In [ ]:
```
import pandas as pd
import numpy as np

# Getting the population for each county to merge to the main dataset used for this

population = pd.read_csv('data/covid_county_population_usafacts.csv', usecols= ['co

population = population[population.countyFIPS != 0]

population = population.set_index('countyFIPS')
population
```

Out[ ]:

countyFIPS	population
1001	55869
1003	223234
1005	24686
1007	22394
1009	57826
...	...
56037	42343
56039	23464
56041	20226
56043	7805
56045	6927

3144 rows × 1 columns

In [ ]:
```
confirmed = pd.read_csv('data/covid_confirmed_usafacts.csv')
confirmed = confirmed.drop(confirmed.iloc[:, 4 : 864], axis=1)
confirmed = confirmed.drop(confirmed.iloc[:, 219 : 235], axis=1)

# Calculating the difference to get the new cases
for i in range (5, len(confirmed.columns)):
    diff = confirmed[confirmed.columns[i]] - confirmed[confirmed.columns[i - 1]]
    confirmed[f'new_cases {confirmed.columns[i]}'] = diff

confirmed = confirmed.drop(confirmed.iloc[:, 4:219], axis= 1)
temp = {}
j = ((len(confirmed.columns) - 4) % 7) - 1

length = len(confirmed.columns) - 3
for i in range(4, len(confirmed.columns), 7):
    if (length) < (i + 7) :
        confirmed[f'{confirmed.columns[i]} - {confirmed.columns[i + j]} Sum'] = con
```

```
        confirmed[f'{confirmed.columns[i]} - {confirmed.columns[i + j]} Mean'] = co
        confirmed[f'{confirmed.columns[i]} - {confirmed.columns[i + j]} Median'] =
        confirmed[f'{confirmed.columns[i]} - {confirmed.columns[i + j]} Mode'] = co
    else:
        confirmed[f'{confirmed.columns[i]} - {confirmed.columns[i + 7]} Sum'] = con
        confirmed[f'{confirmed.columns[i]} - {confirmed.columns[i + 7]} Mean'] = co
        confirmed[f'{confirmed.columns[i]} - {confirmed.columns[i + 7]} Median'] =
        confirmed[f'{confirmed.columns[i]} - {confirmed.columns[i + 7]} Mode'] = co

confirmed.columns = confirmed.columns.str.replace('new_cases ', '')

confirmed
```

Out[ ]:

	countyFIPS	County Name	State	StateFIPS	2022-06-01	2022-06-02	2022-06-03	2022-06-04	2022-06-05	2022-06-06	...	1 M
0	0	Statewide Unallocated	AL	1	0	0	0	0	0	0	...	
1	1001	Autauga County	AL	1	6	9	0	0	0	54	...	
2	1003	Baldwin County	AL	1	68	68	0	0	0	247	...	
3	1005	Barbour County	AL	1	3	4	0	0	0	5	...	
4	1007	Bibb County	AL	1	8	4	0	0	0	22	...	
...	...	...	...	...	...	...	...	...	...	...	...	
3188	56037	Sweetwater County	WY	56	0	0	0	0	0	0	...	
3189	56039	Teton County	WY	56	0	0	0	0	0	0	...	
3190	56041	Uinta County	WY	56	0	0	0	0	0	0	...	
3191	56043	Washakie County	WY	56	0	0	0	0	0	0	...	
3192	56045	Weston County	WY	56	0	0	0	0	0	0	...	

3193 rows × 342 columns

In [ ]:
```
deaths = pd.read_csv("data/covid_deaths_usafacts.csv")

deaths = deaths.drop(deaths.iloc[:, 4 : 864], axis=1)
deaths = deaths.drop(deaths.iloc[:, 219 : 235], axis=1)
```

```
# Calculating the difference to get the new death cases
for i in range (5, len(deaths.columns)):
    diff = deaths[deaths.columns[i]] - deaths[deaths.columns[i - 1]]
    deaths[f'new_deaths {deaths.columns[i]}'] = diff

deaths = deaths.drop(deaths.iloc[:, 4:219], axis= 1)
temp = {}
j = ((len(deaths.columns) - 4) % 7) - 1

length = len(deaths.columns) - 3
for i in range(4, len(deaths.columns), 7):
    if (length) < (i + 7) :
        deaths[f'{deaths.columns[i]} - {deaths.columns[i + j]} Sum'] = deaths[death
        deaths[f'{deaths.columns[i]} - {deaths.columns[i + j]} Mean'] = deaths[deat
        deaths[f'{deaths.columns[i]} - {deaths.columns[i + j]} Median'] = deaths[de
        deaths[f'{deaths.columns[i]} - {deaths.columns[i + j]} Mode'] = deaths[deat
    else:
        deaths[f'{deaths.columns[i]} - {deaths.columns[i + 7]} Sum'] = deaths[death
        deaths[f'{deaths.columns[i]} - {deaths.columns[i + 7]} Mean'] = deaths[deat
        deaths[f'{deaths.columns[i]} - {deaths.columns[i + 7]} Median'] = deaths[de
        deaths[f'{deaths.columns[i]} - {deaths.columns[i + 7]} Mode'] = deaths[deat


deaths.columns = deaths.columns.str.replace('new_deaths ', '')
deaths
```

Out[ ]:

	countyFIPS	County Name	State	StateFIPS	2022-06-01	2022-06-02	2022-06-03	2022-06-04	2022-06-05	2022-06-06	...	1 M
0	0	Statewide Unallocated	AL	1	0	0	0	0	0	0	...	
1	1001	Autauga County	AL	1	0	0	0	0	0	0	...	
2	1003	Baldwin County	AL	1	0	0	0	0	0	0	...	
3	1005	Barbour County	AL	1	0	0	0	0	0	0	...	
4	1007	Bibb County	AL	1	0	0	0	0	0	0	...	
...	...	...	...	...	...	...	...	...	...	...	...	
3188	56037	Sweetwater County	WY	56	0	0	0	0	0	0	...	
3189	56039	Teton County	WY	56	0	0	0	0	0	0	...	
3190	56041	Uinta County	WY	56	0	0	0	0	0	0	...	
3191	56043	Washakie County	WY	56	0	0	0	0	0	0	...	
3192	56045	Weston County	WY	56	0	0	0	0	0	0	...	

3193 rows × 342 columns

In [ ]:
```
# Merging population to both confirmed and death dataframe
confirmed = confirmed.merge(population, how='left', on='countyFIPS')

confirmed = confirmed.fillna(0)
confirmed
```

Out[ ]:

	countyFIPS	County Name	State	StateFIPS	2022-06-01	2022-06-02	2022-06-03	2022-06-04	2022-06-05	2022-06-06	...	2(1: 2(1: M
0	0	Statewide Unallocated	AL	1	0	0	0	0	0	0	...	
1	1001	Autauga County	AL	1	6	9	0	0	0	54	...	
2	1003	Baldwin County	AL	1	68	68	0	0	0	247	...	
3	1005	Barbour County	AL	1	3	4	0	0	0	5	...	
4	1007	Bibb County	AL	1	8	4	0	0	0	22	...	
...	...	...	...	...	...	...	...	...	...	...	...	
3188	56037	Sweetwater County	WY	56	0	0	0	0	0	0	...	
3189	56039	Teton County	WY	56	0	0	0	0	0	0	...	
3190	56041	Uinta County	WY	56	0	0	0	0	0	0	...	
3191	56043	Washakie County	WY	56	0	0	0	0	0	0	...	
3192	56045	Weston County	WY	56	0	0	0	0	0	0	...	

3193 rows × 343 columns

In [ ]:
```
# Merging population to both confirmed and death dataframe
deaths = deaths.merge(population, how='left', on='countyFIPS')

deaths = deaths.fillna(0)
deaths
```

Out[ ]:

	countyFIPS	County Name	State	StateFIPS	2022-06-01	2022-06-02	2022-06-03	2022-06-04	2022-06-05	2022-06-06	...	2(1: 2(1: M
0	0	Statewide Unallocated	AL	1	0	0	0	0	0	0	...	
1	1001	Autauga County	AL	1	0	0	0	0	0	0	...	
2	1003	Baldwin County	AL	1	0	0	0	0	0	0	...	
3	1005	Barbour County	AL	1	0	0	0	0	0	0	...	
4	1007	Bibb County	AL	1	0	0	0	0	0	0	...	
...	...	...	...	...	...	...	...	...	...	...	...	
3188	56037	Sweetwater County	WY	56	0	0	0	0	0	0	...	
3189	56039	Teton County	WY	56	0	0	0	0	0	0	...	
3190	56041	Uinta County	WY	56	0	0	0	0	0	0	...	
3191	56043	Washakie County	WY	56	0	0	0	0	0	0	...	
3192	56045	Weston County	WY	56	0	0	0	0	0	0	...	

3193 rows × 343 columns

In [ ]:
```
# Filter only columns that contain the mean value of the weeks
filter_conf_mean = confirmed.filter(regex=r'countyFIPS|County Name|State|StateFIPS|

# Calculate basic statistics (mean, median, mode) on that mean data
mean_tot = filter_conf_mean.iloc[:,4:].mean(axis=1).round()
filter_conf_mean['Total Mean Mean'] = mean_tot

median_tot = filter_conf_mean.iloc[:,4:].median(axis=1).round()
filter_conf_mean['Total Mean Median'] = median_tot

mode_tot = filter_conf_mean.iloc[:,4:].mode(axis=1)[0]
filter_conf_mean['Total Mean Mode'] = mode_tot

filter_conf_mean
```

```
/tmp/ipykernel_117/3341144699.py:6: 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/stabl
e/user_guide/indexing.html#returning-a-view-versus-a-copy
  filter_conf_mean['Total Mean Mean'] = mean_tot
/tmp/ipykernel_117/3341144699.py:9: 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/stabl
e/user_guide/indexing.html#returning-a-view-versus-a-copy
  filter_conf_mean['Total Mean Median'] = median_tot
/tmp/ipykernel_117/3341144699.py:12: 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/stabl
e/user_guide/indexing.html#returning-a-view-versus-a-copy
  filter_conf_mean['Total Mean Mode'] = mode_tot
```

Out[ ]:

	countyFIPS	County Name	State	StateFIPS	2022-06-01 - 2022-06-08 Mean	2022-06-08 - 2022-06-15 Mean	2022-06-15 - 2022-06-22 Mean	2022-06-22 - 2022-06-29 Mean	2022-06-29 - 2022-07-06 Mean	2022-07-06 - 2022-07-13 Mean	...	2(1' 2(1' M
0	0	Statewide Unallocated	AL	1	0.0	0.0	0.0	0.0	0.0	0.0	...	
1	1001	Autauga County	AL	1	13.0	15.0	22.0	26.0	18.0	43.0	...	
2	1003	Baldwin County	AL	1	63.0	71.0	79.0	98.0	74.0	133.0	...	
3	1005	Barbour County	AL	1	4.0	4.0	7.0	7.0	8.0	18.0	...	
4	1007	Bibb County	AL	1	5.0	5.0	8.0	8.0	6.0	9.0	...	
...	...	...	...	...	...	...	...	...	...	...	...	
3188	56037	Sweetwater County	WY	56	0.0	38.0	7.0	10.0	10.0	10.0	...	
3189	56039	Teton County	WY	56	0.0	46.0	21.0	15.0	15.0	17.0	...	
3190	56041	Uinta County	WY	56	0.0	10.0	4.0	4.0	6.0	7.0	...	
3191	56043	Washakie County	WY	56	0.0	15.0	3.0	-1.0	2.0	3.0	...	
3192	56045	Weston County	WY	56	0.0	5.0	1.0	0.0	3.0	6.0	...	

3193 rows × 38 columns

In [ ]:
```
filter_deaths_mean = deaths.filter(regex=r'countyFIPS|County Name|State|StateFIPS|M

# Calculate basic statistics (mean, median, mode) on that mean data
mean_tot_death = filter_deaths_mean.iloc[:,4:].mean(axis=1).round()
filter_deaths_mean['Total Mean Mean'] = mean_tot_death

median_tot_death = filter_deaths_mean.iloc[:,4:].median(axis=1).round()
filter_deaths_mean['Total Mean Median'] = median_tot_death

mode_tot_death = filter_deaths_mean.iloc[:,4:].mode(axis=1)[0]
filter_deaths_mean['Total Mean Mode'] = mode_tot_death

filter_deaths_mean
```

```
/tmp/ipykernel_117/1492274859.py:5: 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/stabl
e/user_guide/indexing.html#returning-a-view-versus-a-copy
  filter_deaths_mean['Total Mean Mean'] = mean_tot_death
/tmp/ipykernel_117/1492274859.py:8: 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/stabl
e/user_guide/indexing.html#returning-a-view-versus-a-copy
  filter_deaths_mean['Total Mean Median'] = median_tot_death
/tmp/ipykernel_117/1492274859.py:11: 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/stabl
e/user_guide/indexing.html#returning-a-view-versus-a-copy
  filter_deaths_mean['Total Mean Mode'] = mode_tot_death
```

Out[ ]:

	countyFIPS	County Name	State	StateFIPS	2022-06-01 - 2022-06-08 Mean	2022-06-08 - 2022-06-15 Mean	2022-06-15 - 2022-06-22 Mean	2022-06-22 - 2022-06-29 Mean	2022-06-29 - 2022-07-06 Mean	2022-07-06 - 2022-07-13 Mean	...	2(1' 2(1' M
0	0	Statewide Unallocated	AL	1	0.0	0.0	0.0	0.0	0.0	0.0	...	
1	1001	Autauga County	AL	1	0.0	0.0	0.0	0.0	0.0	0.0	...	
2	1003	Baldwin County	AL	1	0.0	0.0	0.0	0.0	0.0	0.0	...	
3	1005	Barbour County	AL	1	0.0	0.0	0.0	0.0	0.0	0.0	...	
4	1007	Bibb County	AL	1	0.0	0.0	0.0	0.0	0.0	0.0	...	
...	...	...	...	...	...	...	...	...	...	...	...	
3188	56037	Sweetwater County	WY	56	0.0	0.0	0.0	0.0	0.0	0.0	...	
3189	56039	Teton County	WY	56	0.0	0.0	0.0	0.0	0.0	0.0	...	
3190	56041	Uinta County	WY	56	0.0	0.0	0.0	0.0	0.0	0.0	...	
3191	56043	Washakie County	WY	56	0.0	0.0	0.0	0.0	0.0	0.0	...	
3192	56045	Weston County	WY	56	0.0	0.0	0.0	0.0	0.0	0.0	...	

3193 rows × 28 columns

In [ ]:
```
world_df = pd.read_csv("data/owid-covid-data-cases.csv", usecols=['location','date'

# Selecting only the countries that have similar population as the US

pop_similar_usa = ['Indonesia','Pakistan','Nigeria']
dates_used = (world_df['date'] >= '2022-06-01') & (world_df['date'] < '2023-01-01')

world_df = world_df[world_df['location'].isin(pop_similar_usa)]
world_df = world_df.loc[dates_used]
world_df
```

Out[ ]:

	location	date	total_cases	new_cases	total_deaths	new_deaths	population
107913	Indonesia	2022-06-01	6055341.0	368.0	156594.0	3.0	275501344.0
107914	Indonesia	2022-06-02	6055645.0	304.0	156600.0	6.0	275501344.0
107915	Indonesia	2022-06-03	6056017.0	372.0	156604.0	4.0	275501344.0
107916	Indonesia	2022-06-04	6056412.0	395.0	156610.0	6.0	275501344.0
107917	Indonesia	2022-06-05	6056800.0	388.0	156615.0	5.0	275501344.0
...	...	...	...	...	...	...	...
179292	Pakistan	2022-12-27	1575651.0	0.0	30635.0	0.0	235824864.0
179293	Pakistan	2022-12-28	1575651.0	0.0	30635.0	0.0	235824864.0
179294	Pakistan	2022-12-29	1575772.0	121.0	30636.0	1.0	235824864.0
179295	Pakistan	2022-12-30	1575772.0	0.0	30636.0	0.0	235824864.0
179296	Pakistan	2022-12-31	1575772.0	0.0	30636.0	0.0	235824864.0

642 rows × 7 columns

In [ ]:
```
pakistan_df = world_df[world_df['location'].str.contains('Pakistan')].reset_index()

pakistan_df
```

Out[ ]:

	location	date	total_cases	new_cases	total_deaths	new_deaths	population
0	Pakistan	2022-06-01	1530520.0	67.0	30379.0	0.0	235824864.0
1	Pakistan	2022-06-02	1530556.0	36.0	30379.0	0.0	235824864.0
2	Pakistan	2022-06-03	1530556.0	0.0	30379.0	0.0	235824864.0
3	Pakistan	2022-06-04	1530556.0	0.0	30379.0	0.0	235824864.0
4	Pakistan	2022-06-05	1530764.0	208.0	30379.0	0.0	235824864.0
...	...	...	...	...	...	...	...
209	Pakistan	2022-12-27	1575651.0	0.0	30635.0	0.0	235824864.0
210	Pakistan	2022-12-28	1575651.0	0.0	30635.0	0.0	235824864.0
211	Pakistan	2022-12-29	1575772.0	121.0	30636.0	1.0	235824864.0
212	Pakistan	2022-12-30	1575772.0	0.0	30636.0	0.0	235824864.0
213	Pakistan	2022-12-31	1575772.0	0.0	30636.0	0.0	235824864.0

214 rows × 7 columns

In [ ]:
```
# Pakistan new cases weekly mean - median - mode
temp = {}
for i in range(0, len(pakistan_df.date), 7):
    if (i + 7) > len(pakistan_df.date):
        j = len(pakistan_df.date) - i -1
```

```
        temp[f'{pakistan_df.date[i]} - {pakistan_df.date[i + j]} Sum'] = (pakistan_
        temp[f'{pakistan_df.date[i]} - {pakistan_df.date[i + j]} Mean'] = (pakistan
        temp[f'{pakistan_df.date[i]} - {pakistan_df.date[i + j]} Median'] = (pakist
        temp[f'{pakistan_df.date[i]} - {pakistan_df.date[i + j]} Mode'] = (pakistan
    else:
        temp[f'{pakistan_df.date[i]} - {pakistan_df.date[i + 7]} Sum'] = (pakistan_
        temp[f'{pakistan_df.date[i]} - {pakistan_df.date[i+7]} Mean'] = (pakistan_d
        temp[f'{pakistan_df.date[i]} - {pakistan_df.date[i + 7]} Median'] = (pakist
        temp[f'{pakistan_df.date[i]} - {pakistan_df.date[i + 7]} Mode'] = (pakistan


pakistan_df_confirmed = pd.DataFrame(temp, index = ['Pakistan'])
pakistan_df_confirmed['population'] = pakistan_df.population[0]

pakistan_df_confirmed
```

Out[ ]:

	2022-06-01 - 2022-06-08 Sum	2022-06-01 - 2022-06-08 Mean	2022-06-01 - 2022-06-08 Median	2022-06-01 - 2022-06-08 Mode	2022-06-08 - 2022-06-15 Sum	2022-06-08 - 2022-06-15 Mean	2022-06-08 - 2022-06-15 Median	2022-06-08 - 2022-06-15 Mode	2022-06-15 - 2022-06-22 Sum	2022-06-15 - 2022-06-22 Mean	...	2022-12-14 - 2022-12-21 Mode
Pakistan	425.0	61.0	50.0	0.0	559.0	80.0	89.0	0.0	1033.0	148.0	...	0.0

1 rows × 125 columns

In [ ]:

```
# Pakistan new deaths weekly mean - median - mode
temp = {}
for i in range(0, len(pakistan_df.date), 7):
    if (i + 7) > len(pakistan_df.date):
        j = len(pakistan_df.date) - i -1
        temp[f'{pakistan_df.date[i]} - {pakistan_df.date[i + j]} Sum'] = (pakistan_
        temp[f'{pakistan_df.date[i]} - {pakistan_df.date[i + j]} Mean'] = (pakistan
        temp[f'{pakistan_df.date[i]} - {pakistan_df.date[i + j]} Median'] = (pakist
        temp[f'{pakistan_df.date[i]} - {pakistan_df.date[i + j]} Mode'] = (pakistan
    else:
        temp[f'{pakistan_df.date[i]} - {pakistan_df.date[i + 7]} Sum'] = (pakistan_
        temp[f'{pakistan_df.date[i]} - {pakistan_df.date[i+7]} Mean'] = (pakistan_d
        temp[f'{pakistan_df.date[i]} - {pakistan_df.date[i + 7]} Median'] = (pakist
        temp[f'{pakistan_df.date[i]} - {pakistan_df.date[i + 7]} Mode'] = (pakistan


pakistan_df_deaths = pd.DataFrame(temp, index = ['Pakistan'])
pakistan_df_deaths['population'] = pakistan_df.population[0]
pakistan_df_deaths
```

Out[ ]:

	2022-06-01 - 2022-06-08 Sum	2022-06-01 - 2022-06-08 Mean	2022-06-01 - 2022-06-08 Median	2022-06-01 - 2022-06-08 Mode	2022-06-08 - 2022-06-15 Sum	2022-06-08 - 2022-06-15 Mean	2022-06-08 - 2022-06-15 Median	2022-06-08 - 2022-06-15 Mode	2022-06-15 - 2022-06-22 Sum	2022-06-15 - 2022-06-22 Mean	...	2022-12-14 - 2022-12-21 Mode
Pakistan	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	3.0	0.0	...	0.0

1 rows × 125 columns

In [ ]:
```
indonesia_df = world_df[world_df['location'].str.contains('Indonesia')].reset_index

indonesia_df
```

Out[ ]:

	location	date	total_cases	new_cases	total_deaths	new_deaths	population
0	Indonesia	2022-06-01	6055341.0	368.0	156594.0	3.0	275501344.0
1	Indonesia	2022-06-02	6055645.0	304.0	156600.0	6.0	275501344.0
2	Indonesia	2022-06-03	6056017.0	372.0	156604.0	4.0	275501344.0
3	Indonesia	2022-06-04	6056412.0	395.0	156610.0	6.0	275501344.0
4	Indonesia	2022-06-05	6056800.0	388.0	156615.0	5.0	275501344.0
...	...	...	...	...	...	...	...
209	Indonesia	2022-12-27	6717395.0	803.0	160560.0	9.0	275501344.0
210	Indonesia	2022-12-28	6718090.0	695.0	160574.0	14.0	275501344.0
211	Indonesia	2022-12-29	6718775.0	685.0	160583.0	9.0	275501344.0
212	Indonesia	2022-12-30	6719327.0	552.0	160593.0	10.0	275501344.0
213	Indonesia	2022-12-31	6719815.0	488.0	160612.0	19.0	275501344.0

214 rows × 7 columns

In [ ]:
```
# Indonesia new cases weekly mean - median - mode
temp = {}
for i in range(0, len(indonesia_df.date), 7):
    if (i + 7) > len(indonesia_df.date):
        j = len(indonesia_df.date) - i -1
        temp[f'{indonesia_df.date[i]} - {indonesia_df.date[i + j]} Sum'] = (indones
        temp[f'{indonesia_df.date[i]} - {indonesia_df.date[i + j]} Mean'] = (indone
        temp[f'{indonesia_df.date[i]} - {indonesia_df.date[i + j]} Median'] = (indo
        temp[f'{indonesia_df.date[i]} - {indonesia_df.date[i + j]} Mode'] = (indone
    else:
        temp[f'{indonesia_df.date[i]} - {indonesia_df.date[i + 7]} Sum'] = (indones
        temp[f'{indonesia_df.date[i]} - {indonesia_df.date[i+7]} Mean'] = (indonesi
        temp[f'{indonesia_df.date[i]} - {indonesia_df.date[i + 7]} Median'] = (indo
        temp[f'{indonesia_df.date[i]} - {indonesia_df.date[i + 7]} Mode'] = (indone
```

```
indonesia_df_confirmed = pd.DataFrame(temp, index = ['Indonesia'])
indonesia_df_confirmed['population'] = indonesia_df.population[0]
indonesia_df_confirmed
```

Out[ ]:

	2022-06-01 - 2022-06-08 Sum	2022-06-01 - 2022-06-08 Mean	2022-06-01 - 2022-06-08 Median	2022-06-01 - 2022-06-08 Mode	2022-06-08 - 2022-06-15 Sum	2022-06-08 - 2022-06-15 Mean	2022-06-08 - 2022-06-15 Median	2022-06-08 - 2022-06-15 Mode	2022-06-15 - 2022-06-22 Sum	2022-06-15 - 2022-06-22 Mean	...	2022 12-14 2022 12-21 Mode
Indonesia	2687.0	384.0	372.0	304.0	4349.0	621.0	574.0	520.0	8924.0	1275.0	...	809.0

1 rows × 125 columns

In [ ]:
```
# Indonesia new deaths weekly mean - median - mode
temp = {}
for i in range(0, len(indonesia_df.date), 7):
    if (i + 7) > len(indonesia_df.date):
        j = len(indonesia_df.date) - i -1
        temp[f'{indonesia_df.date[i]} - {indonesia_df.date[i + j]} Sum'] = (indones
        temp[f'{indonesia_df.date[i]} - {indonesia_df.date[i + j]} Mean'] = (indone
        temp[f'{indonesia_df.date[i]} - {indonesia_df.date[i + j]} Median'] = (indo
        temp[f'{indonesia_df.date[i]} - {indonesia_df.date[i + j]} Mode'] = (indone
    else:
        temp[f'{indonesia_df.date[i]} - {indonesia_df.date[i + 7]} Sum'] = (indones
        temp[f'{indonesia_df.date[i]} - {indonesia_df.date[i+7]} Mean'] = (indonesi
        temp[f'{indonesia_df.date[i]} - {indonesia_df.date[i + 7]} Median'] = (indo
        temp[f'{indonesia_df.date[i]} - {indonesia_df.date[i + 7]} Mode'] = (indone



indonesia_df_deaths = pd.DataFrame(temp, index = ['Indonesia'])
indonesia_df_deaths['population'] = indonesia_df.population[0]
indonesia_df_deaths
```

Out[ ]:

	2022-06-01 - 2022-06-08 Sum	2022-06-01 - 2022-06-08 Mean	2022-06-01 - 2022-06-08 Median	2022-06-01 - 2022-06-08 Mode	2022-06-08 - 2022-06-15 Sum	2022-06-08 - 2022-06-15 Mean	2022-06-08 - 2022-06-15 Median	2022-06-08 - 2022-06-15 Mode	2022-06-15 - 2022-06-22 Sum	2022-06-15 - 2022-06-22 Mean	...	2022-12-14 - 2022-12-21 Mode
Indonesia	33.0	5.0	5.0	6.0	38.0	5.0	4.0	3.0	38.0	5.0	...	24.0

1 rows × 125 columns

In [ ]:
```
nigeria_df = world_df[world_df['location'].str.contains('Nigeria')].reset_index().d

nigeria_df
```

Out[ ]:

	location	date	total_cases	new_cases	total_deaths	new_deaths	population
0	Nigeria	2022-06-01	256028.0	0.0	3143.0	0.0	218541216.0
1	Nigeria	2022-06-02	256113.0	85.0	3143.0	0.0	218541216.0
2	Nigeria	2022-06-03	256113.0	0.0	3143.0	0.0	218541216.0
3	Nigeria	2022-06-04	256148.0	35.0	3143.0	0.0	218541216.0
4	Nigeria	2022-06-05	256148.0	0.0	3143.0	0.0	218541216.0
...	...	...	...	...	...	...	...
209	Nigeria	2022-12-27	266381.0	0.0	3155.0	0.0	218541216.0
210	Nigeria	2022-12-28	266381.0	0.0	3155.0	0.0	218541216.0
211	Nigeria	2022-12-29	266381.0	0.0	3155.0	0.0	218541216.0
212	Nigeria	2022-12-30	266381.0	0.0	3155.0	0.0	218541216.0
213	Nigeria	2022-12-31	266381.0	0.0	3155.0	0.0	218541216.0

214 rows × 7 columns

In [ ]:

```
# Nigeria new cases weekly mean - median - mode

temp = {}
for i in range(0, len(nigeria_df.date), 7):
    if (i + 7) > len(nigeria_df.date):
        j = len(nigeria_df.date) - i -1
        temp[f'{nigeria_df.date[i]} - {nigeria_df.date[i + j]} Sum'] = (nigeria_df.
        temp[f'{nigeria_df.date[i]} - {nigeria_df.date[i + j]} Mean'] = (nigeria_df
        temp[f'{nigeria_df.date[i]} - {nigeria_df.date[i + j]} Median'] = (nigeria_
        temp[f'{nigeria_df.date[i]} - {nigeria_df.date[i + j]} Mode'] = (nigeria_df
    else:
        temp[f'{nigeria_df.date[i]} - {nigeria_df.date[i + 7]} Sum'] = (nigeria_df.
        temp[f'{nigeria_df.date[i]} - {nigeria_df.date[i+7]} Mean'] = (nigeria_df.n
        temp[f'{nigeria_df.date[i]} - {nigeria_df.date[i + 7]} Median'] = (nigeria_
        temp[f'{nigeria_df.date[i]} - {nigeria_df.date[i + 7]} Mode'] = (nigeria_df



nigeria_df_confirmed = pd.DataFrame(temp, index = ['Nigeria'])
nigeria_df_confirmed['population'] = nigeria_df.population[0]
nigeria_df_confirmed
```

Out[ ]:

	2022-06-01 - 2022-06-08 Sum	2022-06-01 - 2022-06-08 Mean	2022-06-01 - 2022-06-08 Median	2022-06-01 - 2022-06-08 Mode	2022-06-08 - 2022-06-15 Sum	2022-06-08 - 2022-06-15 Mean	2022-06-08 - 2022-06-15 Median	2022-06-08 - 2022-06-15 Mode	2022-06-15 - 2022-06-22 Sum	2022-06-15 - 2022-06-22 Mean	...	2022-12-14 - 2022-12-21 Mode	2 1
Nigeria	199.0	28.0	0.0	0.0	177.0	25.0	0.0	0.0	307.0	44.0	...	0.0	

1 rows × 125 columns

In [ ]:
```
# Nigeria new deaths weekly mean - median - mode

temp = {}
for i in range(0, len(nigeria_df.date), 7):
    if (i + 7) > len(nigeria_df.date):
        j = len(nigeria_df.date) - i -1
        temp[f'{nigeria_df.date[i]} - {nigeria_df.date[i + j]} Sum'] = (nigeria_df.
        temp[f'{nigeria_df.date[i]} - {nigeria_df.date[i + j]} Mean'] = (nigeria_df
        temp[f'{nigeria_df.date[i]} - {nigeria_df.date[i + j]} Median'] = (nigeria_
        temp[f'{nigeria_df.date[i]} - {nigeria_df.date[i + j]} Mode'] = (nigeria_df
    else:
        temp[f'{nigeria_df.date[i]} - {nigeria_df.date[i + 7]} Sum'] = (nigeria_df.
        temp[f'{nigeria_df.date[i]} - {nigeria_df.date[i+7]} Mean'] = (nigeria_df.n
        temp[f'{nigeria_df.date[i]} - {nigeria_df.date[i + 7]} Median'] = (nigeria_
        temp[f'{nigeria_df.date[i]} - {nigeria_df.date[i + 7]} Mode'] = (nigeria_df



nigeria_df_deaths = pd.DataFrame(temp, index = ['Nigeria'])
nigeria_df_deaths['population'] = nigeria_df.population[0]
nigeria_df_deaths
```

Out[ ]:

	2022-06-01 - 2022-06-08 Sum	2022-06-01 - 2022-06-08 Mean	2022-06-01 - 2022-06-08 Median	2022-06-01 - 2022-06-08 Mode	2022-06-08 - 2022-06-15 Sum	2022-06-08 - 2022-06-15 Mean	2022-06-08 - 2022-06-15 Median	2022-06-08 - 2022-06-15 Mode	2022-06-15 - 2022-06-22 Sum	2022-06-15 - 2022-06-22 Mean	...	2022-12-14 - 2022-12-21 Mode	2 1
Nigeria	199.0	1.0	0.0	0.0	177.0	0.0	0.0	0.0	307.0	0.0	...	0.0	

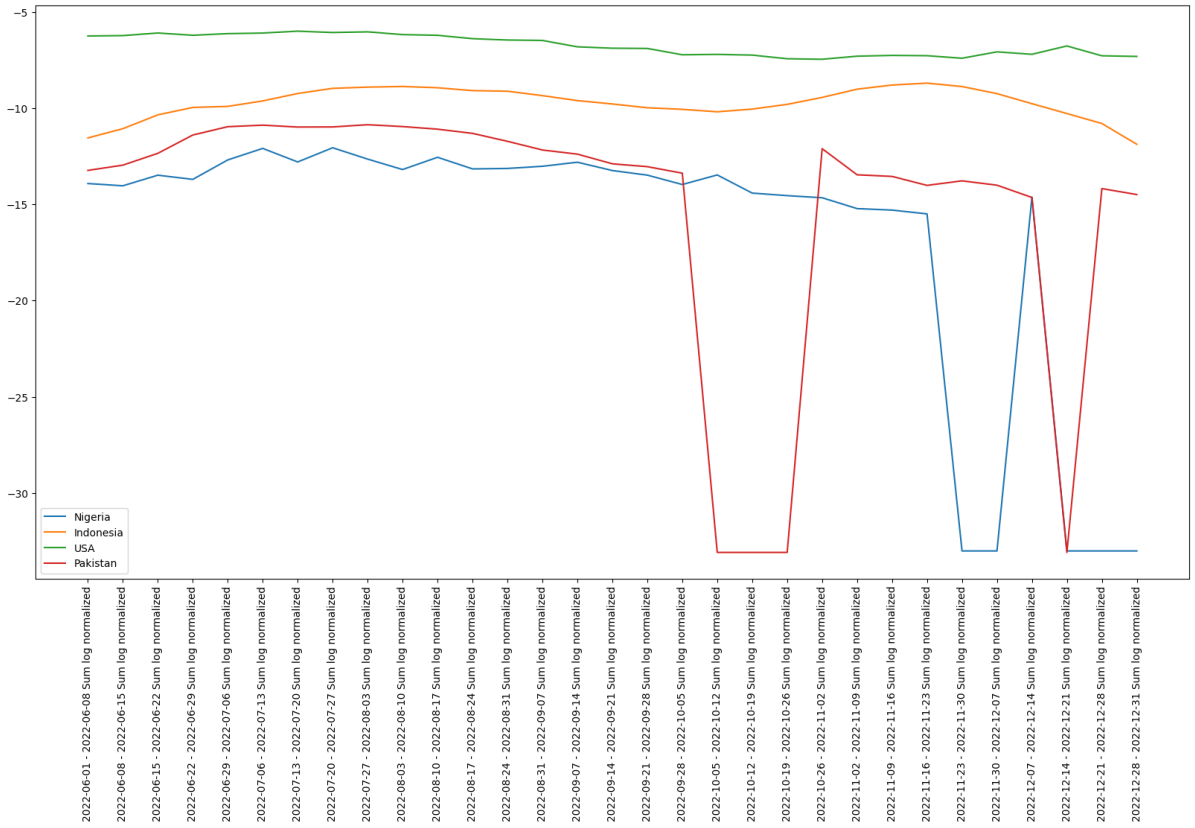
1 rows × 125 columns

In [ ]:
```
def log_normalization(data):
    d = data
    d = d.filter(regex=r'Sum|population')
    d = d.sum()

    for x in range(0, len(d) - 1):
        if d[x] < 0:  # Check if log cannot be taken, get absolute value if so
            d[x] = 0
```

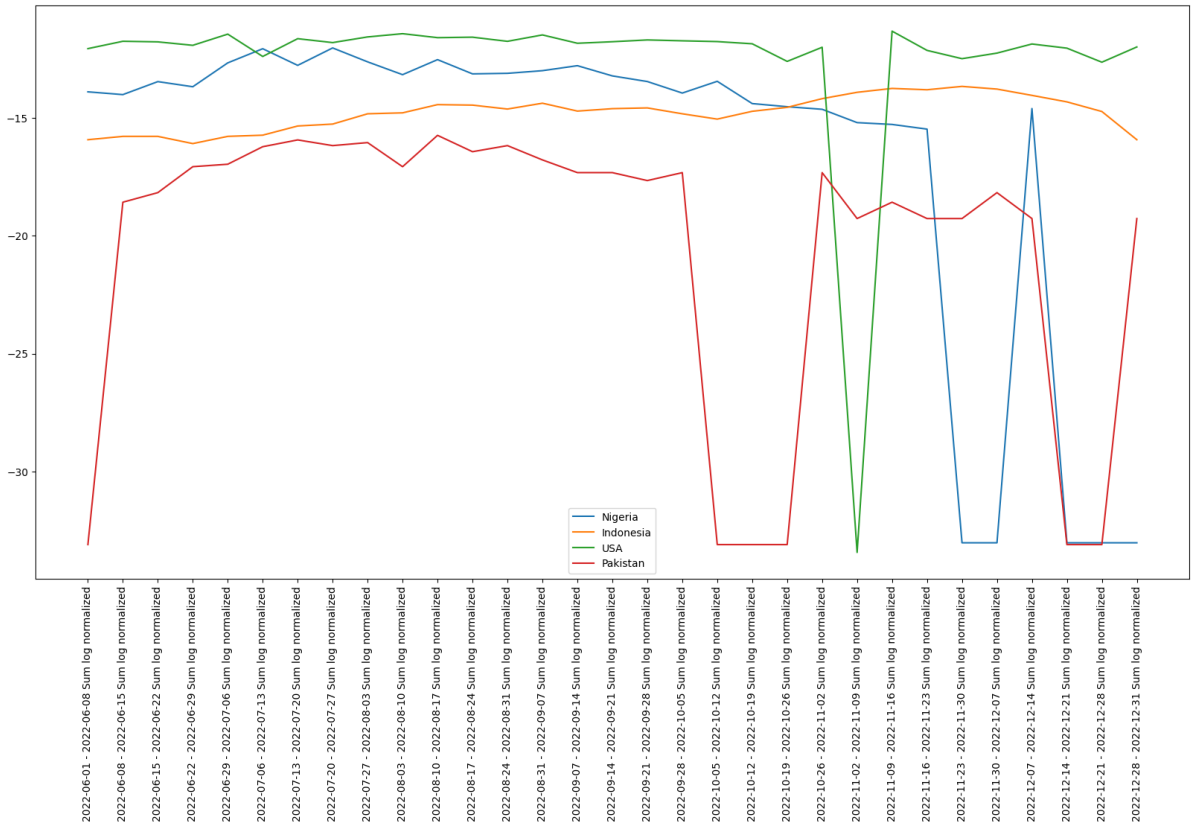
```
    norm_log_cases = {}
    for x in range(0, len(d) - 1):
        denominator = d['population']
        norm_log_cases[f'{d.index.values[x]} log normalized'] = np.log(((d[x] + 1e-

    return norm_log_cases
```

In [ ]:
```
nigeria_norm_cases = log_normalization(nigeria_df_confirmed)
nigeria_norm_death = log_normalization(nigeria_df_confirmed)

indonesia_norm_cases = log_normalization(indonesia_df_confirmed)
indonesia_norm_death = log_normalization(indonesia_df_deaths)

usa_norm_cases = log_normalization(confirmed)
usa_norm_death = log_normalization(deaths)

pakistan_norm_cases = log_normalization(pakistan_df_confirmed)
pakistan_norm_death = log_normalization(pakistan_df_deaths)
```

In [ ]:
```
from matplotlib import pyplot as plt
plt.figure(figsize=(20, 10))

plt.plot(nigeria_norm_cases.keys(), nigeria_norm_cases.values(), label = 'Nigeria')
plt.plot(indonesia_norm_cases.keys(), indonesia_norm_cases.values(), label = 'Indon
plt.plot(usa_norm_cases.keys(), usa_norm_cases.values(), label = 'USA')
plt.plot(pakistan_norm_cases.keys(), pakistan_norm_cases.values(), label = 'Pakista
plt.xticks(rotation=90)

plt.legend()
plt.show()
```



In [ ]:
```
plt.figure(figsize=(20, 10))
plt.plot(nigeria_norm_death.keys(), nigeria_norm_death.values(), label = 'Nigeria')
plt.plot(indonesia_norm_death.keys(), indonesia_norm_death.values(), label = 'Indon
plt.plot(usa_norm_death.keys(), usa_norm_death.values(), label = 'USA')
plt.plot(pakistan_norm_death.keys(), pakistan_norm_death.values(), label = 'Pakista
plt.xticks(rotation=90)

plt.legend()
plt.show()
```



Looking over the data, we definitely see some differences between all of the countries in question. First, we can see that the United States has the overall highest number of cases and deaths versus the other countries, Nigeria, Indonesia and Pakistan. This data reflects that, save for a very jarring dip in deaths in the United States. We found that this dip is explained by poor data collection, in that we had a value that showed a negative number of deaths. When attempting to apply a logarithmic normalization, it causes an invalid entry that causes a break in the graph, so that value was set to zero to accommodate.

Along with that, there are also some jarring jumps from the Pakistani and Nigerian datasets, where we see some weeks there were zero reported cases or deaths. We also see that these remain consistent between cases and deaths. With some extra research, we can begin to make some assumptions about these jumps and why we see such a difference between weeks.

In Pakistan, during the times of October 5th to October 26th, there were a series of floods that killed 1,739 people and caused $14.9 billion of damage and 15.2$ billion of economic losses. It would not be unreasonable to think that tracking covid was not a priority in Pakistan, and could account for the losses to stability when during that month there likely couldn't be much reporting with attention split elsewhere. This carries over into the dip we see in December when, according to the UN Office for the Coordination of Humanitarian Affairs (OCHA), we see monsoon flooding in Pakistan; where an estimated 240,000 people remain displaced from their homes in Sindh Province. While this doesn't address why, country wide, there was a lapse in reporting, the rest may be due to poor practices with reporting cases and deaths, seeing as how both cases and deaths contain the lapse.

Similarly, looking toward Nigeria, we see a lapse in reporting in the last week of November as well as the final weeks of December. Something fairly consistent about the Nigeria is that the political climate tends to be volatile. There are many terrorist organizations operating in and around the country, so it's not unreasonable to think there could be attempts to quell numbers or just weeks of time that reporting was held back for some reason.

As for why America sees the highest numbers of covid 19 cases versus countries with similar populations, it's no secret that America has the highest population density out of any of these countries. Some of the biggest cities in America have millions of people and contribute to a higher spreading rate compared to other countries like Nigeria, Pakistan and Indonesia.

As always, with any country where we see major dips for seemingly no reason, there are some explanations that could tell us why we see such lapses. These reasons are multifaceted and multifactorial, as well as systematic within a system that may not be equipped to handle volumes of data at the scale we expect. Whether it be through technical issues, data management problems, political interference or lack of reports in testing, these issues still exist. It's important in that case for ongoing transparency between nations so we work together to make reporting as accurate and as specific as we need it to be for a healthy world climate.