An Improved Measure of Deaths due to COVID-19 in England and Wales

Non-technical summary

Economic Insight | July 2020

1. Introduction

Over the course of the COVID-19 pandemic, there has been a question mark over exactly how many deaths the virus itself has caused. This is due to the two existing methods of measuring COVID deaths having significant shortcomings, which are likely to lead to inaccuracies. In England and Wales, these two approaches are:

- COVID-associated deaths. This is a count of all deaths that are 'linked' to COVID, and attributes a death to COVID if the patient has tested positive,[1] **or** if the death certificate mentions COVID as an underlying cause (even if no test – or a negative test – has been issued). The shortcomings of this are clear, and include: (i) there is no required evidence of *causality* between COVID and death; (ii) tests are not 100% reliable; and (iii) it is not consistent over time, or between countries.

- Excess deaths. This approach is more statistical, and compares the number of deaths in a given week against the average number in that week over the previous five years. However, there are two weaknesses of this method: (i) COVID deaths are disproportionately concentrated in the elderly, so these deaths may merely be slightly 'brought forward', rather than being 'excess due to COVID'; and (ii) there are other factors aside from COVID that could have increased the death rate during this period.

It is essential to accurately measure the number of COVID deaths so that we can understand properly the damage that has been caused, and the effectiveness of government policies. Generally, excess deaths is seen as the preferred approach to measure the number of COVID deaths. However, unsatisfied with the reliability of this method, Economic Insight director Sam Williams, Professors Anthony and Karli Glass, and myself, wondered whether we could build upon this and develop a more accurate measure the only way we know how: with rigorous economic analysis.

2. Our approach

Whilst the numerous reported measures during the pandemic are complex and unreliable (not just COVID deaths as above, but also infection rates and the 'R'), there is one variable we know for sure is accurate: 'all-cause mortalities'. This became the starting point for our analysis, with our aim being to decompose the figure into COVID and non-COVID deaths. To do this, we used regression analysis, a technique which uses data to identify relationships between different variables. This involves taking one variable of interest (a **dependent variable**) and explaining its levels and movements in terms of a number of other factors (**independent variables**). Regressions allow us to effectively understand how independent variables impact the

[1] *This includes PHE cross-referencing deaths against database records for positive COVID tests. As has been discussed in the media, to date this includes no 'cut off' point, such that any death for an individual with a positive test record is deemed 'COVID-associated'.*

dependent variable, both in terms of their *direction* (positive or negative), and their *size.*

By taking all-cause mortalities (total weekly deaths in England and Wales) as our dependent variable, we were able to use regression analysis to better identify the deaths likely due to COVID. To do this, we had to include independent variables that might cause variation in total deaths, including a variable to represent the impact of COVID itself. Based on a review of previous research, as well as our own experience, we included the following variables in our modelling.

Table 1: Independent variables which affect the death rate

Variable	Reasoning
FTSE All-Share Index	Economic circumstances in the country will affect the mortality rate.
Temperature	Extreme highs and lows in temperature levels will induce more deaths.
Time of year	Prolonged cold periods such as in Winter are usually associated with higher death rates.
% of the population older than 90 years	This represents the age of the population; having an older population will increase the mortality rate.
Population density	There tends to be a higher mortality rate in more dense areas.

As our main aim was to identify deaths due to COVID, we also included a 'dummy' variable to capture the impact of the pandemic. This allowed us to observe the difference in mortality rate in the weeks when COVID was present, versus when it was not (taking into account a detailed review of the epidemiology evidence on the lag between infection, symptom onset, and death).

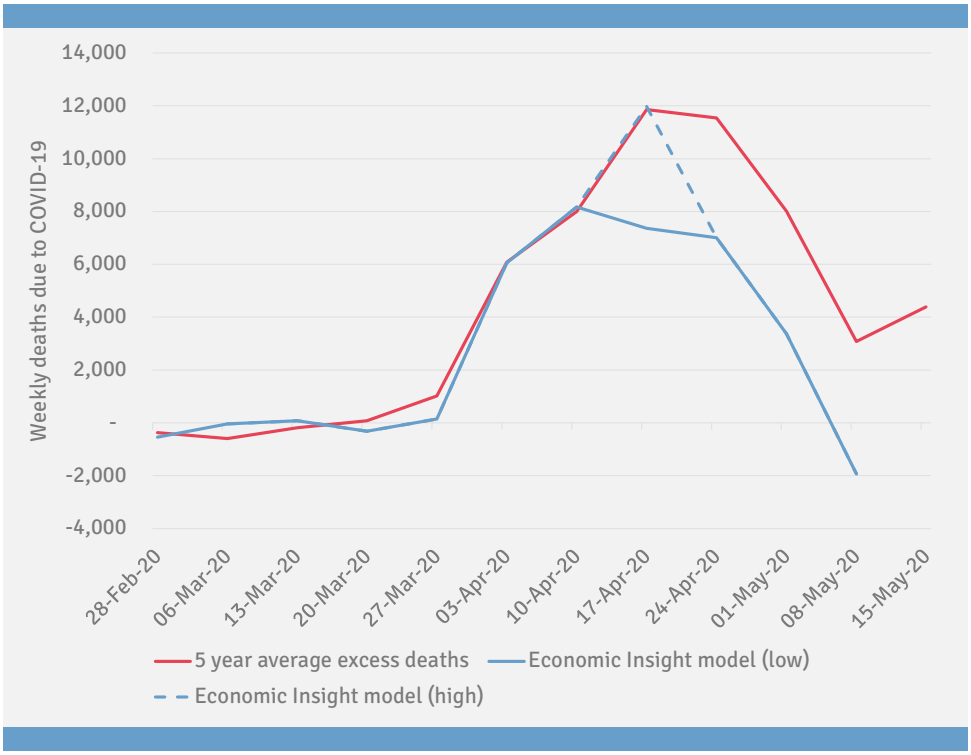
To obtain reliable results from regression analysis, it is important not to omit any factors that are likely to impact the dependent variable. One such factor in this case is, obviously, the government's lockdown policy. Therefore, it was also necessary to include a variable that accounts for the impact lockdown. To do this, we again used a dummy variable, allowing us to distinguish what impact the lockdown had on weekly mortality.

Our regression model, therefore, explains the weekly mortality rate in England and Wales, based on the variables listed in the table, COVID-19, and the government lockdown. To be cautious, and in acknowledgement of the fact that there is no single correct way of carrying out this analysis, we ran a number of variations on the model, which differ in the specification of the COVID and lockdown dummy variables. This allowed us to estimate a range of values for the number of COVID deaths, rather than rely on a single figure.

3. Results

Depending on the exact time period considered, up to week ending 8 May the **average weekly excess deaths were between 7,546 and 8,624**. By contrast, **according to our analysis, the average weekly COVID deaths were between 2,819 and 3,954**. Translating this into more practical terms, the upshot of this finding is that the numbers of deaths due to COVID as reported by **excess deaths figures are likely to be overstated by 54%-63%**. Put another way, this means more than half of the excess deaths observed are likely not COVID deaths. To demonstrate this, the chart below compares weekly excess deaths (the red line) against the weekly COVID deaths calculated from our models (the blue lines).

Figure 1: Weekly deaths compared to Economic Insight measure



Source: Economic Insight; ONS.

This chart illustrates just how large the overestimation of COVID deaths is based on the excess deaths measure. In addition, we find that this overestimation is particularly large in older age groups. Therefore, while it is true that COVID is disproportionately harmful to the elderly, we also believe that **the number of deaths in older age groups is most significantly overstated**.

4. Explaining the 'missing' excess deaths

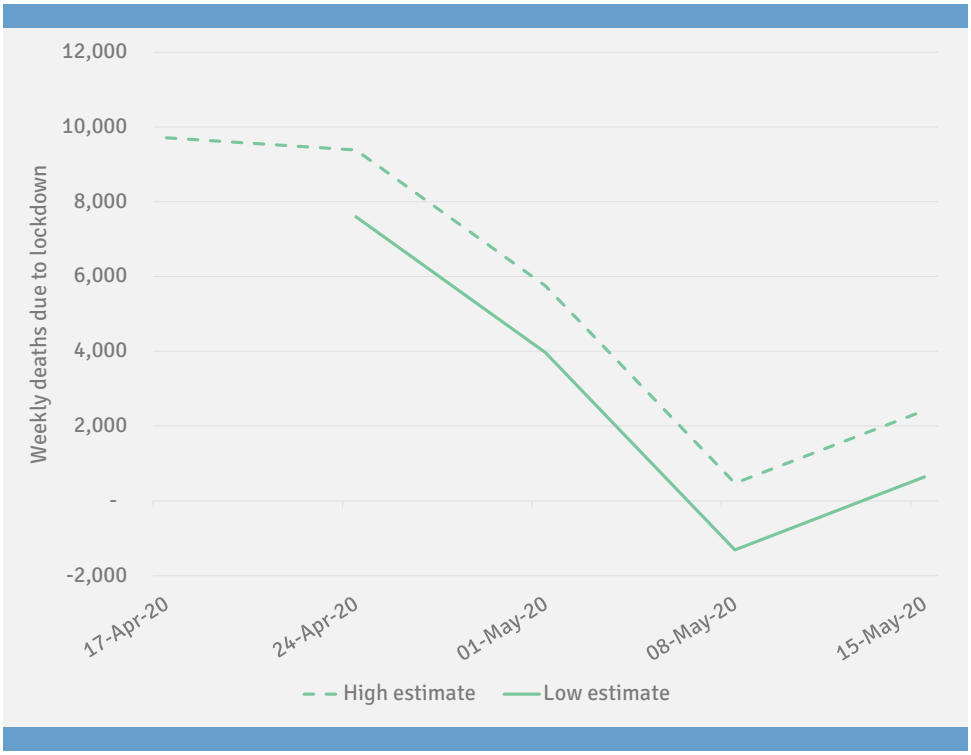
By this point, we have provided a method of answering the question of how many deaths in England and Wales are due to COVID-19, and shown that over half of the excess deaths figures are likely not due to COVID. This, then, gives rise to another question: what has caused the increase in deaths that are not due to COVID?

In principle, there are any number of external factors which could have also increased the death rate at the same time as COVID. These could include factors such as those already included in our model, or some other external phenomenon. However,

intuitively, it is sensible to consider the other large one-off event in the UK in recent months: the government's lockdown policy.

Thanks to our dummy variable representing the lockdown, we were able to use our regression model to estimate what the impact of the government policy has been on overall mortality. The model implies that the lockdown had a net **positive** effect on mortality, although this has reduced over time. Put simply, overall, lockdown is associated with more, not less, deaths. The effect of lockdown on weekly deaths based on our model is shown in the chart below. As can be seen, in recent weeks the lockdown appears to have reduced the death rate, but only after increasing it in the initial weeks.

Figure 2: Weekly deaths due to lockdown according to model



Source: Economic Insight

Whilst a statistical analysis alone cannot tell us *why* lockdown is associated with additional deaths, we think the likely cause relates to its **unintended consequences** in relation to other forms of critical healthcare. Evidence does suggest that this has happened. For example, the British Heart Foundation found a 50% drop in heart attack A&E attendances,[2] while total A&E attendances in April were 48% lower than in the same month a year earlier.[3] Similar figures have been recorded by the Stroke Association for admissions for strokes,[4] and Cancer Research have reported that

[2] *British Heart Foundation (2020): 'Lives at risk due to 50% drop in heart attack A&E attendances'. Available at: https://www.bhf.org.uk/what-we-do/news-from-the-bhf/news-archive/2020/april/drop-in-heart-attackpatients-amidst-coronavirus-outbreak*

[3] *Unify2 / SDCS data collections - WSitAE and MSitAE.*

[4] *Clinical Services Journal (2020): 'Stroke concern rising amid COVID-19 crisis warns top charity'. Available at: https://www.clinicalservicesjournal.com/story/32340/stroke-concern-rising-amid-covid-19-crisis-warnstop-charity*

cancer screenings have been suspended due to the pandemic (and that cancer treatment was disrupted).[5]

The large increases in deaths from causes other than COVID may have both a demand and supply side dimension. On the supply side, there was likely disruption in the provision of / access to other forms of critical health care. On the demand side, people's perception of COVID risk might have led to changes in their behaviour – most obviously, decreasing their willingness to get treatment for other illnesses and conditions. In our view, it's likely both the supply and demand side had an effect.

The next question is whether these impacts were caused by the lockdown policy, or were (to a degree) inevitable. Again, it may be a bit of both. For example, focusing on the demand side, perhaps people would have always been disproportionately 'scared' of COVID, irrespective of policy, leading them to take precautions that actually increased deaths from other causes. At the same time, the public's perception of risk is not formed in a vacuum; it is shaped and influenced by Government policy and communication. I for one can clearly remember Boris Johnson sitting behind a wooden desk and announcing to the nation that we were entering a lockdown. It was a scary moment, and surely exacerbated any existing concerns people had. This implies the lockdown policy itself may have led people to believe that COVID is higher risk than it actually is, relative to other conditions, contributing to the increase in non-COVID deaths.

Whilst unpicking causality is complex, **it seems likely that the lockdown policy itself has contributed to the number of excess deaths**. That is to say, a large number of non-COVID excess deaths are attributable to the lockdown. Four points of further evidence help to support this view.

- Our analysis found that COVID mortalities are highly concentrated in the elderly, meaning that for younger age groups, lockdown cannot plausibly save lives (because their chance of dying from COVID is so low), but could increase deaths from other causes.

- For older age groups, we now know COVID deaths were particularly concentrated in care homes. Unfortunately, the lockdown did nothing to protect those individuals.

- ONS data on deaths from other causes shows large and sudden increases that only commence from the start of lockdown. If these deaths were 'inevitable' (and independent of policy) we might have expected to observe these impacts sooner. Coincidence is not causality, but it is quite a coincidence.

- We now know that all-cause mortalities peaked the week ending April 10th. Even with a conservative assumption that the delay between infection and death is three weeks, this suggests that the lockdown coming into force on 23rd March missed the peak. Therefore, the policy's primary aim of 'flattening the curve'

[5] *Cancer Research UK (2020): 'How coronavirus is impacting cancer services in the UK'. Available at: https://scienceblog.cancerresearchuk.org/2020/04/21/how-coronavirus-is-impacting-cancer-services-in-theuk/*

could not have been achieved, whilst the unintended consequences still arose. This finding in our research is confirmed by Professor Simon Wood (2020).[6]

In a year of dreary news, I'm afraid this article might not do much to raise spirits (word count for "death" = 57). But I do think it brings some hope. Our research signals, firstly, that the threat this virus poses to our lives might not be as bad as we once thought. Secondly, although the government policy has had significant unintended consequences, using research such as this we can learn and implement more effective policies in future. Finally, I hope it's shown that economists can be a force for good (so long as the right lessons are learnt, at least).

[6] *'Did COVID-19 infections decline before UK lockdown?' Wood, S; University of Bristol (2020).*

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