icnarc intensive care national audit & research centre

25 years and counting...

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

This report presents analyses of data on patients critically ill with confirmed COVID-19 reported to ICNARC up to 4pm on 25 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.

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## Participation and population coverage

### Critical care unit participation

| | |
|---|---|
| Total number of units: | 289 |
| Units with at least one patient notified: | 258 |
| Units with zero patients: | 29 |
| Units with uncertain participation: | 2 |

### Admissions to critical care

To date, ICNARC have been notified of 12,881 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 12,416 admissions for 10,130 patients (Figure 1). Of the 10,130 patients, 9505 have outcomes reported and 625 patients were last reported as still receiving critical care.

Of the 181 new patients included in the report for the first time this week, 30 were admitted to critical care within the last week (Figure 2), with the majority representing back-filling of cases from the peak of the epidemic. The numbers of new patients, cumulative numbers of patients and number of patients in critical care by date are shown in Figures 3-5. The largest numbers of patients (2932) have been managed by the three London Operational Delivery Networks (Figure 6). Please note that Figures 3-5 are affected by a variable lag time for submission of data (shaded grey).

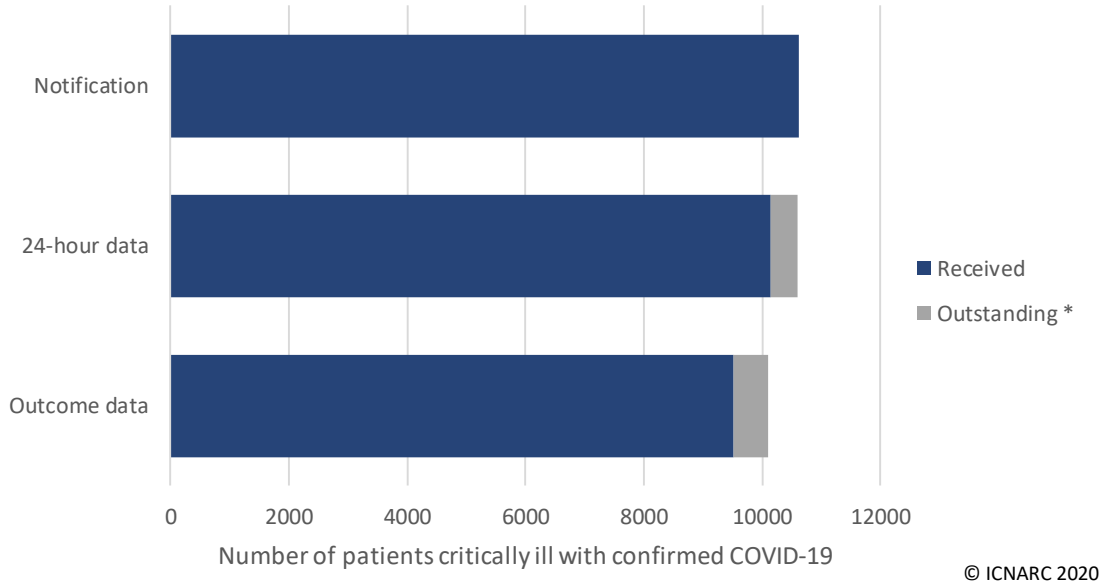



**Figure 1 Numbers of patients with data included in this report and outstanding ***

* 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.

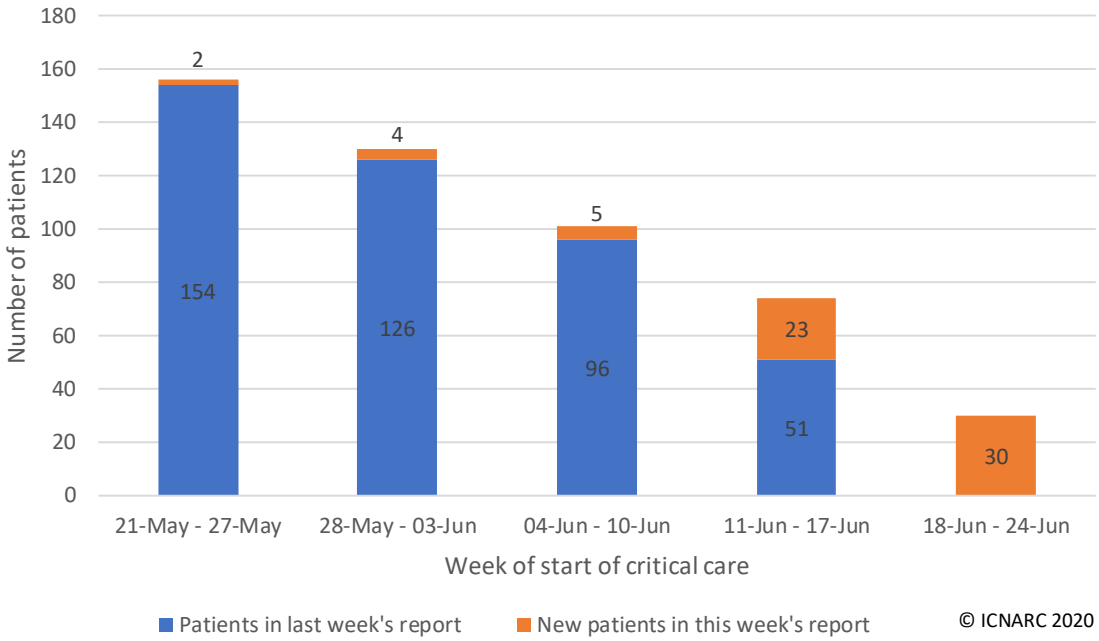



**Figure 2 New patients included this week by week of start critical care**

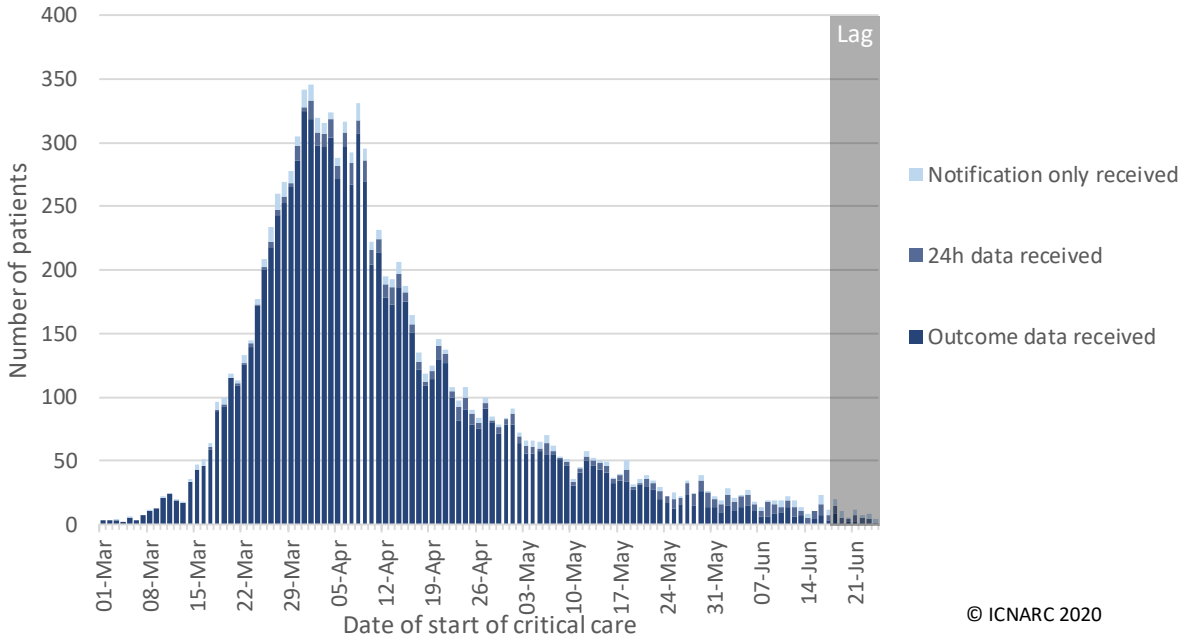



**Figure 3 Number of new patients critically ill with confirmed COVID-19 by date of start of critical care**

Source: ICNARC Case Mix Programme Database

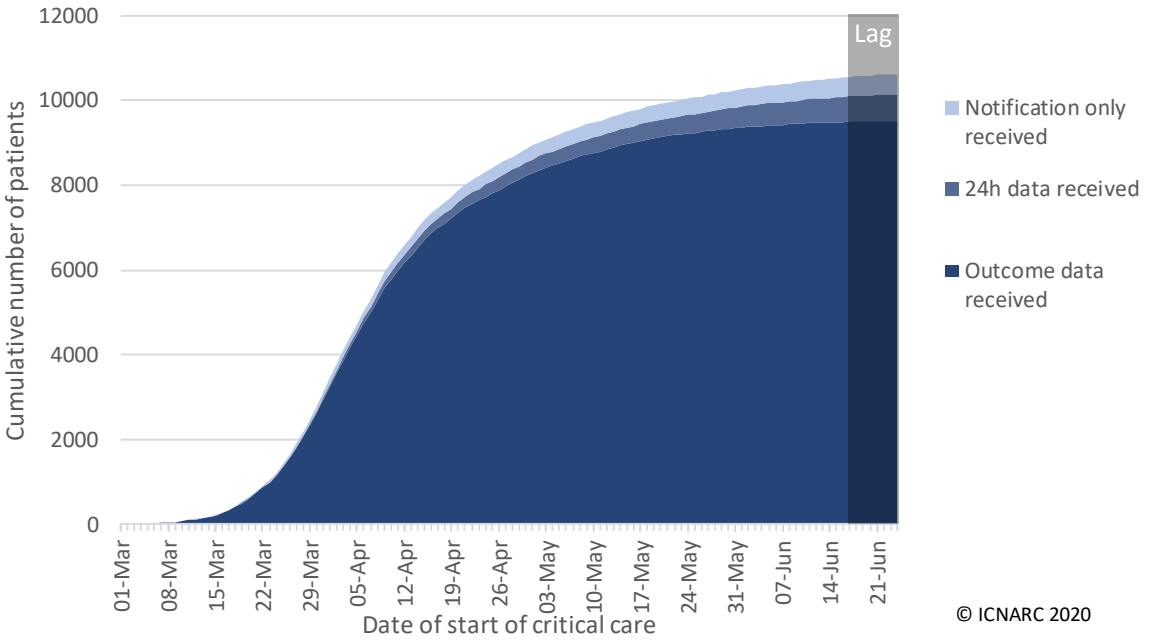



**Figure 4 Cumulative number of patients critically ill with confirmed COVID-19 by date of start of critical care**

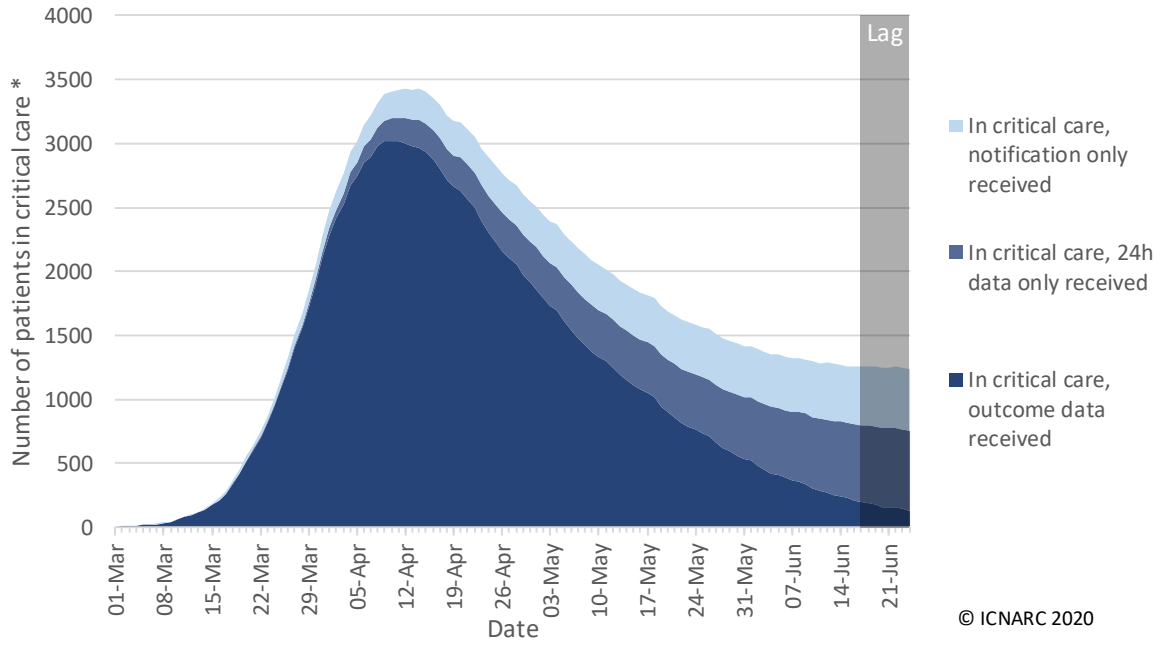



**Figure 5 Total number of patients critically ill with confirmed COVID-19 by date ***

* Please note that patients whose outcome data have not been received are assumed to remain in critical care as of 25 June 2020.

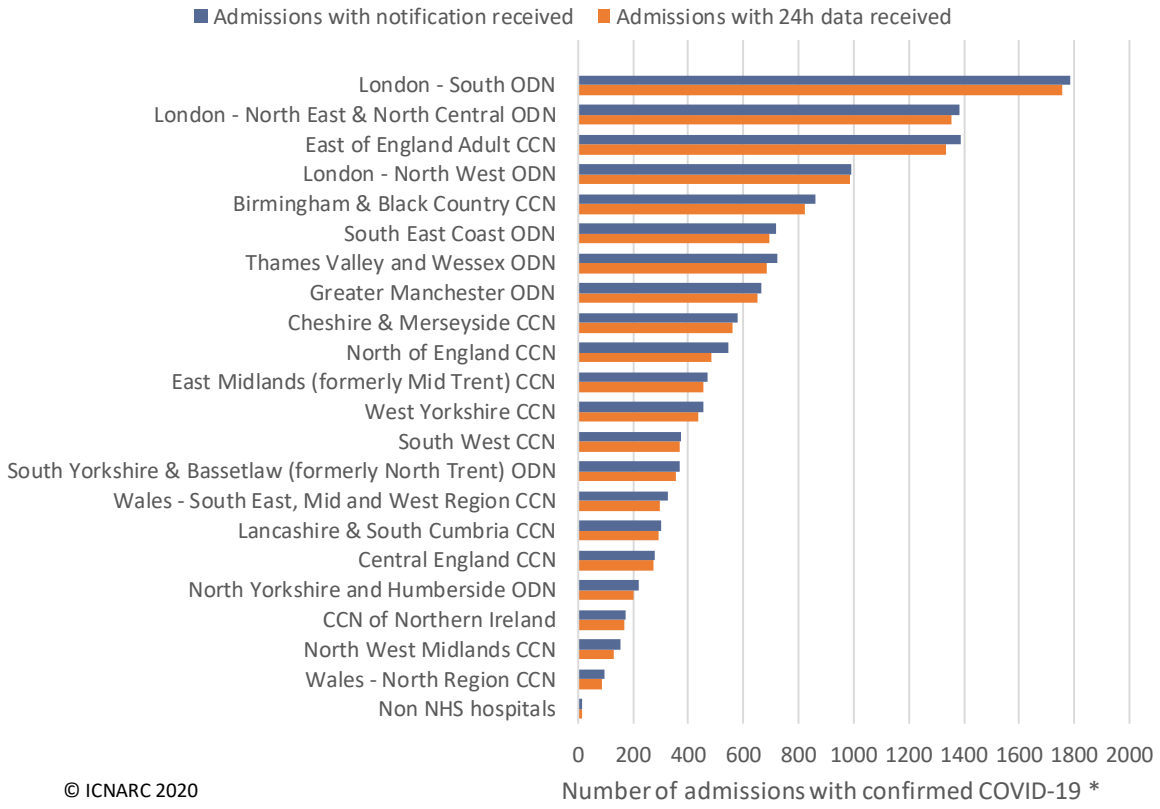



**Figure 6 Number of admissions critically ill with confirmed COVID-19 by Critical Care Network ***

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=10130) | Patients with viral pneumonia (non-COVID-19), 2017-19 (N=5782) |
|---|---|---|
| Age at admission (years) [N=10128] | | |
| Mean (SD) | 58.7 (12.7) | 58.0 (17.4) |
| Median (IQR) | 60 (51, 68) | 61 (48, 71) |
| Sex, n (%) [N=10127] | | |
| Female | 2983 (29.5) | 2641 (45.7) |
| Male | 7144 (70.5) | 3141 (54.3) |
| Currently or recently pregnant, n (% of females aged 16-49) [N=717] | | |
| Currently pregnant | 26 (3.6) | 56 (7.4) |
| Recently pregnant (within 6 weeks) | 37 (5.2) | 29 (3.8) |
| Not known to be pregnant | 654 (91.2) | 674 (88.8) |
| Ethnicity *, n (%) [N=9593] | | |
| White | 6348 (66.2) | 4951 (88.4) |
| Mixed | 176 (1.8) | 52 (0.9) |
| Asian | 1492 (15.6) | 325 (5.8) |
| Black | 941 (9.8) | 155 (2.8) |
| Other | 636 (6.6) | 117 (2.1) |
| Index of Multiple Deprivation (IMD) quintile *, n (%) [N=9957] | | |
| 1 (least deprived) | 1445 (14.5) | 873 (15.3) |
| 2 | 1609 (16.2) | 999 (17.5) |
| 3 | 1942 (19.5) | 1115 (19.5) |
| 4 | 2439 (24.5) | 1232 (21.6) |
| 5 (most deprived) | 2522 (25.3) | 1489 (26.1) |
| Body mass index *, n (%) [N=9461] | | |
| <18.5 | 68 (0.7) | 310 (5.5) |
| 18.5-<25 | 2395 (25.3) | 1933 (34.2) |
| 25-<30 | 3283 (34.7) | 1691 (29.9) |
| 30-<40 | 2968 (31.4) | 1330 (23.5) |
| 40+ | 747 (7.9) | 394 (7.0) |

* Please see Definitions on page 36.

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

| Medical history | Patients with confirmed COVID-19 and 24h data (N=10130) | Patients with viral pneumonia (non-COVID-19), 2017-19 (N=5782) |
|---|---|---|
| Dependency prior to admission to acute hospital *, n (%) [N=9907] | | |
| Able to live without assistance in daily activities | 8935 (90.2) | 4244 (73.6) |
| Some assistance with daily activities | 936 (9.4) | 1392 (24.1) |
| Total assistance with all daily activities | 36 (0.4) | 134 (2.3) |
| Very severe comorbidities *, n (%) [N=9971] | | |
| Cardiovascular | 70 (0.7) | 78 (1.4) |
| Respiratory | 116 (1.2) | 295 (5.1) |
| Renal | 167 (1.7) | 120 (2.1) |
| Liver | 45 (0.5) | 54 (0.9) |
| Metastatic disease | 54 (0.5) | 68 (1.2) |
| Haematological malignancy | 184 (1.8) | 268 (4.6) |
| Immunocompromise | 348 (3.5) | 503 (8.7) |
| Prior hospital length of stay [N=10118] | | |
| Mean (SD) | 2.5 (6.2) | 2.7 (13.0) |
| Median (IQR) | 1 (0, 3) | 1 (0, 2) |
| CPR within previous 24h, n (%) [N=10091] | | |
| In the community | 51 (0.5) | 21 (0.4) |
| In hospital | 66 (0.7) | 85 (1.5) |
| **Indicator of acute severity** | | |
| Mechanically ventilated within first 24h *, n (%) [N=9694] | 5820 (60.0) | 2482 (43.0) |
| APACHE II Score [N=9868] | | |
| 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=9256] | 15.8 (11.2, 22.0) | 18.0 (11.6, 26.4) |
| $PaO_2/FiO_2$ ratio †, n (%) [N=9256] | | |
| ≤ 13.3 kPa (≤ 100 mmHg) | 3433 (37.1) | 1819 (33.3) |
| > 13.3 and ≤ 26.7 kPa (> 100 and ≤ 200 mmHg) | 4441 (48.0) | 2318 (42.4) |
| > 26.7 kPa (> 200 mmHg) | 1382 (14.9) | 1328 (24.3) |

* Please see Definitions on page 36. 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 7. The distribution of ethnicity, matched on 2011 census ward for location of patients critically ill with COVID-19, is presented in Figure 8.

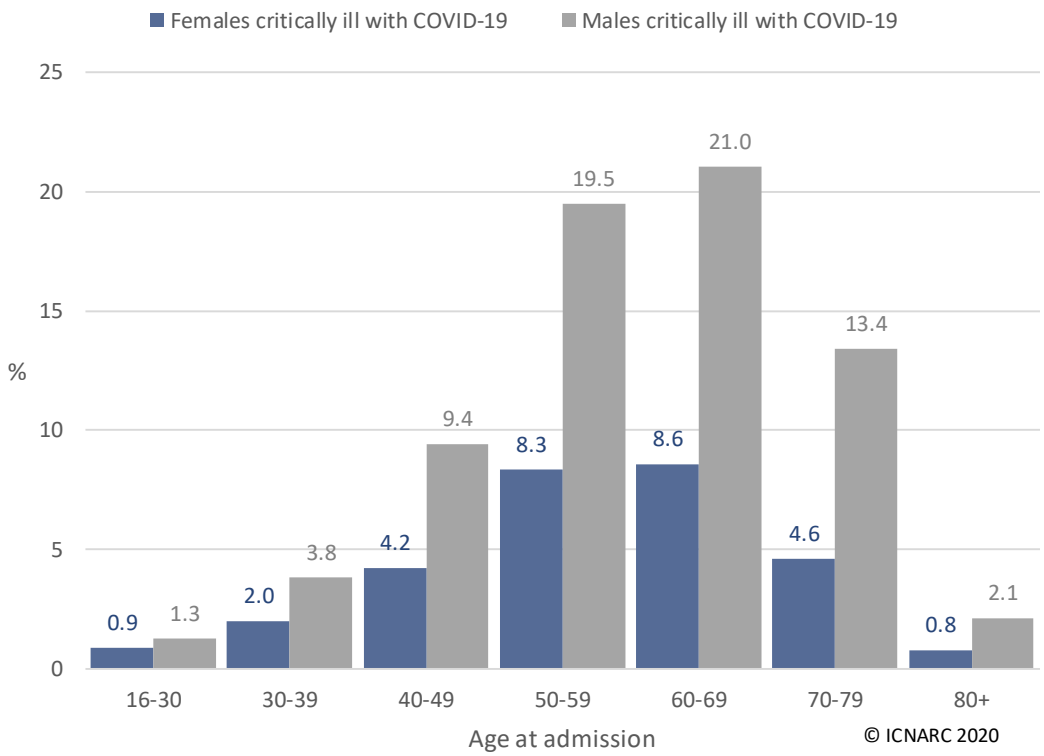



**Figure 7 Age and sex distribution of patients critically ill with confirmed COVID-19**

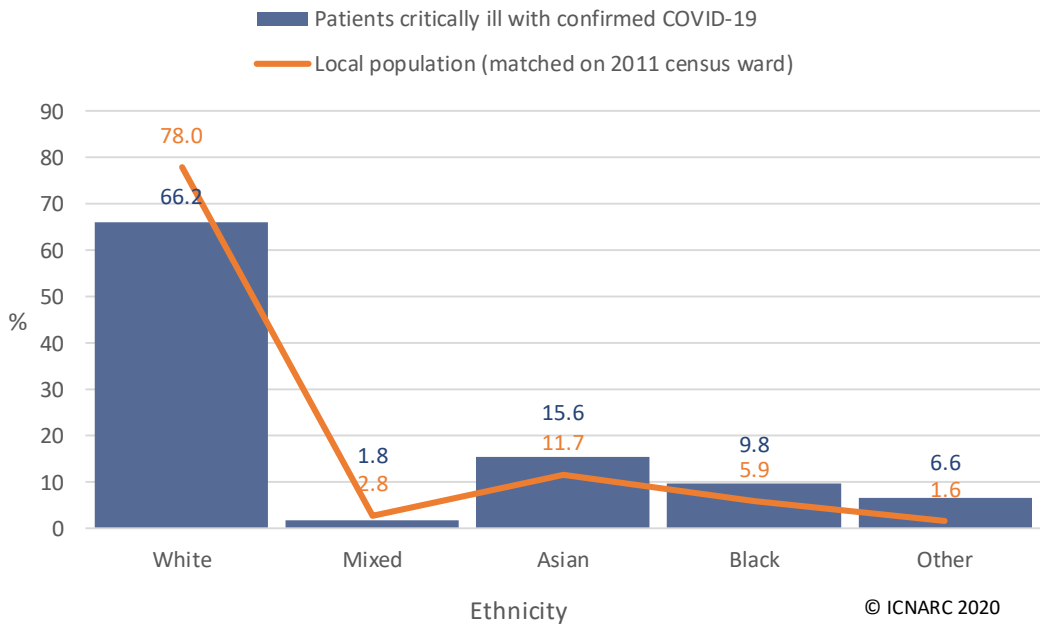



**Figure 8 Ethnicity distribution of patients critically ill with confirmed COVID-19**

The distribution of Index of Multiple Deprivation (IMD) is presented in Figure 9. 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 10.

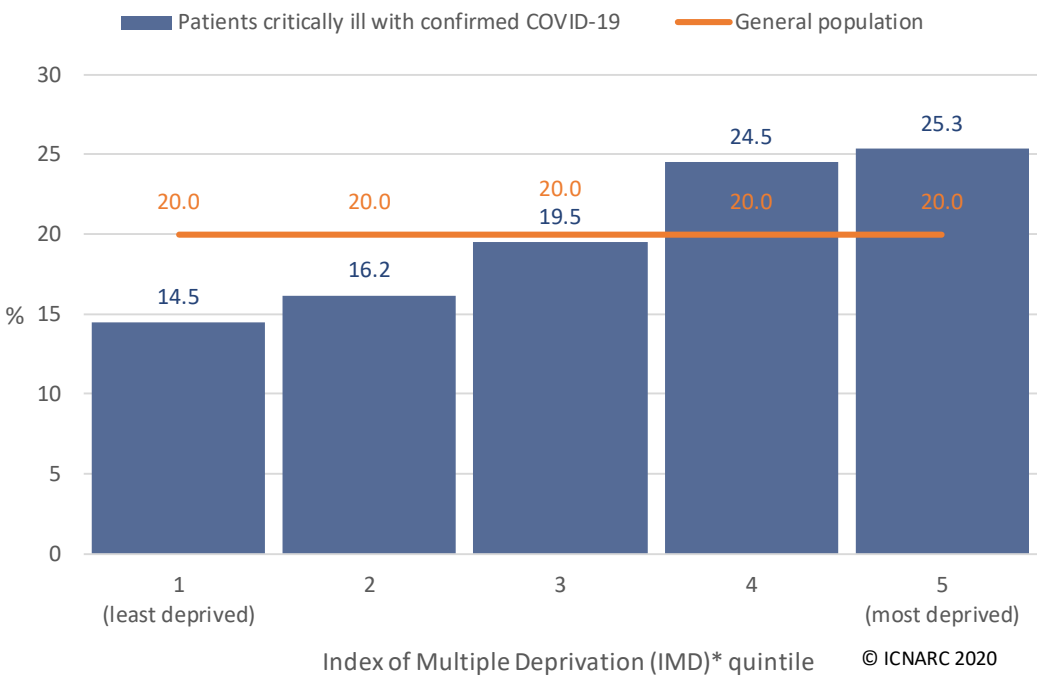



**Figure 9 Index of Multiple Deprivation (IMD) * distribution of patients critically ill with confirmed COVID-19**

* Please see Definitions on page 36.

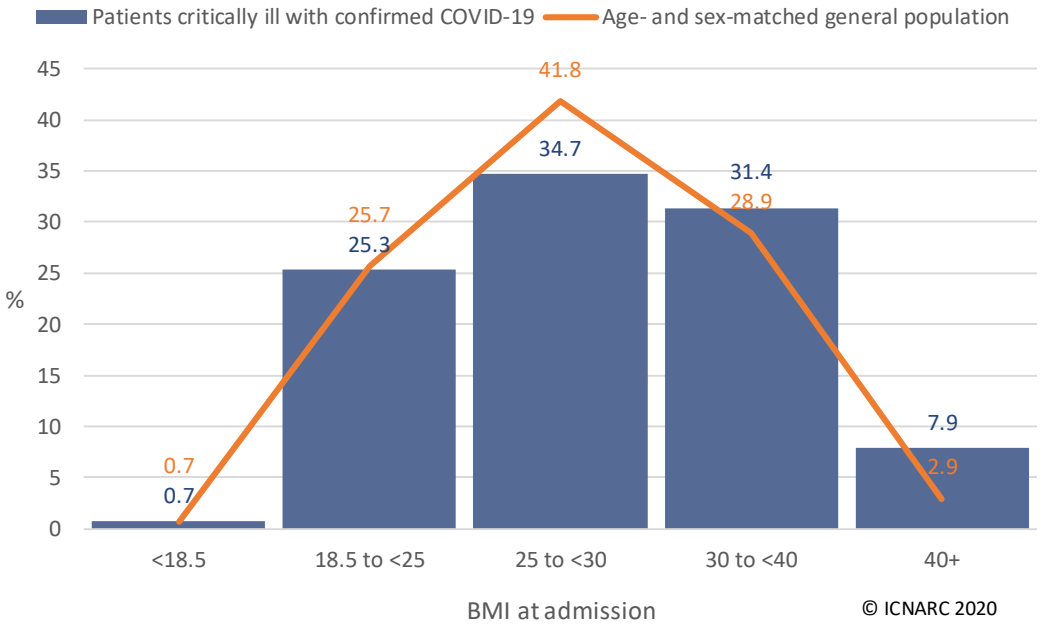



**Figure 10 BMI distribution of patients critically ill with confirmed COVID-19**

## 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=6348) | Patients of non-white ethnicity (N=3245) |
|---|---|---|
| Age at admission (years) [N=9591] | | |
| Mean (SD) | 60.5 (12.4) | 55.4 (12.4) |
| Median (IQR) | 61 (53, 70) | 56 (48, 64) |
| Sex, n (%) [N=9591] | | |
| Female | 1893 (29.8) | 958 (29.5) |
| Male | 4455 (70.2) | 2285 (70.5) |
| Currently or recently pregnant, n (% of females) [N=686] | | |
| Currently pregnant | 11 (2.8) | 14 (4.7) |
| Recently pregnant (within 6 weeks) | 14 (3.6) | 22 (7.4) |
| Not known to be pregnant | 362 (93.5) | 263 (88.0) |
| Index of Multiple Deprivation (IMD) quintile *, n (%) [N=9436] | | |
| 1 (least deprived) | 1115 (17.8) | 252 (7.9) |
| 2 | 1158 (18.5) | 368 (11.6) |
| 3 | 1262 (20.2) | 569 (17.9) |
| 4 | 1312 (21.0) | 984 (30.9) |
| 5 (most deprived) | 1405 (22.5) | 1011 (31.8) |
| Body mass index *, n (%) [N=8970] | | |
| <18.5 | 43 (0.7) | 23 (0.8) |
| 18.5-<25 | 1341 (22.6) | 908 (29.8) |
| 25-<30 | 2007 (33.9) | 1104 (36.3) |
| 30-<40 | 1982 (33.5) | 844 (27.7) |
| 40+ | 552 (9.3) | 166 (5.5) |

* Please see Definitions on page 36. 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=6348) | Patients of non-white ethnicity (N=3245) |
|---|---|---|
| Dependency prior to admission to acute hospital *, n (%) [N=9405] | | |
| Able to live without assistance in daily activities | 5520 (88.6) | 2964 (93.3) |
| Some assistance with daily activities | 683 (11.0) | 203 (6.4) |
| Total assistance with all daily activities | 24 (0.4) | 11 (0.3) |
| Very severe comorbidities *, n (%) [N=9460] | | |
| Cardiovascular | 56 (0.9) | 11 (0.3) |
| Respiratory | 88 (1.4) | 22 (0.7) |
| Renal | 70 (1.1) | 92 (2.9) |
| Liver | 33 (0.5) | 9 (0.3) |
| Metastatic disease | 44 (0.7) | 8 (0.3) |
| Haematological malignancy | 140 (2.2) | 33 (1.0) |
| Immunocompromise | 249 (4.0) | 76 (2.4) |
| Prior hospital length of stay [N=9585] | | |
| Mean (SD) | 2.6 (6.1) | 2.2 (6.4) |
| Median (IQR) | 1 (0, 3) | 1 (0, 3) |
| CPR within previous 24h, n (%) [N=9569] | | |
| In the community | 31 (0.5) | 16 (0.3) |
| In hospital | 35 (0.6) | 23 (0.4) |
| **Indicator of acute severity** | | |
| Mechanically ventilated within first 24h *, n (%) [N=9200] | 3423 (55.8) | 2089 (68.0) |
| APACHE II Score [N=9363] | | |
| 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=8785] | 16.0 (11.3, 22.3) | 15.4 (11.3, 21.8) |
| $PaO_2/FiO_2$ ratio †, n (%) [N=8785] | | |
| ≤ 13.3 kPa (≤ 100 mmHg) | 2131 (36.7) | 1103 (37.1) |
| > 13.3 and ≤ 26.7 kPa (> 100 and ≤ 200 mmHg) | 2792 (48.0) | 1446 (48.7) |
| > 26.7 kPa (> 200 mmHg) | 890 (15.3) | 423 (14.2) |

* Please see Definitions on page 36. 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 $PaO_2$ 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 (95.3%) also received advanced respiratory support.

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

| Demographics | Patients receiving advanced respiratory support (N=6842) | Patients receiving only basic respiratory support (N=2368) |
|---|---|---|
| Age at admission (years) [N=9209] | | |
| Mean (SD) | 58.7 (12.0) | 59.3 (14.2) |
| Median (IQR) | 60 (51, 67) | 60 (50, 70) |
| Sex, n (%) [N=9208] | | |
| Female | 1905 (27.9) | 790 (33.4) |
| Male | 4935 (72.1) | 1578 (66.6) |
| Currently or recently pregnant, n (% of females aged 16-49) [N=644] | | |
| Currently pregnant | 12 (2.7) | 9 (4.4) |
| Recently pregnant (within 6 weeks) | 24 (5.5) | 9 (4.4) |
| Not known to be pregnant | 402 (91.8) | 188 (91.3) |
| Ethnicity *, n (%) [N=8755] | | |
| White | 4108 (63.3) | 1730 (76.2) |
| Mixed | 125 (1.9) | 32 (1.4) |
| Asian | 1067 (16.5) | 266 (11.7) |
| Black | 714 (11.0) | 135 (5.9) |
| Other | 472 (7.3) | 106 (4.7) |
| Index of Multiple Deprivation (IMD) quintile *, n (%) [N=9057] | | |
| 1 (least deprived) | 936 (13.9) | 389 (16.8) |
| 2 | 1081 (16.0) | 404 (17.4) |
| 3 | 1336 (19.8) | 416 (17.9) |
| 4 | 1708 (25.3) | 506 (21.8) |
| 5 (most deprived) | 1678 (24.9) | 603 (26.0) |
| Body mass index *, n (%) [N=8634] | | |
| <18.5 | 35 (0.5) | 21 (1.0) |
| 18.5-<25 | 1584 (24.3) | 547 (25.9) |
| 25-<30 | 2302 (35.3) | 715 (33.9) |
| 30-<40 | 2118 (32.5) | 624 (29.6) |
| 40+ | 485 (7.4) | 203 (9.6) |

* Please see Definitions on page 36. 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=6842) | Patients receiving only basic respiratory support (N=2368) |
|---|---|---|
| Dependency prior to admission to acute hospital *, n (%) [N=9067] | | |
| Able to live without assistance in daily activities | 6237 (92.5) | 1958 (84.3) |
| Some assistance with daily activities | 496 (7.4) | 347 (14.9) |
| Total assistance with all daily activities | 10 (0.1) | 19 (0.8) |
| Very severe comorbidities *, n (%) [N=9103] | | |
| Cardiovascular | 22 (0.3) | 41 (1.8) |
| Respiratory | 41 (0.6) | 67 (2.9) |
| Renal | 83 (1.2) | 64 (2.7) |
| Liver | 24 (0.4) | 16 (0.7) |
| Metastatic disease | 21 (0.3) | 24 (1.0) |
| Haematological malignancy | 104 (1.5) | 68 (2.9) |
| Immunocompromise | 202 (3.0) | 120 (5.1) |
| Prior hospital length of stay [N=9209] | | |
| Mean (SD) | 2.2 (5.4) | 2.9 (7.3) |
| Median (IQR) | 1 (0, 3) | 1 (0, 3) |
| CPR within previous 24h, n (%) [N=9200] | | |
| In the community | 42 (0.4) | 5 (0.2) |
| In hospital | 61 (0.6) | 2 (0.1) |
| **Indicator of acute severity** | | |
| Mechanically ventilated within first 24h *, n (%) [N=8955] | 5342 (80.3) | --- |
| APACHE II Score [N=9046] | | |
| Mean (SD) | 15.3 (5.1) | 14.1 (5.5) |
| Median (IQR) | 15 (12, 18) | 14 (10, 17) |
| $PaO_2/FiO_2$ ratio † (kPa), median (IQR) [N=8580] | 15.2 (10.9, 21.1) | 17.5 (12.6, 24.0) |
| $PaO_2/FiO_2$ ratio †, n(%) [N=8580] | | |
| ≤ 13.3 kPa (≤ 100 mmHg) | 2633 (40.0) | 577 (28.9) |
| > 13.3 and ≤ 26.7 kPa (> 100 and ≤ 200 mmHg) | 3110 (47.3) | 1059 (53.0) |
| > 26.7 kPa (> 200 mmHg) | 837 (12.7) | 364 (18.2) |

* Please see Definitions on page 36. 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 $PaO_2$ 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=2488) | Patients not receiving any renal support (N=6932) |
|---|---|---|
| Age at admission (years) [N=9420] | | |
| Mean (SD) | 59.2 (11.1) | 58.7 (13.2) |
| Median (IQR) | 60 (52, 67) | 60 (51, 68) |
| Sex, n (%) [N=9418] | | |
| Female | 566 (22.8) | 2211 (31.9) |
| Male | 1921 (77.2) | 4720 (68.1) |
| Currently or recently pregnant, n (% of females aged 16-49) [N=661] | | |
| Currently pregnant | 2 (1.6) | 21 (3.9) |
| Recently pregnant (within 6 weeks) | 4 (3.1) | 32 (6.0) |
| Not known to be pregnant | 123 (95.3) | 479 (90.0) |
| Ethnicity *, n (%) [N=8949] | | |
| White | 1407 (59.6) | 4568 (69.3) |
| Mixed | 40 (1.7) | 119 (1.8) |
| Asian | 394 (16.7) | 968 (14.7) |
| Black | 359 (15.2) | 508 (7.7) |
| Other | 159 (6.7) | 427 (6.5) |
| Index of Multiple Deprivation (IMD) quintile *, n (%) [N=9259] | | |
| 1 (least deprived) | 327 (13.4) | 1029 (15.1) |
| 2 | 373 (15.2) | 1147 (16.8) |
| 3 | 494 (20.2) | 1287 (18.9) |
| 4 | 629 (25.7) | 1639 (24.1) |
| 5 (most deprived) | 626 (25.6) | 1708 (25.1) |
| Body mass index *, n (%) [N=8831] | | |
| <18.5 | 13 (0.5) | 48 (0.7) |
| 18.5-<25 | 541 (22.5) | 1659 (25.8) |
| 25-<30 | 824 (34.3) | 2253 (35.0) |
| 30-<40 | 834 (34.7) | 1958 (30.5) |
| 40+ | 190 (7.9) | 511 (7.9) |

* Please see Definitions on page 36. Includes 161 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=2488) | Patients not receiving any renal support (N=6932) |
|---|---|---|
| Dependency prior to admission to acute hospital *, n (%) [N=9272] | | |
| Able to live without assistance in daily activities | 2280 (92.5) | 6076 (89.2) |
| Some assistance with daily activities | 179 (7.3) | 701 (10.3) |
| Total assistance with all daily activities | 5 (0.2) | 31 (0.5) |
| Very severe comorbidities *, n (%) [N=9309] | | |
| Cardiovascular | 12 (0.5) | 55 (0.8) |
| Respiratory | 14 (0.6) | 97 (1.4) |
| Renal | 127 (5.1) | 34 (0.5) |
| Liver | 5 (0.2) | 37 (0.5) |
| Metastatic disease | 10 (0.4) | 42 (0.6) |
| Haematological malignancy | 36 (1.5) | 140 (2.0) |
| Immunocompromise | 80 (3.2) | 254 (3.7) |
| Prior hospital length of stay [N=9419] | | |
| Mean (SD) | 2.3 (5.2) | 2.5 (6.5) |
| Median (IQR) | 1 (0, 3) | 1 (0, 3) |
| CPR within previous 24h, n (%) [N=9410] | | |
| In the community | 12 (0.2) | 34 (0.5) |
| In hospital | 15 (0.2) | 49 (0.8) |
| **Indicator of acute severity** | | |
| Mechanically ventilated within first 24h *, n (%) [N=9146] | 1908 (78.4) | 3589 (53.5) |
| APACHE II Score [N=9247] | | |
| 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=8724] | 14.3 (10.4, 20.0) | 16.4 (11.6, 23.0) |
| $PaO_2/FiO_2$ ratio †, n(%) [N=8724] | | |
| ≤ 13.3 kPa (≤ 100 mmHg) | 1052 (44.1) | 2165 (34.2) |
| > 13.3 and ≤ 26.7 kPa (> 100 and ≤ 200 mmHg) | 1076 (45.1) | 3109 (49.1) |
| > 26.7 kPa (> 200 mmHg) | 260 (10.9) | 1062 (16.8) |

* Please see Definitions on page 36. Includes 161 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 $PaO_2$ from the first 24 hours of critical care.

## Outcomes, duration of critical care and organ support

Critical care outcomes have been received for 9505 (of 10,130 ) patients, of whom 3883 patients have died and 5622 have been discharged alive from critical care (Figures 11, 12 and 13). 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 14 and in Figure 15, respectively. Of the 5622 patients discharged from critical care, 804 (14.3%) were last reported to be still in an acute hospital setting and 250 (4.4%) died before being discharged from hospital (Figure 11).

Please note that Figure 13 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 14 and 15 are biased towards patients with shorter lengths of stay in critical care due to the ongoing nature of the UK epidemic. Figure 12 and Figure 13 assume that patients are still in critical care unless ICNARC has been notified otherwise, and Table 9 and Figures 14 and 15 include only those patients who have either died or been discharged from critical care.

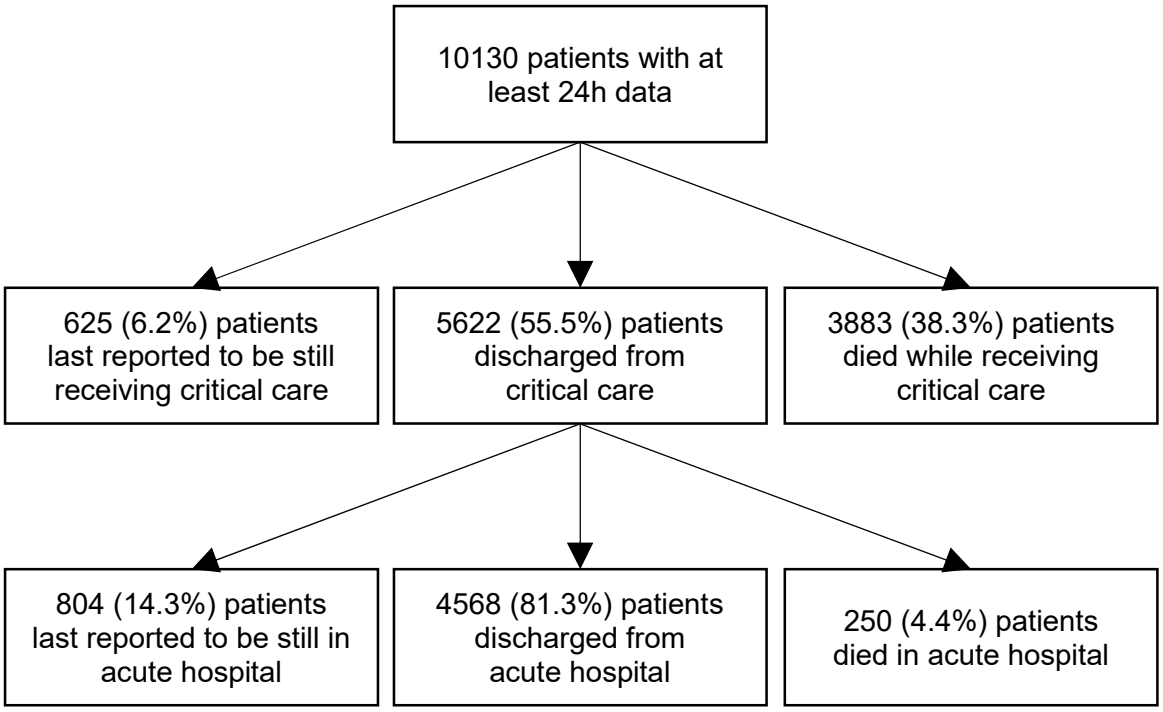



**Figure 11 Critical care and acute hospital outcomes among patients with at least 24h data received**

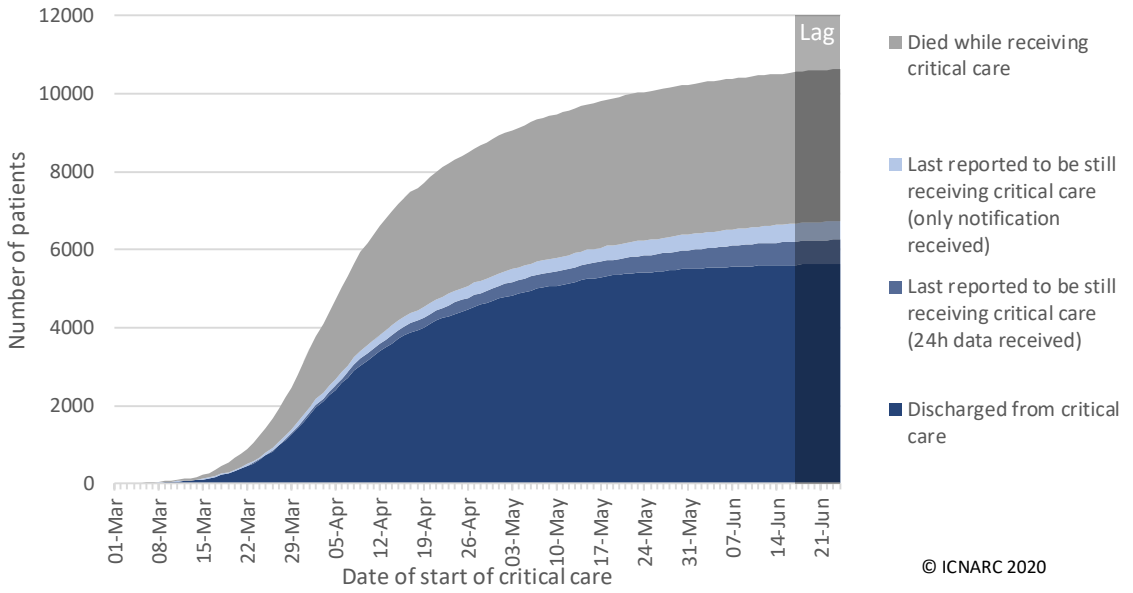
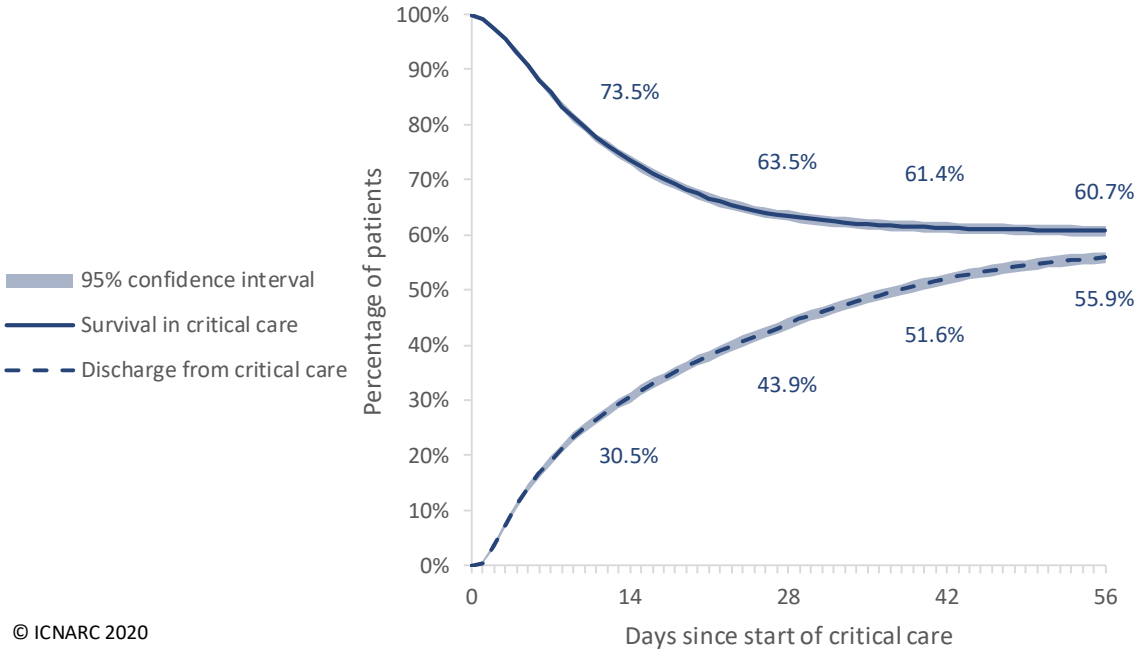



**Figure 12 Cumulative outcomes by date of start of critical care ***

* Please note that patients whose outcome data have not been received are assumed to remain in critical care as of 25 June 2020.




| | | | | | |
|---|---|---|---|---|---|
| Died while receiving critical care | 0 | 2630 | 3590 | 3782 | 3814 |
| Still receiving critical care | 10024 | 4266 | 1926 | 908 | 469 |
| Discharged from critical care | 0 | 3031 | 4315 | 5078 | 5423 |
| Censored | 0 | 97 | 193 | 256 | 318 |

**Figure 13 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 25 June 2020. Due to the ongoing 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=9505) | Patients with viral pneumonia (non-COVID-19), 2017-19 (N=5626) |
|---|---|---|
| Outcome at end of critical care, n (%) | | |
| Discharged | 5622 (59.1) | 4423 (78.6) |
| Died | 3883 (40.9) | 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 | 6842 (72.5) | 2721 (48.4) |
| Basic respiratory support | 6280 (66.5) | 4527 (80.5) |
| Advanced cardiovascular support | 2795 (29.6) | 1261 (22.4) |
| Basic cardiovascular support | 8775 (92.9) | 5219 (92.8) |
| Renal support | 2488 (26.4) | 957 (17.0) |
| Liver support | 93 (1.0) | 53 (0.9) |
| Neurological support | 790 (8.4) | 320 (5.7) |
| Combinations of advanced respiratory, advanced cardiovascular and renal support, n (%): | | |
| Advanced respiratory support only | 3011 (31.7) | 1257 (22.3) |
| Advanced cardiovascular support only | 38 (0.4) | 79 (1.4) |
| Renal support only | 105 (1.1) | 116 (2.1) |
| Advanced respiratory and advanced cardiovascular support only | 1444 (15.2) | 640 (11.4) |
| Advanced respiratory and renal support only | 1086 (11.4) | 299 (5.3) |
| Advanced cardiovascular and renal support only | 12 (0.1) | 17 (0.3) |
| Advanced respiratory, advanced cardiovascular and renal support | 1301 (13.7) | 525 (9.3) |
| Duration of organ support (calendar days), median (IQR) | | |
| Advanced respiratory support | 13 (7, 22) | 9 (4, 17) |
| Total (advanced + basic) respiratory support | 11 (5, 21) | 6 (3, 12) |
| Advanced cardiovascular support | 3 (2, 6) | 3 (2, 5) |
| Total (advanced + basic) cardiovascular support | 11 (5, 21) | 6 (3, 12) |
| Renal support | 7 (3, 14) | 6 (3, 12) |

Please note that owing to the ongoing 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 36. † 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).

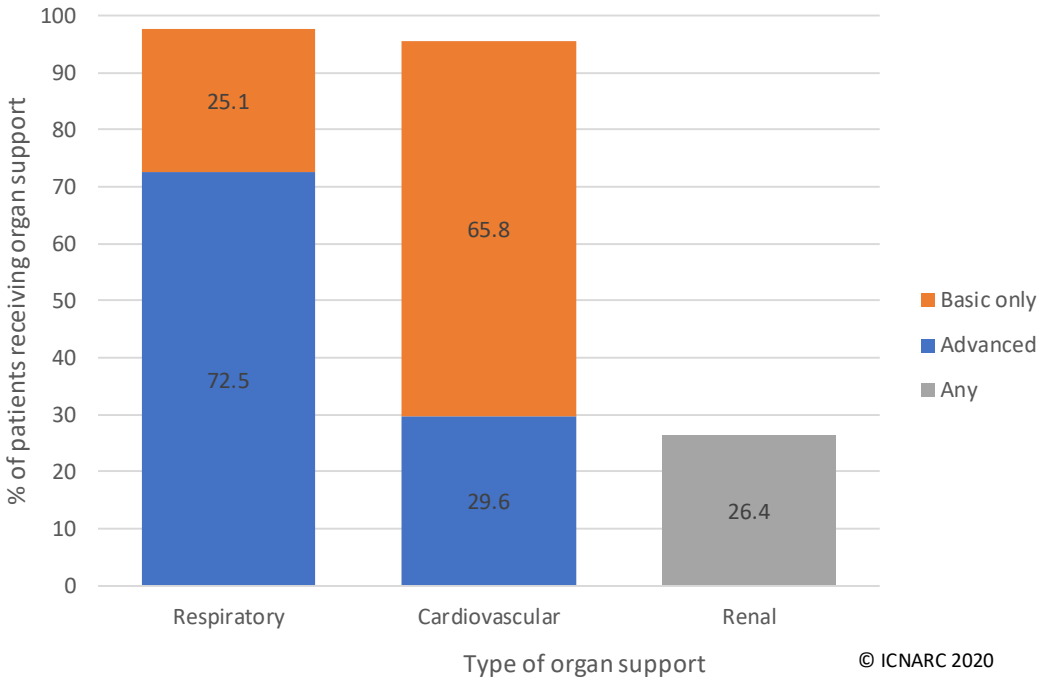



**Figure 14 Percentage of patients receiving organ support ***

Please note that owing to the ongoing nature of the epidemic, the sample of patients with confirmed COVID-19 represented in this figure 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 36.

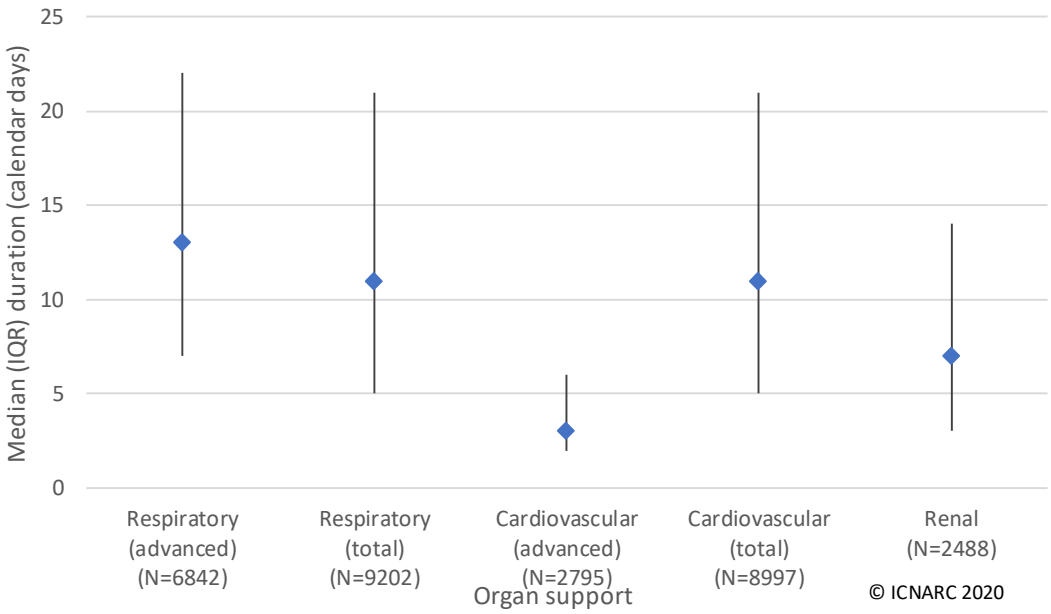



**Figure 15 Duration of organ support received ***

This Figure presents median and interquartile range, in calendar days. Please note that owing to the ongoing nature of the epidemic, the sample of patients with confirmed COVID-19 represented in this figure 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 36.

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 16. Among patients who died in acute hospital following discharge from critical care, 21.9% were reported to have been discharged from critical care for palliative care. A total of 1255 inter-hospital critical care transfers for 1076 patients have been reported, as well as 232 readmissions for 223 patients (Figure 17).

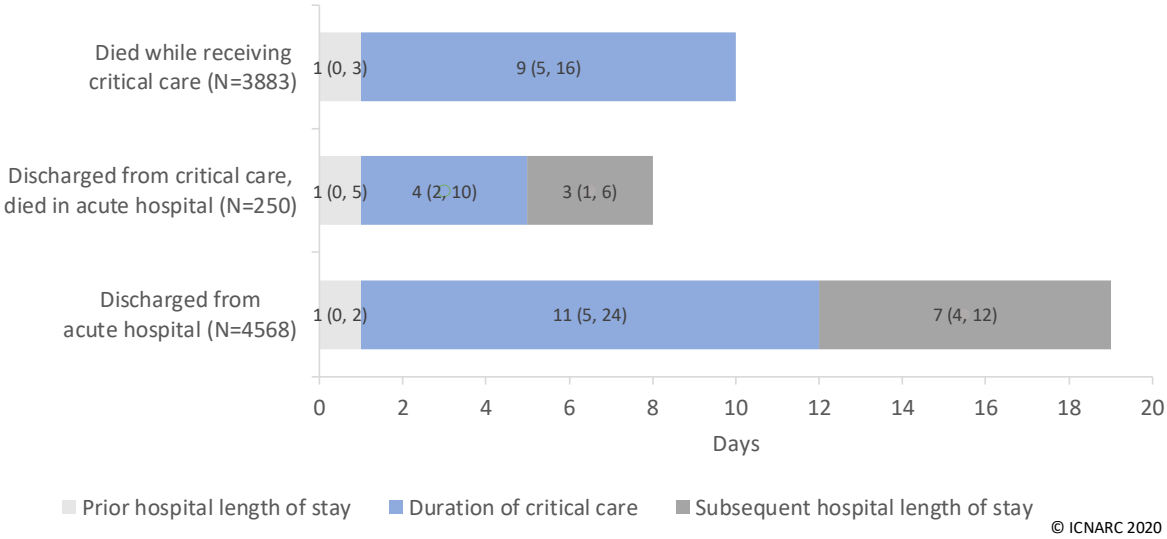



**Figure 16 Median lengths of stay among patients with hospital outcome data received**

The numbers within each bar are the median and interquartile range, in days. Please note that owing to the ongoing nature of the epidemic, the sample of patients with confirmed COVID-19 represented in this figure 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.

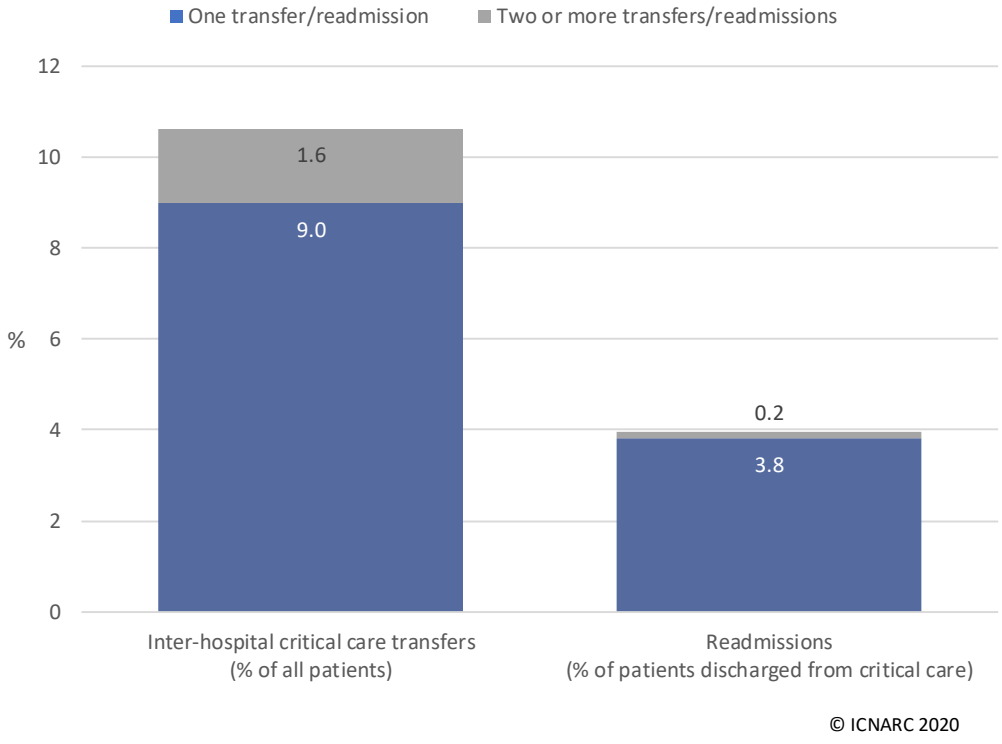



**Figure 17 Inter-hospital critical care transfers and readmissions**

Source: ICNARC Case Mix Programme Database

## 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=9505) | | 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 | 647 (84.8) | 116 (15.2) | (7.1) |
| 40-49 | 1005 (77.7) | 288 (22.3) | (12.1) |
| 50-59 | 1720 (65.5) | 906 (34.5) | (19.1) |
| 60-69 | 1446 (51.8) | 1344 (48.2) | (25.7) |
| 70-79 | 687 (39.5) | 1054 (60.5) | (31.2) |
| 80+ | 116 (39.9) | 175 (60.1) | (30.8) |
| Sex | | | |
| Female | 1791 (63.9) | 1014 (36.1) | (19.1) |
| Male | 3831 (57.2) | 2867 (42.8) | (23.3) |
| Ethnicity * | | | |
| White | 3638 (60.4) | 2388 (39.6) | (21.7) |
| Mixed | 93 (58.1) | 67 (41.9) | (14.0) |
| Asian | 748 (54.4) | 626 (45.6) | (19.4) |
| Black | 495 (56.7) | 378 (43.3) | (12.4) |
| Other | 380 (64.3) | 211 (35.7) | (18.6) |
| Index of Multiple Deprivation (IMD) quintile * | | | |
| 1 (least deprived) | 833 (60.5) | 543 (39.5) | (22.3) |
| 2 | 918 (59.8) | 616 (40.2) | (22.6) |
| 3 | 1066 (59.0) | 740 (41.0) | (22.5) |
| 4 | 1311 (57.4) | 971 (42.6) | (20.1) |
| 5 (most deprived) | 1383 (59.0) | 962 (41.0) | (20.3) |
| Body mass index | | | |
| <25 | 1336 (58.4) | 951 (41.6) | (23.1) |
| 25-<30 | 1757 (56.6) | 1345 (43.4) | (22.5) |
| 30-<40 | 1770 (62.9) | 1046 (37.1) | (18.9) |
| 40+ | 446 (63.3) | 259 (36.7) | (13.6) |
| Assistance required with daily activities | | | |
| No | 5072 (60.2) | 3358 (39.8) | (19.4) |
| Yes | 468 (50.9) | 451 (49.1) | (27.2) |
| Any very severe comorbidities * | | | |
| No | 5185 (60.2) | 3428 (39.8) | (18.8) |
| Yes | 379 (48.7) | 399 (51.3) | (32.8) |

Please note that owing to the ongoing 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 36.

Source: ICNARC Case Mix Programme Database

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=6026) | Patients of non-white ethnicity (N=2998) |
|---|---|---|
| Outcome at end of critical care, n (%) | | |
| Alive | 3638 (60.4) | 1716 (57.2) |
| Dead | 2388 (39.6) | 1282 (42.8) |
| **Duration of critical care** | | |
| Duration of critical care † (days), median (IQR) | | |
| Survivors | 11 (4, 24) | 15 (6, 30) |
| Non-survivors | 8 (4, 15) | 10 (5, 17) |
| **Organ support (Critical Care Minimum Dataset)*** | | |
| Receipt of organ support, at any point, n (%) | | |
| Advanced respiratory support | 4108 (68.7) | 2378 (79.8) |
| Basic respiratory support | 4122 (68.8) | 1868 (62.7) |
| Advanced cardiovascular support | 1671 (28.0) | 970 (32.6) |
| Basic cardiovascular support | 5515 (92.1) | 2824 (94.7) |
| Renal support | 1407 (23.5) | 952 (32.0) |
| Liver support | 38 (0.6) | 41 (1.4) |
| Neurological support | 500 (8.4) | 260 (8.8) |
| Duration of organ support (calendar days), median (IQR) | | |
| Advanced respiratory support | 13 (7, 21) | 14 (8, 23) |
| Total (advanced + basic) respiratory support | 10 (5, 20) | 12 (6, 23) |
| Advanced cardiovascular support | 3 (2, 6) | 3 (1, 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 ongoing 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 36. 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 18 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.

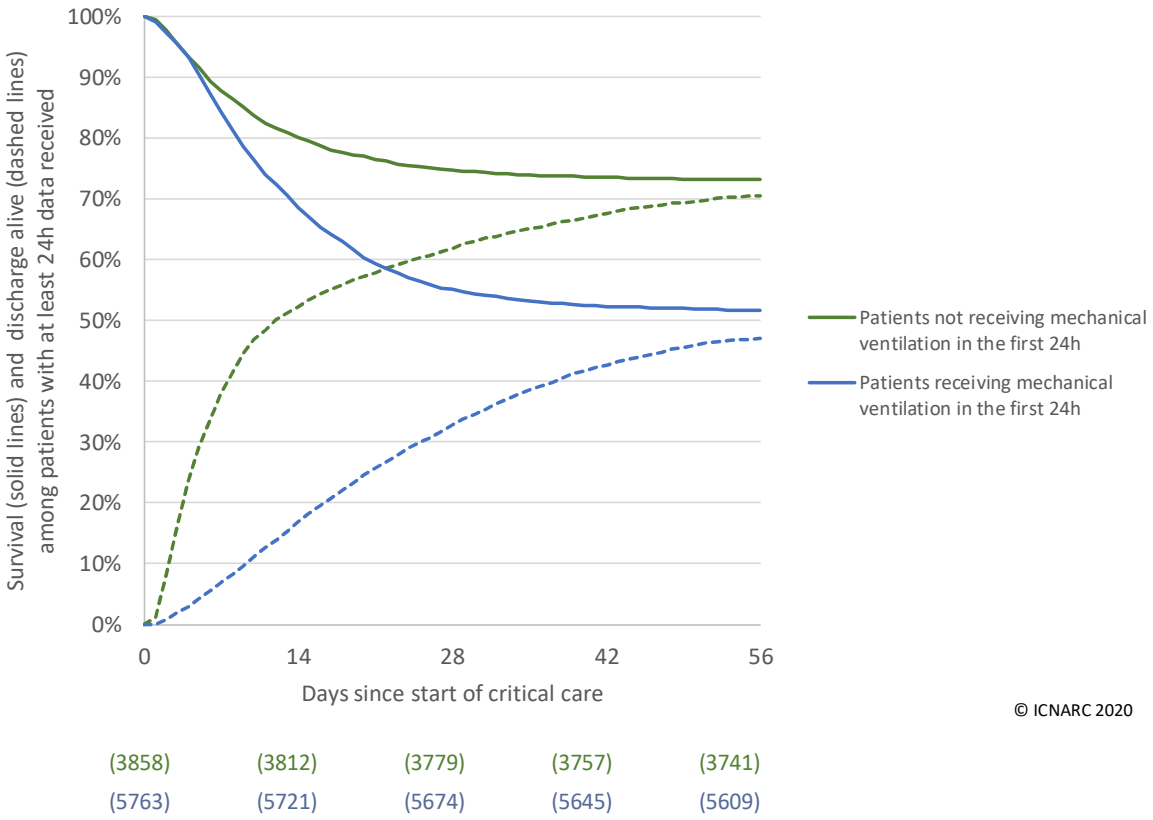



**Figure 18 Survival and discharge by mechanical ventilation during the first 24 hours ***

* Please see Definitions on page 36. 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 25 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 ongoing 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=9505) | | 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 | 1891 (79.9) | 477 (20.1) | (11.2) |
| Advanced | 3488 (51.0) | 3354 (49.0) | (33.3) |
| Any renal support | 1029 (41.1) | 1475 (58.9) | (46.1) |
| Combinations of advanced respiratory, advanced cardiovascular and renal support: | | | |
| Advanced respiratory support only | 1905 (63.3) | 1106 (36.7) | (18.7) |
| Advanced respiratory and advanced cardiovascular support only | 639 (44.3) | 805 (55.7) | (40.2) |
| Advanced respiratory and renal support only | 507 (46.7) | 579 (53.3) | (38.8) |
| Advanced respiratory, advanced cardiovascular and renal support | 437 (33.6) | 864 (66.4) | (56.6) |

Please note that owing to the ongoing 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 36.

## 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=6842) | Patients receiving only basic respiratory support * (N=2368) |
|---|---|---|
| Outcome at end of critical care, n (%) | | |
| Discharged | 3488 (51.0) | 1891 (79.9) |
| Died | 3354 (49.0) | 477 (20.1) |
| **Duration of critical care** | | |
| Duration of critical care † (days), median (IQR) | | |
| Survivors | 21 (12, 34) | 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 | 3903 (57.1) | 2368 (100.0) |
| Advanced cardiovascular support | 2745 (40.2) | 37 (1.6) |
| Basic cardiovascular support | 6595 (96.4) | 1993 (84.2) |
| Renal support | 2371 (34.7) | 88 (3.7) |
| Liver support | 89 (1.3) | 3 (0.1) |
| Neurological support | 765 (11.2) | 22 (0.9) |
| Duration of organ support (calendar days), median (IQR) | | |
| Total (advanced + basic) respiratory support | 15 (8, 25) | 4 (3, 7) |
| Advanced cardiovascular support | 3 (2, 6) | 2 (1, 3) |
| Total (advanced + basic) cardiovascular support | 15 (8, 25) | 4 (3, 7) |
| Renal support | 8 (4, 15) | 3 (2, 5) |

Please note that owing to the ongoing 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 36. 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=2488) | Patients not receiving any renal support * (N=6932) |
|---|---|---|
| Outcome at end of critical care, n (%) | | |
| Discharged | 1017 (40.9) | 4551 (65.7) |
| Died | 1471 (59.1) | 2381 (34.3) |
| **Duration of critical care** | | |
| Duration of critical care † (days), median (IQR) | | |
| Survivors | 29 (19, 42) | 9 (4, 20) |
| Non-survivors | 13 (7, 20) | 7 (4, 13) |
| **Organ support (Critical Care Minimum Dataset) *** | | |
| Receipt of organ support, at any point, n (%) | | |
| Advanced respiratory support | 2371 (95.3) | 4455 (64.3) |
| Basic respiratory support | 1306 (52.5) | 4957 (71.5) |
| Advanced cardiovascular support | 1309 (52.7) | 1481 (21.4) |
| Basic cardiovascular support | 2407 (96.7) | 6344 (91.5) |
| Liver support | 58 (2.3) | 35 (0.5) |
| Neurological support | 331 (13.4) | 459 (6.6) |
| Duration of organ support (calendar days), median (IQR) | | |
| Advanced respiratory support | 17 (10, 27) | 11 (6, 19) |
| Total (advanced + basic) respiratory support | 18 (10, 29) | 9 (4, 17) |
| Advanced cardiovascular support | 4 (2, 7) | 3 (1, 5) |
| Total (advanced + basic) cardiovascular support | 18 (10, 29) | 9 (4, 17) |

Please note that owing to the ongoing 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 36. Includes 161 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=6842) | | Patients receiving only basic respiratory support * (N=2368) | |
|---|---|---|---|---|
| | 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 | 381 (77.9) | 108 (22.1) | 226 (97.4) | 6 (2.6) |
| 40-49 | 662 (72.0) | 258 (28.0) | 304 (92.1) | 26 (7.9) |
| 50-59 | 1134 (57.6) | 835 (42.4) | 539 (90.6) | 56 (9.4) |
| 60-69 | 926 (43.5) | 1204 (56.5) | 459 (78.9) | 123 (21.1) |
| 70-79 | 360 (29.5) | 861 (70.5) | 289 (61.4) | 182 (38.6) |
| 80+ | 24 (21.4) | 88 (78.6) | 74 (46.8) | 84 (53.2) |
| Sex | | | | |
| Female | 1052 (55.2) | 853 (44.8) | 644 (81.5) | 146 (18.5) |
| Male | 2436 (49.4) | 2499 (50.6) | 1247 (79.0) | 331 (21.0) |
| Ethnicity * | | | | |
| White | 2111 (51.4) | 1997 (48.6) | 1366 (79.0) | 364 (21.0) |
| Mixed | 63 (50.4) | 62 (49.6) | 27 (84.4) | 5 (15.6) |
| Asian | 511 (47.9) | 556 (52.1) | 208 (78.2) | 58 (21.8) |
| Black | 363 (50.8) | 351 (49.2) | 114 (84.4) | 21 (15.6) |
| Other | 276 (58.5) | 196 (41.5) | 94 (88.7) | 12 (11.3) |
| Index of Multiple Deprivation (IMD) quintile | | | | |
| 1 (least deprived) | 481 (51.4) | 455 (48.6) | 308 (79.2) | 81 (20.8) |
| 2 | 555 (51.3) | 526 (48.7) | 324 (80.2) | 80 (19.8) |
| 3 | 697 (52.2) | 639 (47.8) | 328 (78.8) | 88 (21.2) |
| 4 | 839 (49.1) | 869 (50.9) | 416 (82.2) | 90 (17.8) |
| 5 (most deprived) | 857 (51.1) | 821 (48.9) | 471 (78.1) | 132 (21.9) |
| Body mass index | | | | |
| <25 | 810 (50.0) | 809 (50.0) | 449 (79.0) | 119 (21.0) |
| 25-<30 | 1111 (48.3) | 1191 (51.7) | 574 (80.3) | 141 (19.7) |
| 30-<40 | 1180 (55.7) | 938 (44.3) | 528 (84.6) | 96 (15.4) |
| 40+ | 262 (54.0) | 223 (46.0) | 168 (82.8) | 35 (17.2) |
| Assistance required with daily activities | | | | |
| No | 3222 (51.7) | 3015 (48.3) | 1654 (84.5) | 304 (15.5) |
| Yes | 219 (43.3) | 287 (56.7) | 209 (57.1) | 157 (42.9) |
| Any very severe comorbidities * | | | | |
| No | 3293 (51.9) | 3048 (48.1) | 1686 (83.3) | 337 (16.7) |
| Yes | 157 (37.4) | 263 (62.6) | 189 (59.2) | 130 (40.8) |

Please note that owing to the ongoing 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 36. 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=2488) | | Patients not receiving any renal support * (N=6932) | |
|---|---|---|---|---|
| | 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 | 80 (63.0) | 47 (37.0) | 558 (89.1) | 68 (10.9) |
| 40-49 | 222 (66.5) | 112 (33.5) | 769 (81.9) | 170 (18.1) |
| 50-59 | 331 (45.3) | 400 (54.7) | 1377 (73.5) | 496 (26.5) |
| 60-69 | 270 (32.6) | 558 (67.4) | 1161 (59.9) | 777 (40.1) |
| 70-79 | 107 (24.4) | 331 (75.6) | 577 (44.5) | 719 (55.5) |
| 80+ | 7 (23.3) | 23 (76.7) | 109 (41.9) | 151 (58.1) |
| Sex | | | | |
| Female | 248 (43.8) | 318 (56.2) | 1524 (68.9) | 687 (31.1) |
| Male | 769 (40.0) | 1152 (60.0) | 3027 (64.1) | 1693 (35.9) |
| Ethnicity * | | | | |
| White | 577 (41.0) | 830 (59.0) | 3023 (66.2) | 1545 (33.8) |
| Mixed | 21 (52.5) | 19 (47.5) | 71 (59.7) | 48 (40.3) |
| Asian | 144 (36.5) | 250 (63.5) | 600 (62.0) | 368 (38.0) |
| Black | 168 (46.8) | 191 (53.2) | 324 (63.8) | 184 (36.2) |
| Other | 66 (41.5) | 93 (58.5) | 311 (72.8) | 116 (27.2) |
| Index of Multiple Deprivation (IMD) quintile | | | | |
| 1 (least deprived) | 145 (44.3) | 182 (55.7) | 672 (65.3) | 357 (34.7) |
| 2 | 150 (40.2) | 223 (59.8) | 757 (66.0) | 390 (34.0) |
| 3 | 225 (45.5) | 269 (54.5) | 825 (64.1) | 462 (35.9) |
| 4 | 230 (36.6) | 399 (63.4) | 1076 (65.6) | 563 (34.4) |
| 5 (most deprived) | 253 (40.4) | 373 (59.6) | 1125 (65.9) | 583 (34.1) |
| Body mass index | | | | |
| <25 | 208 (37.5) | 346 (62.5) | 1117 (65.4) | 590 (34.6) |
| 25-<30 | 301 (36.5) | 523 (63.5) | 1440 (63.9) | 813 (36.1) |
| 30-<40 | 391 (46.9) | 443 (53.1) | 1362 (69.6) | 596 (30.4) |
| 40+ | 93 (48.9) | 97 (51.1) | 349 (68.3) | 162 (31.7) |
| Assistance required with daily activities | | | | |
| No | 935 (41.0) | 1345 (59.0) | 4089 (67.3) | 1987 (32.7) |
| Yes | 72 (39.1) | 112 (60.9) | 394 (53.8) | 338 (46.2) |
| Any very severe comorbidities * | | | | |
| No | 904 (40.7) | 1318 (59.3) | 4228 (67.0) | 2084 (33.0) |
| Yes | 106 (42.9) | 141 (57.1) | 273 (51.7) | 255 (48.3) |

Please note that owing to the ongoing 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 36. Includes 161 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 19-21.

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 has been submitted for publication.

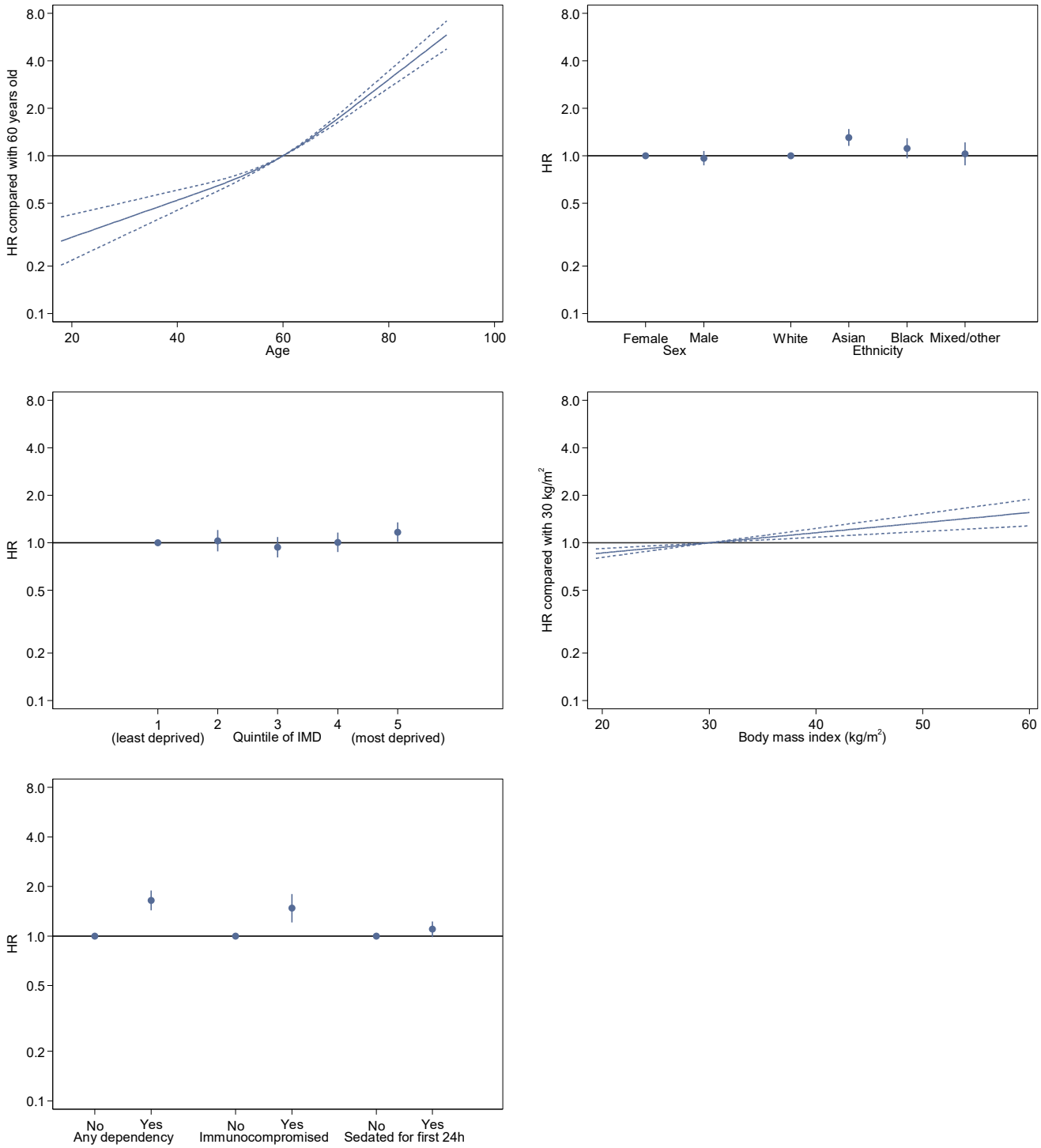



**Figure 19 Hazard ratios and 95% confidence intervals from Cox proportional hazards regression model for death within 30 days following start of critical care: demographics and medical history**

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/m$^2$). Immunocompromised includes the conditions as defined on page 36 and also metastatic disease and haematological malignancy.

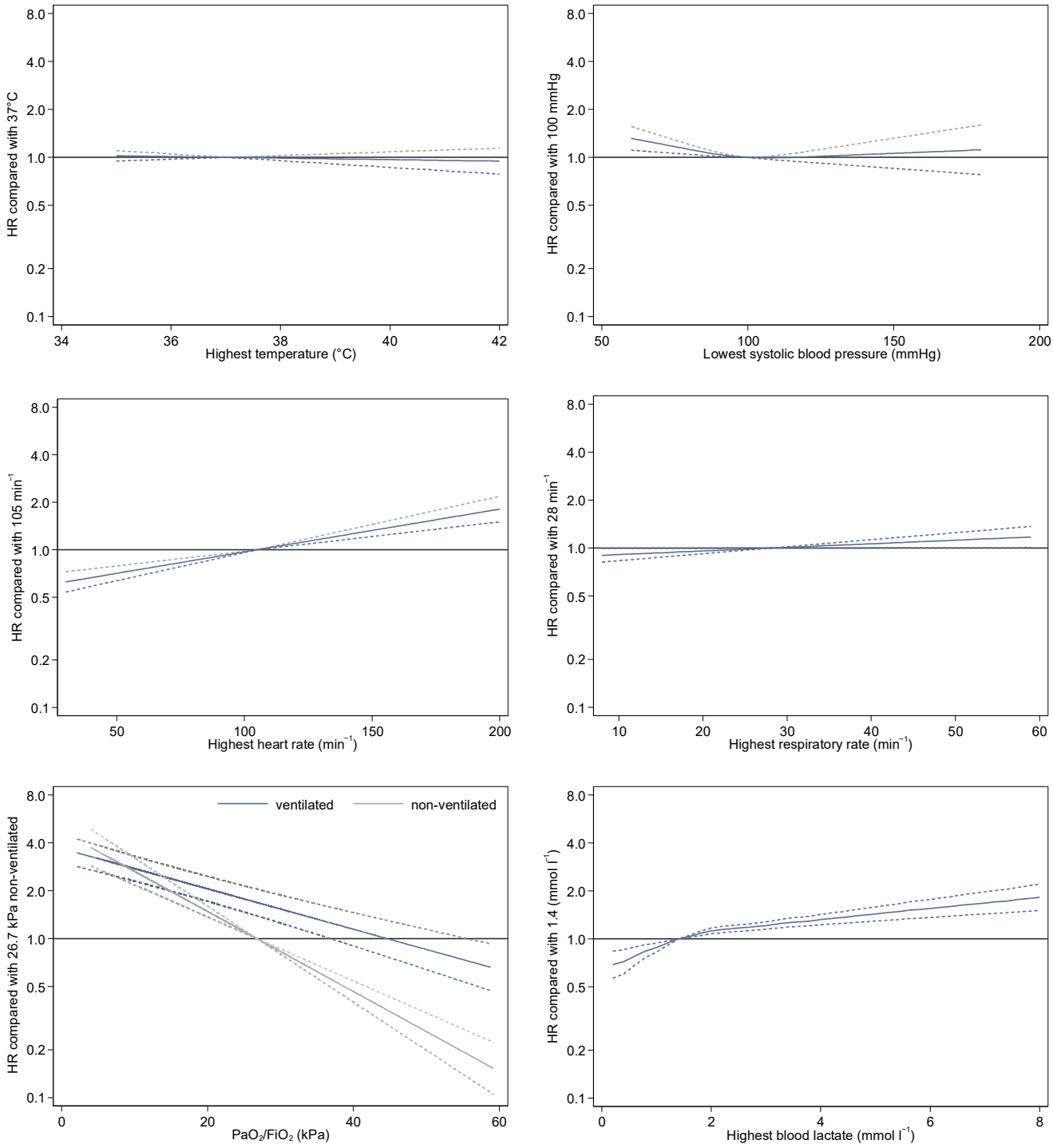



**Figure 20 Hazard ratios and 95% confidence intervals from Cox proportional hazards regression model for death within 30 days following start of critical care: physiology (1)**

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 $PaO_2/FiO_2$ which is reported relative to the threshold for defining ARDS (26.7 kPa).

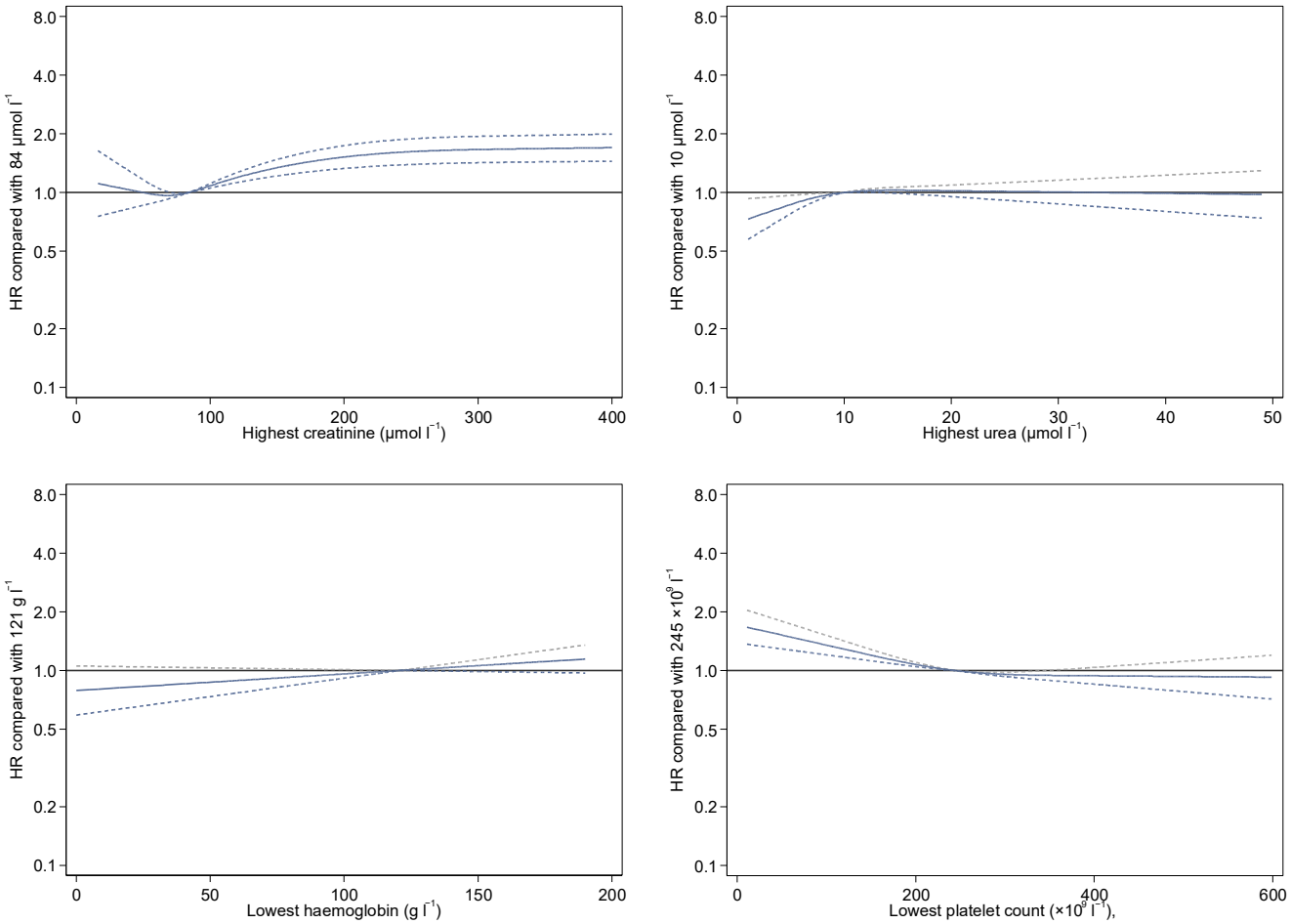



**Figure 21 Hazard ratios and 95% confidence intervals from Cox proportional hazards regression model for death within 30 days following start of critical care: physiology (2)**

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=10130) | |
| NHS number (used to combine transfers and readmissions) | 217 (2.1) |
| Age | 2 (0.0) |
| Sex | 3 (0.0) |
| Currently or recently pregnant | 5 (0.7) † |
| Ethnicity * | 537 (5.3) |
| Index of Multiple Deprivation | 173 (1.7) |
| BMI | 669 (6.6) |
| Prior dependency * | 223 (2.2) |
| Very severe comorbidities * | 159 (1.6) |
| Prior hospital length of stay | 12 (0.1) |
| CPR within previous 24h | 39 (0.4) |
| Mechanical ventilation during the first 24h * | 436 (4.3) |
| APACHE II Score | 260 (2.6) |
| PaO2/FiO2 ratio | 874 (8.6) |
| Outcome variables (N=9505) | |
| Length of stay in critical care | 100 (1.1) |
| Advanced respiratory support * | 69 (0.7) |
| Basic respiratory support * | 68 (0.7) |
| Advanced cardiovascular support * | 78 (0.8) |
| Basic cardiovascular support * | 61 (0.6) |
| Renal support * | 85 (0.9) |
| Liver support * | 101 (1.1) |
| Neurological support * | 98 (1.0) |

* Please see Definitions on page 36; † % 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

**Ethnicity** is recorded using the ethnic category codes from the 2001 census and grouped as:

- White: White – British; White – Irish; White – any other
- Mixed: Mixed – white and black Caribbean; Mixed – white and black African; Mixed – white and Asian; Mixed – any other
- Asian: Asian or Asian British – Indian; Asian or Asian British – Pakistani; Asian or Asian British – Bangladeshi; Asian or Asian British – any other
- Black: Black or black British – Caribbean; Black or black British – African; Black or black British – any other
- Other: Other ethnic group – Chinese; Any other ethnic group
- Not stated or not recorded

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

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

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

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

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

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

**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.”