PREDICTIVE ANALYSIS OF THE COVID DELTA VARIANT

- 1. Effectiveness of the vaccines against delta variant
- 2. Prevalence of the delta variant in the US and other countries.

The delta variant (B.1.617.2) of the corona virus (SARS-CoV-2, is contributing to surge in India and now its widespread has been identified and recognized across the world. According to the research analysis of the yale university, the delta variant is 50% more contagious than the alpha variant originated in UK.

Current vaccines have shown the effectiveness in protecting or minimizing the infection from delta variant. Data has been proved the most of hospitalizations is because of the vaccinations. According to CDC, fully vaccinated can still spread the delta variant. The research analysis also proves that J&J vaccines are highly effective against the delta variant.

```
import pandas as pd
In [ ]:
         import numpy as np
         import matplotlib.pyplot as plt
         import plotly.express as px
         import matplotlib
         from scipy.stats import ttest_ind
         import statsmodels.api as ss
         import warnings
         warnings.filterwarnings("ignore", category=FutureWarning)
         var = pd.read_csv('covid-variants.csv')
In [ ]:
         vacc= pd.read_csv('country_vaccinations.csv')
         manu =pd.read csv ('country vaccinations by manufacturer.csv')
        var =var.rename(columns={'location':'country'})
        # MERGE 1 - df cases and df cv
In [ ]: |
         cases = pd.merge(var,vacc, on= "country",how='left')
         cases=cases[cases['country']=='United States'].sum()
In [ ]:
         cases
         delta=cases[cases['variant']=='Delta']
         delta=delta.reset_index()
         delta=delta.dropna()
         delta
         delta=cases[cases['variant']=='Delta'].groupby(['country','variant']).sum()
         delta=delta[['country','variant','num_sequences_total','total_vaccinations']]
         delta= delta.sort values(ascending=False, by='num sequences total')
         delta=delta.reset_index()
```

```
DATA VISUALIZATION
 In [ ]:
           import pandas as pd
           import numpy as np
           import matplotlib.pyplot as plt
           import seaborn as sns
           import plotly.express as px
           import matplotlib
 In [ ]:
           # correlation
           corr = delta.corr()
           plt.figure(figsize=(10,8))
           sns.heatmap(corr,annot=True)
           delta=delta.reset_index()
In [18]:
           delta
Out[18]:
                country variant num_sequences perc_sequences num_sequences_total total_vaccinations people_vaccinated people_fully_vaccinated country
            0
                                         312.0
                                                                            105924
                                                                                       1.574792e+08
                                                                                                                               4.858263e+07
                 Angola
                          Delta
                                                        380.64
                                                                                                         1.088966e+08
                                         220.0
           1
               Argentina
                          Delta
                                                         88.00
                                                                            472340
                                                                                       5.168198e+10
                                                                                                         4.147147e+10
                                                                                                                               1.019682e+10
            2
                  Aruba
                          Delta
                                        5980.0
                                                      10448.10
                                                                            155220
                                                                                       1.162175e+08
                                                                                                         6.689607e+07
                                                                                                                               4.932147e+07
                                       167012.0
                                                      78105.20
                                                                           2788292
                                                                                       2.137154e+10
                                                                                                                               4.104257e+09
                Australia
                          Delta
                                                                                                         1.350143e+10
```

1494181

1.923354e+10

1.237475e+10

7.079700e+09

226967.0

64635.87

Austria

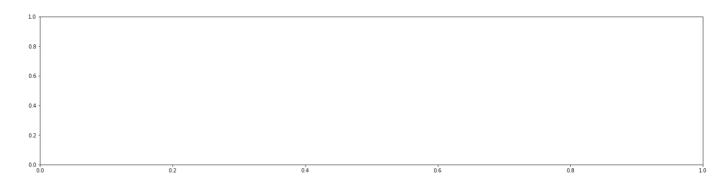
Delta

4

```
United
 81
                 Delta
                            42138790.0
                                               118792.50
                                                                    136900660
                                                                                    3.143174e+11
                                                                                                       2.096074e+11
                                                                                                                               1.047100e+11
      Kingdom
        United
                             7867982.0
                                                                                                                               6.005040e+11
 82
                 Delta
                                               82327.79
                                                                    147972243
                                                                                    1.379373e+12
                                                                                                       8.107234e+11
 83
                                    0.0
                                                    0.00
                                                                        84000
                                                                                    2.681663e+09
                                                                                                       1.634366e+09
                                                                                                                               1.047277e+09
      Uruguay
                 Delta
                                 9576.0
 84
       Zambia
                 Delta
                                                11400.00
                                                                        56430
                                                                                    9 092789e+07
                                                                                                       7.248631e+07
                                                                                                                               1.844158e+07
 85 Zimbabwe
                                    0.0
                                                    0.00
                                                                        74592
                                                                                    7.920746e+08
                                                                                                       5.325602e+08
                                                                                                                               2.595144e+08
                 Delta
86 rows × 14 columns
 import plotly.express as px
 import pandas as pd
```

```
In [50]:
           fig=plt.figure()
           ax=fig.add axes([0,0,3,1])
           plt.plot(delta['location'], delta['num_sequences_total'], 'b--', label='delta variant')
#plt.plot(delta['country'], delta['total_vaccinations'], 'r--', label='vaccinations')
           KeyError
                                                          Traceback (most recent call last)
           C:\ProgramData\Anaconda3\lib\site-packages\pandas\core\indexes\base.py in get_loc(self, key, method, tolerance)
              2894
           -> 2895
                                      return self._engine.get_loc(casted_key)
              2896
                                 except KeyError as err:
          pandas\_libs\index.pyx in pandas. libs.index.IndexEngine.get loc()
           pandas\_libs\index.pyx in pandas. libs.index.IndexEngine.get loc()
           pandas\_libs\hashtable_class_helper.pxi in pandas. libs.hashtable.PyObjectHashTable.get item()
           pandas\_libs\hashtable_class_helper.pxi in pandas._libs.hashtable.PyObjectHashTable.get_item()
```

```
KeyError: 'location'
The above exception was the direct cause of the following exception:
KeyError
                                          Traceback (most recent call last)
<ipython-input-50-b872b0cab70b> in <module>
      1 fig=plt.figure()
      2 ax=fig.add_axes([0,0,3,1])
----> 3 plt.plot(delta['location'],delta['num_sequences_total'],'b--',label='delta variant')
      4 #plt.plot(delta['country'],delta['total_vaccinations'],'r--',label='vaccinations')
C:\ProgramData\Anaconda3\lib\site-packages\pandas\core\frame.py in __getitem__(self, key)
                   if self.columns.nlevels > 1:
   2901
                        return self._getitem_multilevel(key)
-> 2902
                    indexer = self.columns.get_loc(key)
  2903
                    if is integer(indexer):
   2904
                        indexer = [indexer]
C:\ProgramData\Anaconda3\lib\site-packages\pandas\core\indexes\base.py in get_loc(self, key, method, tolerance)
  2895
                        return self._engine.get_loc(casted_key)
                    except KeyError as err:
   2896
-> 2897
                        raise KeyError(key) from err
   2898
               if tolerance is not None:
   2899
KeyError: 'location'
```



[30]:	delta											
t[30]:		index	country	date_x	variant	num_sequences	perc_sequences	num_sequences_total	iso_code	date_y	total_vaccinations	
	1271	31367	Argentina	2020- 05-11	Delta	0.0	0.0	149	ARG	2021- 01-21	265724.0	
	1272	31368	Argentina	2020- 05-11	Delta	0.0	0.0	149	ARG	2021- 01-22	279602.0	
	1273	31369	Argentina	2020- 05-11	Delta	0.0	0.0	149	ARG	2021- 01-23	288064.0	
	1274	31370	Argentina	2020- 05-11	Delta	0.0	0.0	149	ARG	2021- 01-24	292023.0	
	1275	31371	Argentina	2020- 05-11	Delta	0.0	0.0	149	ARG	2021- 01-25	292386.0	
	302151	6948443	Zambia	2021- 05-31	Delta	84.0	100.0	84	ZMB	2021- 08-01	438885.0	
	302152	6948444	Zambia	2021- 05-31	Delta	84.0	100.0	84	ZMB	2021- 08-02	441113.0	
	302153	6948445	Zambia	2021- 05-31	Delta	84.0	100.0	84	ZMB	2021- 08-03	444574.0	
	302154	6948446	Zambia	2021- 05-31	Delta	84.0	100.0	84	ZMB	2021- 08-04	454406.0	
	302155	6948447	Zambia	2021- 05-31	Delta	84.0	100.0	84	ZMB	2021- 08-05	465760.0	
1	197029 1	rows × 21	columns									

In []:

