How many extra deaths have really occurred in the UK due to the COVID-19 outbreak? Part LX. Influenza is suppressed by COVID-19

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Influenza and COVID-19

- It has been widely claimed that lockdown was responsible for lower influenza activity
- However, detailed examination of UK data revels that influenza activity dropped to zero just as lockdown commenced in early 2020, ***not after***.
- Dare one suggest that the HPA are perfectly capable of making this observation from their own data.
- A recent study has concluded that apart from the Spanish flu there is ***no evidence*** that pandemic influenza causes more deaths than seasonal influenza. https://www.mdpi.com/1660-4601/19/6/3407
- This same study concluded that influenza deaths appear to have been over-estimated by between 15% to 30%. https://www.mdpi.com/1660-4601/19/6/3407
- Has death from influenza been "ever so slightly" exaggerated? Once again you get into the 'with' or 'due to' argument which has plagued COVID-19 death reporting.

Ongoing trends in deaths in the UK

- Excess winter mortality looks to have peaked at around normal winter levels – Omicron has simply replaced seasonal influenza.

Errata for previous issues: See Part LII

For wider research on roles of infectious outbreaks on health care capacity and cost fluctuations: See Vol. 47, No. 3, Winter 2021 (healthfinancejournal.com)

World COVID-19 deaths correlated with obesity (β=0.279), hypertension (β=0.285), alcohol consumption (β=0.173) and urbanisation (β=0.204) Investigating the effect of macro-scale estimators on worldwide COVID-19 occurrence and mortality through regression analysis using online country-based data sources | BMJ Open. Partly explains why the USA was so badly affected. Urbanization is a measure of population density.

10 SNPs and 21 mutations in the ACE2 gene, along with 13 SNPs and 12 variants in the TMPRSS2 gene, which may be associated with COVID-19 Polymorphisms and mutations of ACE2 and TMPRSS2 genes are associated with COVID-19: a systematic review | European Journal of Medical Research | Full Text (biomedcentral.com) – continuing the theme of genetic susceptibility to COVID and infectious disease. Alas, no widespread gene testing to determine who is or is not at risk.

COVID-19 infection in the elderly appears to leave a lasting increase in poor health, Risk of persistent and new clinical sequelae among adults aged 65 years and older during the post-acute phase of SARS-CoV-2 infection: retrospective cohort study | The BMJ. A prior respiratory infection in the elderly seems to do something similar, but COVID-19 is worse.

No evidence that influenza pandemics (other than Spanish flu) have higher deaths than seasonal influenza, and evidence that influenza deaths may have been over-estimated by 15% to 30%, see https://www.mdpi.com/1660-4601/19/6/3407

During COVID-19 the genetic diversity of Influenza(s) has dramatically reduced. Influenza B/Yamagata has not been detected around the world, Influenza lineage extinction during the COVID-19 pandemic? | Nature Reviews Microbiology. Refer to the discussion on pathogen interference in earlier parts of this series.

Detailed examination of influenza trends in the UK clearly show that influenza activity dropped to zero ***just as*** lockdown was introduced in 2020, ***not after***. See the HPA report and reach your own conclusions, see National_Influenza_report_1_October_2020_week_40.pdf (publishing.service.gov.uk)

I find it somewhat disappointing when Public Health agencies seem to find it necessary to 'air brush' the influenza story. See earlier parts.

Returning to somewhat pragmatic issues regarding excess winter mortality (EWM). As can be seen in Figure 1 EWM seems to have peaked in early March and is roughly around the levels expected from seasonal influenza. Seemingly Omicron has replaced influenza leading to winter deaths for a sensitive proportion of the population. Recall that people are constantly coming up to the end of their life and that winter pathogens simply act to trigger final demise. Note that the late peak in EWM during April of 2021 will have acted to slightly reduce the 2022 EWM calculation – but only slightly.

As can be seen in Figure 2 the percentage of deaths 'with' (rather than 'due to') COVID-19 has likewise seemingly levelled off.

As to the new "highly infectious" strain of Omicron shall we wait and see. Highly infectious does not immediately imply high mortality.

Figure 1: Trend in excess winter mortality

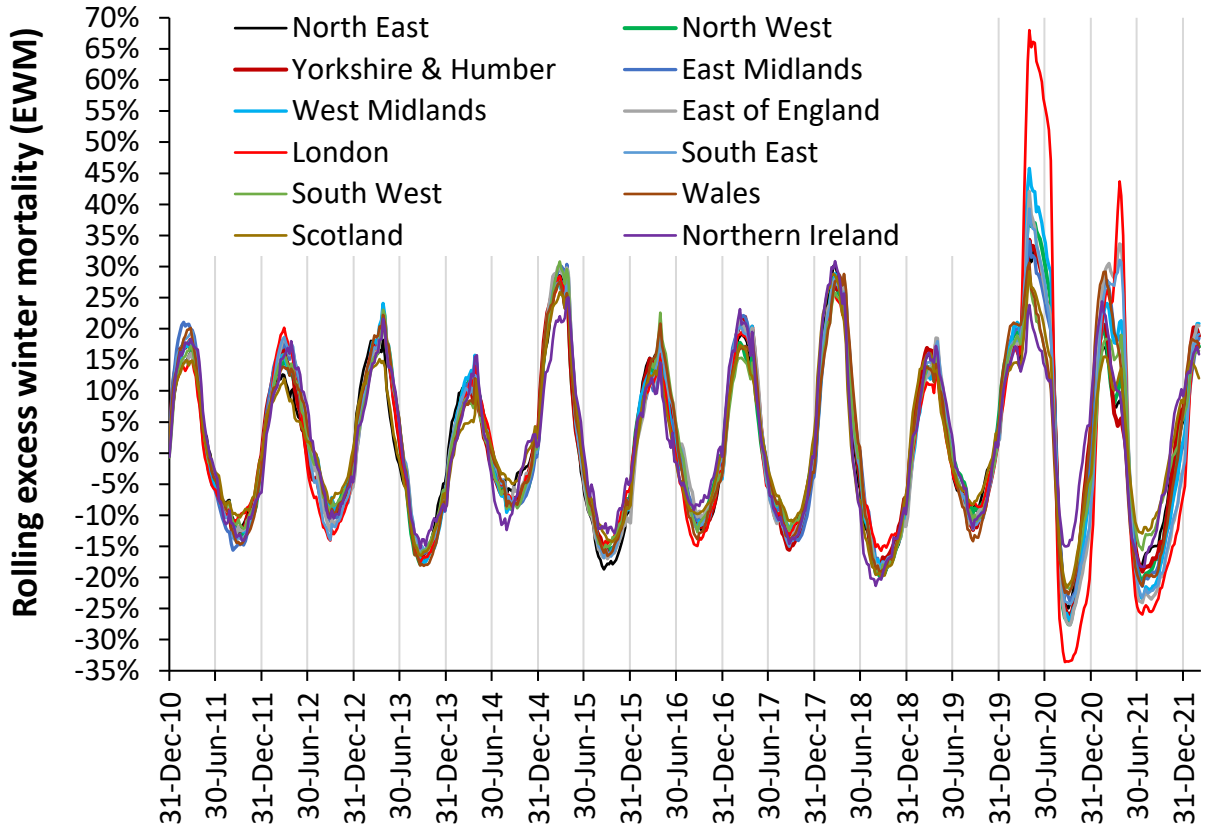
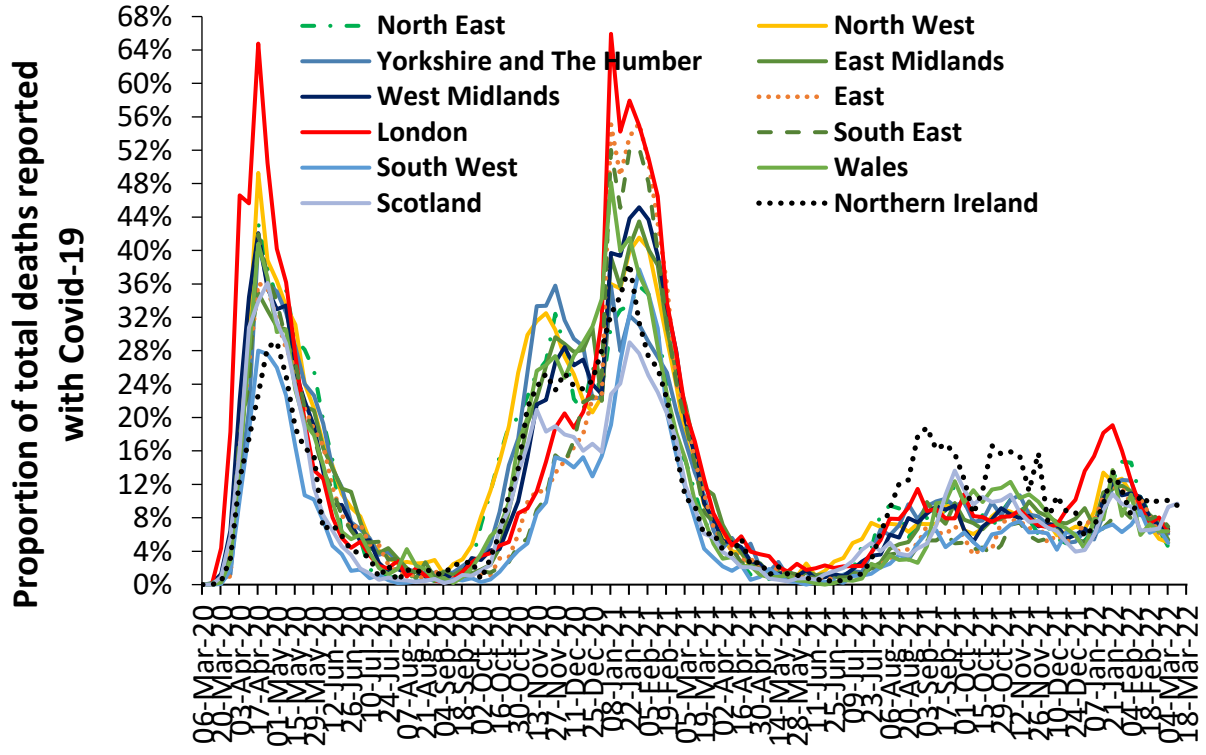


Figure 2: Trend in proportion of total deaths 'with' COVID-19



How many extra deaths have really occurred in the UK due to the COVID-19 outbreak? Part LVIX. German states most affected by COVID-19

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German states most affected by COVID-19

- Germany was not greatly affected during the first COVID winter of 2019/20, however, there was significant excess winter mortality (EWM)during 2020/21.
- Worst affected was Sachsen with 62% EWM. Sachsen shares a border with Poland and Czechia.
- Next affected was Thüringen with 41% EWM. Thüringen is adjacent to Sachsen.
- At the other extreme Bremen had unusually low EWM.
- Many states had high EWM, but this was lower that the maximum EWM in the pre-COVID era which mainly occurred in the winter of 2014/15 when significant new (non-pandemic) clades of influenza emerged.
- No data yet to assess the effect of Omicron.

International situation

- USA reaches >925,000 reported COVID deaths since March 2020 – for comparison around 30,000 flu deaths per annum, so 10-times higher deaths than flu.
- Countries with low testing continue to show massive undercounting of COVID deaths – and hence underestimation of risk.
- Despite over-counting COVID deaths UK ranks 39th for highest reported COVID deaths per 1,000 deaths (before COVID) – the National press have grossly misrepresented the facts.

Ongoing trends in deaths in the UK

- The trend has stayed roughly similar during Omicron for both admissions and occupied beds per death
- Nothing to indicate any unusual trends

Errata for previous issues: See Part LII
For wider research on roles of infectious outbreaks on health care capacity and cost fluctuations: See Vol. 47, No. 3, Winter 2021 (healthfinancejournal.com)

South African doctor pressured over Omicron – told not to use the M-word (mild), South African doctor who discovered Omicron says she was 'pressured' into making variant sound worse | Daily Mail Online. Honestly, half of world countries doing their best to conceal the true extent of deaths and the other half verging on over reaction.

COVID-19 induces diabetic macrophage-mediated inflammation via SETDB2 (which is mediated by Interferon β) Coronavirus induces diabetic macrophage-mediated inflammation via SETDB2 | PNAS

Patients with alpha-1 antitrypsin deficiency at risk of severe COVID infection, see Eur J Hum Genet (2022). https://doi.org/10.1038/s41431-022-01047-4

An ACE2 decoy protein may be a useful addition to the anti-COVID armoury 'Decoy' Protein Works Against Multiple Coronavirus Variants in Early Study – NIH Director's Blog

Mystery COVID-19 genetic material in New York sewage, from infected rats???? In New York City Sewage, a Mysterious Coronavirus Signal (yahoo.com)

New Omicron variant now dominant in Denmark A 'stealth' Omicron subvariant is now spreading, worrying experts (nationalgeographic.com)

COVID-19 deaths in India 6 to 7-times higher than official figures, COVID mortality in India: National survey data and health facility deaths (science.org). What a surprise! Indian government claims the study is complete piffle (not their exact words but something sounding suspiciously like "world class" mortality process. Who do you trust? COVID testing remains extremely low in over half of world countries. I would not be surprised if COVID has killed more than the Spanish flu.

Co-author Andriy Ponomarenko MD (who has 20 years' experience in influenza research) and I have submitted a paper investigating if pandemic influenza outbreaks ***after*** the 1918 Spanish flu caused higher winter mortality. Our study confirmed that winter deaths during the Spanish flu pandemic were indeed very high. However, a large international data set shows the answer is an emphatic ***no*** for all pandemics after the Spanish flu. In many years seasonal flu caused higher winter mortality than pandemic years. 1999/00 and 2014/15 are excellent examples. Don't hold your breath – it must go through peer review.

Researchers seem to have fallen into the trap of ***assuming*** that ***all*** influenza pandemics should/must have higher mortality – leading to misinformation. As an aside, estimates of world influenza deaths contain very large numbers of deaths from Africa and Asia which are based on very little available data. Seasonal influenza remains a capable pathogen with higher deaths in persons with known risk factors. However, i*t is my suspicion that even seasonal influenza deaths have been over-estimated simply because many winter pathogens can generate influenza like illness.*

Returning to more mundane matters of COVID-19 mortality, which as the front summary indicated is probably killing 10-times more people than influenza ever achieved - apart from the Spanish flu which occurred at a time when there were no antibiotics, no ventilators or critical care, etc, etc.

Figure 1 shows the change in reported COVID-19 deaths per 1,000 deaths (before COVID). Please note that the values in the Y-axis are rather low which reflects lower mortality from Omicron. As can be seen the UK remains in the top 50, however, probably due to over-reporting of 'with' rather than 'due to' COVID deaths. Given the high rates of vaccination in the UK the real 'due to' death rates should be far lower. The USA is high, but Israel is surprisingly high considering they have very high vaccination rates. Again, compared to the early days of the pandemic these rates are very low.

Figure 1: Change in reported COVID-19 deaths per 1,000 deaths before COVID over the past 7 and 14 days (up to 5th February 2022)

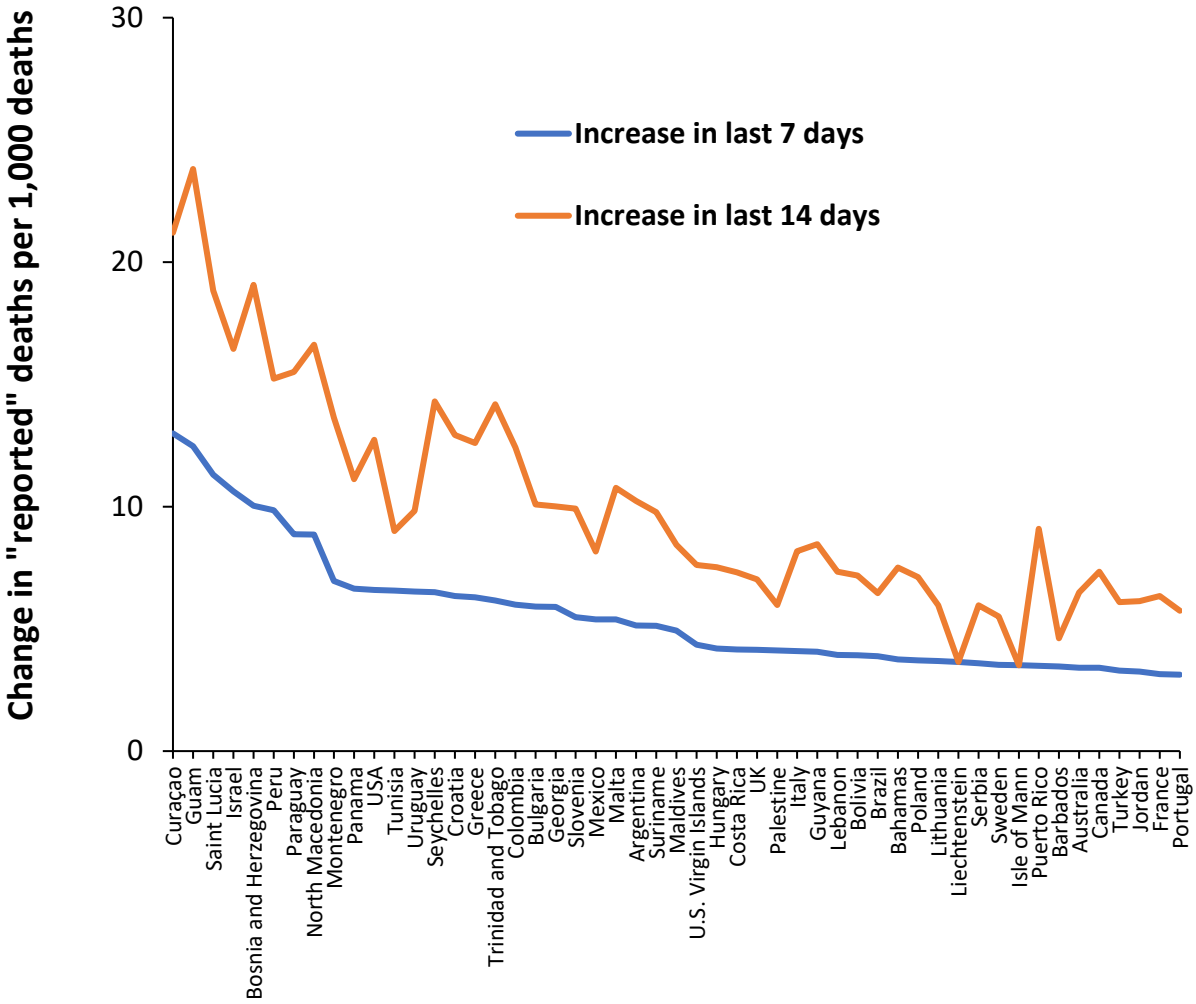
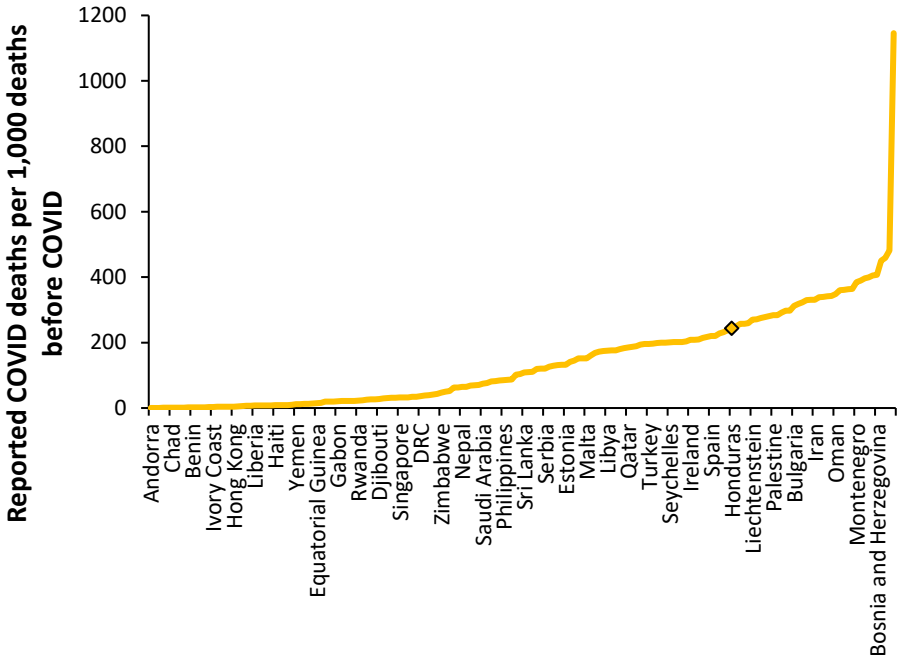


Figure 2 investigates the total 'reported' COVID-19 deaths since the beginning of the pandemic (nearly 3 years ago) as a proportion of annual deaths before the pandemic. The UK is the black triangle and will be elevated due to over-counting. Most of the countries at the left-hand side will have gross undercounting.

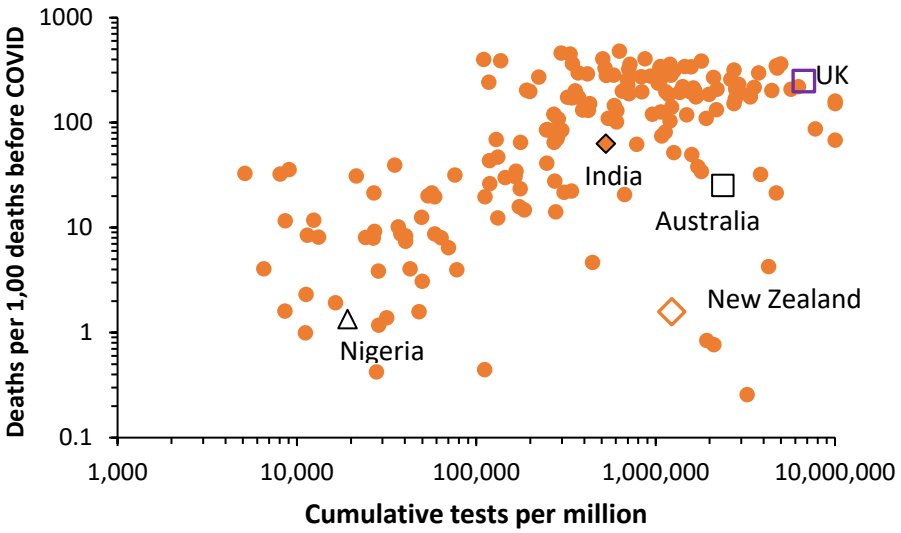
Figure 2: Total 'reported' COVID-19 deaths since the beginning of the pandemic as a proportion of annual deaths before the pandemic.



The issue of undercounting was addressed in earlier parts of this series and Figure 3 gives an update. Australia and New Zealand are shown as reference points for countries which have implemented draconian lockdown measures. Hence any country lower than these two must be considered in the light of the severity of their lockdown measures.

Both Australia and New Zealand have >1.2 million tests per million population despite having very low infection rates. Most countries lie in the range 100 to 800 and anything below 100 is highly suspect unless the most stringent lockdown measures remained in place. Some countries have revised their figures upward. India remains too good to be true as are the figures for countries like Nigeria.

Figure 3: Reported COVID deaths per 1,000 deaths before COVID versus cumulative tests per million population.



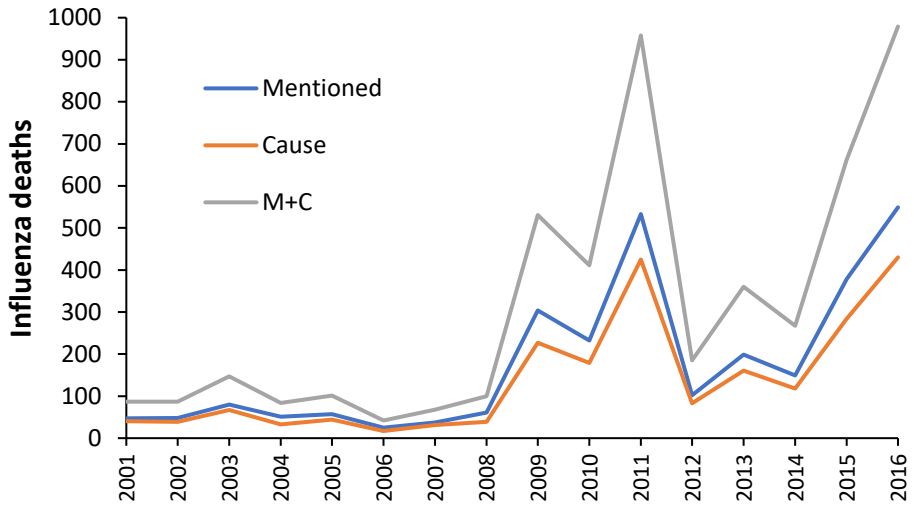
Exactly how many people does influenza kill?

A part of the economic evaluation of the cost benefit of influenza vaccination is the number of deaths averted.[1] Influenza deaths are also used as a powerful message to the public regarding the need for vaccination. The exact number of deaths directly caused by influenza is unknown and hence the need for estimation methods.

Figure 1 shows the number of influenza deaths recorded on the death certificate for England and Wales between 2001 and 2016, both 'due to' and 'with' are shown. These are calendar year totals. The coding of cause of death seems to have improved from 2009 onward.

However, there is only a maximum of 1,000 deaths across all age bands by adding 'due to' and 'with' together. Considering that influenza is such a major pathogen this is abysmal reporting. However, it does give the minimum case and demonstrates that 'due to' is about the same number as 'with' – giving ample scope for over-estimation.

[1] An-economic-analysis-of-flu-vaccination-18.pdf



How many extra deaths have really occurred in the UK due to the COVID-19 outbreak? Part LVIII. Countries with highest EWM during COVID

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Countries with highest EWM during COVID (incomplete data)

- The National Press in various countries have been able to distort the public view by cherry picking.
- Figure 1 shows countries with the highest excess winter mortality (EWM) – subject to incomplete *monthly* data availability.
- North Macedonia, St Helena, Kuwait, Bulgaria top the list while Germany and USA are almost identical – those crafty Germans were only reporting an absolutely confirmed COVID death and so had the appearance of low COVID deaths!
- The list is limited by availability of monthly data which can take several years for some countries to process and is completely unavailable for most of Africa and large parts of Asia.

International trends in deaths during Omicron

- Since Omicron international COVID deaths have shown a very slight trend up in the last 7-days despite high levels of reported new infections (probably underestimated).
- Reported increase in COVID deaths per 1,000 deaths in top 50 world countries over the past 14 days (during omicron) and 38 days (with residual delta) up to 22 January 2022 have been modest to low.
- Another media-fuelled hysterical response to what the South African's were repeatedly saying – Omicron may be highly contagious but is not highly pathogenic – although some will circumb.

Ongoing trends in deaths in the UK

- The trend has stayed roughly similar during Omicron for both admissions and occupied beds per death
- Nothing to indicate any unusual trends

Errata for previous issues: See Part LII
For wider research on roles of infectious outbreaks on health care capacity and cost fluctuations: See Vol. 47, No. 3, Winter 2021 (healthfinancejournal.com)

Coronavirus induces diabetic macrophage-mediated inflammation via SETDB2 (which is mediated by Interferon β) Coronavirus induces diabetic macrophage-mediated inflammation via SETDB2 | PNAS

COVID-19 uses conserved genes to modulate infection, but severity of disease relates to mutations in 6 genes located in Chromosome 3. Genetic variation analyses indicate conserved SARS-CoV-2–host interaction and varied genetic adaptation in immune response factors in modern human evolution - Lee - 2021 - Development, Growth & Differentiation - Wiley Online Library

Fatal COVID infection linked to a late inflammatory response 17-23 days after symptom onset, Time-resolved systems immunology reveals a late juncture linked to fatal COVID-19: Cell

Genetic variants and sepsis in children, Pathogens | Free Full-Text | Impact of Inherited Genetic Variants on Critically Ill Septic Children | HTML (mdpi.com) – continuing the theme of genetic predisposition to serious infection

2021/22 flu vaccine may not be a good match Flu vaccines don't match the main circulating flu virus strain, researchers find - CNN

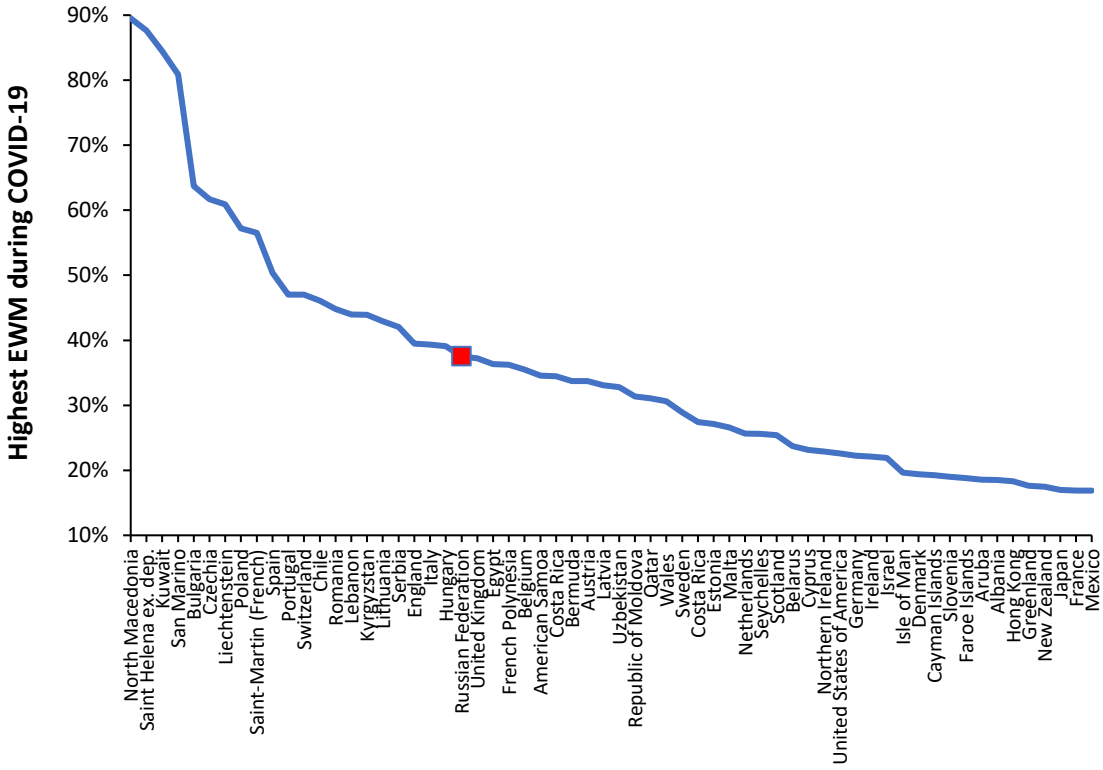
Omicron variant has enhanced resilience to the antiviral type I interferon (IFN-alpha/beta) response in infected cells Omicron variant of SARS-CoV-2 exhibits an increased resilience to the antiviral type I interferon response | bioRxiv. This is important regarding pathogen interference (see parts LIV to LVII) and suggests that Omicron (and perhaps other COVID variants) would out-compete influenza. A potential explanation of low influenza activity since the beginning of the COVID-19 pandemic.

Is repeated COVID vaccination leading to vaccine acquired immune deficiency syndrome? Vaccine Acquired Immune Deficiency Syndrome (VAIDS): 'We should anticipate seeing this immune erosion more widely' | America's Frontline Doctors (americasfrontlinedoctors.org). As always, VAID will only affect a sensitive proportion of the population. We currently do not have the know-how regarding which individuals will suffer adversely from repeated COVID vaccination.

As I have said before, COVID-19 has thrust us into multiple dilemmas and uncertainty.

Figure 1 gives a view of excess deaths from COVID-19 based on excess winter mortality. EWM is a far more reliable tool for evaluating the real death toll from COVID-19 than reported COVID deaths. Reporting varies enormously between countries and reported deaths generally decline with the volume of testing, see Special Guest Authors (healthfinancejournal.com).

Figure 1: Highest excess winter mortality (EWM) during COVID-19 – note data is limited by delays to reporting monthly deaths

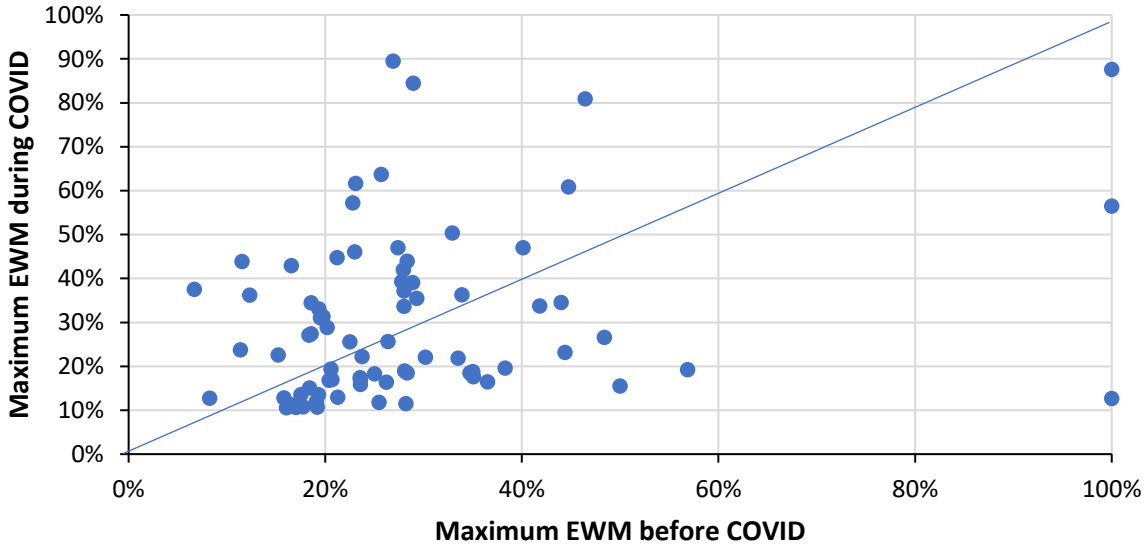


The relative position of countries will change as more recent data becomes available. However, after all the hot air generated by the National Press it is nice to see an unbiased view of where the UK stands relative to other countries – roughly equivalent to Russia and Egypt. The USA is such a large country (52 states which are bigger than many countries), that the Press can always find something bad to report. However, the reality is US EWM equivalent to Germany. Germany stayed out of the news by under-reporting COVID deaths – using a highly stringent criterion of death due to COVID rather than with COVID. Did I hear someone mutter, “Lies, dammed lies and COVID-19 statistics”?

To provide greater insight Figure 2 shows the maximum EWM during COVID compared to the maximum EWM before COVID. Within the limitation of available data nearly one-half of countries have had an EWM during COVID which is ***lower*** than in the years before COVID. To be fair, some countries (as in

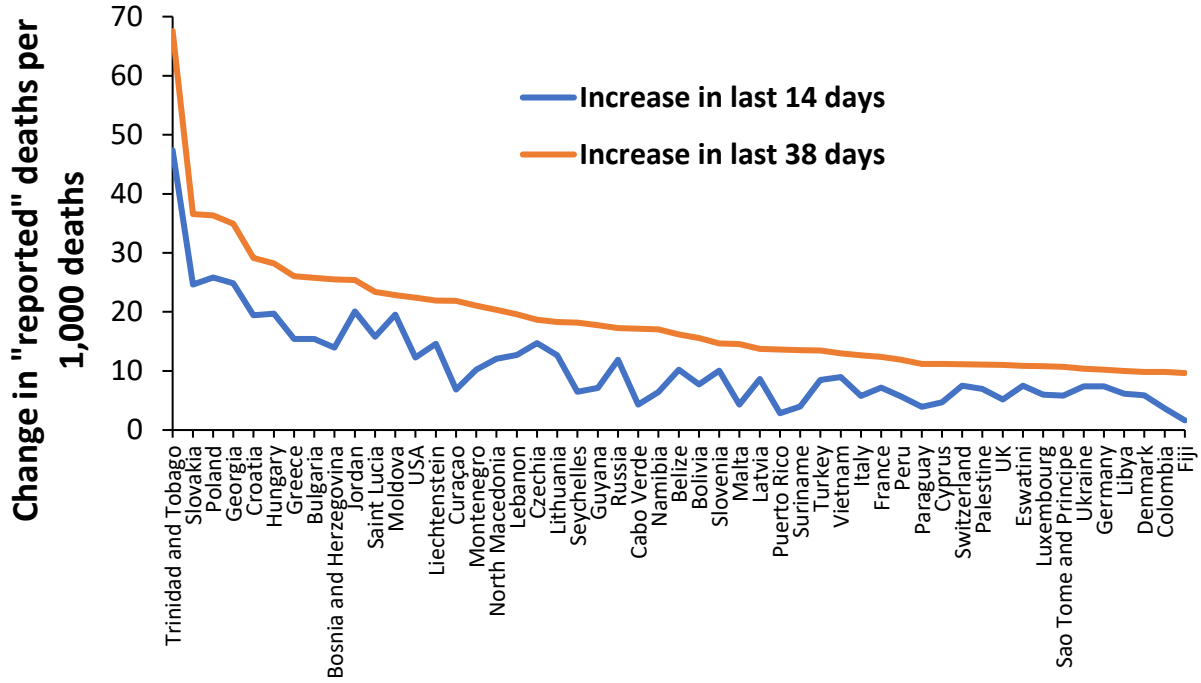
Table 1) have been very badly hit with up to 3-times higher winter deaths. Due to Poisson randomness smaller countries can experience a high maximum. As always, there will be local hotspots in high population density locations – hence London is usually badly affected, as are most large cities.

Figure 2: Maximum EWM before COVID compared to maximum EWM during COVID for world countries. The line shows 1:1 equivalence.



Finally, Figure 3 shows the increase in reported COVID-19 deaths for the 50 highest countries in the 14 and 38 days to 22nd January. Note that in the 38 days there will still be Delta variant deaths before Omicron out-competes the Delta strain in various countries.

Figure 3: Change in reported COVID deaths per 1,000 deaths pre-COVID in the 24 days to 8th January 2022 for the 50 highest countries



Compared to previous examples of this Figure the scale on the Y-axis is very small and the increase is over 14 and 38 days rather than the space of a week, as was previously used. Has Omicron been a blessing in disguise? Should booster jabs have been reserved for the most vulnerable? Was this the moment when natural immunity should have been encouraged?

Dammed if you do, dammed if you don't! No government would risk going down the natural immunity route for fear of getting it wrong. Imagine the media furore! As far as I can see there was no justification for countries attempting to enforce booster vaccination – people are allowed to make choices, even if they are misinformed or wrong! As for healthcare staff, offer an antigen test, and gentle persuasion if there has been no prior exposure. At some point we must live with COVID as we do with influenza plus other nasty winter pathogens (especially if you are elderly) against which there is no vaccine, and little attention.

Nothing to report regarding admissions per death or occupied beds per death – trends are not too distant from the last time this was reported.

Too early to see if excess winter mortality has been affected – will have to wait until around March for that.

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak? Part LVII. Safest UK locations during COVID

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Safest places to live during COVID

- Safest places to live in the UK during COVID-19 have been Moray and Highland in Scotland, Torridge, Mid and East Devon in Devon, and Mendip in Somerset.
- Worst CCG to live in was NW London, worst local authority – Brent.

Ongoing trends in deaths in the UK

- COVID-19 admissions per COVID deaths reaches a minimum in the winter and a peak in the summer, i.e., counter intuitively there are more admissions per death when COVID activity is lowest.
- However, this ratio has been running high since August of 2021 – something peculiar is happening.
- The peculiar trend to higher deaths continues in the UK and this is illustrated by the rolling excess winter mortality (EWM) calculation.

What does influenza vaccination effectiveness measure?

- Shall we call a spade a spade – influenza vaccination is not the best example of the otherwise spectacular success of vaccination.
- Communication of the limitations of influenza vaccination is a genuine "knotty" problem.
- However, it is true that influenza vaccination in working age adults, such as health care workers, does ***reduce*** average sickness absence.
- Influenza vaccination also looks to be protective against subsequent infection by coronaviruses in general and COVID-19 in particular.
- See a discussion of the issues at the end of this part.

Errata for previous issues: See Part LII

For wider research on roles of infectious outbreaks on health care capacity and cost fluctuations: See Vol. 47, No. 3, Winter 2021 (healthfinancejournal.com)

Under reporting of COVID deaths in Peru. During May 2020 there were 7-times more reported deaths that in other years, plus an estimated 20%-30% of

unreported deaths. The COVID-19 pandemic seriously disrupted the mortality reporting process in Peru. How has COVID-19 impacted the civil registration and vital statistics system in Loreto, Perú? Evidence using process mapping and qualitative analysis | BMJ Open

The 2-meter rule is only effective if you are wearing a mask, Estimates of the stochasticity of droplet dispersion by a cough: Physics of Fluids: Vol 33, No 11 (scitation.org)

A new heavily mutated variant of COVID has been discovered in South Africa. Covid: New heavily mutated variant B.1.1.529 in South Africa raises concern - BBC News – 50 mutations in one go! Was this a case of 50 mutations too far – results so far indicate a mild illness as a trade off against rapid transmission. Sufficient justification for booster jabs? See next line.

A comprehensive review of possible unintended consequences of mRNA COVID vaccines, Worse Than the Disease? Reviewing Some Possible Unintended Consequences of the mRNA Vaccines Against COVID-19 | International Journal of Vaccine Theory, Practice, and Research (ijvtpr.com) *This is a MUST read.*

As has been emphasized in this series COVID-19 outbreaks show high spatiotemporal granularity which leaves room for safe spots in which to live.

Figure 1: Maximum excess winter mortality (EWM) in the 20-years before COVID compared for local government areas across the UK

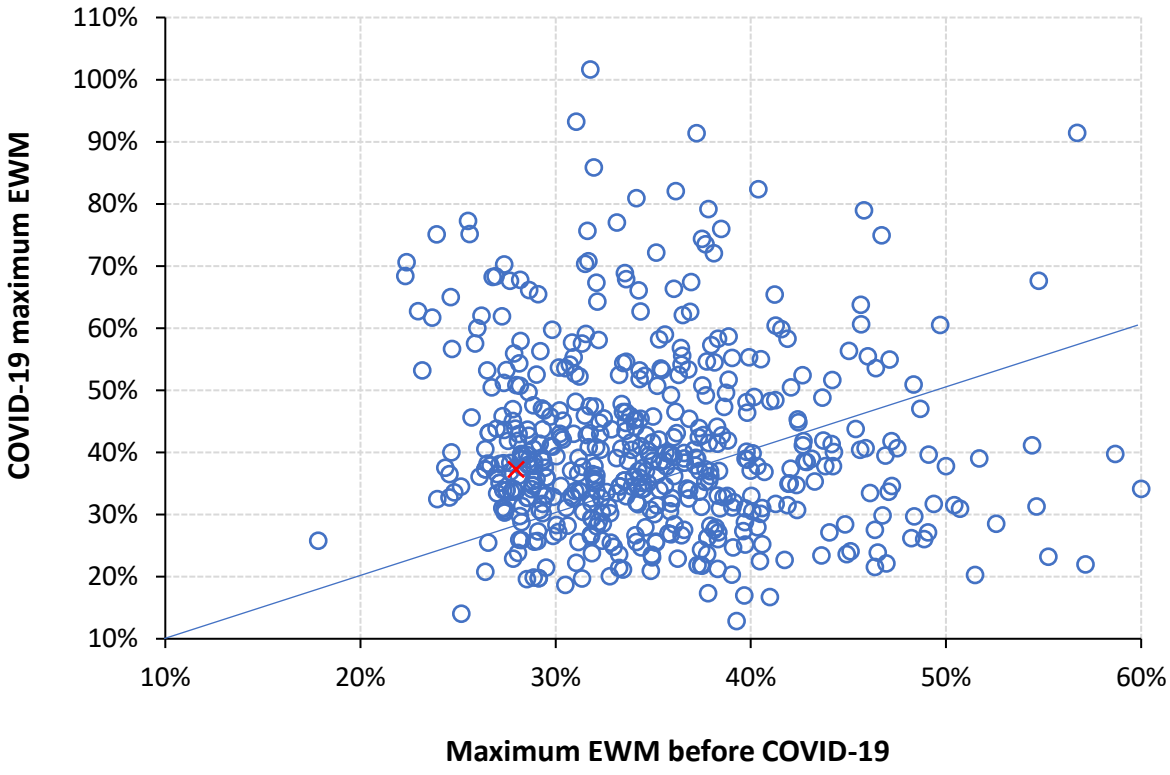


Figure 1 illustrates these safe spots by comparing the maximum excess winter mortality (EWM) before COVID to the maximum EWM during COVID. The red

cross is the UK. Any area under the dashed line has had lower EWM during COVID than the maximum over the previous 20-years.

The worst affected places by high EWM are Brent 102%, Harrow 93%, Newham and Gravesham 91% and Hertsmere 86%. The worst CCG was NW London 75%. The least affected CCGs were Devon 20% and Nottinghamshire 27%.

The last few parts of this series have discussed peculiar trends in all-cause mortality seen since June/July of this year. Figures 2 and 3 explores this issue by looking at the ratio of COVID-19 hospital admissions per COVID-19 death and COVID occupied beds per death. To complicate matters the lag between admissions and deaths seems to shift between 10- and 25-days depending on seasonal effects. This behaviour is included in Figure 2 and the black line 'minimum' tracks the minimum value of the ratio. The ratio goes to a minimum at the ***peak*** of an outbreak and then reaches a maximum during the summer. However, since June/July this ratio is showing intermediate behaviour. Clearly mass vaccination has reduced both deaths and admissions (both the numerator and denominator), but admissions seem to have been reduced less than deaths, hence the higher ratio. Data is from [Healthcare in the UK | Coronavirus in the UK (data.gov.uk)]

Figure 2: Ratio of COVID-19 hospital admissions per COVID-19 death for the whole UK.

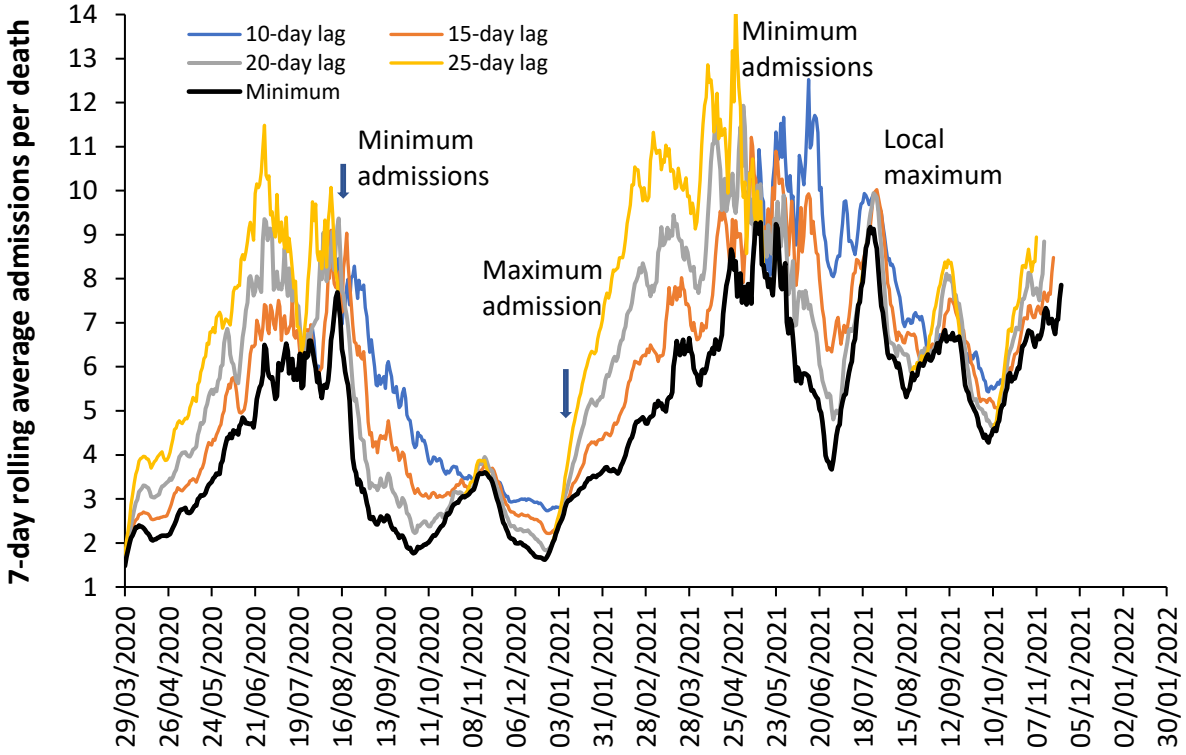
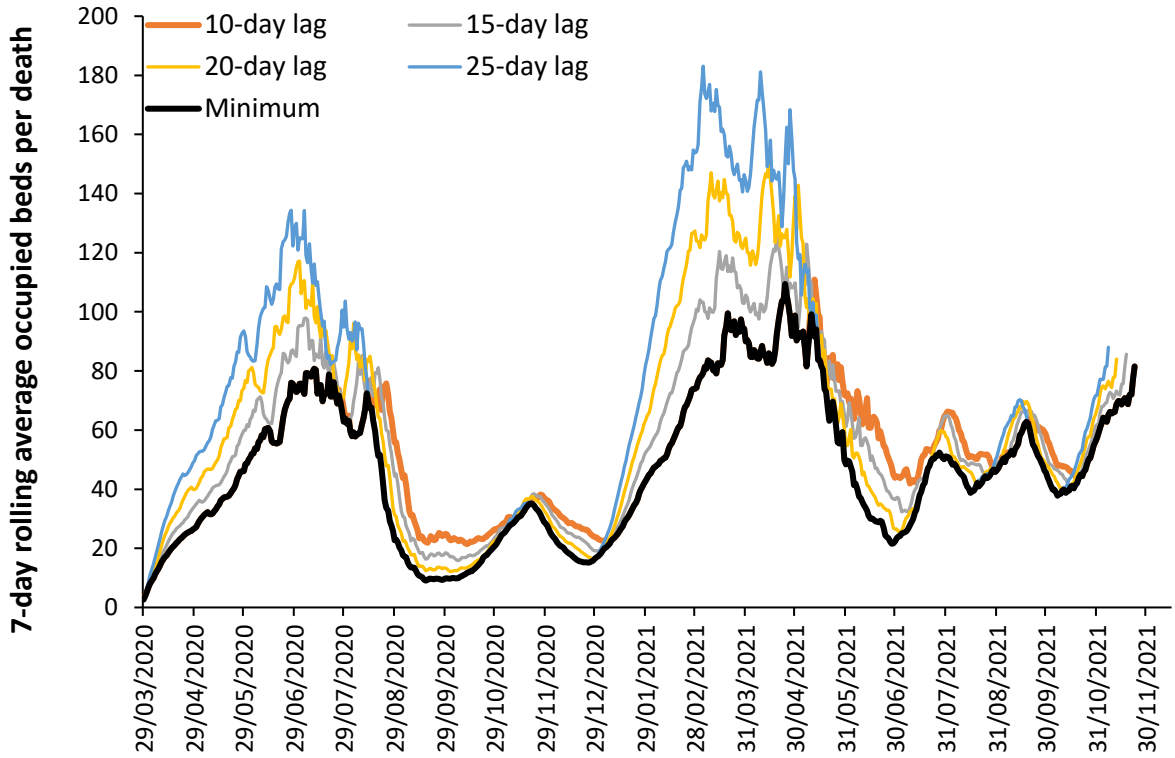
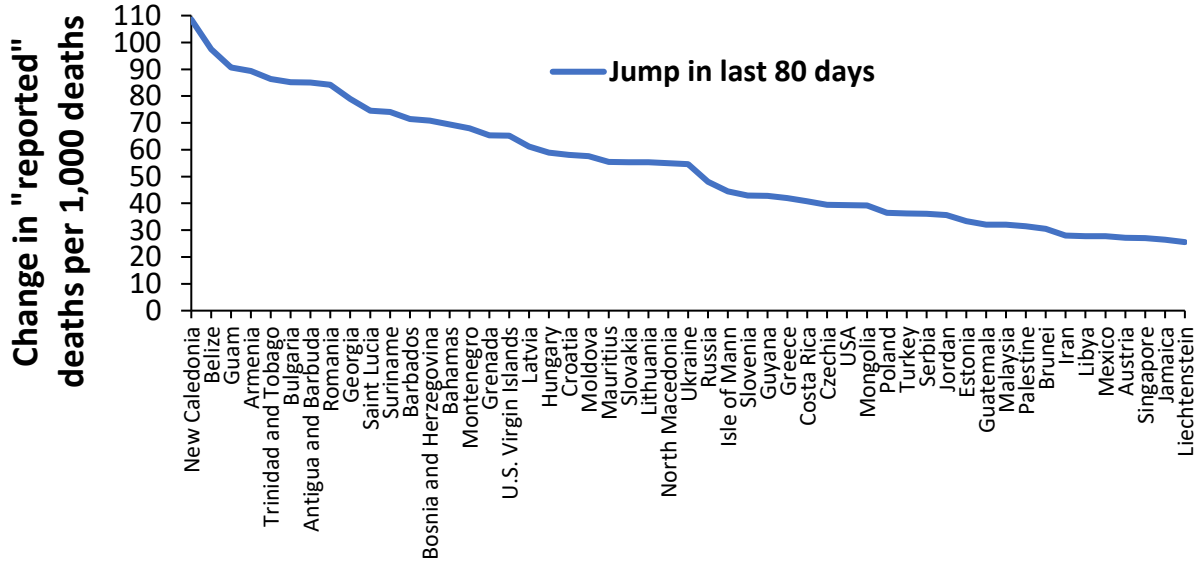


Figure 3: Ratio of COVID-19 occupied beds per COVID-19 deaths for the whole UK.



Advances in therapeutics have reduced mortality but admissions to hospital have also been reported to be mainly from the unvaccinated, hence, the ratio is probably a mix of multiple factors. However, the result is that the health care system is running at a higher ratio of admissions and occupied beds per death. Omicron is upon us so this trend will be evaluated again after Christmas.

Figure 4: Change in reported COVID deaths per 1,000 deaths (before COVID) over the past 80 days.



It has been 80 days since my last international analysis and Figure 4 gives the change in reported COVID-19 deaths per 1,000 deaths (before COVID). As can be seen outbreaks in a mix of countries in Europe, the Caribbean, and parts of North Africa/Asia. The USA is still a top 50 high growth country. The UK ranks at #60 not far from Germany, Brazil and Peru. Usual caution – counting of COVID deaths differs markedly between countries.

This trend will likewise be evaluated after Christmas when the effects of Omicron are more apparent. The issues of higher all-cause mortality since June and excess winter mortality will be revisited in the New Year.

Part 3 of the sub-series on 'What does vaccine effectiveness mean?' now follows.

Influenza vaccination is a poor example of the otherwise spectacular success of vaccination in general

Introduction

This is the third and final part of a series investigating vaccine effectiveness, using influenza as an example of a more complex pathogen/vaccination scenario. There may eventually be similarities with COVID-19 vaccination.

Sometimes there is no point poncing around, you just have to call a spade a spade. Influenza vaccination is indeed by far the least exemplary example of the otherwise spectacular success of vaccination in general. Communication to the public of the limitations of influenza vaccination raises multiple dilemmas.

To qualify the above, most of the public do not have a scientific or medical degree, and some have no interest in any technical discussion on the topic. Public Health agencies have the added complication of the anti-vaxxer movement – and the risk that vaccination *in general* may be confused with the *specifics* relating to influenza vaccination.

Turning first to the spectacular successes of vaccination in general – with a prodigiously long list of life saving vaccines.[2]

[2] Vaccination timeline table from 1796 to present - GOV.UK (www.gov.uk)

Examples of the prodigious success of vaccination in general

The 'pox' (smallpox) which could leave your face pitted and disfigured was one of the deadliest human diseases.[3] This was largely eliminated thanks to the pioneering work of Edward Jenner and cowpox vaccination which was first introduced in 1796. Incidentally the National Press of the time mercilessly ridiculed his work!

Before World War 1 tuberculosis (TB) was a major cause of serious and lingering illness and eventual death. The first human trial was conducted in 1921. A major vaccination programme after World War 2 led to the virtual elimination of TB in the major developed countries.[4,5]

Polio (which damages the nerves and causes partial or complete paralysis) was a greatly feared disease and killed many leaving unfortunate survivors to exist in an 'iron lung'[6] (developed in the late 1920's) – the first form of assisted ventilation as seen in modern critical care units. Hundreds of thousands of children were paralysed every year. The first vaccines became available in the 1950's.[7]

See reference #1, the list is long and noteworthy. The major controversies started with the MMR (measles, mumps rubella) vaccine fiasco – where once again the National Press were instrumental in promoting a scientific debacle.[8] The internet and social media has subsequently made the situation far worse.

Know your DNA and RNA viruses

All RNA viruses have high mutation rates.[9] These include influenza(s), coronaviruses including COVID-19, respiratory syncytial virus (RSV), rhinovirus, poliovirus, hepatitis C, HIV, Ebola, etc.[10] DNA viruses (cytomegalovirus, adenovirus, herpes viruses, varicella, etc) mutate more slowly, and their upper mutation rate is where RNA virus mutation rates start.[11] As a general rule, the smaller the genome the faster the mutation rate.

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[3] Smallpox vaccines (who.int)
[4] The history of tuberculosis: from the first historical records to the isolation of Koch's bacillus (nih.gov)
[5] History of BCG Vaccine (nih.gov)
[6] History of the Iron Lung or Respirator (thoughtco.com)
[7] History of Polio – GPEI (polioeradication.org)
[8] The MMR vaccine and autism: Sensation, refutation, retraction, and fraud (nih.gov)
[9] Mutation rates among RNA viruses https://doi.org/10.1073/pnas.96.24.13910, A speed–fidelity trade-off determines the mutation rate and virulence of an RNA virus (nih.gov)
[10] RNA Viruses: RNA Roles in Pathogenesis, Coreplication and Viral Load (nih.gov)
[11] Viral mutation rates - PubMed (nih.gov)

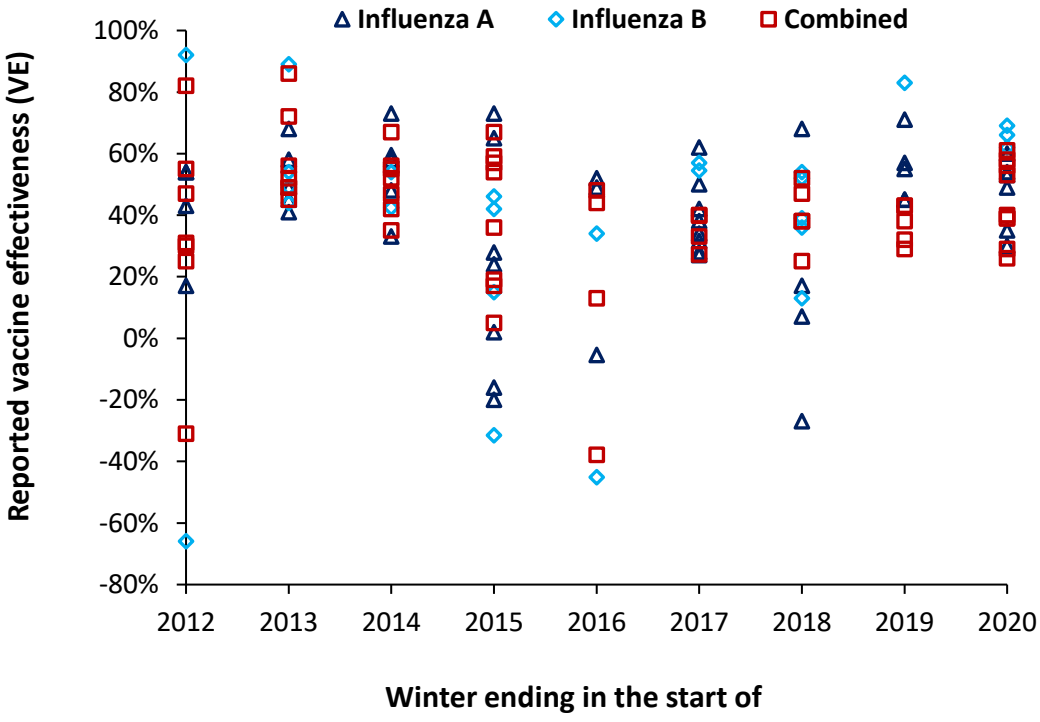
In some instances, the mutation rate for the antigenic virus coat makes vaccine formulation more challenging – as we all well know from COVID-19, and for influenza(s). By pure coincidence the vaccine effectiveness (VE) of the COVID-19 vaccines **for elderly persons** has been far higher than anything ever achieved by influenza vaccines. Influenza VE also varies by the method of production, i.e., cell-based versus egg-based.[12] Given the current approach to influenza vaccine formulation, influenza is a tricky virus to achieve a consistently high VE for the main target group (the elderly).

We can now turn to the specifics regarding influenza vaccination.

Specifics relating to influenza

Figure A1 presents a random sample of international influenza vaccine effectiveness (VE) studies from the winter of 2011/12 through to 2019/20.

Figure A1: A random selection of all-age influenza vaccination effectiveness (VE) estimates from the winter of 2011/12 to 2019/20 from various countries. *Note that data from the southern hemisphere (Australia and New Zealand) for the mid-year winter is reported as the winter ending in the following year as in the northern hemisphere, i.e., winter 2011 shows in winter 2011/12, etc.*



[12] Comparing influenza vaccine effectiveness between cell-derived and egg-derived vaccines, 2017-2018 influenza season - PubMed (nih.gov)

These are for all-age VE and are the VE measured in a primary care, outpatient, or emergency department context. The context depends on how each country organises its influenza surveillance network. All figures are from studies published in peer reviewed journals and are for VE after adjusting for age, risk factors, and timing of vaccination (VE diminishes with time)[13].

The raw VE, i.e., the VE experienced by the sample group, is generally ***lower*** than adjusted VE. Even now researchers write comprehensive reviews trying to understand VE,[14] which most members of the public would find incomprehensible and potentially confusing. Note that VE estimates specific to hospitalization and death are less studied than the primary care/outpatient context commonly reported on Public Health websites.

What is not shown in Figure A1 is that the confidence intervals are usually large because the sample size is generally small, even for relatively big countries such as the USA. However, the scale ranges from negative (yes negative) -80% through to +100%. To further complicate the picture VE is an estimate across all vaccine types (from different manufacturers) and across all ages.

As I have pointed out in previous parts, the VE for persons aged 65+ is **lower** than for the **all-age** VE in Figure A1, and averages around 40%. Most influenza deaths occur in persons aged 65+, the very age group in which VE is lowest.

Next is the seeming undulation in VE with a minimum around 2014/15 and 2015/16. During 2014 several significant new antigenic variants (called clades) arose,[15] which caused havoc in the 2014/15 and 2015/16 winters. The seasonal vaccines were subsequently updated and together with natural immunity the VE recovered in 2016/17 reaching a maximum in 2019/20. At this point COVID-19 burst on the international scene.

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[13] Ray G, Lewis N, Klein N, et al. Intraseason waning of influenza vaccine effectiveness. *Clinical Infectious Diseases*, 2019; 68(10): 1623 –1630. https://doi.org/10.1093/cid/ciy770

[14] Lewnard J, Cobey S. Immune history and influenza vaccine effectiveness. *Vaccines*. 2018; 6(2):28. https://doi.org/10.3390/vaccines6020028

[15] Naeem A, Elbakkouri K, Alfaiz A, et al. Antigenic drift of hemagglutinin and neuraminidase in seasonal H1N1 influenza viruses from Saudi Arabia in 2014 to 2015. J Med Virol. 2020; 92: 3016– 3027. https://doi.org/10.1002/jmv.25759

Valenciano M, Kissling E, Reuss A, et al. Vaccine effectiveness in preventing laboratory-confirmed influenza in primary care patients in a season of co-circulation of influenza A(H1N1)pdm09, B and drifted A(H3N2), I-MOVE Multicentre Case–Control Study, Europe 2014/15. Euro Surveill. 2016; 21(7): pii=30139. https://doi.org/10.2807/1560-7917.ES.2016.21.7.30139

So, what does VE mean to you as an individual? VE is a population-wide estimate that does not apply to individuals. The risk for the individual is a mix of biological rather than chronological age, comorbidities, mutations in key genes[16,17,18] overlaid by epigenetic factors which partly regulate gene expression, plus individual variation in immune function[19] and biological responses to vaccination.[20] The net result is such that with current technology no one can tell you the degree to which you may benefit from influenza vaccination. Vaccination is a population wide issue.

The dilemma faced by public health agencies

Public health agencies must give their advice based on a consideration of the best available evidence**.** The public expects them to weigh the evidence on their behalf. As a government agency their advice must be conservative. They are not at liberty to pursue the nuances of the latest research and must wait till there is a body of conclusive evidence.

No public health agency has ever claimed that influenza vaccination is 100% effective, merely that within the available evidence influenza vaccination is recommended, especially for persons with risk factors.

The evidence can sometimes be conflicting or ambiguous. This ambiguity has the unfortunate consequence that the anti-vaxxers can take an alternative view of reality by selecting pieces of evidence which in isolation appear to confirm their views.

How does pathogen-interference affect the situation?

In the previous two parts I have discussed the potential role of pathogen interference in the net effect of influenza vaccination. In pathogen interference, an individual is given an influenza vaccine but is subsequently infected by a non-influenza virus.

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[16] Mehrbod P, Eybpoosh S, Farahmand B. *et al.* Association of the host genetic factors, hypercholesterolemia and diabetes with mild influenza in an Iranian population. *Virol J* 2021; **18:** 64. https://doi.org/10.1186/s12985-021-01486-3

[17] Downes, D.J., Cross, A.R., Hua, P. *et al.* Identification of *LZTFL1* as a candidate effector gene at a COVID-19 risk locus. *Nat Genet* 2021; **53,** 1606–1615. https://doi.org/10.1038/s41588-021-00955-3

[18] https://doi.org/10.1016/j.ebiom.2021.103390**.**

[19] Duffy D. Understanding immune variation for improved translational medicine. Cur Opin Immunology 2020; 65:83-88. https://doi.org/10.1016/j.coi.2020.06.005.

[20] Jenkins B, Hunter J, Cross M, et al. When is affect variability bad for health? The association between affect variability and immune response to the influenza vaccination. J Psychosomatic Res 2018; 104: 41-47. https://doi.org/10.1016/j.jpsychores.2017.11.002.

Given the sheer logistics of mass vaccination it is necessary to commence influenza vaccination early in the winter when the incidence of influenza is very low, and the consequent likelihood of infection by another pathogen is much higher. Hence, individuals vaccinated early in the season are at greater risk of pathogen interference.

Other than the Polish study[21] which suggested that timing should be an issue (as a general principle) there are no studies investigating if this timing issue is indeed the case with influenza vaccination.

The benefits of influenza vaccination

So, what are the benefits of influenza vaccination? The first conclusive benefit is reduced ***average*** sickness absence among working age adults, including health care workers.[22,23,24] This has the effect of reducing primary care (GP) workload during winter.[25]

Despite the occasional occurrence of negative VE, the overwhelming evidence is that influenza vaccination offers a measure (median VE 43%, interquartile range 32% - 54% in Figure A1) of protection against illness, hospital admission and death from influenza. This is especially so for persons with risk factors. Hundreds of studies exemplify this fact. It is a proven fact that unvaccinated persons have a higher risk of serious illness and death from influenza.

The final reason is that influenza vaccination has been shown to offer a measure of protection against illness due to coronaviruses in general, and

[21] Berencsi G, Kapusinszky B, Rigó Z, Szomor K. Interference among viruses circulating and administered in Hungary from 1931 to 2008. Acta Microbiol Immunol Hung. 2010, 57(2), 73–86. doi: 10.1556/AMicr.57.2010.2.1.
[22] Pereira M, Williams S, Restrick L, et al. Healthcare worker influenza vaccination and sickness absence - an ecological study. Clin Med (Lond). 2017;17(6):484-489. doi:10.7861/clinmedicine.17-6-484
[23] Zaffina S, Gilardi F, Rizzo C, et al. Seasonal influenza vaccination and absenteeism in health-care workers in two subsequent influenza seasons (2016/17 and 2017/18) in an Italian pediatric hospital. Expert Review of Vaccines 2019; 18(4): 411-418, DOI: 10.1080/14760584.2019.1586541
[24] Brown F, Cummings A, Gaydos D, et al. Protecting healthcare personnel in outpatient settings: The influence of mandatory versus nonmandatory influenza vaccination policies on workplace absenteeism during multiple respiratory virus seasons. Infection Control & Hospital Epidemiology, 2018; 39(4), 452-461. doi:10.1017/ice.2018.9
[25] Van Ourti T, Bouckaert N. The Dutch influenza vaccination policy and medication use, outpatient visits, hospitalization and mortality at age 65. Eur J Public Health. 2020; 30(2): 275-280. doi: 10.1093/eurpub/ckaa016.

against COVID-19 in particular.[26,27,28] Without citing the sources a number of other studies have reached the same conclusion across different age groups. No one knows why this association occurs.

The anti-vaxxer claim that natural immunity is better than vaccination

No one in their right mind would suggest that exposing yourself and your children to the likes of the polio virus, smallpox, tuberculosis, etc, etc to gain natural immunity is a rational alternative to vaccination. To do so is to have a malicious desire to cause harm ……. although many anti-vaxxer followers do not realize the insidious reality behind this claim.

Also, natural infection with some pathogens such as RSV and malaria does not confer protection against reinfection.[29] Many pathogens such as influenza exist as multiple types, hence, influenza B infection does not confer immunity against influenza A, etc. Likewise, rapidly mutating viruses such as RSV, HIV, Influenza, COVID-19 evade natural immunity.

However, the issues regarding natural immunity become clearer when it comes to influenza. This is due to a phenomenon known as antigenic priming (formerly called antigenic original sin), i.e., the first influenza virus you encounter as a child primes your antigenic response – your natural immunity.[30]

This type of natural immunity is however a double-edged sword. Hence while antigenic priming protected the elderly during the Swine flu pandemic[31] it was seemingly the basis for the huge mortality seen among 28-year-olds during the Spanish flu pandemic.[32] See Part LIII regarding single year of age and COVID mortality.

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[26] Effect of inactivated influenza vaccination on human coronavirus infection: Secondary analysis of a randomized trial in Hutterite colonies - PubMed (nih.gov)

[27] Influenza vaccination and the risk of COVID-19 infection and severe illness in older adults in the United States | Scientific Reports (nature.com)

[28] Conlon A, Ashur C, Washer L, Eagle KA, Hofmann Bowman MA. Impact of the influenza vaccine on COVID-19 infection rates and severity. Am J Infect Control. 2021; 49(6): 694-700. doi: 10.1016/j.ajic.2021.02.012.

[29] Pulendran B, Ahmed R. Immunological mechanisms of vaccination. *Nat Immunol*. 2011;12(6):509-517. doi:10.1038/ni.2039

[30] Original antigenic sin priming of influenza virus hemagglutinin stalk antibodies - PubMed (nih.gov)

[31] Original Antigenic Sin and Pandemic (H1N1) 2009 - Volume 16, Number 6—June 2010 - Emerging Infectious Diseases journal - CDC

[32] Gagnon A, Miller MS, Hallman SA, et al. Age–specific mortality during the 1918 influenza pandemic, unravelling the mystery of high young adult mortality. *PLoS One*. 2013, 8(8), e69586. Published 2013 Aug 5. doi:10.1371/journal.pone.0069586

Hence the basic conclusion is that natural immunity is a double-edged sword and cannot be relied upon for effective immunity on all occasions.

Conclusion

Vaccination against a long list of eminently dangerous pathogens has been hugely successful. It is true that influenza vaccination protects against influenza, however, with varying degrees of success, and occasional instances of negative vaccine effectiveness. The issues surrounding influenza vaccination are genuinely complex, and some issues remain to be resolved scientifically.

One current area of debate is whether repeated influenza vaccination weakens the immune response over time. Once again conflicting evidence.

Part of the problem lies in the ability of influenza to rapidly mutate. Public Health Agencies appear to have created a vaccination story which is overly simplified. The ambiguity in how an influenza death is estimated [33]and poor communication of this has inadvertently created an opportunity for anti-vaxxers and conspiracy theorists.

Given the inherent uncertainty regarding VE it is my opinion that influenza vaccination should not be compulsory – as is the case in the UK. Many individuals will only experience an asymptomatic infection, but others have inherent genetic predisposition to worse outcomes. Whoever lies in which group is unknown. There is always the inherent risk that declining influenza vaccination may not be the correct decision, which the individual must accept as the consequences of their choice – exercised amid ambiguity.

In my opinion, public health agencies have correctly advised the population to receive influenza vaccination, a decision based on the best available evidence, and their conservative role as government agencies. Whether public health agencies should be more proactive regarding issues such as pathogen interference depends on your view of their role. The crux of the “knotty” problem.

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[33] Nielsen J, Krause TG, Mølbak K. Influenza-associated mortality determined from all-cause mortality, Denmark 2010/11-2016/17: The FluMOMO model. Influenza Other Respir Viruses. 2018 Sep;12(5):591-604. doi: 10.1111/irv.12564.

Issues relating to pathogen interference (previous part) require far greater research, i.e., the currently available evidence is insufficient to alter the current recommendation regarding vaccination but seems to be pointing in an important direction. Logic suggests that persons vaccinated early in the winter when influenza activity is low (and other pathogen levels are higher) could be at highest risk of pathogen interference. It must be pointed out that estimates of VE do vary from the start to the end of the season, however, so does the mix of influenza strains and other pathogens. This probably needs some mathematical modelling to unravel yet another 'knotty' problem. The public deserves this level of investment to assure them that there are no hidden unexpected outcomes.

Targeting the influenza stalk protein antigens (as has been done over the past 80 years) has only produced lacklustre influenza VE and better vaccines of the future may target the larger base protein,[34] or other antigenic areas of the surface.[35] The development of anti-viral drugs is an alternative route.

In my opinion the issues relating to pathogen interference remain the area of greatest risk to the net benefits of influenza vaccination but are the least scientifically explored.

Recall that pathogen interference also applies to COVID vaccination – but no one has had the time to do any research yet. As has always been the case, medical science progresses in the face of ambiguity.

[34] Stalking new vaccines: Methods that target the stems of viral proteins could put universal vaccines within reach | Nature Medicine

[35] The Future of Influenza Vaccines: A Historical and Clinical Perspective (nih.gov)

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak? Part LVI. UK deaths continue to rise

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See http://www.hcaf.biz/2010/Publications_Full.pdf for all research.

Ongoing trends in deaths in the UK

- The peculiar trend to higher deaths continues in the UK and this is illustrated by the rolling excess winter mortality (EWM) calculation.
- The EWM calculation has never risen so rapidly and as early as it has done in 2021 since mid-June.

What does influenza vaccination effectiveness measure?

- The discussion in Part LV is extended to include an overview of the history of controversies in influenza vaccination and how the unrecognised role of pathogen interference may have contributed to these controversies.

Errata for previous issues: See Part LII

For wider research on roles of infectious outbreaks on health care capacity and cost fluctuations: See Vol. 47, No. 3, Winter 2021 (healthfinancejournal.com)

It would appear that COVID-19 spike proteins interfere with the process of DNA repair, see SARS–CoV–2 Spike Impairs DNA Damage Repair and Inhibits V(D)J Recombination In Vitro (nih.gov). mRNA vaccines (which instruct cells to produce spike proteins) may have unintended consequences – only time will tell.

Some people have natural immunity to COVID-19, see Pre-existing polymerase-specific T cells expand in abortive seronegative SARS-CoV-2 | Nature – immunity seemingly delivered by an alternative route to high antibody levels.

Molnupiravir may damage human DNA, see Buyer beware: molnupiravir may damage DNA | The BMJ – COVID-19 has well and truly thrust us into a world of competing dilemma's. From which, in years to come, we will emerge somewhat the wiser.

Breakthrough variants in vaccinated individuals, see An observational study of breakthrough SARS-CoV-2 Delta variant infections among vaccinated healthcare workers in Vietnam

(gmed-una-storage.s3.amazonaws.com) – vaccination coupled with variation in human immune function was always going to shape the course of COVID-19 evolution.

In confirmation of observations made in Part LV is a study in adults aged 60+ where (as expected) influenza vaccination reduced the rate of influenza infection, however, influenza vaccination had ***no effect*** on the rates of influenza-like-illness (ILI), because lower rates of influenza was substituted by other winter pathogens.[36] Hence, it has been demonstrated that in particular places at specific times influenza vaccination can shift the balance of pathogens and either has no effect on ILI rates (in older adults) or increases rates of ILI (in children). The outcomes in children have been confirmed in another study.[37] The available evidence regarding working age adults is inconclusive. We all remain somewhat poorly informed regarding the unintended immunological effects of influenza vaccination toward non-influenza infection following vaccination. Ah, the vicissitudes of life. *See section at the end of this part.*

Returning to the trends in deaths (all-cause mortality) in the UK. The rolling 52-week total trend in *all-cause* deaths in the UK continues to rise (as in Figure 1). As commented upon before, the rolling 52-week chart is useful because it summarises the net capacity pressure on the NHS for that 52-week period. Death is simply acting as a proxy for the nearness to death effect and the wider morbidity indicated by death. Put simply, any agent that will kill someone, will hospitalize many times more, and will cause illness in even more. COVID-19 and influenza are good examples.

Hence for the 52-week period ending 12th November 2021 the approximate capacity pressures in East Midlands are 29% higher than in the 52-week period ending 3rd February 2012. Clearly available acute beds are NOT 29% higher! Hence the crux of the NHS capacity problem.

Despite its usefulness it does have the problem that major surges (above and beyond usual) in deaths remain in the rolling 52-week total before they exit 52-weeks later. Hence the decline in the rolling 52-week total around April 2021 was due to the first wave of COVID-19 exiting the total.

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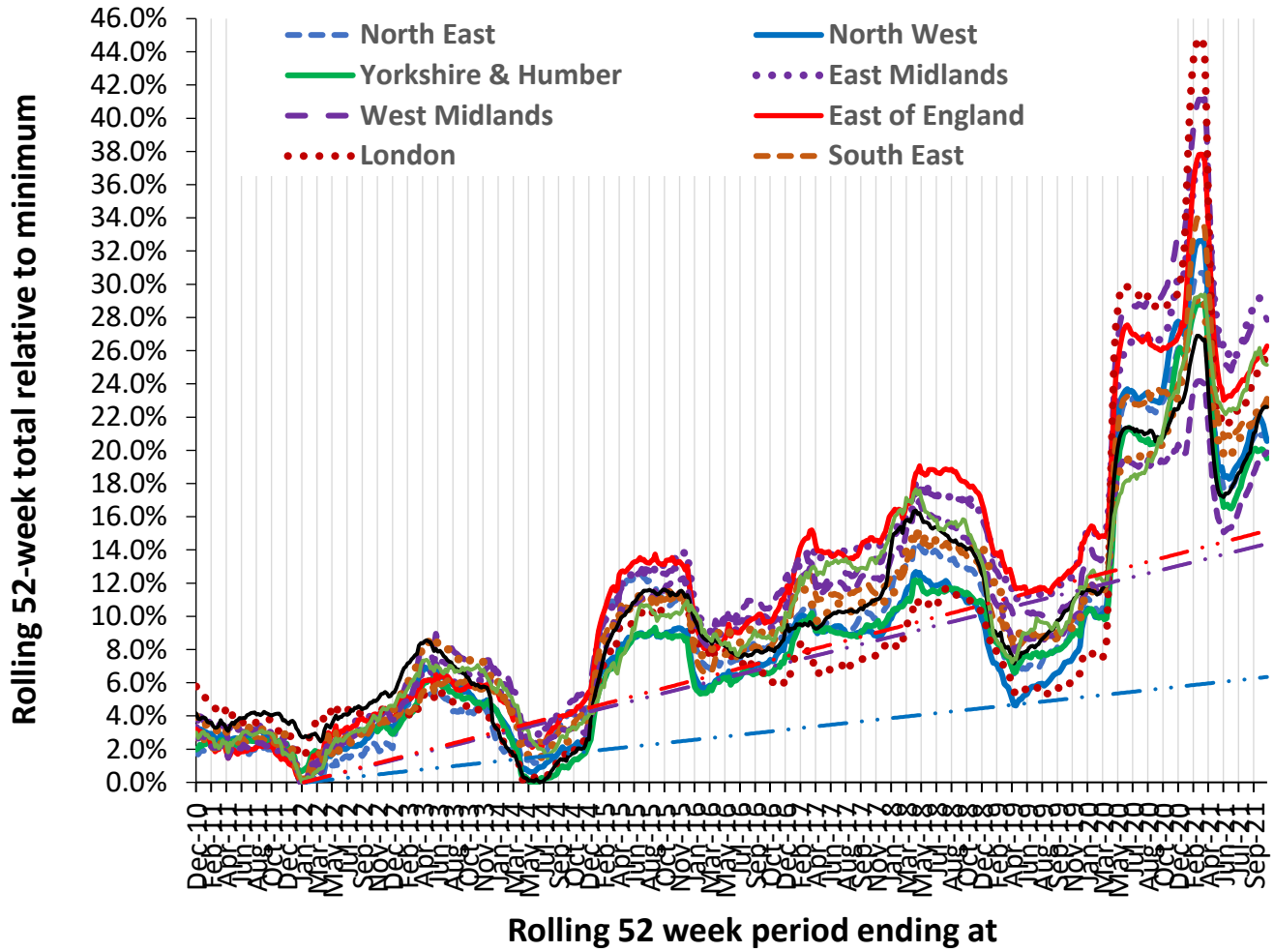
[36] van Beek J, Veenhoven R, Bruin J, et al. Influenza-like Illness Incidence Is Not Reduced by Influenza Vaccination in a Cohort of Older Adults, Despite Effectively Reducing Laboratory-Confirmed Influenza Virus Infections. J Infect Dis 2017; 216(4): 415–424. https://doi.org/10.1093/INFDIS/JIX268

[37] Rikin S, Jia H, Vargas CY, et al. Assessment of temporally-related acute respiratory illness following influenza vaccination. *Vaccine*. 2018;36(15):1958-1964. doi:10.1016/j.vaccine.2018.02.105

The second wave which commenced around October 2020 is now also starting to exit the rolling 52-week total which explains the small dip at the end of the recent increase.

Figure 1: Rolling 52-week total deaths relative to the minimum in 2012 or 2014, ending at the 52-week total ending 12th November 2021



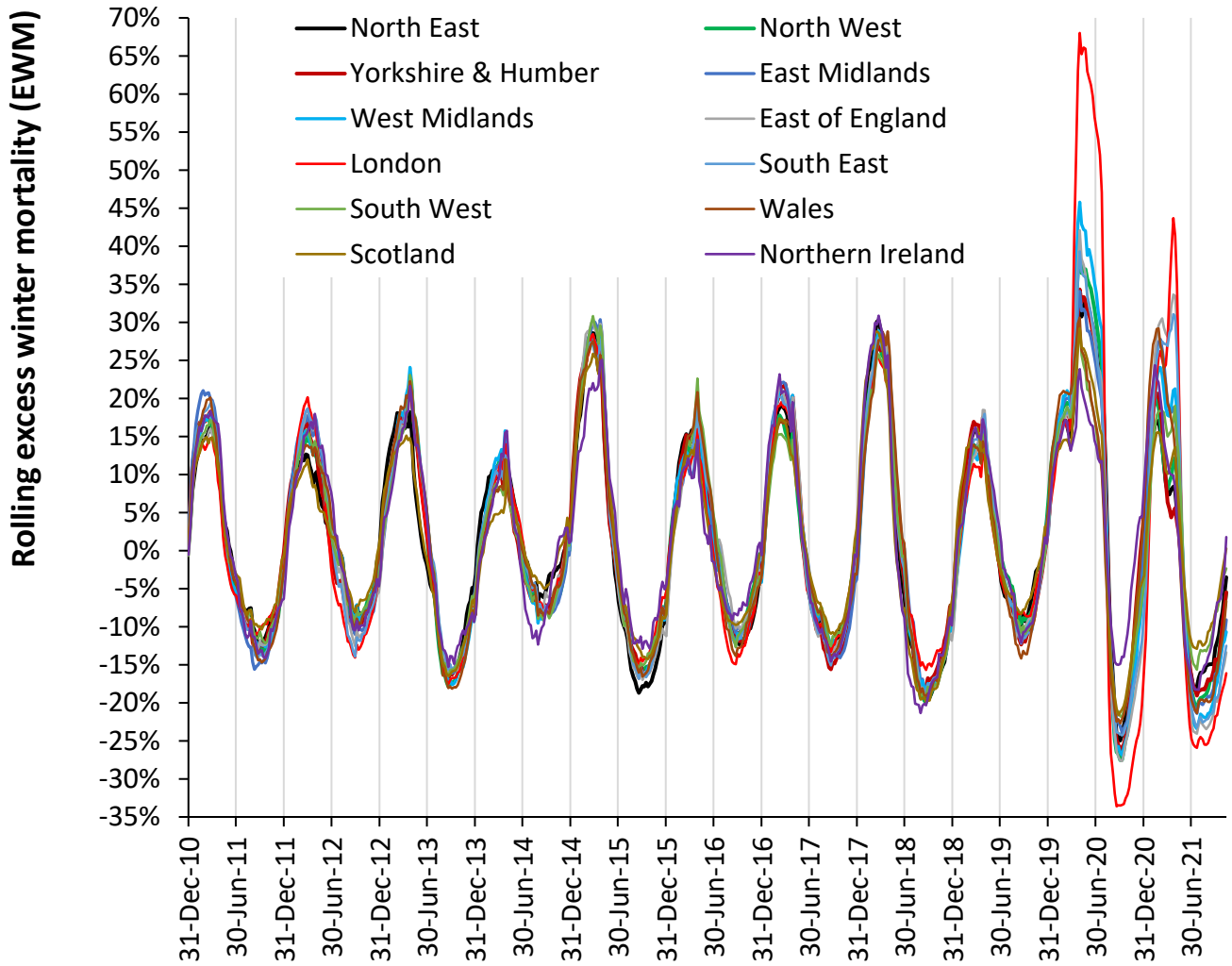
However, the recent increase is indeed real since it occurred in a time when there were no shifts (down) due to previous peaks in deaths. The lines showing baseline are to illustrate the baseline upward trend in deaths which will continue for the next 30-years as the members of the World War II baby boom all die. The East of England represents the highest upward trajectory – which will have been completely ignored in ALL capacity planning for this and all other regions.[38]

[38] Jones R. Does the ageing population correctly predict the need for medical beds over the next 40 years? Part one: Fundamental principles ***BJHCM 2021;*** 27(8): ***doi: 10.12968/bjhc.2020.0156*** Does the ageing population correctly predict the need for medical beds?: Part one: fundamental principles | British Journal of Healthcare Management (magonlinelibrary.com)
Jones R. Does the ageing population correctly predict the need for medical beds over the next 40 years? Part two: Wider implications. ***BJHCM 2021;*** 27(10): ***doi: 10.12968/bjhc.2021.0116*** Does the ageing population correctly predict the need for medical beds? Part two: wider implications | British Journal of Healthcare Management (magonlinelibrary.com)

This has arisen due to policy-based planning rather than evidence-based planning. The North West represents the region with the lowest baseline increase.

So how to avoid the limitations of the rolling 52-week total? We simply turn to the rolling excess winter mortality (EWM) calculation.[39] This is shown in Figure 2 where there is a very notable observation. Namely, the rolling EWM has NEVER risen so fast and so early as it has done since around August of 2021.

Figure 2: Rolling excess winter mortality (EWM) calculation ending 12th November 2021.



While this is partly due to COVID-19 deaths (see Figure 3), COVID-19 cannot explain the full increase.

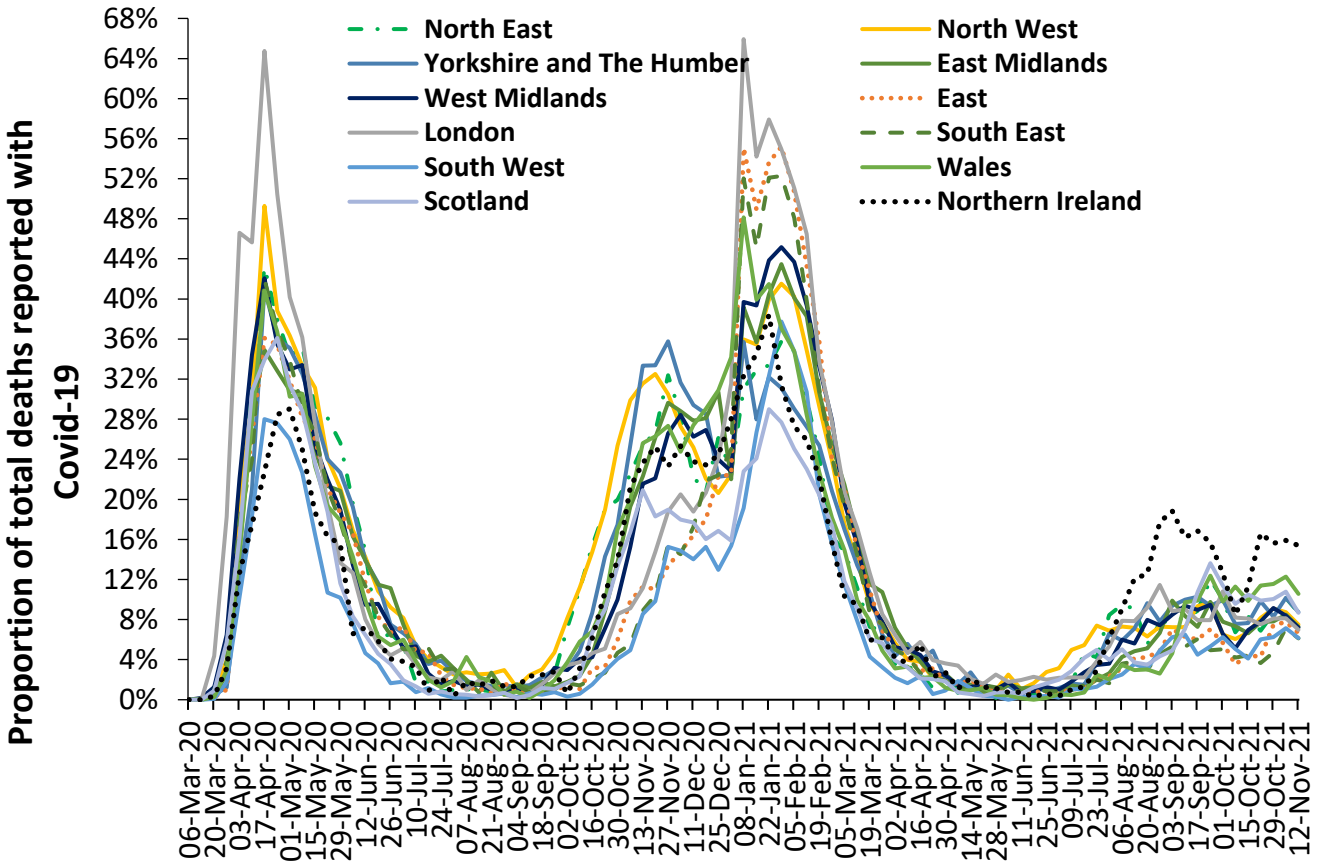
[39] Jones R. Excess winter mortality (EWM) as a dynamic forensic tool: Where, when, which conditions, gender, ethnicity, and age. ***Int J Environmental Research and Public Health 2021;*** 18(4); 2161. https://doi.org/10.3390/ijerph18042161

Regarding the exact date of the unexplained increase in deaths, note that a mid-June date from the rolling 52-week total (Fig. 1) is partly obscured by the first wave exiting the rolling total.

So why are all these extra deaths occurring? Is it possible that COVID-19 vaccination has inadvertently altered the pathogen balance? See Figures 16-18, (pp21-22) of the latest UK Health Security Agency report, Weekly Flu and COVID-19 Report w45 (publishing.service.gov.uk), where it can be seen that respiratory syncytial virus (RSV) and rhinovirus activity has been high. This nicely leads to a discussion regarding a *possible* role for pathogen interference in the world of influenza vaccination controversies which raged back in the 1980's to early 2000's.

Please do not misunderstand me! Vaccination is the best tool we currently have available. Use it! Vaccination against a wide range of pathogens has literally saved millions of lives.

Figure 3: Proportion of total deaths attributed to COVID-19, up to week ending 12th November 2021.



A Brief Overview of the Controversies in Influenza Vaccination Effectiveness

First and foremost, we must all remember it was the UK National Press that made the anti-vaxxer movement what it is today. See MMR debate in the United Kingdom: vaccine scares, statesmanship and the media - University Press Scholarship. The newspaper which decided to put a proposed link (but now disproven) between the MMR vaccine and child autism on the front page, in hindsight, made a huge mistake. This has subsequently made open discussion about any potential limitations of vaccination much more difficult. Science only progresses by open discussion and challenge. It is often in the midst of the controversies that the real truth lies hidden.

With the arrival of COVID-19 and the very rapid development of new vaccines (necessary in the crisis) there will come a time when limitations of the vaccines are recognised. The following is an attempt at a very short history of the controversies in influenza vaccination effectiveness which have led to 1,000's of research papers over the years.

The 1918-1919 Spanish flu pandemic well and truly put influenza foremost in people's minds and the search for a vaccine had its inception, see The Evolving History of Influenza Viruses and Vaccines (medscape.com). Early studies on the efficacy of influenza vaccination conducted in US Army recruits in the early 1940's onward gave very promising results, see Why flu vaccines so often fail | Science | AAAS, which was tempered by the observation that vaccination success could be very poor in certain years – as happened in the winter of 1947.

Then ensued 20-years of controversy during the 1980's through to early 2000's regarding the real value of influenza vaccine effectiveness (VE). This conflicting body of research was conducted by genuine scientists who were not anti-vaxxers. None the less conflicting studies were the norm, and no one could understand why. As a result, there were endless discussions around the role of selection bias and confounding.

PCR testing has made rapid identification of influenza infection far more accessible, see Microsoft Word - Final WHO PCR Meeting Report 28-JULY-2011 cleared for web.doc. The first commercial PCR test was available in 1987 and was used to detect HIV, and then expanded to other pathogens. Hence studies prior to the 1990's had to estimate what was and was not due to influenza, although even with PCR testing (which is far from universal) considerable estimation is still needed for calculations of total influenza infections, hospitalizations and deaths.

However, regarding influenza VE, in recent times the "test negative" design (TND) https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1032813/Weekly_Flu_and_COVID-19_report_w45.pdf has become the foundation for reported VE, although even here there are potential confounding factors.[40] In test negative studies, persons with influenza-like-illness (ILI) or acute respiratory illness (ARI) are tested for influenza (**via PCR**). Those testing positive are then subdivided into vaccinated

[40] Covid-19 Vaccine Effectiveness and the Test-Negative Design | NEJM

and unvaccinated, and the relative risk calculated, and then adjusted for the prevalence of risk-factors and age. Hence PCR made TND possible from around 2004 onward.

At this point I would like to point out that the potential role of pathogen interference was largely unrealized in the earlier influenza studies, and indeed even today. A seminal paper published in 2010 by a group of polish researchers is of great relevance and a direct quote of their summary follows.[41]

"Viral interference was discovered about 60 years ago. Molecular epidemiology revealed that this phenomenon possesses important biological implications, it can reduce the epidemic spread of certain viruses from time to time (influenza and enteroviruses) and the efficiency of live vaccination can be impaired, too. Phenomena observed during the last 80 years in Hungary are analyzed. ***It is suggested to concentrate the distribution of MMR vaccines to seasons of limited influenza and enterovirus circulation.*** *Interference seems to impair the progress of wild poliovirus eradication in the endemic tropical countries. It is recommended to enhance enterovirus surveillance in the region of European countries, since the exchange of the oral poliovirus vaccine to the enhanced inactivated polio vaccine might result in enhanced circulation of non-polio enteroviruses leading to the increase in the number of type I (juvenile) diabetes patients."*

Note their recommendations regarding the **timing** of MMR vaccination (which have never been followed up) – which had the potential for massive confounding in the original MMR-autism study. Also, their proposals regarding the timing of polio vaccination and a possible link to juvenile Type 1 diabetes (T1D). Any link between childhood vaccination and juvenile T1D has been disproven,[42] although the issue regarding timing with respect to enterovirus circulation has not been addressed. While the predictions made by these researchers may not be fully accurate, their major contribution was that pathogen interference was important and that it had a potential role in the timing of vaccination for maximum effectiveness.

The point of relevance is that none of the earlier influenza vaccination papers considered potential pathogen interference effects – except for the handful of more recent PCR studies I have pointed out.

Figure 1 in part LIV was from the USA via the test negative design. It is interesting to note that in persons aged 65+ VE during the past 18 years has NEVER been higher than 60% and has a median value of just 40% (interquartile range of 23% to 49%). Reasons for this can be found in an easy-to-read article, see Why flu vaccines so often fail | Science | AAAS. A case of negative vaccine effectiveness occurred in Figure 1. Negative VE is moderately common and occurred very frequently around the world in the winter of 2014/15, when new clade(s) or antigenic variants of influenza seemingly emerged rendering the vaccine ineffective – note this was not a pandemic, just seasonal influenza. The issues regarding "negative" VE are often side-stepped, but it essentially means that the vaccinated fare worse than the non-vaccinated.

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[41] Berencsi G, Kapusinszky B, Rigó Z, Szomor K. Interference among viruses circulating and administered in Hungary from 1931 to 2008. Acta Microbiol Immunol Hung. 2010 Jun;57(2):73-86. doi: 10.1556/AMicr.57.2010.2.1.

[42] Childhood Vaccination and Type 1 Diabetes | NEJM

So how does this apply to the VE controversies which raged during the 80's through to the early 2000's? It is my conclusion that many of the conflicting results arose when VE was attempted to be measured at whole population level, i.e., the net effects rather than in the limited confine of a test negative study with PCR confirmed influenza infection. I have given another example of this for persons aged 60+ at the start of this part (above), see references #1,2.

This whole issue of pathogen interference could be very easily resolved if public health agencies around the world agreed to alter their data collection protocols to include the vaccination status of persons with non-influenza ILI or ARI. The results could then be published alongside influenza VE, thus assuring everyone that pathogen interference is not a major issue.[43] May I suggest that this needs to be an international effort because pathogen interference (should it exist) is highly likely to be country specific and will vary from year to year because the timing and magnitude of non-influenza pathogens so varies. Also note that winter pathogens are far wider than just viruses.

In summary, influenza vaccination does protect against influenza (on most occasions), but the best available evidence is that the space created is then filled by other respiratory pathogens. Children seem at ***higher*** net risk of a non-influenza infections, adults aged 60+ see no change in *total* infections and influenza-like-illness, and in working age adults the results are inconclusive.

For scientific balance, one study appeared to contradict the above findings (see reference #8) – however, always consider the context of the time and place of each study.

Excess winter mortality seems totally unaffected by increasing influenza vaccination rates (see part LV). It may surprise you to note that influenza deaths are still estimates, simply because widespread PCR testing for influenza is simply not conducted. Widespread PCR testing in the UK only started with COVID-19, which could in theory be partly diverted to influenza screening and could help refine the estimates of influenza deaths.

Clearly the case for influenza vaccination is wider than mortality. Yes, influenza mortality is diminished, however, net mortality is not…… which seems to imply that the other pathogens are as adept at killing the elderly as influenza – which may be an expression of the nearness-to-death effect.

At this point it should be noted that infection due to Respiratory Syncytial Virus (RSV) and influenza seem to occur as an alternating pattern.[44] It is not widely realized that RSV kills just as many elderly people as influenza, and in the elderly is probably misdiagnosed as influenza in the absence of a PCR test.[45] The fact that such alternating patterns exist is yet another example of the reality of pathogen interference.

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[43] Eurosurveillance

[44] Superinfection between influenza and RSV alternating patterns in San Luis Potosí State, México. - Abstract - Europe PMC

[45] Morbidity and mortality of respiratory syncytial virus infection in hospitalized adults: Comparison with seasonal influenza - PubMed (nih.gov) – note the exact RSV mortality depends on the year of the study.

It looks suspiciously like the influenza vaccination effectiveness controversy still has room to progress.

The issues regarding the enhanced efficacy of vaccines by timing their application with respect to competing pathogens may well represent a major development in the area – although I suspect that local weather patterns are also involved.

In conclusion, this section has attempted to use past controversies to illustrate how vaccination efficacy *may be* enhanced in the future. We must wait and see.

Finally, the billion-dollar question is – has vaccination against COVID-19 led to yet another shift in the pathogen balance?

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak? Part LV. What does vaccine effectiveness (VE) mean?

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What does influenza vaccination effectiveness measure?

- Herein follows a genuine attempt to summarize a complex issue
- Influenza vaccination does protect against the effects of subsequent influenza infection – as measured by Vaccine Effectiveness (VE).
- However, VE does NOT measure the outcomes in persons vaccinated but subsequently exposed to a non-influenza infection.
- Data is given for excess winter mortality (EWM) versus VE over a 17-year period in an attempt to gain insight into the ***net balance*** between potentially conflicting trends.
- Complex systems always exhibit unanticipated outcomes

Errata for previous issues: See Part LII

For wider research on roles of infectious outbreaks on health care capacity and cost fluctuations: See Vol. 47, No. 3, Winter 2021 (healthfinancejournal.com)

An excellent article on the true extent of under-reporting of COVID-19 deaths around the world, see Under-reporting of deaths limits our understanding of true burden of covid-19 | The BMJ. In many countries Governments simply did not want to know.

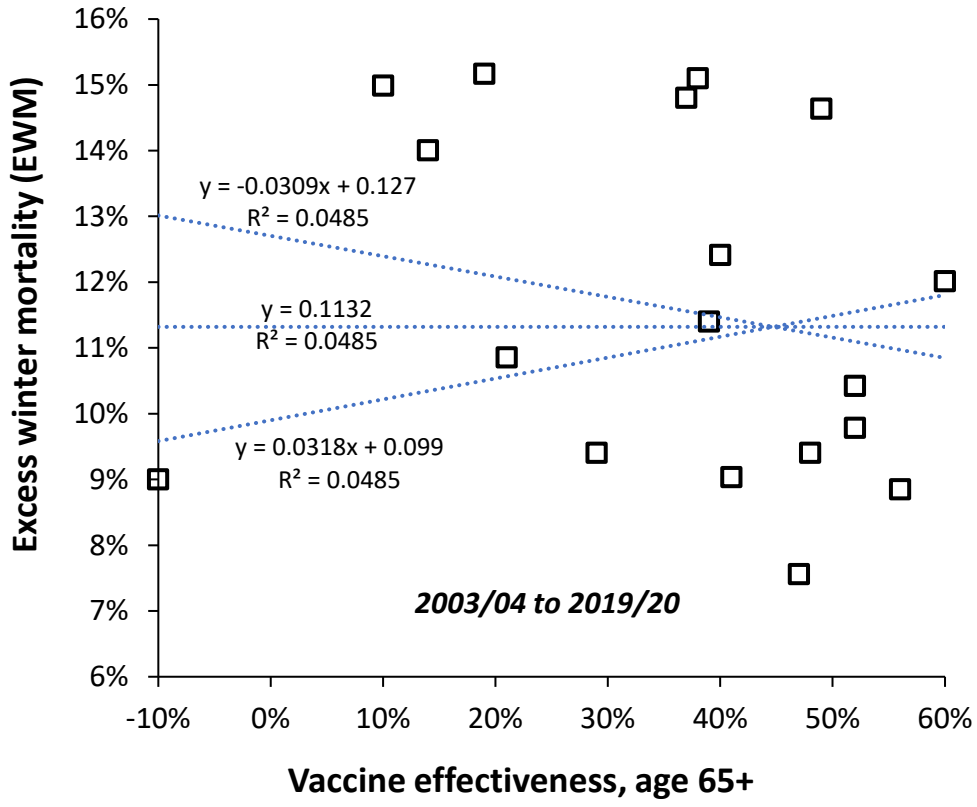
Gene variant discovered which regulates your risk of dying from COVID-19. The gene, LZTFL1, stops lung cells from fighting off coronavirus and can lead to respiratory failure when oxygen cannot reach vital organs. Some 15% of Britons and Europeans could have the gene variant while people of South Asian heritage are at greater risk. See Identification of LZTFL1 as a candidate effector gene at a COVID-19 risk locus | Nature Genetics and Integrative genomic analyses identify susceptibility genes underlying COVID-19 hospitalization | Nature Communications

Whistle blower alleges serious discrepancies regarding Pfizer vaccine trial data and reporting of side-effects. Covid-19: Researcher blows the whistle on data integrity

issues in Pfizer's vaccine trial | The BMJ. No doubt there will be counter claims about the alleged discrepancies.

Perhaps this is a good time to discuss what vaccine effectiveness (VE) does and does not mean. To this end Figure 1 shows a plot of excess winter mortality in the USA versus VE for those aged 65+ for the years 2003/04 to 2019/20. Several points need to be discussed. Data on EWM is from Jones R (2021) Excess winter mortality (EWM) as a dynamic forensic tool: Where, when, which conditions, gender, ethnicity, and age. Int J Environmental Research and Public Health 18(4); 2161. https://doi.org/10.3390/ijerph18042161, while VE is from the CDC website CDC Seasonal Flu Vaccine Effectiveness Studies | CDC.

Figure 1: Excess winter mortality (EWM) in the USA and vaccine effectiveness (VE) for each winter.



1. Figure 1 seems to suggest that there is no link between EWM and VE. Given the fact that high influenza activity is associated with high EWM it would normally be expected that high influenza VE may be associated with lower EWM. This does not appear to be the case and the null hypothesis, namely, that VE has no effect on EWM appears to hold. Why is this so?
2. As can also be seen influenza VE is somewhat variable between years, simply because this season's vaccine composition is an attempt to guess

the mix of strains that will arise in the coming winter all in the face of influenza(s) antigenic shift and drift, see How Flu Viruses Can Change: "Drift" and "Shift" | CDC. The best vaccine match in 17 years gave a VE of 60% while the worst match gave a negative VE. Average is around 40%.

3. It is an undisputed fact that in the majority of winters influenza vaccination will offer a degree of protection against subsequent exposure to influenza. However, VE does not tell you anything about what happened to most persons who were vaccinated against influenza but then got infected by another winter pathogen.
4. In this respect, excess winter mortality (EWM) gives the net effect of a degree of protection in persons vaccinated and then infected by influenza *counterbalanced* against the outcomes (death) of a higher number vaccinated, not exposed to influenza, but infected by another pathogen.
5. Only 1 relevant study has been published on this topic, and this was only conducted in children, see Cowling B, Fang V, Nishiura H, et al. Increased risk of noninfluenza respiratory virus infections associated with receipt of inactivated influenza vaccine. Clin Infect Dis 2012; 54(12): 1778-1783. doi:10.1093/cid/cis307. In this randomized trial influenza vaccination did indeed protect children against respiratory illness due to influenza, as in #3. However, it increased the risk of non-influenza infection by 3.5-times (CI 1.2-10.1) and of non-influenza acute respiratory infection (ARI) by 4.4-times (CI 1.3-14.8). This type of study has not been repeated in the elderly.
6. Two studies in Italy and the USA during a period of rapid expansion in influenza vaccination reached the same conclusion – no observable **net** reduction in winter mortality[46,47]
7. However, the suggestion is that influenza vaccination in a complex world of inter-pathogen interactions could lead to a counterbalancing and completely unanticipated increase. Hence, Figure 1 may be the outcome of such competing forces.

The bulk of EWM is due to persons aged 65+, hence VE for persons aged 65+ in Figure 1 is a relevant parameter.

It is my suspicion (unpublished, no peer review, etc) that for influenza vaccination no ***net*** population-wide effect is possible. You must assess your

[46] Rizzo C, Viboud C, Montomoli E, Simonsen L, Miller MA. Influenza-related mortality in the Italian elderly: no decline associated with increasing vaccination coverage. Vaccine. 2006 Oct 30;24(42-43):6468-75. doi: 10.1016/j.vaccine.2006.06.052.

[47] Simonsen L, Reichert T, Viboud C, et al. Impact of influenza vaccination on seasonal mortality in the US elderly population. Arch Intern Med 2005; 165(3): 265-272. doi:10.1001/archinte.165.3.265

personal risk of “vaccinate or not vaccinate” in a world of imperfect information. Indeed Figure 1 may contain hidden assumptions.

Whether this applies to COVID-19 is entirely unknown. As I keep saying, life is lived in a world of imperfect information and you having to make decisions amid the fog. Sometimes you get it right and other times not so, and with potentially disastrous consequences.

Is this a potentially fertile field for future research – does this apply to all ages? Have researchers been afraid to call a spade a spade for fear of being labelled an anti-vaxxer?

Conclusions

Influenza vaccine effectiveness (VE) has been shown to have no correlation with excess winter mortality (EWM), which is a whole-population measure of ***net*** effects. Rising influenza vaccination rates have likewise been confirmed in two large international studies to have no effect on EWM. A study in children demonstrated that influenza vaccination led to an unanticipated higher risk of non-influenza respiratory infections. There is a huge gap in our understanding of the potential immune mechanisms behind this apparent paradoxical outcome. Unexpected outcomes are always associated with complex systems.

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak? Part LIV. All-cause mortality in the UK continues to increase

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Trends in all-cause mortality in the UK

- This series started last year by using all-cause mortality as a way of testing if government COVID-19 deaths were 'truthful' – a lack of testing capacity early in the pandemic led to gross under-counting.
- Given the complete unreliability of international COVID-19 'reported' deaths, researchers have all resorted to the analysis of all-cause mortality to try and discern the real effects of the pandemic.
- My own analysis puts the death toll at a conservative estimate of >14 million, see Special Guest Authors (healthfinancejournal.com)
- Since mid-June 2021 a concerning trend in all-cause mortality has emerged which can only be partly explained by reported COVID-19 deaths. For reference mid-June corresponds to 'Freedom Day' on Saturday the 19th June in England.
- Given the high proportion of persons who experience apparent asymptomatic COVID-19 infection (range 30% to 75% in various international studies)[48] – presumably with a form of natural immunity. It is my opinion that asymptomatic infection with this aggressive pathogen can trigger death from seemingly unrelated causes.
- The ONS has confirmed that deaths at home (without a COVID-19 diagnosis) are running higher than expected.

Errata for previous issues: See Part LII

For wider research on roles of infectious outbreaks on health care capacity and cost fluctuations: See Vol. 47, No. 3, Winter 2021 (healthfinancejournal.com)

[48] Oran DP, Topol EJ. The Proportion of SARS-CoV-2 Infections That Are Asymptomatic : A Systematic Review. Ann Intern Med. 2021 May;174(5):655-662. doi: 10.7326/M20-6976.

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak? Part LIV. All-cause mortality in the UK continues to increase

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international studies)[49] – presumably with a form of natural immunity. It is my opinion that asymptomatic infection with this aggressive pathogen can trigger death from seemingly unrelated causes. • The ONS has confirmed that deaths at home (without a COVID-19 diagnosis) are running higher than expected.
Errata for previous issues: See Part LII
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The common and persistent immune-modifying pathogen cytomegalovirus (CMV) is considered by many doctors to be an inconvenience rather than a factor associated with increased risk of hospitalization and death. This study demonstrates otherwise, see (PDF) CMV Infection, CD19+ B Cell Depletion, and Lymphopenia as Predictors for Unexpected Admission in the Institutionalized Elderly (researchgate.net).

I have published a series of papers demonstrating the CMV is potentially implicated in outbreaks of a new type or kind of infectious disease, see http://www.hcaf.biz/2010/Publications_Full.pdf. Because CMV acts by stealth (indirect immune subversion) it is incredibly difficult to prove, however, the above study adds to the growing list saying that this virus is not harmless. This cunning virus can even read its genome backwards!

The point is that all >2,000 known human pathogens interact in everyone to become part of their *individual* health landscape which includes baseline genetic and epigenetic factors along with lifestyle and other factors. COVID-19 has only added to the existing complexity.

Regarding a potential influenza outbreak this Christmas you will all be aware of lurid predictions of a major outbreak published in the National Press. May I point out that influenza activity dropped to an ***international*** extreme low at the immediate onset of the COVID-19 pandemic, and that this occurred before the imposition of lockdown(s). It is my opinion that COVID-19 is outcompeting influenza in the complex inter-pathogen interactions which determine the severity of each winter (see Brunstein J, Cline C, McKinney S, Thomas E. Evidence from multiplex molecular assays for complex multipathogen interactions in acute respiratory infections. J Clinical Microbiology 2008; 46(1) 97- 102; doi: 10.1128/JCM.01117-07). This theory is about to be put to the test this winter.

[49] Oran DP, Topol EJ. The Proportion of SARS-CoV-2 Infections That Are Asymptomatic : A Systematic Review. Ann Intern Med. 2021 May;174(5):655-662. doi: 10.7326/M20-6976.

As to the role of influenza in winter health care capacity pressures (in the pre-COVID era), Part 3 of a recent review reveals the mind boggling complexity and controversies regarding this pathogen, see Vol. 47, No. 3, Winter 2021 (healthfinancejournal.com). Regarding influenza vaccine effectiveness a highly readable investigative article published in Science is a must read, see Why flu vaccines so often fail | Science | AAAS.[50]

As to the ***net*** effect of influenza vaccination ***in the elderly*** two studies question currently held views regarding the effect upon deaths – which is an entirely different matter to sickness absence, etc. (See Simonsen L, Reichert T, Viboud C, et al. Impact of influenza vaccination on seasonal mortality in the US elderly population. Arch Intern Med 2005; 165(3): 265-272. doi:10.1001/archinte.165.3.265 and Anderson M, Dobkin C, Gorry D. The effect of influenza vaccination for the elderly on hospitalization and mortality. Ann Intern Med 2020; 172: 445-452. Doi: 10.7326/M-19-3075).

We are dealing with a biological system of vast complexity. As an example of the shift to a more complex system view of influenza epidemics and influenza vaccination Table 1 shows the results of a search using Google Scholar regarding the number of hits for a variety of influenza-related complex system queries, see Table 1.

Table 1: Searches on influenza complexity using Google Scholar conducted on 6th October 2021.

Search string	Documents identified
Influenza epidemics "complex systems"	94,800
Influenza and "systems biology"	22,000
Complex system dynamics "pandemic influenza"	18,800
Interactions, influenza and "other pathogens"	16,200
Influenza and "pathogen interactions"	14,600
Influenza and "complex system"	10,900
Influenza vaccination and "complex system"	4,520
Influenza and "pertussis complex relationship"	566

Complex systems are characterised by ***unanticipated*** outcomes. Alas the world of pathogens/immune function is vastly more complex than current knowledge encapsulates. Hence what may be a good and desirable population-wide intervention may benefit the majority but not you as an individual, and no one at the current time has any idea why this may be so. Everything is a balance between risks and benefits of the available current technology. Today's successes are all built upon yesterday's failures. That is the reality of life!

[50] In case you are wondering I am absolutely not an anti-vaxxer and have greatly benefitted from receiving a full range of childhood vaccinations, including BCG.

Figure 1: Proportion of total deaths due to COVID-19 up to the week ending 22nd October 2021.

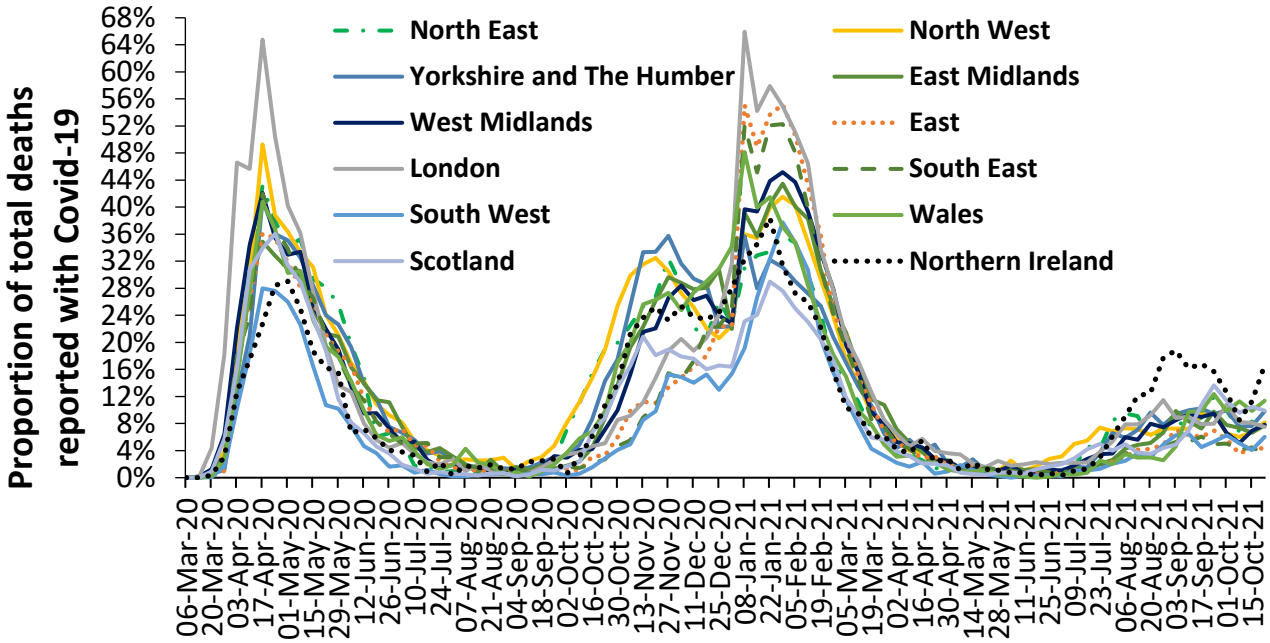
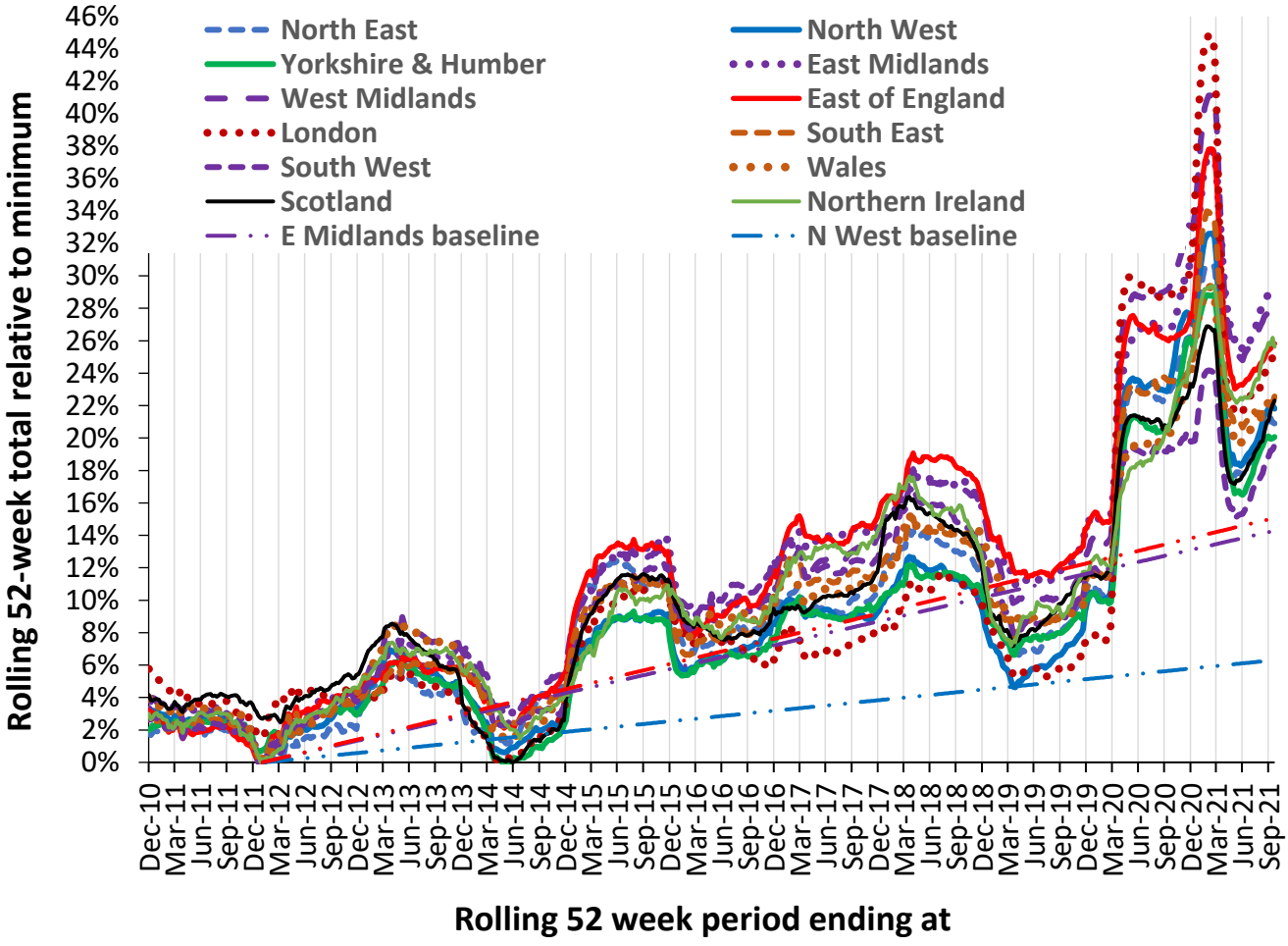


Figure 2: Trend in the rolling 52-week total all-cause deaths across the UK.



Returning to the question of excess mortality in the UK Figure 1 shows the proportion of reported COVID-19 deaths up to the week ending 22nd October 2021. As can be seen the proportion of total deaths has remained relatively constant during September and October.

However, Figure 2 shows the trend in rolling 52-week deaths which shows total all-cause mortality steadily rising since mid-June 2021, i.e., if total deaths are rising the proportion of COVID-19 deaths will be diluted.

As Table 2 demonstrates excess deaths are currently around half of that experienced at the maximum of the 3rd wave. No wonder the NHS is struggling. The million-dollar question is: why this excess?

Complexity has risen to a new pinnacle since the arrival of COVID-19 from a Wuhan lab leak or natural emergence – shrouded in mystery?

Table 2: Excess all-cause deaths as at 22nd October 2021 versus maximum excess deaths at the peak of the third wave which occurred in March 2021.

Region	2012-14 Minimum	2019 Minimum	Gap (years)	2019 Minimum	Growth per year	Second/Third Wave				22-Oct-21		
						Maximum	Actual	Predicted	Excess	Actual	Predicted	Excess
London	16-May-14	09-Aug-19	5.24	5.3%	1.01%	26-Mar-21	44.9%	7.0%	37.9%	25.1%	7.5%	17.6%
North West	10-Feb-12	19-Apr-19	7.19	4.7%	0.65%	19-Mar-21	32.6%	6.0%	26.7%	21.8%	6.3%	15.5%
W Midland	20-Jan-12	19-Apr-19	7.25	9.8%	1.35%	26-Mar-21	41.2%	12.4%	28.7%	28.2%	13.2%	15.0%
E Midland	03-Feb-12	23-Aug-19	7.56	11.1%	1.47%	12-Mar-21	37.8%	13.4%	24.4%	29.2%	14.3%	14.9%
North East	06-Apr-12	19-Apr-19	7.04	6.6%	0.94%	19-Mar-21	30.7%	8.4%	22.3%	20.9%	9.0%	11.9%
South East	03-Feb-12	26-Apr-19	7.23	7.8%	1.08%	05-Mar-21	34.0%	9.8%	24.1%	22.6%	10.5%	12.1%
East	03-Feb-12	07-Jun-19	7.35	11.4%	1.55%	26-Mar-21	37.8%	14.2%	23.6%	25.8%	15.1%	10.7%
Y&Humber	23-May-14	19-Apr-19	4.91	6.6%	1.34%	26-Mar-21	28.9%	9.2%	19.7%	20.1%	10.0%	10.1%
South West	20-Jan-12	26-Apr-19	7.27	7.9%	1.09%	05-Mar-21	24.2%	9.9%	14.3%	19.6%	10.6%	8.9%
England	03-Feb-12	26-Apr-19	7.23	7.5%	1.04%	05-Mar-21	34.1%	9.4%	24.7%	23.2%	10.1%	13.1%
Scotland	24-Jan-14	19-Apr-19	5.24	7.2%	1.38%	05-Mar-21	26.9%	9.8%	17.1%	22.3%	10.7%	11.7%
Wales	10-Feb-12	19-Apr-19	7.19	8.3%	1.15%	12-Mar-21	29.3%	10.5%	18.8%	22.6%	11.2%	11.4%
N Ireland	27-Jan-12	12-Apr-19	7.21	7.2%	1.00%	26-Mar-21	29.4%	9.2%	20.2%	25.6%	9.7%	15.9%
UK	03-Feb-12	19-Apr-19	7.21	7.3%	1.01%	05-Mar-21	32.7%	9.2%	23.5%	22.8%	9.8%	13.0%

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak? Part LIII. Year of birth and increased deaths during 2020

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Year of birth and increased deaths in 2020 for England and Wales

- The year 2020 saw COVID-19 waves 1 and 2.
- Wave 3 due to the Kent variant largely occurred in 2021.
- Year of birth is used to capture potential birth cohort effects.
- Year of birth effects are obscured using the 5-year age bands used in most analysis regarding the effects of age on mortality.
- This analysis has adjusted all percent changes for the underlying trend in deaths for each age over the past 15 or 20 years.
- As expected, male deaths increased more than female deaths for persons born before 1990.
- While male and females born after 1990 generally experienced lower deaths this was more exaggerated for females.
- The highest increase in deaths during 2020 was 79% for males and 58% for females born in 1920 – this may be related to the effects of the Spanish flu epidemic which occurred in three waves between spring 1918 to spring 1919. Persons conceived during the Spanish flu era were specifically affected.
- Peaks also occurred for males born in 2011 (+44%) and females born in 2008 (+34%) – although small numbers (only 11-14 extra deaths).
- Persons born before 1918 generally experienced lower deaths.
- Persons born between 1919 and 1949 experienced the highest deaths
- A cohort born between 1950 and 1975 saw a peak in deaths for year of birth near the 1960's. This roughly corresponds to the rise and fall in atmospheric nuclear radiation from above ground nuclear testing – although other explanations may be possible General overview of the effects of nuclear testing: CTBTO Preparatory Commission
- Another smaller peak is centred around persons born 1979 to 1981.

• Year of birth may be a neglected factor in the need for and success of COVID vaccination.
Errata for previous issues: See Part LII
For wider research on roles of infectious outbreaks on health care capacity and cost fluctuations: See Vol. 47, No. 3, Winter 2021 (healthfinancejournal.com)

Figures 1 and 2 present the percentage change in deaths in England and Wales during 2020 compared to the average of the three previous years 2017 to 2019. Data is from: Deaths registered in England and Wales - Office for National Statistics (ons.gov.uk) A three-year average has been used to minimise statistical variability. Also, the three-year average has almost the same number of total deaths which occurred in 2019 – the year before the COVID-19 pandemic. Rather than use age, the analysis uses year of birth for those who died in 2020.

Figure 1: Difference in deaths during 2020 for males by year of birth

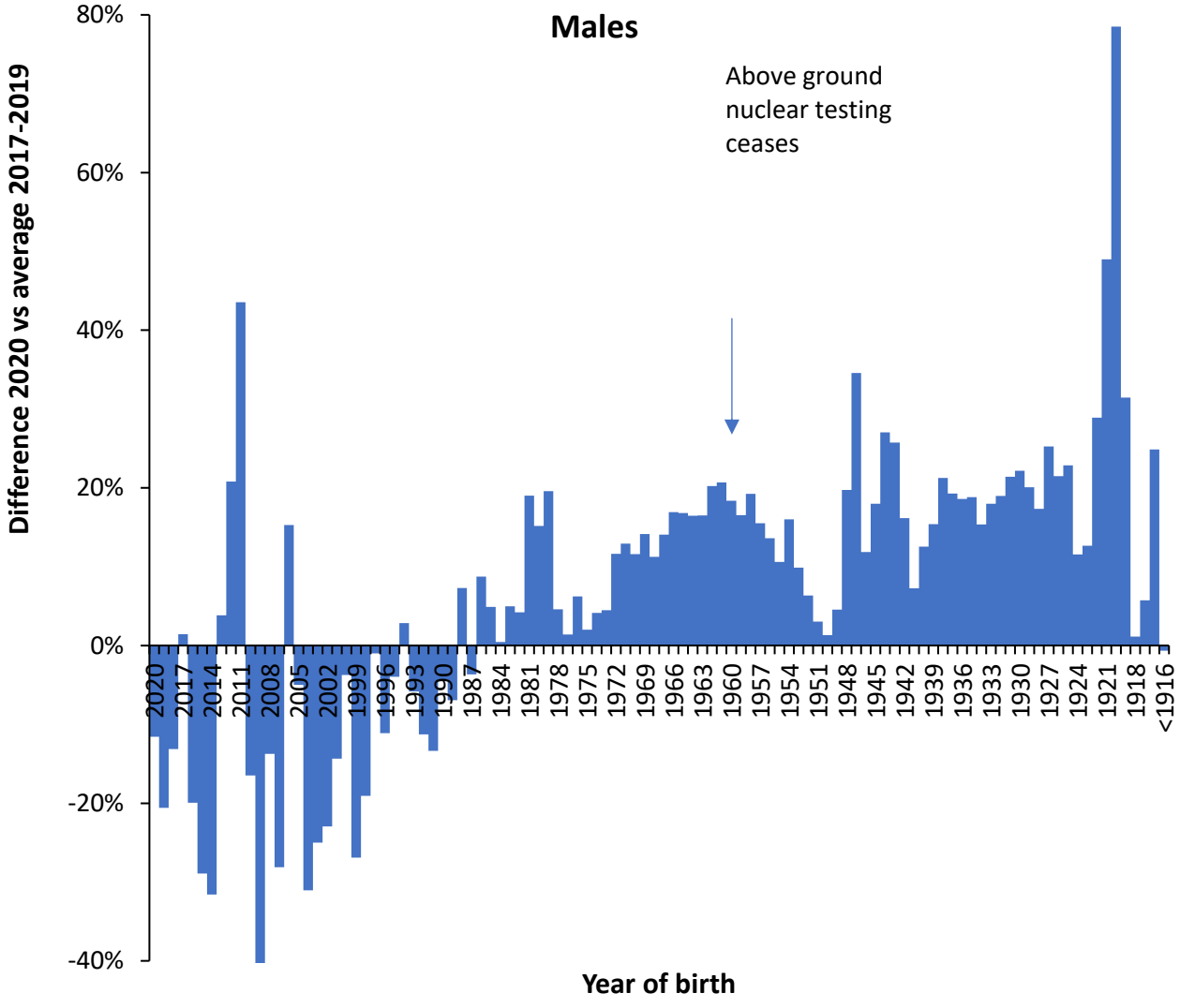
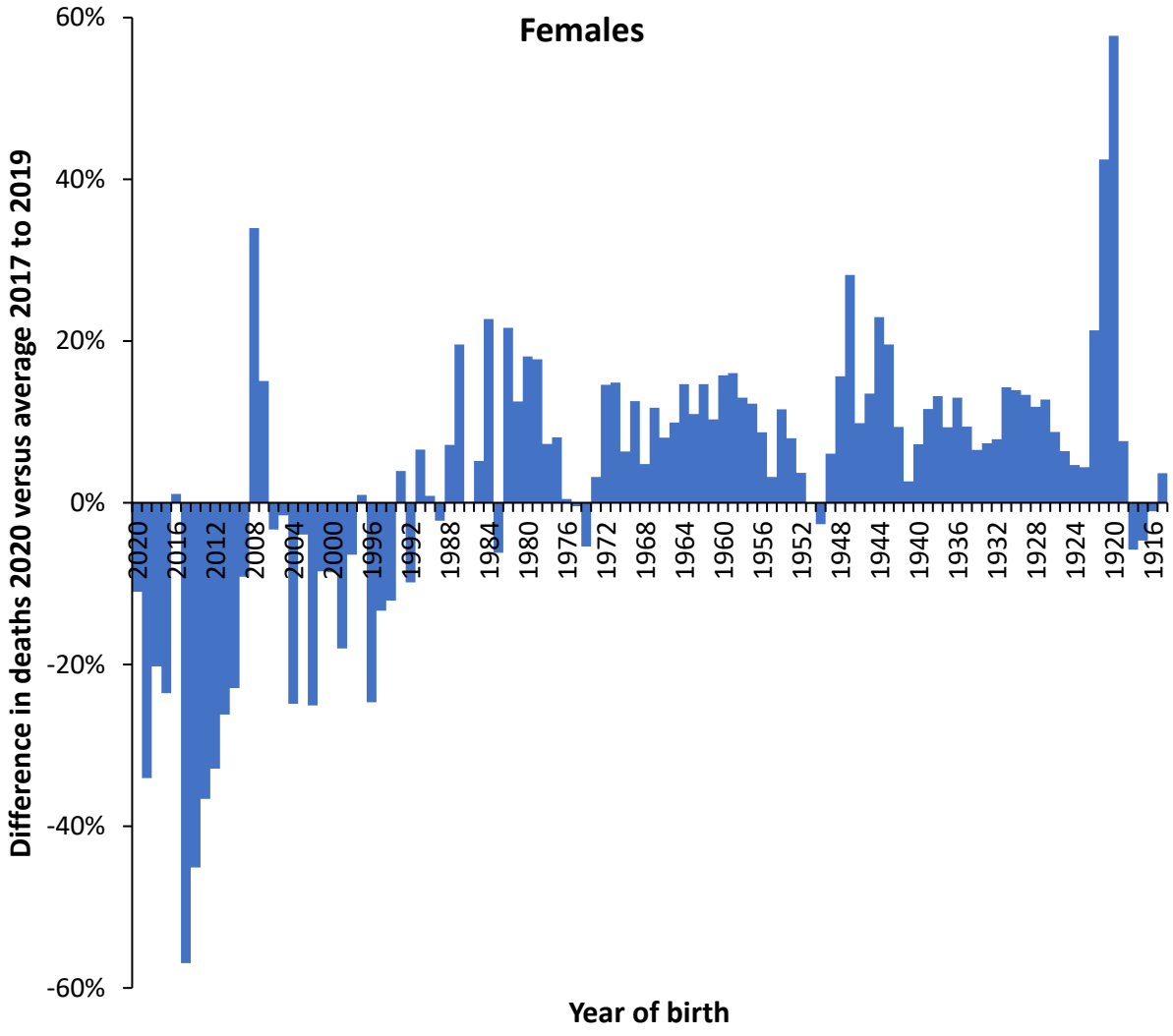


Figure 2: Difference in deaths during 2020 for females by year of birth



This analysis has not been corrected for population per se because the year of birth cohorts are far wider than the known peaks in births in 1947, 1965, 1990 and 2012. While it is strictly not correct to use an average of the previous three-years as the baseline for a birth cohort study, this has been adjusted for by subtracting the highest value of the slope in the trend in deaths over the past 15 or 20 years for each age. This is effectively equivalent to adjusting for population (as mentioned above). This adjustment makes very little difference to the percentage changes, and it must be concluded that the birth cohort effects dominate the observed percentage changes.

Epidemiologists and public health practitioners seem to rush into the use of 5-year age bands when assessing mortality statistics. However, year of birth cohort effects are known to have specific effects on mortality in later life.

For example, during the Spanish flu era pregnant women were especially affected The Effects of the 1918–1919 Influenza Pandemic on Infant and Child Health in Derbyshire (nih.gov) and this included the developing foetus Fetal Influence on Familiar Ailments (northwestern.edu). These observations may well explain the high mortality experienced by persons ***born*** in and around 1920 (see Figures 1 and 2).

Higher deaths among those born between 1919 to 1949 (see Figures 1 and 2) may be due to birth cohort effects previously observed 049580 1..45 (actuaries.org.uk) for the generation centred around 1931, i.e., the rapid increase in life expectancy experienced by this group has been terminated by COVID-19.

Regarding a potential role for atmospheric nuclear radiation due to above ground nuclear testing (which ceased in 1963) Radioactive Fallout From Nuclear Weapons Testing | US EPA it should be noted that the human foetus and the gender ratio at birth is extremely sensitive to even very low levels of nuclear radiation, see Fertility, stillbirth, and gender ratio change in a presumed infectious outbreak (growkudos.com). My own unpublished research shows that there are gradients in the gender ratio across the UK seemingly arising from the background levels of radon gas. See Introduction & General Information · UK Radon Association. The totality of human knowledge does not reside in peer reviewed journals!

Given the intense debate around the vaccination of children against COVID-19 it is highly likely that year of birth may play an important role in the need for, and long-term efficacy of, COVID-19 vaccines – alas only known in retrospect. Figures 1 and 2 tend to suggest that persons born after 1990 experienced lower deaths during COVID than before, and hence infection rates in these ages may be (from one viewpoint) a distraction. Clearly individual risk factors must also be considered.

COVID-19 has thrown up far too many dilemmas and unknowns all at one time. The big question is whether the generation born after 1990 will show continued lower COVID mortality in years to come.

Throughout this series I have constantly emphasized the fact that immune function is incredibly individual, along with the known differences between males and female immune response (often overlooked). All immune studies show huge differences in the levels of immune markers between individuals! See Human immune system variation (nih.gov)

One can only hope that researchers will pursue this line of investigation – providing it does not yield the perceived 'wrong' answer.

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak? Part LII. Highly unusual trends emerge in the UK

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Situation in the UK

- Proportion of deaths due to COVID-19 continues to steadily rise, especially in Northern Ireland.
- The slope of the rise in Northern Ireland is very similar to that at the start of the second wave!
- Figure 1, Part 1 has been updated to week ending 17th September. All regions are showing an increase in the rolling 52-week total deaths (all-cause mortality) which is higher than expected from baseline growth. See Table 1.
- This is around the same as that seen at the start of the third wave.
- Of note is the fact that all-cause mortality (total deaths) are rising faster than reported COVID-19 deaths.
- The trends in rolling Excess Winter Mortality are likewise showing highly unusual features.
- The UK is 'skint' and cannot afford further lockdowns – as are many other countries – expect health care funding to be constrained for at least another decade.

COVID-19 testing and reported COVID-19 deaths

- See Part 49 for more detail.
- The higher the number of COVID-19 tests per million population the higher the reported COVID-19 deaths per million – poorer countries test less therefore find fewer deaths.
    - See latest analysis at Special Guest Authors (healthfinancejournal.com)

International situation

- "Reported" COVID-19 deaths now >4.8 million.
- Actual death toll >14 million is highly likely, Special Guest Authors (healthfinancejournal.com)

- Caribbean, Pacific, and parts of Asia dominate the top 50 places – with undercounting highly likely.
- Grenada and French Polynesia looks to be experiencing a major outbreak.
- Iran was in hospital meltdown due to the sheer number of serious infections, but has now dropped down the ranking. See Iran Covid-19 Crisis: State Media Acknowledge the Death Toll is above 700,000 - NCRI (ncr-iran.org) and Iran News in Brief - September 5, 2021 - NCRI (ncr-iran.org)

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Listen to a 14-minute interview about the series, https://jjunland.egnyte.com/dl/CpdNnjCVle

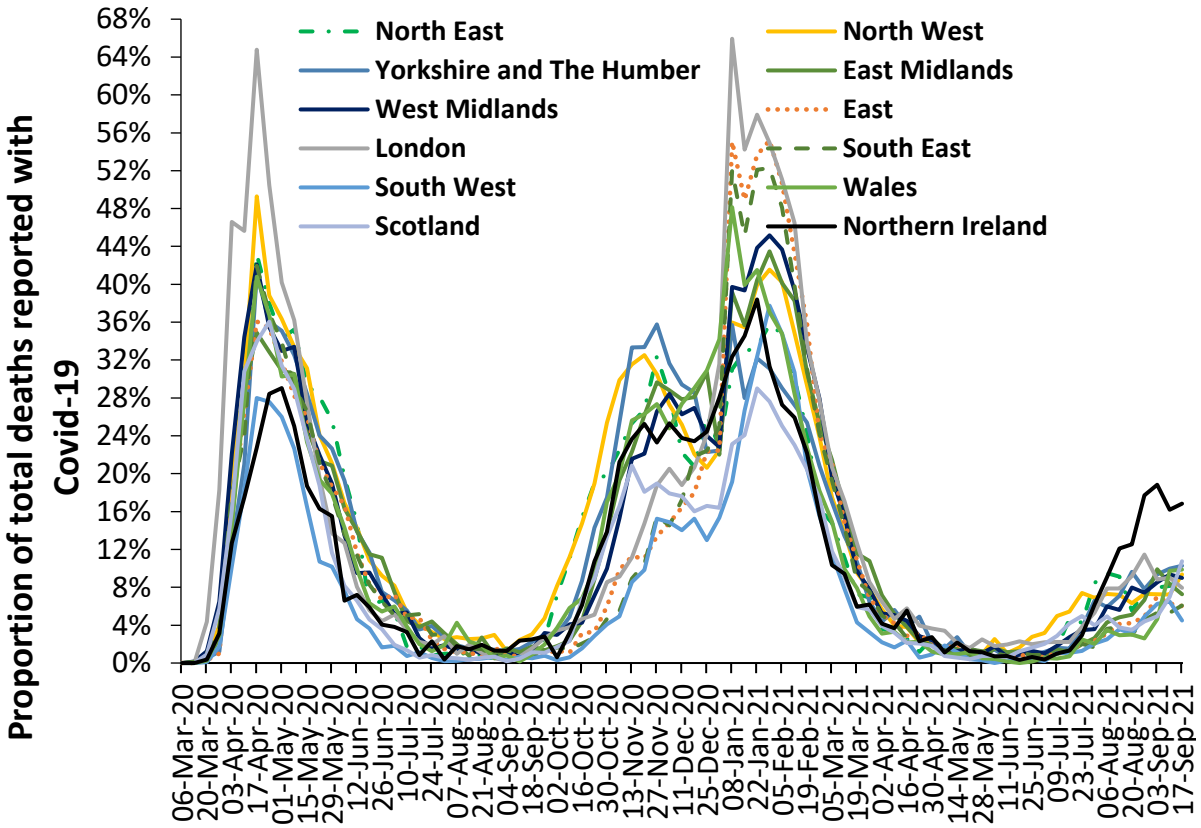
The threat of pandemic influenza: are we ready? Recommendations from a 2005 workshop Free Executive Summary (nih.gov) – includes first-hand accounts of the Spanish flu pandemic at a time when there were no antibiotics, no critical care.

Deaths in Israel due to the delta (Indian) variant estimated to be 3-times lower due to prior vaccination of the population, Infections, hospitalisations, and deaths averted via a nationwide vaccination campaign using the Pfizer–BioNTech BNT162b2 mRNA COVID-19 vaccine in Israel: a retrospective surveillance study - The Lancet Infectious Diseases

Number of non-household contacts, attending large gatherings, and frequent restaurant usage all linked to higher risk of COVID-19 infection, from a large international study. Predictors of incident SARS-CoV-2 infections in an international prospective cohort study | BMJ Open. Eminently sensible but now proved to be the case.

Figure 1 shows the proportion of 'reported' COVID-19 deaths compared to total deaths in the parts of the UK. Proportion of deaths due to COVID looks to have peaked, however, the proportion depends heavily on the trend in total deaths (all-cause mortality).

Figure 1: Proportion of total deaths reported as with COVID-19 up to 17th September 2021



To this end Figure 1 in Part 1 of this series has been updated to the 17th of September and shows a rapid rise in total deaths across ALL regions. Recall that this is a rolling 52-week total which is designed to remove ordinary levels of seasonality – although COVID is far from ordinary! The baseline method was described in Part 47 and examples of the baseline trend are given for three regions.

Table 1 therefore calculates the excess deaths relative to the baseline at the 17th September 2021 versus the excess deaths at the peak of the second wave which occurred back in March 2021.

Table 1: Rolling 52-week total deaths compared to baseline growth (without COVID), excess at the peak of second wave versus excess on 17th September 2021

Region	2012-14 Minimum	2019 Minimum	Gap (years)	2019 Minimum	Growth per year	Second Wave				17-Sep-21		
						Maximum	Actual	Predicted	Excess	Actual	Predicted	Excess
London	16-May-14	09-Aug-19	5.24	5.3%	1.01%	26-Mar-21	44.9%	7.0%	37.9%	24.0%	7.4%	16.5%
North West	10-Feb-12	19-Apr-19	7.19	4.7%	0.65%	19-Mar-21	32.6%	6.0%	26.7%	21.4%	6.3%	15.1%
W Midland	20-Jan-12	19-Apr-19	7.25	9.8%	1.35%	26-Mar-21	41.2%	12.4%	28.7%	27.5%	13.1%	14.4%
E Midland	03-Feb-12	23-Aug-19	7.56	11.1%	1.47%	12-Mar-21	37.8%	13.4%	24.4%	28.4%	14.1%	14.2%
North East	06-Apr-12	19-Apr-19	7.04	6.6%	0.94%	19-Mar-21	30.7%	8.4%	22.3%	20.6%	8.9%	11.7%
South East	03-Feb-12	26-Apr-19	7.23	7.8%	1.08%	05-Mar-21	34.0%	9.8%	24.1%	21.6%	10.4%	11.2%
East	03-Feb-12	07-Jun-19	7.35	11.4%	1.55%	26-Mar-21	37.8%	14.2%	23.6%	24.9%	14.9%	10.0%
Y&Humber	23-May-14	19-Apr-19	4.91	6.6%	1.34%	26-Mar-21	28.9%	9.2%	19.7%	19.9%	9.8%	10.0%
South West	20-Jan-12	26-Apr-19	7.27	7.9%	1.09%	05-Mar-21	24.2%	9.9%	14.3%	18.3%	10.5%	7.8%
England	03-Feb-12	26-Apr-19	7.23	7.5%	1.04%	05-Mar-21	34.1%	9.4%	24.7%	22.5%	10.0%	12.5%
Scotland	24-Jan-14	19-Apr-19	5.24	7.2%	1.38%	05-Mar-21	26.9%	9.8%	17.1%	20.4%	10.5%	9.9%
Wales	10-Feb-12	19-Apr-19	7.19	8.3%	1.15%	12-Mar-21	29.3%	10.5%	18.8%	21.9%	11.1%	10.8%
N Ireland	27-Jan-12	12-Apr-19	7.21	7.2%	1.00%	26-Mar-21	29.4%	9.2%	20.2%	25.3%	9.6%	15.7%
UK	03-Feb-12	19-Apr-19	7.21	7.3%	1.01%	05-Mar-21	32.7%	9.2%	23.5%	22.0%	9.7%	12.2%

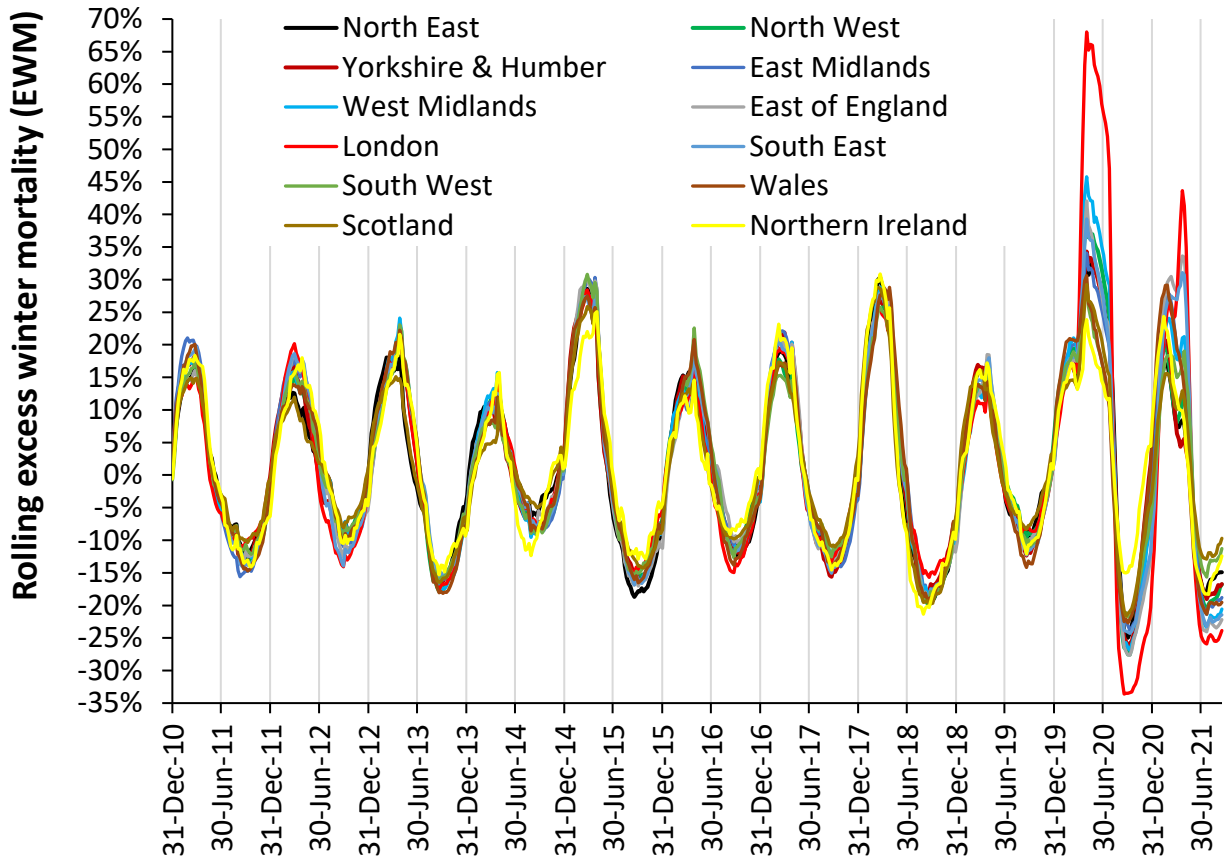
The major point of interest is that the second wave peaked at the end of winter while the 17th September is only toward the end of summer. Hence by the end of summer 2021 most regions have already reached around half of the excess deaths seen in the second wave winter peak. This is a genuinely remarkable statistic achieved in a highly vaccinated population, especially in those ages at greatest risk of death.

To illustrate further Figure 2 shows the rolling Excess Winter Mortality (EWM) calculation over the past 10 years. A rolling EWM is simply average deaths in the current 4 months versus average (all-cause) deaths in the previous 8 months.

The rolling EWM calculation typically reached a minimum in late September to early October, however, in 2021 highly unusual behaviour can be seen.

Note how the downward part of the annual cycle is truncated around the end of July rather than late September – behaviour not seen in the pervious 10 years, and indeed not even after the first wave.

Figure 2: Rolling excess winter mortality (EWM) calculation from winter of 2010/11 to 17th September 2021.



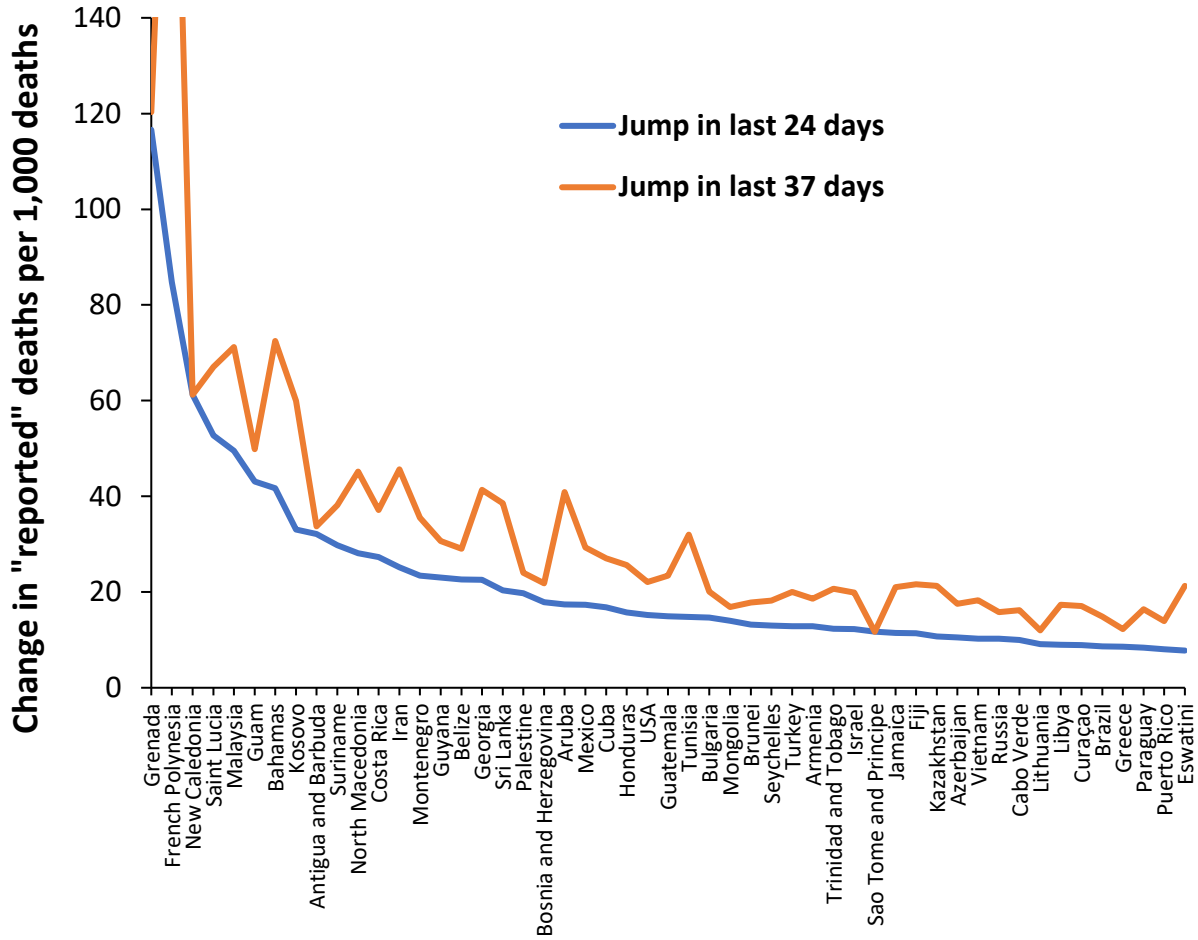
On this occasion I believe that the trends in total deaths (as rolling 52-week total or rolling EWM) are giving a more accurate picture of the severity of the situation.

It is possible that the UK could be about to experience a serious COVID outbreak as the cooler autumn and winter months approach. Viruses transmitted by aerosol typically survive far better in dry colder air. See [Will the coronavirus survive in the refrigerator or freezer? | FAQ (nj.gov)]

Finally, turning to the international situation. Figure 3 shows the change in reported COVID-19 deaths over the past 24 days up to 27th September 2021. As can be seen major outbreaks in the Caribbean, Pacific Islands, parts of Asia, etc. Degrees of undercounting will be present. Iran has dropped down the

ranking while the USA is surprisingly high. The UK ranks 70th close to Peru, Ecuador, and El Salvador.

Figure 3: Change in reported COVID-19 deaths per 1,000 deaths (before COVID) in top 50 countries



As soon as countries relax their vigilance COVID-19 can re-exert its lethal effects.

The sheer economic chaos due to various lock downs imply that this route is no longer available and the simple measures to avoid infection [Predictors of incident SARS-CoV-2 infections in an international prospective cohort study | BMJ Open] need to become more prevalent along with face masks in public places.

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

Part LI. UK deaths continue a steady rise

Dr Rodney P Jones
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hcaf_rod@yahoo.co.uk
See http://www.hcaf.biz/2010/Publications_Full.pdf for all research.

Situation in the UK

- Proportion of deaths due to COVID-19 continues to steadily rise, especially in Northern Ireland and London.
- The slope of the rise in Northern Ireland is very similar to that at the start of the second wave!
- Figure 1, Part 1 has been updated to week ending 27th August. All regions are showing an increase in the rolling 52-week total deaths (all-cause mortality) which is higher than expected from baseline growth. Concerningly this is around the same as that seen at the start of the third wave.
- This is somewhat concerning since we are in the summer not winter!
- The UK is 'skint' and cannot afford further lockdowns – as are many other countries – expect health care funding to be constrained for at least another decade.

COVID-19 testing and reported COVID-19 deaths

- See Part 49 for more detail.
- The higher the number of COVID-19 tests per million population the higher the reported COVID-19 deaths per million – poorer countries test less therefore find fewer deaths.
    - See latest analysis at Special Guest Authors (healthfinancejournal.com)

International situation

- "Reported" COVID-19 deaths now >4.5 million.
- Actual death toll >10 million is highly likely.
- Africa, Middle East, South America, and parts of Asia dominate the top 50 places – with undercounting highly likely.
- French Polynesia looks to be experiencing a major outbreak.
- Iran is in hospital meltdown due to the sheer number of serious infections. See Iran Covid-19 Crisis: State Media Acknowledge the Death Toll is above

700,000 - NCRI (ncr-iran.org) and Iran News in Brief - September 5, 2021 - NCRI (ncr-iran.org)

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Lockdown measures in China during 2020 reduced incidence of other transmissible diseases (mumps) by 50% in China, see Estimating the impact of non-pharmaceutical interventions against COVID-19 on mumps incidence in Sichuan, China | BMC Infectious Diseases | Full Text (biomedcentral.com)

In a US study over 70% of persons testing positive had no symptoms, 25% mild symptoms, and only 5% had COVID-like illness. Those with none or mild symptoms loose sero-positive status more rapidly, see Duration of SARS-CoV-2 sero-

positivity in a large longitudinal sero-surveillance cohort: the COVID-19 Community Research Partnership | BMC Infectious Diseases | Full Text (biomedcentral.com). By implication COVID infection is far more widespread than realised due to a very high proportion with no symptoms who act as potential super-spreaders.

In Nigeria 45% of asymptomatic front-line healthcare workers were COVID-positive, see SARS-CoV-2 Seropositivity in Asymptomatic Frontline Health Workers in Ibadan, Nigeria - PubMed (nih.gov).

A new study suggests that COVID-19 deaths in India are likely to be around 4 to 5 million! See A comparison of five epidemiological models for transmission of SARS-CoV-2 in India | BMC Infectious Diseases | Full Text (biomedcentral.com). and Three New Estimates of India's All-Cause Excess Mortality during the COVID-19 Pandemic | Center For Global Development (cgdev.org) Global estimates of 15 million are being suggested, see True global Covid death toll 'may be more than 15 million' | News | The Times. My earlier estimate of 10 million looks to have been conservative -as indeed it was meant to be.

The extent of undercounting in Zambia has been confirmed by a retrospective autopsy study. Even persons with typical symptoms were not tested, see Covid-19 deaths in Africa: prospective systematic postmortem surveillance study | The BMJ

Lower specificity of commercial COVID tests in Africa has been reported and may be due to the presence of parasites and other infections, see Challenges in interpreting SARS-CoV-2 serological results in African countries - The Lancet Global Health

Figure 1: Change in reported COVID-19 deaths per 1,000 deaths (pre-COVID) over the past 13 and 31 days up to 3rd September 2021.

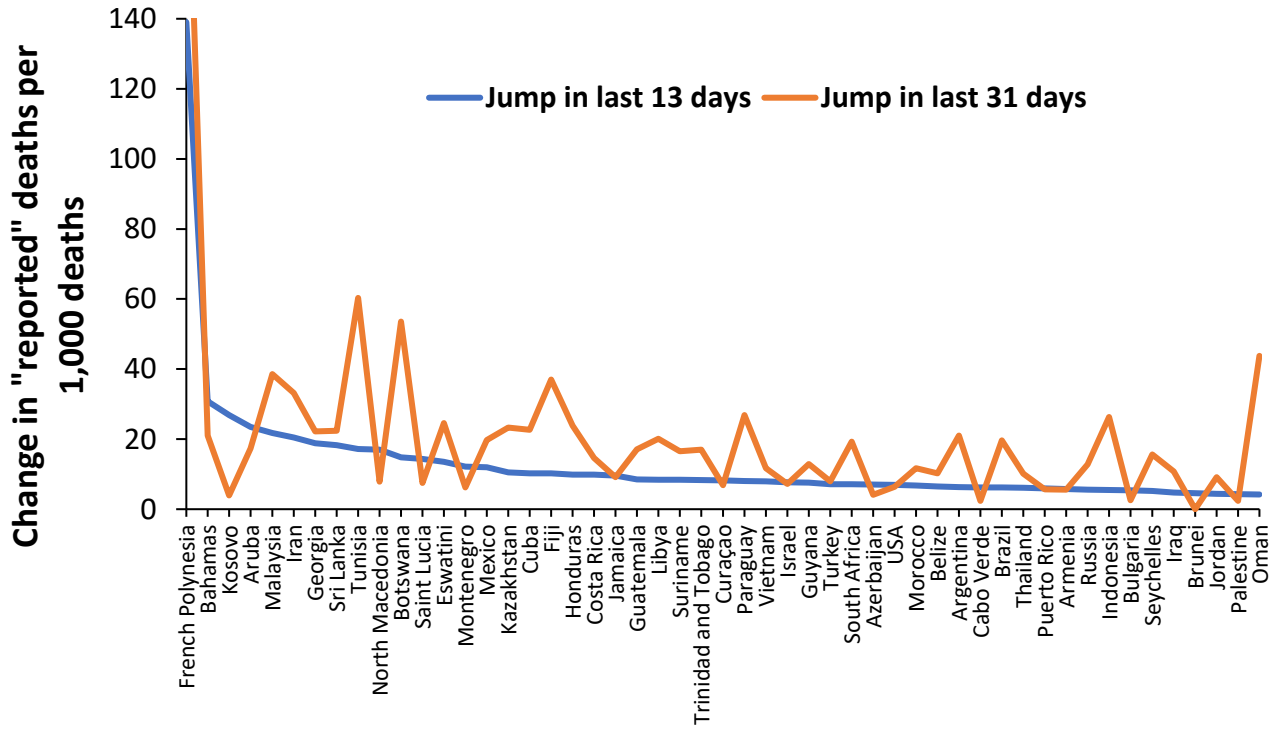
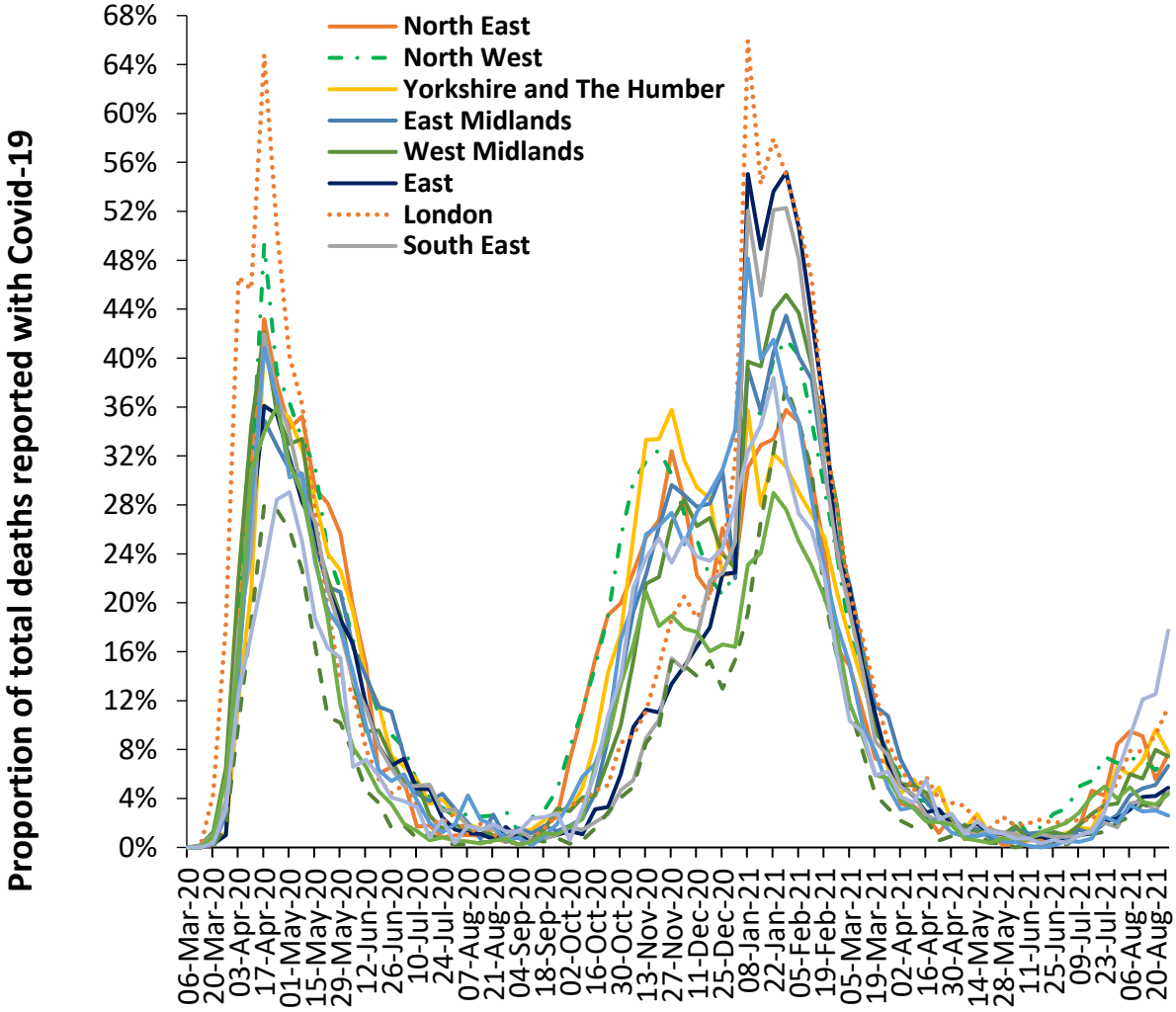


Figure 1 shows the latest position regarding “reported” COVID-19 deaths for the top 50 countries with highest increase in deaths over the past 13 days.

French Polynesia looks to be experiencing a major outbreak. The seriousness of the position in Iran may be muted by undercounting. South Africa is showing another outbreak (possibly >50% undercounting) made worse by massive violence and looting, see [COVID-19 outbreaks: The worst outbreaks in Africa - Deseret News], which may create a super-spreader event.

Figure 2 shows the trend in the proportion of deaths attributed to COVID-19 in the various parts of the UK. As can be seen the trend upward is rapidly rising in Northern Ireland and London. Parts of the UK look to be on the brink of another wave of COVID-19. It would seem prudent to practice your own social distancing

Figure 2: Trend in the proportion of total deaths attributed to COVID-19 in the parts of the UK



Finally, some comment on Figure 1 in Part 1 of this series is warranted. The point is that the rolling 52-week total of deaths (all-cause mortality) is rising in ALL parts of the UK with a trend upward looking very similar to that seen at the start of the 3rd wave. An outbreak like that recently seen in Israel looks to be imminent, see Israel reports record daily Covid cases over 10,900 for 1st time since pandemic outbreak as schools set to open — RT World News

We are seemingly now on the COVID-19 hamster treadmill. New strains emerge, sometimes in response to vaccine-induced evolutionary pressures, leading to further vaccination with modified vaccines, just as is the case with influenza. As it were caught betwixt a rock and a very hard place.

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

Part L. A new wave

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See http://www.hcaf.biz/2010/Publications_Full.pdf for all research.

Situation in the UK

- Proportion of deaths due to COVID-19 continues to rise, especially in Northern Ireland, the North East and London.
- Figure 1, Part 1 has been updated to week ending 13th August. All regions are showing an increase in the rolling 52-week total deaths which is higher than expected from baseline growth.
- The UK is 'skint' and cannot afford further lockdowns – as are many other countries – expect health care funding to be constrained for at least another decade.

COVID-19 testing and reported COVID-19 deaths

- See Part 49 for more detail.
- The higher the number of COVID-19 tests per million population the higher the reported COVID-19 deaths per million – poorer countries test less therefore find fewer deaths.
- A list of the 60 lowest testing countries is given with less than 120,000 cumulative COVID tests per million population during the 17 months of the pandemic, i.e., fewer than 7,000 tests per million persons per month!
    - Countries like Nigeria are not even attempting to conduct widespread testing, while also claiming to have low levels of the virus! A claim which cannot be verified.
    - COVID-19 is likely to be rampant in most of these countries.
    - Travel to these countries is highly unadvised – and most have limited hospital capacity.
    - There are a minority of exceptions where effective measures were implemented to limit spread, i.e., Japan, Taiwan, China, South Korea, etc.
    - Afghanistan is a low testing country.

International situation

- "Reported" COVID-19 deaths now close to 4.5 million.
- Actual death toll >10 million is highly likely.
- Africa, Middle East, South America, and parts of Asia dominate the top 50 places – with undercounting highly likely.
- Iran is in hospital meltdown due to the sheer number of serious infections.

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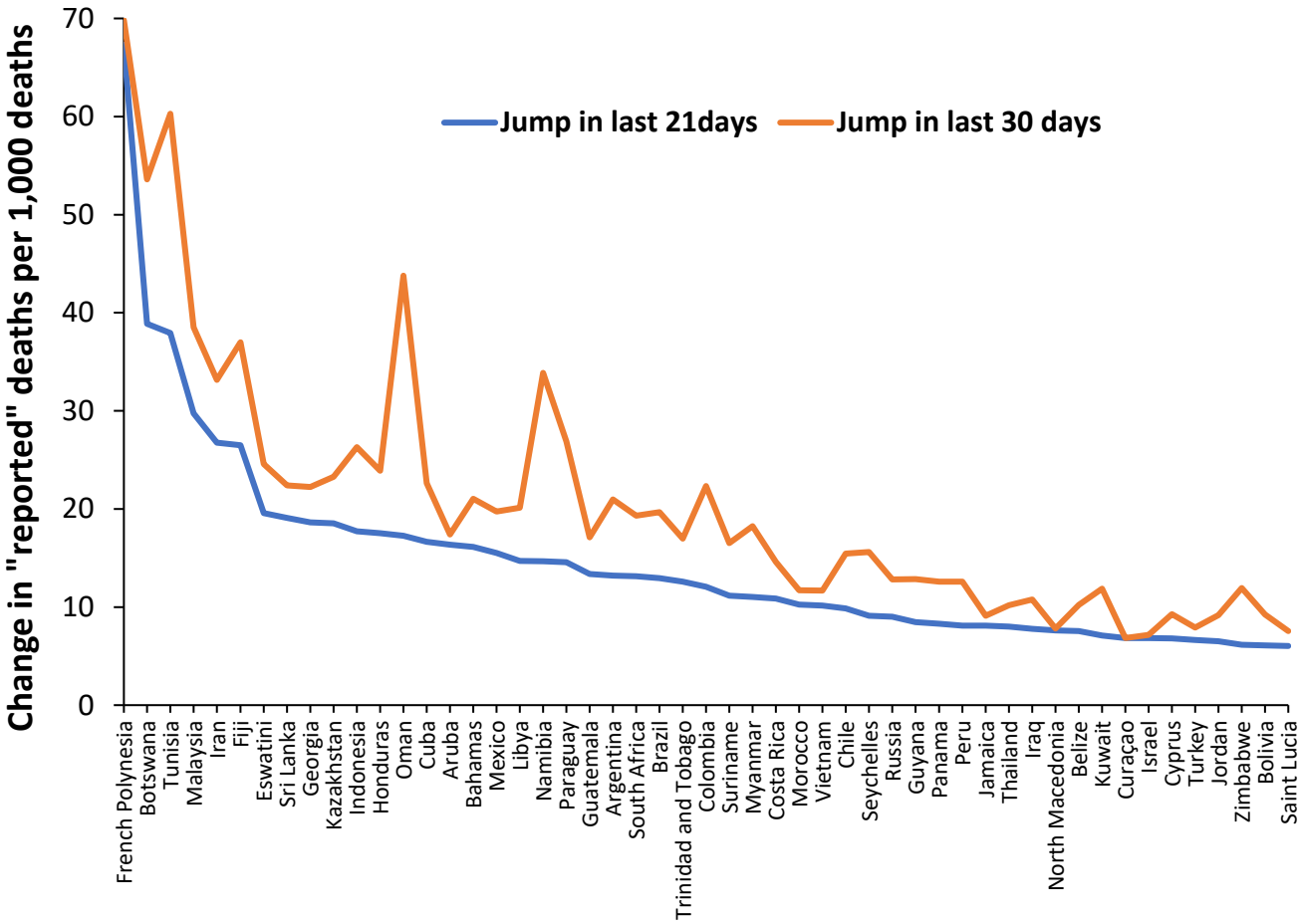
Figure 1 shows the top 50 countries with the highest increase in “reported” COVID-19 deaths in the past three weeks. Africa, the Middle East, South America and parts of Asia now dominate the top 50. Note the high ranking of many African countries. As always, gross under reporting in many countries (see later). Recall that the southern hemisphere is now in the middle of winter.

For example, COVID-19 deaths in Nigeria are too good to be true, etc – a mere 11,000 cumulative tests per million people – which is the cumulative total over 17 months!!!!!! The Central African Republic has always been reluctant to report COVID-19 deaths and claims just 99 cumulative deaths – again a low testing country. Alas politicians seem more than happy to tell you anything. A sad reality that has marred the whole COVID-19 story.

Figure 1: Top 50 countries for the increase in “reported” COVID-19 deaths for the period ending 21st August 2021.

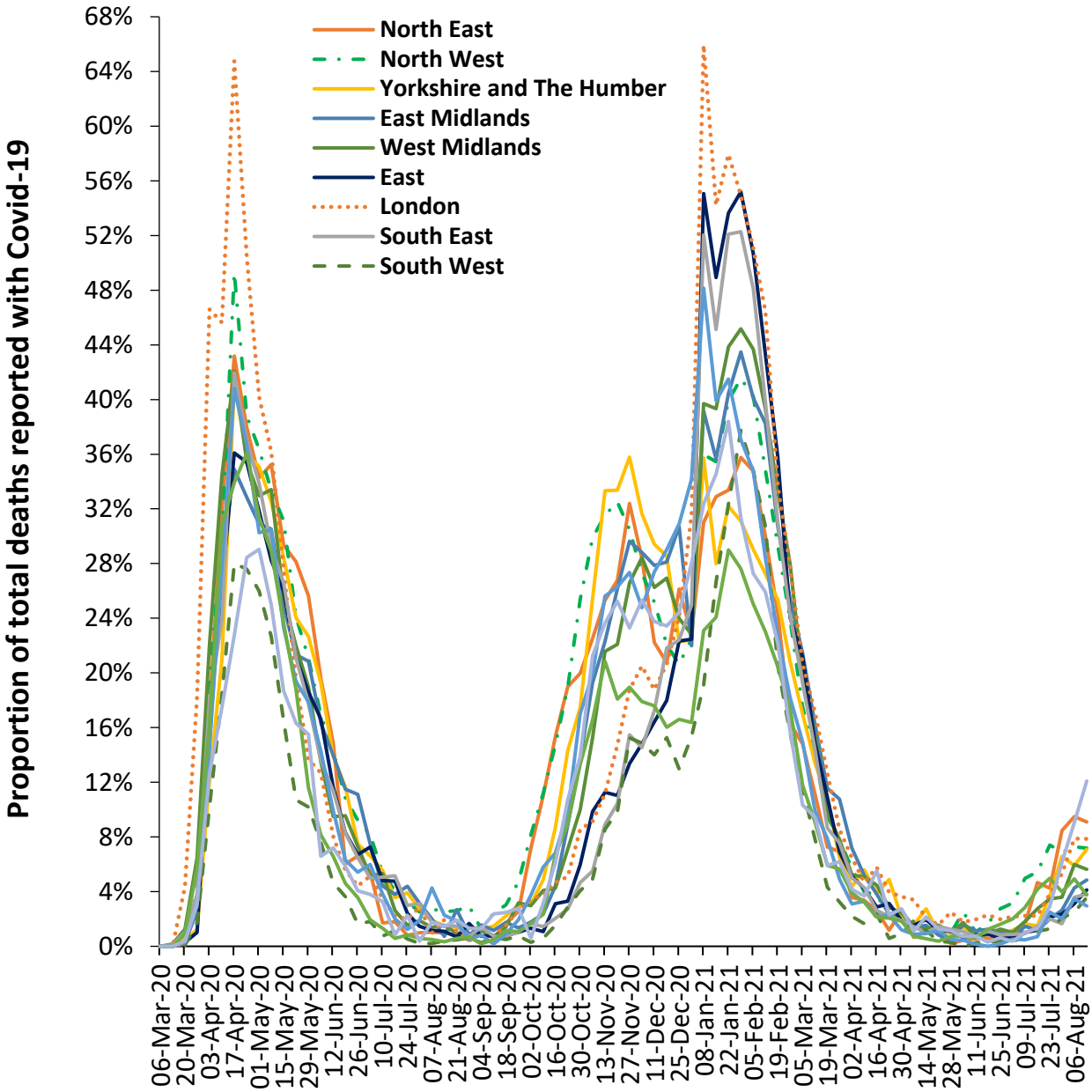


Iran (ranked 5th) is in meltdown with hospital capacity exhausted, see Tehran scrambles for hospital beds as Iran reports record new coronavirus cases (yahoo.com). Testing is relatively low and so actual deaths are likely to be far higher.

I continue to maintain that 10 million deaths are closer to reality.

Figure 2 shows the proportion of total deaths due to COVID-19 in various parts of the UK. This percentage continues to slowly rise. Thankfully the rate of increase has been substantially slowed compared to the first and second wave. Do however remember that this increase is occurring in the middle of summer. Parts of the UK may possibly be on the brink of explosive growth.

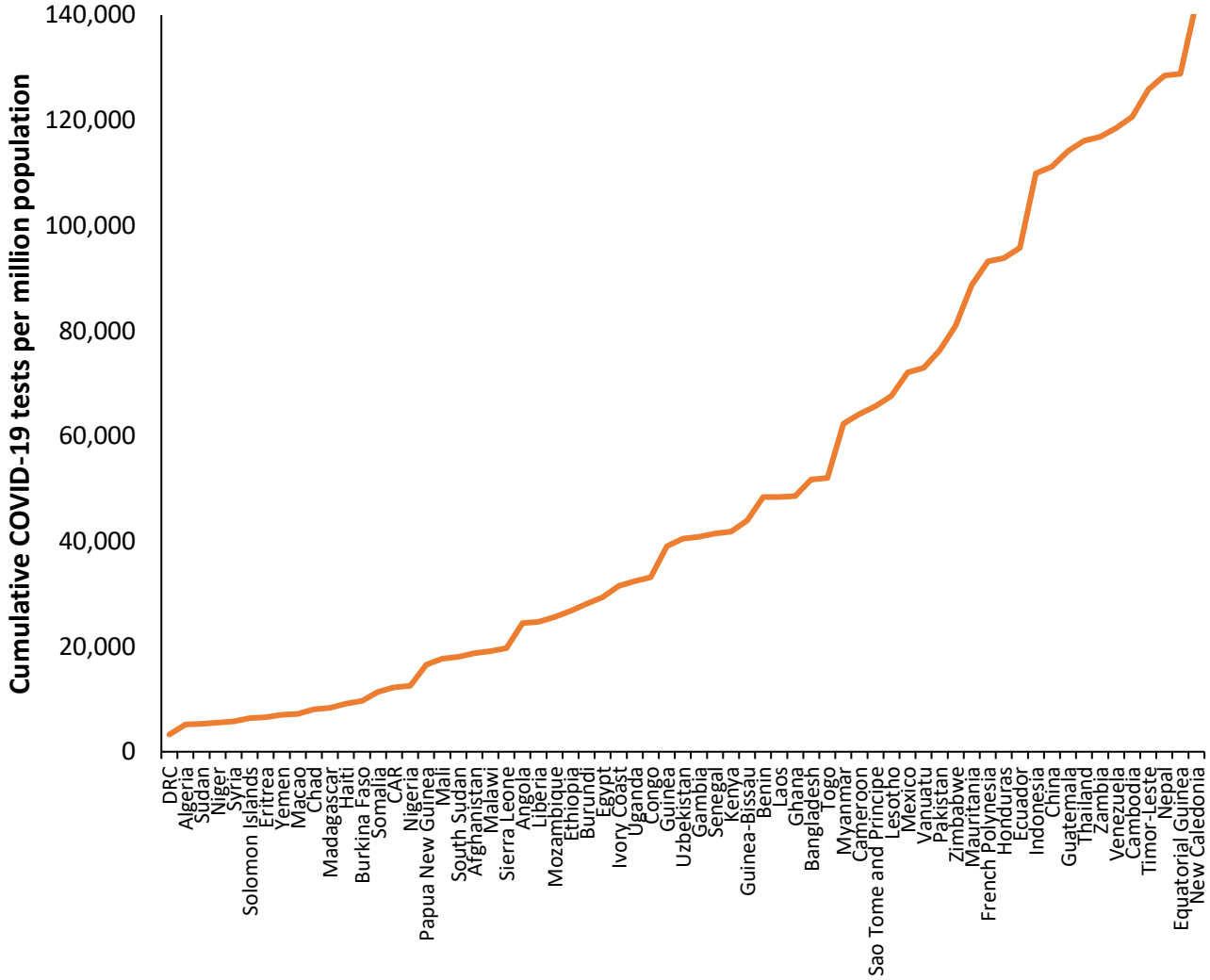
Figure 2: Proportion total deaths due to COVID-19 in parts of the UK.



Finally, Figure 3 lists all countries with fewer than 145,000 cumulative COVID tests per million. Somewhere around 1 million tests per million are required to

give an adequate estimate of real deaths. Recall that all countries were under reporting in the early months of the pandemic. These 65 countries will be subject to gross underestimation of infection rates and deaths.

Figure 3: Countries with fewer than 145,000 cumulative COVID-19 tests per million persons up to 21st August 2021.



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XXXXIX. Africa rising.

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Situation in the UK

- London remains the highest for proportion of total deaths due to COVID-19.
- The UK has moved up the international ranking for weekly change in COVID deaths per 1,000 deaths now at 72nd with USA 65th.
- Figure 1, Part 1 has been updated to week ending 16th July. Almost all regions are showing a slight increase in the rolling 52-week total deaths
- Percentage of deaths due to COVID-19 in Scotland and the North West of England look to be rising. The trend up in Scotland commenced around 11th June.
- The UK is 'skint' and cannot afford further lockdowns – as are many other countries – expect health care funding to be constrained for at least another decade.

COVID-19 testing and reported COVID-19 deaths

- The number of COVID-19 tests per million population shows a power law relationship with GDP per capita – poorer countries do less testing.
- The higher the number of COVID-19 tests per million population the higher the reported COVID-19 deaths per million – poorer countries test less therefore find fewer deaths.
    - Effect reaches saturation around 1 million cumulative tests per million population.
    - 9 countries do not report testing numbers.
    - China and its territories (Hong Kong, Macao) ceased reporting deaths and testing on the 18th April 2020, just at the point when deaths were showing explosive growth.
    - The true death toll is completely unknown.
    - Assumedthat excess mortality will never be reported by China.

- A list of the 85 lowest testing countries is given with fewer than 220,000 cumulative COVID tests per million population.
    - Countries like Nigeria are not even attempting to conduct widespread testing, while also claiming to have low levels of the virus! A claim which cannot be verified.
    - COVID-19 is likely to be rampant in most of these countries.
    - Travel to these countries is highly unadvised – and most have limited hospital capacity.
    - There are a minority of exceptions where effective measures were implemented to limit spread, i.e., Japan, Taiwan, China, South Korea, etc.

International situation

- Commercially available COVID tests do not work as well in Africa, implying underestimation of infection rates, see (7) (PDF) Limited specificity of commercially available SARS-CoV-2 IgG ELISAs in serum samples of African origin (researchgate.net)
- A recent study has estimated 3 to 4 million COVID-19 deaths in India, see Three New Estimates of India's All-Cause Excess Mortality during the COVID-19 Pandemic | Center For Global Development (cgdev.org) – my estimate of 1.2 million was conservative, although this new study is likely to be an over-estimate, 2 million COVID deaths highly likely close to real figure.
- Countries with the most cumulative deaths (% increase in deaths over pre-COVID levels) are Peru 108%, Columbia 42%, Brazil 40%, Paraguay 37%, Bahrain, Ecuador 35%, Panama, Mexico 31%, Argentina 30% - other than Peru, all are subject to under-reporting.
- USA 22%, UK 20% - USA is probably slightly under-reported.
- South America remains the worst hit continent; however, Middle East and Africa are also high.
- Real increase in Africa will be far higher due to very low testing across the whole continent.

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Government advice is that all people with dark skin living in the UK should take a Vitamin D supplement, see Vitamins and minerals - Vitamin D - NHS (www.nhs.uk)

3- to 7-times under reporting of deaths in India during the 2020 first wave. See A comparison of five epidemiological models for transmission of SARS-CoV-2 in India | BMC Infectious Diseases | Full Text (biomedcentral.com). My estimated 1.2 million COVID deaths in India during 2020 + 2021 is highly likely to be close to the real truth, see Special Guest Authors (healthfinancejournal.com)

Figure 1 shows the top 50 countries with the highest increase in “reported” COVID-19 deaths in the last week. Ecuador looks to have revised numbers of COVID deaths, hence the large jump. The Middle East, South America and Africa now dominate the top 50. Note the high ranking of many African countries. As always, gross under reporting in many countries. Recall that the southern hemisphere is now in the middle of winter.

For example, COVID-19 deaths in Nigeria (ranked 151) are too good to be true, etc – a mere 11,000 cumulative tests per million people – which is the cumulative total over 15 months!!!!!! Alas politicians are more than happy to tell you anything. A sad reality that has marred the whole COVID-19 story.

Figure 1: Top 50 countries for the increase in “reported” COVID-19 deaths during the week ending 22nd July 2021.

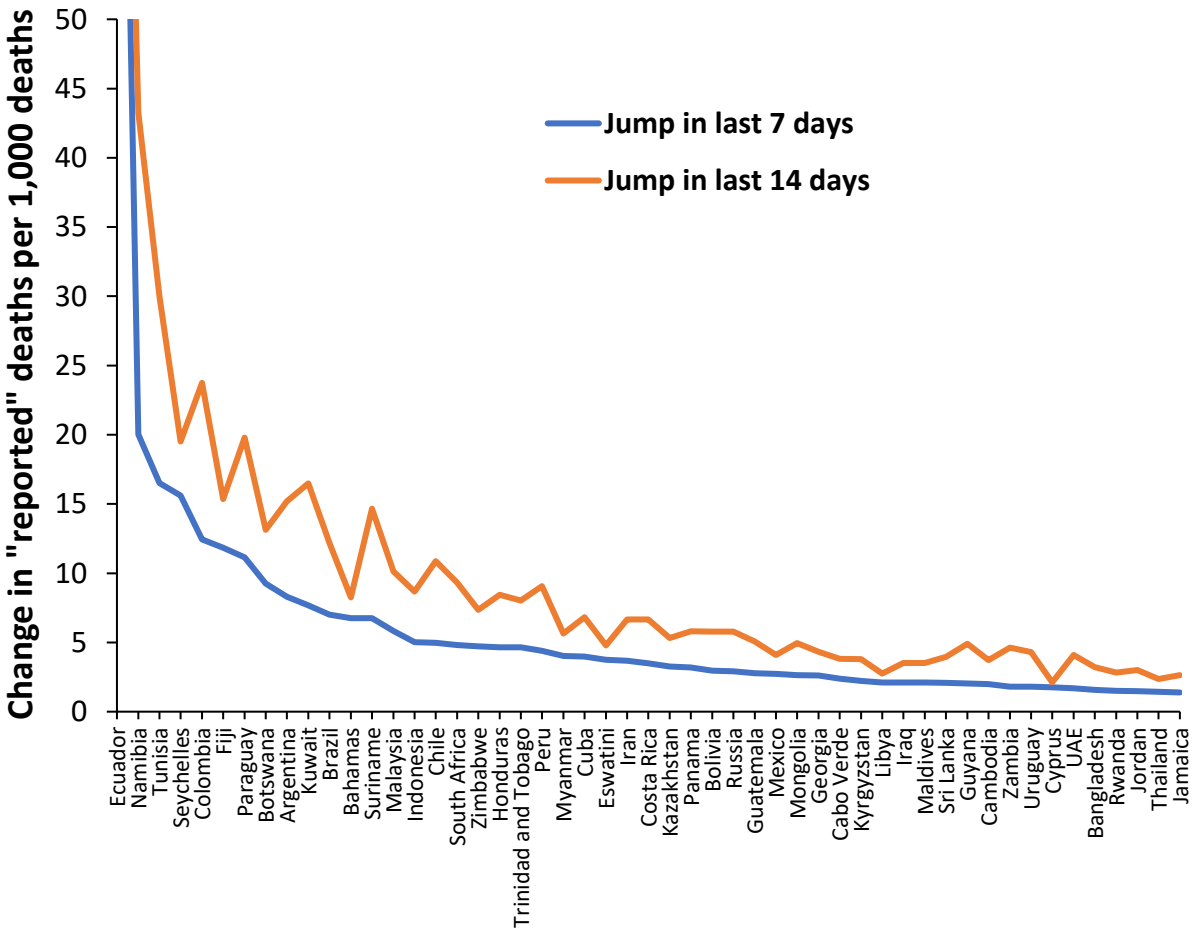


Figure 2 shows the cumulative reported COVID-19 deaths since the start of the pandemic. Note that some countries had large reporting breaks, others stopped reporting very early in the pandemic, etc. Countries in the right-hand tail are usually low testing countries. Peru revised total reported deaths

(equivalent to 110% excess mortality) and may well reflect wider reality around the world.

I continue to maintain that 10 million deaths are closer to reality. Figure 2 shows the cumulative "reported" COVID-19 deaths around the world. The UK is very close to the USA.

Figure 2: Cumulative reported COVID-19 deaths relative to total deaths prior to the pandemic.

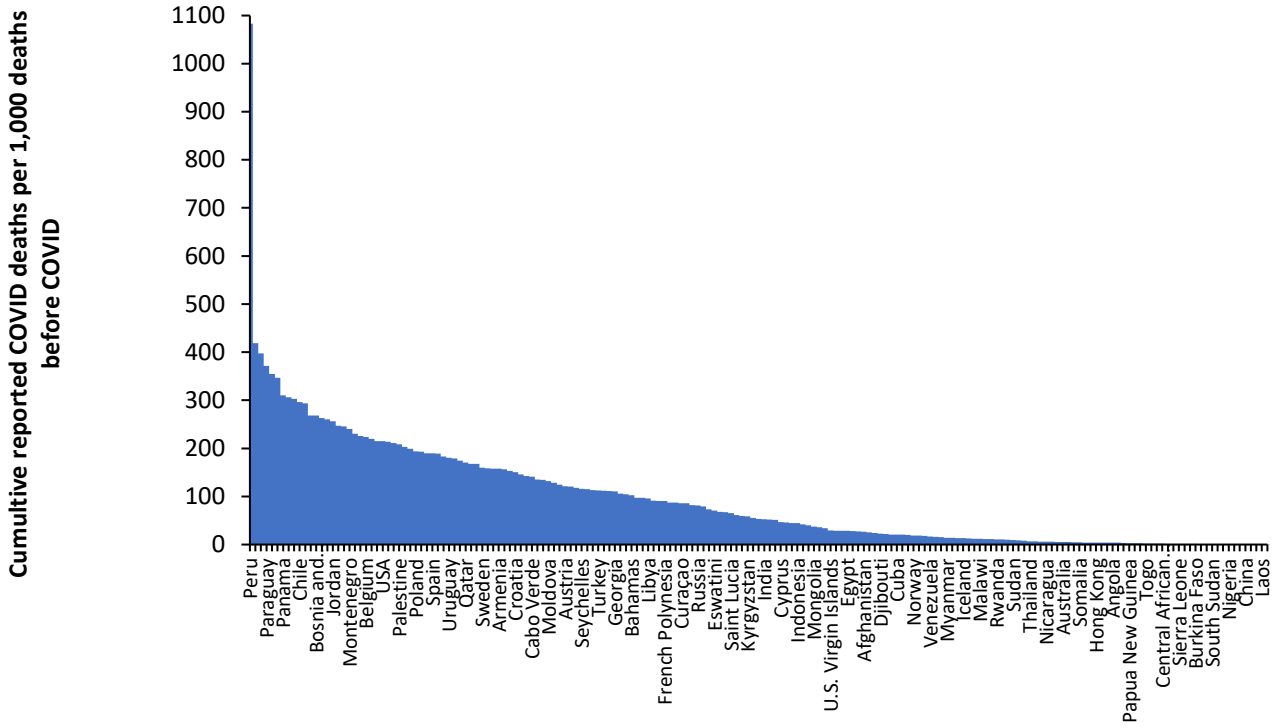
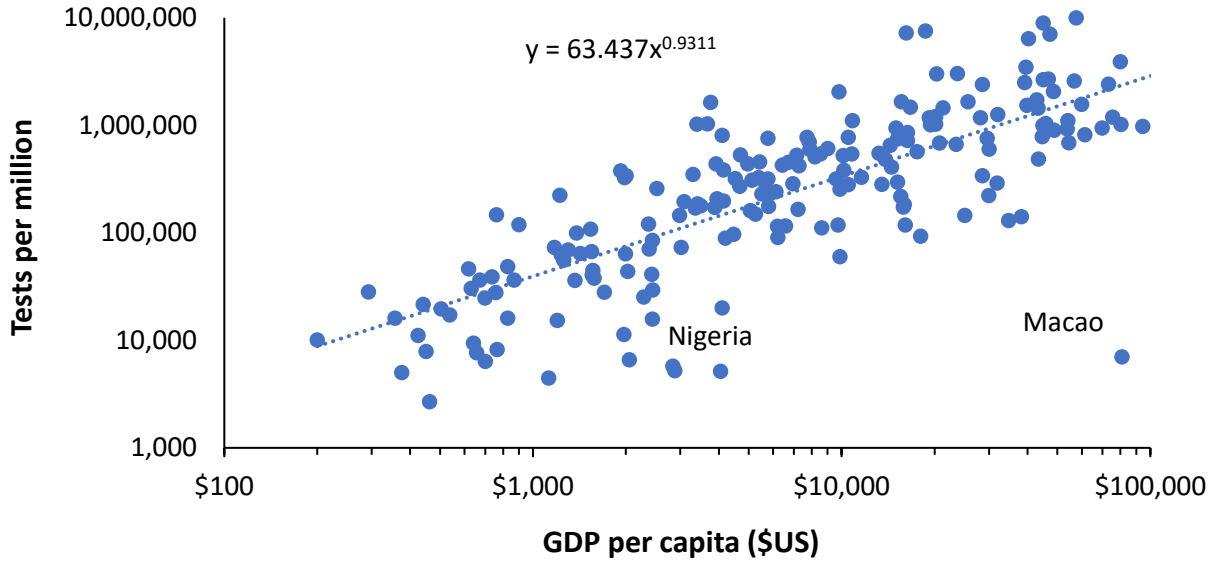


Figure 3: GDP per capita and COVID-19 tests per million population

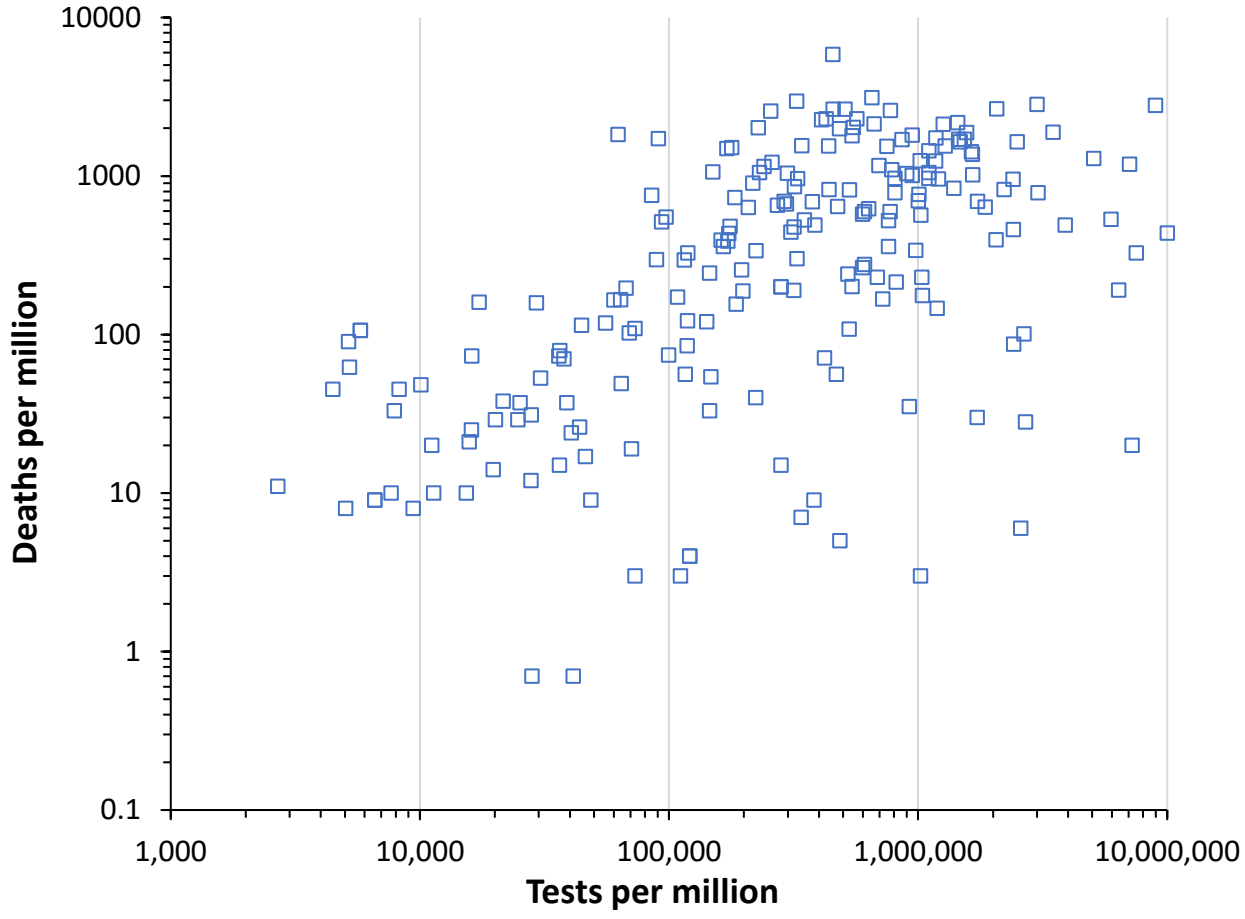


Turning to the issue of under-reporting Figure 3 shows the cumulative number of tests per million versus each countries GDP per capita as a measure of wealth. As can be seen wealth and testing are intimately linked.

Nigeria is highlighted as a relatively wealthy less developed country which is testing far fewer people than similar countries of equal GDP per capita. Claims by Nigeria that COVID is under control in that country are without any evidence. Macao is a Chinese territory, and the low value may be due to censorship of data.

Figure 4 shows the relationship between tests per million and reported deaths per million. Clearly the less you test the fewer COVID deaths you will find. Many of these countries have entirely deficient mortality reporting processes, and annual deaths are often just an estimate – which opens such numbers up to political interference to maintain the appearance that the epidemic was controlled.

Figure 4: Tests per million population and reported COVID-19 deaths per million population



Finally, Table 1 lists all countries with fewer than 220,000 cumulative COVID tests per million. From Figure 4 somewhere around 1 million tests per million are required to give an adequate estimate of real deaths. Recall that all countries were under reporting in the early months of the pandemic.

The DR Congo manages only around 180 tests per million per month. Actual deaths could be over 100-times higher.

As they say, lies, dammed lies and COVID-19 statistics.

Table 1: Countries with lowest levels of cumulative COVID testing over the 15 months of the pandemic.

Country	Deaths	GDP per capita	Tests per million	Deaths per million
DR Congo	1,021	$462	2,686	11
Yemen	1,372	$1,123	4,467	45
Niger	195	$376	5,035	8
Algeria	4,042	$4,048	5,166	90
Sudan	2,776	$2,879	5,218	62
Syria	1,905	$2,835	5,770	106
Solomon Islands	-	$700	6,386	Unknown
Eritrea	33	$2,050	6,585	9
Macao	-	$80,890	7,002	Unknown
Chad	174	$657	7,667	10
Madagascar	939	$450	7,884	33
Haiti	523	$766	8,244	45
Burkina Faso	169	$642	9,409	8
Somalia	781	$200	10,088	48
Central African Republic	98	$424	11,145	20
Nigeria	2,131	$1,969	11,355	10
South Sudan	117	$1,200	15,358	10
Papua New Guinea	192	$2,434	15,778	21
Mali	530	$828	16,087	25
Malawi	1,439	$357	16,130	73
Afghanistan	6,393	$538	17,265	160
Sierra Leone	118	$504	19,681	14
Angola	981	$4,096	20,077	29
Mozambique	1,232	$441	21,556	38
Liberia	148	$699	24,744	29
Ethiopia	4,365	$2,286	25,231	37
Ivory Coast	324	$758	27,903	12
Congo	176	$1,703	27,963	31
Burundi	8	$293	28,193	0.7
Egypt	16,477	$2,441	29,402	158
Uganda	2,496	$631	30,479	53
Senegal	1,264	$1,366	36,138	73
Guinea	197	$868	36,333	15
Gambia	197	$673	36,395	79
Kenya	3,838	$1,578	37,832	70
Guinea-Bissau	74	$737	38,912	37
Uzbekistan	826	$1,554	40,549	24
Laos	5	$2,424	41,290	0.7
Ghana	819	$2,026	43,744	26
Bangladesh	19,046	$1,564	44,571	114
Togo	143	$618	46,212	17

Country	Deaths	GDP per capita	Tests per million	Deaths per million
Benin	107	$827	48,510	9
Myanmar	6,459	$1,256	55,646	118
Lesotho	357	$9,863	60,101	165
Mexico	237,954	$1,234	62,467	1,825
Sao Tome and Principe	37	$1,995	63,862	166
Cameroon	1,334	$1,422	64,305	49
Zimbabwe	2,961	$1,548	67,192	196
Pakistan	22,971	$1,300	69,305	102
Timor-Leste	26	$2,377	70,670	19
Vanuatu	1	$3,022	73,084	3
Mauritania	520	$1,173	73,118	109
Honduras	7,594	$2,437	85,209	754
Indonesia	82,013	$4,200	89,168	297
Ecuador	30,797	$6,214	90,773	1,718
French Polynesia	145	$18,000	93,250	513
Guatemala	10,063	$4,471	97,327	551
Cambodia	1,254	$1,384	99,534	74
Zambia	3,250	$1,535	108,249	172
China	4,636	$8,612	111,163	3
Réunion	266	$6,200	115,206	295
Thailand	3,930	$6,579	116,162	56
Equatorial Guinea	123	$9,741	118,290	85
Venezuela	3,458	$16,050	118,481	122
Nepal	9,695	$900	118,846	327
Vietnam	370	$2,366	121,001	4
New Caledonia	-	$34,780	130,489	Unknown
Japan	15,116	$38,214	141,653	120
Philippines	27,131	$2,982	145,675	244
Taiwan	786	$25,026	145,705	33
Rwanda	718	$762	147,239	54
Suriname	627	$5,251	149,802	1,059
Jamaica	1,168	$5,061	161,652	393
Dominican Republic	3,931	$7,223	165,305	359
Bolivia	17,613	$3,351	170,480	1,487
El Salvador	2,538	$3,883	172,303	389
Antigua and Barbuda	43	$15,825	173,577	435
Libya	3,344	$5,791	175,836	480
Tunisia	18,052	$3,494	178,695	1,511
Trinidad and Tobago	1,026	$15,952	184,009	731
Djibouti	155	$3,409	185,976	155
Morocco	9,559	$3,083	195,835	256
Sri Lanka	4,054	$4,135	197,812	188
Eswatini	742	$3,942	208,053	633
Seychelles	89	$15,536	217,232	899

Was the world ready for a pandemic – absolutely not!

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

XXXXVIII. A turning point.

Dr Rodney P Jones
Statistical Advisor
hcaf_rod@yahoo.co.uk
See http://www.hcaf.biz/2010/Publications_Full.pdf for all research.

Situation in the UK

- London remains the highest for proportion of total deaths due to COVID-19.
- The UK has moved up the international ranking for weekly change in COVID deaths per 1,000 deaths now at 88th with Portugal 86th, France 87th, USA 74th and India 63rd.
- Figure 1, Part 1 has been updated to week ending 25th June.
- Expect deaths to rise further as lockdown is relaxed – the exact rise will depend on vaccine effectiveness and the arrival of new COVID variants – either imported or home grown.
- The UK is 'skint' and cannot afford further lockdowns.

International situation

- Oman had the highest increase in deaths over the week ending 8th July.
- South America remains the worst hit continent; however, Middle East and Africa are also high.
- Real increase in Africa will be higher due to low testing across the African continent.

Errata for previous issues

- Maidstone in Kent ***did not*** have high excess winter mortality (EWM) during the 2nd wave. A transposition error (now corrected) in ONS data caused this erroneous result. I recently identified a transposition error in Scottish data – also now corrected.
- Negative growth ***did not*** occur in Dorset during the 1st wave. This error arose from a change in the boundary of Dorset in January 2019 (my ignorance). Data for Dorset during 2019 looks peculiar, and this remains an outstanding query with the ONS. It is this peculiar

behaviour which amplified the issue. A rolling total is sensitive to changes, even if they are due to data inconsistencies.

- The large drop in the rolling 12-month total of deaths seen in Figure 1, Part 1 is one of the limitations of a rolling 12-month total. The spike in deaths during the 1st wave must leave the rolling total after 12-months and this creates the large decline seen in April/May 2021. In turn, the 2nd wave will likewise exit the rolling total around February/March 2022.
- The main reason that I use a rolling 12-month total is that it visually illustrates the huge (unfunded) volatility in health care costs.

A 4-Part series in *Journal of Health Care Finance* describes the principles behind financial and ***capacity*** risk in health care. Parts 1-3 explain the epidemiological principles behind why things can quickly go terribly wrong – with COVID-19 as an example, while Part 4 explains the changes required in health care policy to limit the damage.

Part 4 should be compulsory reading in Health Departments around the world. Policy must be based on how the real world 'actually' behaves rather than how it 'ought to' or 'should' behave in the narrow world of policy. A MUST read for anyone who cannot understand why seemingly well-run organisations suddenly slip into deficit. NHS managers have seemingly been held to account for that over which they have absolutely no control, See Vol. 47, No. 3, Winter 2021 (healthfinancejournal.com)

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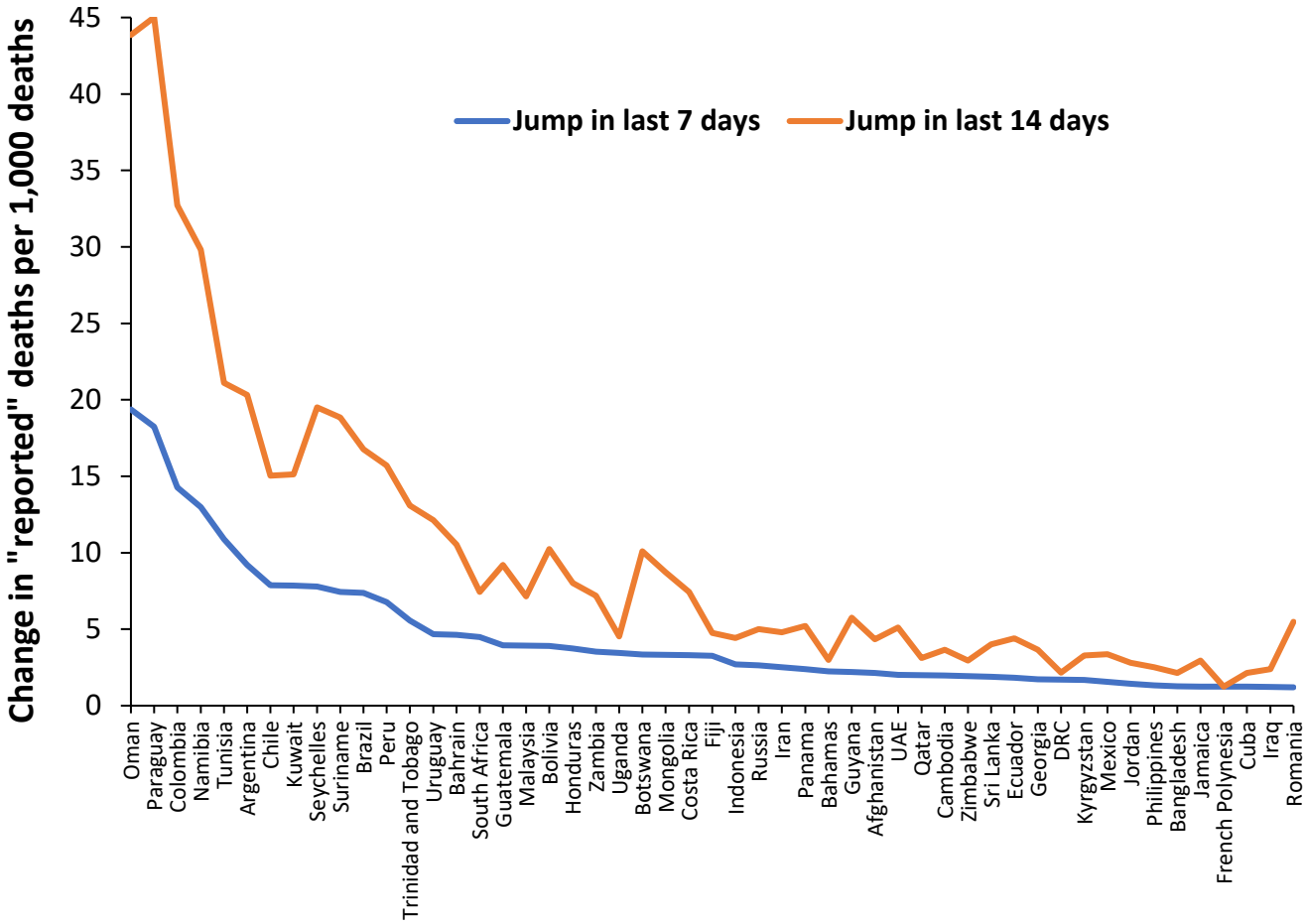
Figure 1: Top 50 countries for the increase in “reported” COVID-19 deaths during the week ending 8th July 2021.



The situation in the UK is at a turning point. National debt limits future options. While you may think it is the governments number one priority to protect your life at all costs, alas, far wider issues are at stake. The never-never has a sting in its tail. Ask the citizens of Greece. However, is a rapid transition to normality the correct route?

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

XXXXVII. Excess mortality in UK regions in both the first and second waves.

Dr Rodney P Jones
Statistical Advisor
hcaf_rod@yahoo.co.uk
See http://www.hcaf.biz/2010/Publications_Full.pdf for all research.

A method based on the underlying trend in deaths is used to verify excess deaths in the UK in both first and second waves

- Genuine excess deaths were generally higher in the first wave.
- The South East and Northern Ireland were the only exceptions.
- London was highest in both waves.
- Reported COVID-19 deaths were under-estimated in the first wave and over-estimated in the second.
- Combined excess deaths over both waves ranges from 38.3% in London down to 15.4% in the South West. At 19% Wales was the next lowest after the South West followed by Scotland at 19.8%.
- Despite all the rhetoric by politicians the excess deaths largely follow weighted population density.

Excess Winter Mortality (EWM) as a way of international comparison

- As a rough guideline the 1918-1920 "Spanish flu" epidemic achieved around 100% EWM.
    - This was at a time when there was no antibiotics or other drugs, no intensive care or ventilators, no PPI, and no lockdown.
- It took over one year for COVID-19 'outbreaks' to occur in the larger US cities and towns.
- During the first wave of COVID-19 New York state (the whole state not just New York city) hit 76% EWM, while New Jersey hit 69%.
- The next highest was 52% in South Dakota during the second wave.
    - Parts of each state, i.e., the Bronx, will have hit higher than the state average.

- Hawaii only achieved 8%, 12% in Washington state, 14% in Maine, 15% in Oregon, Vermont, New Hampshire – all of which are 'normal' for a winter.
- The UK hit 38%, of which 68% for London, 46% for the West Midlands, down to just 24% in Northern Ireland, which was less than the maximum in the years before COVID-19.
    - Note that the UK always has higher EWM than the USA.
- Within the UK; Barnet 102%, Harrow 93%, Newham, Gravesham 91%, Hertsmere 86%, Enfield, Lambeth 82%.
    - These are all far smaller areas than US states.
    - All are first wave and within London, except Hertsmere which is immediately adjacent to Barnet in London.
- The top 50 countries for increasing "reported" deaths in the past 7 and 14 days are listed.
- South America and the Middle East continue to dominate the top 50.
- UK ranks 112th and the USA 62nd.

Situation in the UK

- Figure 1, Part 1 has been updated to week ending 18th June 2021.
- A rolling excess winter mortality (EWM) calculation is shown for UK regions plus the standard deviation between regions.
- Compared to winters since 2000 the COVID-19 epidemic shows unique features of geographic spread with unprecedented variation between regions. Spatiotemporal granularity has been exaggerated.
- Regarding proportion of deaths due to COVID-19, London remains the highest region at 2.3% for the week ending 18th June.

International situation

- Oman and Bahrain had the 1st and 3rd highest increase in deaths over the week ending 24th June.
- South America remains the worst hit continent.

A significant breakthrough in understanding COVID-19 mortality

- A recent study investigating gene involvement in COVID-19 death has made a significant breakthrough.
- This study looked at which genes were involved in respiratory infections including influenza, various coronaviruses, and other pathogens.
- A common set of 166 genes were involved in all respiratory pathogens.
- 20 genes are responsible for disease severity and regulated an IL-15 mediated cytokine storm, Cytokine storm – Wikipedia.

- It was the ability to generate a cytokine storm which made the Spanish flu A(H1N1) pandemic so lethal. Inside a Cytokine Storm: When Your Immune System is Too Strong | Breakthroughs

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Data from the USA demonstrates a direct link between proportion vaccinated and new cases, see CDC COVID Data Tracker

Testing for breakthrough infections, i.e. vaccinated persons who are subsequently infected, is an important part of surveillance for new variants, see Should Vaccinated People Be Tested for Coronavirus? – The Atlantic

Analysis from the USA regarding penetration of the Delta (Indian) variant into communities across the USA, see Expect the Unexpected From the Delta Variant – The Atlantic

Persons with immune-mediated inflammatory disease (IMID) have a lower response to COVID vaccination, see COVID Vax Response Low in Immune-Mediated Inflammatory Diseases (medscape.com)

An especially important study investigated which genes were involved in adverse outcomes from respiratory infections including influenza and COVID-19, see https://doi.org/10.1016/j.ebiom.2021.103390. The authors concluded that:

"*The 166-gene signature was surprisingly conserved across all* viral p*andemics, including COVID-19, and a subset of 20-genes classified disease severity, inspiring the nomenclatures* ViP *and* severe-ViP *signatures, respectively. The* ViP *signatures pinpointed a paradoxical phenomenon wherein lung epithelial and myeloid cells mount an IL15 cytokine storm, and epithelial and NK cell senescence and apoptosis determine severity/fatality. Precise therapeutic goals could be formulated; these goals were met in high-dose SARS-CoV-2-challenged hamsters using either neutralizing antibodies that abrogate SARS-CoV-2•ACE2 engagement or a directly acting antiviral agent, EIDD-2801. IL15/IL15RA were elevated in the lungs of patients with fatal disease, and plasma levels of the cytokine prognosticated disease severity."*

The 20 'severe-ViP' genes were involved, among other aspects, in DNA methylation and amyloid fibre formation. DNA methylation acts to control gene expression while amyloid fibre formation is implicated in Alzheimer's disease. See next study.

Another study found that hypertension plus diabetes gave the greatest risk of mortality from COVID-19, see Hypertension is the major predictor of poor outcomes among inpatients with COVID-19 infection in the UK: a retrospective cohort study | BMJ Open

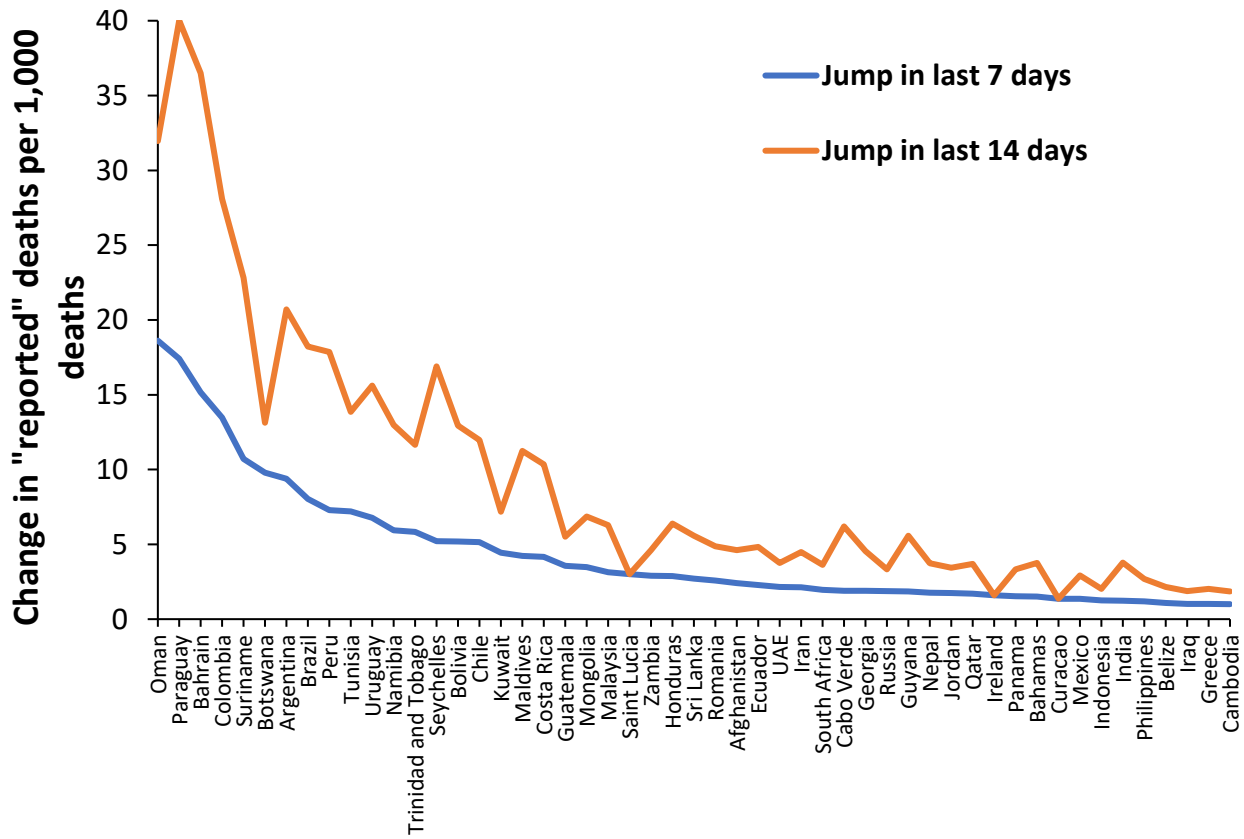
"*The presence of diabetes and hypertension together appears to confer the greatest mortality risk (OR 2.75; 95% CI 1.80 to 4.21; p<0.001) compared with either condition alone. Age >65 years (OR 3.32; 95% CI 2.15 to 5.11), male sex (OR 2.04; 95% CI 1.47 to 2.82), hypertension (OR 1.69; 95% CI 1.10 to 2.61) and cerebrovascular disease (OR 1.87; 95% CI 1.31 to 2.68) were independently associated with increased risk of death. The mortality risk did not differ between the quintiles of deprivation. High-sensitivity troponin I was the best predictor of mortality among biomarkers (OR 4.43; 95% CI 3.10 to 7.10). Angiotensin-receptor blockers (OR 0.57; 95% CI 0.33 to 0.96) and ACE inhibitors (OR 0.65; 95% CI 0.43 to 0.97) were not associated with adverse outcome. The Charlson Index of Comorbidity scores were significantly higher in non-survivors. The combined prevalence of hypertension and diabetes appears to confer the greatest risk, where diabetes may have a modulating effect. Hypertension and*

cerebrovascular disease had a significant impact on inpatient mortality. Social deprivation and ethnicity did not have any effect once the patient was in hospital."

This study does not contradict the previous study, it simply says that if the 20 'severe-ViP' genes show dysfunctional expression then you may well also be fundamentally at risk of diabetes, hypertension and cardiovascular disease. This is sensible since the severe-ViP genes regulate more than cytokine storm.

Turning to the international situation (Figure 1), Oman is the top-ranking country which was identified in Part 46 with outbreaks of Black Fungus and general hospital chaos from Covid-19. Oman was (past tense) the closest 'safe' Middle Eastern country you could fly to from India. If you scan back across previous weeks, you will see that the scale for this figure is gradually getting smaller, although the Southern hemisphere is entering its winter. This explains why African countries are beginning to feature in the top 50 – although with significant undercounting.

Figure 1: Countries with the highest increase in reported COVID-19 deaths up to 24th June.



Finally, Table 1 gives an unbiased value for excess deaths during both waves in the UK.

Table 1: Equivalent annual excess mortality during the first and second wave of COVID-19 in UK regions

Region	2012-14 Minimum	2019 Minimum	Gap year	2019 Minimum	Growth per year	First Wave				Second Wave		
						Maximum	Actual	Predicted	Excess	Actual	Predicted	Excess
London	16-May-14	9-Aug-19	5.24	5.3%	1.01%	29-May-20	29.9%	6.1%	23.8%	21.6%	7.2%	14.5%
N West	10-Feb-12	19-Apr-19	7.19	4.7%	0.65%	12-Jun-20	23.7%	5.5%	18.2%	18.4%	6.1%	12.3%
W Midland	20-Jan-12	19-Apr-19	7.25	9.8%	1.35%	19-Jun-20	28.9%	11.4%	17.5%	25.1%	12.7%	12.3%
N East	06-Apr-12	19-Apr-19	7.04	6.6%	0.94%	05-Jun-20	22.8%	7.7%	15.2%	17.9%	8.6%	9.2%
East	03-Feb-12	07-Jun-19	7.35	11.4%	1.55%	12-Jun-20	27.6%	13.0%	14.6%	23.2%	14.6%	8.7%
E Midland	03-Feb-12	23-Aug-19	7.56	11.1%	1.47%	24-Jul-20	26.8%	12.5%	14.4%	25.9%	13.8%	12.1%
S East	03-Feb-12	26-Apr-19	7.23	7.8%	1.08%	12-Jun-20	23.3%	9.0%	14.2%	20.9%	10.1%	10.8%
Y&Humber	23-May-14	19-Apr-19	4.91	6.6%	1.34%	19-Jun-20	21.4%	8.2%	13.2%	16.7%	9.5%	7.2%
S West	20-Jan-12	26-Apr-19	7.27	7.9%	1.09%	29-May-20	19.4%	9.1%	10.3%	15.3%	10.2%	5.0%
England	03-Feb-12	26-Apr-19	7.23	7.5%	1.04%	12-Jun-20	24.3%	8.7%	15.6%	20.2%	9.7%	10.4%
Scotland	24-Jan-14	19-Apr-19	5.24	7.2%	1.38%	19-Jun-20	21.4%	8.8%	12.6%	17.4%	10.2%	7.2%
Wales	10-Feb-12	19-Apr-19	7.19	8.3%	1.15%	28-Aug-20	20.0%	9.9%	10.1%	19.7%	10.8%	8.9%
N Ireland	27-Jan-12	12-Apr-19	7.21	7.2%	1.00%	10-Jul-20	18.6%	8.4%	10.1%	22.3%	9.4%	12.9%
UK	03-Feb-12	19-Apr-19	7.21	7.3%	1.01%	12-Jun-20	23.3%	8.5%	14.8%	19.6%	9.5%	10.1%

The WWII baby boomers are starting to die in increasing numbers and the ONS anticipates that deaths will rise around 1% per annum for the next 40 years. The reader should re-look at Figure 1, Part 1 which has been updated to 18th June 2021 and which now also includes the baseline trend for deaths in East Midlands as an example, see Table 1.

The baseline trend is obscured for much of the time due to influenza outbreaks and outbreaks of the new type or kind of infectious disease. Hence to find the baseline we need to find occasions when influenza and the other disease are mostly absent. This occurred for the 12-months ending near Feb-12 or the 12-months ending near May-14. The trend for each region is set to zero at these points. The next period when confounding factors are absent is not until the 12-months ending around Apr-19. These two points can then be used to determine the baseline growth. The first five columns in Table 1 provide the information necessary to calculate the baseline.

The baseline can now be used to project the predicted rolling 12-month total deaths at the peak of the first and second waves. The next sets of columns give the information to calculate the excess deaths shown as a percentage increase.

As can be seen the first wave has higher excess deaths than the second wave. As you will recall more COVID-19 deaths were reported during the second wave that the first. This is for two reasons:

1. Due to limited testing capacity, there was considerable under counting during the first wave.
2. Due to excess testing capacity during the second wave, and the very generous definition of a COVID-19 death, reporting in the second wave was an over-estimate.

I suspect that the government knew this but chose to use the over-reporting to ensure that the public maintained support for the second lock-down. A little bit of misinformation goes a long way.

The only locations with a higher genuine excess in the second wave were the South East and Northern Ireland. London was highest for both waves.

To independently check this method, note that the ONS forecast for growth in deaths in England is around 1% per annum while that in Table 1 is 1.04%. This method was used to establish the baseline trend for deaths in Australian states, see A time series of infectious-like events in Australia between 2000 and 2013 leading to extended periods of increased deaths (all-cause mortality) with possible links to increased hospital medical admissions (skums.ac.ir). Also, that the trend in deaths is greatly influenced by winter (rainy season near the equator) infectious outbreaks, see https://doi.org/10.3390/ijerph18042161

Another sense check is that any period of time in which pathogen activity is low should be accompanied by lower deaths, i.e., the proposed new type or kind of disease acts as if it has a pathogen basis. The rolling 12-month total method (as per Figure 1, Part 1 – at end of document) is eminently suited to detecting such periods of time.

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

XXXXVI. COVID-19 and black fungus

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International situation

- Hot on the heels of Peru the Indian state of Bihar has dramatically revised COVID-19 deaths upward after a court challenge forced a review, Covid: India posts global record deaths after state revises data | India | The Guardian
- The suspicion is that even the forced revision is a gross underestimate!
  - Even after revision Bihar still only ranks 5th among Indian states for a 45-day increase in deaths.
  - Placed on a chart analysing the effect of proportion rural in each state the revision barely makes a difference.
  - Seemingly a grudgingly forced revision that still avoids reality.
  - The COVID-19 deaths cover-up continues at pace in India.
- The political situation (and willingness to face reality) in India is complex to say the least, see List of current Indian ruling and opposition parties - Wikipedia
- Dare one suggest a deluge of international revisions to follow?
- The top 50 countries for increasing "reported" deaths in the past 7 and 14 days are listed.
- South America and the Middle East continue to dominate the top 50.
- UK ranks 112th and the USA 62nd.

The human microbiome and implications to COVID-19

- Infection from Black fungus was first reported in India but is now being reported elsewhere.
- Black fungus is from soil and is part of the human lived microbiome. Lung and further invasive infection (including the eyes and brain) is promoted by high blood sugar (diabetes) and over-use of steroids to counter inflammation. See A rare black fungus is infecting many of India's COVID-19 patients—why? (nationalgeographic.com)

- Steroids and other anti-inflammatory agents act to suppress aspects of immune function.
- Fungal infections are notoriously difficult to control.
- With any new disease expect to see unexpected outcomes.
- Upon reading studies on immune function, you will be struck by the huge variation around the average seen in immune responses among participants in the study. The human immune response in all its multidimensional components is uniquely individual.

Situation in the UK

- Figure 1, Part 1 has been updated to week ending 4th June 2021.
- A rolling excess winter mortality (EWM) calculation is shown for UK regions plus the standard deviation between regions.
- Compared to winters since 2000 the COVID-19 epidemic shows unique features of geographic spread with unprecedented variation between regions. Spatiotemporal granularity has been exaggerated.

International bed pressures

- Bed pressures between countries are compared using pre-pandemic bed numbers.
- Peru ranks highest, UK ranks 18th due to extremely low pre-pandemic bed numbers.
- USA ranks 21st due to bed numbers only sufficient for the insured population.

Errata for previous issues

- Maidstone in Kent ***did not*** have high excess winter mortality (EWM) during the 2nd wave. A transposition error (now corrected) in ONS data caused this erroneous result. I recently identified a transposition error in Scottish data – also now corrected.
- Negative growth ***did not*** occur in Dorset during the 1st wave. This error arose from a change in the boundary of Dorset in January 2019 (my ignorance). Data for Dorset during 2019 looks peculiar, and this remains an outstanding query with the ONS. It is this peculiar behaviour which amplified the issue. A rolling total is sensitive to changes, even if they are due to data inconsistencies.
- The large drop in the rolling 12-month total of deaths seen in Figure 1, Part 1 is one of the limitations of a rolling 12-month total. The spike in deaths during the 1st wave must leave the rolling total after 12-months and this creates the large decline seen in April/May 2021. In turn, the 2nd wave will likewise exit the rolling total around February/March 2022.

- The main reason that I use a rolling 12-month total is that it visually illustrates the huge (unfunded) volatility in health care costs.

A 4-Part series in *Journal of Health Care Finance* describes the principles behind financial and ***capacity*** risk in health care. Parts 1-3 explain the epidemiological principles behind why things can quickly go terribly wrong – with COVID-19 as an example, while Part 4 explains the changes required in health care policy to limit the damage.

Part 4 should be compulsory reading in Health Departments around the world. Policy must be based on how the real world 'actually' behaves rather than how it 'ought to' or 'should' behave in the narrow world of policy. A MUST read for anyone who cannot understand why seemingly well-run organisations suddenly slip into deficit. NHS managers have seemingly been held to account for that over which they have absolutely no control, See Vol. 47, No. 3, Winter 2021 (healthfinancejournal.com)

Listen to a 14-minute interview about the series, https://jjunland.egnyte.com/dl/CPdNnjCVle

Fans of Star Wars will recall when Darth Vader says that he senses 'a disturbance in the force'. Rephrasing to COVID-19 and 'I sense a disturbance in the microbiome'.

One of the potential side-effects of COVID-19 is black fungal infection which was first noted in India and has just been detected in Oman, see In Oman, fungal infection detected in some COVID-19 patients - ABC News (go.com). Even children in India have had to have an eye(s) surgically removed to prevent spread of the fungus to the brain with fatal consequences, see Mucormycosis effect: Four children of varying ages lose an eye (freepressjournal.in)

COVID-19 like many infectious agents 'messes' with your immune function. As I have repeatedly stated 'no pathogen operates in splendid isolation'. Some pathogens programme infected cells to release interferons, and interferons then produce symptoms of influenza-like-illness (ILI). See Interferon - Wikipedia. ILI is therefore a misnomer which incorrectly implies an aetiology of influenza. Semantics aside, COVID-19 operates in the soup of commensal, beneficial and potentially pathogenic microbes which forms the external and internal human microbiome (see Part 45).

A fascinating aspect of immune function is that it can be tipped into multiple steady states, see timminspdf.pdf (napier.ac.uk). Some of these steady states are associated with 'disease' types such as Gulf War Illness and Chronic Fatigue Syndrome, see A Role for Homeostatic Drive in the Perpetuation of Complex Chronic Illness: Gulf War Illness and Chronic Fatigue Syndrome (nih.gov). Long-COVID is almost certainly such an altered steady state. Latest research is that noise pollution (which also

affects immune function) also plays are role in COVID-19 incidence and hospital admissions. See pagination_YENRS_110766.pdf

The common persistent pathogen Cytomegalovirus (CMV) manipulates immune function in 'susceptible' individuals. CMV makes you 'ill' by covert rather than overt infection. See Does reactivation of cytomegalovirus contribute to severe COVID-19 disease? | Immunity & Ageing | Full Text (biomedcentral.com). Medical textbooks seriously under rate this pathogen. I have suggested that CMV is somehow involved in outbreaks of a new type or kind of disease which regularly occurs in the UK and around the world, see http://www.hcaf.biz/2010/Publications_Full.pdf. Alas, horrendously tricky to prove simply because CMV is so widely present in humans and its effects are subtle, multidimensional, and specific to individuals and ages. Seemingly beneficial in youth but exacting payment in old age.

Hence the complex interplay between pathogens and immune function has been well and truly 'disturbed' by the arrival of COVID-19 and its increasing host of variants. See Evolution of enhanced innate immune evasion by the SARS-CoV-2 B.1.1.7 UK variant | bioRxiv and Multiple SARS-CoV-2 variants escape neutralization by vaccine-induced humoral immunity: Cell

Alas "that's life" folks. Although it does suggest that the immune erosive effects of unhealthy lifestyles should be avoided as much as possible. Good old-fashioned exercise is the most beneficial and least expensive thing you can do for your immune system. Obesity is bad for you because it increases your background level of inflammation.

Philosophical musings on the ambiguity of life and immunity aside shall we turn to the state of COVID-19 havoc around the globe?

Figure 1 illustrates the vast shift in spatiotemporal granularity associated with COVID-19. The Figure uses Excess Winter Mortality to illustrate the issues. The bigger the standard deviation (STDEV) around the UK average the greater the regional differences. The wobbles and bumps in the STDEV trend before COVID-19 represent outbreaks of multiple pathogens (>2,000 known human pathogens) within the UK.

The mini peak between the two larger peaks is the emergence and spread of the Kent variant. COVID-19 has led to unprecedented changes by virtue of how it spreads (super-spreaders), how it interacts with winter, and how new variants emerge and spread. A similar chart is produced for world countries. Our addiction to international air travel has become part of the problem.

Figure 1: A rolling Excess Winter Mortality (EWM) calculation for the UK and the associated standard deviation between UK regions.

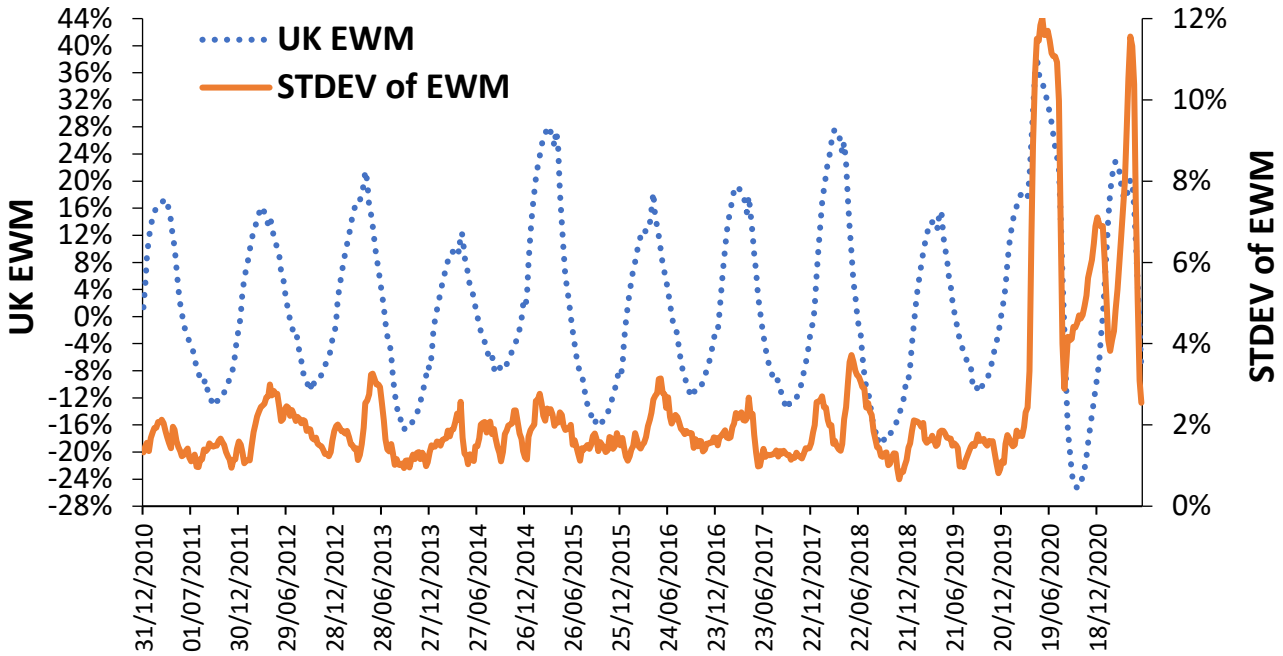
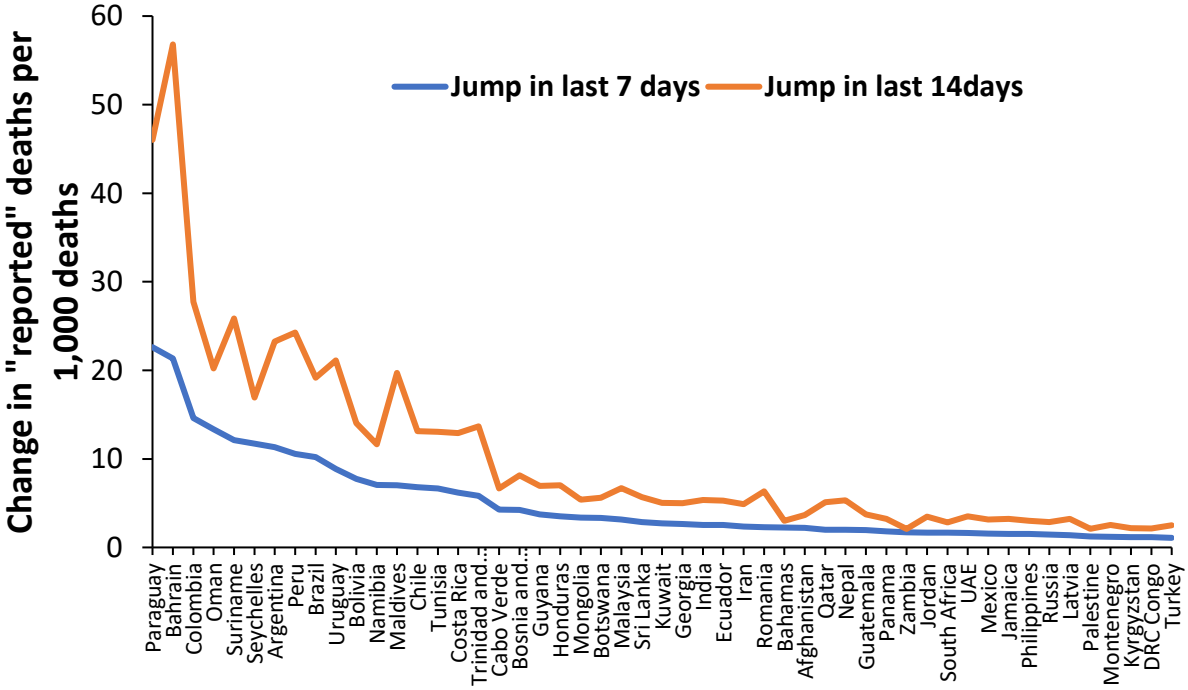


Figure 2 shows the increase in "reported" COVID-19 deaths for the top 50 world countries in the past 7 and 14 days. South America and Middle East still dominate the top ranks. A smattering of African countries now in top 50. However, in general world cases and deaths are declining.

Figure 2: Top 50 countries for reported increase in COVID-19 deaths over the past 7 and 14 days.



You may not be aware that the Indian state of Bihar was forced to re-calculate COVID-19 deaths due to court action and revised deaths were released on Thursday morning of June 10th, see FPJ Explains: How did COVID-19 death toll in Bihar increase drastically overnight? (freepressjournal.in). Clearly the government of Bihar may wish to avoid loss of reputation and may seek to underestimate reality.

To this end Figure 3 shows the reported increase in Covid-19 deaths for Indian states in the 45 days since 1st May 2021. Even after the revised total of COVID deaths Bihar still only ranks 5th. The orange line is the slope of assumed logarithmic growth. Log growth in many states ceases at around day 35 due to a national lock-down, however, even after lock-down deaths continue to rise. Percent growth and magnitude of log growth are never-the-less linked.

Figure 3: Growth in reported Covid-19 deaths in Indian states in the 45 days from 1st May 2021. Bihar includes the revised total.

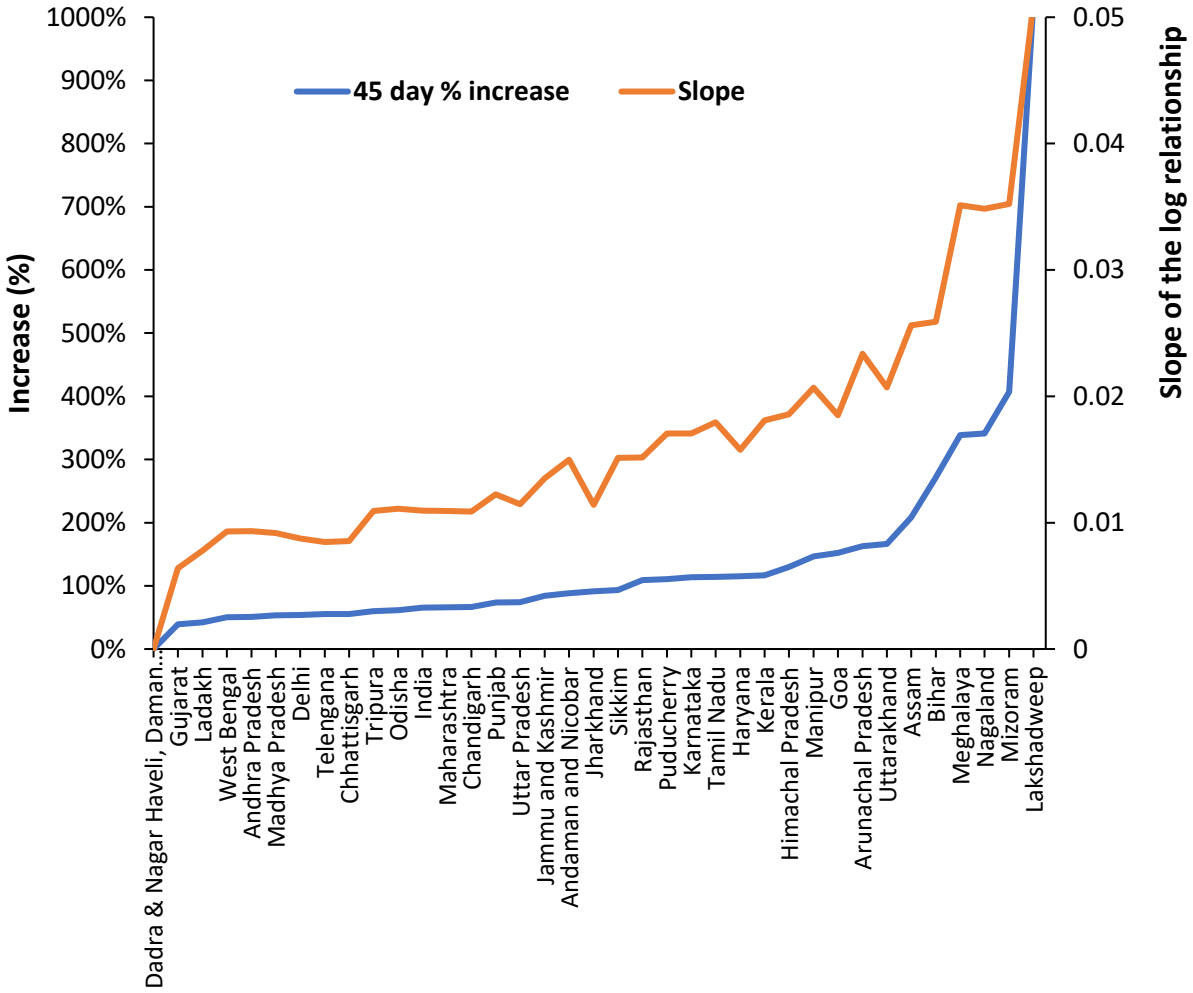


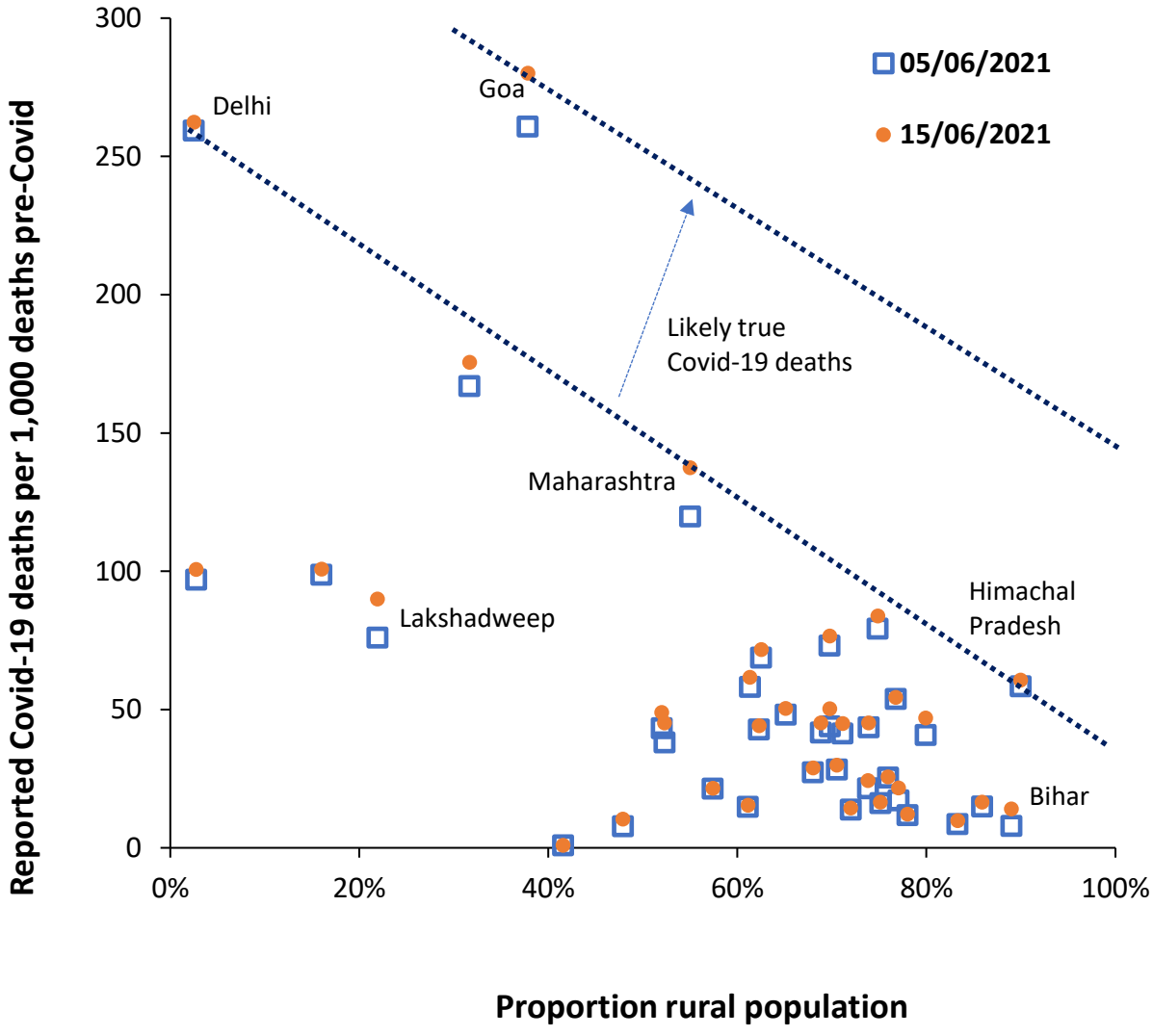
Figure 4 examines the impact of the revision in Bihar using the relationship between state proportion rural (a proxy for lived population density). Similar

analysis was recently used to estimate 1.2 million COVID-19 deaths in India, see Special Guest Authors (healthfinancejournal.com). As can be seen even the revised total makes little impact on the total reported COVID deaths and still leaves Bihar with levels of deaths far below lines representing likely deaths.

It should come as no surprise that the Bihar High Court has challenged the basis for the revision, see Patna HC asks Bihar govt for sources it relied upon to revise Covid-19 death toll (msn.com). Figure 4 provides ample basis for such a challenge.

A huge margin for revision is present in most Indian states. The great Indian COVID-19 deaths cover-up seemingly continues. India contains all the population risk factors for spread and deaths from COVID-19 (too few hospital and critical care beds). The death reporting process is weak in most states, especially those with high rural populations.

Figure 4: Reported Covid-19 deaths in Indian states at 5th and 15th June 2021. Bihar revised deaths on 10th June 2021.

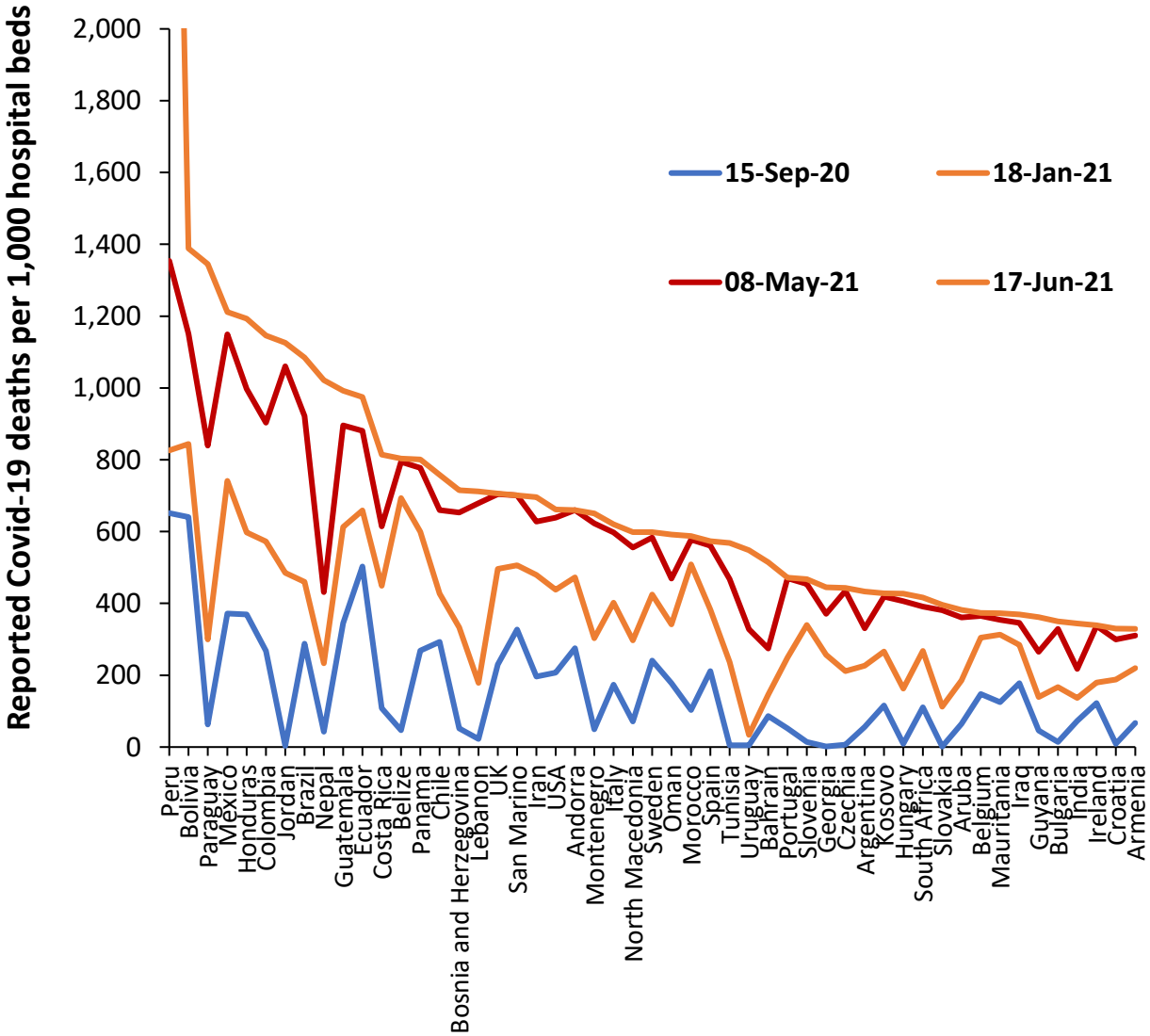


Finally, Figure 5 investigates the cumulative pressure on hospital beds in the top 50 countries for highest pressure.

Extremely high COVID-19 deaths in Peru are partly due to very few hospital beds in this country and the recent revision in the true death toll.

The UK is surprisingly high up the list simply because for a developed country we have pitifully low hospital and CCU bed numbers. The UK came within a cat's whisker of a huge catastrophe. See papers relating to hospital bed numbers and occupancy at http://www.hcaf.biz/2010/Publications_Full.pdf. A paper has been submitted looking at critical care bed numbers in the UK – some Indian states have far more critical care beds than the UK!!!!!

Figure 5: Total "reported" COVID-19 deaths for the top 50 countries by pressure on hospital beds (available beds before COVID).



Likewise, the USA is high up the list due to pitifully low hospital bed numbers. In the USA bed numbers are only sufficient to service the insured population, see IJERPH | Free Full-Text | Would the United States Have Had Too Few Beds for Universal Emergency Care in the Event of a More Widespread Covid-19 Epidemic? (mdpi.com)

India shows up in the top 50, however, a realistic estimate of deaths would put India somewhere around 1,100 COVID-19 deaths per 1,000 beds. This is the average for India and will be worse in the poorer states. Hence, bodies floating in the Ganges, etc.

Parts of Africa show in the top 50, however, gross under counting across Africa means that most of this continent should be among the top 50!

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

XXXXV. Long Covid, vaccination and the human microbiome

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International situation

- "Reported" Covid-19 deaths have already passed 3.8 million.
- The top 50 countries for increasing deaths in the past 7 and 14 days are listed.
- Highest increase in Bahrain.
- UK now ranks 122nd.

The human microbiome and implications to COVID-19

- The immune system is vastly complex.
- New types of immune cells are still being discovered.
- Immunity is far more than just levels of circulating antibodies.
- A recent study took samples from the surfaces in the transport system of 60 world cities and tested these for microbial DNA.
- Each city had a unique microbial biome.
- 1,302 new species of bacteria were discovered along with 10,900 new viruses! For every 10 additional samples a new species was discovered.
- Implications to pathogen interactions and vaccination are outlined.

Situation in the UK

- Figure 1, Part 1 has been updated to week ending 28th May 2021.
- Note that a rolling 52-week total is simply the sum of total deaths (of which COVID deaths are a subset) in the most recent 52 weeks, move forward 1 week and recalculate.
- A large spike in deaths stays in the rolling total for 52 weeks and then moves out of the total.
- Spike in deaths during the first wave is now exiting the rolling total.
- A rolling excess winter mortality (EWM) calculation is shown for UK regions. A rolling EWM is average deaths in most recent 17 weeks

versus average deaths in the previous 35 weeks, move forward 1 week and recalculate.

- Compared to winters since 2000 the COVID-19 epidemic shows unique features of geographic spread
- London is worst hit in both the first and second waves which reflects roles of lived population density, social group health behaviours and unique super-spreader kinetics of COVID-19 spread.
- 68% EWM during the first wave in London is over 2-times that experienced in the past 20 years.
- In contrast, the EWM peak in Northern Ireland during the first wave was no worse than a 'normal' winter.

Errata for previous issues

- Maidstone in Kent ***did not*** have high excess winter mortality (EWM) during the 2nd wave. A transposition error (now corrected) in ONS data caused this erroneous result. I recently identified a transposition error in Scottish data – also now corrected.
- Negative growth ***did not*** occur in Dorset during the 1st wave. This error arose from a change in the boundary of Dorset in January 2019 (my ignorance). However, data for Dorset during 2019 looks highly peculiar, and this remains an outstanding query with the ONS. It is this peculiar behaviour which amplified the issue. A rolling total is sensitive to changes, even if they are due to data inconsistencies.
- The large drop in the rolling 12-month total of deaths seen in Figure 1, Part 1 is one of the limitations of a rolling 12-month total. The spike in deaths during the 1st wave must leave the rolling total after 12-months and this creates the large decline seen in April/May 2021. In turn, the 2nd wave will likewise exit the rolling total around February/March 2022, and we will finally be able to see if the baseline has been altered by all those Covid-19 deaths.
- The main reason that I use a rolling 12-month total is that it visually illustrates the huge (unfunded) volatility in health care costs.

A 4-Part series in *Journal of Health Care Finance* describes the principles behind financial and ***capacity*** risk in health care. Parts 1-3 explain the epidemiological principles behind why things can quickly go terribly wrong – with COVID-19 as an example, while Part 4 explains the changes required in health care policy to limit the damage.

Part 4 should be compulsory reading in Health Departments around the world. Policy must be based on how the real world 'actually' behaves rather than how it 'ought to' or 'should' behave in the narrow world of policy. A MUST read for anyone who cannot understand why seemingly well-run organisations suddenly slip into deficit. NHS managers have seemingly been held to account for that over which they have absolutely no control, See Vol. 47, No. 3, Winter 2021 (healthfinancejournal.com)

Listen to a 14-minute interview about the series, https://jjunland.egnyte.com/dl/CPdNnjCVle

I regularly meet individuals who have experienced a flu-like infection and then suffered the equivalent to long-COVID. Flu-like does not in any way imply influenza as the causative agent. In 2009 it was considered that 46 pathogens (other than influenza) caused flu-like symptoms (15 bacteria, 23 viruses, 4 fungi and 4 protozoa), see List of infectious diseases causing flu-like syndrome - Wikipedia. By now, the list will be longer. Omitted from this list is Respiratory Syncytial Virus (RSV) which has many flu-like symptoms apart from a high fever. However, the elderly rarely show a high fever in response to an infection and misdiagnosis is common, see rsv-report.pdf (nfid.org). RSV kills just as many elderly as influenza, and in some years more, see The burden of respiratory syncytial virus in adults: a systematic review and meta-analysis | Epidemiology & Infection | Cambridge Core. COVID-19 can also be added to this growing list. The opportunities for long-COVID like syndromes (including Gulf War syndrome) are many and varied. COVID-19 has merely bought the issue to wider attention.

Your immune system is incredibly complex. New types of immune cells are still being discovered. Immunity is far more nuanced that levels of circulating antibodies. Individuals will have gene mutations plus epigenetic modifications which render them susceptible to adverse outcomes from infection – such as long-COVID. Throw in inflammaging and immune dysregulation in the elderly and life gets more complex.

No pathogen (or vaccination) acts in supreme isolation, see Multidisciplinary Insights into Health Care Financial Risk and Hospital Surge Capacity, Part 3: Outbreaks of a New Type or Kind of Disease Create Unique Risk Patterns and Confounds Traditional Trend Analysis | Jones, PhD | Journal of Health Care Finance (healthfinancejournal.com).

This nicely brings us to the issue of the human microbiome, i.e., the soup of microorganisms which coexist in the human environment. A recent study took 4,728 samples from the surfaces of the transport systems in 60 cities around the world. See A global metagenomic map of urban microbiomes and antimicrobial resistance: Cell. The samples were analysed for the DNA of the microbes on these surfaces. RNA viruses such as influenza or coronavirus (SARS, MERS, COVID-19) were not included in the study. Some 4,236 ***known species*** of DNA-based microbes were identified plus an additional 10,929 completely new DNA viruses and 1,302 new species of bacteria. The mind boggles.

Many of these microorganisms will be from soil, air, faeces (human and otherwise) and contact with animals but a significant number are known or potential pathogens. The study noted that for every 10 additional samples another new species was identified!

This screams hand hygiene plus the reality of pathogen-pathogen and pathogen-wider microbiome interactions. **Your skin provides a barrier to most pathogens, however, a scratch or touching your mouth or nose opens the door to potential infection(s).** 12,000 unknown species waiting to enter!

Add to this the protective roles of the skin, throat, and gut microbiome …. But maybe for another day, see protective role of the human microbiome - Bing

So how is this relevant to COVID-19 and vaccination?

Firstly, evidence is emerging to suggest that COVID-19 is a major competitor with influenza, hence, partly why world influenza infections have dropped to a record low during the COVID-19 pandemic. I would give you a link to the WHO weekly influenza updates but the WHO have 'updated' their systems and as a result nothing can be located!

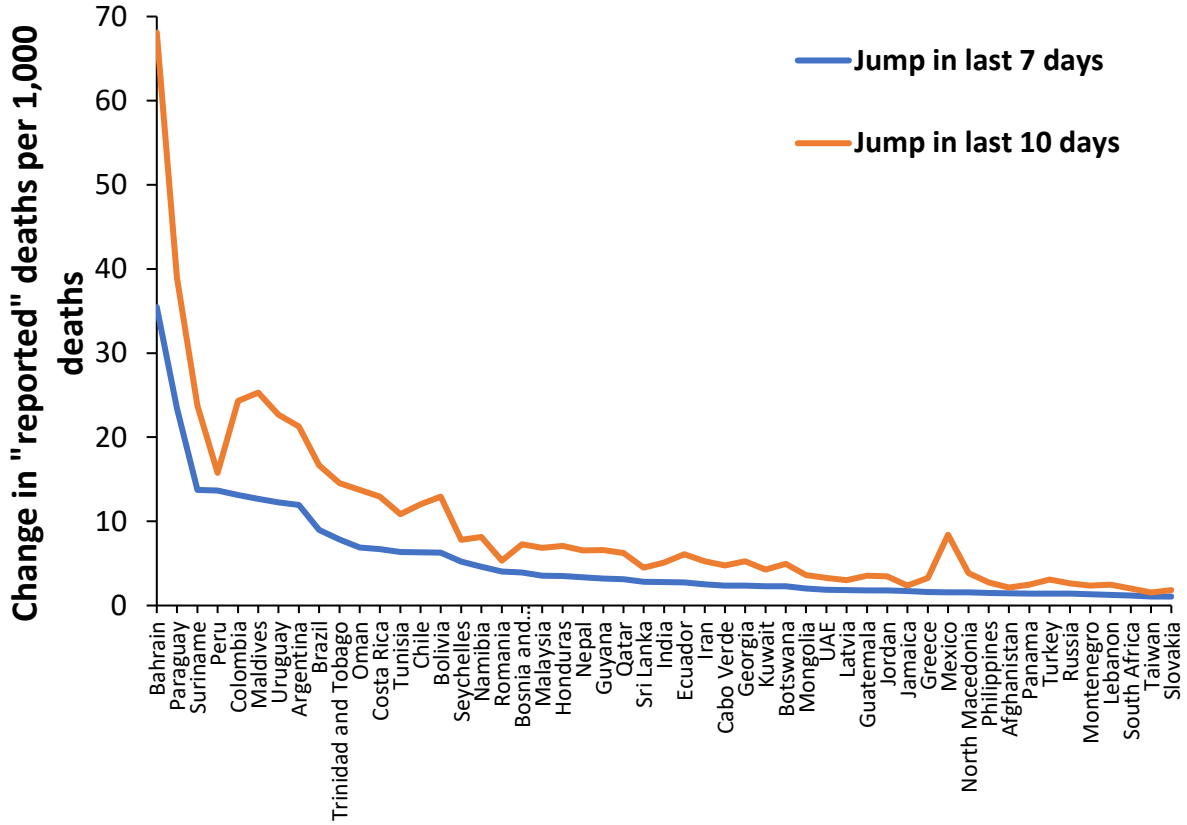
This raises the fascinating possibility of the unintended consequences of COVID vaccination, namely, a resurgence of influenza.

Do ***not*** let this stop you from getting COVID vaccination since there is no current evidence for this fascinating possibility. We must await further developments in this sadly neglected field. However, interactions between other pathogens and influenza are known to occur, see Multidisciplinary Insights into Health Care Financial Risk and Hospital Surge Capacity, Part 3: Outbreaks of a New Type or Kind of Disease Create Unique Risk Patterns and Confounds Traditional Trend Analysis | Jones, PhD | Journal of Health Care Finance (healthfinancejournal.com), and unintended effects of influenza vaccination are possible in that the suppression of influenza may then allow other pathogens such as RSV to come to the fore. Once again, somewhat poorly explored territory and hence do not allow this to deter from influenza vaccination.

The point I am attempting to make is that a VERY complex human microbiome exists in which COVID-19 and other pathogens interact with each other, vaccination and the intricacies of human immunity. It is all about the risks and rewards and the balance of harm. Rare side-effects from COVID vaccination have merely bought this to the attention of the public, however, the reality is that that there are side-effects to everything, including common chemicals and pets! Such side effects range from relatively harmless allergic reactions through to anaphylactic shock, and other rare events. We live in a complex world. How many times have you accidentally gone through a red light?

To my mind the risks from COVID infection, including long-COVID, are multiple times higher that the risks from vaccination, hence, happy to have had two doses of the Oxford/AstraZeneca vaccine. Let's be honest, medical accidents/mistakes are more common! See, how common are medical errors - Bing. You simply cannot reap the multitude of benefits without the contingent risks.

Figure 1: Change in "reported" COVID-19 deaths per 1,000 deaths (before COVID) during last 7 and 14 days.



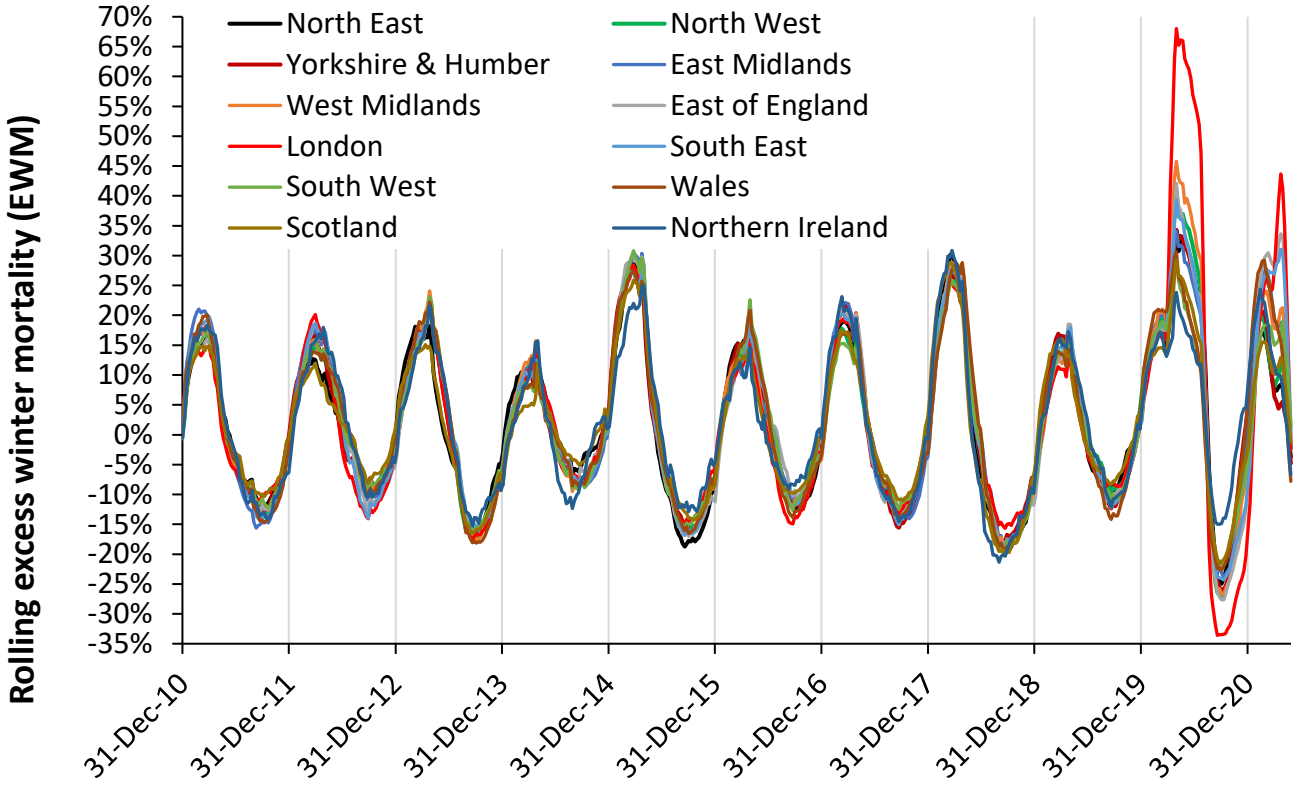
The unintended consequences of the human response to COVID-19 aside, Figure 1 shows the change in deaths per 1,000 deaths (pre-Covid) for the top 50 countries in the past 7 and 14 days. Middle East still severely affected as is South America. India still climbing (despite massive under counting). USA 64th and UK now 122nd, much of Europe higher than the UK. Many countries should be in the top 50 but concealed by under counting. See Part 44. Peru has been rebased to account for the revision in total Covid deaths which took place around the end of May. Several African countries now in the top 50, but hard to say if this is an artefact of recent changes in counting or genuine deaths.

The surge in UK cases due to the Indian variant will be unlikely to translate into deaths due to high levels of vaccination protection in the at-risk groups. Those choosing to remain unvaccinated must take precautions to mitigate the risk.

Overall “reported” world cases are falling. If you are vaccinated and wish to travel overseas, avoid the top 50 countries and probably most of Africa where gross under counting makes any risk assessment exceedingly difficult.

The percentage of total deaths due to COVID remains higher in London than the rest of the UK (data not shown). Figure 1, Part 1 (end of document) has been updated to show the rolling 52-week total of deaths up to 28th May 2021.

Figure 2: Rolling excess winter mortality (EWM) – current 17 weeks versus previous 35 weeks – for UK regions. Up to week ending 28th May 2021.



As an example of the net mortality effects of COVID-19 Figure 2 gives a rolling excess winter mortality (EWM) calculation for regions across the UK. London is consistently worst affected in both first and second waves. Note that due to the timing of the first and second waves the calculated EWM in the second wave has been reduced by the higher deaths in the tail end of the first wave. The key point is that compared to previous winters COVID-19 shows far greater discrimination between regions. One of the major observations of the study on the microbiome in world cities was that the microbiome was unique to each city. Population density was also observed as a contributory factor. COVID-19 behaves as a unique pathogen within this wider context.

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

XXXXIV. 100% excess Covid mortality in Peru

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International situation

- "Reported" Covid-19 deaths have already passed 3.7 million.
- Peru revised its Covid death toll (on Monday) from 69,340 up to 185,000 (Yikes!) giving Peru a jump from 38% to 102% Covid excess deaths compared to deaths in 2019.
- Expect to see more similar revisions in the coming months.
- Other badly hit countries now close to 40% "reported" Covid excess deaths (ignoring undercounting).
- India's reported 4.5% can be multiplied by somewhere >5- up to 10-times.
- USA and UK rank 22nd and 25th, although "reported" Covid deaths in the UK were over-counted in the most recent wave.
- South Africa at 10.3% but known undercounting somewhere >2-times.
- Egypt 2.6% but known undercounting, somewhere around >5-times.

A simple method to determine undercounting.

- The log of Covid deaths per million population is plotted against log tests per million population.
- The less you test the less you find.
- Places like Democratic Republic of Congo (ERC) the actual Covid deaths probably 100-times higher than that reported.
- India somewhere in the range 5- to10-times higher.
- I continue to affirm that 10 million will eventually be somewhere close to reality.

Over-counting of Covid-19 mortality in the UK

- Have double checked and the UK most definitely went into over counting of Covid deaths during 2021.
- Was probably considered 'expedient' to maintain public adherence to the second lockdown.

Errata for previous issues

- Maidstone in Kent ***did not*** have high excess winter mortality (EWM) during the 2nd wave. A transposition error (now corrected) in ONS data caused this erroneous result.
- Negative growth ***did not*** occur in Dorset during the 1st wave. This error arose from a change in the boundary of Dorset in January 2019 (my ignorance). However, data for Dorset during 2019 looks highly peculiar, and this remains an outstanding query with the ONS. It is this peculiar behaviour which amplified the issue. A rolling total is sensitive to changes, even if they are due to data inconsistencies.
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Figure 1 shows the reported Covid-19 death toll up to 3rd June for all world countries. Each country is subject to potential under counting. In 2021 the UK lurched into over-counting as Covid testing rapidly expanded and 'with Covid' deaths included any positive test in the 28 days prior to death (agreed in August 2020). As usual Covid deaths are relative to those before Covid-19, i.e., during 2019. Peru was just before the revision that doubled the official number of Covid deaths. Expect more revisions like this in coming months.

Several countries are shown. South Africa is known to have more than double the official number of Covid deaths. Egypt is known to have more than South Africa (based on sheer excess mortality). India we all know about. Australia is there to show that low Covid deaths are possible based on draconian safety measures and largely preventing international air travel. High volume air travel is the pathogens dream come true. However, Madagascar and Rwanda are only low due to massive undercounting, etc.

Figure 1: Reported Covid-19 deaths per 1,000 deaths (before Covid) in World countries as of 3rd June 2021.

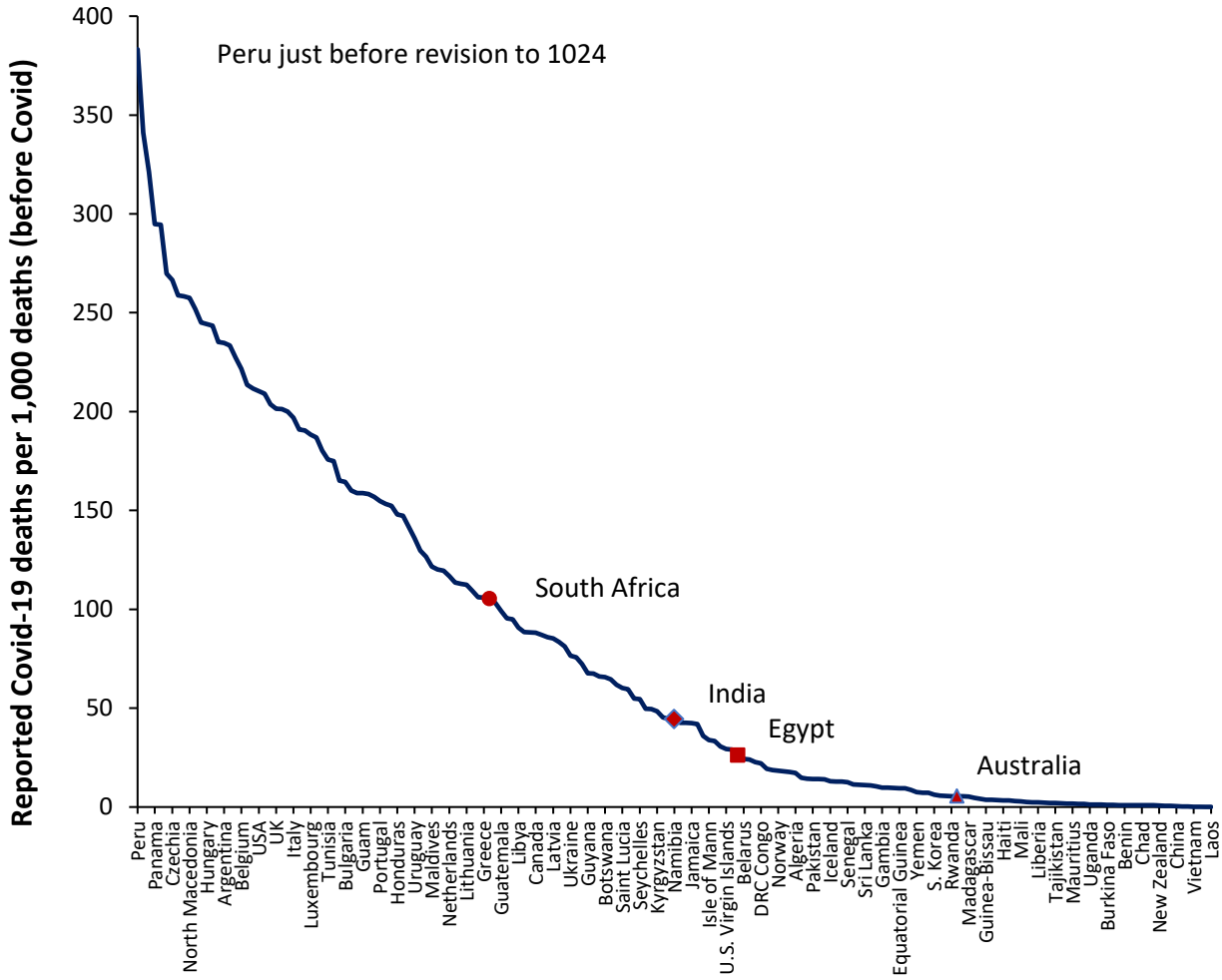
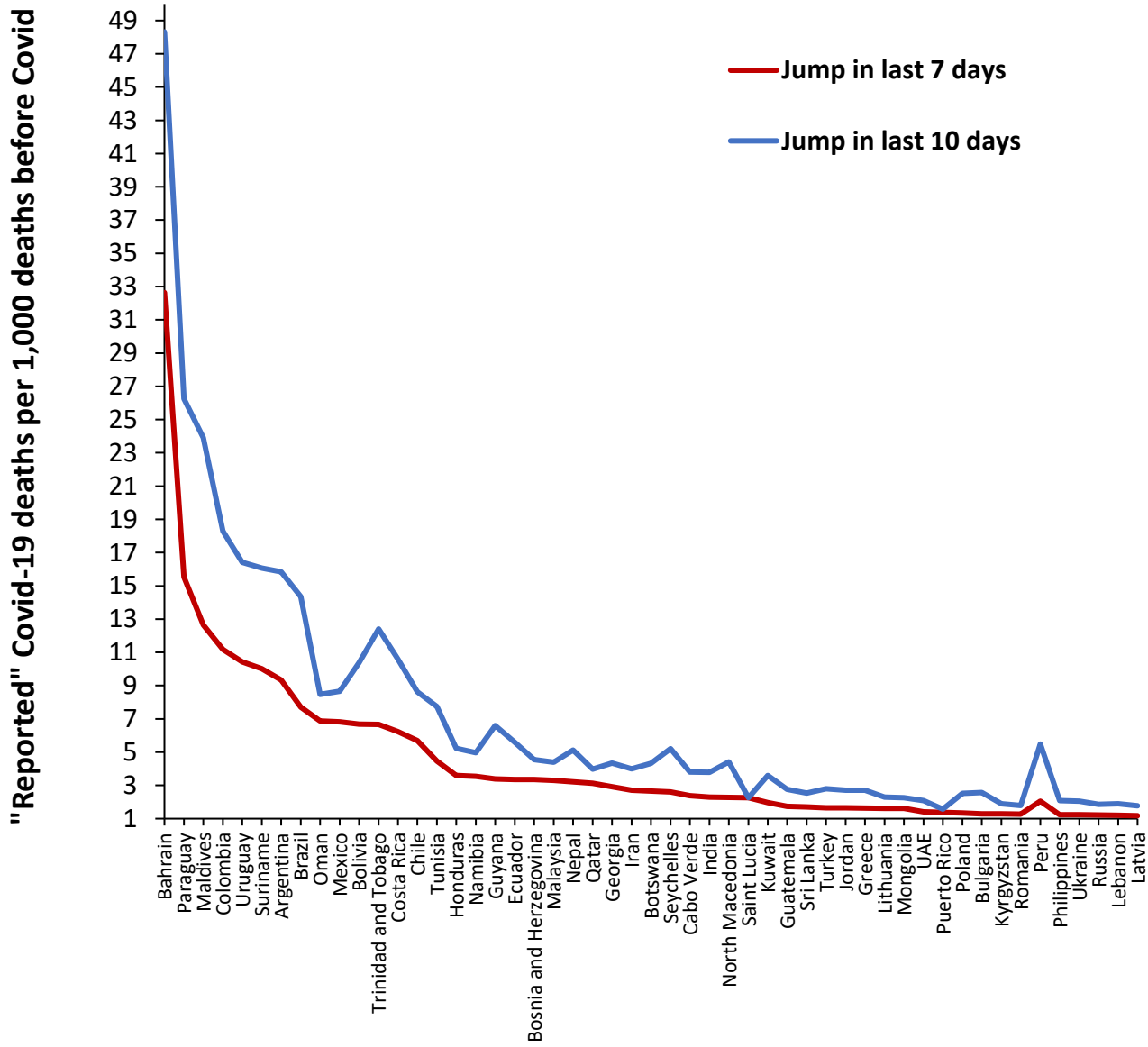


Figure 2 shows the top 50 countries for highest jump in reported Covid deaths in the past 7 to 10 days. Bahrain still being badly hit. Peru excludes the revised figure of deaths. Oman, Qatar, Kuwait all in the top 50. The Middle East was a favourite place for those fleeing India – at a seemingly high cost to the local inhabitants. Currently a large surge in cases in Thailand and elsewhere which in 4 to 8 weeks will show up as deaths.

Figure 2: Top 50 countries for highest jump in reported Covid deaths in the past 7 to 10 days.

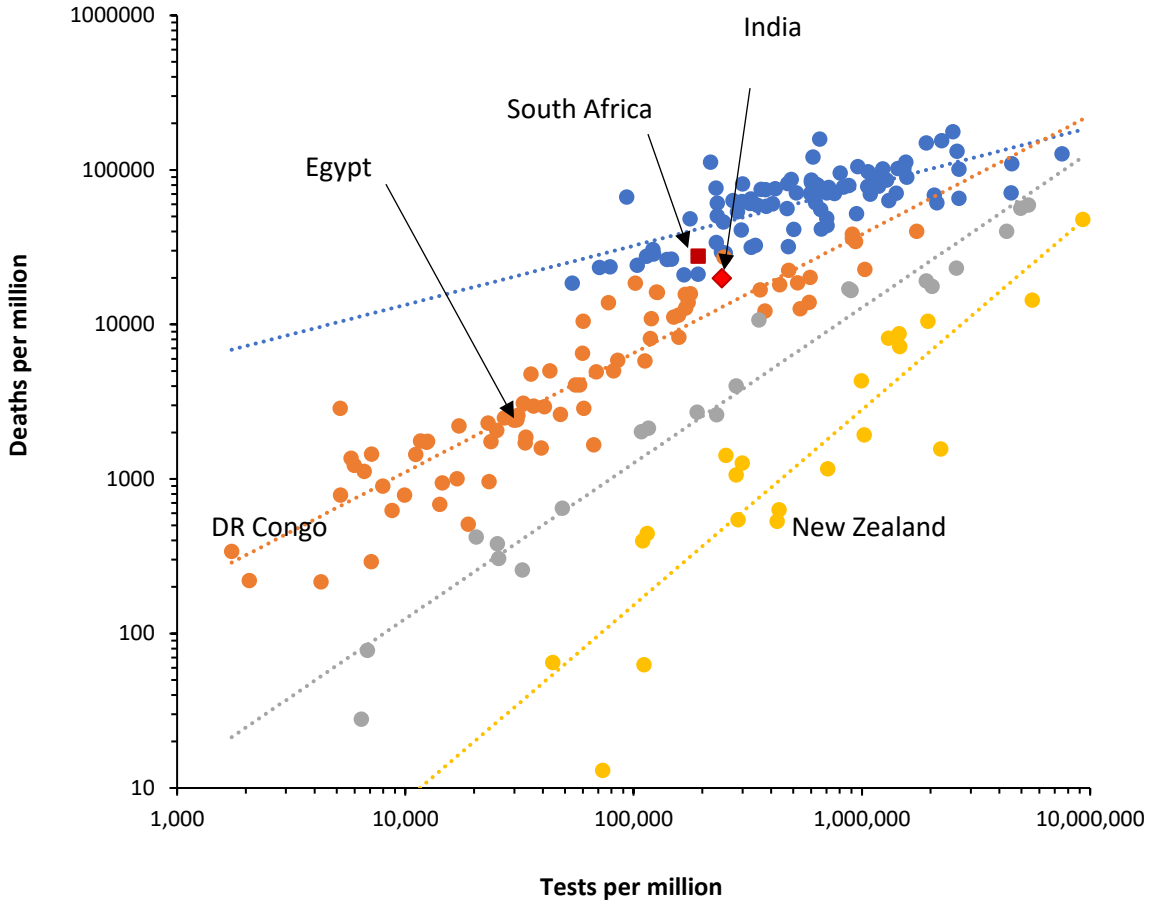


Finally, Figure 3 shows a simple method to determine potential undercounting of Covid-19 deaths. Each line on this figure shows groups of apparently similar countries. The further down a line you go the greater the potential for under counting. The further left on Figure 3 all the testing will be concentrated in the capital city among government officials and the wealthy. However, you must also know local context. Hence, for New Zealand there is little if any undercounting and draconian measures prevented many deaths. However, for the likes of DR Congo you can multiply reported Covid death by 100 to get something like the real answer, i.e., 78,000 real Covid deaths throughout the whole country (including slums) as opposed to the official count of 780. In

DRCs case far too little testing to have any idea of reality – same for most of Africa.

Likewise, Egypt has far higher levels of under counting that South Africa while India is a minimum of 5-times higher.

Figure 3: Lines of potential under counting for various world countries



Politicians choosing wisely or seeking to cover up the truth. The great Covid-19 fiasco continues unabated as a testament to human behaviour both at its best and worst.

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

XXXXIII. What is the baseline to calculate excess deaths?

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See http://www.hcaf.biz/2010/Publications_Full.pdf for all research.

International situation

- "Reported" Covid-19 deaths are about to pass 3.5 million.
- **Indian states largely in exponential growth.**
  - Highest in Lakshadweep at 500% growth in last 24 days – but small numbers.
  - Total for India is driven by Maharashtra (30% of total reported deaths in India), and only 30% growth in last 24 days.
  - Maharashtra has the largest economy, the "financial capital" of India, and is the most urbanised state. Counting of deaths is probably the closest to reality in this state. However, 18% live in poverty and this will drive some under-counting.
- Under-reporting in India is driven by poor cause of death attribution in many states, and a gap between actual and registered deaths in the poorest states/locations.
- See this BBC interview regarding under-counting BBC ReporterFromIndia 05 25 21 - YouTube
- **Growth in past 21 days for various countries still high.**
- The Middle East was a popular destination for those fleeing India.
  - Bahrain showing log growth since mid-March.
  - Oman now 12th, Qatar is 21st.
  - Nepal commenced log growth at end of April, now 11th.
  - India now in top 50 at 25th.
  - Most of South America still in the top 50.
  - Several African & Caribbean countries now in top 50

Over-counting of Covid-19 mortality in the UK

- "Reported" Covid-19 deaths have to be compared to 'excess' deaths from all-cause mortality.

- This implies that the baseline is known with a degree of precision.
- Alas this is not the case, hence different methods will give different answers, see Technical Appendix in Part II.
- Comparison against the average for the previous 5-years ignores the fact that deaths in all countries/locations show unique trends over time.
- In general, deaths in the UK have been increasing since 2011 and are projected to increase over the next 30 years due to the WWII baby boomer reaching the end-of-life.
- However, the trend is specific to each location.
- In the early days of the pandemic testing was limiting and so reported Covid deaths were ***less than*** excess mortality – see earlier parts of the series.
- As testing increased the non-specific definition of a Covid death then led to over-counting.
- In the UK from Dec-20 onward a surge in testing coincided with a switch to large-scale over-reporting, which leads to net >11% (depending on region) over-reported Covid-19 deaths up to May 2020.
- The cumulative reported Covid-19 deaths for England should be adjusted downward by somewhere around 25%.
- Deaths in the UK are not as bad as they first appear to be.

Errata for previous issues

- Maidstone in Kent ***did not*** have high excess winter mortality (EWM) during the 2nd wave. A transposition error (now corrected) in ONS data caused this erroneous result.
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Figure 1 shows the growth in deaths in Indian states over the past 24 days, along with the value of exponential growth. Exponential growth is the equivalent to a chain reaction when deaths balloon out of control. Under-counting in India is rampant, due to the need for a medically certified cause of death, which only occurs in a minority of COVID deaths. Cause of death statistics in India take about 3 years to process and the 'excess' mortality will eventually emerge in all its brutality. As every politician knows people will have lost interest after 3 months, let alone 3 years!

Figure 1: Growth in "reported" COVID-19 deaths for Indian states, 24 days to 25 May 2021.

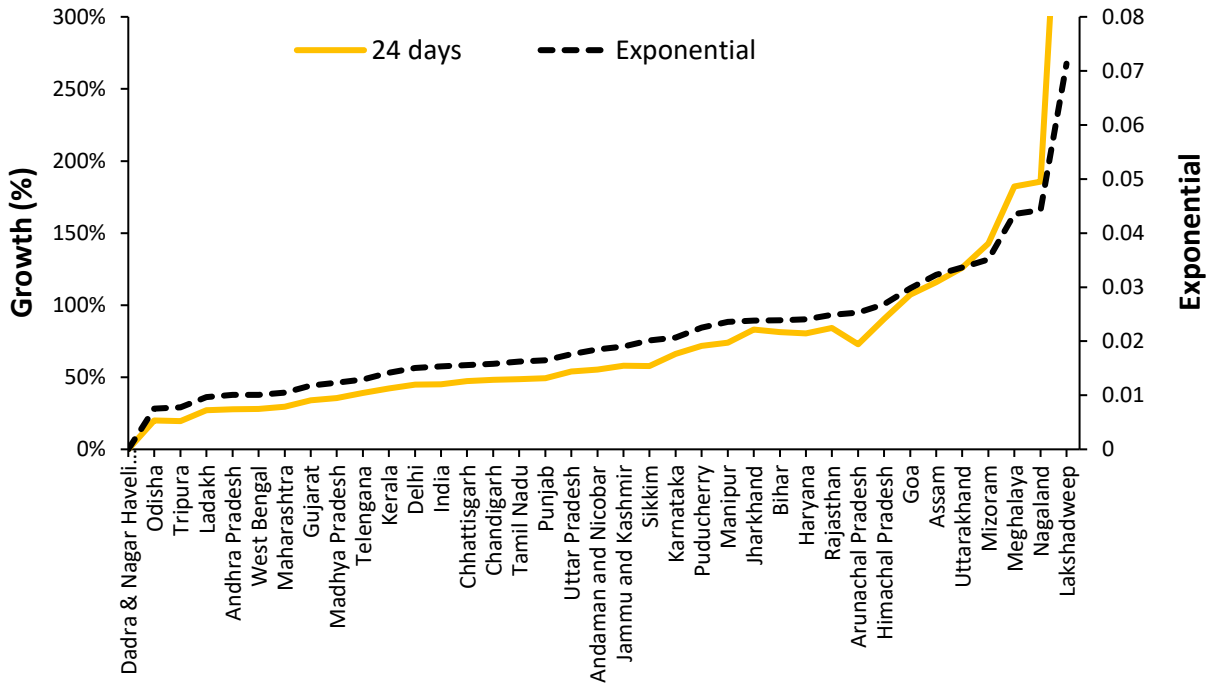


Figure 2 shows the top 50 increase in “reported” COVID deaths per 1,000 deaths before COVID over the 12 days to 25 May 2021. South America remains high, parts of the Middle East are now high. Asian countries Nepal, India, Malaysia makes an appearance, as do several African and Caribbean countries. North Macedonia remains the highest European country. As always, the real change is clouded in under-reporting.

Figure 2: Change in “reported” COVID-19 deaths over the past 12 days.

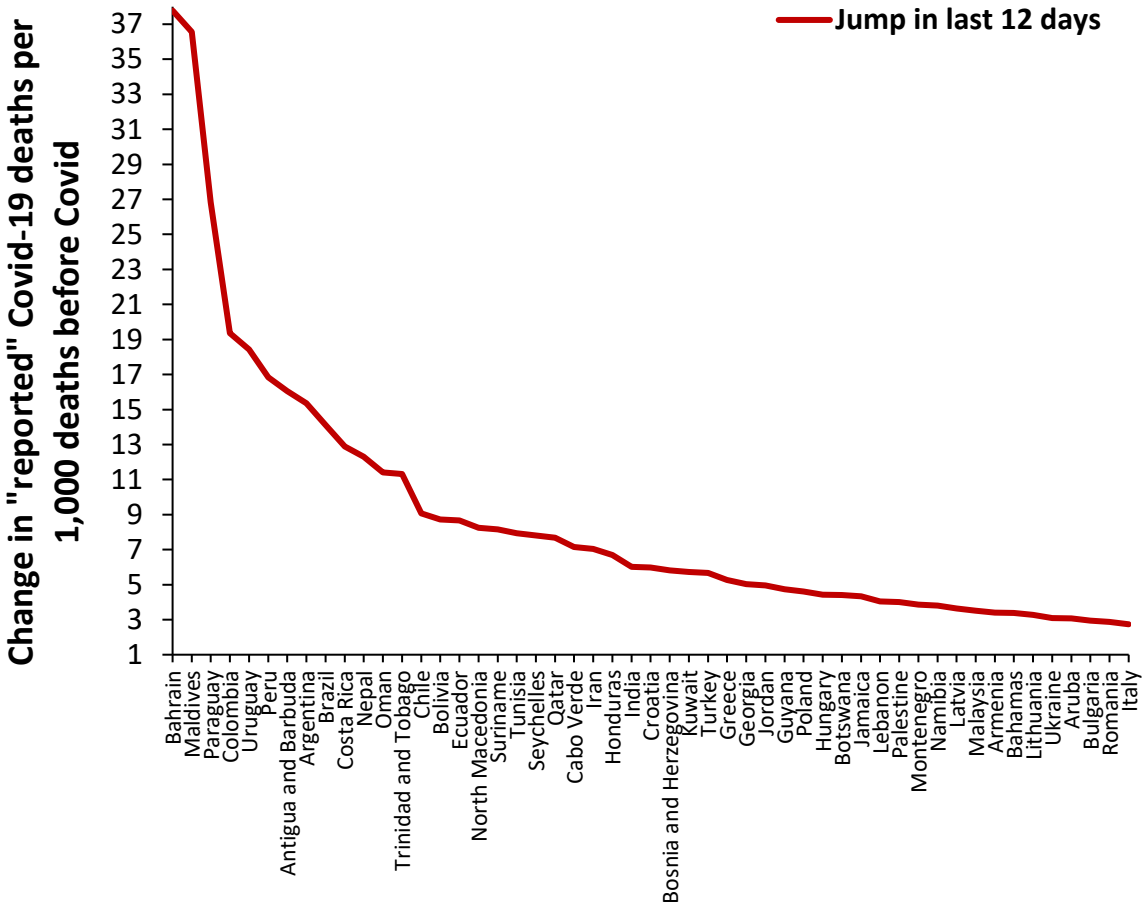
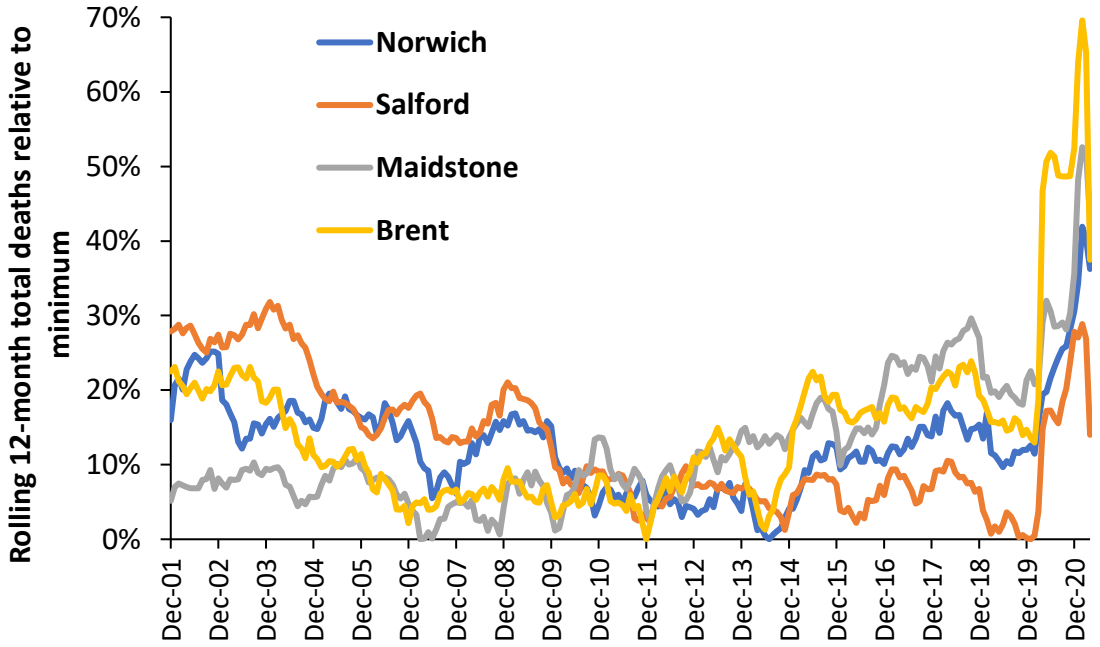


Figure 3 illustrates the difficulty of accurately defining excess mortality during COVID-19 using 4 randomly chosen English local authority areas. Deaths are sensitive to a host of changeable environmental factors, plus long-term trends in population due to migration. Young people typically migrate into large cities, while those of retirement age tend to migrate out, etc. Each location therefore shows a unique time trend. Note the high volatility in the rolling 12-month total in both magnitude and timing. If influenza were the one and only defining feature all locations would rise and fall together, and the pyramid shaped features would be absent. With >2,000 known human pathogens (and increasing) carried around the world by air travel (a pathogens dream) such volatility is more than expected. Hence the conundrum is what would deaths

have been in the absence of COVID-19? At best, deaths could range between a maximum and minimum leaving a variable gap from COVID-19 and associated unintended consequences. See analysis of cardiac arrest deaths in the North East of England [Incidence of emergency calls and out-of-hospital cardiac arrest deaths during the COVID-19 pandemic: findings from a cross-sectional study in a UK ambulance service | Emergency Medicine Journal (bmj.com)](). On the other hand, the reduction in travel and air pollution should have acted to reduce some deaths.

Figure 3: Long-term trends in the rolling 12-month total of deaths in four English local authorities. Data for Maidstone has been corrected for the issue noted in the Erratum - not as high as previously reported, but still high compared to elsewhere.



However, these volatile trends illustrate the point that end-of-life health care costs, and the knock-on effects against non-end-of-life costs, were already highly volatile before COVID-19 and that such volatility is completely ignored in the CCG funding formula. The funding formula is unsuited to the real world! See Part 4 at http://www.healthfinancejournal.com/~junland/index.php/johcf/index. Payment by results (PbR) simply magnifies the financial instability. Ouch!

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

XXXXII. Did the government of India mislead the world about Covid risk in that country?

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Over-counting of Covid-19 mortality in the UK

- Reported Covid-19 deaths have to be compared to 'excess' deaths due to all-cause mortality.
- In the early days of the pandemic testing was limiting and so reported Covid deaths were ***less than*** excess mortality
- As testing increased the non-specific definition of a Covid death then led to over-counting.
- Excess deaths are fiendishly difficult to quantify, see Technical Appendix in Part II.
- In the UK from Dec-20 onward a surge in testing coincided with a switch to large-scale over-reporting, which leads to net >11% (depending on region) over-reported Covid-19 deaths up to May 2020.
- The cumulative reported Covid-19 deaths for England should be adjusted downward by around 25%.
- Deaths in the UK are not as bad as they first appear to be.

The recent international surge in Covid-19 persists.

- "Reported" Covid-19 deaths have now nearly exceeded 3.4 million.
- Large increases persist in many countries.
- India is now in the top 50, despite massive undercounting.
- The percentage of tests positive for Covid-19 in India has been relatively low suggesting testing was concentrated in certain areas.
- Growth of 20% in 14 days for India masks higher growth in many of the smaller states. Many are showing exponential growth.
- Massive gaps between the number of death certificates and "reported" Covid deaths are starting to emerge, Cong alleges under-reporting of COVID-19 deaths in states like Gujarat; demands explanation from govt (republicworld.com)

A 4-Part series has been published in the *Journal of Health Care Finance* describing the principles behind financial and ***capacity*** risk in health care. Parts 1-3 explain the epidemiological principles behind why things can quickly go terribly wrong – with Covid-19 as an example, while Part 4 explains the changes required in health care policy to limit the damage.

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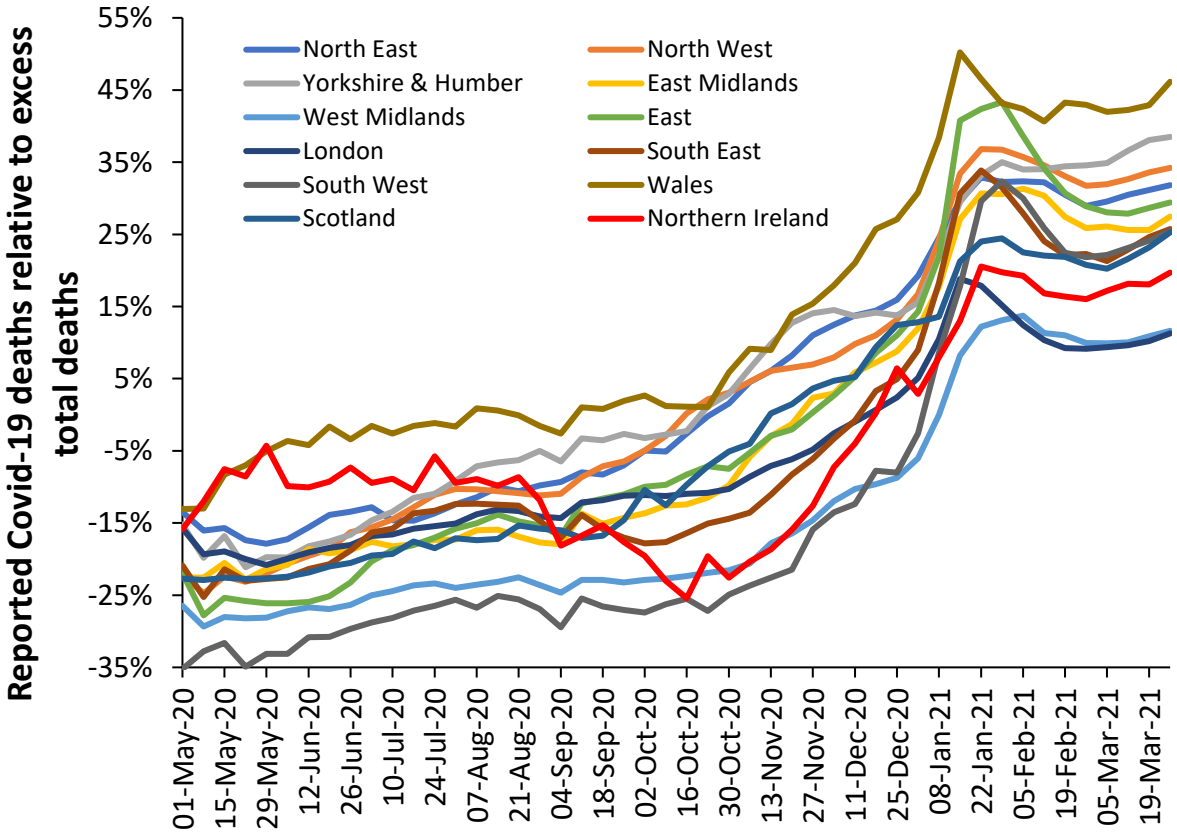
Figure 1 shows the cumulative reported Covid-19 deaths throughout the UK up to the end of March 2020. Rather than use a 5-year average of deaths this analysis uses excess deaths relative to a rolling 52-week total. This method is more objective in that the technical difficulties associated with 'excess' deaths are not obscured. See Technical Appendix in Part II. Comparison against the average for the past 5 years gives a deceptively simple answer.

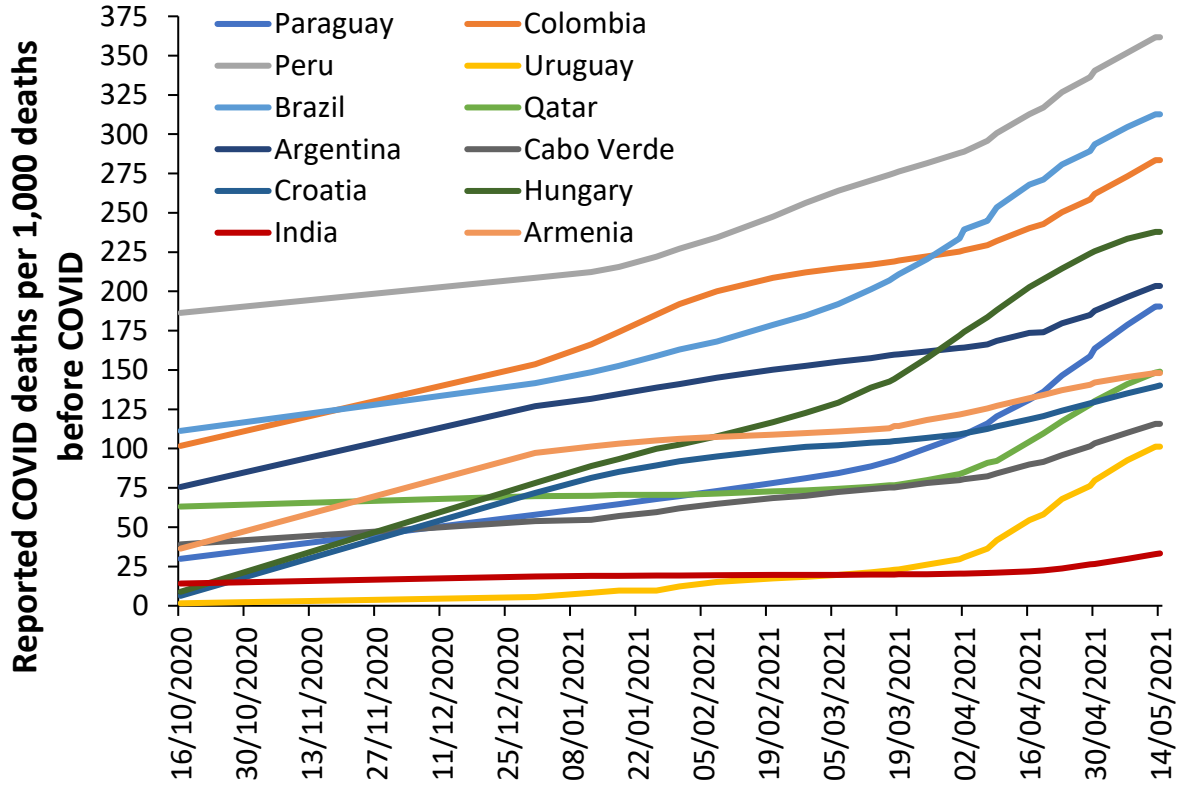
Figure 1: Cumulative "reported" Covid-19 deaths in the UK relative to "excess" mortality.



However, issues of real-world ambiguity aside it can be seen that in the early parts of the epidemic the real Covid-19 death toll is an under-estimate, which eventually shifts to become an over-estimate. Just because you have tested positive for Covid-19 prior to death does not imply that you have died as a direct result of the virus. In addition, a Covid-19 diagnosis became somewhat over-used in ambiguous cases. Hence while over-fastidious UK may have erred on one side other countries have erred in the other direction.

On June 15th, 2020 Bharath Kancharla from India published a detailed analysis of death reporting in India. See Data: How many Deaths are recorded in India every year? (factly.in). In 2017 there were 6.46 million registered deaths out of an estimated 8 million actual deaths, i.e., a general 25% underestimate. The gap between estimated and registered deaths increases as state wealth decreases. Uttar Pradesh, Bihar, and Uttarakhand have low registration of deaths compared to estimated actual deaths. Of the deaths registered, the percentage of medically certified deaths is 100% in Goa (wealthiest state) falling to just 5% in Jharkhand (one of the poorest).

Figure 2: Trajectory of reported Covid-19 deaths for various countries.



The implications to the reporting of Covid-19 deaths should be obvious. In a report by the BBC on the 6th May the reporter in Uttar Pradesh (population 200 million) noted 13 cremations in 1 hour at one site, while the official

government count was just 7 for the whole day, see BBC India OnTheGroundReportMay6 - YouTube. Massive gaps between the number of death certificates and "reported" Covid deaths are beginning to emerge in some states. Cong alleges under-reporting of COVID-19 deaths in states like Gujarat; demands explanation from govt (republicworld.com)

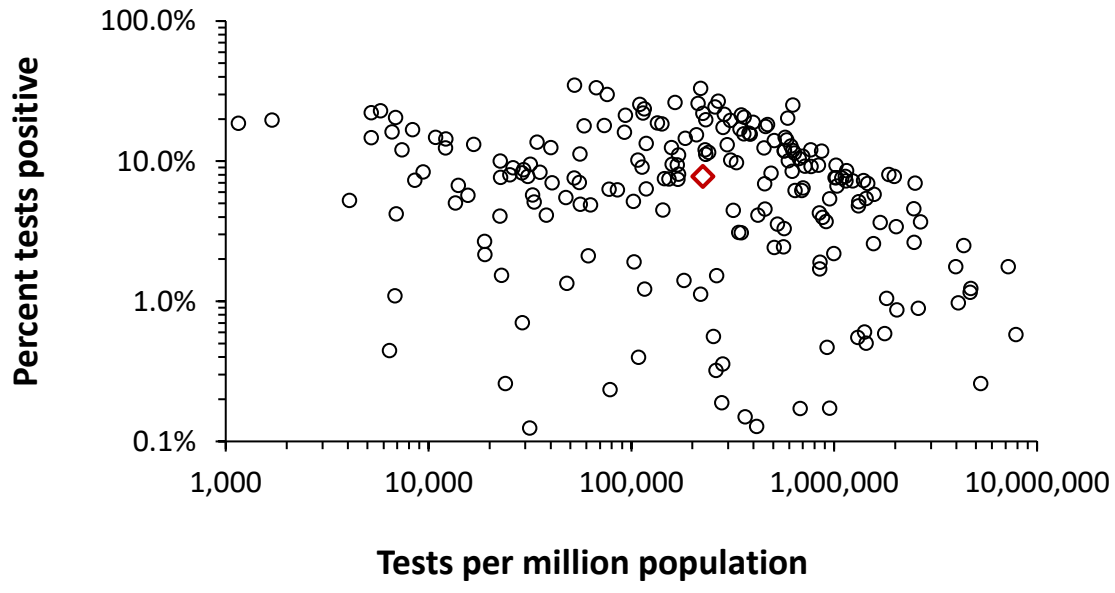
To investigate if the Covid deaths in India are believable Figure 2 compares the trajectory of "reported" Covid-19 deaths per 1,000 deaths (estimated for 2019) for different countries. The trajectory commences toward the end of the first wave.

As can be seen India has a trajectory which is too good to be true. The relatively flat line from October 2020 to April 2021 is unprecedented compared to any other country. The problem with such massive under-reporting is that Indian nationals freely travelled around the world spreading far higher levels of Covid-19 than the official statistics suggested was the case.

India should have been on every countries "Red List". Real deaths are probably a minimum of 3-times up to 10-times higher. The 25% general underestimate of deaths in India would have been amplified during Covid-19 as the death registration system broke down under the pressure.

The extra deaths will be hidden in the most densely populated poorer states with higher slum populations. The real question is whether it was politically expedient to hide the true extent of the risk even before the current surge?

Figure 3: Percentage of tests positive for Covid-19 versus cumulative tests per million population. India red triangle

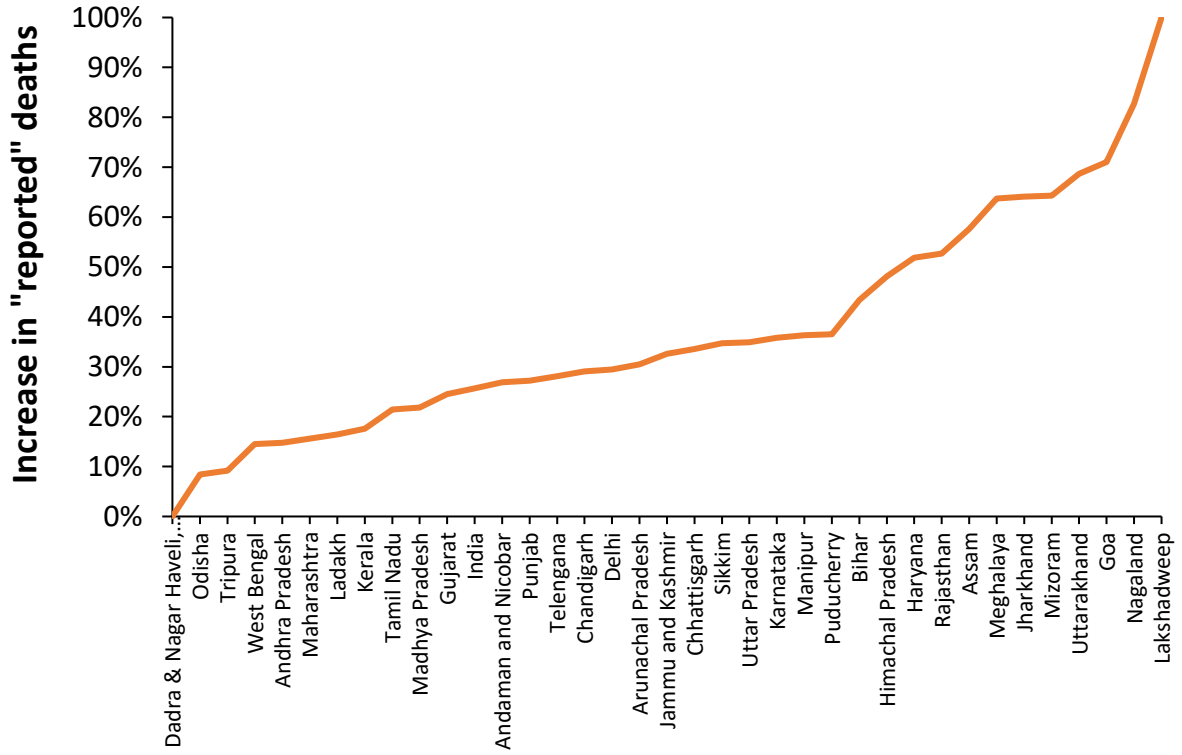


Regarding the risk of death from Covid-19 India has a high prevalence of diabetes similar to that in USA and Brazil, see Countries ranked by Diabetes prevalence (% of population ages 20 to 79) (indexmundi.com). India also has high rates of tuberculosis, hepatitis, asthma, pneumonia, other lung diseases, diarrhoeal diseases, malnutrition, and heart disease, see World Life Expectancy. In fact, most risk factors for high Covid-19 deaths. Which begs the question why other governments did not question the too-good-to-be-true risk?

The percent of tests positive for Covid-19 remain low in India (Figure 3) which suggests that testing was historically disproportionately distributed in lower risk areas such as the wealthier states. India does not have a central source of testing by state and some states have no data, see Decoding India's Covid-19 testing, state by state - News Analysis News (indiatoday.in) More recent results are alarmingly high, see Coronavirus Outbreak in India - covid19india.org. The site covid19india.org seems to have stepped in to fill the gap. This is a volunteer run, crowdsourced organisation.

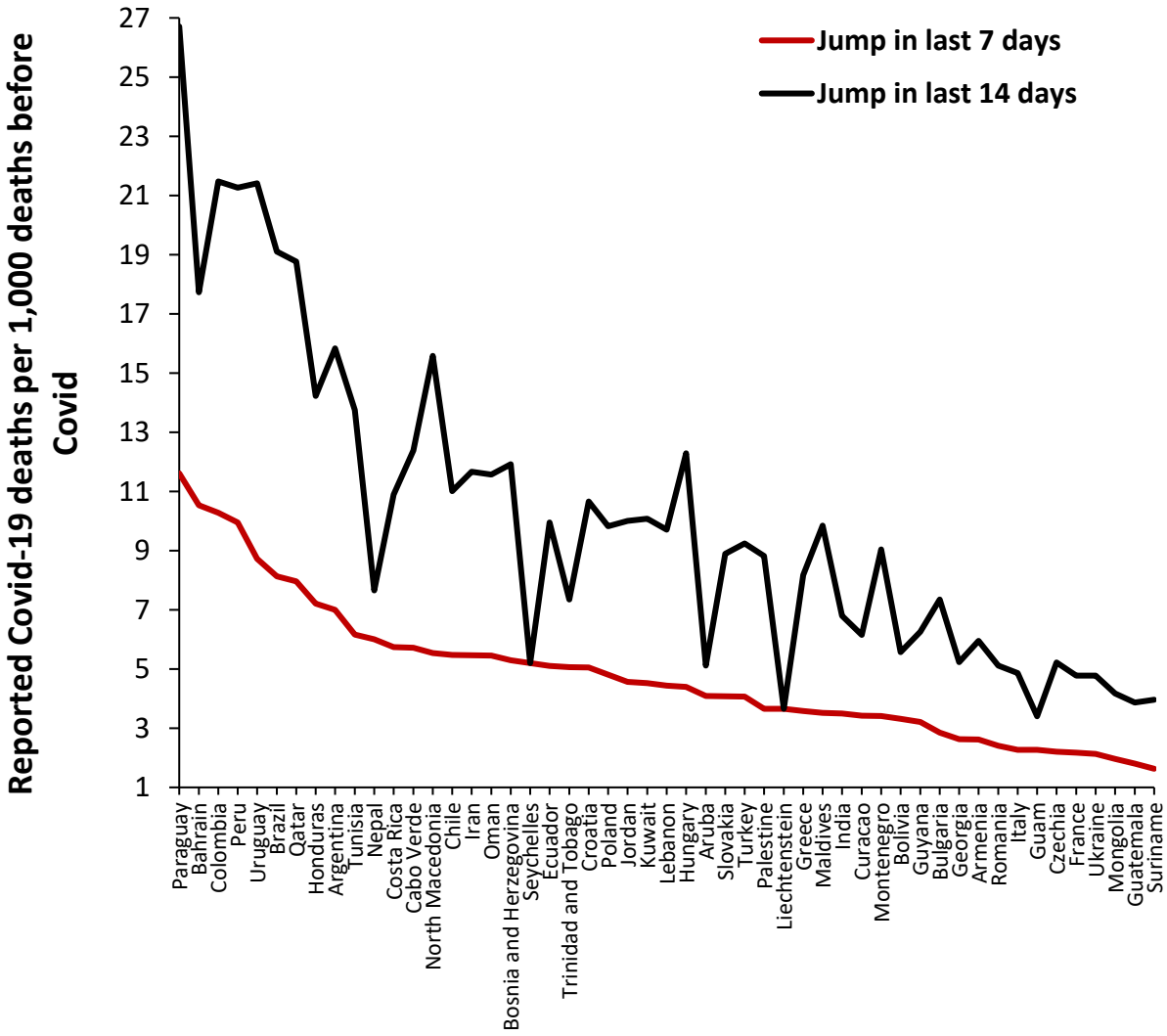
Over the past 14 days (up to 15th May) most Indian states have been showing exponential growth in "reported" deaths. The percentage growth over the past 14 days is therefore high. As discussed above under-counting will vary by state.

Figure 4: Percentage increase in "reported" deaths for Indian states over the 14 days to 15th May 2021.



Indeed, the rate of increase in deaths in recent weeks is not restricted to India and Figure 5 shows the top 50 countries. As always, this chart is beset with varying degrees of undercounting.

Figure 5: Change in reported Covid-19 deaths per 1,000 deaths (before Covid) up to 14th May 2021.



As we now know the Indian variant is rapidly spreading in parts of the UK, see How concerned should we be about the Indian variant? | Daily Mail Online. In my opinion, this is not a good time to abandon all aspects of social distancing. Despite high vaccination rates, Chile has experienced a recent surge. Why is Chile experiencing a COVID wave when it's vaccinating at such a high rate? – HotAir

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

XXXXI. Hospital beds in Indian states.

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Hospital bed numbers in India

- India has an estimated 1.9 million hospital beds ranging from state-of-the-art private hospitals to less-well-equipped rural hospitals.
- Hospital beds are provided by multiple players including the military, the railways, a state insurance scheme for civil servants, state governments and the private sector.
- Average income is nearly 10-times higher in the wealthiest to poorest states and this is reflected in hospital bed numbers.
- Ten Indian states have higher bed numbers than England.
- Ten Indian states fall into the category equivalent to the least developed or poorest countries.
- A total of 20 Indian states (half of all states) are below the average for moderate developed countries, and it will be these states where hospitals will be overwhelmed.
- The reported Covid-19 case fatality rate shows wide divergence between Indian states which suggests that under reporting of deaths has an absolute minimum of 30% but could be 3- to 10-times higher.

The recent international surge in Covid-19 "reported" deaths looks to have peaked in many countries – India excepted.

- "Reported" Covid-19 deaths have now exceeded 3.3 million.
- The recent surge seems to have peaked – at least in those countries with somewhat reliable counting.
- India is now in the top 50, despite massive undercounting.

Figure 1, Part 1 has been updated to give deaths up to 30th April 2021.

- The rolling 52-week total is now showing a rapid decline, especially in London.

- The UK is experiencing a ***massive*** example of the "culling" or "harvesting" effect, i.e., persons who would have died in the future have had their time of death bought forward by Covid-19.
- Percent of total deaths due to Covid-19 has declined to 1% in Wales and the South West up to 4% in London

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Retrospective sampling of respiratory samples in Los Angeles has detected Covid-19 back in January 2020, Retrospective Detection of SARS-CoV-2 in Symptomatic Patients prior to Widespread Diagnostic Testing in Southern California | Clinical Infectious Diseases | Oxford Academic (oup.com).

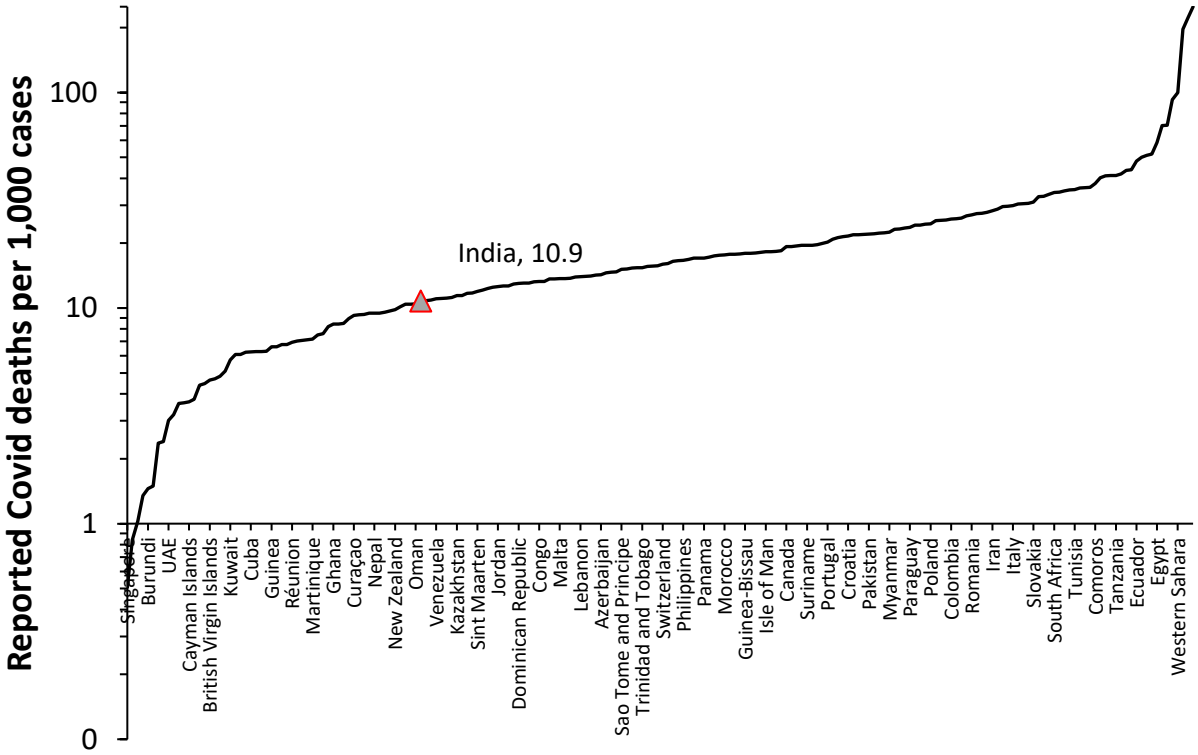
Covid-19 can also be detected in blood and faeces but not in urine, Evaluation of SARS-CoV-2 Existence in Blood, Urine, and Rectal Swab in Positive Patients with Different Virus Titers | Jundishapur Journal of Microbiology | Full Text (kowsarpub.com). Infection by this virus is clearly far wider than just the respiratory tract.

As you all know the main thrust of this series is to detect undercounting of Covid-19 deaths. A broad indicator of potential undercounting is the case fatality rate which is shown in Figure 1. At exceptionally low rates of testing, the available testing will be concentrated in hospitals and the fatality rate will be artificially high – as seen at the far right in Figure 1.

Healthy but noticeably young populations should be at the far left and should include the oil rich gulf states. In the middle is a complicated mess due to population age, weighted population density (massively high in slums), population wealth/health, volume of testing and where testing is concentrated (hospitals, wealthy, politicians and civil servants, random, cities/rural/slums, etc), and lastly the fidelity of the death reporting process.

Potential errors and bias abound at every step. Early parts of this series showed roughly 50% undercounting of deaths during the first months of the epidemic in the UK. The death reporting process seems to be the weakest part in India and somewhere higher than the reported 10.9 deaths per 1,000 (detected) cases is likely.

Figure 1: Reported Covid-19 deaths per 1,000 cases detected, 7th May 2021.
Source COVID Live Update: 157,566,227 Cases and 3,284,549 Deaths from the Coronavirus - Worldometer (worldometers.info)

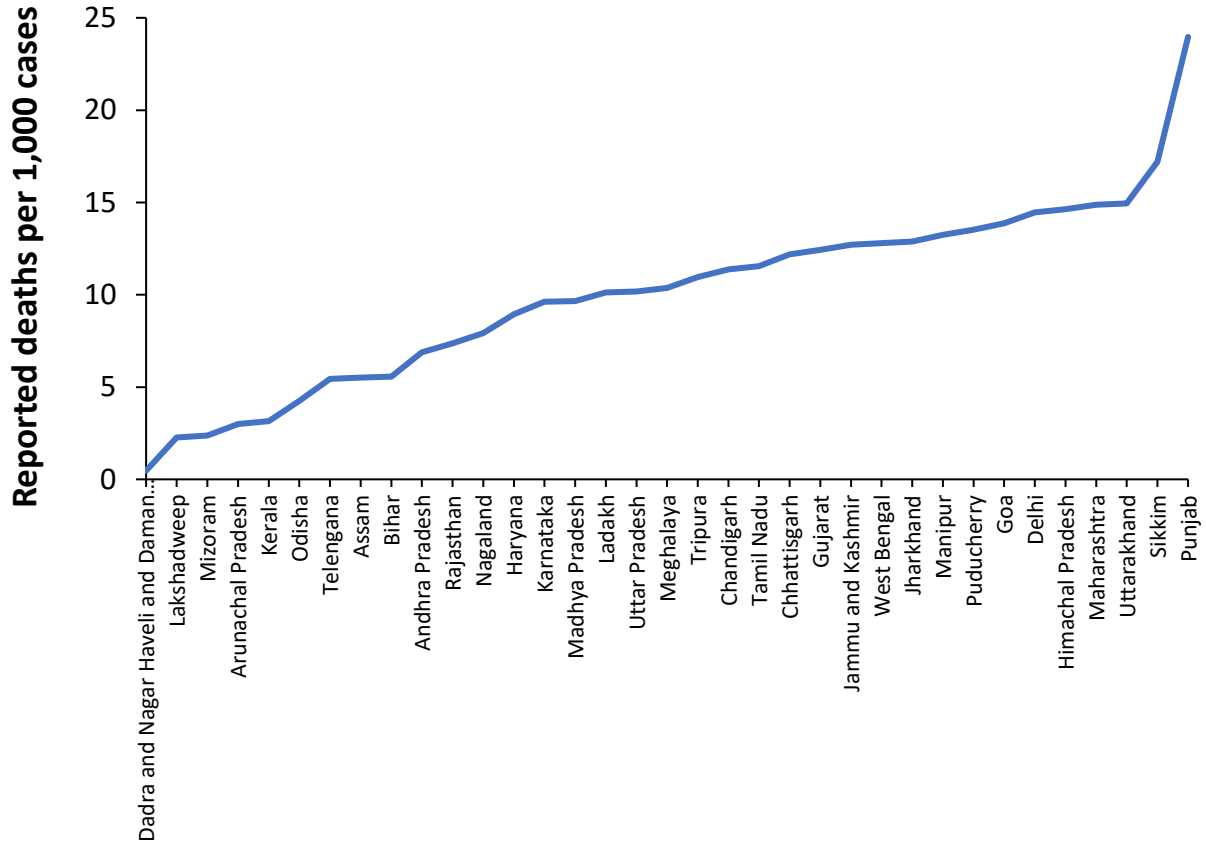


To investigate further Figure 2 gives the "reported" case fatality rate for various Indian states. The number of positive cases (denominator) will be accurate but potentially biased in so far as it reflects the nuances of the testing programme, however, the number of deaths (numerator) will be a massive undercount. India is a relatively young population, however, malnutrition, Tuberculosis, HIV/AIDS, frequent enteric infections, etc among the many slum dwellers provides an immune weakened population and hence a higher fatality rate than based on age alone. Data for Punjab is probably getting somewhere close to reality (although a likely underestimate).

Taking a case fatality rate of 25 per 1,000 cases across all Indian states gives a ***minimum possible*** underestimate of deaths of 30%. Reality could be 2-times to 3-times higher.

For comparison, the USA has a case fatality rate of 18 per 1,000 cases but conducts >10-times as much testing as India. This means that the number of cases (including asymptomatic) detected in the USA will be many times higher than India which will act to pull down the case fatality rate in the USA.

Figure 2: "Reported" Covid-19 deaths per 1,000 cases in Indian states (7th May 2021). Source: COVID19 STATEWISE STATUS | MyGov.in



We have all seen news footage of people queuing outside Indian hospitals; however, the real issue of importance is the availability of hospital beds in respective Indian states. See earlier parts of this series for the use of this metric. Figure 3 provides an overview of total hospital bed numbers in Indian states compared to international averages.

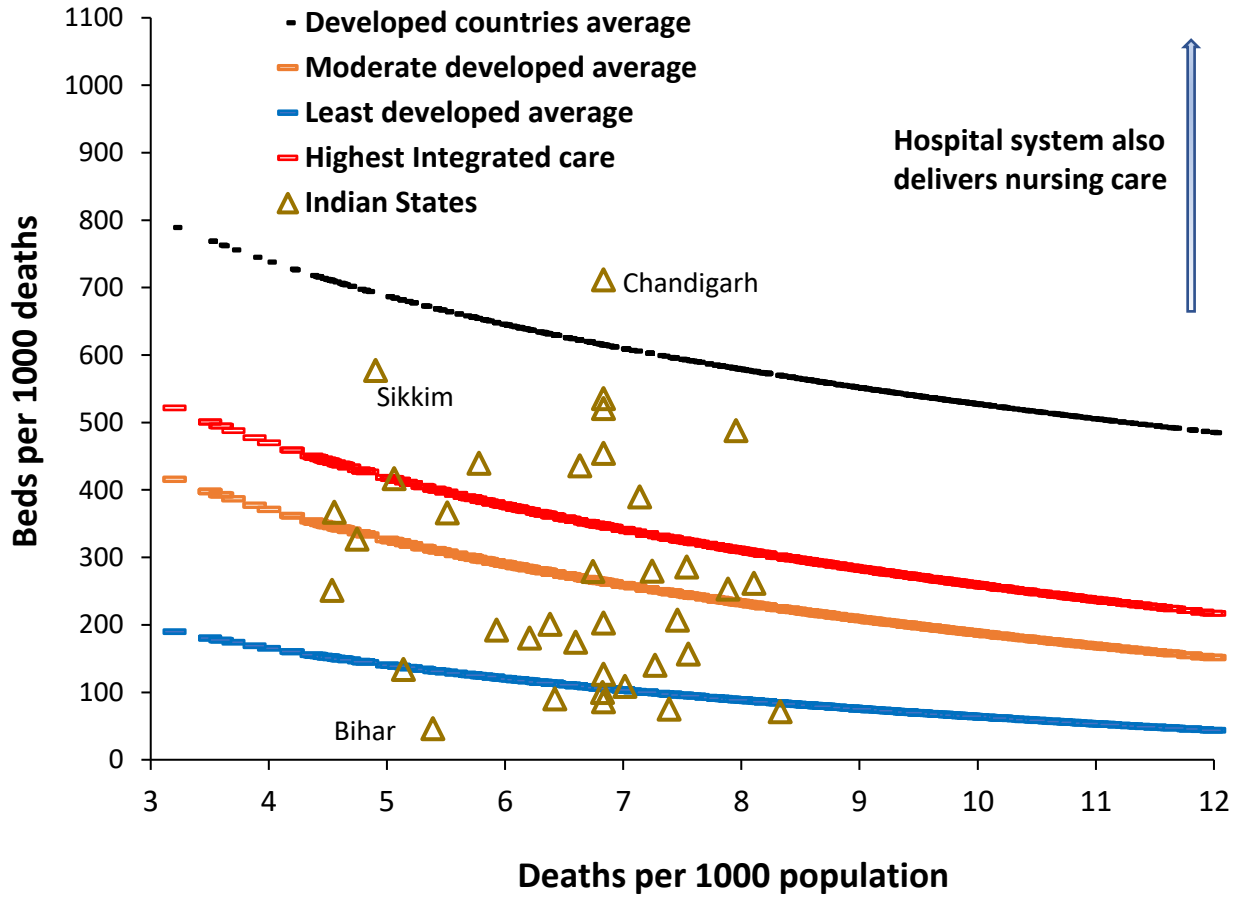
Total bed numbers include acute, mental health and maternity. Bed numbers for state-run hospitals are available, however, there are many private run hospitals about which no statistics appear to be collected. Researchers at Princeton University have attempted to bridge this gap, see State-wise-estimates-of-current-beds-and-ventilators_24Apr2020.pdf (cddep.org) and have estimated a total of 1.9 million beds! Figure 3 uses a new kind of international bed comparison which is sensitive to both age structure and bed use arising from nearness-to-death,

see https://doi.org/10.1002/hpm.2950. The sheer power of the nearness-to-deaths effect is amply demonstrated by Covid-19.

For comparison, countries like Japan lie well above the international average because it counts nursing homes as hospital beds. Countries such as Australia lie at the international average, beds in England lie slightly above the line for the most highly integrated health systems (Singapore and New Zealand), however, England has nowhere near the level of integrated care to justify this low level of bed provision. See https://doi.org/10.1002/hpm.3094. England therefore has fewer hospital beds than 9 Indian states. The Westminster obsession with reducing bed numbers in England has never had any real supporting evidence!

India is a nation of stark contrasts and average income in Goa is 9-times higher than in Bihar, Per Capita Income of Indian States 2019-20 (jagranjosh.com). Figure 3 amply illustrates this huge gap in relation to hospital be provision.

Figure 3: Hospital bed numbers in Indian states compared to averages for developed and less developed countries. Hospital beds in Indian states from State-wise-estimates-of-current-beds-and-ventilators_24Apr2020.pdf (cddep.org) International averages from http://www.hcaf.biz/2018/International_Beds.pdf



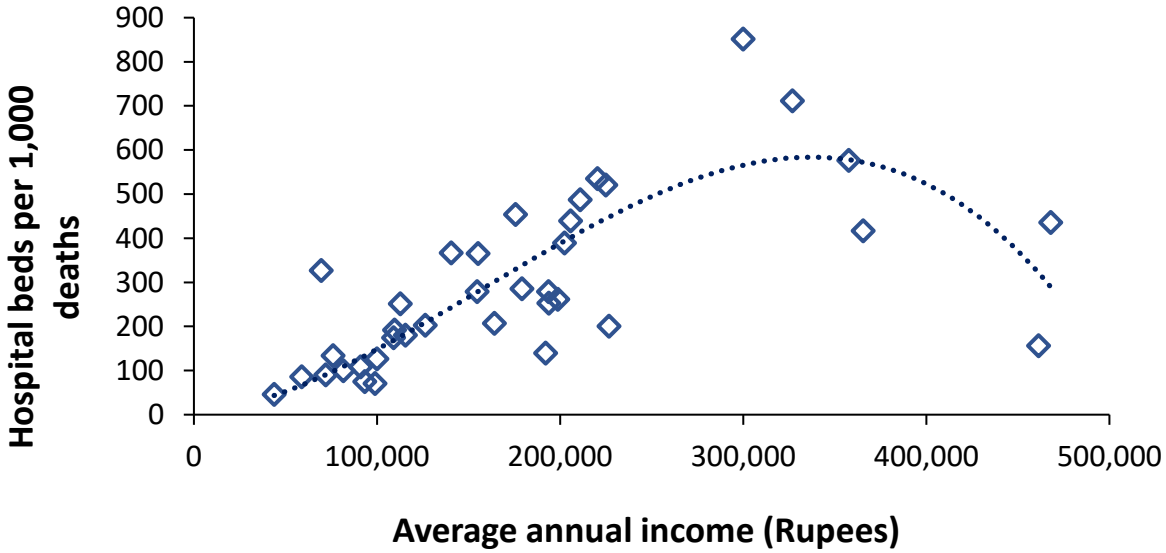
States with high bed provision include Chandigarh which is an administrative city district like Washington DC in the USA. Chandigarh serves as the capital city of both Punjab and Haryana states. It has a high literacy rate; the many public employees enjoy relatively high wages (4th highest average income) and will also benefit from state health insurance. It was India's first planned city and is said to be the cleanest city in India. It has a high proportion of world class private hospitals.

Sikkim is one of the smallest states, is largely rural, but hosts the large Sikkim Manipal Medical University and Hospital. It has the 3rd highest average income. I have published several pieces in the Sikkim Manipal University Medical Journal regarding infectious outbreaks. On the other hand, Bihar (lowest bed provision) is a largely agricultural state and has the lowest average income in India.

This huge range in relative wealth is reflected in the wide range in bed provision shown in Figure 3 from equivalent to the least developed/poorest world countries through to above the international average for developed countries. Around 10 Indian states have bed numbers equivalent to the world's poorest countries such as Uganda, Madagascar, Senegal, Benin, etc.

The link between income and bed provision is illustrated in Figure 4.

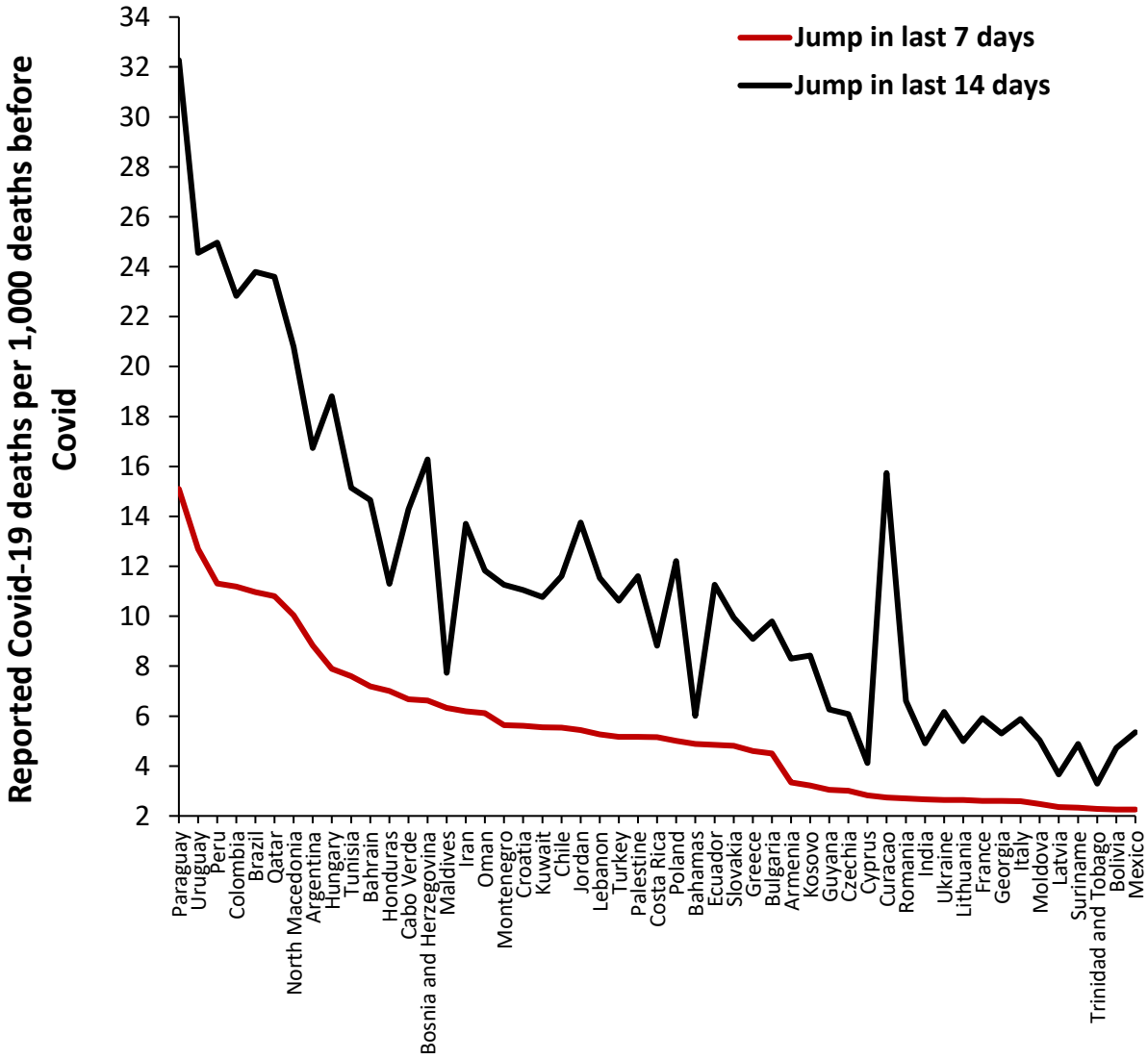
Figure 4: Link between income and hospital bed provision in Indian states.



As to be expected there is scatter around the trend line since both beds and income are estimates. Annual income is based on persons with salaries and many of India's population including farmers, etc receive no 'salary' as such.

Returning to the issue of Covid-19 deaths in world countries Figure 5 shows the latest data on the change in number of Covid-19 deaths per 1,000 deaths (in 2019). India has finally made its way into the top 50 countries, despite massive undercounting. As I keep repeating Africa is an opaque continent with potential massive under counting, as is half of Asia.

Figure 5: Change in the number of Covid-19 deaths per 1,000 deaths before Covid over the past two weeks.



Large parts of South America remain in the top 10 along with parts of the Middle East and Eastern Europe.

Greece, Cyprus, France and Italy remain in the top 50. The world outside the UK remains an unsafe place. However, the Indian variant appears to be rapidly expanding its share of total Covid-19 infections as was the case for the Kent variant in its early days. All must remain vigilant!

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

XXXX. India was a ticking time bomb.

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Covid-19 deaths in India

- India is a federal collection of nearly 40 states and territories.
- Each state/territory is far larger than many countries.
- Bihar, the largest state by population, has an estimated 124.8 million people and only 2,560 "reported" Covid-19 deaths. One assumes a vast underestimate.
- Lakshadweep, Daman and Diu, Dadra and Nagar Haveli have reported less than 5 Covid deaths. True death count completely unknown.
- 33% of the entire Indian Covid death count comes from Maharashtra, a mere 68, 813 reported deaths and even that is probably a gross underestimate!
- Even the capital of Maharashtra, Mumbai, has a larger population than many countries - 62% of Mumbai live in slums.
- Only the minority of "wealthy" in India can afford to access the relatively small number of private hospital beds.
- **Figure 1** shows the results for all states and territories with a line estimating the ***lower*** limit for likely real deaths.
- Alas this level of gross under reporting is probably replicated in many less developed countries.
- India was a ticking time bomb where people from the UK could freely travel.
- All other high-risk Asian countries increasing, but under the radar due to massive under reporting.
- Does it need some bloke researching in their spare time to discover all this! Did all the world governments sit there thinking "Oh, let's take the Indian statistics at face value". Please forgive my rude and untimely outburst, and India is not alone!

The recent international surge in Covid-19 "reported" deaths looks to have peaked in many countries – India excepted.

- "Reported" Covid-19 deaths have now exceeded 3.2 million.
- The recent surge seems to have peaked – at least in those countries with somewhat reliable counting.
- However, countries like Paraguay are quietly going ballistic (probably under counting).
- India has managed to avoid the top 50, behind Lithuania and Estonia.
- Countries considered not safe to travel to are all on the left-hand-side of Figure 1, plus any country with a high proportion of slum dwellers and/or low hospital capacity, see http://www.hcaf.biz/2018/International_Beds.pdf
- My estimate of 10 million Covid-19 deaths remains close to reality.

Deaths as a proxy for acute bed capacity pressures

- I have used this metric in several papers (see link at top of page).
- Covid-19 deaths data from the UK is used to demonstrate that it is indeed a reliable proxy for admission and bed capacity pressures – simple things often work the best!

Proportion of UK deaths with Covid-19 (as on 23rd April 2021).

- As expected, the proportion of Covid-19 deaths continues to fall, but the rate of decrease is slowing as the proportion gets smaller.
- This statistic will no longer be reported unless an adverse trend arises.

Figure 1, Part 1 has been updated to give deaths up to 23rd April 2021.

- The rolling 52-week total has reached a peak in all regions and is now showing a rapid decline, especially in London.
- The UK is experiencing a ***massive*** "culling" or "harvesting" effect, i.e., persons who would have died in the next few years or even longer have had their time of death bought forward by Covid-19.

A 4-Part series has been published in the *Journal of Health Care Finance* describing the principles behind financial and ***capacity*** risk in health care.

Parts 1-3 explain the epidemiological principles behind why things can quickly go terribly wrong – with Covid-19 as an example, while Part 4 explains the changes required in health care policy to limit the damage.

Part 4 should be compulsory reading in Health Departments around the world, NHS England, and English CCGs. Policy must be based on how the real world 'actually' behaves rather than how it 'ought to' or 'should' behave.

A MUST read for anyone who cannot understand why seemingly well-run organisations suddenly slip into deficit. NHS managers have seemingly been held to account for that over which they have absolutely no control, See http://www.healthfinancejournal.com/~junland/index.php/johcf/index

Listen to a 14-minute interview about the series, https://jjunland.egnyte.com/dl/CPdNnjCVle

In this and other publications I have suggested that the absolute number of deaths is a good proxy for international comparison of hospital capacity pressures. See http://www.hcaf.biz/2018/International_Beds.pdf, https://doi.org/doi:10.3390/ijerph17145210, http://www.healthfinancejournal.com/~junland/index.php/johcf/index

It is therefore important to see if this assumption holds true for Covid-19. Table 1 lists the number of Covid-19 admissions in England since the start of the epidemic and the corresponding number of reported Covid-19 deaths. In the UK, the total reported Covid-19 deaths also roughly approximates to total excess mortality. As can be seen in Table 1 there are around 84 admissions for every 100 reported Covid-deaths. Marginal changes in deaths are indeed a good proxy for the marginal changes in health service capacity and cost pressures. See Part 4 at http://www.healthfinancejournal.com/~junland/index.php/johcf/index

This is vastly important to the formulation of the CCG resource allocation formula which makes the entirely fallacious assumption that costs are due largely to age. Hidden assumptions are always the downfall of any model or formula which attempts to describe the real world. If you leave a major parameter out of a model the model will simply convolute itself to minimise the residuals, thereby creating all manner of hidden errors.

Table 1: Covid-19 admissions per Covid-19 deaths in England (up to 7th April 2021). Data source for admissions Statistics » COVID-19 Hospital Activity (england.nhs.uk)

Region	Admissions	Deaths	Admissions per 100 deaths
ENGLAND	108,301	129,048	84
East of England	11,177	15,032	74
London	19,274	18,988	102
Midlands	23,009	26,655	86
North East and Yorkshire	16,446	19,521	84
North West	16,306	20,086	81
South East	13,385	20,645	65
South West	8,704	8,121	107

To put this another way, CCGs your supposed ‘fair funding’ is neither accurate nor fair! My attempts to contact NHS England and the DHSC over this issue have been, shall we say, less than fruitful.

The sheer difficulty of keeping track of Covid-19 mortality is illustrated by a massive linked records project initiated in England, see Linked electronic health

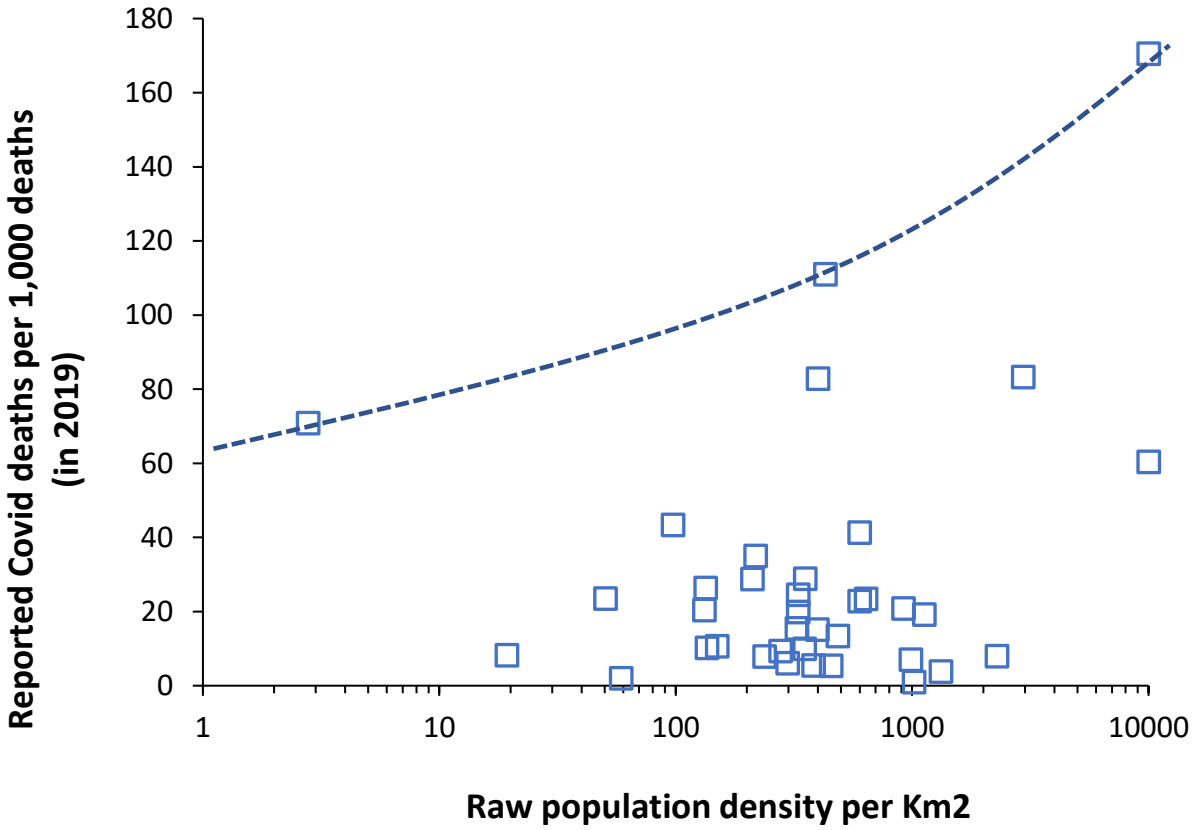
records for research on a nationwide cohort of more than 54 million people in England: data resource (bmj.com).

Decades of IT infrastructure investment have made this possible. Many countries still rely on ink and quill. No wonder the international statistics are of dubious value.

This series has highlighted the role of undercounting of Covid-19 around the world. The big risk factors for undercounting are high population density, poorer countries (inability to pay for widespread testing), high proportion of slum dwellers, and low healthcare resources measured by hospital beds (much Covid-19 detection will occur in hospitals). The spatiotemporal granular nature of infectious was also highlighted regarding the timing of large outbreaks.

The situation in India is highlighted in Figure 1 where just three states have managed to probably get somewhere close to reality – the dashed line.

Figure 1: Reported Covid-19 deaths in Indian states and territories per 1,000 deaths (pre-Covid) versus raw population density.

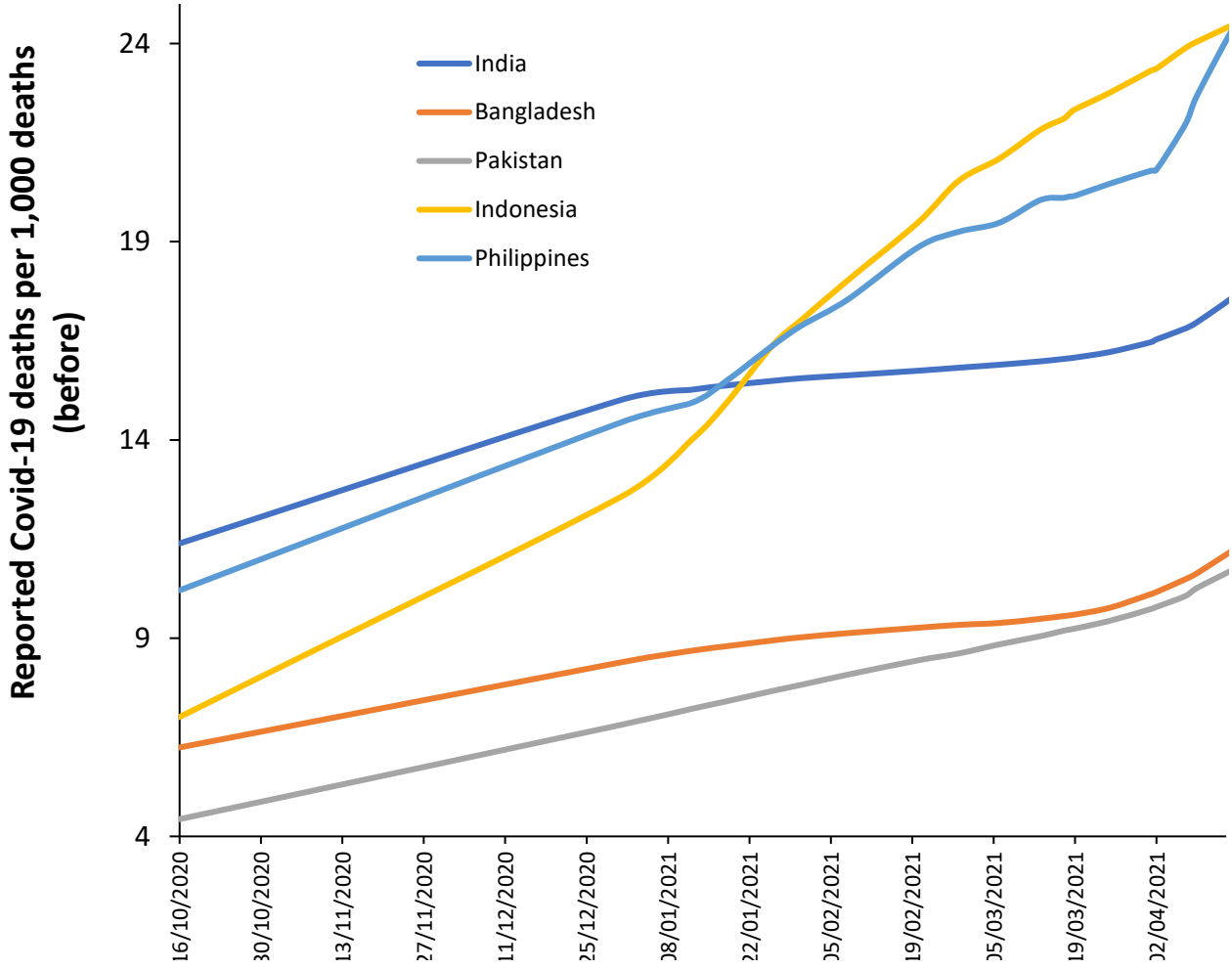


For those with a penchant for facts, the raw population density in US sates is all well below 1,000 per square Km (see Population density and health care costs1 (hcaf.biz). The raw population density in the UK is just 280 per square Km, but

around 40% of the UK population lives at small-area population density above 4,000 per square Km. This is merely to give you some idea of the vast difference between raw population density in Figure 1 and the actual population density experienced at small areas. Whole families in slums live in a small shack.

Figure 2 shows the trends in the five high-risk Asian countries. Take the situation in India and apply this wider afield and you have a small insight into the magnitude of the real problem. China probably up there but censorship prevents any insight.

Figure 2: Trend in reported Covid-19 deaths for high-risk Asian Countries



South American countries other than Brazil get mainly ignored by the national press and Figure 3 gives an insight into ballistic growth in Paraguay, which is also probably a gross underestimate. Ah, what a dangerous place many parts of the world have become.

Figure 3: Growth in reported Covid-19 deaths in Paraguay.

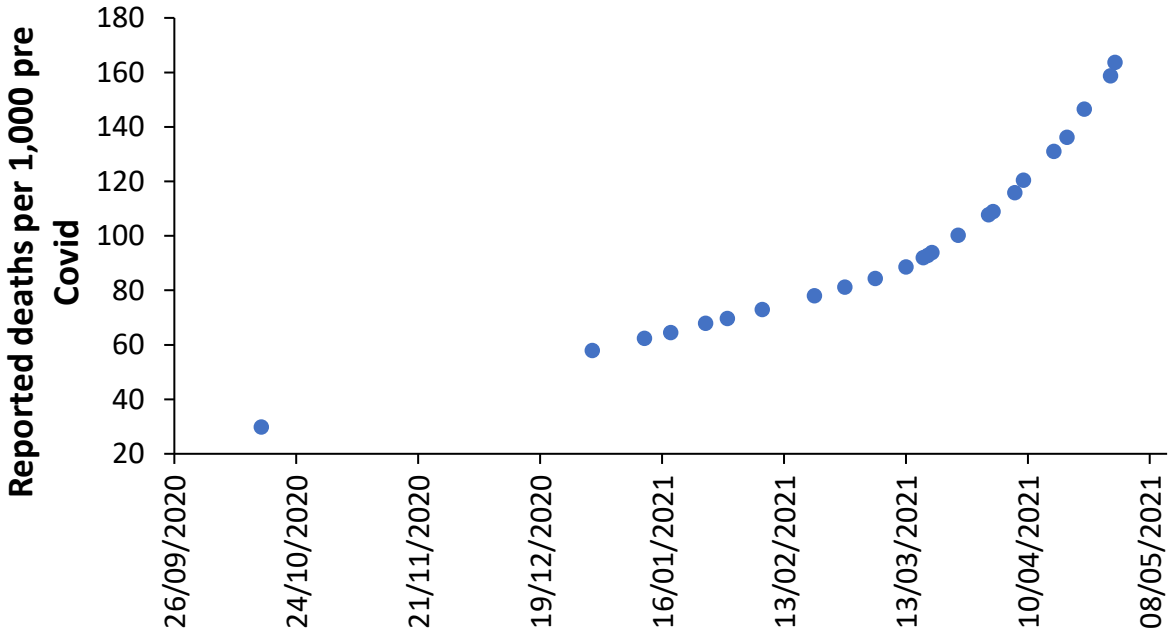


Figure 4: Increase in Covid-19 deaths in past two weeks relative to before Covid total deaths.

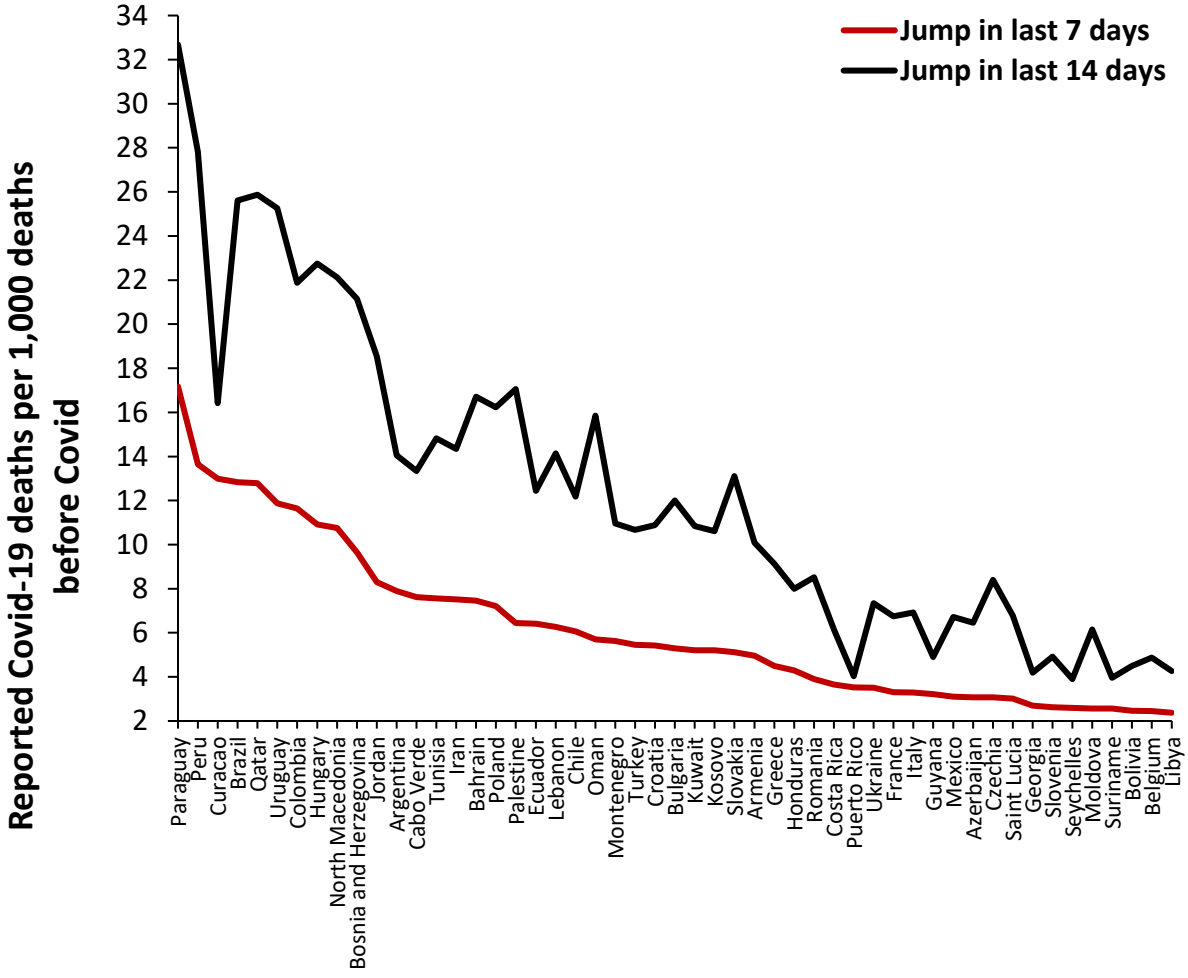


Figure 4 shows the top 50 countries with highest ***reported*** Covid-19 deaths in the last two weeks (up to Friday 30th April). South America is virtually a no-go area, as are large parts of Eastern Europe, parts of the Middle East, etc.

Not shown in Figure 4 will be all countries falling into the high risk of undercounting category detailed above. Countries desperate for tourism income could be tempted to go down the undercounting route.

France and Italy both in the top 50 – maybe not so safe to travel to as HMG would have you believe. UK is 120th on the list, perhaps a staycation in your back garden? Did all the uber wealthy from India flee to Qatar?

And finally, Figure 5 shows the decline in Covid-19 deaths as a proportion of total deaths in the UK. Unless there is a major change this will no longer be reported. We are fortunately down to such low levels that the jumble of scatter from small numbers randomness begins to cloud the trends.

Figure 5: Trend in proportion of total deaths due to Covid-19 in parts of the UK

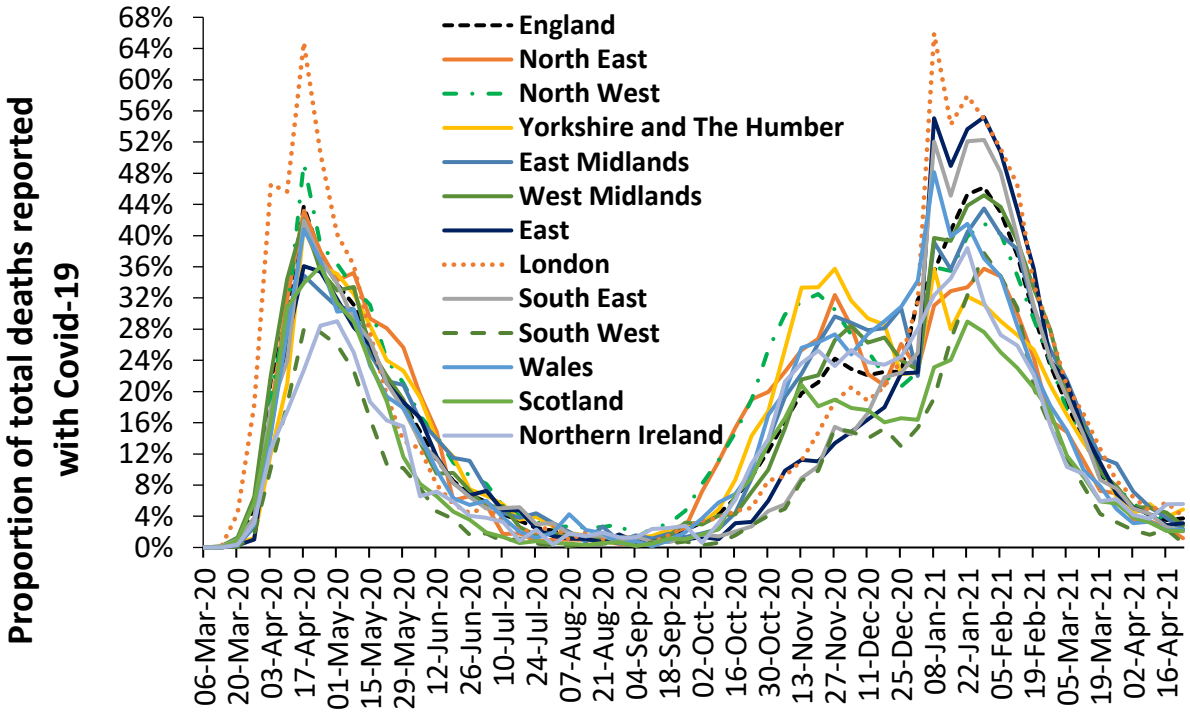


Figure 1 in Part 1 (end of document) has been updated and shows an unprecedented “culling” or ”harvesting” effect in the aftermath of the three large waves. The South West always leads the trend down.

And please forgive my unseemly outbursts of exasperated, attempted humour. It was either that or break into tears of frustration.

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

XXXVIII. International deaths are escalating.

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The recent international surge in Covid-19 reported deaths continues.

- Reported Covid-19 deaths have now exceeded 3 million.
- A ***large*** surge in the last week
- Despite presumed undercounting parts of Africa have now entered the top 50
- The USA ranked 67 and UK ranked 111.
- Germany ranked 66.
- India has had a massive burst - blunted by undercounting and exacerbated by limited hospital capacity.
- This is a natural outcome of the extremely high spatiotemporal granularity of Covid-19 arising from the role of super-spreading individuals/events.

Analysis of deaths in England and Wales over the past 182 years

- Analysis of deaths over the past 182 years shows that periods of high deaths always occur in clusters.
- Presumably, high deaths continue until herd immunity is acquired to whatever agent has precipitated the cluster.
- Hopefully Covid-19 vaccination will allow us to exit the current cluster earlier than has historically been the case.

Proportion of all deaths in hospital during 2021

- Covid-19 hot-spots are likely to have high deaths in hospital.
- Ranges from 69% in Newham (London) down to just 31% in Torbay
- Most of London is in the top rankings plus the occasional location in Wales such as 2nd ranked Merthyr Tydfil.
- Illustrates the vast impact of the epidemic on acute care but greatly modified by spatiotemporal granularity.

Proportion of UK deaths with Covid-19 (as on 9th April 2021).

- As expected, the proportion of Covid-19 deaths continues to fall, but the rate of decrease is slowing as the proportion gets smaller.
- Equivalent to that seen around mid-July 2020.
- This implies close to 0% Covid-19 deaths as early as just 5 weeks – barring outbreaks of new variants – although expect new outbreaks next winter as a wider range of international variants emerge, i.e., the Indian variant.
- The benefits of vaccination are now being seen.

Figure 1, Part 1 has been updated to give deaths up to 9th April 2021.

- The rolling 52-week total has reached a peak in all regions and is now showing a rapid decline, especially in London.
- The UK is now experiencing a ***massive*** example of the "culling" or "harvesting" effect, i.e., persons who would have died in the next few years or even longer have had their time of death bought forward by Covid-19.

A 4-Part series has been published in the *Journal of Health Care Finance* describing the principles behind financial and ***capacity*** risk in health care.

Parts 1-3 explain the epidemiological principles behind why things can quickly go terribly wrong – with Covid-19 as an example, while Part 4 explains the changes required in health care policy to limit the damage.

Part 4 should be compulsory reading in Health Departments around the world, NHS England, and English CCGs.

A MUST read for anyone who cannot understand why seemingly well-run organisations suddenly slip into deficit. See
http://www.healthfinancejournal.com/~junland/index.php/johcf/index

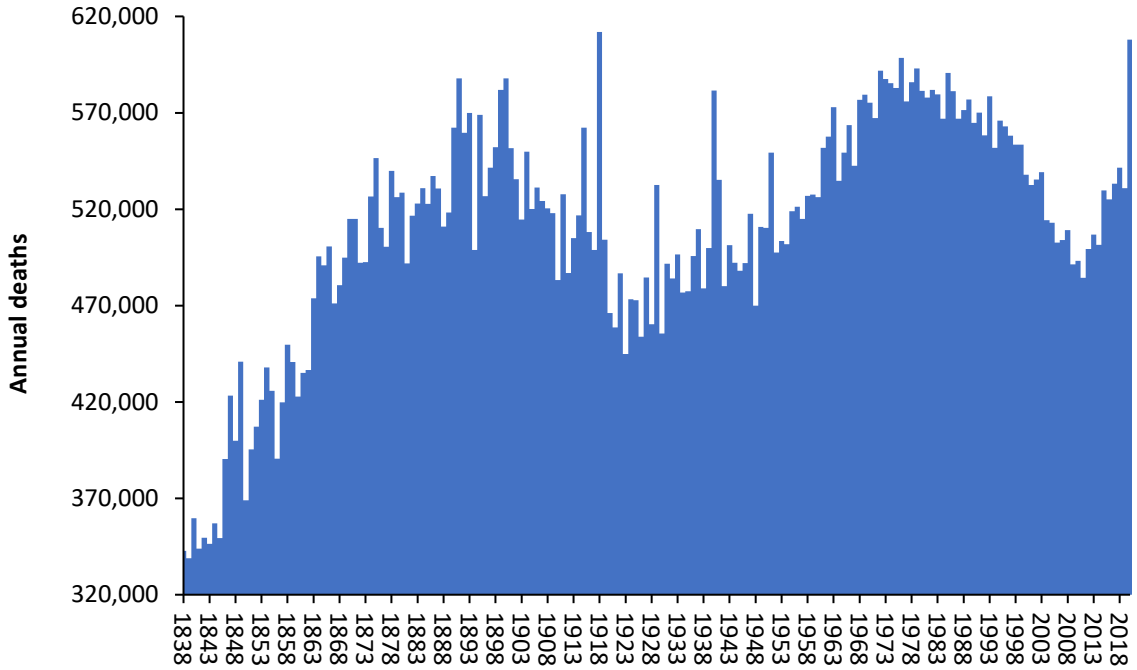
Listen to a 14-minute interview about the series,
https://jjunland.egnyte.com/dl/CPdNnjCVle

A recent study has documented a 500% increase in persons exposed to extreme heat and precipitation events since 1980 in the 150 most populated cities in the world, see IJERPH | Free Full-Text | Global Population Exposed to Extreme Events in the 150 Most Populated Cities of the World: Implications for Public Health (mdpi.com). The risk of environment-induced disease transmission is getting higher.

Figure 1 shows the trend in deaths In England and Wales since 1838. Note how periods of high deaths always occur in clusters. It is assumed that the cluster continues until herd immunity is acquired. Hopefully vaccination will allow the current Covid-19 cluster of deaths to diminish far faster than in the past. So far

the Covid-19 epidemic has been nowhere as bad as the 1918 'Spanish' flu pandemic. Although back in 1918 there were no antibiotics, no intensive care with respirators and no public health measures. Note also that the high year-to-year volatility reaches its lowest value from the 1950s onward, i.e., the antibiotic era.

Figure 1: Trend in annual deaths in England and Wales since 1838. Data source: Annual deaths and mortality rates, 1838 to 2020 (provisional) - Office for National Statistics (ons.gov.uk)



Depression, anxiety and stress among health care workers in Trinidad and Tobago, see Prevalence and factors associated with depression, anxiety and stress among healthcare workers of Trinidad and Tobago during COVID-19 pandemic: a cross-sectional study | BMJ Open …… according to their official Covid-deaths statistics they ranked 118th in the world for Covid-19 'reported' deaths – what was there to get stressed about – ***unless*** of course the official figures represent massive undercounting of reality. At only 82,000 tests per million population, they are not far off Equatorial Guinea. Pressure on HCWs will also be amplified by relatively low numbers of hospital beds as an indicator of low health care resources.

A friend of mine talks about disruption in an Eastern European country where 'reported' Covid-19 deaths are supposedly low. May I continue to suggest that

massive undercounting has occurred in over half of world countries. Also, that hidden risk of infection is extremely high.

The new Covid-19 strain from India is but one example of international travel between a country which I would put in the high-risk category. See previous parts.

Figure 2 shows the 'apparent case fatality rate in various countries. Very low testing leads to a high number of cases per test (probably concentrated in hospital) and hence to high deaths per case. The UK has (cases per test, deaths per case) 3% - 3%, The USA 8% - 2%, Germany 6% - 3%, and Brazil 48% - 3%.

Figure 2: Cases per test and deaths per case for world countries.

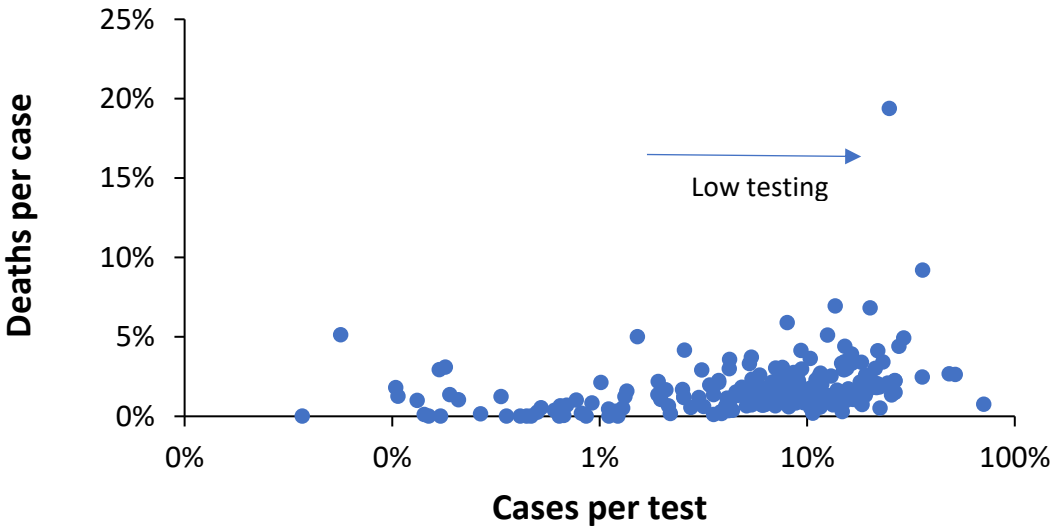


Figure 3: Trend in deaths per 1,000 deaths (before Covid) for Asian countries with high proportion of persons living in slums.

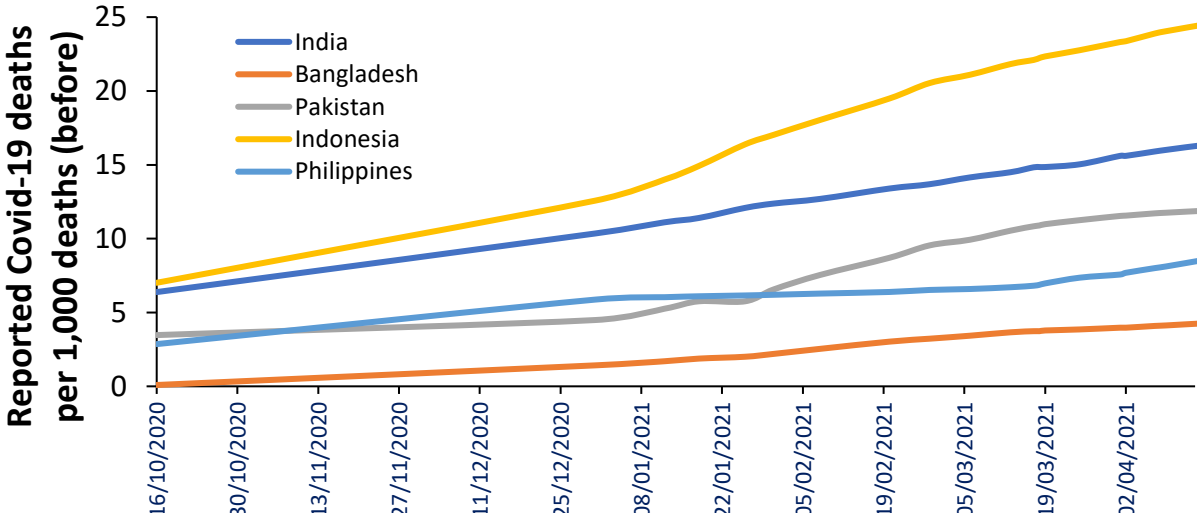


Figure 3 shows the trend in deaths per 1,000 deaths (before Covid) for Asian countries with a high proportion of persons living in slums. The trends look to be suspiciously low and presumably reflect the degree of undercounting. All of these countries have low provision oof acute beds which will exacerbate the real death trends.

Figure 4 shows the increase in 'reported' deaths per 1,000 deaths (before Covid). Some of the countries a very small and just 1 death can make a large difference. However, despite this, this measure is the most relaible available. Several African countries have crept into the top 50.

Figure 4: Top 50 countries for the change in 'reported' Covid-19 deaths per 1,000 deaths (before Covid).

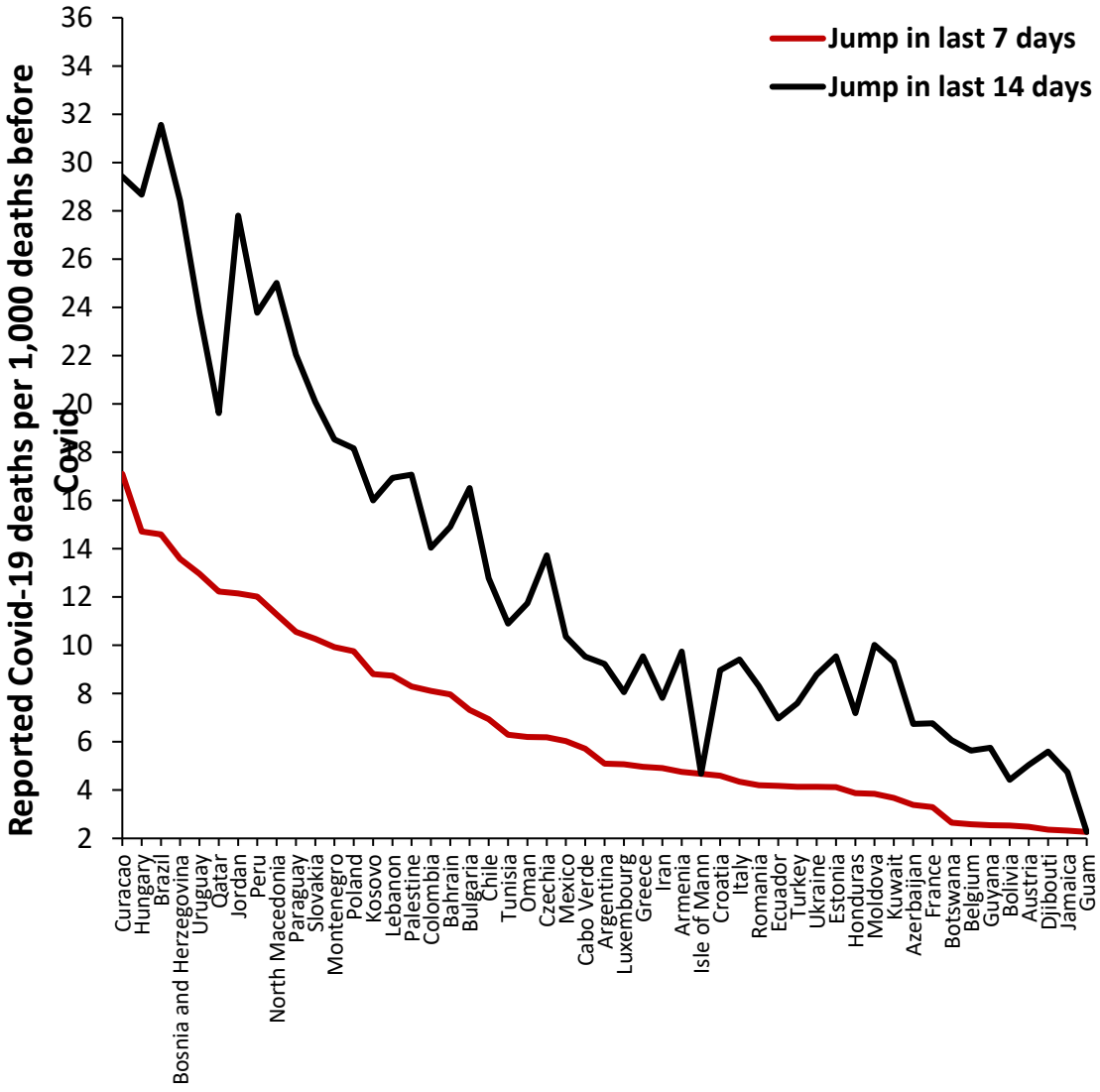


Figure 5 illustrates the pressure that Covid-19 has placed on UK hospitals and shows the proportion of total deaths (all causes) which have occurred in hospital so far during 2021. As expected, London boroughs are high on the list.

Figure 5: Proportion of total deaths occurring in hospital for local authorities in England and Wales during 2021 up to 10th April.

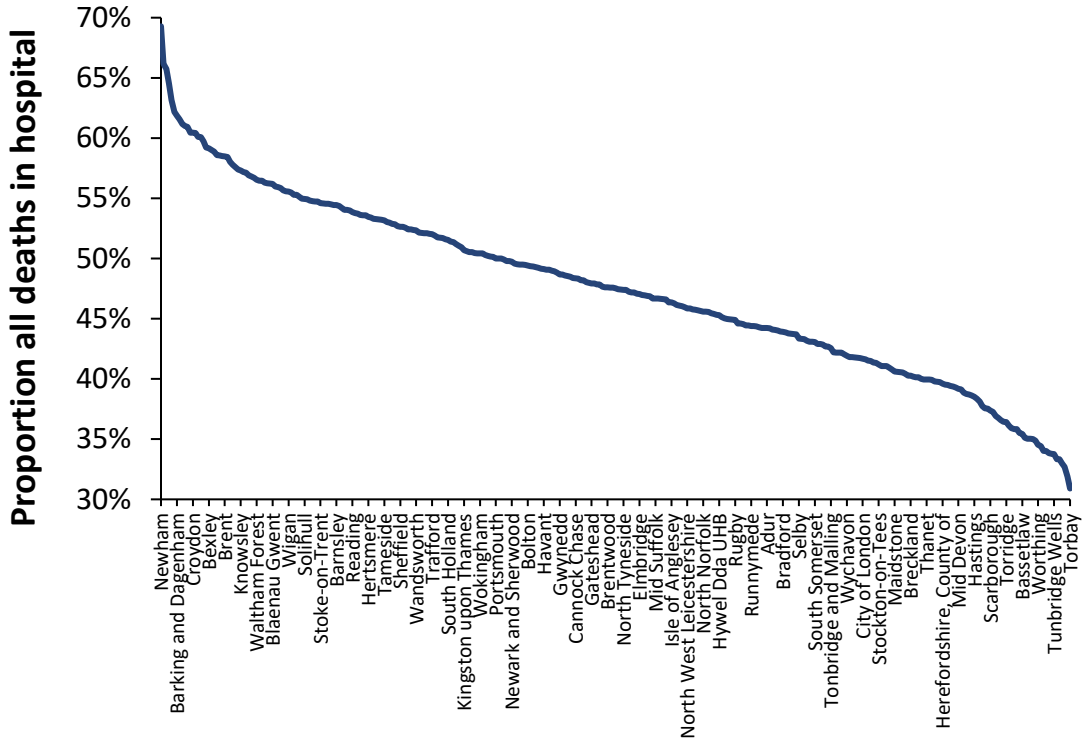


Figure 6: Trend in proportion deaths due to Covid-19 across the UK

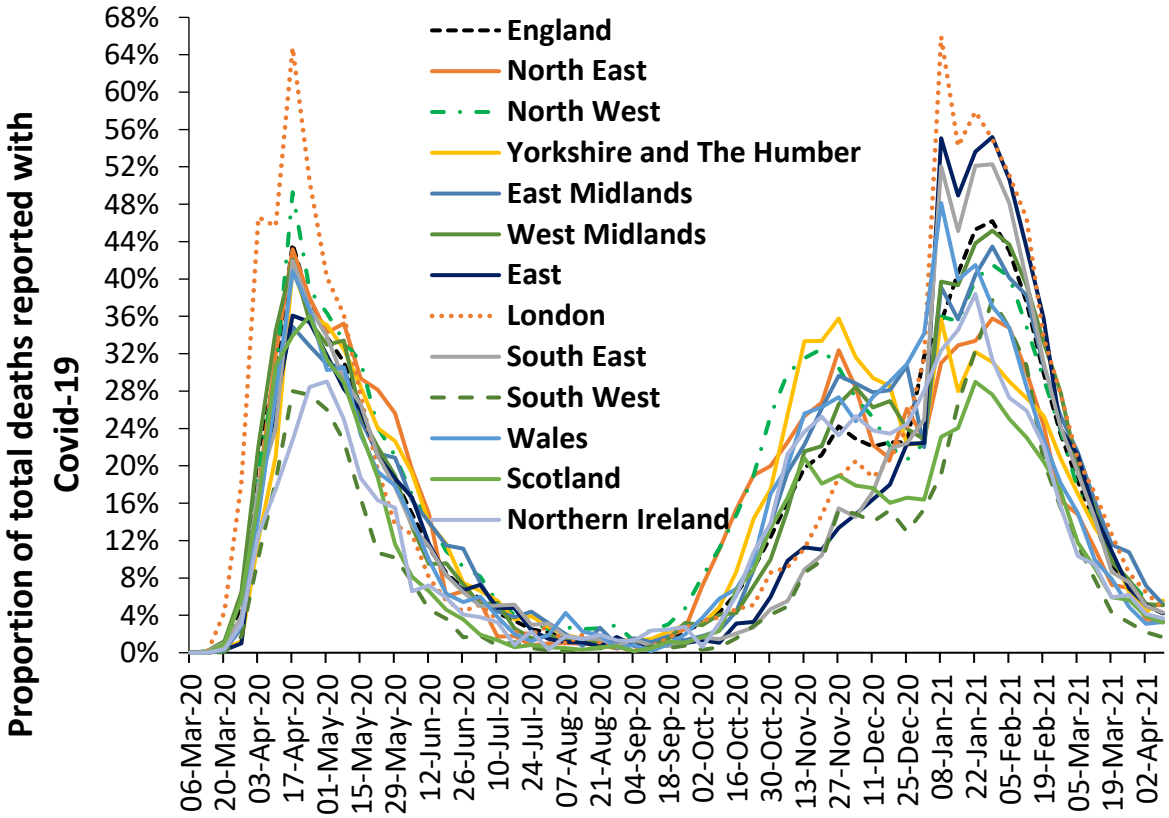


Figure 6 shows the trend in the proportion of deaths due to Covid-19 across the UK. As after the first wave the numbers are getting small hence show small number volatility. East Midlands shows the highest line as it did after the first wave.

Finally Figure 1 in Part 1 has been updated and shows a massive ‘culling’ or ‘harvesting’ effect in the rolling 52-week total (all-cause deaths). A large number of deaths have been bought forward in time due to the action of Covid19, whether acute or sub-acute.

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

XXXVII. International evidence for gross undercounting

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International evidence for gross undercounting of Covid-19 deaths

- "Reported" Covid-19 deaths will shortly reach 3 million.
- Multiple studies are now being published giving evidence for gross undercounting of Covid-19 deaths using all-cause mortality data.
- See Tracking covid-19 excess deaths across countries | The Economist as one example.
- The estimated 10 million deaths in Part 34 are seemingly close to the truth.
- Estimates of the real number of persons infected are likewise giving far higher numbers of cases, see Estimation of the fraction of COVID-19 infected people in U.S. states and countries worldwide (plos.org)
- The Covid-19 data from most of Africa is likely to be highly suspect.

The recent international surge in Covid-19 reported deaths continues.

- Rapid increase in deaths continues in multiple countries.
- Eastern Europe is also severely affected as are parts of the Middle East, the Caribbean, etc.
- The USA has crept back into the top 50.
- This is a natural outcome of the extremely high spatiotemporal granularity of Covid-19 arising from the role of super-spreading individuals/events.

Proportion of UK deaths with Covid-19 (as on 2nd April 2021).

- The UK is now on the brink of achieving herd immunity, see Exclusive: Britain will achieve herd immunity on Monday (yahoo.com) – the exact date may be less certain than implied.
- As expected, the proportion of Covid-19 deaths continues to fall, but the rate of decrease is slowing as the proportion gets smaller.
- Equivalent to that seen around late-June 2020.

- This implies 0% Covid-19 deaths around July 2021 – barring outbreaks of new variants – although expect new outbreaks next winter as a wider range of international variants emerge.

Figure 1, Part 1 has been updated to give deaths up to 2nd April 2021.

- The rolling 52-week total has reached a peak in all regions and is now showing a rapid decline, especially in London.
- The "culling" or "harvesting" effect has now kicked in, i.e., persons who would have died in the next few years or even longer have had their time of death bought forward by Covid-19.

A 4-Part series has been published in the *Journal of Health Care Finance* describing the principles behind financial and ***capacity*** risk in health care.

Parts 1-3 explain the epidemiological principles behind why things can quickly go terribly wrong – with Covid-19 as an example, while Part 4 explains the changes required in health care policy to limit the damage.

Part 4 should be compulsory reading in Health Departments around the world, NHS England, and English CCGs.

A MUST read for anyone who cannot understand why seemingly well-run organisations suddenly slip into deficit. See
http://www.healthfinancejournal.com/~junland/index.php/johcf/index

Listen to a 14-minute interview about the series,
https://jjunland.egnyte.com/dl/CPdNnjCVle

Reagents for testing of Covid-19 infection were in world-wide short supply at the start of the Covid-19 pandemic and evidence for gross undercounting of both Covid-19 cases and deaths during 2020 is beginning to emerge on an international basis, see Estimation of the fraction of COVID-19 infected people in U.S. states and countries worldwide (plos.org), Tracking covid-19 excess deaths across countries | The Economist, (25) (PDF) Age-and Gender-Specific Excess Mortality during the Covid-19 Pandemic in Hungary in 2020 (researchgate.net),

Estimates appear to cluster around 50% undercounting during 2020. This is specific to the developed countries where accurate monthly and weekly deaths data is available. By implication a minimum case of around 5 million deaths.

As repeatedly stated, annual deaths in most of Africa (South Africa and Egypt excluded) are an 'estimate' and data on monthly and weekly deaths is entirely absent. The infrastructure is simply not present to accurately count deaths. Given the high prevalence of slums in Africa, and the continued low level of Covid-19 testing it must be assumed that underreporting of Covid-19 deaths is exceptionally high.

For those who are interested read this fascinating article about the dichotomy of lockdown and social isolation in the elderly 249-506-1-SM.pdf

Figure 1 illustrates the growth of 'reported' Covid-19 deaths over time for the 50 countries with the highest 'reported' rates of death. Note how the UK and USA are slipping down the rankings. Most of South America in in the top 50. The complete absence of any African country is more to do with the extent of gross undercounting than biological reality.

Figure 1: Reported Covid-19 deaths per deaths (before Covid-19) for the top 50 countries as of 9th April 2020.

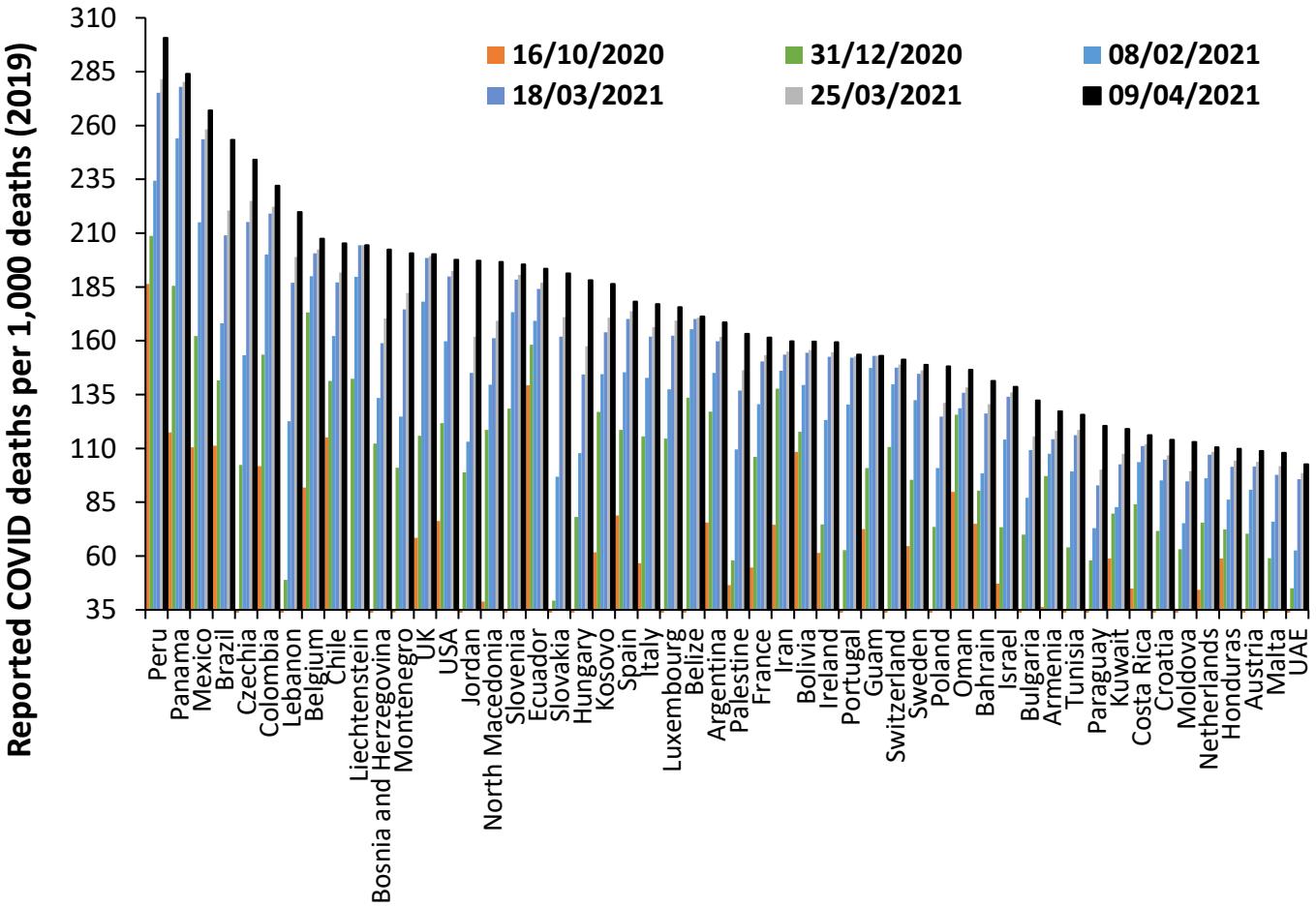


Figure 2 shows the jump in deaths over the past week and two weeks for the same countries as in Figure 1. Figure 2 shows it is a more recent surge in deaths which has carried these countries past the UK and USA - despite recent surges in both these countries. Whatever you may be told about the safety of overseas travel the simple rule is that the risks remain high. Unless absolutely necessary, don't travel overseas is the simplest rule to follow.

Figure 2: Jump in reported Covid-19 'excess' mortality for the top 50 countries from Figure 1 over the past 7 and 14 days.

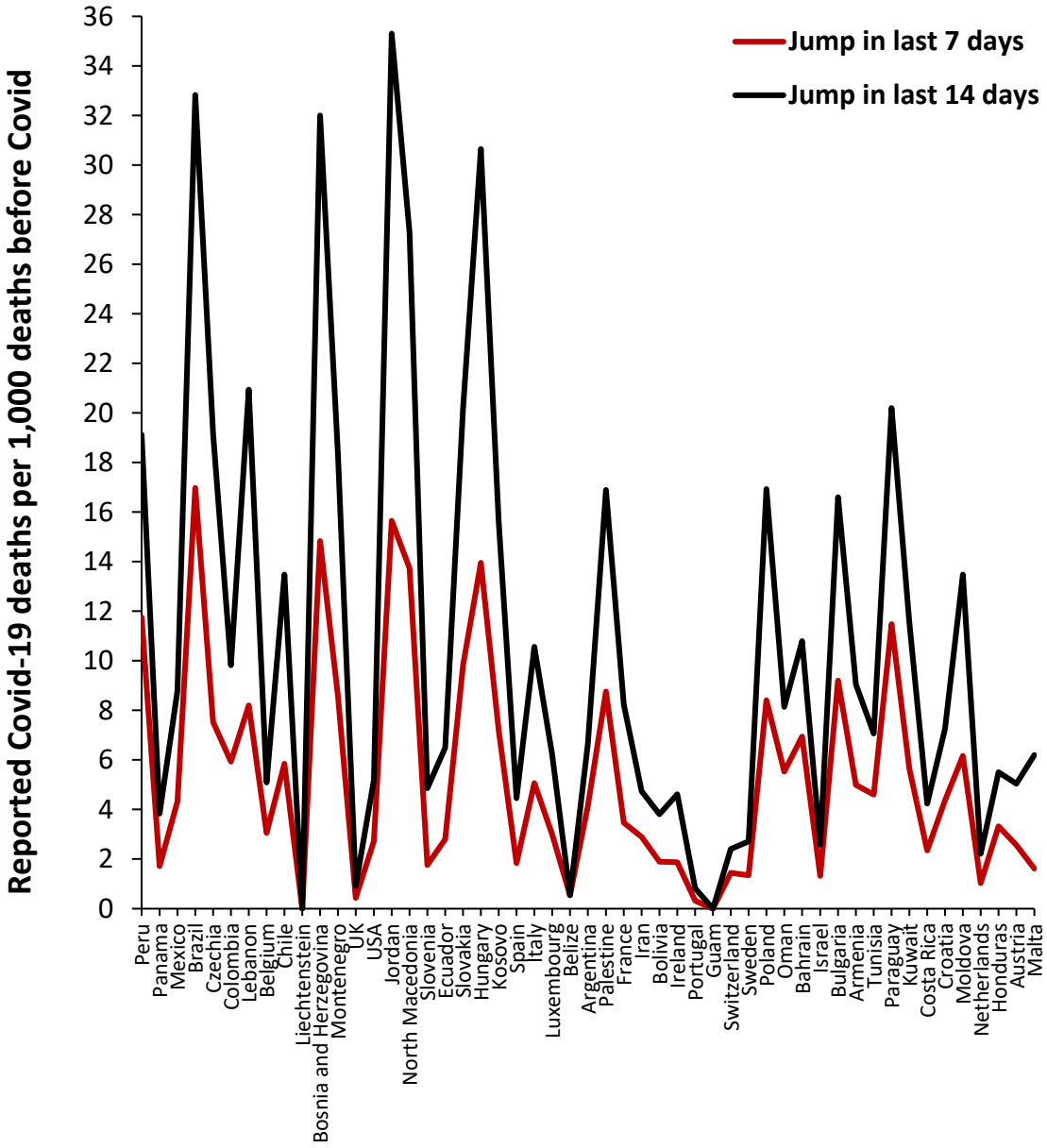


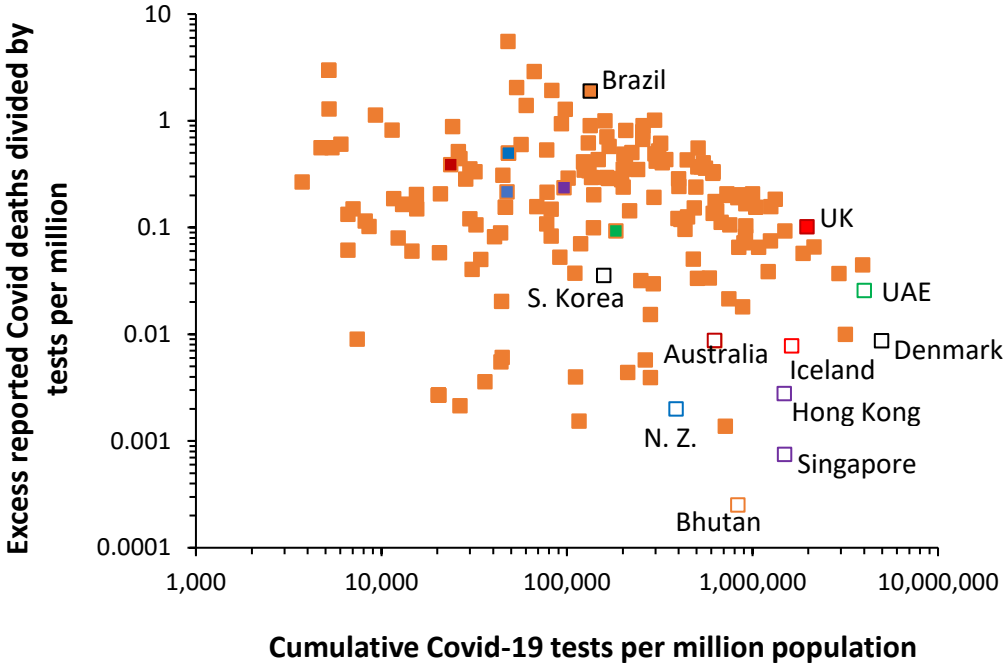
Figure 3 gives the latest position between reported deaths and levels of Covid-19 testing. There is a somewhat complex interplay between level of testing and reported deaths per level of testing. Testing below 100,000 tests per million population opens the possibility of widespread underreporting of Covid-19 deaths. All of Africa lies below this boundary. South Korea can operate close to this boundary because of its highly effective forward and backward track and trace system. The reason for their well-honed track and trace was the threat of biological warfare by North Korea.

The coloured squares toward the middle are the Asian countries India, Pakistan, Bangladesh, Philippines, and Indonesia. All with high slum

populations and lower levels of testing, hence, high opportunity for undercounting.

The opportunity for undercounting will be magnified by limited access to acute care (as hospital beds) which is exceeding low throughout Africa and any country with a high slum population, see International_Beds.pdf (hcaf.biz), A pragmatic method to compare hospital bed provision between countries and regions: Beds in the States of Australia - Jones - 2020 - The International Journal of Health Planning and Management - Wiley Online Library

Figure 3: Ratio of excess reported Covid-19 deaths per million tests versus tests per million population. Note both are log scales.



Despite Internationally low levels of hospital beds the UK managed to survive Covid-19 due to heroic efforts by the NHS and vast reductions in elective surgery. The same need to cut elective surgery in the USA, see https://doi.org/doi:10.3390/ijerph17145210, has resulted in an unfortunate round of US hospitals going bankrupt. There were 42 bankruptcies up to the middle of 2020 alone, see 42 hospitals closed, filed for bankruptcy this year (beckershospitalreview.com). No country should leave health care to the mercy of market forces as has been the case of the USA.

Hence, my estimate of 10 million Covid-19 deaths remains close to the reality of the Covid-19 pandemic.

Returning to more mundane matters. Figure 4 shows the declining ratio of Covid-19 deaths per all-cause deaths. Levels are now around late-June 2020 implying somewhere around June/July 2021 for zero percent Covid-19 deaths.

The shape of the curve so far has been mainly driven by lockdown while the full benefits of vaccination should be seen from this point onward.

Figure 4: Proportion of total deaths (all-cause) which are reported to be associated with Covid-19 infection.

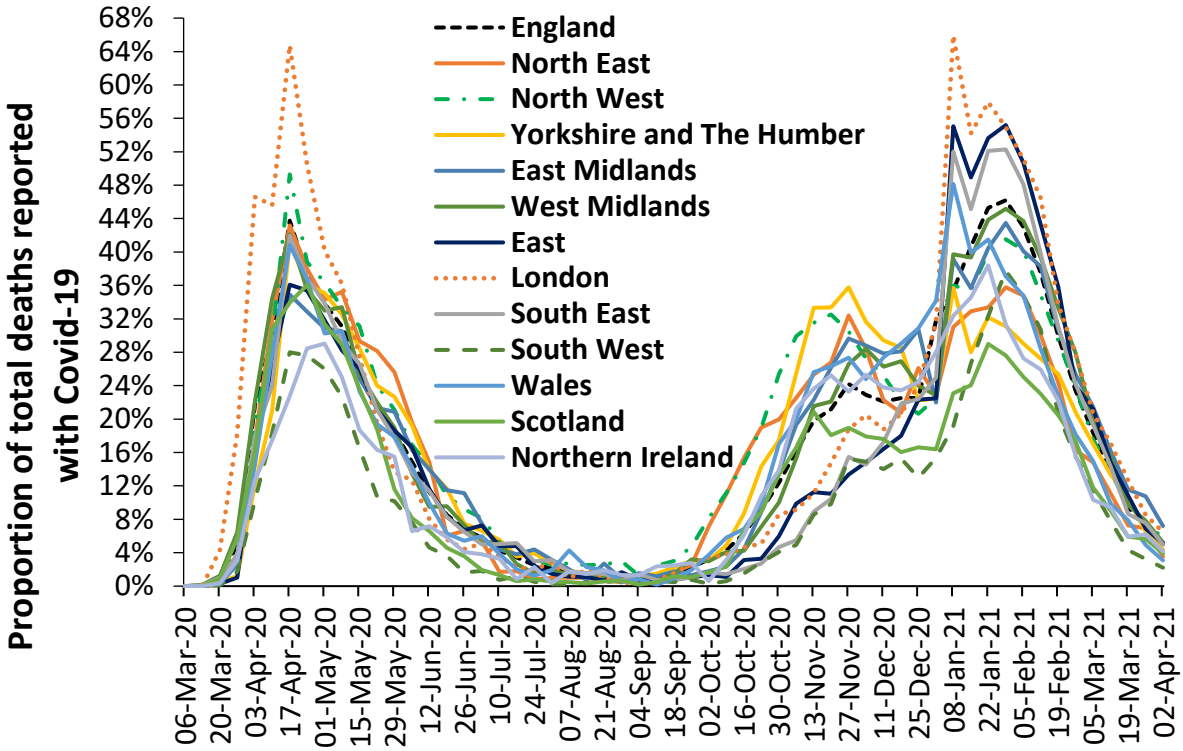


Figure 1 in Part 1 of this series (see end of document) and is now showing signs of the 'culling' or 'harvesting' effect in that the rolling 52-week total of all-cause deaths is rapidly declining. However, the harvesting effect will be counterbalanced by the effects of long-Covid, delayed elective treatment for cancers, etc, the need to address the huge elective waiting list, the rise in deaths arising from the WWII baby boom, and the impending threat of further austerity due to the massive escalation of national debt due to Covid-19.

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

XXXVI. Implications to health service costs and resource allocation

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The profound implications of spatiotemporal granularity.

- The role of spatiotemporal granularity (space – time variation) in outbreaks of Covid-19 has been a central theme of this series. See Part 35 and others for more details.
- Among other factors weighted or lived population density plays an important role.
- Social mixing is also an important factor, see Close contact infection dynamics over time: insights from a second large-scale social contact survey in Flanders, Belgium, in 2010-2011 | BMC Infectious Diseases | Full Text (biomedcentral.com)
- As is the travel of workers into areas with high infection rates, see Spatiotemporal heterogeneity and its determinants of COVID-19 transmission in typical labor export provinces of China | BMC Infectious Diseases | Full Text (biomedcentral.com)
- These factors also apply to health care costs and formula devised to fund different regions/locations/CCGs.
- This explains why NHS commissioning was suspended in England during Covid-19.
- The funding formula is in urgent need of revision due to the naturally high spatiotemporal granularity in costs which is outside of human control – this existed before Covid-19 but was ignored.
- Formerly NHS organisations were blamed for the effects of this spatiotemporal granularity, consistent with the politics of blame rather than seeking out uncomfortable reality.
- High spatiotemporal granularity also explains why hospitals require a high occupancy margin, i.e., free beds, to ensure optimum flow – once again ignored in the undue haste to build smaller hospitals, for which there was never any evidence to do so, see link above this text box.

The recent international surge in Covid-19 reported deaths continues.

- Rapid increase in deaths continues in Jordan.
- Eastern Europe is also severely affected as are parts of the Middle East, Caribbean, and Africa.
- The USA is no longer in the top 50.
- The UK has dropped to 90th close to Portugal and Norway.
- Covid-19 is an 'industrious' virus and will seek out areas with previous low infection rates.
- This is a natural outcome of the extremely high spatiotemporal granularity of Covid-19 arising from the role of super-spreading individuals/events.

Excess winter mortality (EWM) in the UK has peaked.

- Peaked earliest on 19th February in the North West (+19.8%), Yorkshire & Humber (+20.7%) and Northern Ireland (+22.6%).
- Peaked last (12th March) in East of England (+30.5%) and South East (+27.5%).
- These figures are lower than reality due to the inclusion of the tail of the first wave contained in the previous 35 "non-winter" months.

Proportion of UK deaths with Covid-19 (as on 26th March 2021).

- As expected, this proportion continues to fall, but the rate of decrease is slowing as the proportion gets smaller.
- Equivalent to that seen around mid-June 2020.
- 0% Covid-19 deaths around August – barring outbreaks of new variants – although expect new outbreaks next winter.

Figure 1, Part 1 has been updated to give deaths up to 26th March 2021.

- The rolling 52-week total has reached a peak in all regions and is now showing a small decline.

A 4-Part series has been published in the *Journal of Health Care Finance* describing the principles behind financial and ***capacity*** risk in health care.

Parts 1-3 explain the epidemiological principles behind why things can quickly go terribly wrong – with Covid-19 as an example, while Part 4 explains the changes required in health care policy to limit the damage.

Part 4 should be compulsory reading in Health Departments around the world, NHS England, and English CCGs.

A MUST read for anyone who cannot understand why seemingly well-run organisations suddenly slip into deficit. See
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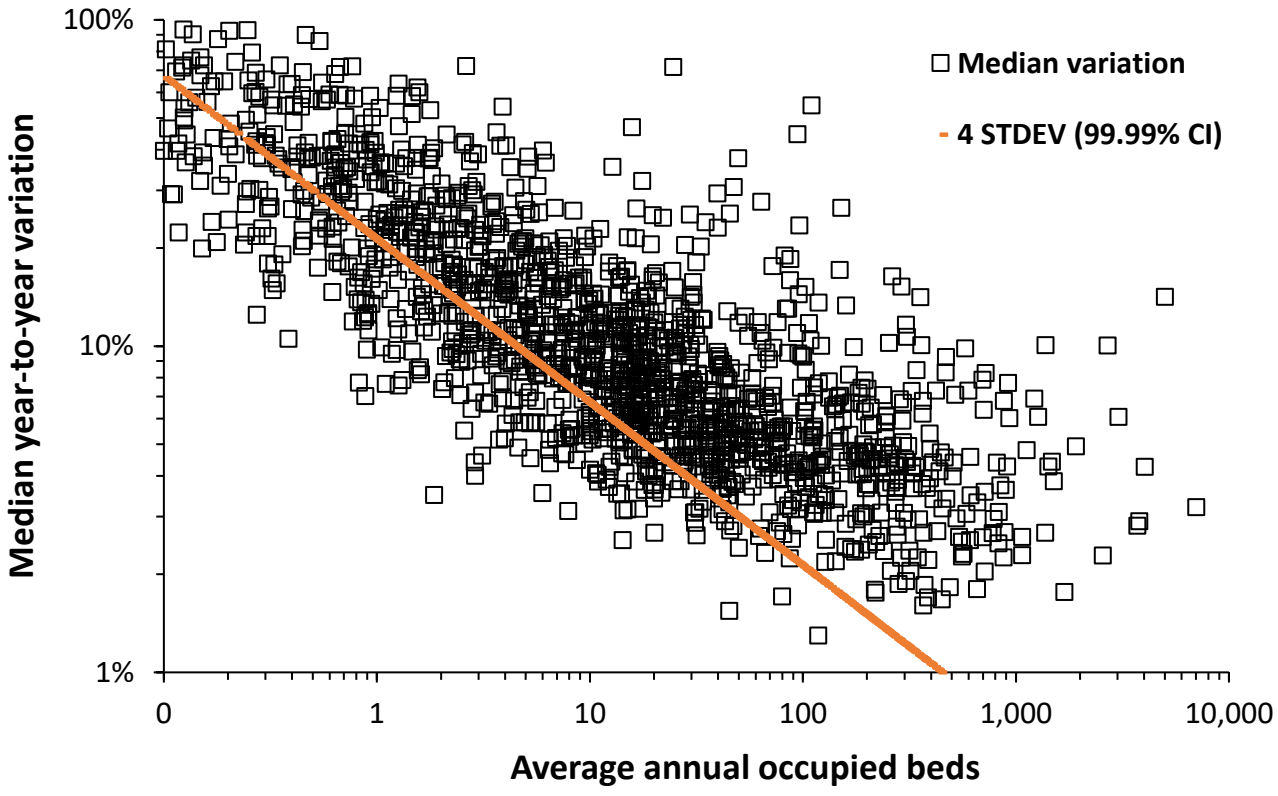
Listen to a 14-minute interview about the series,
https://jjunland.egnyte.com/dl/CPdNnjCVle

A UK study investigating adherence to testing, self-isolation and track & trace has identified male, young age, low education as risk factors, see Adherence to the test, trace, and isolate system in the UK: results from 37 nationally representative surveys | The BMJ. In this study, females were far more aware of Covid-19 symptoms, especially if they had a young child. Conversely, awareness of symptoms was surprisingly low among males.

This series has consistently emphasized the importance of spatiotemporal granularity in both international and UK spread of Covid-19. Such granularity implies that costs in different locations are hard to predict, and this explains why commissioning was suspended in the NHS in England.

However, Part 35 showed that spatiotemporal granularity was surprisingly high ***before*** Covid-19 which suggests that the CCG funding formula almost certainly contains hidden assumptions about steady state which are not applicable to the real world.

Figure 1: Median value of the year-to-year variation (±) over a 21-year period in occupied beds for over 1,500 primary diagnoses. Data includes elective and emergency admission for acute, mental health and maternity inpatient care for the NHS in England.



To illustrate Figure 1 shows the median value of the year-to-year volatility in occupied beds for the ICD-10 primary diagnosis over a 21-year period (1998/99 to 2019/20).

Data is from Hospital Episode Statistics via NHS Digital and covers the whole of the NHS in England and includes acute, mental health and maternity. Each data point is a single diagnosis (elective + emergency) ranging from an average of 0.1 occupied beds per year (for less common diagnoses such as Eustachian salpingitis and obstruction, Laboratory evidence of human immunodeficiency virus [HIV], Chromomycosis and phaeomycotic abscess, etc) through to nearly 10,000 occupied beds per year (for high bed occupancy diagnoses such as Pneumonia, Unknown and unspecified causes of morbidity, Septicaemia, etc). Unknown and unspecified causes of morbidity indicate patients where a definitive diagnosis cannot be reached. The line for +4 standard deviation of Poisson randomness has been included to illustrate the maximum upper limit for simple chance-based variation. Only 1 in 10,000 data points would lie near this line if chance were the only factor involved. It is obvious that most of the data lie above this line indicating that other 'environmental' factors are involved.

Figure 1 applies to the whole of England, move everything up parallel to the 4-STDEV line to get the equivalent variation at smaller local level.

Diagnoses with a remarkably high 'environmental' component include R69 (Unknown and unspecified causes of morbidity), F20 (Schizophrenia), J22 (Unspecified acute lower respiratory infection). Episodes of care for these diagnoses are assumed to be triggered by either primary infection or reactivation of unrecognised infections. See Comorbidity of schizophrenia and infection: a population-based cohort study - PubMed (nih.gov), Toxoplasma gondii and Schizophrenia - Volume 9, Number 11—November 2003 - Emerging Infectious Diseases journal - CDC for links between Schizophrenia and infections. Infections exert indirect effects via increased inflammation.

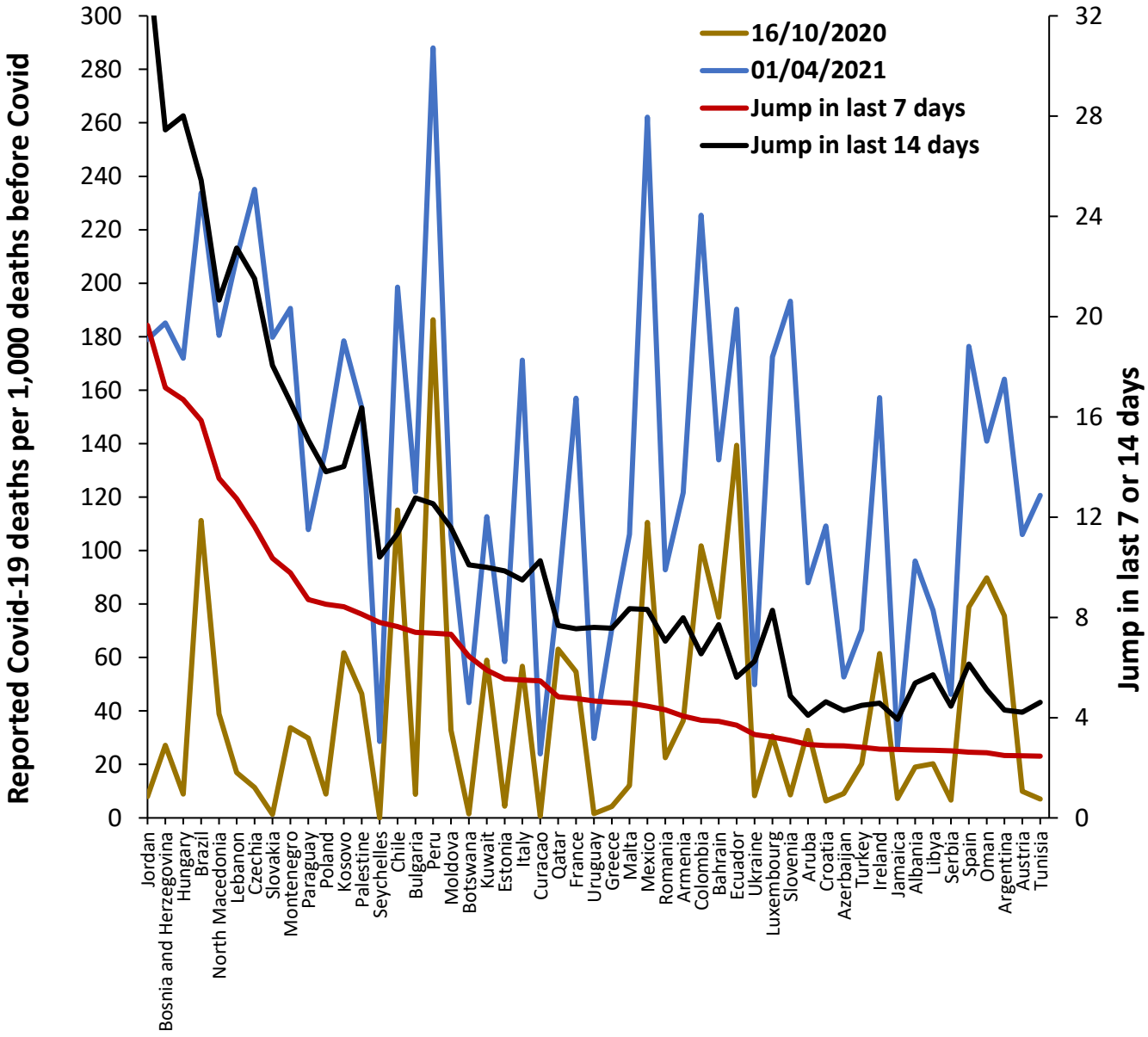
Given that there are over 2,000 known species of human pathogen (many times this number if strains and genetic variants are considered) then the possibility of local mini outbreaks of pathogens is a very real basis for local spatiotemporal variation in health care costs. Such factors have been completely ignored in the English resource allocation formula. For greater discussion see Parts 1-4 (especially Part 4) at http://www.healthfinancejournal.com/~junland/index.php/johcf/index

Up to the present NHS organisations have been blamed for the unavoidable effects of spatiotemporal variation upon costs. It was far easier to blame managers for 'incompetence' or the inability to 'manage' demand than to acknowledge that the resource allocation formula may be the real problem.

The hidden assumptions within any model (formula) are always its downfall when faced with the real world. On this occasion, application of a static formula into a dynamic world will create financial winners and losers – unless you take corrective action.

Returning to the international growth in Covid-19 deaths Figure 2 shows the position up to the 3rd of April 2021.

Figure 2: International 'reported' Covid-19 deaths up to 2nd April 2021 per 1,000 deaths (before Covid-19) and the growth in deaths per 1,000 deaths over the previous weeks.

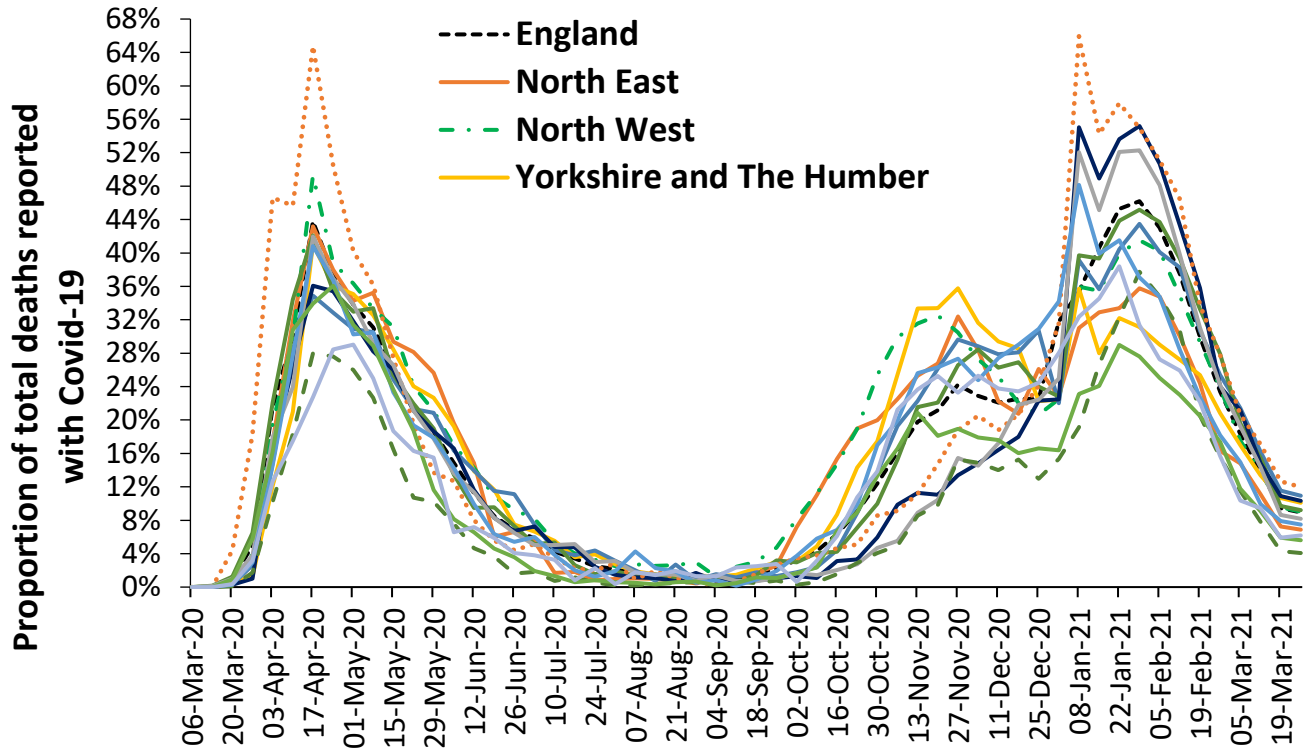


Note that the USA has moved out of the top 50 to be replaced by multiple European countries. The UK now ranks 90th close to Norway and Portugal.

There is an ongoing outbreak in large parts of South America. Travel outside of the UK to many parts of the world remains a high risk.

The proportion of deaths in the UK due to Covid-19 continues to decline (Figure 3) but the rate of decline is slowing most notably in Scotland and Northern Ireland in the last week. However, the trend will become more volatile as the numbers become smaller.

Figure 3: Proportion of total deaths due to Covid-19. **Figure will be updated on 6th April.**



Finally, Figure 1 in Part 1 (end of the document) has been updated. All UK regions have reached a peak in the rolling 52-week total (all-cause) deaths. A period of decline will follow until the impact of the winter of 2021/22.

As before, I must emphasize the fact that within 8 years 2020/21 levels of deaths will become the norm due to the World War II baby boomers increasingly entering the most resource intensive last year of life. Those born at the peak of the boom in 1947 turn 74 this year. This fact has been catastrophically omitted from all hospital bed planning models meaning that their outputs give answers which are hopelessly too low – assuming nothing changes. The 2016 Sustainability and Transformation Planning exercise was a 'world class' example of flawed planning using outdated and highly questionable modelling techniques, see https://doi.org/10.1002/hpm.3094 - there is no such thing as an English CCG with excess hospital beds. Some 30 years of

Public Finance Initiative (PFI) built hospitals far too small to have optimum flow has sadly left us up the creek without a paddle.

Honestly, so much must happen in the next 8 years to cope. A huge waiting list backlog to clear, thousands of nurses and/or technicians trained in end-of-life and palliative care, friends, neighbours, relatives trained to insert catheters and administer drugs (depending on how many nurses are trained), public educated in hospital at home, hospital doctors legally permitted to withhold ***further*** acute care and send the patient into an end-of-life care pathway, Data Protection Act amended to allow access to a common health record and associated care plans, at-home monitoring technology, additional technicians trained to perform autopsies, DNR orders commonplace. Will the politicians grasp the nettle or just continue to give themselves large pay rises while the ship sinks? How do we pay for all this change amid years of Covid-induced additional austerity? Indeed, what are the views and priorities of the public regarding such issues?

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

XXXV. Which countries are genuinely low?

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While the true world death toll from Covid-19 may be close to 10 million, some countries/regions genuinely have low excess all-cause mortality.

- The US states with lowest excess winter mortality (EWM) during the first wave (median 14% EWM, which is close to normal) had a high proportion **rural** population (median 50%) compared with a median EWM of 25% in high proportion **urban** (median 98% urban) states.
- As has been consistently reported in this series, low weighted or lived population density is consistently associated with low Covid-19 mortality.
- Urbanization of the world population has increased dramatically since the 1960s Rural population (% of total population) | Data (worldbank.org), declining from 66% to around 44% in 2019.
- Papua New Guinea and Burundi have 87% rural populations.
- Some 40% of China's population is rural.
- Most Western countries have higher proportion urban populations.
- The UK lies in a group of 47 countries (top 20%) with less than 18% rural population.
- Clearly there are many other risk factors including international travel, travel between areas, proportion BAME, levels of obesity, super-spreader events, etc.
- Also, to be considered is the fact that ***all*** infectious outbreaks show high spatiotemporal granularity, and especially so for Covid-19.
- This implies that one area can be affected while another seemingly similar area is not – although timing can imply a later catch-up.
- Factors preventing an 'explosive' outbreak include:
    - An ongoing outbreak of rhinovirus, see Human rhinovirus infection blocks SARS-CoV-2 replication within the respiratory epithelium: implications for COVID-19 epidemiology | The Journal of Infectious Diseases | Oxford Academic (oup.com)

    - Unfavourable metrological conditions such as hot dry winds, etc.
- It took nearly one year for the first wave to reach all US states, and many low population density US counties have not even experienced a first 'explosive' wave.
- UK data is presented to illustrate this during the first and subsequent waves.
- During the first wave around half of 34 European countries were barely affected – confirmed using all-cause mortality data.
    - The previously unaffected countries are now the ones experiencing high growth in Covid-19 deaths.
- During the first wave Spain was the worst affected European country, followed by England.
- Cities showing high EWM in the first wave were Madrid (124%), Barcelona (83%), London (70%), Birmingham, Milan (66%), Brussels, Manchester (58%)
- Least affected were Prague, Luxembourg, Warsaw, Bucharest, Zurich and Sofia – all now showing a recent wave of increased Covid-19 deaths.

The recent international surge in Covid-19 reported deaths continues.

- The scale on the Figure showing jump since last week has been expanded to cope with the ongoing surge in Covid-19 deaths in Jordan.
- Many countries which were low in October 2020 are now showing a surge.
- Covid-19 is an 'industrious' virus and will seek out areas with previous low infection rates – let your guard down and in it comes!
- This is a natural outcome of the extremely high spatiotemporal granularity of Covid-19 arising from the role of super-spreading individuals.

An excess winter mortality (EWM) calculation is used to reveal hot spots in all-cause death among UK local authorities during Covid-19.

- EWM usually peaks around March, however, using February data:
- In the UK, Maidstone in Kent has the highest EWM of 136% in February 2021 suggesting this was the epicentre of the outbreak of the new variant – compared to 99% in Denmark at the height of the 1919 Spanish flu! The Spanish flu had an R number similar to Covid-19.
- Analysis shows how mobile super-spreaders quickly took the Kent variant around the UK – lorry drivers, etc ??????
    - We all need food and consumables so you cannot shut the transport network down.

- The Kent variant wave can also be seen in (February EWM in brackets): Hastings (76%), Isles of Scilly (67%), Castle Point (66%), Rother (59%), Folkestone & Hythe, Dorset (57%), Medway (56%), Bolsover (54%), etc.

Proportion of UK deaths with Covid-19 (as on 19th March 2021).

- As expected, this proportion continues to fall, but the rate of decrease is slowing as the proportion gets smaller – the remnants of transmission by lockdown evaders, lockdown protesters, etc.
- Equivalent to that seen around mid-June 2020.
- 0% Covid-19 deaths around August – barring outbreaks of new variants – although expect new outbreaks next winter.

Figure 1, Part 1 has been updated to give deaths up to 19th March 2021.

- The rolling 52-week total has reached a peak in all regions and is now showing a small decline.

A 4-Part series has been published in the *Journal of Health Care Finance* describing the principles behind financial and ***capacity*** risk in health care.

Parts 1-3 explain the epidemiological principles behind why things can quickly go terribly wrong – with Covid-19 as an example, while Part 4 explains the changes required in health care policy to limit the damage.

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https://jjunland.egnyte.com/dl/CPdNnjCVle

In the Netherlands low education was associated with an 0.78 Odds Ratio (OR), i.e. 22% less likely to self-report Covid-19 infection and a 0.58 OR to actively seek testing for Covid-19 (42% less likely), see Association between socioeconomic status and self-reported, tested and diagnosed COVID-19 status during the first wave in the Northern Netherlands: a general population-based cohort from 49 474 adults | BMJ Open. Low education creates a reservoir of infected persons who can be assumed to be more likely to act as super-spreaders. As always, multifactorial reasons why.

The issue of spatiotemporal granularity in infectious outbreaks requires some consideration given the recent surge in infections and deaths. This is illustrated in Figure 1 which gives the inter quartile range (IQR) for a rolling excess winter mortality (EWM) in local authority areas across the entire UK. As can be seen

the IQR is generally highest in the winter. A large value of IQR indicates that some areas are affected badly while other areas are barely affected. Prior to Covid-19 this applied largely to influenza. In theory, people in some location-years do not need influenza vaccination per se – the problem being that no one knows ahead of time which areas will or will not be affected, hence, blanket vaccination. The IQR for London has been added to show that different regions have their own unique behaviour.

Compared to influenza, Covid-19 shows extreme granularity. The high IQR in 2019/20 arose from high infection in parts of London, while the second peak in 2020/21 was the spread of the Kent variant. I have already discussed possible reasons for the spike in IQR during the winter of 2014/15 using small-area data, see SMU Med J (July 2017) - 4.pdf. Spatial analysis is an especially important tool hence my repeated comments regarding the usefulness of the output area classification (OAC). Different social groups exhibit different health behaviours and have different risk behaviours and risk profiles.

Figure 1: Inter quartile range (IQR) for a rolling excess winter mortality (EWM) calculation for local government areas across the UK.

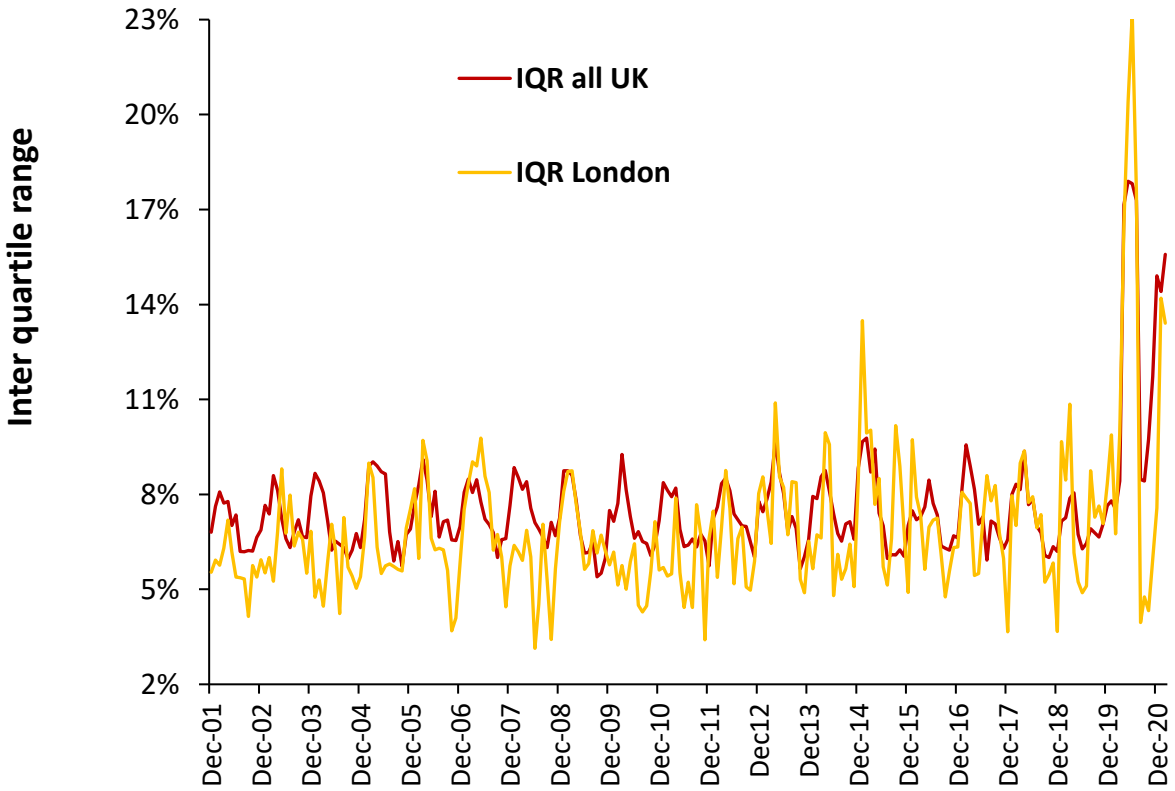


Figure 2 shows the excess winter mortality (EWM) across Europe during the first wave. The gap due to Covid-19 was calculated as the difference between

EWM at March 2020 (just before explosive growth) and the EWM from April onward. Around half of European countries were barely affected in the first wave – leaving their populations with little natural immunity.

Figure 2: Excess winter mortality (EWM) during the first wave of Covid-19 in Europe, plus the maximum value of EWM prior to Covid-19 which mostly occurred in the winter of 2017/18.

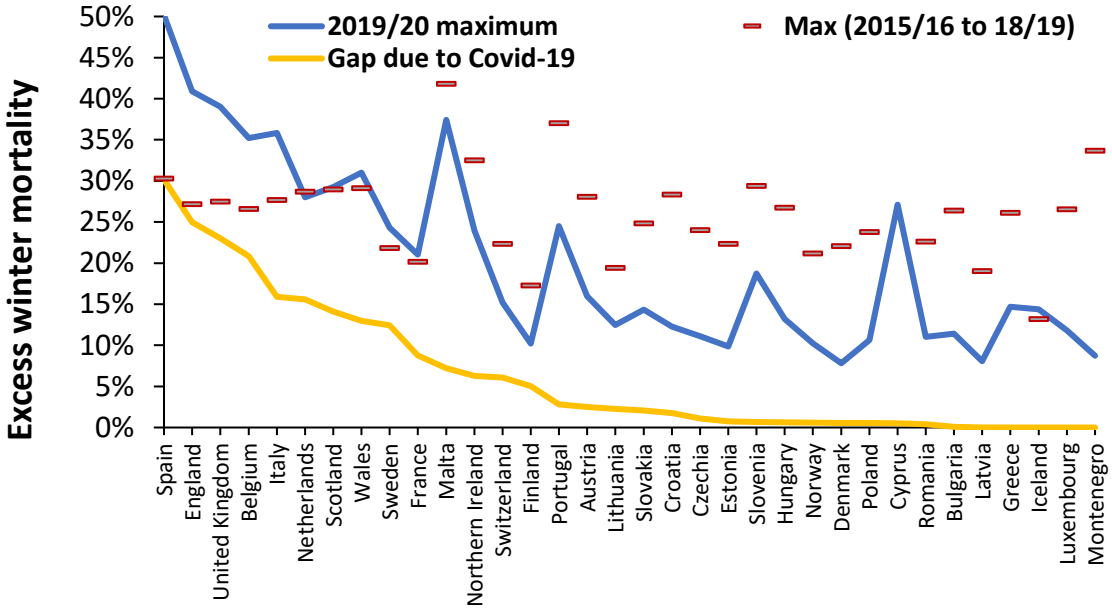


Figure 3: Excess winter mortality in European Cities, maximum before Covid-19, maximum in the first wave and evidence for a rising wave in previously unaffected cities.

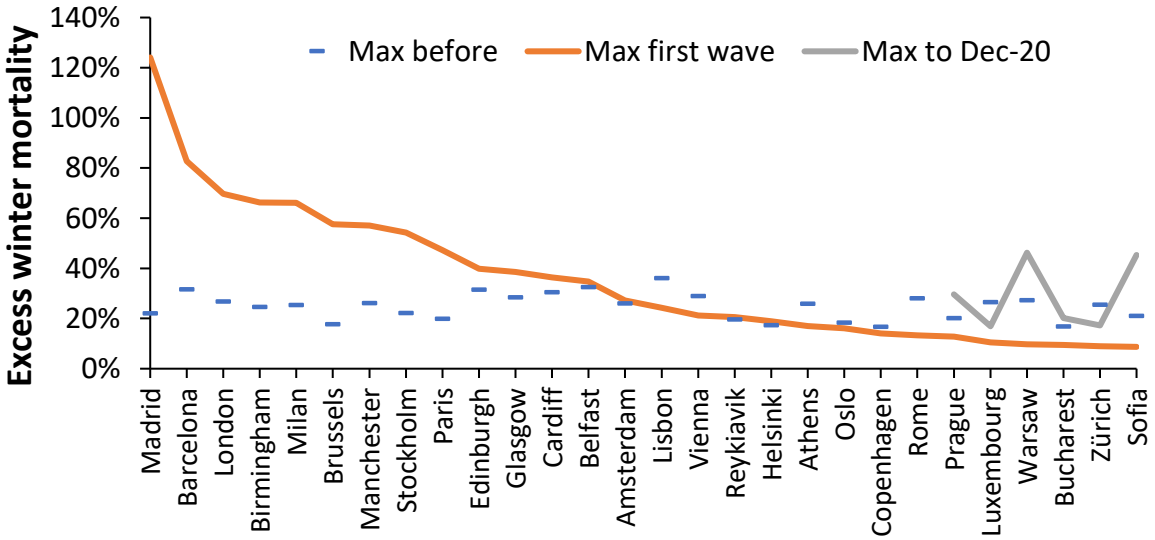
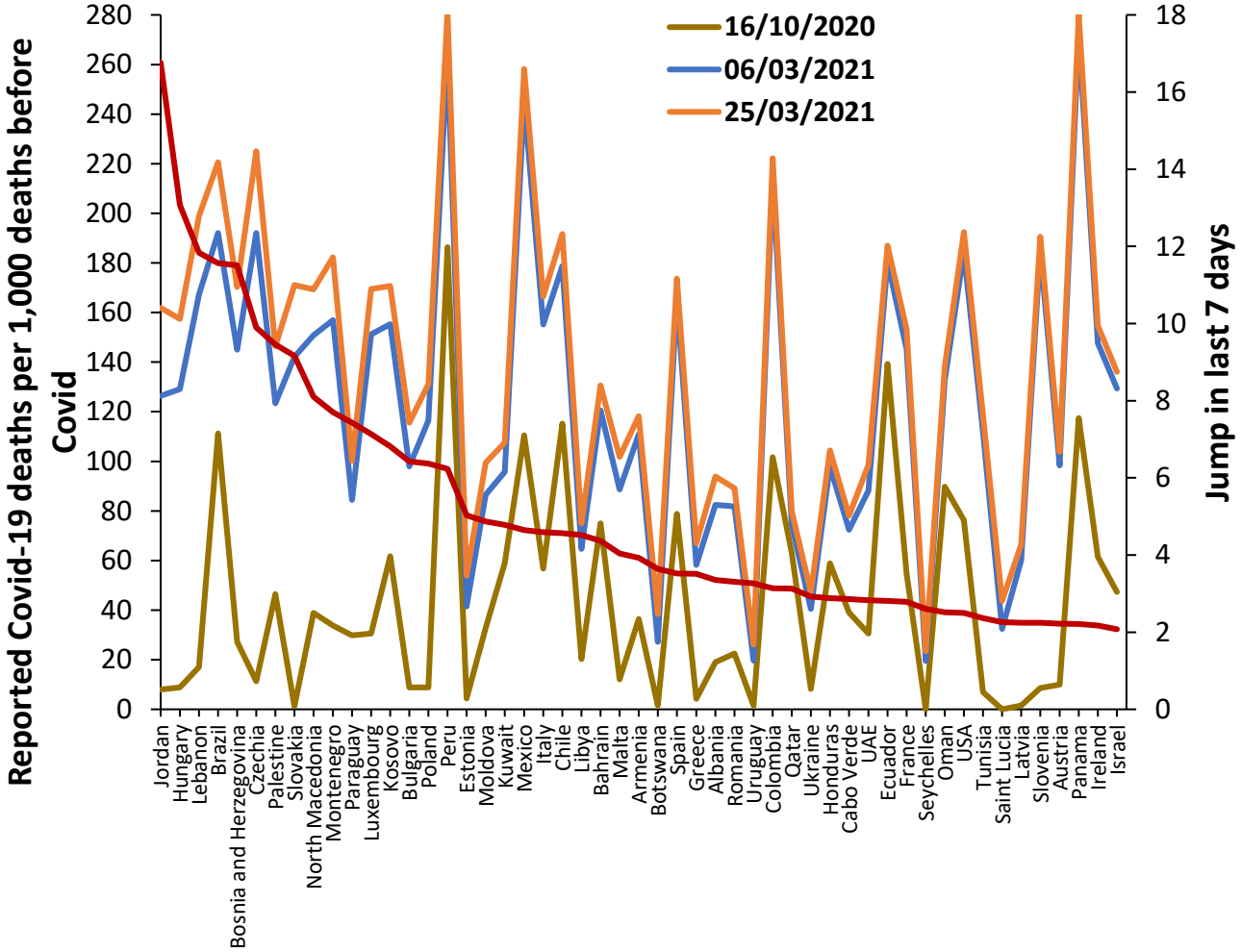


Figure 3 illustrates how large cities have generally higher Covid induced EWM in the first wave and how previously unaffected cities were experiencing rising

EWM up to Dec-20 (the point at which data was available). Source: Comparisons of all-cause mortality between European countries and regions - Office for National Statistics.
Rising EWM in December is the start of the larger wave now hitting parts of Europe. Note that the two largest cities in Spain were severely affected as were London, Birmingham, and Manchester in the UK.

Turning to the issue of the international behaviour of reported Covid-19 deaths (with implied under-counting in some countries), Figure 3 shows the change in the last week. Note the scale has been expanded to cope with the recent surge in deaths in Jordan. Observe how countries little affected in October 2020 are now showing rapid increases in deaths.

Figure 3: Reported Covid-19 deaths per 1,000 deaths before Covid and jump in deaths during the last 7-days.

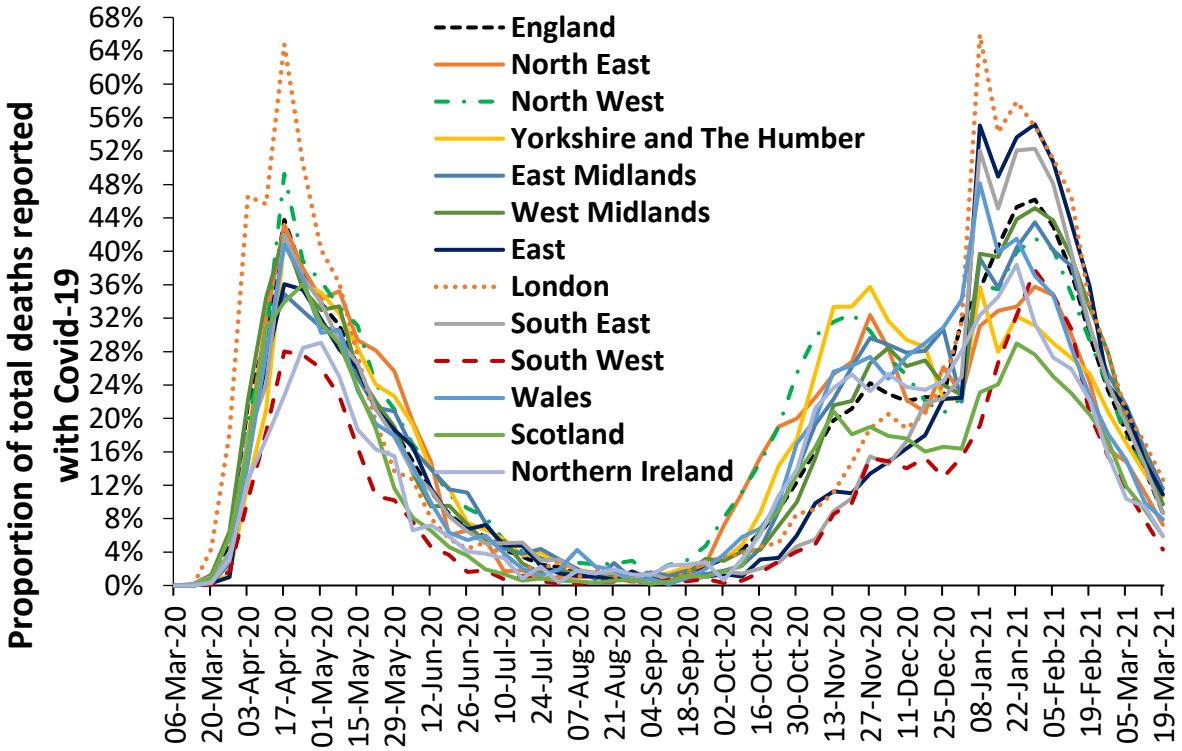


Spatiotemporal granularity neatly illustrated. No infected citizens imply an open door for Covid-19. The parts of London severely affected in the first wave largely escape subsequent waves. The same happened in the USA. Large parts of Kent had been little affected in the first wave only to be hard hit when the

Kent variant arose and altered the patterns of social group transmission. Thankfully, current vaccines remain broadly effective (>75% vaccine effectiveness ***in the elderly***) against all current variants.

As an aside influenza vaccination has never had a vaccine effectiveness higher than 60% ***in the elderly***, average about 40%, and at worst can go negative for particular strains if the strains of influenza have undergone rapid antigenic shift. Some have suggested that vaccination of children (who show highest vaccine effectiveness), the main super-spreaders for influenza, is a far more effective public policy, especially since influenza vaccine effectiveness generally decreases over age 65, see Why flu vaccines so often fail | Science | AAAS (sciencemag.org). Policy can be irrational at times! However, for health care workers below retirement age there remains a strong case for influenza vaccination. As always, nothing is as simple as it first appears.

Figure 4: Proportion of deaths reported as with Covid-19 across the UK.



Now turning our attention to the proportion of Covid-19 deaths in the UK (Figure 4) which continues to decline to levels seen around June 2020. Expect to see this decline slow until a minimum around August 2021. Expect the cycle to begin again after summer this year. Thankfully blunted by vaccination but implying second dose of vaccine before September.

Figure 1 in Part 1 (at the end of the document) has been updated. The rolling 52-week total of deaths has now reached a maximum in all regions. However, all need to be aware that the natural rise in deaths emanating from the World War II baby boom implies that in around 8-years' time England will be experiencing 2020 and 2021 levels of deaths as the norm. Honestly, the NHS is unprepared for the coming storm.

Age plays a less important role in health care demand – especially for the medical specialties. It is nearness-to-death which drives demand, as Covid-19 has so elegantly demonstrated. See International_Medical_Beds.pdf (hcaf.biz)

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

XXXIV. 10 million Covid-19 deaths and rising?

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A sense check of Covid-19 world deaths

- Around 56 million people die each year, see World Death Clock (medindia.net) and currently 2.7 million Covid-19 deaths have been "reported", which gives a mere 4.8% increase in world mortality.
- This series has documented >60% increases in annual mortality in parts of the UK and USA, using standards employed in the UK.
- This 4.8% is likely to be a vast underestimate.
- A likely estimate of the real Covid-19 death toll to date is as follows:
  - Minimum possible 5 million (9% increase in world mortality).
  - Likely value somewhere around 10 million (18% increase).
  - With current counting 15 countries have already exceeded 18%.
  - Despite potential under counting another 39 have exceeded 9%.
  - 26 US States have exceeded 18% as has the USA in total.
  - Using all-cause mortality, both South Africa and Egypt have exceeded 18% - therefore add the other 52 African countries.
  - Indonesia, Bangladesh, Pakistan, and India are probably close to 18% if not higher.
  - The real death toll is close to 10 million and rising.

Real Covid-19 deaths are likely to be 10-times higher in around half of world countries.

- See parts XXXIII and XXXII for additional context.
- A group of 13 countries having similar reported Covid-19 deaths back in October 2020 were followed over time.
  - Of these 13 countries India, Philippines, Egypt, and Kazakhstan all show growth over time which is far too low to be real.
  - Reported Covid-19 deaths probably mainly reflect deaths for those wealthy enough to gain entry to a hospital.

    - Covid-19 infection and undercounting will be rampant among the estimated 1 billion of "non"-persons living in slums, shanty towns, on the streets or even on refuse tips.
    - Malnutrition, lack of sanitation, and untreated communicable disease, combined with high population density, will mean high Covid-19 deaths in children and adults under 65.
- On the basis that "the more you test the more you will find", world countries are plotted in a way which reveals relative undercounting.
    - Around half of world countries look to have greater than 10-times undercounting.
    - Countries like Cambodia probably have >1,000-times under counting.
    - Countries refusing to submit data are likely to be exceedingly high.
    - The UK lies along a line shared by many Western countries.

The recent international surge in Covid-19 reported deaths continues.

- India has shown a large recent surge in cases, which will shortly show up as deaths – howbeit with serious under counting.
- Countries barely affected in the first wave are now showing a surge.
- Lebanon, Jordan and Czechia showed the highest jump last week.
- The UK has disappeared from the top 50 to be replaced by new entrants from Eastern Europe, the Caribbean, Middle East and Africa.
- Travel outside the UK is not as safe as may first appear.

An excess winter mortality (EWM) calculation is used to reveal hot spots in all-cause death among US states and UK local authorities during Covid-19.

- During the first wave (up to June 2020), 35 US states did not exceed usual levels of EWM in the US, i.e., 13% or lower EWM.
- However, New York and New Jersey showed extreme values of +76% and +69% respectively.
- Note that parts of New York state such as the Bronx will have reached a higher EWM value.
- In the UK, Maidstone in Kent had the highest EWM of 104% in January 2021 suggesting this was the epicentre of the outbreak of the new variant.
- This was followed by Brent (102%), Harrow (93%) and Newham (91%) all of which occurred in the first wave around Apr/May 2020.
- Places such as Mid and East Devon, Fife, Moray, Torridge, Highland, S. Cambridgeshire, and Mendip were all below 18% EWM, which is usual for a UK winter, indicating low Covid-19 deaths.

- Note that EWM in the UK is consistently higher than the USA, partly due to higher latitude and partly due to lower disposable income.
- For comparison Denmark reached an EWM of 99% in Jan-1919 during the "Spanish" flu pandemic. The Spanish flu had an R number similar to Covid-19.

Proportion of UK deaths with Covid-19 (as on 12th March 2021).

- As expected, this proportion continues to fall but the rate of decrease is slowing as the proportion gets smaller.
- Equivalent to that seen around May 2020.

Figure 1, Part 1 has been updated to give deaths on 12th March 2021.

- The rolling 52-week total looks to have reached a maximum in North East, North West, Yorkshire & Humber, South West and Scotland
- Before Covid-19, London had the lowest rolling total deaths and now has the highest, while the South West was around average but is now the lowest. Reflecting the role of population density in Covid-19.

A 4-Part series has been published in the *Journal of Health Care Finance* describing the principles behind financial and ***capacity*** risk in health care.

Parts 1-3 explain the epidemiological principles behind why things can quickly go terribly wrong – with Covid-19 as an example, while Part 4 explains the changes required in health care policy to limit the damage.

Part 4 should be compulsory reading in Health Departments around the world, NHS England, and English CCGs.

A MUST read for anyone who cannot understand why seemingly well-run organisations suddenly slip into deficit. See
http://www.healthfinancejournal.com/~junland/index.php/johcf/index

Listen to a 14-minute interview about the series,
https://jjunland.egnyte.com/dl/CPdNnjCVle

The role of under-reporting of Covid-19 deaths has been discussed in the previous 3 parts of this series. Roles for TB, HIV/AIDS, diabetes as risk factors are highlighted. These are highly prevalent in many countries and TB is surprisingly high in London, see UK stats and targets - TB Alert. A sense check has been presented in the summary which suggests gross under-reporting compared to UK standards of counting.

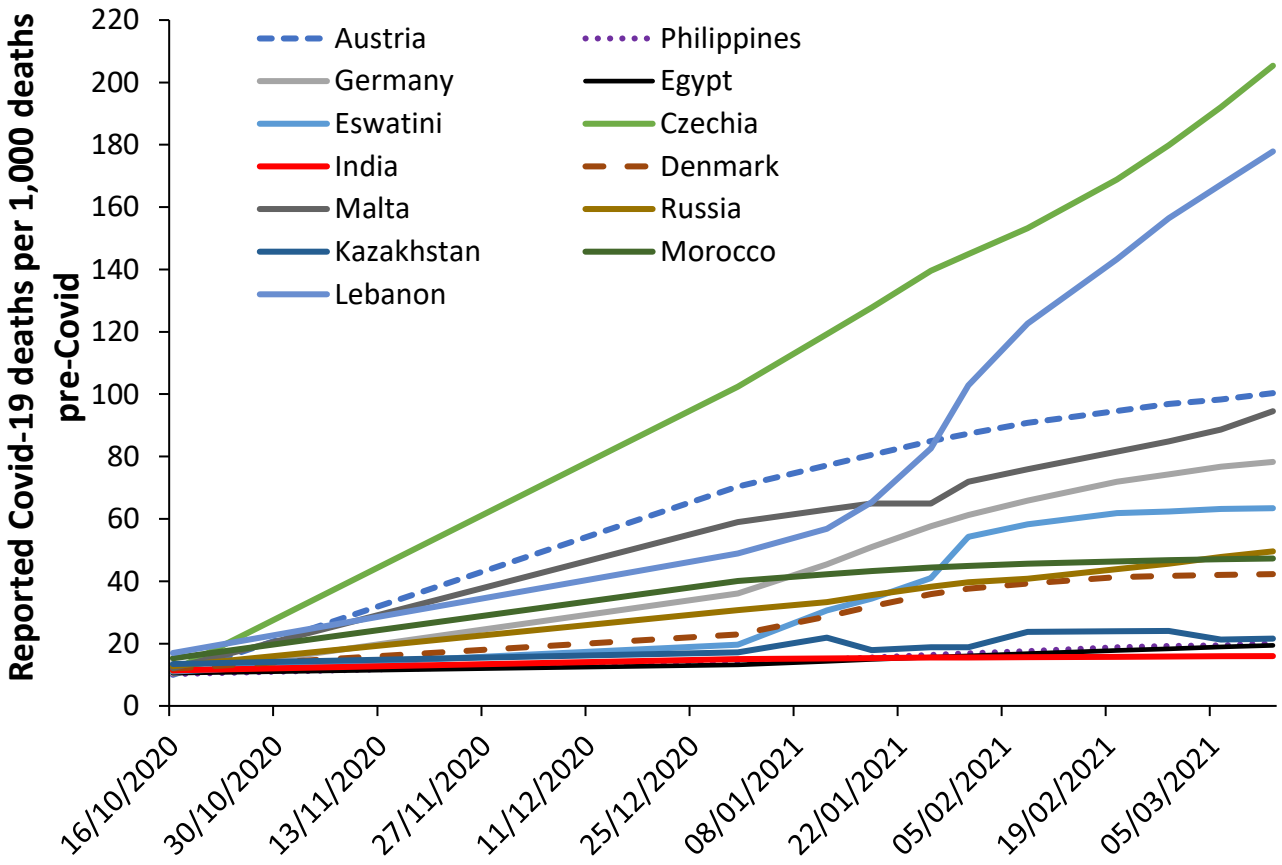
It is estimated that 1 billion people live in slums, see How Many People Live in Slums Around the World? (borgenmagazine.com) with extreme poverty, lack of sanitation, crowding, malnutrition, and untreated communicable diseases making the optimum conditions for spread of Covid-19 and subsequent mortality.

South Sudan, Sudan and Central African Republic are reported to have 90% of their urban population living in slums, see Countries With the Most Slums - WorldAtlas. So why are the many countries hosting such slums showing low Covid mortality?

To quantify the extent of under-reporting two methods have been used. In the first a group of 13 countries having similar levels of reported Covid deaths per 1,000 deaths (pre Covid) back in October 2020 were followed over time. This is shown in Figure 1 where India, Egypt, Indonesia and Kazakhstan follow a trajectory which is entirely incompatible with the reality of other countries.

Egypt and Kazakhstan are both known to have under-reporting, and up to 10-times under-reporting is implied in these countries. Under-reporting in India has already been documented, see India Is Undercounting Its COVID-19 Deaths. This Is How. - The Wire Science

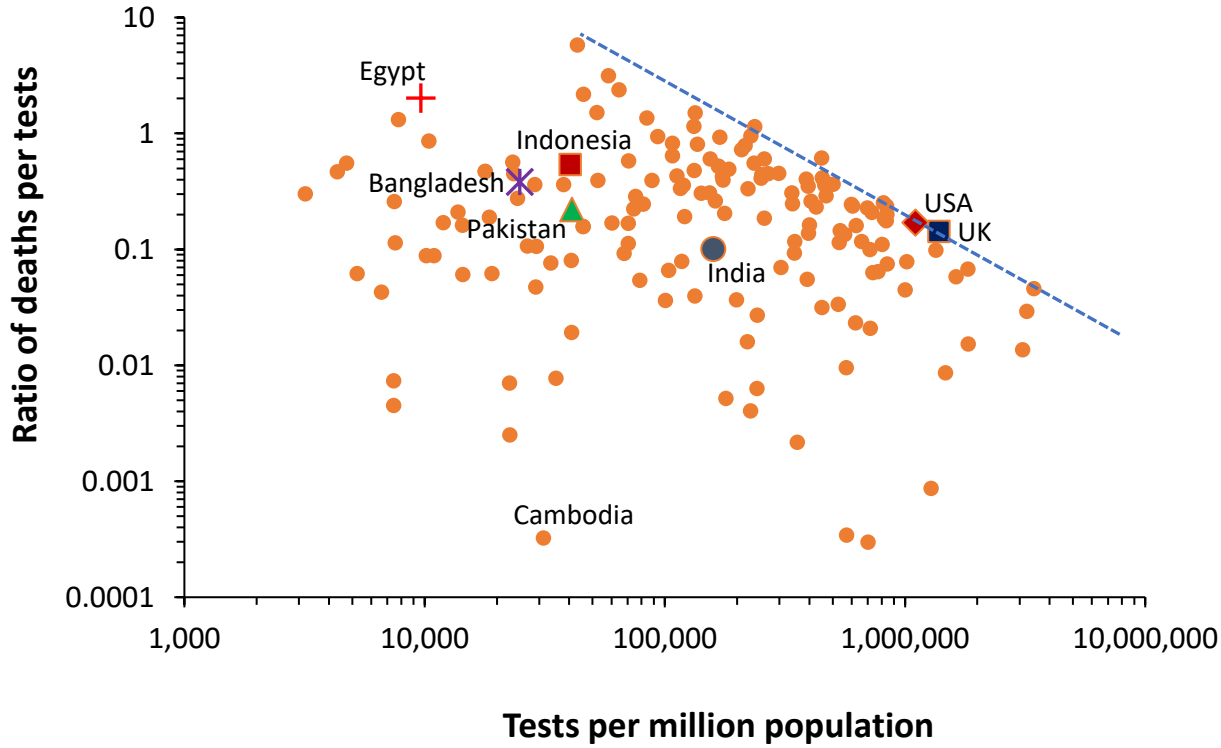
Figure 1: Reported Covid-19 deaths over time for 13 countries with similar levels back in October 2020



Having established that under-reporting is likely to be widespread the second method uses the principle that "the more you test the more you find" to quantify the full extent of under-reporting.

This is shown in Figure 2. In this method the Y-axis is the ratio of "reported" Covid-19 deaths per 1,000 deaths (pre-Covid) divided by the number of tests per million persons, multiplied by 1,000 to give largest values around 1 to 10. The X-axis gives the count of tests per million population.

Figure 2: World countries compared for potential under counting of Covid-19 deaths.



While Figure 2 is an entirely empirical log-log relationship it seems to have established an upper boundary. How does Figure 2 work? In countries with extremely low tests, it can be assumed that nearly all tests are concentrated among those persons wealthy enough to be able to afford hospital admission. Deaths per tests should then be high.

As testing increases deaths per test should diminish. The gap between the upper line and the actual values then indicates the magnitude of potential undercounting. Figure 2 will not apply to countries such as South Korea who implemented aggressive track and trace early in the pandemic, or for countries like Australia and New Zealand which effectively sealed their borders, etc.

A factor somewhere around 10-times seems to apply to Egypt, Indonesia, Bangladesh, India, and Pakistan. Around half of world countries look to be higher than 10-times which makes sense given the huge numbers of persons living in slums around the world, especially in Africa.

Many now believe that Covid-19 behaves like a typical winter pathogen. An excess winter mortality (EWM) calculation can also be used to show how Covid-19 has affected total (all-cause) deaths. EWM is normally a static calculation of average deaths in the four winter months versus average deaths in the eight non-winter months. However, EWM can be turned into a rolling calculation and used to compare countries and regions, see IJERPH | Free Full-Text | Excess Winter Mortality (EWM) as a Dynamic Forensic Tool: Where, When, Which Conditions, Gender, Ethnicity and Age (mdpi.com).

Figure 3: Excess winter mortality (EWM) calculation during the first wave of Covid-19 in the USA

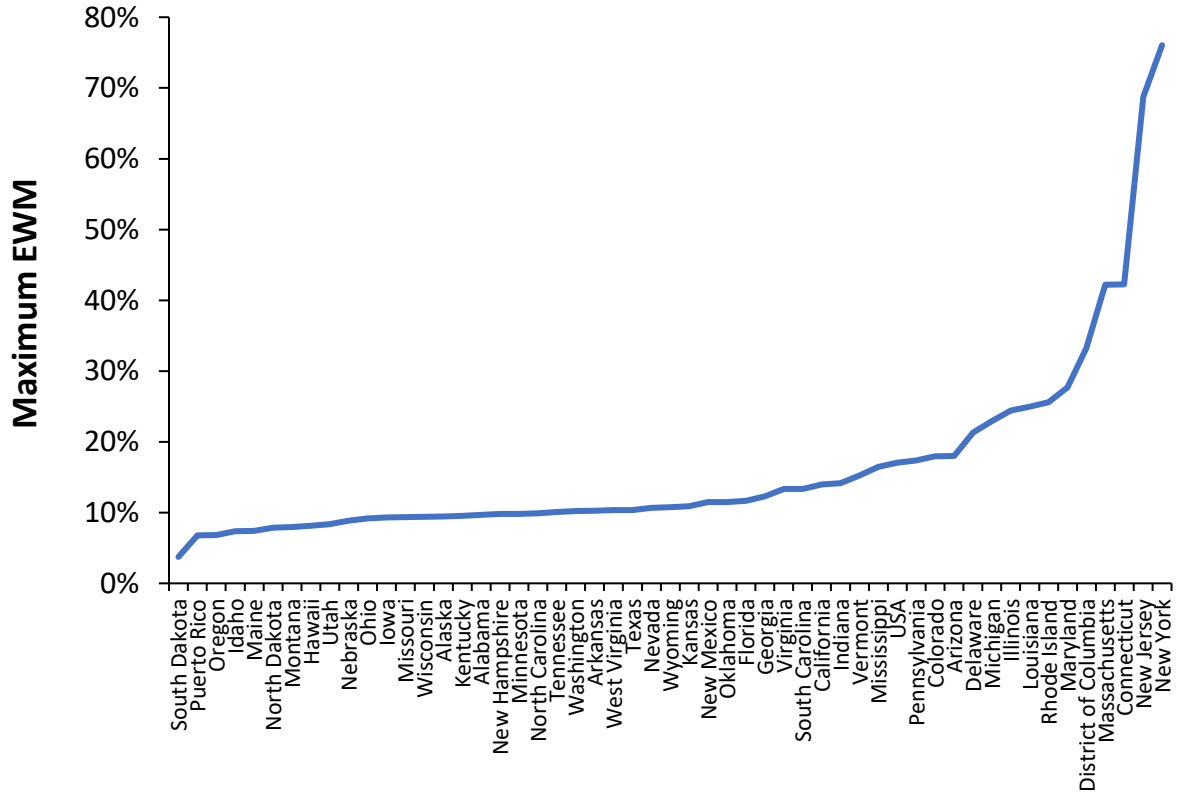


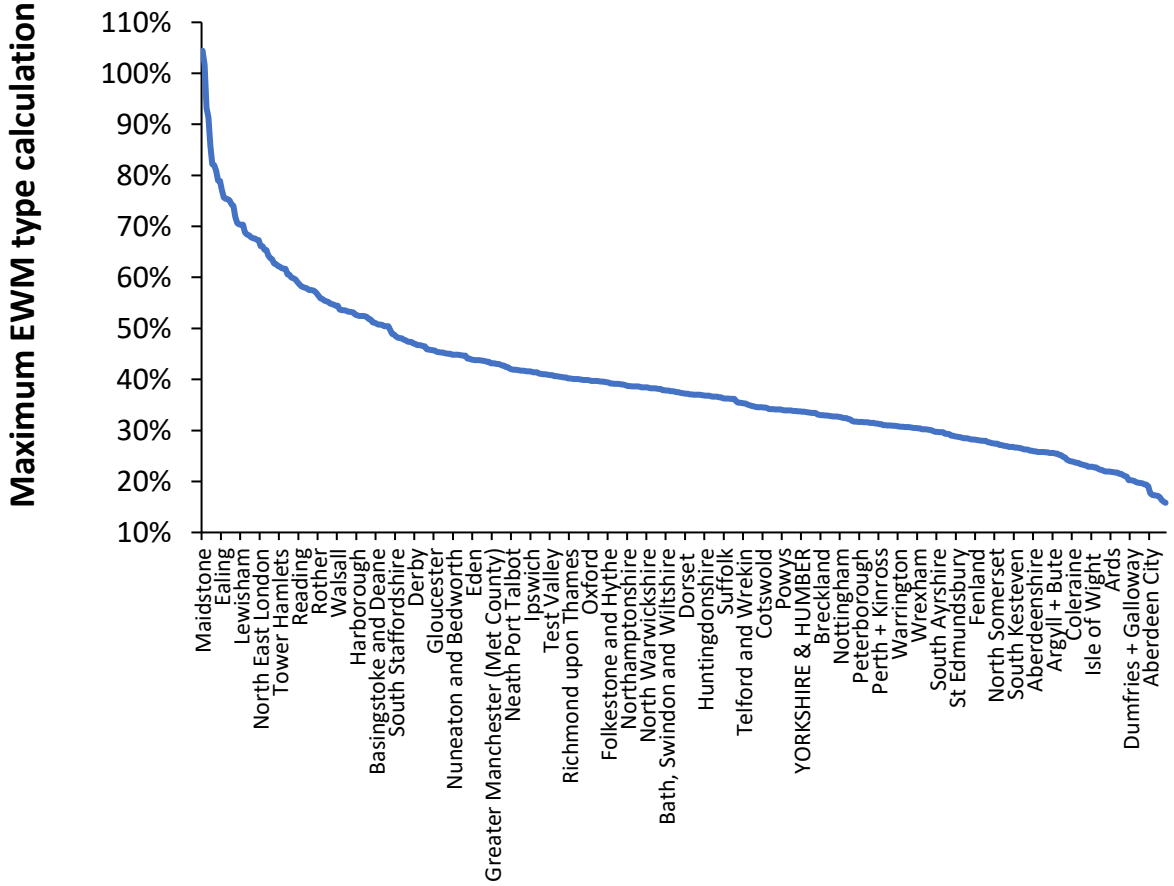
Figure 3 shows the maximum EWM in US states during the first wave up to June 2020. As can be seen a minority of states were affected but those that were showed high EWM. By way of comparison Denmark had an EWM of 99% at the peak of the "Spanish" flu pandemic of 1918/19 (publication in preparation). Parts of New York city, i.e., the Bronx, etc in the state of New

York were severely affected and will therefore have an EWM > 76%. This was just the first wave!

Figure 4 gives a comparable EWM calculation for regions, counties, and local authorities across the UK. Maidstone in Kent had a maximum EWM of 104% for the four months ending January 2021 during the outbreak of the Kent variant. Maidstone was probably the epicentre of that outbreak.

The other high locations notably Brent (+102%), Harrow (+93%), Newham (+91%) all achieved high EWM in the first wave. Brent and Harrow are immediately adjacent to Barnet (+81%) so a likely epicentre in the first wave in this cluster of boroughs. Enfield (+82%) is adjacent to Barnet suggesting spatial movement perhaps along the A411? Likewise, Hertsmere (+86%) is immediately adjacent to Harrow, Barnet, and Enfield. You do not need to be an ace epidemiologist to spot the possibilities. Easily spotted if real-time data on deaths were available, but alas the death registration process is so cumbersome to be unfit for purpose. Speed is vital, detail can be added later.

Figure 4: Excess winter mortality calculation (January 2020 to January 2021) for UK regions, counties, and local authorities



Why was information like this not released early in the pandemic so people could take extra precautions? As I keep reiterating the output area classification (OAC) is ideal for this type of spatial/social group analysis, see http://www.sciencedomain.org/abstract/16693.

Covid-19 has exposed multiple deficiencies around the world in the capacity to deal with any type of pandemic. The quality of information released to the public by the Westminster briefings seems lacking in any depth, almost simple analysis performed by a "temp" on £12 an hour. Is that the best a "world leading" government can manage? These briefings were a totally lost opportunity to showcase how Census data is used to create the OAC, and how the OAC can be used to track movement of Covid-19 through different communities.

OAC social group data could then be applied to the >180,000 OAs in England and Wales to enable local Public Health Teams to target areas with existing or potential risk. There is even a special version of the OAC for London suited to its unique social and ethnic composition. Indeed, the local effective value of R will vary by population density, and the risk in each OA will be a combination of social group behaviour (via the OAC), local levels of air pollution and travel into the OA. Instead, all we got was a Vietnam war style count of body bags and some cherry-picked statistics from some (probably flawed) university models. Honestly, it is enough to make you weep.

Why the Office for National Statistics just sat on this data is a complete mystery.

However, moving swiftly on to the recent international surge in deaths. Everyone should carefully note that India has shown a recent large surge in cases, increased deaths will follow shortly (despite obvious under-counting). Figure 5 gives the countries showing a surge in deaths during the last week.

As can be seen large parts of Europe are showing a recent surge in deaths. Brazil is showing a further surge. Lebanon and Jordan vie for first place (both probably underestimated), etc. Thankfully, lockdown and vaccination have moved the UK to around 75th which is surprisingly good given our level of fastidious counting.

Figure 5: Top 50 countries showing a surge in "reported" Covid-19 deaths during the last week.

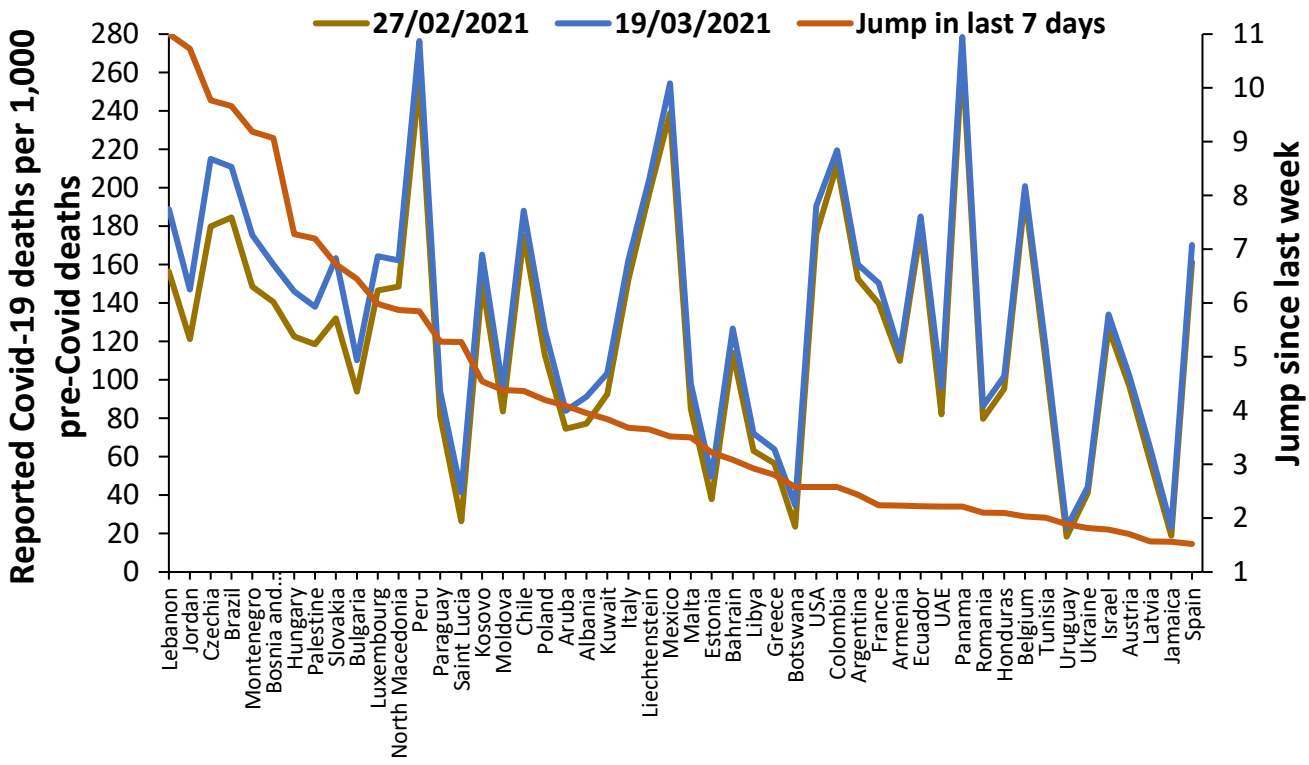
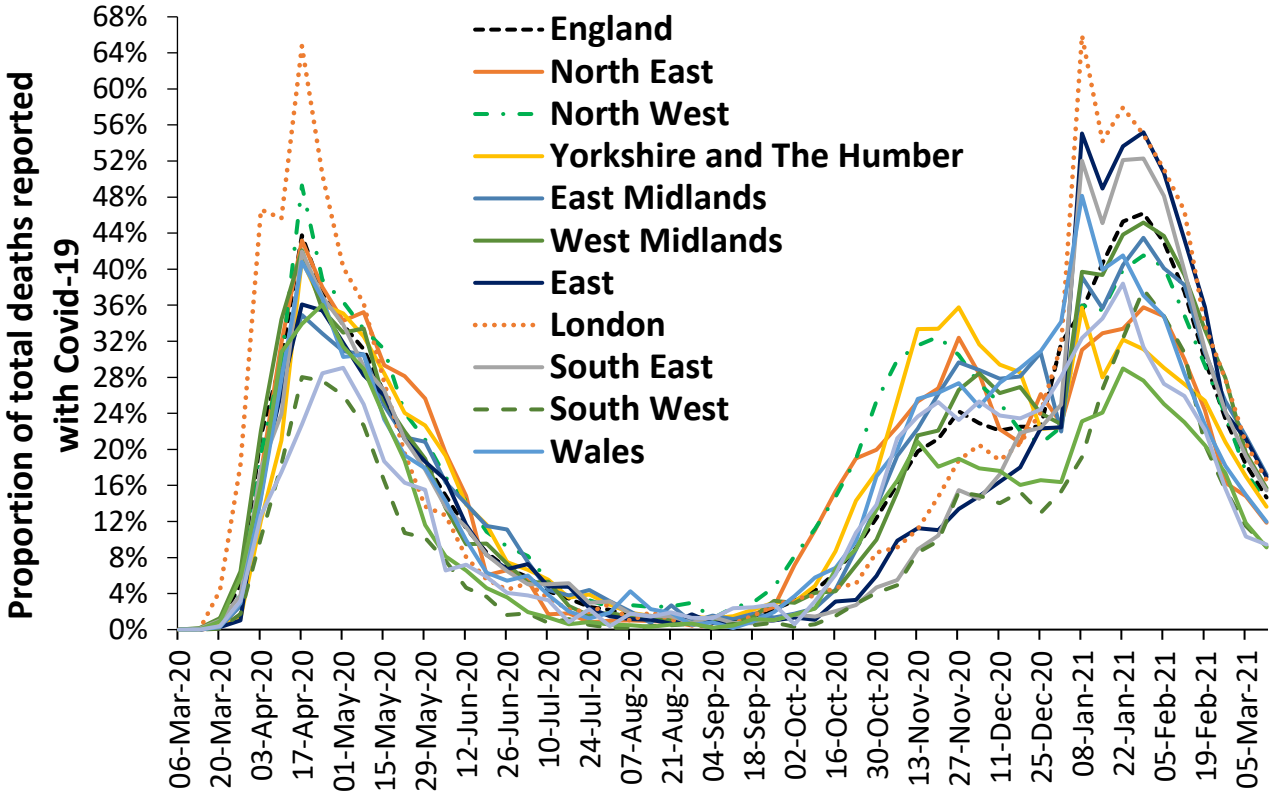


Figure 6: Proportion of deaths due to Covid-19 across the UK for the week ending March 12th, 2021.



Finally, Figure 6 shows the position across the UK for the proportion of deaths due to Covid-19. Data for Scotland and Northern Ireland is actual, while that for England and Wales is an estimate and will be updated Tuesday (23/3/21).

As can be seen, despite residual high proportion deaths with Covid-19 in the East and East Midlands this ratio is showing a decline, however, the rate of decline is now slowing as seen after the first wave. Northern Ireland has shown a wobble in the week ending March 12th with a rise in total deaths and a decline of just 1 in Covid-19 deaths. Lockdown and vaccination are generally having their desired effects despite a higher second wave in some areas.

To conclude, it would not be surprising if 10 million Covid-19 deaths is the real death toll to date in the pandemic, and even if this is an overestimate the 10 million will be eventually reached due to a recent and ongoing surge in deaths.

People living in slums have probably born a disproportionate level of deaths, although in many cases there will be no Covid-19 test or death certificate to document their passing.

People of the UK - be assured there are far worse and dangerous places to live, and that Covid-19 deaths in the UK may be closer to the average than realized given the UKs relatively high population density.

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

XXXIII. Highest death rates?

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Where were the highest death rates?

- A recent publication in the BMJ has used age standardization to calculate Covid-19 death rates around the world, see e042934.full.pdf (bmj.com)
    - This sophisticated method gives similar answers to the deaths per 1,000 deaths (pre-Covid) used in these studies - which is a fundamental measure of excess mortality.
- Another study has used age-bands to estimate infection rates in African countries, both without and with adjustment for rates of HIV/AIDS and TB infection, see Modelling COVID-19 transmission in Africa: countrywise projections of total and severe infections under different lockdown scenarios | BMJ Open
    - Countries with the highest potential infections are Nigeria>Ethopia>Egypt>Congo>Tanzania>South Africa>Kenya.
    - Higher recent infection rates were noted.
- A post-mortem study of deaths in Lusaka, Zambia reports widespread under-reporting of Covid-19 deaths with TB, hypertension, HIV/AIDS, alcohol abuse and diabetes as risk factors. 76% of those who died were aged under 60, including children (10%). See Covid-19 deaths in Africa: prospective systematic postmortem surveillance study | The BMJ
- There were 145,000 excess deaths in South Africa of which 85% to 95% were likely to be Covid-19, see South Africa's 'actual' Covid-19 death rate – one year later (businesstech.co.za), compared to around 50,000 official Covid-19 deaths at the same period.
- The UK is beginning to look less and less like a very high Covid-19 deaths country.

International surge in Covid-19 reported deaths continues.

- Countries which were barely affected in the first wave are now showing a surge in deaths.

- Slovakia and Czechia showed the highest jump last week.
- The UK has disappeared from the top 50 to be replaced by new entrants from Eastern Europe, the Caribbean, Middle East and Africa.
- Travel outside the UK is not as safe as may first appear.

Proportion of UK deaths with Covid-19 (as on 5th March 2021).

- Scotland and Northern Ireland are around the same level seen at 29 May to 5 June 2020, i.e., 10% to 12% Covid-19 deaths.
- Wales (15%) is likewise at around the 5th June 2020.
- The proportion of deaths due to Covid-19 remains higher in England (18%), about the same as the end of May 2020.
- Somewhere around two months from now to get close to 0% Covid-19 deaths – barring any major outbreak of a new variant – approximately when the over 45's should have been vaccinated.

The K number and super-spreading.

- The role of super-spreading was first identified by Woolhouse et al 1997 as the 80:20 rule, but was formalised in a 2005 study for SARS (another coronavirus), see Superspreading and the effect of individual variation on disease emergence | Nature
- To control such outbreaks (as in Covid-19) the importance of identifying and isolating super-spreaders was emphasized.
- This important study was seemingly overlooked in the Covid chaos.
- Further uncertainty was introduced by an early study suggesting the Covid-19 did NOT involve super-spreading, see Inferring super-spreading from transmission clusters of COVID-19 in Hong Kong, Japan, and Singapore - ScienceDirect – Ah! The fog of war.
- However, it explains why the South Korean system of forward and backward track and trace worked so well.
- The K number for Covid-19 is close to that seen for STDs, see Dimensions of superspreading | Nature - I cannot find any references to track and trace of STDs in the UK (????)
- A recent study attempts to apply the principles of super-spreader control into predicting Covid-19 outbreak magnitude, see Chopping the tail: How preventing superspreading can help to maintain COVID-19 control - ScienceDirect
- It must be assumed that super-spreader events have been a common feature of the UK waves.

Figure 1, Part 1 has been updated to give deaths on 5th March 2021.

- The rolling 52-week total looks to have reached a maximum in North East, North West, Yorkshire & Humber, South West and Scotland
- Other regions should follow in the next few weeks.

- Before Covid-19 London had the lowest rolling total deaths and now has the highest, while the South West around average but is now the lowest.

A 4-Part series has been published in the *Journal of Health Care Finance* describing the principles behind financial and ***capacity*** risk in health care.

Parts 1-3 explain the epidemiological principles behind why things can quickly go terribly wrong, while Part 4 explains the changes required in health care policy to limit the damage.

Part 4 should be compulsory reading in Health Departments around the world, NHS England, and English CCGs.

A MUST read for anyone who cannot understand why seemingly well-run organisations suddenly slip into deficit. See
http://www.healthfinancejournal.com/~junland/index.php/johcf/index

Listen to a 14-minute interview about the series,
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The role of under-reporting has been discussed as summary points. Roles for TB, HIV/AIDS as risk factors are highlighted. These diseases are still prevalent in many countries and TB is surprisingly high in London.

A summary of the role of the K number, which is a measure of the skew or dispersion associated with the R (reproduction) number has been given in the summary.

As can be seen an early study suggesting that super-spreading was not associated with Covid-19 may have added to the fog of war. It is so easy to be wise after the event!

Of somewhat greater concern is the recent emergence of a surge in Covid-19 deaths in locations seemingly “missed” by the first wave. Recall that deaths are a lagged indicator.

International data is given in Figure 1 (next page) where Eastern Europe, the Caribbean, the Middle East, and Africa all feature in the top 50. Usual caveats about under-reporting in many countries. The USA manages to keep its place in the top 50 while the UK has slipped lower down the rankings.

Figure 2 shows the trend in proportion Covid-19 deaths across the UK. London and West Midlands remain the highest. London exceeded the first wave.

Figure 1: Reported Covid-19 deaths per 1,000 deaths prior to Covid-19 and the jump in reported deaths since last week.

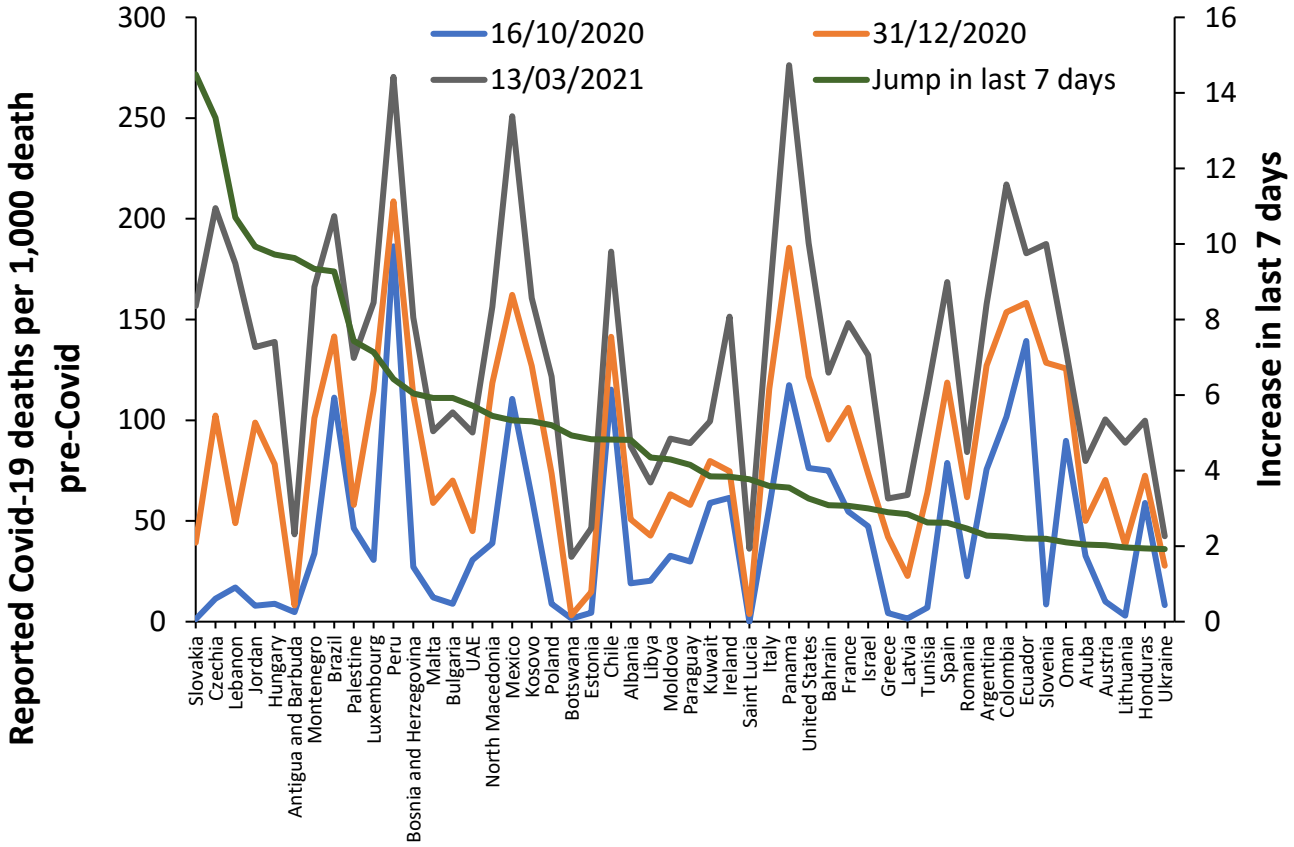
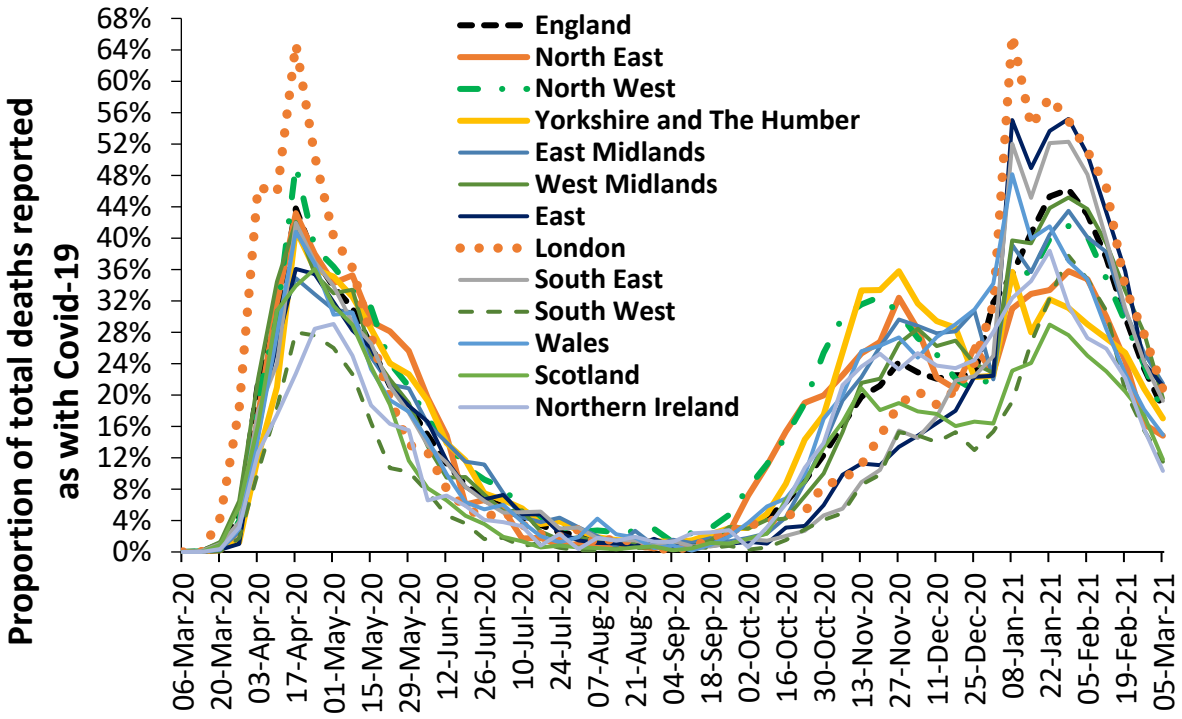


Figure 2: Proportion deaths reported as with Covid-19 across the UK.



How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

XXXII. Where has influenza gone?

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Where has influenza gone?

- Influenza activity has almost vanished off the face of the planet.
- International lockdowns have been sporadic and of mixed standards, international air travel has also continued howbeit at reduced volumes, so that this is unlikely to explain the near universal absence of influenza.
- A more likely explanation is that Covid-19 is the top competitor in the respiratory tract.

Covid-19 tests are low in many countries.

- Over half of world countries have conducted fewer than 2.5 Covid-19 tests per 10 inhabitants (Figure 1).
- The UK has managed 1.4 tests for ***every person*** which is behind Gibraltar 5.7, Faeroe 4.8, Luxembourg 3.4, UAE 3.2, Denmark 3.1, Bermuda 2.9, etc.
- There is a large cluster of countries with fewer than 0.5 tests per person and fewer than 50 reported Covid-19 deaths per 1,000 deaths, where gross undercounting of Covid-19 deaths are likely.
- Large parts of Africa and other poorer countries below 4 tests per 100 persons.
- South Africa, with the new variant, only ranks 115th for Covid-19 testing – safely assume the situation is worse than seems.
- Some countries are still reporting no Covid-19 deaths (unlikely) and/or no data on Covid-19 testing (around 20 countries).
- South Korea has managed with just 13 tests per 100 simply because it has the world's most effective test and trace system which works both forward and backwards to locate the origin.

International surge in Covid-19 reported deaths continues.

- Panama, Peru, Mexico, Columbia still holds the top four places in terms of total reported Covid-19 deaths per 1,000 deaths pre-Covid.
- Largest jumps during last week have been (per 1,000 deaths) Czechia 12, Lebanon 11, Slovakia 10, USA 9, Peru & Montenegro 8, Mexico & Brazil 7.
- Many countries (>50%) probably grossly under-reporting by UK standards.

Proportion of deaths with Covid-19 (as on 26th February 2021)

- This proportion continues to fall.
- Wales, Scotland and Northern Ireland are around the same level seen at 22nd May 2020, i.e., 17% to 18% Covid-19 deaths.
- The proportion of deaths due to Covid-19 remains higher in England (23%), about the same as 22nd May 2020.
- Somewhere around end of April to mid-May to get close to 0% Covid-19 deaths – barring any major outbreak of a new variant – approximately when the over 40's should have been vaccinated.

Figure 1, Part 1 has been updated to give deaths on 26th February 2021.

- While Covid-19 deaths are declining, the all-cause mortality is not declining as quickly. This has helped reduce the percentage Covid-19 deaths as a proportion of the total.
- Is the gap due to the unintended consequences of lockdown?

A 4-Part series has been published in the *Journal of Health Care Finance* describing the principles behind financial and capacity risk in health care.

Parts 1-3 explain the epidemiological principles behind why things can quickly go terribly wrong, while Part 4 explains the changes required in health care policy to limit the damage.

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In the most recent WHO influenza report up to the 14th of February 2021 they indicate only sporadic instances of influenza in countries around the world, usually at below levels expected during the summer months. See WHO | Influenza update - 388

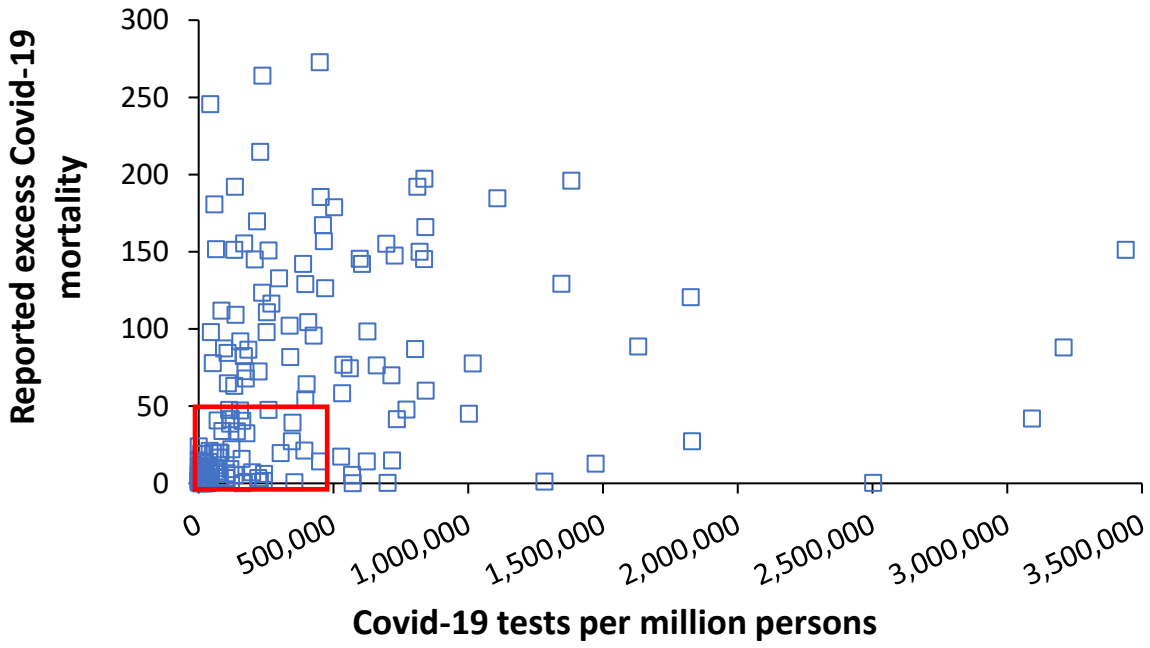
While somewhat sporadic lockdowns around the world (and with variable standards and compliance) will have partly contributed these cannot explain the almost near-absence of influenza.

For example, every US state has implemented its own version(s) of lockdown(s), along with variable compliance including anti-lockdown rallies in some states. Some US cities have versions of lockdown. International air travel has continued, howbeit at reduced levels, with some countries imposing a no entry policy and others not. Repeat this around the world and there is still ample opportunity for sporadic influenza outbreaks.

A far more likely explanation is that Covid-19 is a top competitor in the respiratory tract which has ousted most influenza infections.

For details of a recent review of competition between respiratory pathogens see Part 3 of the 4-Part series at Journal of Health Care Finance (healthfinancejournal.com). Table 1 starting on page 7 contains the relevant studies.

Figure 1: Reported Covid-19 deaths per 1,000 deaths (before Covid-19) and Covid-19 tests per million persons. Data is from worldometers.info Coronavirus Update (Live): 117,129,518 Cases and 2,601,038 Deaths from COVID-19 Virus Pandemic - Worldometer (worldometers.info)



In the pathogen respiratory tract turf wars, Covid-19 is the new top dog. Also relevant is a recent study using data from England where it can be seen that influenza deaths were seemingly cut short during the period where Covid-19 was first introduced and was therefore rapidly spreading, i.e., before Covid-19

deaths began to be reported and during which Covid-19 testing was in limited supply, see [Eurosurveillance | All-cause excess mortality observed by age group and regions in the first wave of the COVID-19 pandemic in England]

Figure 1 gives an overview of how much Covid-19 testing has been conducted to support mortality figures. Largest proportion of countries are near the origin, i.e., few documented deaths along with little testing. This supports the hypothesis that Covid-19 deaths in Africa and other poorer countries have been greatly under-reported. South Africa, with the new variant against which some vaccines perform poorly, has only managed (154,000 per million) or 15.4 tests per 100 persons. Which is well in the danger region for large scale under-reporting of Covid-19 incidence and deaths.

Figure 2: Total reported Covid-19 deaths per 1,000 pre-Covid deaths for top 50 world countries at various points in time.

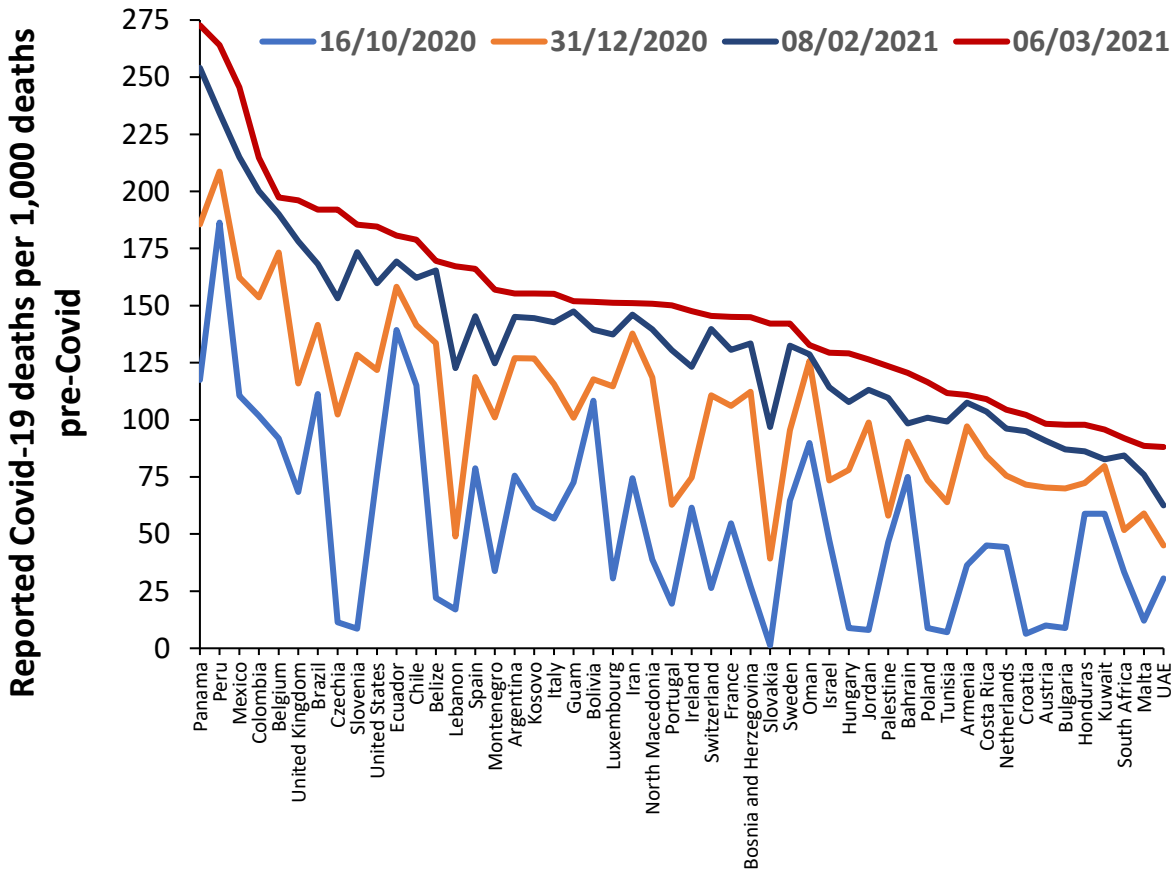
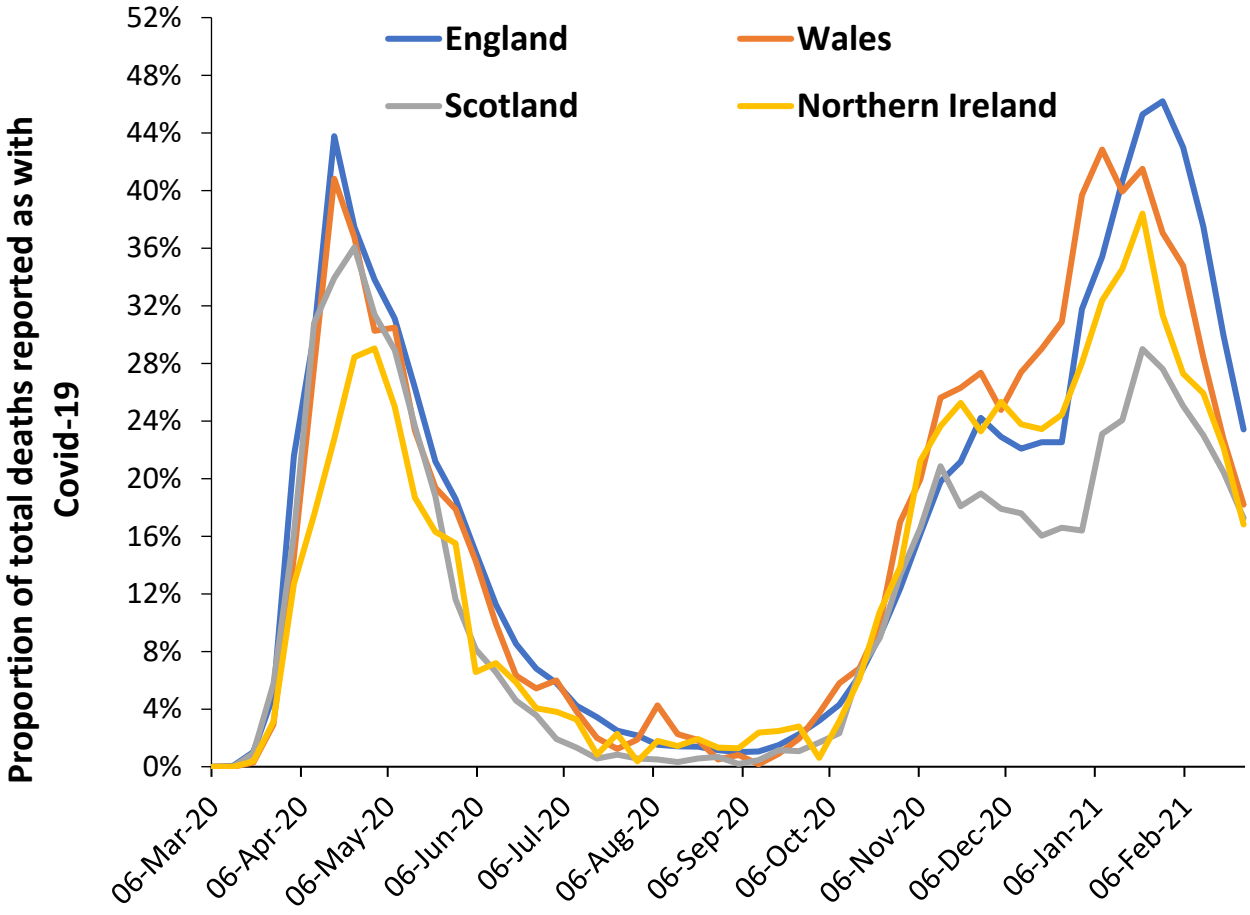


Figure 2 investigates the time trend in reported Covid-19 deaths per 1,000 deaths (pre-Covid-19). As can be seen the UK holds 6th place in a tightly fought contest. Czechia and Slovenia making a late surge, etc. Slovakia had very few cases back in October 2020 but had a late surge from January onwards. The UK was doing moderately well back in October, but things then went downhill.

As I have repeatedly said this virus exploits weak spots due to complacency, indecision, non-compliance, or denial. International attempts at lockdown and social distancing have only produced the outcomes shown in Figure 2. The dilemma between the long-term economic impacts of lockdown(s) and immediate loss of life has left governments with a dammed if you do, dammed if you do not, no-win situation. The magic money tree does not exist. Vaccination is our only real hope to extricate ourselves out of the quagmire. Full credit to the British government for pursuing this option so early.

Figure 3 shows the trend in the proportion of total deaths which have been reported as with Covid-19.

Figure 3: Proportion of total deaths which have been reported as with Covid-19



The proportion due to Covid-19 seems to be declining slightly slower than in the first wave and the peak was sustained for longer than the first wave. Lock down fatigue? However, you can roughly extrapolate to determine when we will be back close to 0% Covid-19 deaths once again. Hopefully sustained by vaccination.

Figure 1 in Part 1 (at the end of this document) has been updated to 26th February. All-cause deaths are starting to decline, especially so in the South West. South West is now lowest of all regions mainly due to experiencing the least deaths in the first and subsequent waves – low population density!

In contrast London, which was the lowest is now the highest – high population density! Covid-19 loves a crowded space. Although it must be mentioned that Covid-19 has a low k number. Which means that just a few 'super-spreaders' cause all the damage (see K: The Overlooked Variable That's Driving the Pandemic - The Atlantic). Hence the importance of South Korea's track and trace which also works backward to isolate the super-spreaders. Were there more super-spreaders in London?

However, a super-spreader needs an 'audience' and hence it is easier for them to infect people in high population density locations or in crowded spaces like cruise ships, etc.

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

XXXI. Low deaths in Africa?

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Reporting of any sort of death in most of Africa is a lottery.

- Only South Africa and Egypt have compulsory death notification.
- The rest of Africa is questionable and is mostly paper records only.
- 45% excess mortality in South Africa during the first peak was higher than the UK which at that time was just 14%!
- Global Covid-19 deaths will be much higher than official figures.

International surge in Covid-19 reported deaths during February.

- Surges during February in many countries, however mostly declining by last week of February.
- Portugal and Ireland above that in the UK for whole of February.
- Many countries probably under-reporting by UK standards.

All the mortality hot spots in the UK were in London.

- Highest excess mortality (all-cause) in the UK as at end of January 2021 was 60% in Gravesham, 51% Newham, 50% Redbridge, 45% Tower Hamlets, 44% Sevenoaks, 44% Brent, and 41% in Hackney.
- However, some areas still have lower excess mortality than the previous maximum seen between 2000 to 2019.
- Negative excess mortality persists in a minority of locations.

Proportion of deaths with Covid-19 (as at 19th February 2021)

- As expected, this proportion continues to fall.
- However, proportion Covid-19 deaths remains above that in late May-2020.
- The proportion of deaths due to Covid-19 remains higher in England (30%) than the other countries in the UK.
- Is lowest in Scotland (20%) and Northern Ireland (22%).

Figure 1, Part 1 has been updated to give deaths on 19th February 2021.

- While Covid-19 deaths are declining the rolling total of all-cause mortality continues to rise – this is due to shift-up in deaths throughout 2020 which should switch to shift-down during 2021.
- Excess mortality calculation is not as simple as first appears.

A 4-Part series has been published in the *Journal of Health Care Finance* describing the principles behind financial and capacity risk in health care.

Parts 1-3 explain the epidemiological principles behind why things can quickly go terribly wrong, while Part 4 explains the changes required in health care policy to limit the damage.

Part 4 should be compulsory reading in all Health Departments around the world and English CCGs.

A MUST read for anyone who cannot understand why seemingly well-run organisations suddenly slip into deficit. See
http://www.healthfinancejournal.com/~junland/index.php/johcf/index

Listen to a 14-minute interview about the series,
https://jjunland.egnyte.com/dl/CPdNnjCVle

The numbers seemingly say that there are few Covid-19 deaths in Africa. Read this fascinating insight into death registration in Africa by the BBC.

Measuring Africa's Data Gap: The cost of not counting the dead - BBC News

Only two countries in the whole of Africa have compulsory death registration – South Africa and Egypt. Elsewhere, voluntary, and mostly paper based. Nothing computerised. Only the well-off need death certificates.

Most were hardly counting deaths before Covid-19, let alone after. Feedback from friends tells of widespread unreported Covid-19 deaths in one seemingly "well" run African country (by African standards). Another African country stopped counting Covid-19 deaths months ago, and the President has declared Covid-19 vaccination a Western conspiracy and hence the population is not being vaccinated.

The Covid-19 fiasco continues around the world. …… and even more reason to quarantine all international travellers.

Massive undercounting of Covid-19 in Egypt and South Africa where compulsory reporting of deaths occurs – with a far higher threshold (barrier) for reporting a Covid-19 death. Some 45% excess mortality in South Africa last

July alone – an even bigger gap when the new variant emerged!!! Which is exactly why all-cause mortality is the most reliable indicator.

If you thought the UK was bad, may I suggest it is perhaps largely due to fastidious counting, although excess (all-cause) mortality remains high.

Figure 1 in Part I (end of document) has been updated. The trend in all-cause mortality is only just beginning to show a change in slope. I am still of the opinion that Covid-19 has far more sub-acute effects than people realize.

Figure 1 shows the trend in proportion of total deaths being reported as due to Covid-19. The proportion deaths are still high around that in early May last year. About 6 weeks to get to moderately low levels.

Figure 1: Trend in proportion of total deaths reported with Covid-19

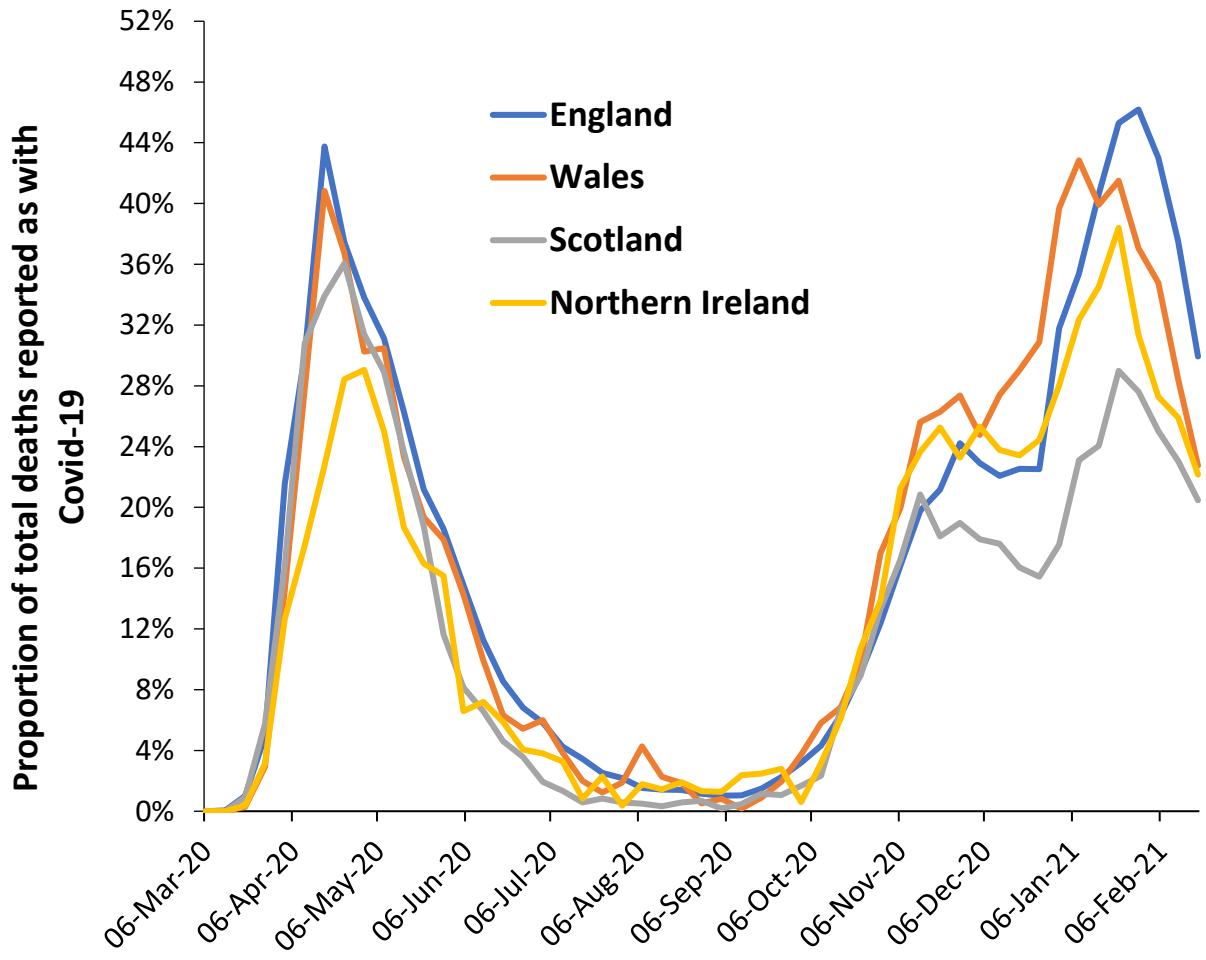


Figure 2 shows the international trends in reported Covid-19 deaths. Zimbabwe makes an appearance. In my opinion this is just the tip of the iceberg for Africa. Panama and Peru continue to have the highest reported death rate.

Figure 2: Covid-19 deaths per 1,000 deaths (before Covid) and change during February.

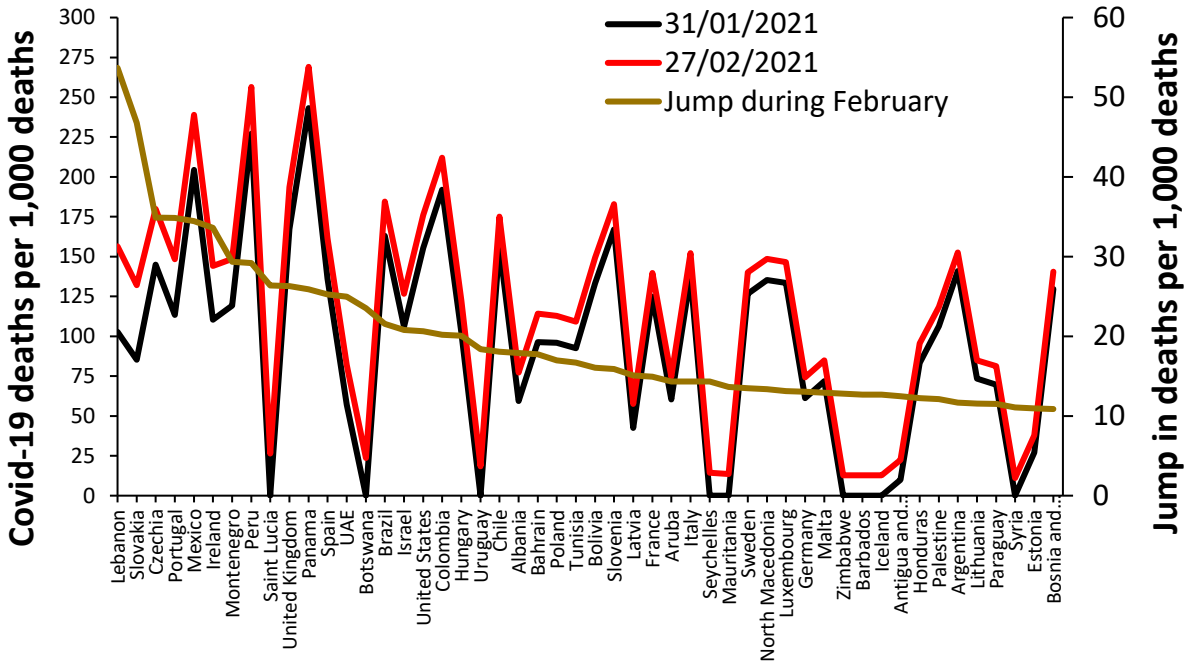


Figure 3: Rolling 12-month increase in all-cause mortality across the UK. Also included is the highest 12-month increase seen in the interval 2001 to 2019.

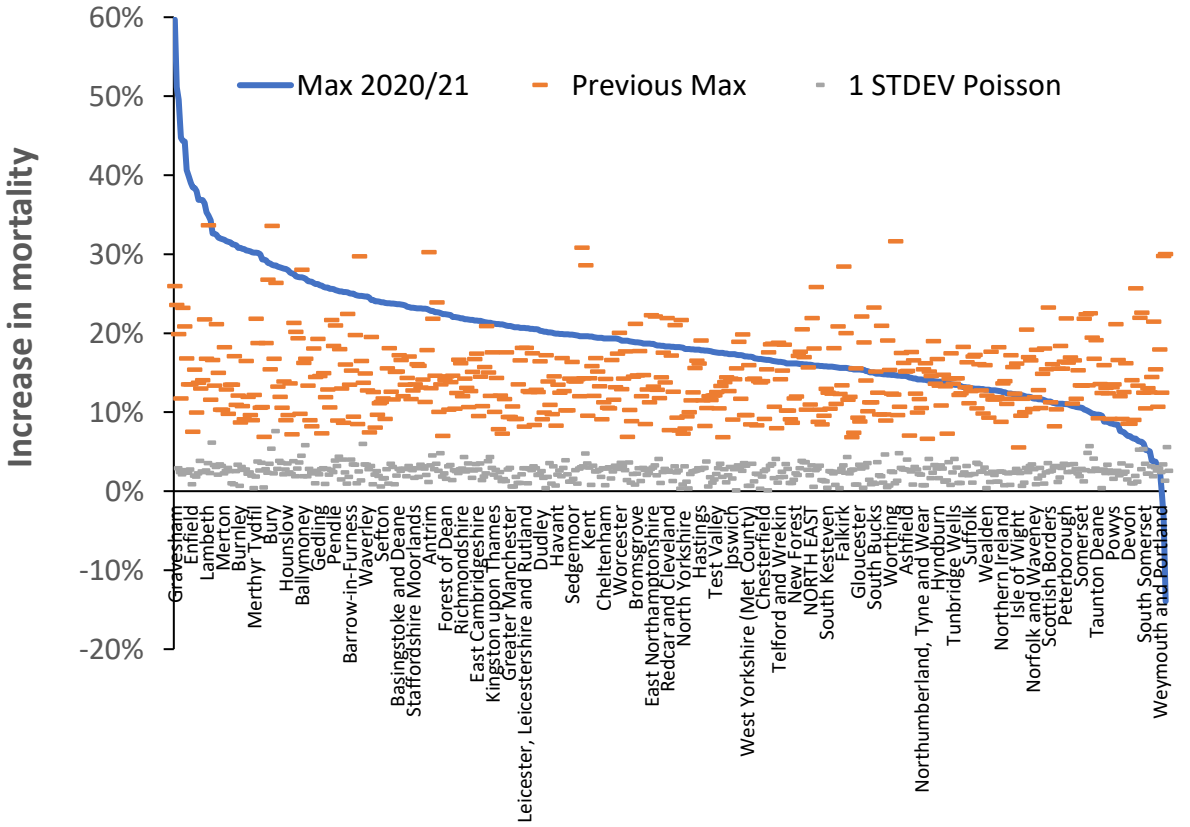
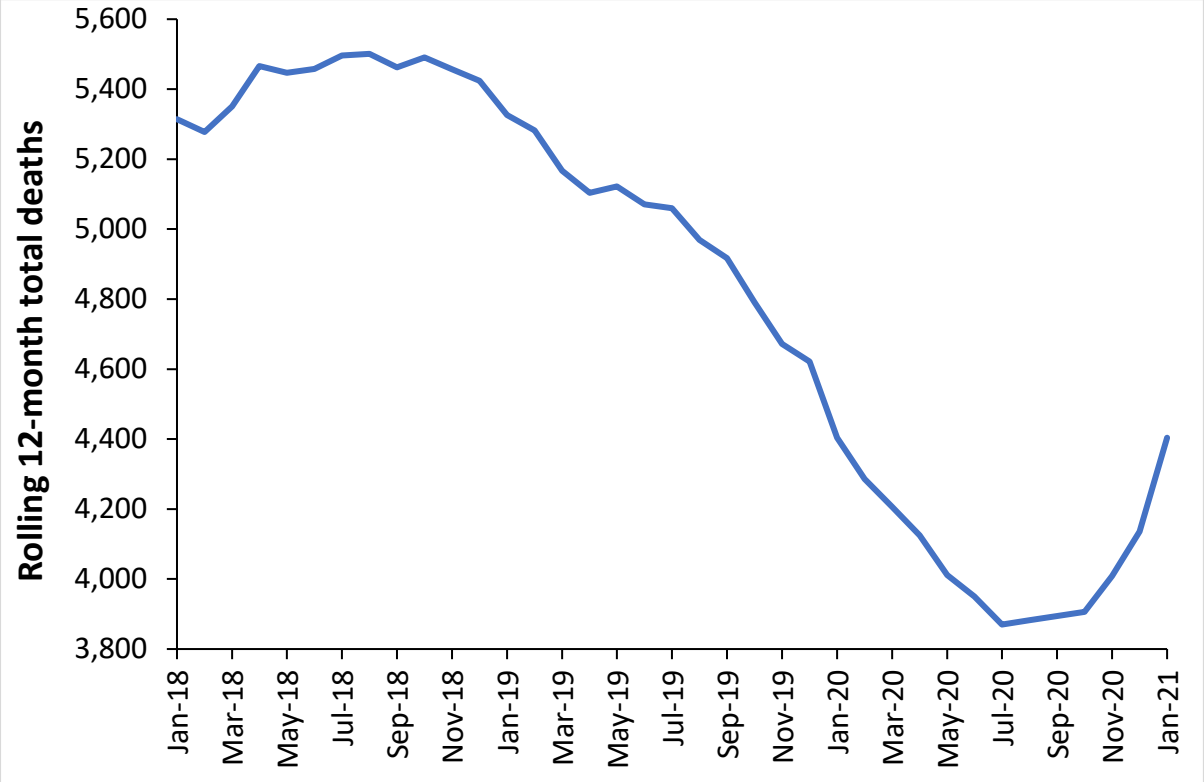


Figure 3 investigates the all-cause mortality rate in UK local government areas up to the end of January 2021. London boroughs hold all the highest places. Merthyr Tydfil (+30%) in Wales is the highest increase outside of England. A 60% increase in all-cause mortality in Gravesham is high by any standard. A world record or surpassed in Africa?

Also shown is the highest 12-month increase in each area see in the interval 2001 to 2019. Despite two large waves of Covid-19 a far higher increase has been seen in the pre-Covid-19 days for a significant number of areas. Which begs the question what can cause such a large increase?

Figure 4 gives a partial explanation by looking at the rolling 12-month total of deaths in Dorset. To explain there is a shift-down commencing around Dec-18. An infectious outbreak (influenza???) creates a shoulder around Apr-19 and then another shift-down leads to an eventual minimum in Jul-20. In total an astronomical 30% reduction in deaths. Totally unheard of. However, deaths in Sweden showed a highly unusual large reduction also around Dec-18.

Figure 4: Rolling 12-month total of deaths in Dorset. Jan-18 to Jan-21.



The Swedish Statistical Agency made a vague reference to a low year in 2019. No statement that there was no demographic reason whatsoever. Such is the

power of shift-down since Covid-19 deaths in Dorset are totally overwhelmed by the shift-down. Then follows a shift-up in October-20 which is reinforced by Covid-19 deaths. Deaths have suddenly jumped back up again.

There was a large shift-up which swept across the UK in early 2012. Public Health England attempted to explain it away as influenza – despite influenza being at its lowest level for many years in early 2012, see The Public Health England report_VF (hcaf.biz). Seemingly if you cannot understand it, then do an obfuscatory report to explain it away, so no one asks questions.

However, the point is that shift-up and shift-down are at work to confound analysis of the trends in all-cause mortality. If you could discover a pill that reduced deaths by 30% you would be a trillionaire overnight. But alas shift-down is followed by shift-up and all the deaths re-appear.

As a technical point, shift down appears to endure for as long as it takes for the next shift-up to occur. Shift-up seems to endure most commonly for 12-months.

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

XXX. Outbreaks continue around the world.

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Reporting Covid-19 deaths per 1,000 population is highly misleading.

- Reported Coivid-19 deaths per 1,000 deaths (before Covid-19) have shown substantial increases since 8th February in many countries.
- Most notably, Slovakia, Lebanon, Mexico, Czechia, Ireland, etc.
- While the UAE has a low total Covid-19 deaths per 1,000 deaths there was a high increase since 8th February.
- The Barbados (indicative of the Caribbean in general) has shown a moderately large increase.

Proportion of deaths with Covid-19

- On 12th February the proportion of deaths due to Covid-19 remains higher in England than the other countries in the UK.
- Is lowest in Scotland.

Figure 1, Part 1 has been updated to give deaths on 12th February 2021.

- The Y-axis has been expanded to cope with deaths in London.
- While Covid-19 deaths are declining the rolling total of all-cause mortality continues to rise

A 4-Part series has been published in the *Journal of Health Care Finance* describing the principles behind financial and capacity risk in health care.

Parts 1-3 explain the epidemiological principles behind why things can quickly go terribly wrong, while Part 4 explains the changes required in health care policy to limit the damage.

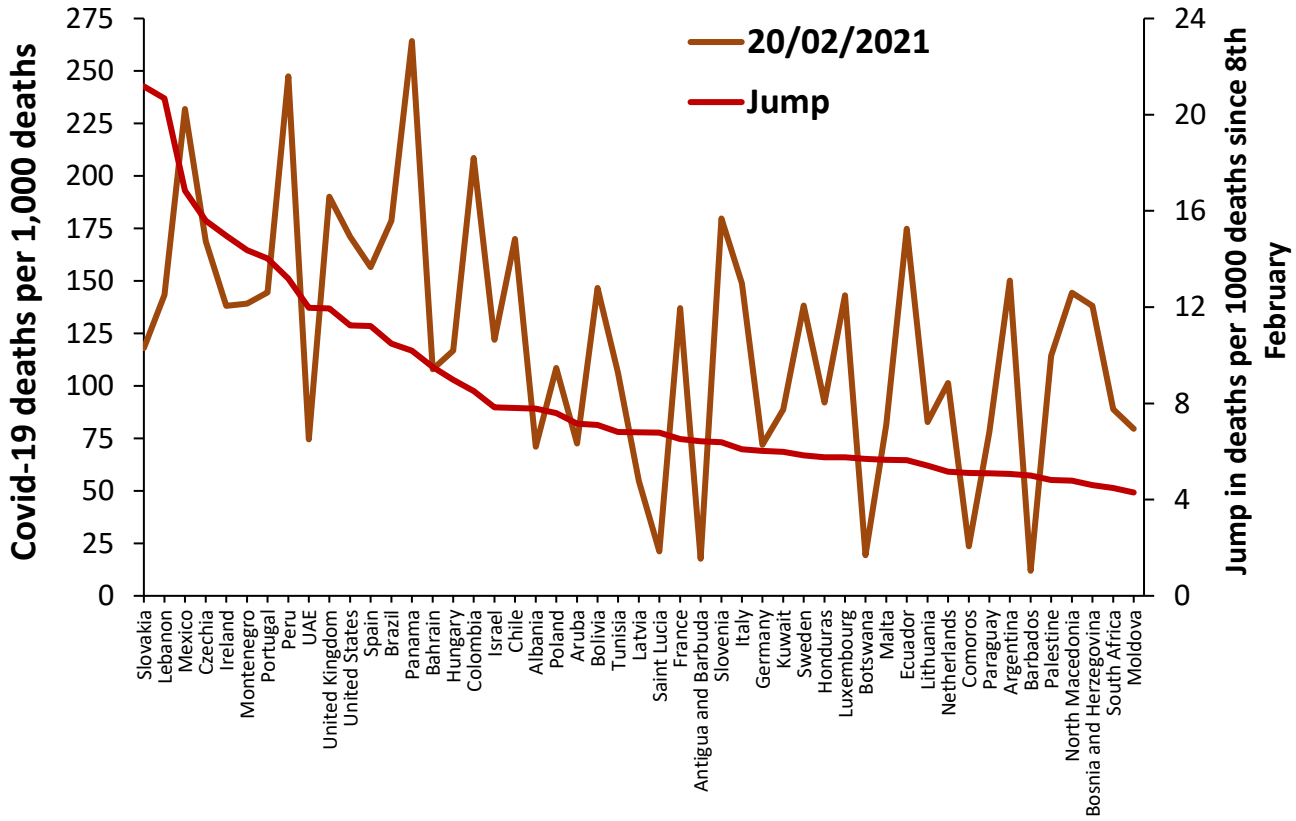
Part 4 should be compulsory reading in all Health Departments around the world and English CCGs.

A MUST read for anyone who cannot understand why seemingly well-run organisations suddenly slip into deficit. See
http://www.healthfinancejournal.com/~junland/index.php/johcf/index

Listen to a 14-minute interview about the series,
https://jjunland.egnyte.com/dl/CPdNnjCVle

In Part 28 I questioned whether the Bahamas was a Covid-19 free zone where all and sundry could go for a 'safe' holiday. All and sundry arriving in any country is a recipe for spread of any contagion. Figure 1 confirms my suspicion with nearby Barbados now in the top 50 countries for a jump in Covid-19 reported deaths since 8th February. My suspicion is that the true picture in the Bahamas remains an underestimate.

Figure 1: Number of total reported Covid-19 deaths on 20th February per 1,000 deaths before Covid-19, and top 50 countries with the greatest increase in the death rate since 8th February.



South Africa is also in the top 50, once again likely to be a substantial underestimate. Brazil is well up the list and Slovakia displaces Lebanon for the highest increase in Covid-19 death rate.

As you will all know deaths lag hospital admissions by around four weeks, with an even greater lag for new infections. However, you all get the idea that international travel is a risky business during ANY pandemic.

Figure 2: Weekly proportion of total deaths ascribed to Covid-19 at 12th February 2021

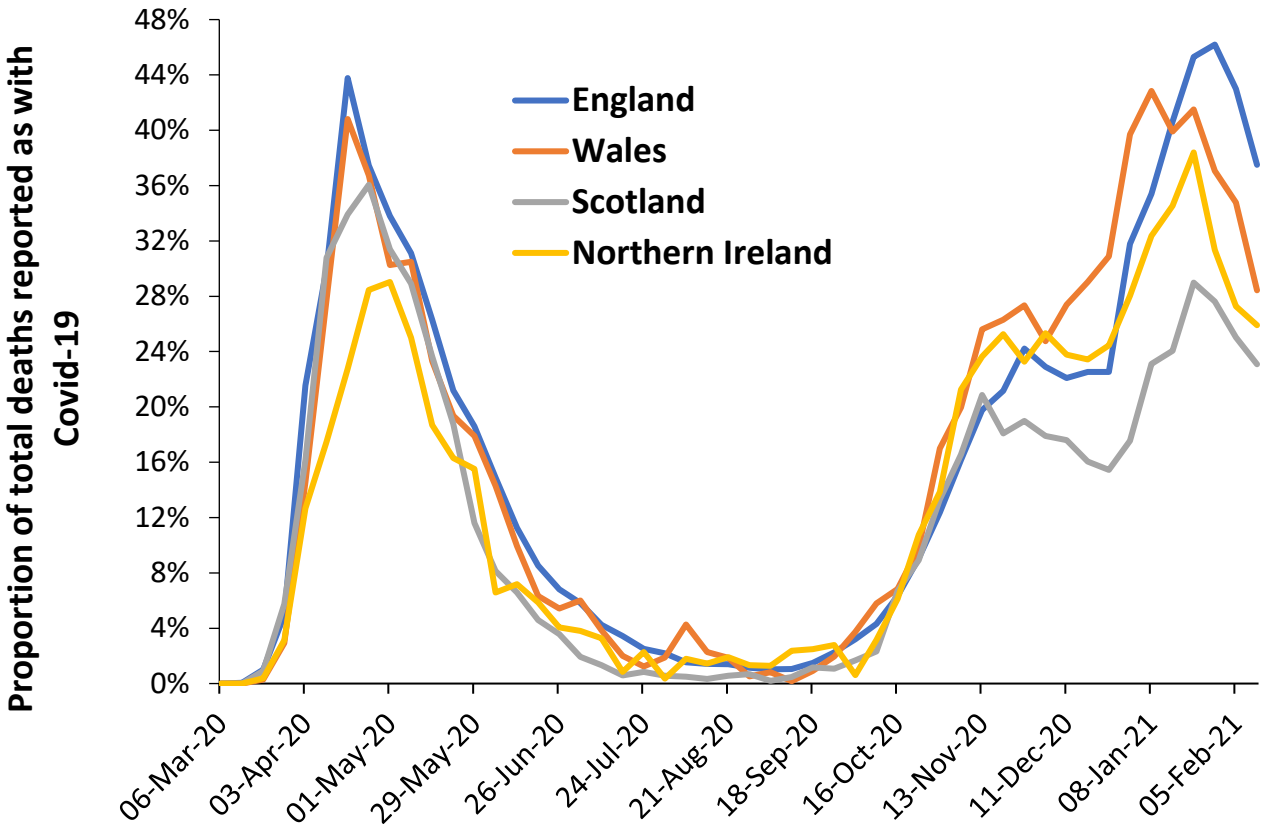


Figure 2 continues the trend in proportion of total deaths where Covid-19 is reported as contributory. England remains high – although deaths are continuing to decline.

Figure 1 in Part I of this series (at the end of the document) has been updated. As of 12th February, the rolling 52-week total of deaths (all-cause mortality) has not yet shown a substantial change. Recall that shift-up and shift-down lie hidden behind the trends in total deaths. A fact which is seemingly ignored in the interpretation of the trends in all-cause mortality. The 'experts' are often the last to realise that the rules have changed.

For those of you who suspected that Covbid-19 may be a winter pathogen one study suggests a protective role for UVB.

Moozhipurath, R.K., Kraft, L. & Skiera, B. Evidence of protective role of Ultraviolet-B (UVB) radiation in reducing COVID-19 deaths. *Sci Rep* **10,** 17705 (2020). https://doi.org/10.1038/s41598-020-74825-z

As far as I can determine there is a balance between excessive use of sunscreen and the need for UVB exposure to synthesize Vitamin D. Clearly common sense is required.

Another study confirms that coronavirus (as a general species) cases also peak during the typical influenza or winter months.

Global Seasonality of Human Seasonal Coronaviruses: A Clue for Postpandemic Circulating Season of Severe Acute Respiratory Syndrome Coronavirus 2? | The Journal of Infectious Diseases | Oxford Academic (oup.com)

All of which makes eminent sense. So, make use of social distancing rule relaxation to enjoy the outdoors this summer.

For those with an interest in Excess Winter Mortality (EWM) a new study has been published looking at EWM across all latitudes, see IJERPH | Free Full-Text | Excess Winter Mortality (EWM) as a Dynamic Forensic Tool: Where, When, Which Conditions, Gender, Ethnicity and Age (mdpi.com)

The factors behind EWM are far more complex than has been appreciated.

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

XXVIV. Proportion total deaths due to COVID

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Reporting Covid-19 deaths per 1,000 population is highly misleading.

- Covid-19 deaths must be reported as like-for-like, hence, versus deaths in 2019 which is before the onset of Covid-19.
- The UK ranks 6th with Belgium 5th, USA in 12th place – see Figure 1.
- Note countries with explosive growth during January: Lebanon, Portugal, Lithuania, etc.
- Largest jumps since end of January: Lebanon 20, Portugal 17, Ireland 13, Slovakia 12, then Panama, Mexico, UK all at 11 extra per 1,000 deaths.
- London drives the UK – high population density, high proportion of young adults less inclined to adhere to social distancing, see Part XXII.

Proportion total deaths due to Covid-19

- The proportion of deaths due to Covid-19 went near to zero around end of August to early September – see Figure 2.
- Wales and Northern Ireland showed the most rapid increase thereafter.
- The total for England hides huge gradients between London and the South West.
- Northern Ireland caught up on a low proportion due to Covid-19 in the first wave during the second wave.
- Covid-19 basically seeks out anywhere which had previously had low exposure – mainly due to the first lockdown.

Figure 1, Part 1 has been updated to give deaths on 29th January 2021.

- The Y-axis has been expanded to cope with deaths in London.
- Northern Ireland continues its inexorable rise upward.
- Estimated all-cause deaths comes to around 109,000 deaths for week ending 5th February – see Table 1.

- Given the very generous definition of a Covid-19 death, we either have modest unintended effects of lockdown, or Covid-19 has far more powerful subclinical effects than appreciated.
- Note that a rolling 52-week difference for excess deaths gives lower excess deaths because of the shift-up and shift-down patterns at local authority level, see Part 25

A 4-Part series has been published in the Journal of Health Care Finance describing the principles behind financial and capacity risk in health care.

Parts 1-3 explain why things can quickly go terribly wrong, while Part 4 explains the changes required in health care policy to limit the damage.

A MUST read for anyone who cannot understand why seemingly well-run organisations suddenly slip into deficit. See
http://www.healthfinancejournal.com/~junland/index.php/johcf/index

In the last part we ascertained that the UK did not have the highest Covid-19 death rate in the world, however, it was nevertheless high in the international rankings. Figure 1 shows the situation since last week along with the end of December 2020 and January 2021. The UK has rapidly caught up with Belgium and displaced some of the South American countries. Lebanon is not faring well.

Figure 2 then investigates the trends in the proportion of total deaths due to Covid-19 in the four countries of the UK from March 2020 to the present. As can be seen Northern Ireland shows the lowest proportion during the first wave, but then suddenly catches up during the second wave.

Covid-19 basically waits for opportunities to move into small areas where there was previously low activity. Residents thinking that social distancing is not important because rates have been low, then unknowingly spread the virus and you get a local hot spot.

Seemingly a virus with more resourcefulness than some humans.

Figure 1: Reported Covid-19 deaths per 1,000 deaths in 2019 (before Covid-19), end of December 2020, end of January 2021 and to 8th February 2021

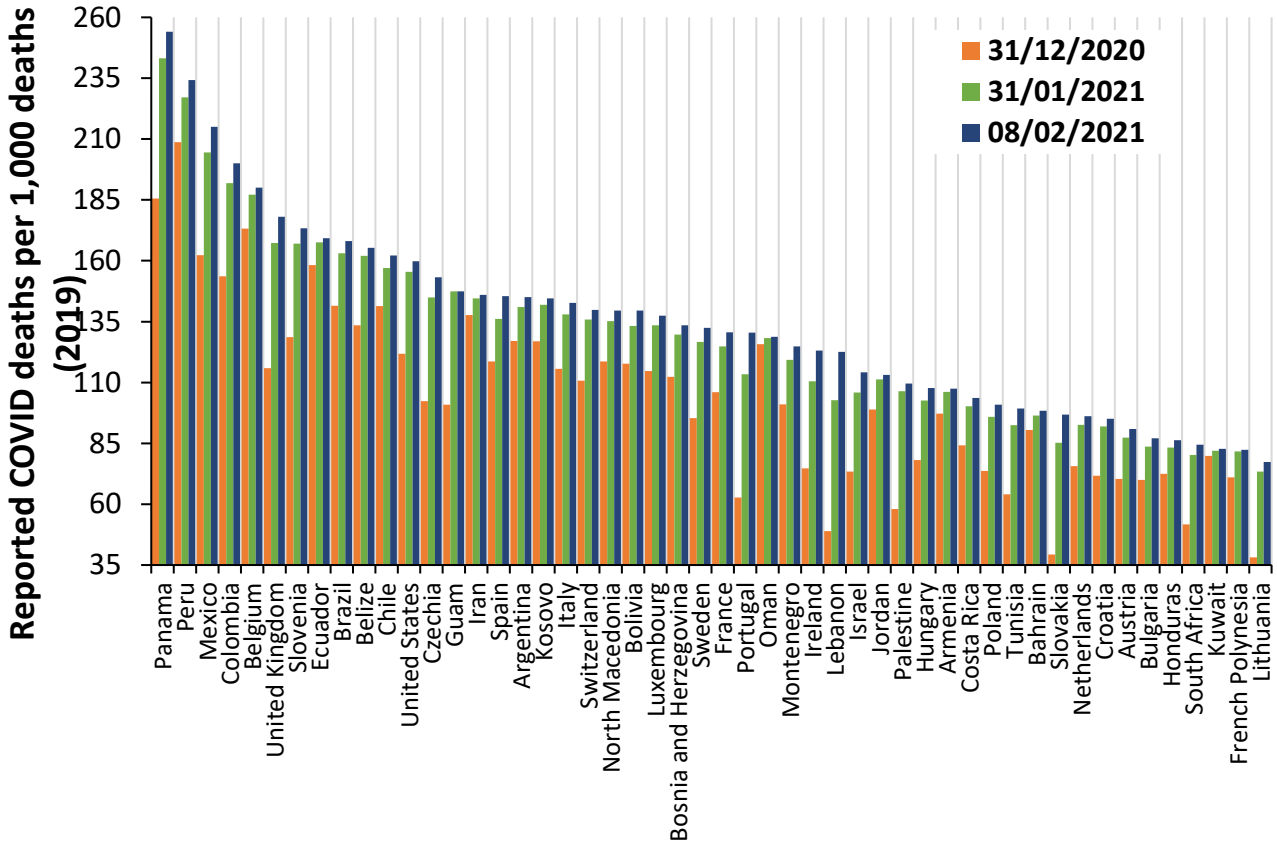

Figure 2: Proportion of total deaths due to Covid-19 in the four countries of the UK

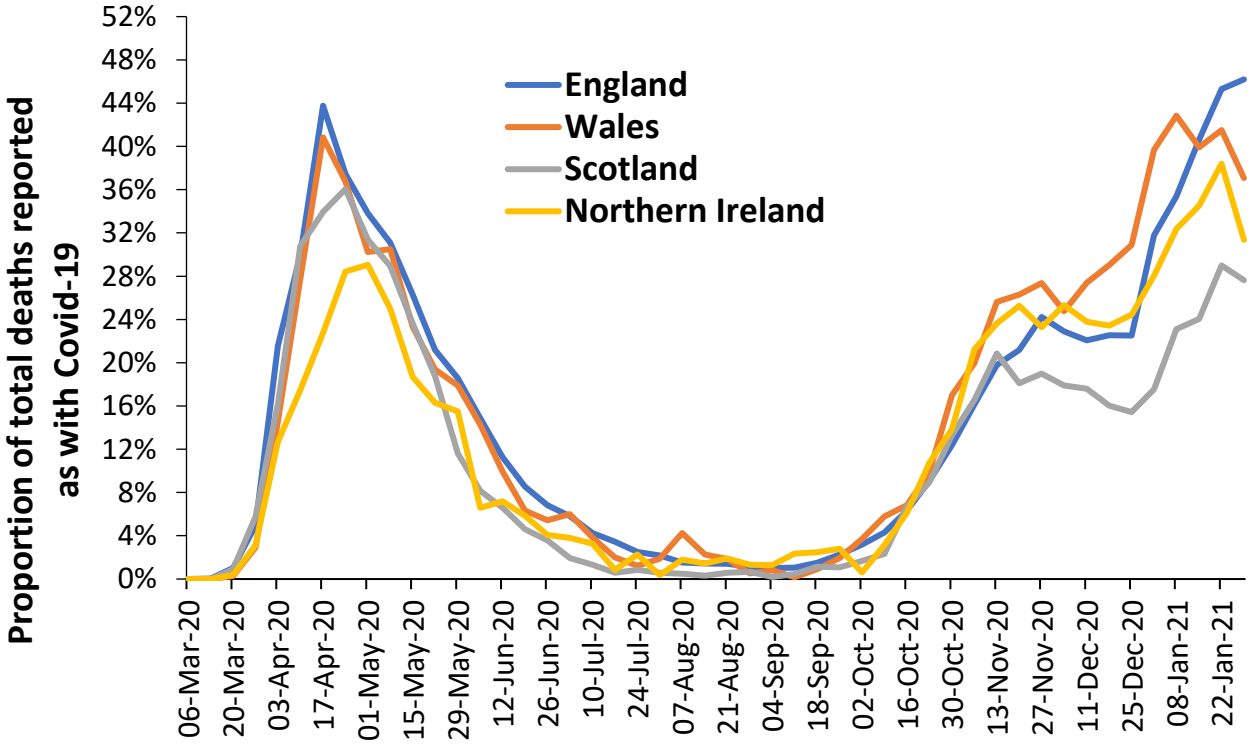

Table 1: Excess mortality during Covid-19 for regions/countries in the UK

Location	To 29th January	Rolling 52-week	5th Feb estimate	Excess mortality
South West	5,262	4,941	5,880	9.3%
Scotland	7,062	6,933	7,439	12.2%
Northern Ireland	2,154	2,056	2,259	13.7%
Wales	4,909	4,829	5,193	14.7%
East	9,089	8,745	10,180	15.8%
Yorkshire and The Humber	8,324	8,018	8,737	15.9%
East Midlands	7,356	7,205	7,837	16.1%
North East	4,616	4,491	4,804	16.5%
UK	**101,286**	**98,947**	**109,236**	**16.8%**
South East	13,769	13,419	15,311	16.9%
England	87,304	85,129	94,488	17.5%
North West	12,962	12,687	13,624	18.0%
West Midlands	11,255	10,901	12,129	20.5%
London	14,930	14,722	16,245	30.5%

Finally, Table 1 lists the excess mortality in the different regions/countries of the UK. The excess deaths to 29th January measure the 'excess' from the start of the outbreak in early March. The rolling 52-week 'excess' measures deaths for the 52-weeks ending 29 January 2021 versus the 52-weeks ending the same week in February 2020. This gives a lower estimate because shift-up and down are happening in the background.

However, 30% excess mortality in London is somewhat sobering, and will be higher than this in the worst hit Boroughs.

At some time later this year I will attempt to unravel the effects of shift-up and down at local authority level and compare the resulting all-cause mortality with the reported Covid-19 mortality.

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

XXVIII. Countries with highest jump in January 2021

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Reporting Covid-19 deaths per 1,000 population is highly misleading.

- Covid-19 deaths must be reported as like-for-like, hence, versus deaths in 2019 which is before the onset of Covid-19.
- Using this basis, the jump in reported Covid-19 deaths during January can be explored between countries.
- Panama and Lebanon saw the greatest increase in January, followed by the UK in 3rd place – uncomfortably high.
- South Africa is fairly high and the reported deaths are probably an underestimate – the South African variant may well be just as lethal as the English variant
- Under-reporting of Covid-19 deaths is highly likely in many countries.

Figure 1, Part 1 has been updated to give estimated deaths on 29th January, 2021

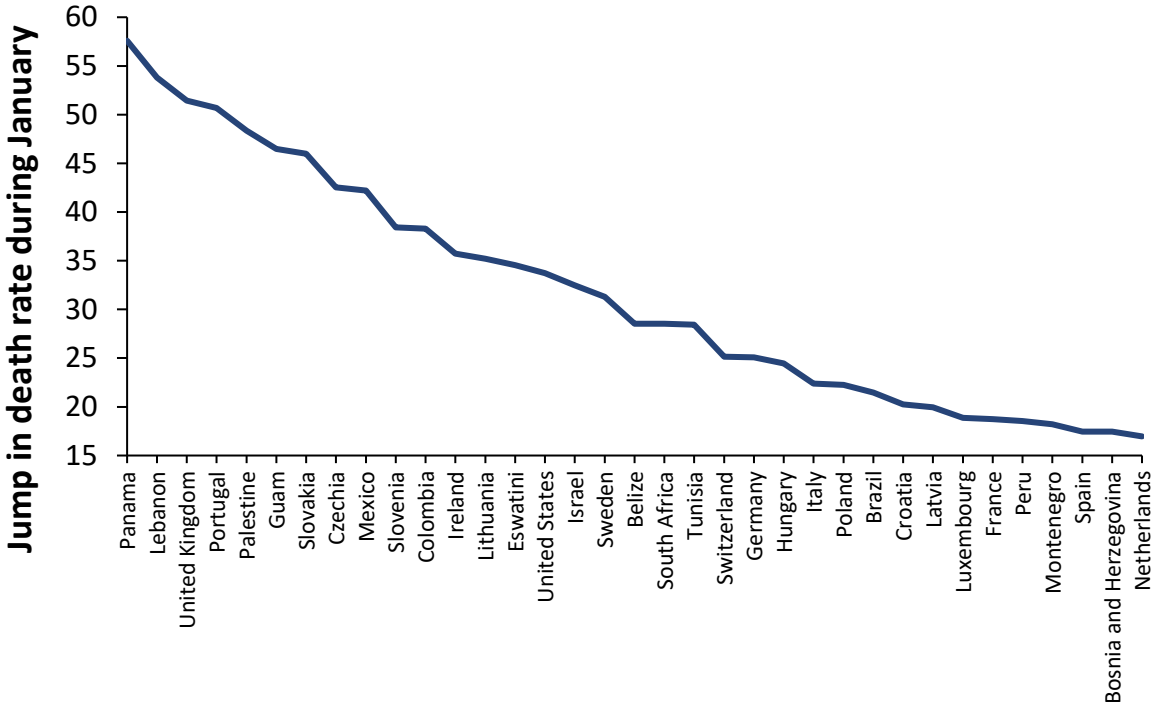
- The Y-axis has been expanded to cope with deaths in London.
- Northern Ireland continues its inexorable rise upward.
- Estimated all-cause deaths comes to >101,000 deaths versus 100,000 reported Covid-19 deaths.
- Given the very generous definition of a Covid-19 death, we either have modest unintended effects of lockdown, or Covid-19 has far more powerful subclinical effects than appreciated.

In the last part we ascertained that the UK did not have the highest Covid-19 death rate in the world, however, it was nevertheless high in the international rankings.

In view of the huge surge in Covid-19 deaths in the UK during January it may therefore be interesting to see if this has occurred elsewhere in the world.

To this end Figure 1 shows the jump in deaths per 1,000 deaths (before Covid-19) which occurred during January 2021. Using this measure, the UK ranks 3rd in the world behind Panama and Lebanon. The USA is further down the list while South Africa has seen a concerning surge.

Figure 1: Top 25 world countries experiencing the largest jump in Covid-19 deaths per 1,000 deaths in 2019.



While the UK is fastidiously counting everything that moves as a Covid-19 death, it is highly likely that there is variable undercounting elsewhere in the world. Which implies that the surge in South Africa may be larger than reported.

Alas international air travel is spreading Covid-19 like confetti in the wind with 'influencers' seemingly determined to do their bit to go on 'work' assignments near the pool in some exotic location.

Low Covid-19 rates in places like the Bahamas are quite possibly manipulated to encourage tourism. With so many people going there due to its 'low' Covid-19 status it would seem likely that transmission is high.

While collecting the international data I do glance at the trends and can assure you all that Covid-19 was remarkably busy in many countries during January.

Deaths get muted due to their relatively young populations, and probable under-reporting, but transmission will be higher than it seems.

Turning to the UK. Figure 1, Part 1 has been updated with all-cause mortality data up to 22nd January, and an estimate for 29th January made assuming the same number of deaths as in the week ending 22-Jan. Possibly an underestimate, however, as Table 1 shows estimated deaths to the end of January are around 101,000 compared to the 100,000-official figure.

The 81,000 deaths at the end of December are a distant memory.

Excess mortality has hit 31% in London. For every 3 deaths in 2019 there is now 1 extra death. London is a high population density location = high risk! The next highest is the West Midlands at 21% down to just 9% in the South West (lowest population density). I simply do not know what is happening in Northern Ireland as deaths have been rising continuously since September!

Table 1: Estimated excess all-cause mortality to 22nd January and 29th January 2021.

Region/Country	To 22nd January	Rolling 12-month	29th Jan estimate	Excess mortality
North East	4,425	4,243	4,700	16.8%
North West	12,232	11,933	12,973	18.0%
Yorkshire and The Humber	7,975	7,674	8,265	15.8%
East Midlands	6,968	6,869	7,449	16.4%
West Midlands	10,591	10,349	11,254	20.5%
East	8,025	7,765	9,006	15.7%
London	13,720	13,538	15,045	30.7%
South East	12,318	12,070	13,826	17.0%
South West	4,720	4,441	5,157	9.1%
Wales	4,662	4,564	5,012	15.0%
Scotland	6,641	6,494	6,996	12.1%
Northern Ireland	2,040	1,969	2,191	14.0%
England	80,715	78,882	87,416	17.6%
UK	93,915	91,909	101,472	16.8%

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

XXVII. UK does not have highest death rate in the world

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Reporting Covid-19 deaths per 1,000 population is highly misleading.

- Covid-19 deaths must be reported as like-for-like, hence, versus deaths in 2019 which is before the onset of Covid-19
- On this basis the UK ranks 9th in the world with the USA 12th
- Belgium is the highest of the developed countries and ranks 5th in the world
- Under-reporting of Covid-19 deaths is highly likely in many countries

While the UK has reached a sad milestone of >100,000 Covid-19 deaths this must be put into correct context.

Deaths per 1,000 population is highly misleading since it does not take population age structure into account.

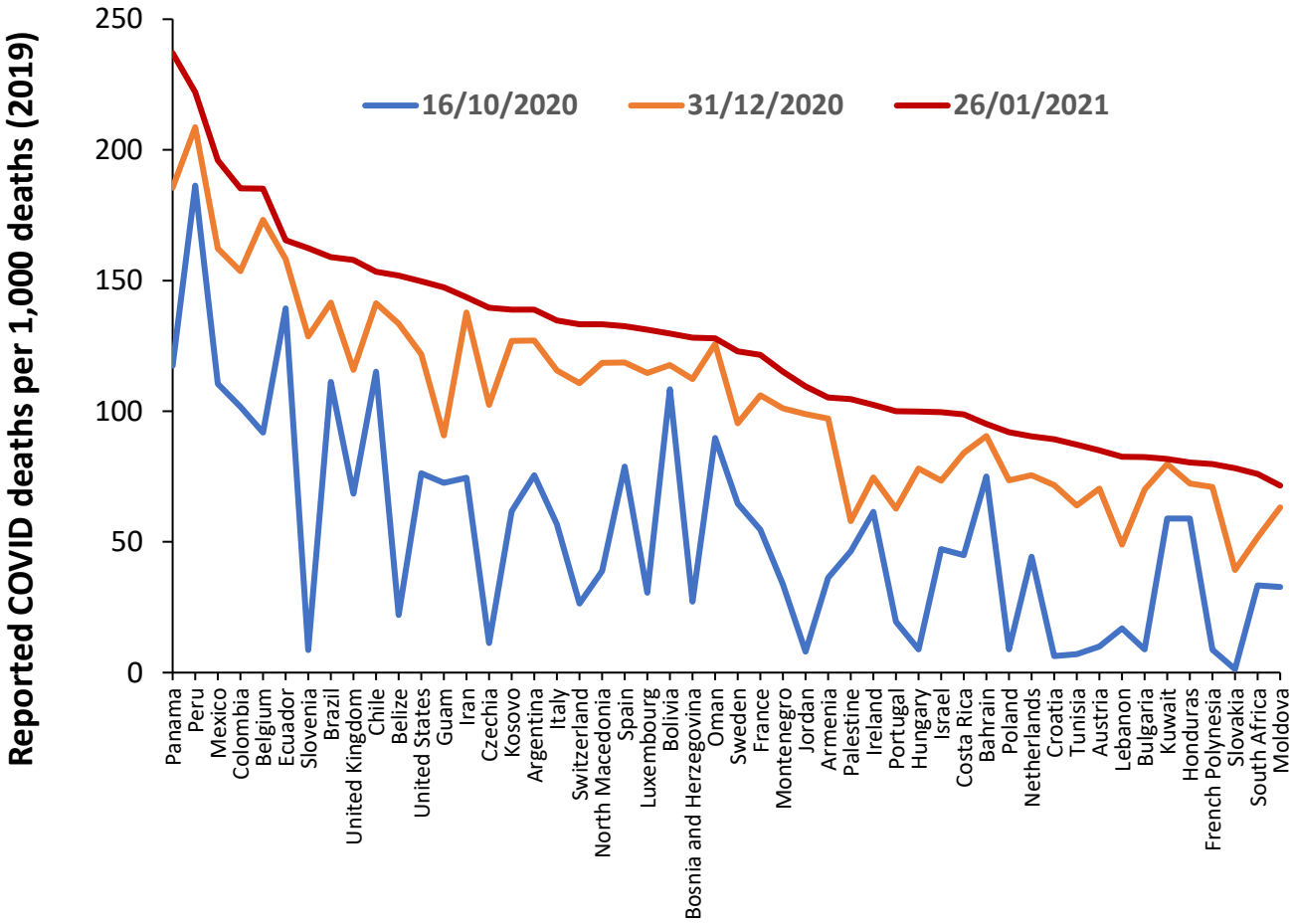
The only valid comparison is against total deaths in 2019 which was before the Covid-19 epidemic started.

Reporting of misleading statistics by the UK National press is a sad indictment to their quest for sensationalism rather than scientific accuracy.

Figure 1 shows the top 50 countries ranked by reported Covid-19 deaths per 1,000 deaths in 2019.

250 deaths per 1,000 deaths is equivalent to a 25% increase in the mortality rate.

Figure 1: Reported total Covid-19 deaths (on 26th January 2021) per 1,000 deaths in 2019



As can be seen Belgium tops the list of developed countries.

While the UK does not top the list, it is still concerningly high with a sizeable contribution from rapid circulation of the new strain.

Note the rapid growth in South Africa and Brazil from the end of December which both have a significant new variant.

Hopefully, vaccination will begin to make an impact – barring the unthinkable of a strain which evades current vaccines.

This is no time for complacency!

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

XXVI. 81,000 excess deaths were exceeded in the UK in 2020.

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More than 81,000 excess deaths occurred in the UK during 2020

- Highest excess occurred in London (+21.9%) and lowest excess occurred in the South West (+7.4%). Northern Ireland consistently rose to roughly the same as Wales and the South East, and eclipsed Scotland (+10.3%).
- Ranking of the regions is roughly according to weighted population density.
- After a full-year of Covid-19 (end of March 2021) up to 90,000 excess deaths are possible.
- Reported deaths in the last two weeks of 2020 were greatly under-reported due to timing of Christmas and the New Year.
- Hence ***reported*** deaths in the first week of 2021 were 45% higher than the last week of 2020 in Scotland, and 70% higher in Northern Ireland.
- These extra deaths have been apportioned back to weeks 51 and 52 of 2020 to arrive at the total ***actual*** excess deaths.
- This lag between actual date of death and when the death is finally reported is a serious flaw and explains why the government has had to institute informal ways to get direct counts from hospitals and nursing homes to give the daily death estimates, which then has to be updated to match with ONS data as it becomes available.

Figure 1, Part I has been updated with weekly data ending 8th January 2021, see end of document

- Only North West and West Midlands show signs that deaths may have peaked.

- Recall that the trends are a mix of shift-up in deaths around mid-2019 which then reverts to shift-down in mid-2020. For this reason, the real excess mortality is an underestimate.

Reported Covid-19 deaths per 1,000 hospital beds (*prior to Covid-19*) for top 60 world countries has been updated to 18th January 2021

- The UK continues to work its way up the international ranking and is highest for the developed countries.
- Bolivia and Peru continue to maintain their position at top of the list.
- Despite attention on total Covid-19 deaths in the USA the gap between the UK and USA continues to widen.
- Clearly all countries have increased ICU and general medical beds since the start of the epidemic however this remains a key indicator of capacity readiness prior to the arrival of Covid-19.
- See, Jones R. A pragmatic method to compare hospital bed provision between countries and regions: Beds in the states of Australia. Intl J Health Plan Mgmt 2019; 35(3): 746-759. https://doi.org/10.1002/hpm.2950 for wider international analysis
- Prior to Covid-19 the UK and England, in particular, was desperately short of beds, see Jones R (2021) Were the hospital bed reductions proposed by English Clinical Commissioning Groups (CCGs) in the Sustainability and Transformation Plans (STPs) achievable? Insights from a new model to compare international bed numbers. Intl J Health Plan Mgmt https://doi.org/10.1002/hpm.3094
- This is an inevitable outcome of a 30-year policy to build smaller and smaller hospitals, irrespective of the evidence (see link at top of page)

While there are Covid-19 hot spots unusually low excess mortality persists in many areas

- Refer to Part XXV

In this analysis total deaths are used as a proxy for Covid-19 as it is often difficult to determine exactly whose death is directly due to Covid-19 rather than death from other causes alongside Covid-19 infection. The sub-clinical effects of Covid-19 remain largely unexplored. All-cause mortality will also pick up any of the unintended consequences of lockdown.

- Latest research on stroke symptoms was that ambulance callouts were NOT affected during lock-down, see McClelland G, Wilson N, Shaw L, et al. Ambulance documentation of stroke symptoms during the UK COVID-19 'Stay at Home' message. **Emergency Medicine Journal** 2021;**38:**83-84.

- This somewhat supports my view that the sub-clinical effects of Covid-19 on mortality are more serious than are appreciated, see View of Vasculitis and COVID-19: what do we have to know? (italjmed.org)

I have been forecasting somewhere more than 80,000 excess deaths during 2020 but the Christmas and New Year period has meant that deaths have been under-reported. The expected catch up occurred for the week ending 8th January. The catch up has therefore been apportioned back to weeks 51 and 52 and the resulting estimates of excess deaths are given in Table 1. Three different estimates are given to show the range in excess deaths. The percentage excess mortality is calculated based on the minimum of the three estimates. All estimates give higher than 81,000 excess deaths across the whole UK. Excess mortality roughly follows weighted population density for each region/country.

Table 1: Excess mortality during 2020, three different estimates

Location	To 1st January	To 8th January	Rolling 12-month	Excess mortality
North East	4,060	4,051	3,893	13.9%
North West	11,485	11,143	11,070	15.4%
Yorkshire and Humber	7,755	7,606	7,466	14.2%
East Midlands	6,271	6,200	6,268	13.6%
West Midlands	9,549	9,484	9,638	17.3%
East	6,476	6,385	6,451	11.1%
London	10,742	11,058	10,927	21.9%
South East	9,592	9,760	9,701	11.8%
South West	4,393	4,176	4,198	7.4%
Wales	3,901	3,905	3,945	11.7%
Scotland	6,183	6,080	5,950	10.3%
Northern Ireland	1,828	1,901	1,913	11.6%
England	70,064	69,604	69,610	14.0%
UK	81,833	81,327	81,418	13.4%

The rolling 52-week total trends are given in Figure 1 at the very beginning of the document. Only the North West and West Midlands show signs that all-cause mortality was beginning to abate.

Determining the exact number of excess deaths is made difficult by the shift-up and shift-down patterns which arise out of the outbreaks of a seeming new type or kind of infectious disease.

Figure 1 at the end of the document shows the rolling 52-week total of deaths reaching a minimum around April to June of 2019 (depending on region). The COVID-19 outbreak commences in March/April 2020 which is around the point at which shift-up would have changed to shift-down. This means that most of the COVID-19 outbreak runs during shift-down, and hence the deaths are underestimated.

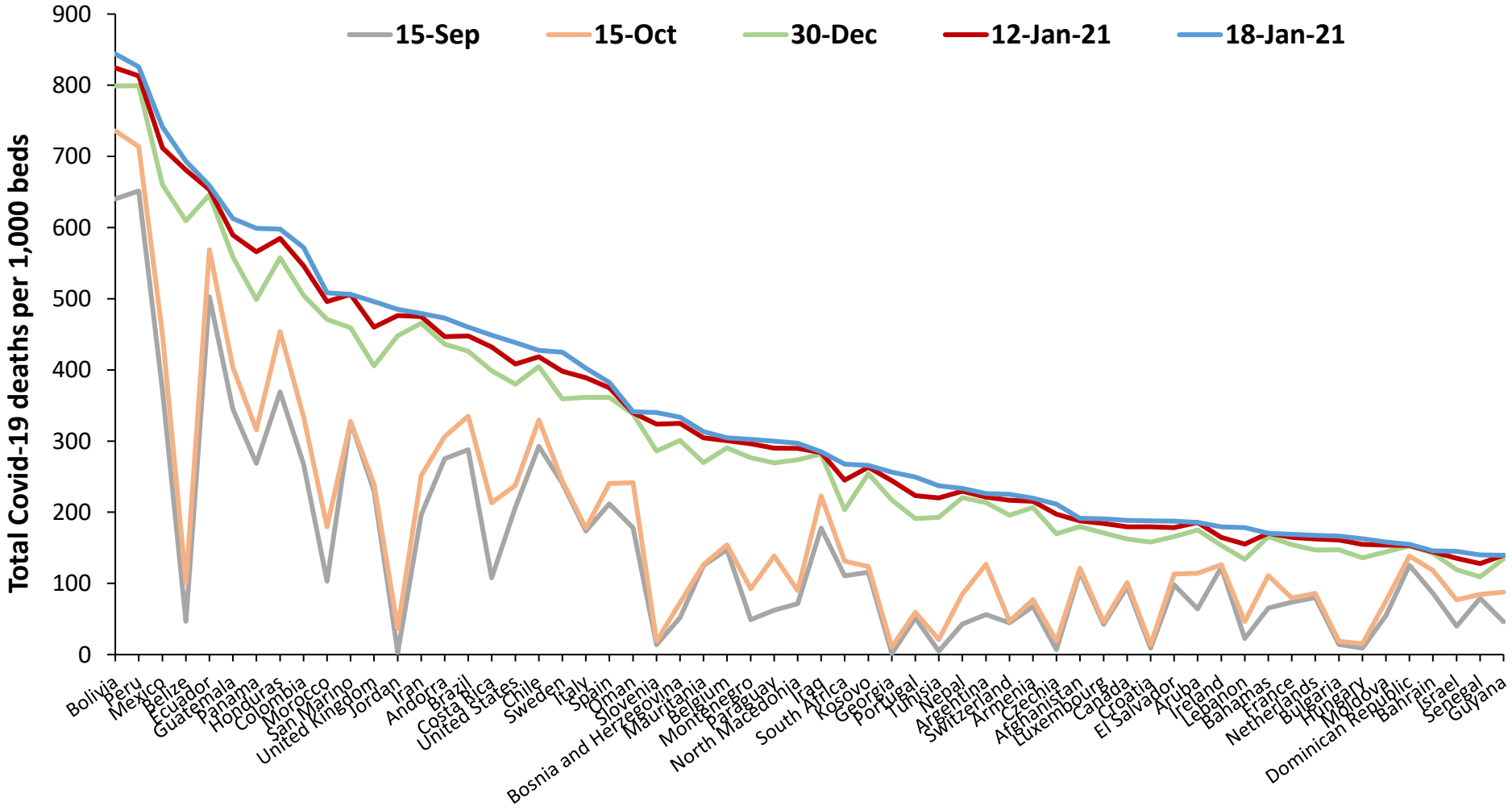
Figure 1 for this part of the series (next page) gives a comparison of international bed pressures using deaths as a proxy for hospital bed occupancy. Data is up to the 18th January and shows a progressive creep of the UK up the rankings. The UK is the highest country in the developed world.

Ignore San Marino and Andorra as these are micro-States which use beds in nearby countries for acute treatment. The gap between the UK and the USA is widening. This comparison uses bed numbers before the onset of COVID-19 as a measure of readiness for a capacity shock. The UK simply had far too few beds before the pandemic arrived. The UK has therefore had to make strenuous efforts to expand the available bed pool, largely by cutting elective surgery and cramming more beds into any available space.

Data in Figure 1 will be an underestimate due to lack of testing capacity early in the epidemic and unwillingness of some countries to acknowledge reality. However, it is still a pragmatic way to compare bed pressures. Clearly the pressures occur in different sub-regional locations and at different times, as discussed in the previous issue.

As for 2021, this will depend on the efficacy of vaccination versus the arrival of new strains which may or may not be sufficiently antigenically different to warrant a new vaccine. A best estimate of 90,000 excess deaths from the start of the epidemic is likely.

Figure 1: Ranking of top 60 countries for reported Covid-19 deaths per hospital bed (available beds before the arrival of Covid-19) including progress over time. The gap between the top two lines shows the magnitude of the surge in just six days.



How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

XXV. Low excess mortality still persists in some areas during Covid-19.

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Around 80,000 excess deaths are likely for the UK during 2020

- As predicted in Part XXIV the trend for >80,000 (possibly >82,000) excess deaths by the New Year remains unchanged
- After a full-year of Covid-19 (end of March 2021) up to 100,000 excess deaths are possible
- Only the North West shows preliminary signs of the effects of lock down on all-cause mortality

Figure 1, Part I has been updated with weekly data ending 25th December 2020, see end of document

Covid-19 deaths per 1,000 hospital beds (prior to Covid-19) for top 100 world countries has been updated to 31st December

- The UK still tops the list of developed countries – too few beds to start with

While there are Covid-19 hot spots unusually low excess mortality persists in many areas

- Reporting by the National Press presents a dire situation which is NOT shared everywhere across the UK
- Excess mortality to the end of November 2020 had been exceeded in 38% of local authorities in the 20 -year period prior to Covid-19
- Some local authorities continue to show negative 'excess' mortality
- Covid-19 is a serious disease leading to high mortality; however, high spatiotemporal granularity means that this is only expressed in certain locations

In this analysis total deaths are used as a proxy for Covid-19 as it is often difficult to determine exactly whose death is directly due to Covid-19 rather than death from other causes alongside Covid-19 infection. The sub-clinical effects of Covid-19 remain largely unexplored. All-cause mortality will also pick up any of the unintended consequences of lockdown.

- Latest research on stroke symptoms was that ambulance callouts were NOT affected during lock-down, see McClelland G, Wilson N, Shaw L, et al. Ambulance documentation of stroke symptoms during the UK COVID-19 'Stay at Home' message. **Emergency Medicine Journal** 2021;**38:**83-84.
- This somewhat supports my view that the sub-clinical effects of Covid-19 on mortality are more serious than are appreciated, see View of Vasculitis and COVID-19: what do we have to know? (italjmed.org)

Comments and feedback are requested on a 4-part series regarding "Financial and Capacity risk in health care" see,
http://www.healthfinancejournal.com/~junland/index.php/johcf/issue/view/7
Pick the part which best suits your interests. Many thanks!

The earlier parts of this series focussed on excess mortality during the initial parts of the epidemic and on evaluating how much Covid-19 mortality was missed due to low testing capacity. Table 1 gives the revised forecast excess deaths by the end of 2020, which will be >80,000 due to the effect of Christmas on reported deaths – at least 1 day of deaths will be missing. This similar to the 80,000 estimated at the 18th December see (Part XXIV). Excess mortality remains the highest in London>West Midlands>North West>Yorkshire & Humber>North East>East Midlands. Excess mortality in Northern Ireland now exceeds that in the South West and Scotland.

Excess mortality in most regions remains below the +17.4% achieved for the 12-months ending February 1951 in England and Wales. Back in 1950/51 there were no face masks, no lockdowns, no daily Westminster briefings, and no hysteria. Just two months of artic conditions. Times have changed since then.

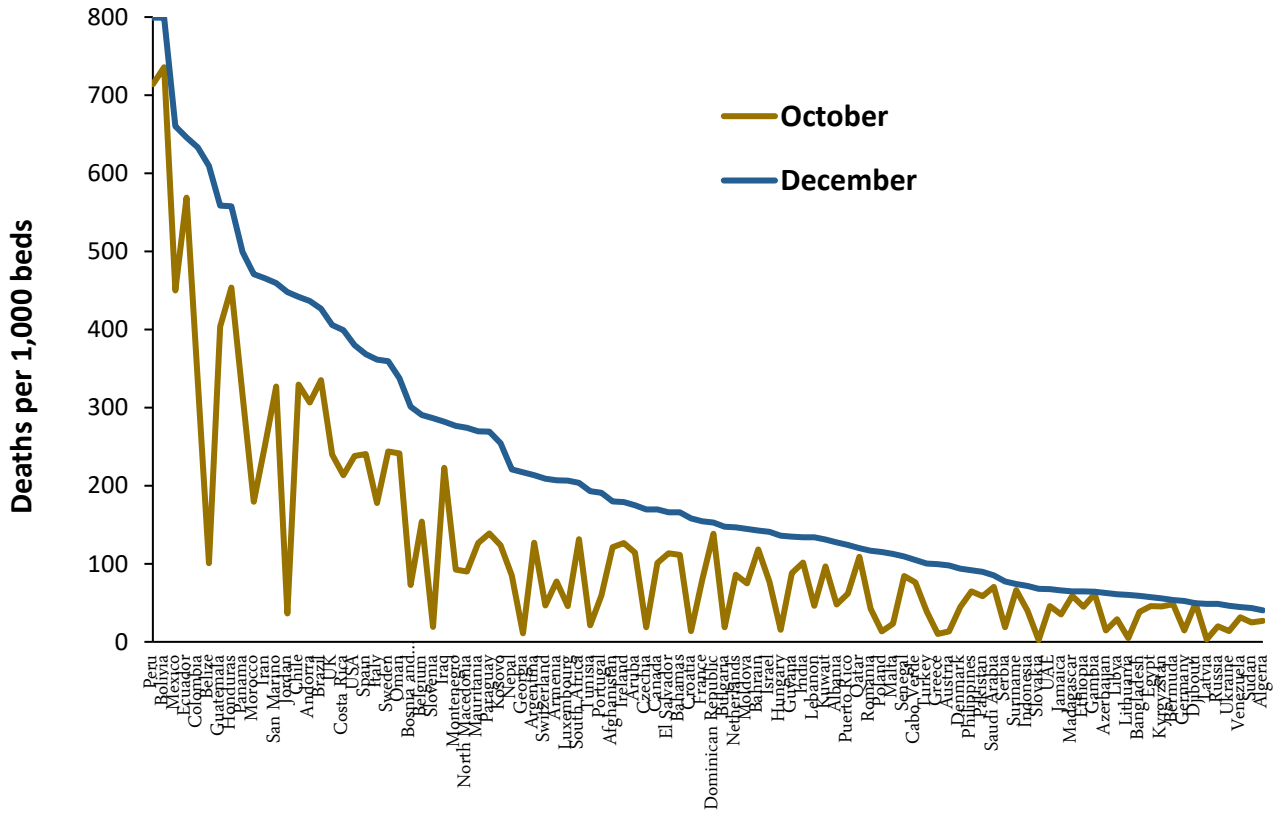
Figure 1 updates the situation regarding Covid-19 deaths per 1,000 hospital beds for world countries. Alas the UK tops the list of developed countries at 406 deaths per 1,000 beds.

This is hardly surprising given the abysmally low number of beds before Covid-19 came along – almost developing country bed numbers. See link to further publications at the top of the front page.

Table 1: Excess deaths (all-cause mortality) during Covid-19

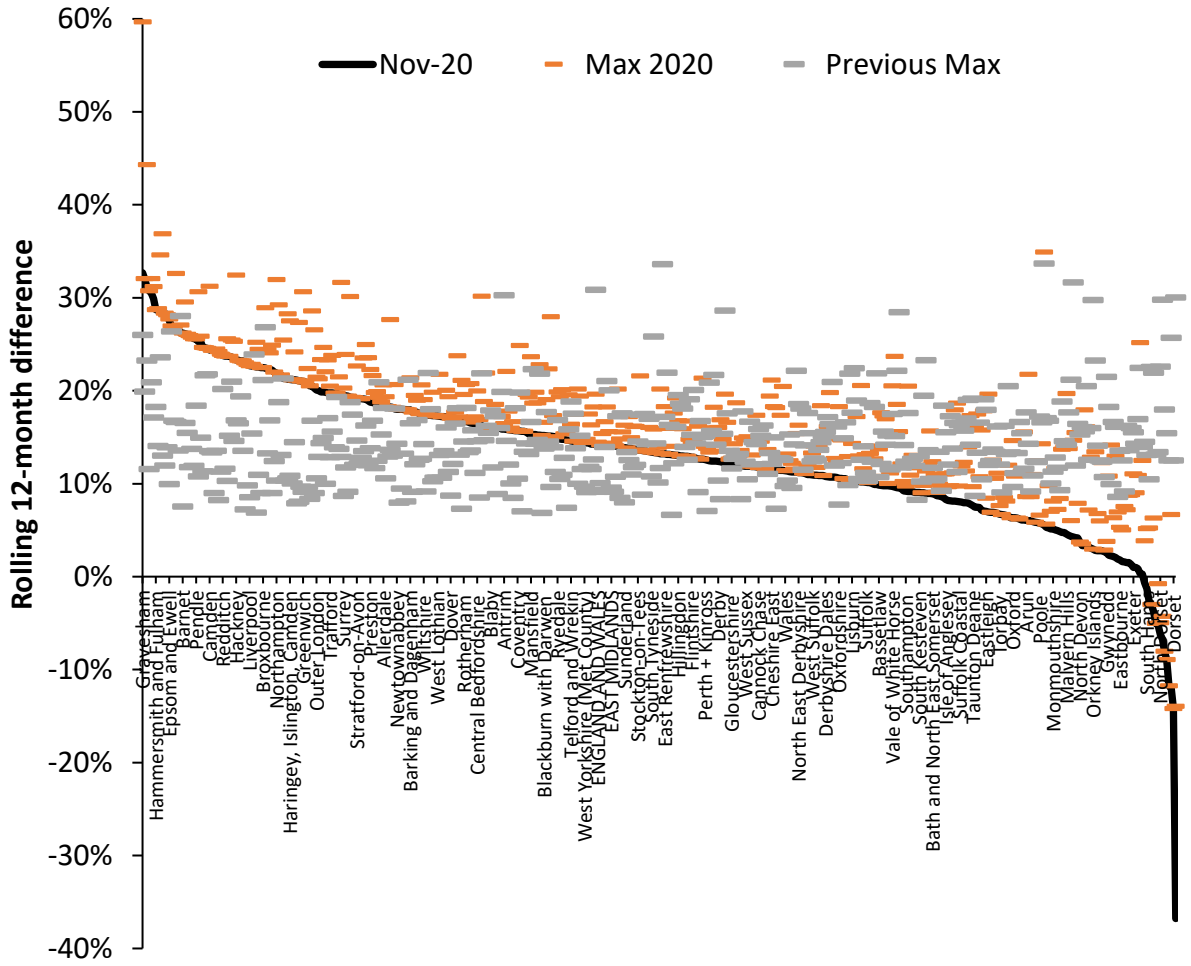
Region/Country	To 25th December	Forecast 31st December	Excess mortality	Commences
North East	4,026	4,025	14.4%	Mar-20
North West	11,445	11,109	15.4%	Feb-20
Yorkshire and The Humber	7,659	7,555	14.4%	Mar-20
East Midlands	6,199	6,241	13.7%	Mar-20
West Midlands	9,474	9,348	17.0%	Mar-20
East	6,041	6,083	10.6%	Feb-20
London	10,146	10,128	20.7%	Feb-20
South East	9,161	9,057	11.1%	Feb-20
South West	4,389	4,285	7.6%	Mar-20
Wales	3,706	3,748	11.2%	Feb-20
Scotland	5,993	6,127	10.6%	Feb-20
Northern Ireland	1,770	1,790	11.4%	Mar-20
England	69,070	69,543	14.0%	Mar-20
UK	79,607	79,075	13.1%	Mar-20

Figure 1: Reported Covid-19 deaths per 1,000 hospital beds, mid-October and end of December 2020



This nicely brings us to the issue as to how excess mortality has been expressed at local authority level throughout the UK. To this end Figure 2 shows the excess mortality to the end of November across the entire UK. This is compared to the maximum point of excess mortality in 2020 and the previous maximum excess since 2001. Only every 6th local authority name is given.

Figure 2: Excess mortality (all cause) for local government areas across the UK up to November 2020. Also shown is any previous maximum year-on-year increase over the past 20 years.



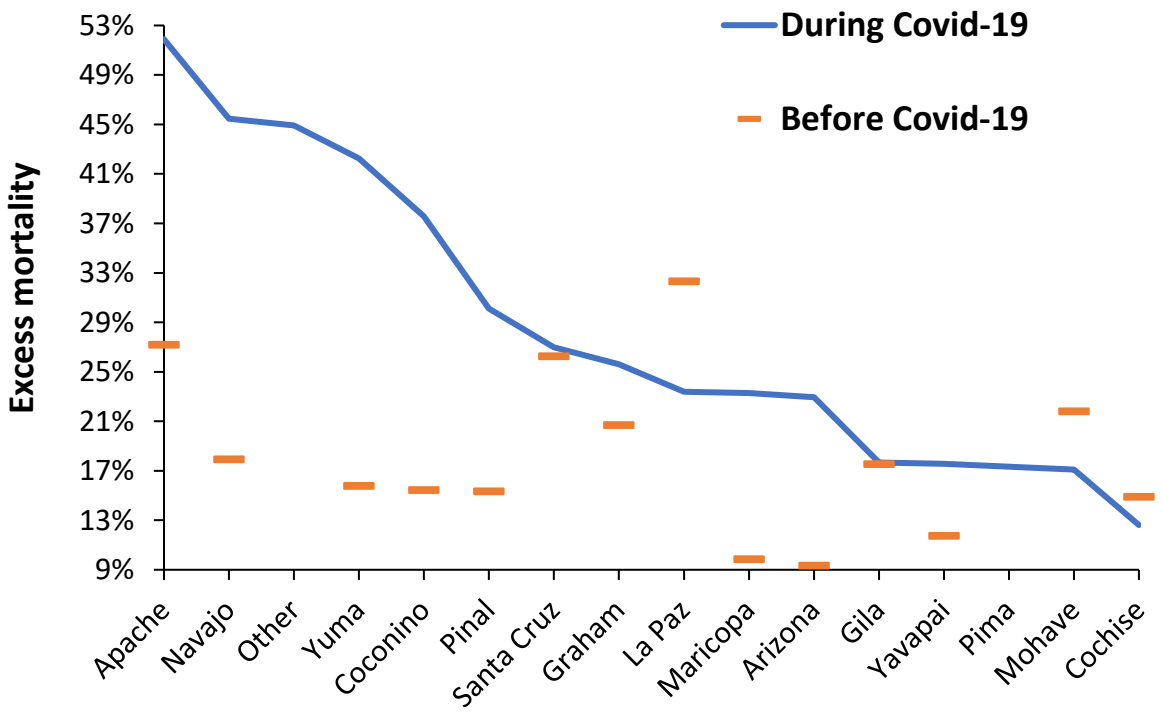
Recall that this is a rolling 12-month difference, hence, Nov-20 implies 12-month total deaths ending November 2020 versus 12-month total deaths ending November 2019. Part XI has already demonstrated that a large shift-down in deaths commenced in 2018 and swept across the UK, followed by a shift-up in deaths in 2019 which swept across the UK just before the arrival of Covid-19 in early 2020. Many of the locations experiencing early shift-up in 2019 will have commenced a shift-down in early 2020 and this shift-down will be acting to diminish the effect of any on-going Covid-related deaths. Do recall

that shift-up and shift-down have no official recognition, but you can see with your own eyes how it is modifying the trends. The local authorities at the far right either never went into shift-up or have experienced a very large shift-down.

Also note that the previous maximum change in deaths since 2001 has so far exceeded the maximum change in 2020 in 38% of local authorities.

Figure 3 simply demonstrates that the UK is no exception to anywhere else in the world. The average for the state of Arizona is 23% excess mortality, while lowest is 12.6% in Cochise. Maricopa which has half the deaths in the state has 23.3% excess mortality. The higher counties (at the left-hand-side) are mostly small and may represent the outcome of a Covid-19 outbreak in a single large town containing all the counties nursing home beds.

Figure 3: Excess mortality (all cause) for counties in Arizona (USA) up to November 2020. Highest excess mortality before Covid-19 covers 2004 to 2019.



However, it confirms my best estimate that the upper limit to Cociv-19 excess mortality is somewhere around 40% to 50%. One standard deviation for Apache is ±3%. As can also be seen excess mortality during Covid-19 has been exceeded in the past in La Paz, Mohave and Cochise. All infectious outbreaks

depend on spatiotemporal granularity. Recall that shift-up and shift-down (see Part XI) plus winter outbreaks act together to regulate excess mortality prior to Covid-19. See Part 3 of the series on financial risk for more detail, http://www.healthfinancejournal.com/~junland/index.php/johcf/issue/view/7

As in Arizona Figure 2 gives a reality check against any previous year-on-year maximum increase in excess mortality in the 20-years prior to Covid-19. As can be seen some 38% of local government areas have previously experienced higher excess mortality than so-far experienced during Covid-19.

Even more fascinating is the local authority areas which have experienced seemingly impossible negative 'excess' mortality during Covid-19. Perhaps the 'experts' will realise something strange is happening.

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

XXIV. Greater than 80,000 excess deaths in the UK by the end of 2020.

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Around 80,000 excess deaths are likely for the UK during 2020

- This is around 11,000 higher than the official Covid-19 deaths
- This gap is partly due to low testing capacity in the early months of the epidemic
- Some may be due to the unintended effects of lock-down
- My suspicion is that the subclinical effects of Covid-19 are more important than realised, see Part XV

Figure 1, Part I has been updated with weekly data ending 11th December 2020, see end of document

- No significant changes in the trends are evident, even though second lockdown commenced on 5th November, i.e. one month earlier
- The trends have been projected to 31st December to arrive at a figure close to 80,000 excess deaths (all-cause mortality)
- A breakdown is given by Region and Country
- Highest population density regions, London and West Midlands, have the highest excess mortality
- The lowest population density region, the South West, has the lowest excess mortality

In this analysis total deaths are used as a proxy for Covid-19 as it is often difficult to determine exactly whose death is directly due to Covid-19 rather than death from other causes alongside Covid-19 infection. The sub-clinical effects of Covid-19 remain largely unexplored. All-cause mortality will also pick up any of the unintended consequences of lockdown.

The earlier parts of this series focussed on excess mortality during the initial parts of the epidemic and on evaluating how much Covid-19 mortality was missed due to low testing capacity.

Issues around international comparison have been addressed, despite early assurances during the Westminster daily briefings that this was “very” difficult.

It is probably time to give an estimate of total excess deaths to the end of 2020. Latest data is to the end of 11th December, and this along with a (conservative) forecast to the end of December is provided in Table 1. Recall that ‘shift down’ is now partly mitigating the full trend (Part XI).

Table 1: Total excess deaths (all-cause mortality) for Covid-19 in the parts of the UK during 2020.

Region	To 11th December	Forecast 31st December	Excess mortality	Commences
North East	3,923	3,998	14.3%	Mar-20
North West	11,613	11,582	16.1%	Feb-20
Yorkshire and The Humber	7,424	7,927	15.1%	Mar-20
East Midlands	5,926	6,476	14.2%	Mar-20
West Midlands	9,271	9,862	18.0%	Mar-20
East	5,940	6,073	10.6%	Feb-20
London	9,961	10,003	20.4%	Feb-20
South East	8,912	8,868	10.9%	Feb-20
South West	4,381	4,241	7.5%	Mar-20
Wales	3,465	3,679	11.0%	Feb-20
Scotland	5,711	6,121	10.6%	Feb-20
Northern Ireland	1,625	1,844	11.7%	Mar-20
England	67,197	69,543	14.0%	Mar-20
UK	77,750	80,252	13.3%	Mar-20

The last time anything like this has happened was back in the winter of 1950/51 when artic conditions prevailed for two months. This was at a time when central heating and home insulation was minimal and not a lot of influenza vaccination either. Excess deaths for England and Wales hit +17.4% compared to just under +14% so far for the Covid-19 epidemic for E&W.

It can be safely assumed that by the end of March 2021 these figures will be somewhat higher. With the new variant of Covid-19, coupled with self-centred behaviour by individuals, I am reluctant to even estimate the potential loss of life.

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

XXIII.Covid-19 infection shows massive spatiotemporal granularity.

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Covid-19 shows slow/fast spread behaviour, i.e., spatiotemporal granularity

- The maximum potential for Covid-19 deaths appears to be a 40% to 50% increase in all-cause mortality
- Thankfully, this requires extremely high population density, as in parts of New York and London, to achieve
- Many local authorities (usually with lower-than-average weighted population density) in the UK were barely affected by the initial outbreak, leaving ample room for the second recent surge following cessation of the first lock down
- All that is required is the irresponsible actions of a few to precipitate new outbreaks
- Vaccination may help to circumvent the effects of seemingly entrenched poor behaviour displayed by certain individuals

Competition between pathogens is a well-researched area

- There is evidence that all-cause mortality dipped during March when Covid-19 was rapidly spreading
- During 2020 most notifiable infectious diseases showed a large decrease
- How much of this was due to lock-down and social distancing and/or due to competition between Covid-19 and other pathogens is unknown

Figure 1, Part I has been updated with weekly data ending 4th December 2020, see end of document

- No significant changes in the trends are evident, even though second lockdown commenced on 5th November, i.e. one month earlier
- It is possible that all-cause mortality is measuring a far more nuanced (although lagged) view than just direct Covid-19 infection rates
- In the rolling total chart London was only beginning to show an increase in deaths

In this analysis total deaths are used as a proxy for Covid-19 as it is often difficult to determine exactly whose death is directly due to Covid-19 rather than death from other causes alongside Covid-19 infection. All-cause mortality will also pick up any of the unintended consequences of lockdown and wider media fear-induced behaviours. As the old nursery rhyme goes "Who killed cock robin?"

In Part 1 of a 4-part soon to be published series on health care financial and capacity risk (see http://www.healthfinancejournal.com/~junland/index.php/johcf/issue/view/7) I have demonstrated massive spatiotemporal granularity in the spread of Covid-19 across the USA. This study utilized county-level data to demonstrate that on 16th October 2020 some 416 counties had yet to report any Covid-19 deaths, a further 285 had only 1 Covid-19 death. Some 723 (23%) of counties had less than 1% excess deaths from Covid-19, and 1,206 (39%) had less than 2% excess deaths, i.e., large parts of the USA had been at that point relatively unaffected by Covid-19. Just 15 counties (cities) accounted for over 27% of total Covid-19 deaths. Spread across the USA is still ongoing in December.

Covid-19 shows a cycle of slow/fast spread. As is always the case, infection travels at the speed of man. Hence the principle behind lock-down.

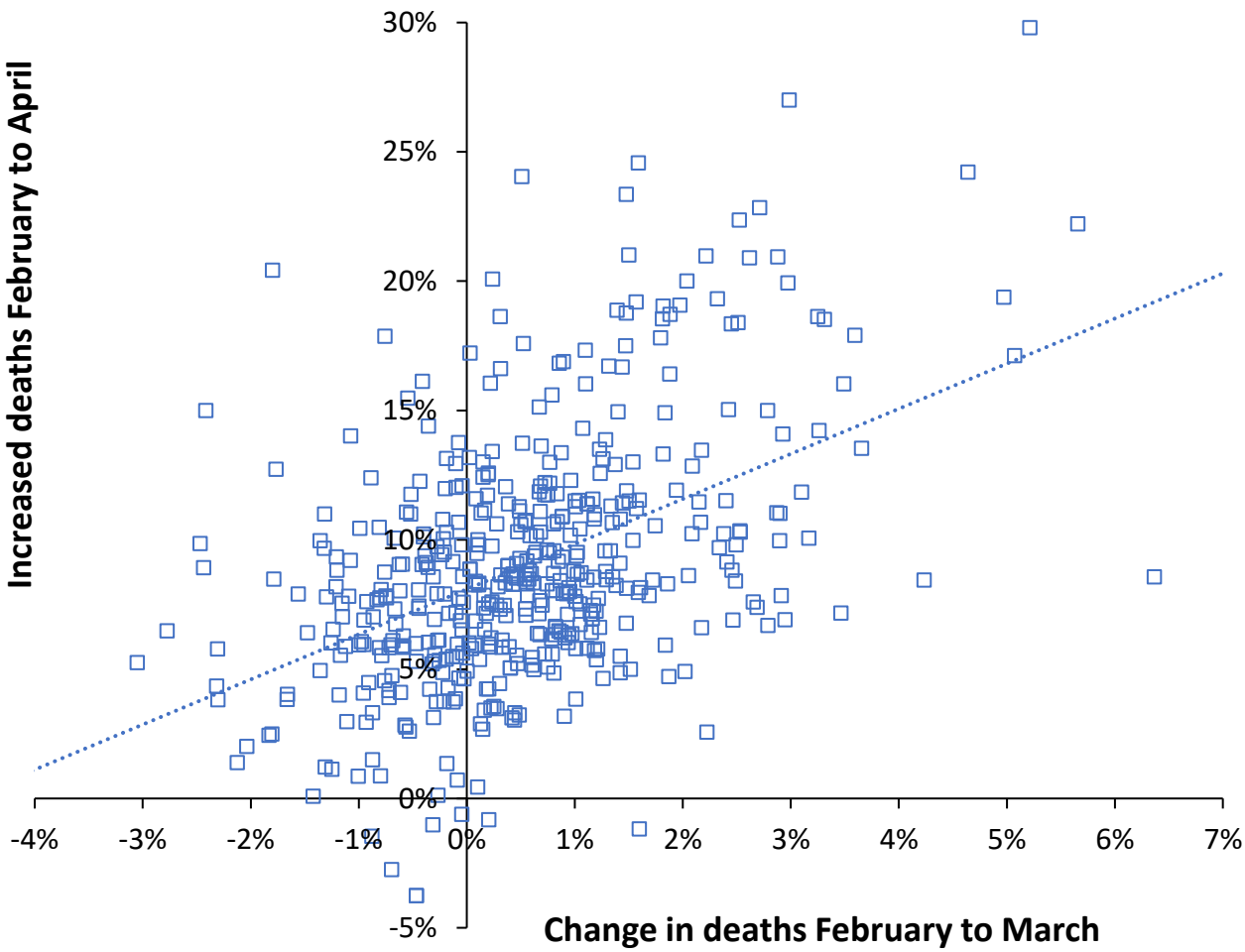
Is there any evidence for this slow/fast cycle of transmission in the UK? Indeed, amply so. To this end Figure 1 shows the spread of excess deaths (all-cause mortality) in the UK during March and April 2020. On the X-axis is the increase in deaths between February and March 2020 after adjusting for the effect of the step-up in deaths travelling across the UK during 2019 (see Parts X and XI). The Y-axis shows the increase in deaths from February to April. April is the month when the explosion in deaths is seen in many areas. The data in Figure 1 also uses a rolling 12-month total to avoid small-number scatter from the use of monthly data. The first reports of deaths due to Covid-19 commence around 23rd of March, however, there is probably under-reporting due to lack of testing capacity at that time.

There are several key points.

1. Areas hit hardest in March (>2% increased deaths) generally show highest cumulative deaths by April (>15% increased deaths)
2. Note the various areas (local authorities) with less than a 5% increase in deaths by the end of April, especially the cluster close to 0%

Hence, even in high population density UK there is evidence for high levels of spatiotemporal granularity. Given the evidence that Covid-19 can precipitate up to 40% to 50% increases in all-cause mortality (an alarming statistic), Figure 1 tells us that there was plenty of potential for further spread after the first lock down was lifted.

Figure 1: Change in total deaths during March 2020 compared to the cumulative increase by the end of April 2020.



Thankfully, such high potential is reserved for exceeding high population densities seen in parts of New York and London. Nevertheless, it only takes the

irresponsible or unknowing action of certain individuals to spread contagion wider afield.

Hopefully, vaccination will break this cycle of lockdown followed by irresponsible behaviour, followed by lockdown, ad infinitum.

However, the existence of negative deaths in March is of considerable significance because the possibility exists that the spread of Covid-19 from December 2019 onward was gradually acting to displace other pathogens such as influenza. This effect arises due to spatial competition between pathogens (Phys. Rev. E 99, 022308 (2019) - Persistent spatial patterns of interacting contagions (aps.org)). This is a well-researched field, and in Part 3 of the series on financial and capacity risk in health care I present evidence that influenza interacts with other pathogens to create excess winter mortality. The likelihood being that excess mortality attributed to influenza may well be an overestimate.

However, is it possible that Covid-19 could be a powerful competitor to influenza?

Previous influenza vaccination has been associated in one study with higher rates of Covid-19 deaths (Positive association between COVID-19 deaths and influenza vaccination rates in elderly people worldwide [PeerJ]). Recall that correlation is not direct evidence for causation, it merely raises interesting possibilities.

However a Brazilian study showed the opposite for ***recent influenza vaccination, even if administered after Covid-19 infection*** "patients who received a recent influenza vaccine experienced on average 8% lower odds of needing intensive care treatment (95% CIs [0.86, 0.99]), 18% lower odds of requiring invasive respiratory support (0.74, 0.88) and 17% lower odds of death (0.75, 0.89)" Inactivated trivalent influenza vaccine is associated with lower mortality among Covid-19 patients in Brazil | medRxiv

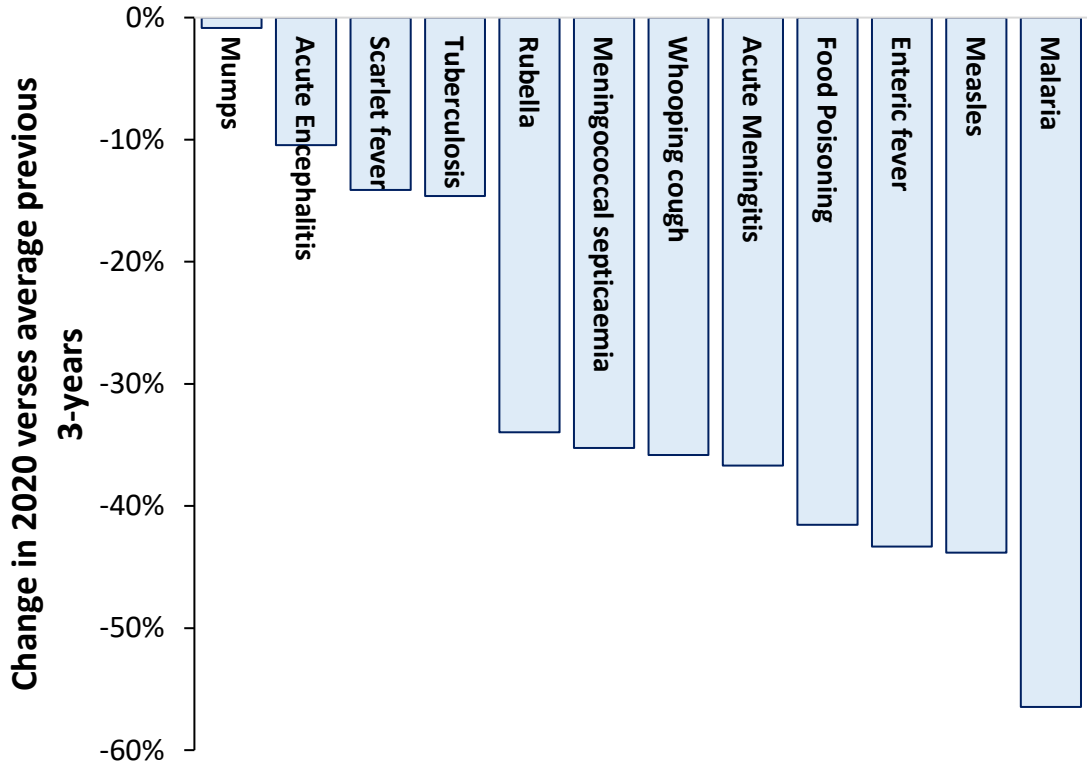
Another study showed that "The risk of testing positive for SARS-CoV-2 was 68% ***lower*** among influenza positive cases, suggesting possible pathogenic competition between the two viruses. Patients with a coinfection had a risk of death of 5.92-times (CI, 3.21-10.91) greater than among those with neither influenza nor SARS-CoV-2 suggesting possible synergistic effects in coinfected individuals. The odds of ventilator use or death and ICU admission or death was greatest among coinfection patients showing strong evidence of an interaction effect compared to SARS-CoV-2/influenza acting independently".

(Interactions between SARS-CoV-2 and Influenza and the impact of coinfection on disease severity: A test negative design | medRxiv)

One study suggested that the 2019/20 influenza season was cut short by the arrival of Covid-19 Assessing the interactions between COVID-19 and influenza in the United States | medRxiv and another study found thar rates of co-infection with Covid-19 and other common respiratory pathogens was surprisingly low Rates of coinfection with other respiratory pathogens in patients positive for coronavirus disease 2019 (COVID-19) - PubMed (nih.gov) – somewhat surprising since co-infection is usually moderately high.

A perusal of PHE influenza reports for the 2019/20 winter show a similar story with influenza all but disappearing by the end of week 12 (March). National_influenza_report_28_May_2020_week_22.pdf (publishing.service.gov.uk) Other respiratory pathogens such as RSV may also have been affected. As at the 29th of November both RSV and influenza remain low. Weekly national Influenza and COVID19 surveillance report: week 49 (publishing.service.gov.uk)

Figure 2: Reduction in reported cases of suspected notifiable infectious diseases at week 49 in 2020 versus the average at week 49 in 2017 to 2019. The change has had been reduced by 1 standard deviation associated with the years 2017 to 2019 to avoid over-stating the change.



Clearly something is going on between Covid-19 and other respiratory pathogens which support the idea that a drop in all-cause mortality did occur in March as Covid-19 muscled in and displaced the other thugs (pathogens) on the block.

Finally, Figure 2 shows the change in reported cases of suspected infectious diseases at week 49 in 2020 versus the average at week 49 from 2017 to 2019. Data is from Public health England. Noids weekly report 202049 (publishing.service.gov.uk)

Lockdown between 23 March and 15 June and ensuing social distancing will have made some contribution to these reductions, however, this is a massive reduction in reported cases of notifiable infectious diseases during 2020. Is Covid-19 so powerful as to change the entire landscape of infectious diseases via inter-species competition?

Diseases on the left-hand side of Figure 2 are more likely to be due to lock-down. The data for mumps shows a raw 40% increase, however, the standard deviation associated with mumps is high and so the 40% increases reduces to close to 0% after subtracting 1 standard deviation.

Those at the right-hand side are most likely to be both sensitive to lock-down and competition between Covid-19 and other pathogens. For example, it is unlikely that people with Meningococcal septicaemia or acute meningitis are failing to seek medical help.

The 15% reduction for tuberculosis is probably a measure of the reluctance of people to seek medical advice during the wider Covid-19 epidemic.

Hence, nothing has been conclusively proven, however we do have some highly likely possibilities. Curiously Covid-19 could present a biological cure for malaria, although suitably modified strains would be required to achieve this end.

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

XXII. Countries with the oldest populations have the lowest Covid-19 death rates.

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- **It is widely recognised that the Covid-19 death rate increases exponentially with age**
- **However, somewhat paradoxically, countries with the oldest populations tend to have the lowest excess Covid-19 deaths**
- **This conundrum is explained by the simple fact that spread of Covid-19 is mainly due to young adults**
    - Young adults will mainly have asymptomatic infections
    - They will be less inclined to follow social distancing rules
    - They are far more likely to indulge in high-risk activities such as attending crowded pubs, clubs, raves, etc
    - They are more likely to be in low-paid occupations with financial pressures necessitating continued work even when ill
    - In the UK young adults aged 20-29 have consistently had the highest rates of Covid-19 infection

Figure 1, Part I has been updated with weekly data ending 27th November 2020, see page 88

- No significant changes in the trends are evident, even though second lockdown commenced on 5th November
- It is possible that all-cause mortality is measuring a far more nuanced (although lagged) view than just direct Covid-19 infection rates

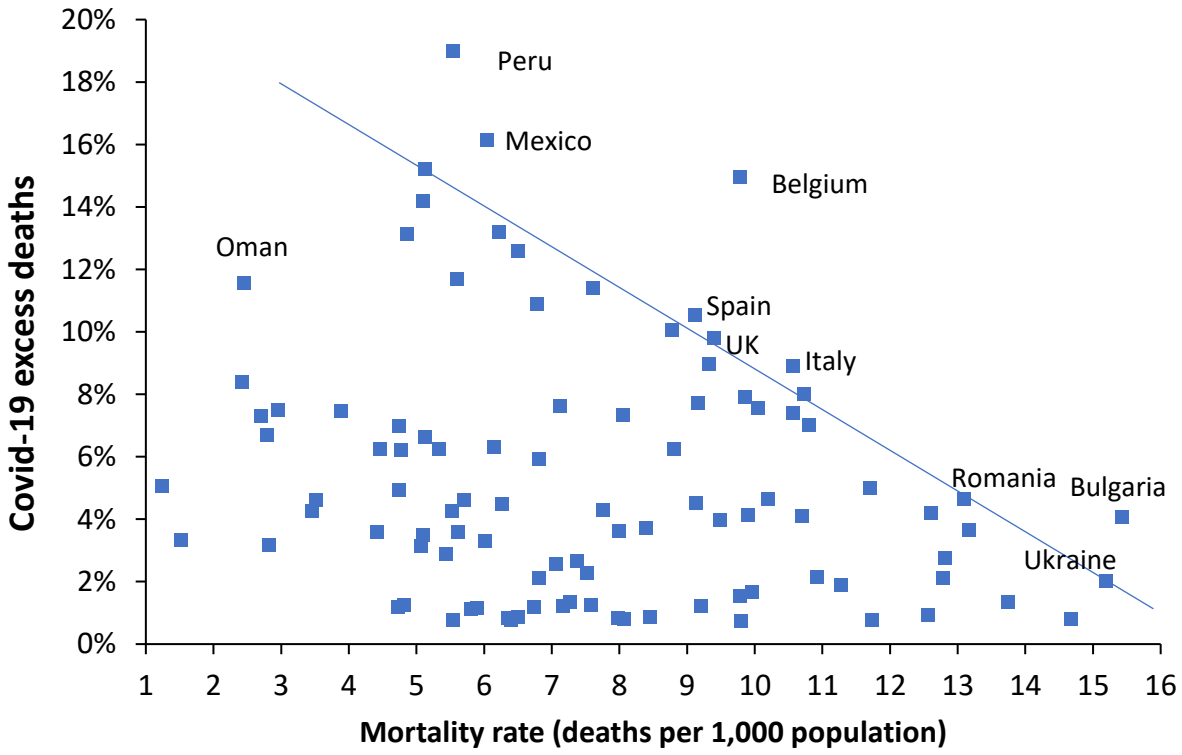
In this analysis total deaths are used as a proxy for Covid-19 as it is often difficult to determine exactly whose death is directly due to Covid-19 rather than death from other causes alongside Covid-19 infection.

All-cause mortality will also pick up any of the unintended consequences of lockdown and wider media fear-induced behaviours. As the old nursery rhyme goes "Who killed cock robin?"

As we all know the elderly are far more likely to die from Covid-19 than the young. It would therefore be reasonable to expect that countries with a higher proportion of the elderly should show higher rates of excess mortality due to Covid-19. As I always say, beware the hidden assumptions.

Figure 1 demonstrates that the opposite is seemingly true. Firstly, it is pleasing to note that the UK is no better or worse than other European countries – although slightly worse that the USA where issues of population density are far more complex. This analysis reveals that Belgium is the only noteworthy European outlier. Covid-19 reported total deaths by country were as of 3rd December 2020.

Figure 1: Covid-19 excess mortality (as Covid-19 reported deaths per 100 expected all-cause deaths in 2020 in the absence of Covid-19) versus the crude mortality rate per 1,000 population (before the arrival of Covid-19) as a measure of the population age structure



Countries which implemented draconian lockdown and even stopped international travel lie along the bottom of the chart, the likes of Australia, Taiwan, and New Zealand. Countries under-reporting Covid-19 deaths will also appear lower down in the chart. Countries with the lowest ***weighted*** population density will lie further down in the chart as will countries where social behaviour is more unified (such as Singapore, South Korea).

How do we explain this huge discrepancy? The answer is relatively simple. It is the young ***not*** the elderly who spread the disease.

- Young adults will mainly have asymptomatic or minor symptom infections
- They will be less inclined to follow social distancing rules
- They are far more likely to indulge in high-risk activities such as attending crowded pubs, clubs, raves, etc
- They are more likely to be in low-paid occupations with financial pressures necessitating continued work even when moderately ill
- They are also most likely to have additional work-related contacts
- In the UK young adults aged 20-29 have consistently had the highest rates of Covid-19 infection
- Covid-19 seroprevalence (among blood donors) has always been highest in the group aged 17 to 29 and has always been highest in London – although recently overtaken by the North West, where daily rates of all-cause deaths rose after the 11th October – despite earlier regional lock downs. See PHE link below

An internet search will quickly reveal that University students have created problems around the world not just in the UK. Seemingly uniform behaviour patterns.

I recall reading a study from Germany which reached the same conclusion and the same has applied even in India, see Epidemiology and transmission dynamics of COVID-19 in two Indian states | Science (sciencemag.org)

The latest PHE weekly report Weekly national Influenza and COVID19 surveillance report: week 49 (publishing.service.gov.uk) released 3rd December shows that Covid-19 rates among the Other and Pakistani groups are declining rapidly – which must be good news for the elderly in these communities.

However, it must be pointed out that Covid-19 infection rates do remain high up to age 50-59 which probably reflects work-based exposure.

So, anyone over the age of 60 can quite confidently attribute the main cause of the Covid pandemic spreading as being the younger generation whose altruism can be readily called into question.

Indeed, the whole Covid-19 story, from its very beginning is one about human behaviour.

Turning to more mundane matters Figure 2 shows the proportion of total weekly deaths in England and Wales attributed to Covid-19. Despite weeks of national publicity parts of Yorkshire and the Humber continue to exhibit disappointing trends during a dangerous epidemic. Yes, we all understand that there may be mitigating factors, but nevertheless individuals are making choices incompatible with the good of others.

Figure 2: Proportion of total deaths in which Covid-19 has been implicated as a possible cause

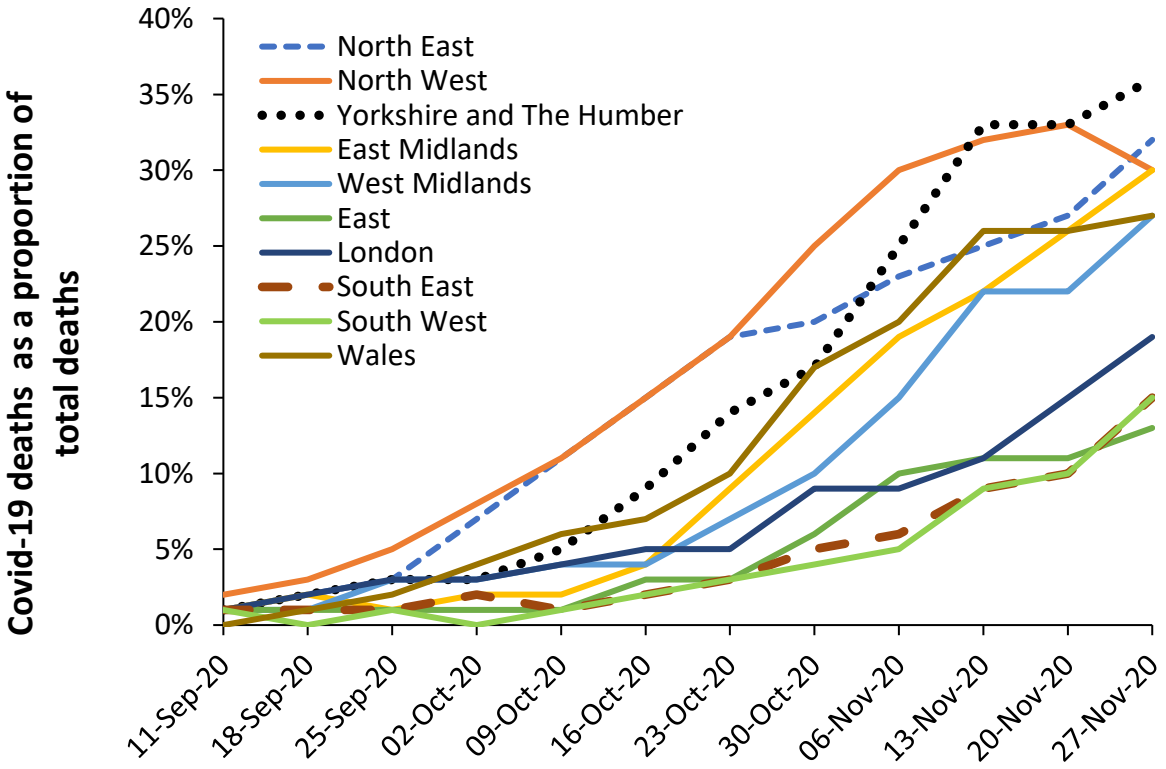


Figure 1 in Part 1 has been updated to the week ending 27th November. Recall that all-cause mortality is the figure that does not lie. As expected, total deaths in North East, North West and Yorkshire and Humber continued to rise.

Deaths (all-cause mortality) in London do not seem to follow the slope of the Covid-19 attributed deaths. Clearly the issues are more complex than first appears.

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

XXI. Some regions are still least affected.

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Figure 1, Part I has been updated with weekly data ending 13th November 2020, see page 88

- Northern Ireland continues to show strong growth in the rolling 52-week total deaths
- This growth in rolling 52-week total deaths in NI commenced around 14th August
- The highest increment in total deaths over the previous week was (in decreasing order): North West > Yorkshire & Humber > East and West Midlands, Northern Ireland > Scotland > Wales, South West, East of England, London. Clearly the whole of Wales and Scotland did not need blanket lockdown. Such decisions are political.
- Highest rate of growth over the past 3 weeks has been (in decreasing order): East Midlands > London > Yorkshire & Humber > West Midlands > North West > East of England
- Local hot spots will always exist and will drive these regional figures
- Is anyone using AI to do pre-emptive local lockdowns?

In this analysis total deaths are used as a proxy for Covid-19 as it is often difficult to determine exactly whose death is directly due to Covid-19 rather than death from other causes along side Covid-19 infection. As the old nursery rhyme goes "Who killed cock robin?"

As always, deaths are a lagging indicator, which for many infectious outbreaks occur 4 to 8 weeks after an increase in hospital admissions

As repeatedly pointed out in this series low population density locations remain at low risk of Covid-19 spread. In these areas sensible baseline precautions are all that is required.

We really do need to move from retrospective lockdown into the realm of pre-emptive lockdown using AI tools. All the base population data (including population density and household crowding) is collected at output area (OA) level (an OA has around 300 residents) and the OA classification (OAC) gives further insight into social groupings and likely health risk behaviour. Indeed, all Covid-19 testing has a post code which can be automatically linked to an OA code which automatically links to an OAC social group. As I have said before the data and tools are all there waiting to be used.

According to the latest PHE weekly report (PHE document (publishing.service.gov.uk) the 'Other' ethnic group, which probably covers members of the EU, has overtaken Pakistani and continues to rise. Rates of Covid-19 infection among Pakistanis are showing signs of reducing. The first time since week 35.

Care Homes continue to dominate the number of acute respiratory outbreak incidents, especially those from Covid-19 and the most likely source will be staff. By this point one would have thought that regular testing of every Care Home worker was a national priority, although weekly testing is being offered from 20th November and this includes home care agencies.

If I may add, postmen and delivery drivers all seem to be playing their part. The parcel goes on the doorstep and they hastily bid a retreat to 20 paces. Well done all!

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak:

XX. Was a second UK lockdown justified?

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Figure 1, Part I has been updated with weekly data ending 6th November 2020, see page 86

- Northern Ireland continues to show strong growth in total deaths
- This growth in NI commenced back on 14th August and a local lockdown probably should have been implemented far earlier than was the case
- The North East, North West, Scotland, and Wales all showed growth from around the end of September. Local lockdowns were correctly implemented in some parts of these areas
- London, East of England, and the South West are not showing strong evidence (as yet) of the need for a blanket lockdown, although local hot spots probably exist

In this analysis total deaths are used as a proxy for Covid-19 as it is often difficult to determine exactly whose death is directly due to Covid-19

As always, deaths are a lagging indicator, which for many infectious outbreaks occur 4 to 8 weeks after an increase in hospital admissions

As repeatedly pointed out in this series low population density locations remain at low risk of Covid-19 spread. In these areas sensible baseline precautions are all that is required.

I would even go so far as to say that pubs in remote areas and small villages could probably remain open with sensible social distancing. Indeed, many of these had already implemented such measures.

Irresponsible behaviour is nevertheless a hallmark of some sections of the community.

Apparently when a local lockdown was implemented in Barrow, Cumbria, all the dedicated drinkers simply drove to nearby Ulverston. Such is life.

Covid-19 cases continue to remain high among those aged 20 to 29 – what a surprise!

Yorkshire and Humber have overtaken the North West as the highest infection rate.

Incidence in what PHE call the 'Other' ethnic group is now equal to that for Pakistani's. Rates among Pakistani's continue to rise.

Rates among Mixed ethnic groups and Black/African/Caribbean remain the lowest and appear to have flattened. Roughly 4-times lower than the Pakistani/Other groups. Clearly some groups are making determined efforts to protect their health.

These factoids come from the most recent PHE weekly report https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/934810/Weekly_Flu_and_COVID-19_report_w46_FINAL.PDF

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak? XVIX. Deaths continue to rise in Northern Ireland

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Data from UK regional government areas at 16th October 2020 is used to demonstrate how relatively low population density in Northern Ireland placed it in the position for ongoing spread of Covid-19 and associated deaths.

- Figure 1, Part I has been updated
- Northern Ireland has been showing a progressive increase in total deaths since the earlier peak up to the end of June
- London and East of England continue to show a decline in the rolling 52-week total deaths
- Total deaths may well escalate should there be a bad influenza outbreak In Part XVIII predictions were made regarding which areas were susceptible to a 'second wave'.
- Areas which have experienced low excess mortality up to September are advised to take extra precautions, especially for the elderly
- Ethnic groups, especially Pakistani and Other ethnicity, appear to be experiencing higher infection rates and the elderly in those groups are likewise advised to take prudent steps to avoid infection, see https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/928766/Weekly_Flu_and_COVID19_report_w43_FINAL.pdf

This susceptibility to further spread was predicted in Part XVIII and is not confined to Northern Ireland, indeed any area which experienced low Covid-19 penetration in the early parts of the epidemic While low population density remains the single biggest contributor to low Covid-19 deaths in the early parts of the outbreak, there are exceptions when risk factors are present

With the advent of winter and confounding influenza like illness (ILI) it is suggested that scarce testing resources should be switched to the over 50's, key workers, and those at highest risk of acute infection – who will live in particular locations measures should focus on those MSOA in the UK with previously low Covid-19 deaths (see Parts XII and XIII) and high-risk factors.

Strictly speaking there is no second wave only a continuation of infectious spread into areas not greatly affected in the early parts of the epidemic.

Northern Ireland experienced low Covid-19 deaths in the early part of the epidemic due to low population density. Deaths were mainly concentrated in (parts of) Belfast. Overall trends in total deaths can be seen in the updated Figure 1 in Part 1 of this series, at the end of this document. Since June deaths in Northern Ireland have continued to escalate.

From this point onward influenza will become increasingly important especially as influenza like illness (ILI) will act as a confounding factor and could overwhelm testing capacity. In some parts of the world children under 5's do not get routinely tested due to low risk of serious illness and seemingly low transmission to adults. The government needs to decide if it wishes to expand testing capacity ad infinitum or to take a more focussed approach.

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

XVIII. Which communities in the UK are susceptible to the 'second' wave

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Data from UK local and regional government areas *at the end of August* is used to demonstrate the relatively slow spread of Covid-19 throughout the UK.

- This is entirely like that demonstrated in the USA in Parts XVI and XVII
- Maximum deaths had been reached in 11% of local government areas by April, mainly in parts of London or other sporadic locations such as Colchester and Maldon in Essex or Watford in Hertfordshire
- 28% of local government areas show an August peak, which implies that the cumulative peak of deaths is in August or September or even later
- Recall that each local government area is the composite of spread throughout the smaller parts of that area

While low population density remains the single biggest contributor to low Covid-19 deaths, there are exceptions when risk factors are present

- Areas which have experienced low excess mortality up to August are advised to take extra precautions, especially if they are elderly (see Figure 2)
- Particular ethnic groups appear to be experiencing higher infection rates and the elderly in those groups are likewise advised to take prudent steps to avoid infection

It is suggested that scarce testing resources should be switched to the over 50's, key workers, and those at highest risk of acute infection – who will live in particular locations

- Precautionary measures should focus on those MSOA in the UK with low Covid-19 deaths (see Parts XII and XIII) and high-risk factors

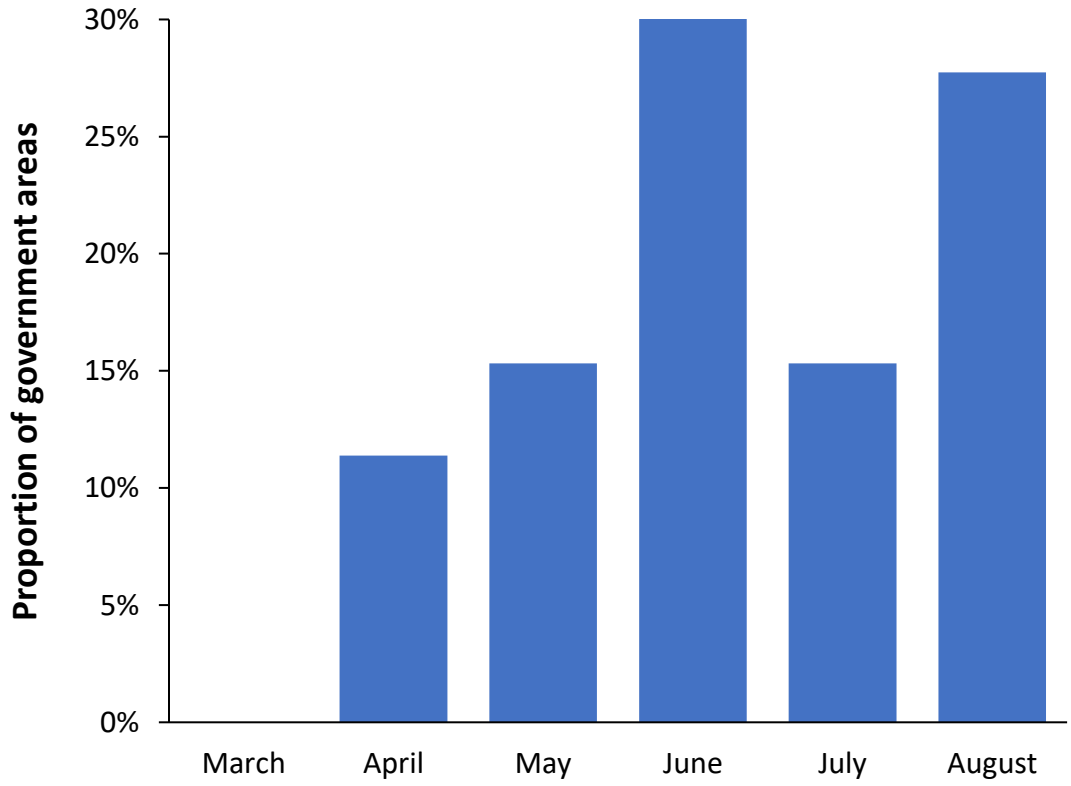
Figure 1, Part I has been updated

- At 11th September, the rolling 52-week all-cause mortality was declining across large regions in the UK, except in Northern Ireland and the South East of England
- However, regional averages can be deceptive as per slow spread demonstrated in Figure 1 in this part XVIII

Part XVII presented a method for determining which counties in the USA were at most risk of the 'second' wave of Covid-19 infection. Basically, these are higher population density counties which have so far evaded major infection with Covid-19. Which takes us back to the issue that all infectious outbreaks exhibit high granularity.

To illustrate, Figure 1 shows the month in which the rolling 12-month total of deaths reaches its maximum in a range of local and regional government areas in England, Wales, and Scotland.

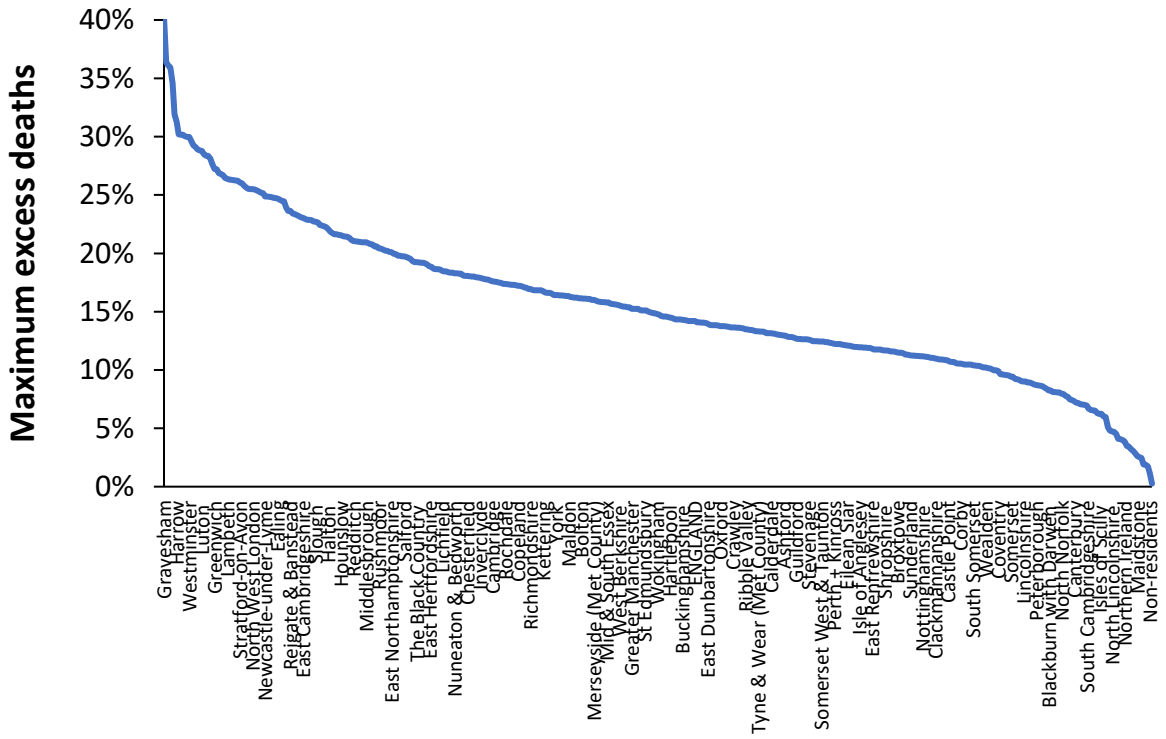
Figure 1: Month in 2020 at which the rolling 12-month total of excess deaths reaches a maximum.



As is usual in this series, total deaths (all-cause mortality) are used as a proxy for excess mortality due to Covid-19 simply because testing was so inadequate in the early months of the outbreak.

The key point from Figure 1 is that slow spread of Covid-19 across the UK has occurred just as it has been demonstrated for the USA.

The next point is which locations remain susceptible to Covid-19 infection. This is addressed in Figure 2 where the maximum excess mortality in 2020 is given for each local government area. Note than only every 6th name is given in Figure 2. Maximum mortality has been adjusted to account for shift high/low prior to the Covid-19 epidemic as per Part XI.



The key point from Figure 2 is that locations on the left-hand side have experienced high exposure to Covid-19 while locations on the right-hand side have not. Non-residents of the UK have seemingly avoided Covid-19 excess mortality.

The basic advice is that residents in locations on the right-hand side need to ensure strict social distancing and other protective measures. In many instances this may be helped by low population density.

Finally, we need to investigate the issue of which age groups are experiencing high rates of Covid-19 infection and hence pose the greatest threat to the elderly.

Public Health England publishes a weekly Covid-19 report called the National Covid-19 Surveillance Report https://www.gov.uk/government/publications/national-covid-19-surveillance-reports.

The latest of these reports is for the week ending 25th September https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/921561/Weekly_COVID19_Surveillance_Report_week_39_FINAL.pdf

On pages 6 and 7 of this report it is clearly detailed that persons aged 20 to 29 have the highest Covid-19 infection rate both as absolute numbers and cases per 100,000. This is almost certainly an underestimate of the true rate due to high levels of asymptomatic infection. This is followed by those aged 30 to 39. Lowest rates are among those aged 0 to 4 and 70 to 79.

It would seem prudent for older persons to avoid close contact with younger adults.

Figure 13 on Page 13 then details infection rates by ethnic group.

The reader is advised to refer to this to ascertain if they belong to an ethnic group experiencing high infection rates and to take appropriate personal measures to avoid infection, especially if they are elderly.

Returning to Figure 2. Every community has a maximum possible Covid-19 excess mortality rate. Spread of the virus is facilitated by population density and related household crowding, plus high-risk activities seen in young adults. Once spread has been achieved risk of acute illness and death are regulated by the known risk factors of age, obesity, diabetes, etc, etc. Some communities at the left-hand side of Figure 2 have already attained close to their maximum.

It is therefore perfectly feasible to create a risk score for every community and to implement targeted measures suited to that community. ***Blanket lockdown measures are not required and indeed can be economically harmful.***

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

XVII. Who is susceptible to the 'second' wave

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Data from the USA is used to illustrate the fact that certain communities have seen very few Covid-19 deaths and are probably highly susceptible to a 'second' wave

- The city of San Francisco is one example which in mid-September had only experienced 1.5% excess Covid-19 deaths relative to 2018 total deaths
- Norfolk City in Virginia is another example with relatively high population density but only 3% excess Covid19 deaths
    - 42% black, 8% Latino, 20% in poverty

While low population density remains the single biggest contributor to low Covid-19 deaths, there are exceptions when risk factors are present

- The county of Hancock in Georgia is one example with 40% excess Covid-19 deaths relative to 2018
    - 71% are black, 24% are aged 65+ and 31% live in poverty
    - Weighted population density is probably 700 persons per square mile

It is suggested that scarce testing resources should be switched to the over 50's, key workers, and those at highest risk of acute infection

Precautionary measures should focus on those MSOA in the UK with low Covid-19 deaths (see Parts XII and XIII) and high-risk factors

Figure 1, Part I has been updated

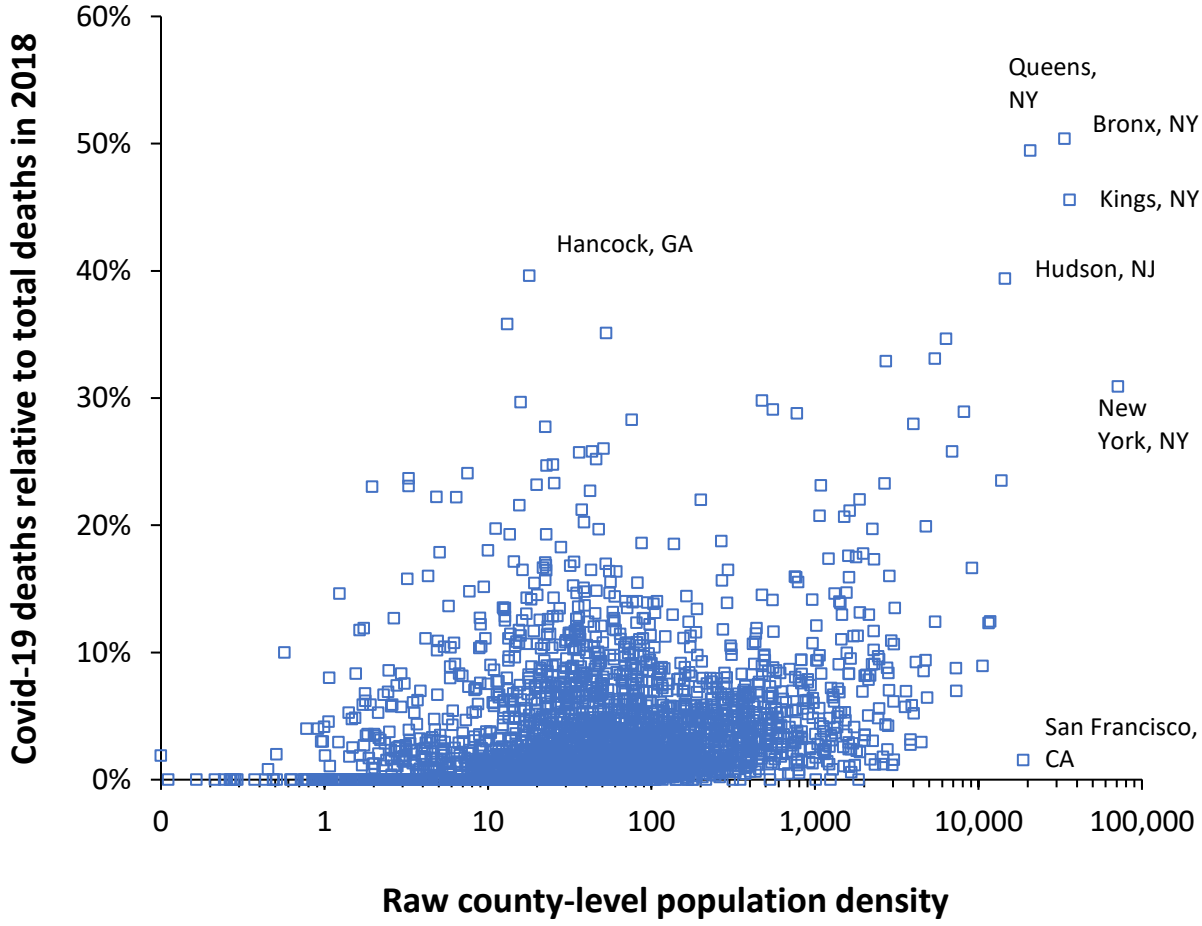
- At 11th September, the rolling 52-week all-cause mortality was declining

In Part XVI it was pointed out that there was no second wave as such, only a single wave seeking out new communities with previous low infection rates. Data from the USA was used to illustrate.

It has been pointed out that low weighted population density remains the single most protective factor against the spread of Covid-19. Given the huge size of the USA data at county level will once again be used to illustrate which communities remain at high risk. Unfortunately, population density in Figure 1 has not been weighted, however, it remains illustrative of the principles.

The official number of Covid-19 deaths in each county on 10th September are given relative to total deaths (all-cause mortality) in 2018 as the reference year in the absence of Covid-19.

Figure 1: Relative Covid-19 deaths for US Counties



As is expected different parts of the state of New York show high relative

deaths and probably only need to maintain usual levels of protective measures.

On the other hand, San Francisco would be wise to implement more stringent measures along with other places like Norfolk City in Virginia which has had low relative Covid-19 deaths at 3% but has relatively high population density (4,500 persons per square mile) plus moderately high-risk factors such as 42% black, 8% Latino, and 20% living in poverty - most of whom will probably live at higher population density than the city average.

Hancock county in Georgia is an example of a relatively low population density county with high relative Covid-19 deaths (40%). There were only 100 deaths in 2018 so 40 Covid-19 deaths are remarkably high. All the key risk factors are present with 71% black, 24% aged 65+ and 31% live in poverty. The high deaths could well have arisen from a nursing home(s).

These factors can easily be reverse engineered to locate those MSOA in the UK which remain at high risk of Covid-19 as discussed in Parts XII and XIII.

Surely such a targeted approach is to be preferred to the blanket measures recently introduced across the UK.

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How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

XVI. Travelling waves and the dreaded 'second' wave

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Data from the USA is used to illustrate the fact that there is no second wave, only a single wave gradually spreading to susceptible communities

- The travelling wave took five months to reach all counties in the state of Alabama
- Seven US states did not experience the maximum rate of Covid-19 deaths until September
- Ten US states were hit by the travelling wave before May
- States experiencing early maximum deaths do not repeat this at a later time

Maximum Covid-19 excess mortality occurred in the Bronx, New York which is similar in magnitude to certain parts of London

- High population density and BAME communities are common features

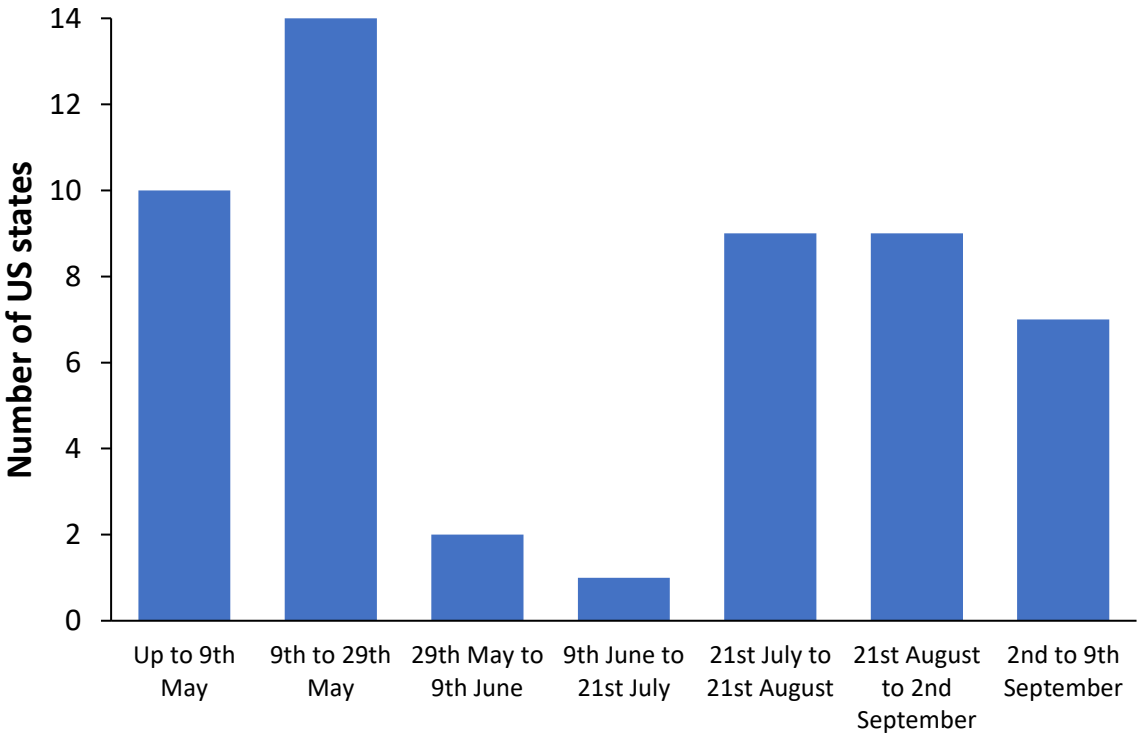
It is suggested that scarce testing resources should be switched to the over 50's, key workers, and those at highest risk of acute infection

In the seminal paper by Grenfell et al in 2001 "Travelling waves and spatial hierarchies in measles epidemics" (see https://www.nature.com/articles/414716a) we have a perfect description of the international spread of Covid-19, and a potential answer to the question as to whether we will ***all*** be engulfed in the 'second' wave.

Figure 1 gives huge insight into the two waves which swept across the USA as it shows which states had the maximum daily increase in deaths during which periods. New York is among those states in the first bar, however, all states

affected in the first wave were exempted from the second wave and vice versa, i.e. at state level there is only one wave!

Figure 1: Time at which US states experience their maximum rate of increase in Covid-19 deaths



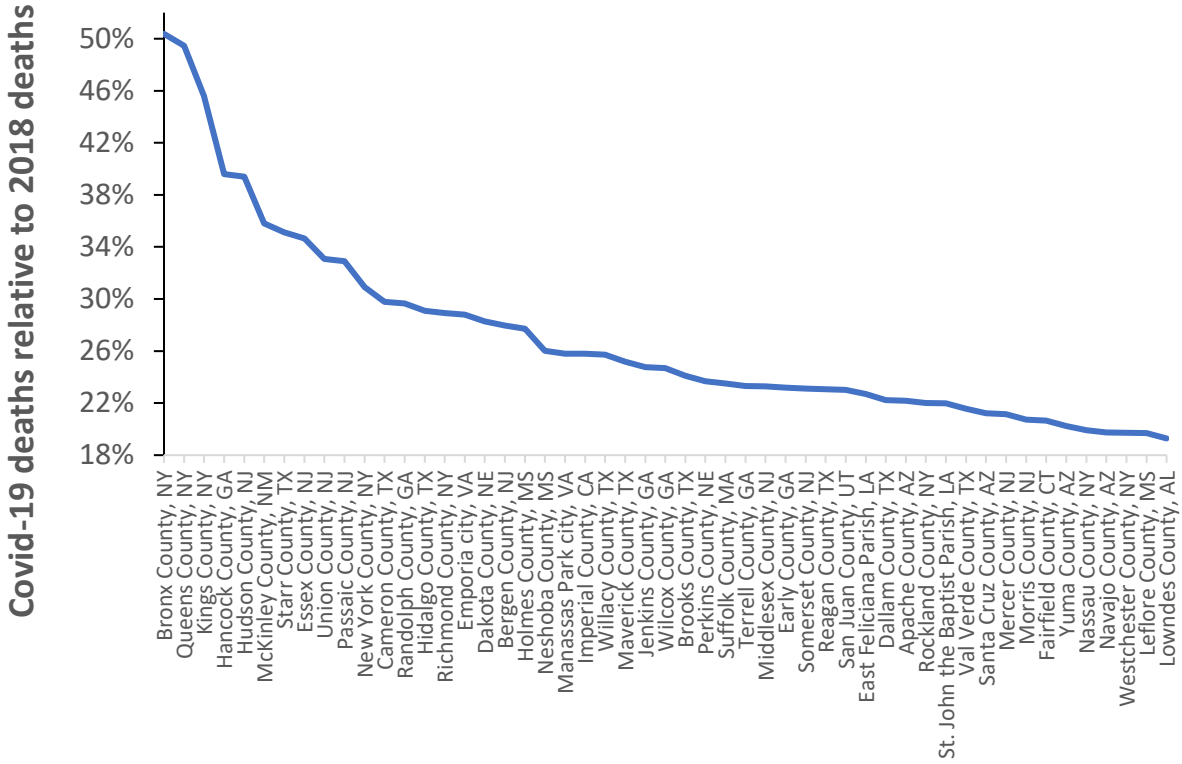
Put another way, the so-called second wave only hits those communities and small areas (the spatial hierarchies in the Grenfell et al paper) which were unaffected by the first wave. More correctly there is only one wave, but it sweeps through diverse communities at different times.

In the Grenfell et al paper the big cities are affected first followed by smaller towns, etc.

Figure 2 illustrates the truth that Covid-19 affects different locations to different degrees, hence, the Bronx in New York shows a 50% increase in deaths relative to 2018 as a non-Covid base year. There are over 3,000 counties in the US and the top 50 counties which represent just 1.6% of counties account for 25% of US Covid deaths. Data in Figure 2 comes from the USAFacts and CDC Wonder data bases.

However, some 18% of counties had experienced 0 Covid deaths. As usual, these are low population density and only account for 2.3% of total deaths in 2018. Parts XII and XIII reflect the same outcomes in the UK.

Figure 2: Total Covid-19 deaths (on 10th September 2020) relative to total deaths (all causes) in 2018, top 50 US counties



If we use the date at which 50% of Covid deaths are reached as a measure of the timing of the 'wave' we see that the wave hit early in the Bronx with 50% of deaths by 18th April. However, the wave hit Hancock County (Georgia) almost a month later with 50% of deaths at the 24th May, i.e. late in the first surge in Figure 1. The point of 50% of total Covid-19 deaths occurs some 70 to 95 days after the first death is reported.

Table 1 illustrates the movement of the 1st wave as it spreads through different communities in the state of Alabama. Lowndes county appears as the 50th highest county in Figure 2, however, Alabama does not have any counties with 0 Covid deaths. As can be seen in Table 1 the travelling wave takes around 5 months to reach all counties in Alabama.

Replicate this across all the states in Figure 1 and what seems to be two waves is merely a single wave travelling through diverse communities within the vast expanse of the USA. As has been wisely said, infection travels at the speed of man.

So, returning to the warnings of politicians and the National Press that we will ***all*** be engulfed in a second wave, the succinct answer is, probably not!

Table 1: The travelling wave moves through Alabama. Date at which 50% of Covid-19 deaths occur (relative to total on 9th September 2020). The 50% point for Alabama occurs at 14th July 2020.

County	Date
Chambers	29-Apr
Lee	06-May
Randolph	07-May
Tallapoosa	09-May
Wilcox	19-May
Henry	23-May
Choctaw	26-May
Butler	04-Jun
Bullock	05-Jun
Sumter	10-Jun
Hale, Lowndes	12-Jun
Marengo	17-Jun
Montgomery	22-Jun
Cherokee	23-Jun
Autauga, Pike	27-Jun
Mobile, Washington	30-Jun
Greene	01-Jul
Franklin, Conecuh	02-Jul
Jefferson	06-Jul
Shelby	07-Jul
Marion	08-Jul
Coffee	09-Jul
Tuscaloosa	10-Jul
Monroe	11-Jul
Covington	13-Jul
Elmore, Winston	14-Jul
Walker, Escambia, Houston, Pickens, Barbour, Fayette	15-Jul
Macon,Perry	16-Jul
Dallas	17-Jul
Clarke	18-Jul
Marshall	22-Jul
Limestone, DeKalb, Coosa	23-Jul
Morgan, Jackson, Clay	24-Jul
Cullman	26-Jul
Lamar	28-Jul
Talladega	29-Jul
Etowah	30-Jul
Colbert	01-Aug
Baldwin	02-Aug
Dale	03-Aug
Russell	04-Aug
Madison	05-Aug
Lauderdale	06-Aug
St. Clair, Chilton	07-Aug
Bibb	08-Aug
Geneva	09-Aug
Calhoun	11-Aug
Blount	20-Aug
Cleburne	21-Aug
Crenshaw	22-Aug
Lawrence	23-Aug

However, based on the analysis in Part XII and XIII what the politicians should be doing is to locate all high population density areas where the wave has not achieved full penetration.

To facilitate this Covid-19 testing should be switched from indiscriminate testing to focussed testing on all individuals at high risk of hospitalization and death, plus key workers. Testing the under 50's (see Part XV) is potentially a waste of scarce testing resources since the bulk of these are either asymptomatic or do not require hospitalization. Testing should also be focussed on high population density locations deemed to have had low exposure to the virus.

It is now becoming apparent that Covid-19 only affects individuals prone to a bradykinin and/or cytokine storm, which is probably a genetic trait and may well place an upper limit on the number of acute infections in certain communities – many of whom may already have died and consequently have been removed from the risk pool. Indeed, despite high exposure not every individual in a nursing home dies of Covid-19.

The world is caught on the horns of a dilemma, strict lockdown which must be maintained to prevent the wave breaching the defences or a Swedish style relaxed approach where the individual determines their risk and takes appropriate measures? Do you allow the under-50's to acquire herd immunity? What is the 'right' approach?

However, the evidence so far is that the 'second' wave is simply part of a slower travelling wave and we need to understand the dynamics of how to work with the wave rather than perhaps trying to completely avoid it.

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

XV. Cause of death during the outbreak

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Covid-19 has exposed huge deficiencies in the process of identification and coding of cause of death.

- **A preliminary analysis of deficiencies in the date of registration was given in Part VI**

Deaths in care homes due to Covid-19 were seemingly massively underestimated.

- **See Part VIII for an estimate of undercounting in the early days of the epidemic.**
- **26,860 people probably died from Covid-19 in care homes in England and Wales between 20th March and 12th June 2020.**
- **Of these deaths 14,000 were reported as "non-Covid" cause of death which will contaminate the reporting of cause of death.**
- **A further 12,000 deaths at home were reported as "non-Covid" but have symptoms suspiciously aligned to Covid-19 infection.**

Cause of death coding for supposed NON-Covid deaths has been massively disrupted and/or altered.

- **Lockdown acted to reduce deaths due to motor accidents by 58% age under 65, 47% over 65.**
- **Lockdown also reduced homicides in the over 65's by 21%**
- **However, other shifts in cause of death suggest the involvement of the indirect effects of asymptomatic Covid-19 infection on human mortality.**

Some 7,100 Covid-19 implicated deaths were coded as NON-Covid in the East of England, London, and the South East

These supposed NON-Covid deaths were mainly coded as dementia & Alzheimer's (8,000), signs, symptoms and ill-defined causes (7,000), various respiratory diseases (4,100) and diabetes (2,400).

Covid-19 therefore appears to have the potential to interact with other conditions to hasten death.

As you are all aware Covid-19 infection manifests in a range of subacute and acute symptoms including stroke, cardiac, digestive, olfactory, ocular plus a range of respiratory symptoms. See
https://jamanetwork.com/journals/jamaotolaryngology/article-abstract/2764417
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7172492/
read://https_www.nejm.org/?url=https%3A%2F%2Fwww.nejm.org%2Fdoi%2Ffull%2F10.1056%2FNEJMc2009787
https://publichealth.jmir.org/2020/2/e19509/

The basis for these seems to be immune-based stimulation of inflammatory responses, see

https://www.nature.com/articles/s41577-020-0308-3
https://www.nature.com/articles/s41577-020-0311-8?fbclid=IwAR006BPp8mRx8nAxiOljiN8dlYJjNncQ4zj4N8mvi1VN9gMFrcSRuIpnTWk
https://www.nature.com/articles/s41418-020-0530-3?fbclid=IwAR2ZxeCwG6GQEZTC1GQbizfu0d5i1wqIREmK5IKRgeR2TsUc1dg8ta1GYyA
https://www.nejm.org/doi/full/10.1056/NEJMc2009567

Clearly the specific pathways of inflammation are characteristic of Covid-19.

Covid-19 therefore shifts the immune system into a new steady state. The most common example of such an immune shift to a new steady state is during pregnancy when auto-immune pathways are suppressed but at the expense of exacerbated inflammatory responses. See

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7205264/
https://www.sciencedirect.com/science/article/abs/pii/S0165037818300056
https://www.frontiersin.org/articles/10.3389/fimmu.2017.01138/full

For this reason, pregnant women suffered high mortality during the 'Spanish Flu' epidemic during WW I and there was also a large shift in the gender ratio at birth indicating that the female foetus was also selectively targeted.

It is apposite to note that those who have recovered from acute Covid-19 infection commonly experience symptoms which endure for many weeks and months, see

https://www.sciencedirect.com/science/article/pii/S0163445320304540
https://www.researchgate.net/profile/Qian_Tao/publication/341319824_Cardiac_involvement_in_recovered_COVID-19_patients_identified_by_magnetic_resonance_imaging/links/5ec4dcdfa6fdcc90d685eef0/Cardiac-involvement-in-recovered-COVID-19-patients-identified-by-magnetic-resonance-imaging.pdf
https://jamanetwork.com/journals/jama/article-abstract/2768351
https://onlinelibrary.wiley.com/doi/full/10.1002/jmv.26368

The point of this rather laboured introduction is to suggest that Covid-19 may have significantly altered the whole spectrum of cause of death reporting. Is there any evidence to support this notion?

The Office for National Statistics has recently released data for England & Wales detailing a count of supposed NON-Covid deaths from week 1 of the calendar year, see
https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/datasets/deathregistrationsnotinvolvingcoronaviruscovid19englandandwales

This analysis uses the early weeks of the epidemic, namely calendar weeks 12 to 23 (20th March to 5th June) when there was insufficient testing to confirm Covid-19 involvement. It estimates the number of deaths occurring as a 'spike' during these weeks. This is a conservative estimate of Covid-19 implicated deaths incorrectly coded as NON-Covid cause of death.

Table 1: Estimated Covid-19 deaths potentially incorrectly coded as NON-Covid cause of death, weeks 12 to 23 (numbers rounded to nearest 5)

Age	Female	Male	Total
50-59	165	95	260
60-69	170	505	675
70-79	360	1,040	1,400
80-89	3,290	2,455	5,745
90+	3,950	1,560	5,510
All ages	**8,140**	**5,590**	**13,730**

To this end Table 1 shows the ages most affected by this incorrect attribution of cause of death. Those mostly affected were over the age of 80 and were most likely to be care home residents.

Table 2: Estimated Covid-19 deaths potentially incorrectly coded as NON-Covid cause of death by Region and place of death, weeks 12 to 23

Region of residence	**Deaths**
East of England	2,640
London	2,375
South East	2,085
North West	1,740
Yorkshire and the Humber	1,505
West Midlands	1,350
North East	785
East Midlands	785
South West	775
Wales	-255
Place of occurrence	**Deaths**
Care Home	13,020
Hospital	-4,520
Hospice	-365
Private home	5,410
Other	190
Total not in care home	710

Table 2 gives further insight as to which regions were involved in the incorrect coding of cause of death and more importantly the place of death. As can be seen the bulk of incorrectly coded deaths were in care homes.

All these incorrectly coded deaths will therefore contaminate the count of deaths by diagnosis and Table 3 investigates which diagnostic groups were most affected.

Persons with Alzheimer's and dementia are somewhat like the canary in the coal mine in that they have both impaired immune function and the inability to communicate symptoms. These conditions therefore accounted for some 8,000 incorrectly coded deaths.

Next comes signs, symptoms and ill-defined conditions which is once again indicative of care home residents unable to communicate due to functional and cognitive decline characteristic of the last year of life. Here some 7,000 deaths were mis-coded. Next come diabetes which is well known for its associated immune impairment and then a range of diagnoses consistent with mis-diagnosis of immune weakened elderly individuals.

Table 3: Top 20 diagnoses with a high count of potentially Covid-19 implicated deaths coded as NON-Covid, weeks 12 to 23

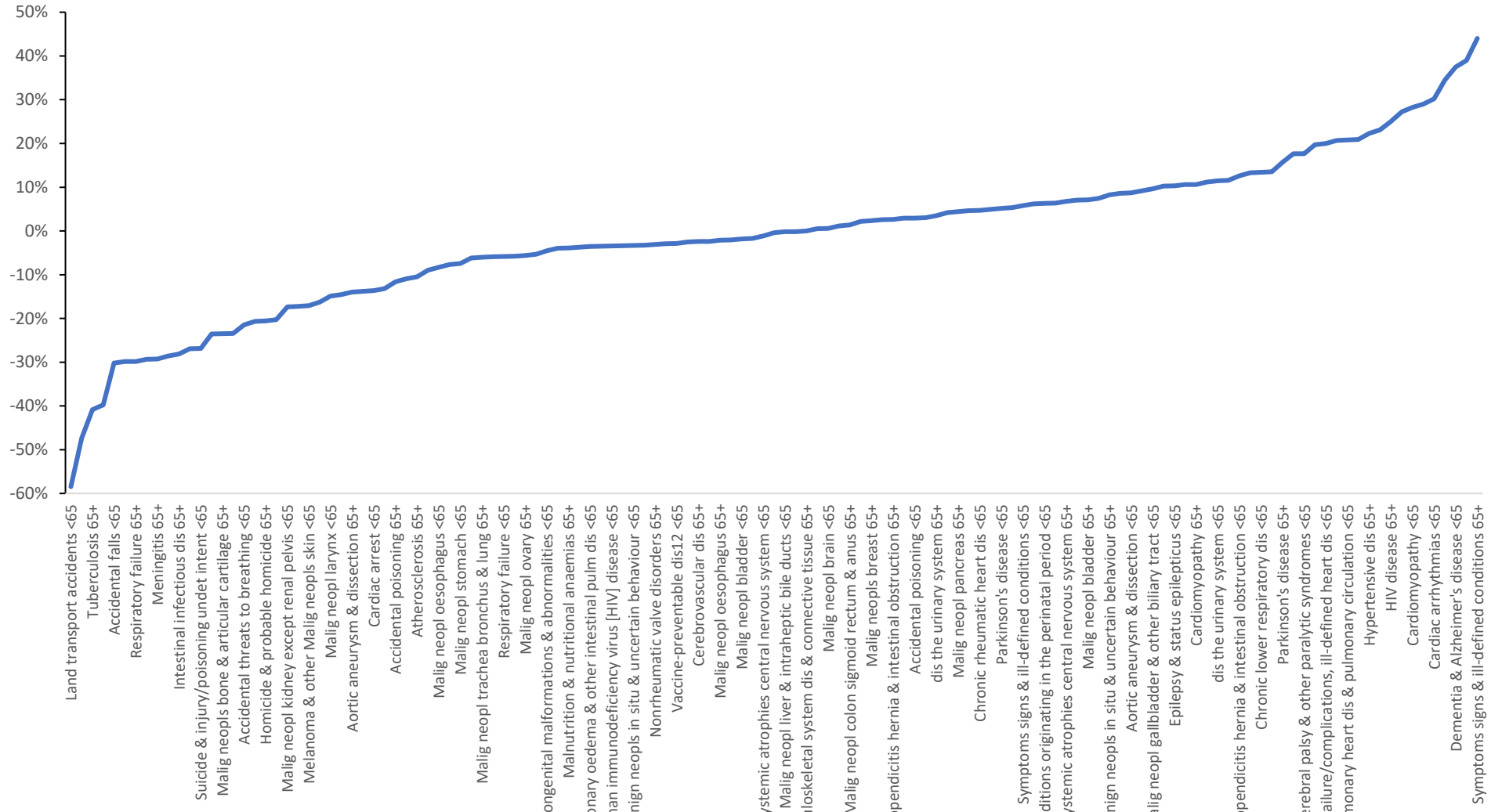
Diagnosis Group and Age band	Deaths
Dementia & Alzheimer's disease 65+	7,995
Symptoms signs & ill-defined conditions 65+	6,965
Diabetes 65+	2,100
Acute respiratory dis not influenza & pneumonia 65+	1,645
Chronic lower respiratory disease 65+	1,345
Cerebrovascular diseases 65+	1,265
Hypertensive diseases 65+	1,095
Urinary system diseases 65+	1,035
Influenza & pneumonia 65+	920
Ischaemic heart dis 65+	845
Heart failure & ill-defined heart disease 65+	775
Parkinson's disease 65+	475
Cardiac arrhythmias 65+	320
Diabetes <65	300
Malig neoplasm colon sigmoid rectum & anus 65+	230
Chronic lower respiratory dis <65	210
Musculoskeletal system & connective tissue diseases 65+	195
Urinary system diseases <65	190
Malig neoplasm prostate 65+	185
Malig neoplasm oesophagus 65+	175

The negative figure for NON-Covid deaths in hospital simply reflects the fact that many elderly people were discharged and then died in nursing homes or at home.

Finally, Figure 1 shows the full shift in cause of death as a percentage change among supposed NON-Covid deaths. On this occasion the shift is calculated based on the average weekly deaths over the past 5 years, hence the percentage change is against this baseline.

As can be seen deaths due to road traffic accidents declined mainly due to the imposition of lockdown on the 23rd of March.

Figure 1: Change in cause of death among those presumed to NOT have Covid-19 (March 12 to July 10)



Homicide in the over 65's also declined probably due to self-isolation. Homicides in the under-65's showed little change probably as gang-related violence was not curtailed. This group of individuals were unlikely to pay any heed to lockdown or precautionary measures.

Interestingly, septicaemia deaths declined by 30% presumably due to Covid-19 pre-empting this immune response.

We must therefore conclude that

- Covid-19 infection was far more prevalent in the early parts of the outbreak, although seemingly most confined to nursing homes
- that infection in care homes was rampant (all countries of the world experienced the same outcome) and was not correctly identified due to lack of testing
- that Covid-19 is a potent immune-modifying agent capable of altering the balance of inflammatory and anti-inflammatory pathways and other immune responses
- death is therefore hastened via immune modulated exacerbation of a range of existing conditions

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

XIV. International hospital capacity pressures

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Covid-19 deaths can serve as an international proxy for hospital capacity pressures using the ratio of Covid-19 deaths per total hospital beds.

Detailed comparison of potential capacity pressures between the states in the USA has been published, see https://www.mdpi.com/1660-4601/17/14/5210/pdf

- **State weighted population density was correlated with Covid-19 deaths and capacity pressures**
- **Population density in England is also strongly associated with risk of Covid-19 death, see Part XII**

An international comparison was given in Figure 1, Part IX on 21st July 2020. In this comparison the UK was second highest in the world.

This comparison has been repeated on 22nd August and the UK has slipped down to 13th in the world.

- **Countries with younger populations generally fare better since hospitalization and death is mainly confined to the elderly**

As in the USA, each country has Covid-19 hot spots with London being the hot spot in the UK, see Parts I to III.

A recent surge in infection rates does not seem to be correlated with deaths and hospitalization.

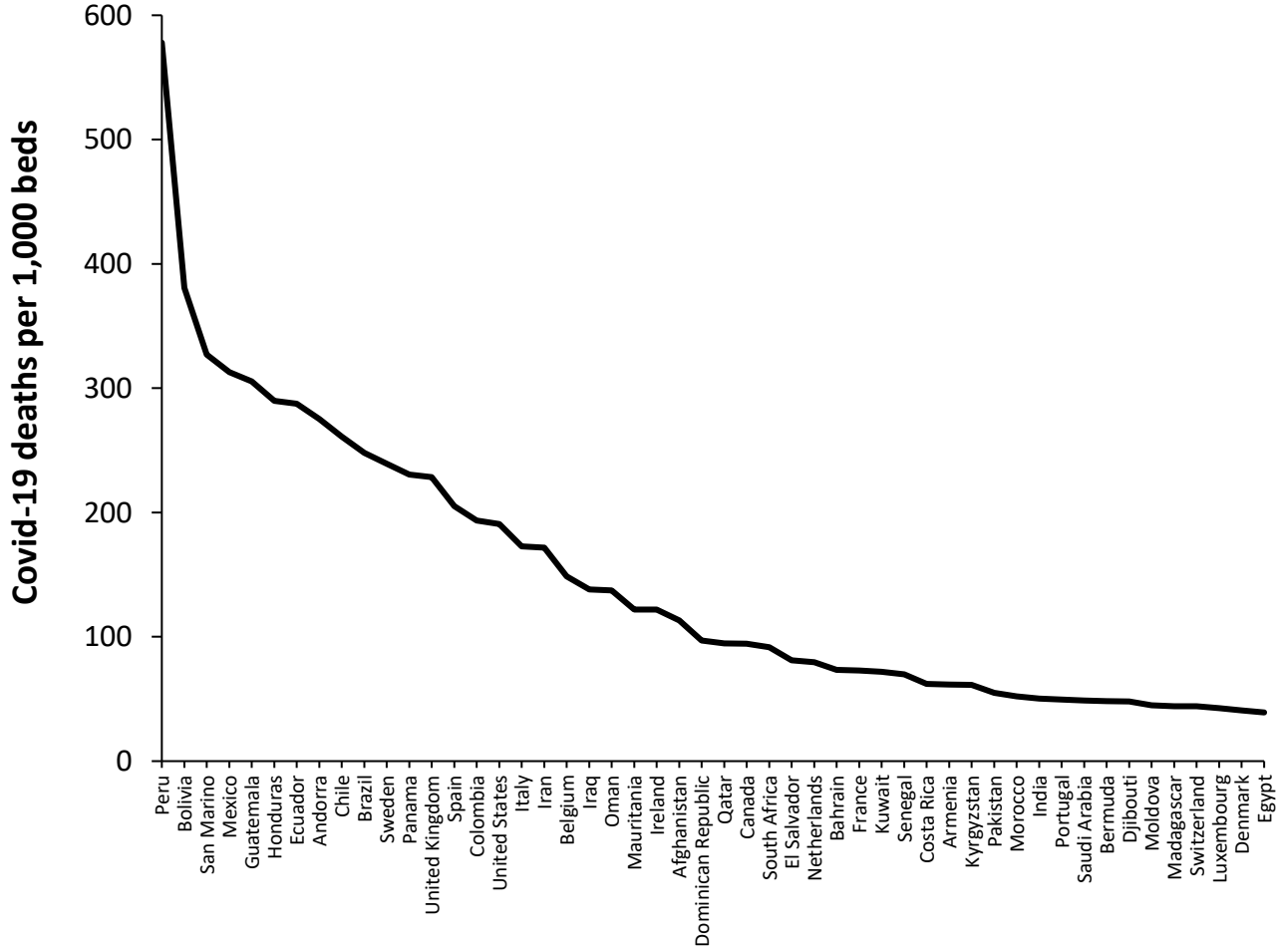
My own observation is that adherence to preventative measures among adults over the age of 50 is generally remarkably high but is abysmally poor among teenagers – who as they say, should be avoided like the plague.

Given that Covid-19 infection among those under the age of 50 tends to be asymptomatic hospital admissions and consequent capacity pressure can be estimated using the ratio of Covid-19 deaths per available hospital beds. An international comparison using this metric was presented in Part IX of this series using data for total Covid-19 deaths on 21st July 2020. The UK ranked very poorly in this initial comparison.

This comparison is repeated in Figure 1 using international data on 22nd August 2020. Available hospital beds are from the World Bank, see link to references at the top of the first page for relevant studies.

Covid-19 deaths are 'official' figures from each country and suffer from reporting bias. For example, Covid-19 deaths in Iran are estimated to be 5-times higher, deaths in Brazil are known to be underestimated and deaths in China are too good to be true.

Figure 1: Estimated hospital capacity pressure due to Covid-19 as the ratio of Covid-19 deaths per total hospital beds



Reporting issues aside the data uses total Covid-19 deaths which could be argued to be a poor proxy for instantaneous capacity pressures. My own research suggests that since deaths tend to occur as a massive surge the correlation between instantaneous and total pressure is reasonably accurate.

As can be seen in Figure 1 Sweden has eclipsed the UK. Given the very relaxed approach taken in this country the approach taken in the UK therefore somewhat approximates the equivalent to a 'relaxed' approach in that international travel from China and other hot spots was not restricted until somewhat late in the outbreak.

Recall that Figure 1 is skewed by hospital bed availability which will be very low in the least developed countries, see study on international bed provision in the list of publications on the first page where the UK lies on the borderline between developed and less developed countries. This seems to contradict the dogma that the UK has too many hospital beds.

The movement down in the rankings by the UK merely reflects the fact that the surge in deaths is moving around the world via incremental transmission.

As an aside, London (just) managed to survive the huge capacity shock simply because it acts as a tertiary centre for most of the south of England and could therefore rapidly release beds by curtailing elective surgery and squeezing extra ICU and medical beds into any available free space.

Hospital bed management is far more nuanced that attempting to run with beds constantly full as seems to be the naïve policy approach in the UK.

See section on hospital bed numbers and occupancy at http://www.hcaf.biz/2010/Publications_Full.pdf for an expose of this policy approach.

Especially relevant is the paper titled **How many medical beds does a country need? An international perspective** which will appear in the September issue of the British Journal of Healthcare Management.

Figure 1 in Part 1 has been updated, total deaths in UK regions/countries. There has been a small increase in the rolling 52-week total deaths which seems disproportionately low compared to the excessive interest in seemingly rising Covid-19 infection rates in some locations. Has the virus mutated or are the over 50's behaving in a more cautious way compared to other age groups?

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

XIII. Population density and risk of Covid-19 death

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Mid super output areas (MSOA) in England and Wales contain around 7,900 persons (range 2,200 – 24,900).

There is a huge range in the small-area proportion of deaths due to Covid-19 for the period March to June 2020.

The proportion of total deaths due to Covid-19 is highly dependent on population density

- **15% for least populated MSOA at 0.2 persons per hectare**
- **41% for most densely populated MSOA at 200 persons per hectare**

Population density is a proxy for poverty, household crowding and associated poor hygiene

- **These are all the classic factors in the John Snow study on the 1854 cholera outbreak**
- **Population density also reflects in crowding on streets, public transport, shops, etc all of which increase chance exposure**

The simple message is that if you live in a crowded area take extra precautions

- **Perversely, those living in crowded areas (especially teenagers and younger adults) are the least likely to adhere to such protective measures**
- **Targeting of just 300 high density MSOA (4% of MSOA) could have a disproportionate effect on reducing Covid-19 transmission and deaths, i.e. isolate the source of the problem**

Note that Figure 1 in Part 1 of this series is continually updated

- **The rolling 52-week total deaths (all causes) continues to rise in Northern Ireland, Wales and East Midlands**
- **Other locations are showing a small reduction as the 'culling effect' operates after the peak of Covid-19 deaths (see Part VIII)**

Part VII of this series investigated the role of weighted population density for local authorities and how this influenced all-cause excess mortality during the Covid-19 epidemic. Excess all-cause mortality was used since it avoided issues of undercounting of Covid-19 deaths. Part XII looked at the proportion of total deaths in Mid Super Output Areas (MSOA) between March and June which were attributed to Covid-19 as an alternative view of the 'excess' deaths due to the outbreak. This data can be matched with population density in each MSOA to see how this variable affects the proportion of total deaths due to Covid-19.

In England population density ranges from 0.06 persons per hectare in the Northumberland MSOA of Bellingham, Otterburn & Redesdale, and 0.08 in the Richmondshire MSOA of Upper Dales through to 283 persons per hectare in the Westminster MSOA of Pimlico North and 268 in Westminster Maida Hill. The median value for MSOA in England and Wales is 25 persons per hectare. Population densities above 185 persons per hectare are all in London. The highest outside London is 185 for Hyde Park in Leeds.

Since deaths in each MSOA are not large it is possible that statistical randomness may obscure the exact proportion. To circumvent this issue MSOA were ranked from least to highest population density and a rolling average of proportion deaths due to Covid-19 was calculated for each group of 100 MSOA. This gives around 2,000 total deaths per group of 100 MSOA and allows statistically sound calculation of the proportion. This is presented in Figure 1.

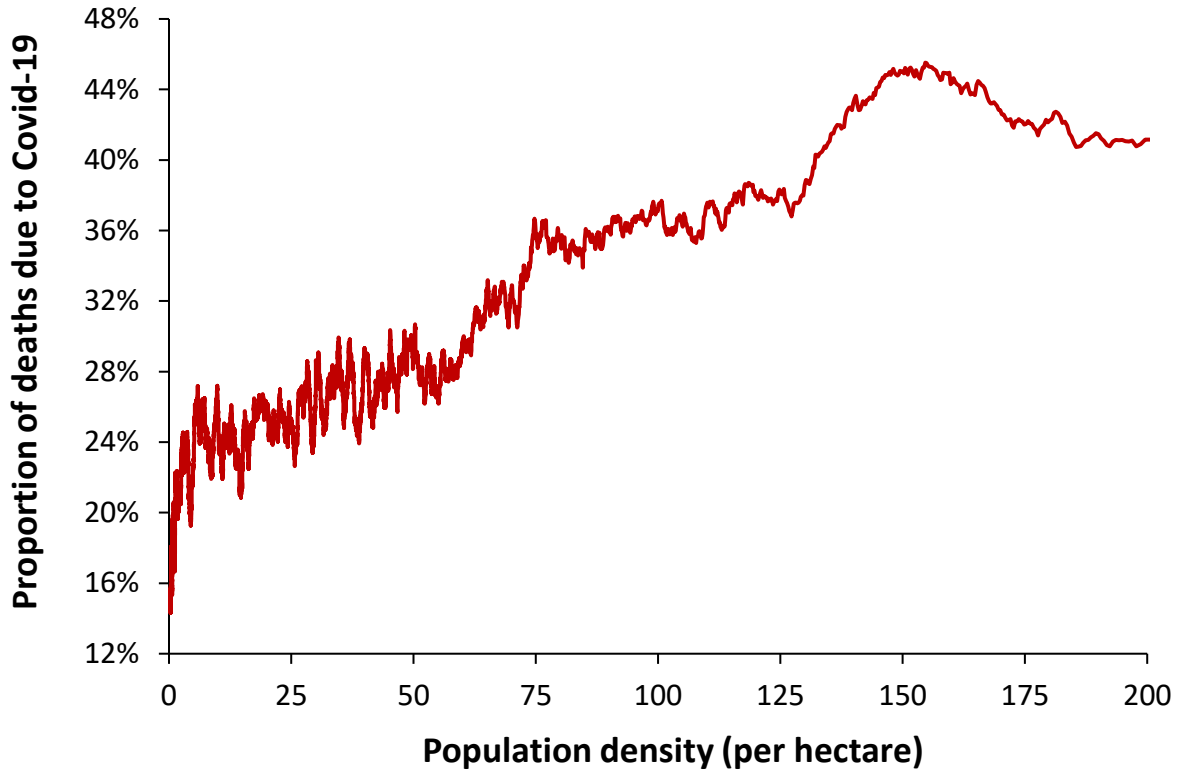
As can be seen the minimum proportion of 15% of total deaths due to Covid-19 occurs at the lowest average population density of 0.2 persons per hectare through to 41% at average population density above 190 persons per hectare. The peak at around 150 persons per hectare is a mix of moderately high-density inner-city areas from around the country.

High population density is usually a proxy for poverty, household crowding with associated poor hygiene and of wider crowding on the streets and in

public transport. All these factors increase the chance of encountering asymptomatic persons.

Hence all 300 MSOA areas with a population density above 120 persons per hectare should be targeted with relevant public health warnings and offered help and assistance to aid compliance.

Figure 1: Effect of MSOA population density on the proportion of total deaths due to Covid-19. Rolling average for 100 ranked MSOA.



While MSOA serve as a useful geography the best method is to use social groups, since health behaviours depend on social grouping. The ONS has such a classification called the Output Area Classification (OAC). See http://www.sciencedomain.org/abstract/16693 as an example of using social groups to categorise admissions to critical care. Alas the ONS will not release Covid-19 data at OA level and neither will they aggregate OA data using the OAC to give greater insight into which social groups have the highest infection and death rates, i.e. social prevention measures can be even more finely targeted. One can only hope that this recalcitrance is not due to political interference or the perception that such analysis may reveal the politically unutterable.

We need to be using the best available tools and social group (as measured by OAC) is the best available. Why the reluctance to use the best tools available?

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

XII. Small areas with a high proportion of Covid-19 deaths

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Mid super output areas (MSOA) in England and Wales contain around 7,900 persons (range 2,200 – 24,900).

There is a huge range in the small-area proportion of deaths due to Covid-19 for the period March to June 2020.

The median value was 21.4% Covid-19 deaths, while the maximum value was 73.5% in Alperton East in Brent (London).

Some 220 MSOA had 0% Covid-19 deaths while 183 MSOA had >50% Covid-19 deaths.

The small area in which you live greatly influences your risk of Covid-19 death.

This series has emphasized the critical role of infectious granularity in both Covid-19 and infectious outbreaks in general.

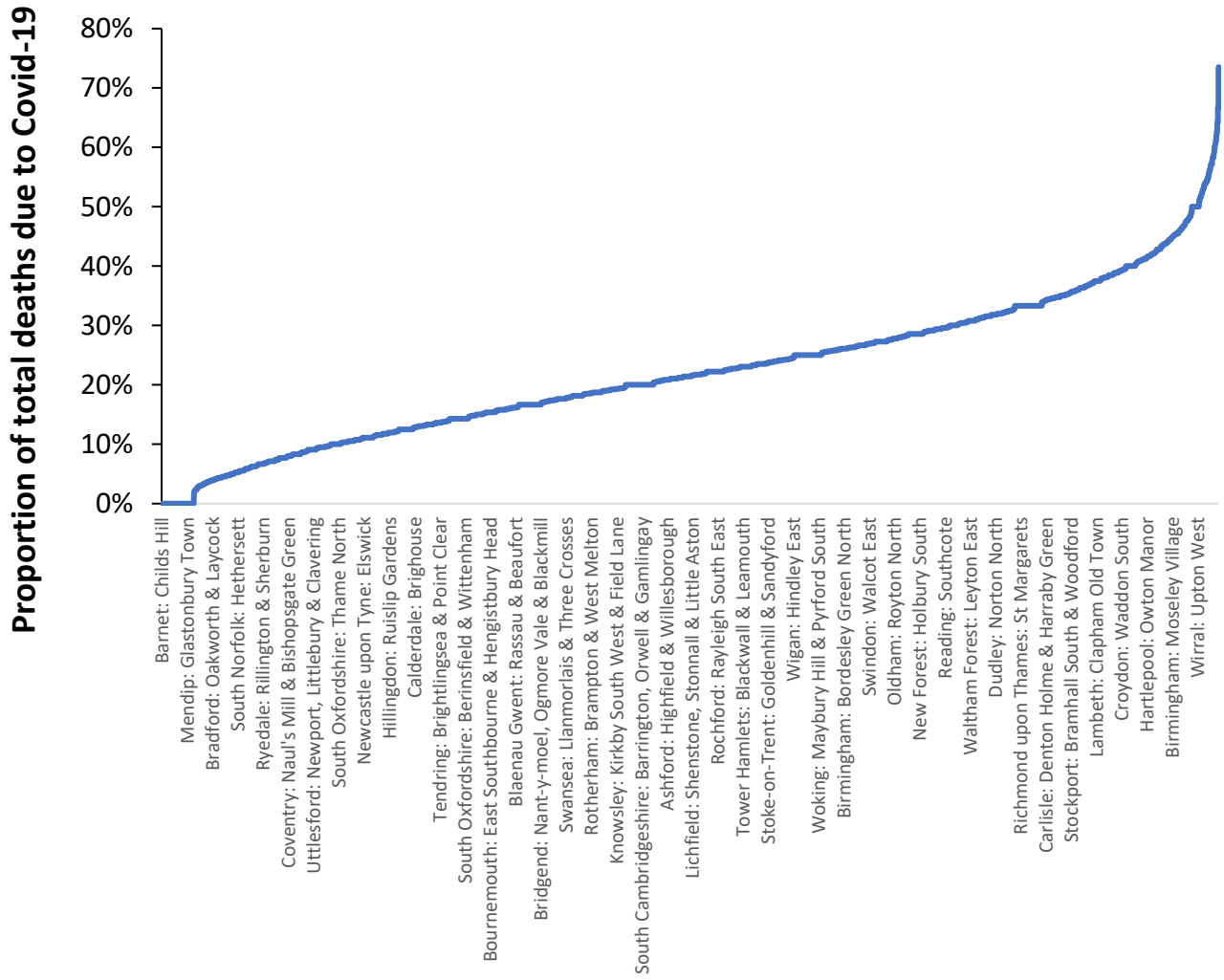
The Office for National Statistics (ONS) has recently released small-area statistics where the proportion of total deaths can be calculated for Covid-19. The data covers the 4-month period March to June 2020 and is at mid super output area level (MSOA). There are some 7,500 MSOA in England and Wales and in 2018 MSOA's contained a median of 7,930 persons (range 2,240 to 24,970) and are generally slightly larger than an electoral ward. There was a median of 28 deaths per MSOA.

Each MSOA will have a unique range in age, gender, ethnicity, deprivation, nursing home beds, social groups and some will have had greater exposure to infected individuals.

To this end Figure 1 shows the range for proportion deaths due to Covid-19 in MSOA in England and Wales. The range is 0% to 74%. Some 220 MSOA had 0% Covid-19 deaths while 183 had >50% of deaths due to Covid-19.

Each local authority shows considerable variation at MSOA level, e.g. North Dorset, Norwich 0% - 13%, Cornwall 0% - 27%, Herefordshire 3% - 34%, Brighton and Hove 0% - 38%, Wokingham 8% - 49%, Salford 5% - 50%, Birmingham 0% - 53%, Bristol 0% - 54%, Barnet 0% - 56%, Hammersmith and Fulham 0% - 63%, Kensington & Chelsea 0% - 73%, Brent 23% - 74%, etc.

Figure 1: Range for the proportion of deaths due to Covid-19 in MSOA in England and Wales, March to Junes 2020.



Data Source: ONS
https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/datasets/deathsinvolvingcovid19bylocalareaanddeprivation

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

XI. Why was there *negative* 'excess' mortality in some locations

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During the Covid-19 epidemic some areas show apparent '*negative*' excess mortality which is not due to statistical randomness.

- *This was confirmed using two different methods*

These arise from the timing of Shift-Up/Down events in total deaths which can be traced back to the 1950's (and probably before).

A significant role for shift-up/down in deaths has only recently been realised.

- *This has significant implications to health care capacity planning (see link above)*

Prior to Covid-19 a shift-up event was spreading across the UK commencing during 2019

- *Initiation occurred earliest in Scotland*
- *Then England and Wales*
- *Latest in London*

After adjusting for Shift-up the magnitude of the effect of Covid-19 on excess mortality is reduced in some locations

However, at the arrival of Covid-19 some locations were in Shift-down and this created apparent 'negative' excess mortality

There is some evidence to suggest that areas in Shift-down experienced slightly *higher* excess mortality, median 9.5% versus 7.9%

Covid-19 has illustrated the fundamental principle of infectious outbreaks, namely, it takes just one infected person to initiate a localised outbreak in space and time, i.e. spatiotemporal effects.

All herpes viruses, STDs, Ebola, Influenza, Hepatitis, Measles, etc behave in this way. Some pathogens (all members of the herpes virus family, etc) establish life-long infection with recurring flare-ups due to reactivation of the dormant virus leading to viral shedding and the opportunity for a local mini-outbreak.

As stated in Part X, no pathogen operates in splendid isolation and a quick overview of the implications of this is warranted.

1. The pathogen burden – all individuals have a lifetime history of infections along with an increasing number (with age) of persistent pathogens. This is called the pathogen burden. The rate of progression of certain diseases appears to depend on the size of the pathogen burden, which is especially relevant to higher mortality rates due to Covid-19 among certain ethnic groups and/or those with poor hygiene standards or higher household crowding. See https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3395457/ https://www.cambridge.org/core/journals/epidemiology-and-infection/article/persistent-socioeconomic-and-racial-and-ethnic-disparities-in-pathogen-burden-in-the-united-states-19992014/47DB126A8EAD90001C9DF5F4872DCB01 https://link.springer.com/article/10.1007/s40615-019-00638-0
2. Heterologous immunity and the order of infection(s) – different pathogens increase/decrease the effect of the next infection, an effect which is called heterologous immunity. Hence populations and individuals can display different responses to the same pathogen. See https://www.nature.com/articles/s12276-019-0316-1
3. Antigenic original sin – lifelong immunity is shaped by the immune response to the first infection by different strains of the same agent (usually occurring in childhood). Covid-19 is merely a different strain of a common Coronavirus. See http://perspectivesinmedicine.cshlp.org/content/early/2020/01/18/cshperspect.a038786.abstract
4. Symptomatic and asymptomatic strains – Covid-19 itself comes as a variety of strains some of which cause serious infection, other strains do not. See https://www.medrxiv.org/content/10.1101/2020.05.27.20114546v1
5. Specific mutations in the human genome – Isoforms in the Apo E gene seemingly confer differing susceptibility to severe Covid-19 infection. This is especially relevant to the susceptibility of different racial groups. See https://academic.oup.com/qjmed/advance-article/doi/10.1093/qjmed/hcaa142/5825736

6. Age – The risk of severity of infection (hence dying) for Covid-19 depends on age (See https://www.researchgate.net/publication/342060945_Does_susceptibility_to_novel_coronavirus_COVID-19_infection_differ_by_age_Insights_from_mathematical_modelling). However, the WW II Spanish Flu pandemic had a W-shaped age profile which targeted infants, young adults and the elderly.
7. All pathogens target by gender and comorbidities – The Spanish Flu was especially deadly among pregnant women(See https://en.wikipedia.org/wiki/Spanish_flu), and those with tuberculosis (See https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2740912/). There is no evidence that Covid-19 targets pregnant women, although it does target men and certain comorbidities.

Having established that an infection can imply different outcomes to different individuals and people groups, and that your immune landscape is modifiable, we can now turn to the interesting role of Shift-Up and Shift-Down discussed in Part X of this series (attached) and how this relates to apparent ***negative*** excess mortality in some locations during Covid-19.

Prior to the Covid-19 outbreak in the UK there was a large Step-down event which initiated during 2018, followed by a Shift-up which was spreading across the UK from around Jan 2019 onward, i.e. some areas were still in Shift-down when Covid-19 struck in early March 2020 (*see link above*).

It will be of interest to note that UK local authorities and world Countries in Shift-down ***did not*** experience the large increase in international deaths seen in 2015. Seemingly Shift-down had conferred some form of protection (see authors studies on deaths in 2015).

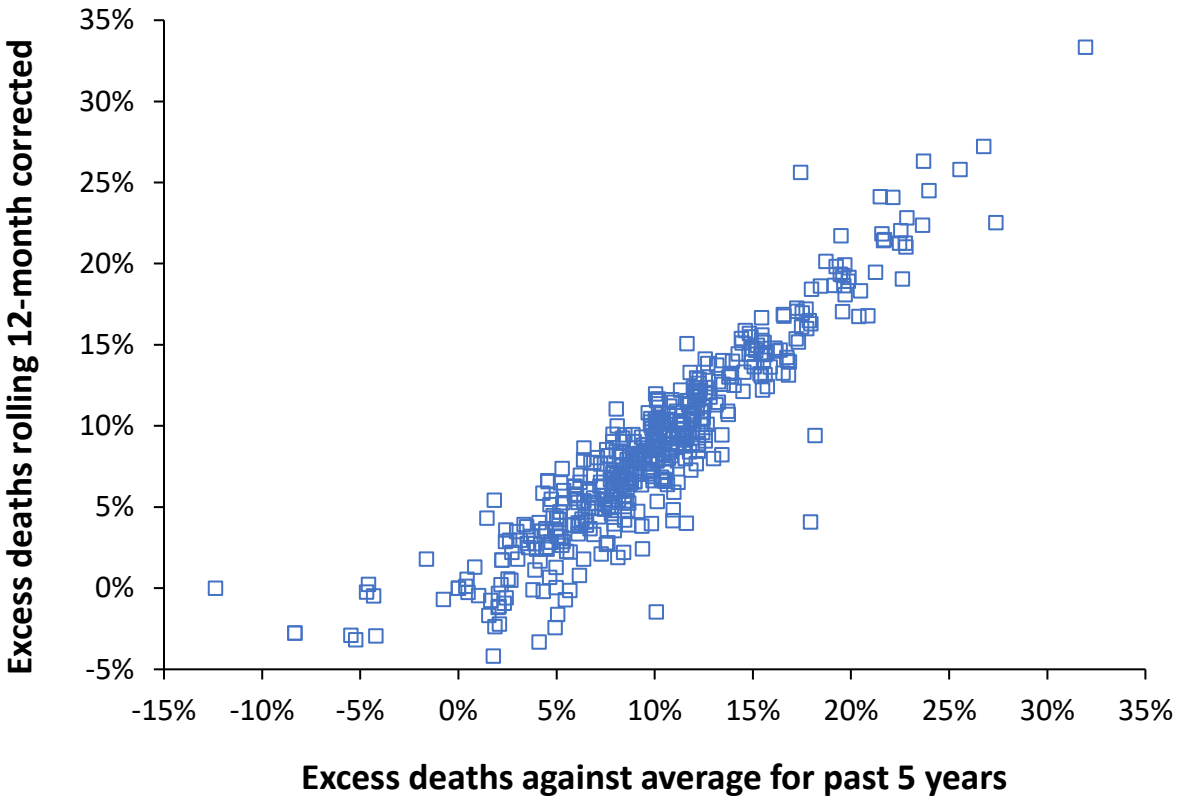
It has already been established that the 2012 Shift-Up in deaths and medical admissions affected different social and racial groups to different degrees (See http://www.sciencedomain.org/abstract/7231), i.e. it behaved just like any other infectious outbreak.

However, given the huge disparity in the effects of Covid-19 in different countries it is of interest to see what happened to those UK local authorities which were in Shift-up or Shift-down during Covid-19.

Part II of this series discussed the limitations of the three main methods for estimating excess deaths. To this end Figure 3 compares the calculated excess deaths using the average monthly deaths over the past five years against that

calculated using the rolling 12-month total method after correcting for the value of Shift-up.

Figure 3: Calculated 'excess' deaths using two methods



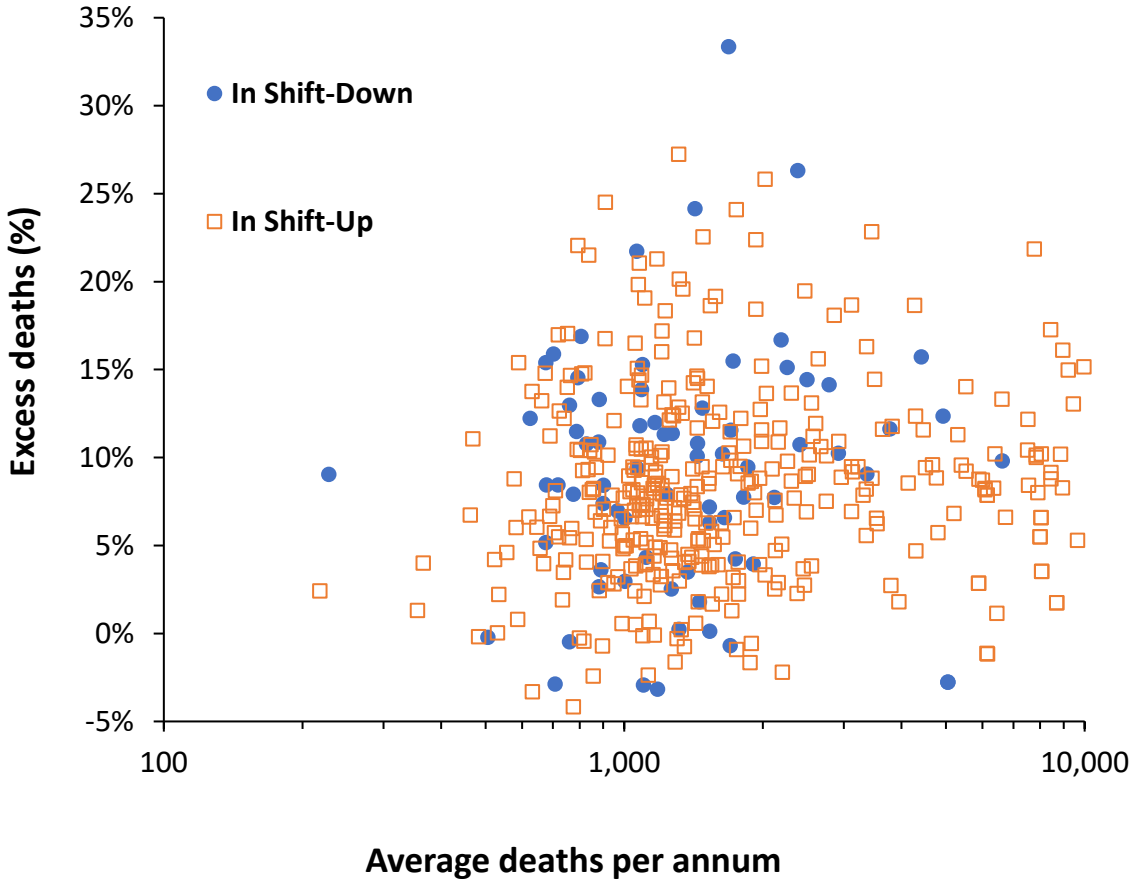
As expected, different methods give slightly different answers. The method used to correct the rolling 12-month total assumes that excess mortality commenced during March and that Shift-up should be deducted from March to May deaths, i.e. this over-corrects some areas. However, the interesting issue is those local authorities showing negative 'excess' mortality.

Quite simply negative excess mortality occurs when an area is in Shift-down, i.e. the 16% of areas mentioned above. The method using the average of the past five years is itself influenced by how often and to what extent each month was in Shift-up or Shift-down during those five years.

Whatever your opinions as to whether Shift-up or -down is caused by an infectious agent the fact remains that it is occurring and affects areas of human health wider than just deaths, i.e. sickness absence, medical admissions and the gender ratio at birth (see link at the beginning of the document).

Finally, it is of interest to see if Shift-up or -down conferred any protective effect against Covid-19 mortality. Figure 4 explores this issue by comparing the magnitude of excess deaths between the two groups.

Figure 4: Excess deaths during Covid-19 in areas in either Shift-up or Shift-down



Clearly this is a complex issue which depends on original exposure to Covid-19 and rate of spread, however, there is tentative evidence to suggest that it is actually shift-down which results in highest Covid-19 mortality with a median of 9.5% excess deaths compared to 7.9% for the Shift-up group.

The original hypothesis that Shift-up and Shift-down involves some subtle form of immune shift may still apply.

However, the message that no pathogen operates in splendid isolation clearly applies to the Covid-19 outbreak.

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

X. Cognitive dissonance and missed warnings

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A curious series of Shift-Up/Down events in total deaths can be traced back to the 1950's (and probably before).

In Shift-Up deaths are elevated in all months for a *minimum* of 12 months.

The % increase in deaths at local authority level shows the same range as that for Covid-19, although Covid-19 kills people over a short period of time.

Shift-Up events and influenza outbreaks are often intertwined leading to the appearance of more influenza deaths than actually occur.

All three agents, Covid-19, influenza, and that causing Shift-Up, show high spatial granularity.

Public Health England have repeatedly attempted to attribute unexplained high deaths as solely due to influenza.

At local authority level the frequency of *influenza-only* outbreaks is surprisingly low.

Shift-Up shows additional granularity regarding timing.

The agent causing Shift-Up behaves in all ways like an infectious outbreak and has seemingly killed just as many people as influenza and, at small area level, just as many as Covid-19.

No infectious agent operates in splendid isolation.

According to Encyclopaedia Britannica cognitive dissonance is defined as: "**Cognitive dissonance**, the mental conflict that occurs when beliefs or assumptions are contradicted by new information. The unease or tension that the conflict arouses in people is relieved by one of several defensive manoeuvres: they reject, explain away, or avoid the new information; persuade themselves that no conflict really exists; reconcile the differences; or resort to any other defensive means of preserving stability or order in their conceptions of the world and of themselves. (https://www.britannica.com/science/cognitive-dissonance)

Were earlier warnings of large 'novel' infectious events ignored simply because they did not fit with known explanations?

My first experience of such a novel infectious event occurred in 1993 when I was Assistant Director of Information at the Royal Berkshire Hospital. Precisely in the middle of March 1993 medical admissions and bed occupancy increased by 13% despite no change occurring anywhere in the health system. The Health Authority accused the hospital of increasing emergency admissions to increase income, however, the same had swept across the entire UK (see review http://www.sciencedomain.org/abstract/7646).

These events have reoccurred at regular intervals since then and are accompanied by unexplained increases in deaths. On every occasion, they tip the NHS into financial difficulties with large overspends (see link on page 1 to full research, especially the "Financial Risk" section, and also attached at end of document). Such events are supposedly 'impossible' and the resulting cognitive dissonance rationalises what has happened and the NHS has therefore been repeatedly blamed for the financial consequences of these events.

Figure 1 shows examples of a series of these 'novel' infectious outbreaks in the UK (arrows). In a rolling total an influenza outbreak (spike event) shows up as a table- top shaped feature. This is illustrated in Figure 2 which uses monthly rather than weekly data. Two large influenza events can be seen, the first spans December-50 to February-51 while the second spans December-52 to February-53. Total deaths in the winter of 1950/51 are approximately the same as due to Covid-19.

However, the resulting spike in deaths enters the rolling 12-month total, moves forward and then drops out of the total 12-months later. Hence the table-top shaped feature.

Figure 1: A rolling 52-week total of deaths in Regions/Countries of the UK, commencing 52-weeks ending Dec-11 up to the recent Covid-19 outbreak.

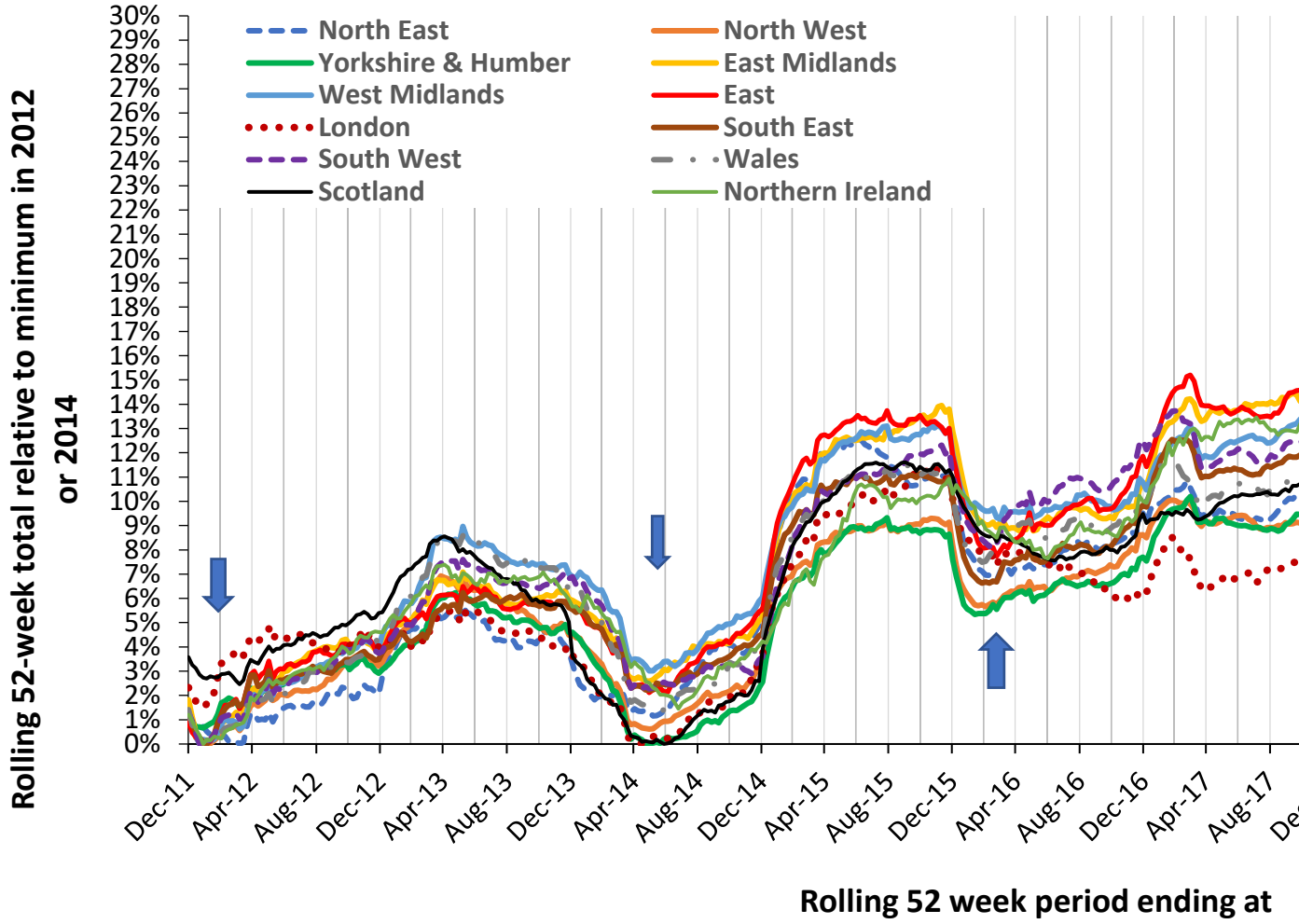


Figure 2: Rolling 12-month total deaths in England and Wales commencing December 1949 to December 1954

Large influenza-only event

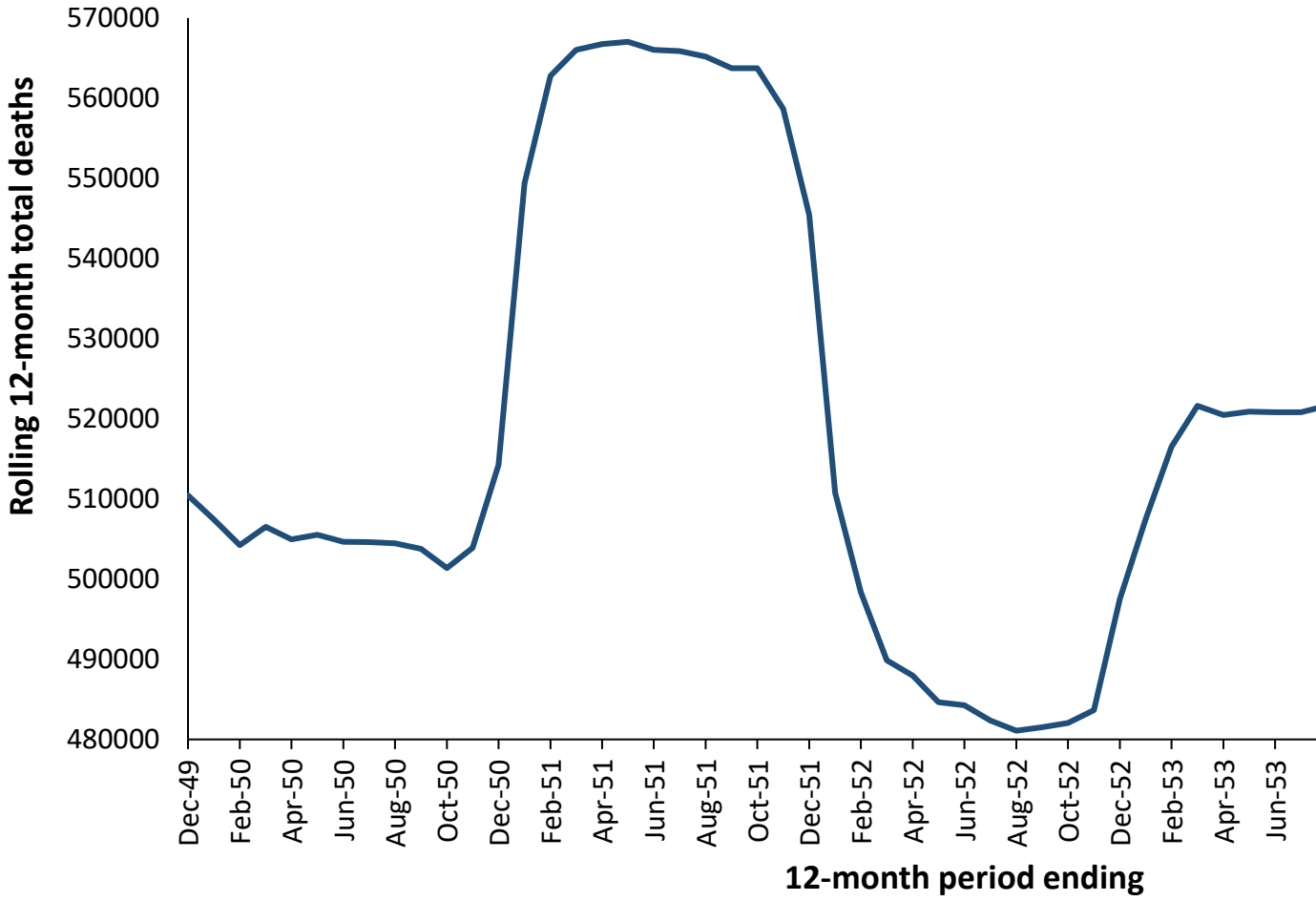
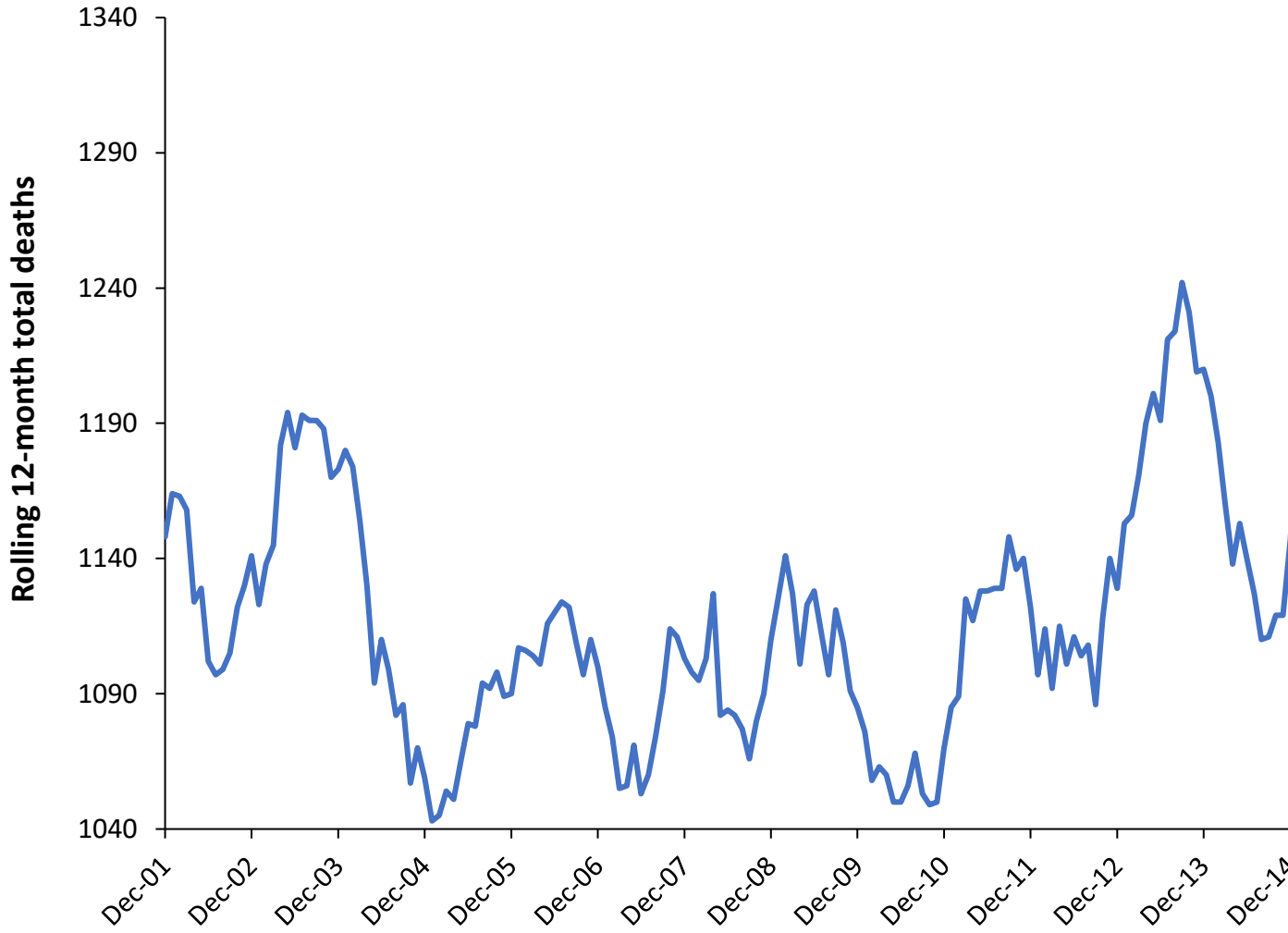


Figure 3: Rolling 12-month total deaths in West Berkshire commencing 12-month ending Dec-01 to Apr-20



For example, in Figure 2 deaths averaged 40,378 per month for the 12-month period up to April-54, but then suddenly shift to an average of 42,077 per month in May-54. The start of an influenza outbreak can be seen at Dec-54 which is ***added on top of*** the previous shift-up in deaths.

However, the upward slope commencing May-54 has no current explanation. What has happened is a sudden shift-up in total deaths, akin to the 13% increase in medical admissions observed in 1993 at the Royal Berkshire Hospital. In a shift-up the extra deaths gradually accrue in the rolling total.

Clearly these unexplained shift-up in deaths did not commence in 1993 but had been ongoing (but ignored) for many years.

When shift-up has finished (some 12 to 36 months later) a shift-down occurs and a ramp down shows up in the rolling total.

The reader is asked to re-look at Figure 1 to see a combination of shift-up events mingled with some small influenza events. The large shift-up commencing April-12 was augmented with a small influenza event in Dec-12/Jan-13. However, Public Health England (PHE) subsequently leapt to explain the increase in deaths as exclusively due to influenza, which is clearly scientifically incorrect. See http://www.hcaf.biz/2013/PHE_BJHCM.pdf for a rebuttal of the PHE analysis. Cognitive dissonance prevented PHE from acknowledging what the data was revealing, and so they reverted to a known (safe) explanation.

The same happened in Apr-14 to Jul-14 (depending on region/Country) and was followed by a modest influenza event in Jan-15/Feb-15. Note that Northern Ireland (Fig. 1) barely experiences the effects of influenza on mortality (see below).

The combined action of shift-up and influenza then led to the largest calendar year increase (2014 vs 2015) seen since 1968. The Office for National Statistics and PHE then made reassuring statements about deaths due to influenza and Alzheimer's in the elderly (see https://www.ons.gov.uk/news/news/spikeinnumberofdeathsin2015drivenbyincreasedmortalityinover75s).

As can be seen in Figure 1 the ensuing shift-down was seemingly delayed until 2018, after which another shift-up commenced from Apr-19 to Jun-19 (depending on region/Country), although shift-up in London did not commence until Oct-19, and was then followed by the Covid-19 epidemic commencing Mar-20.

The point of relevance is that Covid-19 is not disputed as an infectious outbreak and neither is influenza. However, as discussed in Part VII of this series all infectious events show high levels of spatial granularity, i.e. one area is affected worse than another.

Regarding infectious granularity Figure 3 shows a rolling 12-month total of deaths in West Berkshire where it is a mix of shift-up/down and influenza which characterises the trend. In some year's influenza is absent although present at national level. The mixed shift-up and influenza event seen at regional level in Figure 1 is almost absent in West Berkshire due to shift-up being delayed until October-14 followed by a large influenza outbreak (Dec-14 to Feb-15). The 2012 shift-up is delayed until Sep-12 in West Berkshire and no influenza is observed in the winter of 2012/13.

By far the most interesting feature is a very large shift-up event commencing in May-19 and which acts to elevate total deaths during the ensuing moderate Covid-19 outbreak in West Berkshire which commencing Mar-20.

Clearly shift-up events show high granularity both in terms of time of onset and magnitude. However, their unique or 'novel' feature is that higher deaths endure for at least 12 months.

Figure 4 combines all these elements into a single chart with data from local authority, county, region and country in England, Northern Ireland, Scotland and Wales.

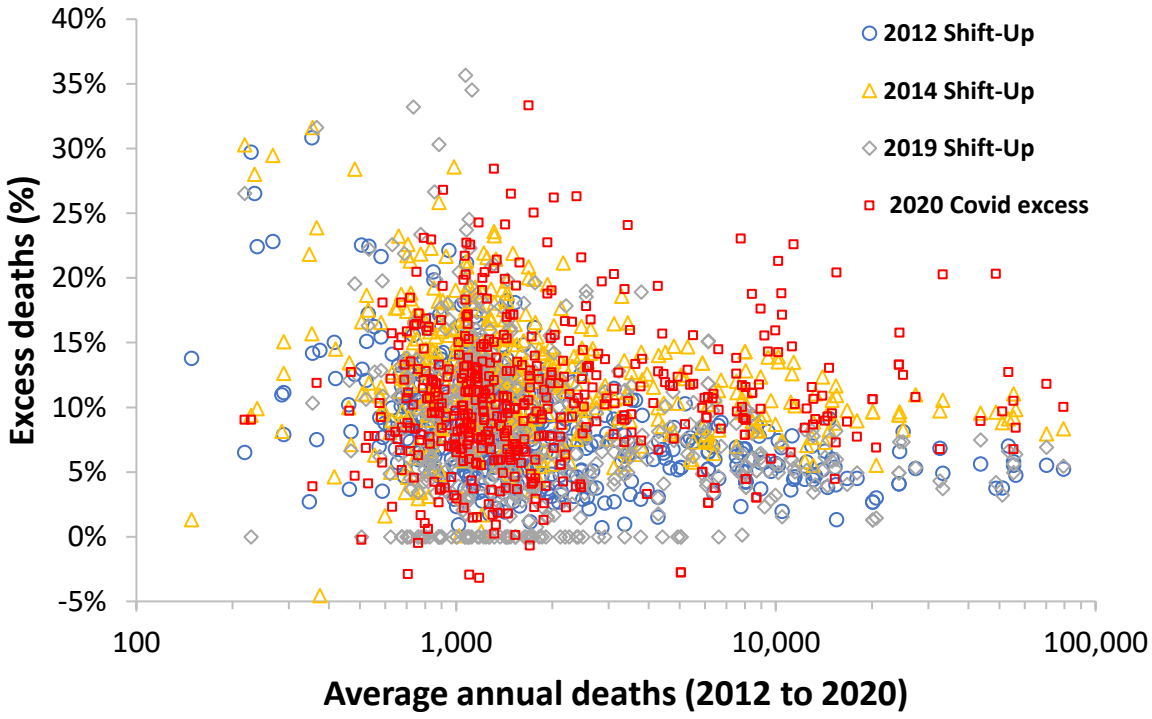
The X-axis shows the average number of annual deaths in each government area/region/country. This is a measure of the size of each spatial area from the viewpoint of annual deaths. The smaller the area the higher the opportunity for small-area spatial granularity. The larger the area and the small-area granularity begins to average out.

The Y-axis gives the magnitude of the 2012, 2014 and 2019 Shift-Up before the onset of Covid-19, and also the magnitude of the Covid-19 spike measured at the end of April.

The 2019 Shift-up ranges from negative, meaning that the 2018 shift-down was still ongoing and thus no Shift-Up had occurred, through to +35% in some areas. Due to the Covid-19 outbreak occurring during the 2019 Shift-Up the magnitude of shift up had to be estimated from the slope of the running 12-month total up to the end of February.

The Covid-19 spike in excess deaths ranges from negative (minimal Covid-19 deaths overwhelmed by the ongoing Shift-Down – mainly in Suffolk) through to >20% in various London Boroughs. A maximum of +30% was reached in the outer London Borough of Brent.

Figure 4: Magnitude of the 2012, 2014 and 2019 Shift-Up events versus the 2020 Covid-19 spike *(see footnote)*



Footnote: The 2019 Shift-up was recalculated 28th June using a more conservative method. Areas in Shift-down are shown as 0%. Excess deaths due to Covid-19 were recalculated using deaths up to May 2019.

The point is that at local authority level Shift-Up kills just as many people as Covid-19, however this is over a 12-month period as opposed to just 2 to 3 months for Covid-19 (the latest available monthly data). However, when aggregated at Regional or Country level, i.e. >10,000 annual deaths, Covid-19 shows higher rates in some regions such as inner and outer London, etc.

We need to ask the uncomfortable question, are public health agencies denying the existence of a major infectious outbreak simply because it conflicts with firmly held beliefs about how outbreaks should or ought to occur?

Indeed, are attributed influenza deaths less than previously thought to be the case?

Influenza and Covid-19 kill people in a spectacular burst of activity, but the other agent seemingly kills by stealth …… either way large numbers of people die.

And do remember, all must eventually die, and if one agent does not tip you into eternity then another will.

No infectious agent operates in splendid isolation.

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

IX. International comparisons

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The daily Downing Street briefings have repeatedly stressed how difficult it is to make international comparisons. Perhaps to deflect attention away from such comparison.

In the absence of international data on Covid-19 hospital admissions total Covid-19 deaths per hospital bed serve as an indicator of the hospital capacity shock (Figure 1).

- **The UK is the highest-ranking developed country.**
- **Spain, Sweden, Isle of Mann, and Italy follow after the UK.**
- **The USA ranks 12th.**

The ratio of excess deaths up to 29th May to acute hospital beds has a value of 65% in London, i.e. 65 deaths per 100 beds, down to just 22% in Northern Ireland

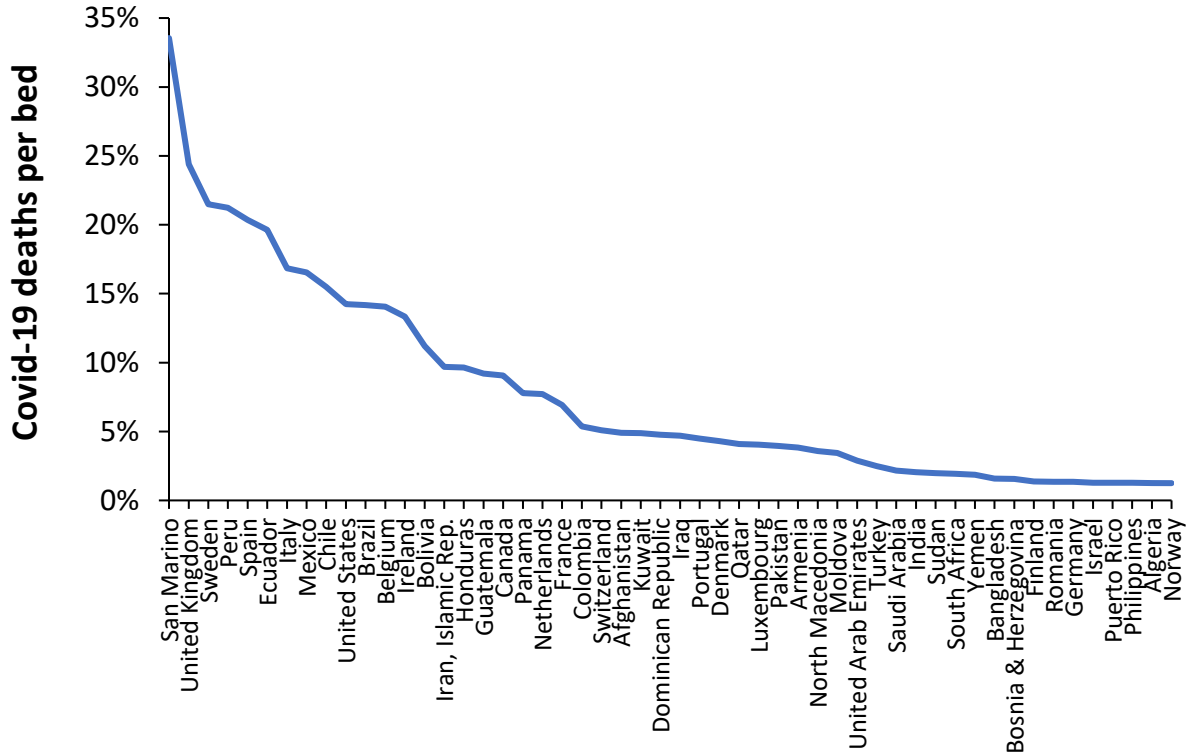
In the USA, the ratio of confirmed Covid-19 deaths per acute bed ranges from 60% in New Jersey down to 1% in Hawaii.

The UK and Belgium top the list of countries for the ratio of Confirmed Covid-19 deaths per expected deaths in 2020, i.e. a measure of 'excess' mortality.

The insistence in the daily Downing Street briefings that international comparison of Covid-19 deaths is incredibly complicated immediately begs the question as to which comparisons are possible.

To this end Figure 1 presents interesting analysis of the potential capacity shock experienced by hospitals in different countries. In the absence of international data on Covid-19 hospital admissions the total reported Covid-19 deaths per total hospital bed numbers can be used as a proxy for the hospital capacity shock. Total hospital beds include mental illness, maternity, childbirth and paediatric beds. A ratio of 35% implies 35 Covid-19 deaths per 100 hospital beds. Deaths are merely the apex of the mortality/morbidity pyramid. *The data is skewed by variable undercounting of true Covid-19 deaths due to lack of testing capacity or countries wishing to conceal the true extent of deaths from their population.*

Figure 1: Reported Covid-19 deaths, as at 4th July 2020, per total hospital beds by country (latest available).

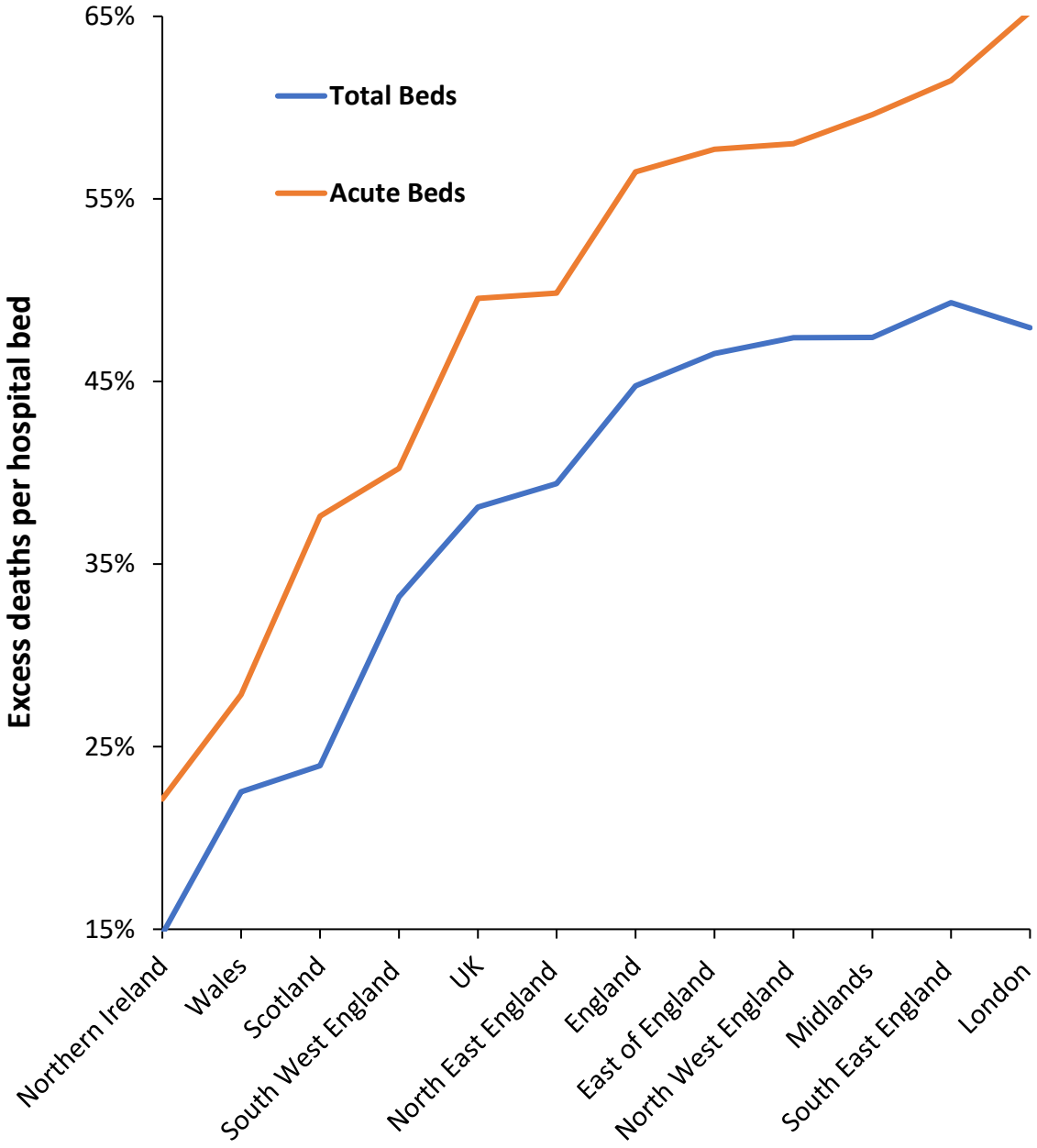


Covid deaths: https://www.bing.com/search?q=covid+19+deaths+by+country&cvid=98820491a19944aca882a45b6843eeaa&FORM=ANAB01&PC=ASTS
Hospital beds and population from World Bank: https://data.worldbank.org/indicator/SH.MED.BEDS.ZS

As can be seen the UK ranks second after San Marino, a small micro-State enclosed by Italy whose inhabitants will access nearby Italian hospitals. In other words, the UK tops the ranking for developed countries, significantly because the UK is desperately deficient in hospital beds. See “Hospital Bed” section at http://www.hcaf.biz/2010/Publications_Full.pdf

Clearly whole country reporting can be misleading and so Figure 2 presents a more detailed view of the situation within the UK which includes total excess deaths rather than just reported Covid-19 deaths. See earlier parts of this series for an explanation of 'excess deaths'.

Figure 2: Ratio of total excess deaths per available hospital bed (latest data available) for different parts of the UK



Available hospital beds from:

https://statswales.gov.wales/Catalogue/Health-and-Social-Care/NHS-Hospital-Activity/NHS-Beds/nhsbeds-by-specialty
https://www.health-ni.gov.uk/sites/default/files/publications/health/hs-inpatient-day-case-stats-18-19_1.pdf
https://www.isdscotland.org/Health-Topics/Hospital-Care/Publications/2019-05-28/Acute-Hospital-Publication/trend-data/
https://www.england.nhs.uk/statistics/statistical-work-areas/bed-availability-and-occupancy/

Due to infectious granularity (see Part VII), which is partly driven by population density, and variable bed availability, the different parts of the UK experience quite different levels of capacity shock. Data is given as both deaths per total hospital beds (as in Figure 1), and deaths per acute hospital beds (excluding mental health, maternity, and childbirth).

London experiences nearly a 3- times higher capacity shock that Northern Ireland, Wales and Scotland. Clearly all the 'noise' coming from Scotland may be more 'politics' than fact.

London survived the capacity shock by ceasing all routine elective surgery and large amounts of urgent surgery and hastily opening medical and critical care beds in every available space. However, this unequal capacity shock will leave an intractable issue regarding the national waiting list for elective surgery.

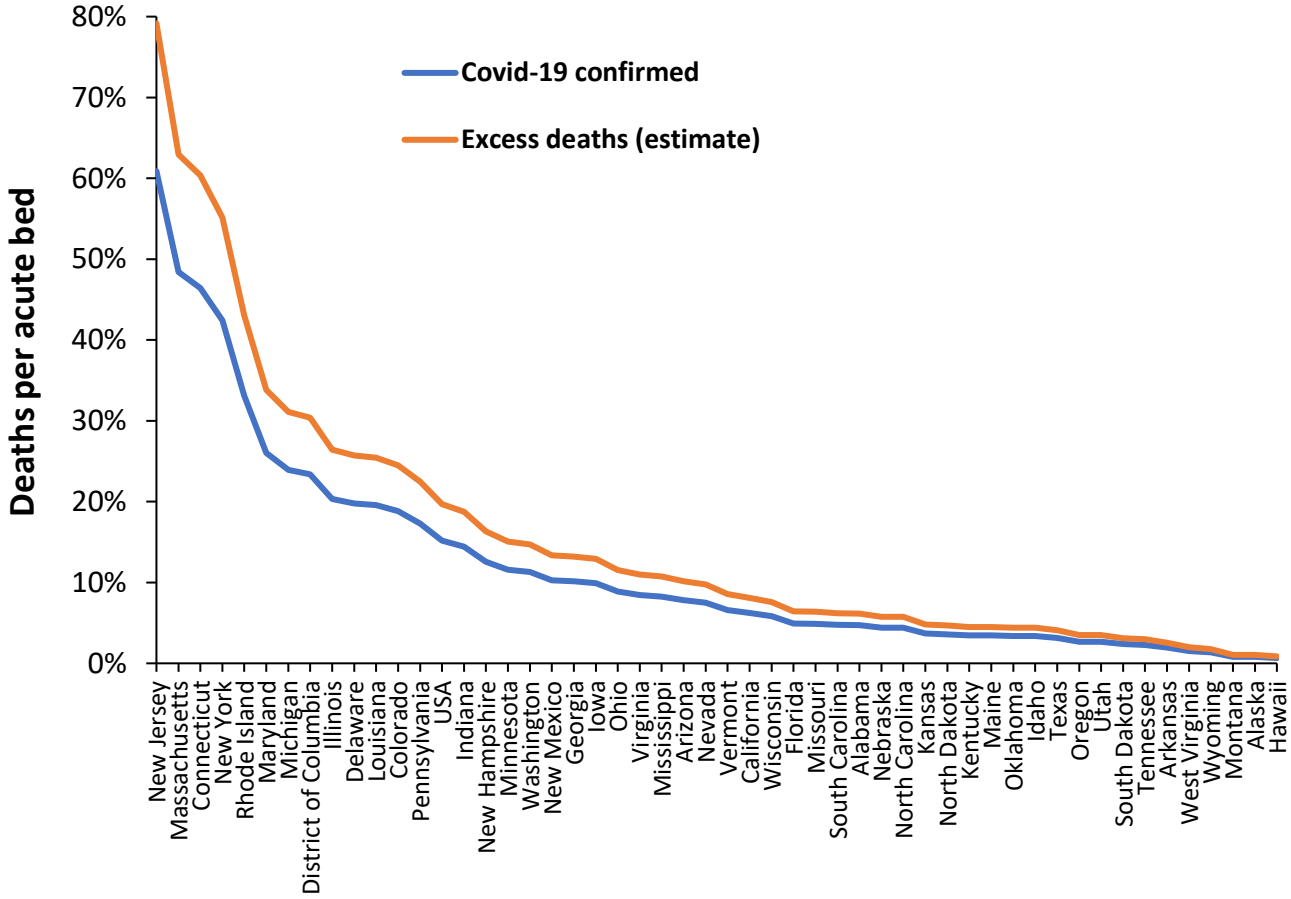
International comparison of the figures in Figure 2 is always useful and next follows a comparison of Covid-19 confirmed deaths per acute bed in different US States (see Figure 3)

Due to its large population New York has been much in the news regarding total numbers of Covid-19 deaths, however, as always reality can be different to that portrayed by the media. An estimate of genuine excess deaths due to Covid-19 under-reporting has assumed 30% undercounting – which will vary by State.

As can be seen New York does not suffer the highest potential capacity challenge but rather New Jersey, Massachusetts, and Connecticut. This is due to the huge disparity in beds between US States. Washington DC (District of Columbia), the wealthiest area has the highest beds (equivalent to The Netherlands), while Oregon, a largely farming State has the fewest (equivalent to Burundi). Many States have bed equivalents to those in developing countries. This is due to the perverse influence of healthcare insurance on access to health services.

The relatively low population density in over half of US States coupled with fewer international visitors has seemingly protected them from widespread Covid-19 infection.

Figure 3: Covid-19 deaths (at 9th June 2020) per acute bed (as at 2019) in US States



Deaths are from:
https://www.bing.com/search?q=Coronavirus+statistics+in+United+States&tf=U2VydmljZT1HZW5lcmljQW5zd2VycyBTY2VuYXJpbz1Db3JvbmFWaXJ1c01MIFBvc2l0aW9uPVRPUCBSYW5raW5nRGF0YT1UcnVlIEZvcmNlUGxhY2U9VHJ1ZSBQYWlycz1zY246Q29yb25hVmlydXNNTDtjb3VudHJ5Q29kZTpVU0E7aW50ZW50OkNoZWNrQ29yb25hU3RhdHM7YWJvdmVuZXdzOlRydWU7IHw%3d&hs=fKdcsSMblU%2flv0MptmzIEHM3ApGFDt1uOb4MeGTK14E%3d&FORM=COVIDR
Forecast total deaths in 2020 are from: https://ourworldindata.org/births-and-deaths

Lastly, to demonstrate the ease of international comparison in Covid-19 deaths Figure 4 shows the number of Confirmed Covid-19 deaths divided by the expected deaths in 2020 for world countries.

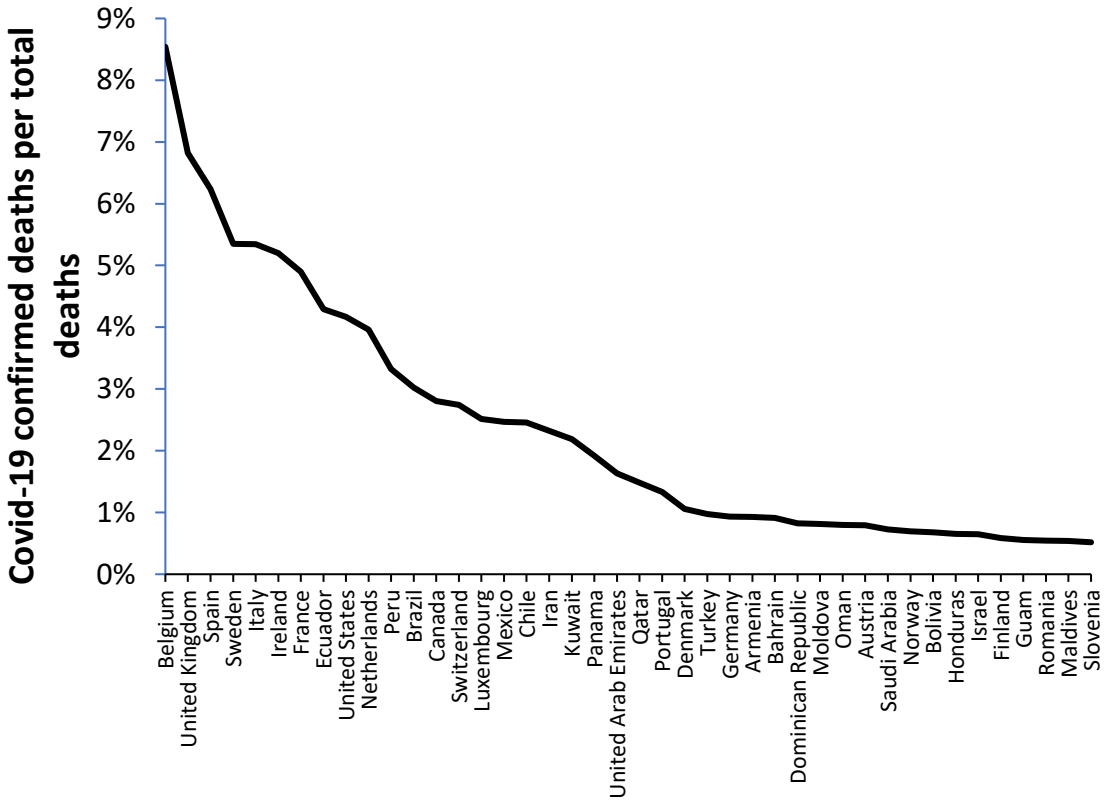
The number of expected deaths in 2020 (in the absence of Covid-19) is from https://ourworldindata.org/births-and-deaths.

As before, there is variable undercounting by country depending on the level of testing capacity and/or political interference. In the UK this leads to 30% higher excess mortality than the official reported deaths (see previous parts of this series).

However, as suspected, the UK is second only to Belgium although estimates of excess mortality via EuroMomo (see https://www.euromomo.eu/graphs-and-maps/ - note the peak is wider in the UK) put the UK higher than Belgium. Ah, the

uncomfortable truth emerges despite repeated assurances that such comparison was exceedingly difficult.

Figure 4: Confirmed Covid-19 deaths per forecast total deaths in 2020 for world countries



The suspicion is that London wins the prize for a ‘world leading’ outbreak.

For those who do not live in the UK we are constantly told by our politicians that everything in the UK from roads, railways, schooling, universities, etc is ‘world leading’. We like the sentiment but suspect the sincerity.

As always, analysis does not need to be 100% accurate, but it does need to be informative and involve creative approaches to existing (and often imperfect) data.

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

VIII. The culling effect

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Due to under-reporting of with-Covid-19 deaths it is 'excess' all-cause mortality which gives the true impact of the epidemic. However, deaths are always a lagged indicator of an infectious outbreak.

The rolling 52-week total of deaths peaked at the end of May. See Fig. 1, Part I at the end of this document.

Projected deaths beyond May seem to indicate that deaths are now lower than the baseline due to the 'culling effect'. The rolling 52-week in Fig. 1, Part I total thus declines.

The culling effect arises from Covid-19 killing so many people in a short space of time and thus reducing future deaths.

Excess deaths in the UK up to the 29th May is somewhere between 63,500 and 65,500 depending on the extent of the delay in death registration.

Beyond the end of May it becomes impossible to calculate true excess mortality due to the operation of the culling effect.

See Part V for details of genuine excess deaths in nursing homes, where, lack of early testing greatly underestimated true Covid-19 deaths.

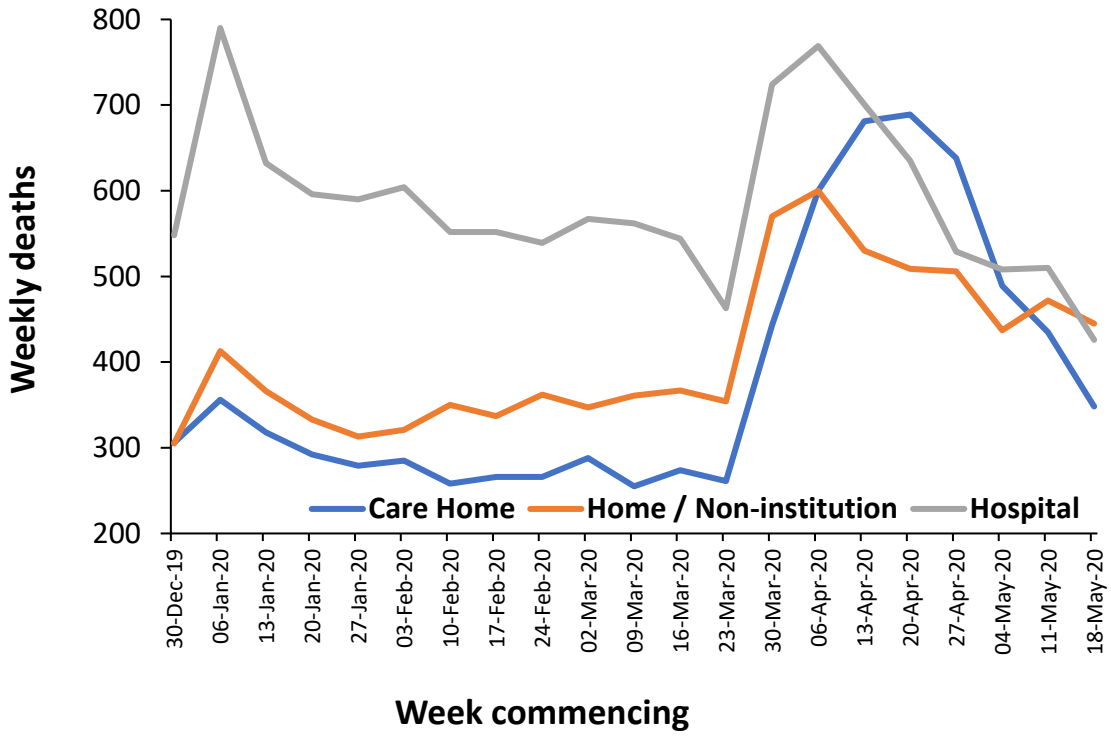
Figure 1 in Part I has been updated and is attached at the end of this document. Parts I to V are attached at the rear of this document.

This series has sought to keep you updated on the true extent of excess mortality during the Covid-19 outbreak in the UK and more specifically in London. The politicians have seemingly done everything possible to avoid a discussion of the true extent of all-cause mortality which at the 29th May was somewhere more than 63,500 deaths, probably 65,500 after taking the delay in death registration into account. People who have died in their homes are now being discovered and enter the overall death toll.

Different places such as home, hospital and care homes act as compartments with different levels of risk associated with Covid-19 exposure. Place of death can also act to obscure what is happening as persons who are ill at home or nursing home may end up dying in hospital.

Each location will also have its own unique baseline against which excess deaths are calculated. Prior to Covod-19 no one really bothered to make finer distinctions. Figure 1 shows weekly (registered) deaths in Scotland by place of death.

Figure 1: Weekly place of death (all-cause) by location in Scotland



Footnote: Data is from https://www.nrscotland.gov.uk/covid19stats

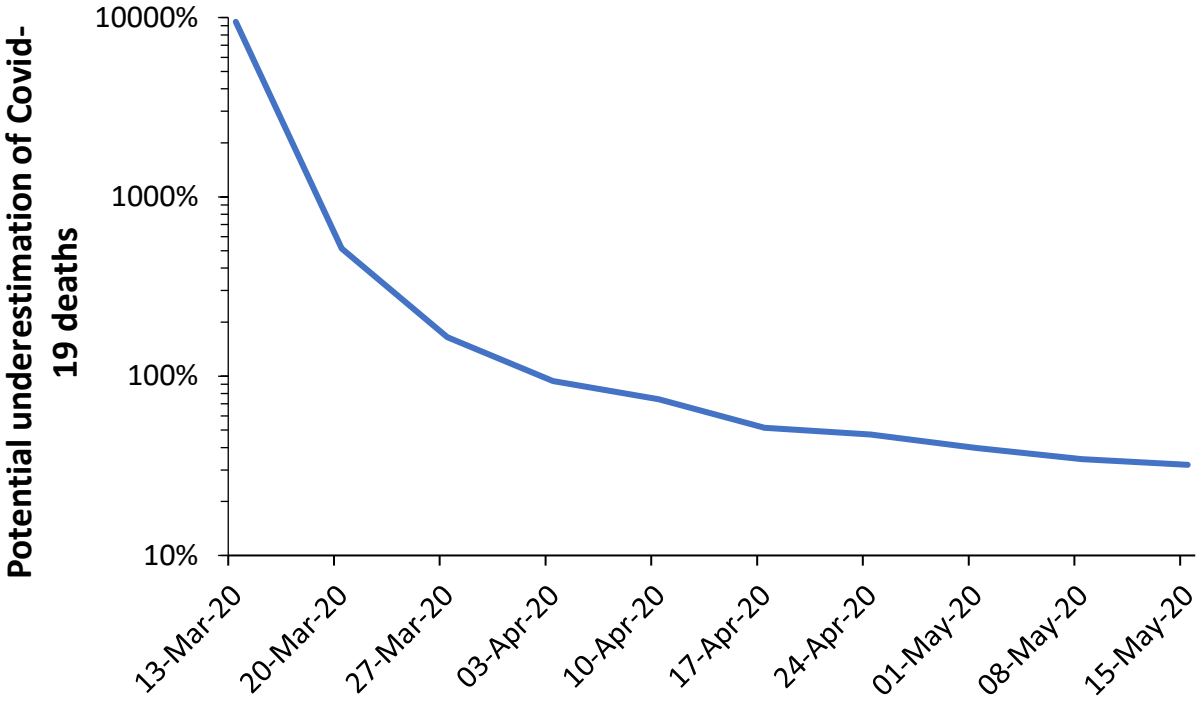
The baseline behaves differently in each location with care homes least affected by a small peak in influenza deaths in the week commencing 6th

January 2020. All three locations show different trajectories over time, but uniformly show a major increase in the week commencing 30th March.

The area under the curve represents total deaths of which the majority occurred in nursing homes, as also in England and indeed around the world. Care home residents are frail and nearer to the end of life than persons elsewhere. As has been pointed out in this series ,under-reporting of Covid-19 deaths has been a serious problem due to the low availability of testing.

To this end Figure 2 attempts to estimate the extent of under-reporting in the early weeks of the outbreak with somewhere between 1,000% to 10,000% under-reporting in the week ending 13th March. At this point small numbers are involved hence the wide range in potential under-reporting. By the week ending 15th May the under-reporting has declined to around 32%, which is still a significant gap, but which is largely due to the cumulative effect of the high under-reporting in the first five weeks.

Figure 2: Potential under-reporting of Covid-19 mortality in England and Wales



However, as can be seen in the updated Fig 1, Part I (at the end of this document) the rolling 52-week total deaths begins to decline after the 29th May. This is due to the operation of the 'culling effect' in which Covid-19 has killed so many people so rapidly that the baseline for deaths drops below the

level expected under normal circumstances. See discussion in Part II regarding estimation of the baseline.

Hence, beyond the 29th May it is no longer possible to calculate excess mortality since the baseline has been changed to an unknown lower value. From this point onward, with Covid-19 deaths must be taken at face value (possibly + 30%) and added to the 65,000 excess deaths already accrued up to that point. Which is around the 67,000 estimated civilian deaths in the UK during WW II (https://en.m.wikipedia.org/wiki/World_War_II_casualties).

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

VII. Infectious granularity

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Due to under-reporting of with-Covid-19 deaths it is 'excess' all-cause mortality which gives the true impact of the epidemic.

Deaths are always a lagged indicator of an infectious outbreak

As at the end of April (it is now June) the Brent Borough Council in London had experienced a huge 30% increase in excess mortality. See Table 1.

The worst affected areas were all in London except for Hertsmere (Hertfordshire) +25%, Mole Valley (Surrey) +20%, Thurrock (Essex) +19%, Reigate & Banstead (Surrey) +17%. All are immediately adjacent to London.

The City of Birmingham had experienced a 17% increase implying a higher increase in some districts – almost certainly those with a high proportion of BME residents.

The Downing Street daily briefings are omitting to give the public the true extent of Covid-19 granularity.

Based on the above, attempting to calculate a single R value at a national level is misleading and avoids a rational discussion about local risk.

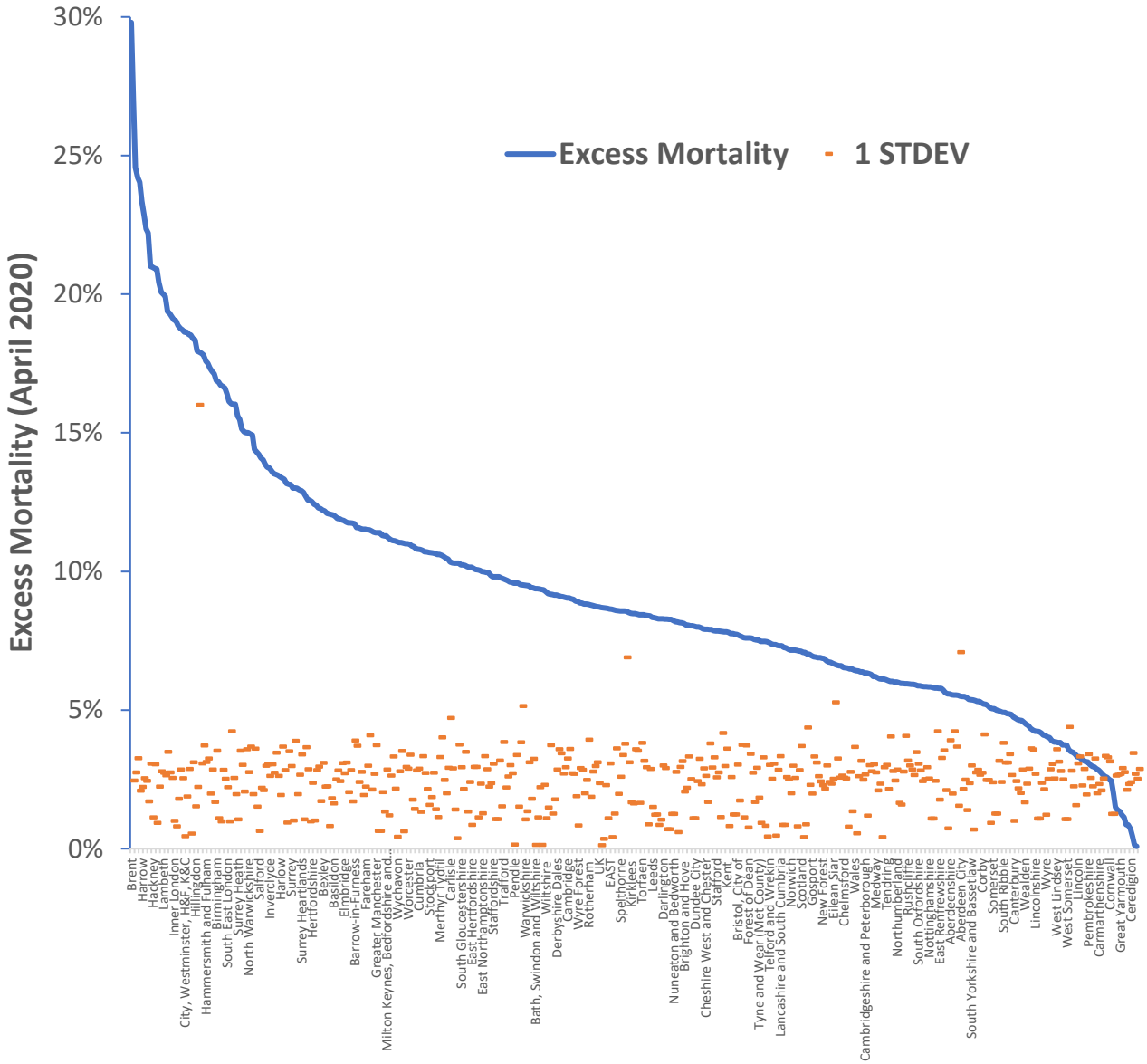
See Part V for details of genuine excess deaths in nursing homes, where, lack of early testing has greatly underestimated true Covid-19 deaths.

Figure 1 in Part I has been updated and is attached at the end of this document. Parts I to V are attached at the rear of this document.

All infectious outbreaks exhibit high granularity, i.e. some areas are affected worse than others. This can arise from population density, popular international visitor locations, conferences, travel in crowded trains and busses, etc.

Table 1 shows the excess mortality in the worst affected local authorities in England, Scotland and Wales while Figure 1 shows the range in excess mortality from +30% in Brent through to none in Ceredigion (Wales) and most of Dorset.

Figure 1: Range in excess mortality (at April 2020) across England, Scotland and Wales. Includes Counties, Regions and CCG STP footprints



The Isle of Wight, where the track and trace app is being piloted, has barely any excess mortality (??????). You can seemingly take nothing at face value in the daily Downing Street briefings.

Such granularity implies that the risk of infection varied, and continues to vary, markedly across the UK.

Indeed, the calculation of a national Covid-19 Reproductive (R) value is somewhat meaningless in the face of such extreme granularity and circumvents the rational discussion of local risk and the tailored application of lockdown rules.

Table 1: Excess mortality for the worst affected areas in the UK, April 2020

Local Authority	Excess mortality	1 STDEV
Brent	30%	2%
Newham	27%	3%
Hertsmere (Hertfordshire)	25%	3%
Barnet	24%	2%
Enfield	24%	2%
Harrow	23%	3%
Redbridge	23%	2%
Westminster	22%	3%
Hackney	21%	3%
Ealing	21%	2%
Haringey	20%	3%
Waltham Forest	20%	3%
Lambeth	20%	3%
Mole Valley (Surrey)	20%	3%
Southwark	19%	3%
Greenwich	19%	3%
Thurrock (Essex)	19%	3%
Lewisham	19%	3%
Merton	19%	3%
Islington	19%	3%
Hillingdon	18%	2%
City of London	18%	16%
Kingston upon Thames	18%	3%
Watford	18%	4%
Tower Hamlets	18%	3%
Hammersmith and Fulham	18%	3%
Croydon	18%	2%
Reigate and Banstead (Surrey)	17%	3%
Slough	17%	4%
Birmingham	17%	1%

For example, parents in some locations are experiencing needless anxiety regarding the return to school of children. Which could be easily alleviated.

This is a continuation of Part II (attached at rear) which investigated excess mortality at the end of March.

As always, excess mortality is used as a more reliable measure of the effects of Covid-19 infection, however, it is very much a lagged indicator.

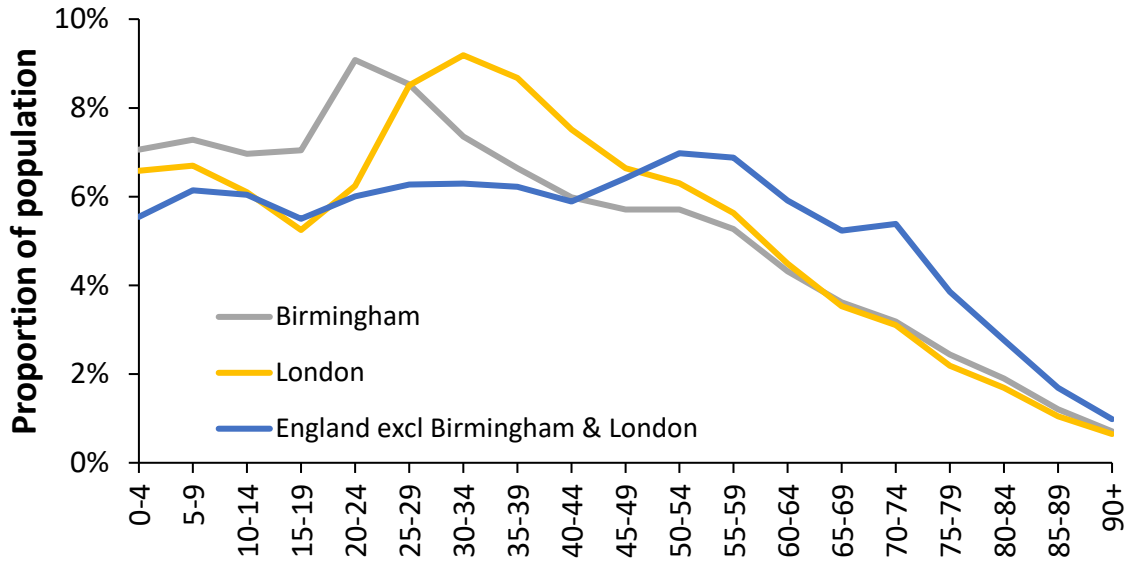
Although not widely appreciated, the same huge granularity also applies to influenza – the problem being that it is difficult to predict ahead of time.

Why London and Birmingham?

We need to ask the question regarding why London and Birmingham rank so high in Figure 1 and Table 1. Birmingham + London make up 18% of the population of England.

Figure 2 shows the age distribution of these two Cities in relation to that for England.

Figure 2: Age distribution in Birmingham, London and England



Data is from:
https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/datasets/localauthoritiesinenglandtable2

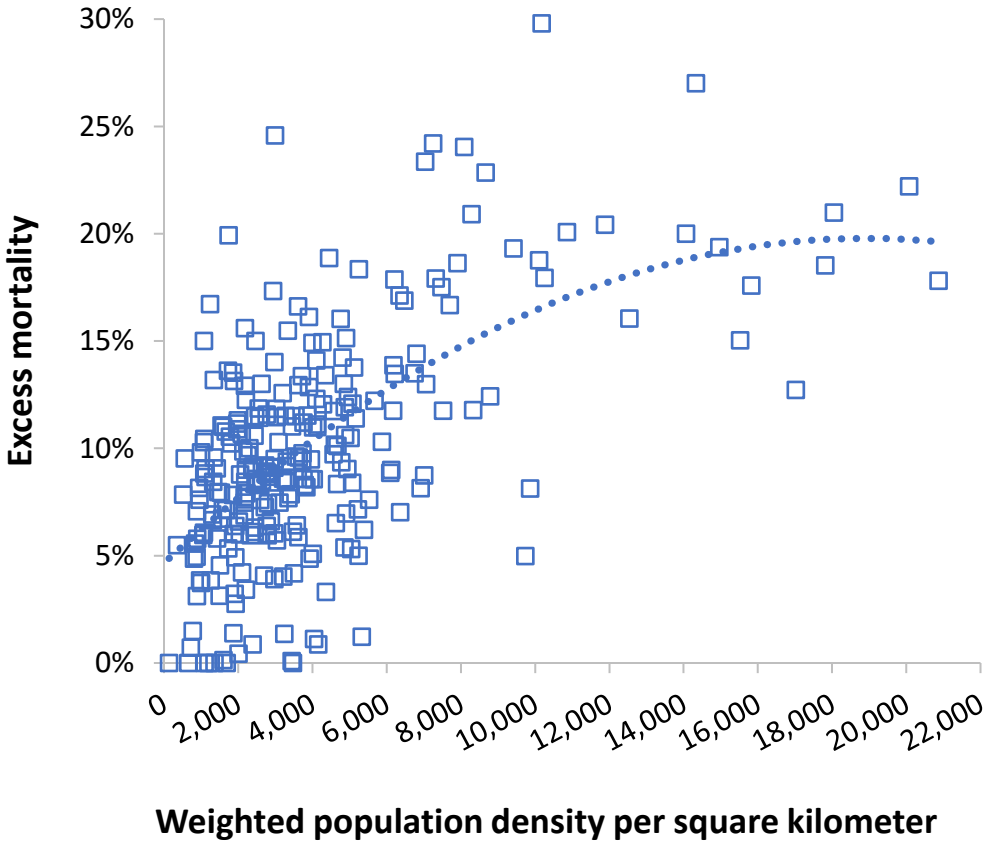
As can be seen both cities have a remarkably high proportion of young adults who can act as asymptomatic carriers, and who are at the age where adherence to lockdown and social distancing will be lower than average (see

https://arxiv.org/ftp/arxiv/papers/2004/2004.02817.pdf). Both cities are also serviced by major International airports.

Finally, Figure 3 shows the role of population density where there is a diminishing effect as population density increases. The high scatter indicates the role of variable Covid-19 transmission in different locations.

Areas with low excess mortality have either no cases of Covid-19 or such low levels that there is no appreciable effect on excess mortality.

Figure 3: Excess mortality (at April 2020) and weighted population density for local government areas in England and Wales



Conclusions

High population density simply creates opportunity for contact.

The ONS should have sufficient data by now to estimate risk ay electoral ward level. Past risk of death is likely to be a good approximation to future potential risk. This can be blended with additional data.

Lack of information simply creates uncertainty.

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

VI. Limitations of death registration

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Due to under-reporting of with-Covid-19 deaths it is 'excess' all-cause mortality which gives the true impact of the epidemic.

There was a serious problem early in the epidemic due to the lag between date of death and date of registration., i.e. in England and Wales at week 11 only 5 with-Covid-19 registrations had been made but 47 with-Covid-19 deaths had occurred, by week 12, 108 and 446 respectively, by week 15, 41,105 and 42,173 respectively.

Due to the early paucity of testing capacity the excess all-cause mortality at these points is far higher, i.e. the epidemic was rising significantly faster than estimated and could have led to inappropriate decisions.

The whole death registration process is not fit for purpose for accurately tracking the initial phases of any major epidemic.

By 15th May total excess deaths in the UK were somewhere around 61,500 – 63,300 (depending on the death registration lag)

By 15th May for every 1,000 official with Covid-19 deaths there were a further 370 unaccounted for excess deaths arising from both the direct and indirect effects of Covid-19. The bulk of this gap will be in nursing homes.

Excess deaths in London had reached 23-26% of annual baseline by the 15th May (after accounting for the lag in death registrations).

During this week, the North East of England showed a significant surge in excess deaths (Table 1, Figure 1).

The downing Street daily briefings are omitting to give the public the true extent of excess deaths, or the limitations of the death registration process and its impact on early decisions in the epidemic.

See Part V for details of genuine excess deaths in nursing homes, where, lack of early testing has greatly underestimated true Covid-19 deaths.

Figure 1 in Part I has been updated and is attached at the end of this document. Parts I to V are attached at the rear of this document.

In the early parts of the outbreak a shortage of tests meant that testing was mainly conducted in hospitals. Hence, it is excess deaths (all-cause mortality) which paints the true Covid-19 death toll across all settings.

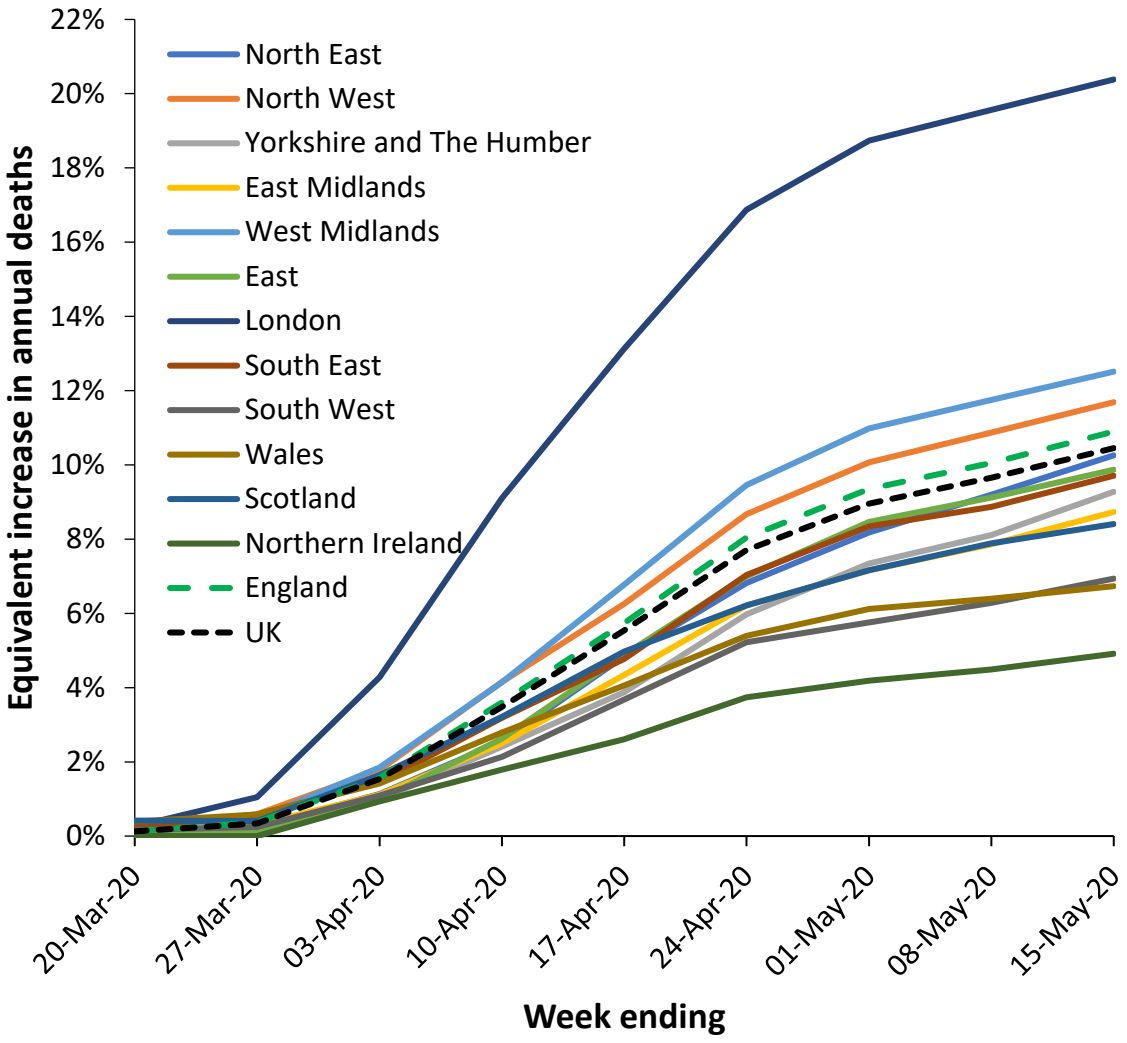
Table 1 shows excess deaths by region up to 15th May. As can be seen most Regions maintain their relative order except for the North East and Yorkshire and the Humber which shows a significant jump (see Figure 1). Figure 1 is cumulative so will continue increasing as long as Covid-19 is in circulation.

Table 1: 'Excess' (registered) deaths on 8th May and 15th May by country and region

Location	Extra deaths up to 8th May	Per year	Extra deaths up to 15th May	Per year
London	9,585	19.6%	9,987	20.4%
West Midlands	6,453	11.7%	6,873	12.5%
North West	7,839	10.9%	8,429	11.7%
England	50,055	10.1%	54,252	10.9%
UK	55,148	9.7%	59,712	10.5%
East	5,246	9.1%	5,677	9.9%
South East	7,235	8.9%	7,916	9.7%
North East	2,571	9.2%	2,868	10.3%
Yorkshire & Humber	4,257	8.1%	4,866	9.3%
Scotland	4,547	7.9%	4,848	8.4%
East Midlands	3,582	7.9%	3,978	8.7%
Wales	2,132	6.4%	2,246	6.7%
South West	3,546	6.3%	3,917	6.9%
Northern Ireland	705	4.5%	771	4.9%

Footnote: Multiply by 1.03 – 1.06 to approximate the real deaths by date of death

Figure 1: Trajectory of excess deaths (registered) by region



The lag between actual date of death and registration of the death in the early parts of the epidemic can be considerable, i.e. in England and Wales at week 11, only 5 with-Covid-19 registrations had been made but 47 with-Covid-19 deaths had occurred, by week 12, 108 and 446 respectively, by week 15, 41,105 and 42,173 respectively. This could have skewed decision making in the crucial early parts of the epidemic.

The whole death registration process is not fit for purpose in terms of any major new pandemic and needs a fundamental overhaul.

For example, the date of death needs to be rapidly registered to enable early detection of changes in all-cause mortality, however the exact cause of death can be appended later.

We now know from the latest ONS report that the first Covid-19 death in England and Wales occurred as early as week 7 (week ending 14th February) which is very close to the early date for onset suggested in Part I (attached at rear).

A review of methods for detecting excess mortality also needs to be conducted (see Technical Appendix Part II). Each method has its own strengths and limitations, however, more advanced methods such as wavelet analysis or Fourier transforms, etc are needed to strengthen this neglected area of detecting excess mortality.

Conclusions

A lack of testing capacity early in the outbreak implies that official with-Covid-19 deaths are a gross underestimate of reality. Excess deaths in the UK are at least 37% higher that those counted as with-Covid-19.

The death registration process may have led to poorly informed decision making early in the outbreak.

As of 15th May excess all-cause mortality was still steadily climbing.

Somewhere in excess of a 22% increase in annual mortality (and rising) in London is an alarming statistic.

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

V. Unintended consequences

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Due to under-reporting of with-Covid-19 deaths it is 'excess' all-cause mortality which gives the true impact of the epidemic.

Excess deaths in England and Wales up to week 18 were: 21,750 in care homes, 18,600 in hospital and 11,250 at home, hospice and elsewhere.

Curiously, the 24,685 with Covid-19 deaths recorded in hospital are 6,090 higher than actual excess hospital deaths. Presumably, these deaths showed up as part of the 11,250 excess deaths at home for people who should have gone to hospital but did not do so – an untended consequence – but would have died anyway in hospital.

There was up to a 500% increase in care home deaths in Hammersmith & Fulham, however, this was due to an extremely low baseline of less than 3 deaths per week prior to Covid-19.

Largest increase in excess care home deaths were in the London boroughs.

High Covid-19 caseload (as deaths) correlates with high care home deaths.

The Isle of Anglesey of the coast of Wales experiences almost no excess hospital or care home deaths.

Deaths in care homes in some locations may have been contained due to a limited supply of free beds.

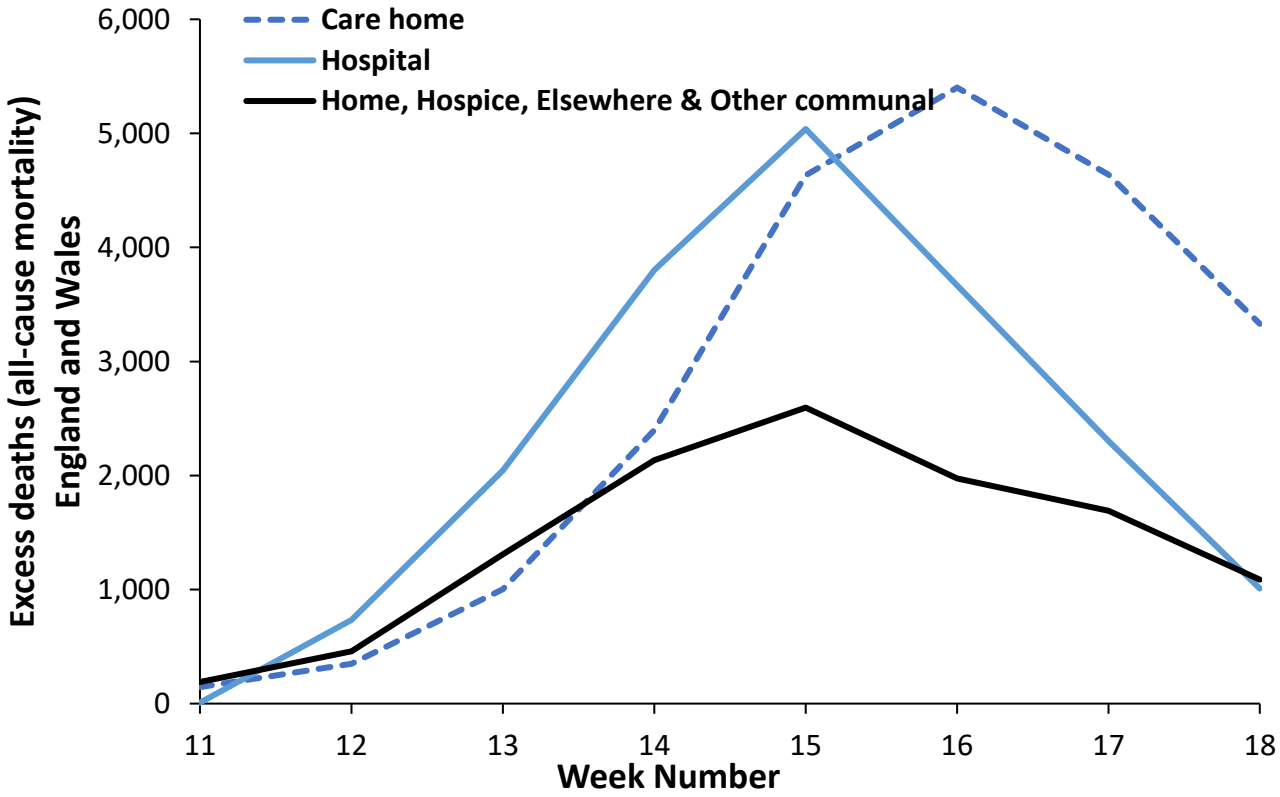
Excess deaths in London had reached 22% of annual baseline by the 8th May (after accounting for the lag in death registrations).

After accounting for the lag in death registrations, excess deaths across the UK had exceeded 60,000 by the 8th of May.

Figure 1 in Part I has been updated and is attached at the end of this document. Parts I to IV are attached at the rear of this document.

In the early parts of the outbreak testing was mainly conducted in hospitals due to a shortage of tests. Hence, it is excess deaths (all-cause mortality) which paints the true Covid-19 death toll across all settings. Figure 1 presents such a picture using Office for National Statistics data for England and Wales where excess deaths (date of death) have been calculated against a baseline over the past 5 years.

Figure 1: Excess deaths (date of death) in different settings in England and Wales



Footnote: Data in this chart is based on the actual date of death, however, actual numbers will be higher due to death registration which can occur weeks and months after the death. The speed of the registration process has been a major weakness in keeping accurate track of the epidemic.

As can be seen by far the most excess deaths occur in care homes. Curiously, with Covid-19 deaths in hospital are higher than the excess deaths in hospital. This is most probably due to the modestly high deaths at home, hospice or elsewhere, i.e. people stayed away from hospital for fear of catching Covid-19 but ended up dying at home. Some of these deaths (approximately 6,090) may have been preventable had the people sought acute care. This was an untended consequence of the Covid-19 epidemic.

Figure 2: Extra hospital deaths due to Covid-19 versus excess deaths in nursing homes, by local authority

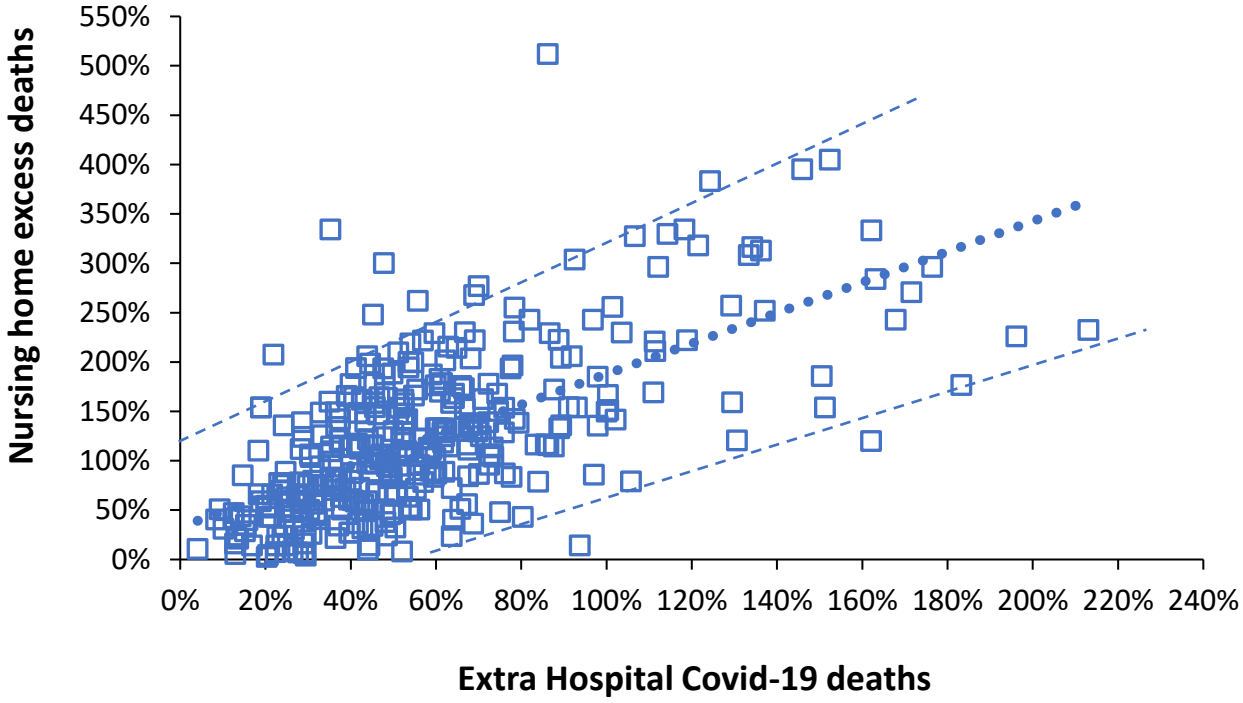


Figure 2 shows how those local authorities serviced by hospitals with a high Covid-19 caseload experienced high care home excess death. The acute system was short of beds and patients were therefore discharged to any available location (home or care home). Care homes suffered due to not being equipped to handle the infection control consequences. As stated last week, this was an International situation. The world was short of PPE and that which was available was prioritised to the acute sector.

In addition, care homes could acquire additional infection via staff, hence, the intercept in Figure 2 is higher than zero.

Table 1 gives the usual summary of deaths be region. After accounting for the lag in death registrations, excess deaths across the UK had exceeded 60,000 by the 8th of May.

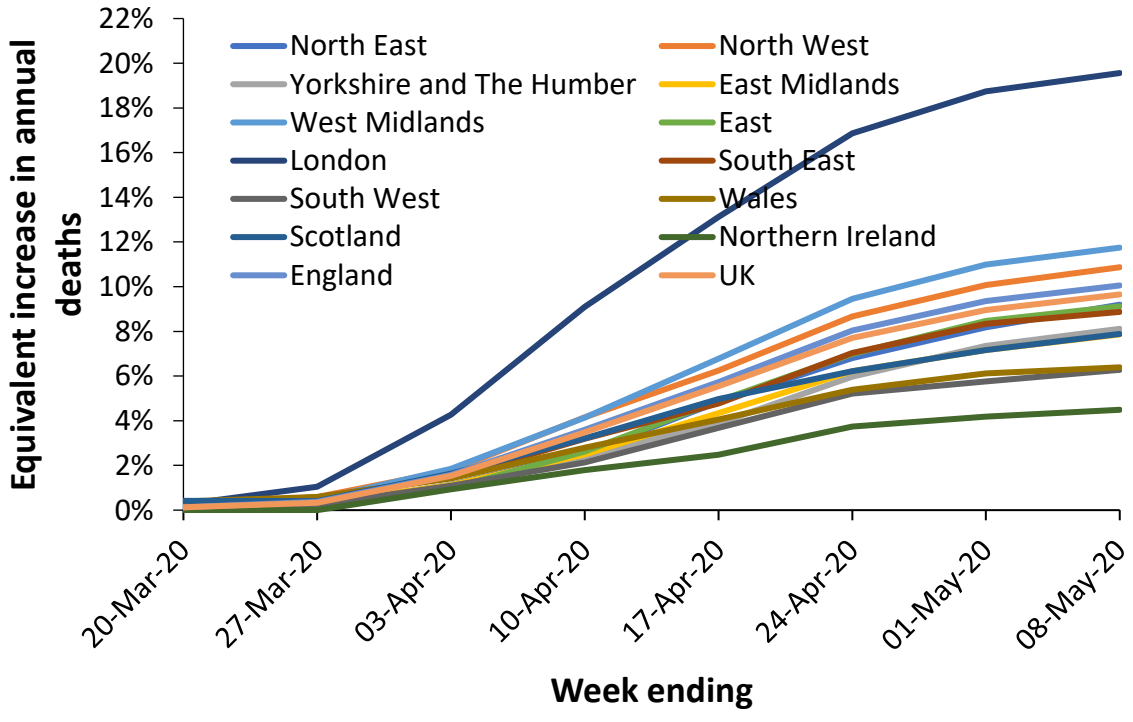
Table 1: 'Excess' deaths on 1st May and 8th May by country and region

Location	Extra deaths up to 1st May	Per year	Extra deaths up to 8th May	Per year
London	9,197	18.7%	9,585	19.6%
West Midlands	6,033	11.0%	6,453	11.7%
North West	7,263	10.1%	7,839	10.9%
England	46,541	9.3%	50,055	10.1%
UK	51,235	9.0%	55,148	9.7%
East	4,868	8.5%	5,246	9.1%
South East	6,840	8.3%	7,235	8.9%
North East	2,286	8.2%	2,571	9.2%
Yorkshire & Humber	3,853	7.3%	4,257	8.1%
Scotland	4,125	7.2%	4,547	7.9%
East Midlands	3,264	7.2%	3,582	7.9%
Wales	2,040	6.1%	2,132	6.4%
South West	3,250	5.8%	3,546	6.3%
Northern Ireland	728	4.6%	705	4.5%

Footnote: Multiply by 1.07 – 1.1 to approximate the real deaths by date of death

As can be seen in Figure 3 excess deaths continue to climb across the regions and will continue to do so while Covid-19 remains in circulation.

Figure 3: Rise in excess deaths over time by region and country



How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

IV. Nursing home deaths

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Due to under-reporting of with-Covid-19 deaths it is 'excess' all-cause mortality which gives the true impact of the epidemic.

Under-reporting of with Covid-19 deaths was occurring in the early weeks of the outbreak, i.e. the outbreak was happening faster than first appeared.

Data from Scotland indicates that actual deaths (by date of death) are around 7-10% higher than deaths by date of registration, i.e. the speed of the outbreak is therefore even faster.

Excess all-cause deaths in the UK had exceeded 51,000 (and possibly >56,000) by 1st May 2020

A revised estimate is provided at the week ending 1st May at regional level, with London experiencing a cumulative 18.7% increase in annual deaths (higher, due to a bank holiday)

For every 1,000 officially attributed Covid-19 deaths in England and Wales (all places of death) there are 456 excess deaths which remain unaccounted for up to 1st of May

Total all-cause excess deaths in the UK are likely to exceed 80,000 – 1000,000 before the end of 2020.

The gap between excess all-cause mortality and Covid-19 deaths looks to be largely due to nursing home deaths incorrectly coded to Alzheimer's and dementia, cancer, circulatory diseases, respiratory diseases, and other causes of death.

Figure 1 in Part I has been updated and is attached at the end of this document.

Parts I to III are attached at the rear of this document.

In the daily Downing Street briefings, it has been constantly emphasized that it is 'excess' all-cause mortality which is the real indicator of true Covid-19 mortality, but that such a measure is 'very complicated' to compare between countries. By implication, this measure will not be available for some time in England and the UK.

This is of course a half-truth. In Part II I discussed the various methods for calculating the baseline against which 'excess' deaths can be calculated. All methods have limitations. However, at least two can be rapidly implemented, namely, comparison against the average deaths for the past 5 years and the rolling 52-week total method used in these reports. The point is whatever method needs to be implemented rapidly since precise numbers are not needed, just a rapid estimate to inform next steps.

The EuroMOMO (https://www.euromomo.eu/graphs-and-maps/) method is already in use for the countries across Europe where it is clear that England has had the highest Z-score of any country (England 44, Spain 35, Belgium 30, Netherlands 24, Italy 23, France 22, etc). For comparison Spain had a maximum Z-score of 14 in the winter of 2016/17. A Z-score is the number of standard deviations away from the expected average, and it allows comparison between countries of different size in terms of annual deaths. However, it presupposes that the number of excess deaths has been calculated and could easily be turned into a percentage figure. Hence, a 35 Z-score excess in Spain is around 5.4% 'excess' deaths, while a 44 Z-score in England is roughly 6% 'excess' deaths. England is still worse than Spain. So much for international comparison being months away. Most countries around the world will have similar data.

Next, Scotland is already applying the average over the past 5-years to determine excess mortality in total and for various diagnosis groups. Freely available (at https://www.nrscotland.gov.uk/covid19stats) along with extensive analysis by National Records Scotland, especially relevant are Figures 5 and 6 in their weekly reports.

From the Scottish data we also learn that as of 26th April cumulative deaths by date the death **occurred** is 7-10% higher than the deaths **registered** data – which is the commonly reported figure. In England and Wales ONS weekly data shows a >10% difference. The real death toll is 7-10% higher than is being reported due to the delay between death and registration of the death. This fact is stressed in the Downing Street briefings, but a percentage figure for the gap is never given.

Table 1: 'Excess' deaths on 24th April and 1st May by country and region

Location	Extra deaths up to 24th April	Per year	Extra deaths up to 1st May	Per year
London	8,266	16.9%	9,197	18.7%
West Midlands	5,194	9.5%	6,033	11.0%
North West	6,253	8.7%	7,263	10.1%
England	40,030	8.0%	46,541	9.3%
UK	44,035	7.7%	51,235	9.0%
East	4,025	7.0%	4,868	8.5%
South East	5,733	7.0%	6,840	8.3%
North East	1,905	6.8%	2,286	8.2%
Yorkshire & Humber	3,134	6.0%	3,853	7.3%
Scotland	3,577	6.2%	4,125	7.2%
East Midlands	2,832	6.2%	3,264	7.2%
Wales	1,799	5.4%	2,040	6.1%
South West	2,947	5.2%	3,250	5.8%
Northern Ireland	587	3.7%	728	4.6%

Footnote: Multiply by 1.07 – 1.1 to approximate the real deaths by date of death

From the data available for Northern Ireland (https://www.nisra.gov.uk/publications/weekly-deaths) it is readily apparent that Covid-19 deaths in nursing homes **exceeded** deaths in hospitals for the weeks ending 24th April and 1st May. Hence, by the week ending 1st May there had been 253 deaths in hospital and 232 deaths in

care homes, and 260 deaths in all settings outside hospital. Hence the figure of double the deaths in-hospital in Parts I and II (attached).

Both the Scottish and Northern Ireland data show 'excess' deaths increasing faster than reported with-Covid-19 deaths in the early parts of the outbreak. Clearly underreporting of with Covid-19 deaths was occurring in the early weeks, and most importantly the speed of the initial outbreak was far faster than at first thought.

I have submitted a paper analysing the gap between excess deaths and with Covid-19 deaths in the UK and concluded that the gap is almost certainly due to nursing home deaths. May I stress that this is not unique to the UK but is an International problem. See an excellent report by "The International Long Term Care Policy Network" (https://ltccovid.org/2020/04/12/mortality-associated-with-covid-19-outbreaks-in-care-homes-early-international-evidence/) which highlights that in some countries nursing home deaths could account for up to 53 to 60% of total Covid-19 deaths.

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

III. Will excess deaths pass the record increase in 2015

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Due to under-reporting of with-Covid-19 deaths it is excess all-cause mortality which gives the true impact of the epidemic.

A revised estimate is provided at the week ending 24th April at regional level, with London experiencing a cumulative 16.9% increase in annual deaths.

For every 1,000 officially attributed Covid-19 deaths in England and Wales (all places of death) there are 553 excess deaths which remain unaccounted for.

Total all-cause excess deaths are likely to exceed 50,000 for the entire UK.

Asymptomatic infection with Covid-19 may be triggering seemingly unrelated deaths (as confirmed by medical reports).

The Covid-19 'extra' deaths in 2020 are compared to an unexplained large increase which occurred from mid-2014 to mid-2015.

Figure 1 in Part I has been updated and is attached at the end of this document.

On Friday 1st May in the Downing Street evening briefing it was once again re-affirmed that excess mortality would probably not be available for several months. This is not quite true as 'excess' mortality for the whole of Europe are available via EuroMOMO (https://www.euromomo.eu/graphs-and-maps/) where England, in particular, can be seen to have the worst excess in Europe. This will mainly be due to London. Also Public Health England (PHE) publishes excess mortality in a weekly bulletin (https://www.gov.uk/government/news/weekly-covid-19-surveillance-report-published) and the absolute number of excess deaths is broadly consistent with those reported in this series (PHE uses the EuroMOMO methodology).

Before people leap to blame the government for shortcomings it must be pointed out that England has one of the highest weighted population densities in Europe. I have demonstrated that weighted population density plays a significant role in Covid-19 cases in the USA (submitted). Population density, and international travel from infected areas, explains why both London and New York have such high Covid-19 fatalities. For example, 18 of the top 20 highest population small areas in England and Wales are in London (see Appendix), with densities ranging from 40,000 to 100,000 people per square kilometre. Westminster contains 5 of the top 20 (see part II).

However, analysis of excess mortality by ***cause of death*** may indeed be several months away.

To keep the whole Covid-19 epidemic in perspective there have been several large increases in excess deaths since the 1950's (over a 70-year period) and these are given in Table 1. These periods of higher excess mortality do not end in neat calendar years, which has been called the "calendar year fallacy" (see link above to full list of publications).

Table 1: Examples of periods of extremely high excess mortality in England & Wales. Monthly deaths courtesy of the Office for National Statistics.

12-month period ending	Excess mortality %
August 1952	17.5%
August 1958	13.3%
March 1961	11.4%
April 1968	9.5%
June 2015	9.1%

These large increases all involve an influenza outbreak, sometimes with extended very cold weather, and sometimes one of the shift-up events described in Part I. Percentage increase has decreased over time due to wider availability of central heating, home insulation and influenza vaccination.

In today's terms a 17% increase would equal 100,000 excess deaths across the UK.

Unfortunately, this data only covers the whole of England and Wales. However, data for the event ending in mid-2015 is available at country, regional and local authority level.

In Table 2 Covid-19 extra deaths for each region/country are compared to the 2014/2015 increase. Note that there were no daily briefings counting deaths during this event, no rush to acquire PPE, and it was only till after that it was realised that many deaths had occurred. See link at top of the document for detailed research into the 2014/2015 event which behaved like an infectious outbreak. A small influenza outbreak occurred in January of 2015 and this added an increment to the overall 'excess' deaths.

Table 1: Extra deaths up to 17th and 24th April 2020

Location	Extra deaths up to 17th April	Per year	Extra deaths up to 24th April	Per year	Increase mid-2014 to mid-2015
London	6,432	13.1%	8,266	16.9%	11.5%
West Midlands	3,721	6.8%	5,194	9.5%	9.8%
North West	4,509	6.3%	6,253	8.7%	8.6%
Scotland	2,863	5.0%	3,577	6.2%	11.6%
England	28,548	5.7%	40,030	8.0%	9.6%
UK	31,641	5.5%	44,035	7.7%	9.8%
South East	3,894	4.8%	5,733	7.0%	8.7%
East	2,810	4.9%	4,025	7.0%	11.4%
East Midlands	1,977	4.3%	2,832	6.2%	11.1%
Wales	1,353	4.1%	1,799	5.4%	10.1%
North East	1,353	4.8%	1,905	6.8%	11.2%
South West	2,076	3.7%	2,947	5.2%	9.8%
Yorkshire & Humber	2,035	3.9%	3,134	6.0%	9.3%
Northern Ireland	389	2.5%	587	3.7%	9.3%

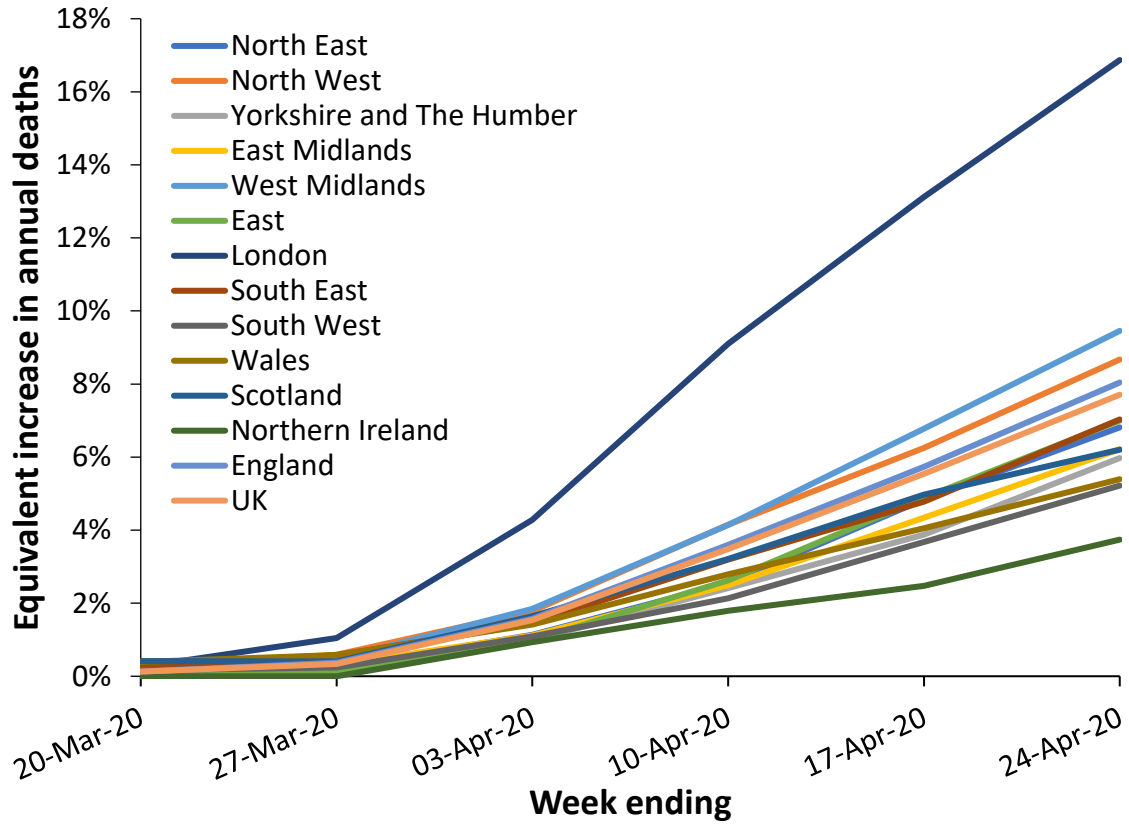
As can be seen after barely six weeks of the Covid-19 epidemic 'excess' deaths in London have already exceeded the 2014/2015 event and reached the equivalent percent increase for 100,000 excess deaths across the UK. North West has exceeded while West Midlands will do so next week. However, many areas remain well below the 2014/15 increase. See updated Figure 1 in Part I attached at the rear of this document.

At the 24th April the official count of Covid-19 deaths in England and Wales stood at 27,330 which leaves 14,499 unaccounted excess deaths.

Regional Trajectories and a Full-year Effect

While Covid-19 deaths may be declining in some regions it is of interest to speculate as to the likely full-year impact of the epidemic. To this end Figure 1 shows the trajectory of cumulative excess deaths over time in each country/region. London is showing evidence that the outbreak is slowing while Northern Ireland is increasing.

Figure 1: Cumulative trajectories of excess deaths by country/region.



While London will exceed the UK equivalent of 100,000 deaths the total for the entire UK is likely to exceed 50,000 excess deaths. A lot depends on if there

are second and third waves of the outbreak. The hopeful total of 20,000 Covid-19 deaths was exceed in around week 3.

However, we really do need to understand why the official with-Covid-19 count of deaths (in all places of death) is failing to capture the full extent of all-cause excess deaths.

Appendix

Table A1: Top 20 highest population density Lower Super Output Areas (LSOA) in England and Wales

LSOA Name	People per Sq Km
Tower Hamlets 032D	102,692
Tower Hamlets 028H	62,852
Islington 011F	59,385
Kensington and Chelsea 021C	55,628
Westminster 024E	51,753
Hammersmith and Fulham 023E	51,572
Islington 006F	51,354
Sheffield 073E	50,059
Westminster 022D	48,412
Hackney 027I	48,119
Tower Hamlets 032B	46,918
Tower Hamlets 025C	46,225
Lambeth 004G	46,180
Manchester 013F	44,203
Southwark 014G	43,783
Westminster 017A	43,574
Westminster 014F	43,100
Hackney 028E	41,418
Westminster 021D	40,916
Southwark 003F	39,651

Data source:
https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/lowersuperoutputareapopulationdensity

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

II. Local hot spots

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An initial estimate (at end of March) is given for the worst affected local authorities in England, Wales and Scotland. Covid-19 hot spots are evident.

A revised estimate is provided at the week ending 17th April at regional level, with London experiencing a 13.1% increase in annual deaths.

Total 'excess' deaths is slightly higher at a level of 2.2-times the in-hospital deaths

It is suspected that asymptomatic infection with Covid-19 may be triggering seemingly unrelated deaths

We need to ask the question if similar events occurred in China?

Current methods for choosing the baseline against which to determine 'excess' deaths have limitations (see Technical Appendix)

In the Tuesday evening Downing Street Covid-19 briefing on 21st March one of the governments scientific advisors claimed that estimates of excess deaths during the Covid-19 outbreak across Europe were not yet available. This data is freely available via the EuroMOMO website (http://www.euromomo.eu/), and

has been so for many years. Was this designed to throw the National Press off the trail of disturbingly high excess mortality?

Excess Deaths up to 17th April (most recent data)

For the method see Part I at the end of this document. Table 1 shows the estimated extra deaths up to the 10th and 17th of April and the percentage increase in deaths that this would have across a whole 52-weeks. Recall that the first official death due to Covid-19 in the UK occurred on the 7th March 2020.

On 17th April reported in-hospital Covid-19 deaths in the UK were 14,576. Total 'extra' or 'excess' deaths are therefore ***2.2-times*** the number of in-hospital deaths. East of England almost doubled total deaths in the week ending 17th April.

Table 1: Extra deaths up to 10th and 17th April 2020

Location	Extra deaths at 10th April	Per year	Extra deaths at 17th April	Per year	Commences
London	3,991	8.1%	6,432	13.1%	21-Feb-20
West Midlands	2,113	3.8%	3,721	6.8%	06-Mar-20
North West	2,539	3.5%	4,509	6.3%	21-Feb-20
Scotland	1,845	3.2%	2,863	5.0%	21-Feb-20
England	15,789	3.2%	28,548	5.7%	06-Mar-20
UK	17,756	3.1%	31,641	5.5%	06-Mar-20
South East	2,160	2.6%	3,894	4.8%	28-Feb-20
East	1,358	2.4%	2,810	4.9%	28-Feb-20
East Midlands	1,104	2.4%	1,977	4.3%	06-Mar-20
Wales	764	2.3%	1,353	4.1%	28-Feb-20
North East	657	2.3%	1,353	4.8%	06-Mar-20
South West	1,141	2.0%	2,076	3.7%	06-Mar-20
Yorkshire & Humber	985	1.9%	2,035	3.9%	20-Mar-20
Northern Ireland	281	1.8%	389	2.5%	27-Mar-20

Public Health England also produce a weekly report on excess mortality (see https://www.gov.uk/government/publications/national-covid-19-surveillance-reports), however, they only report on England as a whole and do not give any comparison with in-hospital deaths.

Sub-acute effects of Covid-19

This analysis points to the potential for a sub-acute infection with Covid-19 to trigger deaths from seemingly unrelated conditions. The earliest official death in the UK occurred on the 7th March, yet the rolling 52-week total methodology suggests that 3 regions showed signs of higher deaths at some point after the 21st February (Table 1). We also need to ask the question if very high levels of seemingly unrelated deaths also occurred in China?

Excess Deaths by Local Authority (to end of March)

Monthly data on deaths is available from the Office for National Statistics and the National Records of Scotland covering local authorities in England, Wales and Scotland.

An initial estimate of the excess deaths which occurred in March as a percentage of annual deaths is shown in Figure 1 which only gives local authorities and regions which exceed the +1 Standard Deviation (STDEV) level.

In Poisson statistics 85.3% of all outcomes fall below +1 STDEV. 108 local government areas passed this simple statistical test while 372 did not achieve this level.

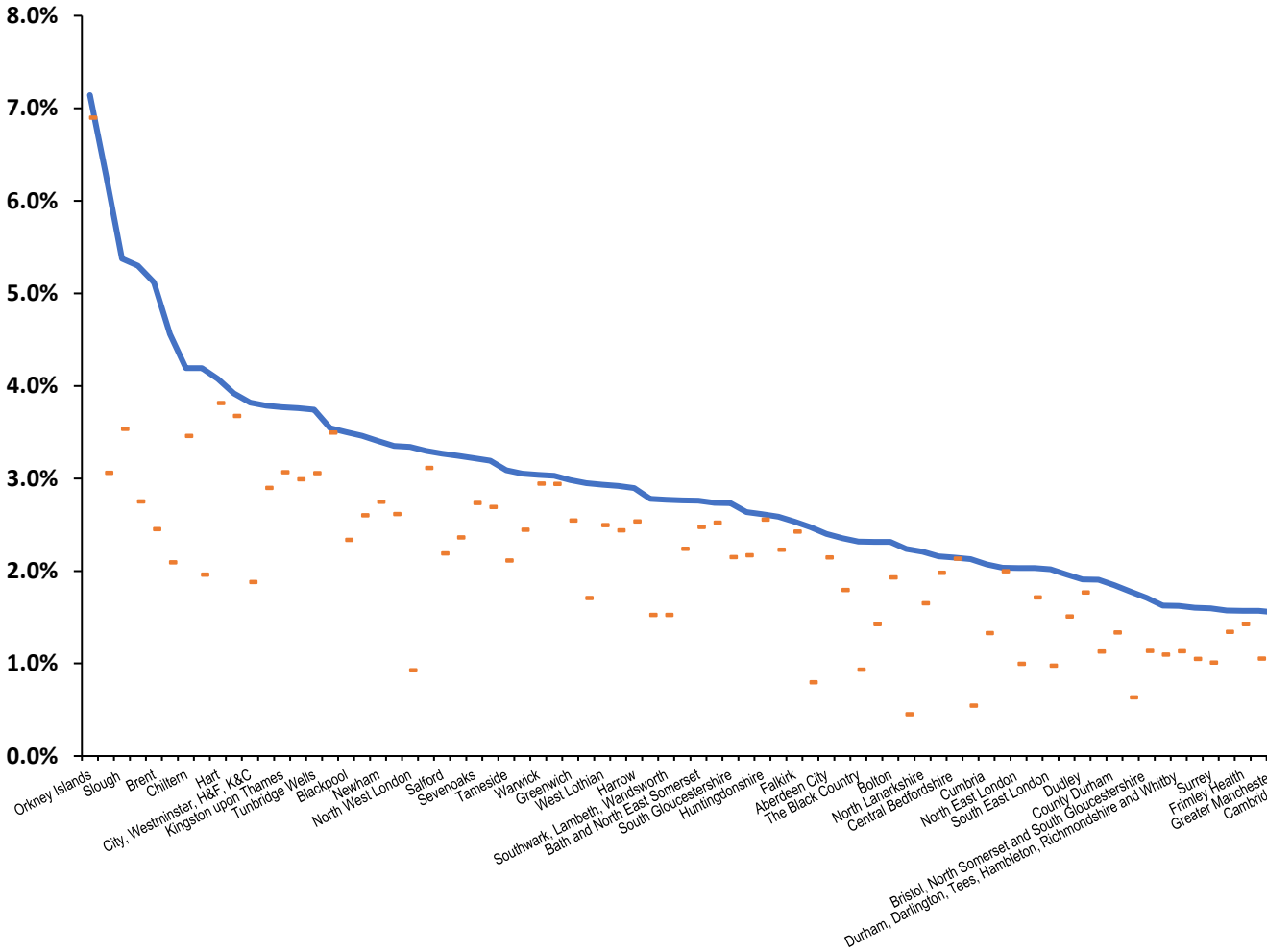
Areas with an increase (excess deaths) greater than 4% (i.e. >10-times UK average excess deaths) were: Orkney islands +7.1%, Westminster +6.3%, Slough +5.4%, Southwark +5.3%, Brent +5.1%, Barnet +4.6%, Chiltern +4.2%, Wolverhampton +4.2% and Hart +4.1%. These figures will be confirmed when April deaths are available in late May.

At the 31st March 2020, some 2,352 in-hospital deaths were reported for the UK which is equivalent to 0.4% annual excess deaths. Hence, total excess deaths in March are at least 1.2 extra or excess death for every 1 reported in-hospital Covid-19 death.

However, it is clear from Figure 1 that there are Covid-19 hot spots scattered throughout the UK, and that some locations initiated far earlier than others (Table 1).

Interestingly, many politicians had to self-quarantine due to Covid-19 infection and the London Borough of Westminster was one such hot spot. Politicians and civil servants are likely to have been high contact individuals.

Figure 1: Local government areas in England, Scotland and Wales showing a significant increase in total deaths during March 2020. The increase is expressed as a percentage increase in the annual total deaths. Only every second name is displayed.



Technical Appendix: What is the baseline for deaths?

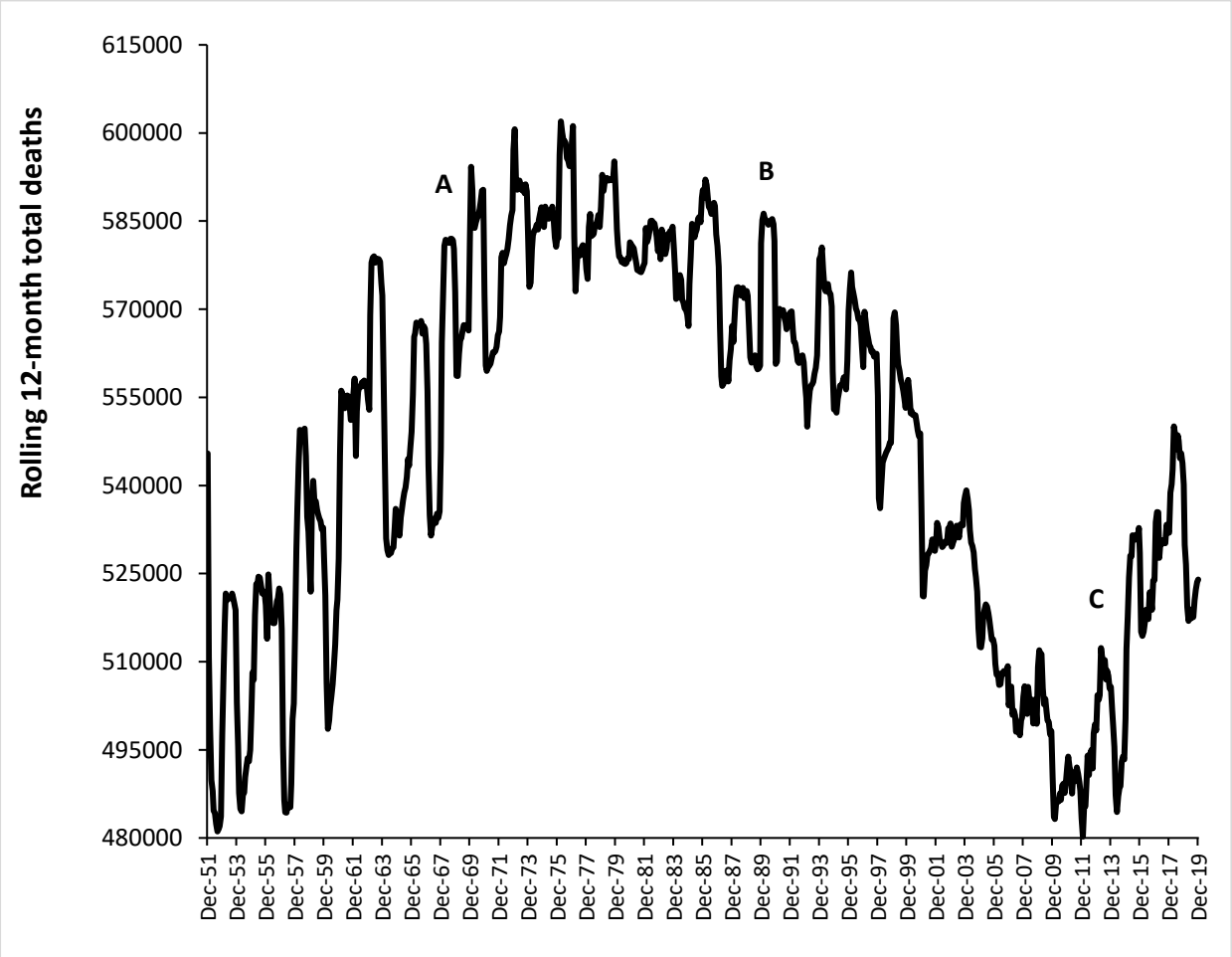
In Part I of this series I made an estimate of the excess deaths during Covid-19 in the UK (see rear of this document) using a method involving rolling 12-month totals.

This brings us to a consideration of how to choose the baseline against which to assess the 'excess' deaths.

What are the trends in the baseline?

To demonstrate the difficulty of choosing a baseline Figure 1 shows a rolling 12-month total trend in deaths in England and Wales over the period 1951 to 2019. Data was kindly provided on request by the Office for National Statistics.

Figure 1: Rolling 12-month total deaths in England and Wales, 1951 to 2019

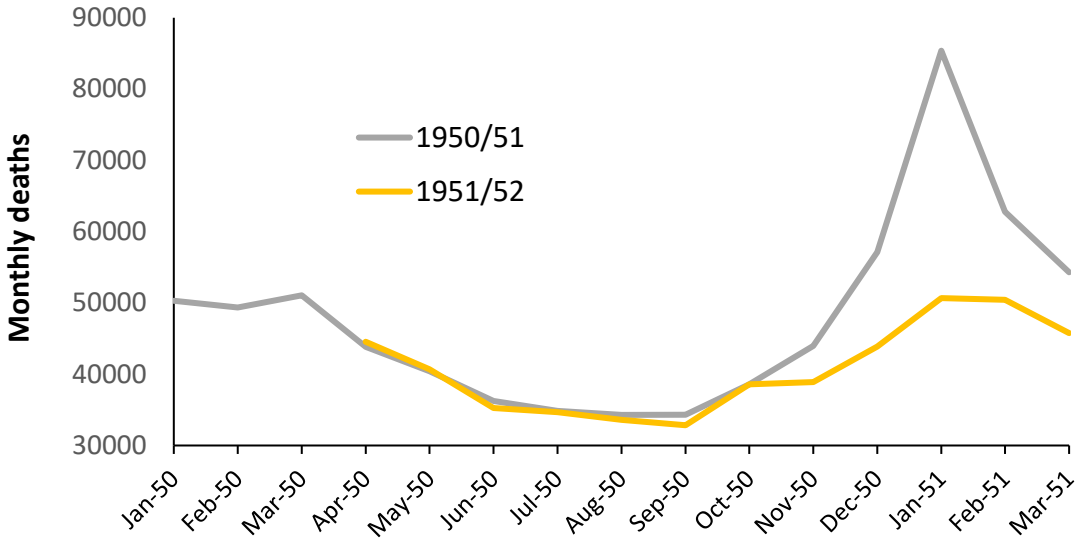


Deaths (all-cause mortality) first rise to a maximum around 1975, then fall to a minimum for the 12 months ending January 2012 and then start to rise again. The pattern is a complex function of previous patterns of births and

immigration, improvements in life expectancy, influenza and other infectious outbreaks and temperature.

While influenza is an important contributor to winter deaths, the incidence of a pure influenza-only event is relatively rare. In a rolling 12-month total an influenza outbreak typically shows up as a table-top shaped feature as in A and B. Curious sudden shift-up/down events also occur as in C, but also occur prior to some influenza events. By shift-up/down it is meant that deaths suddenly increase by say 10% and stay 10% high for at least 12 months (sometimes up to 3 years) and then suddenly shift back down. In a rolling total this shows up as a ramp up/down.

Figure 2: Monthly deaths in two adjacent years covering the winters of 1950/51 and 1951/52



Methods to estimate the baseline

While it is true that deaths are generally the most stable in the summer months even then there are differences due to temperature. Figure 2 gives an example of monthly deaths for two adjacent years. The winter of 1950/51 is a mix of unusually low temperatures and a major influenza epidemic.

Three approaches can be taken to resolve this issue.

1. The approach used by the Office for National Statistics where deaths are average over the previous 5 years for that month or week. This approach has the limitation that deaths may be rising/falling depending on where you are in time, and it also ignores the existence of the curious up/down shifts. Hence during the Covid-19 outbreak in the UK during 2010 the

five previous years cover 2015 to 2019. 2015 commenced with a shift-up which started in 2014 while 2019 contains a large shift-down. 2020 is marked by a shift-up which commenced around May 2019 but shows different timing across the UK. This method probably **underestimates** the 'excess' deaths during the Covid-19 outbreak.

2. The EuroMOMO methodology takes a maximum of 5 years previous data from the most stable parts of spring and autumn (weeks 15-26 and 36-45) to which are applied linear, linear splines or a sine curve models depending on the age bands to be compared. This is more accurate than the ONS method, however, it assumes that shift-up/down events do not exist. Given the key role of shift-down/up in 2018 and 2019 extending into 2020 this model may both over- and under-estimate.
3. The most sophisticated methodology is to use mean daily temperature to correct for the effect of temperature on deaths for different age-bands, leaving residual deaths due to the pathogen (influenza or Covid-19)- see Lytras et al Euro Surveill 2019; 24(14): 1800118. doi: 10.2807/1560-7917.ES.2019.24.14.1800118. This method is currently not widely used but will need to be employed if a more reliable estimate is needed. This method suffers from the fact that it ignores the existence of up/down shifts in deaths but could readily be corrected for these factors.

Hence, the reason that a rolling 52-week total was used in Part I to estimate 'excess' deaths during the Covid-19 epidemic in the UK was that it acknowledged the contribution from up/down shifts and gave the best available approach to a reasonable estimate of the baseline applicable at the time of the Coivid-19 epidemic. It has the limitation that effect of the previous step-up which occurred in 2019 may still be accumulating in the running total.

No method is perfect but hopefully the one used here gets us closest to the true figure.

How many extra deaths have really occurred in the UK due to the Covid-19 outbreak?

I. Initial estimate

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Deaths in hospital with Covid-19 are only half of the total extra deaths occurring during the epidemic.

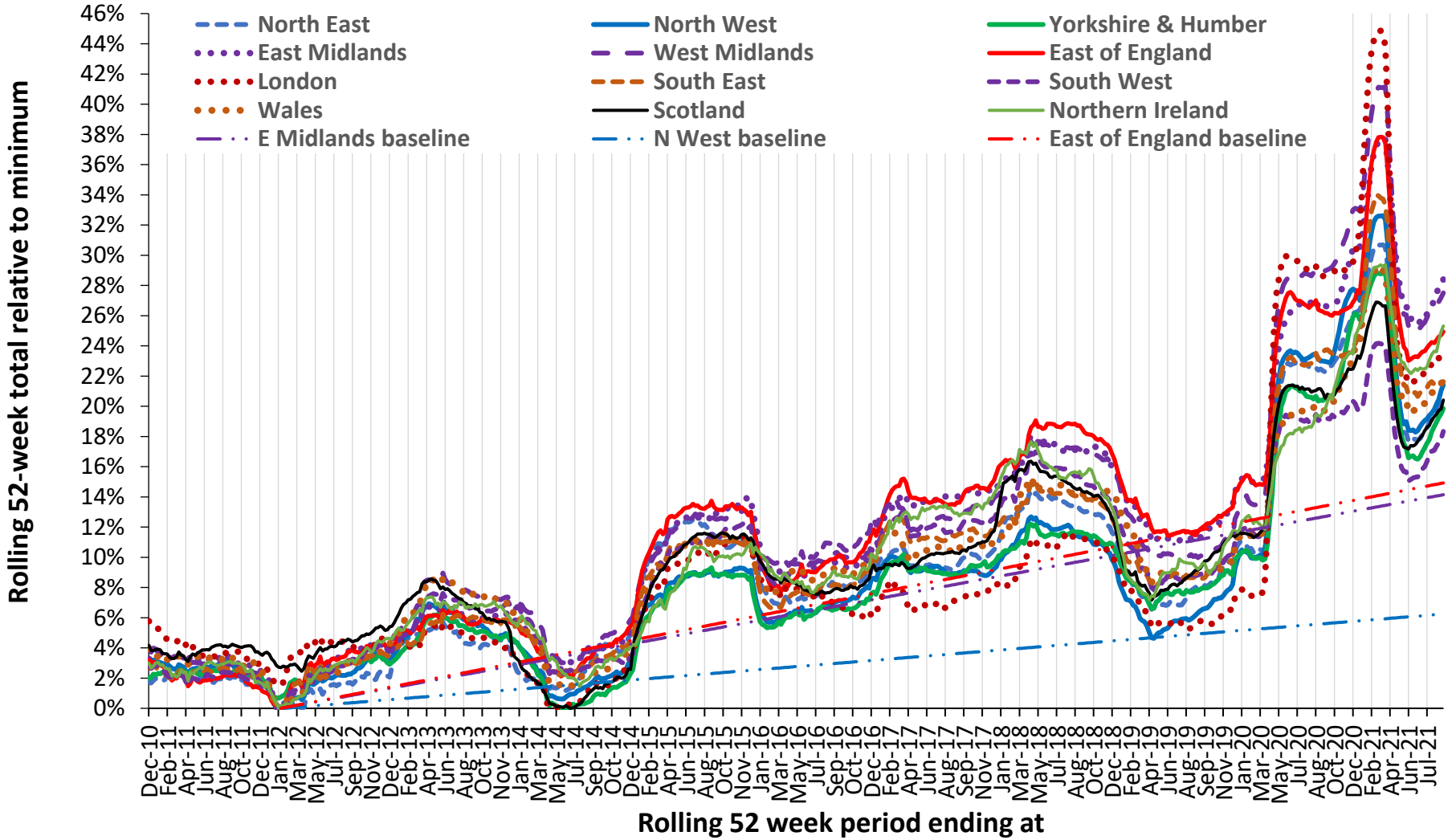
Like many I have been left somewhat disappointed by the Downing Street daily Covid-19 updates in England and by the answers given to questions raised by the press. They have been a missed opportunity in eloquent analysis of the data which should have been a showcase of the scientific expertise available to Her Majesties Government.

Indeed, there has been much debate around the real number of deaths directly attributable to Covid-19. By the real number I mean deaths in all places (Hospitals + Nursing Homes + Elsewhere + the unintended consequences of the disruption of primary and secondary care) and after adjusting for the number of persons who were diagnosed with Covid-19 but would have died anyway from their medical condition(s).

A method exists to extract this number from published weekly deaths (all-cause mortality) using a method called a rolling, running or moving 52-week total. In a rolling 52-week total the effects of summer/winter are minimised since the 52-week total always covers all the seasons.

For example, Figure 1 shows a rolling 52-week total of all deaths across the four countries of the UK and regions within England. Total deaths in Figure 1 are relative to the point of minimum deaths in either 2012 or 2014 as a

Figure 1: Rolling 52-week total of deaths (relative to the point of minimum deaths which occurred in early 2012 or mid 2014) across the UK. Rolling 52-week total commencing 30-Dec-2010 onward (updated to 17th September 2021).



percent difference. Due to the WW II baby boom deaths will trend upward over the next 30 to 40 years.

The first point from Figure 1 is that deaths are following complex patterns which arise from a mix of winter infectious outbreaks (mainly due to influenza) which vary from year to year, plus unexplained sudden shifts up/down which are not supposed to exist.

In a rolling total such sudden shifts show up as a ramp simply because the sudden shift accumulates in a rolling total. Such sudden shifts up occur in early 2012, around June 2014 and around April 2019. A very large and sudden shift-down commences around August 2018.

An influenza outbreak causes a table-top shaped feature which may be imposed on a ramp up/down from the sudden shifts.

Thankfully, the winter of 2018/19 and 19/20 are characterised by low influenza activity.

The total number of extra deaths due to Covid-19 are revealed at the far right of the chart. This is a repeat of the large increase in early 2015, which has never had an adequate explanation (see link above).

Table 1: Extra deaths attributable to Covid-19 and date at which the outbreak takes hold in each location

Location	Extra deaths	Per year	Commences
North West	2,539	3.5%	21-Feb-20
Scotland	1,845	3.2%	21-Feb-20
London	3,991	8.1%	21-Feb-20
East	1,358	2.4%	28-Feb-20
South East	2,160	2.6%	28-Feb-20
Wales	764	2.3%	28-Feb-20
North East	657	2.3%	06-Mar-20
East Midlands	1,104	2.4%	06-Mar-20
West Midlands	2,113	3.8%	06-Mar-20
South West	1,141	2.0%	06-Mar-20
England	15,789	3.2%	06-Mar-20
UK	17,756	3.1%	06-Mar-20
Yorkshire and The Humber	985	1.9%	20-Mar-20
Northern Ireland	281	1.8%	27-Mar-20

To calculate the extra deaths due to Covid-19 involves locating the minimum just before the large jump at the far right of Figure 1 and calculating the difference. The results of this analysis are shown in Table 1 which gives the data at which the Covid-19 outbreak takes hold in each location, the extra deaths from that point to the 10th of April, and the effect this increase would have on the annual total deaths. The date at which the outbreak takes hold is later than the date of first arrival. The percentage extra deaths per year will increase over time as the outbreak adds further deaths to the total.

As can be seen the Covid-19 outbreak commences first in the North West, Scotland, and London. London is affected far worse that the other two, probably due to extremely high population density.

The outbreak commences last in Yorkshire and the Humber and Northern Ireland and this later onset explains the smaller increase to the 10th of April.

On the 10th of April 2020, the official UK Covid-19 death toll stood at 8,958 which is a mere 50% of the total calculated in Table 1.

Since the 10th of April to 21st April a further 7,551 with Covid-10 deaths have occurred in hospital implying 15,102 extra total deaths in that period.

This figure of double the deaths is larger than the 41% higher reported in the National Press. The value of double may be closer to the truth than 41%.

The unintended consequences of Covid-19 may be worse than first appreciated.

Data Sources

The data comes from three sources and finishes on the 10th April 2020 which is the most recent available data released on 21/04/2020.

England & Wales:
https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/datasets/weeklyprovisionalfiguresondeathsregisteredinenglandandwales

Scotland: https://www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/vital-events/general-publications/weekly-and-monthly-data-on-births-and-deaths/weekly-data-on-births-and-deaths

Northern Ireland: https://www.nisra.gov.uk/publications/weekly-deaths

The figure of 8,958 is available from the Trending Stats tab at
https://www.bing.com/search?q=covid-19+deaths+uk&form=EDGEAR&qs=PF&cvid=6c1f4044ab5643ab88300f67cd7792d6&cc=GB&setlang=en-GB&plvar=0&PC=ASTS