

Post-COVID complications following hospitalisation

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Introduction

The ONS, the University of Leicester and UCL are collaborating to investigate the incidence of complications following discharge from NHS hospitals in England. Our latest estimates (using data until the end of September 2020) were [published](#) on 15 January 2021 (medRxiv preprint ahead of journal publication), and are summarised below.

We conducted a retrospective observational study of 47,780 individuals (mean age 65 years, 55% male) in hospital with COVID-19 and discharged alive by 31 August 2020, matched to controls from the general population on demographic and clinical characteristics. Outcomes were defined using Hospital Episode Statistics (HES) data to 31 August 2020, and General Practice Extraction Service Data for Pandemic Planning and Research (GDPPR) and death registrations to 30 September 2020.

While our findings do not confirm the presence of a causal relationship between COVID-19 and subsequent morbidity, they do suggest a statistical correlation that warrants further investigation, including in relation to socio-demographic and clinical risk factors.

Key findings

Over a mean follow-up time of 140 days, 30% of patients were readmitted and 12% died. Rates of post-discharge death, readmission, and respiratory disease were elevated in discharged COVID-19 patients compared with in the matched control group (Table 1).

Table 1. Counts and rates of adverse events contrasting individuals with COVID-19 in England discharged from hospital by 31 August 2020 with matched controls

Adverse event (sample size per group)	COVID-19 cases		Control group	
	Events (n, %)	Rate per 1,000 person- years (95% CI)	Events (n, %)	Rate per 1,000 person- years (95% CI)
Death (n = 47,780)	5,875 (12.3%)	320.0 (311.9 to 328.3)	830 (1.7%)	41.3 (38.6 to 44.3)
Readmission to hospital (n = 47,780)	14,060 (29.4%)	766.0 (753.4 to 778.8)	4,385 (9.2%)	218.9 (212.4 to 225.4)
Respiratory disease (all events) (n = 47,780)	14,140 (29.6%)	770.5 (757.8 to 783.3)	2,585 (5.4%)	129.1 (124.2 to 134.2)
Respiratory disease (new onset) (n = 28,335)	6,085 (21.5%)	538.9 (525.5 to 552.6)	240 (0.8%)	19.7 (17.3 to 22.4)

Table notes: CI: confidence interval. COVID-19 cases were matched to controls on baseline demographic characteristics (age, sex, ethnicity, region, Index of Multiple Deprivation quintile, smoking status) and clinical histories (hypertension, major adverse cardiovascular event, respiratory disease, chronic kidney disease, chronic liver disease, diabetes, cancer).

There was evidence of extrapulmonary, multi-organ dysfunction following discharge, with COVID-19 patients experiencing significant elevated rates of diabetes, major adverse cardiovascular event (MACE), kidney disease, and liver disease (Figure 1). These findings applied when considering all post-discharge events (which may reflect a combination of new-onset cases and exacerbation of pre-existing conditions) and only the new-onset cases.

Figure 1. Rates of adverse events contrasting individuals with COVID-19 in England discharged from hospital by 31 August 2020 with matched controls

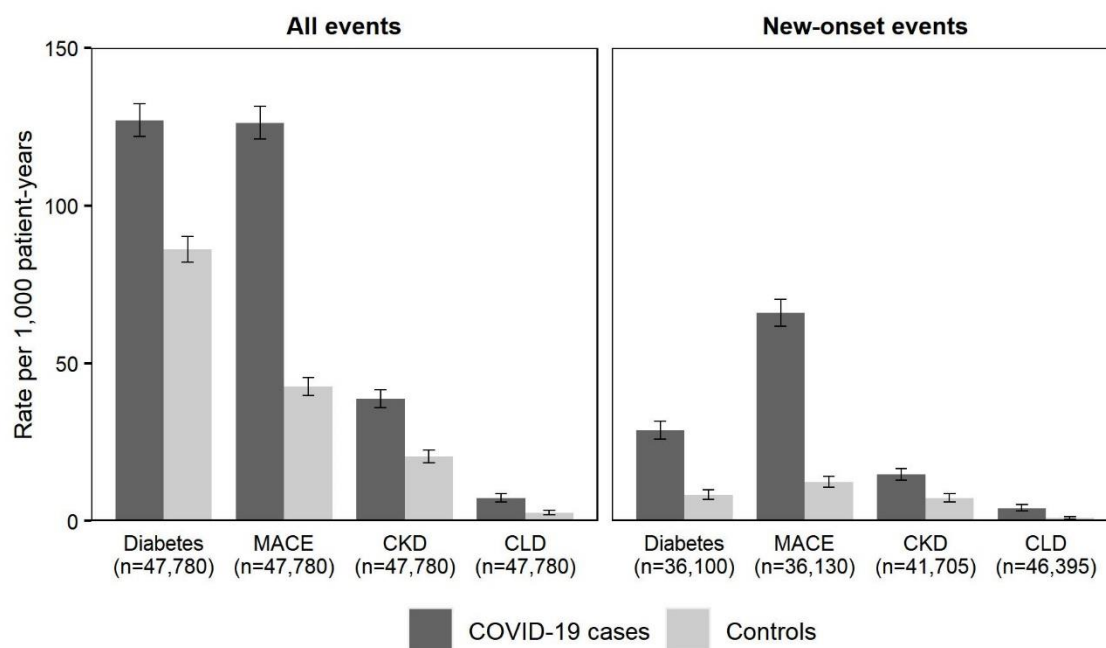


Figure notes: CKD: chronic kidney disease stages 3-5; CLD: chronic liver disease; MACE: major adverse cardiovascular event. COVID-19 cases were matched to controls on baseline demographic characteristics (age, sex, ethnicity, region, Index of Multiple Deprivation quintile, smoking status) and clinical histories (hypertension, MACE, respiratory disease, CKD, CLD, diabetes, cancer).

The absolute risk of post-discharge adverse events was greater for individuals aged ≥ 70 years than < 70 years, and for individuals of White ethnic background than in the Non-White group. However, when contrasted against the background rates of adverse events in the control group, younger and ethnic minority individuals faced greater relative risks than those aged ≥ 70 years and those in the White group, respectively (Figure 2).

Post-discharge mortality over time

In an additional analysis, we investigated how the proportion of COVID-19 patients dying within 90 days of discharge has changed on a weekly basis since the start of the pandemic. Patients were allocated to weeks, numbered from week-commencing 1 January 2020, according to the start date of their first COVID-19 hospital episode.

The risk of post-discharge mortality increased over the course of the pandemic until week-commencing 20 May 2020 (week 21); 16.9% of hospital survivors whose COVID-19 episode started in this week went on to die within 90 days of discharge (Figure 4). However, post-discharge mortality rates have declined since then, falling to 5.4% in week-commencing 19 August 2020 (week 34). For reference, the first full week following publication of results from the [RECOVERY trial](#), showing reduced mortality rates in patients on ventilation support treated with dexamethasone, was week-commencing 17 June 2020 (week 25) – three weeks *after* the start of the decline in post-discharge mortality rates.

Figure 2. Rate ratios of adverse events contrasting individuals with COVID-19 in England discharged from hospital by 31 August 2020 with matched controls, stratified by demographic factors

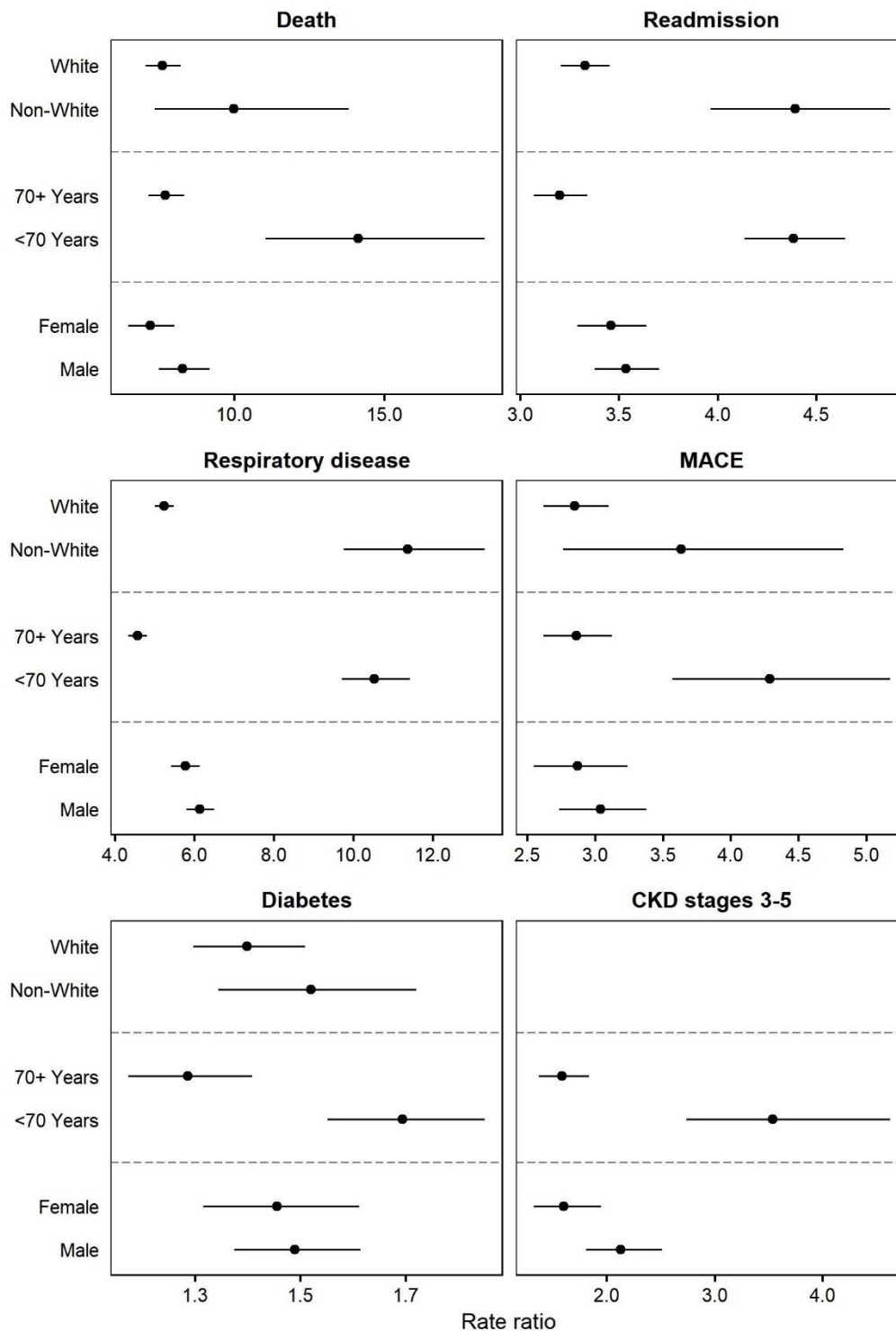
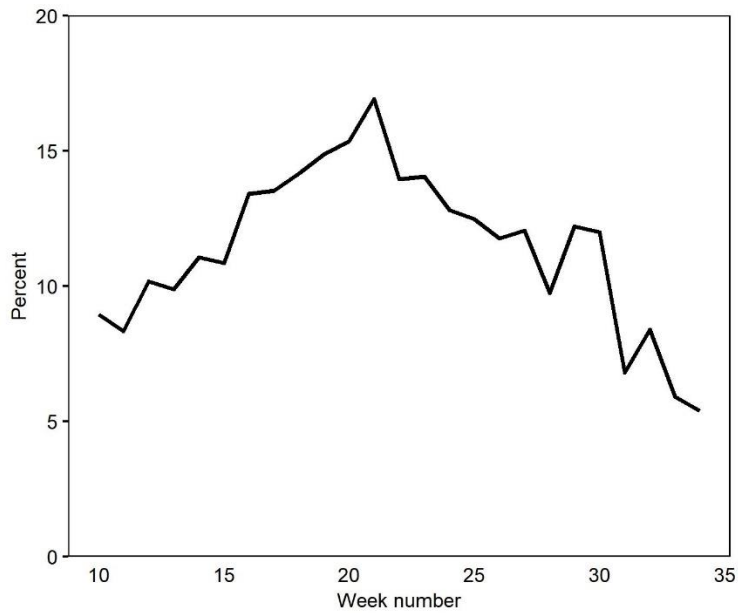


Figure notes: CKD: chronic kidney disease; MACE: major adverse cardiovascular event. COVID-19 cases were matched to controls on baseline demographic characteristics (age, sex, ethnicity, region, Index of Multiple Deprivation quintile, smoking status) and clinical histories (hypertension, MACE, respiratory disease, CKD, CLD, diabetes, cancer). Rate ratios for CKD could not be stratified by ethnic group due to insufficient event counts in the control group.

Figure 4. Weekly percentage of COVID-19 hospital survivors who went on to die within 90 days of discharge, over time since the start of the pandemic



Patients are allocated to weeks (numbered from week-commencing 1 January 2020) according to the start date of the first COVID-19 hospital episode. The denominator for calculation of percentages is all COVID-19 episodes starting in the given week where the patient survived to discharge. Week 10 is week-commencing 4 March 2020 and week 34 is week-commencing 19 August 2020. Mortality rates for episodes starting before week 10 are not shown due to insufficient sample sizes. The analysis includes all COVID-19 hospital episodes ending by 31 August 2020 and death registrations up until 30 November 2020 (rather than 30 September 2020, as in the main analysis), allowing 90-day outcomes to be evaluated consistently over the whole period.