

# NAAN MUDHULVAN PHASE-3

## DEVELOPMENT PART 1

**Project name:** COVID Vaccines Analysis

### DATA ANALYTICS OF COVID VACCINES ANALYSIS

#### Introduction

The COVID-19 pandemic has had a profound impact on global health and society. Vaccination campaigns are one of the most significant strategies to control the spread of the virus and mitigate its effects. This project aims to utilize virtualization technology to analyze and visualize data related to COVID-19 vaccines, offering insights into their development, distribution, and effectiveness. This virtualization shows that the vaccination done records through which has contains various people from various places.

#### Preprocessing of given dataset and program implementation:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	country	iso_code	date	total_vacc	people_v	people_f	daily_vacc	daily_vacc	total_vacc	people_v	people_f	daily_vacc	vaccines	source_na	source_website			
2	Afghanist	AFG	22-02-2021	0	0				0	0			Johnson & World He	https://covid19.who.int/				
3	Afghanist	AFG	23-02-2021					1367					34 Johnson & World He	https://covid19.who.int/				
4	Afghanist	AFG	24-02-2021					1367					34 Johnson & World He	https://covid19.who.int/				
5	Afghanist	AFG	25-02-2021					1367					34 Johnson & World He	https://covid19.who.int/				
6	Afghanist	AFG	26-02-2021					1367					34 Johnson & World He	https://covid19.who.int/				
7	Afghanist	AFG	27-02-2021					1367					34 Johnson & World He	https://covid19.who.int/				
8	Afghanist	AFG	28-02-2021	8200	8200			1367	0.02	0.02			34 Johnson & World He	https://covid19.who.int/				
9	Afghanist	AFG	01-03-2021					1580					40 Johnson & World He	https://covid19.who.int/				
10	Afghanist	AFG	02-03-2021					1794					45 Johnson & World He	https://covid19.who.int/				
11	Afghanist	AFG	03-03-2021					2008					50 Johnson & World He	https://covid19.who.int/				
12	Afghanist	AFG	04-03-2021					2221					56 Johnson & World He	https://covid19.who.int/				
13	Afghanist	AFG	05-03-2021					2435					61 Johnson & World He	https://covid19.who.int/				
14	Afghanist	AFG	06-03-2021					2649					66 Johnson & World He	https://covid19.who.int/				
15	Afghanist	AFG	07-03-2021					2862					72 Johnson & World He	https://covid19.who.int/				
16	Afghanist	AFG	08-03-2021					2862					72 Johnson & World He	https://covid19.who.int/				
17	Afghanist	AFG	09-03-2021					2862					72 Johnson & World He	https://covid19.who.int/				
18	Afghanist	AFG	10-03-2021					2862					72 Johnson & World He	https://covid19.who.int/				
19	Afghanist	AFG	11-03-2021					2862					72 Johnson & World He	https://covid19.who.int/				
20	Afghanist	AFG	12-03-2021					2862					72 Johnson & World He	https://covid19.who.int/				
21	Afghanist	AFG	13-03-2021					2862					72 Johnson & World He	https://covid19.who.int/				
22	Afghanist	AFG	14-03-2021					2862					72 Johnson & World He	https://covid19.who.int/				
23	Afghanist	AFG	15-03-2021					2862					72 Johnson & World He	https://covid19.who.int/				
24	Afghanist	AFG	16-03-2021	54000	54000			2862	0.14	0.14			72 Johnson & World He	https://covid19.who.int/				
25	Afghanist	AFG	17-03-2021					2882					72 Johnson & World He	https://covid19.who.int/				

```

import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
data = pd.read_csv("C:\Users\student\Documents\country_vaccinations.csv")
data.head()

```

	country	iso_code	date	total_vaccinations	people_vaccinated	\
0	Afghanistan	AFG	2021-02-22	0.0	0.0	
1	Afghanistan	AFG	2021-02-23	NaN	NaN	
2	Afghanistan	AFG	2021-02-24	NaN	NaN	
3	Afghanistan	AFG	2021-02-25	NaN	NaN	
4	Afghanistan	AFG	2021-02-26	NaN	NaN	

	people_fully_vaccinated	daily_vaccinations_raw	daily_vaccinations	\
0	NaN	NaN	NaN	
1	NaN	NaN	1367.0	
2	NaN	NaN	1367.0	
3	NaN	NaN	1367.0	
4	NaN	NaN	1367.0	

	total_vaccinations_per_hundred	people_vaccinated_per_hundred	\
0	0.0	0.0	
1	NaN	NaN	
2	NaN	NaN	
3	NaN	NaN	
4	NaN	NaN	

	people_fully_vaccinated_per_hundred	daily_vaccinations_per_million	\
0	NaN	NaN	
1	NaN	34.0	
2	NaN	34.0	
3	NaN	34.0	
4	NaN	34.0	

	vaccines	\
0	Johnson&Johnson, Oxford/AstraZeneca, Pfizer/Bi...	
1	Johnson&Johnson, Oxford/AstraZeneca, Pfizer/Bi...	
2	Johnson&Johnson, Oxford/AstraZeneca, Pfizer/Bi...	
3	Johnson&Johnson, Oxford/AstraZeneca, Pfizer/Bi...	
4	Johnson&Johnson, Oxford/AstraZeneca, Pfizer/Bi...	

	source_name	source_website
0	World Health Organization	<a href="https://covid19.who.int/">https://covid19.who.int/</a>
1	World Health Organization	<a href="https://covid19.who.int/">https://covid19.who.int/</a>
2	World Health Organization	<a href="https://covid19.who.int/">https://covid19.who.int/</a>
3	World Health Organization	<a href="https://covid19.who.int/">https://covid19.who.int/</a>
4	World Health Organization	<a href="https://covid19.who.int/">https://covid19.who.int/</a>

```
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

```
pd.to_datetime(data.date)
data.country.value_counts()
```

```
country
Norway          482
Latvia          480
Denmark         476
United States   471
Russia          470
...
Bonaire Sint Eustatius and Saba 146
Tokelau         114
Saint Helena    92
Pitcairn        85
Falkland Islands 67
Name: count, Length: 223, dtype: int64
```

```
data.vaccines.value_counts()
```

```
vaccines
Johnson&Johnson, Moderna, Oxford/AstraZeneca, Pfizer/BioNTech
7608
Moderna, Oxford/AstraZeneca, Pfizer/BioNTech
6263
Oxford/AstraZeneca
6022
Oxford/AstraZeneca, Pfizer/BioNTech
4629
Johnson&Johnson, Moderna, Novavax, Oxford/AstraZeneca, Pfizer/BioNTech
3564
...
Johnson&Johnson, Oxford/AstraZeneca, Sinovac
312
Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sinovac, Sputnik V
311
Johnson&Johnson, Moderna
251
Johnson&Johnson, Pfizer/BioNTech, Sinopharm/Beijing
228
EpiVacCorona, Oxford/AstraZeneca, QazVac, Sinopharm/Beijing, Sputnik V,
ZF2001      190
Name: count, Length: 84, dtype: int64
```

```
df = data[["vaccines", "country"]]
df.head()
```

	vaccines	country
0	Johnson&Johnson, Oxford/AstraZeneca, Pfizer/Bi...	Afghanistan
1	Johnson&Johnson, Oxford/AstraZeneca, Pfizer/Bi...	Afghanistan
2	Johnson&Johnson, Oxford/AstraZeneca, Pfizer/Bi...	Afghanistan
3	Johnson&Johnson, Oxford/AstraZeneca, Pfizer/Bi...	Afghanistan
4	Johnson&Johnson, Oxford/AstraZeneca, Pfizer/Bi...	Afghanistan

```
dict_={}
for i in df.vaccines.unique():
    dict_[i] = [df["country"][j] for j in df[df["vaccines"]==i].index]

vaccines = {}
for key, value in dict_.items():
    vaccines[key] = set(value)
for i, j in vaccines.items():
    print(f"{i}:>>{j}")
```

Johnson&Johnson, Oxford/AstraZeneca, Pfizer/BioNTech,  
Sinopharm/Beijing:>>{'Trinidad and Tobago', 'Afghanistan', 'Namibia',  
'Cameroon', 'Belize'}

Oxford/AstraZeneca, Pfizer/BioNTech, Sinovac, Sputnik V:>>{'Albania', 'Bosnia  
and Herzegovina', 'Azerbaijan', 'Oman'}

Oxford/AstraZeneca, Sinopharm/Beijing, Sinovac, Sputnik V:>>{'Zimbabwe',  
'Algeria'}

Moderna, Oxford/AstraZeneca, Pfizer/BioNTech:>>{'United Kingdom', 'England',  
'Scotland', 'Guernsey', 'Finland', 'Fiji', 'Northern Ireland', 'Sweden',  
'Isle of Man', 'Jersey', 'Wales', 'Sint Maarten (Dutch part)', 'Japan',  
'Australia', 'Andorra'}

Oxford/AstraZeneca:>>{'Mali', 'Saint Vincent and the Grenadines', 'Angola',  
'Nigeria', 'Saint Helena', 'Samoa', 'Liberia', 'Tuvalu', 'Nauru', 'Pitcairn',  
'Tonga', 'Vanuatu', 'Togo', 'Kiribati', 'Papua New Guinea', 'Democratic  
Republic of Congo', 'Solomon Islands', 'Sao Tome and Principe', 'Falkland  
Islands', 'Montserrat'}

Oxford/AstraZeneca, Pfizer/BioNTech:>>{'New Zealand', 'Bermuda', 'Kosovo',  
'Saudi Arabia', 'Cayman Islands', 'Gibraltar', 'Costa Rica', 'Panama', 'Saint  
Kitts and Nevis', 'Saint Lucia', 'Anguilla'}

Oxford/AstraZeneca, Pfizer/BioNTech, Sputnik V:>>{'Antigua and Barbuda'}

CanSino, Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing,  
Sputnik V:>>{'Argentina'}

Moderna, Oxford/AstraZeneca, Sinopharm/Beijing, Sinovac, Sputnik  
V:>>{'Armenia'}

Pfizer/BioNTech:>>{'Niue', 'New Caledonia', 'Cook Islands', 'Tokelau',  
'Monaco', 'Turks and Caicos Islands', 'Aruba'}

Johnson&Johnson, Moderna, Novavax, Oxford/AstraZeneca,  
Pfizer/BioNTech:>>{'Germany', 'Austria', 'Czechia', 'Lithuania',  
'Netherlands', 'South Korea', 'Italy', 'Slovenia'}

Johnson&Johnson, Oxford/AstraZeneca, Pfizer/BioNTech:>>{'Bahamas', 'Grenada',  
'Eswatini'}

Johnson&Johnson, Moderna, Oxford/AstraZeneca, Pfizer/BioNTech,  
Sinopharm/Beijing, Sputnik Light, Sputnik V:>>{'Bahrain'}

Johnson&Johnson, Moderna, Oxford/AstraZeneca, Pfizer/BioNTech,  
Sinopharm/Beijing, Sinovac:>>{'Bangladesh'}

Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing:>>{'Maldives',  
'Suriname', 'Peru', 'Barbados', 'Dominica'}

Sinopharm/Beijing, Sputnik V:>>{'Belarus', 'Kyrgyzstan'}

Johnson&Johnson, Moderna, Oxford/AstraZeneca, Pfizer/BioNTech:>>{'Ireland',  
'Romania', 'Luxembourg', 'Belgium', 'Jamaica', 'Bulgaria', 'Iceland',  
'Greece', 'Estonia', 'Poland', 'Spain', 'Croatia', 'Portugal', 'Cyprus',  
'Canada', 'Malta', 'France'}

Johnson&Johnson, Oxford/AstraZeneca, Pfizer/BioNTech, Sinovac:>>{'Brazil',  
'Benin'}

Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing:>>{'Bhutan',  
'Cape Verde'}

Johnson&Johnson, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing,  
Sputnik V:>>{'Morocco', 'Bolivia', 'Cote d'Ivoire', 'Moldova'}

Moderna, Pfizer/BioNTech:>>{'Israel', 'Norway', 'Curacao', 'Bonaire Sint  
Eustatius and Saba', 'Qatar', 'Faeroe Islands'}

Covaxin, Johnson&Johnson, Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sinovac:>>{'Botswana'}

Johnson&Johnson, Oxford/AstraZeneca:>>{'British Virgin Islands', 'Malawi', 'South Sudan'}

Johnson&Johnson, Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing:>>{'Kuwait', 'Brunei', 'Nepal', 'Kenya'}

Johnson&Johnson, Oxford/AstraZeneca, Sinopharm/Beijing:>>{'Burkina Faso', 'Mozambique', 'Lesotho', 'Senegal', 'Zambia', 'Gambia', 'Madagascar'}

Sinopharm/Beijing:>>{'Burundi', 'Equatorial Guinea', 'Chad'}

Johnson&Johnson, Oxford/AstraZeneca, Sinopharm/Beijing, Sinovac:>>{'Somalia', 'Cambodia'}

Covaxin, Oxford/AstraZeneca:>>{'Central African Republic'}

CanSino, Oxford/AstraZeneca, Pfizer/BioNTech, Sinovac:>>{'Ecuador', 'Chile'}

CanSino, Sinopharm/Beijing, Sinopharm/Wuhan, Sinovac, ZF2001:>>{'China'}

Johnson&Johnson, Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sinovac:>>{'Ukraine', 'Uganda', 'Colombia'}

Covaxin, Oxford/AstraZeneca, Sinopharm/Beijing:>>{'Mauritius', 'Comoros'}

Moderna, Oxford/AstraZeneca, Sinopharm/Beijing, Sputnik V:>>{'Congo'}

Abdala, Soberana Plus, Soberana02:>>{'Cuba'}

Johnson&Johnson, Moderna, Pfizer/BioNTech:>>{'United States', 'Denmark', 'Liechtenstein', 'Switzerland'}

Johnson&Johnson, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing, Sinovac, Sputnik V:>>{'Djibouti', 'Guinea', 'Egypt'}

Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing, Sinovac:>>{'Dominican Republic', 'El Salvador', 'Georgia'}

Covaxin, Johnson&Johnson, Oxford/AstraZeneca, Sinopharm/Beijing, Sinovac:>>{'Ethiopia'}

Johnson&Johnson, Pfizer/BioNTech:>>{'South Africa', 'French Polynesia'}

Pfizer/BioNTech, Sinopharm/Beijing, Sputnik V:>>{'Gabon'}

Oxford/AstraZeneca, Sputnik V:>>{'Ghana'}

Moderna:>>{'Greenland', 'Wallis and Futuna'}

Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sputnik V:>>{'Guatemala'}

Oxford/AstraZeneca, Sinopharm/Beijing:>>{'Niger', 'Guinea-Bissau', 'Myanmar', 'Mauritania', 'Sierra Leone'}

Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing, Sputnik V:>>{'Guyana', 'Sri Lanka'}

Johnson&Johnson, Moderna:>>{'Haiti'}

Johnson&Johnson, Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sputnik V:>>{'Honduras'}

Pfizer/BioNTech, Sinovac:>>{'Hong Kong'}

Johnson&Johnson, Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing, Sputnik V:>>{'Jordan', 'Hungary'}

Covaxin, Oxford/AstraZeneca, Sputnik V:>>{'India'}

Johnson&Johnson, Moderna, Novavax, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing, Sinovac:>>{'Indonesia'}

COVIran Barekat, Covaxin, FAKHRAVAC, Oxford/AstraZeneca, Razi Cov Pars, Sinopharm/Beijing, Soberana02, SpikoGen, Sputnik V:>>{'Iran'}

Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing, Sputnik V:>>{'Lebanon', 'Mongolia', 'Iraq', 'Serbia', 'Montenegro'}

QazVac, Sinopharm/Beijing, Sputnik V:>>{'Kazakhstan'}

Johnson&Johnson, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing, Sinovac, Sputnik Light, Sputnik V:>>{'Laos'}

Johnson&Johnson, Moderna, Novavax, Pfizer/BioNTech:>>{'Latvia'}

Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing, Sinovac, Sputnik V:>>{'Libya', 'North Macedonia'}

Pfizer/BioNTech, Sinopharm/Beijing:>>{'Macao'}

CanSino, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing, Sinovac:>>{'Malaysia'}

CanSino, Johnson&Johnson, Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sinovac, Sputnik V:>>{'Mexico'}

Abdala, Johnson&Johnson, Oxford/AstraZeneca, Pfizer/BioNTech, Soberana02, Sputnik Light, Sputnik V:>>{'Nicaragua'}

Oxford/AstraZeneca, Pfizer/BioNTech, Sinovac:>>{'Uruguay', 'Northern Cyprus', 'Timor'}

CanSino, Covaxin, Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing, Sinovac, Sputnik V:>>{'Pakistan'}

Johnson&Johnson, Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing, Sinovac, Sputnik Light, Sputnik V:>>{'Palestine', 'Philippines'}

Covaxin, Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing, Sinovac, Sputnik V:>>{'Paraguay'}

EpiVacCorona, Sputnik V:>>{'Russia'}

Johnson&Johnson, Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing, Sinovac, Sputnik V:>>{'Rwanda', 'Tunisia'}

Pfizer/BioNTech, Sputnik V:>>{'San Marino'}

Oxford/AstraZeneca, Sinopharm/Beijing, Sputnik V:>>{'Seychelles'}

Moderna, Pfizer/BioNTech, Sinopharm/Beijing, Sinovac:>>{'Singapore'}

Johnson&Johnson, Moderna, Novavax, Oxford/AstraZeneca, Pfizer/BioNTech, Sputnik V:>>{'Slovakia'}

Johnson&Johnson, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing, Sinovac:>>{'Sudan'}

Johnson&Johnson, Oxford/AstraZeneca, Sinopharm/Beijing, Sinovac, Sputnik Light, Sputnik V:>>{'Syria'}

Medigen, Moderna, Oxford/AstraZeneca, Pfizer/BioNTech:>>{'Taiwan'}

Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sinovac, Sputnik V:>>{'Tajikistan'}

Johnson&Johnson, Pfizer/BioNTech, Sinopharm/Beijing:>>{'Tanzania'}

Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing, Sinovac:>>{'Thailand'}

Pfizer/BioNTech, Sinovac, Turkovac:>>{'Turkey'}

EpiVacCorona, Oxford/AstraZeneca, QazVac, Sinopharm/Beijing, Sputnik V, ZF2001:>>{'Turkmenistan'}

Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing, Sinopharm/Wuhan, Sputnik V:>>{'United Arab Emirates'}

Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sinovac, Sputnik Light, Sputnik V, ZF2001:>>{'Uzbekistan'}

Abdala, Sinopharm/Beijing, Sinovac, Soberana02, Sputnik Light, Sputnik V:>>{'Venezuela'}

Abdala, Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing,



Sputnik V:>>{'Vietnam'}

Johnson&Johnson, Oxford/AstraZeneca, Sinovac:>>{'Yemen'}