CA-COVID

April 24, 2021

[1]:

```
#!/usr/bin/env python

'''
This iPython Notebook Visualized COVID-19 data from the data.cdc.gov APIs
Dataset Name: COVID-19 Case Surveillance Public Use Data with Geography
Dataser URL: https://data.cdc.gov/Case-Surveillance/
 ↪COVID-19-Case-Surveillance-Public-Use-Data-with-Ge/n8mc-b4w4
'''

# import all the required libraries to use Panda and Plotly for data␣
 ↪visualization
import pandas as pd
import os
from sodapy import Socrata
import numpy as np
import matplotlib
import cufflinks as cf
import plotly
import plotly.offline as py
import plotly.graph_objs as go
pd.options.plotting.backend = "plotly"
cf.go_offline()

# Unauthenticated client only works with public data sets. Note 'None'
# in place of application token, and no username or password:
# client = Socrata# ("data.cdc.gov", None)

# Example authenticated client (needed for non-public datasets):
client = Socrata("data.cdc.gov", os.environ["SOCRATA_APP_TOKEN"])

# Get records where Residential State is California, returned as JSON from API /
 ↪ converted to Python list of
# dictionaries by sodapy.
results = client.get("n8mc-b4w4", res_state="CA", limit="1000000")

# Convert result to pandas DataFrame
results_df=pd.DataFrame.from_records(results)
```

```python
# Print result dataframe from the obtained data for COVID-19 cases in California
results_df
```

[1]:

```
       case_month res_state state_fips_code res_county county_fips_code  \
0         2020-12        CA              06         NA               NA
1         2020-12        CA              06         NA               NA
2         2020-12        CA              06         NA               NA
3         2020-03        CA              06      BUTTE            06007
4         2020-03        CA              06      BUTTE            06007
…           …       …             …         …              …
999995    2021-01        CA              06     ORANGE            06059
999996    2021-01        CA              06     ORANGE            06059
999997    2021-01        CA              06     ORANGE            06059
999998    2021-01        CA              06     ORANGE            06059
999999    2021-01        CA              06     ORANGE            06059

             age_group     sex     race ethnicity case_onset_interval  \
0              Missing      NA       NA        NA                 0.0
1              Missing      NA       NA        NA                 NaN
2                   NA      NA       NA        NA                 0.0
3                   NA      NA       NA        NA                 0.0
4                   NA      NA       NA        NA                 0.0
…                 …     …      …       …                 …
999995  18 to 49 years  Female  Unknown   Unknown                 NaN
999996  18 to 49 years  Female  Unknown   Unknown                 NaN
999997  18 to 49 years  Female  Unknown   Unknown                 NaN
999998  18 to 49 years  Female  Unknown   Unknown                 0.0
999999  18 to 49 years  Female  Unknown   Unknown                 NaN

        process exposure_yn             current_status symptom_status  \
0       Missing     Missing  Laboratory-confirmed case    Symptomatic
1       Missing     Missing  Laboratory-confirmed case        Unknown
2       Missing     Missing  Laboratory-confirmed case    Symptomatic
3       Missing     Missing  Laboratory-confirmed case    Symptomatic
4       Missing     Missing  Laboratory-confirmed case    Symptomatic
…         …         …                         …             …
999995  Missing     Missing  Laboratory-confirmed case        Unknown
999996  Missing     Missing  Laboratory-confirmed case        Unknown
999997  Missing     Missing  Laboratory-confirmed case        Unknown
999998  Missing     Missing  Laboratory-confirmed case    Symptomatic
999999  Missing     Missing  Laboratory-confirmed case        Unknown

        hosp_yn   icu_yn death_yn case_positive_specimen  \
0           Yes  Missing       NA                    NaN
1            No  Missing       NA                    NaN
2           Yes  Unknown       NA                    NaN
3            No  Missing       No                    NaN
```

```
4           Yes       No      No                    NaN
…         …      …      …                    …
999995  Missing  Missing       No                    NaN
999996  Missing  Missing       No                    NaN
999997  Missing  Missing       No                    NaN
999998       No  Missing       No                    NaN
999999  Missing  Missing       No                    NaN

       underlying_conditions_yn
0                           NaN
1                           NaN
2                           NaN
3                           NaN
4                           NaN
…                         …
999995                      NaN
999996                      NaN
999997                      NaN
999998                      NaN
999999                      NaN

[1000000 rows x 19 columns]
```

[2]:

```
# select county column from the result dataframe
cases_by_county = pd.concat([results_df.res_county])
cases_by_county
```

[2]:

```
0             NA
1             NA
2             NA
3          BUTTE
4          BUTTE
           …
999995    ORANGE
999996    ORANGE
999997    ORANGE
999998    ORANGE
999999    ORANGE
Name: res_county, Length: 1000000, dtype: object
```

[3]:

```
# count the number of cases by county
cases_by_county.value_counts()
```

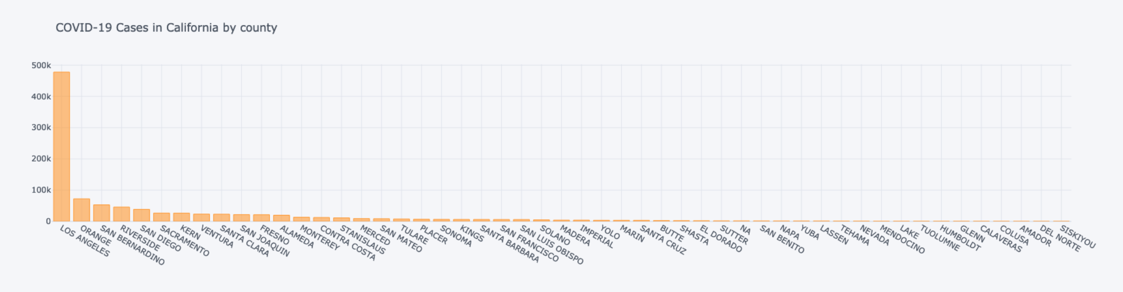
[3]:

```
LOS ANGELES        477821
ORANGE              72427
SAN BERNARDINO      52974
RIVERSIDE           45910
```

```
SAN DIEGO           38638
SACRAMENTO          26601
KERN                26458
VENTURA             23460
SANTA CLARA         23119
SAN JOAQUIN         21794
FRESNO              21429
ALAMEDA             19781
MONTEREY            13333
CONTRA COSTA        12523
STANISLAUS          11417
MERCED               9079
SAN MATEO            8615
TULARE               7856
PLACER               6859
SONOMA               6454
KINGS                6272
SANTA BARBARA        6174
SAN FRANCISCO        6039
SAN LUIS OBISPO      5939
SOLANO               4956
MADERA               4047
IMPERIAL             4036
YOLO                 3570
MARIN                3551
SANTA CRUZ           3487
BUTTE                2747
SHASTA               2462
EL DORADO            2203
SUTTER               1849
NA                   1813
SAN BENITO           1649
NAPA                 1539
YUBA                 1484
LASSEN               1483
TEHAMA               1240
NEVADA               1185
MENDOCINO             841
LAKE                  805
TUOLUMNE              682
HUMBOLDT              681
GLENN                 665
CALAVERAS             627
COLUSA                510
AMADOR                351
DEL NORTE             318
SISKIYOU              247
```

```
Name: res_county, dtype: int64
```

[4]:
```
# graph the number of cases by county
cases_by_county.value_counts().iplot(kind="bar",title="COVID-19 Cases in␣
↪California by county")
```



[5]:
```
# We would create a Panda DataFrame that would allow us to use the county name␣
↪as an index.
tmp = pd.DataFrame({'cases_by_county':cases_by_county.value_counts()})
tmp
```

[5]:
```
                 cases_by_county
LOS ANGELES               477821
ORANGE                     72427
SAN BERNARDINO             52974
RIVERSIDE                  45910
SAN DIEGO                  38638
SACRAMENTO                 26601
KERN                       26458
VENTURA                    23460
SANTA CLARA                23119
SAN JOAQUIN                21794
FRESNO                     21429
ALAMEDA                    19781
MONTEREY                   13333
CONTRA COSTA               12523
STANISLAUS                 11417
MERCED                      9079
SAN MATEO                   8615
TULARE                      7856
PLACER                      6859
SONOMA                      6454
KINGS                       6272
SANTA BARBARA               6174
SAN FRANCISCO               6039
SAN LUIS OBISPO             5939
```

```
SOLANO                      4956
MADERA                      4047
IMPERIAL                    4036
YOLO                        3570
MARIN                       3551
SANTA CRUZ                  3487
BUTTE                       2747
SHASTA                      2462
EL DORADO                   2203
SUTTER                      1849
NA                          1813
SAN BENITO                  1649
NAPA                        1539
YUBA                        1484
LASSEN                      1483
TEHAMA                      1240
NEVADA                      1185
MENDOCINO                    841
LAKE                         805
TUOLUMNE                     682
HUMBOLDT                     681
GLENN                        665
CALAVERAS                    627
COLUSA                       510
AMADOR                       351
DEL NORTE                    318
SISKIYOU                     247
```

[6]:

```
# Remove the cases where we don't have the county information
# Select data where the index != NA
cases_by_county_df = tmp[tmp.index != "NA"]
# sort the results in acceding order by the number of cases
cases_by_county_df = cases_by_county_df.sort_values(by='cases_by_county',␣
 ↪ascending=True)
cases_by_county_df
```

[6]:

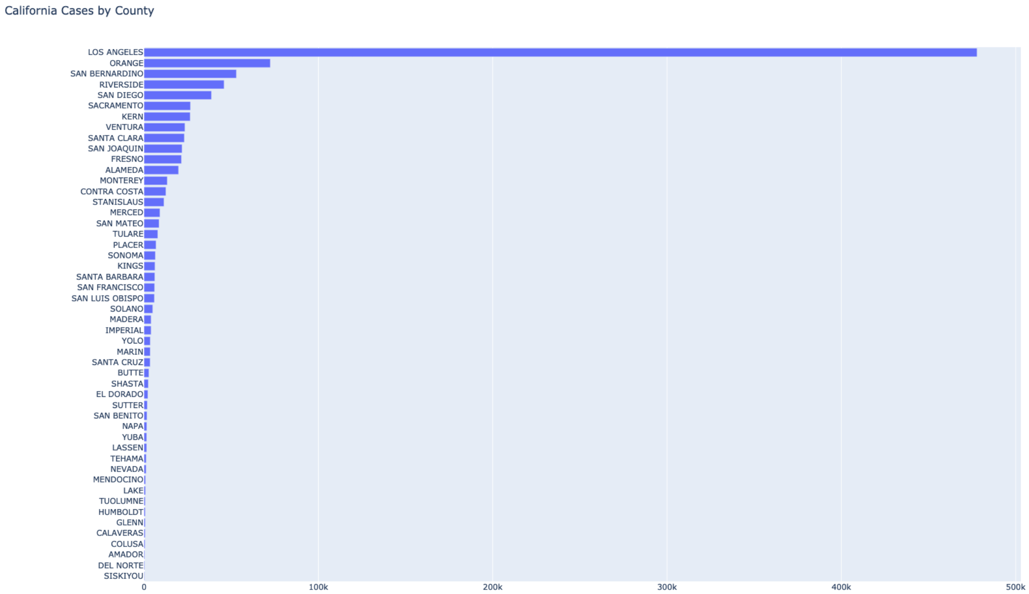
```
                 cases_by_county
SISKIYOU                     247
DEL NORTE                    318
AMADOR                       351
COLUSA                       510
CALAVERAS                    627
GLENN                        665
HUMBOLDT                     681
TUOLUMNE                     682
LAKE                         805
MENDOCINO                    841
```

```
NEVADA                      1185
TEHAMA                      1240
LASSEN                      1483
YUBA                        1484
NAPA                        1539
SAN BENITO                  1649
SUTTER                      1849
EL DORADO                   2203
SHASTA                      2462
BUTTE                       2747
SANTA CRUZ                  3487
MARIN                       3551
YOLO                        3570
IMPERIAL                    4036
MADERA                      4047
SOLANO                      4956
SAN LUIS OBISPO             5939
SAN FRANCISCO               6039
SANTA BARBARA               6174
KINGS                       6272
SONOMA                      6454
PLACER                      6859
TULARE                      7856
SAN MATEO                   8615
MERCED                      9079
STANISLAUS                 11417
CONTRA COSTA               12523
MONTEREY                   13333
ALAMEDA                    19781
FRESNO                     21429
SAN JOAQUIN                21794
SANTA CLARA                23119
VENTURA                    23460
KERN                       26458
SACRAMENTO                 26601
SAN DIEGO                  38638
RIVERSIDE                  45910
SAN BERNARDINO             52974
ORANGE                     72427
LOS ANGELES               477821
```

[7]:

```
# Create a Plotly Graph Object of type Bar and use the index on the Y axis and␣
 ↪the value on the x axis
data = [go.Bar(
                y = cases_by_county_df.index,
                x = cases_by_county_df.cases_by_county,
                orientation='h'
```

```
            )]
# create the Plotly layout object
layout = go.Layout(
        height = 1000,
        margin=go.layout.Margin(l=300),
        title = "California Cases by County"
)
# create a Plotly figure object
fig = go.Figure(data=data,layout=layout)
# call the Plotly iplot() and pass the Figure object
py.iplot(fig)
```



[8]:
```
# In the next steps lets find the number of reported cases by county and race
```

[9]:
```
"""
Below is the information related to the 'race' field of the dataset
From https://data.cdc.gov/Case-Surveillance/
 ↪COVID-19-Case-Surveillance-Public-Use-Data-with-Ge/n8mc-b4w4
Race [American Indian/Alaska Native; Asian; Black; Multiple/Other; Native␣
 ↪Hawaiian/Other Pacific Islander; White; Unknown; Missing; NA, if value␣
 ↪suppressed for privacy protection.]
"""
df = pd.DataFrame({'county':results_df.res_county,'race':results_df.race})
df
```

[9]:

```
        county     race
0           NA       NA
1           NA       NA
2           NA       NA
3        BUTTE       NA
4        BUTTE       NA
…          …       …
999995  ORANGE  Unknown
999996  ORANGE  Unknown
999997  ORANGE  Unknown
999998  ORANGE  Unknown
999999  ORANGE  Unknown

[1000000 rows x 2 columns]
```

[10]:

```
# see all the posible race values
race_values = list()
'''
iterate over the series returned by value_counts() and convert the results to a␣
 ↪list
'''
for key,value in pd.concat([df.race]).value_counts().items():
    race_values.append(key)
race_values
```

[10]:

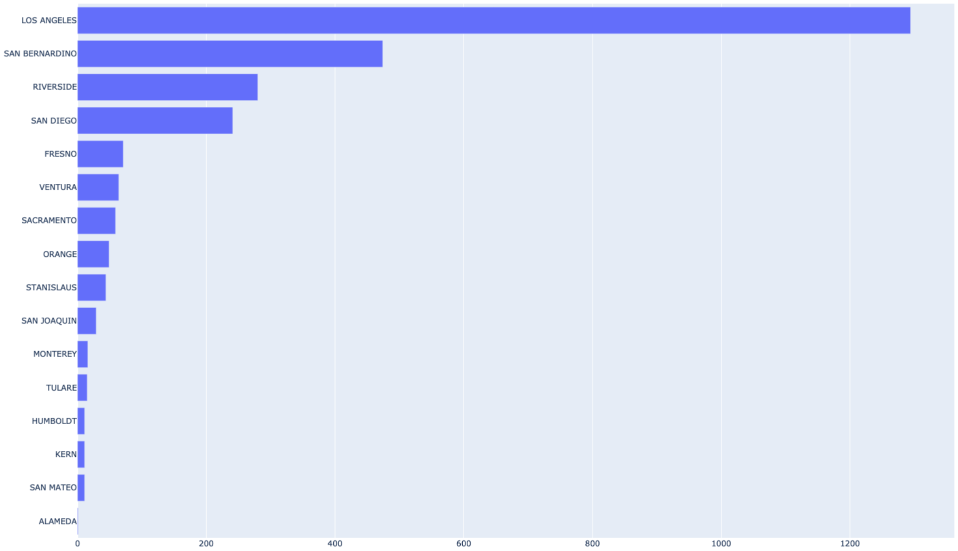
```
['NA',
 'Unknown',
 'White',
 'Multiple/Other',
 'Missing',
 'Asian',
 'Black',
 'Native Hawaiian/Other Pacific Islander',
 'American Indian/Alaska Native']
```

[11]:

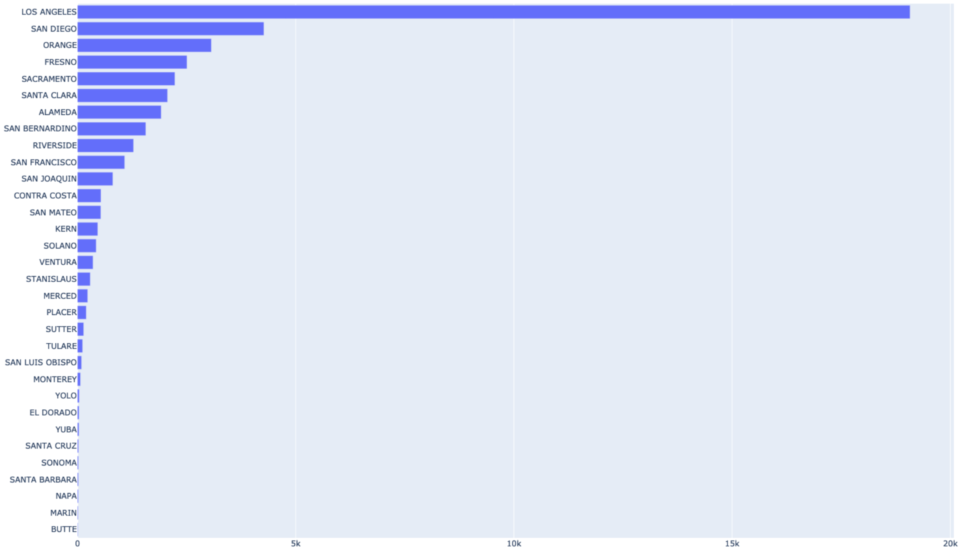
```
# collect the cases by race and by county.
# Lets use the race as the key in a dictionary to store the results
race_df_dic = dict()
ignore_values =['NA','Unknown','Missing'] # list of race values to ignore
race_values.sort()
for race in race_values:
    if race not in ignore_values:
        ''' below an example on how to get all the cases where the race was␣
 ↪White:
            df[df["race"] == "White"]
        '''
        race_df_dic[race] = df[df['race'] == race]
```

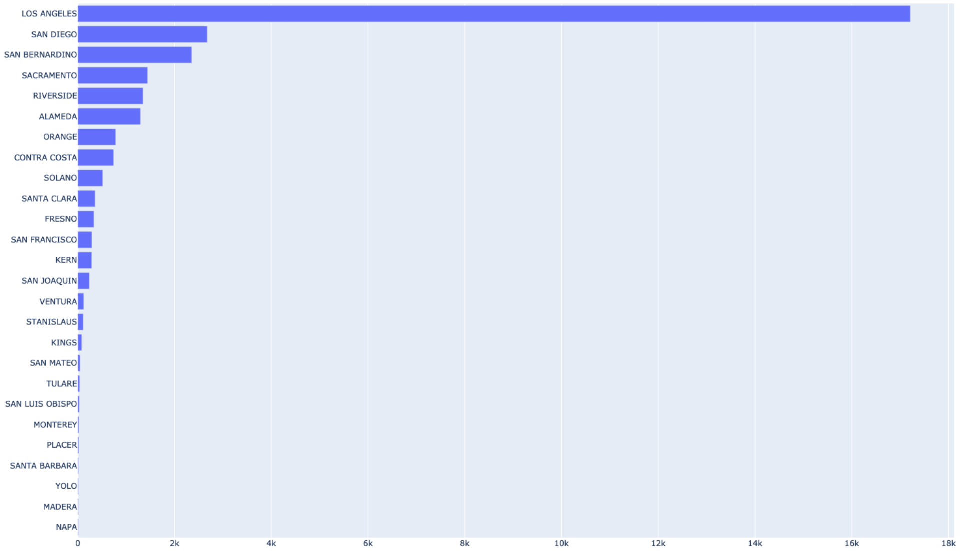
```
# get the number of cases by race by county
race_bycounty_dic = dict()

for race in race_df_dic.keys():
    # count the number of cases for each race and create a dataframe with the␣
 ↪results we can graph
    race_bycounty_dic[race] = pd.DataFrame({'race': pd.
 ↪concat([race_df_dic[race].county]).value_counts()})
    # remove any 'NA' county
    race_bycounty_dic[race] = race_bycounty_dic[race][race_bycounty_dic[race].
 ↪index != "NA"]
    # sort the results in ascending order by the number of cases
    race_bycounty_dic[race] = race_bycounty_dic[race].
 ↪sort_values(by='race',ascending=True)
    # create the data for the grap
    data = [go.Bar(
                y = race_bycounty_dic[race].index,
                x = race_bycounty_dic[race].race,
                orientation='h'
            )]
    # now create our figure layout
    layout = go.Layout(
            height = 1000,
            margin=go.layout.Margin(l=300),
            title = "%s race reported COVID-19 Cases in California by county" %␣
 ↪(race)
            )
    # create a figure object
    fig = go.Figure(data=data,layout=layout)
    py.iplot(fig)
```

American Indian/Alaska Native race reported COVID-19 Cases in California by county

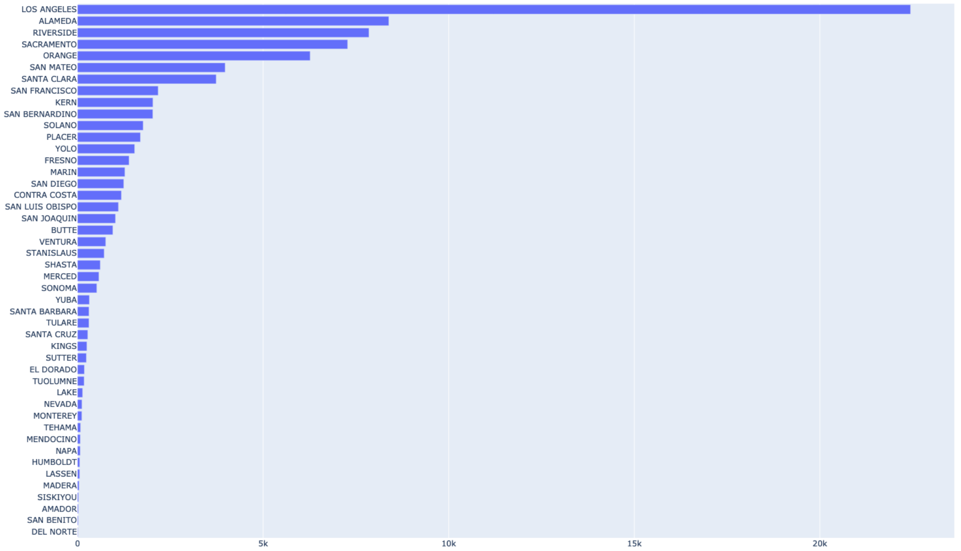


Asian race reported COVID-19 Cases in California by county



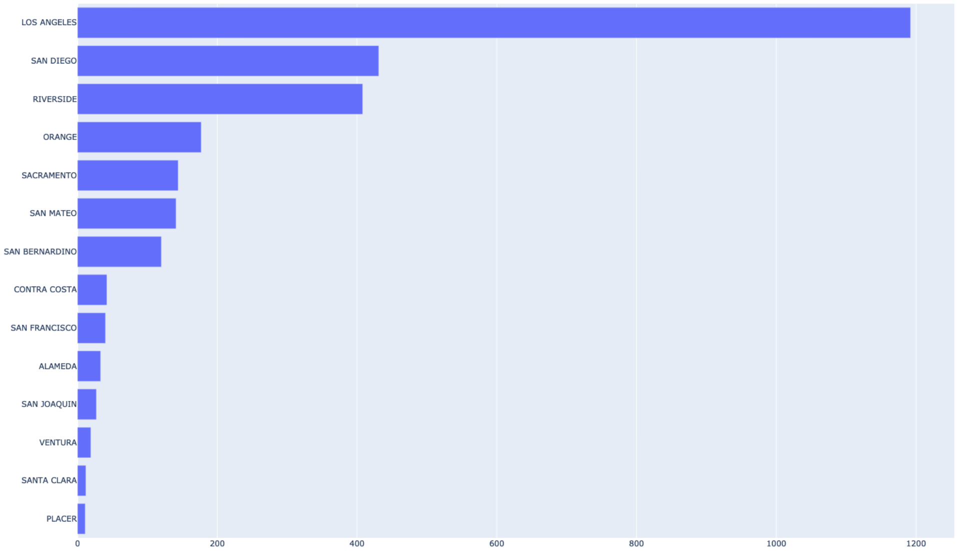


Black race reported COVID-19 Cases in California by county

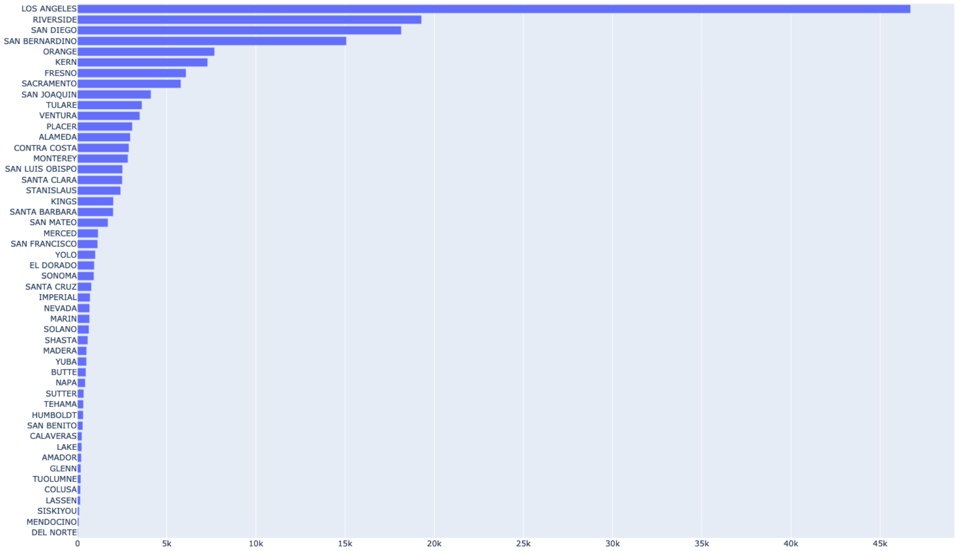


Multiple/Other race reported COVID-19 Cases in California by county

Native Hawaiian/Other Pacific Islander race reported COVID-19 Cases in California by county



White race reported COVID-19 Cases in California by county


LOS ANGELES
RIVERSIDE
SAN DIEGO
SAN BERNARDINO
ORANGE
KERN
FRESNO
SACRAMENTO
SAN JOAQUIN
TULARE
VENTURA
PLACER
ALAMEDA
CONTRA COSTA
MONTEREY
SAN LUIS OBISPO
SANTA CLARA
STANISLAUS
KINGS
SANTA BARBARA
SAN MATEO
MERCED
SAN FRANCISCO
YOLO
EL DORADO
SONOMA
SANTA CRUZ
IMPERIAL
NEVADA
MARIN
SOLANO
SHASTA
MADERA
YUBA
BUTTE
NAPA
SUTTER
TEHAMA
HUMBOLDT
SAN BENITO
CALAVERAS
LAKE
AMADOR
GLENN
TUOLUMNE
COLUSA
LASSEN
SISKIYOU
MENDOCINO
DEL NORTE
5k
10k
15k
20k
25k
30k
35k
40k
45k