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## EDITORIAL

### The 2020 Novel Corona Virus Outbreak: One Year On

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#### 1. INTRODUCTION

On December 31, 2019 Chinese health authorities reported an outbreak of atypical pneumonia in Wuhan, the capital of Hubei province [1]. On January 7, 2020 Chinese authorities attributed this to a new type of coronavirus (novel coronavirus, Covid or nCoV) [2]. The WHO declared the outbreak a Public Health Emergency of International Concern on January 30, 2020 [3, 4].

About one year later, on January 5, 2021 the WHO reported a cumulative Covid case number of over 83 million and over 1.8 million deaths globally since the start of the pandemic [5]. For the week prior to January 5, 2021 alone, a total of 76,000 deaths were registered by the WHO, with the region of the Americas accounting for 47% of all new cases and 42% of all new deaths globally, and the European region for 38% and 43% respectively; bringing the combined count of these two regions to 85% for recent global cases and recent global deaths [5].

#### 2. THE TWO PEAK PATTERN

For most countries in Europe, some countries in the Americas, and a small number of Asian countries, the recent deaths are part of a pronounced second peak, and it is sobering to examine the concentration of Covid deaths within the two time periods from April to May, 2020 (first peak) and from November to December, 2020 (second peak). Table 1 shows this concentration of Covid fatalities for countries that were affected by Covid early on (excluding China), with data being drawn from official WHO reports [6].

With the exception of seven countries (India, Australia, Ireland, Sweden, Mexico, Brazil and Chile - highlighted in green), all other early Covid affected countries listed here (24 in total) had more than 50% of deaths occur in these two periods of two months length. For most countries, this rate was

much higher, amounting to over 70% for population-rich Japan, France, Germany, Italy, Turkey and the UK, which highlights the importance of non-pharmaceutical interventions in suppressing the escalation of Covid peaks.

Countries that did experience these peak concentrations differ widely in terms of the relative size of the first peak (April & May) as compared to the second peak (November & December). This is partly due to more or less effective measures to contain these. Nonetheless, there is a strong correlation between the number of first and second peak fatalities, which Fig. (1) depicts in double log format. This correlation allows for an approximate identification of countries that worse or better in terms of Covid fatalities than the model would predict when the first peak was followed by the second; with those above the line having fared worse, and those below the line better. A more detailed interpretation of this data in terms of health systems capability is difficult because of the aforementioned avoidance of a full blown first wave in some countries (e.g. Austria, Czechia, Greece, Hungary, Poland, Slovakia), or a very high relative number of deaths to population rate during the first peak period (e.g. Belgium), which would have made statistical improvements during the second peak period likely. The success of some countries in suppressing the first peak or wave of Covid has been attributed to a number of factors including delayed landfall of Covid, early imposition of lockdown measures as well as stringent enforcement measures [6 - 10].

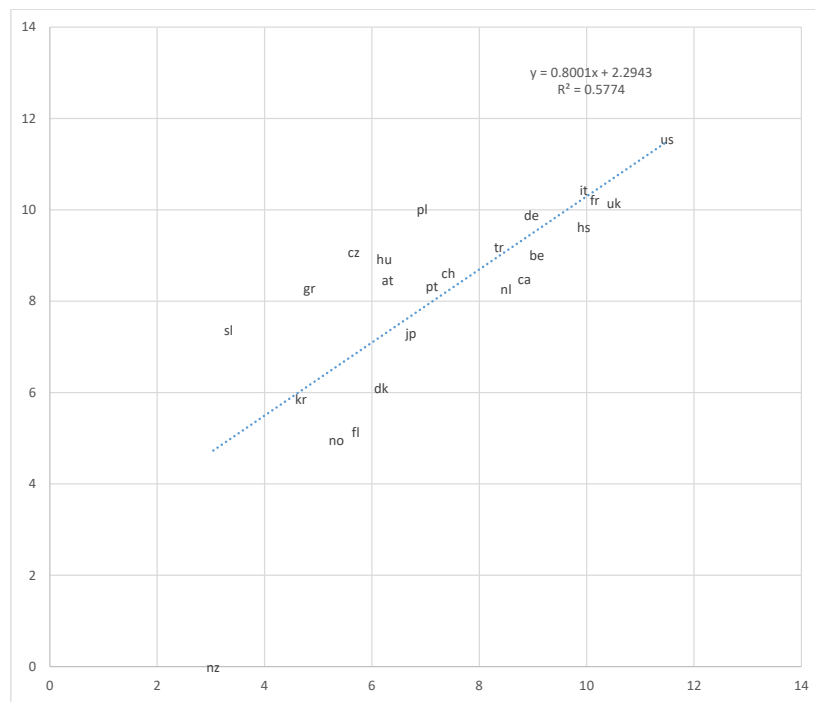
The analysis of Covid fatalities relative to population [6, 7] during the first and second peaks confirms the presence of shifts in the relative position of countries over time. Table 2 shows Covid fatality rates per 100,000. For each column of Table 2, the eight countries (out of 24) with the highest fatality rates (per 100,000) are highlighted in red, while the eight countries with the lowest rates are highlighted in green.

The eight (of 24) countries with the highest Covid fatality rates per 100,000 for the first peak include Belgium, France, Italy, the Netherlands, Spain, the United Kingdom, Canada and the United States. For the second peak, they include Austria,

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Belgium, Czechia, France, Hungary, Italy, Poland and Switzerland. This means that three (of eight) countries, namely Belgium, France and Italy, are ranked in the severely affected

category (marked red) for both peaks, which is potentially indicative of a high vulnerability to the effects of Covid outbreaks.



**Fig. (1).** Unweighted log-log scatterplot of first peak (April & May) and second peak (November & December) Covid fatality numbers (horizontal x axis measures logged first peak deaths, vertical y axis measures logged second peak deaths).

**Table 1. Concentration of Covid deaths during two peak month blocks (April & May, November & December) and expressed as percentage of total.**

Region	Country	Deaths			Peak Months Deaths as % of Total		
		1st peak April-May	2nd peak Nov-Dec	Total To Dec 30	1st peak April-May	2nd peak Nov-Dec	1st & 2nd Peak
Asia/Pacific	India	5126	28120	147622	3.47%	19.05%	22.52%
(W-E)	South Korea	108	348	808	13.37%	43.07%	56.44%
-	Japan	835	1488	3213	25.99%	46.31%	72.30%
-	Australia	83	3	908	9.14%	0.33%	9.47%
-	NZ	21	1	25	84.00%	4.00%	88.00%
Europe	Austria	540	4764	5752	9.39%	82.82%	92.21%
-	Belgium	8748	8293	19192	45.58%	43.21%	88.79%
-	Czechia	288	8679	11044	2.61%	78.59%	81.19%
-	Denmark	481	445	1153	41.72%	38.59%	80.31%
-	Finland	299	170	524	57.06%	32.44%	89.50%
-	France	25700	27476	62197	41.32%	44.18%	85.50%
-	Germany	7917	19680	29778	26.59%	66.09%	92.68%
-	Greece	126	3972	4553	2.77%	87.24%	90.01%
-	Hungary	508	7512	9047	5.62%	83.03%	88.65%
-	Ireland	263	315	2200	11.95%	14.32%	26.27%
-	Italy	20910	34141	71620	29.20%	47.67%	76.87%
-	Netherlands	4912	3912	10974	44.76%	35.65%	80.41%
-	Norway	208	142	421	49.41%	33.73%	83.14%
-	Poland	1028	22635	27118	3.79%	83.47%	87.26%

(Table 1) contd....

Region	Country	-	Deaths			Peak Months Deaths as % of Total		
			1st peak	2nd peak	Total	1st peak	2nd peak	1st & 2nd
-	-	-	April-May	Nov-Dec	To Dec 30	April-May	Nov-Dec	Peak
-	Portugal	-	1236	4213	6556	18.85%	64.26%	83.11%
-	Slovakia	-	28	1608	1773	1.58%	90.69%	92.27%
-	Spain	-	20854	15072	49824	41.86%	30.25%	72.11%
-	Sweden	-	1028	2346	8279	12.42%	28.34%	40.75%
-	Switzerland	-	1283	4595	6508	19.71%	70.61%	90.32%
-	Turkey	-	4301	9750	19624	21.92%	49.68%	71.60%
-	United Kingdom	-	36587	25407	70405	51.97%	36.09%	88.05%
Americas	Canada	-	6907	4835	14781	46.73%	32.71%	79.44%
(N-S)	United States	-	98717	104315	328014	30.10%	31.80%	61.90%
-	Mexico	-	9387	32913	121837	7.70%	27.01%	34.72%
-	Brazil	-	27719	33354	190488	14.55%	17.51%	32.06%
-	Chile	-	985	31	16404	6.00%	0.19%	6.19%

Table 2. Covid fatality rates (per 100,000) during the two peak periods and for the total.

-	-	Covid Fatality Rates (per 100.000)		
		1st peak	2nd peak	Total
		April-May	Nov-Dec	to Dec 30
Asia/Pacific	South Korea	2.11	6.79	15.76
(W-.E)	Japan	6.6	11.77	25.4
	NZ	4.34	0.21	5.16
Europe	Austria	60.67	535.22	646.22
	Belgium	757.47	718.07	1661.79
	Czechia	26.93	811.65	1032.83
	Denmark	82.6	76.42	198.01
	Finland	54.12	30.77	94.84
	France	383.02	409.48	926.94
	Germany	95.19	236.63	358.05
	Greece	11.76	370.87	425.12
	Hungary	52	768.88	926
	Italy	347.08	566.7	1188.81
	Netherlands	282.17	224.72	630.4
	Norway	38.75	26.45	78.43
	Poland	27.08	596.32	714.42
	Portugal	67.7	230.77	359.11
	Slovakia	5.13	294.61	324.84
	Spain	440.61	318.44	1052.69
	Switzerland	147.69	528.95	749.17
	Turkey	51.72	117.25	235.99
	United Kingdom	539.42	374.59	1038.02
Americas	Canada	181.76	127.24	388.97
(N-S)	United States	298.24	315.15	990.98

3. ASSESSMENT

The fact that a country counts among the worst (or least) affected in terms of Covid fatality rates during both the first and second peak investigated here might give some indication regarding its overall Covid vulnerability. However, it does not allow for conclusions regarding health systems capability. For such inferences to be made, the stresses put on national health care systems would have to be gauged and this data than related to observed Covid deaths [10].

Data provided by the European Centre for Disease Prevention and Control (ECDC) allows for an estimate of Covid related ICU utilisation during the first and second peak period for some European countries, which can be interpreted as a proxy for some of the stresses or pressures a national health care system may have experienced [11]. Table 3 shows the average daily ICU occupancy rate (per 100,000) for the first and second peak period, as well as the average for both periods taken together for European countries for which these

data are available. For each column, the four countries (out of 11) with the highest ICU occupancy rates (per 100,000) are again highlighted in red, while the four countries with the lowest rates are highlighted in green.

With the possible exception of the UK (where ICU occupancy is relatively low for both peaks and death rates high), high average daily Covid-related ICU occupancy rates during the two peak periods as well as their sum appear to be closely related to the relative Covid fatality rates shown in the previous Table 2.

**Table 3. Average daily Covid-related ICU occupancy rate (per 100,000) during the two peak periods and for both periods together.**

-	ICU Occupancy Rates		
	1st Peak	2nd Peak	1st & 2nd
	April-May	Nov-Dec	Peak
Austria	14.85	63.35	39.1
Belgium	63.6	84.14	73.87
Czechia	5.22	73.69	39.46
Denmark	11.31	8.54	9.92
Finland	8.97	3.79	6.38
France	60.24	55.03	57.63
Germany	23.24	47.22	35.23
Italy	31.73	52.4	42.06
Netherlands	41.24	31.41	36.33
Portugal	8.78	25.39	17.08
UK	29.94	19.95	24.95

**Table 4. Proxy death rate of hospitalised Covid patients during the two peak periods.**

-	Proxy Hosp. Death Rate	
	1st Peak	2nd Peak
	April-May	Nov-Dec
Austria	10.39%	12.58%
Belgium	20.91%	14.82%
Czechia	9.27%	12.42%
Denmark	14.08%	10.64%
Finland	14.12%	8.73%
France	8.40%	7.94%
Hungary	5.32%	8.72%
Italy	8.13%	8.64%
Norway	12.99%	9.72%
Portugal	11.13%	11.42%
Slovakia	10.95%	7.53%
UK	20.18%	12.19%

While it should be possible to calculate a proxy death rate by dividing Covid fatalities which occurred during the two peak periods by an estimate of the number of Covid ICU patients during the periods, the data are probably not sufficiently robust for this. An alternative, therefore, is to calculate Covid deaths relative to the number of persons hospitalised for Covid and to see whether any improvements (or otherwise) occurred from the first to the second peak period. Table 4

shows a proxy death rate for hospitalised Covid patients which has been calculated based on Covid hospitalization data provided by the ECDC [8] and the assumption of an average length of Covid-related hospital stays of 5 days [12]. Data on Covid is only available for some of the countries shown in Table 4 plus some others. In total, we are able to present data for twelve countries. In Table 4, the four countries (out of 12) with the highest death are highlighted in red and the four with the lowest in green.

The data in Table 4 indicate significant improvements in the proxy Covid hospitalised death rate between the first and second peak period for seven countries (Belgium, Denmark, France, Norway, Slovakia and the UK) a slight worsening for two (Italy and Portugal) and a more substantial worsening for three (Austria, Czechia and Hungary). Italy’s worsening position is puzzling given its initial success in applying non-pharmaceutical measures during the second wave, but it has the highest old-age dependency rate in the EU. The changes for Austria, Czechia and Hungary could potentially be explained by the greater severity of the second peak in these countries as well as the geographic proximity of these countries to each other. Also, it must be kept in mind that data for countries with both a relatively small population size and a relative low incidence of Covid hospitalization must possibly be interpreted with caution.

**CONCLUSION**

Looking back at data for the first and second Covid peak which we approximated as having occurred in the two months periods of April and May 2020 and the November and December period of 2020, this paper suggested that for a great number of countries, Covid death have been highly concentrated during these periods. This highlights the importance of non-pharmaceutical interventions when Covid case numbers are on the increase. Further to this, we note that for specific countries, high Covid death rates during both the first and the second peak period could give an indication of overall vulnerability to Covid. However, as Table 4 indicates, overall vulnerability to Covid is not necessarily reflected in the capability of health care systems as health care providers in different nations face widely different levels of pressure from Covid outbreaks. We suggest that some information on the differential ability of health care systems to learn to cope with Covid can be gained from comparing Covid deaths and Covid hospitalisations during the first and second peak period, but we acknowledge that potential improvements in some countries might have been adversely affected by sudden increases in hospitalisations during the second peak period, the speed of learning required of public health organizations, and a lack of matching responses and corrective actions [13].

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