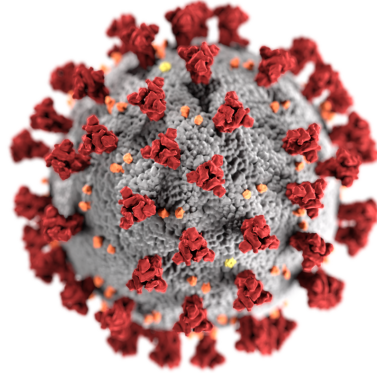


COVID-19 CORONAVIRUS PANDEMIC ANALYSIS



Analysis of Confirmed Cases and Deaths by Date,
Province, Country due to corona virus.

The opinion expressed in this report are only for learning purpose.

By Dinesh, 15 April 2020

1. Introduction:

Coronavirus disease (COVID-19) is an infectious disease caused by a new virus.

The disease causes respiratory illness (like the flu) with symptoms such as a cough, fever, and in more severe cases, difficulty breathing. Coronavirus disease spreads primarily through contact with an infected person when they cough or sneeze. It also spreads when a person touches a surface or object that has the virus on it, then touches their eyes, nose, or mouth.

2. Analysis

2.1. WORLD WIDE CASES

MySQL Query:

```
SELECT Date, SUM(confirmed_cases) AS total_confirmed_cases,  
SUM(fatalities) AS total_fatalities  
from covid_19_data  
GROUP BY Date  
order by Date DESC;
```

output : 81 rows in set (0.04 sec)

ANALYSIS:

Globally, the the total number of coronavirus cases has crossed 17.7 lakh while fatalities has risen to 1.08 lakh on 11th April 2020.

| Date | total_confirmed_cases | total_fatalities |
|------------|-----------------------|------------------|
| 2020-04-11 | 1771337 | 108497 |
| 2020-04-10 | 1691542 | 102519 |
| 2020-04-09 | 1595174 | 95449 |
| 2020-04-08 | 1510928 | 88332 |
| 2020-04-07 | 1425923 | 81859 |
| 2020-04-06 | 1344928 | 74560 |
| 2020-04-05 | 1271942 | 69369 |
| 2020-04-04 | 1197235 | 64601 |
| 2020-04-03 | 1095744 | 58782 |
| 2020-04-02 | 1013132 | 52978 |
| 2020-04-01 | 932434 | 46804 |
| 2020-03-31 | 857320 | 42103 |
| 2020-03-30 | 782224 | 37578 |
| 2020-03-29 | 719975 | 33921 |
| 2020-03-28 | 660528 | 30648 |
| 2020-03-27 | 593201 | 27194 |
| 2020-03-26 | 529501 | 23968 |
| 2020-03-25 | 467563 | 21179 |
| 2020-03-24 | 417951 | 18623 |
| 2020-03-23 | 377961 | 16498 |
| 2020-03-22 | 337429 | 14659 |
| 2020-03-21 | 304332 | 12973 |
| 2020-03-20 | 271950 | 11299 |
| 2020-03-19 | 242422 | 9867 |
| 2020-03-18 | 214744 | 8733 |
| 2020-03-17 | 197026 | 7905 |
| 2020-03-16 | 181505 | 7126 |
| 2020-03-15 | 167384 | 6440 |
| 2020-03-14 | 156030 | 5819 |
| 2020-03-13 | 145136 | 5404 |
| 2020-03-12 | 128285 | 4720 |
| 2020-03-11 | 125808 | 4615 |
| 2020-03-10 | 118553 | 4262 |
| 2020-03-09 | 112007 | 3866 |

2.2. DATE WISE ANALYSIS FOR EACH COUNTRY

MySQL Query:

```
SELECT Date, country, SUM(confirmed_cases) AS  
total_confirmed_cases, SUM(fatalities) AS total_fatalities  
from covid_19_data  
GROUP BY Date, country  
HAVING total_confirmed_cases > 0  
order by Date DESC, total_confirmed_cases DESC;
```

Output:

7188 rows in set (0.09 sec)

MySQL Query:

```
SELECT Date, country, SUM(confirmed_cases) AS  
total_confirmed_cases, SUM(fatalities) AS total_fatalities  
from covid_19_data  
WHERE country = "China"  
GROUP BY Date, country  
HAVING total_confirmed_cases > 0  
order by Date;
```

Output:

81 rows in set (0.02 sec)

ANALYSIS:

- China is where coronavirus all started! By looking at the output it can be seen that China has been able to almost stop the spread of COVID19 substantially.
- After 29th March there was only few new cases in China.
- Almost all the cases are from the Hubei Province which can be attributed to the fact that the outbreak started from its capital, Wuhan. There was 444 confirmed cases on 22nd Jan in Hubei.
- Till 25th March China has maximum number of cases, however on next day 26th March US has maximum no of confirmed cases.
- Cases and Deaths for China have stagnated over time.
- The cases and deaths are monotonically increasing(almost exponentially) for rest of the countries.
- US has shown the greatest rise in the number of Confirmed Cases. Italy, on the other hand having the highest rise in deaths has to bear the brunt of the virus. Spain is a close second to Italy.
- 6 out of the top 10 affected countries are Western European countries.
- COVID19 outbreak has started a bit late in India as compared to other countries.

| | | | |
|------------|----------------|--------|-------|
| 2020-04-11 | US | 526233 | 20458 |
| 2020-04-11 | Spain | 163027 | 16606 |
| 2020-04-11 | Italy | 152271 | 19468 |
| 2020-04-11 | France | 130727 | 13851 |
| 2020-04-11 | Germany | 124908 | 2736 |
| 2020-04-11 | China | 83014 | 3343 |
| 2020-04-11 | United Kingdom | 79874 | 9892 |
| 2020-04-11 | Iran | 70029 | 4357 |
| 2020-04-11 | Turkey | 52167 | 1101 |
| 2020-04-11 | Belgium | 28018 | 3346 |
| 2020-04-11 | Switzerland | 25107 | 1036 |
| 2020-04-11 | Netherlands | 24571 | 2653 |
| 2020-04-11 | Canada | 23303 | 653 |
| 2020-04-11 | Brazil | 20727 | 1124 |
| 2020-04-11 | Portugal | 15987 | 470 |
| 2020-04-11 | Austria | 13806 | 337 |
| 2020-04-11 | Russia | 13584 | 106 |
| 2020-04-11 | Israel | 10743 | 101 |
| 2020-04-11 | Korea, South | 10480 | 211 |
| 2020-04-11 | Sweden | 10151 | 887 |
| 2020-04-11 | Ireland | 8928 | 320 |
| 2020-04-11 | India | 8446 | 288 |
| 2020-04-11 | Ecuador | 7257 | 315 |
| 2020-04-11 | Chile | 6927 | 73 |
| 2020-04-11 | Peru | 6848 | 181 |
| 2020-04-11 | Norway | 6409 | 119 |
| 2020-04-11 | Poland | 6356 | 208 |
| 2020-04-11 | Australia | 6303 | 57 |
| 2020-04-11 | Denmark | 6191 | 260 |
| 2020-04-11 | Japan | 6005 | 99 |
| 2020-04-11 | Romania | 5990 | 291 |
| 2020-04-11 | Czechia | 5831 | 129 |
| 2020-04-11 | Pakistan | 5011 | 86 |
| 2020-04-11 | Malaysia | 4530 | 73 |
| 2020-04-11 | Philippines | 4428 | 247 |
| 2020-04-11 | Saudi Arabia | 4033 | 52 |
| 2020-04-11 | Mexico | 3844 | 233 |
| 2020-04-11 | Indonesia | 3842 | 327 |

| Date | country | total_confirmed_cases | total_fatalities |
|------------|---------|-----------------------|------------------|
| 2020-01-22 | China | 548 | 17 |
| 2020-01-23 | China | 643 | 18 |
| 2020-01-24 | China | 920 | 26 |
| 2020-01-25 | China | 1406 | 42 |
| 2020-01-26 | China | 2075 | 56 |
| 2020-01-27 | China | 2877 | 82 |
| 2020-01-28 | China | 5509 | 131 |
| 2020-01-29 | China | 6087 | 133 |
| 2020-01-30 | China | 8141 | 171 |
| 2020-01-31 | China | 9802 | 213 |
| 2020-02-01 | China | 11891 | 259 |
| 2020-02-02 | China | 16630 | 361 |
| 2020-02-03 | China | 19716 | 425 |
| 2020-02-04 | China | 23707 | 491 |
| 2020-02-05 | China | 27440 | 563 |
| 2020-02-06 | China | 30587 | 633 |
| 2020-02-07 | China | 34110 | 718 |
| 2020-02-08 | China | 36814 | 805 |
| 2020-02-09 | China | 39829 | 905 |
| 2020-02-10 | China | 42354 | 1012 |
| 2020-02-11 | China | 44386 | 1112 |
| 2020-02-12 | China | 44759 | 1117 |
| 2020-02-13 | China | 59895 | 1369 |
| 2020-02-14 | China | 66358 | 1521 |
| 2020-02-15 | China | 68413 | 1663 |
| 2020-02-16 | China | 70513 | 1766 |
| 2020-02-17 | China | 72434 | 1864 |
| 2020-02-18 | China | 74211 | 2003 |
| 2020-02-19 | China | 74619 | 2116 |
| 2020-02-20 | China | 75077 | 2238 |
| 2020-02-21 | China | 75550 | 2238 |
| 2020-02-22 | China | 77001 | 2443 |
| 2020-02-23 | China | 77022 | 2445 |

2.3. COUNTRY WISE ANALYSIS

MySQL Query:

```
SELECT country, SUM(confirmed_cases) AS
total_confirmed_cases, SUM(fatalities) AS total_fatalities
FROM (
    SELECT country, province_state,
    MAX(confirmed_cases) AS confirmed_cases,
    MAX(fatalities) AS fatalities
    from covid_19_data
    GROUP BY province_state, country) AS temp
GROUP BY country
HAVING total_confirmed_cases > 0
order by total_confirmed_cases DESC;
```

Output:

184 rows in set (0.04 sec)

ANALYSIS:

- US and Italy, which are the worst affected countries.
- Western Europe is the worst affected. Hence, it can be adjudged as the new epicenter of COVID19.

| country | total_confirmed_cases | total_fatalities |
|----------------|-----------------------|------------------|
| US | 526253 | 20458 |
| Spain | 163027 | 16606 |
| Italy | 152271 | 19468 |
| France | 130727 | 13851 |
| Germany | 124908 | 2767 |
| China | 83015 | 3343 |
| United Kingdom | 79874 | 9892 |
| Iran | 70029 | 4357 |
| Turkey | 52167 | 1101 |
| Belgium | 28018 | 3346 |
| Switzerland | 25107 | 1036 |
| Netherlands | 24571 | 2653 |
| Canada | 23303 | 654 |
| Brazil | 20727 | 1124 |
| Portugal | 15987 | 470 |
| Austria | 13806 | 337 |
| Russia | 13584 | 106 |
| Israel | 10743 | 101 |
| Korea, South | 10480 | 211 |
| Sweden | 10151 | 887 |
| Ireland | 8928 | 320 |
| India | 8446 | 288 |
| Ecuador | 7257 | 315 |
| Chile | 6927 | 73 |
| Peru | 6848 | 181 |
| Norway | 6409 | 119 |
| Poland | 6356 | 208 |
| Australia | 6303 | 57 |
| Denmark | 6191 | 260 |
| Japan | 6005 | 99 |
| Romania | 5990 | 291 |
| Czechia | 5831 | 129 |

2.4. RATE OF CHANGE IN CONFIRM CASES AND FATALITIES

MySQL Query:

```
SELECT
A.*,
CASE WHEN (A.total_confirmed_cases IS NULL OR
B.total_confirmed_cases IS NULL OR B.total_confirmed_cases=0) THEN
0 ELSE
(A.total_confirmed_cases -
B.total_confirmed_cases)*100/B.total_confirmed_cases END AS
confirmed_cases_rate,
CASE WHEN (A.total_fatalities IS NULL OR B.total_fatalities IS NULL
OR B.total_fatalities=0) THEN 0 ELSE
(A.total_fatalities - B.total_fatalities)*100/B.total_fatalities END AS
fatalities_rate
FROM (SELECT Date, country,
SUM(confirmed_cases) AS total_confirmed_cases,
SUM(fatalities) AS total_fatalities
from covid_19_data
GROUP BY Date, country
HAVING total_confirmed_cases > 5000
order by total_confirmed_cases DESC) A LEFT JOIN (SELECT Date,
country,
SUM(confirmed_cases) AS total_confirmed_cases,
SUM(fatalities) AS total_fatalities
from covid_19_data
GROUP BY Date, country
HAVING total_confirmed_cases > 5000
order by total_confirmed_cases DESC) B
ON A.date = (B.date+1) AND A.country = B.country;
```

| Date | country | total_confirmed_cases | total_fatalities | confirmed_cases_rate | fatalities_rate |
|------------|---------|-----------------------|------------------|----------------------|-----------------|
| 2020-04-11 | US | 526233 | 20458 | 6.0159 | 10.1017 |
| 2020-04-10 | US | 496372 | 18581 | 7.6089 | 12.7967 |
| 2020-04-09 | US | 461274 | 16473 | 7.5509 | 12.1375 |
| 2020-04-08 | US | 428889 | 14690 | 8.2881 | 15.5147 |
| 2020-04-07 | US | 396063 | 12717 | 8.0642 | 17.9794 |
| 2020-04-06 | US | 366507 | 10779 | 8.7842 | 12.1061 |
| 2020-04-05 | US | 336912 | 9615 | 9.1414 | 14.4234 |
| 2020-04-04 | US | 308693 | 8403 | 12.0784 | 18.6362 |
| 2020-04-03 | US | 275426 | 7083 | 13.1387 | 19.6049 |
| 2020-04-02 | US | 243441 | 5922 | 14.1768 | 24.5950 |
| 2020-04-01 | US | 213214 | 4753 | 0 | 0 |
| 2020-03-31 | US | 188018 | 3870 | 16.2909 | 30.0840 |
| 2020-04-11 | Spain | 163027 | 16606 | 3.0037 | 3.2647 |
| 2020-03-30 | US | 161679 | 2975 | 14.8639 | 20.7386 |
| 2020-04-10 | Spain | 158273 | 16081 | 3.2965 | 4.1044 |
| 2020-04-09 | Spain | 153222 | 15447 | 3.3747 | 4.4281 |
| 2020-04-11 | Italy | 152271 | 19468 | 3.1807 | 3.2840 |
| 2020-04-08 | Spain | 148220 | 14792 | 4.4229 | 5.3186 |
| 2020-04-10 | Italy | 147577 | 18849 | 2.7509 | 3.1183 |
| 2020-04-09 | Italy | 143626 | 18279 | 3.0153 | 3.4524 |
| 2020-04-07 | Spain | 141942 | 14045 | 3.8537 | 5.2770 |
| 2020-03-29 | US | 140757 | 2464 | 16.0280 | 21.7993 |
| 2020-04-08 | Italy | 139422 | 17669 | 2.8292 | 3.1646 |
| 2020-04-06 | Spain | 136675 | 13341 | 3.8201 | 5.5375 |
| 2020-04-07 | Italy | 135586 | 17127 | 2.2928 | 3.6555 |
| 2020-04-06 | Italy | 132547 | 16523 | 2.7910 | 4.0033 |
| 2020-04-05 | Spain | 131646 | 12641 | 4.3418 | 5.8090 |
| 2020-04-11 | France | 130727 | 13851 | 3.8084 | 4.8127 |
| 2020-04-05 | Italy | 128948 | 15887 | 3.4630 | 3.4175 |
| 2020-04-04 | Spain | 126168 | 11947 | 5.8465 | 6.6887 |
| 2020-04-10 | France | 125931 | 13215 | 6.0195 | 8.0716 |
| 2020-04-11 | Germany | 124908 | 2736 | 2.2403 | -1.1203 |
| 2020-04-04 | Italy | 124632 | 15362 | 4.0099 | 4.6386 |
| 2020-04-10 | Germany | 122171 | 2767 | 3.3762 | 6.1373 |

Output: 546 rows in set (0.15 sec)

ANALYSIS:

- Confirmed Cases and Deaths for China have stagnated over time.
- The cases and deaths are monotonically increasing(almost exponentially) for rest of the countries.

2.5. IMPACT OF AGE AND HEALTH CARE INDEX ON CONFIRMED CASES

MySQL Query:

```
SELECT t.country, SUM(t.confirmed_cases) AS Confirmed,
SUM(t.fatalities) AS Deaths,
((SUM(t.confirmed_cases)/p.population) * 1000000) as 'Cases per 1M people',
p.density_pop_per_km2 as DensityPopPerkm2,
p.population,
a.age_15_64_yrs,
a.age_above_65_yrs,
h.health_care_index
FROM (
    SELECT country, province_state, MAX(confirmed_cases) AS confirmed_cases, MAX(fatalities) AS fatalities
    from covid_19_data
    GROUP BY province_state, country) AS t
INNER JOIN population_density AS p
    ON t.country = p.country
INNER JOIN age_structure a
    ON t.country = a.country
INNER JOIN health_care_index h
    ON t.country = h.country
GROUP BY t.country
HAVING Confirmed > 1000
order by 4 DESC;
```

| country | Confirmed | Deaths | Cases per 1M people | DensityPopPerkm2 | population | age_15_64_yrs | age_above_65_yrs | health_care_index |
|----------------------|-----------|--------|---------------------|------------------|------------|---------------|------------------|-------------------|
| Iceland | 1689 | 8 | 4686.5890 | 3.5 | 360390 | 65.5 | 14 | 65.92 |
| Spain | 163027 | 16606 | 3473.4900 | 93 | 46934632 | 65.9 | 19 | 78.88 |
| Switzerland | 25107 | 1036 | 2923.9910 | 208 | 8586550 | 66.7 | 18 | 72.44 |
| Italy | 152271 | 19468 | 2527.2010 | 200 | 60252824 | 63.5 | 23 | 66.59 |
| Belgium | 28018 | 3346 | 2431.1780 | 376 | 11524454 | 64.3 | 19 | 74.34 |
| France | 130727 | 13851 | 1949.4030 | 123 | 67060000 | 62.2 | 20 | 79.99 |
| Ireland | 8928 | 320 | 1814.0810 | 70 | 4921500 | 64.4 | 14 | 51.89 |
| US | 526253 | 20458 | 1597.2660 | 34 | 329470935 | 65.7 | 15 | 69.27 |
| Portugal | 15987 | 470 | 1555.6670 | 112 | 10276617 | 64.9 | 22 | 71.88 |
| Austria | 13806 | 337 | 1550.7820 | 106 | 8902600 | 66.7 | 19 | 78.73 |
| Germany | 124908 | 2767 | 1502.2130 | 233 | 83149300 | 65.5 | 22 | 73.32 |
| Netherlands | 24571 | 2653 | 1408.4200 | 420 | 17445781 | 64.8 | 19 | 74.65 |
| United Kingdom | 79874 | 9892 | 1202.2770 | 274 | 66435600 | 63.8 | 19 | 74.46 |
| Norway | 6409 | 119 | 1194.0200 | 17 | 5367580 | 65.4 | 17 | 74.36 |
| Israel | 10743 | 101 | 1171.1220 | 416 | 9173250 | 60.4 | 12 | 73.29 |
| Denmark | 6191 | 260 | 1064.7590 | 135 | 5814461 | 63.8 | 20 | 80 |
| Qatar | 2728 | 6 | 995.4460 | 237 | 2740479 | 84.8 | 1 | 73.3 |
| Estonia | 1304 | 24 | 984.2840 | 29 | 1324820 | 64.2 | 20 | 72.67 |
| Sweden | 10151 | 887 | 979.2860 | 23 | 10365705 | 62.5 | 20 | 69.23 |
| Iran | 70029 | 4357 | 840.7830 | 51 | 83290141 | 70.9 | 5 | 51.7 |
| Panama | 2974 | 74 | 715.1130 | 56 | 4158783 | 64.7 | 8 | 59.93 |
| Turkey | 52167 | 1101 | 627.3460 | 106 | 83154997 | 66.9 | 8 | 69.8 |
| Canada | 23303 | 654 | 613.8580 | 4 | 37961548 | 67 | 17 | 71.58 |
| Slovenia | 1188 | 50 | 569.9750 | 103 | 2084301 | 66 | 19 | 64.58 |
| Finland | 2905 | 49 | 525.5630 | 16 | 5527405 | 62.4 | 21 | 75.79 |
| Serbia | 3380 | 74 | 489.7700 | 89 | 6901188 | 66.2 | 17 | 51.27 |
| Ecuador | 7257 | 315 | 415.9550 | 63 | 17446584 | 64.5 | 7 | 70.59 |
| Singapore | 2299 | 8 | 403.0780 | 7894 | 5703600 | 72.1 | 13 | 70.84 |
| Chile | 6927 | 73 | 398.7030 | 23 | 17373831 | 68.6 | 11 | 65.44 |
| United Arab Emirates | 3736 | 20 | 382.3740 | 117 | 9770529 | 85 | 1 | 67.04 |
| Croatia | 1534 | 21 | 375.2590 | 72 | 4087843 | 65.6 | 20 | 62.68 |
| Lithuania | 1026 | 23 | 367.2850 | 43 | 2793466 | 66.2 | 19 | 69.49 |
| Romania | 5990 | 291 | 308.6800 | 81 | 19405156 | 66.9 | 18 | 55.06 |
| Dominican Republic | 2759 | 135 | 266.3550 | 216 | 10358320 | 63.7 | 7 | 54.67 |
| New Zealand | 1312 | 4 | 263.0190 | 18 | 4971205 | 64.9 | 15 | 73.81 |

ANALYSIS:

- Italy has the second oldest population in the world after Japan, with over 23 percent over the age of 65. Experts believe this was the determining factor in its high fatality rate of 323 per 1 M population.
- Health Care Index doesn't seem to be much effective in controlling the spreading of infection. Italy with second highest health care index of 66.59 is not able to save lives of their people.