Stage_3

March 28, 2023

1 Stage-3

[1]:
```
import numpy as np
import pandas as pd
import datetime
import plotly.express as px
import seaborn as sns
import matplotlib.pyplot as plt
import scipy.stats as stats
```

2 Task-1 : Fitting a distribution.

-> I have used KDE as KDE uses kernel function. -> Kernel function is special type of probability density function.

[2]:
```
# Reading day wise new cases generated in stage-2

dayNewCases=pd.read_csv("../../Member/Pulibandla-Venkatesh/dayWise.csv")
dayNewCases
```

[2]:

	Unnamed: 0	countyFIPS	County Name	State	StateFIPS	\
0	0	1001	Autauga County	AL	1	
1	1	1003	Baldwin County	AL	1	
2	2	1005	Barbour County	AL	1	
3	3	1007	Bibb County	AL	1	
4	4	1009	Blount County	AL	1	
…	…	…	…	…	…	
681809	681809	56037	Sweetwater County	WY	56	
681810	681810	56039	Teton County	WY	56	
681811	681811	56041	Uinta County	WY	56	
681812	681812	56043	Washakie County	WY	56	
681813	681813	56045	Weston County	WY	56	

	Date	Number of new cases	Number of new Deaths
0	2022-05-30	9	0
1	2022-05-30	55	1
2	2022-05-30	1	0

```
3       2022-05-30                    9                     0
4       2022-05-30                    6                     0
…            …                      …                     …
681809  2023-01-01                    0                     0
681810  2023-01-01                    0                     0
681811  2023-01-01                    0                     0
681812  2023-01-01                    0                     0
681813  2023-01-01                    0                     0

[681814 rows x 8 columns]
```

[3]:
```
# since we want only cases data, filtering the unwanted columns in the above
 ↪dataframe and displaying it.

dayNewCases.drop(['Unnamed: 0','Number of new Deaths'],axis=1,inplace=True)
dayNewCases
```

[3]:
```
        countyFIPS         County Name State  StateFIPS        Date  \
0             1001     Autauga County     AL          1  2022-05-30
1             1003     Baldwin County     AL          1  2022-05-30
2             1005     Barbour County     AL          1  2022-05-30
3             1007        Bibb County     AL          1  2022-05-30
4             1009      Blount County     AL          1  2022-05-30
…              …                 …   …        …         …
681809       56037  Sweetwater County     WY         56  2023-01-01
681810       56039       Teton County     WY         56  2023-01-01
681811       56041       Uinta County     WY         56  2023-01-01
681812       56043    Washakie County     WY         56  2023-01-01
681813       56045      Weston County     WY         56  2023-01-01

        Number of new cases
0                         9
1                        55
2                         1
3                         9
4                         6
…                       …
681809                    0
681810                    0
681811                    0
681812                    0
681813                    0

[681814 rows x 6 columns]
```

[4]:
```
# converting the date column to datetime type.
```

```
dayNewCases['Date'] = pd.to_datetime(dayNewCases['Date'])
dayNewCases.dtypes
```

[4]:
```
countyFIPS                      int64
County Name                    object
State                          object
StateFIPS                       int64
Date                  datetime64[ns]
Number of new cases             int64
dtype: object
```

[5]:
```
# Selecting the virginia State to fit to a distribution.

virginia = dayNewCases[dayNewCases['State']=='VA'].groupby('Date')['Number of␣
 ↪new cases'].sum()
virginia = pd.DataFrame(virginia)
virginia
```

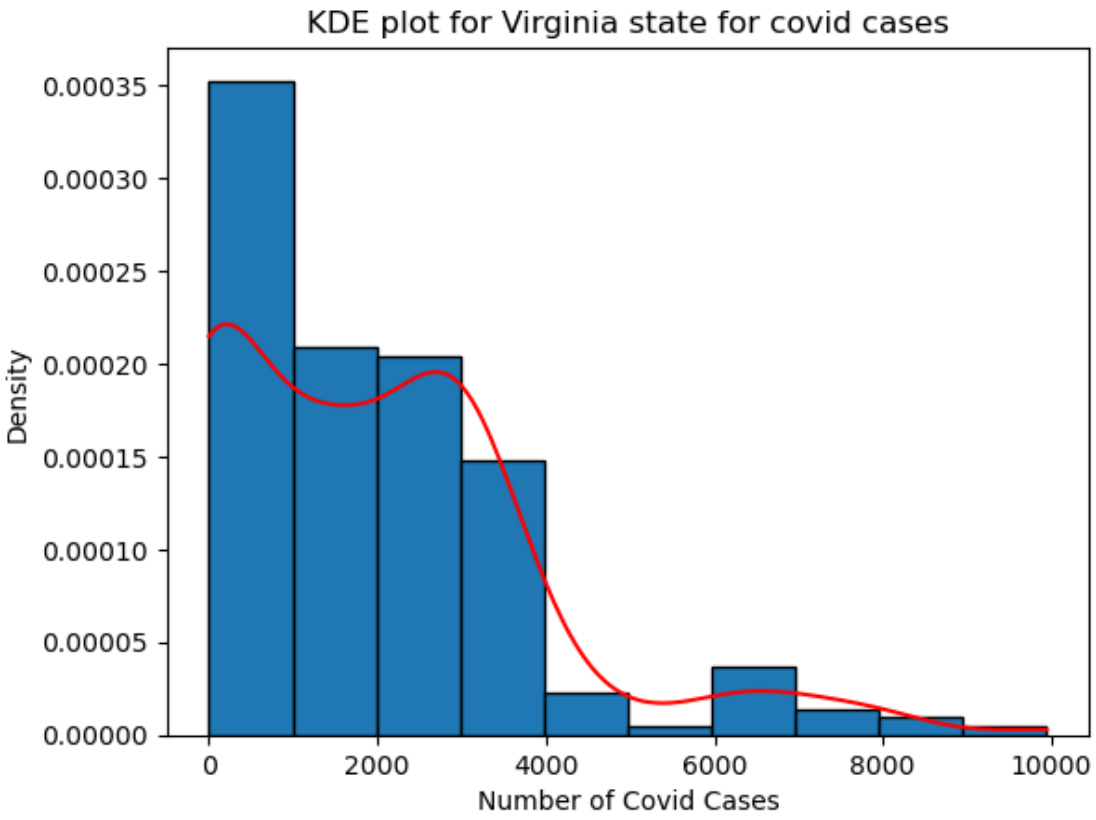
[5]:

Date	Number of new cases
2022-05-30	0
2022-05-31	9943
2022-06-01	2970
2022-06-02	2918
2022-06-03	4056
…	…
2022-12-28	2435
2022-12-29	0
2022-12-30	0
2022-12-31	0
2023-01-01	0

[217 rows x 1 columns]

[6]:
```
# I have used the KDE method on the virginia sate and displayed the plot.
# KDE plot is drawn based on the kernel function, a kernel is a special type of␣
 ↪probability density function.
# I have use bw_adjust=1 for all the plots, to get the optimally smoothed curve.

virginiaData = virginia['Number of new cases']
sns.kdeplot(x = virginiaData, color = 'red', label = 'KDE plot for VA State',␣
 ↪cut=0,bw_adjust=1)
plt.hist(virginiaData, bins=10, ec='black', density = True)
plt.xlabel('Number of Covid Cases')
plt.title('KDE plot for Virginia state for covid cases')
```

[6]:
```
Text(0.5, 1.0, 'KDE plot for Virginia state for covid cases')
```



[7]:
```
# calculating the statistics for the virginiaData.

print("Mean of Virginia Cases : ",virginiaData.mean())
print("Median of Virginia Cases : ",virginiaData.median())
print("Mode of Virginia Cases : ",virginiaData.mode()[0])
print("skewness of Virginia distribution : ",virginiaData.skew())
print("Kurtosis of Virginia distribution : ",virginiaData.kurt())
```

```
Mean of Virginia Cases :  1942.3456221198157
Median of Virginia Cases :  1675.0
Mode of Virginia Cases :  0
skewness of Virginia distribution :  1.2599183309397768
Kurtosis of Virginia distribution :  1.9694469402485675
```

The KDE ditribution peaks at the most occured values in the data.As the skewness value is 1.2599, the distribution is skewed to the right and there are more values after the mean value. The value of kurtosis is 1.9694, the distribution has a sharp peak. The mode value of the above data is 0, that is why the kde plot at the 0 has the peak value.

[8]:
```
# Choosing Three other states to compare  with virginia state.
```

```
compStates = dayNewCases[dayNewCases['State'].isin(['AR','AZ','NC'])]
compStates
```

[8]:

	countyFIPS	County Name	State	StateFIPS	Date	Number of new cases
96	4001	Apache County	AZ	4	2022-05-30	0
97	4003	Cochise County	AZ	4	2022-05-30	0
98	4005	Coconino County	AZ	4	2022-05-30	0
99	4007	Gila County	AZ	4	2022-05-30	0
100	4009	Graham County	AZ	4	2022-05-30	0
…	…	… …	…	…		…
680657	37191	Wayne County	NC	37	2023-01-01	0
680658	37193	Wilkes County	NC	37	2023-01-01	0
680659	37195	Wilson County	NC	37	2023-01-01	0
680660	37197	Yadkin County	NC	37	2023-01-01	0
680661	37199	Yancey County	NC	37	2023-01-01	0

[41230 rows x 6 columns]

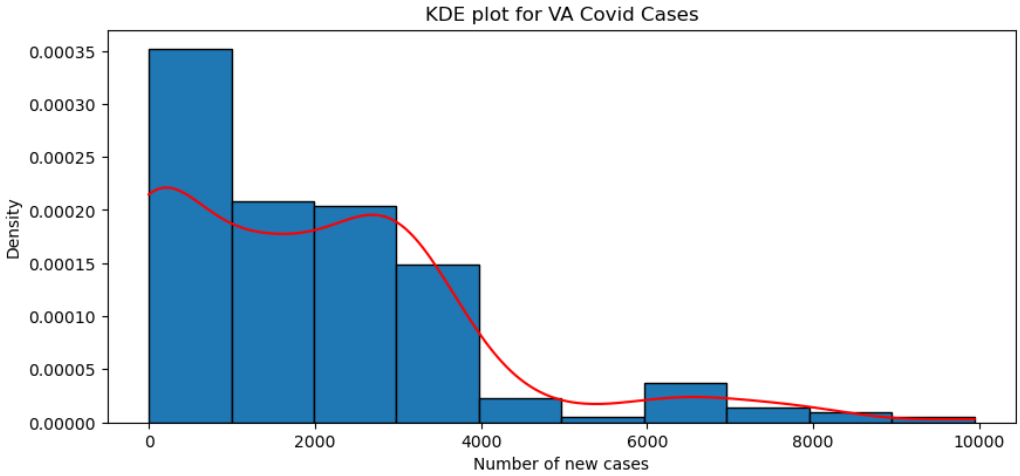
[9]:
```
# Grouping the States data according to the date.

AR = compStates[compStates['State']=='AR'].groupby('Date')['Number of new␣
 ↪cases'].sum()
AR = pd.DataFrame(AR)

AZ = compStates[compStates['State']=='AZ'].groupby('Date')['Number of new␣
 ↪cases'].sum()
AZ = pd.DataFrame(AZ)

NC = compStates[compStates['State']=='NC'].groupby('Date')['Number of new␣
 ↪cases'].sum()
NC = pd.DataFrame(NC)
```

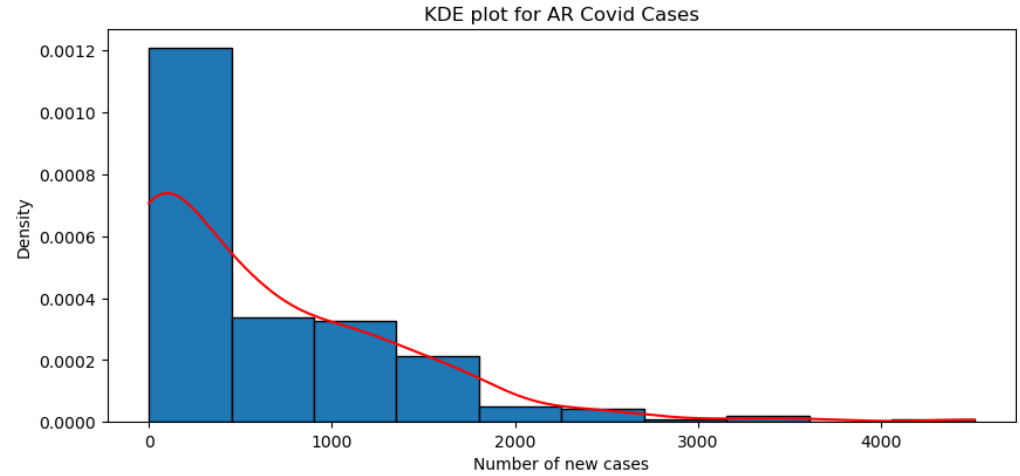
[10]:
```
# Taking only cases columns from each state data.
```

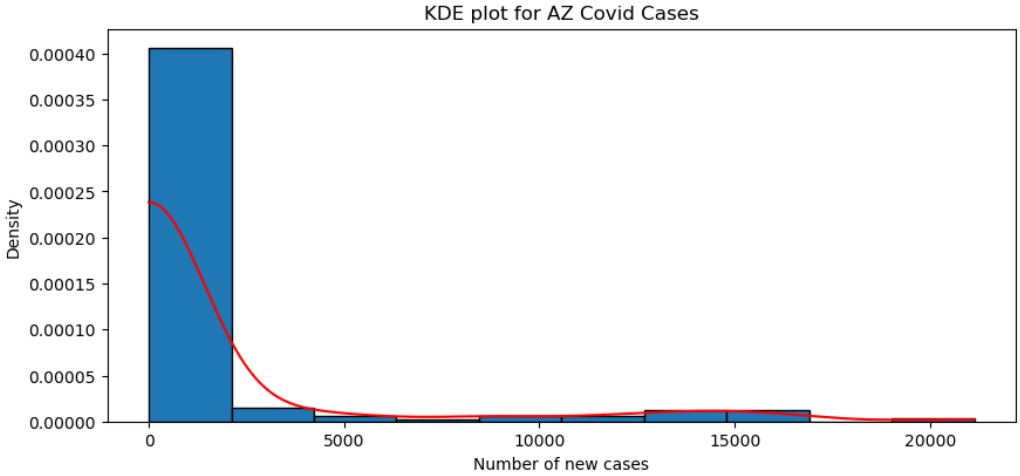
```
ARData = AR['Number of new cases']
AZData = AZ['Number of new cases']
NCData = NC['Number of new cases']
```

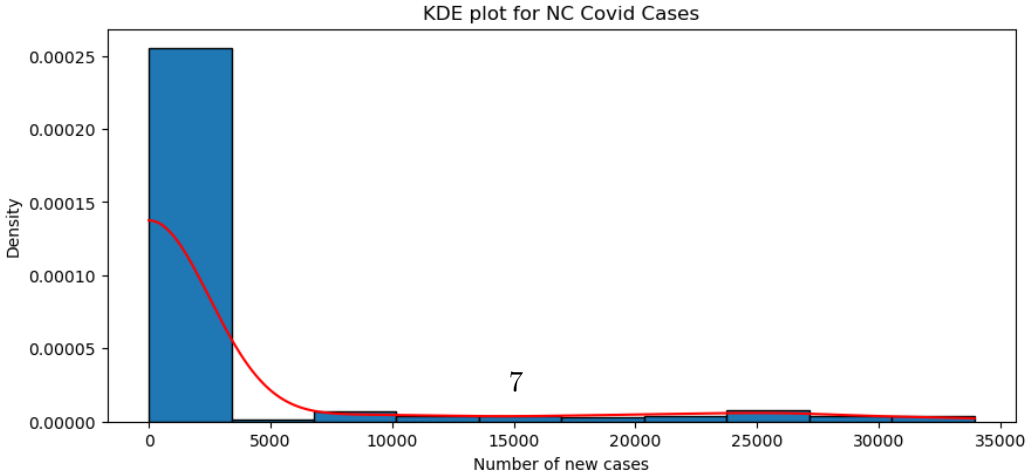
[11]:
```
# Plotting the KDE Plot for the 4 States to compare  the distributions.

fig,(ax1,ax2,ax3,ax4) = plt.subplots(4, figsize=(10,20))

sns.kdeplot(x = virginiaData,ax=ax1, color = 'red', label = 'KDE plot for VA␣
 ↪State',cut=0,bw_adjust=1)
ax1.hist(virginiaData, bins=10, ec='black', density = True)
ax1.set_title('KDE plot for VA Covid Cases')

sns.kdeplot(x = ARData,ax=ax2, color = 'red', label = 'KDE plot for AR␣
 ↪State',cut=0,bw_adjust=1)
ax2.hist(ARData, bins=10, ec='black', density = True)
ax2.set_title('KDE plot for AR Covid Cases')

sns.kdeplot(x = AZData,ax=ax3, color = 'red', label = 'KDE plot for AZ␣
 ↪State',cut=0,bw_adjust=1)
ax3.hist(AZData, bins=10, ec='black', density = True)
ax3.set_title('KDE plot for AZ Covid Cases')

sns.kdeplot(x = NCData,ax=ax4, color = 'red', label = 'KDE plot for NC␣
 ↪State',cut=0,bw_adjust=1)
ax4.hist(NCData, bins=10, ec='black', density = True)
ax4.set_title('KDE plot for NC Covid Cases')
```

[11]:
```
Text(0.5, 1.0, 'KDE plot for NC Covid Cases')
```


KDE plot for VA Covid Cases
Density
0.00035
0.00030
0.00025
0.00020
0.00015
0.00010
0.00005
0.00000
0
2000
4000
6000
8000
10000
Number of new cases


KDE plot for AR Covid Cases
Density
0.0012
0.0010
0.0008
0.0006
0.0004
0.0002
0.0000
0
1000
2000
3000
4000
Number of new cases


KDE plot for AZ Covid Cases
Density
0.00040
0.00035
0.00030
0.00025
0.00020
0.00015
0.00010
0.00005
0.00000
0
5000
10000
15000
20000
Number of new cases


KDE plot for NC Covid Cases
Density
0.00025
0.00020
0.00015
0.00010
0.00005
0.00000
0
5000
10000
15000
20000
25000
30000
35000
Number of new cases

[12]:
```
# Calculating ARData statistics.

print("Mean of AR Cases : ",ARData.mean())
print("Mode of AR Cases : ",ARData.mode()[0])
print("Median of AR Cases : ",ARData.median())
print("skewness of AR distribution : ",ARData.skew())
print("Kurtosis of AR distribution : ",ARData.kurt())
```

```
Mean of AR Cases :  630.8617511520737
Mode of AR Cases :  0
Median of AR Cases :  403.0
skewness of AR distribution :  1.691944710351396
Kurtosis of AR distribution :  4.133470274752526
```

[13]:
```
# Calculating AZData Statistics.

print("Mean of AZ Cases : ",AZData.mean())
print("Median of AZ Cases : ",AZData.median())
print("Mode of AZ Cases : ",AZData.mode()[0])
print("skewness of AZ distribution : ",AZData.skew())
print("Kurtosis of AZ distribution : ",AZData.kurt())
```

```
Mean of AZ Cases :  1510.1705069124423
Median of AZ Cases :  0.0
Mode of AZ Cases :  0
skewness of AZ distribution :  2.8863569638172266
Kurtosis of AZ distribution :  7.377696798905775
```

[14]:
```
# Calculating NCData statistics.

print("Mean of NC Cases : ",NCData.mean())
print("Median of NC Cases : ",NCData.median())
print("Mode of NC Cases : ",NCData.mode()[0])
print("skewness of NC distribution : ",NCData.skew())
print("Kurtosis of NC distribution : ",NCData.kurt())
```

```
Mean of NC Cases :  2635.3870967741937
Median of NC Cases :  0.0
Mode of NC Cases :  0
skewness of NC distribution :  2.810493815628634
Kurtosis of NC distribution :  6.779155116871395
```

Comparing the distributions with 3 other states:

All the distribution are right skewed as the skew values are positive. AZ state has the highest skew value, so it more skewed to the right. All the distribution has a positive kurtosis, that means they are all peaked. AZ state has the high kurtosis value , that means it has more sharp peak than the

other distributions. Mode value for all the states are same. the distributions are peaked at the mode values, so the peaks for all the distributions occur at same value. EVery state data has mode as 0, so every state plot has peak values at 0.

3 Task-2 : Performing correlation.

[15]:
```
# Reading the demographic enrichment data generated in Stage-1.

demographicNew=pd.read_csv("../../Member/Pulibandla-Venkatesh/demographicNew.
 ↪csv")
demographicNew
```

[15]:

	Unnamed: 0	countyFIPS	GEO_ID	NAME	Total Population	Male population	Female Population	Sex Ratio	Population under 5 Years
0	1	1003	0500000US01003	Baldwin County, Alabama	239294	115696	123598	93.6	12360
1	2	1015	0500000US01015	Calhoun County, Alabama	115972	55581	60391	92.0	6478
2	3	1043	0500000US01043	Cullman County, Alabama	89496	44331	45165	98.2	5022
3	4	1049	0500000US01049	DeKalb County, Alabama	71813	35952	35861	100.3	6080
4	5	1051	0500000US01051	Elmore County, Alabama	89304	44004	45300	97.1	4667
..	…	…	…	…	…	…	…	…	…
836	837	72113	0500000US72113	Ponce Municipio, Puerto Rico	135084	64529	70555	91.5	4685
837	838	72127	0500000US72127	San Juan Municipio, Puerto Rico	337300	154195	183105	84.2	11385
838	839	72135	0500000US72135	Toa Alta Municipio, Puerto Rico	67569	31626			
839	840	72137	0500000US72137	Toa Baja Municipio, Puerto Rico	74368	33780			
840	841	72139	0500000US72139	Trujillo Alto Municipio, Puerto Rico	67211	31040			

```
838              35943       88.0                       2000
839              40588       83.2                       2313
840              36171       85.8                       1919

     Population 5 to 9 Years  …  Population of White Race  \
0                      12848  …                     198355
1                       7374  …                      82072
2                       4415  …                      81885
3                       4690  …                      58855
4                       5476  …                      66105
..                       …  …                       …
836                     6420  …                      45980
837                    12406  …                      85990
838                     3255  …                      14048
839                     3706  …                      10436
840                     3540  …                      32660

     Population of Black Race  \
0                       21305
1                       22470
2                        1098
3                        1160
4                       19046
..                        …
836                      5171
837                     34376
838                      1747
839                      3681
840                      9547

     Population of American Indian and Alaska Native  \
0                                                884
1                                               1307
2                                                426
3                                               1822
4                                                167
..                                                …
836                                               35
837                                              693
838                                                0
839                                              817
840                                                0

     Population of Asian Race  Population of Indian Race  \
0                        1956                          N
1                         983                          N
2                         509                          N
```

```
3                          71                          N
4                          88                          N
..                        …                          …
836                         0                          N
837                       210                          N
838                         0                          N
839                         0                          N
840                         0                          N

     Population of Native Hawaiian and Other Pacific Islander  \
0                                                     0
1                                                     0
2                                                    33
3                                                    10
4                                                     0
..                                                  …
836                                                   0
837                                                   0
838                                                   0
839                                                   0
840                                                   0

     Total Housing Units  Population of Citizen Over 18  \
0                 128533                         185566
1                  53211                          88832
2                  39465                          68751
3                  30774                          49274
4                  37081                          68232
..                   …                            …
836                65434                         110128
837               183964                         263918
838                25754                          55680
839                34372                          61112
840                28630                          55195

     Population of Male Citizen  Population of Female Citizen
0                         90007                          95559
1                         42469                          46363
2                         33921                          34830
3                         23916                          25358
4                         32750                          35482
..                          …                            …
836                       51854                          58274
837                      116663                         147255
838                       26338                          29342
839                       27603                          33509
840                       25494                          29701
```

```
[841 rows x 32 columns]
```

[16]:
```
# filtering the data.

demographicNew.drop(['GEO_ID','NAME','Unnamed: 0','Population of Indian␣
 ↪Race'],axis=1, inplace=True)
```

[17]:
```
demographicNew
```

[17]:
```
     countyFIPS  Total Population  Male population  Female Population  \
0          1003            239294           115696             123598
1          1015            115972            55581              60391
2          1043             89496            44331              45165
3          1049             71813            35952              35861
4          1051             89304            44004              45300
..          …                …                …                  …
836       72113            135084            64529              70555
837       72127            337300           154195             183105
838       72135             67569            31626              35943
839       72137             74368            33780              40588
840       72139             67211            31040              36171

     Sex Ratio  Population under 5 Years  Population 5 to 9 Years  \
0         93.6                     12360                    12848
1         92.0                      6478                     7374
2         98.2                      5022                     4415
3        100.3                      6080                     4690
4         97.1                      4667                     5476
..         …                         …                        …
836       91.5                      4685                     6420
837       84.2                     11385                    12406
838       88.0                      2000                     3255
839       83.2                      2313                     3706
840       85.8                      1919                     3540

     Population 10 to 14 Years  Population 15 to 19 Years  \
0                        16966                      13471
1                         6684                       8780
2                         6954                       5277
3                         4079                       4148
4                         5962                       5693
..                         …                          …
836                       7766                       7619
837                      18111                      19643
838                       3895                       5222
839                       3764                       4317
```

```
840                       3268                        3743

     Population 20 to 24 Years  …  Meadin Age Population  \
0                         10753  …                   43.9
1                          7780  …                   40.2
2                          5456  …                   40.5
3                          4018  …                   40.2
4                          5023  …                   40.0
..                          …  …                     …
836                       10041  …                   43.9
837                       23178  …                   45.3
838                        4575  …                   40.4
839                        5352  …                   42.8
840                        4838  …                   43.5

     Population of White Race  Population of Black Race  \
0                      198355                     21305
1                       82072                     22470
2                       81885                      1098
3                       58855                      1160
4                       66105                     19046
..                        …                        …
836                     45980                      5171
837                     85990                     34376
838                     14048                      1747
839                     10436                      3681
840                     32660                      9547

     Population of American Indian and Alaska Native  \
0                                                884
1                                               1307
2                                                426
3                                               1822
4                                                167
..                                                …
836                                               35
837                                              693
838                                                0
839                                              817
840                                                0

     Population of Asian Race  \
0                        1956
1                         983
2                         509
3                          71
4                          88
```

```
..                          …
836                           0
837                         210
838                           0
839                           0
840                           0

     Population of Native Hawaiian and Other Pacific Islander  \
0                                                           0
1                                                           0
2                                                          33
3                                                          10
4                                                           0
..                                                        …
836                                                         0
837                                                         0
838                                                         0
839                                                         0
840                                                         0

     Total Housing Units  Population of Citizen Over 18  \
0                 128533                          185566
1                  53211                           88832
2                  39465                           68751
3                  30774                           49274
4                  37081                           68232
..                   …                              …
836                65434                          110128
837               183964                          263918
838                25754                           55680
839                34372                           61112
840                28630                           55195

     Population of Male Citizen Population of Female Citizen
0                         90007                         95559
1                         42469                         46363
2                         33921                         34830
3                         23916                         25358
4                         32750                         35482
..                          …                             …
836                       51854                         58274
837                      116663                        147255
838                       26338                         29342
839                       27603                         33509
840                       25494                         29701

[841 rows x 28 columns]
```

[18]:
```
# merging the cases data with the enrichment data for finding the correlation.

combinedData = pd.merge(dayNewCases,demographicNew,on='countyFIPS',how='inner')
```

[19]:
```
combinedData
```

[19]:

	countyFIPS	County Name	State	StateFIPS	Date	\
0	1003	Baldwin County	AL	1	2022-05-30	
1	1003	Baldwin County	AL	1	2022-05-31	
2	1003	Baldwin County	AL	1	2022-06-01	
3	1003	Baldwin County	AL	1	2022-06-02	
4	1003	Baldwin County	AL	1	2022-06-03	
…	…	…	…	…	…	
180105	56025	Natrona County	WY	56	2022-12-28	
180106	56025	Natrona County	WY	56	2022-12-29	
180107	56025	Natrona County	WY	56	2022-12-30	
180108	56025	Natrona County	WY	56	2022-12-31	
180109	56025	Natrona County	WY	56	2023-01-01	

	Number of new cases	Total Population	Male population	\
0	55	239294	115696	
1	183	239294	115696	
2	68	239294	115696	
3	68	239294	115696	
4	0	239294	115696	
…	…	…	…	
180105	0	79555	41070	
180106	0	79555	41070	
180107	0	79555	41070	
180108	0	79555	41070	
180109	0	79555	41070	

	Female Population	Sex Ratio	…	Meadin Age Population	\
0	123598	93.6	…	43.9	
1	123598	93.6	…	43.9	
2	123598	93.6	…	43.9	
3	123598	93.6	…	43.9	
4	123598	93.6	…	43.9	
…	…	…	…	…	
180105	38485	106.7	…	37.5	
180106	38485	106.7	…	37.5	
180107	38485	106.7	…	37.5	
180108	38485	106.7	…	37.5	
180109	38485	106.7	…	37.5	

	Population of White Race	Population of Black Race	\
0	198355	21305	

```
1                          198355                        21305
2                          198355                        21305
3                          198355                        21305
4                          198355                        21305
…                           …                           …
180105                      69303                           72
180106                      69303                           72
180107                      69303                           72
180108                      69303                           72
180109                      69303                           72

        Population of American Indian and Alaska Native  \
0                                                   884
1                                                   884
2                                                   884
3                                                   884
4                                                   884
…                                                  …
180105                                              598
180106                                              598
180107                                              598
180108                                              598
180109                                              598

        Population of Asian Race  \
0                          1956
1                          1956
2                          1956
3                          1956
4                          1956
…                         …
180105                      228
180106                      228
180107                      228
180108                      228
180109                      228

        Population of Native Hawaiian and Other Pacific Islander  \
0                                                               0
1                                                               0
2                                                               0
3                                                               0
4                                                               0
…                                                              …
180105                                                          0
180106                                                          0
180107                                                          0
```

```
180108                                                  0
180109                                                  0

        Total Housing Units  Population of Citizen Over 18  \
0                    128533                         185566
1                    128533                         185566
2                    128533                         185566
3                    128533                         185566
4                    128533                         185566
…                       …                              …
180105                37051                          59929
180106                37051                          59929
180107                37051                          59929
180108                37051                          59929
180109                37051                          59929

        Population of Male Citizen  Population of Female Citizen
0                            90007                         95559
1                            90007                         95559
2                            90007                         95559
3                            90007                         95559
4                            90007                         95559
…                              …                             …
180105                       30603                         29326
180106                       30603                         29326
180107                       30603                         29326
180108                       30603                         29326
180109                       30603                         29326

[180110 rows x 33 columns]
```

[20]:
```
# filling NaN values with zero.

combinedData.fillna(value = 0, inplace=True)
```

[21]:
```
# Reading the population data for normalizing the cases and enrichment data by␣
 ↪population.

population = pd.read_csv("../../DATASETS/COVID DATASETS/
 ↪covid_county_population_usafacts.csv")
population
```

[21]:
```
      countyFIPS            County Name State  population
0              0  Statewide Unallocated    AL           0
1           1001         Autauga County    AL       55869
2           1003         Baldwin County    AL      223234
3           1005         Barbour County    AL       24686
```

```
4           1007            Bibb County    AL       22394
…           …                     …   …         …
3190       56037      Sweetwater County    WY       42343
3191       56039           Teton County    WY       23464
3192       56041           Uinta County    WY       20226
3193       56043        Washakie County    WY        7805
3194       56045          Weston County    WY        6927

[3195 rows x 4 columns]
```

[22]:
```
# Dropping the unwanted columns.

population.drop(['County Name','State'],axis=1,inplace=True)
```

[23]:
```
# merging the population data with combinedData dataframe.

combinedData = pd.merge(combinedData,population,on='countyFIPS')
```

[24]:
```
combinedData
```

[24]:
```
        countyFIPS      County Name State  StateFIPS       Date  \
0             1003  Baldwin County     AL          1 2022-05-30
1             1003  Baldwin County     AL          1 2022-05-31
2             1003  Baldwin County     AL          1 2022-06-01
3             1003  Baldwin County     AL          1 2022-06-02
4             1003  Baldwin County     AL          1 2022-06-03
…              …              …   …         …        …
180105       56025  Natrona County     WY         56 2022-12-28
180106       56025  Natrona County     WY         56 2022-12-29
180107       56025  Natrona County     WY         56 2022-12-30
180108       56025  Natrona County     WY         56 2022-12-31
180109       56025  Natrona County     WY         56 2023-01-01

        Number of new cases  Total Population  Male population  \
0                        55            239294           115696
1                       183            239294           115696
2                        68            239294           115696
3                        68            239294           115696
4                         0            239294           115696
…                       …                 …                …
180105                    0             79555            41070
180106                    0             79555            41070
180107                    0             79555            41070
180108                    0             79555            41070
180109                    0             79555            41070

        Female Population  Sex Ratio  …  Population of White Race  \
```

```
0                  123598       93.6  …                   198355
1                  123598       93.6  …                   198355
2                  123598       93.6  …                   198355
3                  123598       93.6  …                   198355
4                  123598       93.6  …                   198355
…                   …        …  …                     …
180105              38485      106.7  …                    69303
180106              38485      106.7  …                    69303
180107              38485      106.7  …                    69303
180108              38485      106.7  …                    69303
180109              38485      106.7  …                    69303

        Population of Black Race  \
0                         21305
1                         21305
2                         21305
3                         21305
4                         21305
…                         …
180105                       72
180106                       72
180107                       72
180108                       72
180109                       72

        Population of American Indian and Alaska Native  \
0                                                   884
1                                                   884
2                                                   884
3                                                   884
4                                                   884
…                                                  …
180105                                              598
180106                                              598
180107                                              598
180108                                              598
180109                                              598

        Population of Asian Race  \
0                          1956
1                          1956
2                          1956
3                          1956
4                          1956
…                         …
180105                      228
180106                      228
```

```
180107                      228
180108                      228
180109                      228

        Population of Native Hawaiian and Other Pacific Islander  \
0                                                       0
1                                                       0
2                                                       0
3                                                       0
4                                                       0
…                                                     …
180105                                                  0
180106                                                  0
180107                                                  0
180108                                                  0
180109                                                  0

        Total Housing Units  Population of Citizen Over 18  \
0                    128533                         185566
1                    128533                         185566
2                    128533                         185566
3                    128533                         185566
4                    128533                         185566
…                     …                            …
180105                37051                          59929
180106                37051                          59929
180107                37051                          59929
180108                37051                          59929
180109                37051                          59929

        Population of Male Citizen  Population of Female Citizen  population
0                            90007                         95559      223234
1                            90007                         95559      223234
2                            90007                         95559      223234
3                            90007                         95559      223234
4                            90007                         95559      223234
…                            …                           …          …
180105                       30603                         29326       79858
180106                       30603                         29326       79858
180107                       30603                         29326       79858
180108                       30603                         29326       79858
180109                       30603                         29326       79858

[180110 rows x 34 columns]
```

[25]:
```
# Dropping the unwanted data.
```

```
combinedData.drop(['countyFIPS','StateFIPS'],axis=1,inplace=True)
combinedData
```

[25]:

```
            County Name State       Date  Number of new cases  \
0       Baldwin County     AL 2022-05-30                   55
1       Baldwin County     AL 2022-05-31                  183
2       Baldwin County     AL 2022-06-01                   68
3       Baldwin County     AL 2022-06-02                   68
4       Baldwin County     AL 2022-06-03                    0
…                  …   …        …                    …
180105  Natrona County     WY 2022-12-28                    0
180106  Natrona County     WY 2022-12-29                    0
180107  Natrona County     WY 2022-12-30                    0
180108  Natrona County     WY 2022-12-31                    0
180109  Natrona County     WY 2023-01-01                    0

        Total Population  Male population  Female Population  Sex Ratio  \
0                 239294           115696             123598       93.6
1                 239294           115696             123598       93.6
2                 239294           115696             123598       93.6
3                 239294           115696             123598       93.6
4                 239294           115696             123598       93.6
…                  …               …                  …        …
180105             79555            41070              38485      106.7
180106             79555            41070              38485      106.7
180107             79555            41070              38485      106.7
180108             79555            41070              38485      106.7
180109             79555            41070              38485      106.7

        Population under 5 Years  Population 5 to 9 Years  …  \
0                          12360                    12848  …
1                          12360                    12848  …
2                          12360                    12848  …
3                          12360                    12848  …
4                          12360                    12848  …
…                          …                        …  …
180105                      4733                     4844  …
180106                      4733                     4844  …
180107                      4733                     4844  …
180108                      4733                     4844  …
180109                      4733                     4844  …

        Population of White Race  Population of Black Race  \
0                         198355                     21305
1                         198355                     21305
2                         198355                     21305
3                         198355                     21305
```

```
4                         198355                      21305
…                           …                           …
180105                     69303                         72
180106                     69303                         72
180107                     69303                         72
180108                     69303                         72
180109                     69303                         72

        Population of American Indian and Alaska Native  \
0                                                   884
1                                                   884
2                                                   884
3                                                   884
4                                                   884
…                                                   …
180105                                              598
180106                                              598
180107                                              598
180108                                              598
180109                                              598

        Population of Asian Race  \
0                          1956
1                          1956
2                          1956
3                          1956
4                          1956
…                          …
180105                      228
180106                      228
180107                      228
180108                      228
180109                      228

        Population of Native Hawaiian and Other Pacific Islander  \
0                                                               0
1                                                               0
2                                                               0
3                                                               0
4                                                               0
…                                                               …
180105                                                          0
180106                                                          0
180107                                                          0
180108                                                          0
180109                                                          0
```

```
        Total Housing Units  Population of Citizen Over 18  \
0                    128533                         185566
1                    128533                         185566
2                    128533                         185566
3                    128533                         185566
4                    128533                         185566
…                       …                              …
180105                37051                          59929
180106                37051                          59929
180107                37051                          59929
180108                37051                          59929
180109                37051                          59929

        Population of Male Citizen  Population of Female Citizen  population
0                             90007                         95559      223234
1                             90007                         95559      223234
2                             90007                         95559      223234
3                             90007                         95559      223234
4                             90007                         95559      223234
…                               …                             …           …
180105                        30603                         29326       79858
180106                        30603                         29326       79858
180107                        30603                         29326       79858
180108                        30603                         29326       79858
180109                        30603                         29326       79858

[180110 rows x 32 columns]
```

[26]:
```
combinedData.dtypes
```

[26]:
```
County Name                                 object
State                                       object
Date                                datetime64[ns]
Number of new cases                          int64
Total Population                             int64
Male population                              int64
Female Population                            int64
Sex Ratio                                  float64
Population under 5 Years                     int64
Population 5 to 9 Years                      int64
Population 10 to 14 Years                    int64
Population 15 to 19 Years                    int64
Population 20 to 24 Years                    int64
Population 25 to 34 Years                    int64
Population 35 to 44 Years                    int64
Population 45 to 54 Years                    int64
Population 55 to 59 Years                    int64
```

```
Population 60 to 64 Years                                          int64
Population 65 to 74 Years                                          int64
Population 75 to 84 Years                                          int64
Population Above 85 Years                                          int64
Meadin Age Population                                            float64
Population of White Race                                          object
Population of Black Race                                          object
Population of American Indian and Alaska Native                   object
Population of Asian Race                                          object
Population of Native Hawaiian and Other Pacific Islander          object
Total Housing Units                                                int64
Population of Citizen Over 18                                      int64
Population of Male Citizen                                         int64
Population of Female Citizen                                       int64
population                                                         int64
dtype: object
```

[27]:
```
# taking all the required column names from the combinedData dataframe and␣
 ↪appending them to the list l[].

l=[]
for i in range(3,len(combinedData.columns)):

    l.append(combinedData.columns[i])
print(l)
```

```
['Number of new cases', 'Total Population', 'Male population', 'Female
Population', 'Sex Ratio', 'Population under 5 Years', 'Population 5 to 9 Years',
'Population 10 to 14 Years', 'Population 15 to 19 Years', 'Population 20 to 24
Years', 'Population 25 to 34 Years', 'Population 35 to 44 Years', 'Population 45
to 54 Years', 'Population 55 to 59 Years', 'Population 60 to 64 Years',
'Population 65 to 74 Years', 'Population 75 to 84 Years', 'Population Above 85
Years', 'Meadin Age Population', 'Population of White Race', 'Population of
Black Race', 'Population of American Indian and Alaska Native', 'Population of
Asian Race', 'Population of Native Hawaiian and Other Pacific Islander', 'Total
Housing Units', 'Population of Citizen Over 18', 'Population of Male Citizen',
'Population of Female Citizen', 'population']
```

[28]:
```
# Replacing some null values with 0.

# looping through list l[] to make all variables to float as some are object␣
 ↪type, as object type is not usefull for coreelation.
# I made all of them to float type because some column contain float data, so␣
 ↪they are not changed.

combinedData=combinedData.replace('N',0)
for i in l:
```

```
    combinedData[i] = combinedData[i].astype(float)

combinedData.dtypes
```

[28]:
```
County Name                                                        object
State                                                              object
Date                                                       datetime64[ns]
Number of new cases                                               float64
Total Population                                                  float64
Male population                                                   float64
Female Population                                                 float64
Sex Ratio                                                         float64
Population under 5 Years                                          float64
Population 5 to 9 Years                                           float64
Population 10 to 14 Years                                         float64
Population 15 to 19 Years                                         float64
Population 20 to 24 Years                                         float64
Population 25 to 34 Years                                         float64
Population 35 to 44 Years                                         float64
Population 45 to 54 Years                                         float64
Population 55 to 59 Years                                         float64
Population 60 to 64 Years                                         float64
Population 65 to 74 Years                                         float64
Population 75 to 84 Years                                         float64
Population Above 85 Years                                         float64
Meadin Age Population                                             float64
Population of White Race                                          float64
Population of Black Race                                          float64
Population of American Indian and Alaska Native                   float64
Population of Asian Race                                          float64
Population of Native Hawaiian and Other Pacific Islander          float64
Total Housing Units                                               float64
Population of Citizen Over 18                                     float64
Population of Male Citizen                                        float64
Population of Female Citizen                                      float64
population                                                        float64
dtype: object
```

[29]:
```
# Aggregating the data to the state level.

combinedStates = combinedData.groupby('State').sum().reset_index()
combinedStates
```

[29]:

	State	Number of new cases	Total Population	Male population	\
0	AK	21199.0	1.072848e+08	5.583215e+07	
1	AL	193676.0	8.135096e+08	3.932546e+08	
2	AR	77808.0	3.798904e+08	1.865161e+08	

3	AZ	318692.0	1.542866e+09	7.695349e+08
4	CA	1918982.0	8.428265e+09	4.211980e+09
5	CO	261485.0	1.087026e+09	5.477551e+08
6	CT	140984.0	7.824145e+08	3.836658e+08
7	DC	19511.0	1.454008e+08	6.922842e+07
8	DE	46799.0	2.177343e+08	1.054420e+08
9	FL	1181249.0	4.586069e+09	2.249401e+09
10	GA	259052.0	1.830951e+09	8.875875e+08
11	HI	92392.0	3.128094e+08	1.574528e+08
12	IA	59571.0	3.658546e+08	1.824197e+08
13	ID	42408.0	2.697898e+08	1.348931e+08
14	IL	-270415.0	2.355147e+09	1.159726e+09
15	IN	0.0	1.082645e+09	5.340166e+08
16	KS	76798.0	3.958082e+08	1.979932e+08
17	KY	141459.0	4.997530e+08	2.465354e+08
18	LA	146509.0	7.376192e+08	3.560744e+08
19	MA	248108.0	1.507962e+09	7.355137e+08
20	MD	126528.0	1.277076e+09	6.218083e+08
21	ME	31655.0	2.115676e+08	1.036830e+08
22	MI	406609.0	1.875776e+09	9.246726e+08
23	MN	38078.0	9.089585e+08	4.533905e+08
24	MO	-68111.0	9.192419e+08	4.488762e+08
25	MS	8400.0	3.032677e+08	1.455367e+08
26	MT	28977.0	1.463839e+08	7.416474e+07
27	NC	470519.0	1.871677e+09	9.103326e+08
28	ND	20155.0	9.271781e+07	4.706860e+07
29	NE	0.0	2.393380e+08	1.196664e+08
30	NH	20261.0	2.600116e+08	1.294615e+08
31	NJ	518909.0	2.010967e+09	9.902925e+08
32	NM	99058.0	3.502326e+08	1.740848e+08
33	NV	127446.0	6.045334e+08	3.033619e+08
34	NY	1020476.0	4.077471e+09	1.988860e+09
35	OH	446710.0	2.125867e+09	1.045167e+09
36	OK	127216.0	5.483065e+08	2.715312e+08
37	OR	0.0	8.157688e+08	4.071293e+08
38	PA	469617.0	2.594120e+09	1.277102e+09
39	RI	51737.0	2.267199e+08	1.110526e+08
40	SC	0.0	9.686806e+08	4.704093e+08
41	SD	12571.0	8.232134e+07	4.159955e+07
42	TN	0.0	1.046008e+09	5.091293e+08
43	TX	807448.0	5.651148e+09	2.810620e+09
44	UT	101641.0	6.316959e+08	3.201533e+08
45	VA	299072.0	1.365742e+09	6.741493e+08
46	VT	3576.0	3.664370e+07	1.806134e+07
47	WA	293939.0	1.573490e+09	7.921318e+08
48	WI	232982.0	1.001358e+09	4.991493e+08
49	WV	42207.0	1.576242e+08	7.833266e+07

```
50    WY              7606.0      3.915071e+07     1.991018e+07

    Female Population  Sex Ratio  Population under 5 Years  \
0        5.145265e+07    72282.7                 6899949.0
1        4.202550e+08   410347.0                47430992.0
2        1.933743e+08   231126.7                23158674.0
3        7.733311e+08   218627.5                85114561.0
4        4.216285e+09   917150.5               475619081.0
5        5.392706e+08   263372.9                59201723.0
6        3.987488e+08   169238.3                38534209.0
7        7.617242e+07    19725.3                 8855553.0
8        1.122923e+08    60911.9                11509463.0
9        2.336669e+09   865374.3               230179495.0
10       9.433634e+08   800187.5               107025268.0
11       1.553566e+08    87212.3                17624740.0
12       1.834349e+08   216197.1                21679819.0
13       1.348967e+08   129852.8                16022629.0
14       1.195420e+09   467982.2               132036688.0
15       5.486285e+08   556496.5                64996491.0
16       1.978150e+08   181976.2                23810759.0
17       2.532175e+08   301868.7                29497895.0
18       3.815448e+08   346245.2                46092753.0
19       7.724486e+08   244298.6                74739574.0
20       6.552675e+08   339561.6                73551716.0
21       1.078846e+08   125773.2                 9747857.0
22       9.511030e+08   647983.7               104194069.0
23       4.555681e+08   351279.6                53588584.0
24       4.703657e+08   358939.7                53027639.0
25       1.577310e+08   221253.2                18092158.0
26       7.221912e+07   134648.5                 7576121.0
27       9.613445e+08   825489.7               106202838.0
28       4.564920e+07    90749.4                 6155856.0
29       1.196716e+08    65382.1                15581251.0
30       1.305500e+08   128702.7                11829321.0
31       1.020675e+09   445153.8               112015400.0
32       1.761478e+08   197752.1                18959507.0
33       3.011715e+08    44094.4                34415766.0
34       2.088611e+09   816440.8               226942506.0
35       1.080699e+09   796346.6               121180178.0
36       2.767753e+08   238027.3                34545532.0
37       4.086394e+08   328234.2                40584208.0
38       1.317018e+09   839507.9               136354771.0
39       1.156673e+08    83067.6                11073510.0
40       4.982713e+08   429269.4                51900758.0
41       4.072179e+07    65902.9                 5584061.0
42       5.368786e+08   417052.3                61788797.0
43       2.840527e+09  1175272.0               368550847.0
```

44	3.115426e+08	156717.4	44914226.0
45	6.915927e+08	629343.4	79895060.0
46	1.858236e+07	21092.4	1526161.0
47	7.813580e+08	440401.5	89087180.0
48	5.022085e+08	548185.4	54612607.0
49	7.929158e+07	150489.5	8288315.0
50	1.924052e+07	45070.9	2253328.0

	Population 5 to 9 Years	Population 10 to 14 Years	\
0	7762958.0	7223062.0	
1	48253205.0	54734344.0	
2	26403692.0	24830442.0	
3	94403463.0	101043446.0	
4	507733345.0	569247203.0	
5	63472500.0	70572306.0	
6	42704732.0	46153513.0	
7	7775761.0	7320495.0	
8	12674970.0	13000036.0	
9	241307472.0	271193363.0	
10	115092243.0	132013686.0	
11	18153569.0	19936875.0	
12	23566417.0	24385592.0	
13	18889199.0	19989172.0	
14	147182854.0	150250366.0	
15	68378436.0	75637737.0	
16	25781553.0	28036834.0	
17	30949842.0	33087075.0	
18	46512648.0	51108274.0	
19	78957403.0	86686292.0	
20	77831173.0	83112953.0	
21	10790108.0	11142299.0	
22	110811050.0	119642299.0	
23	57718528.0	62090644.0	
24	55281401.0	61435087.0	
25	18417441.0	22747893.0	
26	8783943.0	9166731.0	
27	111022408.0	124234453.0	
28	6097049.0	5703845.0	
29	15794345.0	17871903.0	
30	12678659.0	15030722.0	
31	119715428.0	128654526.0	
32	20996703.0	23488948.0	
33	37009133.0	40623702.0	
34	228918508.0	246095577.0	
35	128440998.0	136323740.0	
36	37238936.0	38463684.0	
37	45041171.0	50022840.0	

```
38              145101173.0                160812624.0
39               11596046.0                 12713596.0
40               58318533.0                 61606951.0
41                5826016.0                  6029779.0
42               66249449.0                 67275425.0
43              397025370.0                425742065.0
44               50091412.0                 52260544.0
45               84585732.0                 90045235.0
46                1556975.0                  2147215.0
47               95624956.0                100552375.0
48               59163531.0                 66281999.0
49                8589077.0                  9948365.0
50                2536730.0                  2728992.0

    Population 15 to 19 Years  …  Population of White Race  \
0                    7303569.0  …              6.839645e+07
1                   54175786.0  …              5.073069e+08
2                   25575186.0  …              2.516851e+08
3                  102834130.0  …              9.022754e+08
4                  555191462.0  …              3.289760e+09
5                   71297086.0  …              7.576440e+08
6                   53096862.0  …              5.109439e+08
7                    7706972.0  …              5.508371e+07
8                   13733496.0  …              1.323177e+08
9                  261141489.0  …              2.554975e+09
10                 131312342.0  …              8.562703e+08
11                  16687083.0  …              6.936448e+07
12                  27321385.0  …              2.924531e+08
13                  18625761.0  …              2.196420e+08
14                 157377731.0  …              1.335429e+09
15                  77077315.0  …              7.888367e+08
16                  28174846.0  …              2.868675e+08
17                  33902127.0  …              3.492595e+08
18                  47550559.0  …              4.149311e+08
19                  99452836.0  …              1.042560e+09
20                  80873513.0  …              6.091188e+08
21                  12408711.0  …              1.889790e+08
22                 123423958.0  …              1.340364e+09
23                  60332727.0  …              6.748704e+08
24                  58537269.0  …              6.653420e+08
25                  20640606.0  …              1.712781e+08
26                   9028719.0  …              1.283805e+08
27                 126740586.0  …              1.148179e+09
28                   6535389.0  …              7.769229e+07
29                  16901045.0  …              1.784840e+08
30                  16589650.0  …              2.261492e+08
31                 125812911.0  …              1.098647e+09
```

32	24560277.0	…	1.516724e+08
33	36930362.0	…	2.835552e+08
34	247965466.0	…	2.191271e+09
35	138391967.0	…	1.578585e+09
36	38063970.0	…	3.501838e+08
37	49788046.0	…	6.043480e+08
38	164077172.0	…	1.903771e+09
39	15256836.0	…	1.583297e+08
40	66213861.0	…	6.247118e+08
41	4829335.0	…	6.710313e+07
42	67906678.0	…	7.015074e+08
43	410091157.0	…	2.573212e+09
44	50705305.0	…	4.950571e+08
45	90544335.0	…	7.514202e+08
46	2908668.0	…	3.198515e+07
47	92804607.0	…	1.035335e+09
48	66845331.0	…	7.743862e+08
49	9982217.0	…	1.245639e+08
50	2401322.0	…	3.295948e+07

	Population of Black Race	Population of American Indian and Alaska Native	\
0	4284665.0	6789930.0	
1	210474593.0	3526467.0	
2	57264781.0	2383094.0	
3	70720300.0	60234426.0	
4	467684693.0	113575196.0	
5	47991503.0	10149958.0	
6	82643582.0	2655646.0	
7	62778534.0	277977.0	
8	45216073.0	734545.0	
9	689549616.0	12911500.0	
10	606071235.0	8902642.0	
11	6181028.0	1049629.0	
12	21666799.0	1377082.0	
13	2569063.0	2802338.0	
14	360843007.0	17516023.0	
15	127488151.0	3743250.0	
16	28114520.0	2519153.0	
17	57429050.0	1115814.0	
18	234970421.0	4043361.0	
19	100822540.0	3409721.0	
20	384768993.0	5078234.0	
21	4336094.0	729120.0	
22	287351834.0	6835717.0	
23	79868586.0	4232151.0	
24	135377403.0	2836190.0	
25	104289549.0	1221710.0	

26	899682.0	3848712.0
27	376065774.0	19212963.0
28	3991498.0	1986635.0
29	17642751.0	1903741.0
30	3975006.0	282968.0
31	259116445.0	7752759.0
32	7253225.0	37572682.0
33	61516679.0	7389284.0
34	604689813.0	24825451.0
35	299399674.0	3684877.0
36	50669066.0	29827301.0
37	16653882.0	9474003.0
38	288793148.0	4780510.0
39	11645088.0	715449.0
40	210265405.0	3790556.0
41	3154963.0	2978325.0
42	209166083.0	2778685.0
43	719243462.0	43117900.0
44	7400568.0	4767490.0
45	264350919.0	6056687.0
46	858669.0	22785.0
47	66045903.0	18625978.0
48	76783931.0	4788756.0
49	5945149.0	231756.0
50	892304.0	250201.0

	Population of Asian Race \
0	7.134526e+06
1	1.328170e+07
2	8.309581e+06
3	5.299140e+07
4	1.293609e+09
5	3.863663e+07
6	3.751453e+07
7	6.009164e+06
8	8.911322e+06
9	1.337312e+08
10	9.668869e+07
11	1.163469e+08
12	1.312720e+07
13	4.465209e+06
14	1.557863e+08
15	3.349308e+07
16	1.661916e+07
17	1.204958e+07
18	1.560642e+07
19	1.070376e+08

20	8.784399e+07
21	3.048850e+06
22	6.839601e+07
23	5.889011e+07
24	2.437170e+07
25	4.111499e+06
26	1.732094e+06
27	6.787782e+07
28	2.024176e+06
29	8.415043e+06
30	7.443534e+06
31	2.007369e+08
32	6.571411e+06
33	5.722963e+07
34	3.730258e+08
35	5.910754e+07
36	1.740318e+07
37	4.045227e+07
38	1.009224e+08
39	7.162736e+06
40	1.792702e+07
41	1.519868e+06
42	2.355644e+07
43	3.304877e+08
44	1.736933e+07
45	1.205042e+08
46	1.521387e+06
47	1.573378e+08
48	3.584840e+07
49	1.911770e+06
50	3.767120e+05

	Population of Native Hawaiian and Other Pacific Islander \
0	2143960.0
1	337001.0
2	1793505.0
3	2662807.0
4	32934958.0
5	1674806.0
6	320726.0
7	33201.0
8	90055.0
9	2698178.0
10	1017730.0
11	31585652.0
12	397761.0
13	263438.0

14	1060045.0
15	338737.0
16	201593.0
17	830459.0
18	634074.0
19	457002.0
20	768397.0
21	71393.0
22	410781.0
23	164052.0
24	1040298.0
25	82677.0
26	8463.0
27	1169630.0
28	260834.0
29	73780.0
30	3472.0
31	795088.0
32	207018.0
33	4874254.0
34	2063887.0
35	1378167.0
36	598269.0
37	3408853.0
38	958055.0
39	323764.0
40	453313.0
41	51863.0
42	1247750.0
43	4610165.0
44	5695816.0
45	1477770.0
46	21917.0
47	11418974.0
48	134323.0
49	54033.0
50	0.0

	Total Housing Units	Population of Citizen Over 18	\
0	4.635597e+07	7.847111e+07	
1	3.671844e+08	6.146900e+08	
2	1.672371e+08	2.768666e+08	
3	6.629634e+08	1.106057e+09	
4	3.103957e+09	5.581510e+09	
5	4.555169e+08	8.001558e+08	
6	3.333830e+08	5.772154e+08	
7	7.757359e+07	1.090794e+08	

8	9.938123e+07	1.636427e+08
9	2.120391e+09	3.333919e+09
10	7.441431e+08	1.301146e+09
11	1.225642e+08	2.265445e+08
12	1.587796e+08	2.698814e+08
13	1.054442e+08	1.955075e+08
14	9.977005e+08	1.664848e+09
15	4.672414e+08	7.923395e+08
16	1.677171e+08	2.859420e+08
17	2.194792e+08	3.713873e+08
18	3.329470e+08	5.453158e+08
19	6.483305e+08	1.105450e+09
20	5.162701e+08	9.104003e+08
21	1.067052e+08	1.688023e+08
22	8.177224e+08	1.414554e+09
23	3.847134e+08	6.655809e+08
24	4.120084e+08	6.941235e+08
25	1.320469e+08	2.268245e+08
26	6.684294e+07	1.136833e+08
27	8.272148e+08	1.370132e+09
28	4.268846e+07	6.921324e+07
29	1.000513e+08	1.702775e+08
30	1.134732e+08	2.054762e+08
31	8.201712e+08	1.395976e+09
32	1.504185e+08	2.559511e+08
33	2.490785e+08	4.163058e+08
34	1.732915e+09	2.879797e+09
35	9.524868e+08	1.609669e+09
36	2.363610e+08	3.930258e+08
37	3.461499e+08	6.126934e+08
38	1.139595e+09	1.977198e+09
39	1.005519e+08	1.706312e+08
40	4.429471e+08	7.326317e+08
41	3.563314e+07	6.005410e+07
42	4.575614e+08	7.747150e+08
43	2.236996e+09	3.659648e+09
44	2.186564e+08	4.240853e+08
45	5.534459e+08	9.810129e+08
46	1.608035e+07	2.897753e+07
47	6.548633e+08	1.119109e+09
48	4.420596e+08	7.537321e+08
49	7.469596e+07	1.237968e+08
50	1.776492e+07	2.965674e+07

	Population of Male Citizen	Population of Female Citizen	population
0	4.105966e+07	3.741145e+07	1.070170e+08
1	2.922096e+08	3.224804e+08	7.859399e+08

2	1.333465e+08	1.435201e+08	3.721797e+08
3	5.472805e+08	5.587767e+08	1.542600e+09
4	2.755120e+09	2.826389e+09	8.490444e+09
5	4.002988e+08	3.998570e+08	1.075527e+09
6	2.792449e+08	2.979705e+08	7.736673e+08
7	5.087804e+07	5.820135e+07	1.531475e+08
8	7.807356e+07	8.556918e+07	2.113068e+08
9	1.608406e+09	1.725513e+09	4.518925e+09
10	6.168242e+08	6.843221e+08	1.794568e+09
11	1.143531e+08	1.121914e+08	3.072256e+08
12	1.326948e+08	1.371865e+08	3.594327e+08
13	9.694301e+07	9.856444e+07	2.540812e+08
14	8.052416e+08	8.596067e+08	2.350838e+09
15	3.836645e+08	4.086750e+08	1.067948e+09
16	1.407304e+08	1.452116e+08	3.918818e+08
17	1.806032e+08	1.907840e+08	4.929713e+08
18	2.590147e+08	2.863011e+08	7.341741e+08
19	5.307065e+08	5.747434e+08	1.489439e+09
20	4.348880e+08	4.755123e+08	1.251321e+09
21	8.223953e+07	8.656282e+07	2.066764e+08
22	6.883192e+08	7.262348e+08	1.862907e+09
23	3.290751e+08	3.365058e+08	8.976429e+08
24	3.338311e+08	3.602925e+08	9.076405e+08
25	1.070674e+08	1.197571e+08	3.029155e+08
26	5.722160e+07	5.646166e+07	1.410365e+08
27	6.554776e+08	7.146546e+08	1.845901e+09
28	3.525208e+07	3.396115e+07	8.997710e+07
29	8.425350e+07	8.602401e+07	2.338420e+08
30	1.016747e+08	1.038015e+08	2.549292e+08
31	6.769986e+08	7.189772e+08	1.927435e+09
32	1.257995e+08	1.301516e+08	3.482839e+08
33	2.077530e+08	2.085528e+08	5.941968e+08
34	1.378836e+09	1.500961e+09	3.993520e+09
35	7.793911e+08	8.302778e+08	2.105491e+09
36	1.915368e+08	2.014891e+08	5.359245e+08
37	3.014616e+08	3.112318e+08	8.119699e+08
38	9.604379e+08	1.016760e+09	2.556727e+09
39	8.239620e+07	8.823502e+07	2.193614e+08
40	3.500221e+08	3.826096e+08	9.550292e+08
41	3.021009e+07	2.984401e+07	7.986403e+07
42	3.697049e+08	4.050101e+08	1.020921e+09
43	1.792574e+09	1.867073e+09	5.526275e+09
44	2.121561e+08	2.119291e+08	6.055320e+08
45	4.777930e+08	5.032200e+08	1.345745e+09
46	1.415209e+07	1.482544e+07	3.553896e+07
47	5.602098e+08	5.588989e+08	1.547723e+09
48	3.716865e+08	3.820456e+08	9.920255e+08

```
49                6.045837e+07                    6.333839e+07  1.560202e+08
50                1.507716e+07                    1.457958e+07  3.892069e+07

[51 rows x 30 columns]
```

[30]:
```
# choosing the 4 states to find correlation.

corrStates =combinedStates[combinedStates['State'].isin(['VA','AR','AZ','NC'])]
corrStates
```

[30]:
```
   State  Number of new cases  Total Population  Male population  \
2     AR              77808.0      3.798904e+08      186516057.0
3     AZ             318692.0      1.542866e+09      769534948.0
27    NC             470519.0      1.871677e+09      910332577.0
45    VA             299072.0      1.365742e+09      674149343.0

    Female Population  Sex Ratio  Population under 5 Years  \
2         193374342.0   231126.7                23158674.0
3         773331146.0   218627.5                85114561.0
27        961344503.0   825489.7               106202838.0
45        691592671.0   629343.4                79895060.0

    Population 5 to 9 Years  Population 10 to 14 Years  \
2                26403692.0                 24830442.0
3                94403463.0                101043446.0
27              111022408.0                124234453.0
45               84585732.0                 90045235.0

    Population 15 to 19 Years  …  Population of White Race  \
2                   25575186.0  …              2.516851e+08
3                  102834130.0  …              9.022754e+08
27                 126740586.0  …              1.148179e+09
45                  90544335.0  …              7.514202e+08

    Population of Black Race  Population of American Indian and Alaska Native  \
2                 57264781.0                                          2383094.0
3                 70720300.0                                         60234426.0
27               376065774.0                                         19212963.0
45               264350919.0                                          6056687.0

    Population of Asian Race  \
2                  8309581.0
3                 52991400.0
27                67877817.0
45               120504223.0

    Population of Native Hawaiian and Other Pacific Islander  \
```

```
2                                          1793505.0
3                                          2662807.0
27                                         1169630.0
45                                         1477770.0

    Total Housing Units  Population of Citizen Over 18  \
2          167237126.0                   2.768666e+08
3          662963427.0                   1.106057e+09
27         827214850.0                   1.370132e+09
45         553445914.0                   9.810129e+08

    Population of Male Citizen  Population of Female Citizen    population
2                 133346500.0                   143520111.0  3.721797e+08
3                 547280510.0                   558776736.0  1.542600e+09
27                655477578.0                   714654563.0  1.845901e+09
45                477792987.0                   503219962.0  1.345745e+09

[4 rows x 30 columns]
```

[31]:
```
# calculating the mean value of cases for the choosen states.

VA = combinedData[combinedData['State']=='VA'].groupby('Date').sum()
VA_Mean = VA['Number of new cases'].mean()


AR = combinedData[combinedData['State']=='AR'].groupby('Date').sum()
AR_Mean = AR['Number of new cases'].mean()


AZ = combinedData[combinedData['State']=='AZ'].groupby('Date').sum()
AZ_Mean = AZ['Number of new cases'].mean()


NC = combinedData[combinedData['State']=='NC'].groupby('Date').sum()
NC_Mean = NC['Number of new cases'].mean()


print('AR Mean cases are : ',AR_Mean)
print('AZ Mean cases are : ',AZ_Mean)
print('NC Mean cases are : ',NC_Mean)
print('VA Mean cases are : ',VA_Mean)
```

```
AR Mean cases are :  358.5622119815668
AZ Mean cases are :  1468.626728110599
NC Mean cases are :  2168.2903225806454
VA Mean cases are :  1378.2119815668202
```

[32]:
```
corrStates
```

[32]:

	State	Number of new cases	Total Population	Male population	\
2	AR	77808.0	3.798904e+08	186516057.0	
3	AZ	318692.0	1.542866e+09	769534948.0	
27	NC	470519.0	1.871677e+09	910332577.0	
45	VA	299072.0	1.365742e+09	674149343.0	

	Female Population	Sex Ratio	Population under 5 Years	\
2	193374342.0	231126.7	23158674.0	
3	773331146.0	218627.5	85114561.0	
27	961344503.0	825489.7	106202838.0	
45	691592671.0	629343.4	79895060.0	

	Population 5 to 9 Years	Population 10 to 14 Years	\
2	26403692.0	24830442.0	
3	94403463.0	101043446.0	
27	111022408.0	124234453.0	
45	84585732.0	90045235.0	

	Population 15 to 19 Years	…	Population of White Race	\
2	25575186.0	…	2.516851e+08	
3	102834130.0	…	9.022754e+08	
27	126740586.0	…	1.148179e+09	
45	90544335.0	…	7.514202e+08	

	Population of Black Race	Population of American Indian and Alaska Native	\
2	57264781.0	2383094.0	
3	70720300.0	60234426.0	
27	376065774.0	19212963.0	
45	264350919.0	6056687.0	

	Population of Asian Race	\
2	8309581.0	
3	52991400.0	
27	67877817.0	
45	120504223.0	

	Population of Native Hawaiian and Other Pacific Islander	\
2	1793505.0	
3	2662807.0	
27	1169630.0	
45	1477770.0	

	Total Housing Units	Population of Citizen Over 18	\
2	167237126.0	2.768666e+08	
3	662963427.0	1.106057e+09	
27	827214850.0	1.370132e+09	
45	553445914.0	9.810129e+08	

```
    Population of Male Citizen  Population of Female Citizen    population
2                    133346500.0                    143520111.0  3.721797e+08
3                    547280510.0                    558776736.0  1.542600e+09
27                   655477578.0                    714654563.0  1.845901e+09
45                   477792987.0                    503219962.0  1.345745e+09

[4 rows x 30 columns]
```

[33]:
```
# Taking the mean cases into a list in order that matches with the corrStates␣
↪dataframe.

Mean_Cases = [AR_Mean,AZ_Mean,NC_Mean,VA_Mean]
print(Mean_Cases)
```

```
[358.5622119815668, 1468.626728110599, 2168.2903225806454, 1378.2119815668202]
```

[34]:
```
# Creating a Mean_Cases column in corrStates dataframe.

corrStates["Mean_Cases"]=Mean_Cases
corrStates
```

```
C:\Users\venka\AppData\Local\Temp\ipykernel_12540\306739941.py:3:
SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-
docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  corrStates["Mean_Cases"]=Mean_Cases
```

[34]:
```
    State  Number of new cases  Total Population  Male population  \
2      AR              77808.0      3.798904e+08      186516057.0
3      AZ             318692.0      1.542866e+09      769534948.0
27     NC             470519.0      1.871677e+09      910332577.0
45     VA             299072.0      1.365742e+09      674149343.0

    Female Population  Sex Ratio  Population under 5 Years  \
2          193374342.0   231126.7                23158674.0
3          773331146.0   218627.5                85114561.0
27         961344503.0   825489.7               106202838.0
45         691592671.0   629343.4                79895060.0

    Population 5 to 9 Years  Population 10 to 14 Years  \
2                26403692.0                 24830442.0
3                94403463.0                101043446.0
27              111022408.0                124234453.0
45               84585732.0                 90045235.0
```

```
    Population 15 to 19 Years  …  Population of Black Race  \
2                   25575186.0  …                57264781.0
3                  102834130.0  …                70720300.0
27                 126740586.0  …               376065774.0
45                  90544335.0  …               264350919.0

    Population of American Indian and Alaska Native  Population of Asian Race  \
2                                         2383094.0                 8309581.0
3                                        60234426.0                52991400.0
27                                       19212963.0                67877817.0
45                                        6056687.0               120504223.0

    Population of Native Hawaiian and Other Pacific Islander  \
2                                                  1793505.0
3                                                  2662807.0
27                                                 1169630.0
45                                                 1477770.0

    Total Housing Units  Population of Citizen Over 18  \
2           167237126.0                   2.768666e+08
3           662963427.0                   1.106057e+09
27          827214850.0                   1.370132e+09
45          553445914.0                   9.810129e+08

    Population of Male Citizen  Population of Female Citizen    population  \
2                  133346500.0                   143520111.0  3.721797e+08
3                  547280510.0                   558776736.0  1.542600e+09
27                 655477578.0                   714654563.0  1.845901e+09
45                 477792987.0                   503219962.0  1.345745e+09

     Mean_Cases
2    358.562212
3   1468.626728
27  2168.290323
45  1378.211982

[4 rows x 31 columns]
```

[35]:
```
# Normalizing the data by population with a normalization factor of 10000.

for col in corrStates.columns:
    if col== "State":
        continue
    else:
        corrStates[col]=(corrStates[col]/corrStates['population'])*10000
corrStates
```

```
C:\Users\venka\AppData\Local\Temp\ipykernel_12540\2647199782.py:7:
SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-
docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  corrStates[col]=(corrStates[col]/corrStates['population'])*10000
```

[35]:

	State	Number of new cases	Total Population	Male population	\
2	AR	2.090603	10207.175733	5011.451134	
3	AZ	2.065940	10001.721820	4988.556369	
27	NC	2.548994	10139.642206	4931.644843	
45	VA	2.222353	10148.595787	5009.488697	

	Female Population	Sex Ratio	Population under 5 Years	\
2	5195.724599	6.210083	622.244352	
3	5013.165450	1.417266	551.760237	
27	5207.997363	4.472016	575.344321	
45	5139.107090	4.676543	593.686554	

	Population 5 to 9 Years	Population 10 to 14 Years	\
2	709.433892	667.162649	
3	611.976100	655.020188	
27	601.453908	673.028973	
45	628.542137	669.110771	

	Population 15 to 19 Years	…	Population of Black Race	\
2	687.172981	…	1538.632417	
3	666.628404	…	458.448578	
27	686.605723	…	2037.302500	
45	672.819498	…	1964.346557	

	Population of American Indian and Alaska Native	Population of Asian Race	\
2	64.030729	223.267958	
3	390.473273	343.519923	
27	104.084499	367.721967	
45	45.006207	895.446312	

	Population of Native Hawaiian and Other Pacific Islander	\
2	48.189217	
3	17.261806	
27	6.336365	
45	10.981057	

	Total Housing Units	Population of Citizen Over 18	\
2	4493.450581	7439.056529	

```
3          4297.700105                    7170.082313
27         4481.362034                    7422.567617
45         4112.562119                    7289.739775

    Population of Male Citizen  Population of Female Citizen  population  \
2                   3582.852219                   3856.204311     10000.0
3                   3547.778670                   3622.303643     10000.0
27                  3550.990812                   3871.576805     10000.0
45                  3550.398132                   3739.341643     10000.0

     Mean_Cases
2    358.562212
3   1468.626728
27  2168.290323
45  1378.211982

[4 rows x 31 columns]
```

[36]:
```
# dropping the population column so as to avoid NaN values in correlation data,␣
↪as all population column data is same after normalisation.

corrStates.drop(['population'],axis=1,inplace = True)
```

```
C:\Users\venka\AppData\Local\Temp\ipykernel_12540\2066476803.py:3:
SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-
docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  corrStates.drop(['population'],axis=1,inplace = True)
```

[37]:
```
# Calculating the correlation on corrStates dataframe.

correlation = corrStates.corr()
correlation
```

[37]:
```
                                        Number of new cases  \
Number of new cases                                1.000000
Total Population                                   0.228661
Male population                                   -0.865416
Female Population                                  0.584999
Sex Ratio                                          0.193948
Population under 5 Years                          -0.145675
Population 5 to 9 Years                           -0.528683
Population 10 to 14 Years                          0.744922
Population 15 to 19 Years                          0.494020
Population 20 to 24 Years                         -0.201233
Population 25 to 34 Years                         -0.432543
```

Population 35 to 44 Years	0.118763
Population 45 to 54 Years	0.890220
Population 55 to 59 Years	0.453948
Population 60 to 64 Years	0.681772
Population 65 to 74 Years	-0.078334
Population 75 to 84 Years	-0.382894
Population Above 85 Years	-0.757138
Meadin Age Population	0.298738
Population of White Race	-0.026214
Population of Black Race	0.686681
Population of American Indian and Alaska Native	-0.383525
Population of Asian Race	0.097229
Population of Native Hawaiian and Other Pacific…	-0.618071
Total Housing Units	0.269869
Population of Citizen Over 18	0.486375
Population of Male Citizen	-0.357796
Population of Female Citizen	0.578925
Mean_Cases	0.763816

	Total Population \
Number of new cases	0.228661
Total Population	1.000000
Male population	0.157678
Female Population	0.910884
Sex Ratio	0.998953
Population under 5 Years	0.929550
Population 5 to 9 Years	0.650258
Population 10 to 14 Years	0.801741
Population 15 to 19 Years	0.808852
Population 20 to 24 Years	0.785370
Population 25 to 34 Years	0.668334
Population 35 to 44 Years	0.663861
Population 45 to 54 Years	0.376876
Population 55 to 59 Years	0.967786
Population 60 to 64 Years	-0.497026
Population 65 to 74 Years	-0.847895
Population 75 to 84 Years	-0.841525
Population Above 85 Years	-0.739804
Meadin Age Population	0.996636
Population of White Race	0.562102
Population of Black Race	0.791150
Population of American Indian and Alaska Native	-0.944698
Population of Asian Race	0.049009
Population of Native Hawaiian and Other Pacific…	0.455324
Total Housing Units	0.310026
Population of Citizen Over 18	0.883843
Population of Male Citizen	0.695939

Population of Female Citizen	0.859386
Mean_Cases	-0.428865

	Male population \
Number of new cases	-0.865416
Total Population	0.157678
Male population	1.000000
Female Population	-0.263874
Sex Ratio	0.180376
Population under 5 Years	0.479409
Population 5 to 9 Years	0.642238
Population 10 to 14 Years	-0.354172
Population 15 to 19 Years	-0.336217
Population 20 to 24 Years	0.321509
Population 25 to 34 Years	0.812393
Population 35 to 44 Years	0.392357
Population 45 to 54 Years	-0.561561
Population 55 to 59 Years	-0.041526
Population 60 to 64 Years	-0.734763
Population 65 to 74 Years	-0.420837
Population 75 to 84 Years	-0.124233
Population Above 85 Years	0.340935
Meadin Age Population	0.076830
Population of White Race	-0.042577
Population of Black Race	-0.245648
Population of American Indian and Alaska Native	-0.085381
Population of Asian Race	0.267155
Population of Native Hawaiian and Other Pacific…	0.589880
Total Housing Units	-0.458866
Population of Citizen Over 18	-0.256392
Population of Male Citizen	0.435619
Population of Female Citizen	-0.340527
Mean_Cases	-0.825844

	Female Population \
Number of new cases	0.584999
Total Population	0.910884
Male population	-0.263874
Female Population	1.000000
Sex Ratio	0.900377
Population under 5 Years	0.707622
Population 5 to 9 Years	0.366772
Population 10 to 14 Years	0.931127
Population 15 to 19 Years	0.930569
Population 20 to 24 Years	0.632776
Population 25 to 34 Years	0.313322
Population 35 to 44 Years	0.484481

Population 45 to 54 Years	0.602795
Population 55 to 59 Years	0.962664
Population 60 to 64 Years	-0.178433
Population 65 to 74 Years	-0.652340
Population 75 to 84 Years	-0.770066
Population Above 85 Years	-0.865097
Meadin Age Population	0.941384
Population of White Race	0.566840
Population of Black Race	0.875430
Population of American Indian and Alaska Native	-0.887079
Population of Asian Race	-0.063770
Population of Native Hawaiian and Other Pacific…	0.198244
Total Housing Units	0.494582
Population of Citizen Over 18	0.970460
Population of Male Citizen	0.497736
Population of Female Citizen	0.981730
Mean_Cases	-0.073793

	Sex Ratio \
Number of new cases	0.193948
Total Population	0.998953
Male population	0.180376
Female Population	0.900377
Sex Ratio	1.000000
Population under 5 Years	0.942275
Population 5 to 9 Years	0.683047
Population 10 to 14 Years	0.775950
Population 15 to 19 Years	0.811090
Population 20 to 24 Years	0.812289
Population 25 to 34 Years	0.676251
Population 35 to 44 Years	0.642741
Population 45 to 54 Years	0.335096
Population 55 to 59 Years	0.956017
Population 60 to 64 Years	-0.533897
Population 65 to 74 Years	-0.836253
Population 75 to 84 Years	-0.819139
Population Above 85 Years	-0.709059
Meadin Age Population	0.994107
Population of White Race	0.590638
Population of Black Race	0.762581
Population of American Indian and Alaska Native	-0.929535
Population of Asian Race	0.017029
Population of Native Hawaiian and Other Pacific…	0.495368
Total Housing Units	0.329342
Population of Citizen Over 18	0.883156
Population of Male Citizen	0.728009
Population of Female Citizen	0.854051

Mean_Cases	-0.464967

	Population under 5 Years
Number of new cases	-0.145675
Total Population	0.929550
Male population	0.479409
Female Population	0.707622
Sex Ratio	0.942275
Population under 5 Years	1.000000
Population 5 to 9 Years	0.867519
Population 10 to 14 Years	0.529378
Population 15 to 19 Years	0.646454
Population 20 to 24 Years	0.885046
Population 25 to 34 Years	0.832416
Population 35 to 44 Years	0.612355
Population 45 to 54 Years	0.036738
Population 55 to 59 Years	0.809838
Population 60 to 64 Years	-0.769407
Population 65 to 74 Years	-0.819923
Population 75 to 84 Years	-0.698634
Population Above 85 Years	-0.458601
Meadin Age Population	0.900512
Population of White Race	0.599706
Population of Black Race	0.536794
Population of American Indian and Alaska Native	-0.808391
Population of Asian Race	-0.009896
Population of Native Hawaiian and Other Pacific…	0.707575
Total Housing Units	0.234379
Population of Citizen Over 18	0.722548
Population of Male Citizen	0.853450
Population of Female Citizen	0.661838
Mean_Cases	-0.728574

	Population 5 to 9 Years
Number of new cases	-0.528683
Total Population	0.650258
Male population	0.642238
Female Population	0.366772
Sex Ratio	0.683047
Population under 5 Years	0.867519
Population 5 to 9 Years	1.000000
Population 10 to 14 Years	0.072281
Population 15 to 19 Years	0.456010
Population 20 to 24 Years	0.929201
Population 25 to 34 Years	0.719415
Population 35 to 44 Years	0.227441
Population 45 to 54 Years	-0.457498

Population 55 to 59 Years	0.438860
Population 60 to 64 Years	-0.980825
Population 65 to 74 Years	-0.476347
Population 75 to 84 Years	-0.257496
Population Above 85 Years	0.029610
Meadin Age Population	0.608930
Population of White Race	0.723657
Population of Black Race	0.054521
Population of American Indian and Alaska Native	-0.409427
Population of Asian Race	-0.333043
Population of Native Hawaiian and Other Pacific…	0.962399
Total Housing Units	0.342560
Population of Citizen Over 18	0.483000
Population of Male Citizen	0.969454
Population of Female Citizen	0.385325
Mean_Cases	-0.949670

	Population 10 to 14 Years \
Number of new cases	0.744922
Total Population	0.801741
Male population	-0.354172
Female Population	0.931127
Sex Ratio	0.775950
Population under 5 Years	0.529378
Population 5 to 9 Years	0.072281
Population 10 to 14 Years	1.000000
Population 15 to 19 Years	0.754290
Population 20 to 24 Years	0.329026
Population 25 to 34 Years	0.257391
Population 35 to 44 Years	0.629418
Population 45 to 54 Years	0.844142
Population 55 to 59 Years	0.926160
Population 60 to 64 Years	0.118523
Population 65 to 74 Years	-0.692070
Population 75 to 84 Years	-0.866244
Population Above 85 Years	-0.987885
Meadin Age Population	0.835136
Population of White Race	0.232122
Population of Black Race	0.984445
Population of American Indian and Alaska Native	-0.900293
Population of Asian Race	0.245742
Population of Native Hawaiian and Other Pacific…	-0.139833
Total Housing Units	0.221371
Population of Citizen Over 18	0.819959
Population of Male Citizen	0.176093
Population of Female Citizen	0.864464
Mean_Cases	0.194960

	Population 15 to 19 Years \
Number of new cases	0.494020
Total Population	0.808852
Male population	-0.336217
Female Population	0.930569
Sex Ratio	0.811090
Population under 5 Years	0.646454
Population 5 to 9 Years	0.456010
Population 10 to 14 Years	0.754290
Population 15 to 19 Years	1.000000
Population 20 to 24 Years	0.748510
Population 25 to 34 Years	0.132941
Population 35 to 44 Years	0.156428
Population 45 to 54 Years	0.359522
Population 55 to 59 Years	0.819455
Population 60 to 64 Years	-0.287225
Population 65 to 74 Years	-0.392401
Population 75 to 84 Years	-0.493561
Population Above 85 Years	-0.643398
Meadin Age Population	0.847890
Population of White Race	0.805910
Population of Black Race	0.645130
Population of American Indian and Alaska Native	-0.680575
Population of Asian Race	-0.424712
Population of Native Hawaiian and Other Pacific…	0.376428
Total Housing Units	0.775206
Population of Citizen Over 18	0.988480
Population of Male Citizen	0.633602
Population of Female Citizen	0.981838
Mean_Cases	-0.154702

	Population 20 to 24 Years \
Number of new cases	-0.201233
Total Population	0.785370
Male population	0.321509
Female Population	0.632776
Sex Ratio	0.812289
Population under 5 Years	0.885046
Population 5 to 9 Years	0.929201
Population 10 to 14 Years	0.329026
Population 15 to 19 Years	0.748510
Population 20 to 24 Years	1.000000
Population 25 to 34 Years	0.550008
Population 35 to 44 Years	0.176228
Population 45 to 54 Years	-0.228262
Population 55 to 59 Years	0.628574

```
Population 60 to 64 Years                                    -0.850143
Population 65 to 74 Years                                    -0.464445
Population 75 to 84 Years                                    -0.342792
Population Above 85 Years                                    -0.202515
Meadin Age Population                                         0.772344
Population of White Race                                      0.893037
Population of Black Race                                      0.263274
Population of American Indian and Alaska Native              -0.540692
Population of Asian Race                                     -0.473382
Population of Native Hawaiian and Other Pacific…              0.883975
Total Housing Units                                           0.608988
Population of Citizen Over 18                                 0.755242
Population of Male Citizen                                    0.986220
Population of Female Citizen                                  0.678311
Mean_Cases                                                   -0.769307

                                                          …  \
Number of new cases                                       …
Total Population                                          …
Male population                                           …
Female Population                                         …
Sex Ratio                                                 …
Population under 5 Years                                  …
Population 5 to 9 Years                                   …
Population 10 to 14 Years                                 …
Population 15 to 19 Years                                 …
Population 20 to 24 Years                                 …
Population 25 to 34 Years                                 …
Population 35 to 44 Years                                 …
Population 45 to 54 Years                                 …
Population 55 to 59 Years                                 …
Population 60 to 64 Years                                 …
Population 65 to 74 Years                                 …
Population 75 to 84 Years                                 …
Population Above 85 Years                                 …
Meadin Age Population                                     …
Population of White Race                                  …
Population of Black Race                                  …
Population of American Indian and Alaska Native           …
Population of Asian Race                                  …
Population of Native Hawaiian and Other Pacific…          …
Total Housing Units                                       …
Population of Citizen Over 18                             …
Population of Male Citizen                                …
Population of Female Citizen                              …
Mean_Cases                                                …
```

	Population of White Race \
Number of new cases	-0.026214
Total Population	0.562102
Male population	-0.042577
Female Population	0.566840
Sex Ratio	0.590638
Population under 5 Years	0.599706
Population 5 to 9 Years	0.723657
Population 10 to 14 Years	0.232122
Population 15 to 19 Years	0.805910
Population 20 to 24 Years	0.893037
Population 25 to 34 Years	0.115815
Population 35 to 44 Years	-0.227820
Population 45 to 54 Years	-0.259767
Population 55 to 59 Years	0.441701
Population 60 to 64 Years	-0.646397
Population 65 to 74 Years	-0.076085
Population 75 to 84 Years	-0.033222
Population Above 85 Years	-0.079197
Meadin Age Population	0.579236
Population of White Race	1.000000
Population of Black Race	0.100172
Population of American Indian and Alaska Native	-0.277075
Population of Asian Race	-0.793993
Population of Native Hawaiian and Other Pacific…	0.773429
Total Housing Units	0.895391
Population of Citizen Over 18	0.747007
Population of Male Citizen	0.867974
Population of Female Citizen	0.686298
Mean_Cases	-0.527565

	Population of Black Race \
Number of new cases	0.686681
Total Population	0.791150
Male population	-0.245648
Female Population	0.875430
Sex Ratio	0.762581
Population under 5 Years	0.536794
Population 5 to 9 Years	0.054521
Population 10 to 14 Years	0.984445
Population 15 to 19 Years	0.645130
Population 20 to 24 Years	0.263274
Population 25 to 34 Years	0.357688
Population 35 to 44 Years	0.748696
Population 45 to 54 Years	0.862591
Population 55 to 59 Years	0.915395
Population 60 to 64 Years	0.125573

```
Population 65 to 74 Years                                    -0.775909
Population 75 to 84 Years                                    -0.929935
Population Above 85 Years                                    -0.994773
Meadin Age Population                                         0.814133
Population of White Race                                      0.100172
Population of Black Race                                      1.000000
Population of American Indian and Alaska Native              -0.926894
Population of Asian Race                                      0.405769
Population of Native Hawaiian and Other Pacific…             -0.184069
Total Housing Units                                           0.051806
Population of Citizen Over 18                                 0.733020
Population of Male Citizen                                    0.118694
Population of Female Citizen                                  0.778349
Mean_Cases                                                    0.178634

                                                    Population of American
Indian and Alaska Native  \
Number of new cases
-0.383525
Total Population
-0.944698
Male population
-0.085381
Female Population
-0.887079
Sex Ratio
-0.929535
Population under 5 Years
-0.808391
Population 5 to 9 Years
-0.409427
Population 10 to 14 Years
-0.900293
Population 15 to 19 Years
-0.680575
Population 20 to 24 Years
-0.540692
Population 25 to 34 Years
-0.650166
Population 35 to 44 Years
-0.829875
Population 45 to 54 Years
-0.615207
Population 55 to 59 Years
-0.977505
Population 60 to 64 Years
0.247382
```

```
Population 65 to 74 Years
0.924833
Population 75 to 84 Years
0.969229
Population Above 85 Years
0.885588
Meadin Age Population
-0.943520
Population of White Race
-0.277075
Population of Black Race
-0.926894
Population of American Indian and Alaska Native
1.000000
Population of Asian Race
-0.339248
Population of Native Hawaiian and Other Pacific…
-0.165061
Total Housing Units
-0.068839
Population of Citizen Over 18
-0.783188
Population of Male Citizen
-0.431122
Population of Female Citizen
-0.788071
Mean_Cases
0.202671
```

	Population of Asian Race \
Number of new cases	0.097229
Total Population	0.049009
Male population	0.267155
Female Population	-0.063770
Sex Ratio	0.017029
Population under 5 Years	-0.009896
Population 5 to 9 Years	-0.333043
Population 10 to 14 Years	0.245742
Population 15 to 19 Years	-0.424712
Population 20 to 24 Years	-0.473382
Population 25 to 34 Years	0.415299
Population 35 to 44 Years	0.772799
Population 45 to 54 Years	0.508606
Population 55 to 59 Years	0.147370
Population 60 to 64 Years	0.338515
Population 65 to 74 Years	-0.545129
Population 75 to 84 Years	-0.559497

```
Population Above 85 Years                                    -0.384595
Meadin Age Population                                         0.017776
Population of White Race                                     -0.793993
Population of Black Race                                      0.405769
Population of American Indian and Alaska Native              -0.339248
Population of Asian Race                                      1.000000
Population of Native Hawaiian and Other Pacific…             -0.533012
Total Housing Units                                          -0.890490
Population of Citizen Over 18                                -0.294456
Population of Male Citizen                                   -0.493774
Population of Female Citizen                                 -0.248826
Mean_Cases                                                    0.235891

                                                    Population of Native
Hawaiian and Other Pacific Islander  \
Number of new cases
-0.618071
Total Population
0.455324
Male population
0.589880
Female Population
0.198244
Sex Ratio
0.495368
Population under 5 Years
0.707575
Population 5 to 9 Years
0.962399
Population 10 to 14 Years
-0.139833
Population 15 to 19 Years
0.376428
Population 20 to 24 Years
0.883975
Population 25 to 34 Years
0.534788
Population 35 to 44 Years
-0.040340
Population 45 to 54 Years
-0.647522
Population 55 to 59 Years
0.224364
Population 60 to 64 Years
-0.976276
Population 65 to 74 Years
-0.219744
```

Population 75 to 84 Years
0.009870
Population Above 85 Years
0.257161
Meadin Age Population
0.418361
Population of White Race
0.773429
Population of Black Race
-0.184069
Population of American Indian and Alaska Native
-0.165061
Population of Asian Race
-0.533012
Population of Native Hawaiian and Other Pacific…
1.000000
Total Housing Units
0.446630
Population of Citizen Over 18
0.365716
Population of Male Citizen
0.948786
Population of Female Citizen
0.261029
Mean_Cases
-0.940464

	Total Housing Units \
Number of new cases	0.269869
Total Population	0.310026
Male population	-0.458866
Female Population	0.494582
Sex Ratio	0.329342
Population under 5 Years	0.234379
Population 5 to 9 Years	0.342560
Population 10 to 14 Years	0.221371
Population 15 to 19 Years	0.775206
Population 20 to 24 Years	0.608988
Population 25 to 34 Years	-0.322306
Population 35 to 44 Years	-0.494789
Population 45 to 54 Years	-0.103664
Population 55 to 59 Years	0.275323
Population 60 to 64 Years	-0.258367
Population 65 to 74 Years	0.241151
Population 75 to 84 Years	0.166654
Population Above 85 Years	-0.077520
Meadin Age Population	0.358855

```
Population of White Race                                    0.895391
Population of Black Race                                    0.051806
Population of American Indian and Alaska Native            -0.068839
Population of Asian Race                                   -0.890490
Population of Native Hawaiian and Other Pacific…           0.446630
Total Housing Units                                         1.000000
Population of Citizen Over 18                               0.673015
Population of Male Citizen                                  0.556095
Population of Female Citizen                                0.650648
Mean_Cases                                                 -0.118757

                                                    Population of Citizen Over
18  \
Number of new cases
0.486375
Total Population
0.883843
Male population
-0.256392
Female Population
0.970460
Sex Ratio
0.883156
Population under 5 Years
0.722548
Population 5 to 9 Years
0.483000
Population 10 to 14 Years
0.819959
Population 15 to 19 Years
0.988480
Population 20 to 24 Years
0.755242
Population 25 to 34 Years
0.255082
Population 35 to 44 Years
0.303819
Population 45 to 54 Years
0.421047
Population 55 to 59 Years
0.896204
Population 60 to 64 Years
-0.307472
Population 65 to 74 Years
-0.525919
Population 75 to 84 Years
-0.616891
```

```
Population Above 85 Years
-0.721889
Meadin Age Population
0.915895
Population of White Race
0.747007
Population of Black Race
0.733020
Population of American Indian and Alaska Native
-0.783188
Population of Asian Race
-0.294456
Population of Native Hawaiian and Other Pacific…
0.365716
Total Housing Units
0.673015
Population of Citizen Over 18
1.000000
Population of Male Citizen
0.636713
Population of Female Citizen
0.993893
Mean_Cases
-0.186154
```

	Population of Male Citizen
Number of new cases	-0.357796
Total Population	0.695939
Male population	0.435619
Female Population	0.497736
Sex Ratio	0.728009
Population under 5 Years	0.853450
Population 5 to 9 Years	0.969454
Population 10 to 14 Years	0.176093
Population 15 to 19 Years	0.633602
Population 20 to 24 Years	0.986220
Population 25 to 34 Years	0.572702
Population 35 to 44 Years	0.118859
Population 45 to 54 Years	-0.378986
Population 55 to 59 Years	0.508318
Population 60 to 64 Years	-0.921007
Population 65 to 74 Years	-0.403314
Population 75 to 84 Years	-0.238327
Population Above 85 Years	-0.050817
Meadin Age Population	0.673177
Population of White Race	0.867974

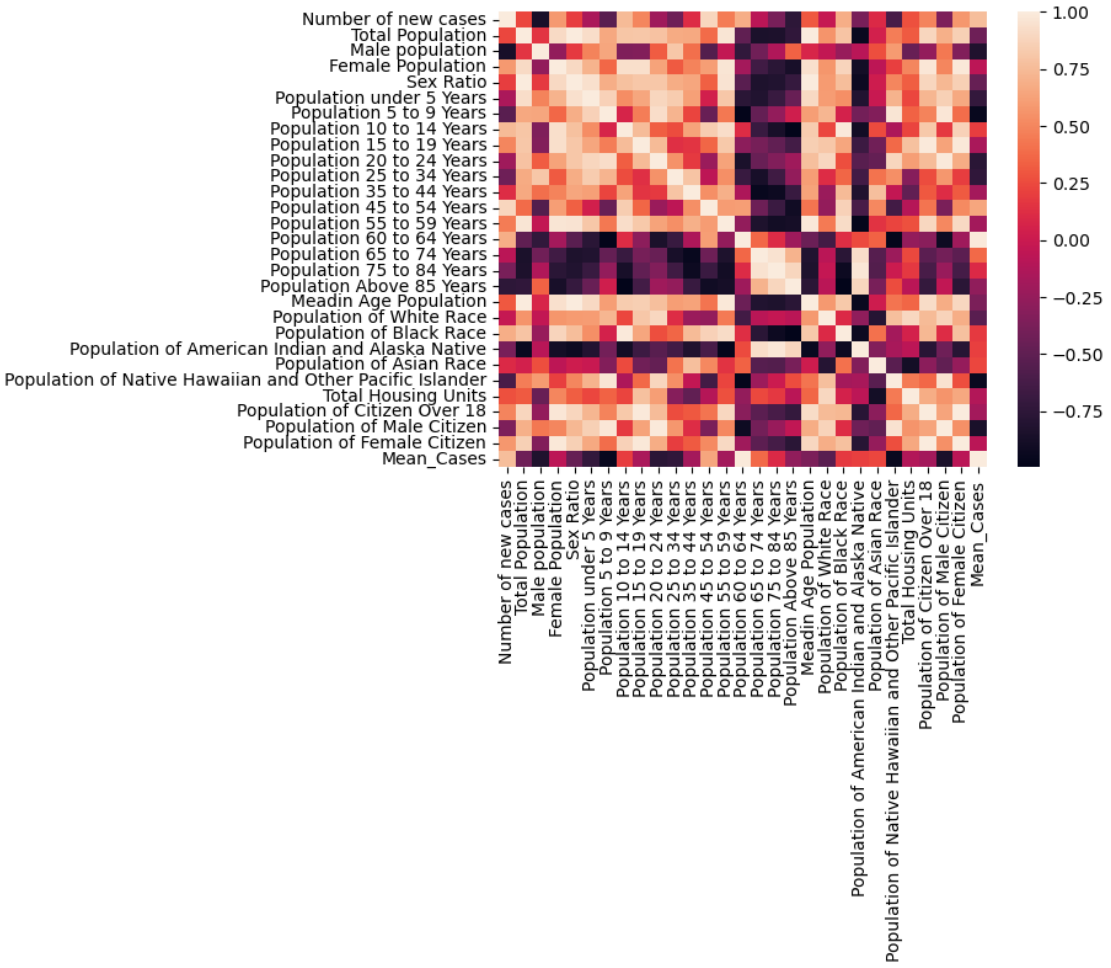
Population of Black Race	0.118694
Population of American Indian and Alaska Native	-0.431122
Population of Asian Race	-0.493774
Population of Native Hawaiian and Other Pacific…	0.948786
Total Housing Units	0.556095
Population of Citizen Over 18	0.636713
Population of Male Citizen	1.000000
Population of Female Citizen	0.547734
Mean_Cases	-0.855399

	Population of Female Citizen
Number of new cases	0.578925
Total Population	0.859386
Male population	-0.340527
Female Population	0.981730
Sex Ratio	0.854051
Population under 5 Years	0.661838
Population 5 to 9 Years	0.385325
Population 10 to 14 Years	0.864464
Population 15 to 19 Years	0.981838
Population 20 to 24 Years	0.678311
Population 25 to 34 Years	0.194809
Population 35 to 44 Years	0.312638
Population 45 to 54 Years	0.511076
Population 55 to 59 Years	0.899647
Population 60 to 64 Years	-0.201808
Population 65 to 74 Years	-0.512911
Population 75 to 84 Years	-0.635227
Population Above 85 Years	-0.775984
Meadin Age Population	0.897420
Population of White Race	0.686298
Population of Black Race	0.778349
Population of American Indian and Alaska Native	-0.788071
Population of Asian Race	-0.248826
Population of Native Hawaiian and Other Pacific…	0.261029
Total Housing Units	0.650648
Population of Citizen Over 18	0.993893
Population of Male Citizen	0.547734
Population of Female Citizen	1.000000
Mean_Cases	-0.079566

	Mean_Cases
Number of new cases	0.763816
Total Population	-0.428865
Male population	-0.825844
Female Population	-0.073793

```
Sex Ratio                                            -0.464967
Population under 5 Years                             -0.728574
Population 5 to 9 Years                              -0.949670
Population 10 to 14 Years                             0.194960
Population 15 to 19 Years                            -0.154702
Population 20 to 24 Years                            -0.769307
Population 25 to 34 Years                            -0.740325
Population 35 to 44 Years                            -0.180577
Population 45 to 54 Years                             0.644897
Population 55 to 59 Years                            -0.189239
Population 60 to 64 Years                             0.989010
Population 65 to 74 Years                             0.375915
Population 75 to 84 Years                             0.097246
Population Above 85 Years                            -0.270693
Meadin Age Population                                -0.369762
Population of White Race                             -0.527565
Population of Black Race                              0.178634
Population of American Indian and Alaska Native       0.202671
Population of Asian Race                              0.235891
Population of Native Hawaiian and Other Pacific…     -0.940464
Total Housing Units                                  -0.118757
Population of Citizen Over 18                        -0.186154
Population of Male Citizen                           -0.855399
Population of Female Citizen                         -0.079566
Mean_Cases                                            1.000000

[29 rows x 29 columns]
```

[38]:
```
# Generating a heatmap for the correlation data using seaborn package.

heatMap = sns.heatmap(correlation,xticklabels=True,yticklabels=True)
```



4 Task-3 : Hypothesis questions.

Forming Hypothesis:

I am choosing below 3 enrichment variables and compared with Mean_Cases :

1) population 60 to 64
2) population of male citizen
3) Total housing unit

Hypothesis Questions:

1) Does the population between 60 to 64 age group caused the number of covid cases to increase rapidly ?
2) Does the higher population of Male citizen citizen has reduced the number of cases in that area ?

3) Does the population of 75 to 84 has no effect on covid cases in that area ?

Referenes:

1) https://seaborn.pydata.org/generated/seaborn.heatmap.html

2) https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.DataFrame.corr.html

3) https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.DataFrame.merge.html

4) https://seaborn.pydata.org/generated/seaborn.kdeplot.html

5) https://matplotlib.org/stable/api/_as_gen/matplotlib.pyplot.hist.html