



## Development of the coronavirus pandemic in the UK and similar countries

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*COVID-19 Actuaries Response Group – Learn. Share. Educate. Influence.*

### Summary

In order to make meaningful international comparisons of the impact of the pandemic, it is important to allow for the dates at which infections began to take off in different countries and the relative population sizes. This note adjusts for these factors in order to provide a more appropriate comparison than is often presented.

Counts of numbers infected are not a reliable basis for comparison, as generally only a small proportion of the population has been tested, this varying a great deal between countries, and there is no firm basis for knowing the true level of infection country-wide. Instead this note concentrates on deaths reported involving coronavirus. Even though this is a firmer foundation, there are significant differences between countries in what is reported, and whether the numbers include deaths in hospital, deaths in care homes or total deaths including those in the community.

Other relevant factors determining the death rate are the age and gender of those affected; preliminary consideration is given to the age and gender-related impact of deaths. Other factors which may be relevant to the impact of the pandemic are not analysed here: population density, extent of connectedness between different parts of the country and the genetic make-up of the population.

### Introduction

Comparisons between countries of the progress of COVID-19 are complicated by the different effective starting points in different countries and because the number of cases and number of deaths should be related to population size. In the graphs below the assumption is made that Day 1 for each country is when deaths were reported from coronavirus at 0.8 per million of the population<sup>1</sup>. For the UK this is similar to the officially published graphs, with Day 1 being 16 March, when deaths were 55, but it changes the starting date materially for countries of very different population size to the UK, such as the US, Spain and smaller countries such as Belgium, Netherlands, Sweden and Switzerland. For China the figures below assume that the population at risk is that of the province of Hubei (in which Wuhan is the largest city), rather than the whole population of China.

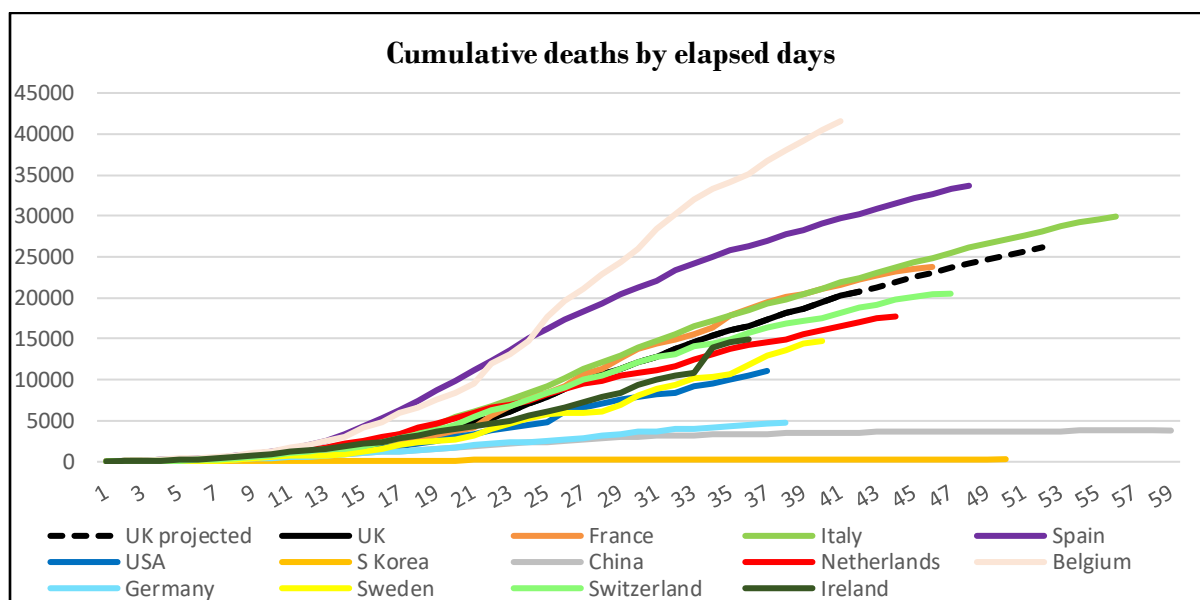
Having used this method to get the starting date for each country, the deaths have then been scaled to deem each country to be of equivalent size to the UK, so that the progression of deaths and the daily death figures are comparable with what we might expect for the UK if the UK were following a similar path.

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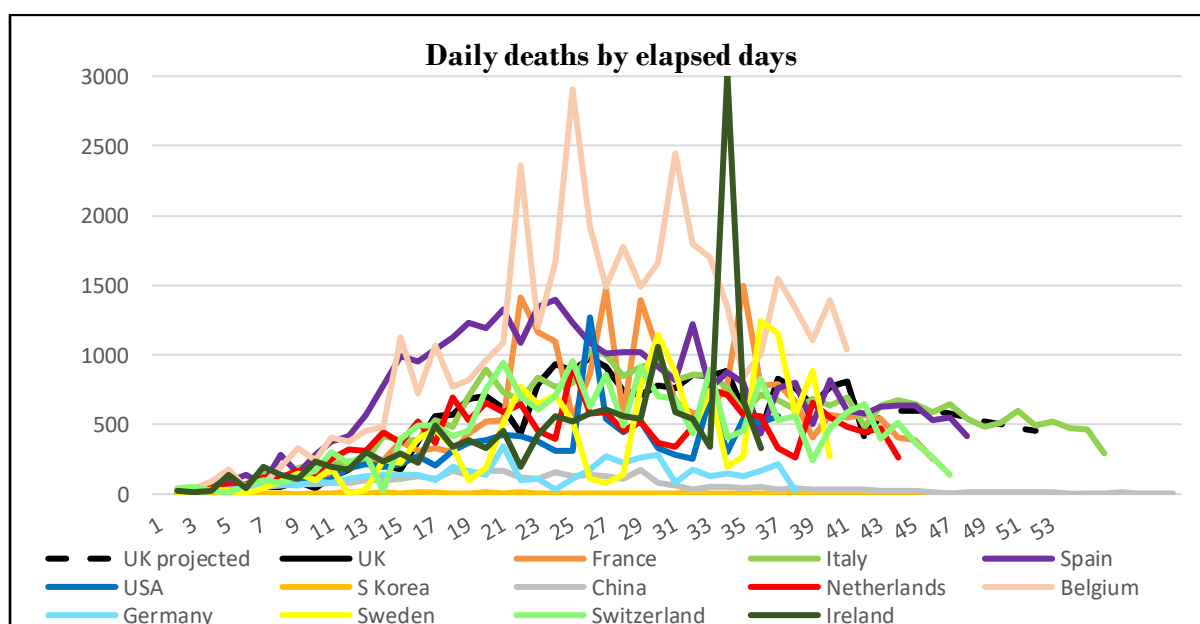
<sup>1</sup> Some graphs prepared by Public Health England make the assumption that Day 1 is the first day when 50 deaths are reported. For the UK this is roughly equivalent to 0.8 deaths per million total population.

## Death comparisons<sup>2</sup>

The graph of cumulative deaths<sup>3</sup> shows the UK tracking a similar but slightly lower path to Italy (14 days ahead) and France (4 days ahead), and above Switzerland (5 days ahead). Netherlands (2 days ahead) and Ireland (6 days behind) are following a slightly lower track. Spain (6 days ahead of the UK) and Belgium (1 day behind) appear to be on significantly steeper paths. US (4 days behind) and Sweden (1 day behind) are below the UK trajectory, whereas Germany (also 4 days behind) is noticeably lower at about 60% of the UK figures at the same duration.



The second graph shows the daily deaths over the same periods. These are volatile from day to day as the numbers are relatively small in population terms and there are variable delays in reporting. The projection for the UK broadly follows the Italian pattern and assumes a peak number of deaths at the same point as Italy in the development of the pandemic (around 10/11 April in the UK). There is still a good deal of uncertainty about this because the peak has been fairly extended with numbers of deaths going up and down each day for about a week. On the basis of this projection the total number of hospital deaths for the UK asymptotically approaches around 30,000.



<sup>2</sup> Graphs drawn by author from statistics on <https://www.worldometers.info/coronavirus/xx>

<sup>3</sup> The graphs use a normal scale rather than logarithmic as these are more readily understood by the layman and it is easier to distinguish the paths for different countries.

It should be borne in mind when interpreting these figures that the UK has about 617,000 deaths a year in normal conditions, or about 1,700 a day if evenly spread over the year, and in practice there would be more than this in winter months and less in summer months. A major seasonal flu outbreak can account for 'excess deaths' – or perhaps to some extent 'brought forward' deaths – of around 20,000. In 1918 there was a death toll in the UK of 228,000 attributed to the Spanish flu pandemic, when the total population was about two-thirds of what it is now. What is impossible to know is the level to which the deaths from coronavirus would have risen without the measures taken to enforce social distancing and closure of businesses. The public policy initiatives were a response to the possibility that infections could rise to a level which would overwhelm the capacity of the NHS to cope with the most serious infections, leading to high numbers of deaths.

The reporting of deaths is not consistent between countries. The figures for France jumped materially on 7 April, when they started to include care home deaths. Belgium may be the most comprehensive with deaths reported including those in care homes and in the community and that is one reason why their numbers appear higher than other countries. However, the UK reports only deaths in hospital in the daily figures and this is likely also to be the case for most other countries. Deaths out of hospital, including significant numbers in care homes and others in the community, are not being reported in the daily UK numbers.

The Office for National Statistics publishes weekly information from death registrations mentioning COVID-19 on the death certificate, albeit with a lag of several days. Figures published by ONS on 21 April, showing deaths for England & Wales registered in the weeks up to 10 April, disclosed a cumulative figure of 10,335 deaths which mentioned coronavirus as one or more of the causes of death. Of all deaths registered in the latest week, 33.6% mentioned coronavirus, increasing from 21.2% in the previous week.

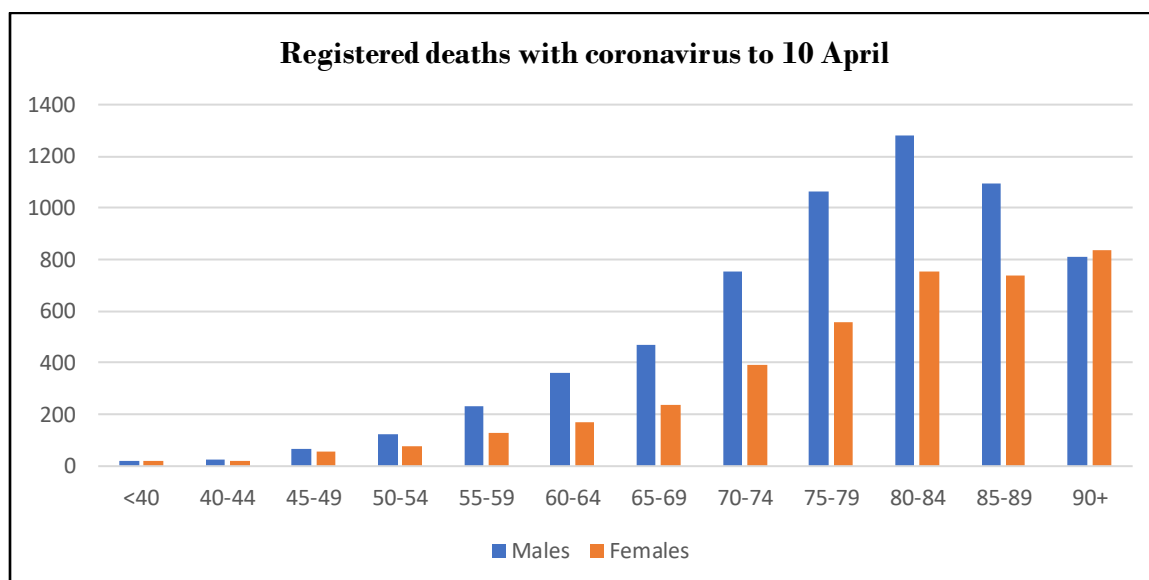
Of the cumulative figure for deaths registered with a mention of coronavirus up to 10 April, ONS comment that 83.9% (8,673 deaths) of deaths in England & Wales took place in hospital, with the remainder taking place in care homes, private homes and hospices. There are different lags in the systems for daily reporting of deaths in hospitals, which makes it difficult to compare reporting one figure with another. The national hospital figures include Scotland and Northern Ireland, for which registered deaths are reported by different entities. The ONS numbers are slower to prepare because they have to be certified by a doctor, registered and processed but, once ready, they are the most comprehensive and detailed.

ONS commented that the total deaths in the week to 10 April were 2,129 higher than the previous week and 7,996 higher than the 5-year average for that week of the year, notwithstanding the fact that the number of deaths reported with a mention of coronavirus was 6,213 in that week. The implication may be that there could be significant numbers of deaths in addition to those reported as related to coronavirus, which are in some way the result of the pandemic. This could be because some deaths are not reported as related to coronavirus if there was no evidence of a positive test. It could also be the result of secondary effects such as people not seeking treatment for other conditions because of concerns about getting infected in a hospital. Figures reported in Scotland suggest that about 25% of deaths from coronavirus could be in care homes and in the community. Although this aspect is rather uncertain, it suggests that the total number of deaths in the UK from the current wave of coronavirus infections could be around 40,000, with a quarter of them outside hospital.

For 10,335 deaths registered in England & Wales up to 10 April where coronavirus is mentioned on the death certificate, the ONS figures provide a break-down of cases by age-group and gender, which shows that 61.3% of deaths were males and 80.5% of cases were at ages 70 and over, as depicted in the graph below.

Other studies which have been published suggests that a high proportion of deaths occur in people with other underlying health conditions, including diabetes, obesity, respiratory problems, cancer, high blood pressure and heart conditions. These clearly tend to be more prevalent in older people.

It is too early to draw specific conclusions from this, except that it appears that the death rate in otherwise completely healthy individuals is quite low. There is some evidence that genetic factors may play a part in determining the severity of the disease in those who become infected, with a higher number of cases than might be expected on a proportionate basis among those with an African or Asian heritage. The virus also appears to be less easily transmitted than other pandemics which have been experienced, such as SARS, MERS and measles, all of which had a higher case fatality rate than COVID-19.



Source: ONS bulletin Deaths in England & Wales involving COVID-19 up to 10 April 2020, 21 April 2020

With the US having almost five times the population of the UK, an equivalent total number of deaths there to 40,000 in the UK would be close to 200,000, but this will depend on how effective the measures taken in the US are relative to the UK. The spread may also be different as it is geographically a much larger country and there are large areas of the US with relatively little contact with other parts, which might naturally inhibit the spread country-wide compared to the UK. However, some have suggested that 200,000 deaths from COVID-19 in the US would be regarded as a reasonably benign outcome for a pandemic, compared to deaths in a normal year of around 3 million.

It is also possible to compare growth in number of infections between countries but, given the huge variation in the approach to testing between countries, this is not very illuminating. The UK has close to the lowest infections reported of the countries monitored in the earlier graphs (with Sweden at about the same level) but this is because there has been less testing than elsewhere and does not tell us anything about the numbers likely to progress to more serious states of illness.

Unfortunately this also means that little information has been gathered so far about infection rates, the transition from infected to showing symptoms and from that to being seriously ill, either in total or by age group and allowing for prior vulnerabilities, so the task of modelling the future progress of the epidemic and whether there will be recurring peaks of infections and deaths, is difficult.

Chris Daykin

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### Countries with highest deaths per million population (reported to 26 April 2020)

	COVID deaths	COVID deaths per million
Belgium	7,094	612.1
Spain	23,190	496.0
Italy	26,644	440.7
France	22,856	350.2
UK	20,732	305.3
Netherlands	4,475	261.1
Ireland	1,087	220.0
Sweden	2,194	217.2
Isle of Man	18	214.3
Channel Islands	35	201.1
Switzerland	1,610	186.1
USA	54,965	166.1
Luxembourg	88	140.6
Portugal	903	88.5
China (Hubei)	4,636	79.2
Denmark	422	72.9
Germany	5,884	70.2
Iran	5,710	68.0
Canada	2,560	67.8
Austria	542	60.2