College code:4212
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COVID VACCINES ANALYSIS
PHASE 4-DATA ANALYTICS WITH COGNOS GROUP 2
DEVELOPMENT PART 2

In the previous phases we have discussed the step-by-step process, Design thinking and at the phase3 we have discussed the data preprocessing techniques and many more in the last steps and in this step, we have given some problem statements to solve.

In this part we will continue building your project. Continue conducting the Covid-19 vaccines analysis by performing:

- Exploratory data analysis
- Statistical analysis
- Visualization

Development Part 2 - COVID VACCINES ANALYSIS

Exploratory data analysis

In [1]:
```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from scipy import stats
```

In [2]:
```
# Load your Covid-19 vaccine data into a DataFrame
data = pd.read_csv("D:/ibm naan mudhalvan/country_vaccinations.csv")  # Replace with your dataset's filename
```

In [3]:
```
# Display basic information about the dataset
print(data.info())
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 86512 entries, 0 to 86511
Data columns (total 15 columns):
 #   Column                               Non-Null Count  Dtype  
---  ------                               --------------  -----  
 0   country                              86512 non-null  object 
 1   iso_code                             86512 non-null  object 
 2   date                                 86512 non-null  object 
 3   total_vaccinations                   43607 non-null  float64
 4   people_vaccinated                    41294 non-null  float64
 5   people_fully_vaccinated              38802 non-null  float64
 6   daily_vaccinations_raw               35362 non-null  float64
 7   daily_vaccinations                   86213 non-null  float64
 8   total_vaccinations_per_hundred       43607 non-null  float64
 9   people_vaccinated_per_hundred        41294 non-null  float64
 10  people_fully_vaccinated_per_hundred  38802 non-null  float64
 11  daily_vaccinations_per_million       86213 non-null  float64
 12  vaccines                             86512 non-null  object 
 13  source_name                          86512 non-null  object 
 14  source_website                       86512 non-null  object 
dtypes: float64(9), object(6)
memory usage: 9.9+ MB
None
```

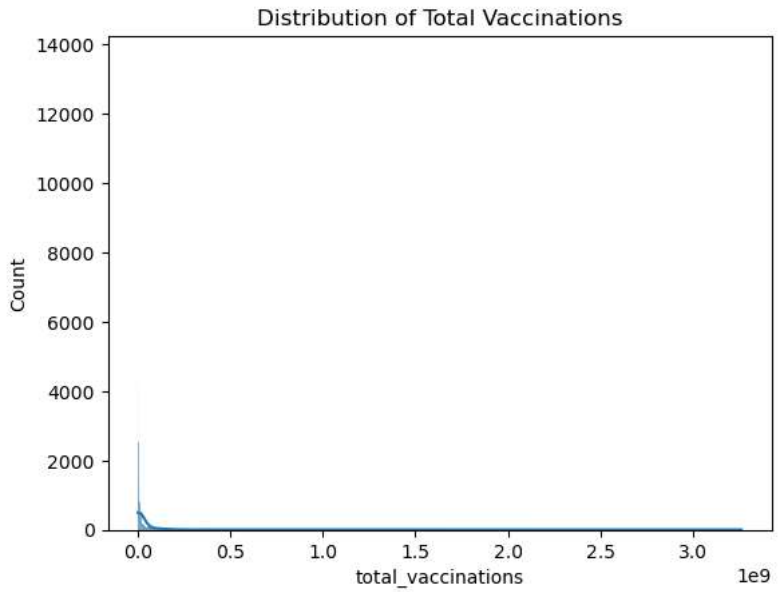
In [4]:
```
# Display summary statistics
print(data.describe())
```

```
       total_vaccinations  people_vaccinated  people_fully_vaccinated  \
count        4.360700e+04       4.129400e+04             3.880200e+04
mean         4.592964e+07       1.770508e+07             1.413830e+07
std          2.246004e+08       7.078731e+07             5.713920e+07
min          0.000000e+00       0.000000e+00             1.000000e+00
25%          5.264100e+05       3.494642e+05             2.439622e+05
50%          3.590096e+06       2.187310e+06             1.722140e+06
75%          1.701230e+07       9.152520e+06             7.559870e+06
max          3.263129e+09       1.275541e+09             1.240777e+09

       daily_vaccinations_raw  daily_vaccinations  \
count            3.536200e+04        8.621300e+04
mean             2.705996e+05        1.313055e+05
std              1.212427e+06        7.682388e+05
min              0.000000e+00        0.000000e+00
25%              4.668000e+03        9.000000e+02
50%              2.530900e+04        7.343000e+03
75%              1.234925e+05        4.409800e+04
max              2.474100e+07        2.242429e+07

       total_vaccinations_per_hundred  people_vaccinated_per_hundred  \
count                    43607.000000                   41294.000000
mean                        80.188543                      40.927317
std                         67.913577                      29.290759
min                          0.000000                       0.000000
25%                         16.050000                      11.370000
50%                         67.520000                      41.435000
75%                        132.735000                      67.910000
max                        345.370000                     124.760000

       people_fully_vaccinated_per_hundred  daily_vaccinations_per_million
count                         38802.000000                    86213.000000
mean                             35.523243                     3257.049157
std                              28.376252                     3934.312440
min                               0.000000                        0.000000
25%                               7.020000                      636.000000
50%                              31.750000                     2050.000000
75%                              62.080000                     4682.000000
max                             122.370000                   117497.000000
```

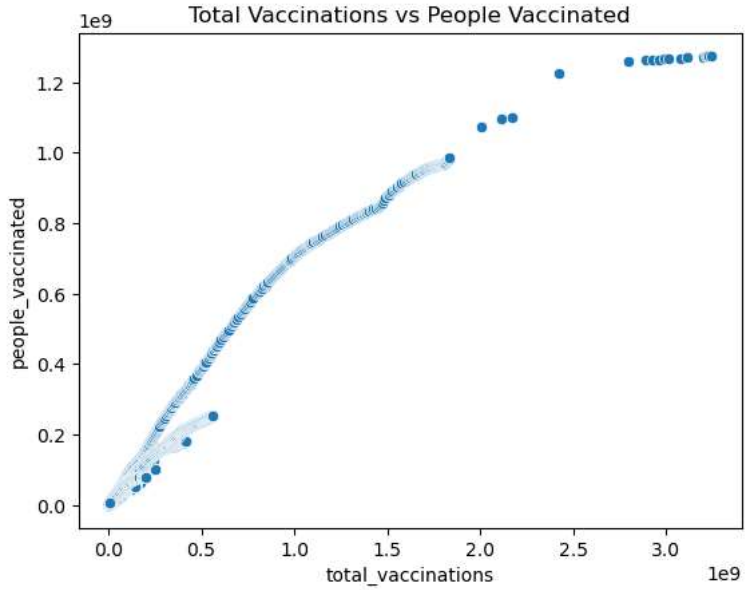
In [5]:
```
# Check for missing values
print(data.isnull().sum())
```

```
country                                0
iso_code                               0
date                                   0
total_vaccinations                 42905
people_vaccinated                  45218
people_fully_vaccinated            47710
daily_vaccinations_raw             51150
daily_vaccinations                   299
total_vaccinations_per_hundred     42905
people_vaccinated_per_hundred      45218
people_fully_vaccinated_per_hundred    47710
daily_vaccinations_per_million       299
vaccines                               0
source_name                            0
source_website                         0
dtype: int64
```

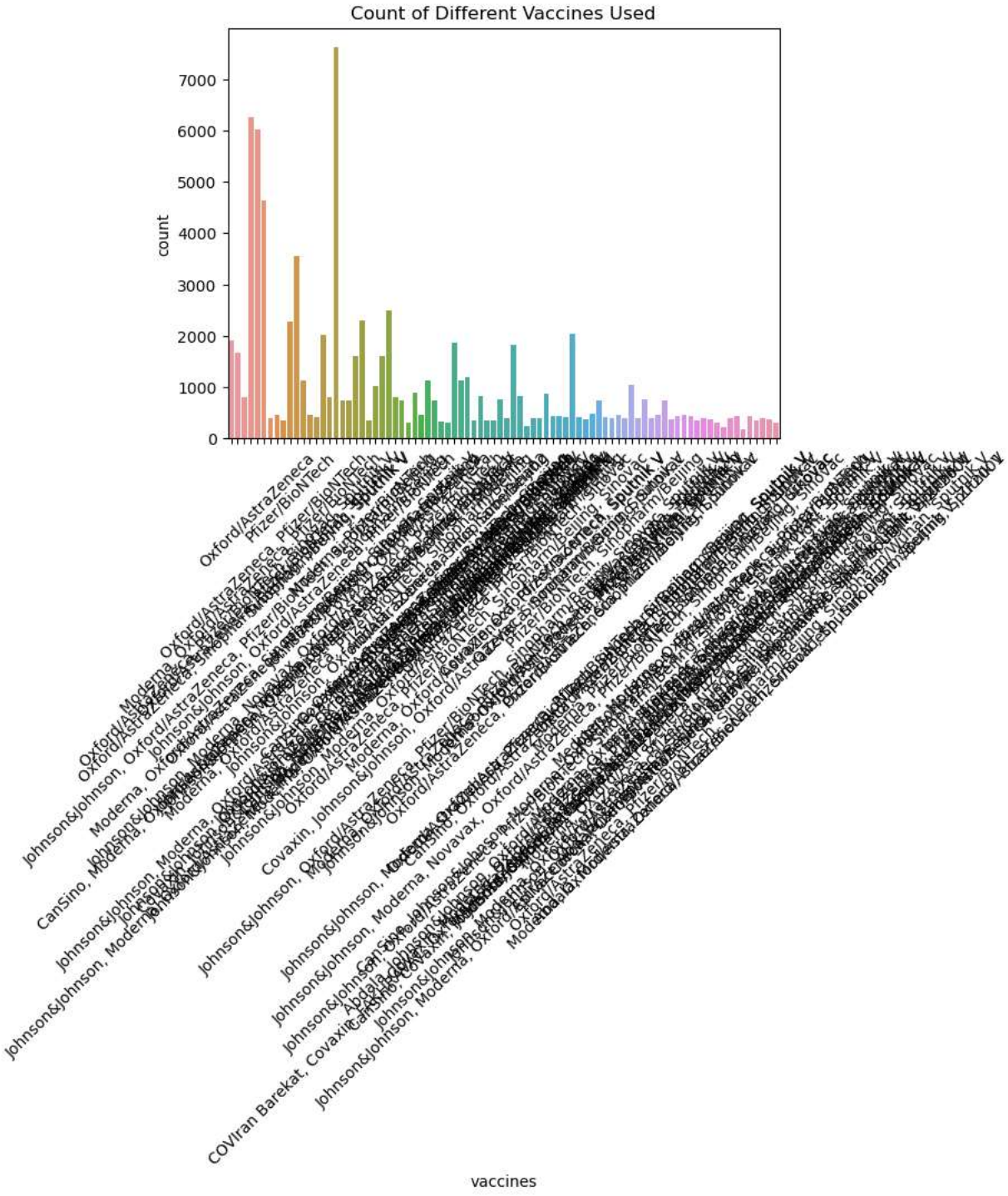
In [6]:
```
# Visualize the distribution of total_vaccinations
sns.histplot(data['total_vaccinations'].dropna(), kde=True)
plt.title('Distribution of Total Vaccinations')
plt.show()
```



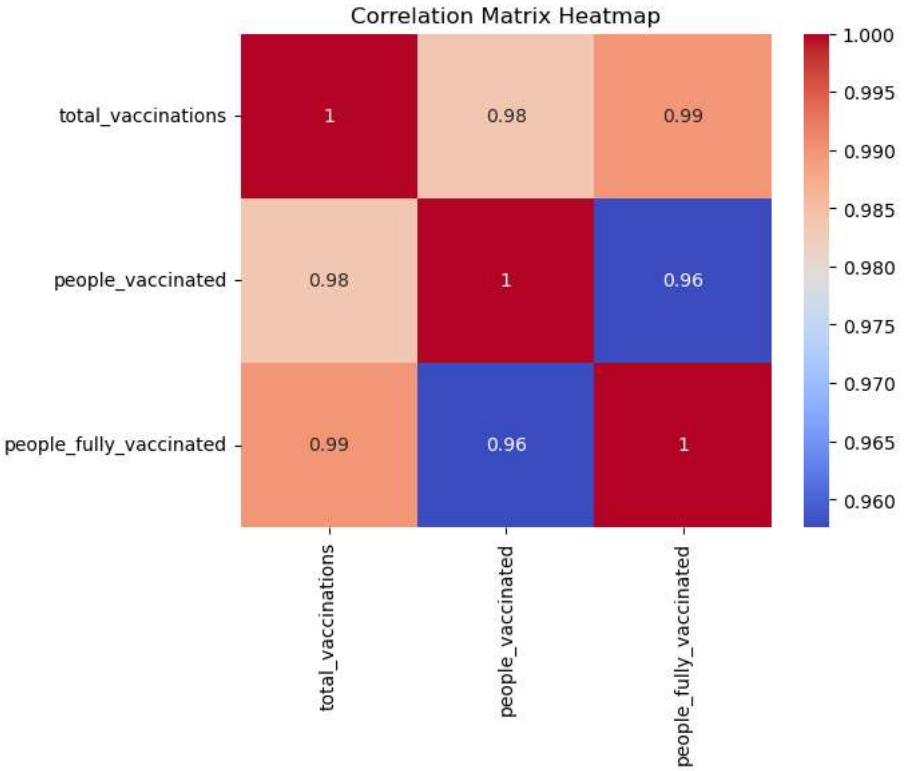
In [7]:
```
# Visualize the relationship between total_vaccinations and people_vaccinated
sns.scatterplot(x='total_vaccinations', y='people_vaccinated', data=data)
plt.title('Total Vaccinations vs People Vaccinated')
plt.show()
```



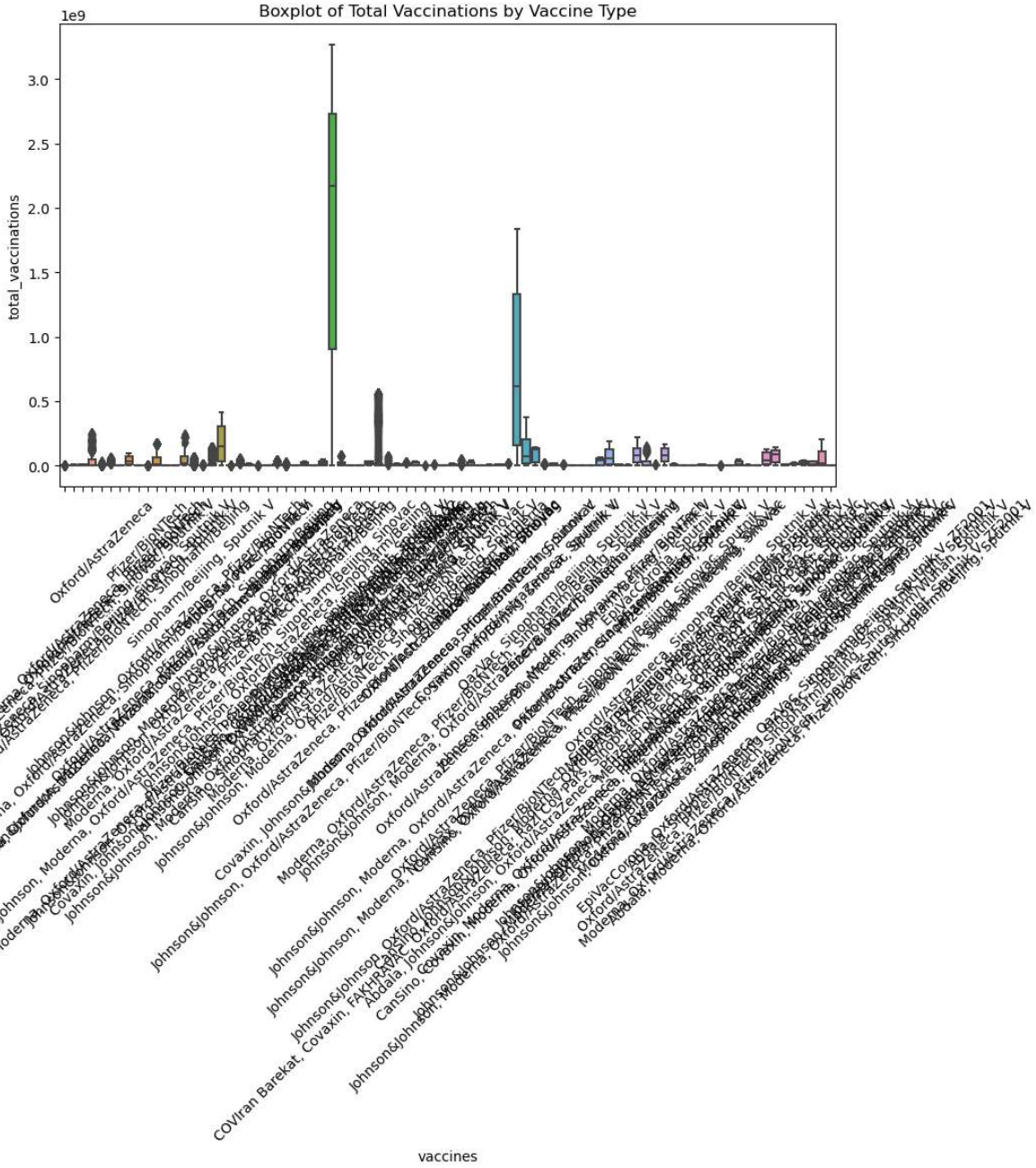
In [8]:
```
# Visualize the distribution of vaccines used
sns.countplot(x='vaccines', data=data)
plt.title('Count of Different Vaccines Used')
plt.xticks(rotation=45)
plt.show()
```



In [9]:
```
# Correlation matrix heatmap for relevant numerical variables
numerical_columns = ['total_vaccinations', 'people_vaccinated', 'people_fully_vaccinated']
correlation_matrix = data[numerical_columns].corr()
sns.heatmap(correlation_matrix, annot=True, cmap='coolwarm')
plt.title('Correlation Matrix Heatmap')
plt.show()
```



In [10]:
```
# Boxplot to identify outliers in 'total_vaccinations' for each 'vaccines' category
plt.figure(figsize=(10, 6))  # Adjust the figure size if needed
sns.boxplot(x='vaccines', y='total_vaccinations', data=data)
plt.title('Boxplot of Total Vaccinations by Vaccine Type')
plt.xticks(rotation=45)
plt.show()
```



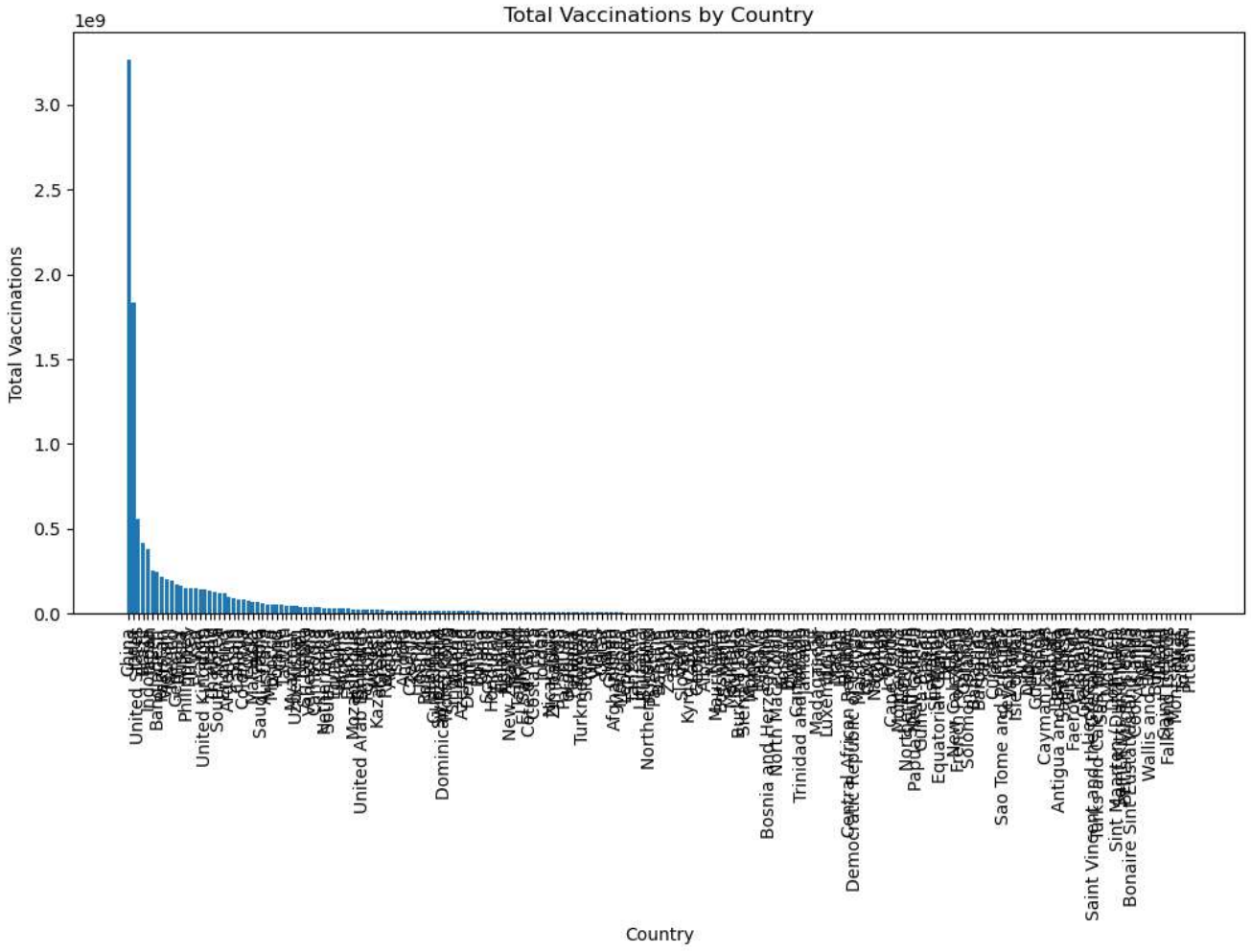
Statistical Analysis

In [11]:
```
#Statistical Analysis

# Extract data for two countries of interest
country1_data = data[data['country'] == 'Country1']
country2_data = data[data['country'] == 'Country2']

# Perform a two-sample t-test to compare total vaccinations in the two countries
t_stat, p_value = stats.ttest_ind(country1_data['total_vaccinations'].dropna(), country2_data['total_vaccinations'].dropna())

# Display the results
print(f"t-statistic: {t_stat}")
print(f"P-value: {p_value}")

# Determine the significance of the test
alpha = 0.05  # Set your significance level
if p_value < alpha:
    print("Reject the null hypothesis: There is a significant difference in total vaccinations between the two countries.")
else:
    print("Fail to reject the null hypothesis: There is no significant difference in total vaccinations between the two countries
```

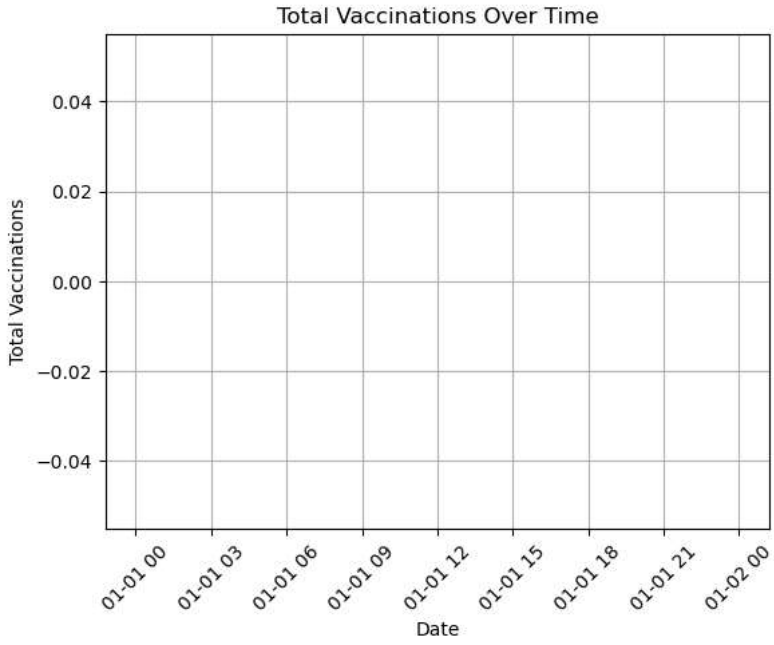
```
t-statistic: nan
P-value: nan
Fail to reject the null hypothesis: There is no significant difference in total vaccinations between the two countries.
```

Visualization

In [12]:
```
#Visualization

#Bar chart

# Group the data by 'country' and calculate the total vaccinations for each country
country_totals = data.groupby('country')['total_vaccinations'].max().reset_index()

# Sort the data by total vaccinations in descending order
country_totals = country_totals.sort_values(by='total_vaccinations', ascending=False)

# Create a bar chart
plt.figure(figsize=(12, 6))  # Adjust the figure size if needed
plt.bar(country_totals['country'], country_totals['total_vaccinations'])

# Add labels and a title
plt.xlabel('Country')
plt.ylabel('Total Vaccinations')
plt.title('Total Vaccinations by Country')

# Show the chart
plt.xticks(rotation=90)
plt.show()
```



In [13]:
```
#Line chart

# Assuming 'date' is in datetime format, if not, convert it to datetime
data['date'] = pd.to_datetime(data['date'])

# Sort the data by date
data.sort_values(by='date', inplace=True)

# Extract data for a specific country (you can change the country)
country_data = data[data['country'] == 'Your_Country_Name']

# Create a line chart
plt.plot(country_data['date'], country_data['total_vaccinations'], marker='o', linestyle='-')

# Add labels and a title
plt.xlabel('Date')
plt.ylabel('Total Vaccinations')
plt.title('Total Vaccinations Over Time')

# Show the chart
plt.grid(True)  # Add grid lines
plt.xticks(rotation=45)
plt.show()
```

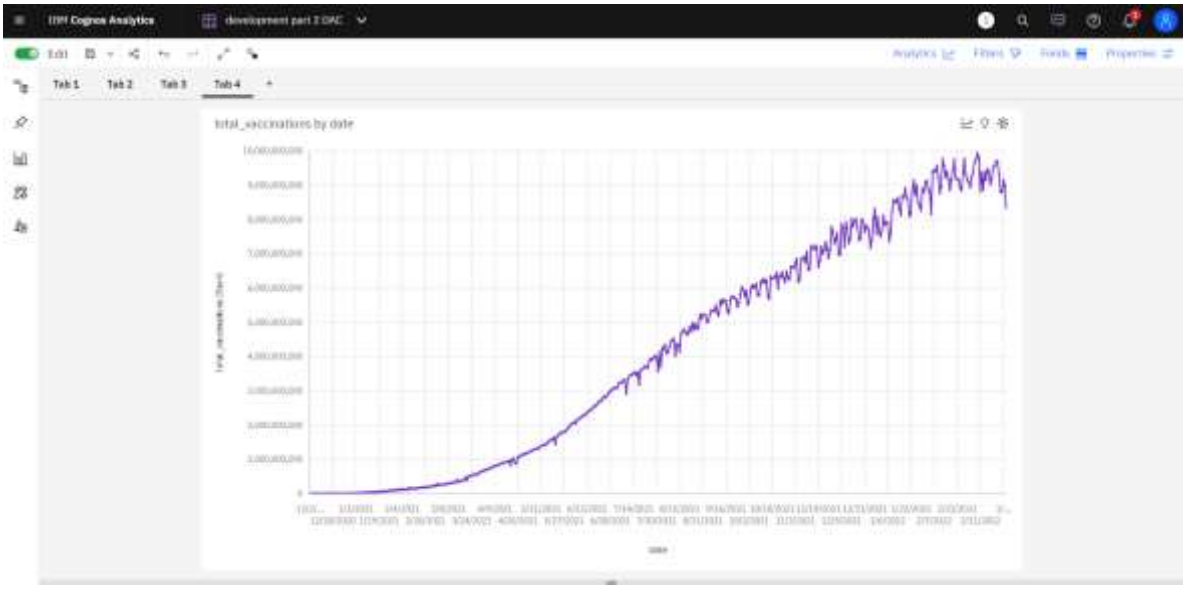


In [ ]:

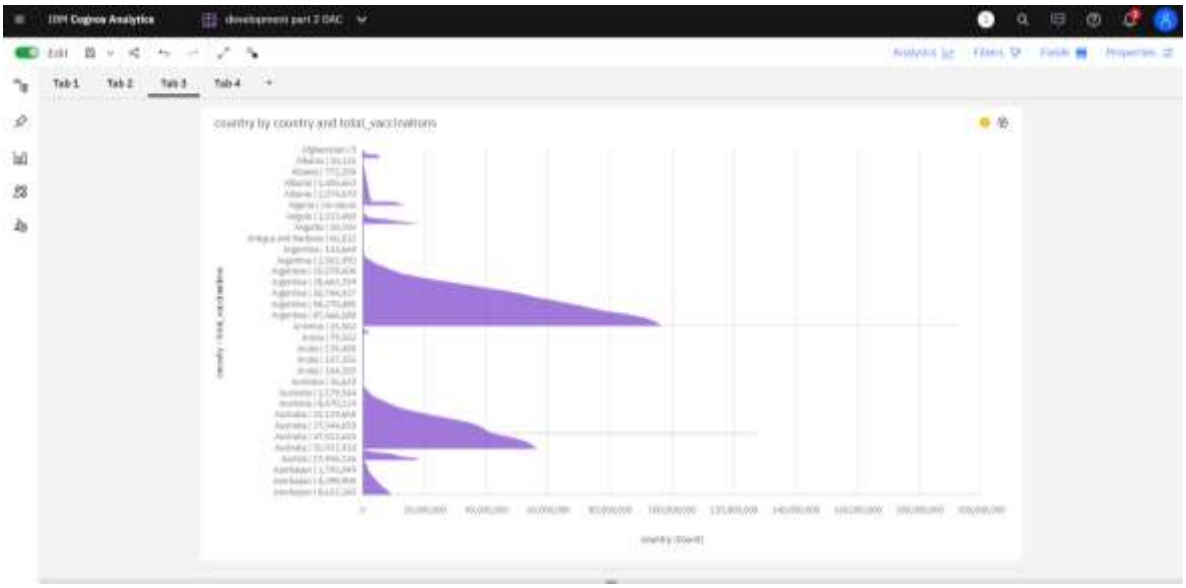
VISUALIZATION USING IBM COGNOS

SCATTER PLOT

LINE CHART



BAR CHART



BOX PLOT