

Basic statistics: the world, continents, countries, UK (May 2020, update)¹

Gordon Burt²

21 May 2020

The world

There are 7.713 billion people in the world.

In 2019, last year, 0.060 billion (60 million) people died in total (all causes), almost 1% of the population.

Deaths per million people, per year, all causes, worldwide: 8365.

Now, so far, in the middle of May 2020, six months after the first case of coronavirus in Wuhan,

there have been 0.004 billion (four million) coronavirus cases*, and 0.00029 billion (291,904, three tenths of a million) coronavirus deaths worldwide**.

Cases per *ten million* population is 5.6. Deaths per cases is 7%.

Deaths per million people, so far, due to coronavirus, worldwide: 38.

Thus so far the deaths due to coronavirus (291,904 in almost half a year) constitute less than 1% of all annual deaths (60 million in a full year).

We now consider how the number of coronavirus deaths has grown over time in the period up to 18 May 2020. Figures 2 to 4B all show the number of deaths over time, first the total number of deaths; next the logarithm of the total number of deaths (base 10); and finally the difference in the logarithm from one day to the next (A, over the whole period; and B, over the recent period).

The numbers show: a steep accelerating increase, Figure 2. The logarithms allow us to study the steepness more clearly: there is a steep increase then a shallower increase ... and then a second steep increase then a shallower increase, Figure 3. Finally the differences in logarithms show something like a wave shape starting from a peak down to a trough then up to a lower second peak and a turn down into a continuing second trough, Figure 4A. Figure 4B shows the latter part of the curve, from the lower second peak down into the continuing second trough.

The functions in Figures 2 and 3 are necessarily increasing whereas the function in Figure 4 is for the most part decreasing. The following point can be noted for later: cumulative numbers necessarily increase but the change in the cumulative numbers sometimes decreases.

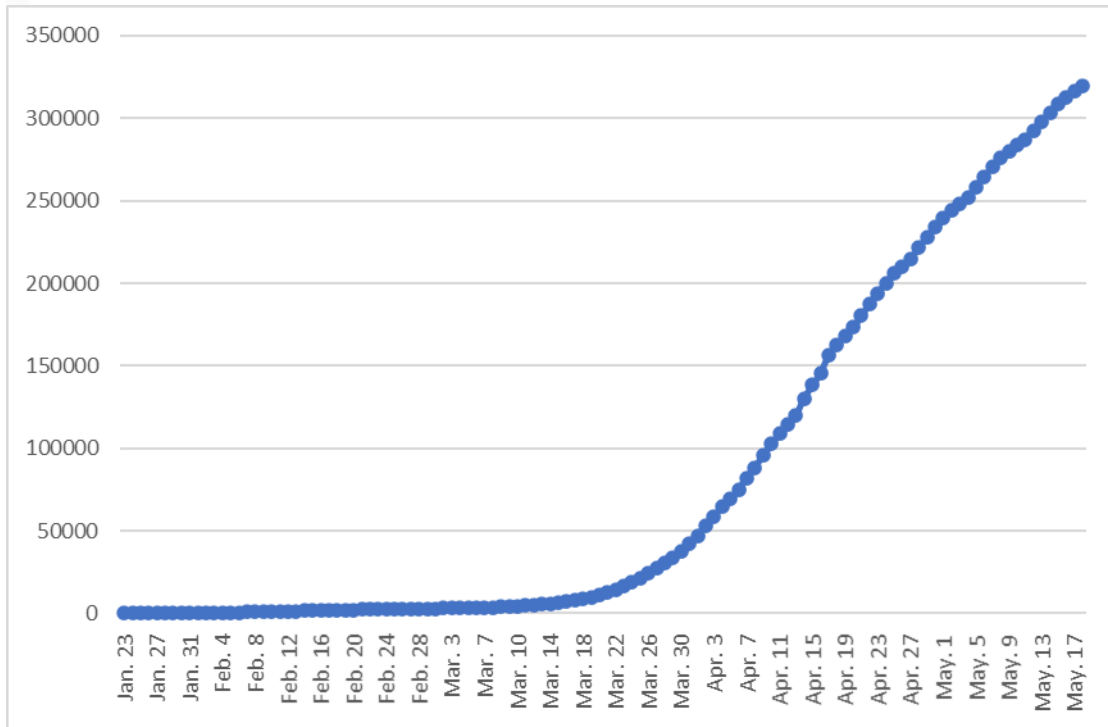
¹ This is Paper 77.4, part of ANA Commentary for May 2020. **Draft:** 21 May 2020

<https://sites.google.com/site/gordonburmathsocsci/home/a-new-agenda>;

² Gordon Burt: gordonjburt@gmail.com. Website: <https://sites.google.com/site/gordonburmathsocsci/all>.

Figure 2 Worldwide: total number of coronavirus deaths, January to May 2020

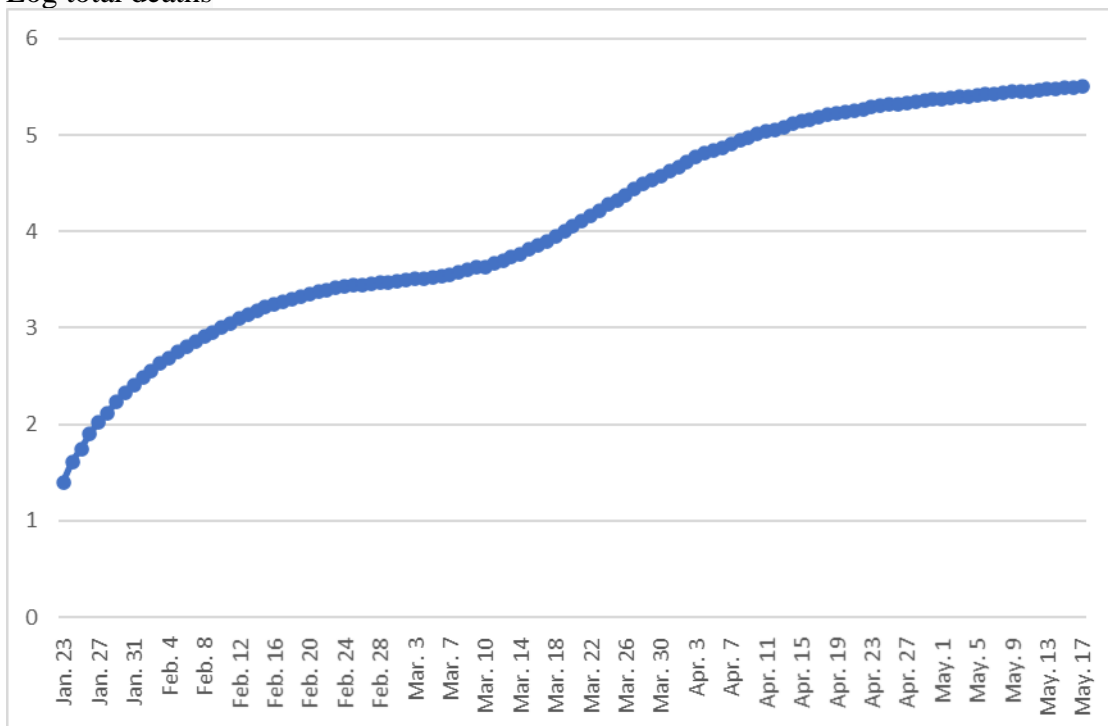
N



My Excel 75.1 virus part 1 time Chart 10 Sheet 2 HE

Figure 3 Worldwide: logarithm of the total number of deaths (base 10), January to May 2020

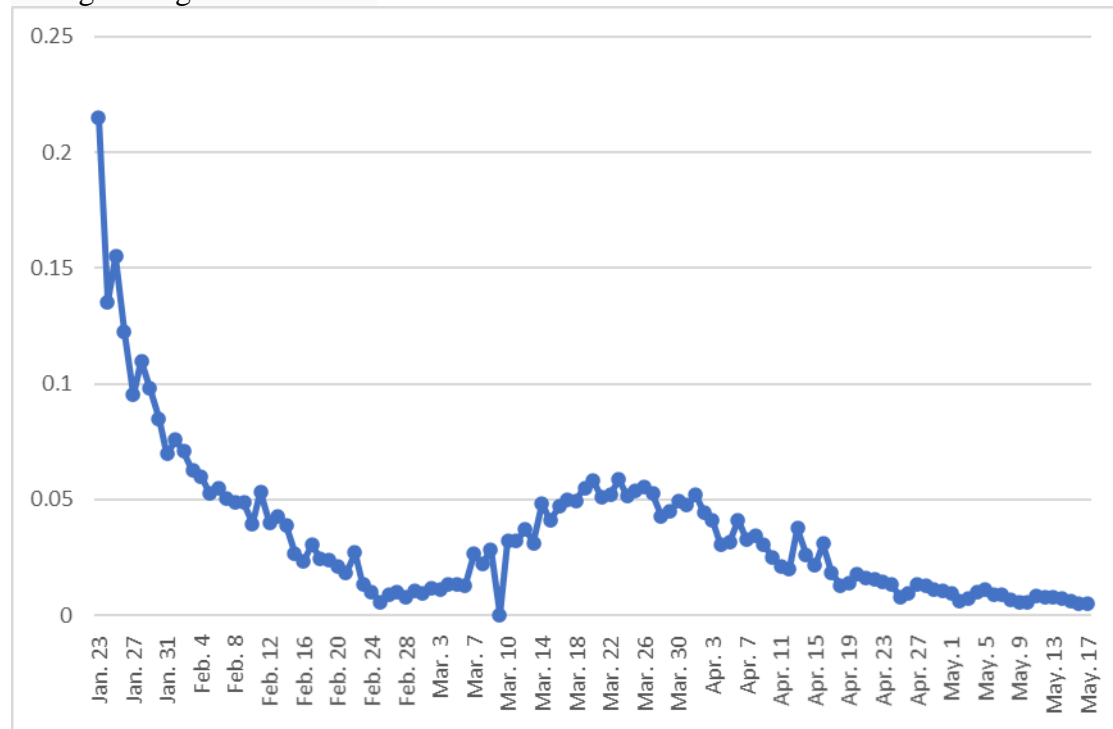
Log total deaths



My Excel 75.1 virus part 1 time Chart 11 Sheet 2 QR

Figure 4A Worldwide: the difference in the logarithm from one day to the next, January to May 2020

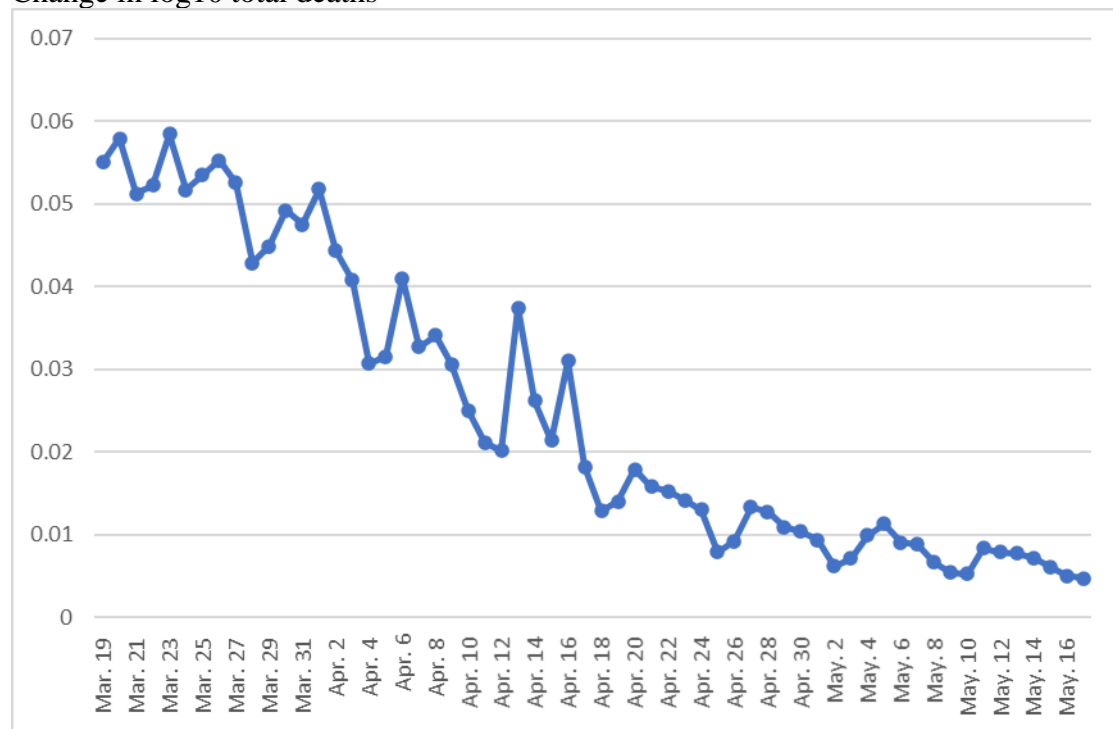
Change in log₁₀ total deaths



My Excel 75.1 virus part 1 time Chart 10 Sheet 2 UV

Figure 4B Worldwide: the difference in the logarithm from one day to the next, late March to May 2020

Change in log₁₀ total deaths



My Excel 75.1 virus part 1 time Chart 10 Sheet 2 UV

Source:

<https://www.worldometers.info/coronavirus/coronavirus-death-toll/>

Feb. 12: Provisional data, pending redistribution resulting from the [new diagnosis classification adopted by Hubei starting on Feb. 12](#)

The graphs above relate to total world deaths, D . What about world deaths D per world population N , in other words D/N ? Over the short time period we are considering the world population can be considered to be constant, N . So the graphs for world D/N will be exactly the same shape as those above.

[D/N is like D but reduced by a factor N ; $\log(D/N)$ is like $\log D$ but diminished by $\log N$; $d\log(D/N)$ equals $d\log D$.]

Countries: the distribution of deaths per population, D/N , April 2020

We now consider variation between individual countries, at a particular point in time, namely April 2020. Note that this will change over time. Our source of information is the website Worldometer. There are 159 countries which have experienced Coronavirus deaths. Of course countries with large populations tend to have many deaths and so to correct for this we consider deaths per million in the population, D/N .

Note: elsewhere we have commented on how the media uses statistics. Naturally there is interest in the number of people who have died but this number can be misleading when used to make comparisons.

There are many countries with relatively low D/N and a few countries with relatively high D/N : the curve in Figure 5 shows the cumulative distribution: rising sharply at the beginning and then mostly flat at a high level thereafter. The rate D/N ranges between 0.03 for Yemen and 1032 for San Merino, with a mean of 30 and a median of 2. (April 2020)

Taking logarithms provides a clearer picture. Figure 6 shows the cumulative distribution for the logarithm of D/N . This shape is not unlike that of the lognormal distribution. Perhaps there are two line segments: the steep middle portion and the high shallow slope at the end.³

³ Consider a cumulative distribution $P=F(x)$. $Q=1-P$. It is a property of cumulative distributions that they are (possibly weakly) increasing. Sometimes the middle portion of the distribution is approximately linear; and sometimes there may be a tail at one or both ends. A variety of distributions are consistent with these shapes. Sometimes a logarithmic transformation of x or of P or Q (or of both x and one of P or Q) is appropriate. Here we choose $\log x$.

Figure 5 The cumulative distribution P for the rate D/N (base 10), countries ranked in order of increasing D/N. April 2020.

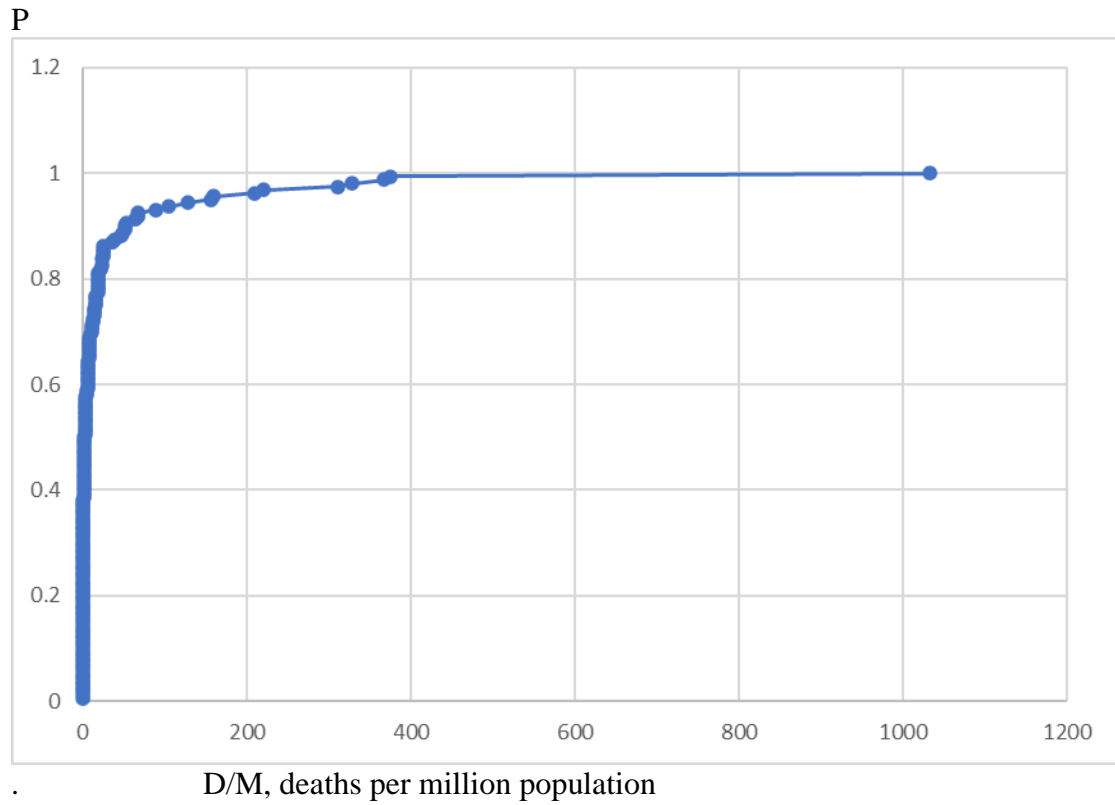
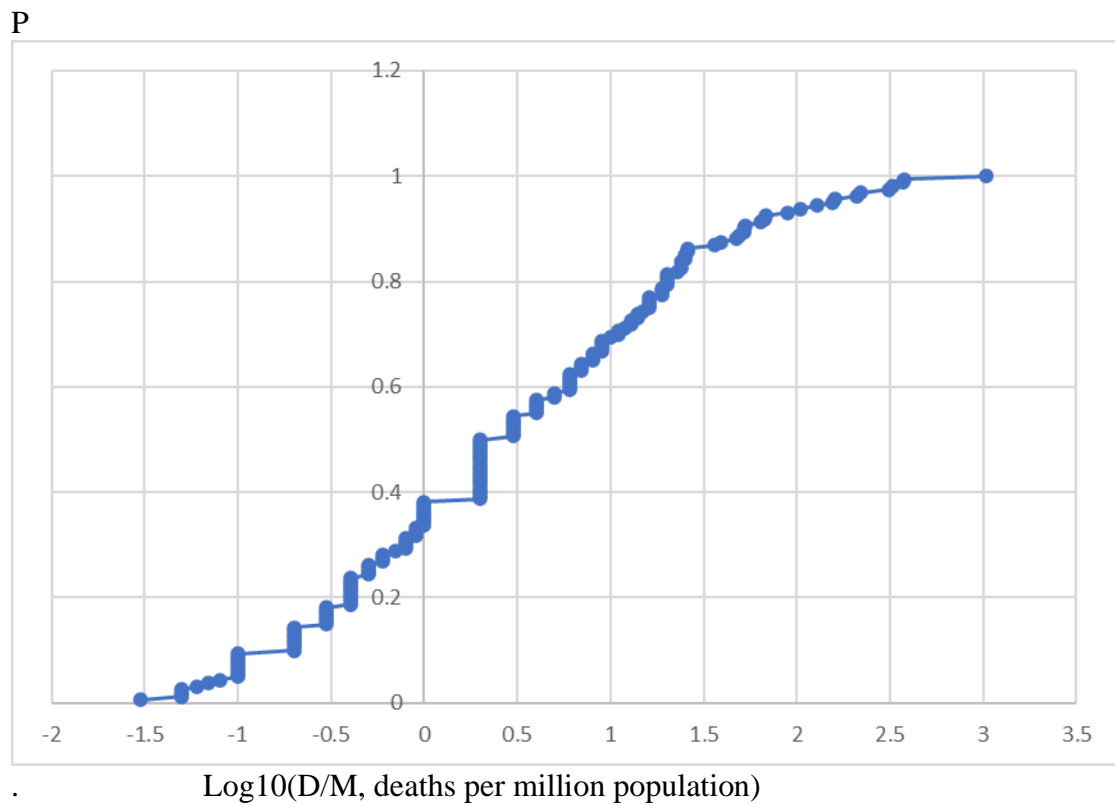


Figure 6 The cumulative distribution P for the logarithm of the rate D/N (base 10), countries ranked in order of increasing D/N. April 2020.



Continents

Looking at individual countries and grouping them by continent, there are dramatic differences in deaths per population. Table 2 shows that the rates for Europe, North America and the Caribbean are very much higher than for other continents. The rates for the Middle East, Latin America and Russia & Central Asia are very much lower. The lowest rates are shown by Africa and Asia (and Australia & New Zealand).

Thus in mid-April 2020 the continents were ordered from highest to least deaths per population: Europe, North America, Caribbean, Middle East, Latin America, Russia & Central Asia, New Zealand & Australia, Africa, Asia. See also Table A below in next section.

Table 2 Continents' deaths per population: mean, min and max of country rates April 2020.

	N	mean	min	max
Europe: Slovakia, San Marino	44	88.6	0.4	1032
North America: Canada, USA	2	43	19	67
Caribbean: Haiti, Sint Marten	15	30.6	0.3	210
Middle East: Syria, Iran	14	6.9	0.1	53
Latin America: Nicaragua, Panama	18	4.5	0.2	20
Russia, Central Asia: Uzbekistan, Czechia	9	2.6	0.1	13
New Zealand, Australia	2	1.5	1	2
Africa: Ethiopia, Mayotte	36	1.3	0.03	11
Asia: Myanmar, South Korea	18	1.2	0.07	4

Because the virus started in Asia, one might have thought that its rate would be highest. Because Europe has the highest rate, one might have thought that Australia & New Zealand would also have a high rate. One suggestion has been that the virus thrives as follows:

“Coronavirus Disease 2019 (COVID-19), caused by SARS-CoV-2, has established significant community spread in cities and regions along a narrow east west distribution roughly along the 30-50° N’ corridor at consistently similar weather patterns consisting of average temperatures of 5-11°C, combined with low specific (3-6 g/kg) and absolute humidity (4-7 g/m³).”

<https://www.washingtonpost.com/weather/2020/03/24/warm-humid-weather-coronavirus/>

https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3550308

Again, taking logarithms provides a clearer picture. Figures 7A to 7G shows the cumulative distributions for the logarithm of D/N for the different continents. The shapes are not unlike that of the lognormal distribution. In several there is a prolonged steep linear middle portion which dominates the shape.

Figure 7A Asia. The cumulative distribution P for the logarithm of the rate D/N (base 10), countries ranked in order of increasing D/N. 18 countries.

P

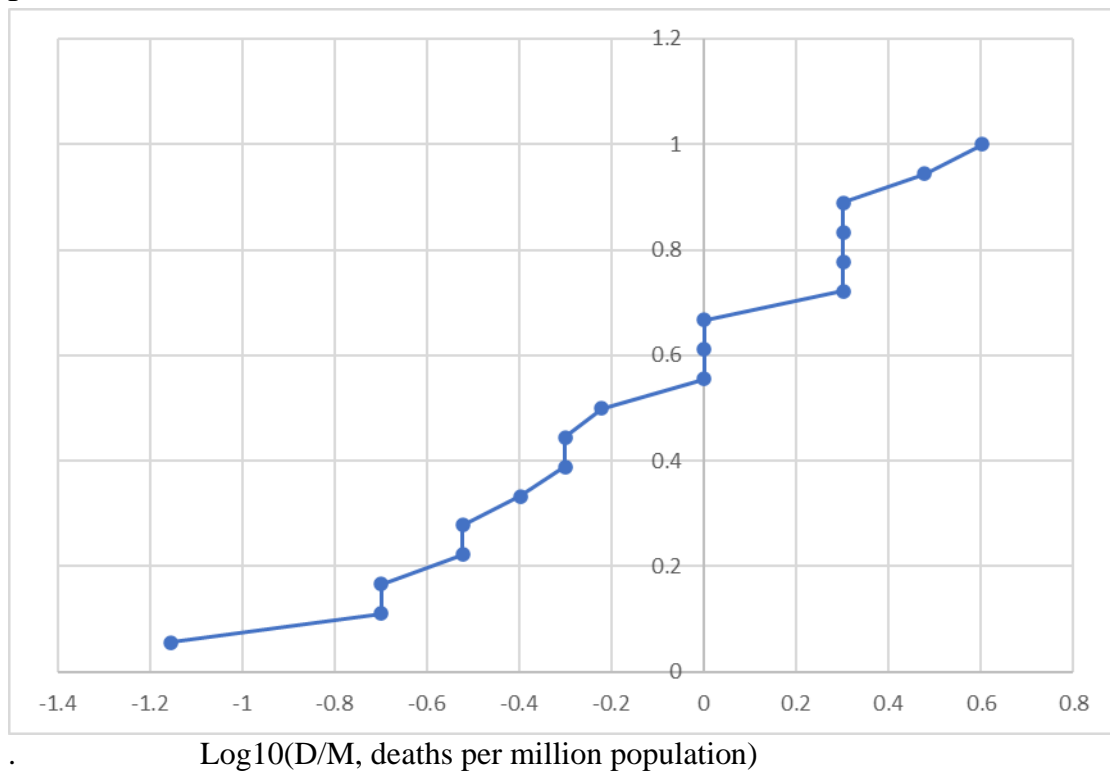


Figure 7B Russia & Central Asia. The cumulative distribution P for the logarithm of the rate D/N (base 10), countries ranked in order of increasing D/N. 9 countries.

P

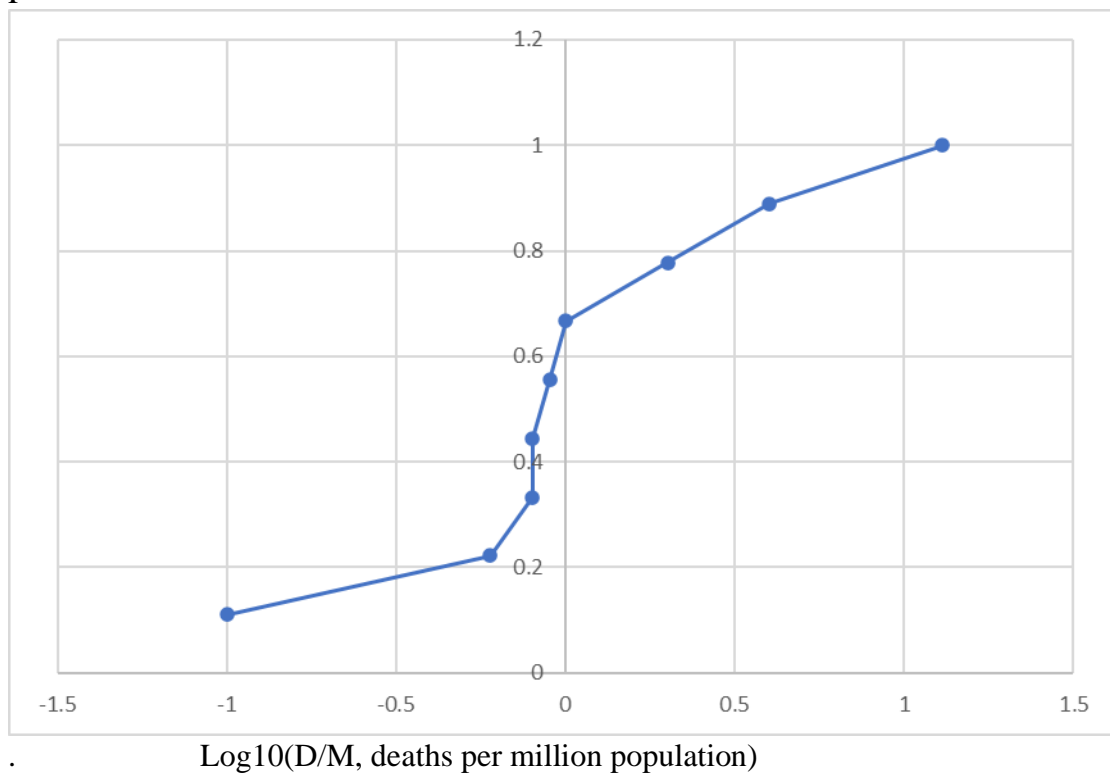


Figure 7C Middle East. The cumulative distribution P for the logarithm of the rate D/N (base 10), countries ranked in order of increasing D/N. 14 countries.

P

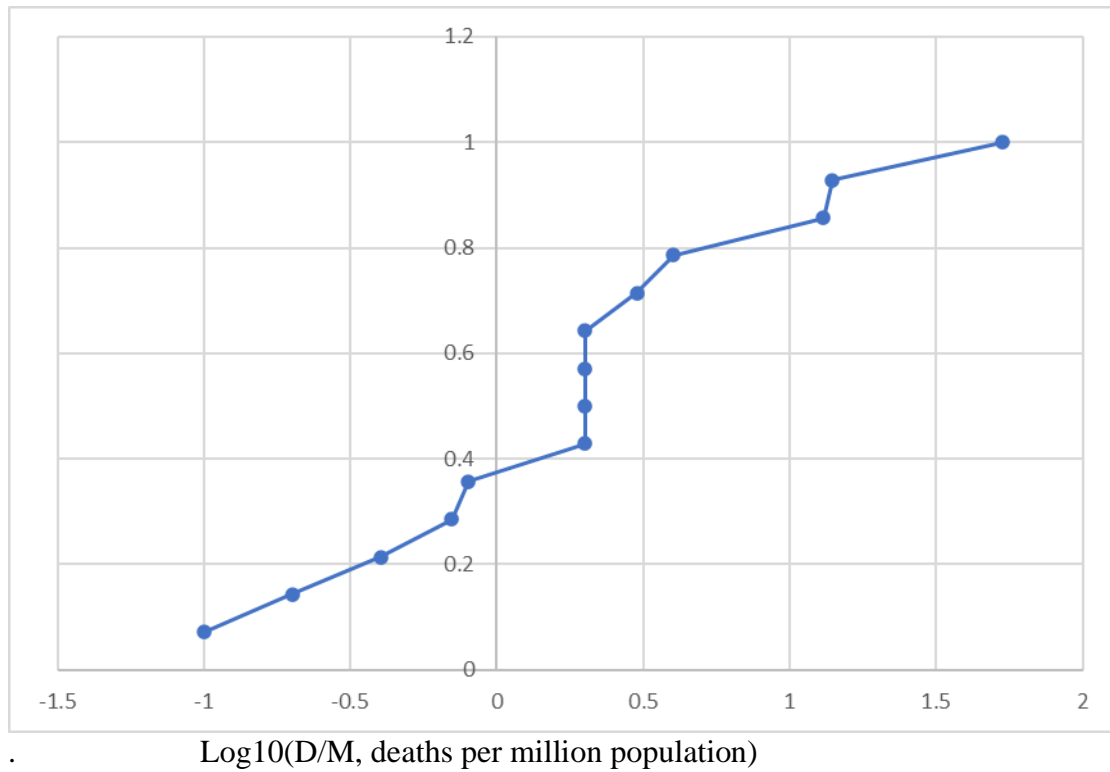


Figure 7D Caribbean. The cumulative distribution P for the logarithm of the rate D/N (base 10), countries ranked in order of increasing D/N. 15 countries.

P

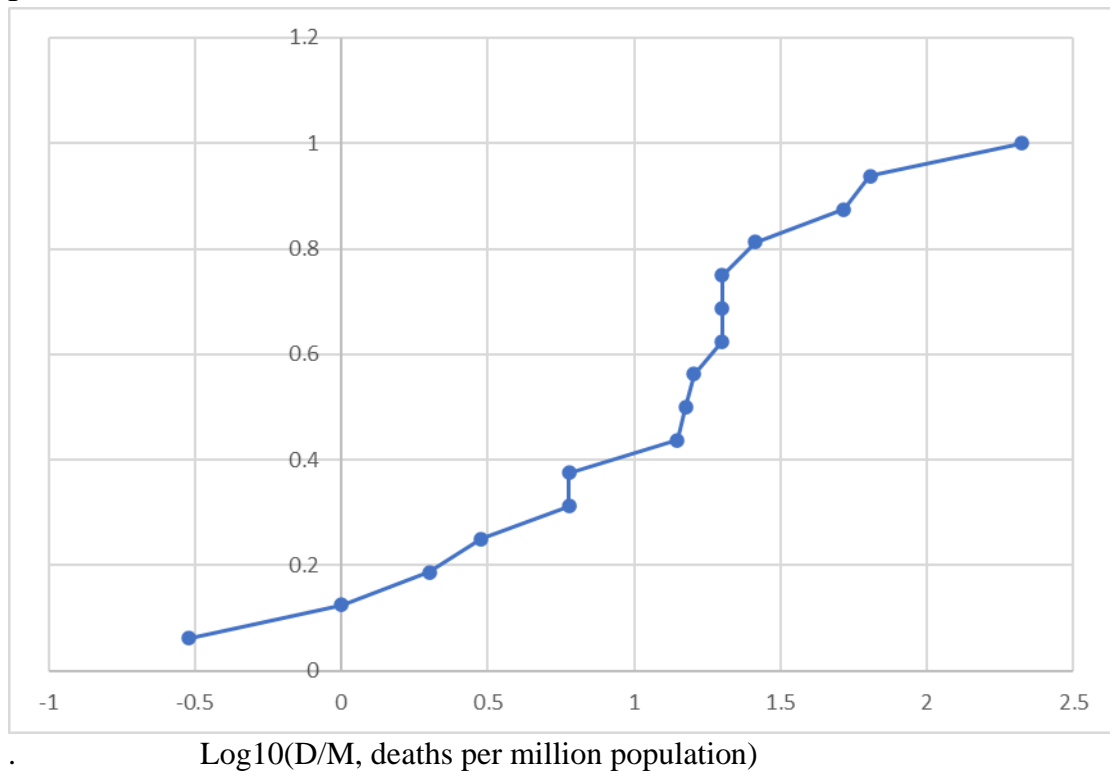


Figure 7E Latin America. The cumulative distribution P for the logarithm of the rate D/N (base 10), countries ranked in order of increasing D/N. 18 countries.

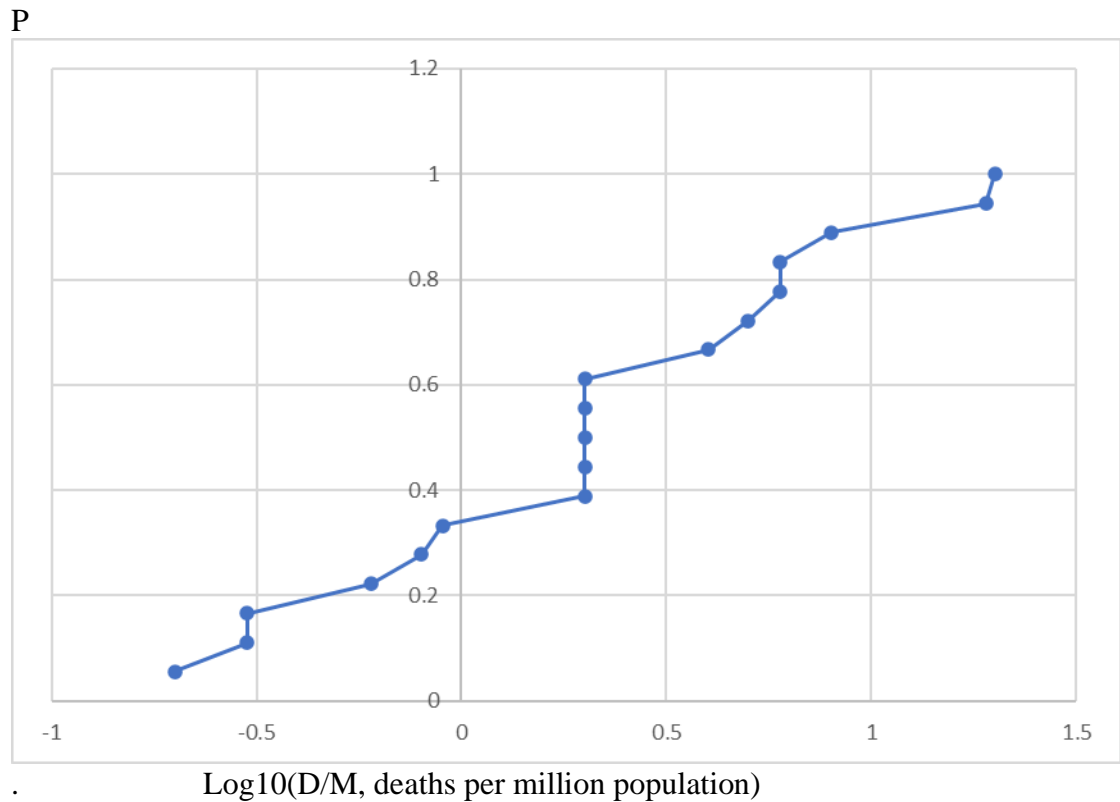


Figure 7F Africa. The cumulative distribution P for the logarithm of the rate D/N (base 10), countries ranked in order of increasing D/N

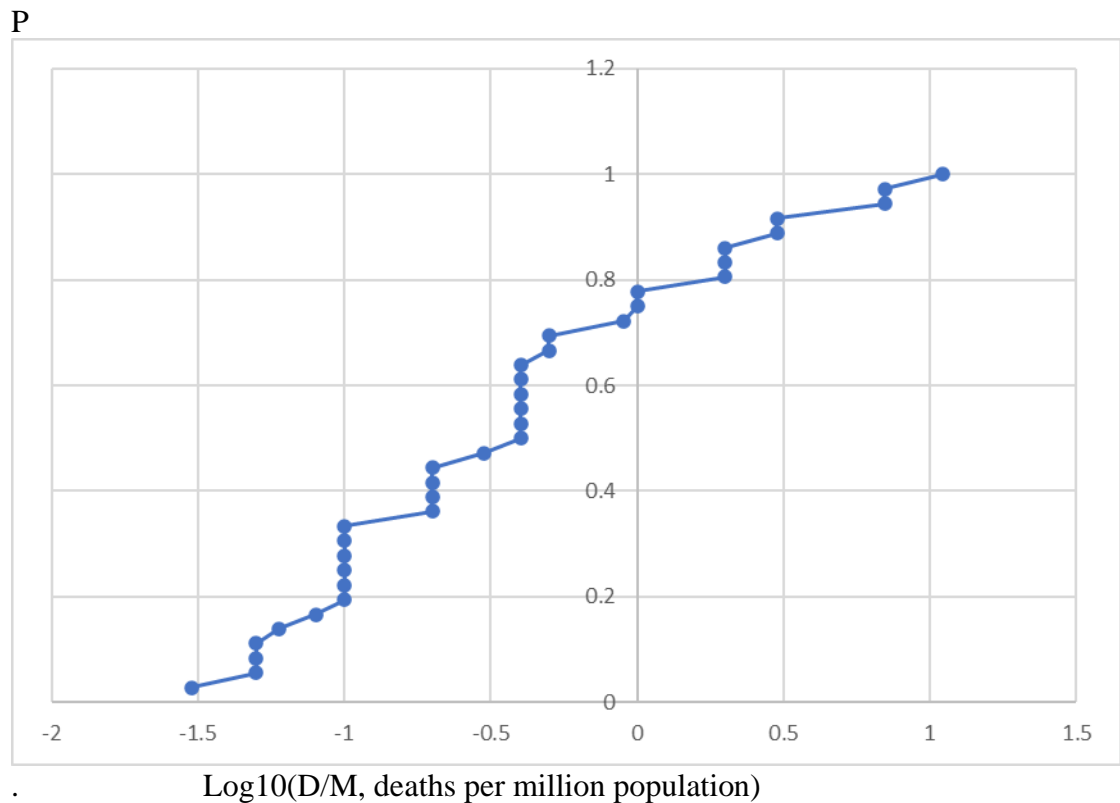
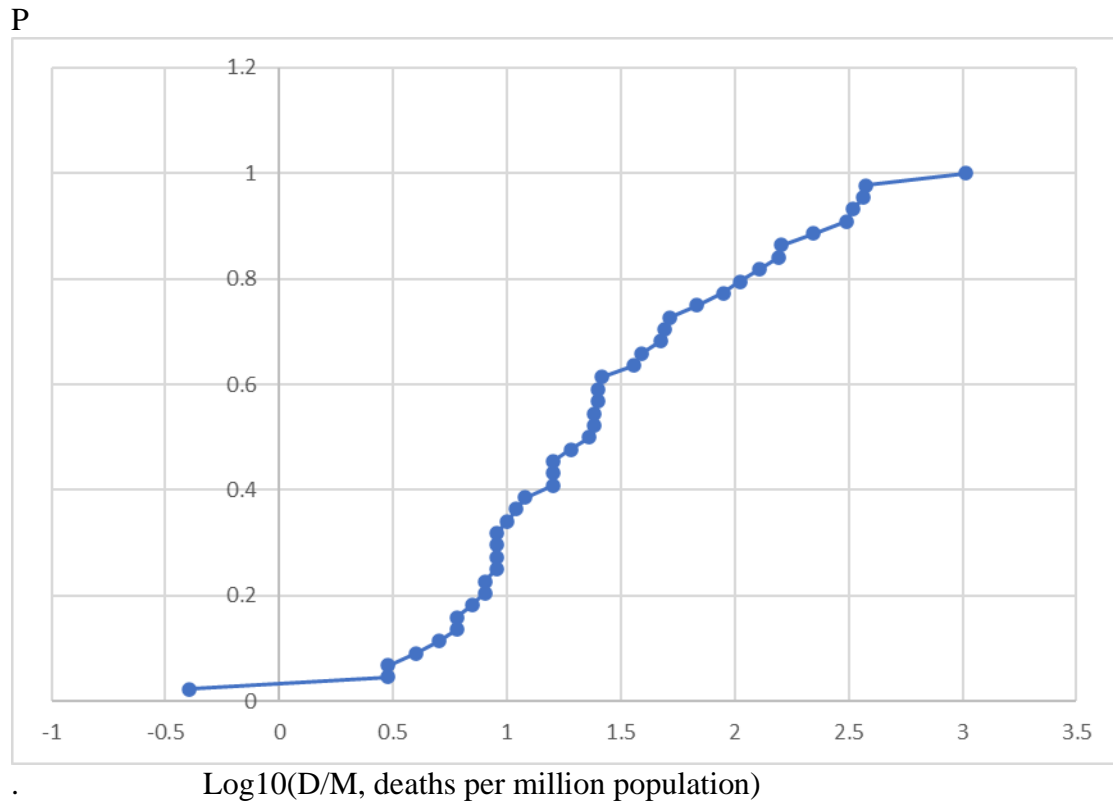


Figure 7G Europe. The cumulative distribution P for the logarithm of the rate D/N (base 10), countries ranked in order of increasing D/N



Change in deaths per population

“Thus in mid-April 2020 the continents were ordered from highest to least deaths per population: Europe, North America, Caribbean, Middle East, Latin America, Russia & CentralAsia, New Zealand & Australia, Africa, Asia. See also Table A below in next section.”

In our discussion of Figures 2 to 4 above, we noted that cumulative numbers necessarily increase but the change in the numbers sometimes decreases. As deaths increase, the rate of increase in deaths decreases – the deaths slow down.

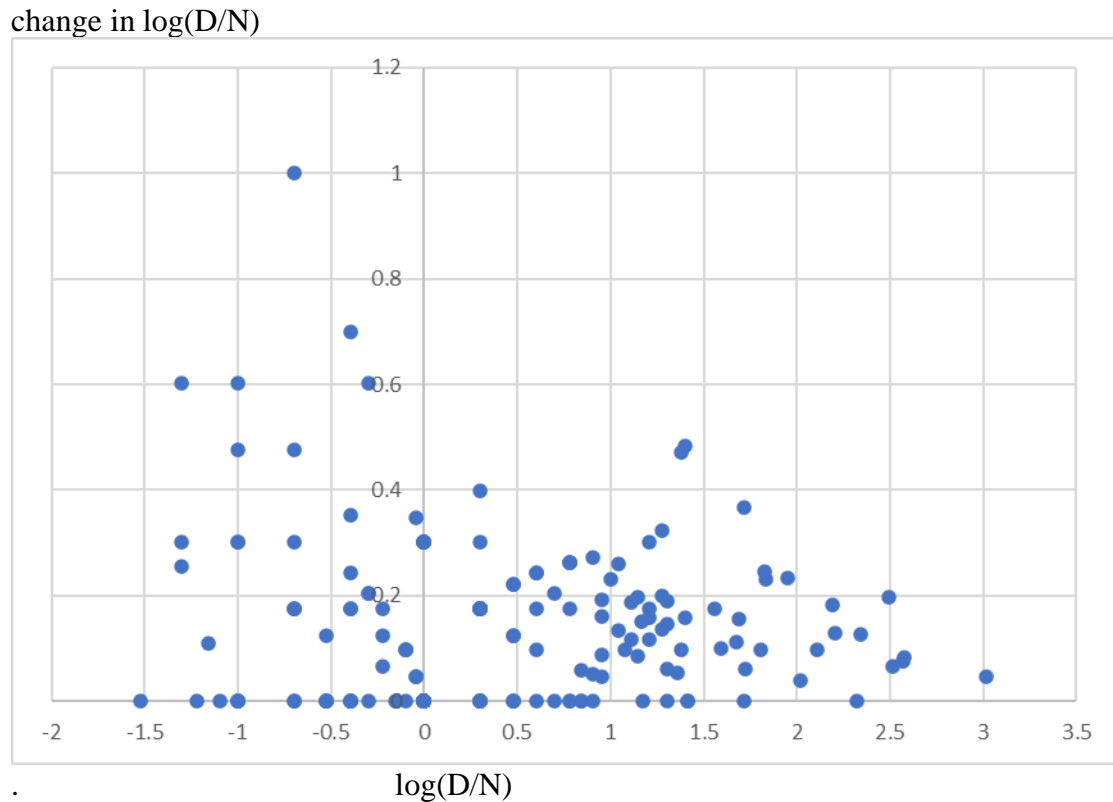
When we compare countries at any one point in time, a difference may be due to one country having an intrinsically higher death rate than another; or it may be because one country started the process earlier.

Comparing countries there is a negative correlation between deaths per population and change in that variable. See Figure A.

The details for some of the countries/points in Figure A above, are presented in Table A below. Countries are listed in order of increasing deaths per population, $\log(D/N)$. As noted earlier African and Asian countries have low $\log(D/N)$. Also given is the change in $\log(D/N)$. African countries and South Asia have high increase in $\log(D/N)$. This suggests that their low (D/N) may be due to starting the process later rather than

because of intrinsically lower (D/N). In contrast other Asian countries started early but yet have low $d\log(D/N)$.

Figure A. Deaths per population, D/N: change in $\log(D/N)$ versus D/N. April 13 to 19, 2020.



“Thus in mid-April 2020 the continents were ordered from highest to least deaths per population: Europe, North America, Caribbean, Middle East, Latin America, Russia & Central Asia, New Zealand & Australia, Africa, Asia.” Table 2 above.

The preceding analysis was carried out in mid-April. How has the situation changed over the past month? I hope to carry out a proper analysis in due course but in the meantime here is a very quick initial appraisal of the change. We consider the twenty-two countries with the most deaths (as given in The Times), and look at the continents they are in and at their deaths per population. We compare mid-April and mid-May – see Table B below.

The distribution of continents represented by these countries hardly changes over time: just over half the countries in the top twelve are in Europe, with another five or six from American countries. Just one or two are from Asia and none are from the Middle East and none from Africa.

For each continent we consider the range between countries in deaths per million. The continents are ordered the same way in May as they were in April. Europe has the highest range followed by North America then the rest. Deaths in American countries are growing faster than deaths in Europe but seem unlikely to catch up (?).

Table A Deaths per million: log and change in log for selected countries. April 2020

	log(D/M)	change	Africa	S Asia	Carib	L Amer	Asia	ME	N Amer	Europe
<hr/>										
	<1/m									
Nigeria	-1.30	0.26	*							
Somalia	-1	0.60	*							
Kenya	-1	0.48	*							
India	-0.70	0.30		*						
Bangladesh	-0.70	0.48		*						
Taiwan	-0.52	0					*			
Pakistan	-0.40	0.24		*						
S. Africa	-0.40	0.35	*							
Thailand	-0.22	0.07					*			
Russia	-0.05	0.35								*
<hr/>										
	1/m									
Jamaica	0	0.31			*					
Japan	0	0.31					*			
Indonesia	0	0.31					*			
New Zea.	0	0.31					*			
<hr/>										
	>1/m									
Australia	0.30	0.18					*			
China	0.30	0.18					*			
Saudi Ar	0.30	0.18						*		
Malaysia	0.31	0.18					*			
Cuba	0.31	0.18			*					
Mexico	0.30	0.40				*				
Phillipin.	0.47	0.12					*			
S. Korea	0.60	0.10					*			
Brazil	0.78	0.26				*				
<hr/>										
Israel	1.11	0.19						*		
Turkey	1.15	0.20						*		
Canada	1.28	0.32							*	
Norway	1.38	0.10								
Germany	1.56	0.18								*
Iran	1.72	0.06						*		
USA	1.83	0.25							*	
Ireland	1.83	0.23								*
Sweden	1.94	0.23								*
<hr/>										
Switzerld	2.11	0.10								*
UK	2.19	0.18								*
Netherld	2.20	0.13								*
France	2.34	0.13								*
Belgium	2.49	0.20								*
Italy	2.52	0.17								*
Spain	2.57	0.07								*

Table B The top twenty countries in terms of number of deaths. The number of countries in each continent. The range in deaths per million in the population. April and May 2020

	Africa	S Asia	Carib	L Amer	Asia	ME	N Amer	Europe
<hr/>								
N countries in top 22 for deaths								
Apr 22	0	1	0	3	2	2	2	12
May 20	0	1	0	4	1	2	2	12
<hr/>								
Death/m								
Apr 22		0.5		6-29	2-3	27-63	49-136	26-518
May 20		2		41-161	3	50-85	157-282	19-786

UK, cases and deaths

The events leading up to the first coronavirus in the UK are as follows:

First case of coronavirus, China
November 2019

“World health chiefs declare virus is global emergency ...
... Britain has not had a case of the virus ...
... about 150 Britons evacuated from Wuhan city are to start a fortnight in an
NHS hospital in the Wirral today after they land at Brize Norton today”
The Times, January 31, 2020: 1.

“Race to track down contacts of Britain’s first coronavirus cases.”
The Times, February 1, 2020: 6-7.

“First death in UK from coronavirus as toll rises.”
Chris Smyth and Kay Lay. *The Times*, March 6, 2020: 1.

Figures 8/9 to 11 below cover the period from March 11 onwards. There were 6
deaths reported on March 11th.

Figures C cover cases and Figures D cover deaths.

The source is the Wednesday figures reported in *The Times*

Total cases and total deaths are cumulative and necessarily increase.

The increase looks exponential, which would mean that the logarithm increased
linearly.

In fact the logarithm does increase but at a decreasing rate.

55,242 cases and 6,159 deaths
Wednesday, April 8th, 2020

[My Excel 75.2 virus part 1 time; Sheet 3; Chart 789

UK, Cases and Deaths, mid-week: number, log(number), change in log(number)

Cases, January 29 to April 15

Deaths, March 11 to April 15

Figure 8/9C UK, total cases, mid-week

Figure 8/9D UK, total deaths, mid-week

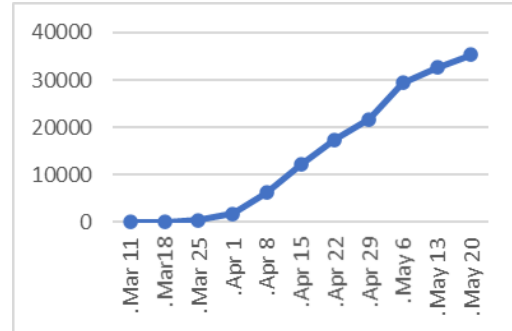
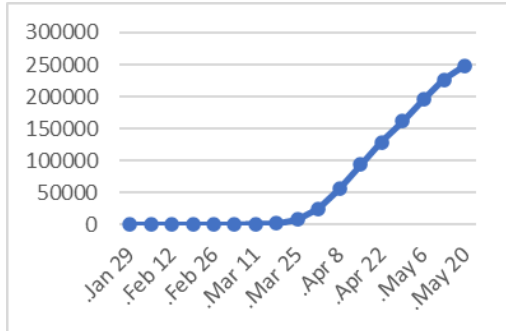


Figure 10C UK, log(total cases, mid-week)

Figure 10D UK, log(total deaths, mid-week)

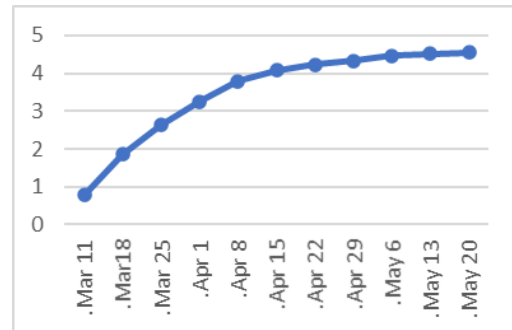
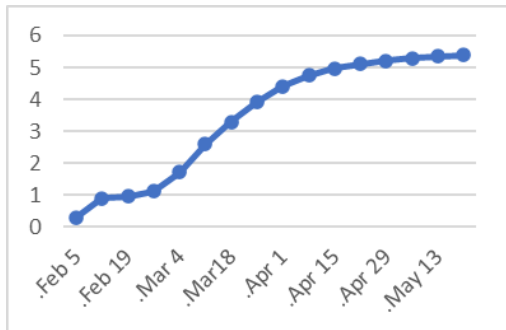
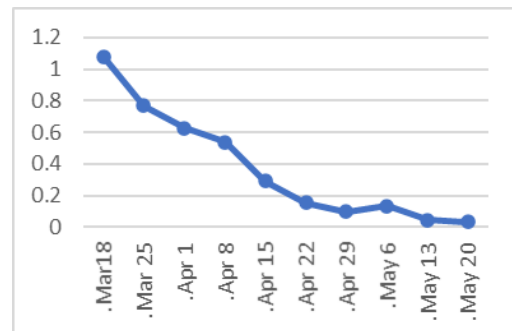
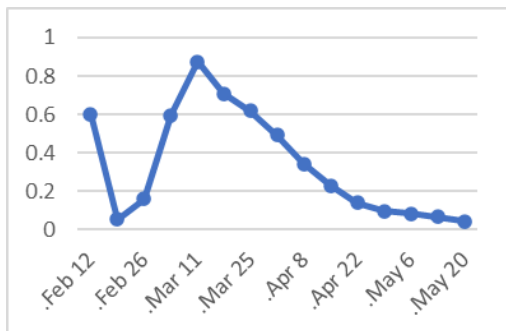


Figure 11C UK, change in log(total cases, mid-week)

Figure 11D UK, change in log(total deaths, mid-week)



USA, Cases and Deaths, mid-week: number, log(number), change in log(number)

Cases, January 29 to April 15

Deaths, March 11 to April 15

Figure 8/9C UK, total cases, mid-week

Figure 8/9D UK, total deaths, mid-week

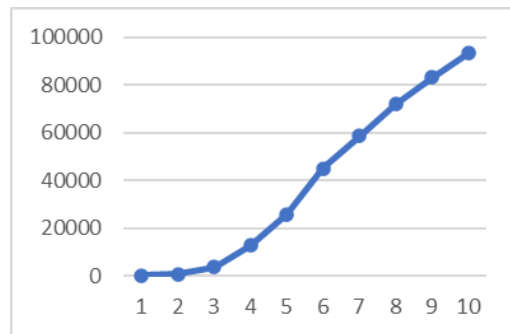
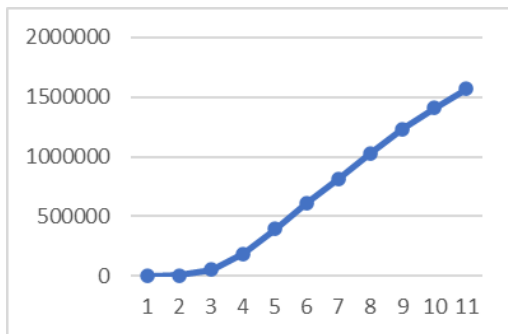


Figure 10C UK, log(total cases, mid-week)

Figure 10D UK, log(total deaths, mid-week)

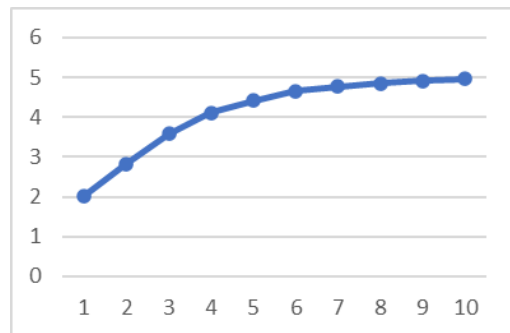
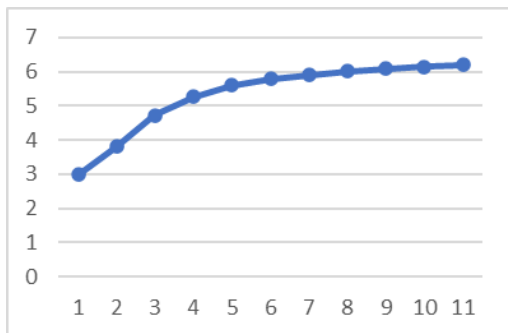


Figure 11C UK, change in log(total cases, mid-week)

Figure 11D UK, change in log(total deaths, mid-week)

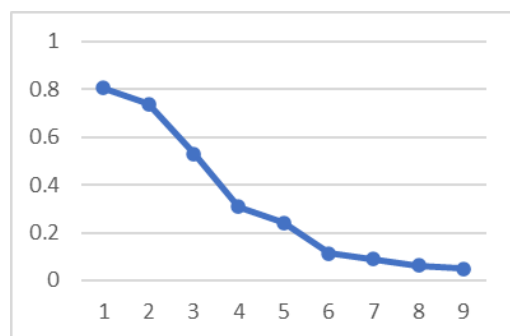
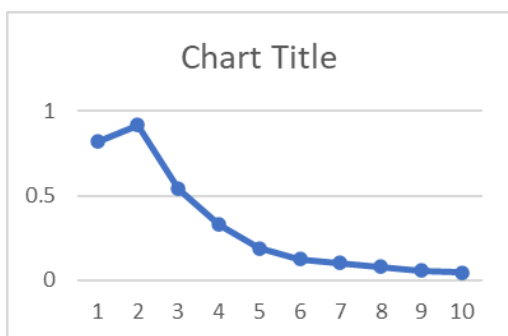


Table 3D provides the basic statistics for UK regions and nations. The first column gives the total population in millions. The final column gives the total number of deaths from all causes for every million in the population. This figure is given only for the UK as a whole. There are about nine thousand deaths for every million in the population – this corresponds to a death rate of 0.9%, in other words roughly one in a hundred people die each year.

The other columns concern the Coronavirus. The second and third columns give the numbers - the numbers of cases and the number of deaths. The fourth, fifth and sixth columns give the rates - the cases per population; the deaths per cases; and the deaths per population.

England has very many more cases and deaths than the other nations. Controlling for the size of population however, we find that both England and Scotland have a middling value of cases per million people, whereas Wales has relatively more cases and Northern Ireland has relatively fewer cases (per population). Looking at deaths per cases, England is highest, then Northern Ireland, then Wales and finally Scotland. Looking at deaths per population, England is highest and then Wales, and then (about half as many) Northern Ireland and finally Scotland.

London has a much higher rate of cases per population, more than double, than the rest of England and the other nations. Two factors are likely to be at play here: London has a greater population density (and interactivity?) making for a faster spread of the virus and also the virus arrived in London earlier. These same factors may also explain the differences between regions. Response and intervention strategies may also be different. The fact that London has a higher rate is ironic in that London has a young population who are less at risk of dying.

Table 3D Basic statistics for UK regions and nations, 2018; 26 March 2020

	all pop mill. 2018	virus cases	deaths	cases/ mill. pop	deaths/ cases	deaths/ mill. pop.	all causes deaths/ mill. pop.
London	8.9	3919	?	440.3			
England-London	47.1	5863	?	124.5			
England	56.0	9782	515	174.7	0.053	9.2	
Scotland	5.4	894	25	165.6	0.028	4.6	
Wales	3.1	741	28	239.0	0.038	9.0	
N Ireland	1.9	241	10	126.8	0.041	5.3	
UK	66.4	11658	578	175.6	0.050	8.7	9400

Given the higher rates for Wales, Table 3E provides some more detailed information. The higher figure for Cardiff suggests that the capital of Wales has a similar situation to the capital city of England. Powys is even more of hot spot.

Table 4E Basic statistics for Welsh regions, UK nations, 2018; 26 March 2020

	all pop mill. 2018	virus cases	deaths	cases/ mill. pop	deaths/ cases	deaths/ mill. pop.	all causes deaths/ mill. pop.
Betsi Cad.		25		40			
Hywel Dda		45		120			
Swansea Bay		16		40			
Cym Taf		54		120			
Cardiff &...		156		310			
Powys		358		610			