

ICNARC report on COVID-19 in critical care 19 June 2020

This report presents analyses of data on patients critically ill with confirmed COVID-19 reported to ICNARC up to 4pm on 18 June 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). 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:

- notify ICNARC as soon as they have an admission with confirmed COVID-19;
- submit early data for admissions with confirmed COVID-19, including demographics and 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.

The same data are reported for an historic cohort of patients critically ill with viral pneumonia (non-COVID-19) admitted between 1 January 2017 and 31 December 2019.

Contents

Participation and population coverage	4
Patient characteristics	7
Patient characteristics by ethnicity	11
Patient characteristics by receipt of organ support	13
Outcomes, duration of critical care and organ support	17
Outcomes by patient characteristics.....	22
Outcomes by receipt of organ support	24
Multivariable analyses.....	30
Data completeness	34
Definitions	35
Acknowledgement.....	36

List of tables

Table 1	Patient characteristics: demographics.....	7
Table 2	Patient characteristics: medical history and indicators of acute severity *	8
Table 3	Patient characteristics: demographics by ethnicity	11
Table 4	Patient characteristics: medical history and indicators of acute severity by ethnicity	12
Table 5	Patient characteristics: demographics by receipt of respiratory support *.....	13
Table 6	Patient characteristics: medical history and indicators of acute severity by receipt of respiratory support *	14
Table 7	Patient characteristics: demographics by receipt of renal support *	15
Table 8	Patient characteristics: medical history and indicators of acute severity by receipt of renal support *	16
Table 9	Outcome, duration of critical care and organ support *.....	19
Table 10	Outcome by patient characteristics	22
Table 11	Outcome, duration of critical care and organ support by ethnicity	23
Table 12	Outcome by combinations of organ support *	25
Table 13	Outcome, duration of critical care and organ support by receipt of respiratory support *	26
Table 14	Outcome, duration of critical care and organ support by receipt of renal support *	27
Table 15	Outcome by receipt of respiratory support * and patient characteristics	28
Table 16	Outcome by receipt of renal support * and patient characteristics	29
Table 17	Data completeness of key variables.....	34

List of figures

Figure 1	Numbers of patients with data included in this report and outstanding *	4
Figure 2	Number of new patients critically ill with confirmed COVID-19 by date of start of critical care	5
Figure 3	Cumulative number of patients critically ill with confirmed COVID-19 by date of start of critical care	5
Figure 4	Total number of patients critically ill with confirmed COVID-19 by date *	6
Figure 5	Number of admissions critically ill with confirmed COVID-19 by Critical Care Network *	6
Figure 6	Age and sex distribution of patients critically ill with confirmed COVID-19	9
Figure 7	Ethnicity distribution of patients critically ill with confirmed COVID-19	9
Figure 8	Index of Multiple Deprivation (IMD) * distribution of patients critically ill with confirmed COVID-19	10
Figure 9	BMI distribution of patients critically ill with confirmed COVID-19	10
Figure 10	Critical care and acute hospital outcomes among patients with at least 24h data received	17
Figure 11	Cumulative outcomes by date of start of critical care *	18
Figure 12	Survival and discharge among patients with at least 24h data received	18
Figure 13	Percentage of patients receiving organ support *	20
Figure 14	Duration of organ support received *	20
Figure 15	Median lengths of stay among patients with hospital outcome data received	21
Figure 16	Inter-hospital critical care transfers and readmissions	21
Figure 17	Survival and discharge by mechanical ventilation during the first 24 hours *	24
Figure 18	Hazard ratios and 95% confidence intervals from Cox proportional hazards regression model for death within 30 days following start of critical care: demographics and medical history	31
Figure 19	Hazard ratios and 95% confidence intervals from Cox proportional hazards regression model for death within 30 days following start of critical care: physiology (1)	32
Figure 20	Hazard ratios and 95% confidence intervals from Cox proportional hazards regression model for death within 30 days following start of critical care: physiology (2)	33

* Please see individual notes for Tables/Figures

Participation and population coverage

Critical care unit participation

Total number of units:	<u>289</u>
Units with at least one patient notified:	<u>258</u>
Units with zero patients:	29
Units with uncertain participation:	2

Admissions to critical care

To date, ICNARC have been notified of 12,573 admissions for critical care with confirmed COVID-19, either at or after the start of critical care, in England, Wales and Northern Ireland. Of these, early data covering the first 24 hours of critical care have been submitted to ICNARC for 12,132 admissions for 9949 patients (Figures 1-3). Of the 9949 patients, 9217 have outcomes reported and 732 patients were last reported as still receiving critical care (Figure 4). The largest numbers of patients (2868) have been managed by the three London Operational Delivery Networks (Figure 5). Please note that Figures 2-4 are affected by a variable lag time for submission of data of about 1-3 days (shaded grey).

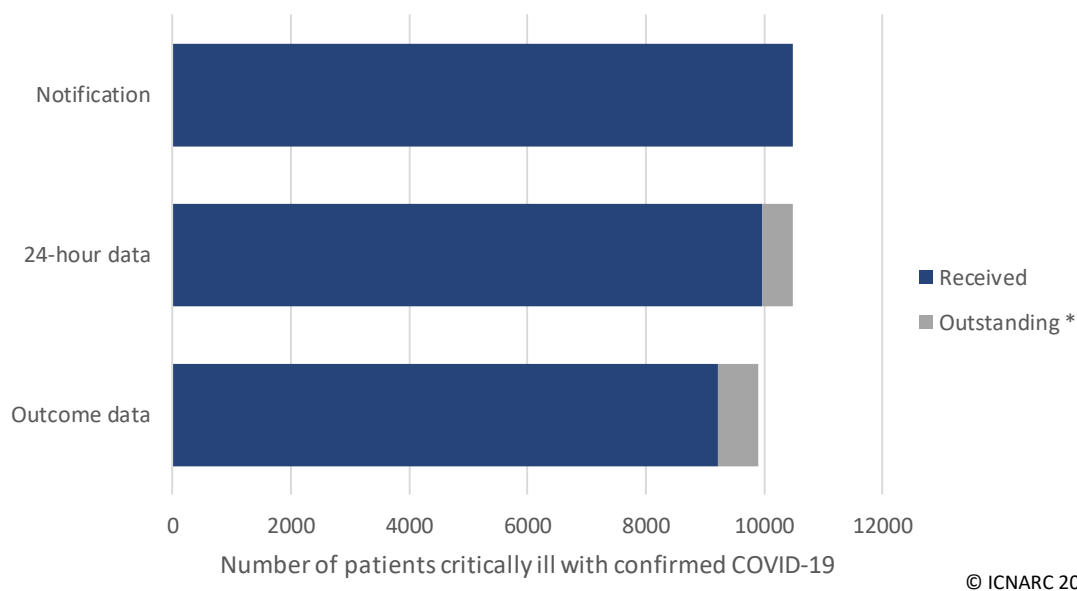


Figure 1 Numbers of patients with data included in this report and outstanding *

* Please note that 24-hour data are considered outstanding where ICNARC was notified of the admission 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.

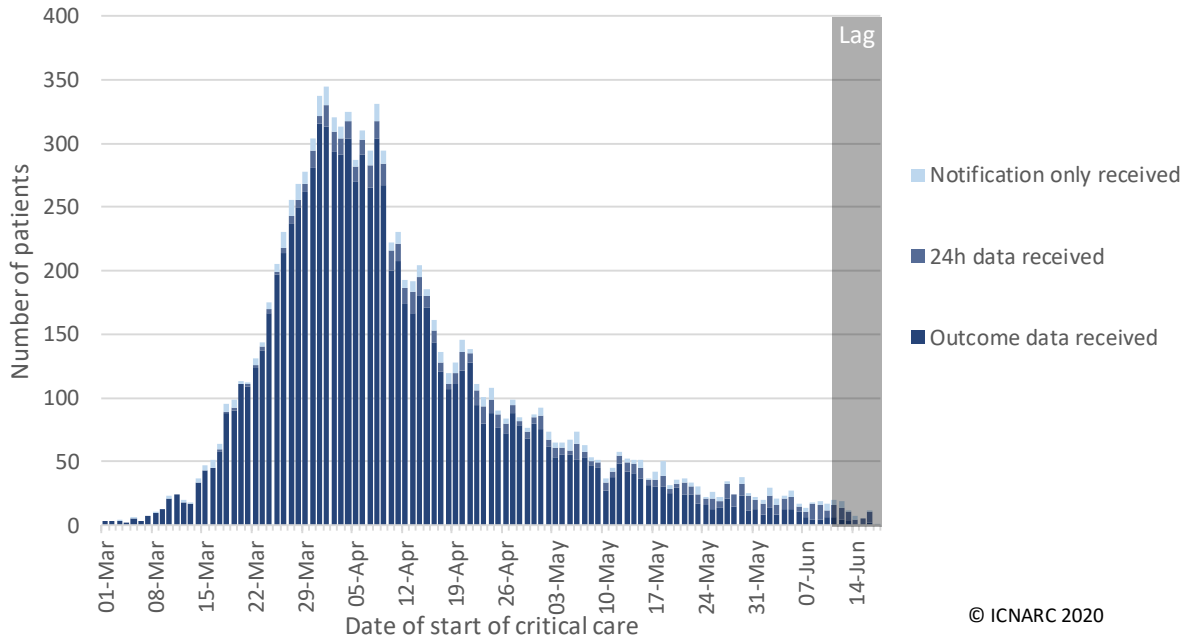


Figure 2 Number of new patients critically ill with confirmed COVID-19 by date of start of critical care

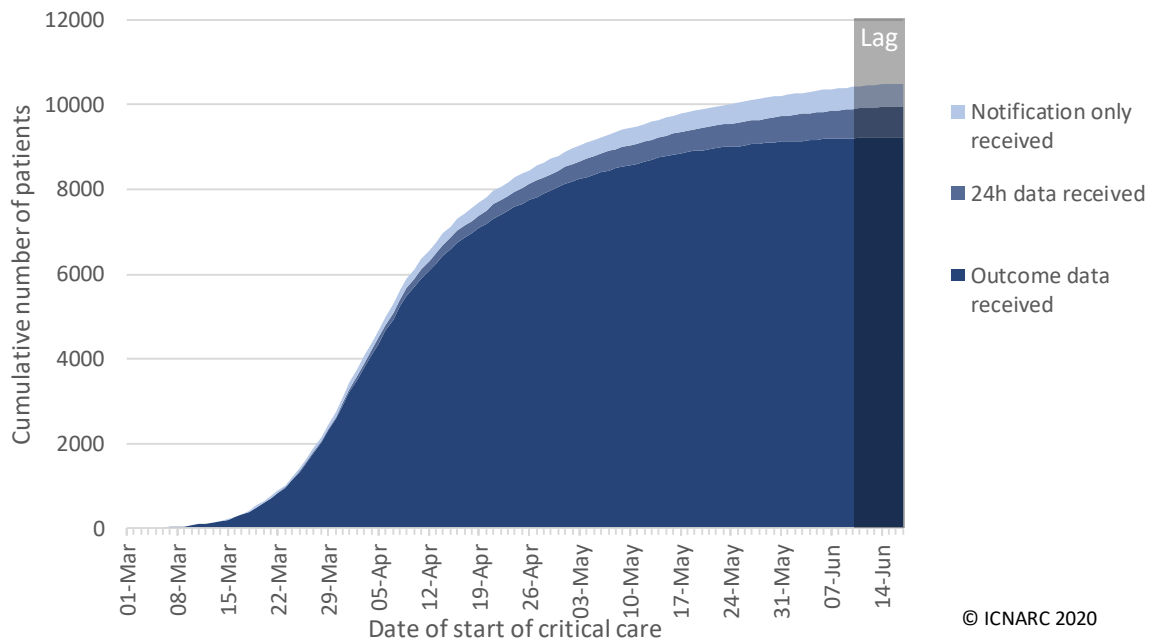


Figure 3 Cumulative number of patients critically ill with confirmed COVID-19 by date of start of critical care

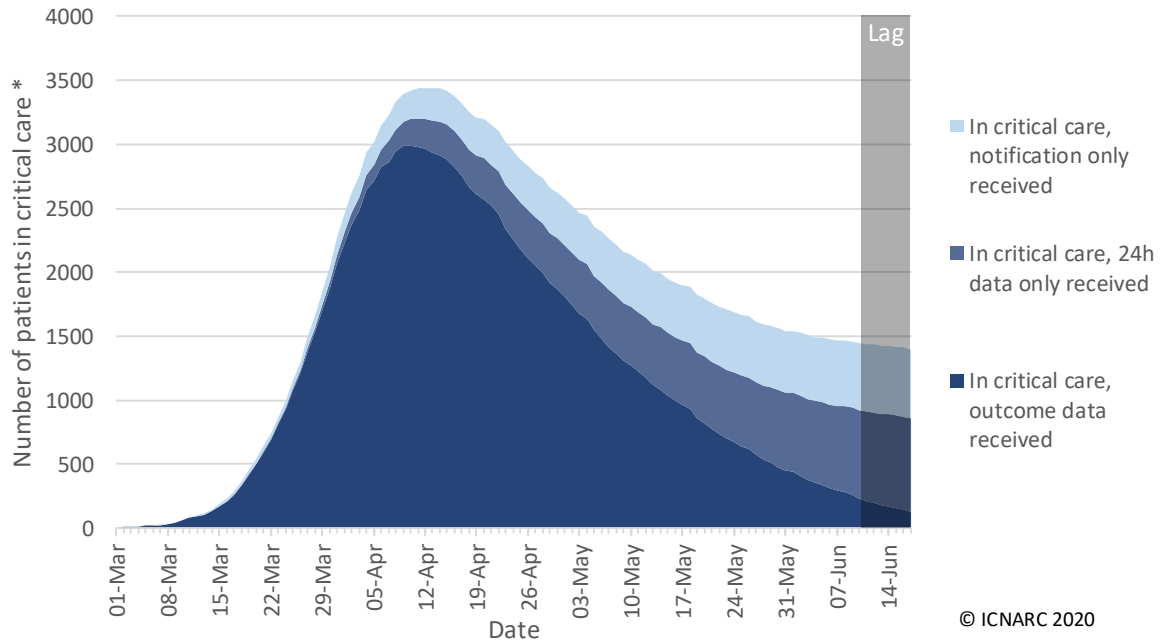


Figure 4 Total number of patients critically ill with confirmed COVID-19 by date *

* Please note that patients whose outcome data have not been received are assumed to remain in critical care as of 18 June 2020.

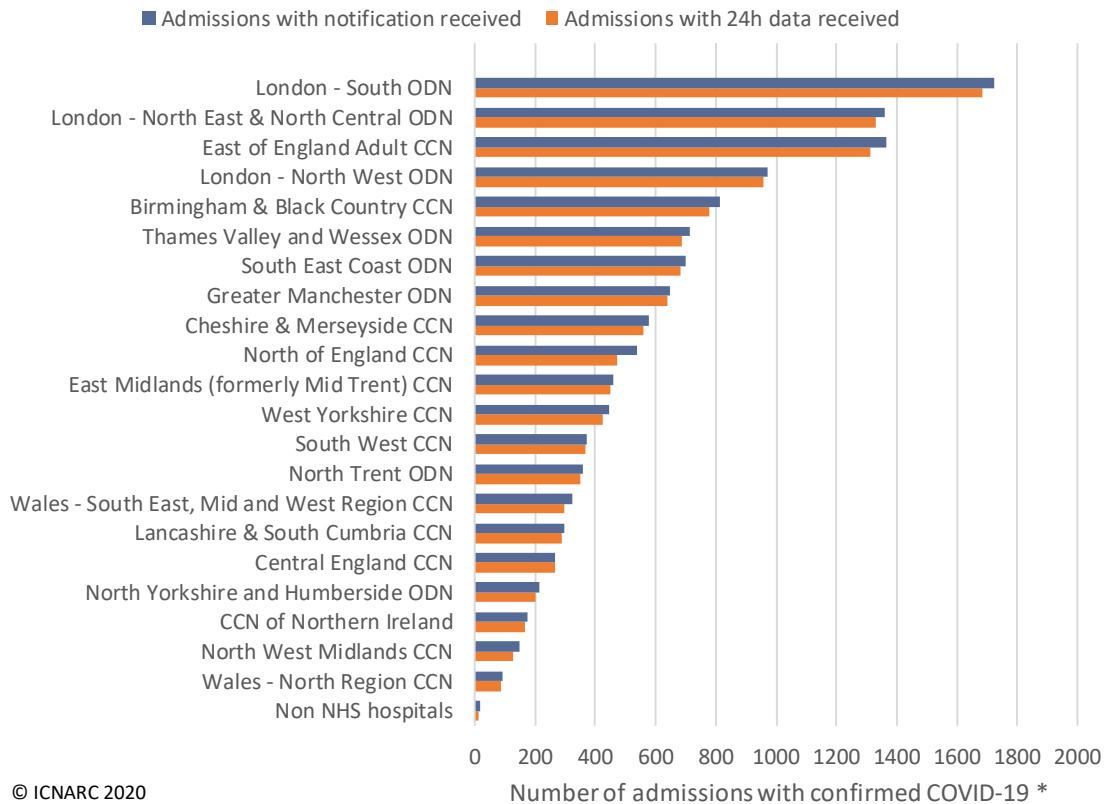


Figure 5 Number of admissions critically ill with confirmed COVID-19 by Critical Care Network *

ODN: Organisational Delivery Network; CCN: Critical Care Network. * Please note that this figure represents the number of admissions (i.e. includes transfers between units and readmissions) and NOT the number of patients.

Patient characteristics

Characteristics of patients critically ill with confirmed COVID-19 are summarised in Table 1 and Table 2 and compared with an historic cohort of patients critically ill with viral pneumonia (non-COVID-19) admitted between 1 January 2017 and 31 December 2019.

Table 1 Patient characteristics: demographics

Demographics	Patients with confirmed COVID-19 and 24h data (N=9949)	Patients with viral pneumonia (non-COVID-19), 2017-19 (N=5782)
Age at admission (years) [N=9946]		
Mean (SD)	58.7 (12.7)	58.0 (17.4)
Median (IQR)	60 (51, 68)	61 (48, 71)
Sex, n (%) [N=9945]		
Female	2920 (29.4)	2641 (45.7)
Male	7025 (70.6)	3141 (54.3)
Currently or recently pregnant, n (% of females aged 16-49) [N=705]		
Currently pregnant	26 (3.7)	56 (7.4)
Recently pregnant (within 6 weeks)	37 (5.2)	29 (3.8)
Not known to be pregnant	642 (91.1)	674 (88.8)
Ethnicity, n (%) [N=9328]		
White	6213 (66.6)	4951 (88.4)
Mixed	166 (1.8)	52 (0.9)
Asian	1426 (15.3)	325 (5.8)
Black	909 (9.7)	155 (2.8)
Other	614 (6.6)	117 (2.1)
Index of Multiple Deprivation (IMD) quintile *, n (%) [N=9777]		
1 (least deprived)	1424 (14.6)	873 (15.3)
2	1583 (16.2)	999 (17.5)
3	1905 (19.5)	1115 (19.5)
4	2389 (24.4)	1232 (21.6)
5 (most deprived)	2476 (25.3)	1489 (26.1)
Body mass index *, n (%) [N=9272]		
<18.5	66 (0.7)	310 (5.5)
18.5-<25	2344 (25.3)	1933 (34.2)
25-<30	3217 (34.7)	1691 (29.9)
30-<40	2914 (31.4)	1330 (23.5)
40+	731 (7.9)	394 (7.0)

* Please see Definitions on page 35.

Table 2 Patient characteristics: medical history and indicators of acute severity *

Medical history	Patients with confirmed COVID-19 and 24h data (N=9949)	Patients with viral pneumonia (non-COVID-19), 2017-19 (N=5782)
Dependency prior to admission to acute hospital *, n (%) [N=9714]		
Able to live without assistance in daily activities	8781 (90.4)	4244 (73.6)
Some assistance with daily activities	897 (9.2)	1392 (24.1)
Total assistance with all daily activities	36 (0.4)	134 (2.3)
Very severe comorbidities *, n (%) [N=9780]		
Cardiovascular	63 (0.6)	78 (1.4)
Respiratory	109 (1.1)	295 (5.1)
Renal	163 (1.7)	120 (2.1)
Liver	43 (0.4)	54 (0.9)
Metastatic disease	50 (0.5)	68 (1.2)
Haematological malignancy	173 (1.8)	268 (4.6)
Immunocompromise	334 (3.4)	503 (8.7)
Prior hospital length of stay [N=9935]		
Mean (SD)	2.5 (6.9)	2.7 (13.0)
Median (IQR)	1 (0, 3)	1 (0, 2)
CPR within previous 24h, n (%) [N=9898]		
In the community	47 (0.5)	21 (0.4)
In hospital	63 (0.6)	85 (1.5)
Indicator of acute severity		
Mechanically ventilated within first 24h *, n (%) [N=9501]	5754 (60.6)	2482 (43.0)
APACHE II Score [N=9682]		
Mean (SD)	14.9 (5.3)	17.2 (6.3)
Median (IQR)	15 (11, 18)	17 (13, 21)
PaO ₂ /FiO ₂ ratio † (kPa), median (IQR) [N=9075]	15.8 (11.2, 22.0)	18.0 (11.6, 26.4)
PaO ₂ /FiO ₂ ratio †, n (%) [N=9075]		
≤ 13.3 kPa (≤ 100 mmHg)	3375 (37.2)	1819 (33.3)
> 13.3 and ≤ 26.7 kPa (> 100 and ≤ 200 mmHg)	4352 (48.0)	2318 (42.4)
> 26.7 kPa (> 200 mmHg)	1348 (14.9)	1328 (24.3)

* Please see Definitions on page 35. 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 PaO₂ during the first 24 hours of critical care.

The distribution of age and sex is presented in Figure 6. The distribution of ethnicity, matched on 2011 census ward for location of patients critically ill with COVID-19, is presented in Figure 7.

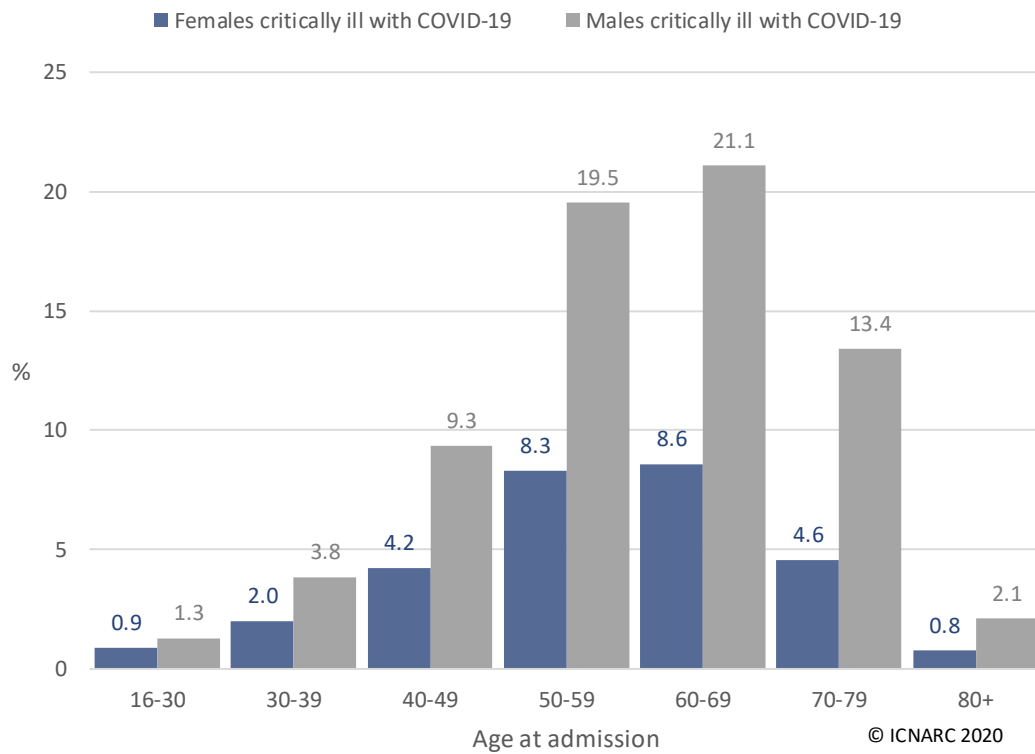


Figure 6 Age and sex distribution of patients critically ill with confirmed COVID-19

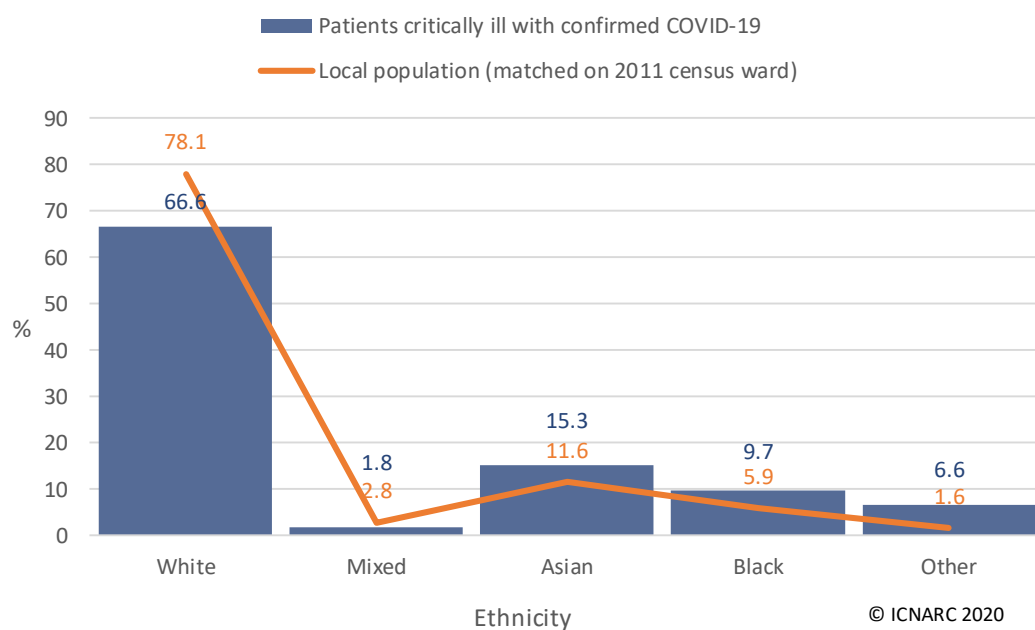


Figure 7 Ethnicity distribution of patients critically ill with confirmed COVID-19

The distribution of Index of Multiple Deprivation (IMD) is presented in Figure 8. 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 9.

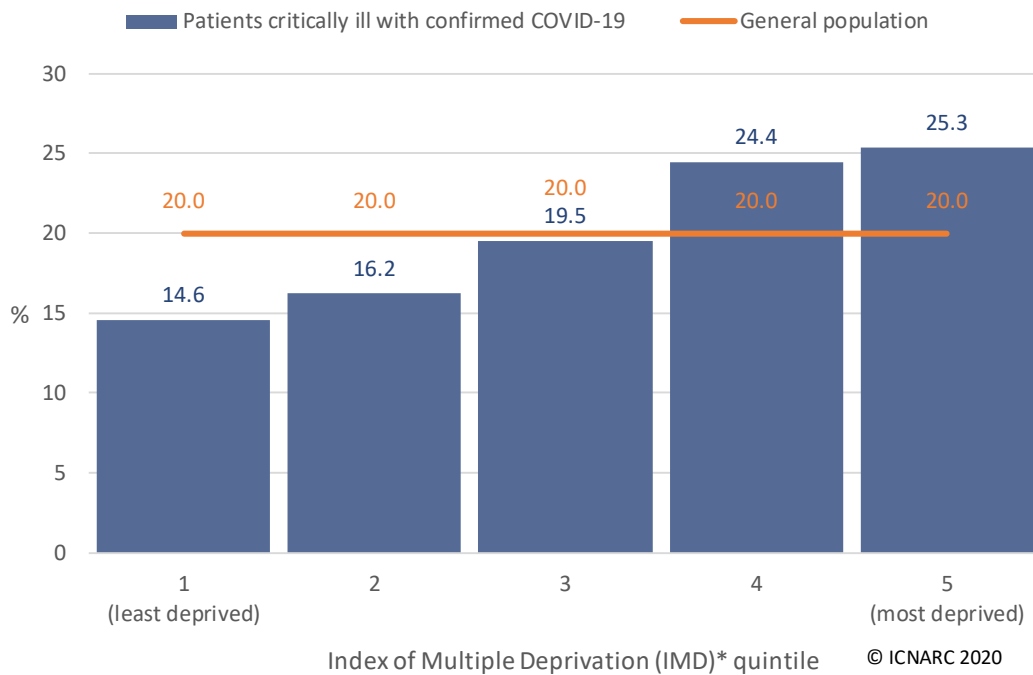


Figure 8 Index of Multiple Deprivation (IMD) * distribution of patients critically ill with confirmed COVID-19

* Please see Definitions on page 35.

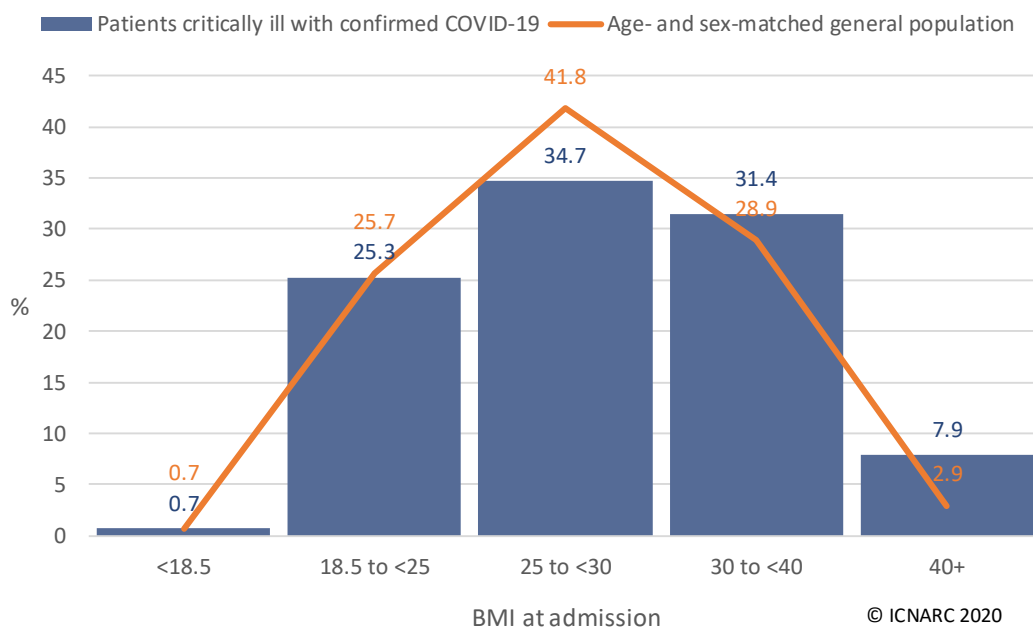


Figure 9 BMI distribution of patients critically ill with confirmed COVID-19

Patient characteristics by ethnicity

Characteristics of patients critically ill with confirmed COVID-19 by ethnicity, for patients of white ethnicities compared with patients of all non-white ethnicities combined (mixed, Asian, black or other), are summarised in Table 3 and Table 4.

Table 3 Patient characteristics: demographics by ethnicity

Demographics	Patients of white ethnicity (N=6213)	Patients of non-white ethnicity (N=3115)
Age at admission (years) [N=9327]		
Mean (SD)	60.5 (12.4)	55.5 (12.4)
Median (IQR)	61 (53, 70)	57 (47, 64)
Sex, n (%) [N=9326]		
Female	1841 (29.6)	924 (29.7)
Male	4372 (70.4)	2189 (70.3)
Currently or recently pregnant, n (% of females) [N=672]		
Currently pregnant	11 (2.9)	14 (4.8)
Recently pregnant (within 6 weeks)	14 (3.7)	22 (7.5)
Not known to be pregnant	355 (93.4)	256 (87.7)
Index of Multiple Deprivation (IMD) quintile *, n (%) [N=9173]		
1 (least deprived)	1085 (17.7)	248 (8.1)
2	1137 (18.6)	347 (11.4)
3	1240 (20.3)	548 (17.9)
4	1278 (20.9)	938 (30.7)
5 (most deprived)	1377 (22.5)	975 (31.9)
Body mass index *, n (%) [N=8702]		
<18.5	41 (0.7)	23 (0.8)
18.5-<25	1309 (22.6)	871 (29.8)
25-<30	1953 (33.8)	1058 (36.2)
30-<40	1939 (33.5)	807 (27.6)
40+	541 (9.4)	160 (5.5)

* Please see Definitions on page 35. Patients with ethnicity recorded as 'not stated' excluded.

Table 4 Patient characteristics: medical history and indicators of acute severity by ethnicity

Medical history	Patients of white ethnicity (N=6213)	Patients of non-white ethnicity (N=3115)
Dependency prior to admission to acute hospital *, n (%) [N=9136]		
Able to live without assistance in daily activities	5410 (88.9)	2842 (93.2)
Some assistance with daily activities	652 (10.7)	197 (6.5)
Total assistance with all daily activities	24 (0.4)	11 (0.4)
Very severe comorbidities *, n (%) [N=9189]		
Cardiovascular	51 (0.8)	9 (0.3)
Respiratory	82 (1.3)	21 (0.7)
Renal	68 (1.1)	88 (2.9)
Liver	33 (0.5)	7 (0.2)
Metastatic disease	42 (0.7)	7 (0.2)
Haematological malignancy	131 (2.1)	32 (1.0)
Immunocompromise	241 (3.9)	72 (2.3)
Prior hospital length of stay [N=9318]		
Mean (SD)	2.7 (7.3)	2.2 (6.6)
Median (IQR)	1 (0, 3)	1 (0, 3)
CPR within previous 24h, n (%) [N=9293]		
In the community	28 (0.5)	15 (0.2)
In hospital	34 (0.5)	21 (0.3)
Indicator of acute severity		
Mechanically ventilated within first 24h *, n (%) [N=8933]	3381 (56.4)	2010 (68.3)
APACHE II Score [N=9101]		
Mean (SD)	15.0 (5.2)	14.8 (5.4)
Median (IQR)	15 (12, 18)	14 (11, 18)
PaO ₂ /FiO ₂ ratio † (kPa), median (IQR) [N=8528]	16.0 (11.2, 22.3)	15.5 (11.3, 21.8)
PaO ₂ /FiO ₂ ratio †, n (%) [N=8528]		
≤ 13.3 kPa (≤ 100 mmHg)	2093 (36.8)	1052 (37.0)
> 13.3 and ≤ 26.7 kPa (> 100 and ≤ 200 mmHg)	2716 (47.8)	1392 (48.9)
> 26.7 kPa (> 200 mmHg)	872 (15.3)	403 (14.2)

* Please see Definitions on page 35. Patients with ethnicity recorded as 'not stated' excluded. 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 PaO₂ from the first 24 hours of critical care.

Patient characteristics by receipt of organ support

Characteristics of patients critically ill with confirmed COVID-19 who received advanced respiratory support at any point during critical care and those who received basic respiratory support only are summarised in Table 5 and Table 6. Characteristics of patients critically ill with confirmed COVID-19 who received renal support at any point during critical care and those who did not receive renal support are summarised in Table 7 and Table 8. Most patients who received renal support (95.2%) also received advanced respiratory support.

Table 5 Patient characteristics: demographics by receipt of respiratory support *

Demographics	Patients receiving advanced respiratory support (N=6643)	Patients receiving only basic respiratory support (N=2267)
Age at admission (years) [N=8909]		
Mean (SD)	58.8 (12.0)	59.3 (14.2)
Median (IQR)	60 (52, 67)	60 (50, 70)
Sex, n (%) [N=8908]		
Female	1848 (27.8)	750 (33.1)
Male	4793 (72.2)	1517 (66.9)
Currently or recently pregnant, n (% of females aged 16-49) [N=624]		
Currently pregnant	10 (2.3)	9 (4.6)
Recently pregnant (within 6 weeks)	24 (5.6)	9 (4.6)
Not known to be pregnant	394 (92.1)	178 (90.8)
Ethnicity, n (%) [N=8377]		
White	3979 (64.0)	1655 (76.6)
Mixed	115 (1.9)	31 (1.4)
Asian	1003 (16.1)	249 (11.5)
Black	673 (10.8)	125 (5.8)
Other	446 (7.2)	101 (4.7)
Index of Multiple Deprivation (IMD) quintile *, n (%) [N=8761]		
1 (least deprived)	914 (14.0)	373 (16.8)
2	1054 (16.1)	388 (17.5)
3	1288 (19.7)	405 (18.3)
4	1661 (25.4)	478 (21.5)
5 (most deprived)	1625 (24.8)	575 (25.9)
Body mass index *, n (%) [N=8350]		
<18.5	34 (0.5)	20 (1.0)
18.5-<25	1536 (24.3)	521 (25.8)
25-<30	2238 (35.4)	686 (33.9)
30-<40	2052 (32.4)	601 (29.7)
40+	468 (7.4)	194 (9.6)

* Please see Definitions on page 35. Patients receiving no respiratory support excluded due to small numbers.

Table 6 Patient characteristics: medical history and indicators of acute severity by receipt of respiratory support *

Medical history	Patients receiving advanced respiratory support (N=6643)	Patients receiving only basic respiratory support (N=2267)
Dependency prior to admission to acute hospital *, n (%) [N=8768]		
Able to live without assistance in daily activities	6052 (92.5)	1888 (84.8)
Some assistance with daily activities	479 (7.3)	322 (14.5)
Total assistance with all daily activities	10 (0.2)	17 (0.8)
Very severe comorbidities *, n (%) [N=8802]		
Cardiovascular	20 (0.3)	35 (1.6)
Respiratory	41 (0.6)	62 (2.8)
Renal	79 (1.2)	63 (2.8)
Liver	22 (0.3)	16 (0.7)
Metastatic disease	20 (0.3)	22 (1.0)
Haematological malignancy	98 (1.5)	62 (2.8)
Immunocompromise	197 (3.0)	108 (4.8)
Prior hospital length of stay [N=8909]		
Mean (SD)	2.2 (6.6)	2.9 (7.4)
Median (IQR)	1 (0, 3)	1 (0, 3)
CPR within previous 24h, n (%) [N=8899]		
In the community	39 (0.4)	4 (0.2)
In hospital	57 (0.6)	2 (0.1)
Indicator of acute severity		
Mechanically ventilated within first 24h *, n (%) [N=8662]	5192 (80.4)	---
APACHE II Score [N=8750]		
Mean (SD)	15.3 (5.1)	14.0 (5.4)
Median (IQR)	15 (12, 18)	13 (10, 17)
PaO ₂ /FiO ₂ ratio † (kPa), median (IQR) [N=8301]	15.2 (10.9, 21.2)	17.5 (12.5, 24.0)
PaO ₂ /FiO ₂ ratio †, n(%) [N=8301]		
≤ 13.3 kPa (≤ 100 mmHg)	2546 (39.8)	564 (29.5)
> 13.3 and ≤ 26.7 kPa (> 100 and ≤ 200 mmHg)	3028 (47.4)	1005 (52.6)
> 26.7 kPa (> 200 mmHg)	816 (12.8)	342 (17.9)

* Please see Definitions on page 35. Patients receiving no respiratory support excluded due to small numbers. 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 PaO₂ from the first 24 hours of critical care.

Table 7 Patient characteristics: demographics by receipt of renal support *

Demographics	Patients receiving any renal support (N=2393)	Patients not receiving any renal support (N=6739)
Age at admission (years) [N=9132]		
Mean (SD)	59.4 (11.1)	58.7 (13.2)
Median (IQR)	60 (53, 67)	60 (51, 68)
Sex, n (%) [N=9130]		
Female	543 (22.7)	2141 (31.8)
Male	1849 (77.3)	4597 (68.2)
Currently or recently pregnant, n (% of females aged 16-49) [N=643]		
Currently pregnant	2 (1.6)	20 (3.8)
Recently pregnant (within 6 weeks)	4 (3.3)	32 (6.1)
Not known to be pregnant	116 (95.1)	469 (90.0)
Ethnicity, n (%) [N=8585]		
White	1350 (60.2)	4428 (69.8)
Mixed	35 (1.6)	113 (1.8)
Asian	370 (16.5)	913 (14.4)
Black	341 (15.2)	479 (7.6)
Other	145 (6.5)	411 (6.5)
Index of Multiple Deprivation (IMD) quintile *, n (%) [N=8975]		
1 (least deprived)	314 (13.3)	1005 (15.2)
2	360 (15.3)	1119 (16.9)
3	473 (20.1)	1250 (18.9)
4	609 (25.8)	1585 (23.9)
5 (most deprived)	600 (25.5)	1660 (25.1)
Body mass index *, n (%) [N=8555]		
<18.5	13 (0.6)	46 (0.7)
18.5-<25	521 (22.6)	1607 (25.7)
25-<30	794 (34.4)	2192 (35.1)
30-<40	800 (34.7)	1908 (30.5)
40+	179 (7.8)	495 (7.9)

* Please see Definitions on page 35. Includes 156 patients requiring chronic renal replacement therapy for end stage renal disease prior to critical care; outcomes for these patients are similar.

Table 8 Patient characteristics: medical history and indicators of acute severity by receipt of renal support *

Medical history	Patients receiving any renal support (N=2393)	Patients not receiving any renal support (N=6739)
Dependency prior to admission to acute hospital *, n (%) [N=8984]		
Able to live without assistance in daily activities	2193 (92.6)	5919 (89.5)
Some assistance with daily activities	170 (7.2)	668 (10.1)
Total assistance with all daily activities	5 (0.2)	29 (0.4)
Very severe comorbidities *, n (%) [N=9019]		
Cardiovascular	10 (0.4)	49 (0.7)
Respiratory	15 (0.6)	91 (1.4)
Renal	122 (5.1)	34 (0.5)
Liver	5 (0.2)	35 (0.5)
Metastatic disease	9 (0.4)	39 (0.6)
Haematological malignancy	34 (1.4)	129 (1.9)
Immunocompromise	78 (3.3)	238 (3.6)
Prior hospital length of stay [N=9131]		
Mean (SD)	2.2 (5.1)	2.6 (7.5)
Median (IQR)	1 (0, 3)	1 (0, 3)
CPR within previous 24h, n (%) [N=9121]		
In the community	12 (0.2)	31 (0.5)
In hospital	14 (0.2)	47 (0.8)
Indicator of acute severity		
Mechanically ventilated within first 24h *, n (%) [N=8866]	1836 (78.5)	3525 (54.0)
APACHE II Score [N=8964]		
Mean (SD)	16.9 (5.4)	14.3 (5.0)
Median (IQR)	16 (13, 20)	14 (11, 17)
PaO ₂ /FiO ₂ ratio † (kPa), median (IQR) [N=8459]	14.4 (10.4, 20.2)	16.4 (11.6, 23.0)
PaO ₂ /FiO ₂ ratio †, n(%) [N=8459]		
≤ 13.3 kPa (≤ 100 mmHg)	1007 (43.8)	2116 (34.4)
> 13.3 and ≤ 26.7 kPa (> 100 and ≤ 200 mmHg)	1040 (45.2)	3018 (49.0)
> 26.7 kPa (> 200 mmHg)	252 (11.0)	1026 (16.7)

* Please see Definitions on page 35. Includes 156 patients requiring chronic renal replacement therapy for end stage renal disease prior to critical care; outcomes for these patients are similar. 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 PaO₂ from the first 24 hours of critical care.

Outcomes, duration of critical care and organ support

Critical care outcomes have been received for 9217 (of 9949) patients, of whom 3791 patients have died and 5426 have been discharged alive from critical care (Figures 10, 11 and 12). Duration of critical care and receipt and duration of organ support in critical care are summarised in Table 9 and compared with an historic cohort of patients critically ill with viral pneumonia (non-COVID-19) admitted between 1 January 2017 and 31 December 2019. Receipt and duration of organ support are summarised graphically in Figure 13 and in Figure 14, respectively. Of the 5426 patients discharged from critical care, 887 (16.3%) were last reported to be still in an acute hospital setting and 237 (4.4%) died before being discharged from hospital (Figure 10).

Please note that Figure 12 is biased towards longer lengths of stay in critical care due to the time lag in notification of a patients' discharge or death, while Table 9 and Figures 13 and 14 are biased towards patients with shorter lengths of stay in critical care due to the emerging nature of the UK epidemic. Figure 11 and Figure 12 assume that patients are still in critical care unless ICNARC has been notified otherwise, and Table 9 and Figures 13 and 14 include only those patients who have either died or been discharged from critical care.

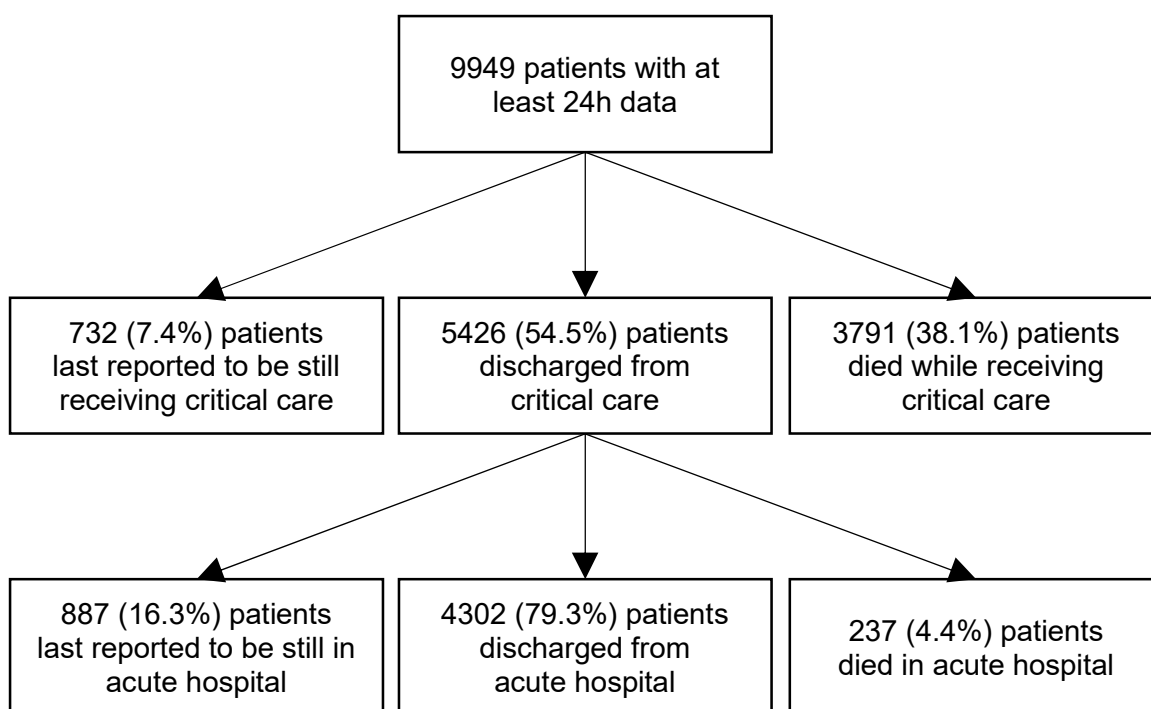


Figure 10 Critical care and acute hospital outcomes among patients with at least 24h data received

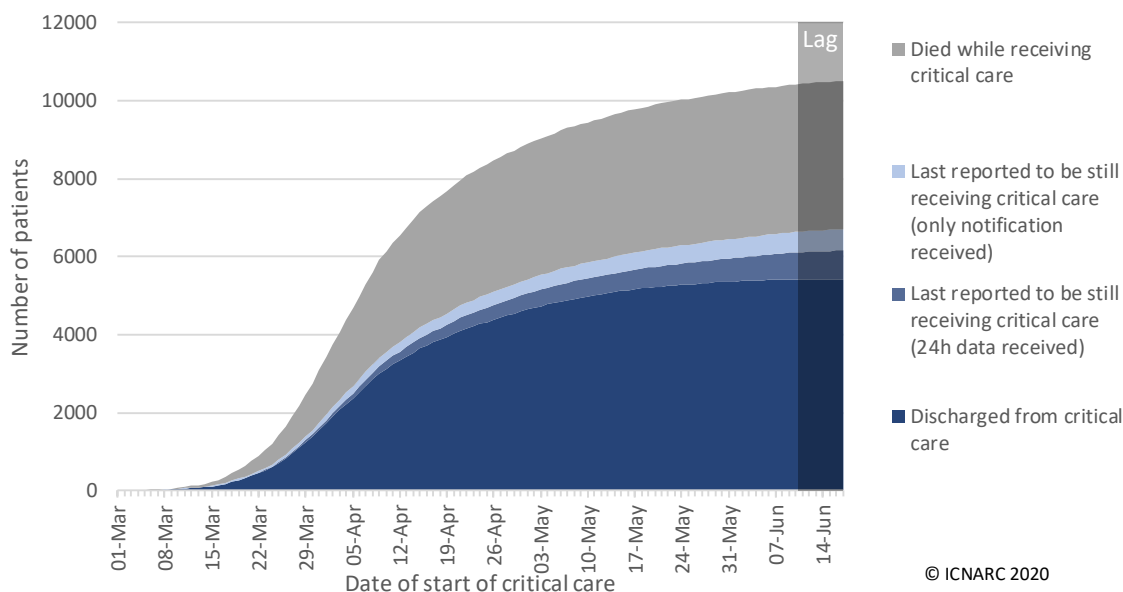
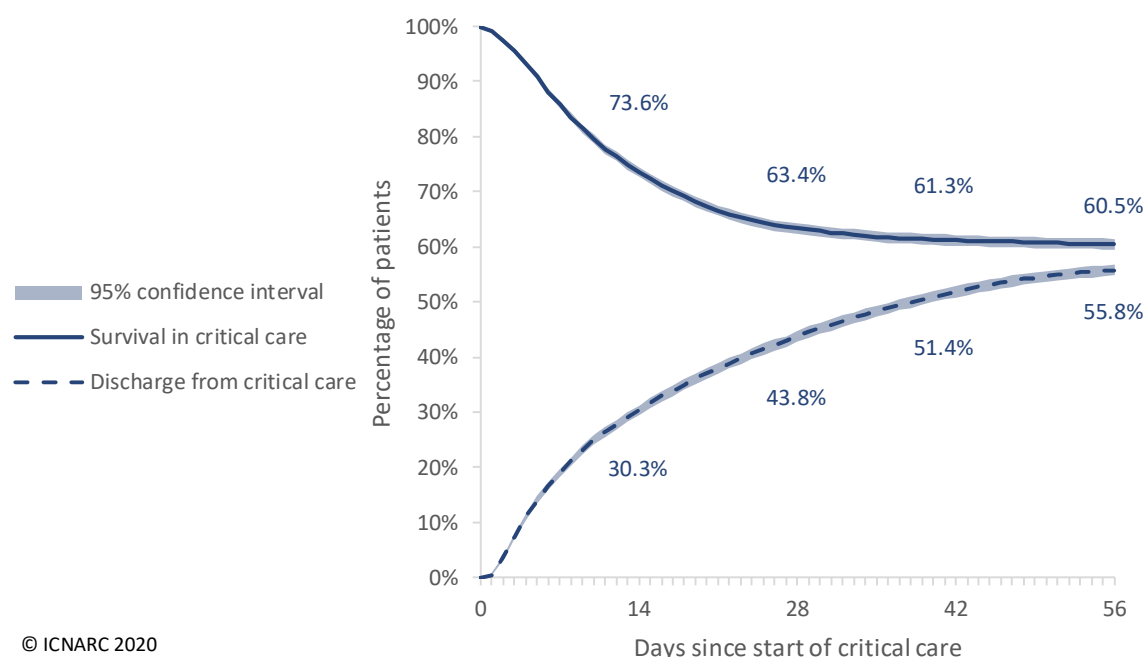


Figure 11 Cumulative outcomes by date of start of critical care *

* Please note that patients whose outcome data have not been received are assumed to remain in critical care as of 18 June 2020.



Died while receiving critical care	0	2566	3517	3700	3729
Still receiving critical care	9849	4201	1881	892	441
Discharged from critical care	0	2944	4205	4945	5266
Censored	0	138	246	312	413

Figure 12 Survival and discharge among patients with at least 24h data received

Please note that due to the time lag in notification of patients' discharge or death, this figure is expected to be biased towards *longer* lengths of stay in critical care. Patients who are still in critical care are included only for the period in which they are known to have been in critical care, i.e. from their date of admission until 18 June 2020. Due to the emerging nature of the UK epidemic, the total number of patients available for reporting becomes smaller at longer lengths of follow-up. Compared with the survival statistics presented in Tables 9, 13 and 14, this approach makes better use of all available data, including data about patients who are still in critical care.

Table 9 Outcome, duration of critical care and organ support *

Critical care outcomes among patients who have been discharged or died	Patients with COVID-19 and outcome reported (N=9217)	Patients with viral pneumonia (non-COVID-19), 2017-19 (N=5626)
Outcome at end of critical care, n (%)		
Discharged	5426 (58.9)	4423 (78.6)
Died	3791 (41.1)	1203 (21.4)
Duration of critical care		
Duration of critical care † (days), median (IQR)		
Survivors	12 (5, 26)	6 (3, 13)
Non-survivors	9 (5, 16)	6 (3, 13)
Organ support (Critical Care Minimum Dataset) *		
Receipt of organ support, at any point, n (%)		
Advanced respiratory support	6643 (72.7)	2721 (48.4)
Basic respiratory support	6054 (66.2)	4527 (80.5)
Advanced cardiovascular support	2681 (29.3)	1261 (22.4)
Basic cardiovascular support	8496 (92.9)	5219 (92.8)
Renal support	2393 (26.2)	957 (17.0)
Liver support	87 (1.0)	53 (0.9)
Neurological support	746 (8.2)	320 (5.7)
Combinations of advanced respiratory, advanced cardiovascular and renal support, n (%):		
Advanced respiratory support only	2961 (32.1)	1257 (22.3)
Advanced cardiovascular support only	36 (0.4)	79 (1.4)
Renal support only	102 (1.1)	116 (2.1)
Advanced respiratory and advanced cardiovascular support only	1393 (15.1)	640 (11.4)
Advanced respiratory and renal support only	1049 (11.4)	299 (5.3)
Advanced cardiovascular and renal support only	12 (0.1)	17 (0.3)
Advanced respiratory, advanced cardiovascular and renal support	1240 (13.5)	525 (9.3)
Duration of organ support (calendar days), median (IQR)		
Advanced respiratory support	13 (7, 21)	9 (4, 17)
Total (advanced + basic) respiratory support	11 (5, 20)	6 (3, 12)
Advanced cardiovascular support	3 (2, 6)	3 (2, 5)
Total (advanced + basic) cardiovascular support	11 (5, 20)	6 (3, 12)
Renal support	7 (3, 14)	6 (3, 12)

Please note that owing to the emerging nature of the epidemic, the sample of patients with confirmed COVID-19 represented in this table is biased towards patients with *shorter* lengths of stay in critical care prior to discharge or death, i.e. those who died or recovered quickly. This does not apply to the comparison patients with viral pneumonia (non-COVID-19), 2017-19. * Please see Definitions on page 35. † Duration of critical care is from original admission to critical care until final unit outcome and includes any time spent outside critical care areas (e.g. prior to any readmissions).

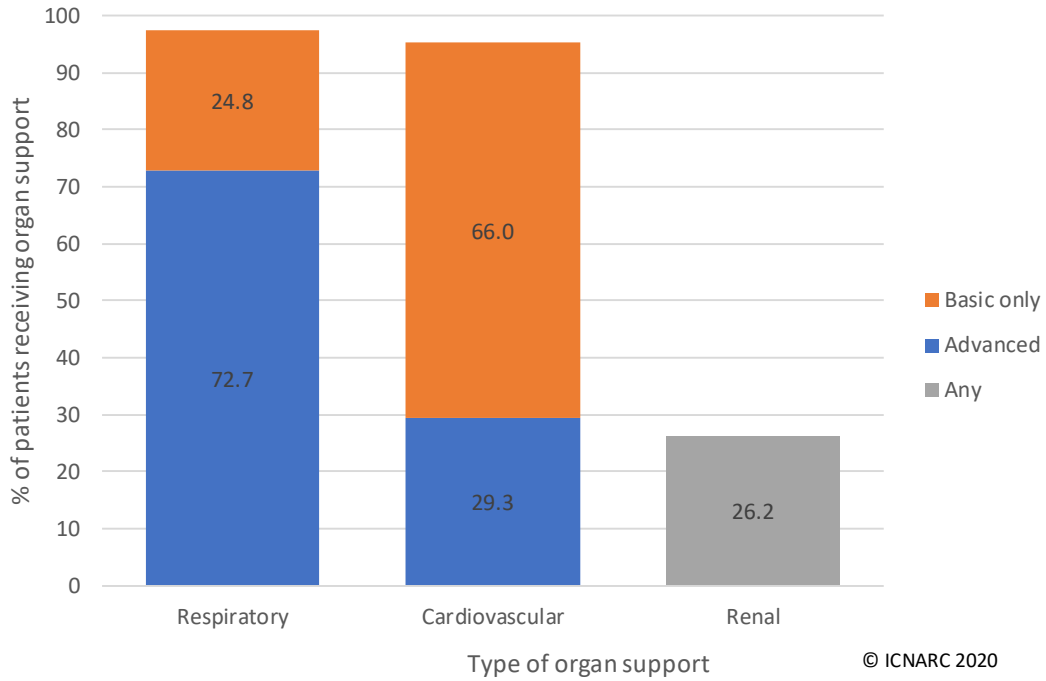


Figure 13 Percentage of patients receiving organ support *

Please note that owing to the emerging nature of the epidemic, the sample of patients with confirmed COVID-19 represented in this table is biased towards patients with *shorter* lengths of stay in critical care prior to discharge or death, i.e. patients who died or recovered quickly. * Please see Definitions on page 35.

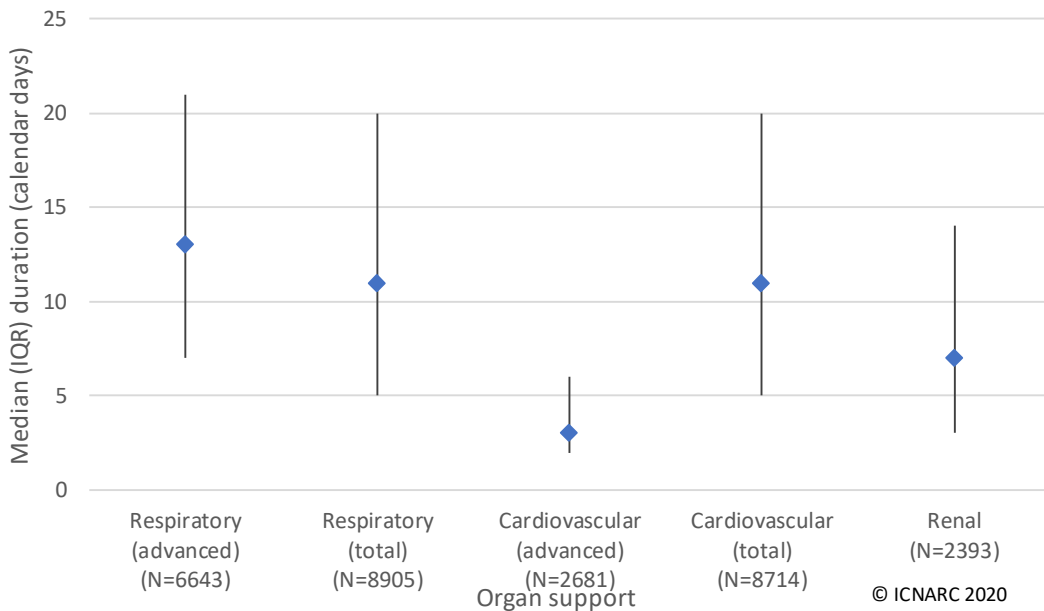


Figure 14 Duration of organ support received *

This Figure presents median and interquartile range, in calendar days. Please note that owing to the emerging nature of the epidemic, the sample of patients with confirmed COVID-19 represented in this table is biased towards patients with *shorter* lengths of stay in critical care prior to discharge or death, i.e. patients who died or recovered quickly. * Please see Definitions on page 35.

The median length of stay in hospital prior to the start of critical care, duration of critical care, and subsequent length of stay in hospital following discharge from critical care are summarised in Figure 15. A total of 1193 inter-hospital critical care transfers for 1046 patients have been reported, as well as 218 readmissions for 209 patients (Figure 16).

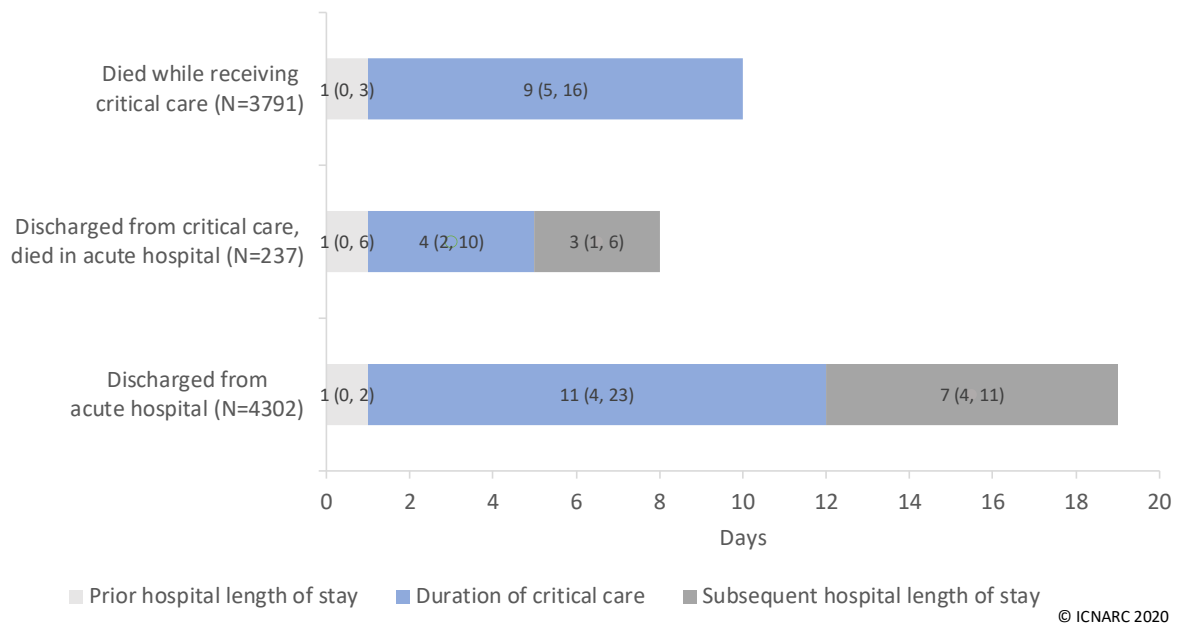


Figure 15 Median lengths of stay among patients with hospital outcome data received

The numbers within each bar are the median and interquartile range, in days. Please note that owing to the emerging nature of the epidemic, the sample of patients with confirmed COVID-19 represented in this table is biased towards patients with *shorter* lengths of stay in acute hospital prior to discharge or death, i.e. patients who died or recovered more quickly.

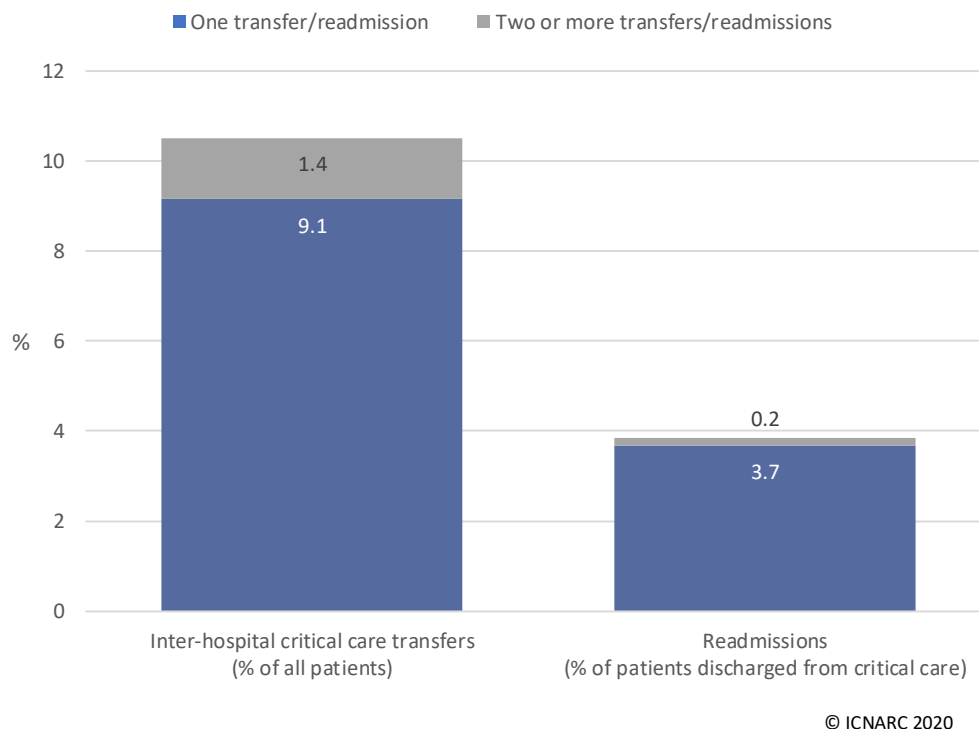


Figure 16 Inter-hospital critical care transfers and readmissions

Outcomes by patient characteristics

Critical care outcomes for patients critically ill with confirmed COVID-19 across major patient subgroups are summarised in Table 10 and compared with an historic cohort of patients critically ill with viral pneumonia (non-COVID-19) admitted between 1 January 2017 and 31 December 2019.

Table 10 Outcome by patient characteristics

Patient characteristic	Patients with COVID-19 and outcome reported (N=9217)		Patients with viral pneumonia (non-COVID-19), 2017-19 (N=5782)
	Discharged alive from critical care	Died in critical care	Died in critical care
	n (%)	n (%)	(%)
Age at admission (years)			
16-39	625 (84.7)	113 (15.3)	(7.1)
40-49	963 (77.7)	276 (22.3)	(12.1)
50-59	1663 (65.3)	882 (34.7)	(19.1)
60-69	1403 (51.6)	1314 (48.4)	(25.7)
70-79	659 (38.9)	1037 (61.1)	(31.2)
80+	112 (39.9)	169 (60.1)	(30.8)
Sex			
Female	1729 (63.7)	984 (36.3)	(19.1)
Male	3697 (56.9)	2805 (43.1)	(23.3)
Ethnicity			
White	3496 (60.0)	2329 (40.0)	(21.7)
Mixed	83 (56.1)	65 (43.9)	(14.0)
Asian	695 (53.6)	601 (46.4)	(19.4)
Black	468 (56.5)	360 (43.5)	(12.4)
Other	364 (65.0)	196 (35.0)	(18.6)
Index of Multiple Deprivation (IMD) quintile *			
1 (least deprived)	804 (60.2)	532 (39.8)	(22.3)
2	887 (59.4)	606 (40.6)	(22.6)
3	1032 (59.0)	717 (41.0)	(22.5)
4	1263 (57.1)	947 (42.9)	(20.1)
5 (most deprived)	1332 (58.7)	939 (41.3)	(20.3)
Body mass index			
<25	1286 (58.0)	930 (42.0)	(23.1)
25-<30	1694 (56.3)	1315 (43.7)	(22.5)
30-<40	1708 (62.6)	1021 (37.4)	(18.9)
40+	430 (63.3)	249 (36.7)	(13.6)
Assistance required with daily activities			
No	4897 (59.8)	3287 (40.2)	(19.4)
Yes	447 (51.0)	429 (49.0)	(27.2)
Any very severe comorbidities *			
No	5010 (59.9)	3353 (40.1)	(18.8)
Yes	358 (48.5)	380 (51.5)	(32.8)

Please note that owing to the emerging nature of the epidemic, the sample of patients with COVID-19 represented in this table is biased towards patients with *shorter* lengths of stay in critical care prior to discharge or death (i.e. those who died or recovered quickly). This does not apply to the comparison patients with viral pneumonia (non-COVID-19), 2017-19. * Please see Definitions on page 35.

Critical care outcomes for patients of white ethnicities compared with patients of non-white ethnicities are summarised in Table 11.

Table 11 Outcome, duration of critical care and organ support by ethnicity

Critical care unit outcomes among patients who have been discharged or died	Patients of white ethnicity (N=5825)	Patients of non-white ethnicity (N=2832)
Outcome at end of critical care, n (%)		
Alive	3496 (60.0)	1610 (56.9)
Dead	2329 (40.0)	1222 (43.1)
Duration of critical care		
Duration of critical care † (days), median (IQR)		
Survivors	10 (4, 24)	15 (5, 30)
Non-survivors	8 (4, 15)	10 (5, 16)
Organ support (Critical Care Minimum Dataset)*		
Receipt of organ support, at any point, n (%)		
Advanced respiratory support	3979 (68.8)	2237 (79.6)
Basic respiratory support	3957 (68.4)	1754 (62.5)
Advanced cardiovascular support	1606 (27.8)	893 (31.8)
Basic cardiovascular support	5322 (91.9)	2659 (94.6)
Renal support	1350 (23.4)	891 (31.7)
Liver support	36 (0.6)	38 (1.4)
Neurological support	466 (8.1)	237 (8.4)
Duration of organ support (calendar days), median (IQR)		
Advanced respiratory support	12 (7, 21)	14 (8, 23)
Total (advanced + basic) respiratory support	10 (5, 19)	12 (6, 22)
Advanced cardiovascular support	3 (2, 6)	3 (2, 6)
Total (advanced + basic) cardiovascular support	10 (5, 20)	13 (6, 23)
Renal support	7 (3, 14)	7 (3, 15)

Please note that owing to the emerging nature of the epidemic, the sample of patients with COVID-19 represented in this table is 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 35. Patients with ethnicity reported as 'not stated' excluded. † Duration of critical care is from original admission to critical care until final unit outcome and includes any time spent outside critical care areas (e.g. prior to any readmissions).

Outcomes by receipt of organ support

Figure 17 presents 30-day survival for patients critically ill with confirmed COVID-19 who received mechanical ventilation during the first 24 hours of critical care compared with patients who did not.

Critical care outcomes for patients critically ill with confirmed COVID-19 who received advanced respiratory support at any point during critical care and who received basic respiratory support only are summarised in Table 13. Critical care outcomes for patients critically ill with confirmed COVID-19 who received renal support at any point during critical care and who did not receive renal support are summarised in Table 14.

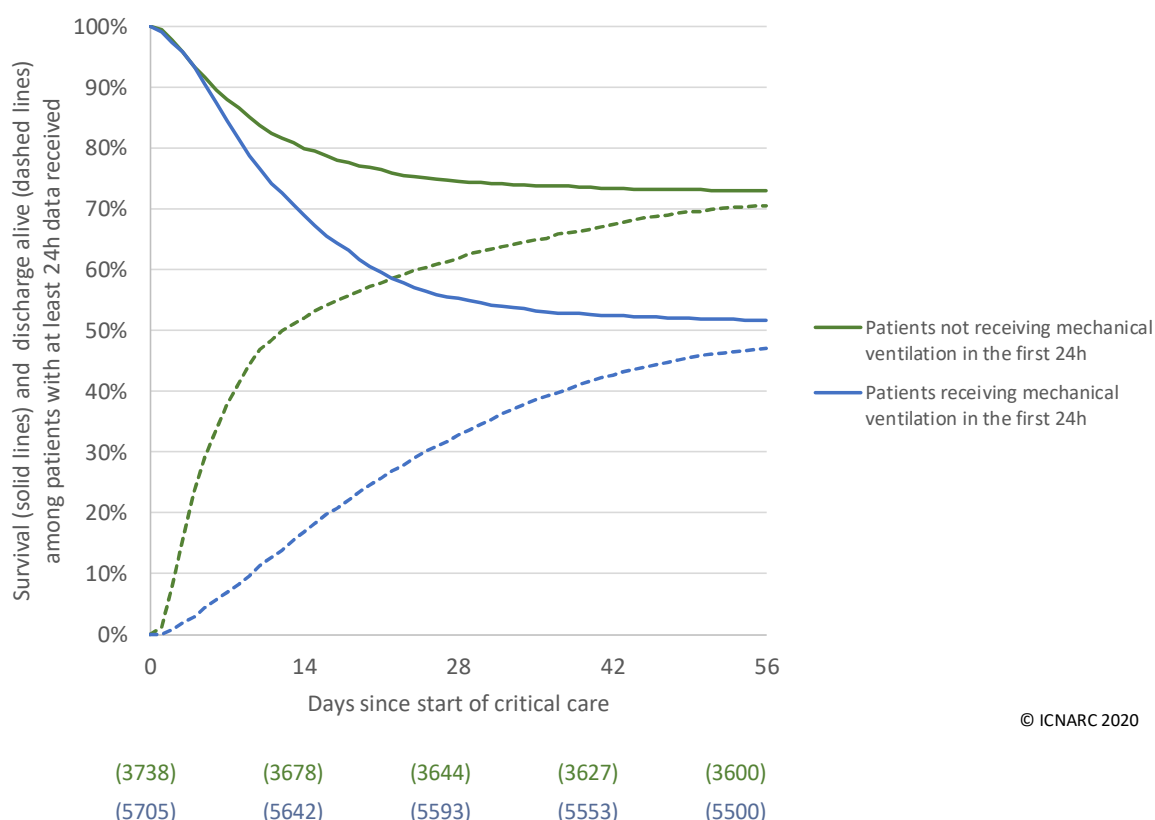


Figure 17 Survival and discharge by mechanical ventilation during the first 24 hours *

* Please see Definitions on page 35. Patients who are still in critical care are included only for the period in which they are known to have been in critical care, i.e. from their date of start of critical care until 18 June 2020. The numbers of patients available for reporting (in brackets) are the number of patients who are known to have either died or been discharged on or before that time point plus the number of patients known to have been still in critical care beyond that time point. Due to the emerging nature of the UK epidemic, the total number of patients available for reporting becomes smaller at longer lengths of follow-up. Compared with the survival statistics presented in Tables 9, 13 and 14, this approach makes better use of all available data, including data about patients who are still in critical care.

Table 12 Outcome by combinations of organ support *

Organ support received *	Patients with COVID-19 and outcome reported (N=9217)		Patients with viral pneumonia (non-COVID-19), 2017-19 (N=5782)
	Discharged alive from critical care	Died in critical care	Died in critical care
	n (%)	n (%)	(%)
Any respiratory support			
Basic only	1818 (80.2)	449 (19.8)	(11.2)
Advanced	3364 (50.6)	3279 (49.4)	(33.3)
Any renal support	964 (40.1)	1439 (59.9)	(46.1)
Combinations of advanced respiratory, advanced cardiovascular and renal support:			
Advanced respiratory support only	1880 (63.5)	1081 (36.5)	(18.7)
Advanced respiratory and advanced cardiovascular support only	604 (43.4)	789 (56.6)	(40.2)
Advanced respiratory and renal support only	479 (45.7)	570 (54.3)	(38.8)
Advanced respiratory, advanced cardiovascular and renal support	401 (32.3)	839 (67.7)	(56.6)

Please note that owing to the emerging nature of the epidemic, the sample of patients with COVID-19 represented in this table is 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 35.

Table 13 Outcome, duration of critical care and organ support by receipt of respiratory support *

Critical care outcomes among patients who have been discharged or died	Patients receiving advanced respiratory support * (N=6643)	Patients receiving only basic respiratory support * (N=2267)
Outcome at end of critical care, n (%)		
Discharged	3364 (50.6)	1818 (80.2)
Died	3279 (49.4)	449 (19.8)
Duration of critical care		
Duration of critical care † (days), median (IQR)		
Survivors	21 (12, 33)	4 (2, 7)
Non-survivors	10 (5, 17)	4 (2, 7)
Organ support (Critical Care Minimum Dataset) *		
Receipt of organ support, at any point, n (%)		
Basic respiratory support	3778 (56.9)	2267 (100.0)
Advanced cardiovascular support	2633 (39.7)	35 (1.5)
Basic cardiovascular support	6406 (96.5)	1907 (84.1)
Renal support	2279 (34.4)	86 (3.8)
Liver support	83 (1.3)	3 (0.1)
Neurological support	723 (10.9)	20 (0.9)
Duration of organ support (calendar days), median (IQR)		
Total (advanced + basic) respiratory support	14 (8, 24)	4 (3, 7)
Advanced cardiovascular support	3 (2, 6)	2 (1, 4)
Total (advanced + basic) cardiovascular support	15 (8, 24)	4 (3, 7)
Renal support	8 (4, 14)	3 (2, 5)

Please note that owing to the emerging nature of the epidemic, the sample of patients with COVID-19 represented in this table is 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 35. Patients receiving no respiratory support excluded due to small numbers. † Duration of critical care is from original admission to critical care until final unit outcome and includes any time spent outside critical care areas (e.g. prior to any readmissions).

Table 14 Outcome, duration of critical care and organ support by receipt of renal support *

Critical care outcomes among patients who have been discharged or died	Patients receiving any renal support * (N=2393)	Patients not receiving any renal support * (N=6739)
Outcome at end of critical care, n (%)		
Discharged	957 (40.0)	4417 (65.5)
Died	1436 (60.0)	2322 (34.5)
Duration of critical care		
Duration of critical care † (days), median (IQR)		
Survivors	28 (18, 40)	9 (4, 20)
Non-survivors	13 (7, 19)	7 (4, 13)
Organ support (Critical Care Minimum Dataset) *		
Receipt of organ support, at any point, n (%)		
Advanced respiratory support	2279 (95.2)	4354 (64.6)
Basic respiratory support	1244 (52.0)	4795 (71.2)
Advanced cardiovascular support	1248 (52.2)	1428 (21.2)
Basic cardiovascular support	2316 (96.8)	6162 (91.4)
Liver support	55 (2.3)	32 (0.5)
Neurological support	308 (12.9)	438 (6.5)
Duration of organ support (calendar days), median (IQR)		
Advanced respiratory support	16 (10, 26)	11 (6, 19)
Total (advanced + basic) respiratory support	18 (10, 28)	9 (4, 17)
Advanced cardiovascular support	4 (2, 7)	2.5 (1, 5)
Total (advanced + basic) cardiovascular support	18 (10, 28)	9 (4, 17)

Please note that owing to the emerging nature of the epidemic, the sample of patients with COVID-19 represented in this table is 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 35. Includes 156 patients requiring chronic renal replacement therapy for end stage renal disease prior to critical care; outcomes for these patients are similar. † Duration of critical care is from original admission to critical care until final unit outcome and includes any time spent outside critical care areas (e.g. prior to any readmissions).

Critical care outcomes for patients critically ill with confirmed COVID-19 who received advanced respiratory support at any point during critical care and who received basic respiratory support only across major patient subgroups are summarised in Table 15. Critical care outcomes for patients critically ill with confirmed COVID-19 who received renal support at any point during critical care and who did not receive renal support across major patient subgroups are summarised in Table 16.

Table 15 Outcome by receipt of respiratory support * and patient characteristics

Patient characteristic	Patients receiving advanced respiratory support * (N=6643)		Patients receiving only basic respiratory support * (N=2267)	
	Discharged alive from critical care	Died in critical care	Discharged alive from critical care	Died in critical care
	n (%)	n (%)	n (%)	n (%)
Age at admission (years)				
16-39	364 (77.6)	105 (22.4)	218 (97.3)	6 (2.7)
40-49	634 (72.0)	247 (28.0)	289 (92.3)	24 (7.7)
50-59	1096 (57.4)	814 (42.6)	520 (90.9)	52 (9.1)
60-69	898 (43.4)	1173 (56.6)	444 (79.3)	116 (20.7)
70-79	348 (29.0)	852 (71.0)	275 (61.2)	174 (38.8)
80+	23 (20.7)	88 (79.3)	72 (48.3)	77 (51.7)
Sex				
Female	1016 (55.0)	832 (45.0)	615 (82.0)	135 (18.0)
Male	2348 (49.0)	2445 (51.0)	1203 (79.3)	314 (20.7)
Ethnicity				
White	2025 (50.9)	1954 (49.1)	1314 (79.4)	341 (20.6)
Mixed	55 (47.8)	60 (52.2)	26 (83.9)	5 (16.1)
Asian	470 (46.9)	533 (53.1)	194 (77.9)	55 (22.1)
Black	342 (50.8)	331 (49.2)	105 (84.0)	20 (16.0)
Other	266 (59.6)	180 (40.4)	88 (87.1)	13 (12.9)
Index of Multiple Deprivation (IMD) quintile				
1 (least deprived)	465 (50.9)	449 (49.1)	298 (79.9)	75 (20.1)
2	534 (50.7)	520 (49.3)	314 (80.9)	74 (19.1)
3	669 (51.9)	619 (48.1)	321 (79.3)	84 (20.7)
4	815 (49.1)	846 (50.9)	393 (82.2)	85 (17.8)
5 (most deprived)	823 (50.6)	802 (49.4)	450 (78.3)	125 (21.7)
Body mass index				
<25	779 (49.6)	791 (50.4)	429 (79.3)	112 (20.7)
25-<30	1074 (48.0)	1164 (52.0)	551 (80.3)	135 (19.7)
30-<40	1135 (55.3)	917 (44.7)	510 (84.9)	91 (15.1)
40+	253 (54.1)	215 (45.9)	161 (83.0)	33 (17.0)
Assistance required with daily activities				
No	3106 (51.3)	2946 (48.7)	1595 (84.5)	293 (15.5)
Yes	210 (42.9)	279 (57.1)	197 (58.1)	142 (41.9)
Any very severe comorbidities *				
No	3178 (51.6)	2977 (48.4)	1625 (83.5)	321 (16.5)
Yes	147 (36.4)	257 (63.6)	179 (60.3)	118 (39.7)

Please note that owing to the emerging nature of the epidemic, the sample of patients with COVID-19 represented in this table is 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 35. Patients receiving no respiratory support excluded due to small numbers.

Table 16 Outcome by receipt of renal support * and patient characteristics

Patient characteristic	Patients receiving any renal support * (N=2393)		Patients not receiving any renal support * (N=6739)	
	Discharged alive from critical care	Died in critical care	Discharged alive from critical care	Died in critical care
	n (%)	n (%)	n (%)	n (%)
Age at admission (years)				
16-39	72 (61.0)	46 (39.0)	542 (89.1)	66 (10.9)
40-49	204 (65.6)	107 (34.4)	747 (82.0)	164 (18.0)
50-59	313 (44.7)	387 (55.3)	1341 (73.4)	485 (26.6)
60-69	259 (32.2)	545 (67.8)	1128 (59.8)	757 (40.2)
70-79	102 (23.7)	328 (76.3)	554 (44.0)	705 (56.0)
80+	7 (23.3)	23 (76.7)	105 (42.0)	145 (58.0)
Sex				
Female	231 (42.5)	312 (57.5)	1479 (69.1)	662 (30.9)
Male	726 (39.3)	1123 (60.7)	2938 (63.9)	1659 (36.1)
Ethnicity				
White	542 (40.1)	808 (59.9)	2921 (66.0)	1507 (34.0)
Mixed	17 (48.6)	18 (51.4)	66 (58.4)	47 (41.6)
Asian	131 (35.4)	239 (64.6)	559 (61.2)	354 (38.8)
Black	156 (45.7)	185 (54.3)	309 (64.5)	170 (35.5)
Other	60 (41.4)	85 (58.6)	302 (73.5)	109 (26.5)
Index of Multiple Deprivation (IMD) quintile				
1 (least deprived)	135 (43.0)	179 (57.0)	656 (65.3)	349 (34.7)
2	139 (38.6)	221 (61.4)	737 (65.9)	382 (34.1)
3	212 (44.8)	261 (55.2)	803 (64.2)	447 (35.8)
4	219 (36.0)	390 (64.0)	1039 (65.6)	546 (34.4)
5 (most deprived)	238 (39.7)	362 (60.3)	1089 (65.6)	571 (34.4)
Body mass index				
<25	197 (36.9)	337 (63.1)	1079 (65.3)	574 (34.7)
25-<30	282 (35.5)	512 (64.5)	1398 (63.8)	794 (36.2)
30-<40	369 (46.1)	431 (53.9)	1323 (69.3)	585 (30.7)
40+	86 (48.0)	93 (52.0)	339 (68.5)	156 (31.5)
Assistance required with daily activities				
No	879 (40.1)	1314 (59.9)	3973 (67.1)	1946 (32.9)
Yes	67 (38.3)	108 (61.7)	378 (54.2)	319 (45.8)
Any very severe comorbidities *				
No	851 (39.8)	1286 (60.2)	4109 (66.8)	2038 (33.2)
Yes	99 (41.6)	139 (58.4)	259 (52.1)	238 (47.9)

Please note that owing to the emerging nature of the epidemic, the sample of patients with COVID-19 represented in this table is 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 35. Includes 156 patients requiring chronic renal replacement therapy for end stage renal disease prior to critical care; outcomes for these patients are similar.

Multivariable analyses

Patient population:

- A multivariable Cox proportional hazards regression model was developed based solely on available data from patients critically ill with confirmed COVID-19 with a start of critical care between 1 March and 21 April 2020.
- All patients were followed up for a minimum of 7 days, and outcomes were censored at 30 days following the start of critical care. Patients discharged alive from hospital within 30 days, and those ending critical care within 30 days with missing hospital outcome were assumed to survive to 30 days.
- Patients either with a duration of critical care of less than 24 hours or with no data recorded for any core physiology (temperature, systolic blood pressure, heart rate or respiratory rate) were excluded.

Prognostic factors:

- Prognostic factors were selected, a priori, based on established relationships with outcome for critically ill patients and on emerging information from the COVID-19 pandemic.
- Continuous prognostic factors were assessed for non-linearity using restricted cubic splines with up to five knots.
- Missing data were imputed using fully conditional specification (with models fitted in ten multiply imputed datasets and results combined).

Results:

- Of 6989 patients, 58 had a duration of critical care of less than 24 hours and 595 had no data recorded for any core physiology; a cohort of 6336 patients were included in the model.
- The results of the multivariable modelling are presented in Figures 18-20.

Explanation:

- The figures present the hazard ratio (solid lines or points) for values of each prognostic factor compared with a reference value (as indicated).
- A hazard ratio is a measure of how much more or less likely the event (death) is to occur.

For example, a patient aged 70 has a hazard ratio of approximately 2 compared with a patient aged 60; this means that they are twice as likely to die within 30 days of the start of critical care. In contrast, a patient aged 40 has a hazard ratio of approximately 0.5 compared with a patient aged 60; this means that they are half as likely to die within 30 days of the start of critical care. A hazard ratio of 1 means that the risk of death is the same.

- The hazard ratios indicate the association between each prognostic factor and the outcome adjusted for the effect of all the other variables in the model.

For example, the hazard ratio for dependency is adjusted for patients with dependency being older on average than those without dependency.

- The estimated hazard ratios are shown with 95% confidence intervals (as dashed lines or vertical spikes) indicating a range of possible values for the hazard ratio that will include the true value 19 times out of 20.

A manuscript reporting the full details of the modelling is being prepared for publication.

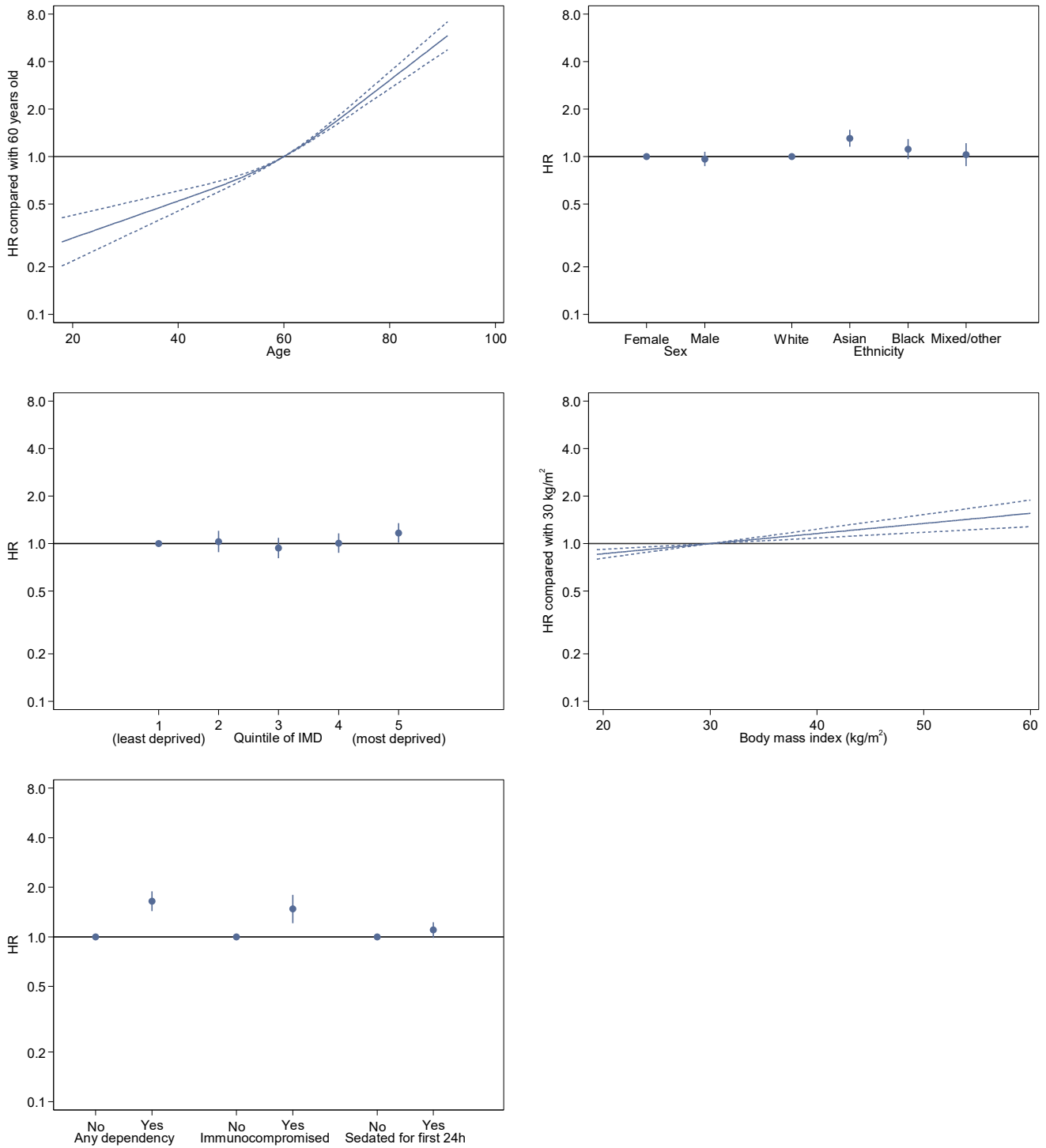


Figure 18 Hazard ratios and 95% confidence intervals from Cox proportional hazards regression model for death within 30 days following start of critical care: demographics and medical history

Please note that hazard ratios (HR) are reported relative to the median value for age (60 years) and the threshold for defining obesity for body mass index (30 kg/m²). Immunocompromised includes the conditions as defined on page 35 and also metastatic disease and haematological malignancy.

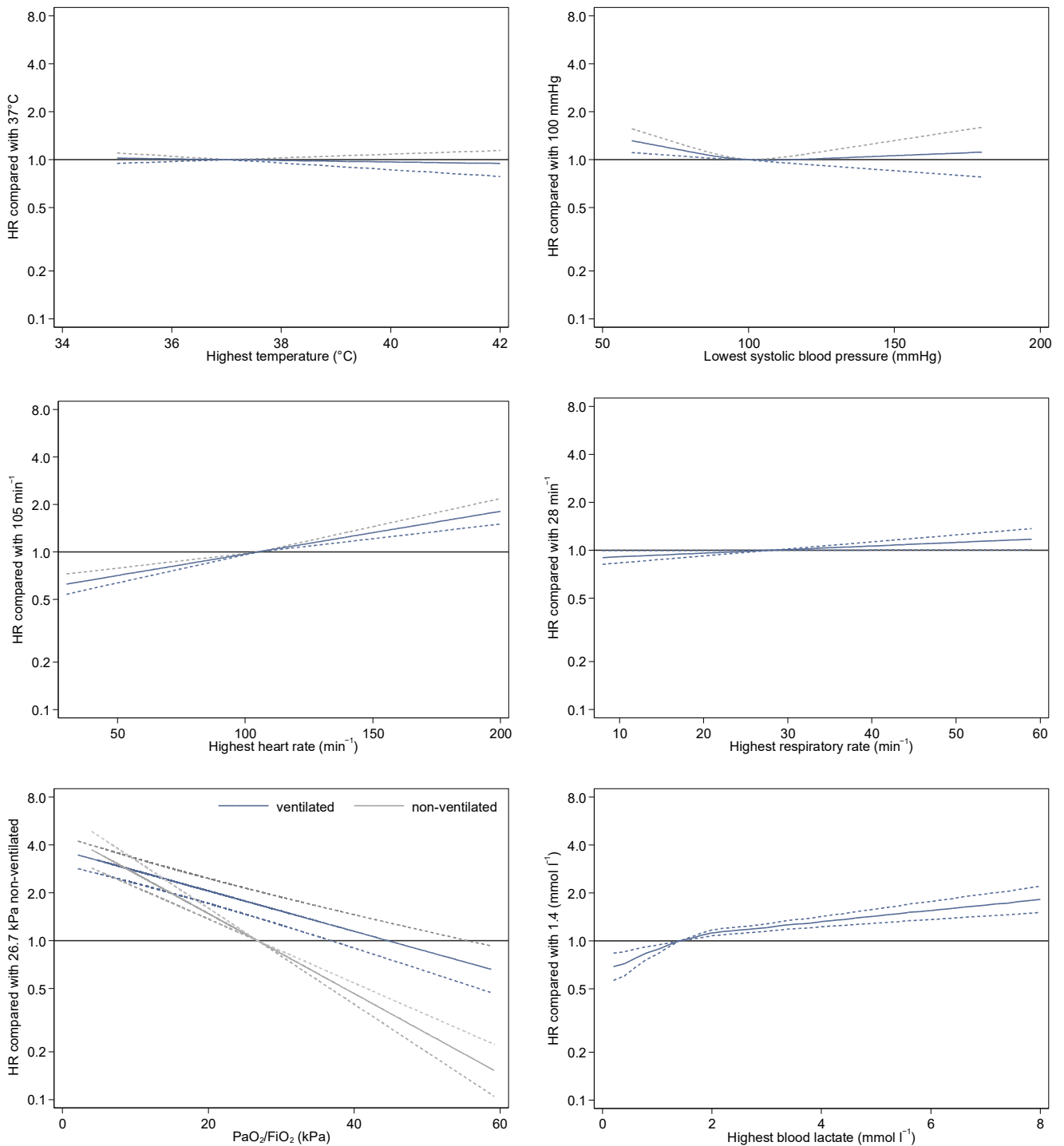


Figure 19 Hazard ratios and 95% confidence intervals from Cox proportional hazards regression model for death within 30 days following start of critical care: physiology (1)

Please note that hazard ratios (HR) are reported relative to the median value for each physiological parameter (as indicated on the y-axis) except for $\text{PaO}_2/\text{FiO}_2$ which is reported relative to the threshold for defining ARDS (26.7 kPa).

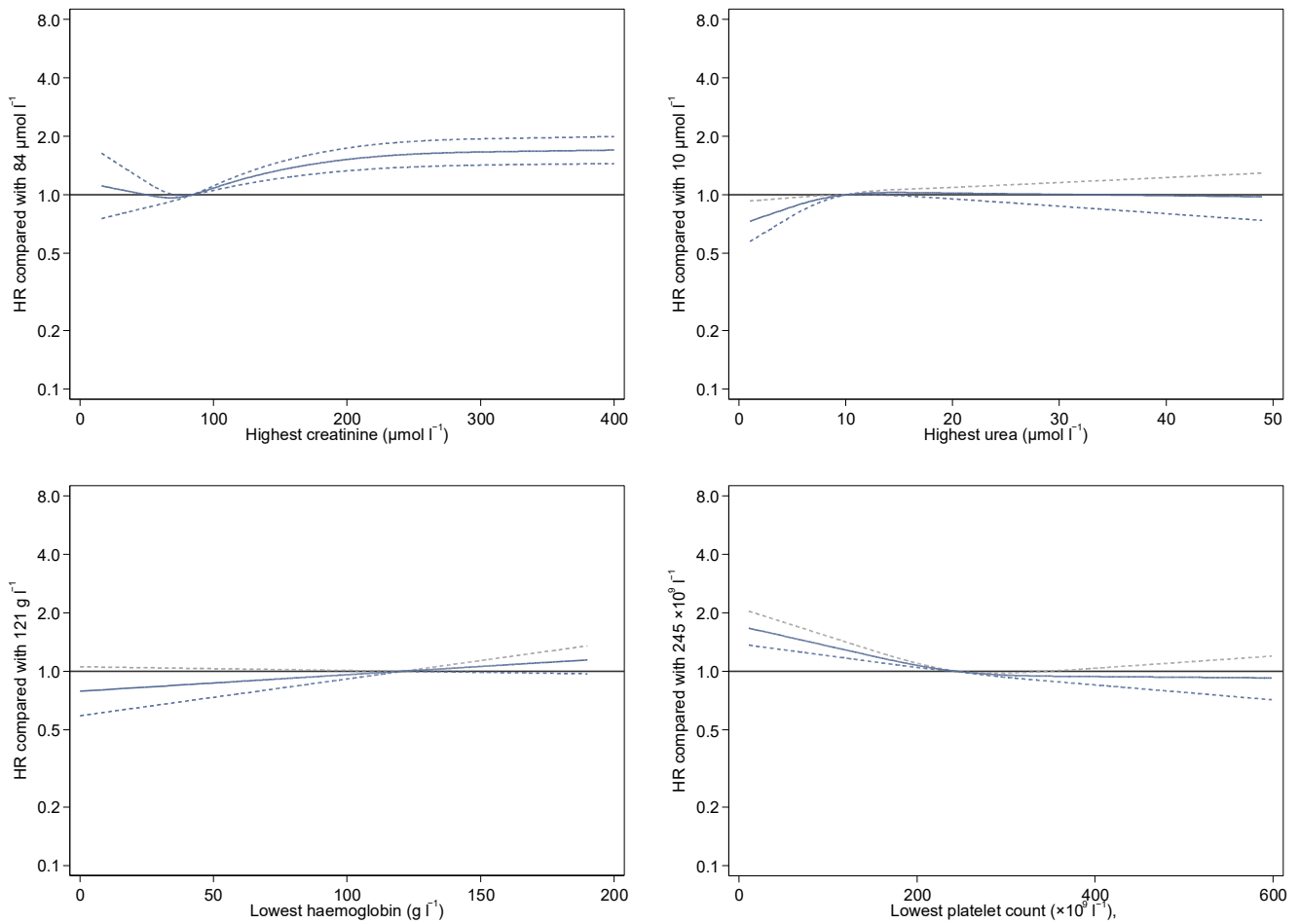


Figure 20 Hazard ratios and 95% confidence intervals from Cox proportional hazards regression model for death within 30 days following start of critical care: physiology (2)

Please note that hazard ratios (HR) are reported relative to the median value for each physiological parameter (as indicated on the y-axis).

Data completeness

Completeness of key variables is summarised in Table 17.

Table 17 Data completeness of key variables

Variable	N missing %
24h variables (N=9949)	
NHS number (used to combine transfers and readmissions)	223 (2.2)
Age	3 (0.0)
Sex	4 (0.0)
Currently or recently pregnant	6 (0.8) †
Ethnicity	621 (6.2)
Index of Multiple Deprivation	172 (1.7)
BMI	677 (6.8)
Prior dependency *	235 (2.4)
Very severe comorbidities	169 (1.7)
Prior hospital length of stay	14 (0.1)
CPR within previous 24h	51 (0.5)
Mechanical ventilation during the first 24h *	448 (4.5)
APACHE II Score	265 (2.7)
PaO ₂ /FiO ₂ ratio	874 (8.8)
Outcome variables (N=9217)	
Length of stay in critical care	106 (1.2)
Advanced respiratory support *	75 (0.8)
Basic respiratory support *	71 (0.8)
Advanced cardiovascular support *	78 (0.8)
Basic cardiovascular support *	67 (0.7)
Renal support *	85 (0.9)
Liver support *	94 (1.0)
Neurological support *	94 (1.0)

* Please see Definitions on page 35; † % of female patients aged 16-49 years

Definitions

Patients are classified as either:

- Notification only received: ICNARC has received a notification of the patient's admission to critical care but has not received any patient data from the first 24 hours or beyond
- 24h data only received: ICNARC has received patient data relating to the first 24 hours in critical care but has not yet been notified of the patient's critical care outcome
- Outcome data received: ICNARC has received submission of data relating to the patient's critical care outcome (e.g. survival, length of stay, duration of organ support)
- Hospital outcome data received: Data have been updated with outcomes at ultimate discharge from hospital

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

Mechanical ventilation during the first 24 hours was identified by the recording of a ventilated respiratory rate, indicating that all or some of the breaths or a portion of the breaths (pressure support) were delivered by a mechanical device. This usually indicates invasive ventilation; BPAP (bilevel positive airway pressure) would meet this definition but CPAP (continuous positive airway pressure) does not.

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

Acknowledgement

Please acknowledge the source of these data in all future presentations (oral and/or written), as follows:

“These data derive from the ICNARC Case Mix Programme Database. The Case Mix Programme is the national clinical audit of patient outcomes from adult critical care coordinated by the Intensive Care National Audit & Research Centre (ICNARC). For more information on the representativeness and quality of these data, please contact ICNARC.”