

## **Lethality, Velocity and Acceleration of COVID-19 Contamination in the World and 20 Selected Countries (April-24-2020)**

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The objective of this paper is to introduce a study relative a mathematical modeling of coronavirus contamination, knowing some current numbers first, by COVID-19 pandemic.

Initiating with data of 20 countries and total values relate to the world, is possible to note that the United State of America is the worse country with relation to the current coronavirus contamination (COVID-19). Probably United Kingdom is not providing your data on recovered patients correctly, with regularity, because your lethality coefficient is abnormally high: 96.34 %.

For table 1 we are defining

Active Cases = Confirmed Cases – Death – Recovered Cases,

Resolved Cases = Death + Recovered Cases,

Lethality % =  $100 \times \text{Death} / \text{Resolved Cases}$ .

We are not using Lethality % =  $100 \times \text{Death} / \text{Confirmed Cases}$ .

Korea South (2.75 %), Israel (3.28 %), Germany (4.96 %), China (5.61 %), Iraq (6.62 %), Iran (7.79 %) and Russia (9.95 %) have the lowest lethality rates in Table 1, less than 10%.

For table 2 we are defining

Velocity 1 = Confirmed Cases 1 – Confirmed Cases 2,

Velocity 2 = Confirmed Cases 2 – Confirmed Cases 3,

Acceleration = Velocity 1 – Velocity 2.

We also use

Confirmed Cases 1 as the number of Confirmed Cases of April-24-2020,

Confirmed Cases 2 as the number of Confirmed Cases of April-23-2020,

Confirmed Cases 3 as the number of Confirmed Cases of April-22-2020.

From Table 2 we see that Spain, Italy, Iran, China, Portugal, Japan, Korea South and Cuba are with negative acceleration, i.e., declining the speed of growth of confirmed cases, while US, France, Russia and Brazil, and the world in general, are in strong case growth, especially the US.

All primary data was extracted from the Johns Hopkins University website.

Type	Confirmed Cases	Death	Recovered	Active Cases	Resolved Cases	Lethality %
Time	7:31:38 AM	7:31:38 AM	7:31:38 AM	7:31:38 AM	7:31:38 AM	7:31:38 AM
Date	April 24-2020	April 24-2020	April 24-2020	April 24-2020	April 24-2020	April 24-2020
Country						
World	2,721,354	191,231	745,605	1,784,518	936,836	20.41
US	869,172	50,114	80,934	738,124	131,048	38.24
Spain	213,024	22,157	89,250	101,617	111,407	19.89
Italy	189,973	25,549	57,576	106,848	83,125	30.74
France	159,467	21,856	42,773	94,838	64,629	33.82
Gemany	153,129	5,575	106,800	40,754	112,375	4.96
United Kingdom	139,246	18,738	712	119,796	19,450	96.34
Turkey	101,790	2,491	18,491	80,808	20,982	11.87
Iran	87,026	5,481	64,843	16,702	70,324	7.79
China	83,884	4,636	77,997	1,251	82,633	5.61
Russia	68,622	615	5,568	62,439	6,183	9.95
Brazil	50,036	3,331	26,573	20,132	29,904	11.14
India	23,502	722	5,012	17,768	5,734	12.59
Portugal	22,353	820	1,201	20,332	2,021	40.57
Israel	14,882	193	5,685	9,004	5,878	3.28
Japan	12,368	328	1,494	10,546	1,822	18.00
Korea South	10,708	240	8,501	1,967	8,741	2.75
Egypt	3,891	287	1,004	2,600	1,291	22.23
Greece	2,463	127	577	1,759	704	18.04
Iraq	1,677	83	1,171	423	1,254	6.62
Cuba	1,235	43	365	827	408	10.54

Table 1 – Percentage of Lethality as a quotient of Death by Resolved Cases

Type	Confirmed Cases 1	Confirmed Cases 2	Confirmed Cases 3	Velocity 1	Velocity 2	Acceleration
Time	7:31:38 AM	7:31:22 AM	6:38:24 AM	7:31:38 AM	7:31:22 AM	7:31:38 AM
Date	April 24-2020	April 23-2020	April 22-2020	April 24-2020	April 23-2020	April 24-2020
Country						
World	2,721,354	2,645,092	2,578,930	76,262	66,162	10,100
US	869,172	842,624	825,306	26,548	17,318	9,230
Spain	213,024	213,024	208,389	-	4,635	-4,635
Italy	189,973	187,327	183,957	2,646	3,370	-724
France	159,467	157,135	159,300	2,332	-2,165	4,497
Gemany	153,129	150,729	148,453	2,400	2,276	124
United Kingdom	139,246	134,639	130,184	4,607	4,455	152
Turkey	101,790	98,674	95,591	3,116	3,083	33
Iran	87,026	85,996	84,802	1,030	1,194	-164
China	83,884	83,876	83,864	8	12	-4
Russia	68,622	62,773	57,999	5,849	4,774	1,075
Brazil	50,036	46,182	43,368	3,854	2,814	1,040
India	23,502	21,797	20,178	1,705	1,619	86
Portugal	22,353	21,982	21,379	371	603	-232
Israel	14,882	14,592	14,326	290	266	24
Japan	12,368	11,950	11,512	418	438	-20
Korea South	10,708	10,702	10,694	6	8	-2
Egypt	3,891	3,659	3,490	232	169	63
Greece	2,463	2,408	2,401	55	7	48
Iraq	1,677	1,631	1,602	46	29	17
Cuba	1,235	1,189	1,137	46	52	-6

Table 2 – Velocity and Acceleration of Confirmed Cases