ICNARC report on COVID-19 in critical care:

England, Wales and Northern Ireland
20 November 2020

This report presents analyses of data on patients critically ill with confirmed COVID-19, reported to ICNARC up to 4pm on 19 November 2020, from critical care units participating in the Case Mix Programme (the national clinical audit covering all NHS adult, general intensive care and combined intensive care/high dependency units in England, Wales and Northern Ireland, plus some additional specialist and non-NHS critical care units).

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

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

Please note that adult critical care units in Scotland, paediatric intensive care units and neonatal intensive care units do not participate in the Case Mix Programme.

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 – COVID-19

ICNARC have logged data for 5425 admissions of 4869 patients critically ill with confirmed COVID-19, either at or after the start of critical care, admitted from 1 September 2020 to date in England, Wales and Northern Ireland. Of these, data covering the first 24 hours of critical care have been submitted to ICNARC for 4501 patients (Figure 1). Of the 4869 total patients, 3293 have outcomes reported and 1576 patients were last reported as still receiving critical care. These patients are compared with a cohort of 10,914 patients with confirmed COVID-19 admitted up to 31 August 2020.

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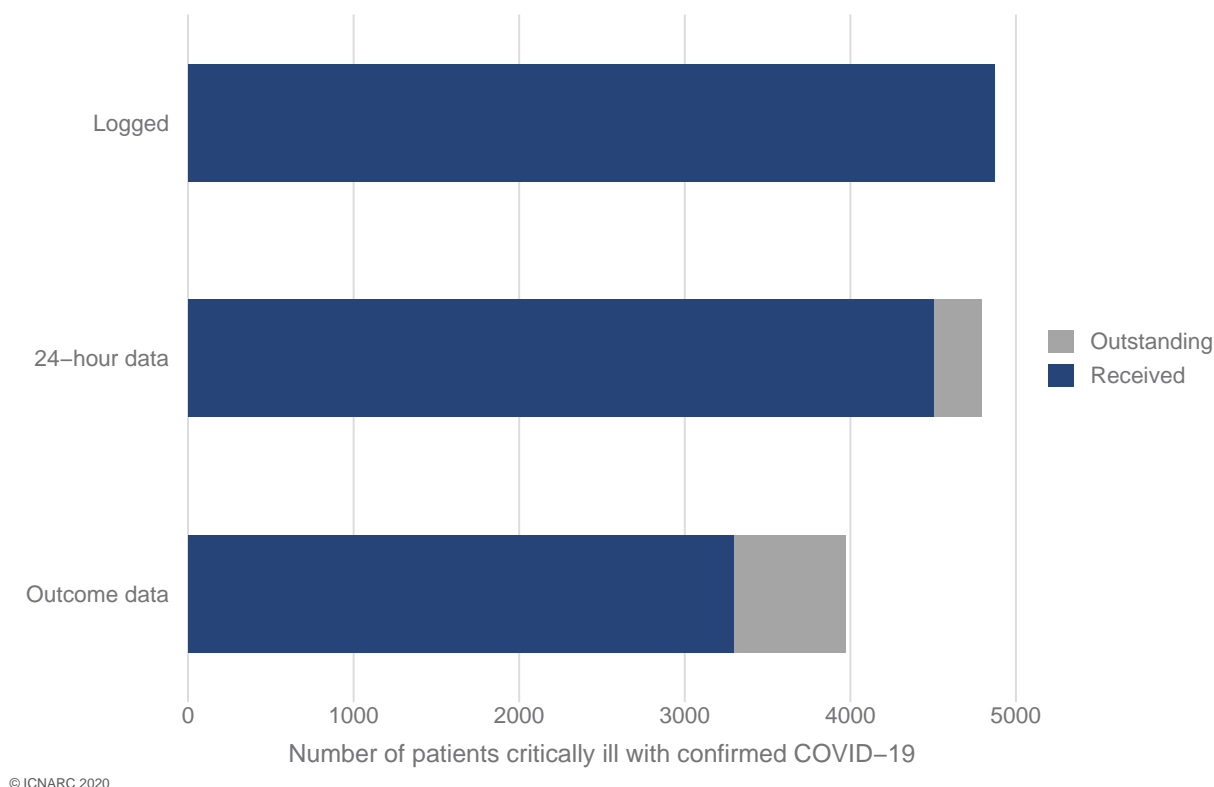
Figure 1. Numbers of critically ill patients with confirmed COVID-19 admitted from 1 September 2020 with data included in this report and outstanding *

* 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 start of critical care.

Of the 4869 patients critically ill with confirmed COVID-19 admitted from 1 September 2020 to date, the largest numbers were admitted in the North West, North East And Yorkshire, and Midlands regions (Figure 2). Of the patients included in this week's report, 1485 patients were admitted to critical care within the past 14 days (05 Nov 2020 to 18 Nov 2020). The geographical spread of these patients was similar to that for all patients admitted from 1 September 2020 to date (Figure 3).
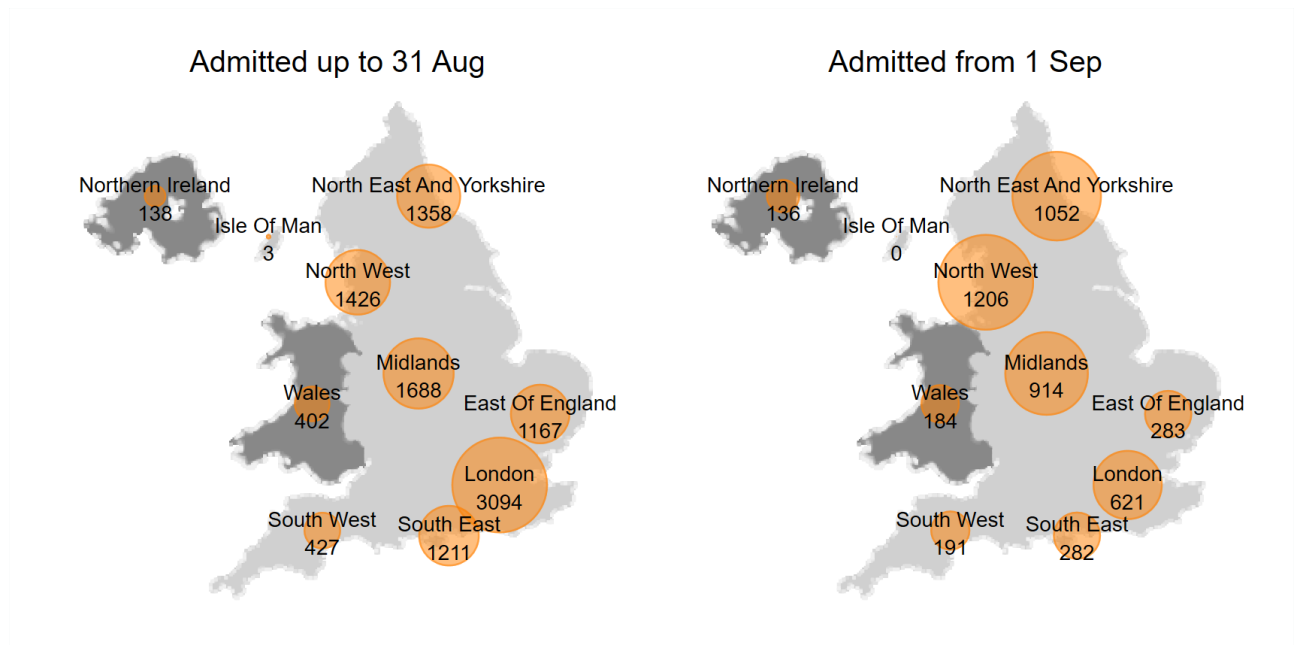
Figure 2. Geographical distribution of patients critically ill with confirmed COVID-19
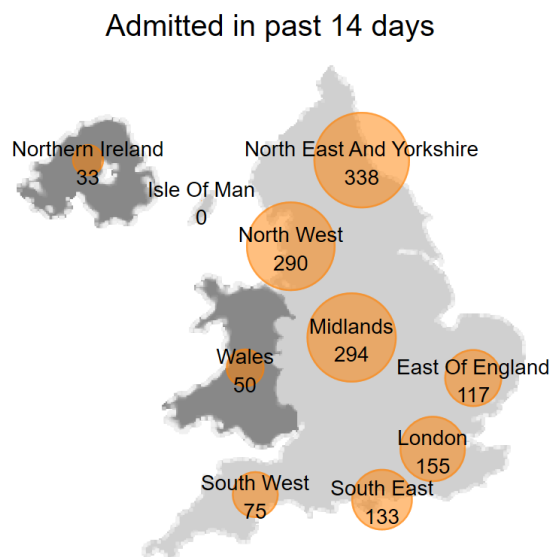
Figure 3. Geographical distribution of patients critically ill with confirmed COVID-19 admitted during the past 14 days

The numbers of new patients, cumulative numbers of patients and numbers of patients in critical care by date are shown in Figures 4-12. Please note that these figures are affected by a variable lag time for submission of data.
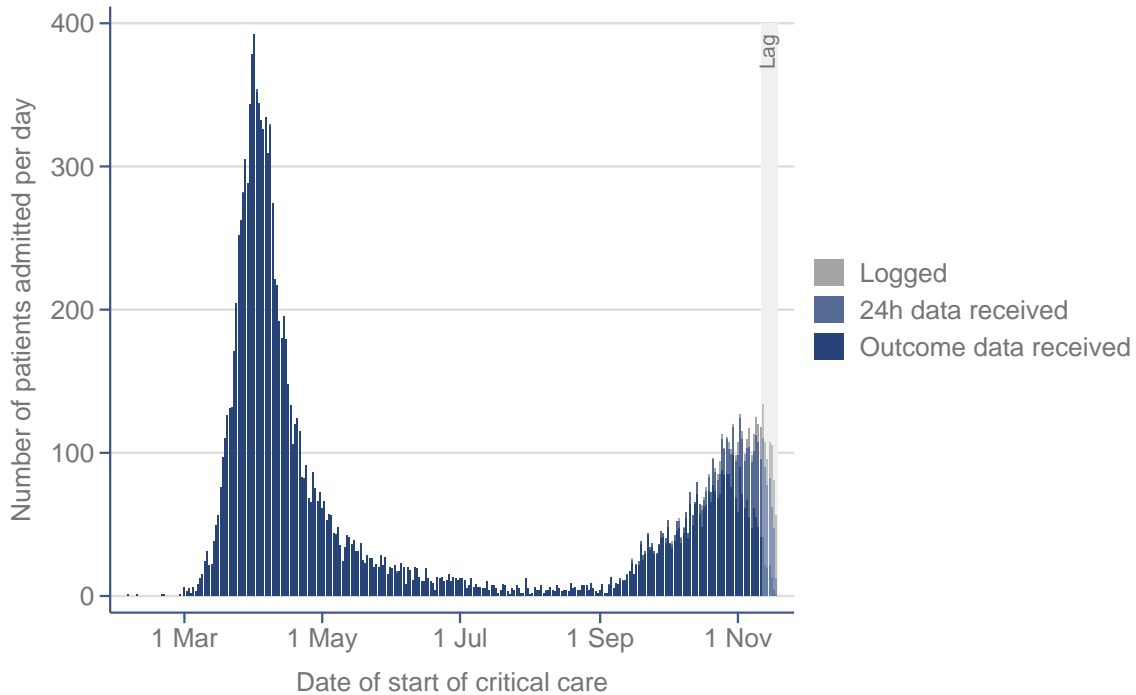
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Figure 4. Number of new patients critically ill with confirmed COVID-19 by date of start of critical care over the entire epidemic
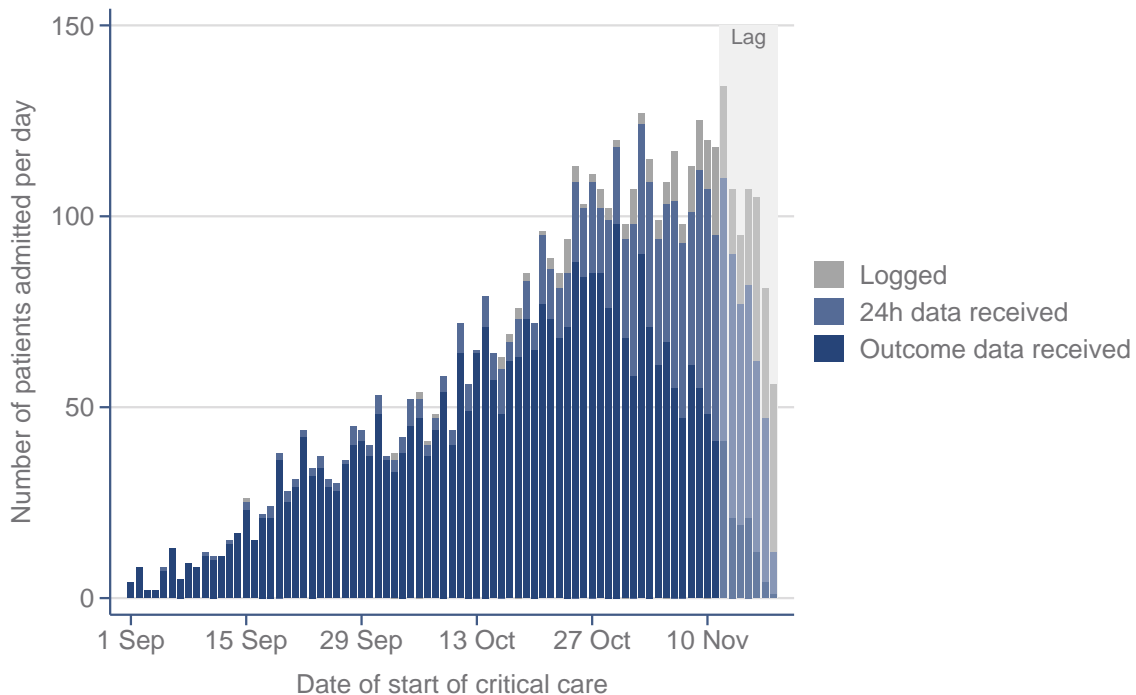
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Figure 5. Number of new patients critically ill with confirmed COVID-19 admitted from 1 September 2020 by date of start of critical care
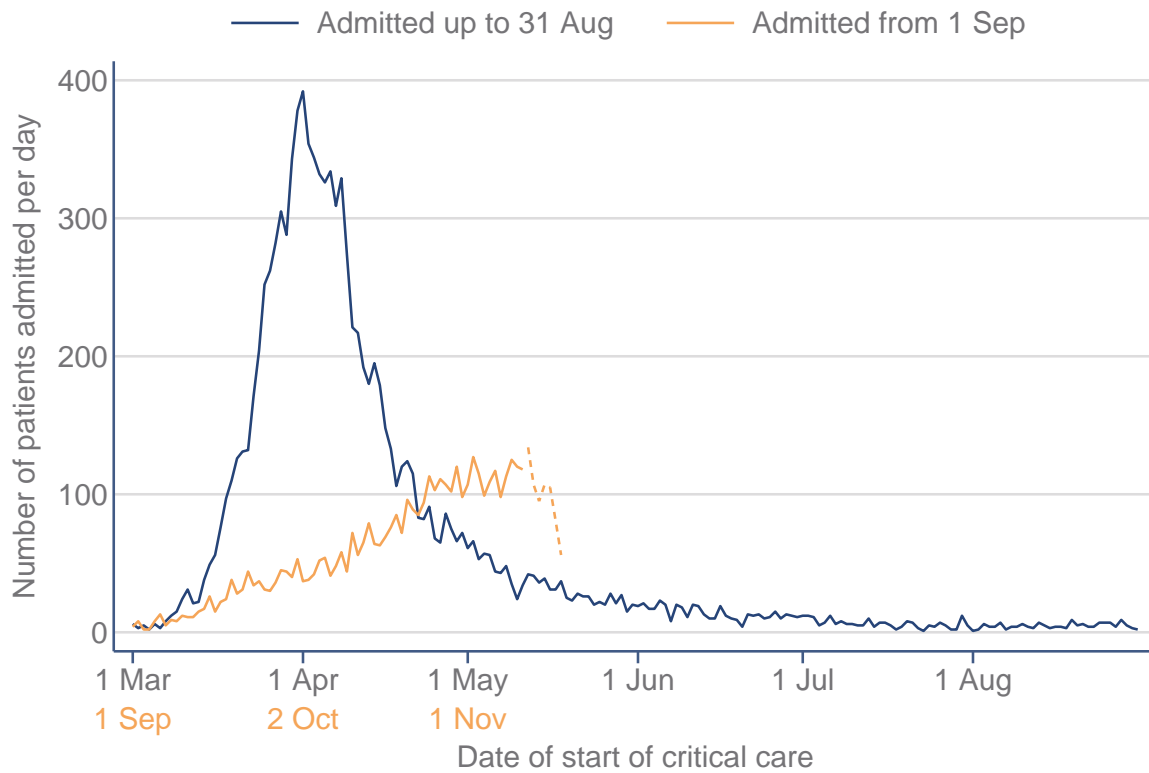
Figure 6. Comparison of the number of new patients critically ill with confirmed COVID-19 by date of start of critical care from 1 March 2020 to 31 August 2020 versus 1 September 2020 to date *

* Dashed line indicates potential lag in data submission.
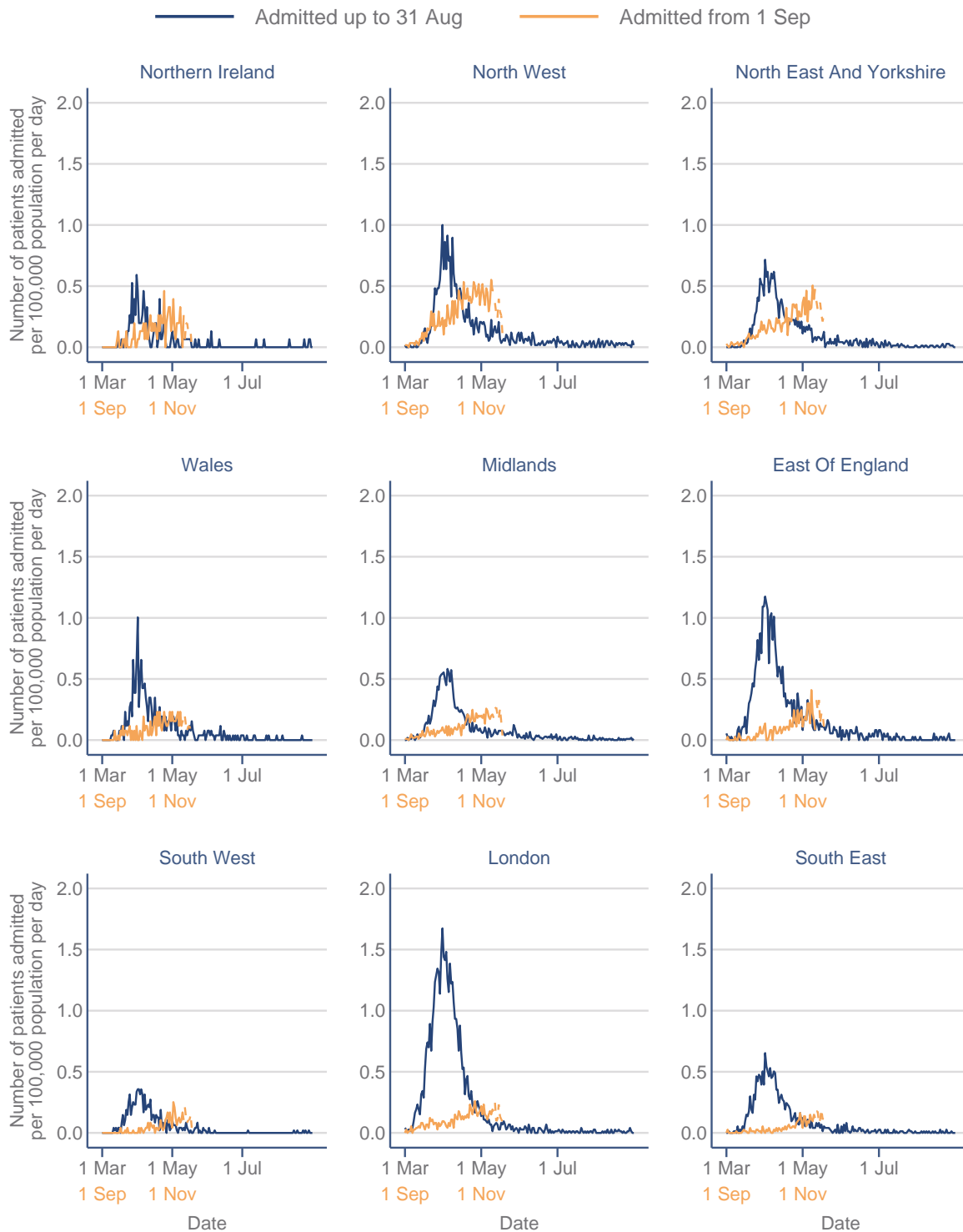
Figure 7. Number of new patients critically ill with confirmed COVID-19 by date of start of critical care from 1 March 2020 to 31 August 2020 versus 1 September 2020 to date by region *

* Dashed line indicates potential lag in data submission.

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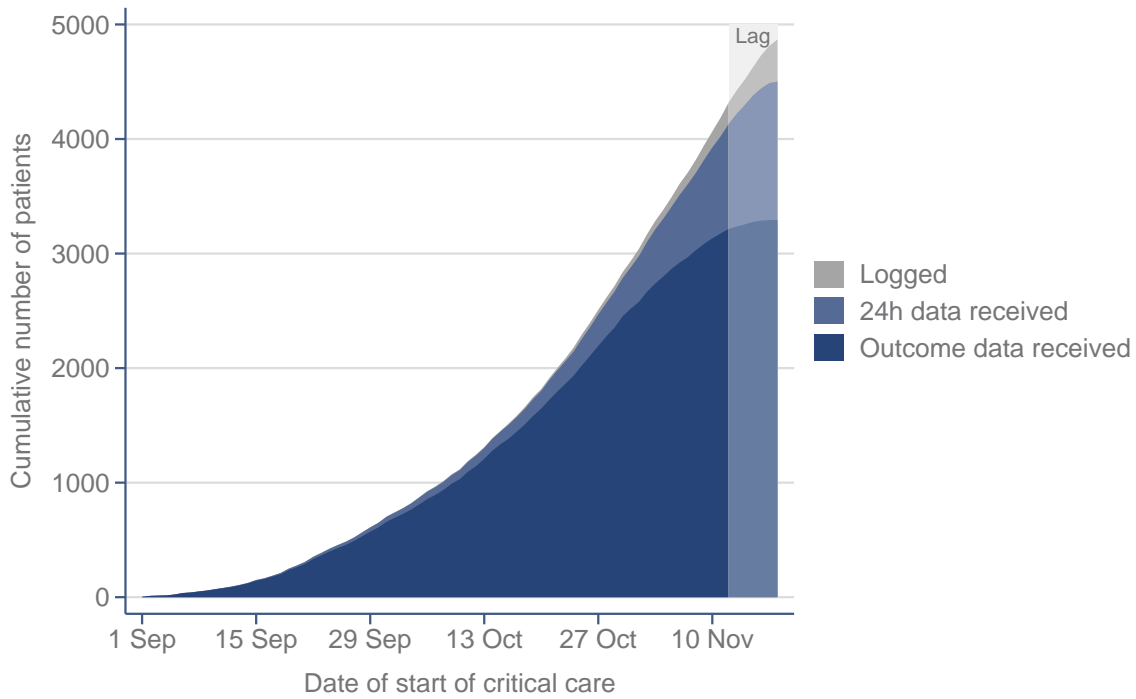
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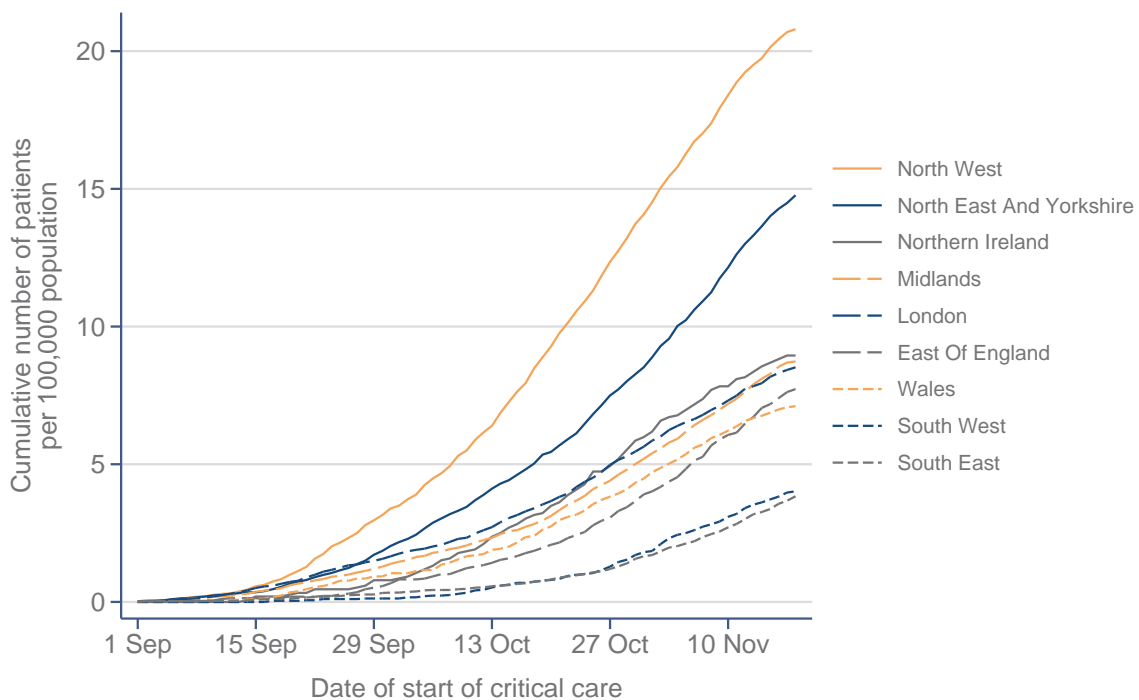
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Figure 9. Cumulative number of patients critically ill with confirmed COVID-19 admitted from 1 September 2020 per 100,000 adult population by region
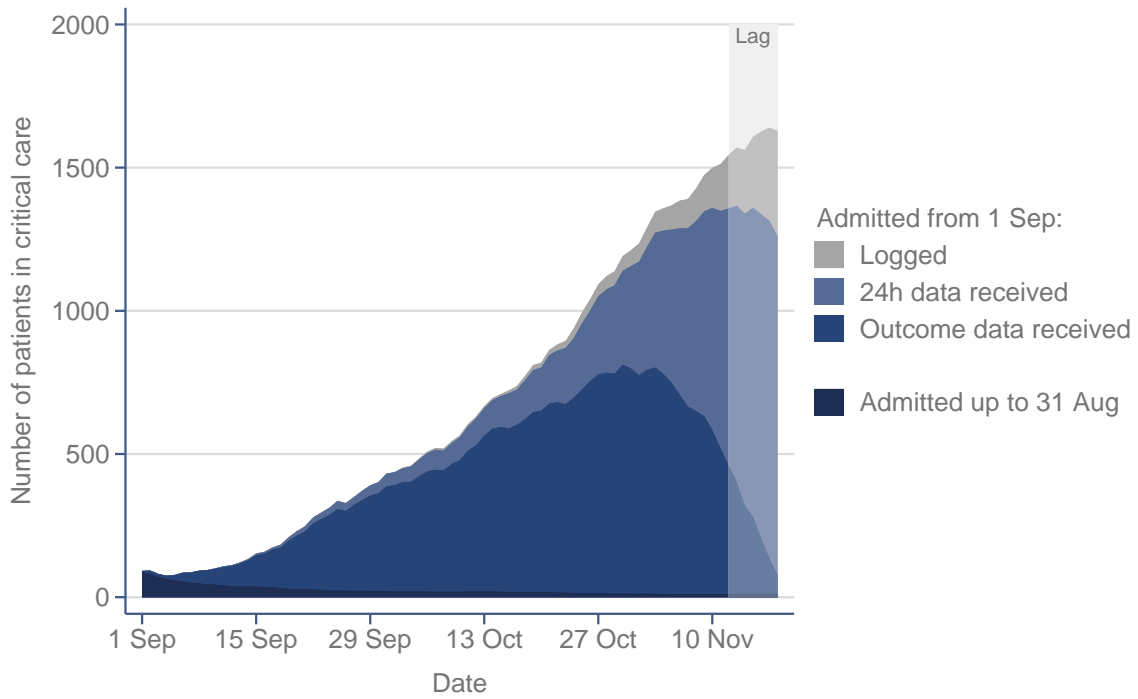
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Figure 10. Number of patients with confirmed COVID-19 in critical care from 1 September 2020 by date *

* Please note patients whose outcome data have not been received are assumed to remain in critical care as of 19 November 2020.
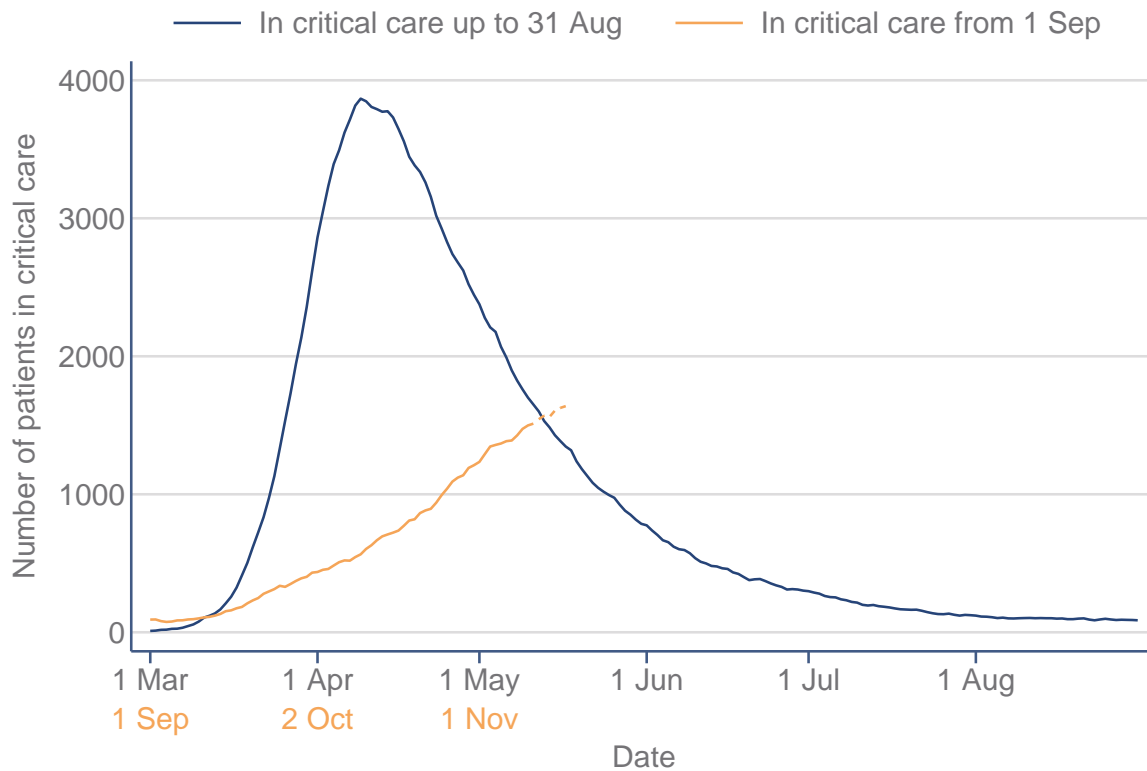
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Figure 11. Number of patients with confirmed COVID-19 in critical care by date *
from 1 March 2020 to 31 August 2020 versus 1 September 2020 to date

* Please note patients whose outcome data have not been received are assumed to remain in critical care as of 19 November 2020. Dashed line indicates potential lag in data submission.
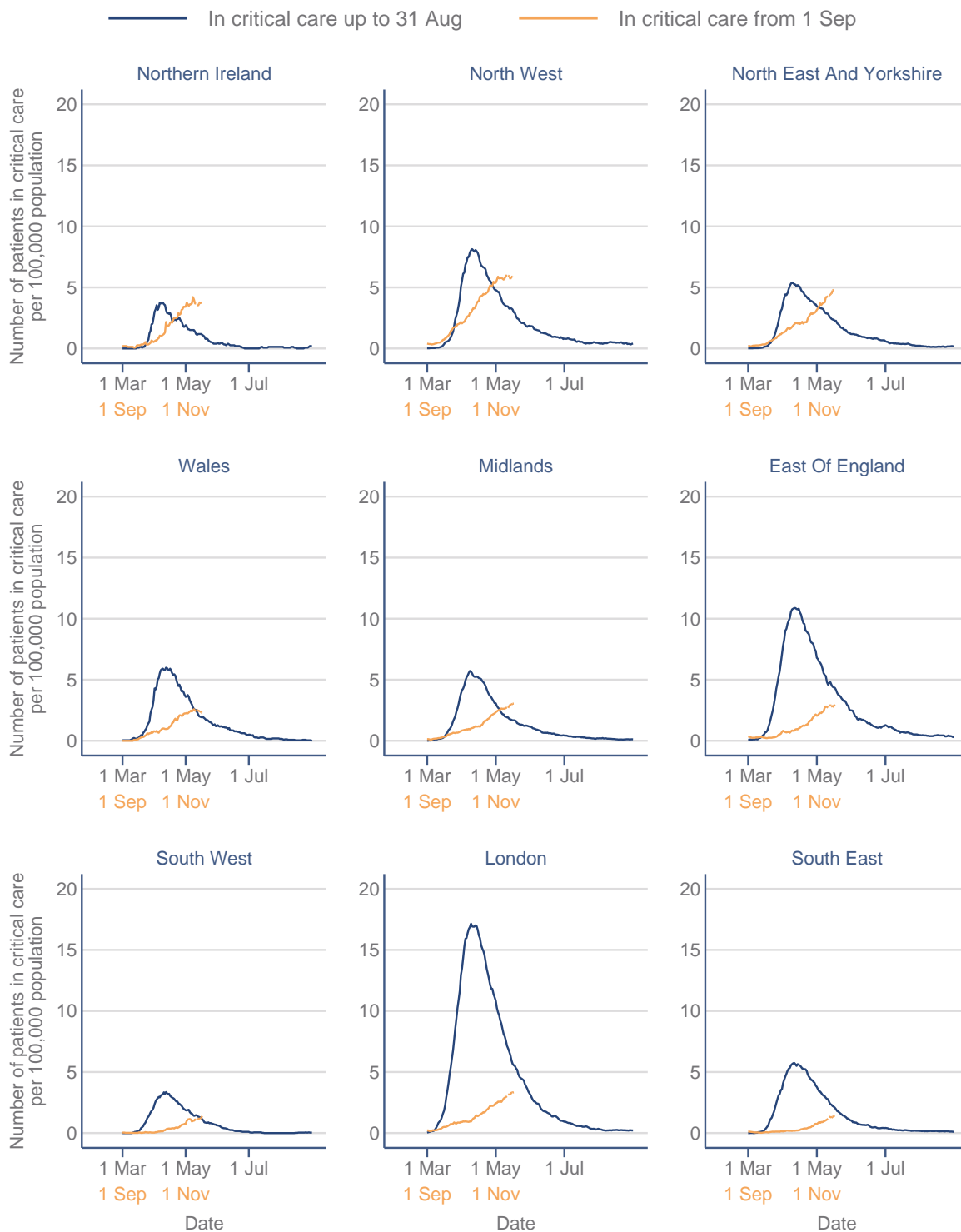
Figure 12. Number of patients with confirmed COVID-19 in critical care by date * from 1 March 2020 to 31 August 2020 versus 1 September 2020 to date by region

* Please note patients whose outcome data have not been received are assumed to remain in critical care as of 19 November 2020. Dahsed line indicates potential lag in data submission.

Figure 13 shows the total numbers of admissions to critical care over the past five years by month of admission reported as due to pneumonia (not COVID-19), compared with the numbers with confirmed COVID-19. Figure 14 shows the number of these pneumonia admissions that were specifically coded as due to influenza. Note that not all admissions due to influenza will be coded as viral pneumonia (influenza) as if the organism has not yet been identified, then these will likely be coded under pneumonia (no organism isolated).
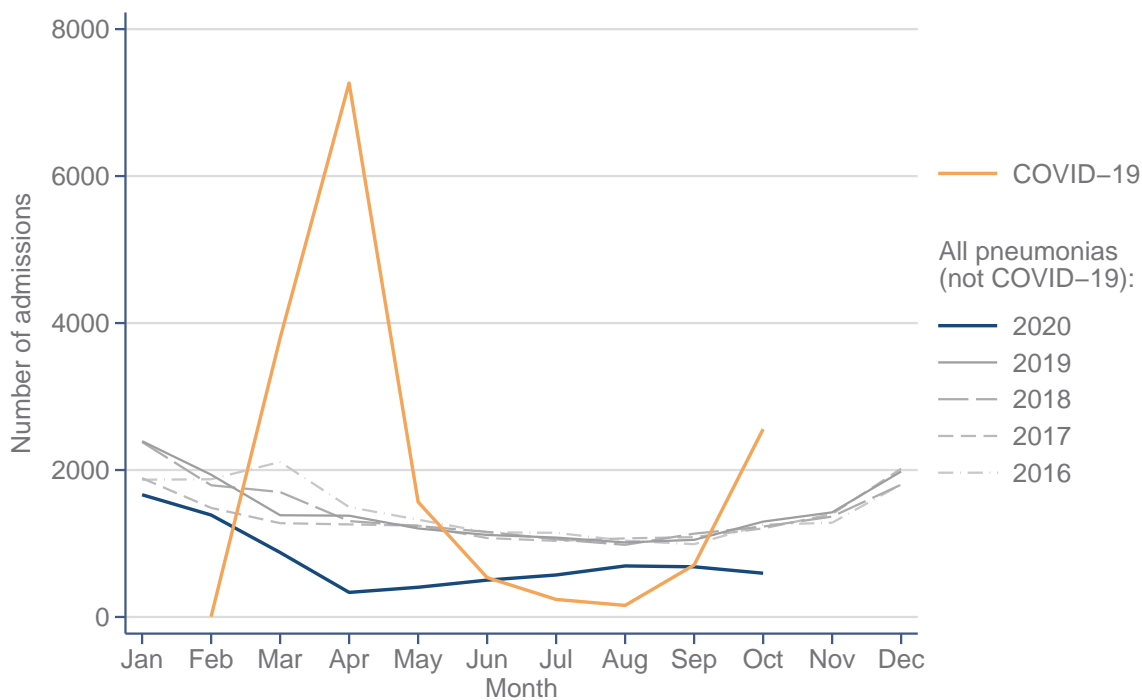
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Figure 13. Number of admissions with pneumonia (not COVID-19) by month, 2016-2020 *, compared with confirmed COVID-19 during 2020

* Please note that data for patients without COVID-19 are submitted by participating critical care units either monthly or quarterly.
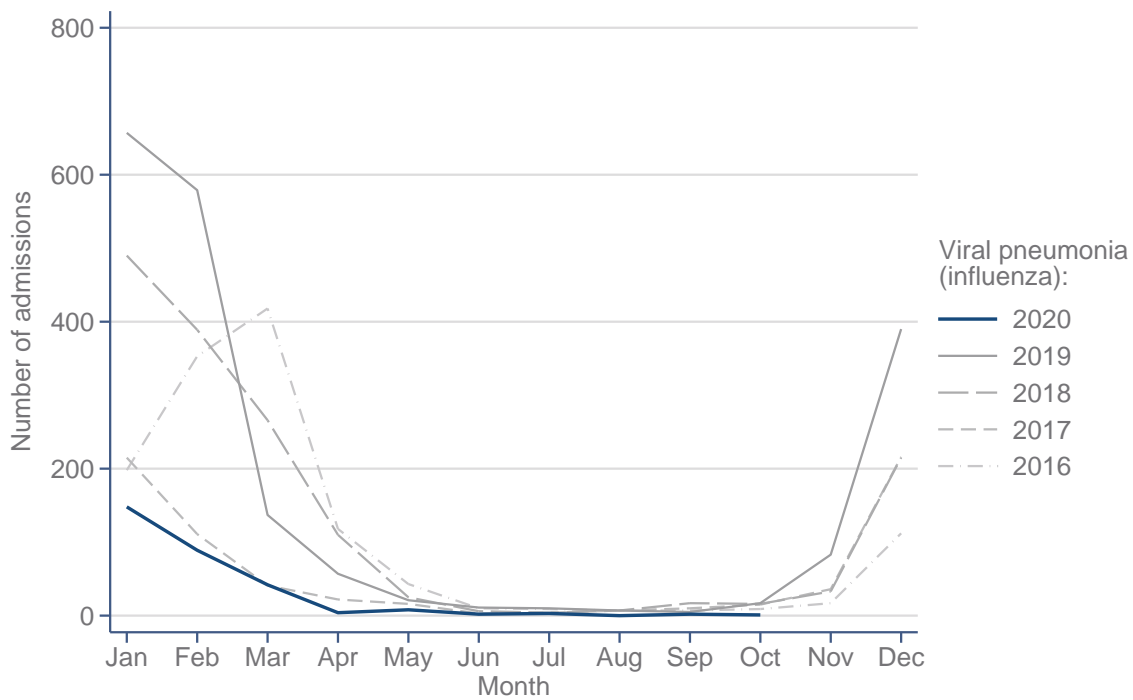
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Figure 14. Number of admissions with viral pneumonia (influenza) by month, 2016-2020 *

* Please note that data for patients without COVID-19 are submitted by participating critical care units either monthly or quarterly.

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 patients admitted up to 31 August 2020.

Table 1. Patient characteristics: demographics

Demographics	Patients with confirmed COVID-19	
	Admitted from 1 Sep (N=4869)	Admitted up to 31 Aug (N=10,914)
Age at admission (years) [N=4859]		
Mean (SD)	61.0 (13.8)	58.8 (12.7)
Median (IQR)	62 (53, 71)	60 (51, 68)
Sex, n (%) [N=4860]		
Female	1489 (30.6)	3267 (30.0)
Male	3371 (69.4)	7641 (70.0)
Ethnicity, n (%) [N=4486]		
White	3372 (75.2)	6932 (66.0)
Mixed	46 (1.0)	190 (1.8)
Asian	728 (16.2)	1677 (16.0)
Black	173 (3.9)	1004 (9.6)
Other	167 (3.7)	696 (6.6)
Index of Multiple Deprivation (IMD) quintile *, n (%) [N=4781]		
1 (least deprived)	543 (11.4)	1543 (14.3)
2	654 (13.7)	1735 (16.1)
3	771 (16.1)	2077 (19.3)
4	1116 (23.3)	2604 (24.2)
5 (most deprived)	1697 (35.5)	2801 (26.0)
Urban/rural classification *, n (%) [N=4677]		
Major conurbation	2156 (46.1)	5212 (48.8)
Minor conurbation	285 (6.1)	337 (3.2)
City and town	1789 (38.3)	3977 (37.2)
Rural	447 (9.6)	1151 (10.8)

* Please see Definitions on page 49.

Table 2. Patient characteristics: medical history

Medical history	Patients with confirmed COVID-19	
	Admitted from 1 Sep (N=4869)	Admitted up to 31 Aug (N=10,914)
Dependency prior to admission to acute hospital, n (%) [N=4285]		
Able to live without assistance in daily activities	3782 (88.3)	9664 (89.3)
Some assistance with daily activities	491 (11.5)	1112 (10.3)
Total assistance with all daily activities	12 (0.3)	40 (0.4)
Very severe comorbidities *, n (%) [N=4386]		
Cardiovascular	36 (0.8)	68 (0.6)
Respiratory	52 (1.2)	124 (1.1)
Renal	81 (1.8)	186 (1.7)
Liver	31 (0.7)	51 (0.5)
Metastatic disease	33 (0.8)	59 (0.5)
Haematological malignancy	76 (1.7)	213 (2.0)
Immunocompromise	191 (4.4)	386 (3.6)
Body mass index *, n (%) [N=4215]		
<18.5	31 (0.7)	79 (0.8)
18.5-<25	850 (20.2)	2640 (25.5)
25-<30	1378 (32.7)	3566 (34.4)
30-<40	1486 (35.3)	3258 (31.4)
≥40	470 (11.2)	828 (8.0)
CPR within previous 24h, n (%) [N=4465]		
In the community	28 (0.6)	50 (0.5)
In hospital	33 (0.7)	76 (0.7)
Prior hospital length of stay [N=4750]		
Mean (SD)	2.7 (6.4)	2.5 (6.2)
Median (IQR)	1 (0, 3)	1 (0, 3)
Currently or recently pregnant, n (% of females aged 16-49) [N=349]		
Currently pregnant	30 (8.6)	29 (3.7)
Recently pregnant (within 6 weeks)	18 (5.2)	41 (5.2)
Not known to be pregnant	301 (86.2)	718 (91.1)

* Please see Definitions on page 49.

Table 3. Patient characteristics: indicators of acute severity

	Patients with confirmed COVID-19 and 24h data received	
Indicators of acute severity	Admitted from 1 Sep (N=4501)	Admitted up to 31 Aug (N=10,914)
Invasively ventilated within first 24h *, n (%) [N=4200]	959 (22.8)	5854 (54.3)
APACHE II Score [N=4353]		
Mean (SD)	14.4 (5.3)	15.1 (5.3)
Median (IQR)	14 (11, 17)	15 (11, 18)
PaO_2 /FiO_2 ratio † (kPa), median (IQR) [N=4035]	13.5 (10.0, 18.8)	15.8 (11.3, 22.0)
PaO_2 /FiO_2 ratio †, n (%) [N=4035]		
$<$ 13.3 kPa ($<$ 100 mmHg)	1971 (48.8)	3803 (37.0)
13.3-26.6 kPa (100-200 mmHg)	1620 (40.1)	4922 (47.9)
$\geq$ 26.7 kPa ($\geq$ 200 mmHg)	444 (11.0)	1556 (15.1)

* Please see Definitions on page 49. 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 is presented in Figure 15.
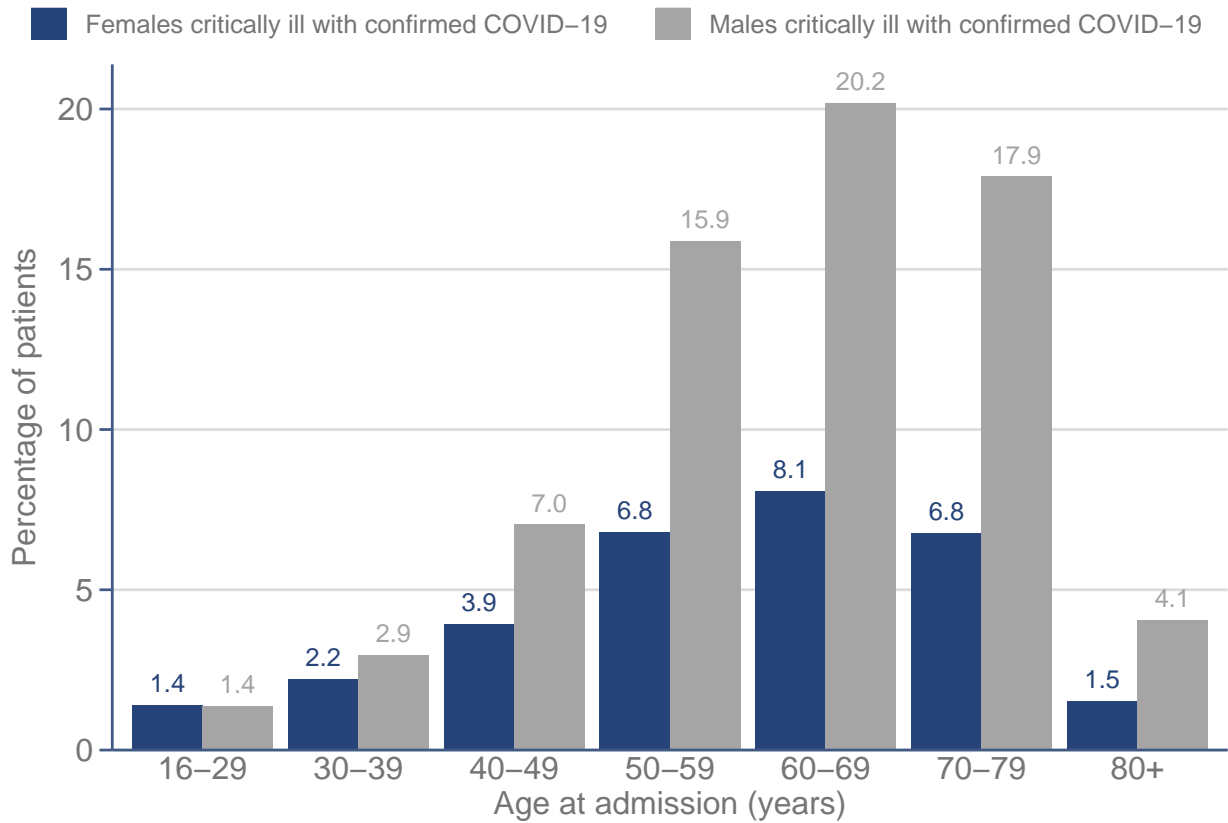
Figure 15. Age and sex distribution of patients critically ill with confirmed COVID-19 admitted from 1 September 2020

The distribution of ethnicity, matched on 2011 census ward for location of patients critically ill with COVID-19, is presented in Figure 16.
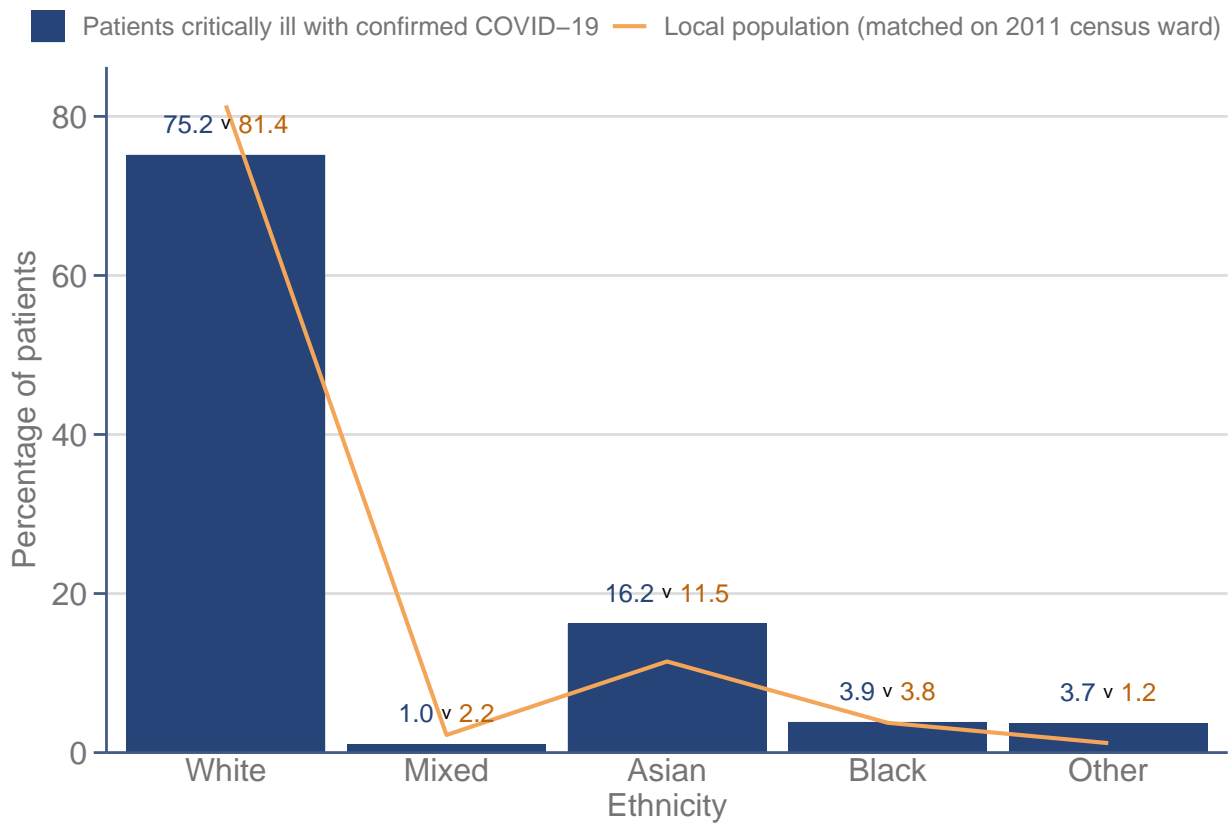
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Figure 16. Ethnicity distribution of patients critically ill with confirmed COVID-19 admitted from 1 September 2020 compared with the local population (linked to 2011 census ward)

The distribution of Index of Multiple Deprivation (IMD) is presented in Figure 17.
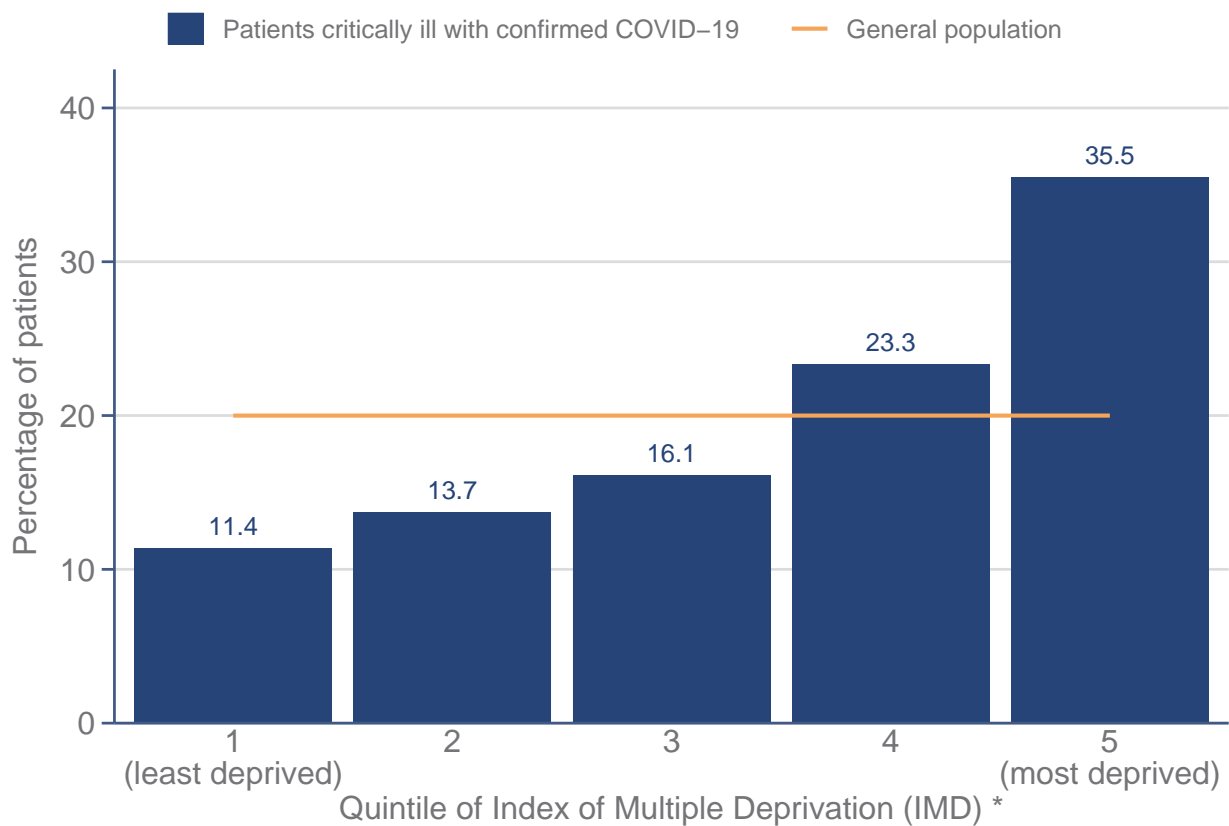
Figure 17. Index of Multiple Deprivation (IMD) * distribution of patients critically ill with confirmed COVID-19 admitted from 1 September 2020 compared with the general population

* Please see Definitions on page 49.

The distribution of patients by the urban/rural classification of their usual residence, compared with the age-matched general population (Office for National Statistics 2020), is presented in Figure 18.
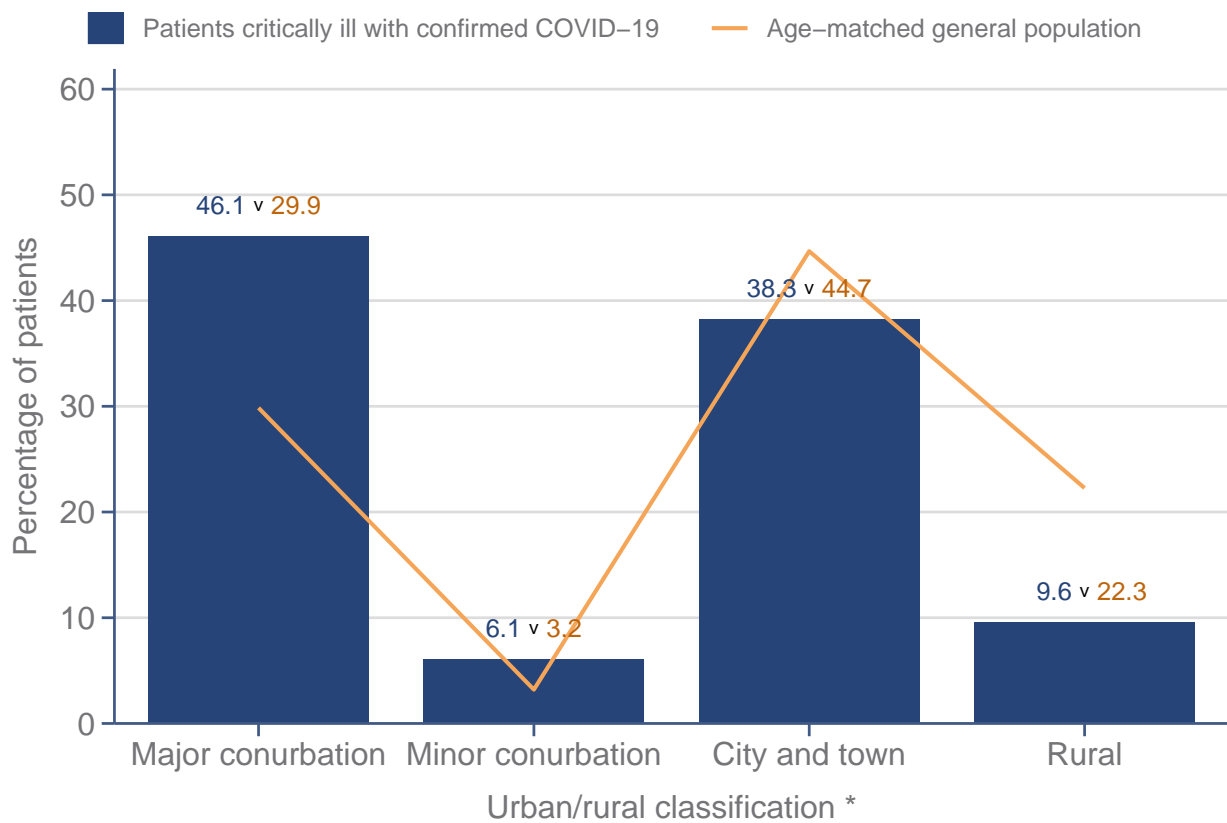
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Figure 18. Urban/rural * distribution of patients critically ill with confirmed COVID-19 admitted from 1 September 2020 compared with the age-matched general population

* Please see Definitions on page 49.

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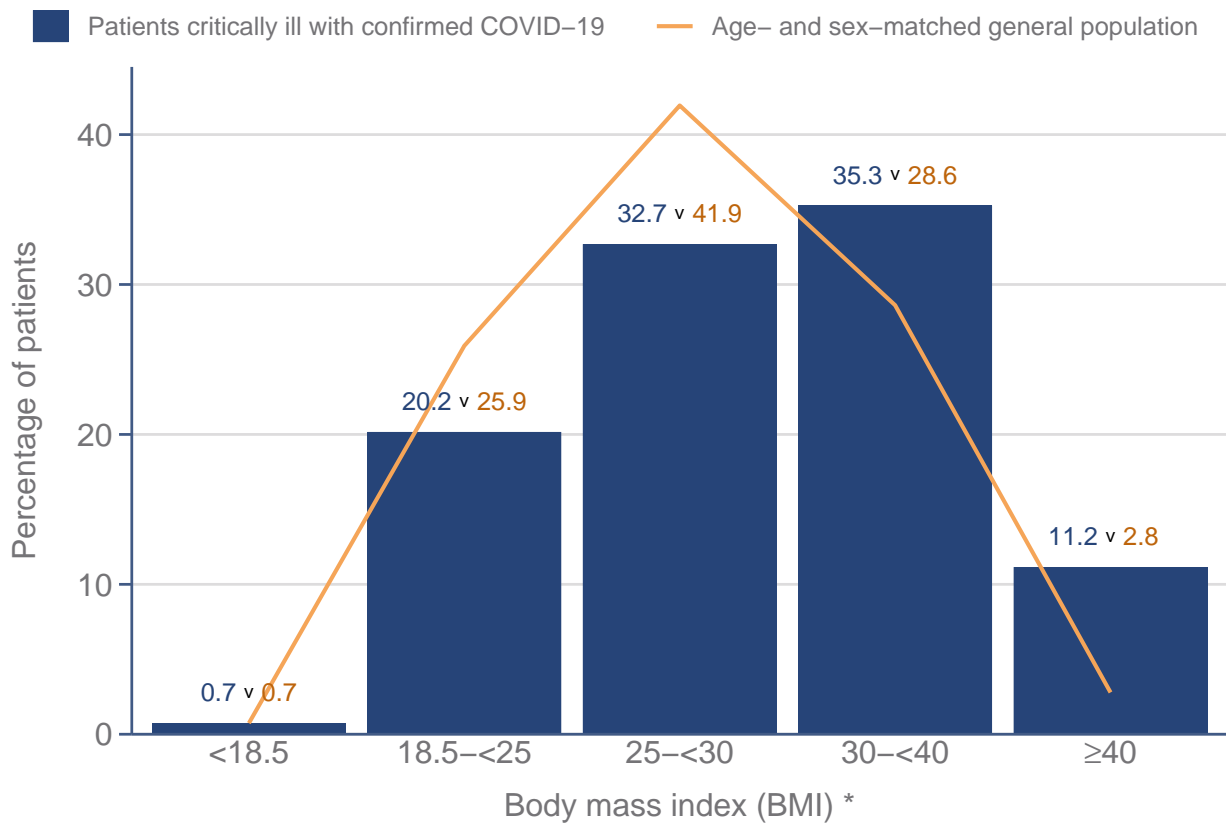
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Figure 19. Body mass index (BMI) * distribution of patients critically ill with confirmed COVID-19 admitted from 1 September 2020 compared with the age- and sex-matched general population (Health Survey for England 2018)

* Please see Definitions on page 49.

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 patients 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=959)	Admitted up to 31 Aug (N=5854)
Age at admission (years) [N=959]		
Mean (SD)	60.3 (13.9)	58.5 (12.0)
Median (IQR)	63 (52, 70)	59 (51, 67)
Sex, n (%) [N=958]		
Female	289 (30.2)	1606 (27.5)
Male	669 (69.8)	4243 (72.5)
Ethnicity, n (%) [N=910]		
White	677 (74.4)	3459 (61.5)
Mixed	5 (0.5)	114 (2.0)
Asian	149 (16.4)	961 (17.1)
Black	38 (4.2)	647 (11.5)
Other	41 (4.5)	443 (7.9)
Index of Multiple Deprivation (IMD) quintile *, n (%) [N=943]		
1 (least deprived)	104 (11.0)	784 (13.6)
2	118 (12.5)	925 (16.0)
3	165 (17.5)	1150 (19.9)
4	229 (24.3)	1482 (25.6)
5 (most deprived)	327 (34.7)	1441 (24.9)
Urban/rural classification *, n (%) [N=887]		
Major conurbation	474 (53.4)	3117 (54.6)
Minor conurbation	38 (4.3)	119 (2.1)
City and town	298 (33.6)	1906 (33.4)
Rural	77 (8.7)	566 (9.9)

* Please see Definitions on page 49.

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=959)	Admitted up to 31 Aug (N=5854)
Dependency prior to admission to acute hospital, n (%) [N=910]		
Able to live without assistance in daily activities	807 (88.7)	5350 (92.3)
Some assistance with daily activities	102 (11.2)	439 (7.6)
Total assistance with all daily activities	1 (0.1)	10 (0.2)
Very severe comorbidities *, n (%) [N=916]		
Cardiovascular	13 (1.4)	19 (0.3)
Respiratory	4 (0.4)	33 (0.6)
Renal	13 (1.4)	79 (1.4)
Liver	10 (1.1)	23 (0.4)
Metastatic disease	3 (0.3)	20 (0.3)
Haematological malignancy	11 (1.2)	75 (1.3)
Immunocompromise	33 (3.6)	162 (2.8)
Body mass index *, n (%) [N=896]		
<18.5	10 (1.1)	30 (0.5)
18.5-<25	190 (21.2)	1416 (24.9)
25-<30	277 (30.9)	1976 (34.7)
30-<40	308 (34.4)	1843 (32.4)
≥40	111 (12.4)	422 (7.4)
CPR within previous 24h, n (%) [N=936]		
In the community	15 (1.6)	38 (0.6)
In hospital	26 (2.8)	58 (1.0)
Prior hospital length of stay [N=954]		
Mean (SD)	3.1 (5.4)	2.2 (5.3)
Median (IQR)	1 (0, 4)	1 (0, 3)
Currently or recently pregnant, n (% of females aged 16-49) [N=81]		
Currently pregnant	5 (6.2)	9 (2.4)
Recently pregnant (within 6 weeks)	7 (8.6)	22 (5.9)
Not known to be pregnant	69 (85.2)	344 (91.7)

* Please see Definitions on page 49.

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

	Patients with confirmed COVID-19 invasively ventilated first 24 hours *	
Indicators of acute severity	Admitted from 1 Sep (N=959)	Admitted up to 31 Aug (N=5854)
APACHE II Score [N=959]		
Mean (SD)	16.7 (5.4)	15.6 (5.2)
Median (IQR)	16 (13, 20)	15 (12, 19)
PaO_2 /FiO_2 ratio † (kPa), median (IQR) [N=956]	12.3 (8.6, 19.6)	15.5 (10.8, 21.5)
PaO_2 /FiO_2 ratio †, n (%) [N=956]		
< 13.3 kPa ($<$ 100 mmHg)	521 (54.5)	2279 (39.1)
13.3-26.6 kPa (100-200 mmHg)	303 (31.7)	2774 (47.5)
≥ 26.7 kPa ($\geq$ 200 mmHg)	132 (13.8)	781 (13.4)

* Please see Definitions on page 49. 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 patients admitted up to 31 August 2020.

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

	Patients with confirmed COVID-19 and advanced respiratory support *	
Demographics	Admitted from 1 Sep (N=1218)	Admitted up to 31 Aug (N=7861)
Age at admission (years) [N=1217]		
Mean (SD)	61.6 (13.4)	58.6 (11.9)
Median (IQR)	64 (54, 72)	60 (51, 67)
Sex, n (%) [N=1217]		
Female	353 (29.0)	2201 (28.0)
Male	864 (71.0)	5655 (72.0)
Ethnicity, n (%) [N=1152]		
White	872 (75.7)	4741 (62.7)
Mixed	5 (0.4)	147 (1.9)
Asian	199 (17.3)	1293 (17.1)
Black	40 (3.5)	820 (10.8)
Other	36 (3.1)	563 (7.4)
Index of Multiple Deprivation (IMD) quintile *, n (%) [N=1202]		
1 (least deprived)	128 (10.6)	1061 (13.7)
2	158 (13.1)	1228 (15.8)
3	198 (16.5)	1549 (19.9)
4	276 (23.0)	1938 (25.0)
5 (most deprived)	442 (36.8)	1990 (25.6)
Urban/rural classification *, n (%) [N=1155]		
Major conurbation	590 (51.1)	4009 (52.2)
Minor conurbation	55 (4.8)	205 (2.7)
City and town	401 (34.7)	2669 (34.7)
Rural	109 (9.4)	801 (10.4)

* Please see Definitions on page 49.

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

	Patients with confirmed COVID-19 and advanced respiratory support *	
Medical history	**Admitted from 1 Sep (N=1218)**	**Admitted up to 31 Aug (N=7861)**
Dependency prior to admission to acute hospital, n (%) [N=1166]		
Able to live without assistance in daily activities	1031 (88.4)	7165 (92.0)
Some assistance with daily activities	133 (11.4)	612 (7.9)
Total assistance with all daily activities	2 (0.2)	11 (0.1)
Very severe comorbidities *, n (%) [N=1173]		
Cardiovascular	11 (0.9)	25 (0.3)
Respiratory	11 (0.9)	47 (0.6)
Renal	20 (1.7)	94 (1.2)
Liver	11 (0.9)	31 (0.4)
Metastatic disease	3 (0.3)	24 (0.3)
Haematological malignancy	23 (2.0)	128 (1.6)
Immunocompromise	60 (5.1)	234 (3.0)
Body mass index *, n (%) [N=1144]		
$<$18.5	10 (0.9)	41 (0.5)
18.5-$<$25	252 (22.0)	1887 (24.9)
25-$<$30	366 (32.0)	2631 (34.7)
30-$<$40	393 (34.4)	2457 (32.4)
$\geq$40	123 (10.8)	565 (7.5)
CPR within previous 24h, n (%) [N=1191]		
In the community	14 (1.2)	45 (0.6)
In hospital	28 (2.4)	70 (0.9)
Prior hospital length of stay [N=1199]		
Mean (SD)	3.2 (7.7)	2.2 (5.4)
Median (IQR)	1 (0, 4)	1 (0, 3)
Currently or recently pregnant, n (% of females aged 16-49) [N=88]		
Currently pregnant	8 (9.1)	15 (2.9)
Recently pregnant (within 6 weeks)	7 (8.0)	27 (5.2)
Not known to be pregnant	73 (83.0)	480 (92.0)

* Please see Definitions on page 49.

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

Indicators of acute severity	Patients with confirmed COVID-19 and advanced respiratory support *	
	Admitted from 1 Sep (N=1218)	Admitted up to 31 Aug (N=7861)
APACHE II Score [N=1189]		
Mean (SD)	16.1 (5.3)	15.4 (5.1)
Median (IQR)	16 (13, 19)	15 (12, 18)
PaO_2 /FiO_2 ratio † (kPa), median (IQR) [N=1152]	12.3 (9.1, 17.5)	15.0 (10.8, 21.0)
PaO_2 /FiO_2 ratio †, n (%) [N=1152]		
< 13.3 kPa ($<$ 100 mmHg)	658 (57.1)	3100 (40.4)
13.3-26.6 kPa (100-200 mmHg)	366 (31.8)	3614 (47.1)
≥ 26.7 kPa ($\geq$ 200 mmHg)	128 (11.1)	960 (12.5)

* Please see Definitions on page 49. 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 patients admitted up to 31 August 2020.

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

	Patients with confirmed COVID-19 and basic respiratory support only *	
Demographics	**Admitted from 1 Sep (N=1882)**	**Admitted up to 31 Aug (N=2781)**
Age at admission (years) [N=1882]		
Mean (SD)	60.7 (14.5)	59.4 (14.4)
Median (IQR)	62 (52, 72)	60 (50, 70)
Sex, n (%) [N=1882]		
Female	616 (32.7)	953 (34.3)
Male	1266 (67.3)	1827 (65.7)
Ethnicity, n (%) [N=1780]		
White	1355 (76.1)	2010 (74.9)
Mixed	19 (1.1)	41 (1.5)
Asian	264 (14.8)	351 (13.1)
Black	74 (4.2)	164 (6.1)
Other	68 (3.8)	116 (4.3)
Index of Multiple Deprivation (IMD) quintile *, n (%) [N=1846]		
1 (least deprived)	208 (11.3)	439 (16.1)
2	268 (14.5)	463 (16.9)
3	293 (15.9)	484 (17.7)
4	413 (22.4)	598 (21.9)
5 (most deprived)	664 (36.0)	748 (27.4)
Urban/rural classification *, n (%) [N=1842]		
Major conurbation	795 (43.2)	1047 (38.3)
Minor conurbation	132 (7.2)	128 (4.7)
City and town	746 (40.5)	1232 (45.0)
Rural	169 (9.2)	324 (11.8)

* Please see Definitions on page 49.

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

	Patients with confirmed COVID-19 and basic respiratory support only *	
Medical history	**Admitted from 1 Sep (N=1882)**	**Admitted up to 31 Aug (N=2781)**
Dependency prior to admission to acute hospital, n (%) [N=1808]		
Able to live without assistance in daily activities	1563 (86.4)	2289 (83.0)
Some assistance with daily activities	241 (13.3)	445 (16.1)
Total assistance with all daily activities	4 (0.2)	24 (0.9)
Very severe comorbidities *, n (%) [N=1816]		
Cardiovascular	20 (1.1)	39 (1.4)
Respiratory	36 (2.0)	73 (2.6)
Renal	25 (1.4)	74 (2.7)
Liver	7 (0.4)	17 (0.6)
Metastatic disease	20 (1.1)	26 (0.9)
Haematological malignancy	36 (2.0)	77 (2.8)
Immunocompromise	75 (4.1)	136 (4.9)
Body mass index *, n (%) [N=1759]		
<18.5	13 (0.7)	28 (1.1)
18.5-<25	336 (19.1)	663 (26.2)
25-<30	581 (33.0)	853 (33.8)
30-<40	625 (35.5)	735 (29.1)
≥40	204 (11.6)	248 (9.8)
CPR within previous 24h, n (%) [N=1828]		
In the community	5 (0.3)	5 (0.2)
In hospital	1 (0.1)	3 (0.1)
Prior hospital length of stay [N=1849]		
Mean (SD)	2.4 (5.8)	3.0 (7.4)
Median (IQR)	1 (0, 3)	1 (0, 3)
Currently or recently pregnant, n (% of females aged 16-49) [N=145]		
Currently pregnant	13 (9.0)	11 (4.6)
Recently pregnant (within 6 weeks)	5 (3.4)	11 (4.6)
Not known to be pregnant	127 (87.6)	215 (90.7)

* Please see Definitions on page 49.

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

Indicators of acute severity	Patients with confirmed COVID-19 and basic respiratory support only *	
	Admitted from 1 Sep (N=1882)	Admitted up to 31 Aug (N=2781)
APACHE II Score [N=1833]		
Mean (SD)	13.6 (5.2)	14.2 (5.5)
Median (IQR)	13 (10, 16)	14 (10, 17)
PaO$_2$ /FiO$_2$ ratio † (kPa), median (IQR) [N=1681]	14.8 (11.4, 19.8)	17.5 (12.5, 24.0)
PaO$_2$ /FiO$_2$ ratio †, n (%) [N=1681]		
$<$ 13.3 kPa ($<$ 100 mmHg)	664 (39.5)	697 (29.0)
13.3-26.6 kPa (100-200 mmHg)	852 (50.7)	1269 (52.8)
$\geq$ 26.7 kPa ($\geq$ 200 mmHg)	165 (9.8)	436 (18.2)

* Please see Definitions on page 49. 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 3293 (of 4869) patients. Of these, 1172 have died and 2121 have been discharged from critical care (Figures 20 and 21). The remaining 1576 were last reported to still be receiving critical care.
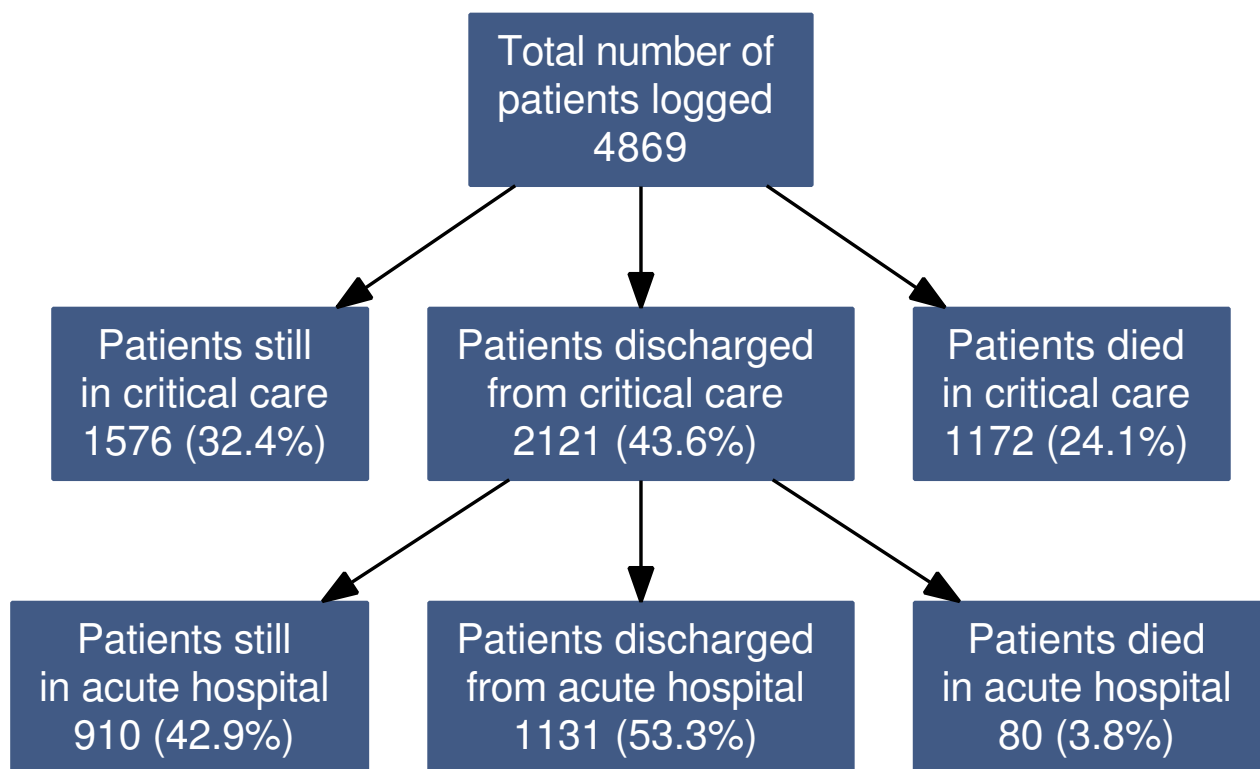
Figure 20. Critical care and acute hospital outcomes for patients admitted from 1 September 2020
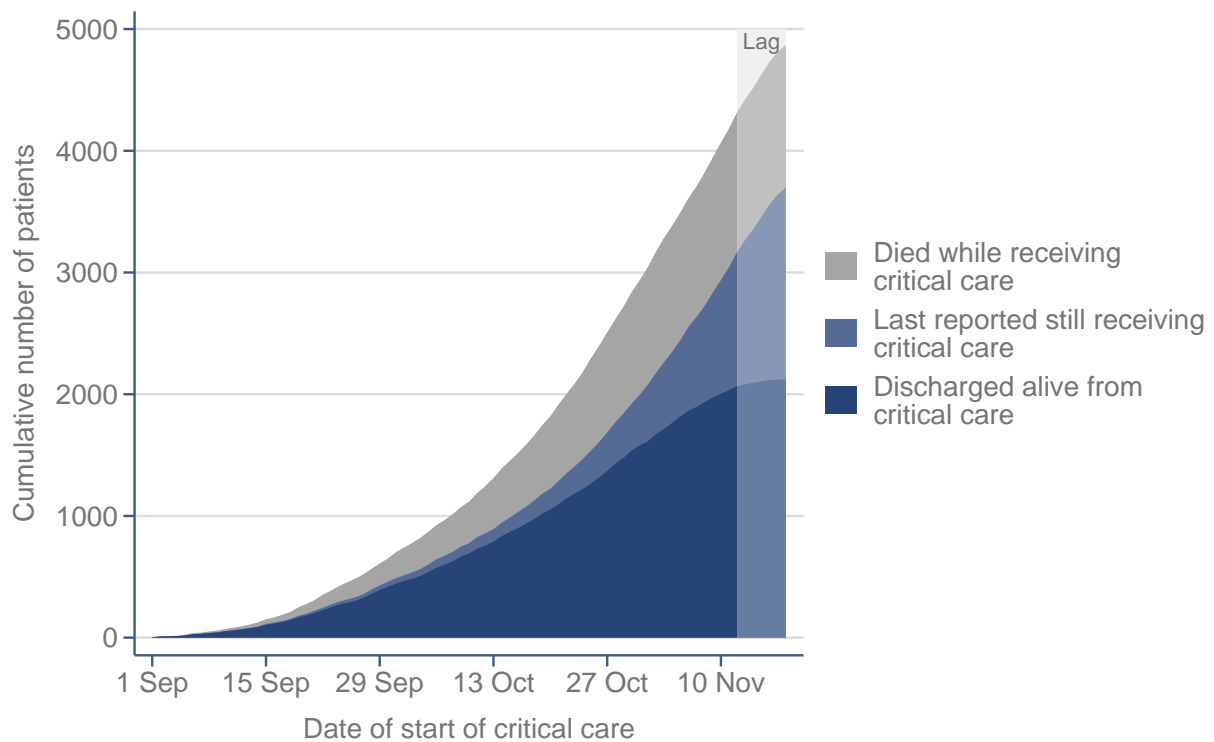
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Figure 21. Cumulative outcomes for patients admitted from 1 September 2020 by date of start of critical care *

* Please note that patients whose outcome data have not been received are assumed to remain in critical care as of 19 November 2020.

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 13 and compared with patients admitted up to 31 August 2020.

Table 13. Critical care outcome, duration of critical care and organ support

	Patients with confirmed COVID-19 and outcome received	
Critical care outcome	**Admitted from 1 Sep (N=4869)**	**Admitted up to 31 Aug (N=10,914)**
Outcome at end of critical care, n (%)		
Discharged	2121 (43.6)	6607 (60.5)
Died	1172 (24.1)	4301 (39.4)
Still receiving critical care	1576 (32.4)	6 (0.1)
Duration of critical care	**(N=3286)**	**(N=10,901)**
Duration of critical care (days) †, median (IQR)		
Survivors	5 (3, 9)	12 (5, 28)
Non-survivors	9 (4, 15)	9 (5, 16)
Organ support (Critical Care Minimum Dataset) *	**(N=3240)**	**(N=10,904)**
Receipt of organ support, at any point, n (%)		
Advanced respiratory support	1218 (37.6)	7861 (72.1)
Basic respiratory support only	1882 (58.1)	2781 (25.5)
No respiratory support	140 (4.3)	262 (2.4)
Advanced cardiovascular support	517 (16.0)	3357 (30.8)
Basic cardiovascular support only	2542 (78.5)	7086 (65.0)
No cardiovascular support	181 (5.6)	461 (4.2)
Renal support	382 (11.8)	2920 (26.8)
Liver support	21 (0.6)	114 (1.0)
Neurological support	160 (4.9)	993 (9.1)
Duration of organ support (calendar days), median (IQR)		
Advanced respiratory support	8 (4, 14)	14 (7, 24)
Total (advanced + basic) respiratory support	7 (4, 12)	11 (5, 22)
Advanced cardiovascular support	2 (1, 4)	3 (2, 6)
Total (advanced + basic) cardiovascular support	7 (4, 12)	11 (5, 22)
Renal support	4 (2, 8)	8 (3, 15)

Please note that the results for patients admitted from 1 September 2020 are biased towards patients with shorter lengths of stay in critical care prior to discharge or death, i.e. those who died or recovered quickly. * Please see Definitions on page 49. † 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 and receiving invasive ventilation during the first 24 hours in critical care admitted from 1 September 2020 to date for whom outcomes have been received are summarised in Table 14 and compared with patients admitted up to 31 August 2020.

Table 14. 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=959)**	**Admitted up to 31 Aug (N=5854)**
Outcome at end of critical care, n (%)		
Discharged	269 (28.1)	3127 (53.4)
Died	353 (36.8)	2724 (46.5)
Still receiving critical care	337 (35.1)	3 (0.1)
Duration of critical care	**(N=622)**	**(N=5847)**
Duration of critical care (days) †, median (IQR)		
Survivors	10 (6, 15)	22 (12, 35)
Non-survivors	10 (4, 15)	10 (5, 17)
Organ support (Critical Care Minimum Dataset) *	**(N=612)**	**(N=5849)**
Receipt of organ support, at any point, n (%)		
Advanced cardiovascular support	239 (39.1)	2386 (40.8)
Basic cardiovascular support only	372 (60.8)	3450 (59.0)
No cardiovascular support	1 (0.2)	13 (0.2)
Renal support	158 (25.8)	2115 (36.2)
Liver support	12 (2.0)	80 (1.4)
Neurological support	80 (13.1)	715 (12.2)
Duration of organ support (calendar days), median (IQR)		
Advanced respiratory support	8 (4, 14)	14 (7, 24)
Total (advanced + basic) respiratory support	10 (5, 15)	15 (8, 26)
Advanced cardiovascular support	2 (1, 4)	3 (2, 6)
Total (advanced + basic) cardiovascular support	10 (6, 16)	15 (8, 26)
Renal support	3.5 (2, 9)	8 (4, 16)

Please note that the results for patients admitted from 1 September 2020 are biased towards patients with shorter lengths of stay in critical care prior to discharge or death, i.e. those who died or recovered quickly. * Please see Definitions on page 49. † 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 that received advanced respiratory support at any time during their critical care stay admitted from 1 September 2020 to date for whom outcomes have been received are summarised in Table 15 and compared with patients admitted up to 31 August 2020.

Table 15. Critical care outcome, duration of critical care and organ support (any advanced respiratory support and known outcomes)

	Patients with confirmed COVID-19 and advanced respiratory support *	
Critical care outcome	**Admitted from 1 Sep (N=1218)**	**Admitted up to 31 Aug (N=7861)**
Outcome at end of critical care, n (%)		
Discharged	420 (34.5)	4115 (52.3)
Died	798 (65.5)	3746 (47.7)
Still receiving critical care	0 (0.0)	0 (0.0)
Duration of critical care	**(N=1217)**	**(N=7855)**
Duration of critical care (days) †, median (IQR)		
Survivors	11 (6, 17)	23 (12, 37)
Non-survivors	12 (7, 17)	10 (6, 17)
Organ support (Critical Care Minimum Dataset) *	**(N=1218)**	**(N=7861)**
Receipt of organ support, at any point, n (%)		
Advanced cardiovascular support	477 (39.2)	3288 (41.8)
Basic cardiovascular support only	740 (60.8)	4556 (58.0)
No cardiovascular support	1 (0.1)	17 (0.2)
Renal support	320 (26.3)	2771 (35.2)
Liver support	18 (1.5)	110 (1.4)
Neurological support	145 (11.9)	967 (12.3)
Duration of organ support (calendar days), median (IQR)		
Advanced respiratory support	8 (4, 14)	14 (7, 24)
Total (advanced + basic) respiratory support	12 (7, 17)	16 (8, 27)
Advanced cardiovascular support	2 (1, 5)	3 (2, 6)
Total (advanced + basic) cardiovascular support	12 (7, 17)	16 (9, 27)
Renal support	4 (2, 8)	8 (4, 16)

Please note that the results for patients admitted from 1 September 2020 are biased towards patients with shorter lengths of stay in critical care prior to discharge or death, i.e. those who died or recovered quickly. * Please see Definitions on page 49. † 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 – basic respiratory support only

Critical care outcome, duration of critical care and organ support for 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 for whom outcomes have been received are summarised in Table 16 and compared with patients admitted up to 31 August 2020.

Table 16. Critical care outcome, duration of critical care and organ support (basic respiratory support only and known outcomes)

	Patients with confirmed COVID-19 and basic respiratory support only *	
Critical care outcome	Admitted from 1 Sep (N=1882)	Admitted up to 31 Aug (N=2781)
Outcome at end of critical care, n (%)		
Discharged	1539 (81.8)	2242 (80.6)
Died	343 (18.2)	539 (19.4)
Duration of critical care	**(N=1878)**	**(N=2780)**
Duration of critical care (days) †, median (IQR)		
Survivors	5 (3, 7)	4 (2, 7)
Non-survivors	5 (2, 8)	4 (2, 7)
Organ support (Critical Care Minimum Dataset) *	**(N=1882)**	**(N=2781)**
Receipt of organ support, at any point, n (%)		
Advanced cardiovascular support	33 (1.8)	52 (1.9)
Basic cardiovascular support only	1713 (91.0)	2318 (83.4)
No cardiovascular support	136 (7.2)	411 (14.8)
Renal support	50 (2.7)	114 (4.1)
Liver support	1 (0.1)	3 (0.1)
Neurological support	13 (0.7)	22 (0.8)
Duration of organ support (calendar days), median (IQR)		
Total (advanced + basic) respiratory support	5 (3, 8)	4 (3, 7)
Advanced cardiovascular support	1 (1, 2)	2 (1, 3.5)
Total (advanced + basic) cardiovascular support	5 (4, 8)	5 (3, 7)
Renal support	3 (2, 6)	3 (2, 5)

Please note that the results for patients admitted from 1 September 2020 are biased towards patients with shorter lengths of stay in critical care prior to discharge or death, i.e. those who died or recovered quickly. * Please see Definitions on page 49. † 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).

28-day in-hospital outcome

A Kaplan-Meier plot of in-hospital survival to 28 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 22 and compared with patients admitted up to 31 August 2020.
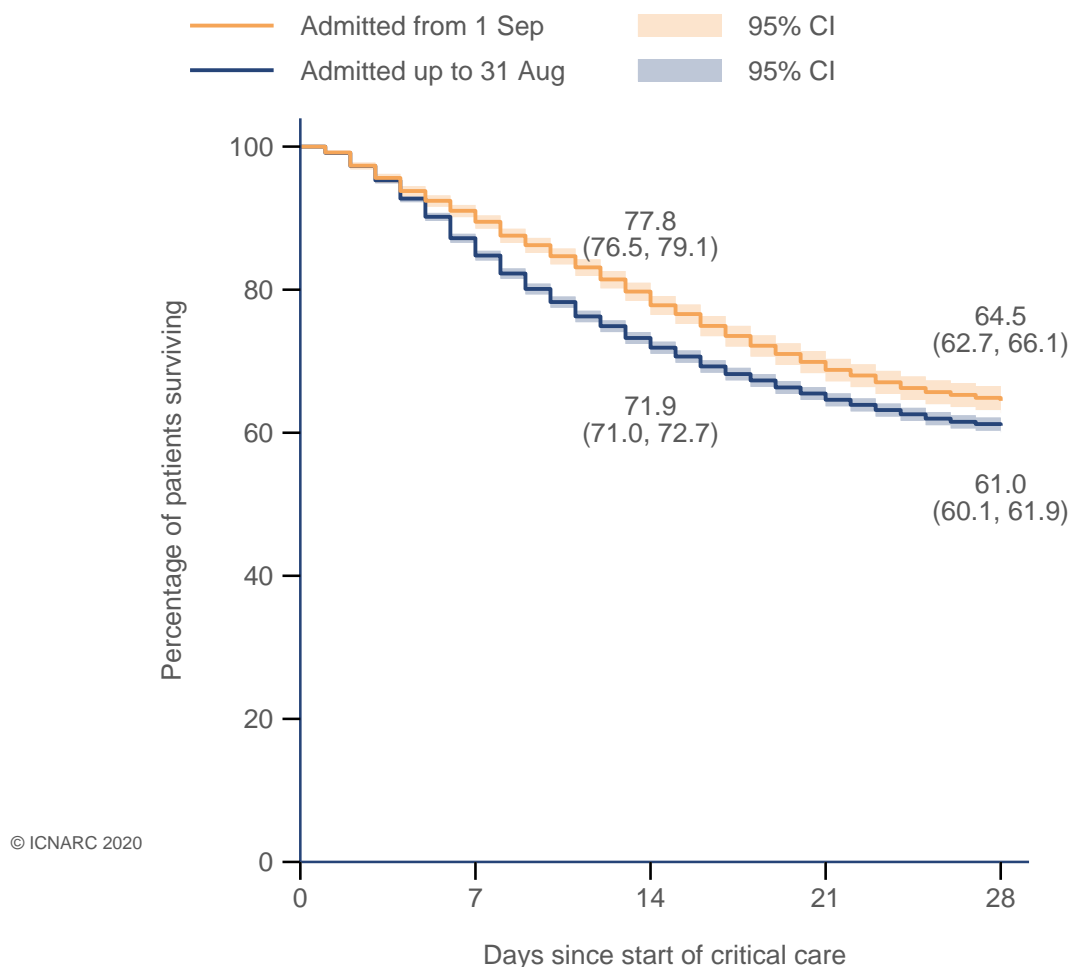
Admitted from 1 Sep				
At risk	4501	3514	2421	1661	1194
Died (in hospital)	0	454	871	1126	1221
Censored	0	533	1209	1714	2086
Admitted up to 31 Aug				
At risk	10914	9250	7844	7048	6651
Died (in hospital)	0	1662	3067	3862	4257
Censored	0	2	3	4	6

Figure 22. In-hospital survival to 28 days following admission to critical care

Kaplan-Meier survival analysis. 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 28 days assumed to survive to 28 days. Please note that these survival curves are not adjusted for differences in patient characteristics (see Tables 1-3).
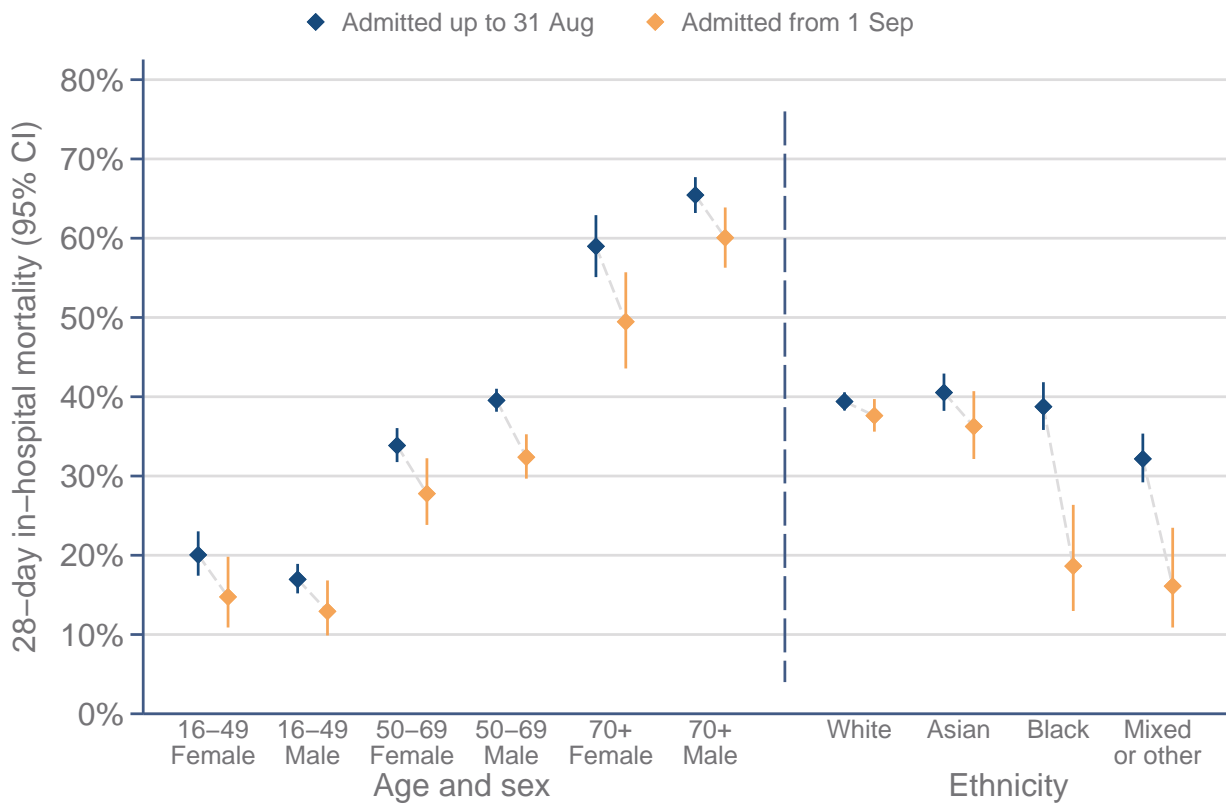
28-day in-hospital mortality for patients critically ill with confirmed COVID-19 admitted from 1 September 2020 to date by patient characteristics (demographics, medical history and indicators of acute severity) is presented in Figures 23-26 and compared with patients admitted up to 31 August 2020.
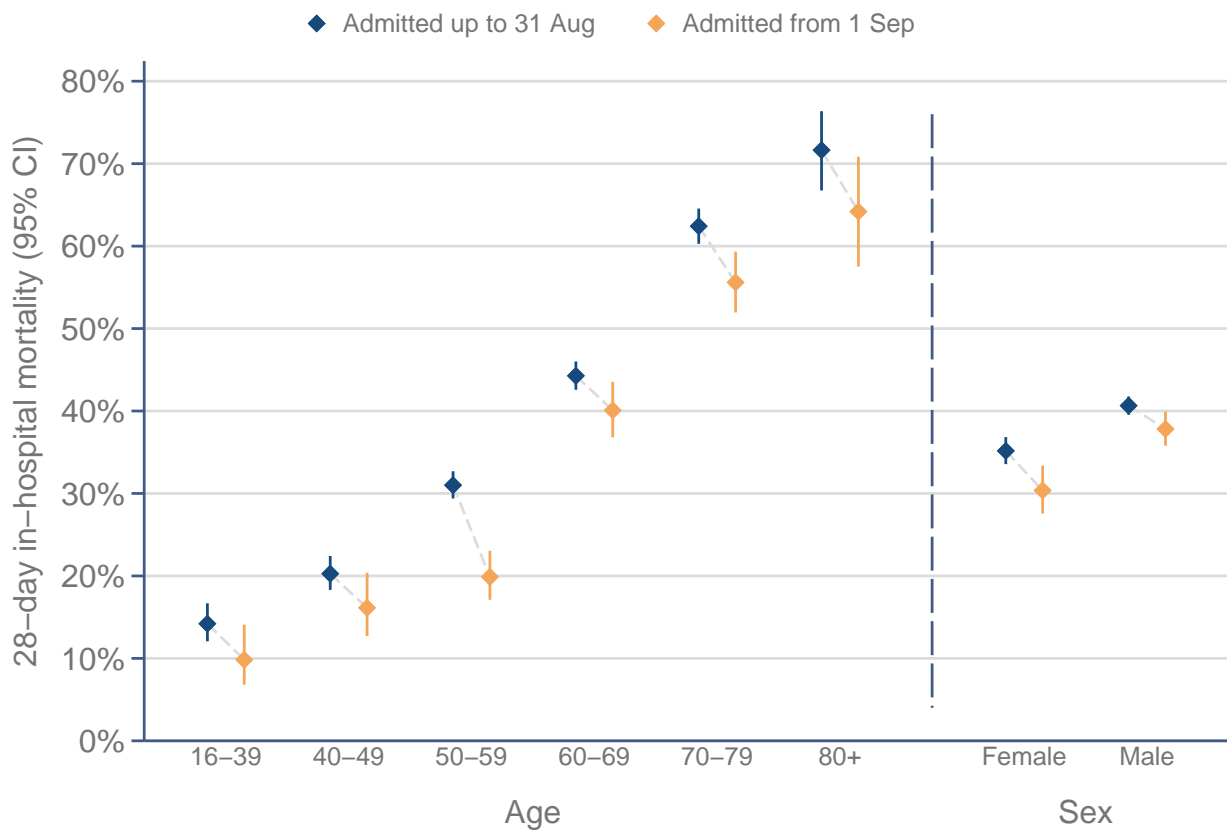
Figure 23. 28-day in-hospital mortality by patient characteristics (demographics)

Estimates of 28-day in-hospital mortality based on Kaplan-Meier survival analysis. 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 28 days assumed to survive to 28 days. Please note that these estimates are not adjusted for differences in other patient characteristics (see Tables 1-3).

Figure 24. 28-day in-hospital mortality by patient characteristics (demographics continued)
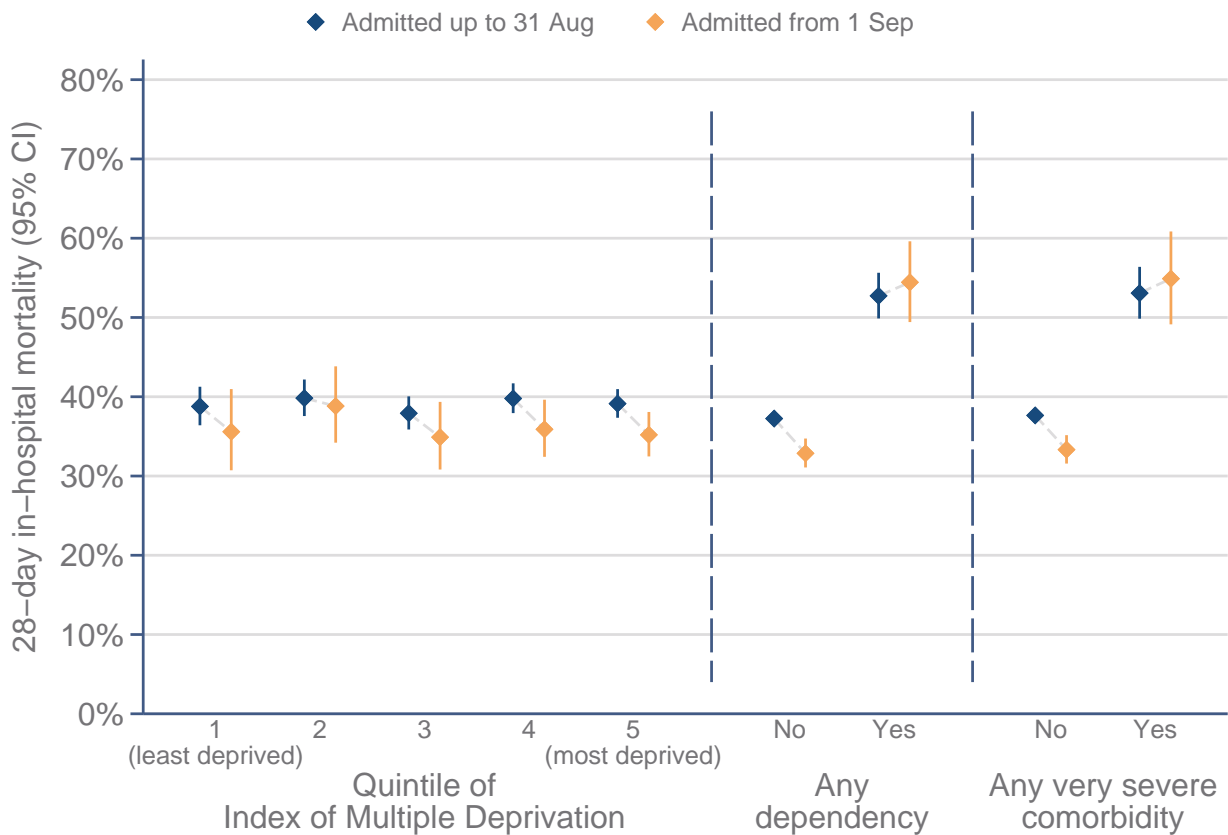
Estimates of 28-day in-hospital mortality based on Kaplan-Meier survival analysis. Patients last reported to be still receiving critical care censored on the most recent date of data submission by the treating unit. Patients discharged from acute hospital within 28 days assumed to survive to 28 days. Please note that these estimates are not adjusted for differences in other patient characteristics (see Tables 1-3).

Figure 25. 28-day in-hospital mortality by patient characteristics (demographics and medical history)
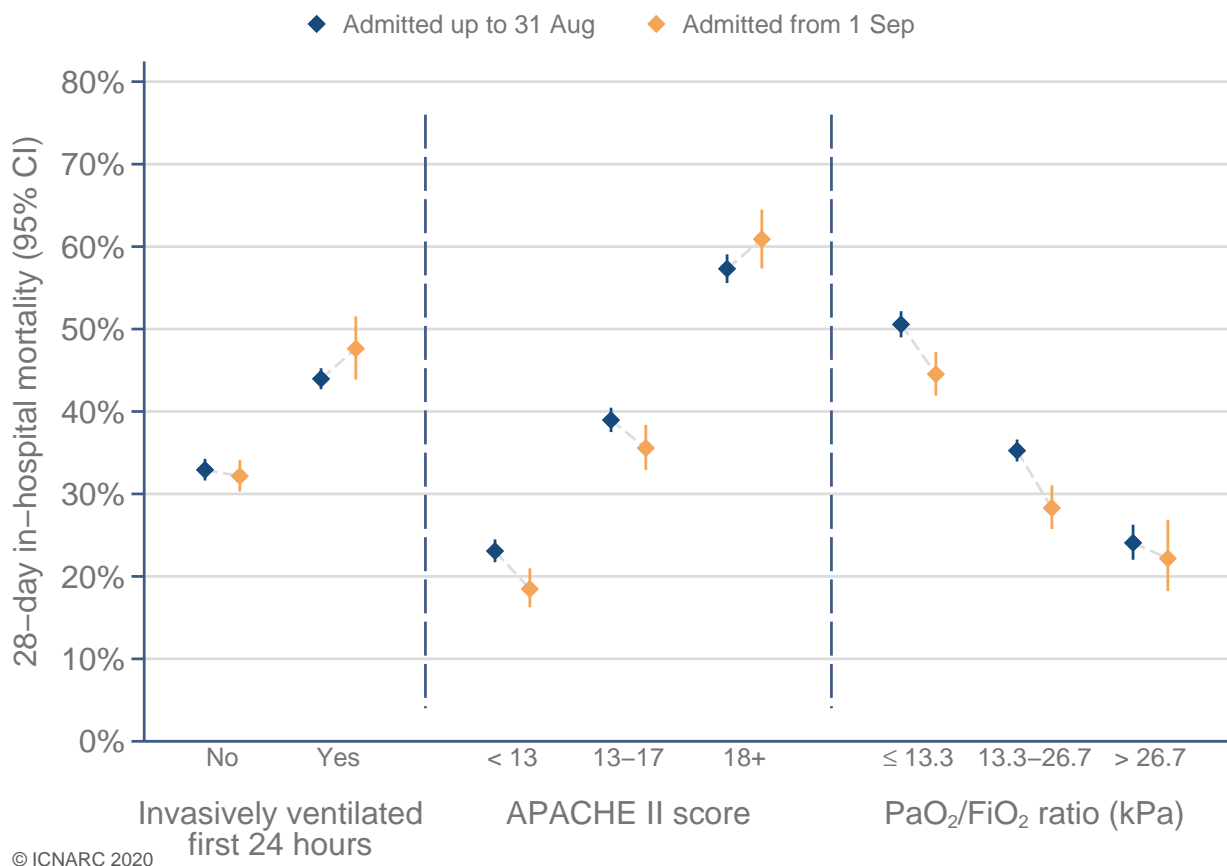
Estimates of 28-day in-hospital mortality based on Kaplan-Meier survival analysis. Patients last reported to be still receiving critical care censored on the most recent date of data submission by the treating unit. Patients discharged from acute hospital within 28 days assumed to survive to 28 days. Please note that these estimates are not adjusted for differences in other patient characteristics (see Tables 1-3).

Figure 26. 28-day in-hospital mortality by patient characteristics (indicators of acute severity *)

Estimates of 28-day in-hospital mortality based on Kaplan-Meier survival analysis. 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 28 days assumed to survive to 28 days. Please note that these estimates are not adjusted for differences in other patient characteristics (see Tables 1-3). * Please see Definitions on page 49. Indicators of acute severity are based on data from the first 24 hours of critical care.

Updated outcomes up to discharge from acute hospital for patients critically ill with confirmed COVID-19 admitted up to 31 August 2020 are shown in Figure 27.
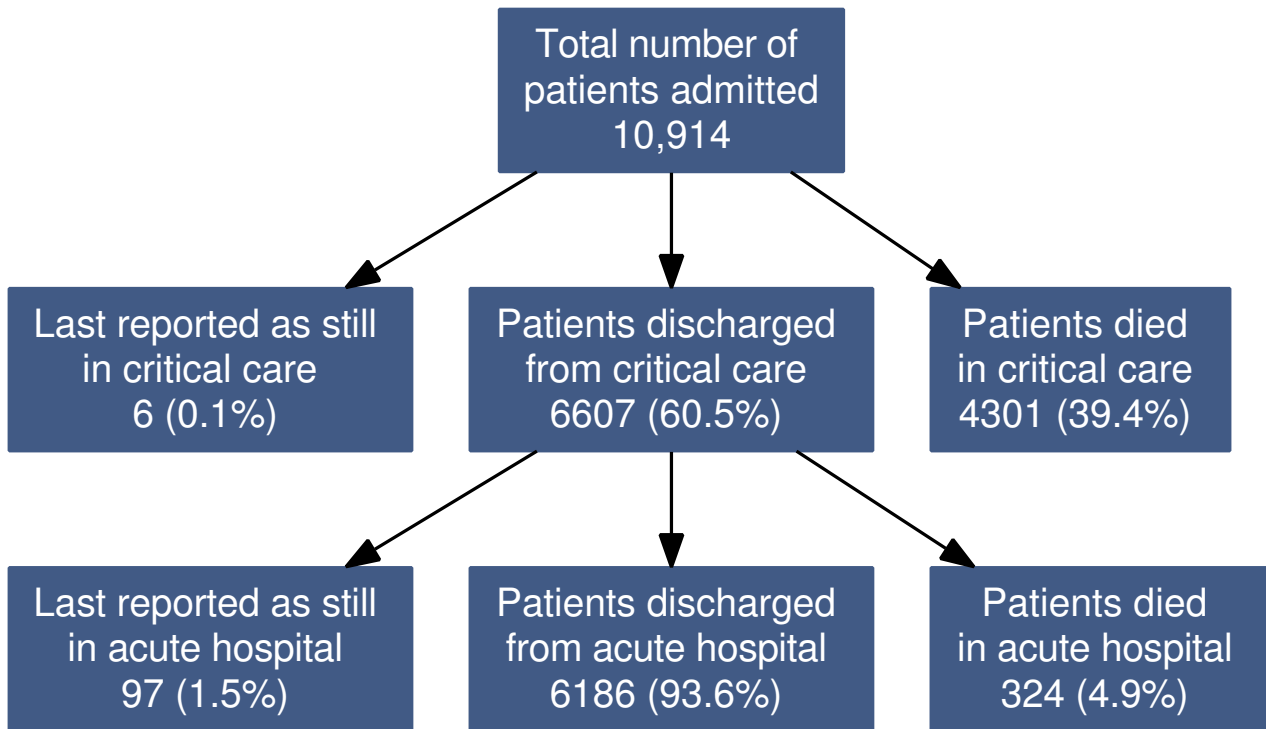
Figure 27. Critical care and acute hospital outcomes for patients admitted up to 31 August 2020

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 up to 31 August 2020 is shown in Figure 28.
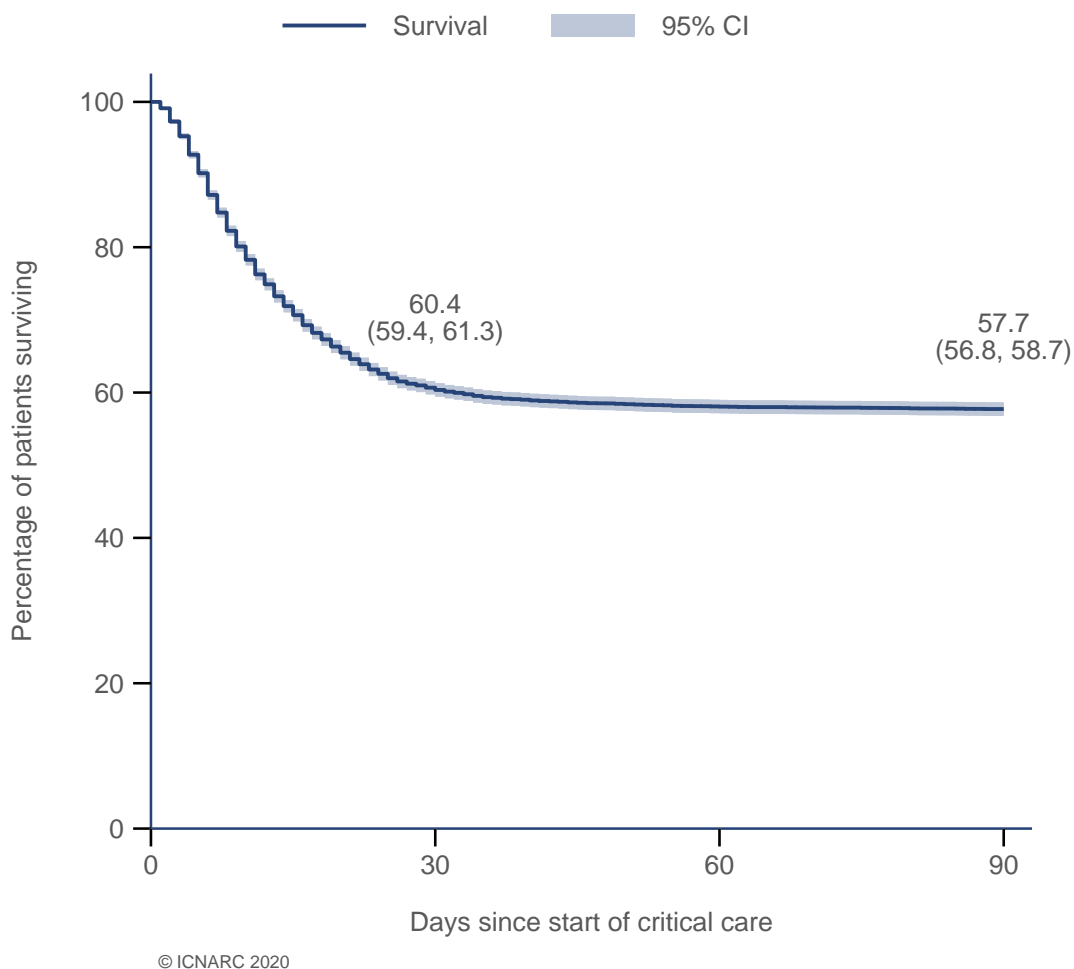
At risk   10914   6583   6301   6214
Died (in hospital)   0   4325   4575   4611
Censored   0   6   38   89

Figure 28. In-hospital survival to 90 days following admission to critical care for patients admitted up to 31 August 2020

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

Urban/rural classification is based on the patient's usual residential postcode (assigned at the level of Output Area) and categorised according to 2011 census categories as:

- Urban: the majority of the population lives within settlements with a population of more than 10,000 people, subcategorised according to dwelling densities for every 100m x 100m square and the density in squares at varying distances around each square as either Major conurbation, Minor conurbation, or City or town
- Rural: the majority of the population lives within settlements with a population of less than 10,000 people (combining the categories Town and fringe, Village, and Hamlet or isolated dwellings)

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 with or without paralysing agents) 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 these data, 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; 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* 2020; doi:10.1097/CCM.0000000000004740
- Doidge JC, Mouncey PR, Thomas K, Gould DW, Ferrando-Vivas P, Shankar-Hari M, Harrison DA, Rowan KM. Trends in intensive care for patients with COVID-19 in England, Wales and Northern Ireland. *Preprints* 2020; 2020080267; doi:10.20944/preprints202008.0267.v2

Acknowledgement