Dynamic CO-CIN report to SAGE and NERVTAG (Recent cases)
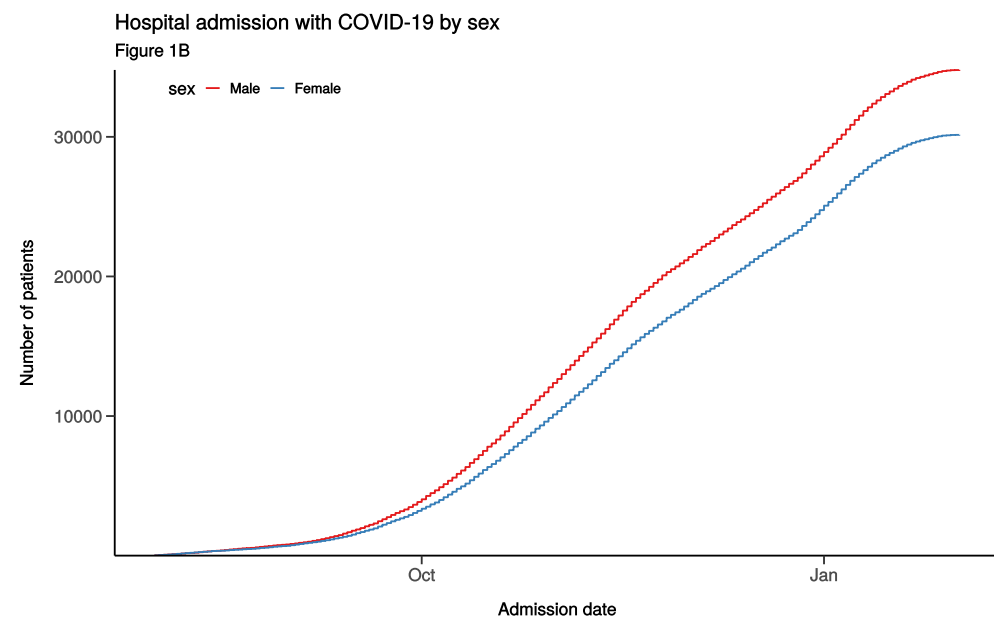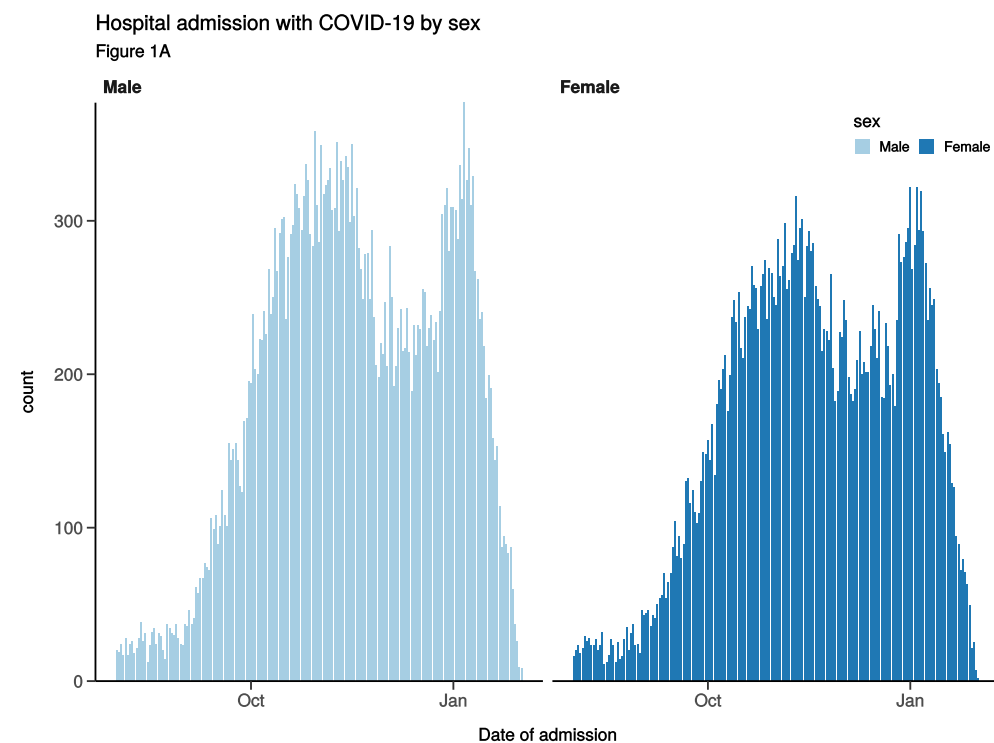
Executive summary

Includes patients admitted after 01 August 2020

There are 65179 patients included in CO-CIN. Of these, 11177 patient(s) have died and 11179 required ICU. 34602 have been discharged home.
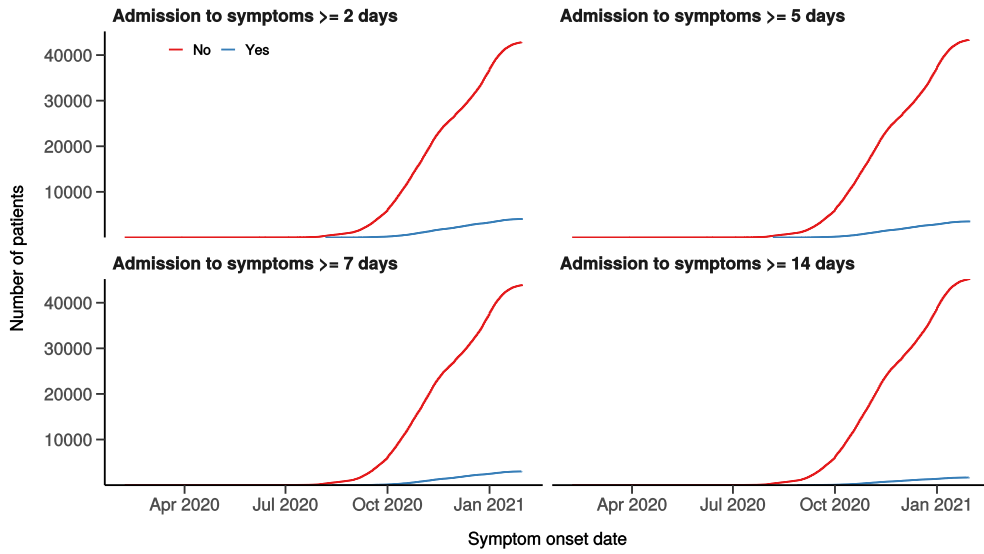
Admission

Figure 1

Hospital admission with COVID-19 by sex
Figure 1A

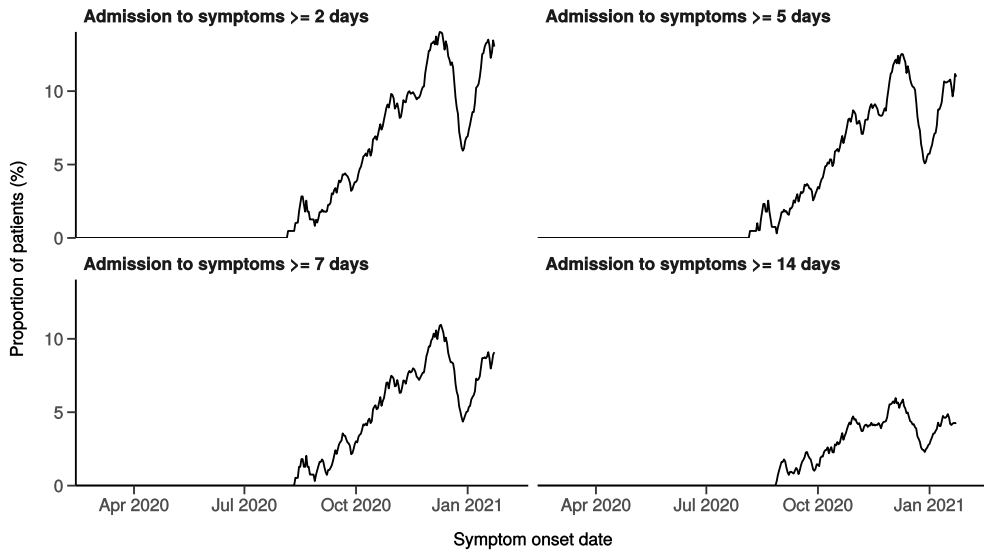
Hospital admission with COVID-19 by sex
Figure 1B

Number with symptom onset occuring after admission to hospital
Figure 1C

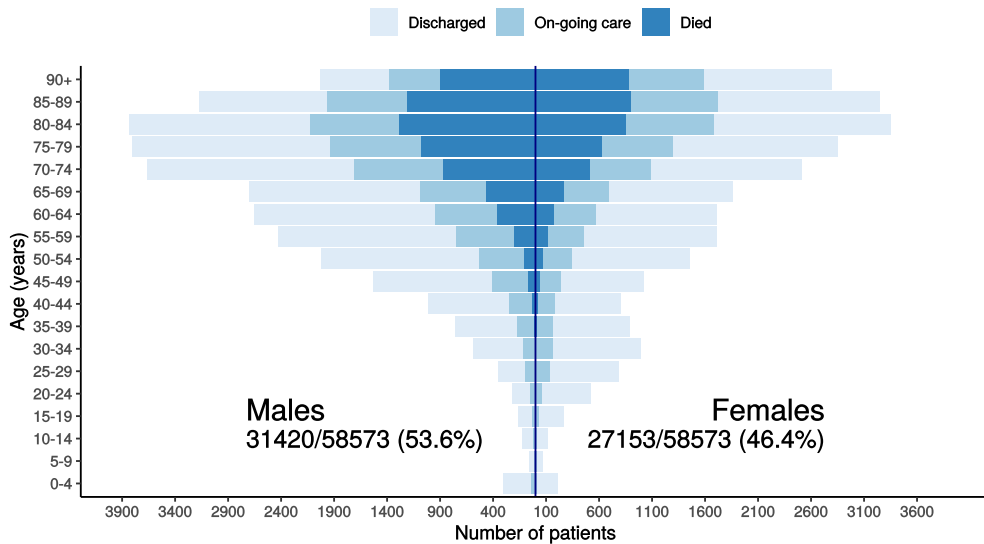# Proportion with symptom onset occuring after hospital admission
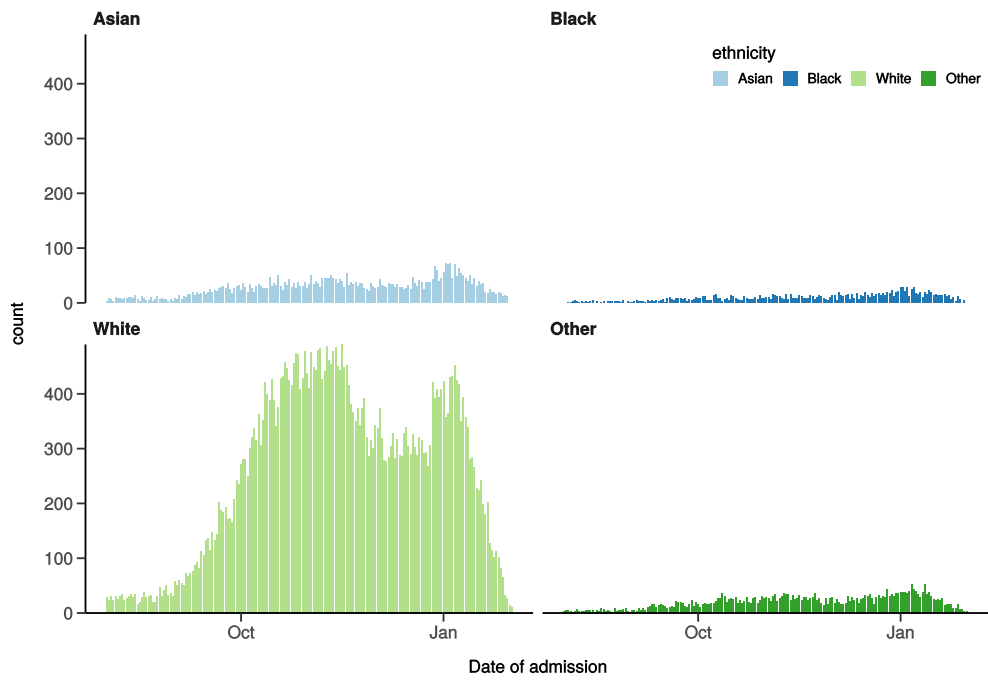Figure 1D - 7-day rolling percentage. n = 46862

Patients with outcome stratified by age, and sex
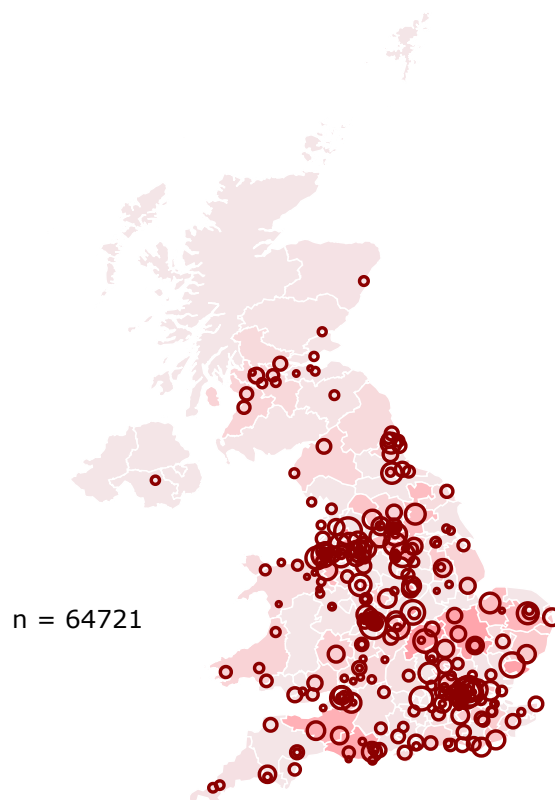Figure 1E

Hospital admission with COVID-19 by ethnicity

Figure 1F

Location by CCG / Healthboard

Figure 2

Click and drag on map to zoom into area. Reset via toolbar at top of map.
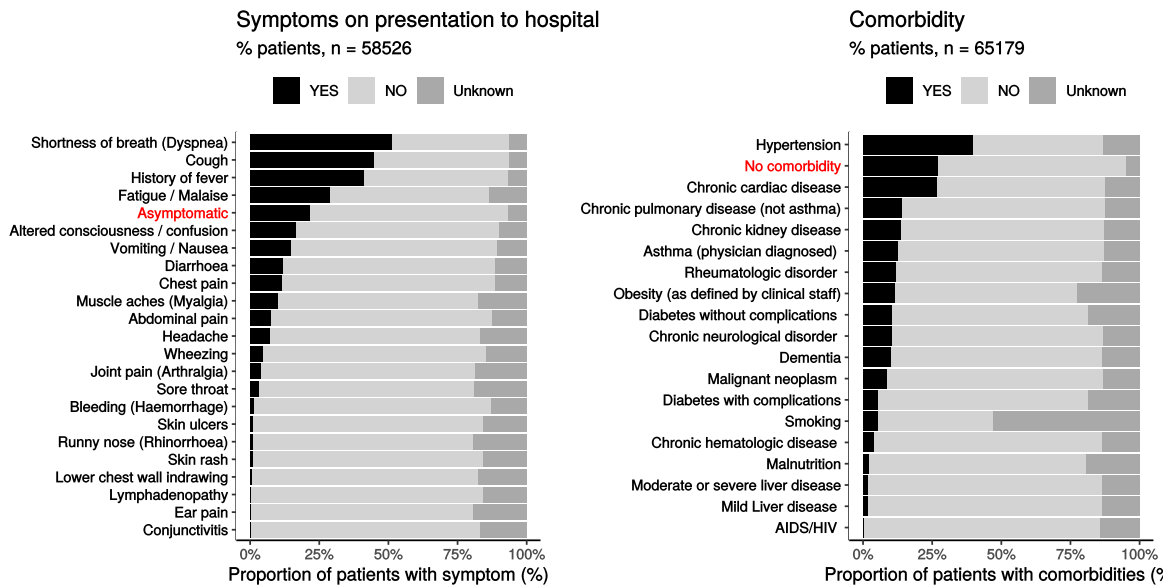

n = 64721

Symptoms and comorbidity

Figure 3A

Symptoms on presentation to hospital
% patients, n = 58526

Comorbidity
% patients, n = 65179

Legend: YES (black), NO (light grey), Unknown (grey)

Symptoms (top to bottom):
- Shortness of breath (Dyspnea)
- Cough
- History of fever
- Fatigue / Malaise
- Asymptomatic
- Altered consciousness / confusion
- Vomiting / Nausea
- Diarrhoea
- Chest pain
- Muscle aches (Myalgia)
- Abdominal pain
- Headache
- Wheezing
- Joint pain (Arthralgia)
- Sore throat
- Bleeding (Haemorrhage)
- Skin ulcers
- Runny nose (Rhinorrhoea)
- Skin rash
- Lower chest wall indrawing
- Lymphadenopathy
- Ear pain
- Conjunctivitis

X-axis: Proportion of patients with symptom (%) — 0%, 25%, 50%, 75%, 100%

Comorbidities (top to bottom):
- Hypertension
- No comorbidity
- Chronic cardiac disease
- Chronic pulmonary disease (not asthma)
- Chronic kidney disease
- Asthma (physician diagnosed)
- Rheumatologic disorder
- Obesity (as defined by clinical staff)
- Diabetes without complications
- Chronic neurological disorder
- Dementia
- Malignant neoplasm
- Diabetes with complications
- Smoking
- Chronic hematologic disease
- Malnutrition
- Moderate or severe liver disease
- Mild Liver disease
- AIDS/HIV

X-axis: Proportion of patients with comorbidities (%) — 0%, 25%, 50%, 75%, 100%

Figure 3B - Symptoms by Age

Symptoms on presentation to hospital
Stratifed by age

Legend: YES (black), NO (light grey), Unknown (grey)

Panels: <50, 50-69, 70-79, 80+

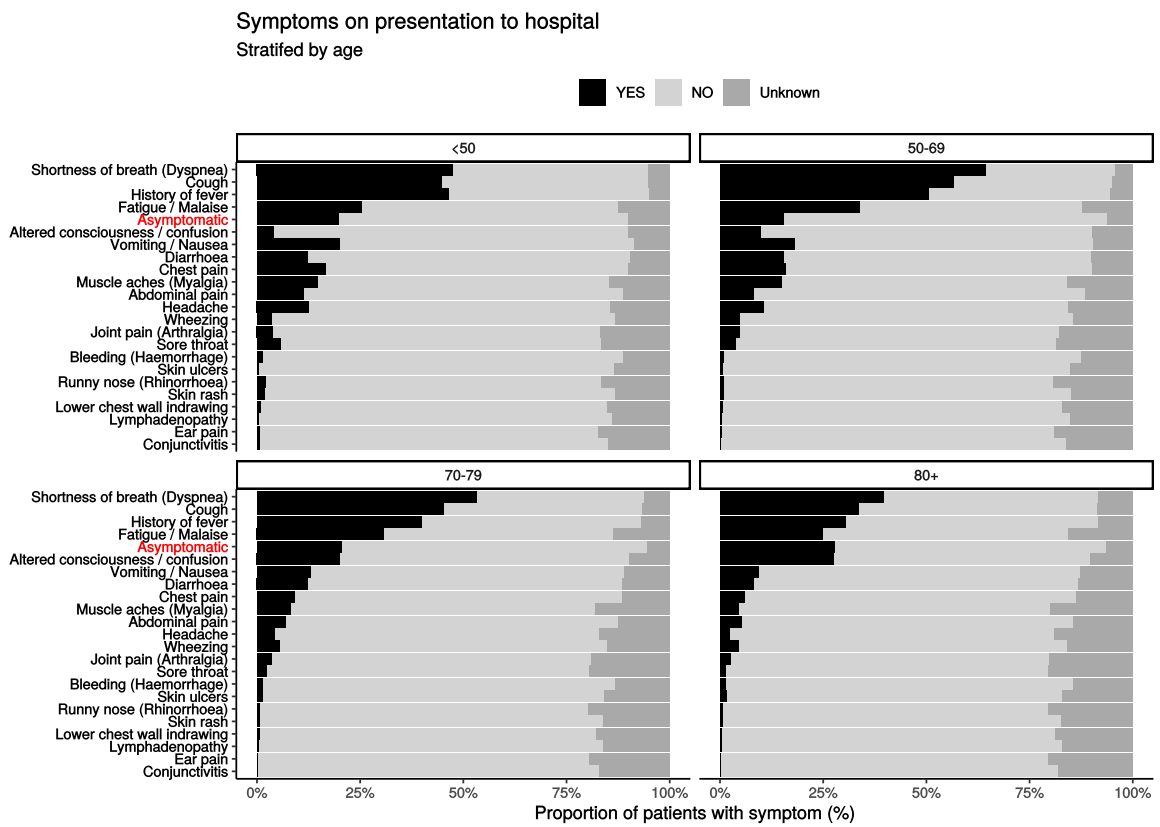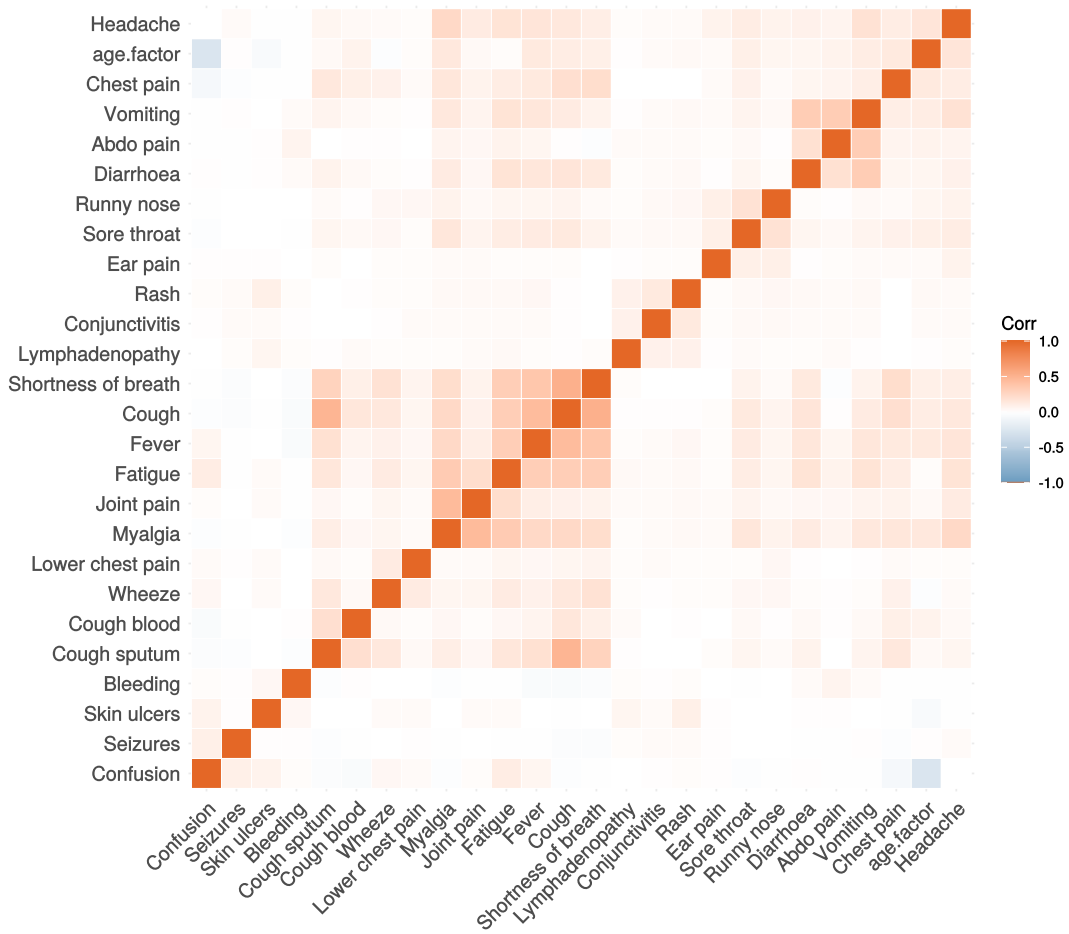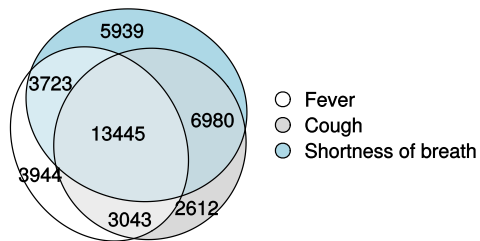X-axis: Proportion of patients with symptom (%) — 0%, 25%, 50%, 75%, 100%

Figure 3C

Correlation of symtpoms in all pages. Note clusters, top right to bottom left, flu-like, coryzal, abdominal, respiratory, neurocutaneous.

Symptoms (diagnostic criteria)

Figure 4A

n = 58526

Fever
Cough
Shortness of breath
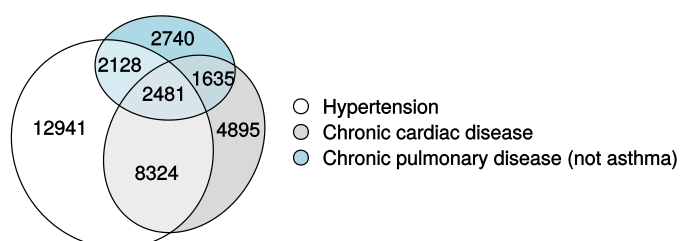
Symptoms (most common)

Figure 4B

n = 58526

Shortness of breath (Dyspnea)
Cough
History of fever

Comorbidity (most common)

Figure 4C

n = 65179

Hypertension
Chronic cardiac disease
Chronic pulmonary disease (not asthma)

Medication prior to illness

Figure 5

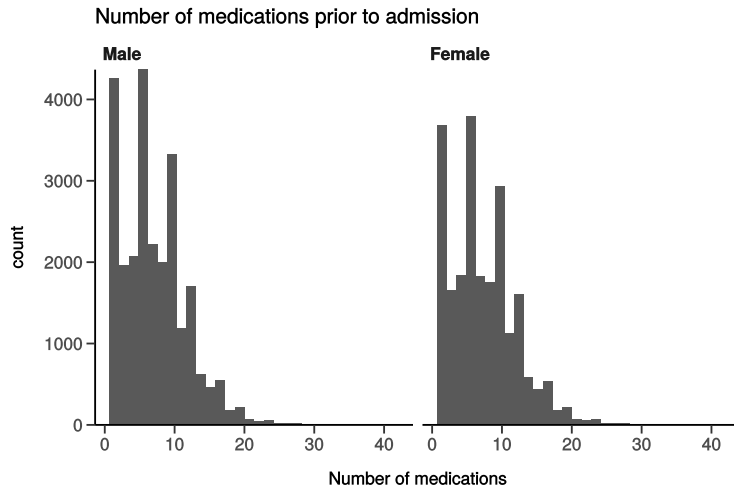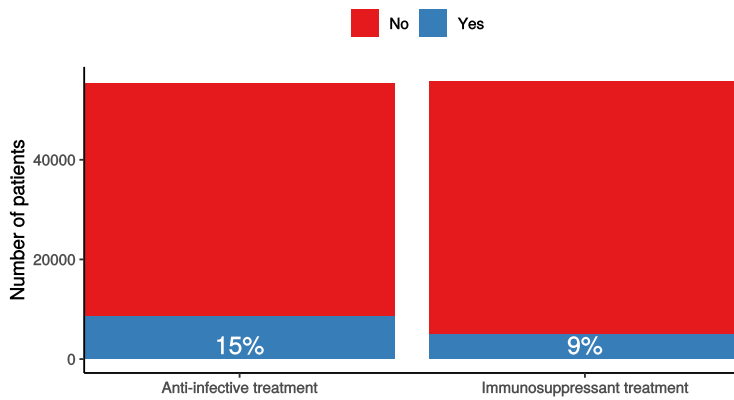## Number of medications prior to admission

Preadmission treatment

Figure 6

Pre-admission treatment
Anti-infectives for illness episode (left) immunosuppressants including oral (not
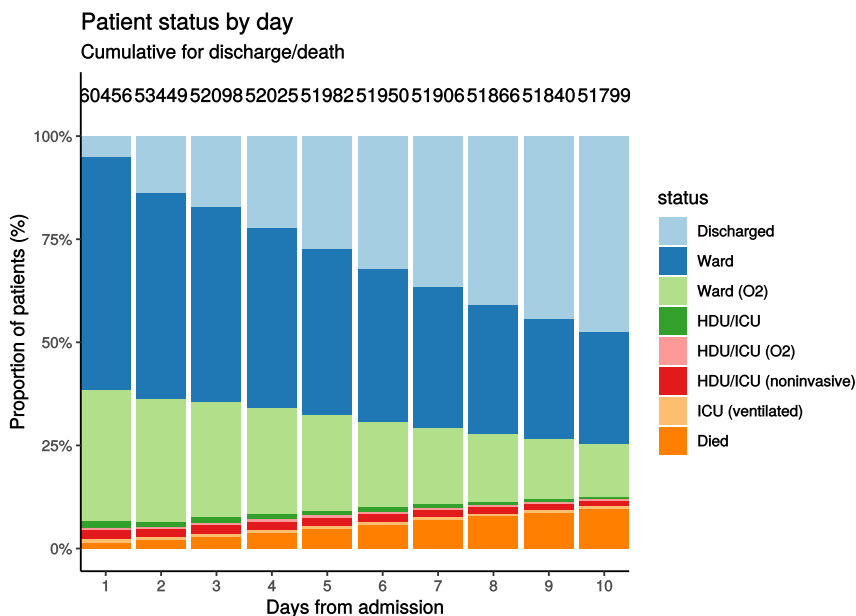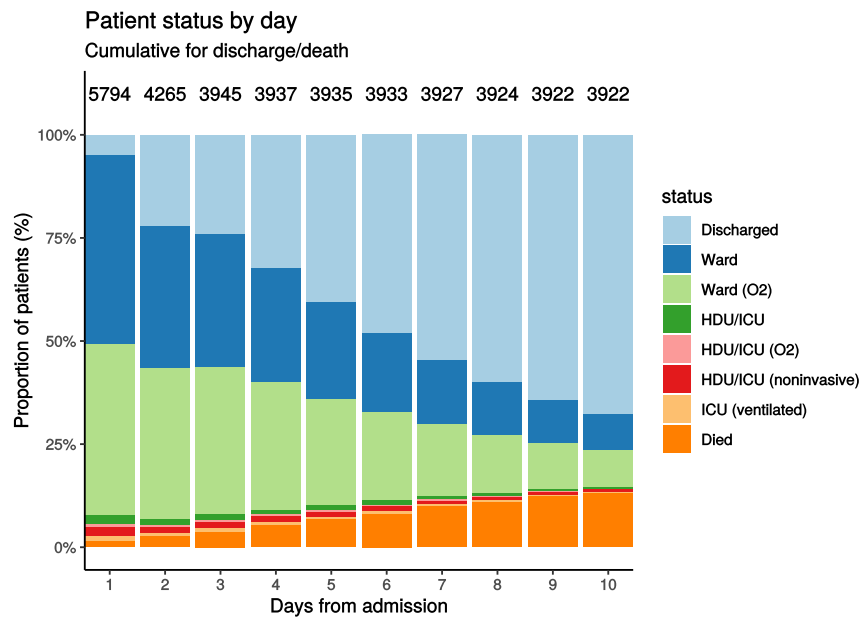

Patient flow

Figure 7A - All patients

N = 60456

Figure 7B - Patients admitted >=14 days and <=28 days ago

N = 5794

Patient status by day
Cumulative for discharge/death

5794 4265 3945 3937 3935 3933 3927 3924 3922 3922

status
- Discharged
- Ward
- Ward (O2)
- HDU/ICU
- HDU/ICU (O2)
- HDU/ICU (noninvasive)
- ICU (ventilated)
- Died

Oxygen requirement
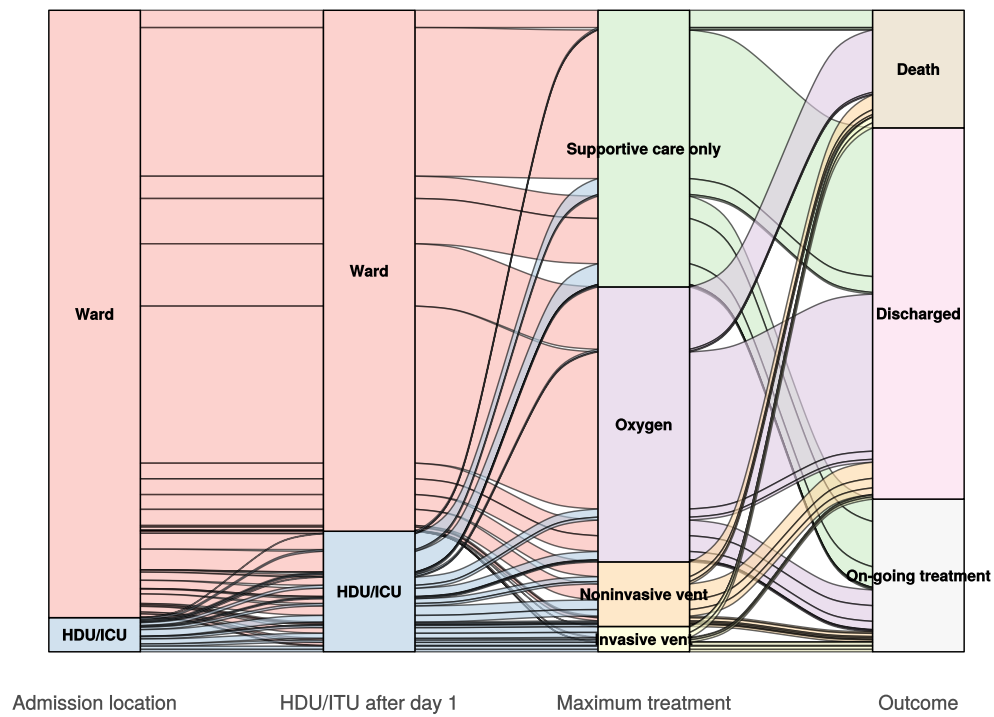
Figure 8A - All patients

N = 57514

Figure 8B - Patients admitted >=14 days and <=28 days ago

N = 5496

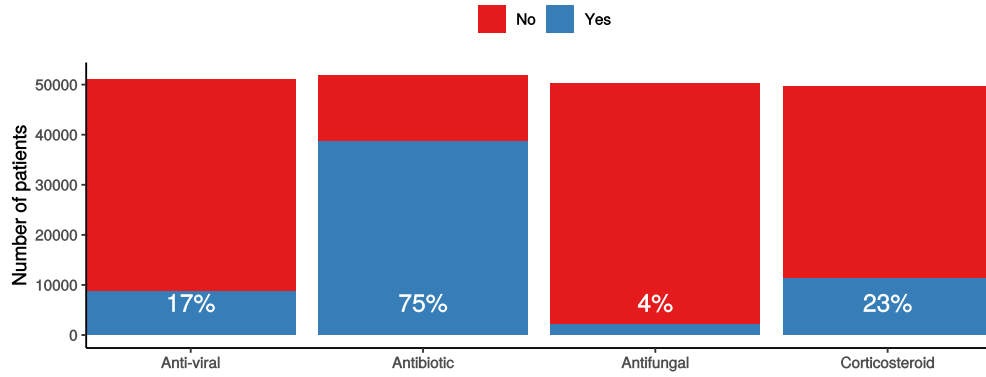## In-hospital medical treatment

Figure 9

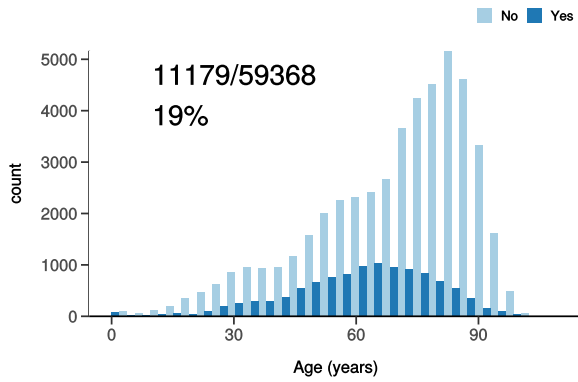## In-hospital treatment

Anti-virals, antibiotics, corticosteroids,
and anti-fungals for patients who have completed journey.
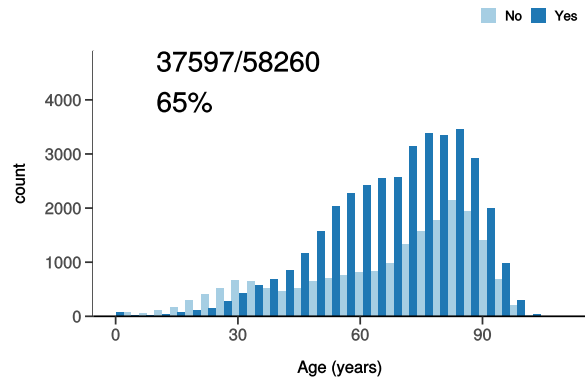

Treatment

Figure 10

ICU/HDU admission
Figure 10A

High flow oxygen
Figure 10B

Noninvasive ventilation
Figure 10C
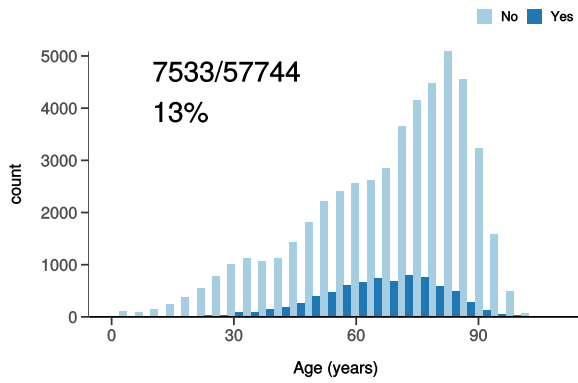
Invasive ventilation
Figure 10D
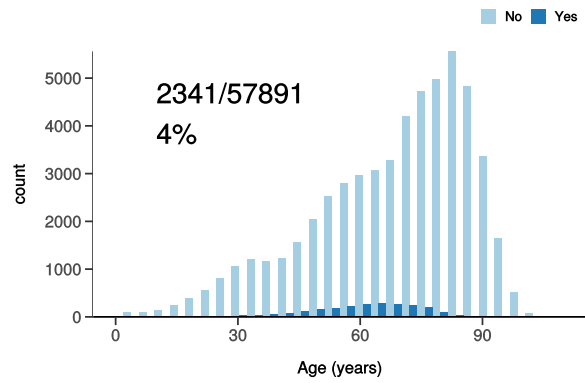
Status in patients admitted >=14 days from today

Figure 11

All: status in patients admitted >=14 days ago
Figure 11A

Died
11126/57929
19%

On-going care
12384/57929
21%

Discharged alive
34306/57929
59%
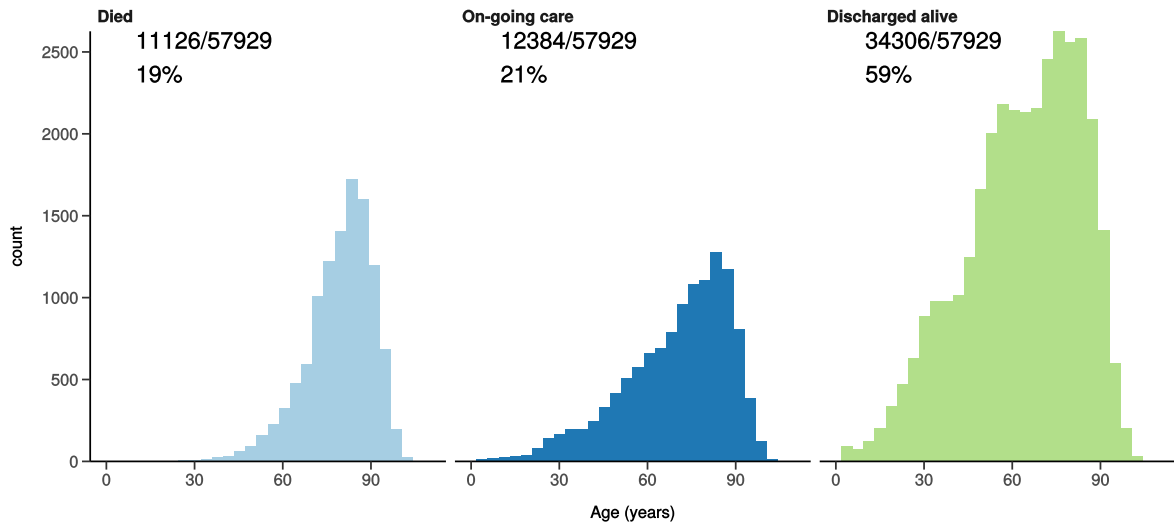
ICU/HDU admissions: status in patients admitted >=14 days ago
Figure 11B

Died
2099/10303
20%

On-going care
3873/10303
38%

Discharged alive
4321/10303
42%
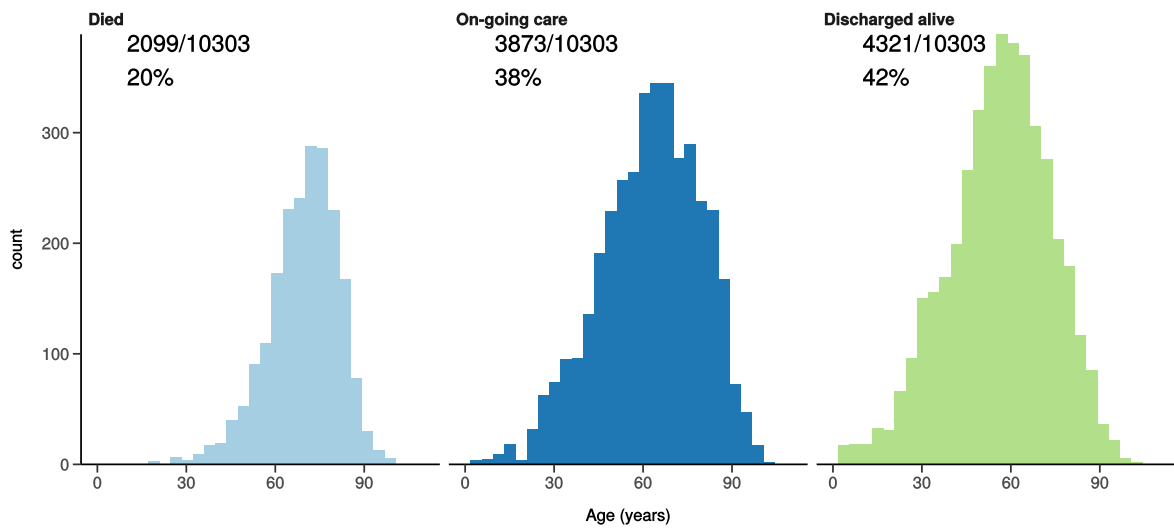
Invasive ventilation: status in patients admitted >=14 days ago
Figure 11c

Died
987/2231
44%

On-going care
806/2231
36%

Discharged alive
434/2231
19%
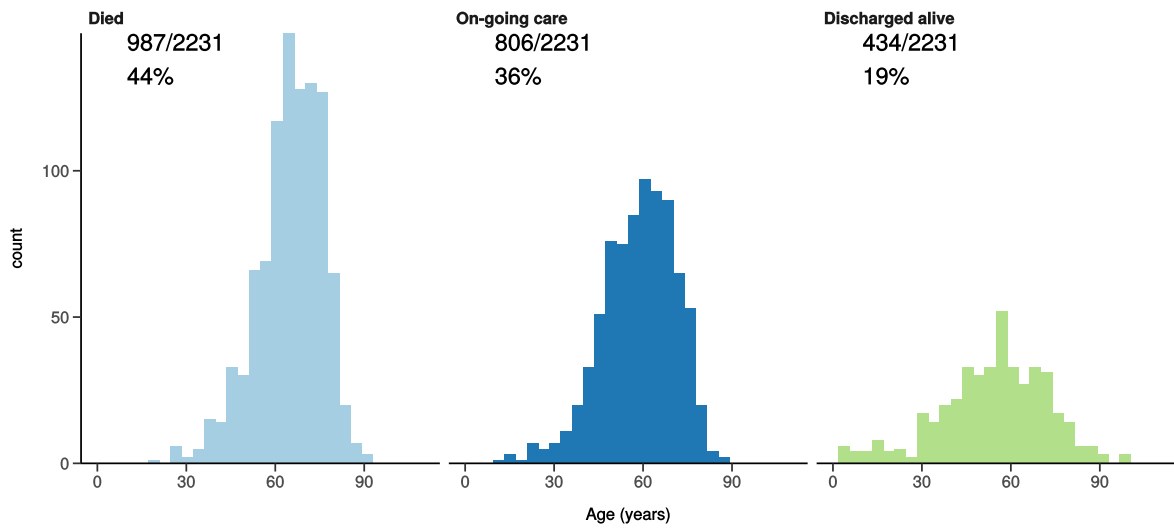
Length of stay stratified by age

Figure 12

Length of stay stratified by age and mortality
Proportion who reach outcome by day 14 shown
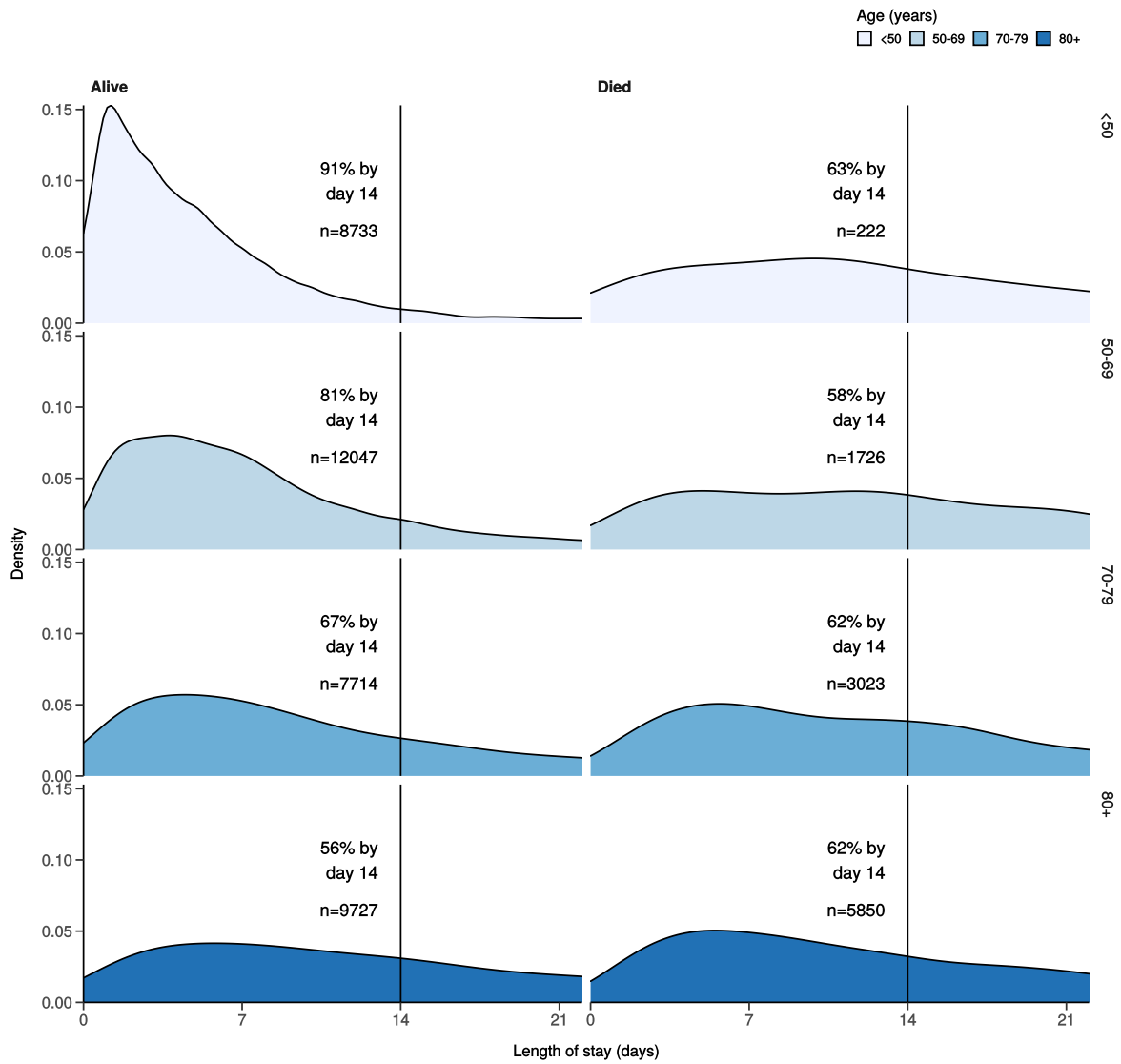
Predictors of death: logistic regression multivariable model

Logistic regression model only includes patients admitted >14 days ago from today.

Dependent: death		No	Yes	OR (univariable)	OR (multivariable)
Age on admission (years)	<50	9487 (97.7)	228 (2.3)	•	•
	50-69	12841 (87.9)	1768 (12.1)	5.73 (4.99-6.61, p<0.001)	4.91 (4.21-5.76, p<0.001)
	70-79	8314 (72.9)	3085 (27.1)	15.44 (13.49-17.76, p<0.001)	11.46 (9.83-13.43, p<0.001)
	80+	10500 (63.6)	6010 (36.4)	23.82 (20.86-27.33, p<0.001)	17.38 (14.92-20.36, p<0.001)
Sex at Birth	Male	21331 (76.3)	6613 (23.7)	•	•
	Female	19837 (81.5)	4488 (18.5)	0.73 (0.70-0.76, p<0.001)	0.69 (0.65-0.72, p<0.001)
	Not specified	0 (NaN)	0 (NaN)	•	•
Chronic cardiac disease	NO	28377 (83.9)	5447 (16.1)	•	•
	YES	10178 (68.1)	4765 (31.9)	2.44 (2.33-2.55, p<0.001)	1.22 (1.15-1.29, p<0.001)

Dependent: death		No	Yes	OR (univariable)	OR (multivariable)
Chronic pulmonary disease (not asthma)	NO	33471 (81.5)	7612 (18.5)	•	•
	YES	5093 (66.3)	2594 (33.7)	2.24 (2.12-2.36, p<0.001)	1.54 (1.45-1.65, p<0.001)
Chronic neurological disorder	NO	34182 (80.0)	8535 (20.0)	•	•
	YES	4209 (72.8)	1576 (27.2)	1.50 (1.41-1.60, p<0.001)	1.04 (0.97-1.12, p=0.288)
Chronic hematologic disease	NO	36708 (79.4)	9497 (20.6)	•	•
	YES	1615 (72.9)	601 (27.1)	1.44 (1.31-1.58, p<0.001)	0.92 (0.82-1.04, p=0.178)
Chronic kidney disease	NO	33475 (81.7)	7482 (18.3)	•	•
	YES	5020 (65.1)	2692 (34.9)	2.40 (2.27-2.53, p<0.001)	1.34 (1.26-1.43, p<0.001)
Dementia	NO	34875 (81.4)	7994 (18.6)	•	•
	YES	3457 (63.3)	2001 (36.7)	2.53 (2.38-2.68, p<0.001)	1.36 (1.27-1.47, p<0.001)
Obesity (as defined by clinical staff)	NO	29239 (79.1)	7730 (20.9)	•	•
	YES	5272 (82.7)	1102 (17.3)	0.79 (0.74-0.85, p<0.001)	1.09 (1.00-1.18, p=0.040)
Malignant neoplasm	NO	35317 (80.7)	8444 (19.3)	•	•
	YES	3052 (64.5)	1681 (35.5)	2.30 (2.16-2.46, p<0.001)	1.64 (1.52-1.77, p<0.001)

Number in dataframe = 63389, Number in model = 41531, Missing = 21858, AIC = 35810, C-statistic = 0.755, H&L = Chi-sq(8) 94.25 (p<0.001)

Figure 13 - Adjusted odds ratio plot

Death

Age on admission (years)	<50	-
	50-69	4.91 (4.21-5.76, p<0.001)
	70-79	11.46 (9.83-13.43, p<0.001)
	80+	17.38 (14.92-20.36, p<0.001)
Sex at Birth	Male	-
	Female	0.69 (0.65-0.72, p<0.001)
	Not specified	-
Chronic cardiac disease	YES	1.22 (1.15-1.29, p<0.001)
Chronic pulmonary disease (not asthma)	YES	1.54 (1.45-1.65, p<0.001)
Chronic neurological disorder	YES	1.04 (0.97-1.12, p=0.288)
Chronic hematologic disease	YES	0.92 (0.82-1.04, p=0.178)
Chronic kidney disease	YES	1.34 (1.26-1.43, p<0.001)
Dementia	YES	1.36 (1.27-1.47, p<0.001)
Obesity (as defined by clinical staff)	YES	1.09 (1.00-1.18, p=0.040)
Malignant neoplasm	YES	1.64 (1.52-1.77, p<0.001)

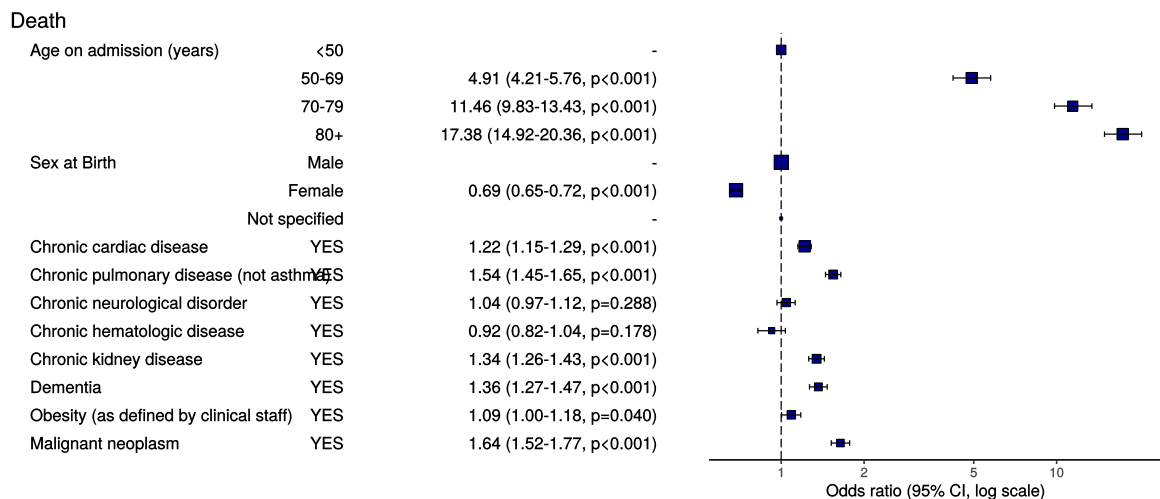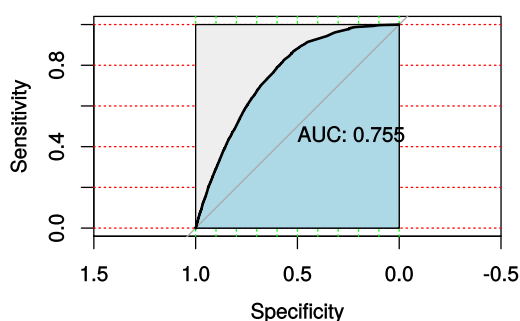Odds ratio (95% CI, log scale)
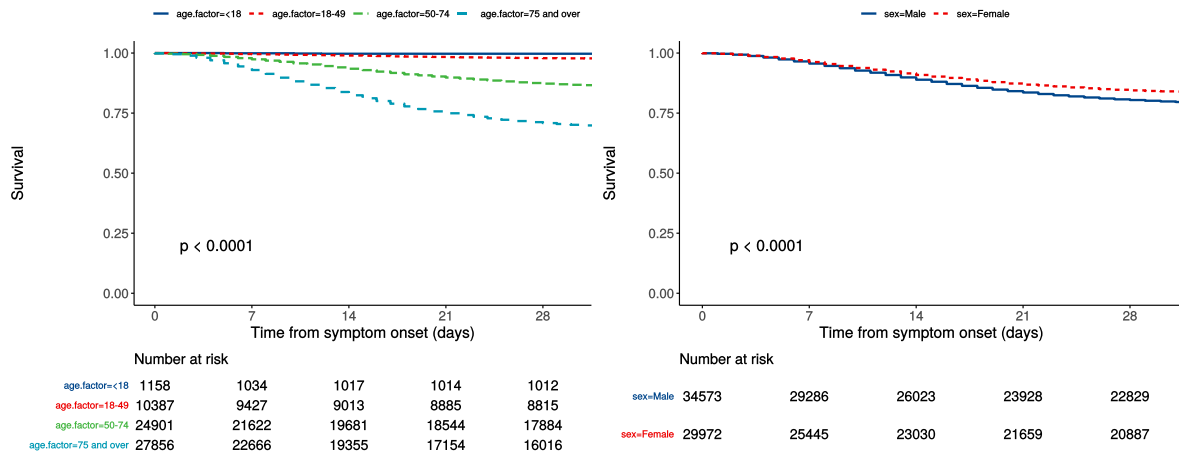
Figure 14 - ROC

AUC: 0.755

Survival models

Kaplan-Meier plots for survival from symptom onset stratified by age (left) and sex (right)

Figure 15

P-value is log-rank test.

Cox proportional hazards model

The methodology for this is now up and running, but models are still being explored. **What is presented here is not a final model, but to demonstrate methodology**. The results are correct, but important variables have not yet been included.

Time from symptom onset.

Dependent: Surv(time, status)		all	HR (univariable)	HR (multivariable)
Age on admission (years)	<50	11545 (18.0)	•	•
	50-69	18098 (28.1)	5.30 (4.62-6.08, p<0.001)	4.53 (3.86-5.33, p<0.001)
	70-79	14236 (22.1)	13.03 (11.40-14.88, p<0.001)	10.59 (9.03-12.42, p<0.001)
	80+	20432 (31.8)	18.94 (16.61-21.60, p<0.001)	15.48 (13.20-18.14, p<0.001)
Sex at Birth	Male	34573 (53.6)	•	•
	Female	29972 (46.4)	0.76 (0.74-0.79, p<0.001)	0.76 (0.72-0.79, p<0.001)
qSOFA score on admission	0	26619 (51.7)	•	•
	1	21285 (41.3)	1.65 (1.58-1.72, p<0.001)	1.85 (1.76-1.94, p<0.001)
	2	3365 (6.5)	3.32 (3.11-3.54, p<0.001)	3.11 (2.88-3.34, p<0.001)
	3	223 (0.4)	5.91 (4.93-7.10, p<0.001)	5.59 (4.55-6.86, p<0.001)
Symptomatic at presentation	No symptoms	10816 (18.4)	•	•
	Symptoms	48060 (81.6)	1.60 (1.51-1.69, p<0.001)	•
Chronic cardiac disease	NO	39393 (69.5)	•	•
	YES	17247 (30.5)	2.21 (2.13-2.30, p<0.001)	1.20 (1.14-1.26, p<0.001)
Chronic kidney disease	NO	47618 (84.3)	•	•
	YES	8876 (15.7)	2.14 (2.05-2.24, p<0.001)	1.26 (1.20-1.33, p<0.001)
Moderate or severe liver disease	NO	54981 (98.1)	•	•
	YES	1088 (1.9)	1.59 (1.42-1.79, p<0.001)	1.64 (1.42-1.89, p<0.001)
Chronic neurological disorder	NO	49617 (88.1)	•	•
	YES	6685 (11.9)	1.43 (1.36-1.51, p<0.001)	•

Dependent: Surv(time, status)		all	HR (univariable)	HR (multivariable)
Malignant neoplasm	NO	50869 (90.4)	•	•
	YES	5427 (9.6)	2.06 (1.96-2.17, p<0.001)	1.50 (1.41-1.60, p<0.001)
Chronic hematologic disease	NO	53696 (95.6)	•	•
	YES	2473 (4.4)	1.39 (1.28-1.51, p<0.001)	•
Obesity (as defined by clinical staff)	NO	42953 (85.4)	•	•
	YES	7320 (14.6)	0.81 (0.76-0.86, p<0.001)	1.05 (0.97-1.12, p=0.223)
Diabetes without complications	NO	46068 (87.3)	•	•
	YES	6717 (12.7)	1.16 (1.09-1.23, p<0.001)	•
Rheumatologic disorder	NO	48362 (86.2)	•	•
	YES	7739 (13.8)	1.22 (1.16-1.29, p<0.001)	•
Dementia	NO	49749 (88.6)	•	•
	YES	6375 (11.4)	2.24 (2.13-2.35, p<0.001)	1.18 (1.11-1.25, p<0.001)
Malnutrition	NO	51022 (97.7)	•	•
	YES	1210 (2.3)	1.68 (1.51-1.87, p<0.001)	•
smoking_mhyn_2levels	NO	26990 (46.0)	•	•
	YES	3332 (5.7)	0.91 (0.83-1.00, p=0.046)	•
	N/K	28373 (48.3)	1.16 (1.12-1.21, p<0.001)	•

Number in dataframe = 64773, Number in model = 42003, Missing = 22770, Number of events = 7503, Concordance = 0.753 (SE = 0.003), R-squared = 0.137(Max possible = 0.976), Likelihood ratio test = 6201.016 (df = 13, p = 0.000)

Figure 16a - Multivariable Cox proportional hazards model

Survival: HR (95% CI, p-value)

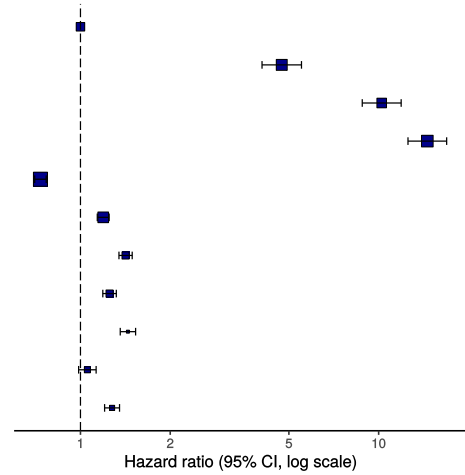|		
Age on admission (years)	<50	-
	50-69	4.53 (3.86-5.33, p<0.001)
	70-79	10.59 (9.03-12.42, p<0.001)
	80+	15.48 (13.20-18.14, p<0.001)
Sex at Birth	Female	0.76 (0.72-0.79, p<0.001)
qSOFA score on admission	0	-
	1	1.85 (1.76-1.94, p<0.001)
	2	3.11 (2.88-3.34, p<0.001)
	3	5.59 (4.55-6.86, p<0.001)
Chronic cardiac disease	YES	1.20 (1.14-1.26, p<0.001)
Chronic kidney disease	YES	1.26 (1.20-1.33, p<0.001)
Moderate or severe liver disease	YES	1.64 (1.42-1.89, p<0.001)
Malignant neoplasm	YES	1.50 (1.41-1.60, p<0.001)
Obesity (as defined by clinical staff)	YES	1.05 (0.97-1.12, p=0.223)
Dementia	YES	1.18 (1.11-1.25, p<0.001)

Hazard ratio (95% CI, log scale)
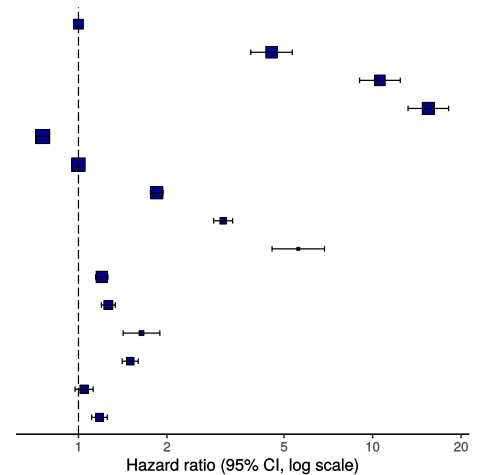
Figure 16b - Multivariable Cox proportional hazards model (age, sex, comorbidities only)

Survival: HR (95% CI, p-value)

Age on admission (years)	<50	-
	50-69	4.73 (4.06-5.51, p<0.001)
	70-79	10.24 (8.81-11.90, p<0.001)
	80+	14.56 (12.54-16.91, p<0.001)
Sex at Birth	Female	0.73 (0.70-0.77, p<0.001)
Chronic cardiac disease	YES	1.19 (1.14-1.25, p<0.001)
Chronic pulmonary disease (not asthma)	YES	1.42 (1.35-1.49, p<0.001)
Chronic kidney disease	YES	1.25 (1.19-1.32, p<0.001)
Malignant neoplasm	YES	1.44 (1.36-1.53, p<0.001)
Obesity (as defined by clinical staff)	YES	1.05 (0.99-1.13, p=0.122)
Dementia	YES	1.28 (1.20-1.35, p<0.001)

Hazard ratio (95% CI, log scale)

ROC = 0.7541223

Figure 17 - Predictions calibration plot

Black: observed Gray: ideal
Blue : optimism corrected

Predicted 7 Day Survival B=40 based on observed-predicted
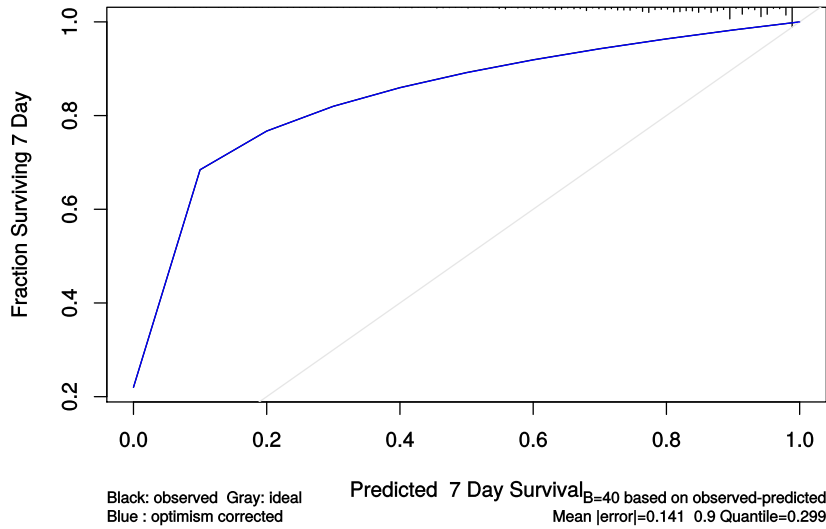Mean |error|=0.141 0.9 Quantile=0.299

Figure 18 - Prognostic model predictions

Again, for demonstration of methods.

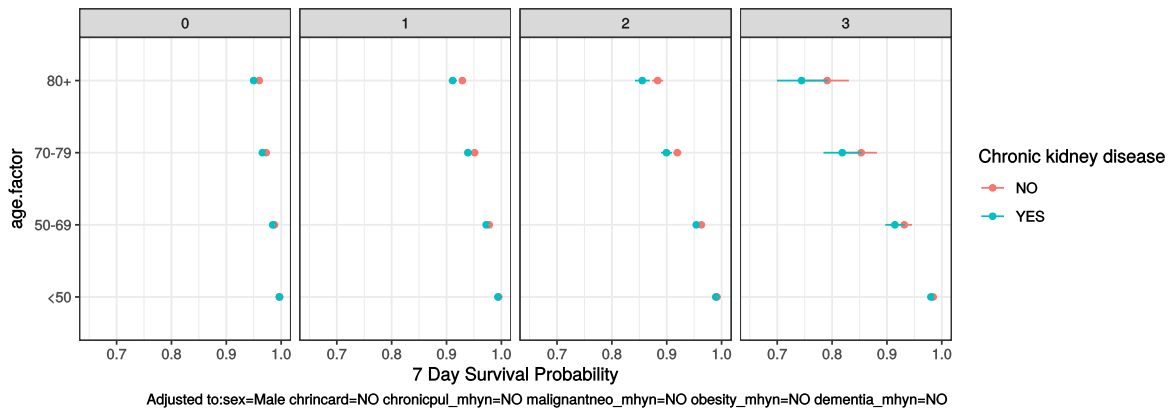Prognostic model for survival 7 days after onset

qSOFA score on admission

Adjusted to:sex=Male chrincard=NO chronicpul_mhyn=NO malignantneo_mhyn=NO obesity_mhyn=NO dementia_mhyn=NO

Figure 19 - Death by severity (NEWS) on admission

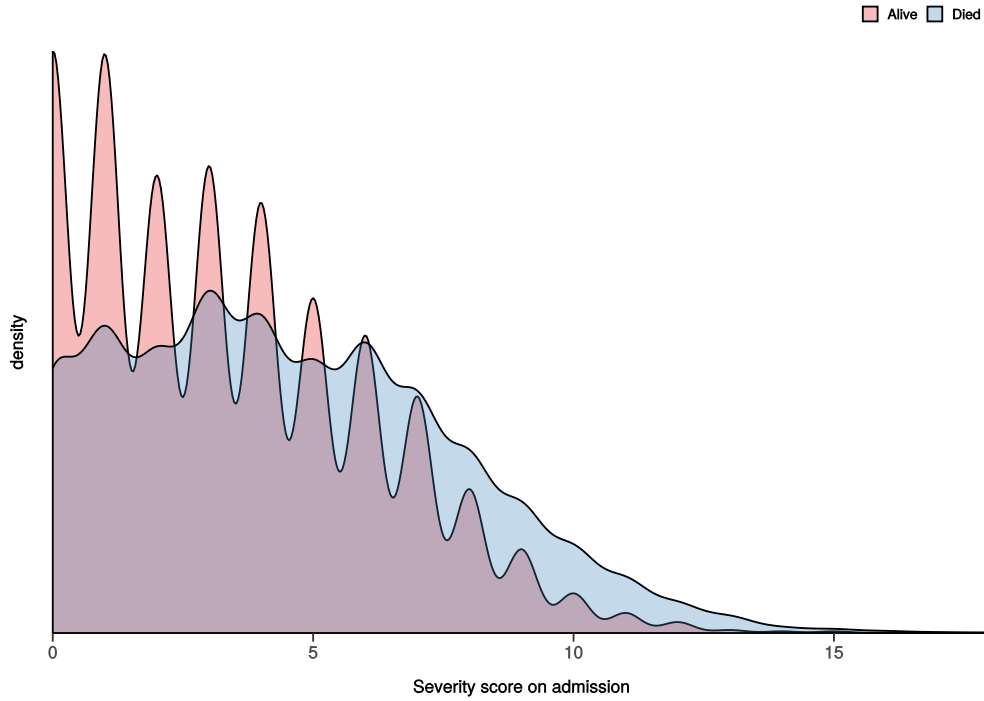Number of deaths by NEWS score at admission

Figure 20 - Death by severity (NEWS) on admission stratified by age

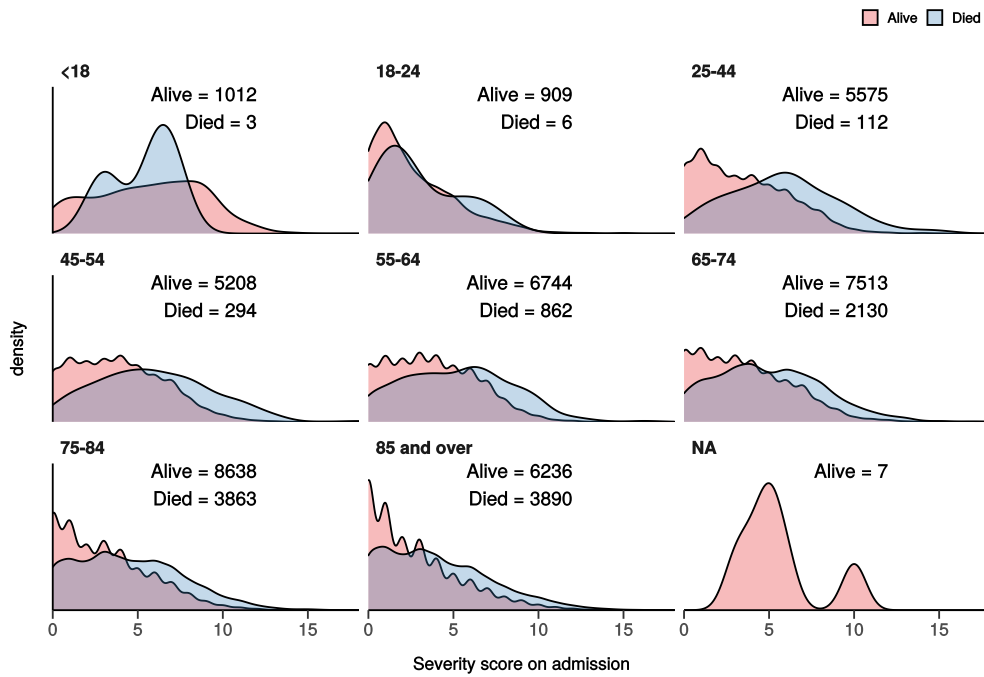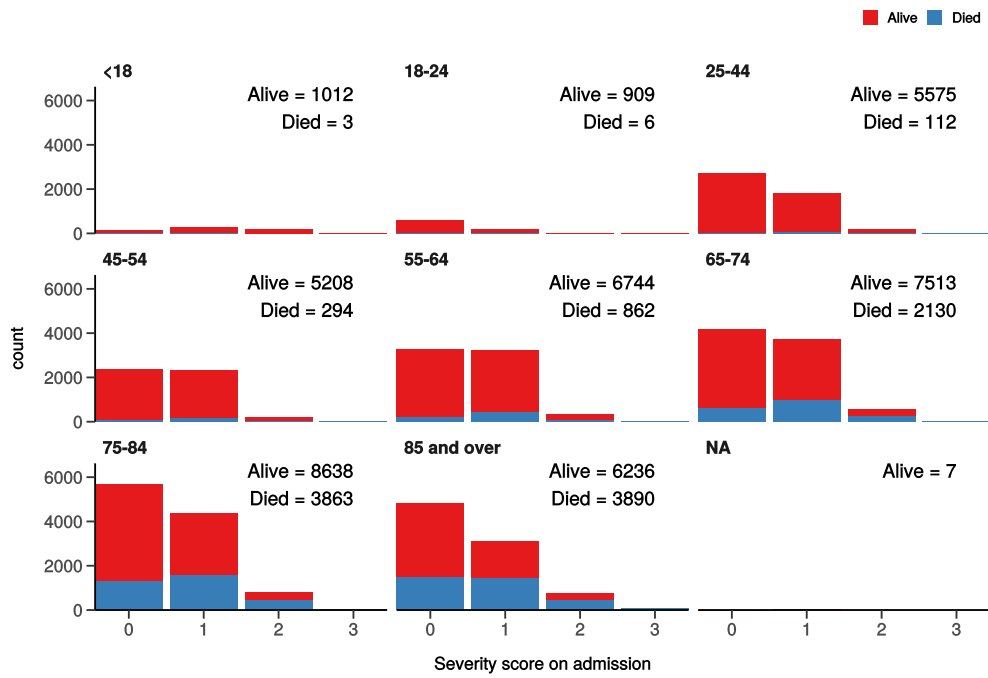Number of deaths by NEWS score at admission
Stratified by age

Figure 21 - Death by severity (qSOFA) on admission stratified by age

Number of deaths by qSOFA score at admission
Stratified by age

Healthcare workers

Employed as a healthcare worker?		NO	YES	p
Total N (%)		49711 (97.6)	1234 (2.4)	
NEWS score on admission	Median (IQR)	3.0 (4.0)	3.0 (5.0)	<0.001
Death	No	30843 (75.7)	994 (94.3)	<0.001
	Yes	9891 (24.3)	60 (5.7)	