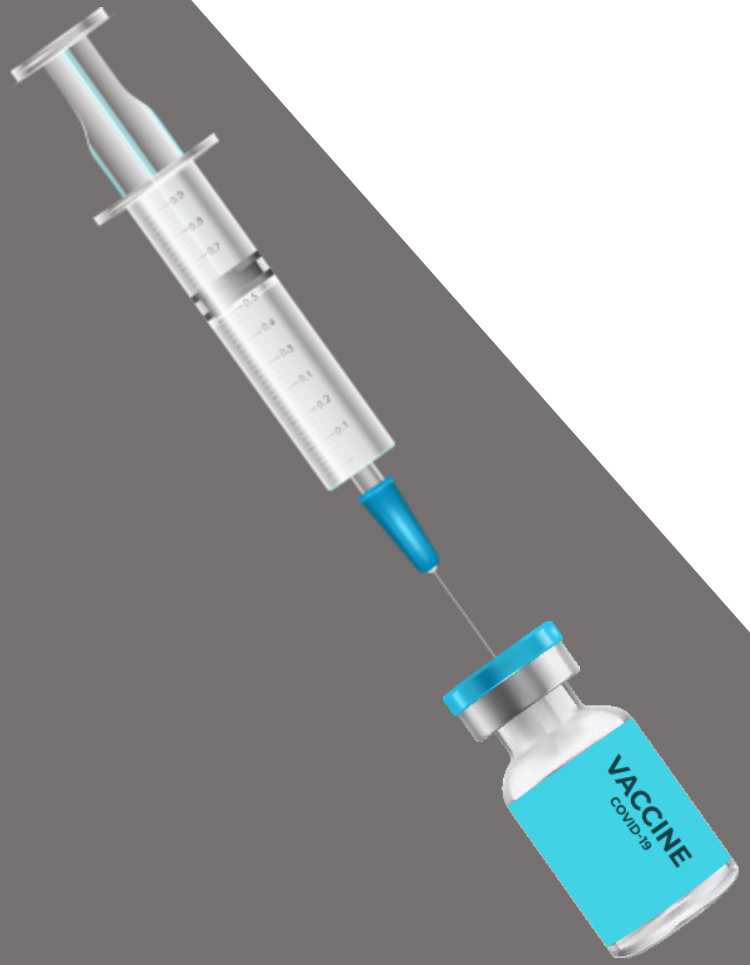


COVID-19

Coronavirus vaccine efficiency

Can we find out from Data Work, is vaccine effective ?

Data Science project

Date:26/6/2021

WHAT IS A VACCINE ?

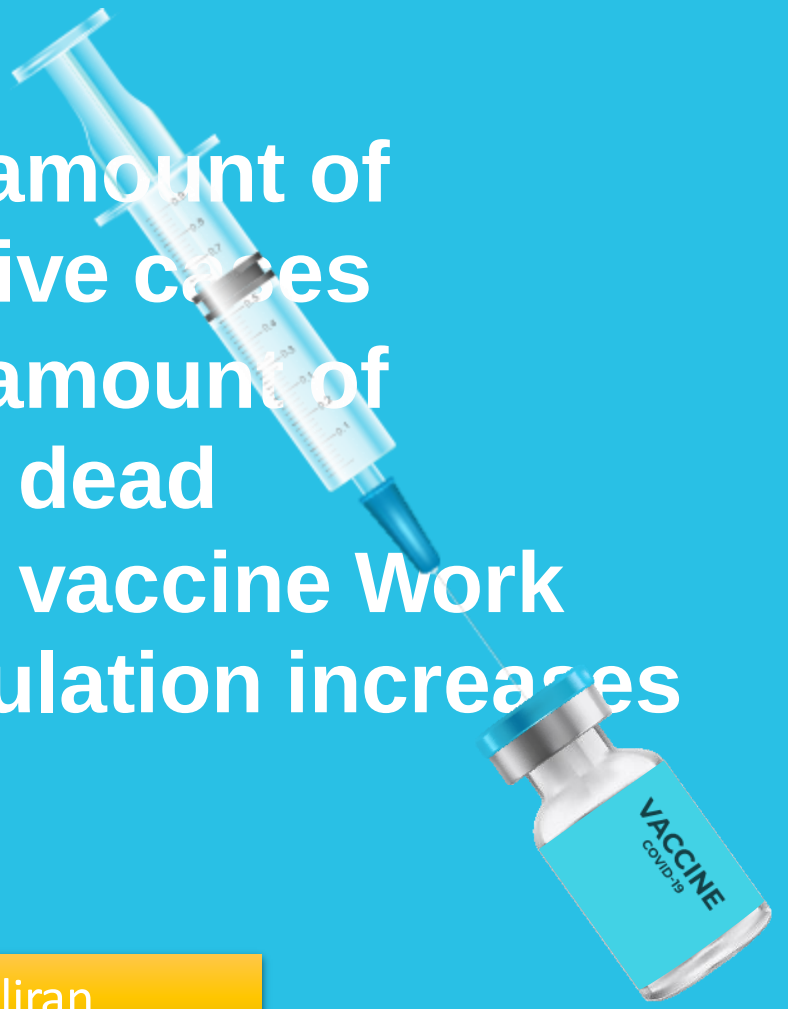
A **vaccine** is a type of medicine that trains the body's immune system so that it can fight a disease it has not come into contact with before.

How does a VACCINE work?

Vaccines contain weakened or inactive parts of a particular organism (antigen) that triggers an immune response within the body. Newer **vaccines** contain the blueprint for producing antigens rather than the antigen itself.

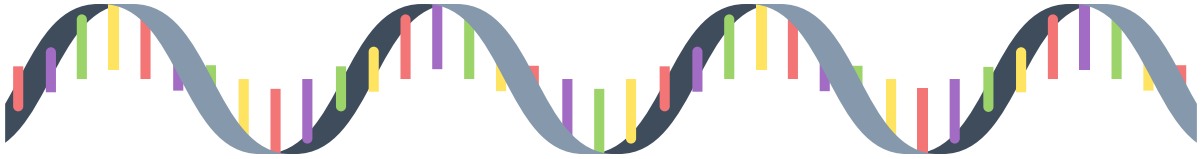
Our Research Will Check:

1) What is the connection between The amount of vaccinated population to amount of active cases
2) What is the connection between The amount of vaccinated population To the number of dead
3) Will Try to prove that efficiency of the vaccine Work better As the number of vaccinated population increases



Github:https://github.com/nikaloamashvili/corona-time-nika-eliran

Data Sources



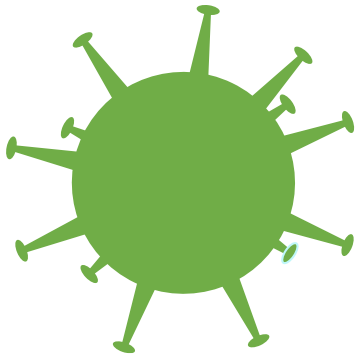
API

- https://ourworldindata.org/covid-vaccinations
- https://www.worldometers.info/coronavirus/#countries

Data cleaning

Vaccines worldwide

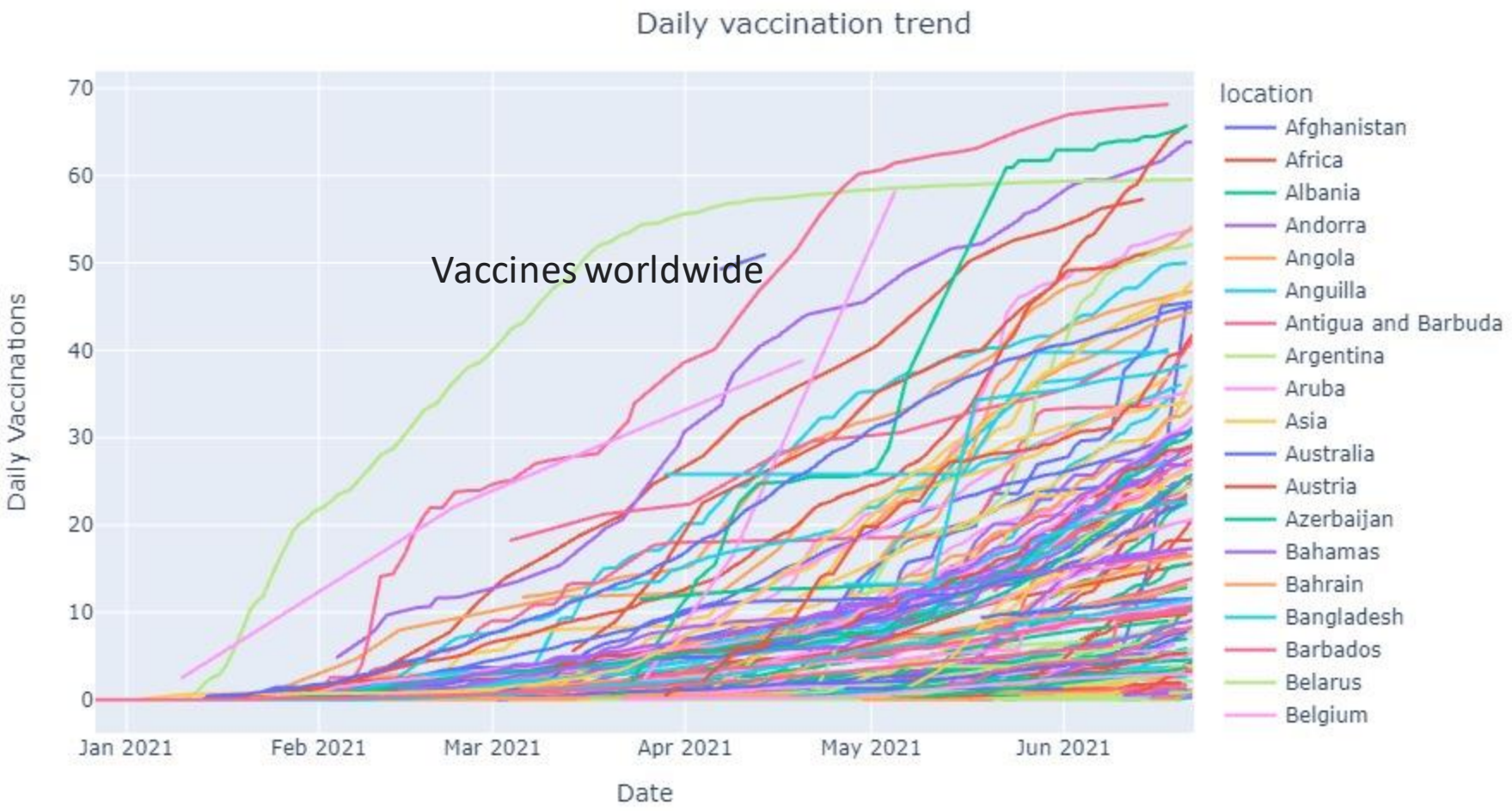
```
rVaccinated.dropna(subset = ["people_fully_vaccinated_per_hundred"], inplace=True)
rVaccinated = rVaccinated[rVaccinated["location"] != 'Gibraltar']
rVaccinated.query("people_fully_vaccinated_per_hundred>0" , inplace = True)
```

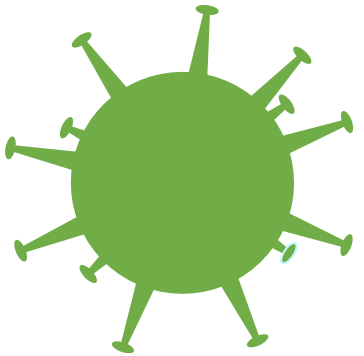


- We rejected the countries vaccined with over 100%
- We didn't used information with data that are =0 or not exists(vaccined %)

Vaccines worldwide

- %of vaccined population worldwide





GERMANY

UNITED STATES

ISRAEL

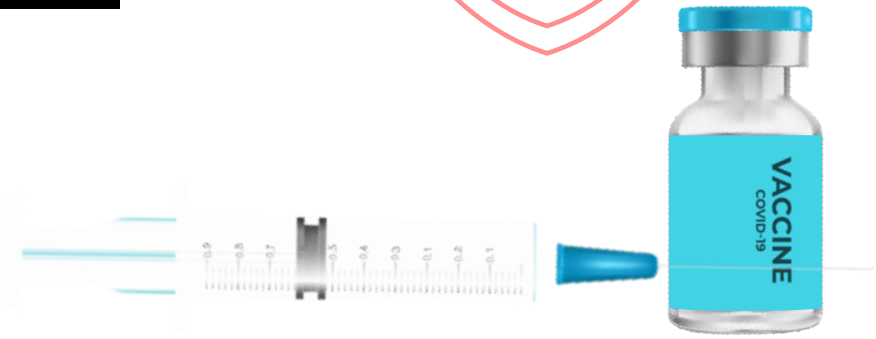
We chose to check 7 countries for our research
6 Countries with high % of vaccined
1 Country with low % of vacined

UNITED KINGDOM

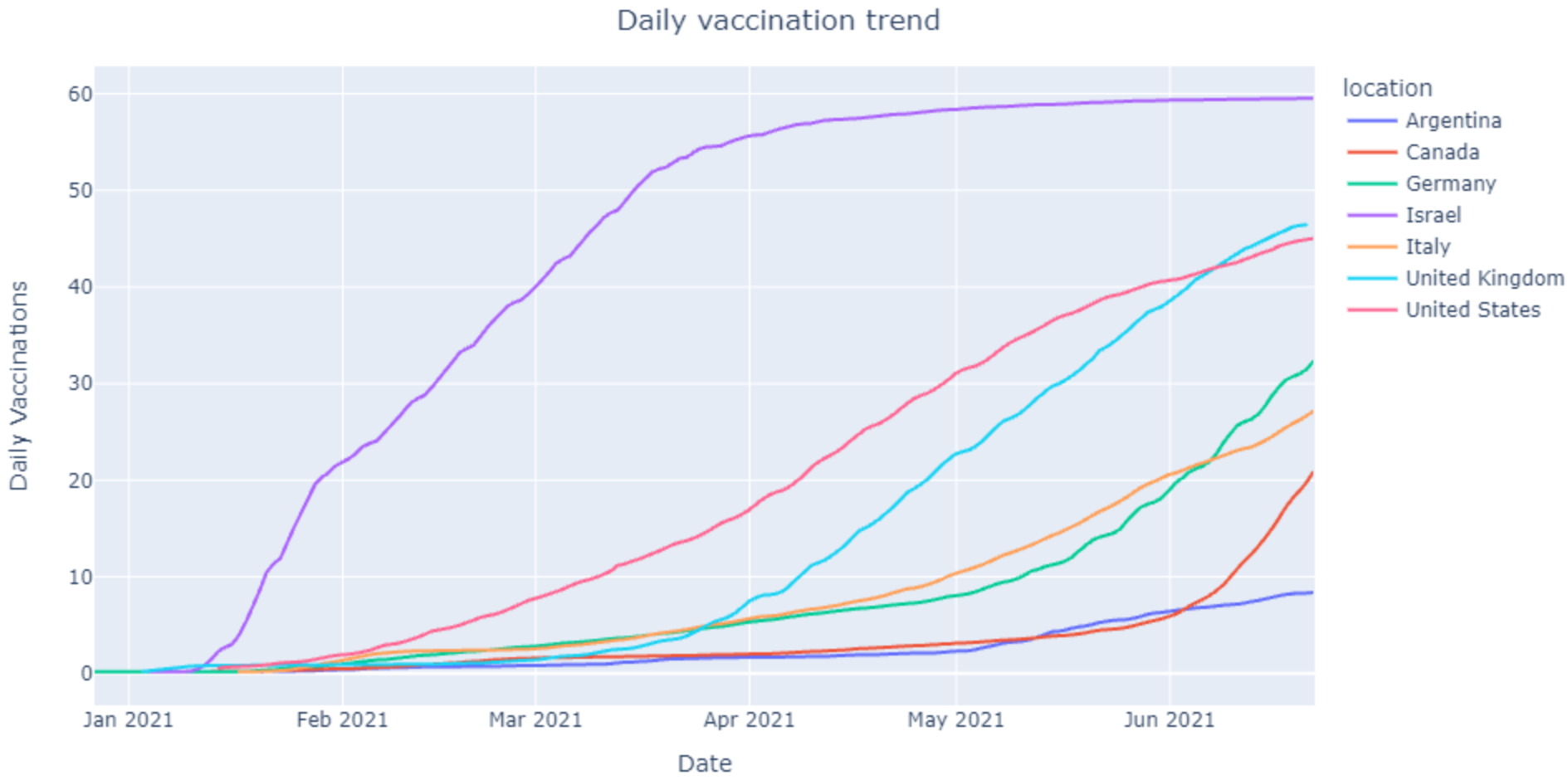
ITALY

Argentina

CANADA



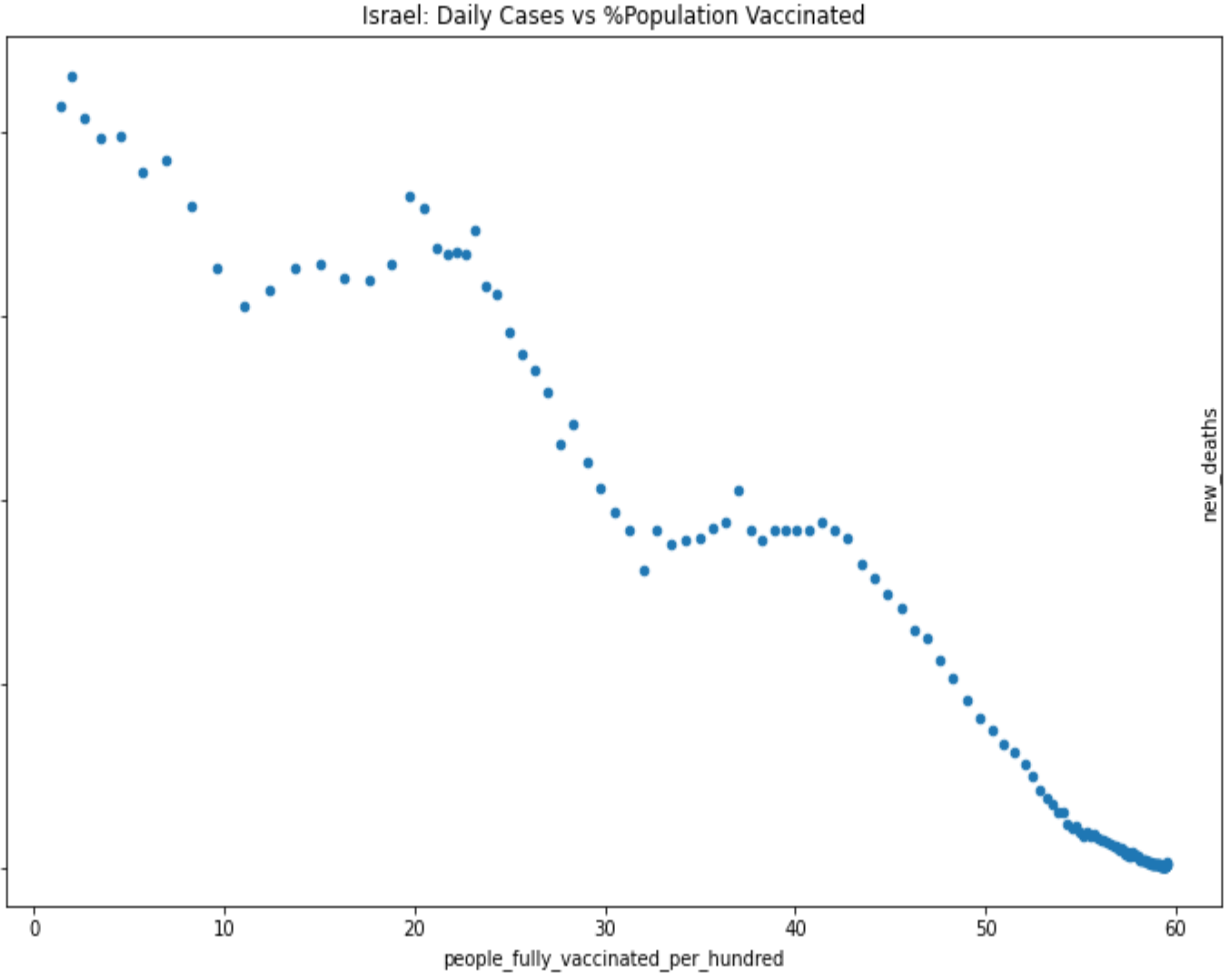
%vaccined population in selected counries

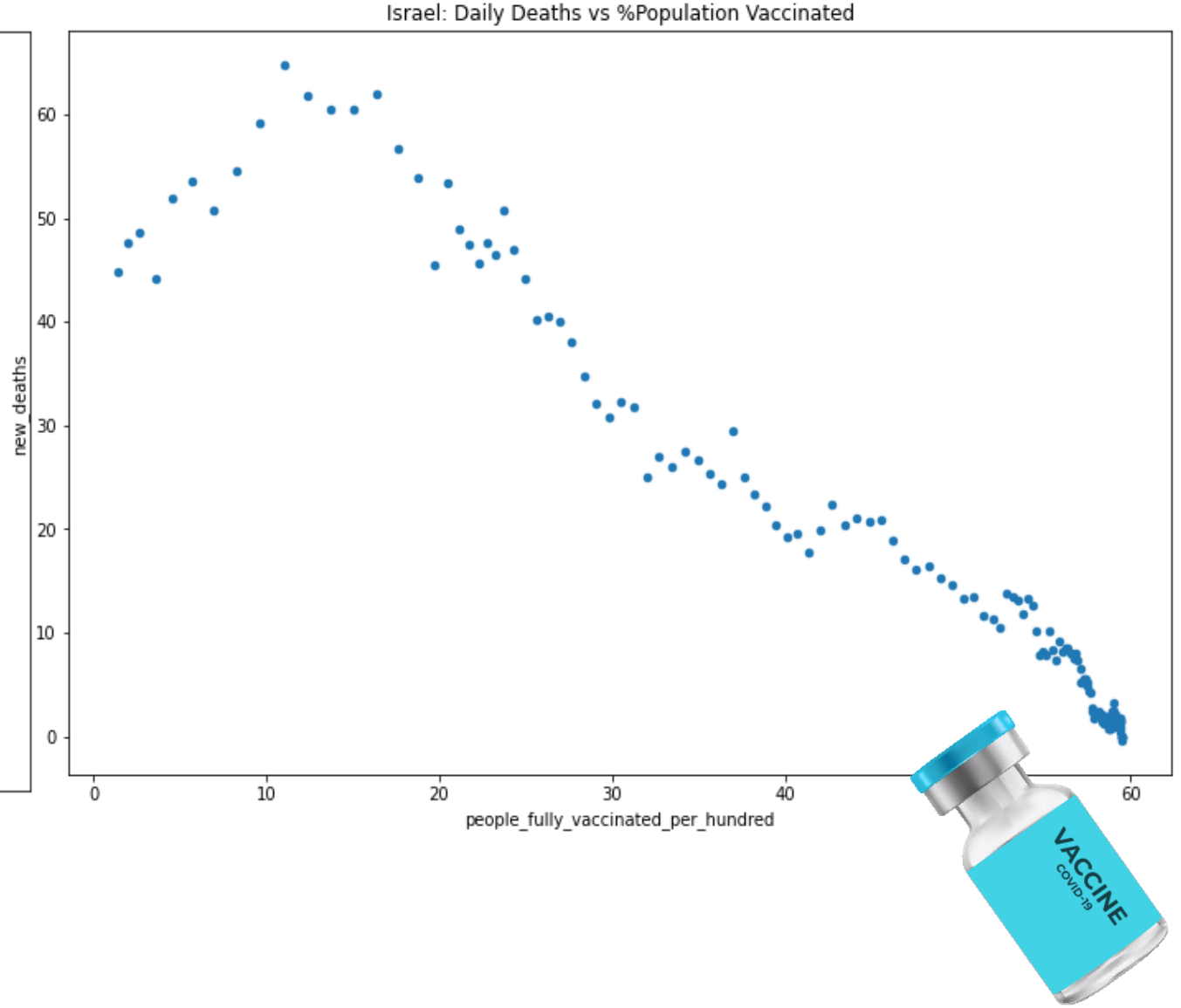


```
countries=["UK","US","Canada","Israel","Italy","Germany","Argentina"]
# Get Data only for Israel
for c in countries:
    KPI = covid_daily.data(country=c, chart = 'graph-cases-daily',  as_json=False)
    Vaccinated=rVaccinated.copy()
    Vaccinated.query("location=='%s'" %c, inplace = True)
    # Start Measuring from the time the vaccines started
    #Vaccinated.query("people_fully_vaccinated_per_hundred>0" , inplace =
True)
    # Conver the Day to Datetime Index
    Vaccinated['date'] = pd.DatetimeIndex(Vaccinated['date'])

    # Join the data
    merged = KPI.merge(Vaccinated, how='inner', left_index=True,
right_on='date')
    merged.index=merged.date
    merged.index.name = 'Date'

    rolling_merged = merged[['people_fully_vaccinated_per_hundred', 'Novel
Coronavirus Daily Cases']].rolling(7).mean().dropna()

    rolling_merged.plot.scatter('people_fully_vaccinated_per_hundred', 'Novel
Coronavirus Daily Cases',
                figsize=(12,8), title = c+": Daily Cases vs %Population Vaccinated")
```

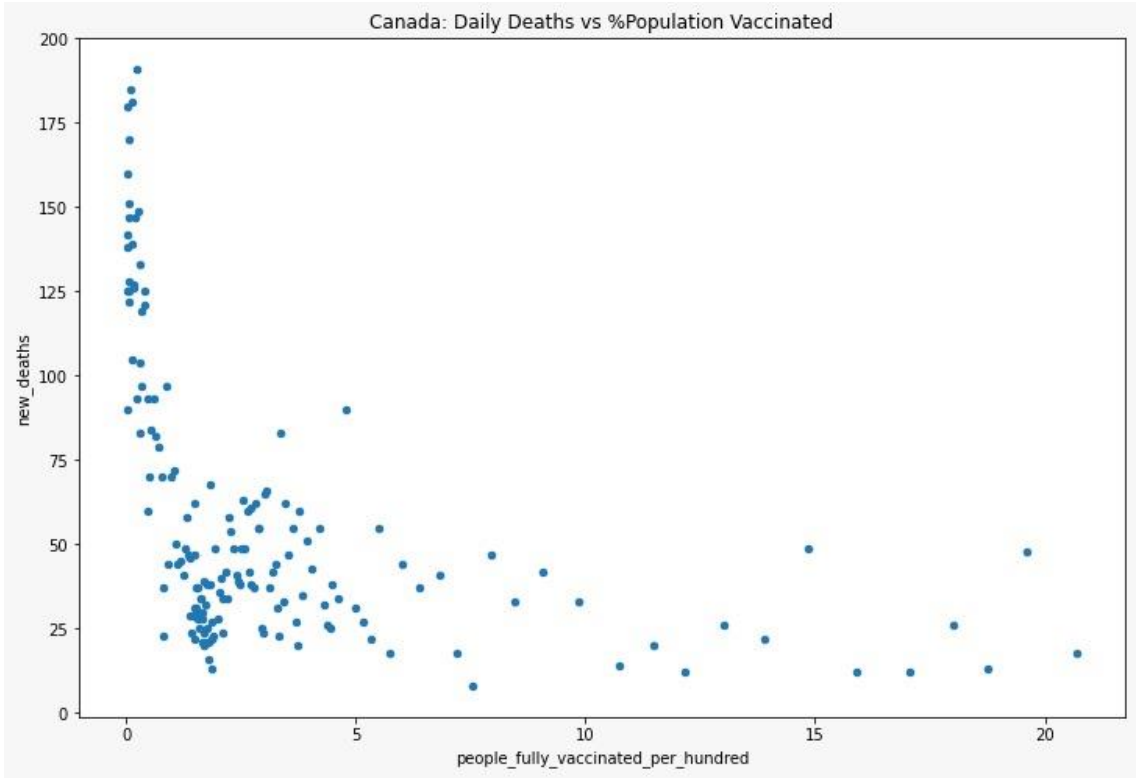
From the data we created 2 graphs for each country that shows the corelation between the % of new cases and the % of vaccined, and the conection between vaccined and total deaths

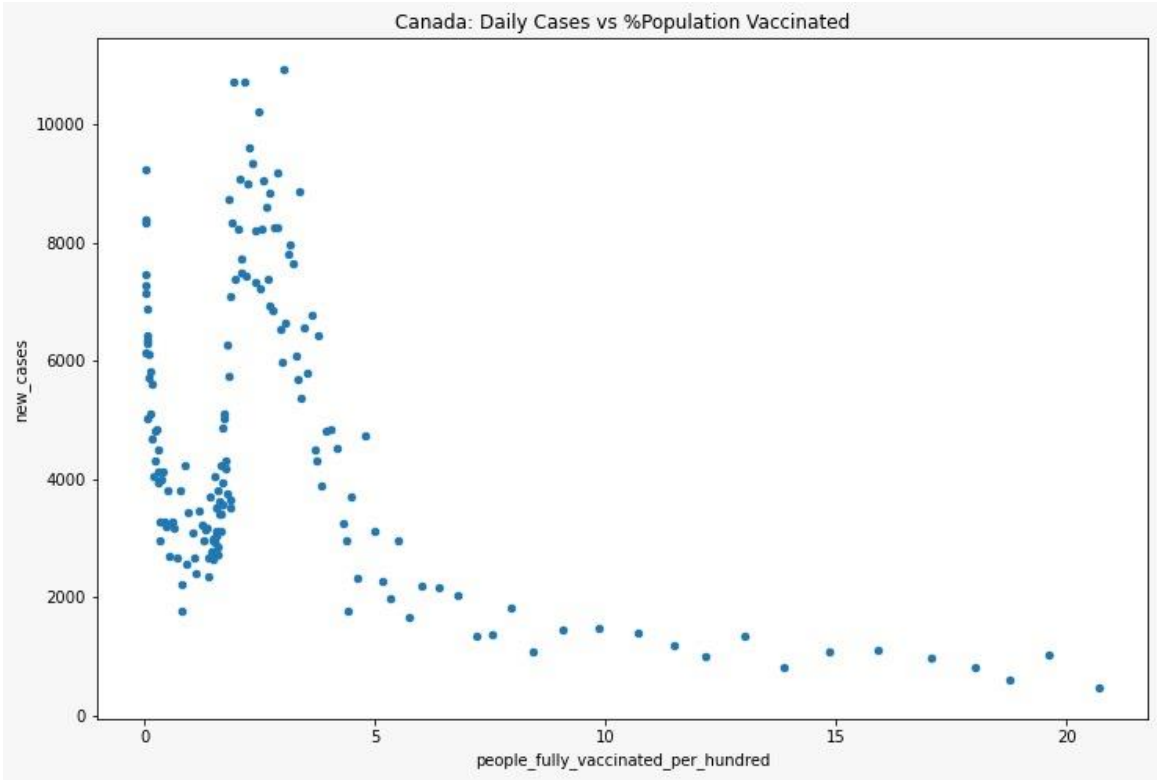
ISRAEL


Israel: Daily Cases vs %Population Vaccinated
0
10
20
30
40
50
60
people_fully_vaccinated_per_hundred

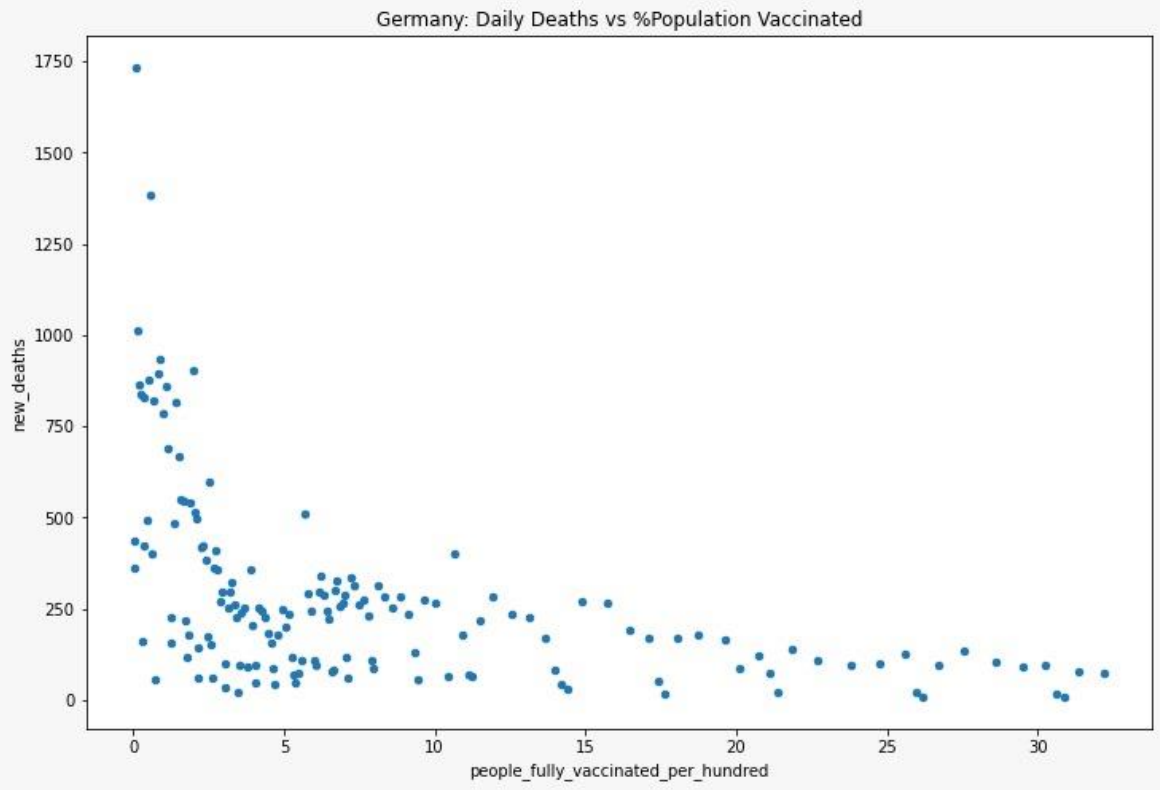

Israel: Daily Deaths vs %Population Vaccinated
new_deaths
0
10
20
30
40
50
60
people_fully_vaccinated_per_hundred
VACCINE
COVID-19

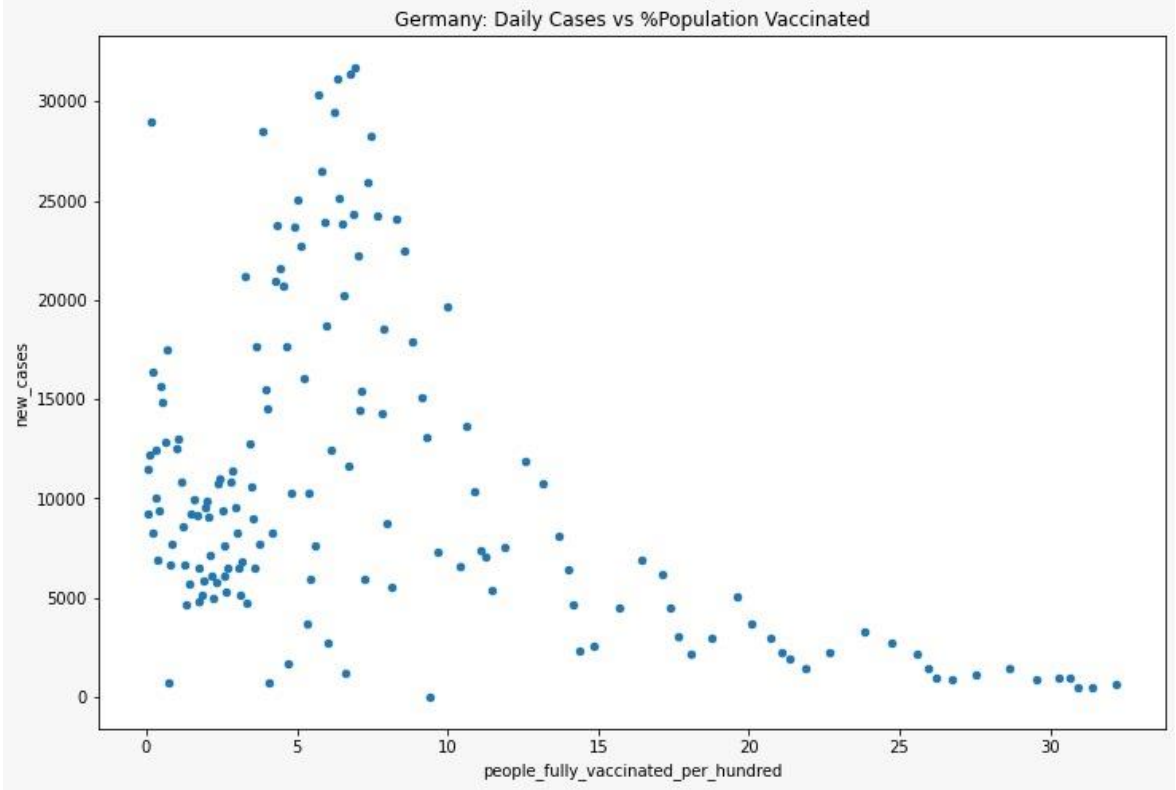
CANADA


Canada: Daily Deaths vs %Population Vaccinated
new_deaths
people_fully_vaccinated_per_hundred
0
25
50
75
100
125
150
175
200
0
5
10
15
20


Canada: Daily Cases vs %Population Vaccinated
new_cases
people_fully_vaccinated_per_hundred
0
2000
4000
6000
8000
10000
0
5
10
15
20

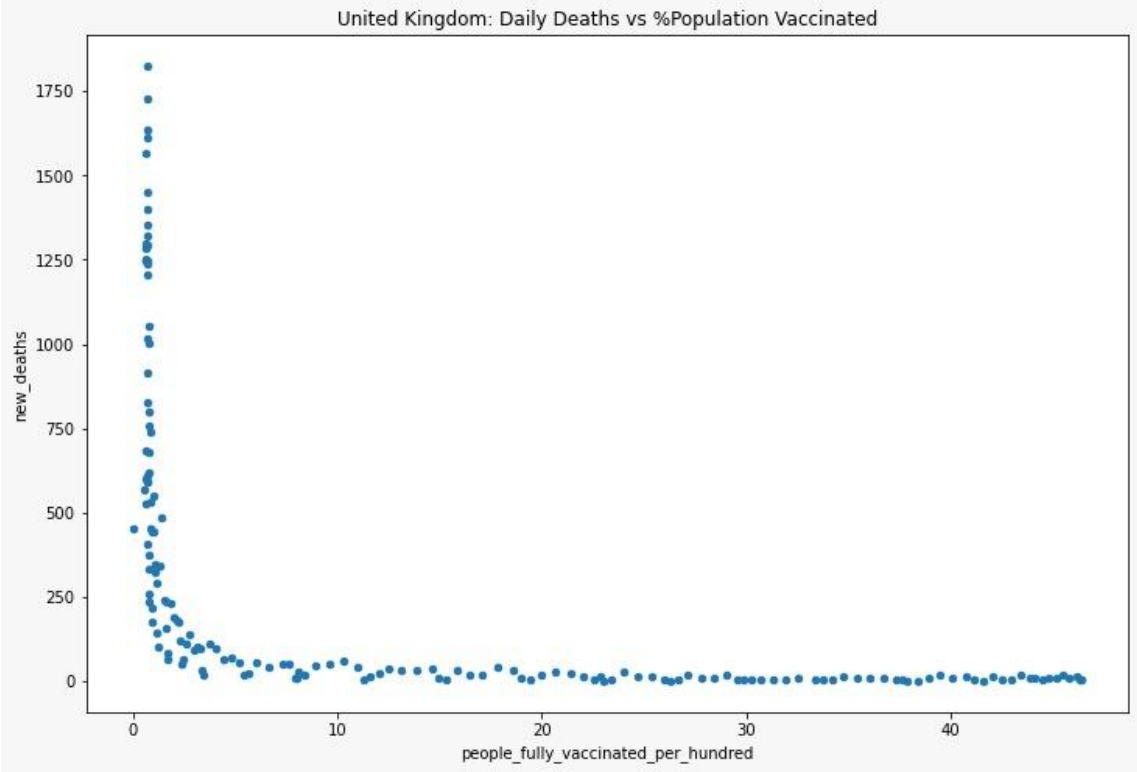
GERMANY

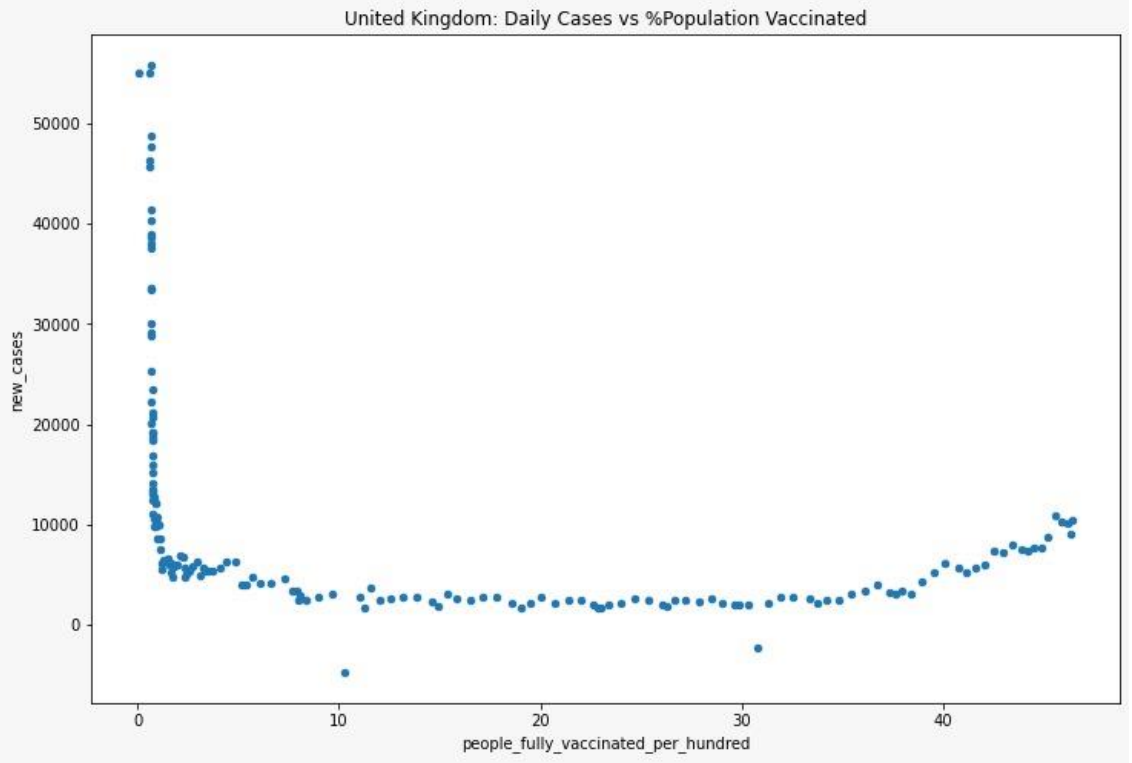

Germany: Daily Deaths vs %Population Vaccinated
new_deaths
people_fully_vaccinated_per_hundred
0
250
500
750
1000
1250
1500
1750
0
5
10
15
20
25
30

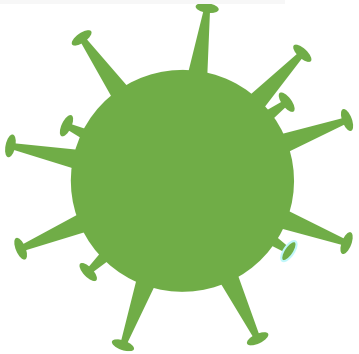

Germany: Daily Cases vs %Population Vaccinated
new_cases
people_fully_vaccinated_per_hundred
0
5000
10000
15000
20000
25000
30000
0
5
10
15
20
25
30


VACCINE
COVID-19

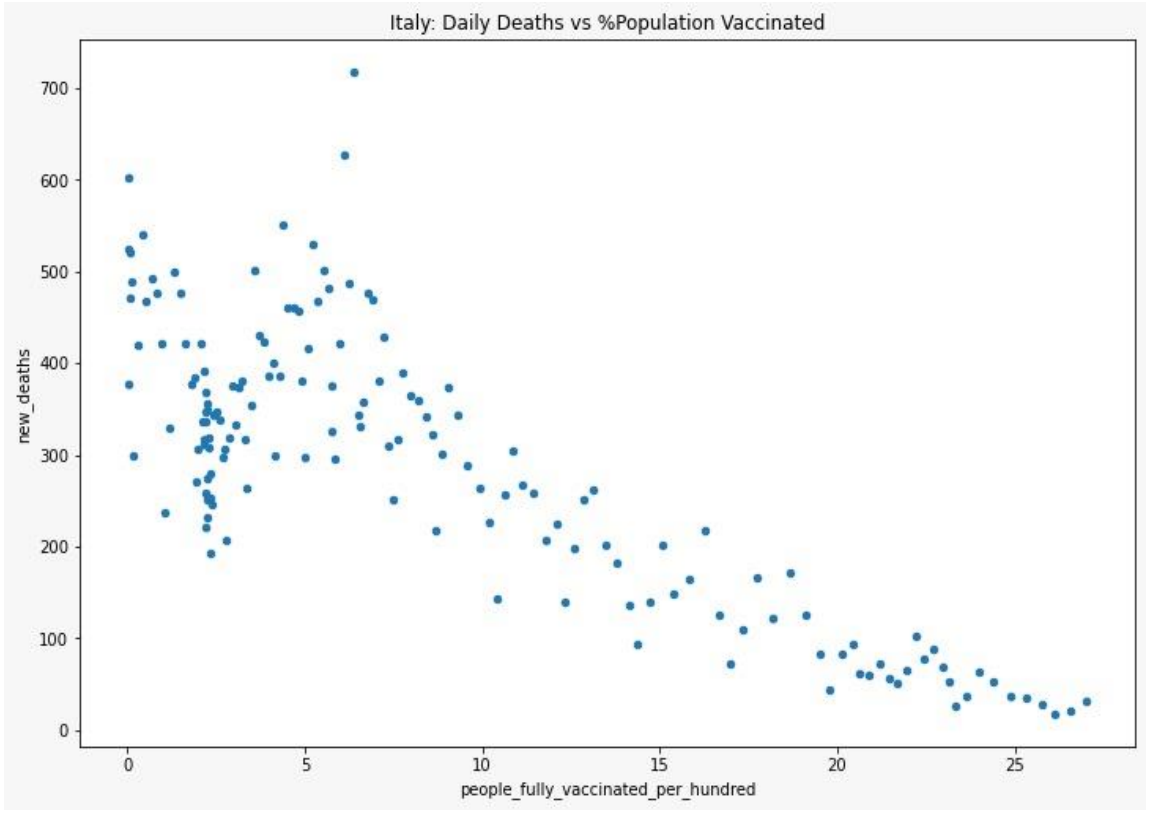
UNITED KINGDOM

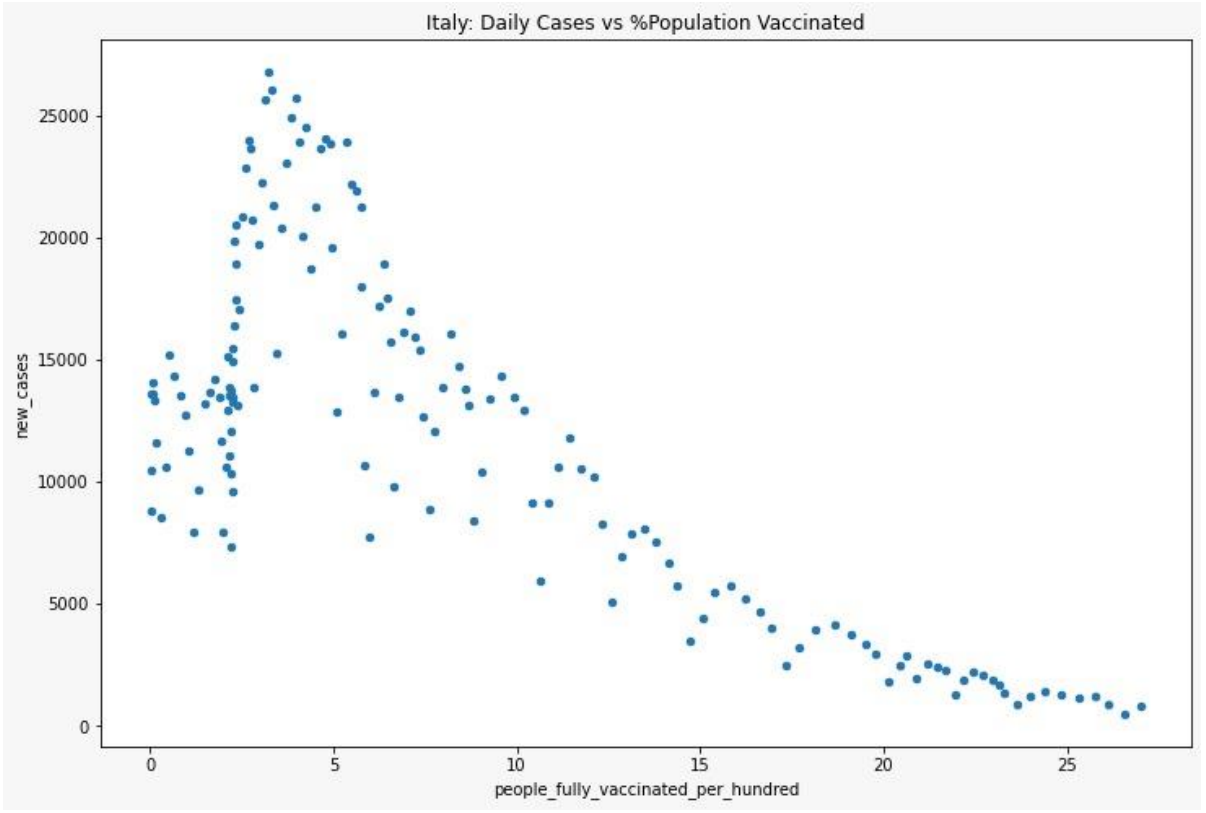




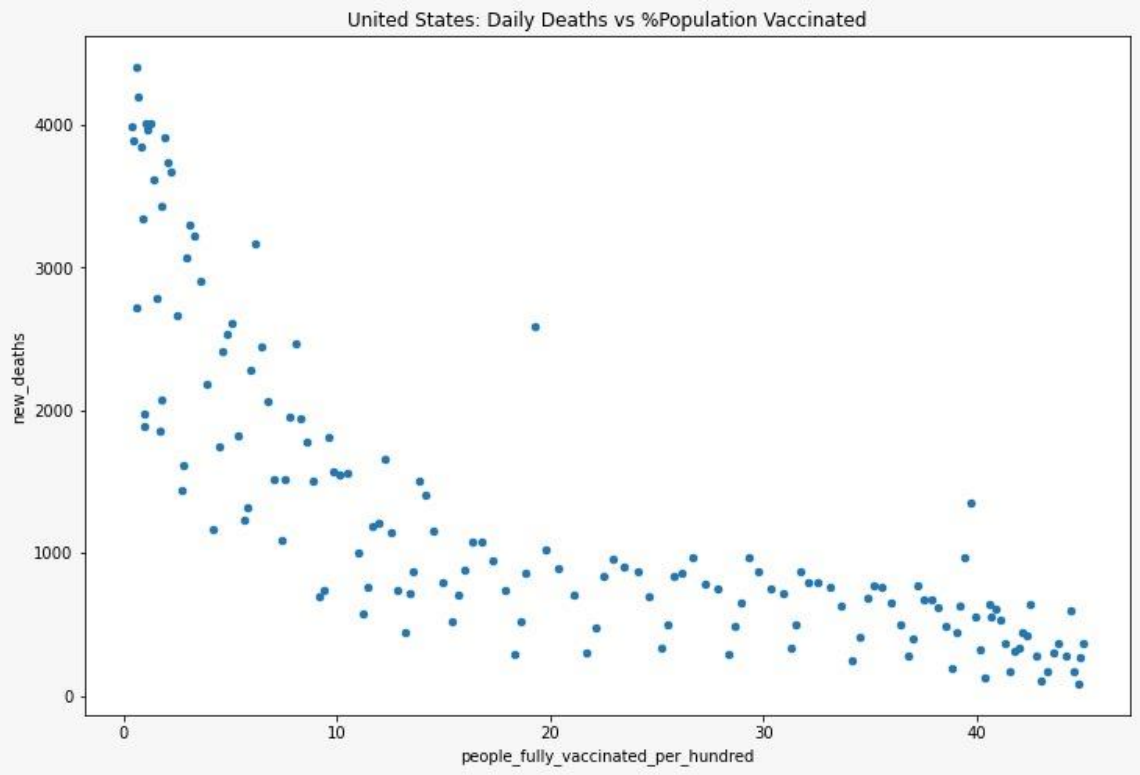


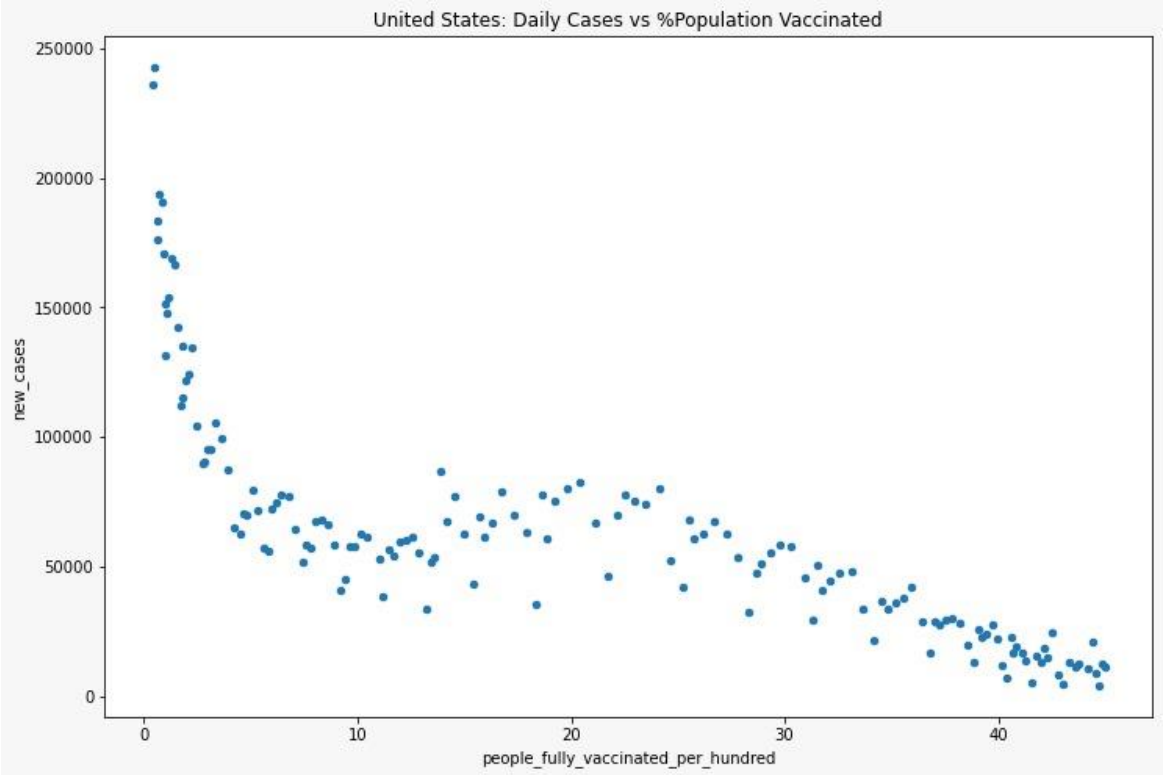
ITALY


Italy: Daily Deaths vs %Population Vaccinated
new_deaths
people_fully_vaccinated_per_hundred
0
100
200
300
400
500
600
700
0
5
10
15
20
25

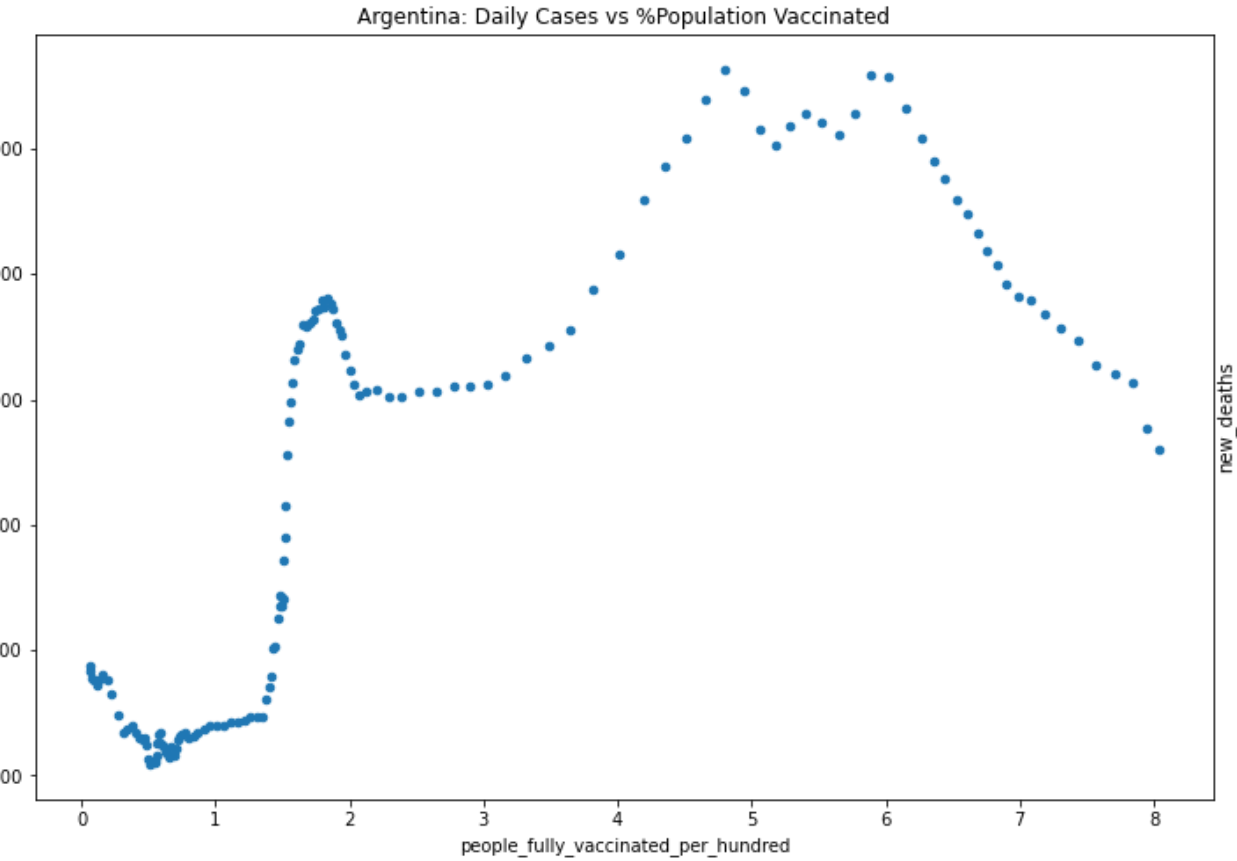

Italy: Daily Cases vs %Population Vaccinated
new_cases
people_fully_vaccinated_per_hundred
0
5000
10000
15000
20000
25000
0
5
10
15
20
25

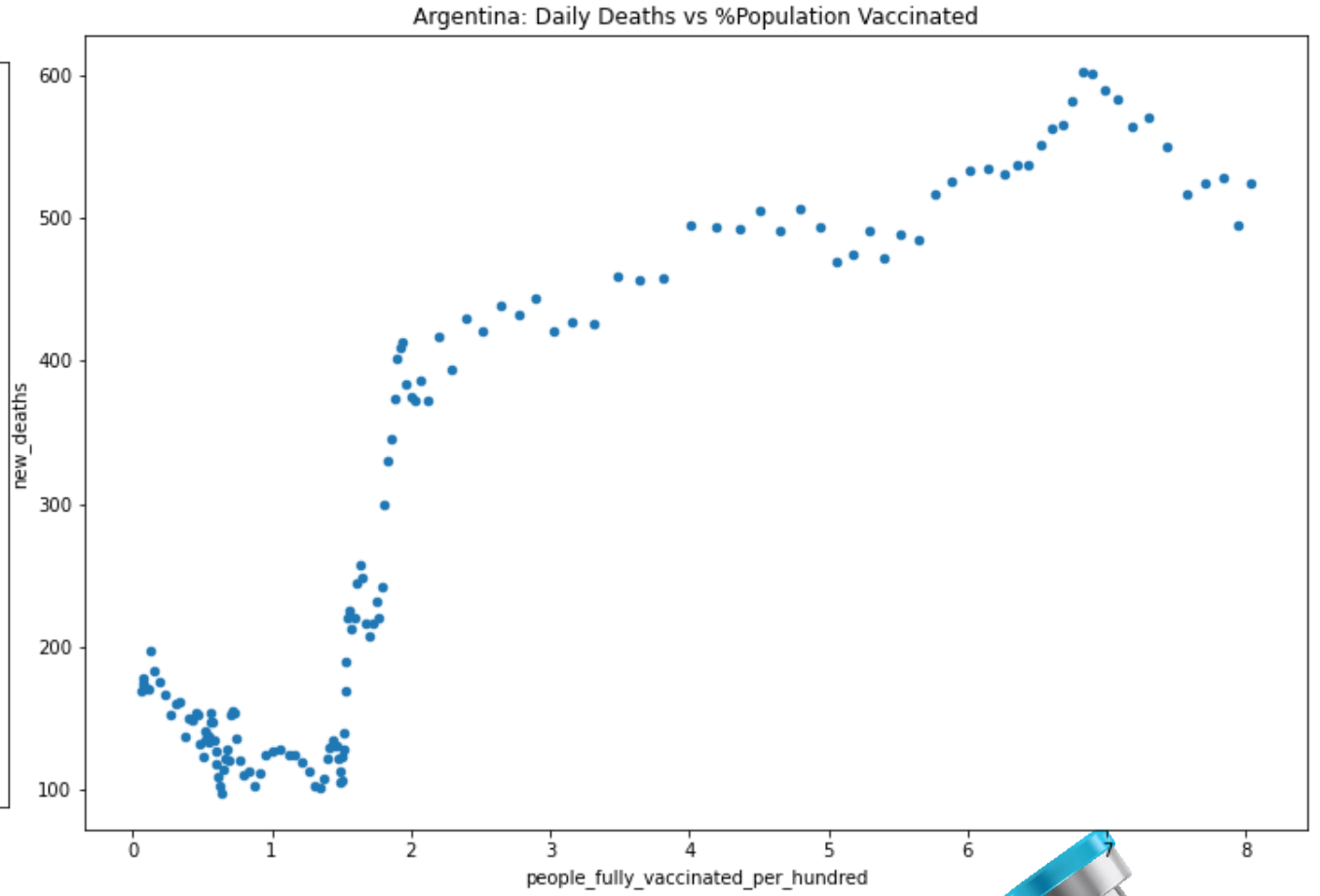
UNITED STATES





ARGENTINA


Argentina: Daily Cases vs %Population Vaccinated
people_fully_vaccinated_per_hundred


Argentina: Daily Deaths vs %Population Vaccinated
new_deaths
people_fully_vaccinated_per_hundred


VACCINE
COVID-19

EDA

```
countries=["UK","US","Canada","Israel","Italy","Germany","Argentina"]
# Get Data only for Israel
for c in countries:
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    Vaccinated=rVaccinated.copy()
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    merged.index=merged.date
    merged.index.name = 'Date'

    rolling_merged = merged[['people_fully_vaccinated_per_hundred', 'Novel Coronavirus Daily
Cases']].rolling(7).mean().dropna()
    rolling_merged.plot.scatter('people_fully_vaccinated_per_hundred', 'Novel Coronavirus Daily Cases',
                figsize=(12,8), title = c+": Daily Cases vs %Population Vaccinated")


    corrMatrix = rolling_merged.corr()
    sn.heatmap(corrMatrix, annot=True)
```
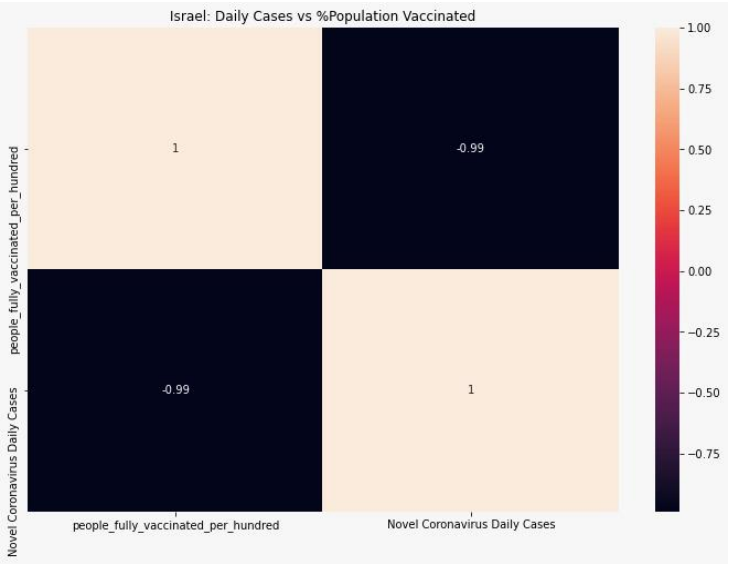
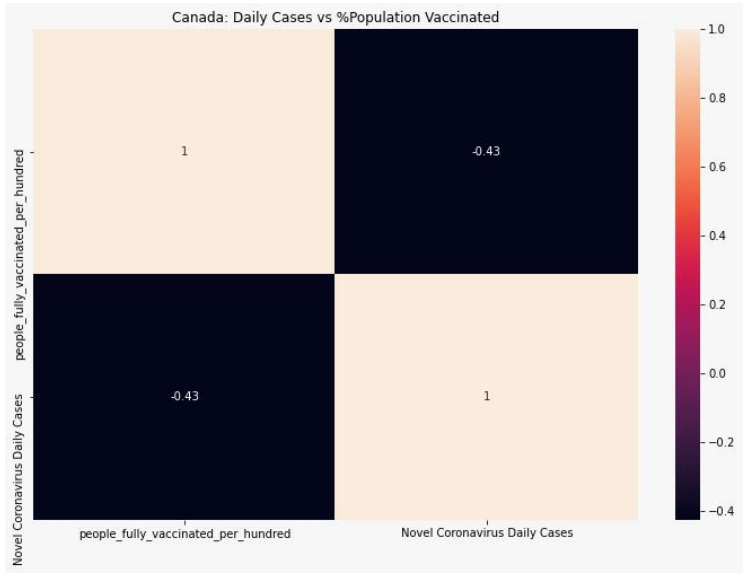
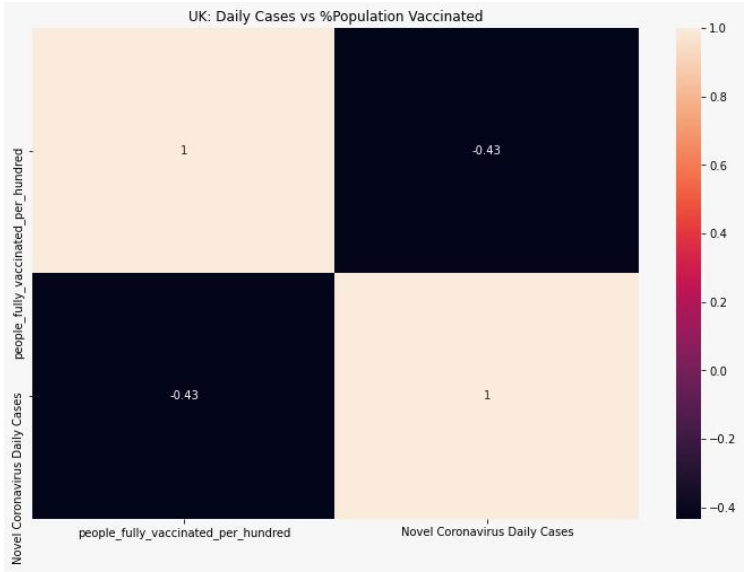
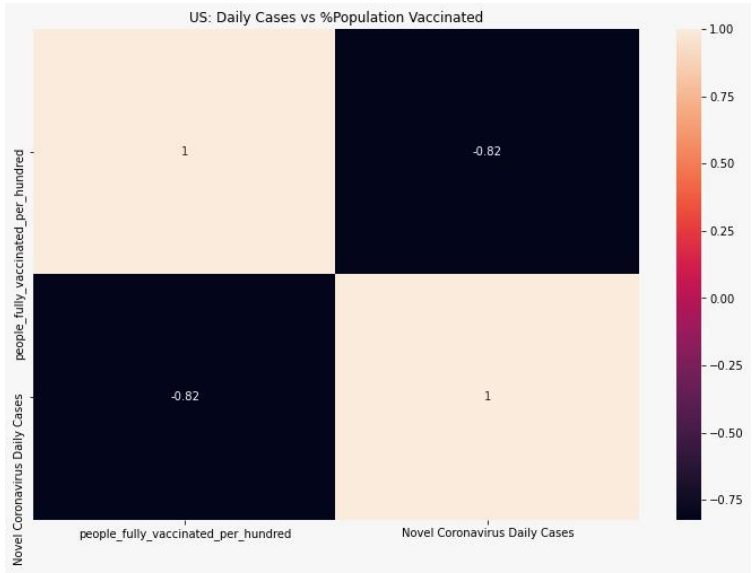

Correlation –to understand if there is a conection between the % of vaccined to new cases

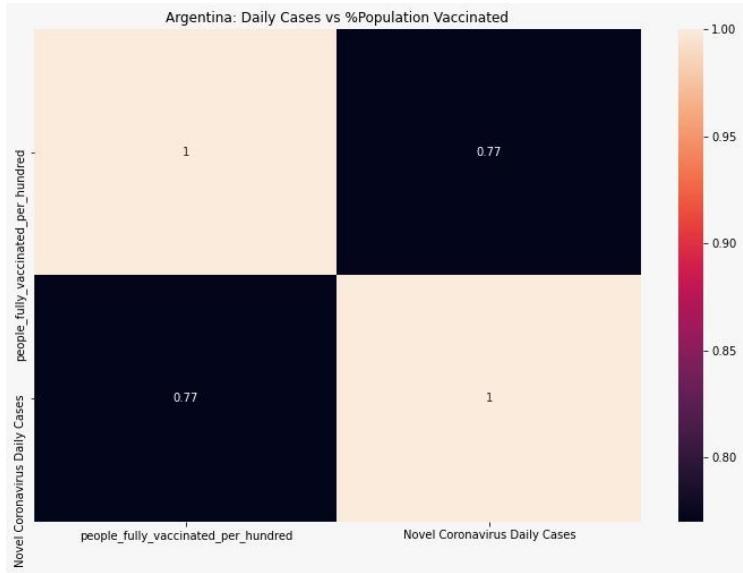
If it returns ' – '1there is a conection, if it returns 'noitalerroc on si ereht '0' snruter ti fi 'pihsnoitaler esrever '1–

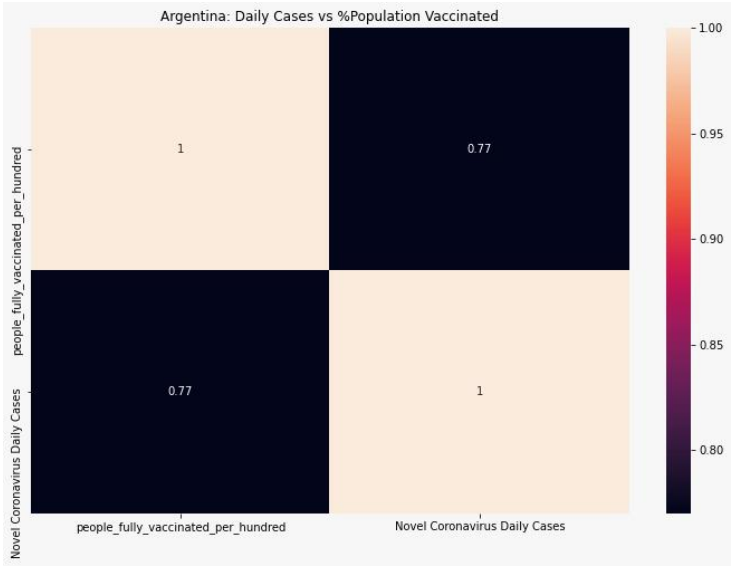

Israel: Daily Cases vs %Population Vaccinated
1
-0.99
-0.99
1
people_fully_vaccinated_per_hundred
Novel Coronavirus Daily Cases
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75

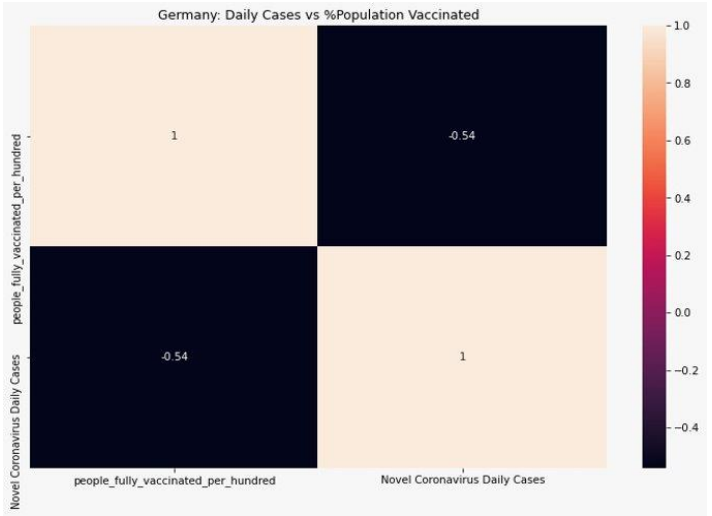

Canada: Daily Cases vs %Population Vaccinated
1
-0.43
-0.43
1
people_fully_vaccinated_per_hundred
Novel Coronavirus Daily Cases
1.0
0.8
0.6
0.4
0.2
0.0
−0.2
−0.4

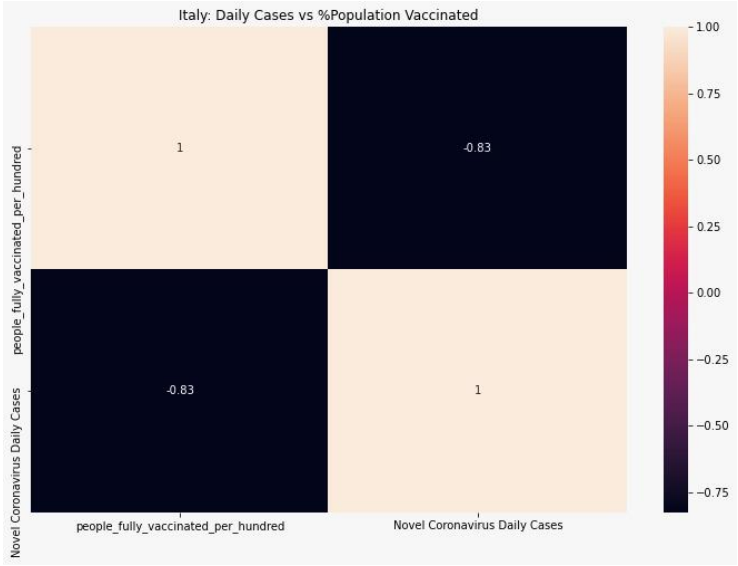

UK: Daily Cases vs %Population Vaccinated
1
-0.43
-0.43
1
people_fully_vaccinated_per_hundred
Novel Coronavirus Daily Cases
1.0
0.8
0.6
0.4
0.2
0.0
−0.2
−0.4

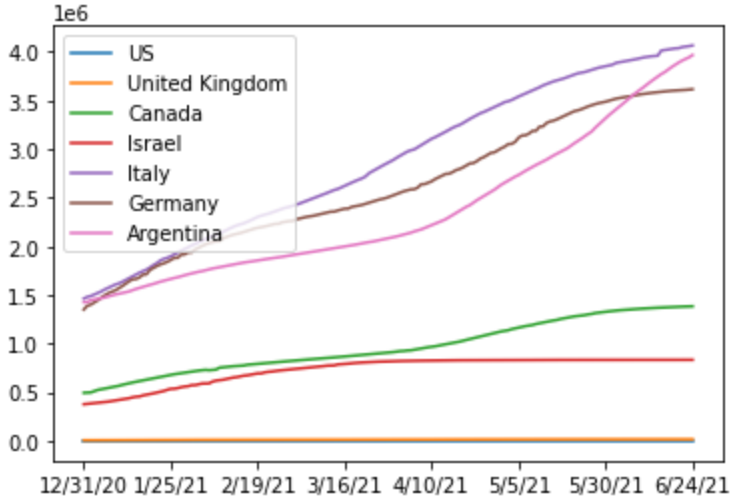

US: Daily Cases vs %Population Vaccinated
1
-0.82
-0.82
1
people_fully_vaccinated_per_hundred
Novel Coronavirus Daily Cases
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75


Argentina: Daily Cases vs %Population Vaccinated
1
0.77
0.77
1
people_fully_vaccinated_per_hundred
Novel Coronavirus Daily Cases
1.00
0.95
0.90
0.85
0.80


Argentina: Daily Cases vs %Population Vaccinated
1
0.77
0.77
1
people_fully_vaccinated_per_hundred
Novel Coronavirus Daily Cases
people_fully_vaccinated_per_hundred
Novel Coronavirus Daily Cases
1.00
0.95
0.90
0.85
0.80


Germany: Daily Cases vs %Population Vaccinated
1
-0.54
-0.54
1
people_fully_vaccinated_per_hundred
Novel Coronavirus Daily Cases
people_fully_vaccinated_per_hundred
Novel Coronavirus Daily Cases
1.0
0.8
0.6
0.4
0.2
0.0
−0.2
−0.4


Italy: Daily Cases vs %Population Vaccinated
1
-0.83
-0.83
1
people_fully_vaccinated_per_hundred
Novel Coronavirus Daily Cases
people_fully_vaccinated_per_hundred
Novel Coronavirus Daily Cases
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75



We can see reverse connection in data from all the countries –
as the % of vaccined population rise, the number of new cases is gating lower

For instance, Israel is standing on 60% vaccined, and we see a reverse connection 0.99
In USA there is 40% vaccined' and the reverse connection is 0.82
In Italy, 25% vaccined and 0.83 reverse connection (because of high number of cases)
While there is more then 4 million of people recovered, that are vaccined naturally

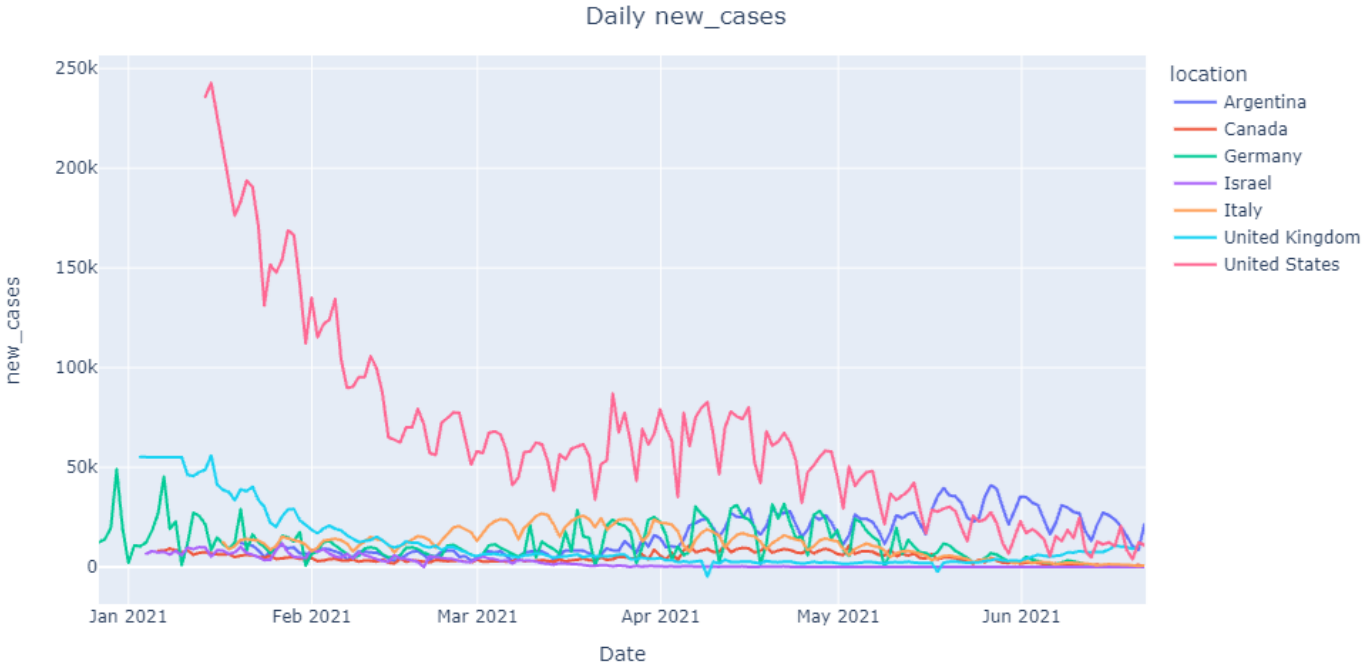
On the other hand –Argentina has only 8% vaccined, and so we can see that there is
No connection between new cases and the % of vaccined population

```
counter=0;
esum=0;
country_list=['US','Russia','Germany','France','UK','Japan','India','Italy','Israel','Canada','Spain','South
Korea','Switzerland','Netherlands','Argentina']
for c in country_list:
    KPI = covid_daily.data(country=c, chart = 'graph-cases-daily',  as_json=False)
    Vaccinated=rVaccinated.copy()
    Vaccinated.query("location=='%s'" %c, inplace = True)
    # Start Measuring from the time the vaccines started
    #Vaccinated.query("people_fully_vaccinated_per_hundred>0"  , inplace = True)
    # Conver the Day to Datetime Index
    Vaccinated['date'] = pd.DatetimeIndex(Vaccinated['date'])

    # Join the data
    merged = KPI.merge(Vaccinated, how='inner', left_index=True, right_on='date')
    merged.index=merged.date
    merged.index.name = 'Date'

    rolling_merged = merged[['people_fully_vaccinated_per_hundred', 'Novel Coronavirus Daily
Cases']].rolling(7).mean().dropna()
    if(rolling_merged['people_fully_vaccinated_per_hundred'].corr(rolling_merged['Novel Coronavirus Daily
Cases'])<(-0.5)):
        esum+=rolling_merged['people_fully_vaccinated_per_hundred'].iloc[-1]
        counter+=1

print(esum/counter)
```

We ran the test on 15 countries to check what is the connection between % vaccined and corelation that less then 0.5

The resoult showed that there is a reversed connection between decline of new cases and the % vaccined

And the average is 33%



Conclusions:
There is a reversed connection between % vaccined and new cases detected

This connection is intensified when % vaccined is 33% or higher, then our assumption is working
To answer the quastion what is the minimum % vaccined we need- to see decline in new cases, we can't say .

Because the vaccine came after many cases of people recovered or dead, after the winter has passed, and all the countries has been in embargo .

Therefore, we saw the decline in new cases from january, regardless vaccine.