COVID-19 first anniversary review of cases, hospitalisation, and mortality in the UK

Hamid A. Merchant[1], Chia Siang Kow[2], Syed Shahzad Hasan[1,3]

[1]School of Applied Sciences, University of Huddersfield, Huddersfield, United Kingdom
[2]School of Postgraduate Studies, International Medical University, Kuala Lumpur, Malaysia
[3]School of Biomedical Sciences and Pharmacy, University of Newcastle, Newcastle, Australia

Corresponding author:
Email ID: s.hasan@hud.ac.uk; hamid.merchant@hud.ac.uk

Abstract:

Introduction: The first confirmed COVID-19 case in the UK dates to 11th January 2020, exhibiting its first peak during April 2020. The country has since been hit by second and third waves in November and December 2020 respectively, almost at the first anniversary of the pandemic.

Areas Covered: This perspective provides an in-depth analysis of the COVID-19 positive cases in the UK throughout the year, the number of hospitalisations, patients in critical care, and COVID-19 associated deaths.

Expert Opinion: The COVID-19 associated hospital admission represents only 15% of total COVID-19 positive cases in November 2020 compared to around 65% during the first wave. In April 2020, 17% of total COVID-19 positive patients in the country died from the disease, this was dropped to under 4% in November 2020. Age was the single most determinator of COVID-19 associated mortality, people with 50 years or older age accounted for 98% of total COVID deaths recorded in the country. This probes interesting questions about the current state of immunity, national lockdown, and mass immunisation measures to curb the pandemic cycle; it also emphasises the need to invest in novel antivirals to save the most vulnerable in the society and hence a refocus in efforts and resources needed to bring the life back to normality

Keywords: Case fatality ratio; herd immunity; lockdown; cure; mortality; SARS-CoV-2; seroprevalence; COVID vaccine

Article Highlights

- 65% of COVID-19 patients were hospitalised during the first wave, this has dropped to only 15% in November 2020
- 17% of people with confirmed COVID-19 died in April 2020, this has dropped to only 4% in November 2020
- 33% of total hospitalised patients with COVID-19 died in April 2020 (one in three patients died), this is now 27% in Nov 2020 indicating that one in four patients are still dying with COVID-19 while receiving hospital care
- 45% of COVID-19 patients on critical care in hospitals died during the first wave, whereas 33% of those admitted to critical care from Sep to Nov 2020 died from the disease, nevertheless, most of the patients (60%) were still in the hospital receiving critical or acute care.
- Age distribution of the COVID-19 associated deaths in 2020 was similar to the age distribution of the all-cause mortality in 2019 suggesting coronavirus has hit the vulnerable the hardest.
- Age was the single most determinator of COVID-19 associated mortality, people with 50 years or older age accounted for 98% of total COVID deaths recorded in the country.
- It is worth investing resources and strategies for a potential cure that may reduce the risk of death in severely-ill hospitalised COVID-19 patients, for instance, novel broad-spectrum antivirals with efficacy against SARS-CoV-2 or monoclonal antibodies capable of clinically neutralising the virus to improve the disease survival rates in a vulnerable population.

1. Introduction

It has been a year since the coronavirus disease 2019 (COVID-19) emerged and spread globally. The first confirmed COVID-19 case in the United Kingdom (UK) dates to 11th January 2020 as per Public Health England records, exhibiting its first peak during April 2020. The country has since been hit by a second and third wave in November and December 2020, respectively, almost at the first anniversary of the pandemic [1]. This article provides an annual review of the COVID-19 positive cases in the UK throughout the year, the number of hospitalisations, and COVID-19 associated deaths. This has led to interesting findings on how pandemic has progressed in the country throughout the year, the possible distribution of mild to severe cases, and how the quality and standard of care in the hospital would have benefited the mortality rate.

2. Data extraction and analysis

COVID-19 confirmed cases in the UK, represented by the number of people with at least one positive COVID-19 test result by the sample date, the number of COVID-19 associated deaths within 28 days of COVID-19 positive test by the date of death, and the daily numbers of COVID-19 patients admitted to hospital and the counts of COVID-19 patients in mechanical ventilation beds were obtained from the Public Health England COVID-19 database [2]. The data was plotted against time access showing a trend throughout the year and summarised in **Figures 1 and 2**. The in-hospital survival to 28 days following admission to critical care for patients critically ill with confirmed COVID-19 admitted to the hospitals during 2020 was obtained from ICNARC (Intensive Care National Audit & Research Centre) [3]. The all-cause mortality data were extracted from the Office for National Statistics (ONS). The data was further analysed to study the mortality rates as a function of the number of COVID-19 positive cases, age, or the number of COVID-19 associated hospitalisations (**Figures 3, 4**).

3. Results and discussion

The analysis of COVID-19 cases reported in the United Kingdom, associated hospitalisation, and deaths revealed several interesting trends.

First, during the peak of the first wave of COVID-19 in the UK (April 2020), around 65% of total patients who tested positive for COVID-19 were being hospitalised. However, this has dropped to only 15% by the second wave of COVID-19 (November 2020). This may suggest that in November 2020 most patients (85%) were recovered from a mild-moderate disease and did not need hospital care.

Second, the COVID-19 mortality rate per 100 positive cases was spiking at 17% during the first wave (April 2020) that were significantly dropped to under 4% (**Figure 3**) during the second wave (November 2020). Apparently, this showed that a majority of COVID-19 positive patients (~95%) were recovering

from the illness. The total number of deaths (all causes) registered in England in April 2020 was about twice more than the deaths recorded in the same month in 2018 and 2019. However, the overall death toll in England starts to decrease after April and remained stable from June to October 2020 without any significant changes but increased again in November and December 2020 (**Figure 4**).

Third, during the peak of the first wave of COVID-19 in the UK (April 2020), the mortality rate was approximately 33% of total hospitalised patients with COVID-19; in other words, one in three patients died while receiving hospital care in the UK (**Figure 3**) earlier this year. Nevertheless, in November 2020, this had dropped to just under 27% indicating that about one in four patients were still dying with COVID-19 while receiving hospital care in the UK. This is further confirmed by the in-hospital survival to 28 days following admission to critical care for patients critically ill with confirmed COVID-19, the percentage survival was slightly improved from 61% (first wave) to 64% during the second wave.

Fourth, the age distribution of the COVID-19 associated deaths in 2020 was similar to the age distribution of the all-cause mortality in 2019 **(Figure 4)**. The coronavirus did not specifically target any age groups, but it has hit the vulnerable age groups the hardest. The older age was the single most determinator of COVID-19 associated mortality, people with 70 years or older age accounted for 84% of total COVID deaths recorded in the country. In total, 98% of the total COVID deaths were found in people aged 50 years or older. The age distribution pattern of COVID-19 associated mortality was similar during the first and second waves of pandemic during 2020 in England.

4. Expert Opinion:

It is worth mentioning that the COVID-19 testing was not available widely during the first wave and the test was only offered to a patient if their symptoms persisted after a couple of weeks of self-isolation. During the second wave, the test was available widely without any formal restrictions. There were only ~30,000 tests conducted per day in April 2020 which was increased to about 330,000 tests performed every day in November 2020 which was further increased to over 600,000 tests per day by the new year. The limited availability of test during the first wave meant that many mild-moderate cases who recovered from the mild illness were never tested, and therefore could not be included in the statistics. This would have contributed, in part, to the increased hospitalisation rate observed during the first wave. This would have also contributed, in part, to the higher mortality rate (per 100 positive cases) observed early in the pandemic.

The improved recovery rates and the reduced mortality rates observed in November 2020 may also be explained by the shifting demographics of COVID-19 in the UK towards individuals aged 35 years or younger. In the early pandemic, rates were skewed towards population aged 35-49 years (0.33%) and

50-69 years (0.53%) with increased prevalence of comorbidities e.g., hypertension, cardiovascular diseases, or diabetes compared to the younger population aged 25-34 years (0.32%) [4]. It is evident that by November 2020, an increased number of COVID-19 positive cases were seen in the population aged 25-34 years (1.56%) compared to the population aged 35-49 years (1.30%) and 50-69 years (1.09%) [4]. It is now evidenced that comorbidities pose a higher risk of mortality among patients with COVID-19 [5], and with a shift of COVID-19 cases towards the younger population, the overall prognosis of patients with COVID-19 may have been improved. The improved survival and reduced mortality can also be explained by the genetic evolution of the SARS-CoV-2 virus over the pandemic, the increased prevalence of type VI haplotype is seen in the UK (and worldwide) that may hint at a possible fitness gain conferred by the signature single-nucleotide variations [6]. The preceding types (I to V) were predominant early in the pandemic and may have attributed to more deaths during the first wave.

There was about a one-fifth reduction in the mortality in hospitalised COVID-19 patients during the second wave as compared to the first wave, which may also be attributed to the increased understanding of the disease and improved standard of care in the hospital over the year. In July 2020, when preliminary results of the RECOVERY trial [7], revealed the mortality benefit of dexamethasone and findings from several other trials [8], confirmed the beneficial role of systemic corticosteroids in severely ill COVID-19 patients, steroids became part of standard care across NHS hospitals in the UK. The inclusion of corticosteroids in the standard of care for severely ill COVID-19 patients has been beneficial in reducing the COVID-19 associated mortality, albeit data suggest that still about 1 in 4 COVID-19 hospitalised patients were dying from the disease in November 2020. The percentage of COVID-19 patients surviving from critical care throughout the year further confirms this trend (**Figure 3**). The percentage of survival in critically ill CoViD-19 patients did not improve much throughout the year (61% first wave vs. 64% second wave). About 45% of COVID-19 patients who received critical care in hospitals died during the first wave, this has dropped to ~33% among patients admitted to critical care from September to November 2020. Noteworthily, most of the critically ill patients (~60%) during the second wave who survived the infection were still in hospital receiving critical or acute care at the time of writing this manuscript. As of 21st November 2020, over 1400 severely ill COVID-19 patients were receiving mechanical ventilation in the UK, and there were over 16,000 COVID-19 patients still admitted to the hospitals, suggesting over 4,000 patients (i.e., 27% of total hospitalised) were at severe risk of dying from the disease in the absence of definitive treatment to neutralise the virus and prevent death. In fact, other than systemic corticosteroids, no other therapeutic agents to date had consistently demonstrated a mortality risk reduction in severely ill patients with COVID-19.

There are ~3.4 million people tested positive for COVID-19 in the United Kingdom as of 17th January 2021. The UK population was estimated to be approx. 67 million in mid-2019 by the Office of National

Statistics in the UK, which means ~5% of the UK population has already contracted the disease. The infection rate in the UK was peaking in November at over 30,000 new cases per day that were dropped to under 15,000 new cases per day by the 29th November 2020 as a result of the second national lockdown before it started to increase again in December 2020 peaking at over 60,000 cases per day at the beginning of the new year. It may be interesting to assess how far we are from achieving the minimum thresholds of herd-immunity considering the soaring infection rates despite social distancing, national lockdowns, and other measures already in place in the country. Moreover, it is highly likely that a significant proportion of the population has been asymptomatic carriers [4,9], and could not have been included in the COVID-19 positive statistics as yet.

It may be worth revitalising the resources and strategies to strengthen the research for a potential cure that may reduce the risk of death in severely-ill hospitalised COVID-19 patients, such as drugs with antiviral efficacy against SARS-CoV-2 or monoclonal antibodies capable of clinically neutralising the virus with a confirmed mortality benefit. The lack of financial incentive had momentarily discouraged big pharmaceutical companies to invest in discovering new antimicrobial therapeutics [10] and has been recognised as a threat to contain drug-resistant infections and risks of emerging infectious diseases [11]. The initiatives like a billion-dollar fundraised by the industry to bring new drugs by 2030 [12], is encouraging, but similar initiatives from public health agencies across the world are needed to fund new antimicrobial chemotherapeutics. The Japanese flu drug, favipravir, [13,14], which is an orally administered broad-spectrum antiviral drug is a promising candidate for COVID-19. Moreover, molnupiravir, also an orally bioavailable broad-spectrum antiviral drug originally developed for flu from a university spin-off in the United States, has inhibited SARS-CoV-2 in human airway epithelial cell cultures and multiple coronaviruses in mice [15]. The drug has recently demonstrated a significant reduction in the SARS-CoV-2 load in the upper respiratory tract of ferrets and suppressed the viral spread to untreated contact animals [16]; it is currently under clinical evaluation for COVID-19 (NCT04575584, NCT04575597, NCT04405739, NCT04405570) and can be a promising candidate.

If a cure for COVID-19 can be found in parallel to the efforts in pursuit of herd immunity (vaccination and/or naturally), we can not only overcome the pandemic much more efficiently than the immunisation alone but can also potentially save thousands of vulnerable lives currently receiving hospital care for COVID-19. It is encouraging that the COVID-19 vaccines from Pfizer-BNT, Moderna, and Oxford-AZ have been rolled out in the United Kingdom and other prospective vaccines are also on the way. It may still take several months for a mass national immunisation campaign to complete, and a significant part of the population may either not respond to the vaccine or be contraindicated to the vaccine due to various pre-existing conditions. It is also not clear how long a vaccine acquired immunity would last in the body, and if it will offer protection from potential mutations in the future. It is also not yet known if the vaccine

would offer protection to those who are at the most risk of dying from COVID-19; hence further emphasising the importance of unparalleled efforts in strengthening our measures to treat the disease more efficiently.

Declarations

Conflict of interest/Competing interests

The authors declare that they have no conflict of interest

Funding

The authors of this manuscript received no funding

Availability of data and material

The intensive care data were derived from the ICNARC Case Mix Programme Database. The Case Mix Programme is the national clinical audit of patient outcomes from adult critical care coordinated by the Intensive Care National Audit Research Centre (ICNARC). For more information on the representativeness and quality of these data, please contact ICNARC. The data related to the ICU bed occupancy, positive cases, 28-day mortality was retrieved from https://coronavirus.data.gov.uk/. The mortality data is extracted from the Office for National Statistics (ONS) and is available at https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/datasets/weeklyprovisionalfiguresondeathsregisteredinenglandandwales

Authors' contribution

HAM and SSH conceived the content, retrieved the data, and wrote the manuscript. HAM, SSH, and CSK reviewed the data, revised the manuscript, and approved the final version.

References

Papers of special note have been highlighted as either of interest (•) or of considerable interest (••) to readers.

1. First COVID-19case happened in November, China government records show – report. [cited November 28 2020]. https://www.theguardian.com/world/2020/mar/13/first-COVID-19-case-happened-in-november-china-government-records-show-report
2. Gov.UK Coronavirus 2019 COVID-19) in the UK. [cited November 28 2020]. https://coronavirus.data.gov.uk/.
3. Intensive Care National Audit & Research Center. COVID-19 report. [cited December 9 2020]. https://www.icnarc.org/Our-Audit/Audits/Cmp/Reports,
4. Office for National Statistics. COVID-19 positivity rates by age. [cited November 28 2020]. https://www.ons.gov.uk/aboutus/transparencyandgovernance/freedomofinformationfoi/covid19positivityratesbyage.
5. Atkins JL, Masoli JAH, Delgado J, et al. Pre-existing Comorbidities Predicting COVID-19and Mortality in the UK Biobank Community Cohort. J Gerontol A Biol Sci Med Sci. 2020;75(11):2224-2230.
6. Hsin-Chou Yang, Chun-houh Chen, Jen-Hung Wang, et al. Analysis of genomic distributions of SARS-CoV-2 reveals a dominant strain type with strong allelic associations. PNAS 2020, 117 (48) 30679-30686.
7. RECOVERY Collaborative Group, Horby P, Lim WS, et al. Dexamethasone in Hospitalized Patients with COVID-19- Preliminary Report [published online ahead of print, 2020 Jul 17]. N Engl J Med. 2020; NEJMoa2021436.
8. WHO Rapid Evidence Appraisal for COVID-19 Therapies (REACT) Working Group, Sterne JAC, Murthy S, et al. Association Between Administration of Systemic Corticosteroids and Mortality Among Critically Ill Patients With COVID-19: A Meta-analysis. JAMA. 2020;324(13):1330-1341.
9. Keeley AJ, Evans CM, de Silva TI. Asymptomatic SARS-CoV-2 infection: the tip or the iceberg? Thorax. 2020;75:621-622.
10. Plackett B., 2020. Why big pharma has abandoned antibiotics: No money for new drugs. Nature, 2020; 586: S50-2. [cited December 9 2020]. https://www.nature.com/articles/d41586-020-02884-3,.
11. World Health Organisation, 2020. Lack of new antibiotics threatens global efforts to contain drug-resistant infections. [cited December 9 2020]. https://www.who.int/news/item/17-01-2020-lack-of-new-antibiotics-threatens-global-efforts-to-contain-drug-resistant-infections.
12. Association of Business Pharmaceutical Industry UK, 2020. $1 billion antibiotics research fund launched by pharmaceutical companies. [cited January 17 2021]. https://www.abpi.org.uk/media-centre/news/2020/july/1-billion-antibiotics-research-fund-launched-by-pharmaceutical-companies/
13. Furuta Y, Komeno T, Nakamura T. Favipiravir (T-705), a broad spectrum inhibitor of viral RNA polymerase. Proc Jpn Acad Ser B Phys Biol Sci. 2017;93(7):449-463.
14. Shiraki K, Daikoku T. Favipiravir, an anti-influenza drug against life-threatening RNA virus infections. Pharmacol Ther. 2020 May;209:107512. doi: 10.1016/j.pharmthera.2020.107512.

•• The only study thus far at the time of writing which reported an anti-influenza effect of Favipiravir against life-threatening RNA virus infections

15. Sheahan TP, Sims AC, Zhou S, Graham RL, et al. An orally bioavailable broad-spectrum antiviral inhibits SARS-CoV-2 in human airway epithelial cell cultures and multiple coronaviruses in mice. Sci Transl Med. 2020;12(541) doi: 10.1126/scitranslmed.abb5883.
16. Cox RM, Wolf JD, Plemper RK. Therapeutically administered ribonucleoside analogue MK-4482/EIDD-2801 blocks SARS-CoV-2 transmission in ferrets. Nat Microbiol 6, 11–18 (2021). https://doi.org/10.1038/s41564-020-00835-2

•• The only study thus far at the time of writing which reported the blocking of SARS-CoV-2 transmission in ferrets

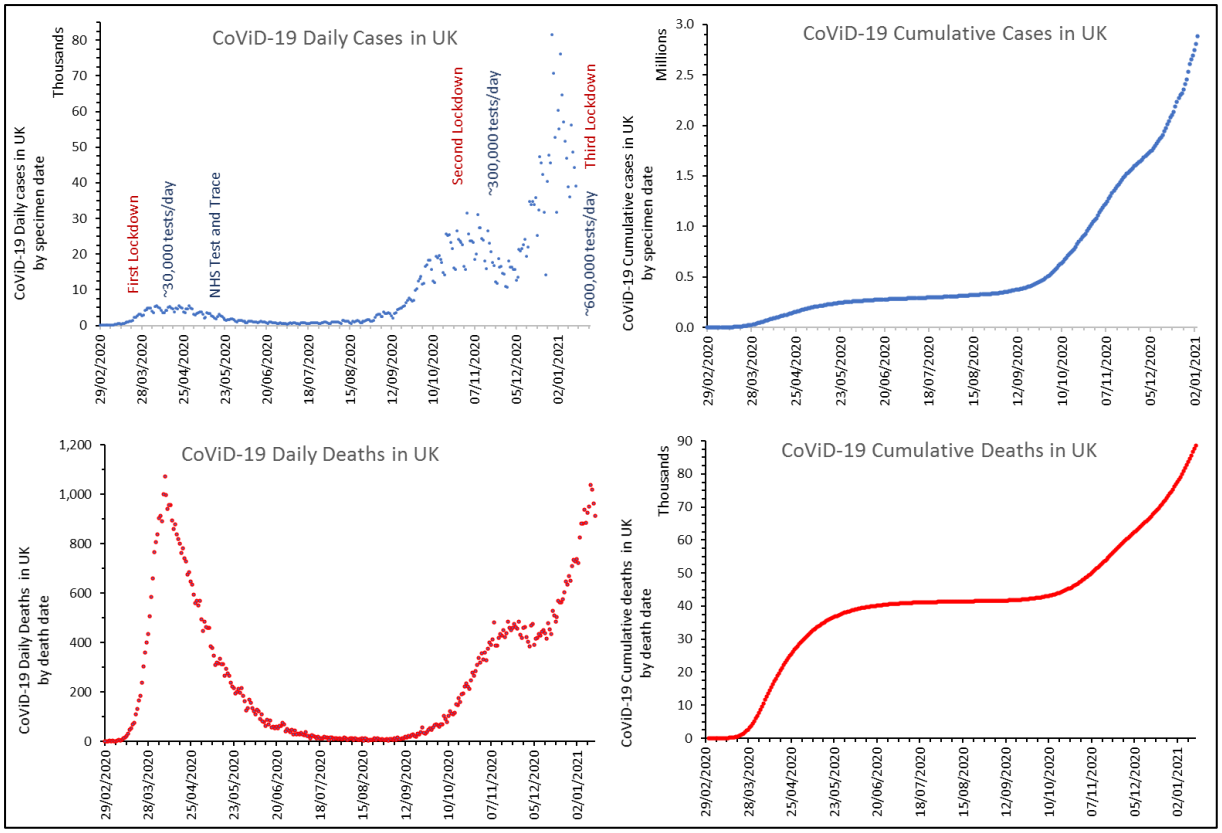

Figure 1. COVID-19daily and cumulative cases (top) and deaths (bottom) in the UK during 2020.

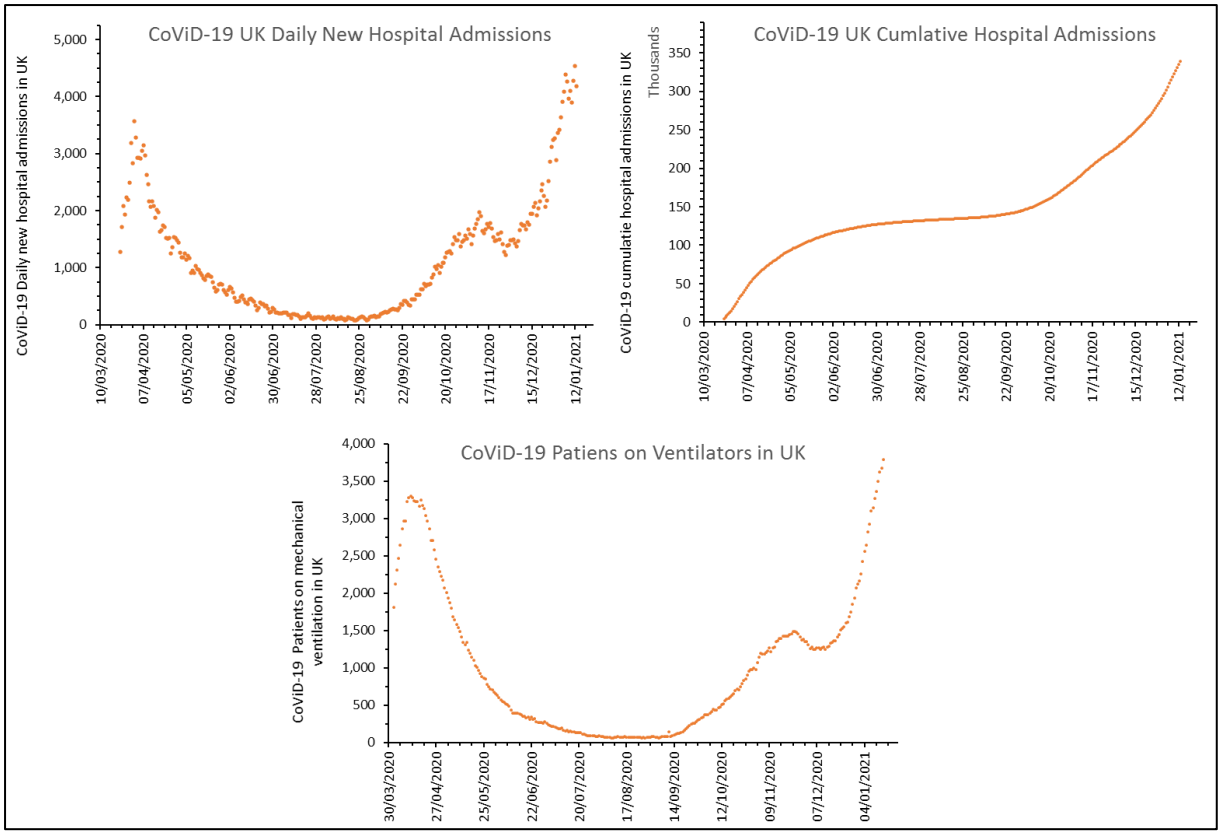

Figure 2. COVID-19daily and cumulative new hospital admissions (top) and daily counts of patients on mechanical ventilation support (bottom) in the UK during 2020.

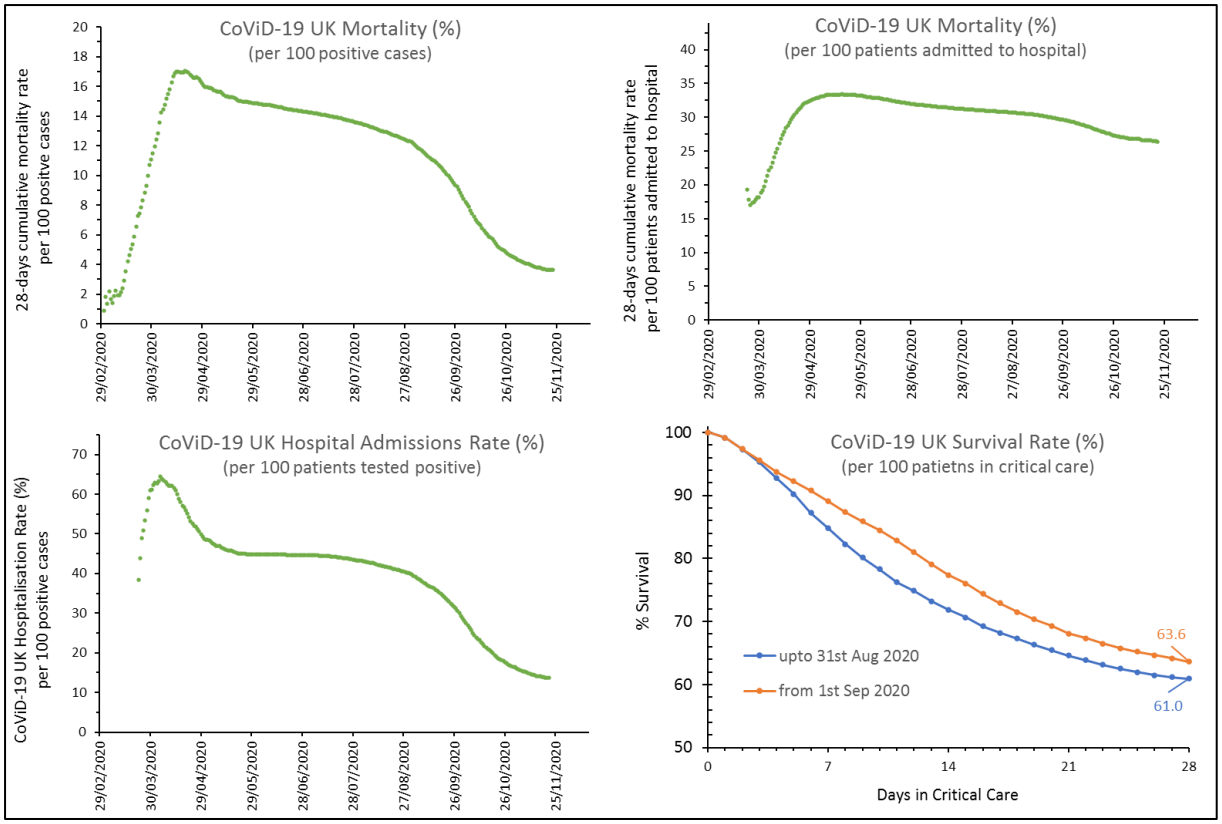

Figure 3. COVID-19mortality rate (%) by positive cases and by hospital admission in the UK (top). COVID-19 associated hospital admission rate (%) by positive cases in the UK and the % survival in COVID-19 patients receiving critical care in hospitals (bottom).

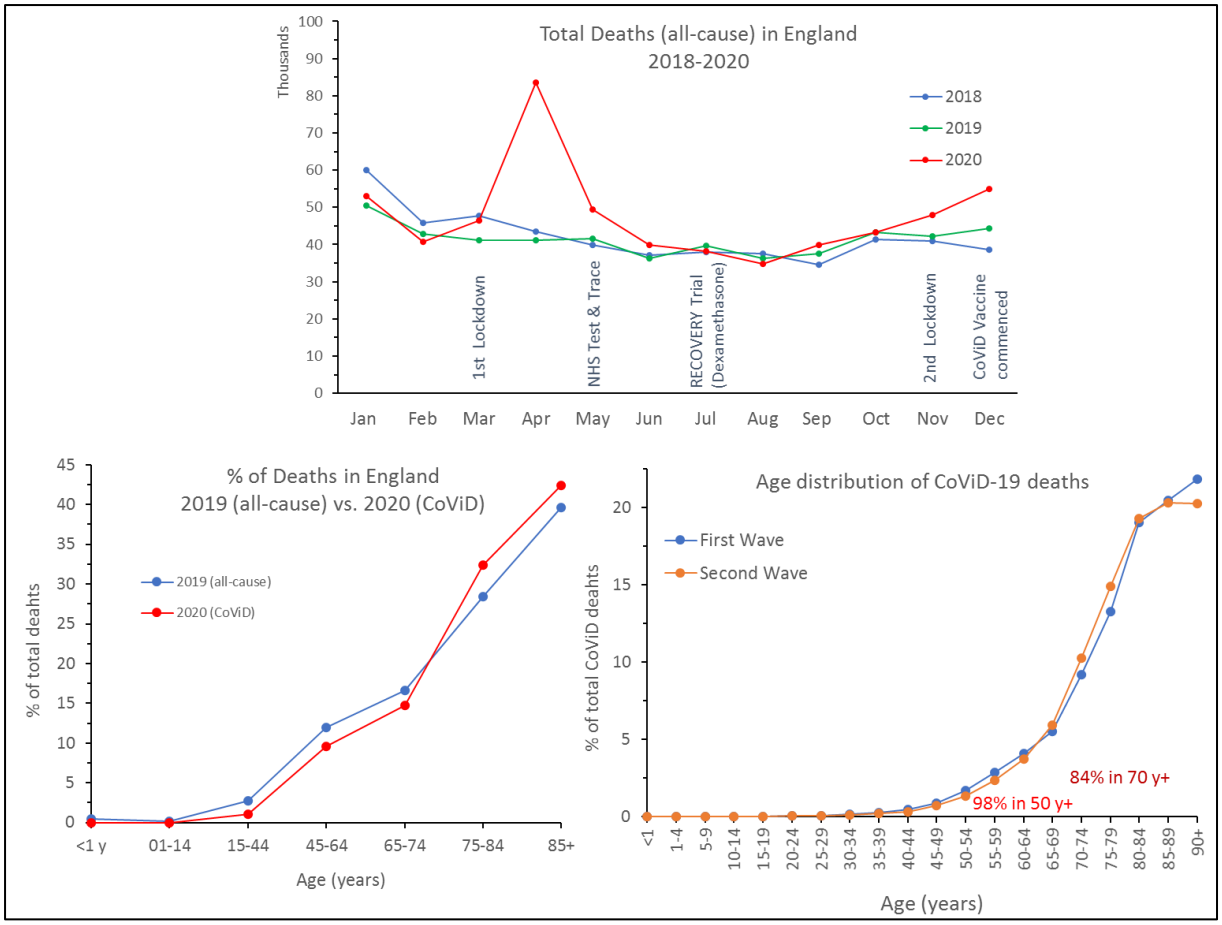

Figure 4. Total deaths in England (all-cause) during Jan 2008 to Oct 2020 (top) and age distribution of all-cause mortality in 2019 compared to COVID-19 associated deaths in 2020.