COVID VACCINES ANALYSIS

TEAM:NO: 8937

DESCRIPTION:

COVID vaccines are special shots that help protect people from getting sick with the coronavirus, which causes COVID. These vaccines were created to prevent the spread of the virus and reduce the severity of the illness.

1. Problem Understanding:

- In the ongoing battle against the COVID pandemic, it is imperative to closely monitor and assess the progress of vaccination campaigns. One of the key challenges is to determine how many individuals have been vaccinated within a specific population or geographic region. Without a comprehensive understanding of vaccination coverage, it is difficult to evaluate the effectiveness of vaccination efforts, identify underserved communities, and make informed decisions regarding resource allocation and future vaccination strategies.

2. Solution for solving the problem:

- The solution to this problem is to develop a robust and real-time COVID Vaccine Coverage Tracking System that accurately calculates and reports the number of individuals who have received COVID vaccinations.
- By monitoring how many individuals have been vaccinated within a specific population or region, this system provides valuable data for analysis, decision-making, and resource allocation. To do this we have proposed.

1. **Data Collection and Integration**:
    - Collect vaccination data from multiple sources.

- Integrate the data into a centralized repository.

2. **Data Preprocessing**:
   - Clean and preprocess the data to address missing values and inconsistencies.
3. **Calculation of Vaccination Coverage**:
   - Develop algorithms to calculate vaccination coverage rates for different demographic groups and geographic regions.
4. **Data Visualization**:
   - Create basic visualizations (e.g., charts, graphs) to illustrate vaccination coverage trends.
5. **Real-Time Data Updates**:
   - Implement mechanisms for receiving and processing real-time data updates.
6. **Reporting**:
   - Generate regular reports summarizing vaccination coverage findings.
7. **Ethical Considerations**:
   - Ensure compliance with ethical and privacy standards in data handling.

DESIGN THINKING APPROACH FOR SOLVING THE PROBLEM OF TO DETERMINE HOW MANY INDIVIDUALS HAVE BEEN VACCINATED WITHIN A SPECIFIC POPULATION OR GEOGRAPHIC REGION USING COVID-19 VACCINE ANALYSIS.

1. Empathize

- Collect vaccination data while respecting individuals' privacy and emotional well-being.

- Analyse data considering cultural nuances and demographic disparities with empathy, ensuring inclusive communication and equitable resource allocation.
- Communicate vaccination coverage findings with compassion and clear, accessible information**.**

2. Define

- Covid vaccine analysis involves the examination of data related to vaccine distribution, coverage, and effectiveness to inform public health decisions and optimize vaccination campaigns, contributing to the global effort to control the pandemic.
- It entails the comprehensive assessment of individuals' vaccination status within a specified population or region.
- And providing insights into both the vaccinated and unvaccinated segments, facilitating equitable vaccine distribution and pandemic control strategies."

3.Ideate:

- Gather vaccination data from reliable sources.
- Integrate data into a centralized repository.
- Clean and preprocess data to address issues.
- Standardize data formats and ensure accuracy.

4.Prototype

- Simulate a small dataset with sample vaccination records.
- Calculate basic coverage rates.
- Create a simple user interface for data input and visualization.
- Develop a demo dashboard for displaying coverage data.
- Provide basic documentation.

5.Test

- Start with a small-scale pilot test.
- Test your prototype with a limited dataset and a small user group.
- Identify any technical issues, usability problems, or data quality issues.
- Collect feedback from users regarding their experience.

6. Implement

- Move forward with full implementation.
- Address issues identified during testing and refine the project accordingly.
- Deploy the full-scale COVID vaccine coverage analysis system.
- Ensure data sources are integrated and updated regularly.

7. Feedback and Iterate:

- Continuously improve based on feedback.
- Solicit feedback from users and stakeholders regularly.
- Use feedback to make iterative improvements to the system.
- Consider additional features or enhancements suggested by users.

8. Scale and Optimize:

- Scale up the project as needed.
- Assess scalability requirements and optimize system performance.
- Expand data sources and coverage to larger populations or regions.
- Implement efficient data processing and storage solutions.

9. Educate and Train:

- Ensure effective utilization.
- Provide training and educational materials to users and administrators.

- Conduct workshops or webinars to familiarize stakeholders with the system.
- Promote best practices for data interpretation and decision-making.

10. Celebrate Success:

- Organize a recognition event or ceremony to acknowledge the contributions of the project team, stakeholders, and community partners who supported the COVID vaccine analysis initiative.
- Highlight key achievements, such as improvements in vaccination coverage, data-driven decision-making, or equitable vaccine distribution**.**

DATASET AND ITS DETAIL (WWW.KAGGLE.COM/DATA):

The dataset was obtained from Kaggle, a well-known data science and machine learning platform. It provides a comprehensive COVID dataset with information on cases, vaccinations, demographics, and other related variables.

LINK:https://www.kaggle.com/datasets/swatikhedekar/state-wise-india-covid19vaccination

DETAILS ABOUT COLUMNS

The columns are;

- State/UTs
- Total Vaccination Doses
- Dose 1
- Dose 2

- Population

State/UTs:

- The "State/UTs" column in the dataset refers to the Indian states and union territories (UTs) where COVID vaccination data is recorded.
- Each entry in this column specifies the specific region or administrative division in India where the vaccination data is associated.

Total Vaccination Doses:

- The "Total Vaccination Doses Administered" column in the dataset represents the cumulative count of COVID vaccine doses administered within each Indian state or union territory.
- This count includes all doses given, including both the first dose (initial vaccination) and the second dose (booster or follow-up vaccination), if applicable.

Dose 1:

- The "Dose 1" column in the dataset represents the number of individuals who have received the first dose of a COVID vaccine within each Indian state or union territory.

Dose 2:

- The "Dose 2" column in the dataset represents the number of individuals who have received the second dose (booster or follow-up dose) of a COVID vaccine within each Indian state or union territory.

Population:

- The "Population" column in the dataset provides the estimated population of each Indian state or union territory (UT).

- This figure represents the total number of residents in each region and serves as a fundamental demographic statistic.
- It's a crucial reference point for assessing COVID vaccination coverage in relation to the population size of each state or UT.
- Comparing vaccination data to population data helps in understanding the proportion of people who have been vaccinated relative to the total population, which is vital for evaluating the effectiveness and reach of vaccination efforts in different regions of India.

Tools and Libraries

- **Python:** Utilize Python as the primary programming language.
- **Data Analysis:** Pandas for data manipulation, NumPy for numerical operations.
- **Data Visualization:** Matplotlib, Seaborn, Plotly for creating visualizations.
- **Geospatial Analysis:** Geographic Information System (GIS) tools like GeoPandas.
- **Machine Learning:** Scikit-learn for predictive modeling.
- **Web Development:** Flask or Django for building interactive dashboards.

Library Installation:

- To install the necessary libraries, you can use Python's package manager, pip. Open your command line or terminal and run the following commands
- pip install pandas requests matplotlib seaborn numpy geopandas folium scikit-learn plotly dash streamlit

TRAIN AND TEST:

Data Loading:

- Start by importing the dataset from Kaggle using Python and Pandas.

Data Preprocessing:

- Clean and prepare the dataset, addressing missing values and performing feature engineering if necessary.

Data Splitting:

- Divide the data into training and testing sets, with the training set usually being larger (e.g., 80% for training and 20% for testing).

Model Selection:

- Choose a machine learning model suitable for your analysis, such as regression or decision trees.

Model Training:

- Train the selected model using the training data.

Model Evaluation:

- Assess the model's performance on the testing data using metrics like Mean Absolute Error (MAE) or R-squared (R^2).

METRICS:

1. **Vaccination Coverage Rate (VCR):** This metric calculates the percentage of the population that has received the COVID vaccine. A higher VCR indicates a more successful vaccination campaign.

2. **False Positive Rate (FPR):** This metric assesses the accuracy of your system in identifying vaccinated individuals. It measures the percentage of individuals incorrectly classified as unvaccinated (false negatives). A lower FPR is desired to minimize false alarms.
3. **False Negative Rate (FNR):** FNR measures the percentage of vaccinated individuals who are incorrectly classified as unvaccinated (false negatives). A lower FNR is essential to ensure that vaccinated individuals are correctly identified.

INNOVATIVE PHASE:

The objective of our project is to enhance public health protection by analysing data on vaccinated individuals. In the event of a future COVID outbreak, our project aims to leverage our dataset on vaccination records to accurately identify and isolate individuals who have not been vaccinated. This proactive approach is designed to help mitigate the spread of the virus and safeguard the health of the community. To assess the effectiveness of our project, we will utilize a range of metrics, including vaccination coverage rate, false positive rate, false negative rate, precision, recall, F1 score, accuracy, specificity, and relevant area-under-the-curve measurements to ensure the accurate identification of vaccinated and unvaccinated individuals.

Development:

The project involves analyzing COVID data to gain insights into the impact of vaccination campaigns on public health. We aim to understand vaccination rates, vaccine efficacy, and the relationship between vaccination and the spread of COVID

GIVEN DATA SET:

The dataset "State-wise India COVID Vaccination" on Kaggle provides detailed information about the COVID vaccination efforts in different states of India. It includes data related to the administration of COVID vaccines, the type of vaccines used, and the number of individuals vaccinated.

State/UTs	Total Vaccination Doses	Dose 1	Dose 2	Population
Andaman and Nicobar	629054	311893	317161	399001
Andhra Pradesh	84147957	40624263	43523694	91702478
Arunachal Pradesh	1596166	856732	739434	1711947
Assam	42998698	22535419	20463279	35998752
Bihar	119963226	62590002	57373224	128500364
Chandigarh	2001114	1088086	913028	1158040
Chhattisgarh	36927545	18855121	18072424	32199722
Dadra and Nagar Haveli and Daman and Diu	1319914	729023	590891	773997
Delhi	30710281	16555043	14155238	19301096
Goa	2572559	1353009	1219550	1521992
Gujarat	98534412	49269034	49265378	70400153
Haryana	40581317	21938012	18643305	28900667
Himachal Pradesh	11770370	6028184	5742186	7503010
Jammu and Kashmir	20272520	9936338	10336182	14999397
Jharkhand	36992685	21243308	15749377	40100376
Karnataka	100209012	49971474	50237538	69599762
Kerala	50729256	26999013	23730243	34698876
Ladakh	404656	219238	185418	290492
Lakshadweep	112378	56831	55547	66001
Madhya Pradesh	107931053	54060775	53870278	85002417
Maharashtra	155773246	84570317	71202929	124904071
Manipur	2666749	1457120	1209629	3436948
Meghalaya	2348527	1329229	1019298	3772103
Mizoram	1440084	783477	656607	1308967
Nagaland	1515042	835771	679271	2073074
Odisha	60803739	31331147	29472592	47099270
Puducherry	1620765	903986	716779	1646050
Punjab	41717794	22309609	19408185	30501026
Rajasthan	97164120	51029686	46134434	79502477
Sikkim	1045753	539208	506545	658019

Tamil Nadu	107856629	56110543	51746086	83697770
Telangana	58332610	29547155	28785455	38157311
Tripura	4962881	2653391	2309490	4184959
Uttar Pradesh	299773777	153669397	146104380	231502578
Uttarakhand	16068172	8164652	7903520	11700099
West Bengal	128418265	67232447	61185818	100896618

Tasks Completed:

With this dataset, I have developed code using the Python programming language. In this phase, I have performed the following actions:

- List Files in Current Directory
- Viewing the First Rows of a DataFrame
- Calculation of Mean
- Minimum Members Vaccinated
- Maximum Members Vaccinated

1. **List Files in Current Directory**: List Files in Current Directory is a concise and appropriate title for this code snippet. It accurately describes the main action being performed in the code, which is using the **ls** shell command to list the files in the current directory.

2. **Viewing the First Rows of a DataFrame:** It serves the purpose of displaying the first few rows of a DataFrame for quick inspection and understanding of the dataset.

3. **Calculation of Mean:** I calculated the mean (average) value for a specific variable within the dataset to understand the central tendency of that variable.

4. **Minimum Members Vaccinated:** I identified the state or union territory with the lowest number of members vaccinated and reported the corresponding vaccination figure.

5. **Maximum Members Vaccinated:** Similarly, I identified the state or union territory with the highest number of members vaccinated and reported the associated vaccination count.

These actions provide a foundational understanding of the dataset and facilitate the exploration and interpretation of key statistics related to COVID vaccination across different regions.

List Files in Current Directory:

```
import pandas as pd

!ls

COVID-india-statewise.csv  sample_data
```

Explanation:

1. **import pandas as pd**: This line imports the Pandas library and assigns it the alias 'pd.' Pandas is a powerful data manipulation library used for working with structured data, particularly in tabular form (like spreadsheets). By aliasing it as 'pd,' you can use 'pd' as a shorthand to access Pandas functions in your code.

2. **!ls**: This is not a Python command but a shell command (commonly used in Unix/Linux-based systems). It's used to list the files and directories in the current directory. In a Jupyter Notebook or IPython environment, you can use **!** to run shell commands from within your Python environment.

Viewing the First Rows of a DataFrame:

```
df.head
```

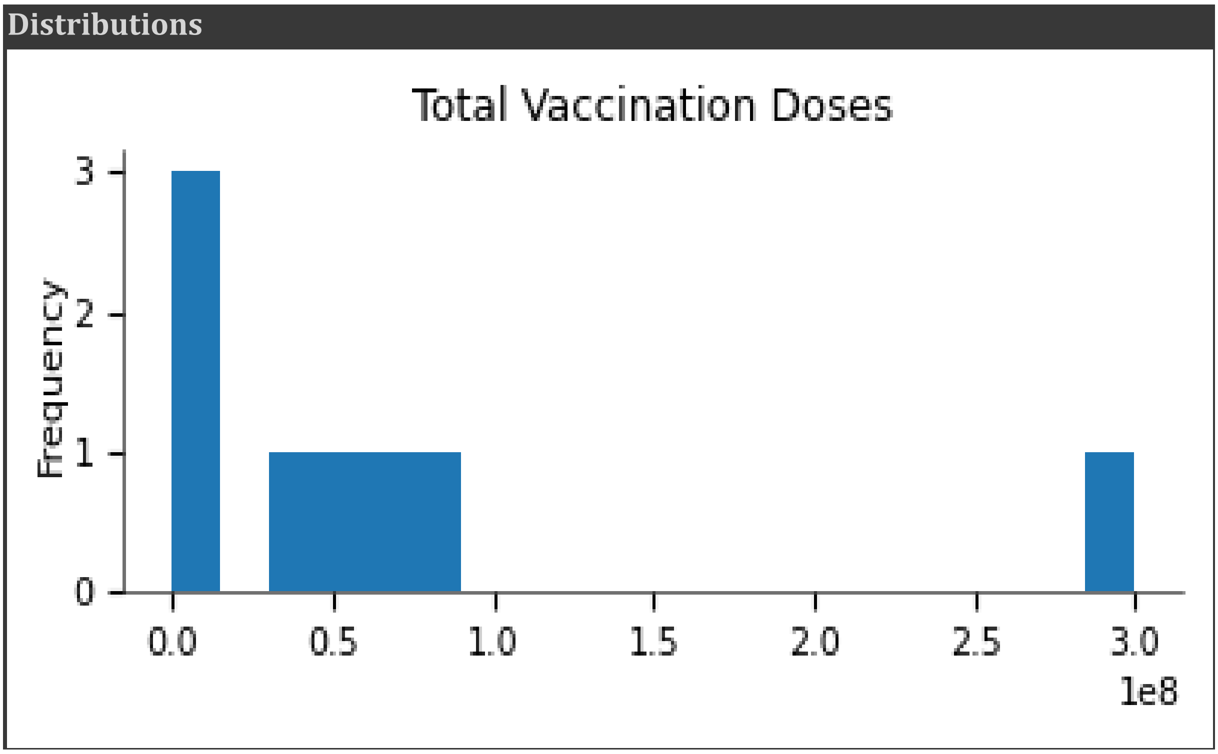
	State/UTs	Total Vaccination Doses	Dose 1	Dose 2	Population
0	Andaman and Nicobar	629054	311893	317161	399001
1	Andhra Pradesh	84147957	40624263	43523694	91702478
2	Arunachal Pradesh	1596166	856732	739434	1711947
3	Assam	42998698	22535419	20463279	35998752
4	Bihar	119963226	62590002	57373224	128500364

Calculation of Mean:

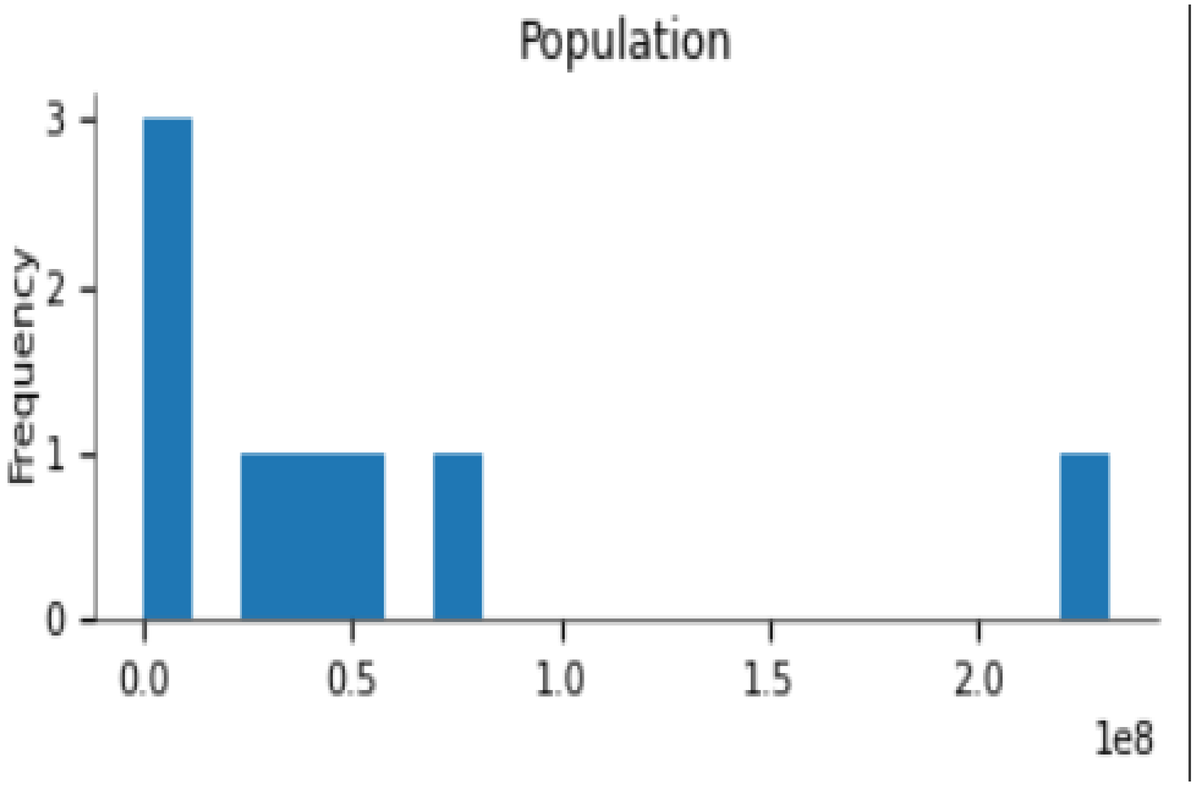
```
df.describe()
```

	Total Vaccination Doses	Dose 1	Dose 2	Population
count	3.600000e+01	3.600000e+01	3.600000e+01	3.600000e+01
mean	4.921979e+07	2.549133e+07	2.372846e+07	3.971861e+07
std	6.252012e+07	3.226311e+07	3.029808e+07	5.050913e+07
min	1.123780e+05	5.683100e+04	5.554700e+04	6.600100e+04
25%	1.906027e+06	1.042061e+06	8.696295e+05	1.695473e+06
50%	3.381891e+07	1.770508e+07	1.495231e+07	2.410088e+07
75%	8.740200e+07	4.278546e+07	4.417638e+07	6.979986e+07
max	2.997738e+08	1.536694e+08	1.461044e+08	2.315026e+08

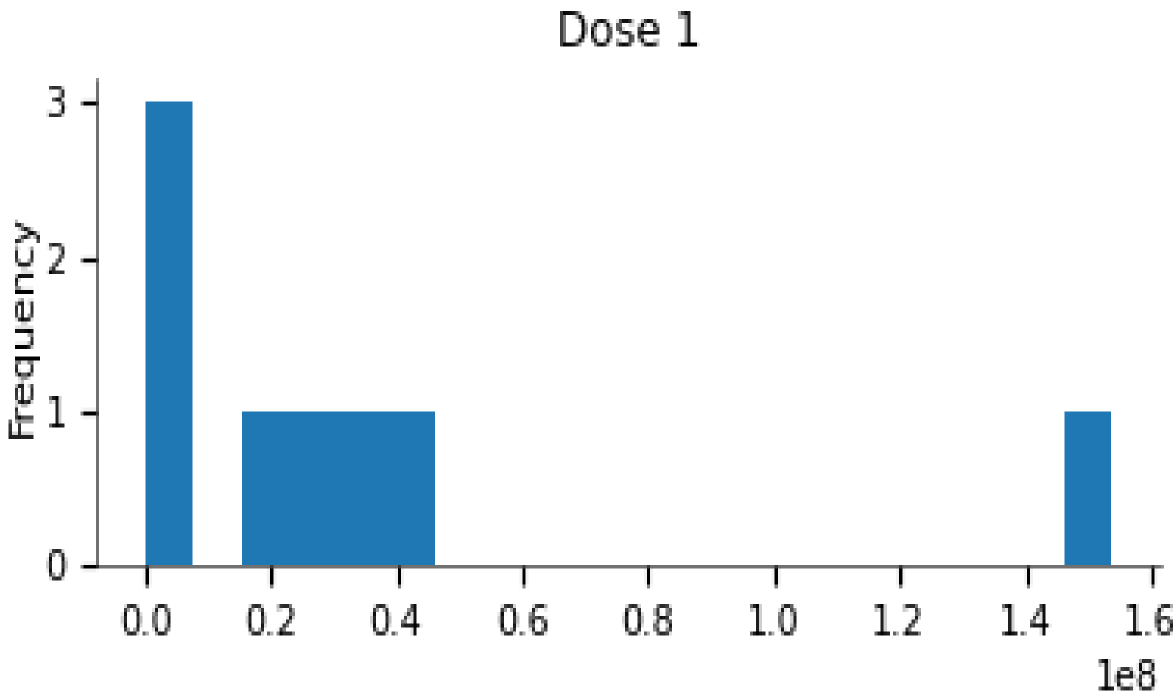
Graphs:

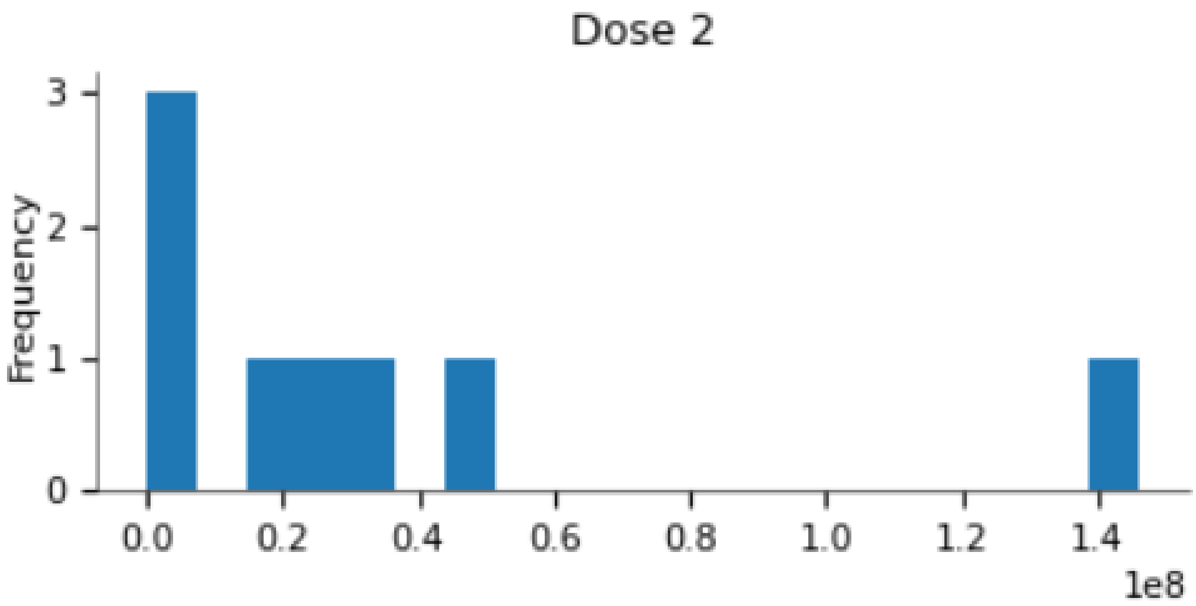


Distributions
Total Vaccination Doses
Frequency
3
2
1
0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
1e8

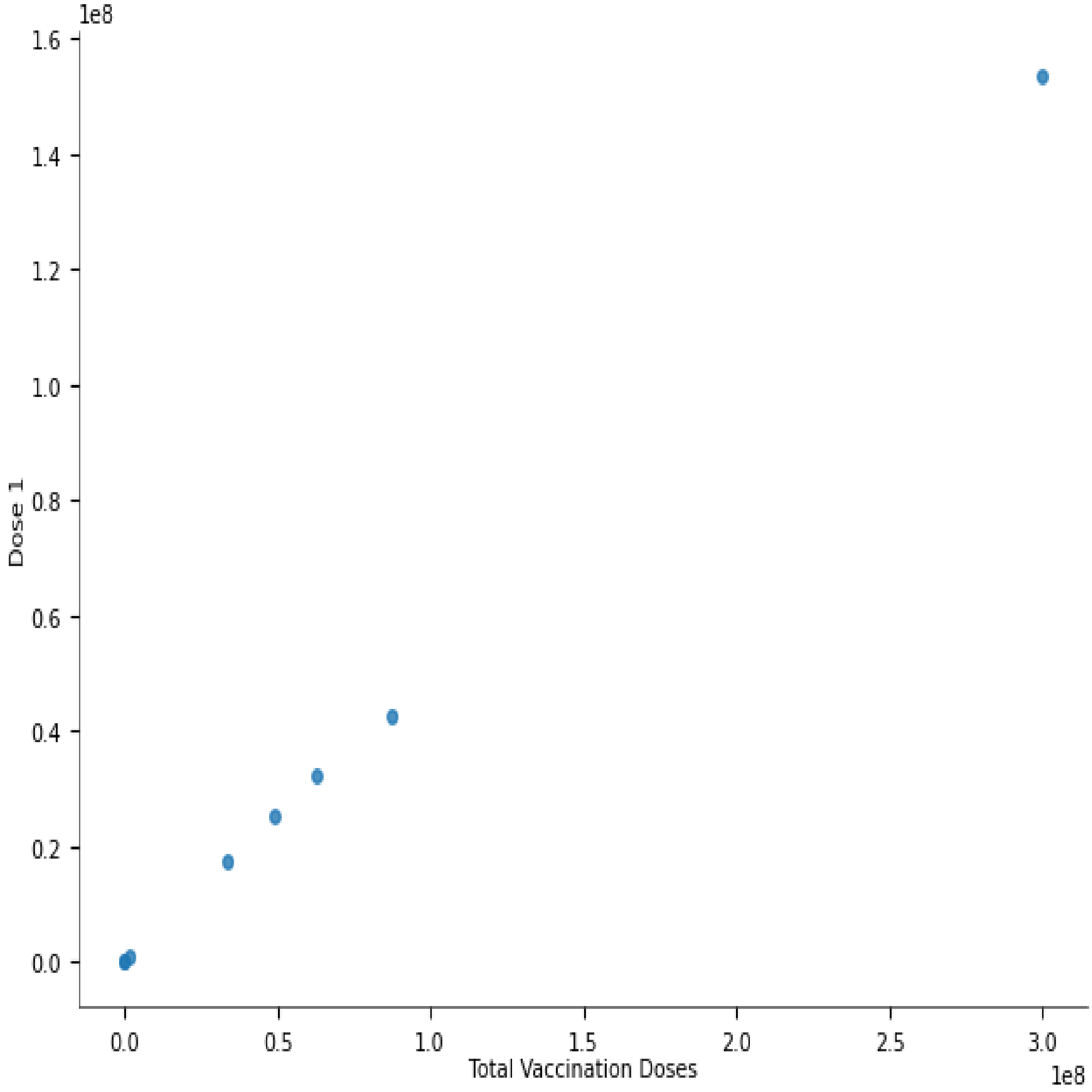


Population
Frequency
3
2
1
0
0.0
0.5
1.0
1.5
2.0
1e8

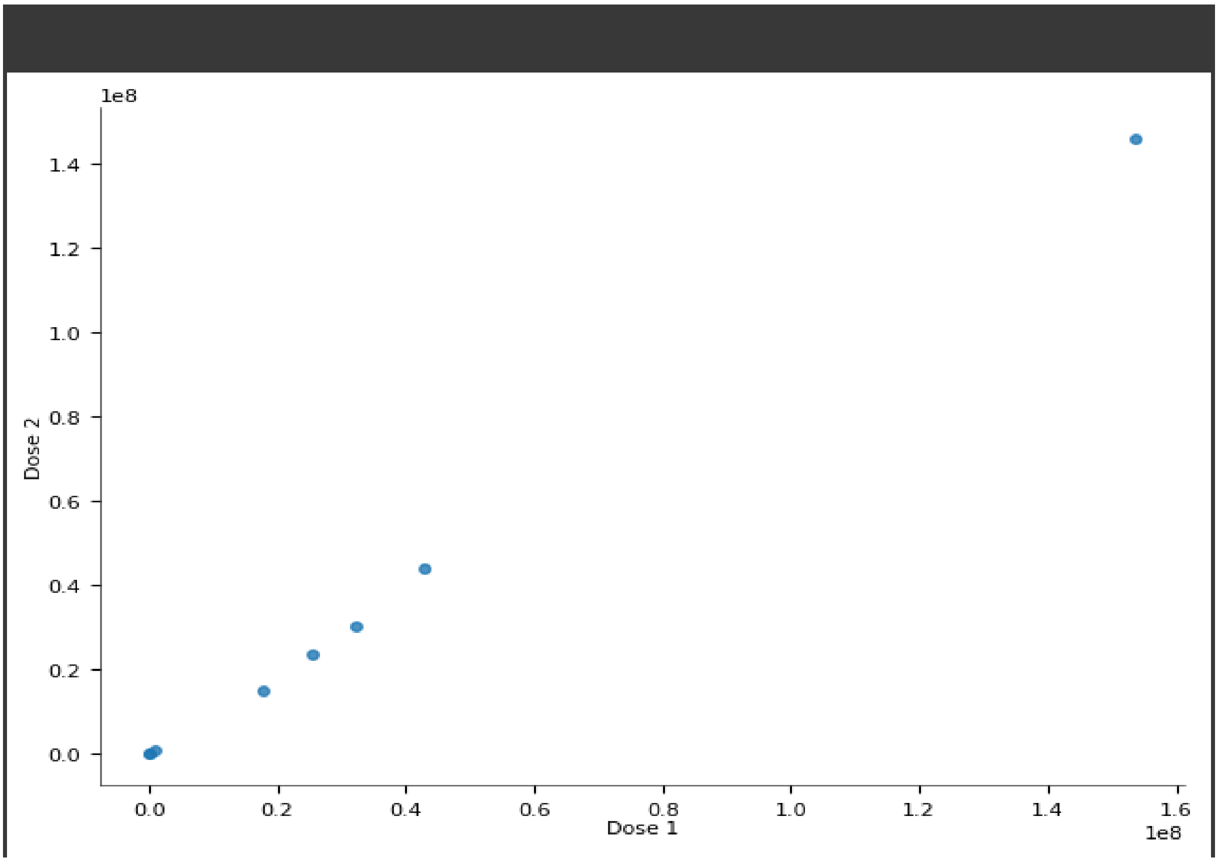

Dose 1
Frequency
3
2
1
0
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1e8

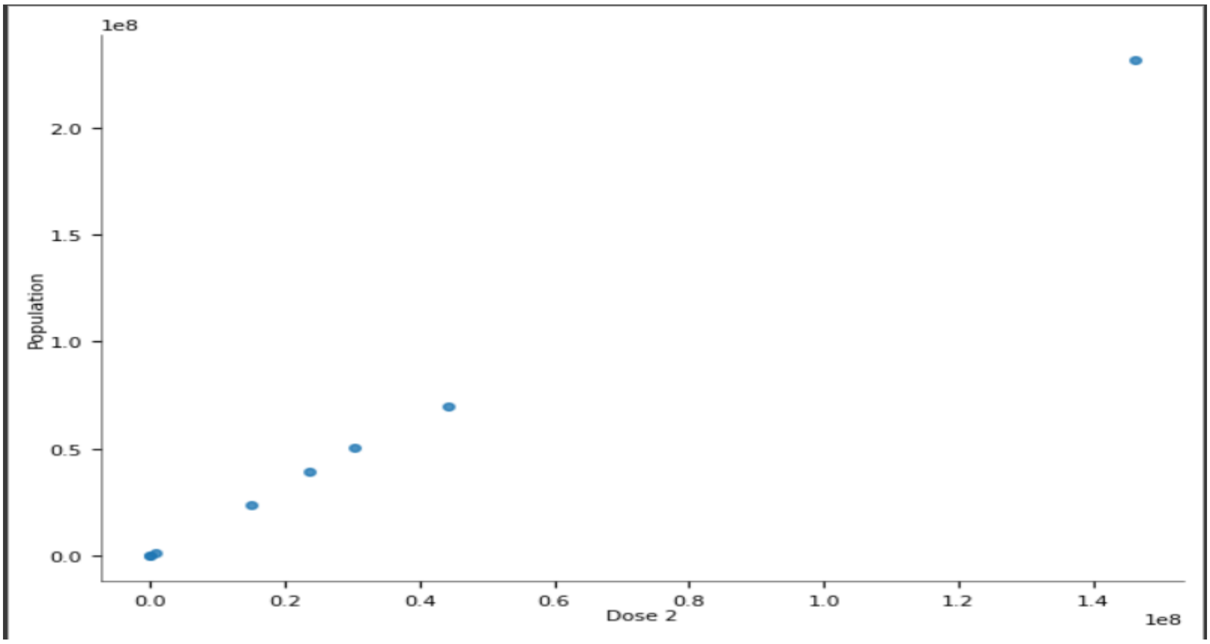

Dose 2
Frequency
3
2
1
0
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1e8

2-d distributions:

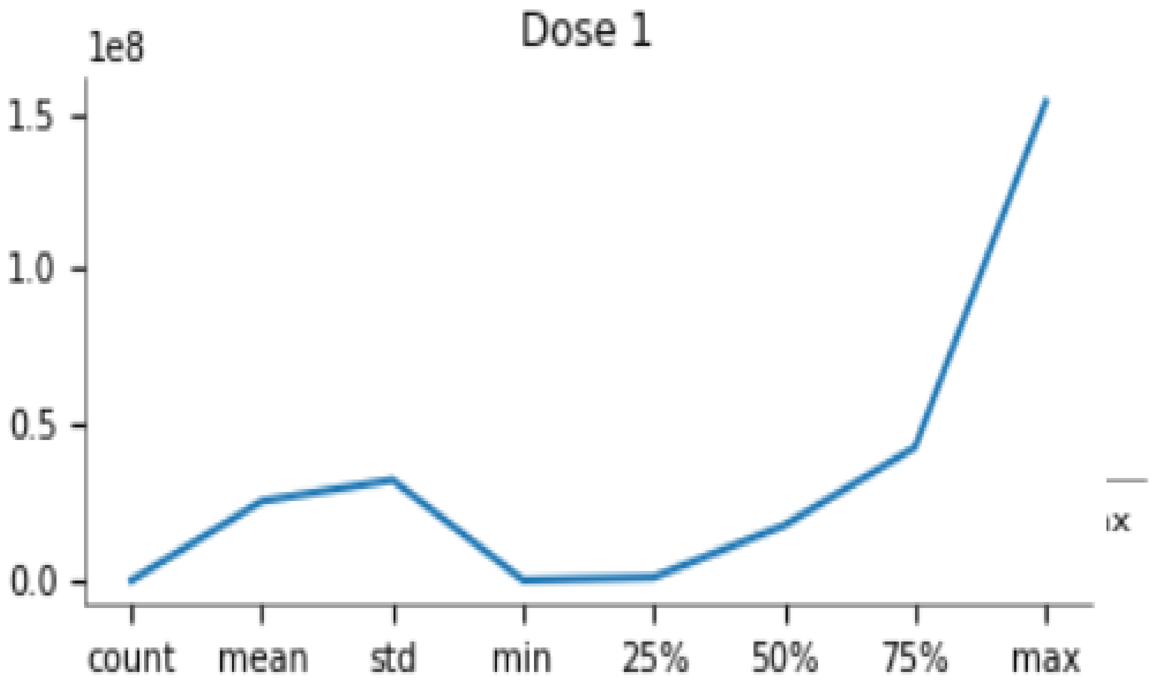


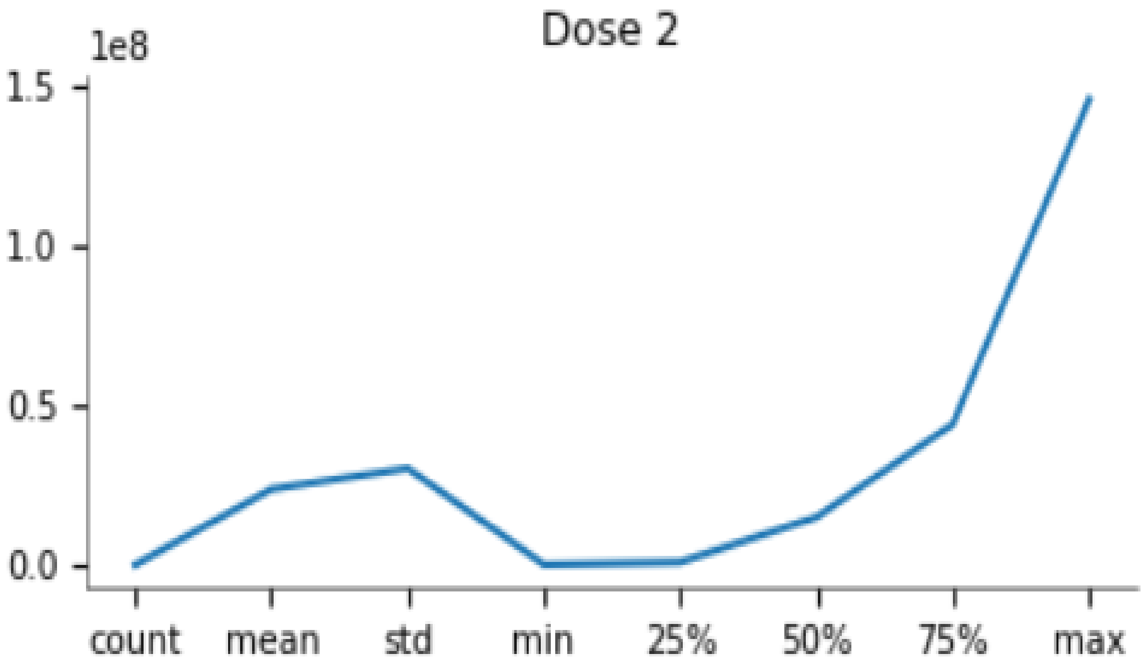
2-d distributions:

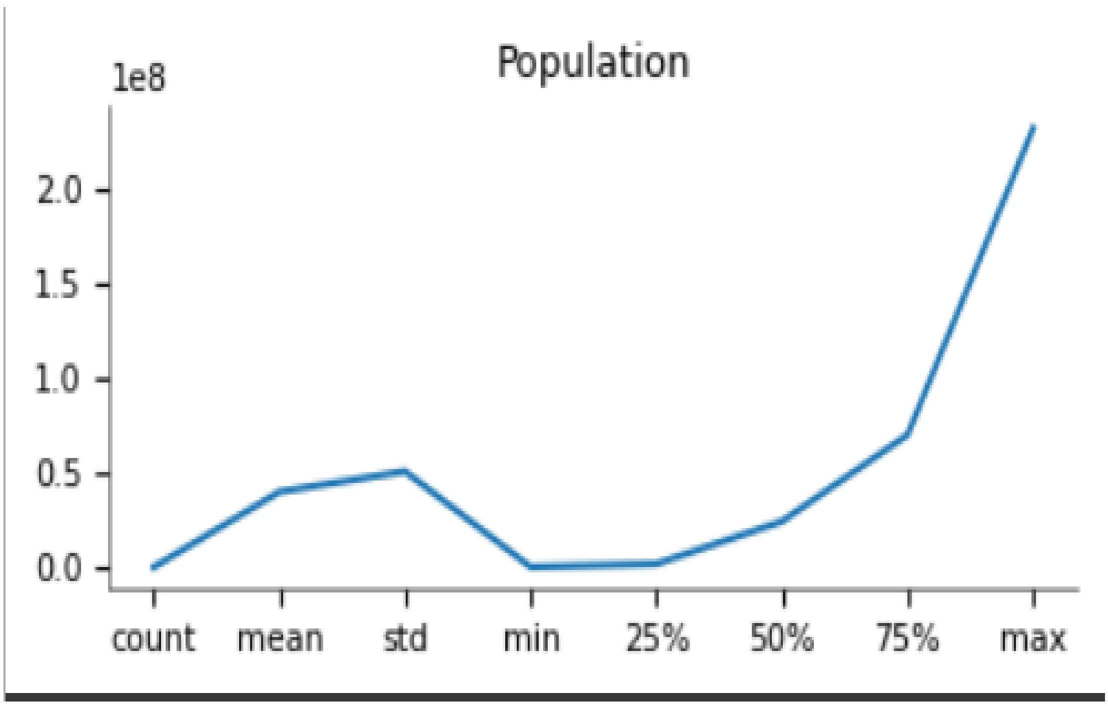


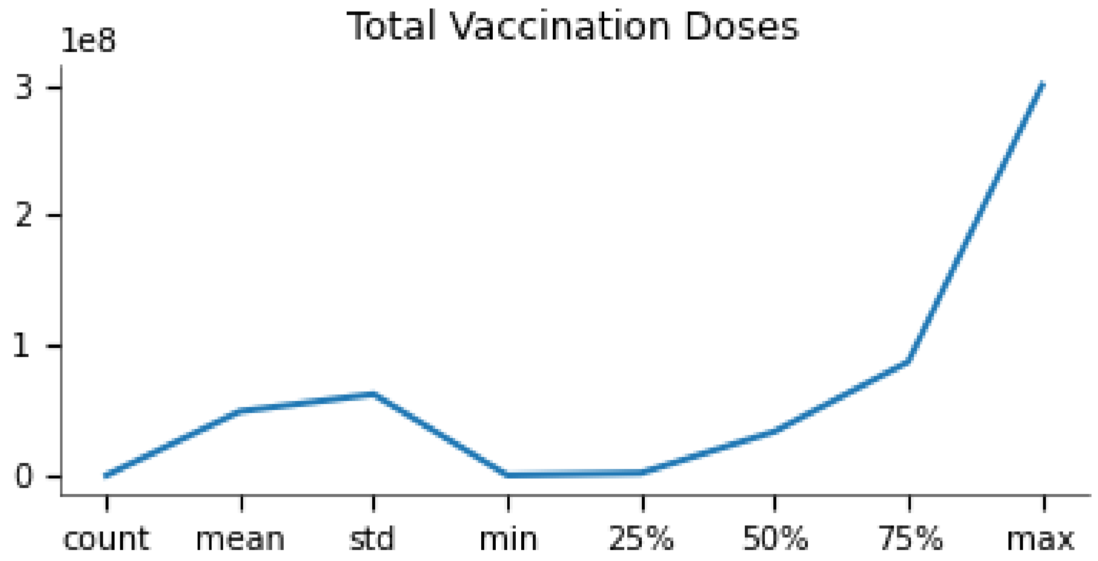


Values :




Dose 2
1e8
1.5
1.0
0.5
0.0
count
mean
std
min
25%
50%
75%
max


Population
1e8
2.0
1.5
1.0
0.5
0.0
count
mean
std
min
25%
50%
75%
max



Minimum Members Vaccinated:

```
df.min()
```

```
State/UTs                  Andaman and Nicobar
Total Vaccination Doses                 112378
Dose 1                                   56831
Dose 2                                   55547
Population                               66001
dtype: object
```

Maximum Members Vaccinated:

```
df.max()
```

```
State/UTs                 West Bengal
Total Vaccination Doses     299773777
Dose 1                      153669397
Dose 2                      146104380
Population                  231502578
dtype: object
```

Analysis:

```
# dose 1 - Not vaccinated

NoDoseOnepopulation = df["Population"] - df["Dose 1"]

df = df.assign(NoDoseOnePopulation=NoDoseOnepopulation)

df
```

OUTPUT:

	State/UTs	Total Vaccination Doses	Dose 1	Dose 2	Population	NoDoseOnePopulation
0	Andaman and Nicobar	629054	311893	317161	399001	87108
1	Andhra Pradesh	84147957	40624263	43523694	91702478	51078215
2	Arunachal Pradesh	1596166	856732	739434	1711947	855215
3	Assam	42998698	22535419	20463279	35998752	13463333
4	Bihar	119963226	62590002	57373224	128500364	65910362
5	Chandigarh	2001114	1088086	913028	1158040	69954
6	Chhattisgarh	36927545	18855121	18072424	32199722	13344601
7	Dadra and Nagar Haveli and Daman and Diu	1319914	729023	590891	773997	44974
8	Delhi	30710281	16555043	14155238	19301096	2746053
9	Goa	2572559	1353009	1219550	1521992	168983
10	Gujarat	98534412	49269034	49265378	70400153	21131119
11	Haryana	40581317	21938012	18643305	28900667	6962655
12	Himachal Pradesh	11770370	6028184	5742186	7503010	1474826
13	Jammu and Kashmir	20272520	9936338	10336182	14999397	5063059

14	Jharkhand	36992685	21243308	15749377	40100376	18857068
15	Karnataka	100209012	49971474	50237538	69599762	19628288
16	Kerala	50729256	26999013	23730243	34698876	7699863
17	Ladakh	404656	219238	185418	290492	71254
18	Lakshadweep	112378	56831	55547	66001	9170
19	Madhya Pradesh	107931053	54060775	53870278	85002417	30941642
20	Maharashtra	155773246	84570317	71202929	124904071	40333754
21	Manipur	2666749	1457120	1209629	3436948	1979828
22	Meghalaya	2348527	1329229	1019298	3772103	2442874
23	Mizoram	1440084	783477	656607	1308967	525490
24	Nagaland	1515042	835771	679271	2073074	1237303
25	Odisha	60803739	31331147	29472592	47099270	15768123
26	Puducherry	1620765	903986	716779	1646050	742064
27	Punjab	41717794	22309609	19408185	30501026	8191417
28	Rajasthan	97164120	51029686	46134434	79502477	28472791
29	Sikkim	1045753	539208	506545	658019	118811
30	Tamil Nadu	107856629	56110543	51746086	83697770	27587227

27	Punjab	41717794	22309609	19408185	30501026	8191417
28	Rajasthan	97164120	51029686	46134434	79502477	28472791
29	Sikkim	1045753	539208	506545	658019	118811
30	Tamil Nadu	107856629	56110543	51746086	83697770	27587227

31	Telangana	58332610	29547155	28785455	38157311	8610156
32	Tripura	4962881	2653391	2309490	4184959	1531568
33	Uttar Pradesh	299773777	153669397	146104380	231502578	77833181
34	Uttarakhand	16068172	8164652	7903520	11700099	3535447
35	West Bengal	128418265	67232447	61185818	100896618	33664171

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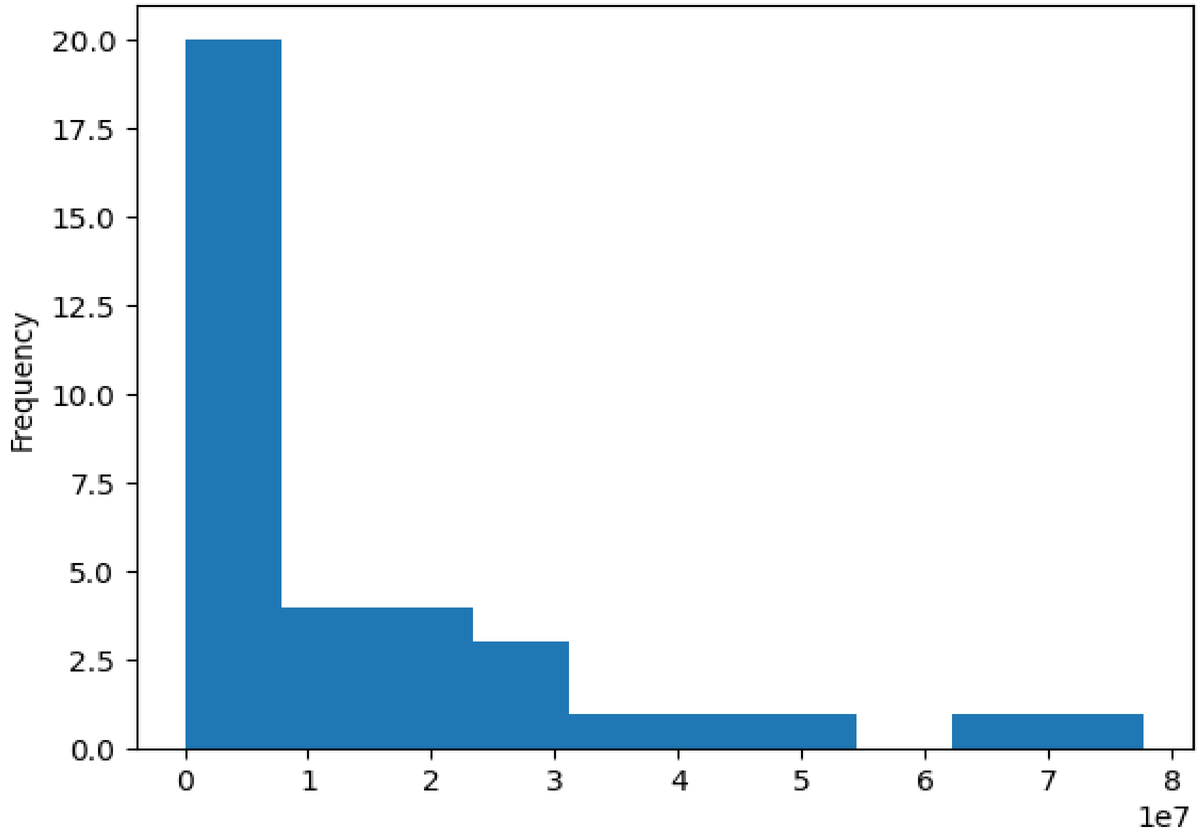

Dose 2 - Not vaccinated:

```
#dose 2 - Not vaccinated

NoDoseTwoPopulation = df["Population"] - df["Dose 2"]

df = df.assign(NoDoseTwoPopulation=NoDoseTwoPopulation)

df
```

OUTPUT

	State/UTs	Total Vaccination Doses	Dose 1	Dose 2	Population	NoDoseOnePopulation	NoDoseTwoPopulation
0	Andaman and Nicobar	629054	311893	317161	399001	87108	81840
1	Andhra Pradesh	84147957	40624263	43523694	91702478	51078215	48178784
2	Arunachal Pradesh	1596166	856732	739434	1711947	855215	972513
3	Assam	42998698	22535419	20463279	35998752	13463333	15535473
4	Bihar	119963226	62590002	57373224	128500364	65910362	71127140
5	Chandigarh	2001114	1088086	913028	1158040	69954	245012
6	Chhattisgarh	36927545	18855121	18072424	32199722	13344601	14127298
7	Dadra and Nagar Haveli and Daman and Diu	1319914	729023	590891	773997	44974	183106
8	Delhi	30710281	16555043	14155238	19301096	2746053	5145858
9	Goa	2572559	1353009	1219550	1521992	168983	302442
10	Gujarat	98534412	49269034	49265378	70400153	21131119	21134775
11	Haryana	40581317	21938012	18643305	28900667	6962655	10257362
12	Himachal Pradesh	11770370	6028184	5742186	7503010	1474826	1760824
13	Jammu and Kashmir	20272520	9936338	10336182	14999397	5063059	4663215
14	Jharkhand	36992685	21243308	15749377	40100376	18857068	24350999
15	Karnataka	100209012	49971474	50237538	69599762	19628288	19362224
16	Kerala	50729256	26999013	23730243	34698876	7699863	10968633
17	Ladakh	404656	219238	185418	290492	71254	105074
18	Lakshadweep	112378	56831	55547	66001	9170	10454
19	Madhya Pradesh	107931053	54060775	53870278	85002417	30941642	31132139
20	Maharashtra	155773246	84570317	71202929	124904071	40333754	53701142
21	Manipur	2666749	1457120	1209629	3436948	1979828	2227319
22	Meghalaya	2348527	1329229	1019298	3772103	2442874	2752805
23	Mizoram	1440084	783477	656607	1308967	525490	652360
24	Nagaland	1515042	835771	679271	2073074	1237303	1393803
25	Odisha	60803739	31331147	29472592	47099270	15768123	17626678

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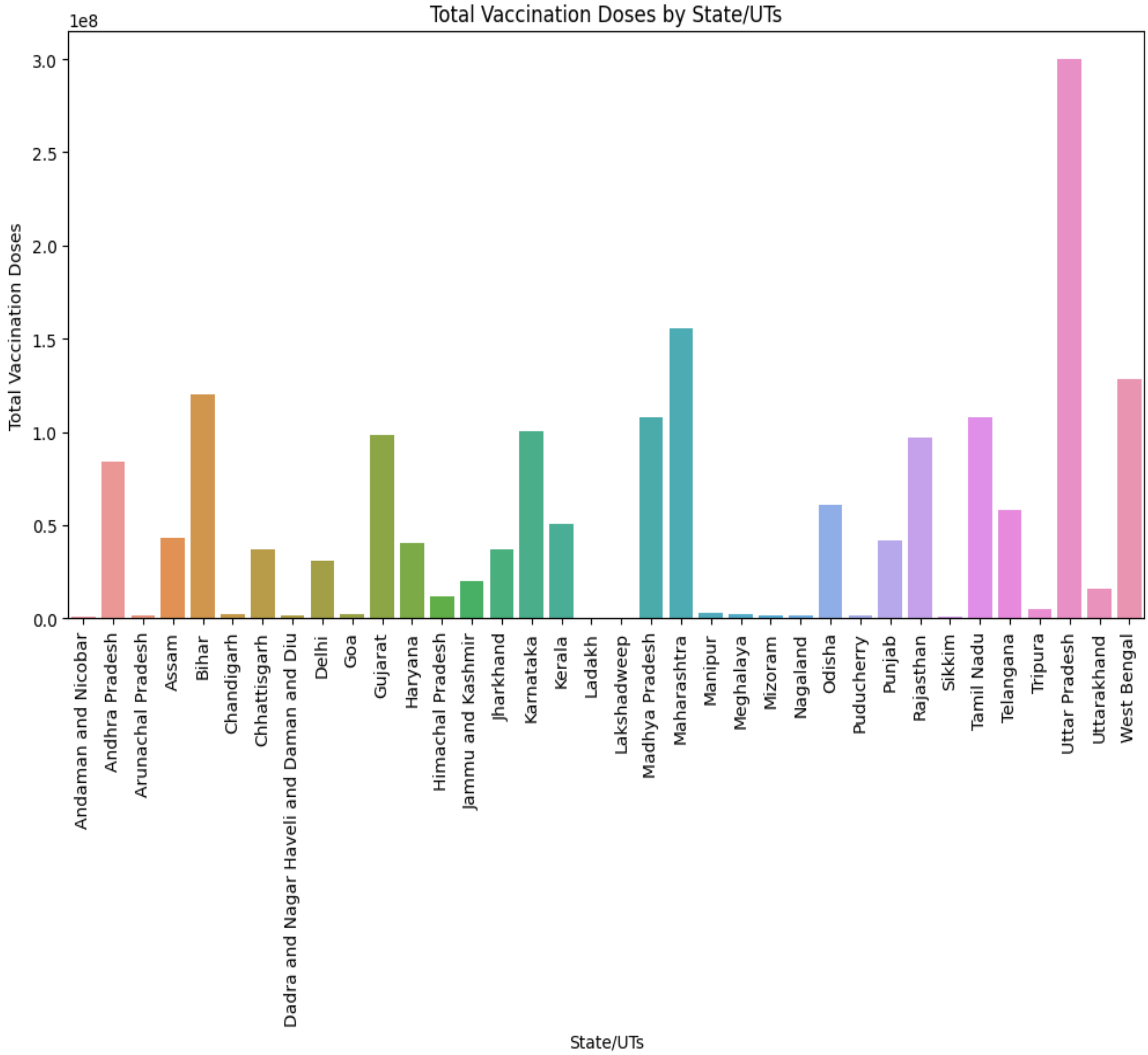
26	Puducherry	1620765	903986	716779	1646050	742064	929271
27	Punjab	41717794	22309609	19408185	30501026	8191417	11092841
28	Rajasthan	97164120	51029686	46134434	79502477	28472791	33368043
29	Sikkim	1045753	539208	506545	658019	118811	151474
30	Tamil Nadu	107856629	56110543	51746086	83697770	27587227	31951684
31	Telangana	58332610	29547155	28785455	38157311	8610156	9371856
32	Tripura	4962881	2653391	2309490	4184959	1531568	1875469
33	Uttar Pradesh	299773777	153669397	146104380	231502578	77833181	85398198
34	Uttarakhand	16068172	8164652	7903520	11700099	3535447	3796579
35	West Bengal	128418265	67232447	61185818	100896618	33664171	39710800

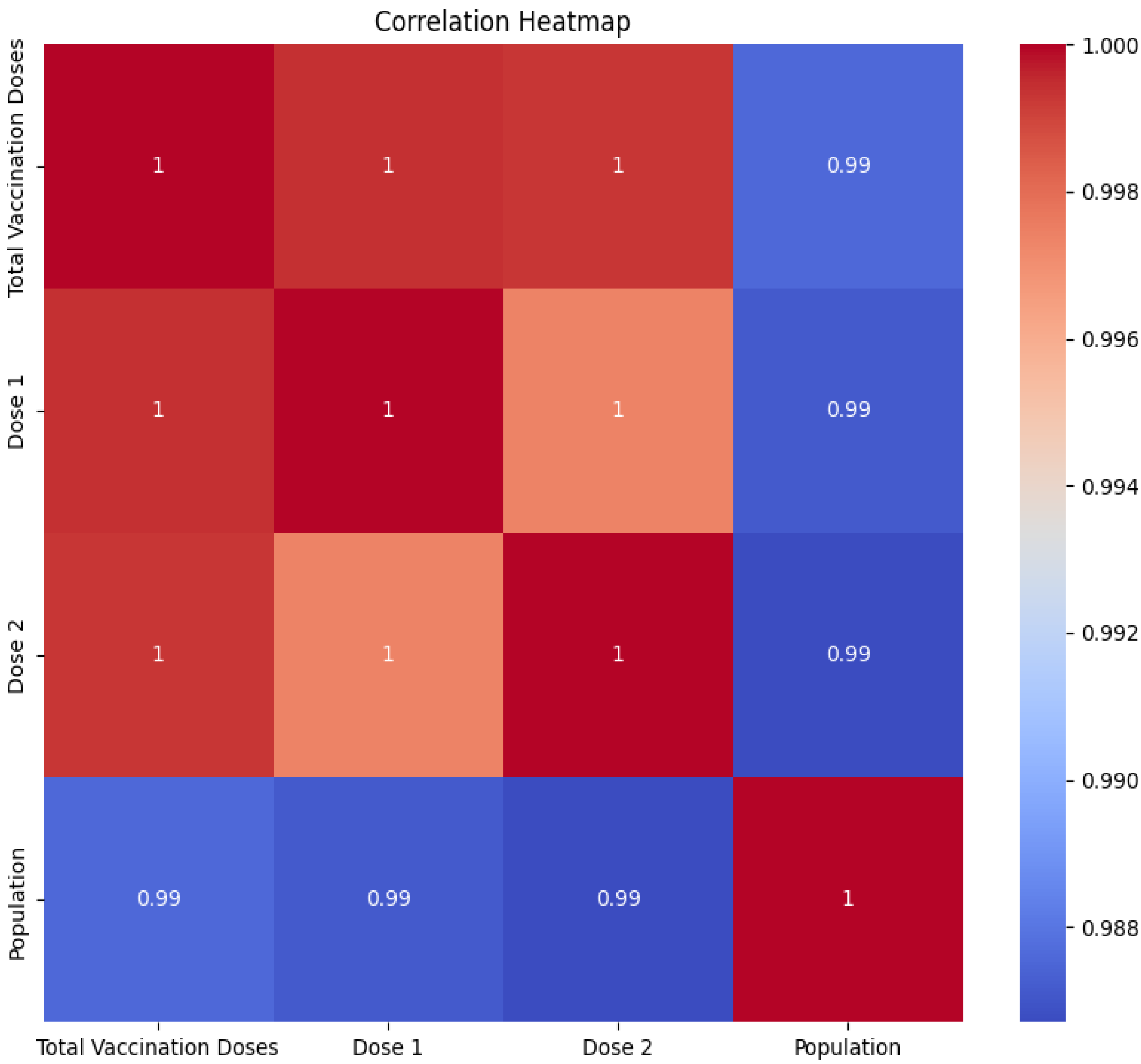
VISUALIZATION:

```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
data = pd.read_csv(r"/content/COVID-19 India Statewise Vaccine Data.csv")
plt.figure(figsize=(12, 6))
sns.barplot(data=data, x='State/UTs', y='Total Vaccination Doses')
plt.xticks(rotation=90)
plt.title('Total Vaccination Doses by State/UTs')
plt.show()
correlation_matrix = data.corr()
```

```
plt.figure(figsize=(10, 8))
sns.heatmap(correlation_matrix, annot=True, cmap='coolwarm')
plt.title('Correlation Heatmap')
plt.show()
```

OUTPUT:





FEATURE ENGINEERING - EXPLORATARY DATA ANALYSIS(EDA):

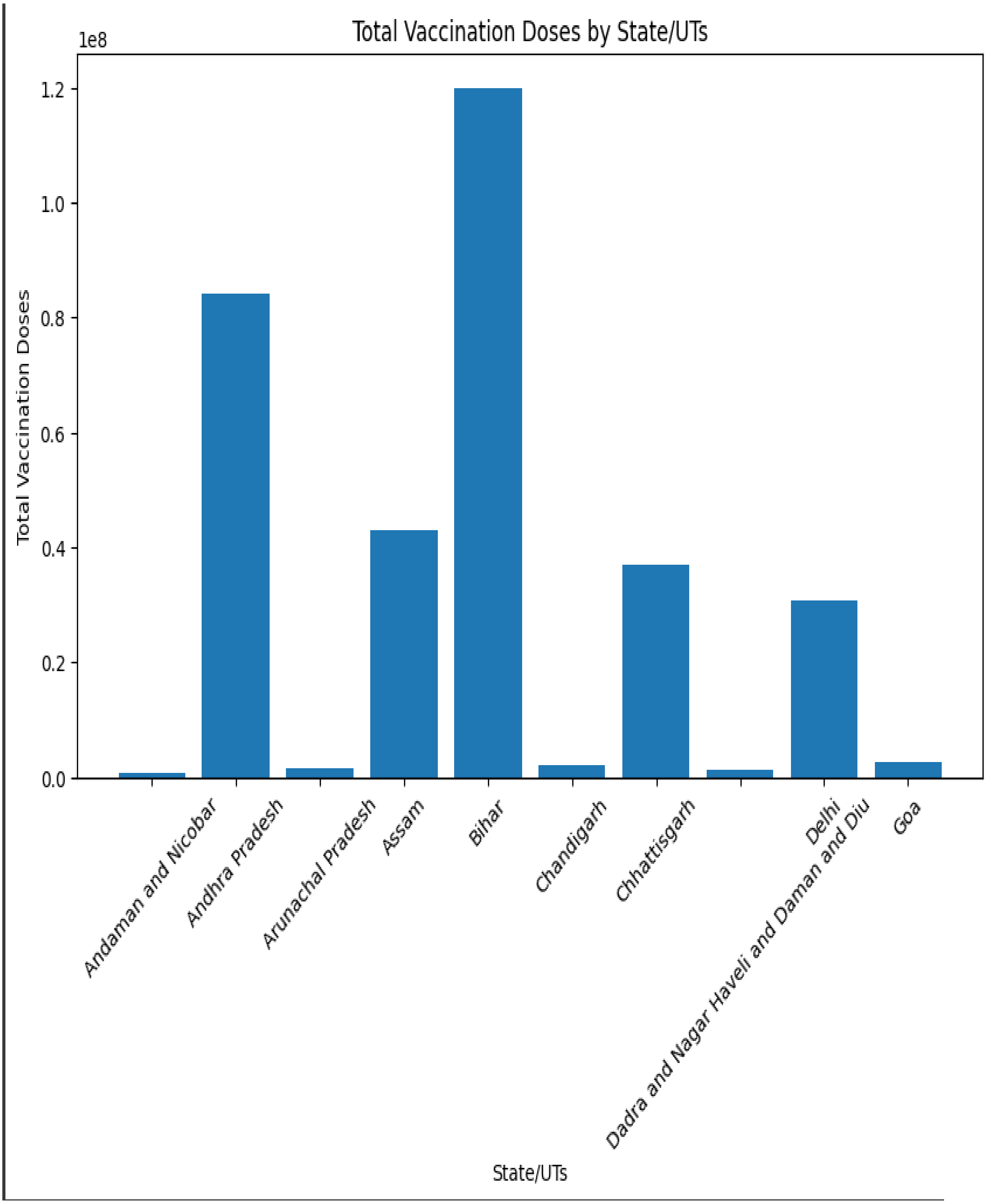
```
import pandas as pd
import matplotlib.pyplot as plt


# Create a Pandas DataFrame with the provided data
data = pd.DataFrame({
```

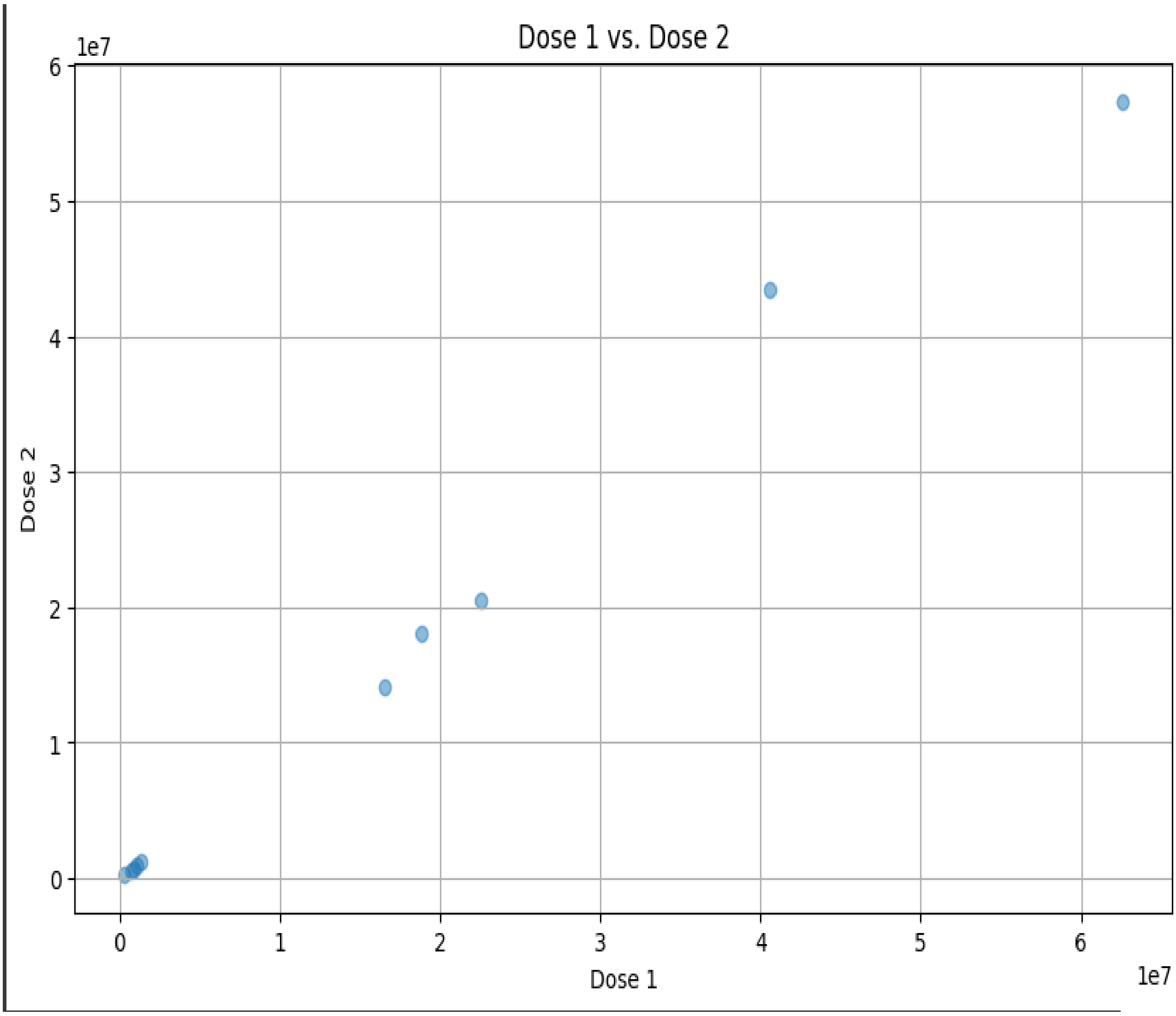
```
    'State/UTs': ['Andaman and Nicobar', 'Andhra Pradesh', 'Arunachal Pradesh', 'Assam', 'Bihar', 'Chandigarh', 'Chhattisgarh', 'Dadra and Nagar Haveli and Daman and Diu', 'Delhi', 'Goa'],

    'Total Vaccination Doses': [629054, 84147957, 1596166, 42998698, 119963226, 2001114, 36927545, 1319914, 30710281, 2572559],

    'Dose 1': [311893, 40624263, 856732, 22535419, 62590002, 1088086, 18855121, 729023, 16555043, 1353009],

    'Dose 2': [317161, 43523694, 739434, 20463279, 57373224, 913028, 18072424, 590891, 14155238, 1219550],

    'Population': [399001, 91702478, 1711947, 35998752, 128500364, 1158040, 32199722, 773997, 19301096, 1521992]

})


# Display the first few rows of the dataset

print(data.head())


# Calculate basic statistics

summary_statistics = data.describe()

print(summary_statistics)


# Create a bar plot to visualize Total Vaccination Doses by State/UTs

plt.figure(figsize=(10, 6))

plt.bar(data['State/UTs'], data['Total Vaccination Doses'])

plt.title('Total Vaccination Doses by State/UTs')

plt.xlabel('State/UTs')

plt.ylabel('Total Vaccination Doses')

plt.xticks(rotation=45)

plt.show()
```

```
# Create a scatter plot to visualize the relationship between Dose 1 and Dose 2
plt.figure(figsize=(10, 6))
plt.scatter(data['Dose 1'], data['Dose 2'], alpha=0.5)
plt.title('Dose 1 vs. Dose 2')
plt.xlabel('Dose 1')
plt.ylabel('Dose 2')
plt.grid(True)
plt.show()
```

OUTPUT:

```
State/UTs  Total Vaccination Doses    Dose 1    Dose 2  \
0  Andaman and Nicobar                  629054    311893    317161
1       Andhra Pradesh                84147957  40624263  43523694
2    Arunachal Pradesh                 1596166    856732    739434
3                Assam                42998698  22535419  20463279
4                Bihar               119963226  62590002  57373224

   Population
0      399001
1    91702478
2     1711947
3    35998752
4   128500364
       Total Vaccination Doses        Dose 1        Dose 2    Population
count             1.000000e+01  1.000000e+01  1.000000e+01  1.000000e+01
mean              3.228665e+07  1.654986e+07  1.573679e+07  3.132674e+07
std               4.112141e+07  2.100441e+07  2.016206e+07  4.449801e+07
min               6.290540e+05  3.118930e+05  3.171610e+05  3.990010e+05
25%               1.697403e+06  9.145705e+05  7.828325e+05  1.249028e+06
50%               1.664142e+07  8.954026e+06  7.687394e+06  1.050652e+07
75%               4.148091e+07  2.161534e+07  1.986557e+07  3.504899e+07
max               1.199632e+08  6.259000e+07  5.737322e+07  1.285004e+08
```


Total Vaccination Doses by State/UTs
1e8
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Total Vaccination Doses
Andaman and Nicobar
Andhra Pradesh
Arunachal Pradesh
Assam
Bihar
Chandigarh
Chhattisgarh
Dadra and Nagar Haveli and Daman and Diu
Delhi
Goa
State/UTs



PREDICTIVE ANALYSIS:

- Predictive analysis in data science is a process of using historical data to make informed predictions or forecasts about future events or outcomes.

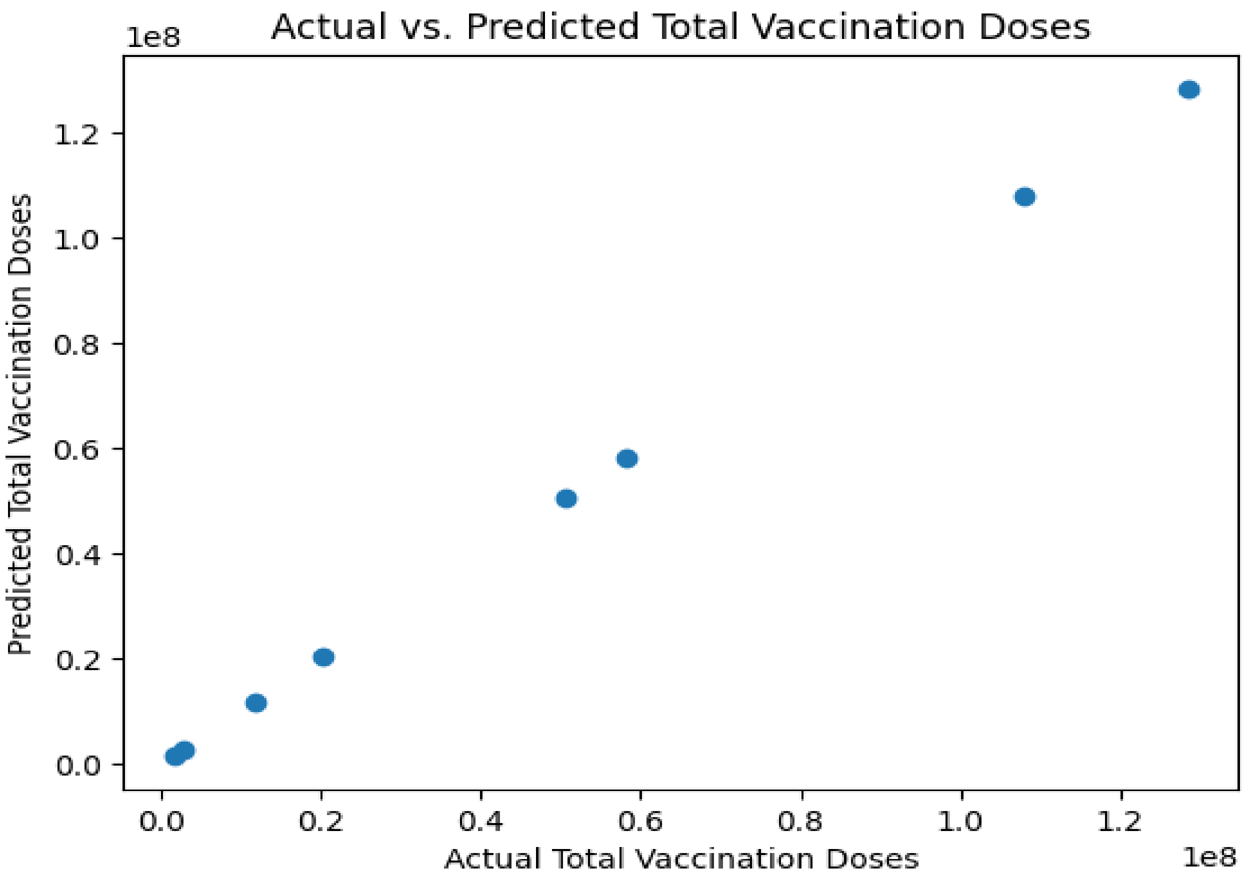
PROGRAM:

```
import pandas as pd

from sklearn.model_selection import train_test_split

from sklearn.linear_model import LinearRegression
```

```
from sklearn.metrics import mean_absolute_error, mean_squared_error, r2_score
import matplotlib.pyplot as plt

# Load the dataset
df = pd.read_csv(r"/content/COVID-19 India Statewise Vaccine Data.csv")

# Select relevant features
X = df[['Dose 1', 'Dose 2']]
y = df['Total Vaccination Doses']

# Split the data into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)

# Create a linear regression model
model = LinearRegression()

# Train the model on the training data
model.fit(X_train, y_train)

# Make predictions on the test data
y_pred = model.predict(X_test)

# Evaluate the model
mae = mean_absolute_error(y_test, y_pred)
mse = mean_squared_error(y_test, y_pred)
r2 = r2_score(y_test, y_pred)
```

```
# Visualize the results
plt.scatter(y_test, y_pred)
plt.xlabel("Actual Total Vaccination Doses")
plt.ylabel("Predicted Total Vaccination Doses")
plt.title("Actual vs. Predicted Total Vaccination Doses")
plt.show()


print("Mean Absolute Error:", mae)
print("Mean Squared Error:", mse)
print("R-squared (R^2):", r2)
```

OUTPUT:



Mean Absolute Error: 1.3300450518727303e-08

Mean Squared Error: 2.248160967284474e-16

R-squared (R^2): 1.0

Conclusion:

In the fight against the COVID pandemic, a comprehensive and data-driven approach is indispensable. The project of COVID Vaccine Analysis presented here plays a vital role in monitoring and assessing vaccination campaigns, ultimately contributing to the protection of public health. the analysis of the 'State-wise India COVID Vaccination' dataset provided valuable insights into the vaccination efforts across different states and union territories in India. Key statistics, including the mean number of vaccination doses administered, the total count of records, and the states with the minimum and maximum members vaccinated, were calculated. These statistics shed light on the variation in vaccination coverage across regions, offering essential information for assessing and planning public health strategies. This initial analysis serves as a foundational step for further in-depth exploration and data-driven decision-making in the fight against COVID.