ICNARC report on COVID-19 in critical care:

Wales
6 July 2021

This report presents analyses of data on patients critically ill with confirmed COVID-19 admitted up to 23:59 on 30 June 2021 (reported to ICNARC up to 23:59 on 4 July 2021), from critical care units in Wales participating in the Case Mix Programme (the national clinical audit for adult critical care).

Data are reported separately for patients critically ill with confirmed COVID-19 at or after the admission to critical care:

- admitted from 1 September 2020 to date; and
- admitted up to 31 August 2020.

Reporting process

Critical care units participating in the Case Mix Programme are asked to:
- log a case with ICNARC by submitting a record, with minimal data, as soon as they have an admission with confirmed COVID-19;
- resubmit data, including first 24-hour physiology, as soon as possible after the end of the first 24 hours in critical care;
- resubmit data for the whole critical care stay, including critical care outcome and organ support, when the patient leaves critical care; and
- submit final data when the patient leaves acute hospital.

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Admissions to critical care

ICNARC have logged data for 989 admissions of 914 patients critically ill with confirmed COVID-19, either at or after the admission to critical care admitted from 1 September 2020 to date in Wales. Of these, data covering the first 24 hours of critical care have been submitted to ICNARC for 914 patients (Figure 1). Of the 914 total patients, 909 have outcomes reported and 5 patients were last reported as still receiving critical care. These patients are compared with a cohort of 403 patients with confirmed COVID-19 admitted up to 31 August 2020.
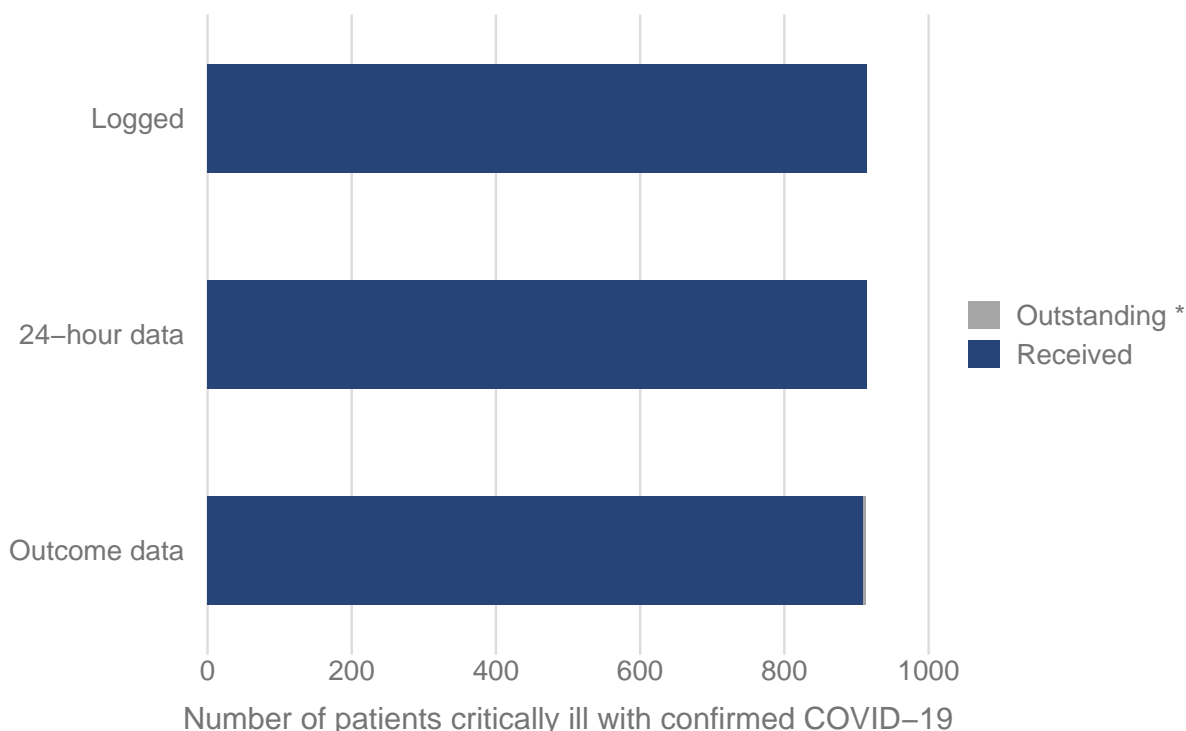
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Figure 1. Numbers of patients with data included in this report and outstanding *

Numbers of critically ill patients with confirmed COVID-19 admitted from 1 September 2020 to date with data included in this report and outstanding *.

* Please note that 24-hour data are considered outstanding when a case was logged at least 48 hours previously and outcome data are considered outstanding when 24-hour data have been received and at least 10 days have elapsed since the admission to critical care.

The numbers of new patients, cumulative numbers of patients and numbers of patients in critical care by date are shown in Figures 2-5. Please note that these figures are affected by a variable lag time for submission of data.
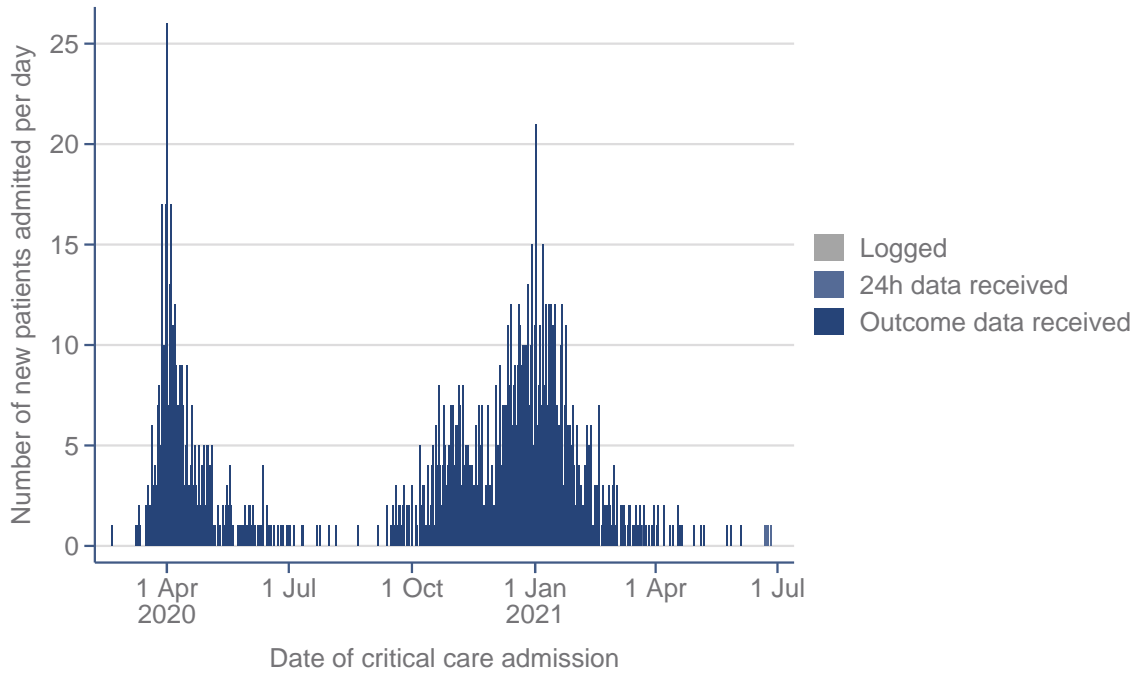
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Figure 2. Number of new patients by date of admission to critical care

Number of new patients critically ill with confirmed COVID-19 by date of admissions to critical care over the entire epidemic.
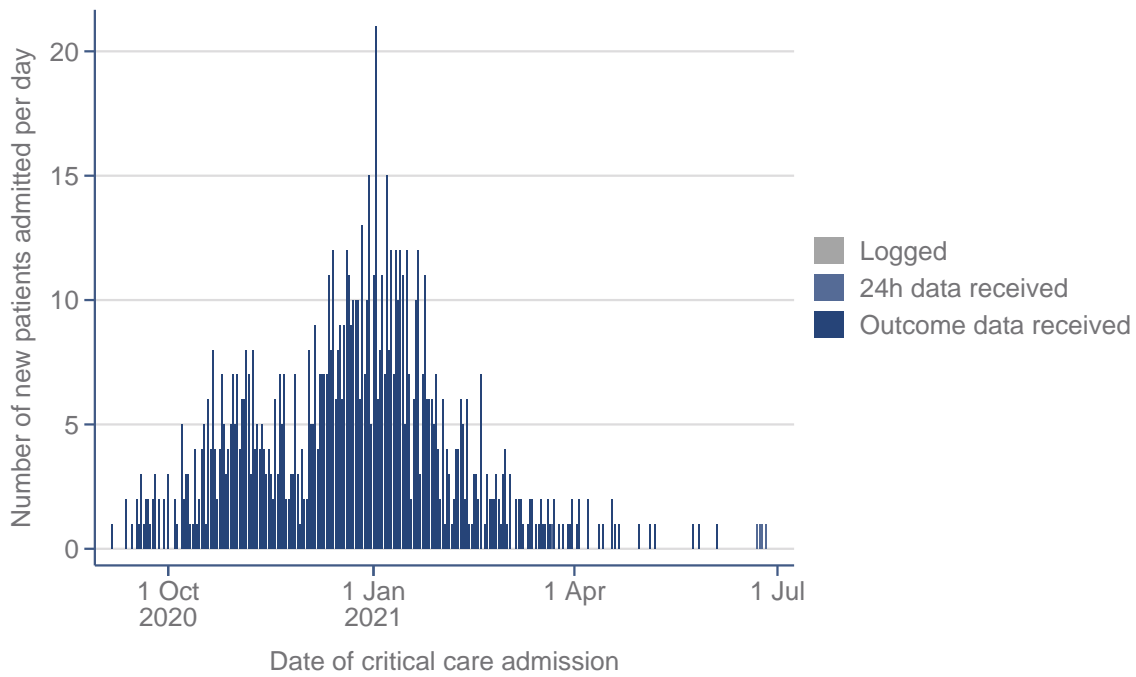
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Figure 3. Number of new patients admitted from 1 September 2020 by date of admission to critical care

Number of new patients critically ill with confirmed COVID-19 admitted from 1 September 2020 to date by date of admission to critical care.
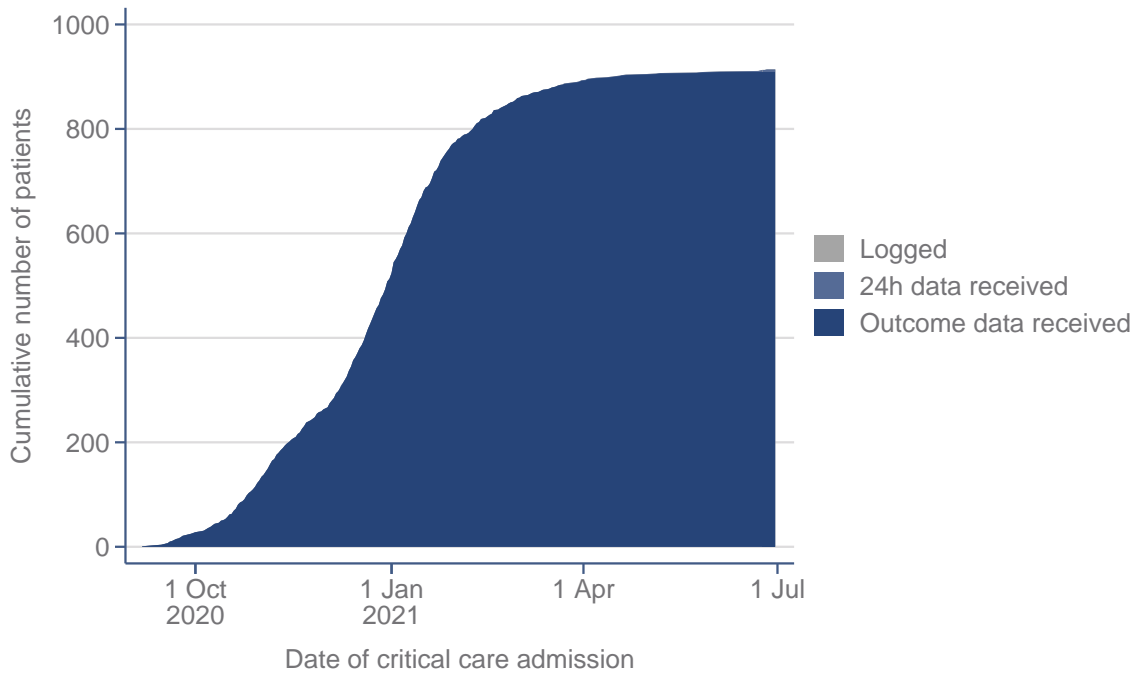
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Figure 4. Cumulative number of patients

Cumulative number of patients critically ill with confirmed COVID-19 admitted from 1 September 2020 by date of admission to critical care.
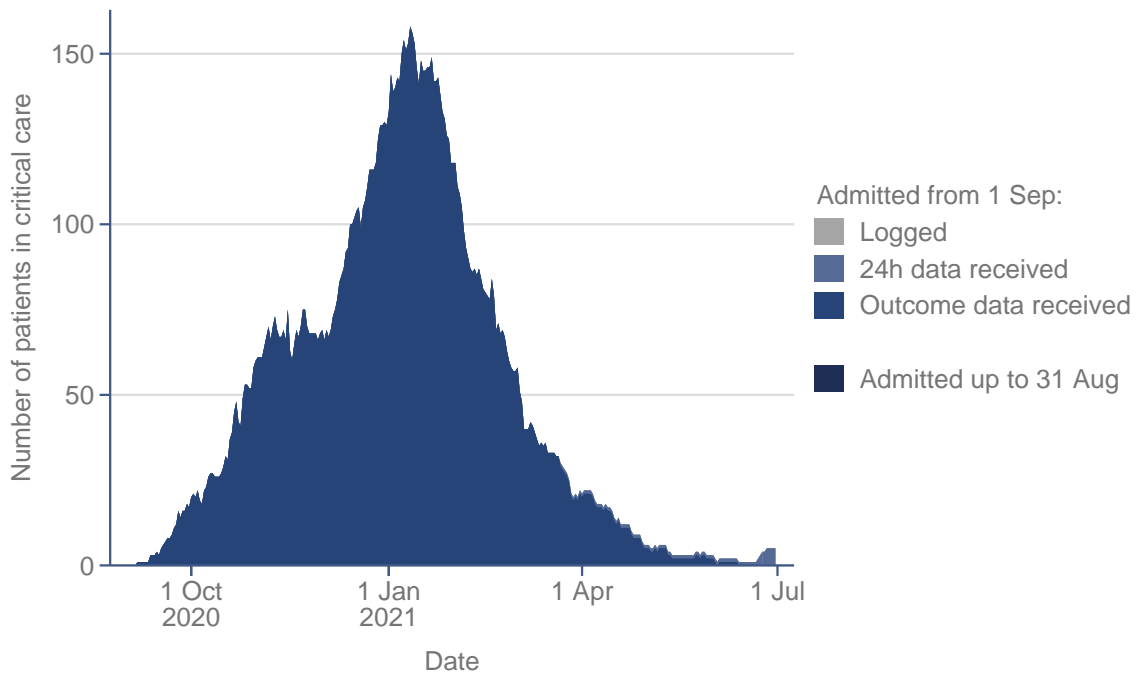
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Figure 5. Number of patients in critical care *

Number of patients with confirmed COVID-19 in critical care * from 1 September 2020 by date.

* Please note patients whose outcome data have not been received are assumed to remain in critical care as of 30 June 2021.

Patient characteristics

Characteristics of patients critically ill with confirmed COVID-19 admitted from 1 September 2020 to date are summarised in Tables 1-3 and compared with those admitted up to 31 August 2020.

Table 1. Patient characteristics: demographics

Demographics	Patients with confirmed COVID-19	
	Admitted from 1 Sep (N=914)	Admitted up to 31 Aug (N=403)
Age at admission (years) [N=914]		
Mean (SD)	58.9 (12.1)	57.0 (12.7)
Median (IQR)	60 (52, 68)	58 (50, 66)
Sex, n (%) [N=914]		
Female	305 (33.4)	132 (32.8)
Male	609 (66.6)	271 (67.2)
Ethnicity, n (%) [N=903]		
White	842 (93.2)	351 (87.3)
Mixed	7 (0.8)	6 (1.5)
Asian	42 (4.7)	25 (6.2)
Black	7 (0.8)	5 (1.2)
Other	5 (0.6)	15 (3.7)
Index of Multiple Deprivation (IMD) quintile *, n (%) [N=909]		
1 (least deprived)	135 (14.9)	57 (14.3)
2	153 (16.8)	63 (15.8)
3	146 (16.1)	72 (18.0)
4	206 (22.7)	85 (21.3)
5 (most deprived)	269 (29.6)	122 (30.6)

* Please see Definitions on page 40.

Table 2. Patient characteristics: medical history

Medical history	Patients with confirmed COVID-19	
	Admitted from 1 Sep (N=914)	Admitted up to 31 Aug (N=403)
Dependency prior to admission to acute hospital, n (%) [N=913]		
Able to live without assistance in daily activities	772 (84.6)	358 (88.8)
Some assistance with daily activities	140 (15.3)	44 (10.9)
Total assistance with all daily activities	1 (0.1)	1 (0.2)
Very severe comorbidities *, n (%) [N=913]		
Cardiovascular	6 (0.7)	3 (0.7)
Respiratory	17 (1.9)	7 (1.7)
Renal	17 (1.9)	2 (0.5)
Liver	7 (0.8)	1 (0.2)
Metastatic disease	2 (0.2)	2 (0.5)
Haematological malignancy	18 (2.0)	5 (1.2)
Immunocompromised	37 (4.1)	12 (3.0)
Body mass index *, n (%) [N=914]		
$<$18.5	2 (0.2)	1 (0.2)
18.5-$<$25	185 (20.2)	116 (28.8)
25-$<$30	278 (30.4)	137 (34.0)
30-$<$40	338 (37.0)	118 (29.3)
$\geq$40	111 (12.1)	31 (7.7)
CPR within previous 24h, n (%) [N=914]		
In the community	11 (1.2)	3 (0.7)
In hospital	11 (1.2)	1 (0.2)
Prior hospital length of stay [N=914]		
Mean (SD)	4.0 (7.5)	2.4 (5.5)
Median (IQR)	2 (0, 5)	1 (0, 3)
Currently or recently pregnant, n (% of females aged 16-49) [N=79]		
Currently pregnant	3 (3.8)	0 (0.0)
Recently pregnant (within 6 weeks)	4 (5.1)	1 (2.4)
Not known to be pregnant	72 (91.1)	40 (97.6)

* Please see Definitions on page 40.

Table 3. Patient characteristics: indicators of acute severity

Indicators of acute severity	Patients with confirmed COVID-19 and 24h data received	
	Admitted from 1 Sep (N=914)	Admitted up to 31 Aug (N=403)
Invasively ventilated within first 24h *, n (%) [N=910]	457 (50.2)	266 (68.7)
APACHE II Score [N=912]		
Mean (SD)	15.1 (5.3)	14.5 (5.7)
Median (IQR)	15 (11, 18)	14 (11, 17)
PaO_2 /FiO_2 ratio † (kPa), median (IQR) [N=898]	12.6 (8.9, 18.3)	17.5 (12.3, 23.5)
PaO_2 /FiO_2 ratio †, n (%) [N=898]		
$<$ 13.3 kPa ($<$ 100 mmHg)	488 (54.3)	119 (31.1)
13.3-26.6 kPa (100-200 mmHg)	317 (35.3)	203 (53.0)
$\geq$ 26.7 kPa ($\geq$ 200 mmHg)	93 (10.4)	61 (15.9)
FiO_2 †, median (IQR) [N=898]	0.65 (0.50, 0.80)	0.50 (0.40, 0.70)

* Please see Definitions on page 40. Indicators of acute severity are based on data from the first 24 hours of critical care.

† Derived from the arterial blood gas with the lowest PaO_2 during the first 24 hours of critical care.

The distribution of age and sex for patients critically ill with confirmed COVID-19 admitted from 1 September 2020 to date is presented in Figure 6.
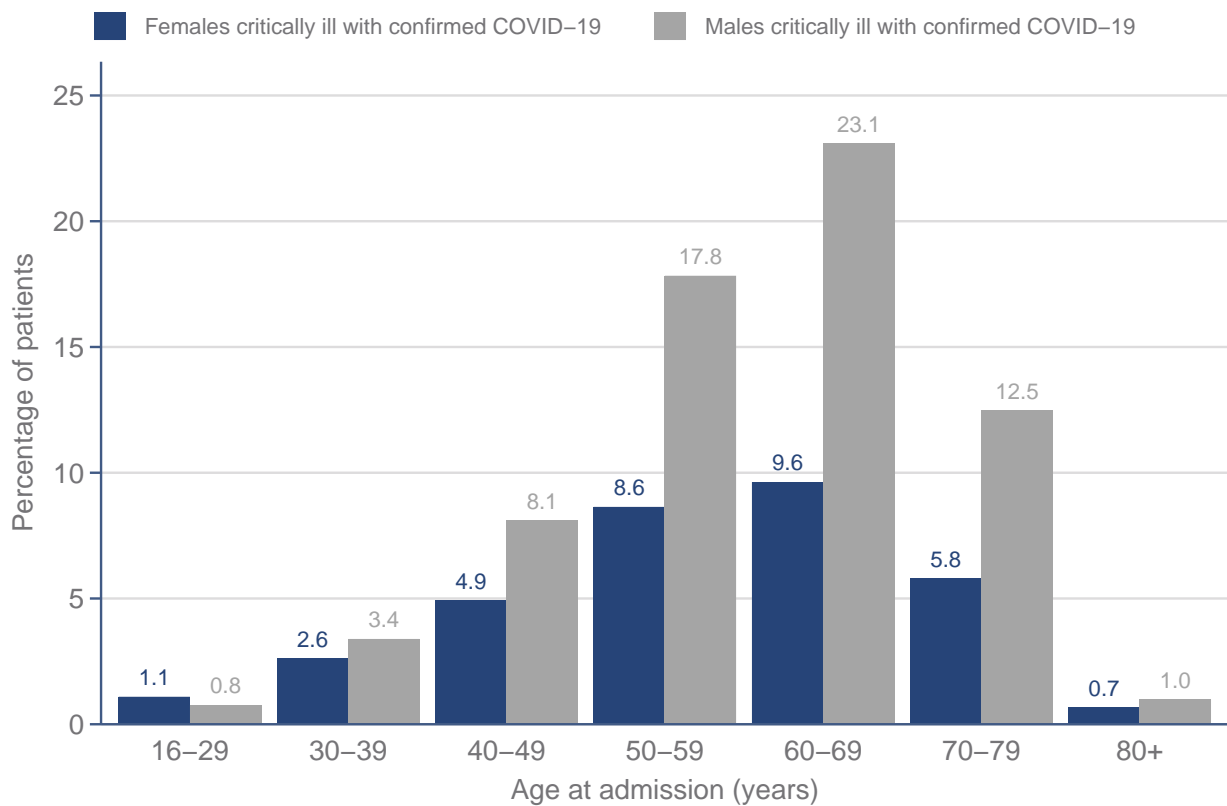
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Figure 6. Age and sex distribution

Age and sex distribution of patients critically ill with confirmed COVID-19 admitted from 1 September 2020 to date.

The distribution of ethnicity for patients critically ill with confirmed COVID-19 admitted from 1 September 2020 to date, compared with a local population matched on 2011 census ward for residence of patients critically ill with COVID-19, is presented in Figure 7.
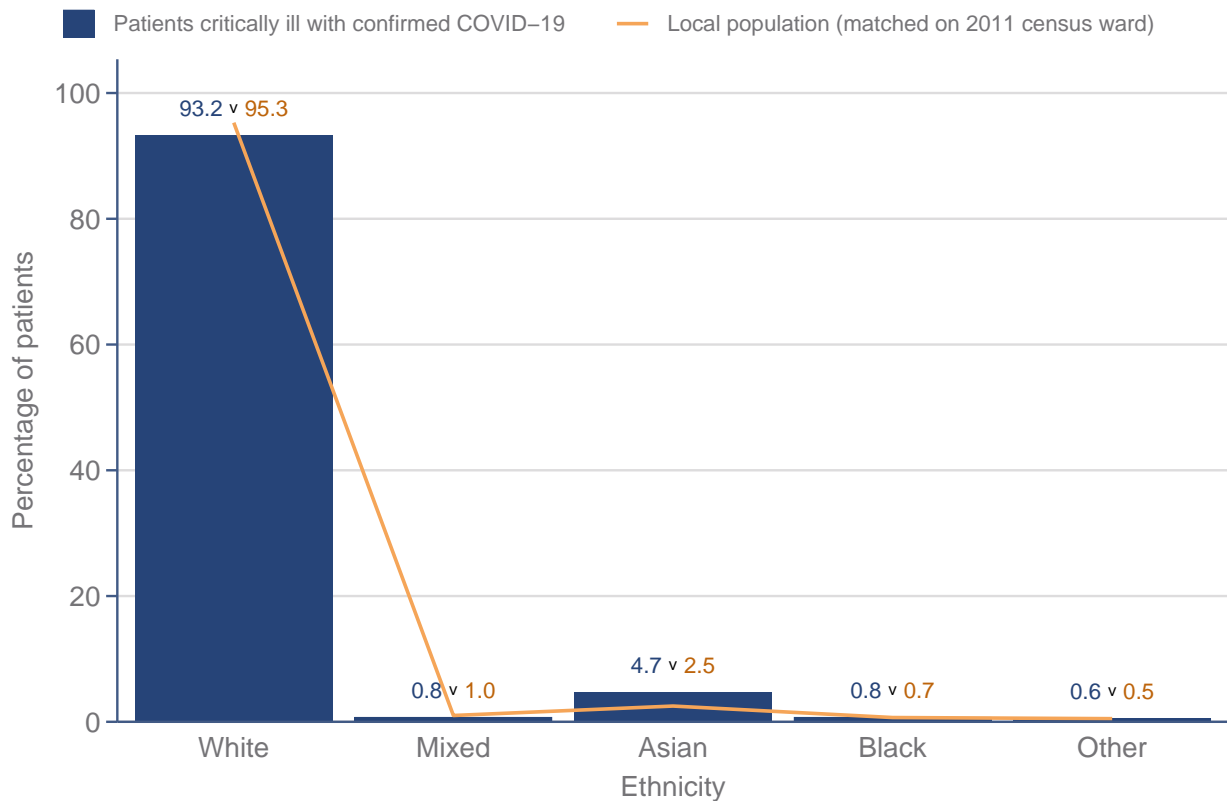
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Figure 7. Ethnicity distribution compared with the local population

Ethnicity distribution of patients critically ill with confirmed COVID-19 admitted from 1 September 2020 to date compared with the local population (linked to 2011 census ward).

The distribution of Index of Multiple Deprivation (IMD) for patients critically ill with confirmed COVID-19 admitted from 1 September 2020 to date, compared with the general population, is presented in Figure 8.
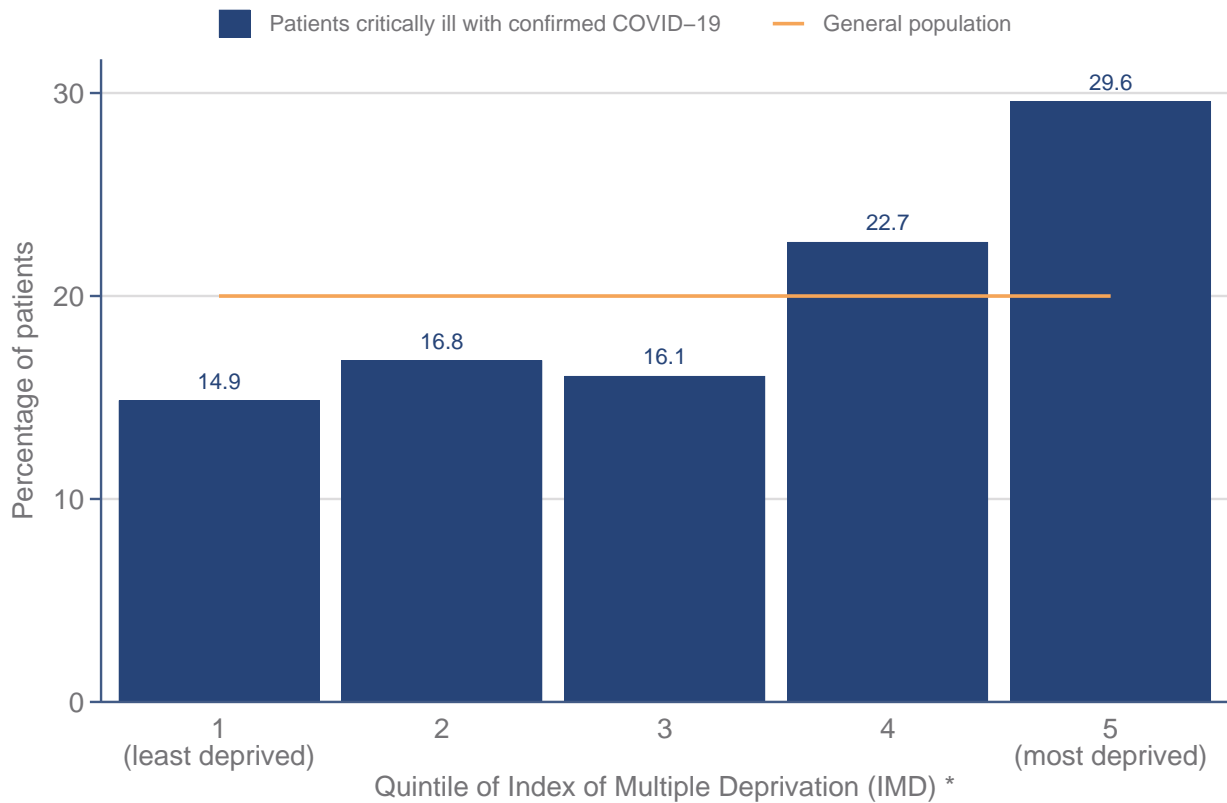
Figure 8. Index of Multiple Deprivation * distribution compared with the general population

Index of Multiple Deprivation (IMD) * distribution of patients critically ill with confirmed COVID-19 admitted from 1 September 2020 to date compared with the general population.

* Please see Definitions on page 40.

The distribution of body mass index (BMI) for patients critically ill with confirmed COVID-19 admitted from 1 September 2020 to date, compared with an age- and sex-matched population (from the Health Survey for England 2018), is presented in Figure 9.
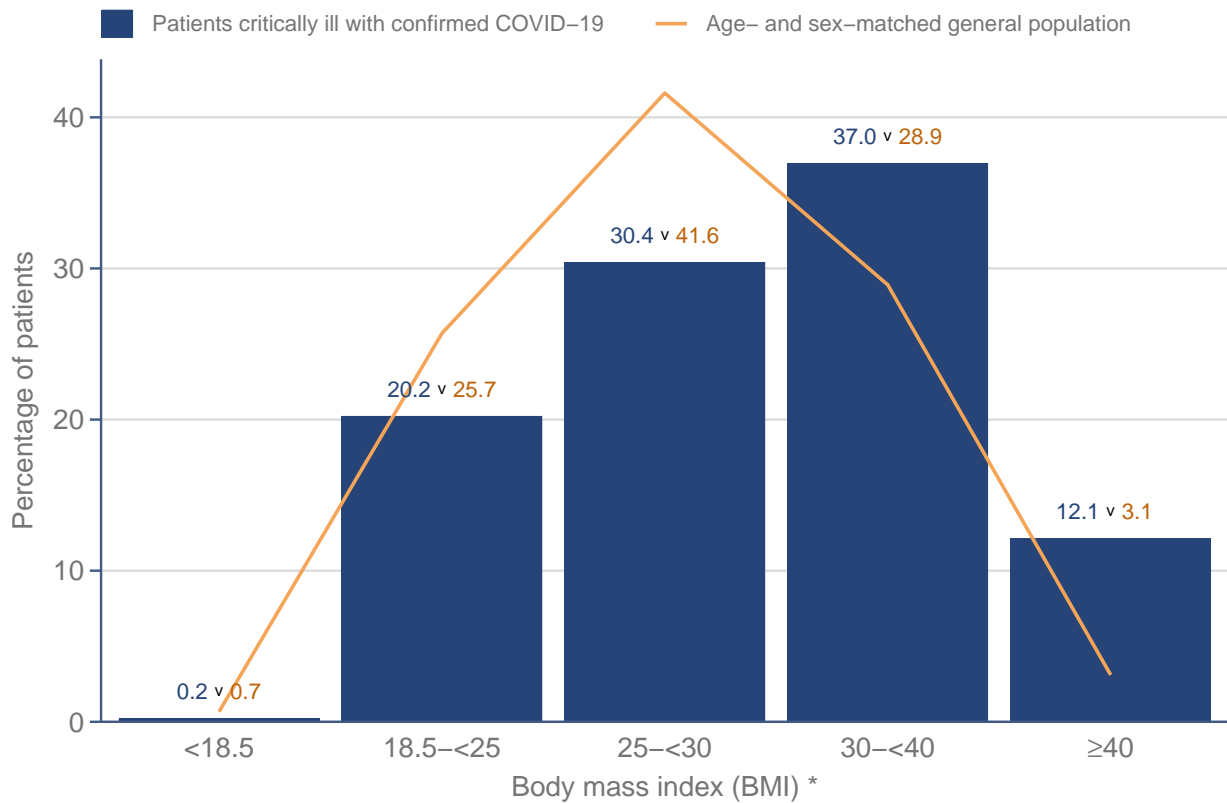
Figure 9. Body mass index * distribution compared with the age- and sex-matched general population

Body mass index (BMI) * distribution of patients critically ill with confirmed COVID-19 admitted from 1 September 2020 compared with the age- and sex-matched general population (Health Survey for England 2018).

* Please see Definitions on page 40.

Patient characteristics – invasively ventilated first 24 hours

Characteristics of patients critically ill with confirmed COVID-19 and receiving invasive ventilation during the first 24 hours in critical care admitted from 1 September 2020 to date are summarised in Tables 4-6 and compared with those admitted up to 31 August 2020.

Table 4. Patient characteristics: demographics (invasively ventilated first 24 hours)

Demographics	Patients with confirmed COVID-19 invasively ventilated first 24 hours *	
	Admitted from 1 Sep (N=457)	Admitted up to 31 Aug (N=266)
Age at admission (years) [N=457]		
Mean (SD)	59.8 (11.7)	57.1 (11.9)
Median (IQR)	61 (53, 68)	58 (50, 65)
Sex, n (%) [N=457]		
Female	139 (30.4)	81 (30.5)
Male	318 (69.6)	185 (69.5)
Ethnicity, n (%) [N=450]		
White	406 (90.2)	225 (84.6)
Mixed	6 (1.3)	3 (1.1)
Asian	29 (6.4)	18 (6.8)
Black	5 (1.1)	5 (1.9)
Other	4 (0.9)	15 (5.6)
Index of Multiple Deprivation (IMD) quintile *, n (%) [N=453]		
1 (least deprived)	65 (14.3)	32 (12.1)
2	61 (13.5)	36 (13.6)
3	68 (15.0)	50 (18.9)
4	102 (22.5)	57 (21.5)
5 (most deprived)	157 (34.7)	90 (34.0)

* Please see Definitions on page 40.

Table 5. Patient characteristics: medical history (invasively ventilated first 24 hours)

	Patients with confirmed COVID-19 invasively ventilated first 24 hours *	
Medical history	**Admitted from 1 Sep (N=457)**	**Admitted up to 31 Aug (N=266)**
Dependency prior to admission to acute hospital, n (%) [N=456]		
Able to live without assistance in daily activities	397 (87.1)	242 (91.0)
Some assistance with daily activities	58 (12.7)	24 (9.0)
Total assistance with all daily activities	1 (0.2)	0 (0.0)
Very severe comorbidities *, n (%) [N=456]		
Cardiovascular	1 (0.2)	1 (0.4)
Respiratory	3 (0.7)	2 (0.8)
Renal	3 (0.7)	1 (0.4)
Liver	5 (1.1)	1 (0.4)
Metastatic disease	2 (0.4)	0 (0.0)
Haematological malignancy	8 (1.8)	3 (1.1)
Immunocompromised	19 (4.2)	4 (1.5)
Body mass index *, n (%) [N=457]		
<18.5	0 (0.0)	1 (0.4)
18.5-<25	87 (19.0)	67 (25.2)
25-<30	151 (33.0)	95 (35.7)
30-<40	163 (35.7)	88 (33.1)
≥40	56 (12.3)	15 (5.6)
CPR within previous 24h, n (%) [N=457]		
In the community	11 (2.4)	3 (1.1)
In hospital	9 (2.0)	1 (0.4)
Prior hospital length of stay [N=457]		
Mean (SD)	4.1 (6.2)	2.2 (5.8)
Median (IQR)	2 (0, 5)	1 (0, 2)
Currently or recently pregnant, n (% of females aged 16-49) [N=32]		
Currently pregnant	2 (6.3)	0 (0.0)
Recently pregnant (within 6 weeks)	1 (3.1)	1 (3.8)
Not known to be pregnant	29 (90.6)	25 (96.2)

* Please see Definitions on page 40.

Table 6. Patient characteristics: indicators of acute severity (invasively ventilated first 24 hours)

Indicators of acute severity	Patients with confirmed COVID-19 invasively ventilated first 24 hours *	
	Admitted from 1 Sep (N=457)	Admitted up to 31 Aug (N=266)
APACHE II Score [N=457]		
Mean (SD)	16.2 (4.9)	14.8 (5.6)
Median (IQR)	16 (13, 19)	14 (11, 18)
PaO_2 /FiO_2 ratio † (kPa), median (IQR) [N=452]	12.2 (8.2, 17.6)	17.3 (11.9, 23.0)
PaO_2 /FiO_2 ratio †, n (%) [N=452]		
$<$ 13.3 kPa ($<$ 100 mmHg)	258 (57.1)	88 (33.3)
13.3-26.6 kPa (100-200 mmHg)	156 (34.5)	141 (53.4)
$\geq$ 26.7 kPa ($\geq$ 200 mmHg)	38 (8.4)	35 (13.3)
FiO_2 †, median (IQR) [N=452]	0.70 (0.50, 0.92)	0.52 (0.40, 0.70)

* Please see Definitions on page 40. Indicators of acute severity are based on data from the first 24 hours of critical care.

† Derived from the arterial blood gas with the lowest PaO_2 during the first 24 hours of critical care.

Patient characteristics – advanced respiratory support

Characteristics of patients critically ill with confirmed COVID-19 that received advanced respiratory support at any time during their critical care stay admitted from 1 September 2020 to date are summarised in Tables 7-9 and compared with those admitted up to 31 August 2020.

Table 7. Patient characteristics: demographics (any advanced respiratory support)

Demographics	Patients with confirmed COVID-19 and any advanced respiratory support *	
	Admitted from 1 Sep (N=641)	Admitted up to 31 Aug (N=325)
Age at admission (years) [N=641]		
Mean (SD)	59.3 (11.7)	57.6 (11.7)
Median (IQR)	61 (52, 68)	58 (50, 66)
Sex, n (%) [N=641]		
Female	201 (31.4)	100 (30.8)
Male	440 (68.6)	225 (69.2)
Ethnicity, n (%) [N=634]		
White	582 (91.8)	281 (86.5)
Mixed	6 (0.9)	4 (1.2)
Asian	36 (5.7)	20 (6.2)
Black	5 (0.8)	5 (1.5)
Other	5 (0.8)	15 (4.6)
Index of Multiple Deprivation (IMD) quintile *, n (%) [N=637]		
1 (least deprived)	89 (14.0)	42 (13.0)
2	100 (15.7)	50 (15.5)
3	98 (15.4)	57 (17.7)
4	147 (23.1)	69 (21.4)
5 (most deprived)	203 (31.9)	104 (32.3)

* Please see Definitions on page 40.

Table 8. Patient characteristics: medical history (any advanced respiratory support)

	Patients with confirmed COVID-19 and any advanced respiratory support *	
Medical history	Admitted from 1 Sep (N=641)	Admitted up to 31 Aug (N=325)
Dependency prior to admission to acute hospital, n (%) [N=640]		
Able to live without assistance in daily activities	556 (86.9)	290 (89.2)
Some assistance with daily activities	83 (13.0)	35 (10.8)
Total assistance with all daily activities	1 (0.2)	0 (0.0)
Very severe comorbidities *, n (%) [N=640]		
Cardiovascular	1 (0.2)	2 (0.6)
Respiratory	7 (1.1)	4 (1.2)
Renal	8 (1.3)	1 (0.3)
Liver	6 (0.9)	1 (0.3)
Metastatic disease	2 (0.3)	0 (0.0)
Haematological malignancy	11 (1.7)	4 (1.2)
Immunocompromised	29 (4.5)	8 (2.5)
Body mass index *, n (%) [N=641]		
<18.5	0 (0.0)	1 (0.3)
18.5-<25	135 (21.1)	98 (30.2)
25-<30	201 (31.4)	109 (33.5)
30-<40	233 (36.3)	98 (30.2)
≥40	72 (11.2)	19 (5.8)
CPR within previous 24h, n (%) [N=641]		
In the community	11 (1.7)	3 (0.9)
In hospital	9 (1.4)	1 (0.3)
Prior hospital length of stay [N=641]		
Mean (SD)	4.1 (7.0)	2.2 (5.5)
Median (IQR)	2 (0, 5)	1 (0, 2)
Currently or recently pregnant, n (% of females aged 16-49) [N=52]		
Currently pregnant	3 (5.8)	0 (0.0)
Recently pregnant (within 6 weeks)	2 (3.8)	1 (3.2)
Not known to be pregnant	47 (90.4)	30 (96.8)

* Please see Definitions on page 40.

Table 9. Patient characteristics: indicators of acute severity (any advanced respiratory support)

	Patients with confirmed COVID-19 and any advanced respiratory support *	
Indicators of acute severity	Admitted from 1 Sep (N=641)	Admitted up to 31 Aug (N=325)
APACHE II Score [N=640]		
Mean (SD)	15.7 (5.1)	14.8 (5.5)
Median (IQR)	15 (12, 19)	14 (11, 18)
PaO_2 /FiO_2 ratio † (kPa), median (IQR) [N=632]	11.5 (8.3, 16.6)	16.8 (11.9, 23.0)
PaO_2 /FiO_2 ratio †, n (%) [N=632]		
$<$ 13.3 kPa ($<$ 100 mmHg)	383 (60.6)	104 (33.3)
13.3-26.6 kPa (100-200 mmHg)	204 (32.3)	164 (52.6)
$\geq$ 26.7 kPa ($\geq$ 200 mmHg)	45 (7.1)	44 (14.1)
FiO_2 †, median (IQR) [N=632]	0.70 (0.50, 0.90)	0.52 (0.40, 0.70)

* Please see Definitions on page 40. Indicators of acute severity are based on data from the first 24 hours of critical care.

† Derived from the arterial blood gas with the lowest PaO_2 during the first 24 hours of critical care.

Patient characteristics – basic respiratory support only

Characteristics of patients critically ill with confirmed COVID-19 that received basic respiratory support only during their critical care stay admitted from 1 September 2020 to date are summarised in Tables 10-12 and compared with those admitted up to 31 August 2020.

Table 10. Patient characteristics: demographics (basic respiratory support only)

Demographics	Patients with confirmed COVID-19 and basic respiratory support only *	
	Admitted from 1 Sep (N=248)	Admitted up to 31 Aug (N=66)
Age at admission (years) [N=248]		
Mean (SD)	57.8 (12.7)	54.3 (15.9)
Median (IQR)	59 (51, 66)	56 (41, 65)
Sex, n (%) [N=248]		
Female	93 (37.5)	28 (42.4)
Male	155 (62.5)	38 (57.6)
Ethnicity, n (%) [N=245]		
White	238 (97.1)	60 (92.3)
Mixed	1 (0.4)	2 (3.1)
Asian	5 (2.0)	3 (4.6)
Black	1 (0.4)	0 (0.0)
Other	0 (0.0)	0 (0.0)
Index of Multiple Deprivation (IMD) quintile *, n (%) [N=247]		
1 (least deprived)	42 (17.0)	11 (16.9)
2	49 (19.8)	12 (18.5)
3	39 (15.8)	12 (18.5)
4	54 (21.9)	14 (21.5)
5 (most deprived)	63 (25.5)	16 (24.6)

* Please see Definitions on page 40.

Table 11. Patient characteristics: medical history (basic respiratory support only)

Medical history	Patients with confirmed COVID-19 and basic respiratory support only *	
	Admitted from 1 Sep (N=248)	Admitted up to 31 Aug (N=66)
Dependency prior to admission to acute hospital, n (%) [N=248]		
Able to live without assistance in daily activities	194 (78.2)	58 (87.9)
Some assistance with daily activities	54 (21.8)	7 (10.6)
Total assistance with all daily activities	0 (0.0)	1 (1.5)
Very severe comorbidities *, n (%) [N=248]		
Cardiovascular	5 (2.0)	0 (0.0)
Respiratory	9 (3.6)	2 (3.0)
Renal	7 (2.8)	1 (1.5)
Liver	1 (0.4)	0 (0.0)
Metastatic disease	0 (0.0)	1 (1.5)
Haematological malignancy	6 (2.4)	1 (1.5)
Immunocompromised	7 (2.8)	3 (4.5)
Body mass index *, n (%) [N=248]		
$<$18.5	2 (0.8)	0 (0.0)
18.5-$<$25	40 (16.1)	12 (18.2)
25-$<$30	73 (29.4)	25 (37.9)
30-$<$40	100 (40.3)	19 (28.8)
$\geq$40	33 (13.3)	10 (15.2)
CPR within previous 24h, n (%) [N=248]		
In the community	0 (0.0)	0 (0.0)
In hospital	2 (0.8)	0 (0.0)
Prior hospital length of stay [N=248]		
Mean (SD)	3.7 (8.5)	3.1 (5.3)
Median (IQR)	1 (0, 4)	1 (0, 4)
Currently or recently pregnant, n (% of females aged 16-49) [N=21]		
Currently pregnant	0 (0.0)	0 (0.0)
Recently pregnant (within 6 weeks)	1 (4.8)	0 (0.0)
Not known to be pregnant	20 (95.2)	10 (100.0)

* Please see Definitions on page 40.

Table 12. Patient characteristics: indicators of acute severity (basic respiratory support only)

	Patients with confirmed COVID-19 and basic respiratory support only *	
Indicators of acute severity	**Admitted from 1 Sep (N=248)**	**Admitted up to 31 Aug (N=66)**
APACHE II Score [N=247]		
Mean (SD)	13.9 (5.5)	13.0 (5.9)
Median (IQR)	13 (10, 16)	12 (9, 16)
PaO_2 /FiO_2 ratio † (kPa), median (IQR) [N=245]	14.7 (11.0, 21.0)	19.8 (13.8, 23.9)
PaO_2 /FiO_2 ratio †, n (%) [N=245]		
$<$ 13.3 kPa ($<$ 100 mmHg)	102 (41.6)	15 (24.6)
13.3-26.6 kPa (100-200 mmHg)	110 (44.9)	36 (59.0)
$\geq$ 26.7 kPa ($\geq$ 200 mmHg)	33 (13.5)	10 (16.4)
FiO_2 †, median (IQR) [N=245]	0.60 (0.40, 0.70)	0.40 (0.35, 0.60)

* Please see Definitions on page 40. Indicators of acute severity are based on data from the first 24 hours of critical care.

† Derived from the arterial blood gas with the lowest PaO_2 during the first 24 hours of critical care.

Patient characteristics – renal support

Characteristics of patients critically ill with confirmed COVID-19 that received renal support at any time during their critical care stay admitted from 1 September 2020 to date are summarised in Tables 13-15 and compared with those admitted up to 31 August 2020.

Table 13. Patient characteristics: demographics (any renal support)

Demographics	Patients with confirmed COVID-19 and any renal support *	
	Admitted from 1 Sep (N=208)	Admitted up to 31 Aug (N=123)
Age at admission (years) [N=208]		
Mean (SD)	60.6 (10.2)	57.9 (11.9)
Median (IQR)	62 (55, 68)	59 (50, 67)
Sex, n (%) [N=208]		
Female	52 (25.0)	27 (22.0)
Male	156 (75.0)	96 (78.0)
Ethnicity, n (%) [N=207]		
White	190 (91.8)	103 (83.7)
Mixed	0 (0.0)	3 (2.4)
Asian	13 (6.3)	9 (7.3)
Black	3 (1.4)	3 (2.4)
Other	1 (0.5)	5 (4.1)
Index of Multiple Deprivation (IMD) quintile *, n (%) [N=206]		
1 (least deprived)	26 (12.6)	12 (9.9)
2	27 (13.1)	15 (12.4)
3	28 (13.6)	19 (15.7)
4	53 (25.7)	31 (25.6)
5 (most deprived)	72 (35.0)	44 (36.4)

* Please see Definitions on page 40.

Table 14. Patient characteristics: medical history (any renal support)

Medical history	Patients with confirmed COVID-19 and any renal support *	
	Admitted from 1 Sep (N=208)	Admitted up to 31 Aug (N=123)
Dependency prior to admission to acute hospital, n (%) [N=207]		
Able to live without assistance in daily activities	173 (83.6)	110 (89.4)
Some assistance with daily activities	34 (16.4)	13 (10.6)
Total assistance with all daily activities	0 (0.0)	0 (0.0)
Very severe comorbidities *, n (%) [N=207]		
Cardiovascular	1 (0.5)	1 (0.8)
Respiratory	3 (1.4)	2 (1.6)
Renal	16 (7.7)	2 (1.6)
Liver	2 (1.0)	1 (0.8)
Metastatic disease	0 (0.0)	0 (0.0)
Haematological malignancy	3 (1.4)	1 (0.8)
Immunocompromised	12 (5.8)	2 (1.6)
Body mass index *, n (%) [N=208]		
<18.5	0 (0.0)	0 (0.0)
18.5-<25	38 (18.3)	32 (26.0)
25-<30	70 (33.7)	41 (33.3)
30-<40	73 (35.1)	42 (34.1)
≥40	27 (13.0)	8 (6.5)
CPR within previous 24h, n (%) [N=208]		
In the community	2 (1.0)	1 (0.8)
In hospital	1 (0.5)	0 (0.0)
Prior hospital length of stay [N=208]		
Mean (SD)	5.2 (10.1)	1.9 (4.1)
Median (IQR)	3 (0, 6)	0 (0, 2)
Currently or recently pregnant, n (% of females aged 16-49) [N=11]		
Currently pregnant	0 (0.0)	0 (0.0)
Recently pregnant (within 6 weeks)	0 (0.0)	0 (0.0)
Not known to be pregnant	11 (100.0)	10 (100.0)

* Please see Definitions on page 40.

Table 15. Patient characteristics: indicators of acute severity (any renal support)

	Patients with confirmed COVID-19 and any renal support *	
Indicators of acute severity	Admitted from 1 Sep (N=208)	Admitted up to 31 Aug (N=123)
Invasively ventilated within first 24h *, n (%) [N=207]	138 (66.7)	91 (78.4)
APACHE II Score [N=207]		
Mean (SD)	17.5 (5.7)	16.9 (6.8)
Median (IQR)	17 (13, 21)	16 (12, 21)
PaO_2 /FiO_2 ratio † (kPa), median (IQR) [N=205]	12.3 (8.6, 18.0)	16.5 (10.8, 23.5)
PaO_2 /FiO_2 ratio †, n (%) [N=205]		
$<$ 13.3 kPa ($<$ 100 mmHg)	114 (55.6)	46 (39.0)
13.3-26.6 kPa (100-200 mmHg)	76 (37.1)	55 (46.6)
$\geq$ 26.7 kPa ($\geq$ 200 mmHg)	15 (7.3)	17 (14.4)
FiO_2 †, median (IQR) [N=205]	0.65 (0.50, 0.85)	0.55 (0.40, 0.75)

* Please see Definitions on page 40. Indicators of acute severity are based on data from the first 24 hours of critical care.

† Derived from the arterial blood gas with the lowest PaO_2 during the first 24 hours of critical care.

Critical care outcomes have been received for 909 (of 914) patients critically ill with confirmed COVID-19 admitted from 1 September 2020 to date. Of these, 417 have died and 492 have been discharged from critical care (Figures 10 and 11). The remaining 5 were last reported to still be receiving critical care.
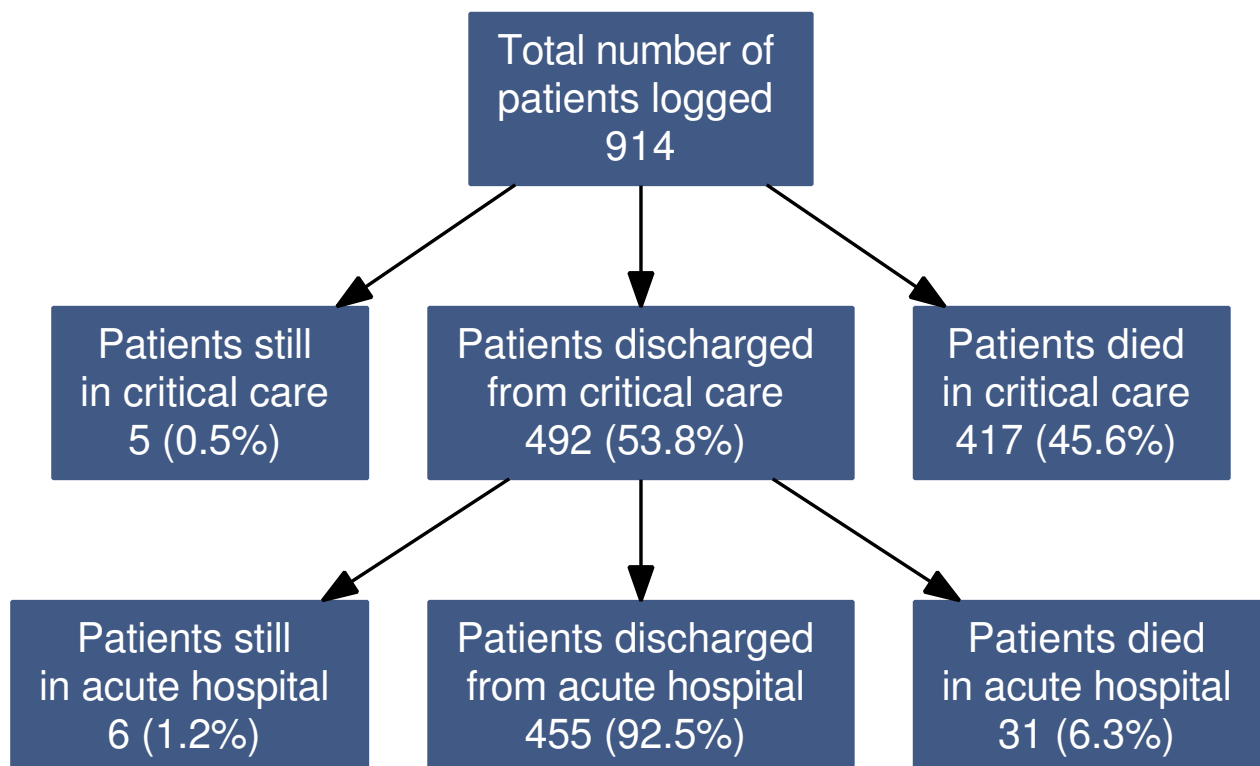
Figure 10. Critical care and acute hospital outcomes

Critical care and acute hospital outcomes for patients critically ill with confirmed COVID-19 admitted from 1 September 2020 to date.
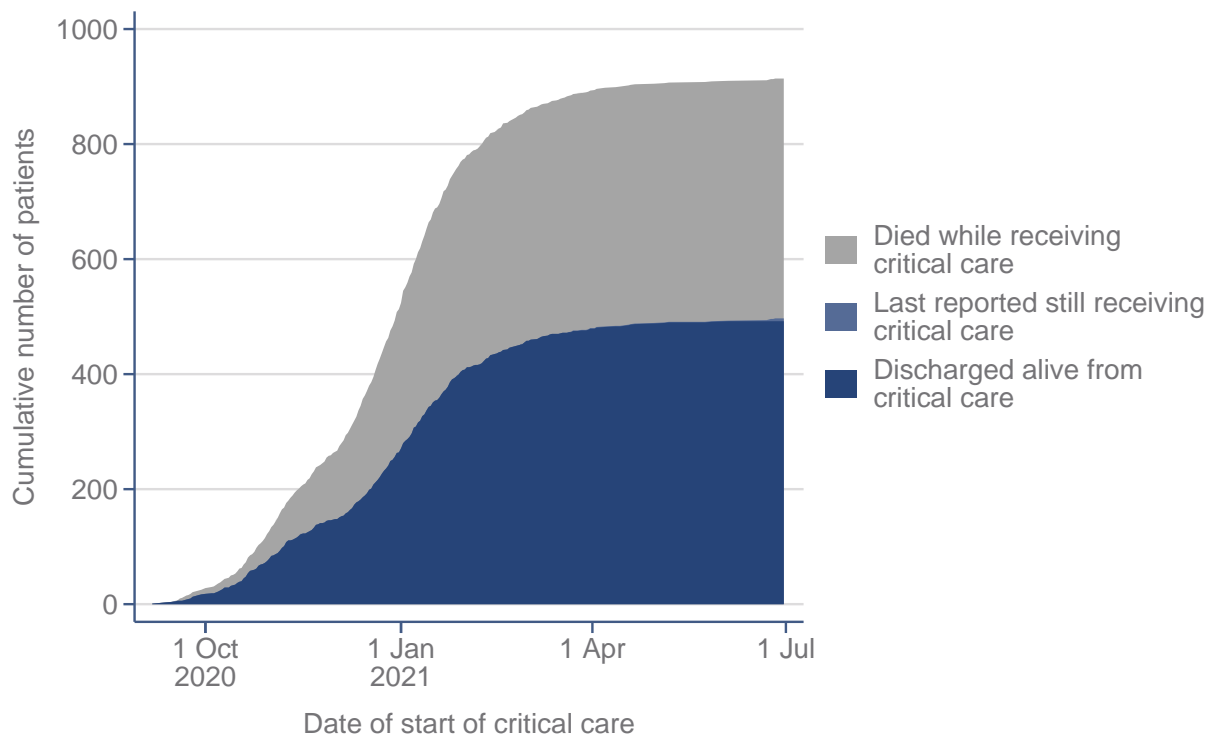
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Figure 11. Cumulative outcomes *

Cumulative outcomes for patients critically ill with confirmed COVID-19 admitted from 1 September 2020 to date by date of admission to critical care.

* Please note that patients whose outcome data have not been received are assumed to remain in critical care as of 30 June 2021.

Critical care outcome, duration of critical care and organ support for patients critically ill with confirmed COVID-19 admitted from 1 September 2020 to date for whom outcomes have been received are summarised in Table 16 and compared with those admitted up to 31 August 2020.

Table 16. Critical care outcome, duration of critical care and organ support

Critical care outcome	Patients with confirmed COVID-19 and outcome received	
	Admitted from 1 Sep (N=914)	Admitted up to 31 Aug (N=403)
Outcome at end of critical care, n (%)		
Discharged	492 (53.8)	250 (62.0)
Died	417 (45.6)	153 (38.0)
Last reported still in critical care	5 (0.5)	0 (0.0)
Duration of critical care	**(N=909)**	**(N=403)**
Duration of critical care (days) †, median (IQR)		
Survivors	10 (4, 24)	15 (6, 27)
Non-survivors	10 (6, 17)	10 (6, 20)
Organ support (Critical Care Minimum Dataset) *	**(N=909)**	**(N=403)**
Receipt of organ support, at any point, n (%)		
Advanced respiratory support	641 (70.5)	325 (80.6)
Basic respiratory support only	248 (27.3)	66 (16.4)
No respiratory support	20 (2.2)	12 (3.0)
Advanced cardiovascular support	248 (27.3)	109 (27.0)
Basic cardiovascular support only	653 (71.8)	291 (72.2)
No cardiovascular support	8 (0.9)	3 (0.7)
Renal support	208 (22.9)	123 (30.5)
Liver support	6 (0.7)	0 (0.0)
Neurological support	69 (7.6)	34 (8.4)
Duration of organ support (calendar days), median (IQR)		
Advanced respiratory support	12 (7, 21)	15 (8, 23)
Total (advanced + basic) respiratory support	11 (6, 20)	14 (6, 23)
Advanced cardiovascular support	3 (1, 5)	3 (2, 6)
Total (advanced + basic) cardiovascular support	11 (6, 20)	14 (7, 24)
Renal support	6 (3, 15.5)	8 (3, 16)

* Please see Definitions on page 40.

† Duration of critical care is the total over all critical care admissions for the the same patient and excludes any time spent outside critical care areas (e.g. prior to any readmissions).

Outcomes, duration of critical care and organ support – invasively ventilated first 24 hours

Critical care outcome, duration of critical care and organ support for patients critically ill with confirmed COVID-19 for whom outcomes have been received and who received invasive ventilation during the first 24 hours in critical care admitted from 1 September 2020 to date are summarised in Table 17 and compared with those admitted up to 31 August 2020.

Table 17. Critical care outcome, duration of critical care and organ support (invasively ventilated first 24 hours)

	Patients with confirmed COVID-19 invasively ventilated first 24 hours *	
Critical care outcome	**Admitted from 1 Sep (N=457)**	**Admitted up to 31 Aug (N=266)**
Outcome at end of critical care, n (%)		
Discharged	190 (41.6)	153 (57.5)
Died	264 (57.8)	113 (42.5)
Last reported still in critical care	3 (0.7)	0 (0.0)
Duration of critical care	**(N=454)**	**(N=266)**
Duration of critical care (days) †, median (IQR)		
Survivors	16.5 (10, 36)	21 (13, 31)
Non-survivors	10 (6, 16)	11 (6, 20)
Organ support (Critical Care Minimum Dataset) *	**(N=454)**	**(N=266)**
Receipt of organ support, at any point, n (%)		
Advanced cardiovascular support	179 (39.4)	81 (30.5)
Basic cardiovascular support only	274 (60.4)	185 (69.5)
No cardiovascular support	1 (0.2)	0 (0.0)
Renal support	138 (30.4)	91 (34.2)
Liver support	3 (0.7)	0 (0.0)
Neurological support	60 (13.2)	25 (9.4)
Duration of organ support (calendar days), median (IQR)		
Advanced respiratory support	11 (7, 20)	15 (9, 24)
Total (advanced + basic) respiratory support	12 (7, 21)	16 (9, 27)
Advanced cardiovascular support	3 (1, 5)	3 (2, 6)
Total (advanced + basic) cardiovascular support	12 (8, 22)	17 (9, 27)
Renal support	6 (3, 15)	10 (4, 18)

* Please see Definitions on page 40.

† Duration of critical care is the total over all critical care admissions for the the same patient and excludes any time spent outside critical care areas (e.g. prior to any readmissions).

Outcomes, duration of critical care and organ support – advanced respiratory support

Critical care outcome, duration of critical care and organ support for patients critically ill with confirmed COVID-19 for whom outcomes have been received and who received advanced respiratory support at any time during their critical care stay admitted from 1 September 2020 to date are summarised in Table 18 and compared with those admitted up to 31 August 2020.

Table 18. Critical care outcome, duration of critical care and organ support (any advanced respiratory support)

	Patients with confirmed COVID-19 and any advanced respiratory support *	
Critical care outcome	**Admitted from 1 Sep (N=646 ‡)**	**Admitted up to 31 Aug (N=325)**
Outcome at end of critical care, n (%)		
Discharged	264 (40.9)	180 (55.4)
Died	377 (58.4)	145 (44.6)
Last reported still in critical care ‡	5 (0.8)	0 (0.0)
Duration of critical care	**(N=641)**	**(N=325)**
Duration of critical care (days) †, median (IQR)		
Survivors	20 (10, 39)	21 (13.5, 32)
Non-survivors	11 (6, 18)	11 (6, 20)
Organ support (Critical Care Minimum Dataset) *	**(N=641)**	**(N=325)**
Receipt of organ support, at any point, n (%)		
Advanced cardiovascular support	244 (38.1)	106 (32.6)
Basic cardiovascular support only	396 (61.8)	219 (67.4)
No cardiovascular support	1 (0.2)	0 (0.0)
Renal support	194 (30.3)	113 (34.8)
Liver support	6 (0.9)	0 (0.0)
Neurological support	67 (10.5)	33 (10.2)
Duration of organ support (calendar days), median (IQR)		
Advanced respiratory support	12 (7, 21)	15 (8, 23)
Total (advanced + basic) respiratory support	14 (8, 25)	16 (9, 26)
Advanced cardiovascular support	3 (1, 5)	3 (2, 6)
Total (advanced + basic) cardiovascular support	14 (9, 25)	17 (9, 26)
Renal support	6.5 (3, 17)	9 (4, 18)

* Please see Definitions on page 40.

† Duration of critical care is the total over all critical care admissions for the the same patient and excludes any time spent outside critical care areas (e.g. prior to any readmissions).

‡ Numbers of patients still receiving critical care estimated based on observed, incomplete organ support data received.

Outcomes, duration of critical care and organ support – basic respiratory support only

Critical care outcome, duration of critical care and organ support for patients critically ill with confirmed COVID-19 for whom outcomes have been received and who received basic respiratory support only during their critical care stay admitted from 1 September 2020 to date are summarised in Table 19 and compared with those admitted up to 31 August 2020.

Table 19. Critical care outcome, duration of critical care and organ support (basic respiratory support only)

	Patients with confirmed COVID-19 and basic respiratory support only *	
Critical care outcome	**Admitted from 1 Sep (N=248 ‡)**	**Admitted up to 31 Aug (N=66)**
Outcome at end of critical care, n (%)		
Discharged	208 (83.9)	59 (89.4)
Died	40 (16.1)	7 (10.6)
Last reported still in critical care ‡	0 (0.0)	0 (0.0)
Duration of critical care	**(N=248)**	**(N=66)**
Duration of critical care (days) †, median (IQR)		
Survivors	5 (3, 8)	5 (2, 8)
Non-survivors	6 (2.5, 10)	3 (2, 8)
Organ support (Critical Care Minimum Dataset) *	**(N=248)**	**(N=66)**
Receipt of organ support, at any point, n (%)		
Advanced cardiovascular support	3 (1.2)	1 (1.5)
Basic cardiovascular support only	240 (96.8)	63 (95.5)
No cardiovascular support	5 (2.0)	2 (3.0)
Renal support	12 (4.8)	7 (10.6)
Liver support	0 (0.0)	0 (0.0)
Neurological support	2 (0.8)	0 (0.0)
Duration of organ support (calendar days), median (IQR)		
Total (advanced + basic) respiratory support	5 (3, 8)	4 (3, 6)
Advanced cardiovascular support	2 (1, 3)	3 (3, 3)
Total (advanced + basic) cardiovascular support	6 (3, 9)	5 (3, 8)
Renal support	6 (3, 7)	2 (1, 3)

* Please see Definitions on page 40.

† Duration of critical care is the total over all critical care admissions for the the same patient and excludes any time spent outside critical care areas (e.g. prior to any readmissions).

‡ Numbers of patients still receiving critical care estimated based on observed, incomplete organ support data received.

Critical care outcome, duration of critical care and organ support for patients critically ill with confirmed COVID-19 for whom outcomes have been received and who received renal support at any time during their critical care stay admitted from 1 September 2020 to date are summarised in Table 20 and compared with those admitted up to 31 August 2020.

Table 20. Critical care outcome, duration of critical care and organ support (any renal support)

|	Patients with confirmed COVID-19 and any renal support *	
Critical care outcome	**Admitted from 1 Sep (N=211 ‡)**	**Admitted up to 31 Aug (N=123)**
Outcome at end of critical care, n (%)		
Discharged	63 (29.9)	52 (42.3)
Died	145 (68.7)	71 (57.7)
Last reported still in critical care ‡	3 (1.4)	0 (0.0)
Duration of critical care	**(N=208)**	**(N=123)**
Duration of critical care (days) †, median (IQR)		
Survivors	36 (14, 49)	26.5 (12.5, 44)
Non-survivors	12 (8, 20)	15 (8, 24)
Organ support (Critical Care Minimum Dataset) *	**(N=208)**	**(N=123)**
Receipt of organ support, at any point, n (%)		
Advanced respiratory support	194 (93.3)	113 (91.9)
Basic respiratory support only	12 (5.8)	7 (5.7)
No respiratory support	2 (1.0)	3 (2.4)
Advanced cardiovascular support	99 (47.6)	51 (41.5)
Basic cardiovascular support only	108 (51.9)	71 (57.7)
No cardiovascular support	1 (0.5)	1 (0.8)
Liver support	4 (1.9)	0 (0.0)
Neurological support	23 (11.1)	10 (8.1)
Duration of organ support (calendar days), median (IQR)		
Advanced respiratory support	16 (9, 25)	18 (10, 30)
Total (advanced + basic) respiratory support	16 (10, 28)	18 (9, 31)
Advanced cardiovascular support	3 (2, 5)	3 (2, 6)
Total (advanced + basic) cardiovascular support	16 (10, 28)	19 (9, 30)
Renal support	6 (3, 15.5)	8 (3, 16)

* Please see Definitions on page 40.

† Duration of critical care is the total over all critical care admissions for the the same patient and excludes any time spent outside critical care areas (e.g. prior to any readmissions).

‡ Numbers of patients still receiving critical care estimated based on observed, incomplete organ support data received.

90-day in-hospital outcome

A Kaplan-Meier plot of in-hospital survival to 90 days following admission to critical care for patients critically ill with confirmed COVID-19 admitted from 1 September 2020 to date is shown in Figure 12 and compared with those admitted up to 31 August 2020.
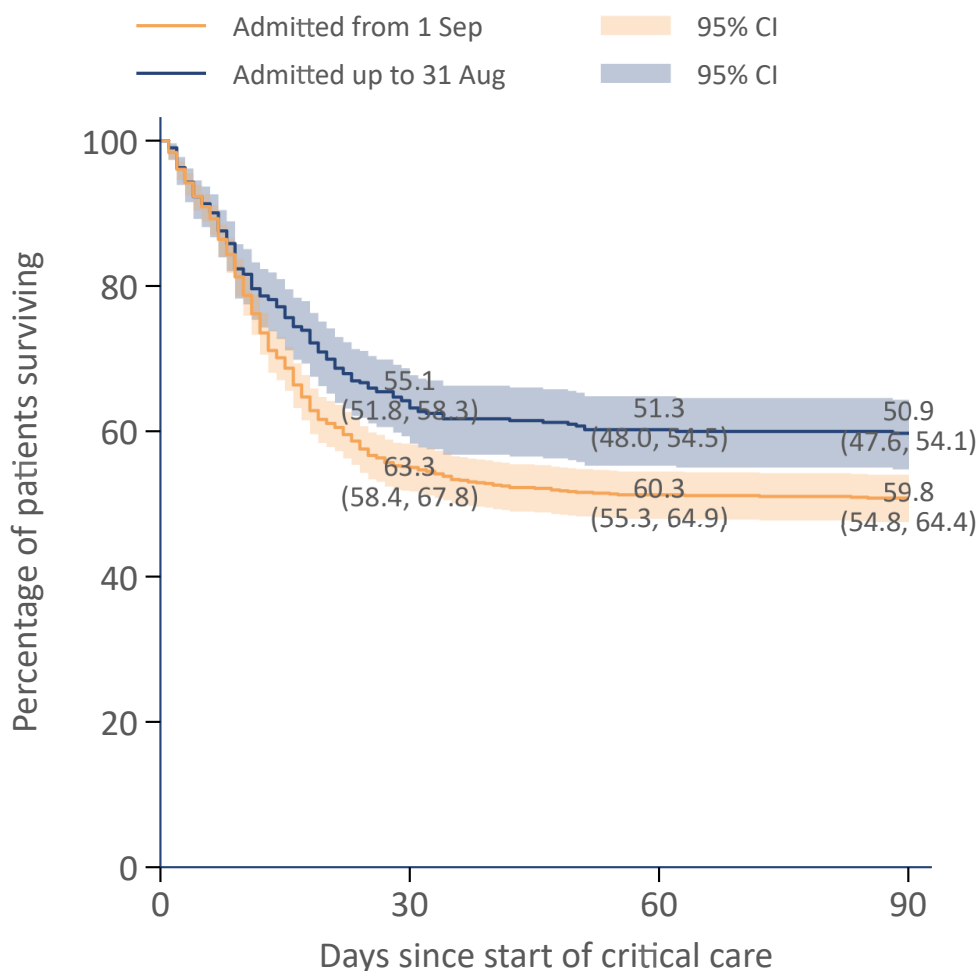
Admitted from 1 Sep				
At risk	914	500	462	451
Died (in hospital)	0	409	443	447
Censored	0	5	9	16
Admitted up to 31 Aug				
At risk	403	255	241	239
Died (in hospital)	0	148	160	162
Censored	0	0	2	2

Figure 12. In-hospital survival to 90 days following admission to critical care

Kaplan-Meier survival analysis for patients critically ill with confirmed COVID-19. Patients last reported to be still receiving critical care censored on the most recent date of data submission by the treating unit. Patients discharged from acute hospital within 90 days assumed to survive to 90 days. Please note that these survival curves are not adjusted for differences in patient characteristics (see Tables 1-3).

Definitions

Ethnicity is recorded using the ethnic category codes from the 2001 census and grouped as:
- White: White – British; White – Irish; White – any other
- Mixed: Mixed – white and black Caribbean; Mixed – white and black African; Mixed – white and Asian; Mixed – any other
- Asian: Asian or Asian British – Indian; Asian or Asian British – Pakistani; Asian or Asian British – Bangladeshi; Asian or Asian British – any other
- Black: Black or black British – Caribbean; Black or black British – African; Black or black British – any other
- Other: Other ethnic group – Chinese; Any other ethnic group
- Not stated or not recorded

Index of Multiple Deprivation (IMD) is based on the patient's usual residential postcode (assigned at the level of Lower Layer Super Output Area) according to:

- English Index of Multiple Deprivation 2019 for postcodes in England
- Welsh Index of Multiple Deprivation 2019 for postcodes in Wales
- Northern Ireland Multiple Deprivation Measure 2017 for postcodes in Northern Ireland

Body mass index is calculated as the weight in kilograms divided by the height in metres squared. Weight and height values may have been measured or estimated.

Dependency prior to admission to acute hospital is assessed as the best description for the dependency of the patient in the two weeks prior to admission to acute hospital and prior to the onset of the acute illness, i.e. "usual" dependency. It is assessed according to the amount of personal assistance they receive with daily activities (bathing, dressing, going to the toilet, moving in/out of bed/chair, continence and eating).

Very severe comorbidities must have been evident within the six months prior to critical care and documented at or prior to critical care:

- Cardiovascular: symptoms at rest
- Respiratory: shortness of breath with light activity or home ventilation
- Renal: renal replacement therapy for end-stage renal disease
- Liver: biopsy-proven cirrhosis, portal hypertension or hepatic encephalopathy
- Metastatic disease: distant metastases
- Haematological malignancy: acute or chronic leukaemia, multiple myeloma or lymphoma
- Immunocompromise: chemotherapy, radiotherapy or daily high dose steroid treatment in previous six months, HIV/AIDS or congenital immune deficiency

Invasive ventilation during the first 24 hours was defined as mechanical ventilation (identified by the recording of a ventilated respiratory rate, indicating that all or some of the breaths or a portion of the breaths were delivered by a mechanical device) and sedation (receiving continuous or intermittent doses of agents to produce and maintain a continuous decreased level of consciousness) at any time during the first 24 hours and not reported as having zero days of advanced respiratory support.

Organ support is recorded as the number of calendar days (00:00-23:59) on which the support was received at any time, defined as:

- Advanced respiratory: invasive ventilation, BPAP via trans-laryngeal tube or tracheostomy, CPAP via trans-laryngeal tube, extracorporeal respiratory support
- Basic respiratory: >50% oxygen by face mask, close observation due to potential for acute deterioration, physiotherapy/suction to clear secretions at least two-hourly, recently extubated after a period of mechanical ventilation, mask/hood CPAP/BPAP, non-invasive ventilation, CPAP via a tracheostomy, intubated to protect airway
- Advanced cardiovascular: multiple IV/rhythm controlling drugs (at least one vasoactive), continuous observation of cardiac output, intra-aortic balloon pump, temporary cardiac pacemaker
- Basic cardiovascular: central venous catheter, arterial line, single IV vasoactive/ rhythm controlling drug
- Renal: acute renal replacement therapy, renal replacement therapy for chronic renal failure where other organ support is received
- Liver: management of coagulopathy and/or portal hypertension for acute on chronic hepatocellular failure or primary acute hepatocellular failure
- Neurological: central nervous system depression sufficient to prejudice airway, invasive neurological monitoring, continuous IV medication to control seizures, therapeutic hypothermia

Publications

The following publications, based on Case Mix Programme data for patients critically ill with confirmed COVID-19, are published, in press or in preprint:

- Richards-Belle A, Orzechowska I, Doidge J, Thomas K, Harrison DA, Koelewyn A, Christian MD, Shankar-Hari M, Rowan KM, Gould DW. Critical care outcomes, for the first 200 patients with confirmed COVID-19, in England, Wales and Northern Ireland: a report from the ICNARC Case Mix Programme. *J Intensive Care Soc* 2020; doi:10.1177/1751143720961672
- Richards-Belle A, Orzechowska I, Gould DW, Thomas K, Doidge JC, Mouncey PR, Christian MD, Shankar-Hari M, Harrison DA, Rowan KM. COVID-19 in critical care: epidemiology of the first epidemic wave across England, Wales and Northern Ireland. *Intensive Care Med* 2020; 46:2035-47. doi:10.1007/s00134-020-06267-0
- Ferrando-Vivas P, Doidge J, Thomas K, Gould DW, Mouncey P, Shankar-Hari M, Young JD, Rowan KM, Harrison DA. Prognostic Factors for 30-day Mortality in Critically Ill Patients with Coronavirus Disease 2019: An Observational Cohort Study. *Crit Care Med* 2021; 49:102-11. doi:10.1097/CCM.0000000000004740
- Doidge JC, Gould DW, Ferrando-Vivas P, Mouncey PR, Thomas K, Shankar-Hari M, Harrison DA, Rowan KM. Trends in intensive care for patients with COVID-19 in England, Wales and Northern Ireland. *Am J Respir Crit Care Med* 2021; 203:565-74. doi:10.1164/rccm.202008-321OC
- Ferrando-Vivas P, Doidge J, Thomas K, Gould DW, Mouncey P, Shankar-Hari M, Young JD, Rowan KM, Harrison DA. Development and validation of a prediction model for 28-day in-hospital mortality in critically ill patients with COVID-19. *Preprints.org* 2021; doi:10.20944/preprints202102.0059.v1
- Harrison DA, Gould DW, Rowan KM. Potential impact of the UK vaccination strategy on the numbers of patients becoming critically ill with COVID-19. *OSF Preprints* 2021; doi:10.31219/osf.io/yks8c

The following publications, based on external data sources linked with Case Mix Programme data for patients critically ill with confirmed COVID-19, are published, in press or in preprint:

- Hippisley-Cox J, Young D, Coupland C, et al. Risk of severe COVID-19 disease with ACE inhibitors and angiotensin receptor blockers: cohort study including 8.3 million people. *Heart* 2020; 106:1503-11. doi:10.1136/heartjnl-2020-317393
- Pairo-Castineira E, Clohisey S, Klaric L, et al. Genetic mechanisms of critical illness in Covid-19. *Nature* 2021; 591:92-8. doi:10.1038/s41586-020-03065-y
- Forbes H, Morton CE, Bacon S, et al. Association between living with children and outcomes from covid-19: OpenSAFELY cohort study of 12 million adults in England. *BMJ* 2021; 372:n628. doi:10.1136/bmj.n628
- Aveyard P, Gao M, Lindson N, et al. Association between pre-existing respiratory disease and its treatments and severe COVID-19: a population cohort study. *Lancet Respir Med* 2021; doi:10.1016/S2213-2600(21)00095-3
- Mathur R, Rentsch CT, Morton C, et al. Ethnic differences in SARS-CoV-2 infection and COVID-19-related hospitalisation, intensive care unit admission, and death in 17 million adults in England: an observational cohort study using the OpenSAFELY platform. *Lancet* 2021; 397:1711-24. doi:10.1016/S0140-6736(21)00634-6
- Patone M, Thomas K, Hatch R, et al. Mortality and critical care unit admission associated with the SARS-CoV-2 lineage B.1.1.7 in England: an observational cohort study. *Lancet Infect Dis* 2021; doi:10.1016/S1473-3099(21)00318-2

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