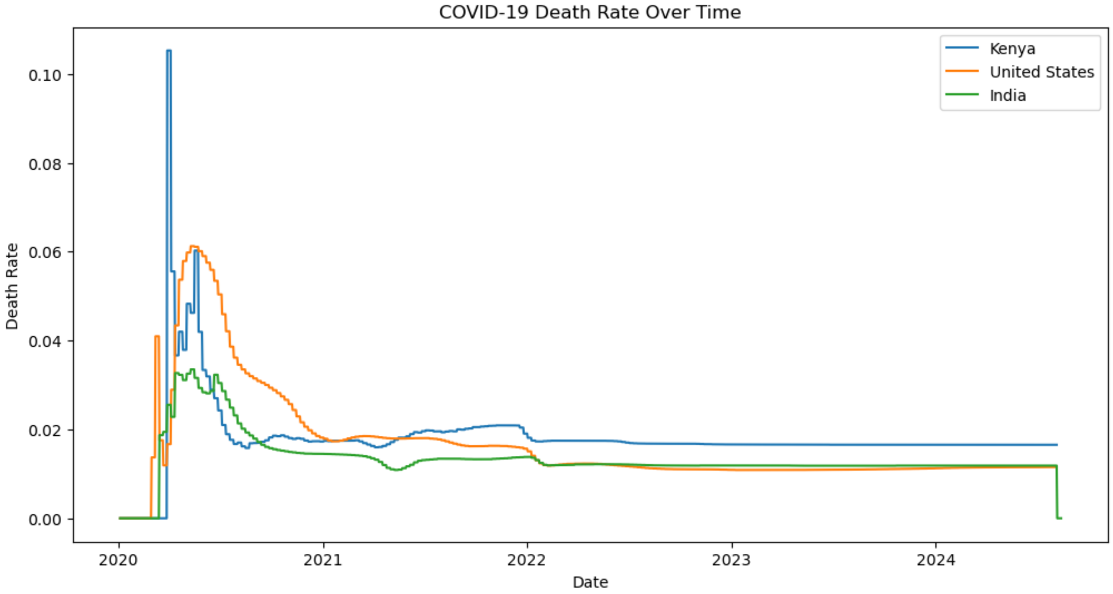


```
Latest Date in Dataset: 2024-08-04 00:00:00
```









```
Index(['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',
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```

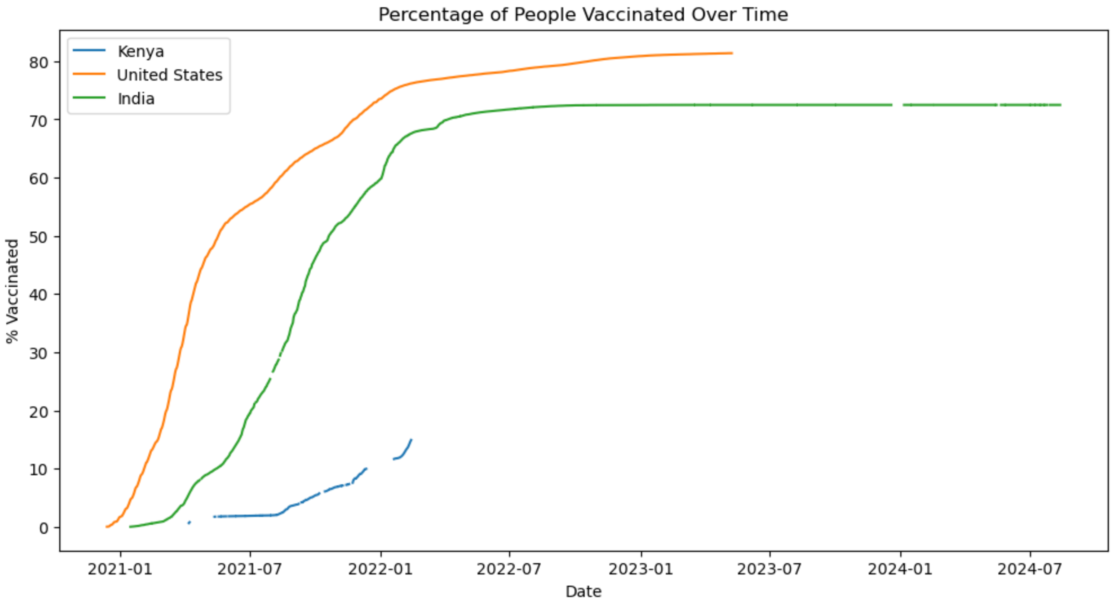

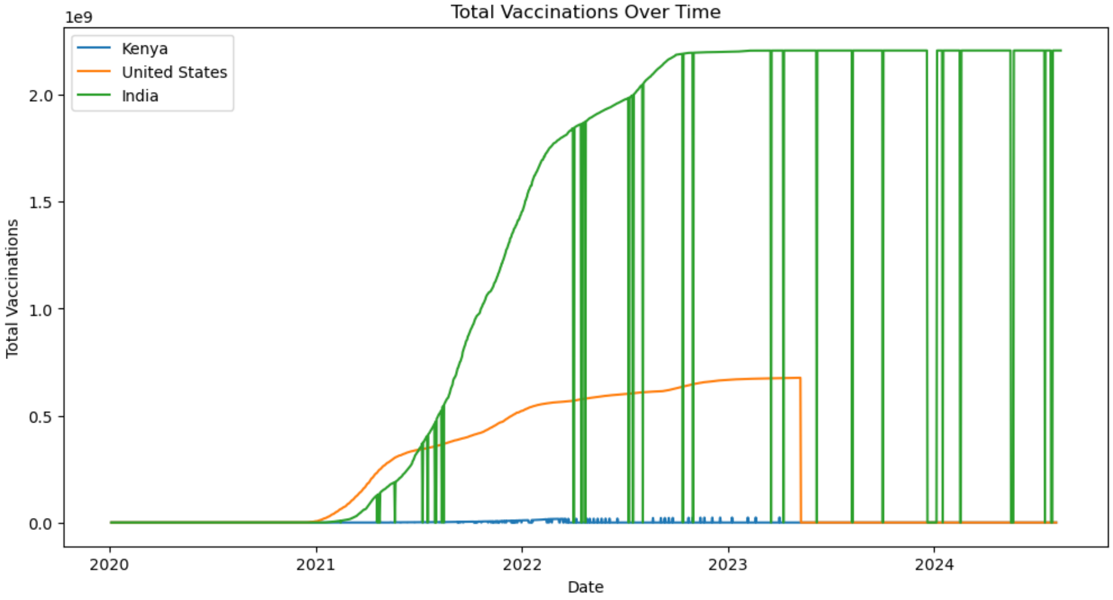

Step 6: Key Insights from COVID-19 Data Analysis

United States had the highest total cases and vaccinations Over the observed period, the US consistently reported the highest number of total COVID-19 cases and vaccinations compared to Kenya and India.

India achieved the highest vaccination growth rate Although the US had higher total numbers, India's vaccination rollout showed rapid growth over time, reflecting strong national efforts.

Kenya reported the lowest total cases but had a higher death rate Despite fewer total cases, Kenya's death rate (deaths as a percentage of confirmed cases) was higher, possibly due to limited testing and healthcare resources.

New daily cases varied significantly over time All three countries experienced multiple waves of COVID-19 infections. The US and India had very sharp increases in new daily cases during specific periods, while Kenya had fewer fluctuations.

Death rate trends highlight health system disparities The higher death rate in Kenya suggests differences in healthcare access or underreporting of mild cases. Meanwhile, India showed the lowest death rate due to widespread testing and younger population demographics.

This project compared COVID-19 data from Kenya, the USA, and India. It analyzed total cases, deaths, and vaccinations over time. Results showed that countries responded differently, with varying outcomes based on healthcare systems, population, and policies. These insights can help improve future health planning.

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