Estimating additional deaths to expand the RWCS

Office for National Statistics (ONS), Department of Health and Social Care, July 2020

Table of contents

1. Summary

The Scientific Pandemic Influenza Group on Modelling (SPI-M) have produced a new Reasonable Worst-Case Scenario (RWCS) for government planning for the period August 2020 to March 2021; estimating the deaths which could occur directly due to COVID-19. The estimate is aligned to ONS's weekly death registration data. These show deaths where COVID-19 is mentioned on the death certificate whether or not a test for COVID-19 was completed. There have also been increases in deaths *not* involving COVID-19 visible in those data which coincide with spikes in COVID-19 deaths, assumed to be related to the COVID-19 outbreak and/or government's interventions to tackle COVID-19[1]. To assist in planning, ONS and DHSC have produced the following adjustments to SPI-M's scenarios, to identify how many are "excess deaths" and to capture the deaths which the SPI-M analysis does not include.

The adjustments change the RWCS to account for:

- Out of the COVID-19 direct deaths, the number which would have been expected to die from other causes within the 38-week scenario reference period (1 July 2020 to 30 March 2021). This adjusts the estimates down.
- The number of non-COVID-19 excess deaths expected. In most cases this adjusts the estimates up; for younger age groups there is no effect.

The accompanying workbook demonstrates the calculations to produce these adjustments.

For each of these calculations, the adjustments provided are based on the information we have so far about COVID-19 deaths and non-COVID-19 excess deaths, which remains a limited time-series. Further, we still have a lot to understand about COVID-19 fatalities and how close the individuals were to end of life. SPI-M have provided estimates of deaths in care homes separately from deaths in other settings, which allowed some adjustment for the lower life expectancy of care home residents for the same age/gender grouping. This has been adjusted for in the calculations.

The relationship between deaths involving COVID-19 and not involving COVID-19 has been unstable over time. In the absence of better understanding, we have compiled a set of instructions to create an adjustment to the RWCS to present *all excess* deaths, based on cautious assumptions that err on being a potential over-estimate, rather than under-estimate, of total deaths. The estimates cover

[1] A possible, alternative explanation is that a proportion of these were undiagnosed COVID deaths but this cannot be proven at present.

deaths in all settings; these could not be separated out as there are insufficient data to apply uplifts separately for different settings.

As for SPI-M's estimates themselves, these represent **scenarios** and not forecasts of all deaths.

SPI-M acknowledge that their modelling has been performed at the UK, nation and NHS England region level and does not necessarily reflect the variability that might be observed at a more local level. Care must be taken when applying this scenario and its data to smaller geographies as there will be significantly more variability at more local scales.

2. Removing deaths which would have occurred anyway within the reference period

ONS's internal modelling has estimated how many of the SPI-M scenarios' deaths were expected to occur anyway within the 38-week period due to non-COVID-19 related causes, so would not represent additional activity for mortality-related services such as funeral homes. This estimate is broken down by age. Overall, the expected change in total deaths is -7.0%. So 93.0% of COVID-19 deaths (both in the RWCS, and additional added in Section 2) are not expected to occur otherwise within the 38-week period.

Table 1 below provides the adjustment factor to apply to the number of COVID-19 deaths. For example, 94.2% of deaths involving COVID-19 for 70-79 year olds are excess deaths – so 5.8% of COVID-19 deaths within that age group would have occurred anyway within the RWCS reference period, and do not represent additional deaths during this period.

Analysis does suggest some deaths in age groups younger than 40 years would have occurred anyway within the reference period in the absence of COVID-19; but the analysis is not sufficiently robust at these ages to include an adjustment.

When producing values for regions, we recommend only using the 'all ages' factor.

Table 1: adjustment factor for COVID-19 excess deaths

Age group	Adjustment factor
40 to 59	0.943
60 to 69	0.956
70 to 79	0.942
80+	0.902
All ages	0.930

3. Adding non-COVID-19 deaths

The following uplifts in Table 2 can be applied to the England and Wales RWCS estimate; the regions of England, and Wales independently estimates; and estimates broken down by age. The same proportional increase should be applied to all weeks.

Table 2: weekly non-COVID-19 excess deaths to add to the RWCS

Breakdown	Weekly non-COVID-19 excess deaths expected
England and Wales	+31.1%
By region:	
North East and Yorkshire	+31.6%
North West	+28.6%
Midlands	+38.2%
East of England	+41.9%
London	+23.9%
South East	+30.7%
South West	+43.1%
Wales	+3.3%
England	+32.5%
By ageband:	
0-19	0
20-39	0
40-59	+19.0%
60-69	+9.2%
70-79	+26.0%
80+	+38.7%

These percentage uplifts are calculated using ONS's weekly registration data[2].

- Non-COVID-19 deaths are calculated by subtracting death registrations involving COVID-19 from "all causes" total deaths;
- The non-COVID-19 *excess* deaths are calculated by subtracting the five-year average from the non-COVID-19 deaths;
- The average (mean) of this non-COVID-19 excess deaths result for Weeks 14 to 20 (28th March to 15th May) is divided by the total number of COVID-19 deaths in that period. This is used to give a suitable estimate for the number of additional non-COVID-19 deaths to expect for this group, per week. This can be added to the RWCS for that breakdown for every week of the reference period.

We recommend applying the same change to every week of the RWCS reference period, as the evidence available from the first COVID-19 spike does not support using more precise adjustments. A proportional increase has been applied, rather than an absolute number, to account for the RWCS (and other scenarios) presenting peaks and troughs in numbers of deaths.

2 https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/datasets/weeklyprovisionalfiguresondeathsregisteredinenglandandwales

For some regions and age breakdowns, notably younger age groups, the result for the above calculation is negative. This is because the non-COVID-19 deaths observed in latest data are below the five-year average. In these cases for the RWCS the additional number of deaths to expect has been treated as 0, rather than a reduction in deaths.

Due to the small number of deaths per week in ages 0 to 59, we have summed these into three age bands: 0-19, 20-39, 40-59. The older age groups have sufficient numbers of deaths to not require this change.

Weeks 14 to 20 are used for the average, as these are the weeks in which non-COVID-19 excess deaths were most significant so far, matching the future RWC estimates. This period has been used to represent the first spike. While Week 19 presented non-COVID-19 deaths below the five-year average, this was due to bank holidays affecting registration, and Week 20 again presented an excess for most breakdowns.

Death registrations are used rather than occurrences because there is usually a delay between a death occurrence and its registration, with that delay varying depending on cause of death. As such registrations are a more meaningful measurement when looking at deaths data in very recent periods.

There are alternative methods for calculating the expected number of deaths in the absence of COVID-19, other than the five-year average. However, the five-year average is the simplest and relies less on additional assumptions, such as adjusting for how the population size and age distribution has changed over time.

The published data used to produce these estimates cover England and Wales. There is no consistent trend over time for non-COVID-19 excess deaths or the relationship between them and COVID-19 deaths – and time series are even more unpredictable for individual regions. For this reason, we are not in a position to recommend what uplift to apply to Scotland or Northern Ireland COVID-19 deaths.

4. Combining these adjustments

Both of these adjustments multiply the RWCS to create a proportional change, both applied to the RWCS directly (rather than one adjustment applied to the other adjusted figure. The calculation is as follows:

(RWCS * adjustment in Table 1) + (RWCS * adjustment in Table 2)

The RWCS's weekly values should be adjusted as in Table 3 overleaf to produce a weekly estimate of COVID-19 and non-COVID-19 excess deaths. The full time-series for each of these breakdowns is presented in the accompanying workbook.

Table 3: weekly non-COVID-19 excess deaths to add to the RWCS

Breakdown	Adjustment to RWCS
England and Wales	(RWCS * 0.930) + (RWCS * 0.311)
By region:	
North East and Yorkshire	(RWCS * 0.930) + (RWCS * 0.316)
North West	(RWCS * 0.930) + (RWCS * 0.286)
Midlands	(RWCS * 0.930) + (RWCS * 0.382)
East of England	(RWCS * 0.930) + (RWCS * 0.419)
London	(RWCS * 0.930) + (RWCS * 0.239)
South East	(RWCS * 0.930) + (RWCS * 0.307)
South West	(RWCS * 0.930) + (RWCS * 0.431)
Wales	(RWCS * 0.930) + (RWCS * 0.033)
England	(RWCS * 0.930) + (RWCS * 0.325)
By age band:	
0-19	RWCS
20-39	RWCS
40-59	(RWCS * 0.943) + (RWCS * 0.190)
60-69	(RWCS * 0.956) + (RWCS * 0.092)
70-79	(RWCS * 0.942) + (RWCS * 0.260)
80+	(RWCS * 0.902) + (RWCS * 0.387)

5. Calculating total number of deaths each week

The RWCS deaths, adjusted as in Table 3, can be added to the weekly expected deaths (five-year average of 2015-2019) to produce the total number of deaths expected each week under the RWCS. This is presented below with excess COVID-19 and non-COVID-19 deaths separated. Note the "Excess COVID-19 deaths" element does not equal the SPI-M RWCS deaths estimate, as it has been adjusted down using the methodology in Section 2.

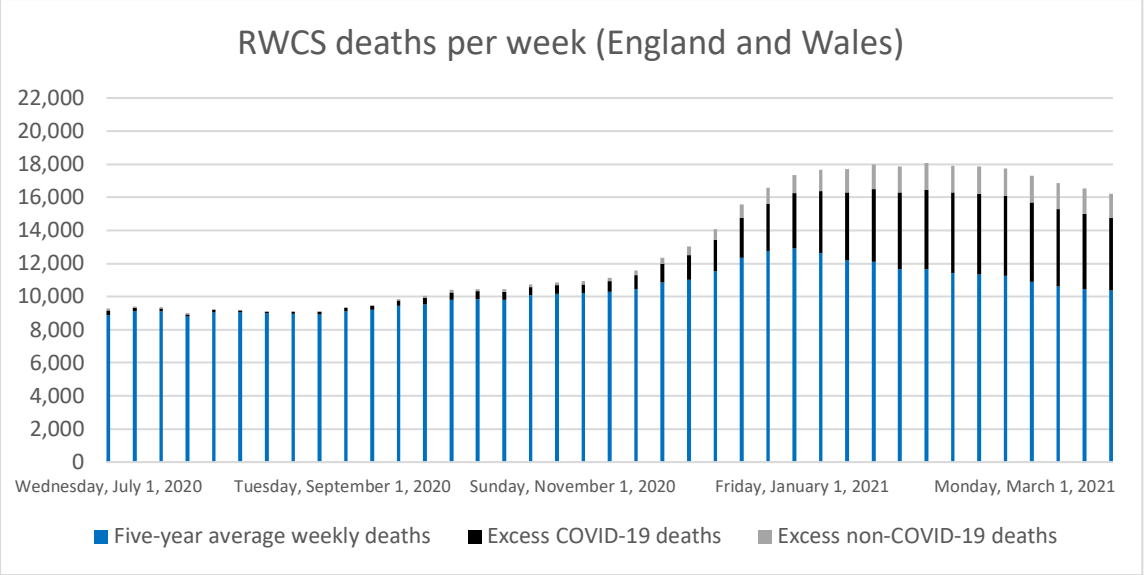

Table 4: Total deaths over RWCS period

Total deaths for 1st July – 30th March	*England and Wales*
Directly attributed excess COVID deaths	75,000
Excess non-COVID deaths	25,000
5 year average deaths	405,000