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

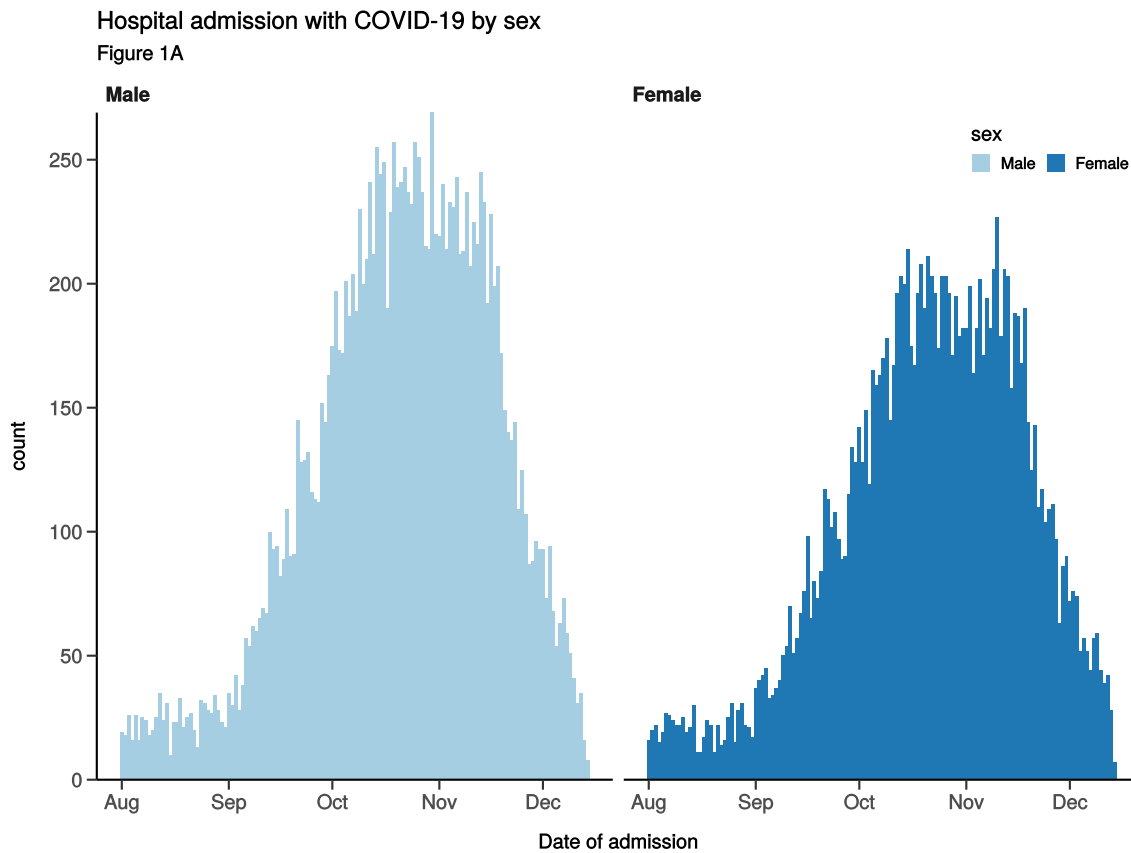Dynamic content updated: 2020-12-16 04:05:16.

Executive summary

Includes patients admitted after 01 August 2020

There are 30462 patients included in CO-CIN. Of these, 4740 patient(s) have died and 4210 required ICU. 16442 have been discharged home.
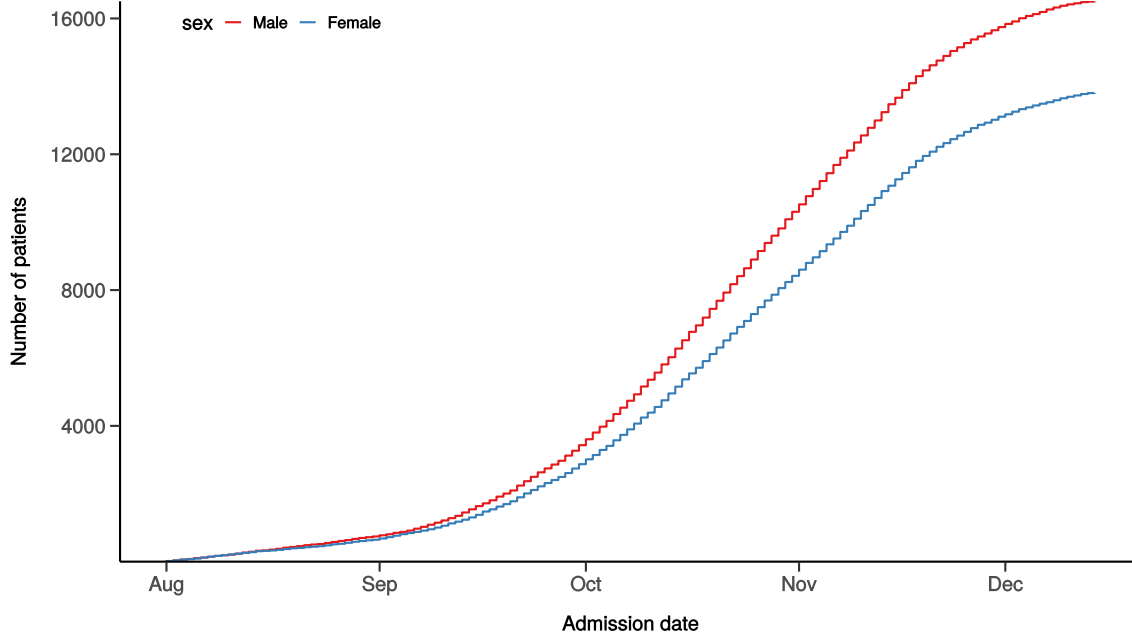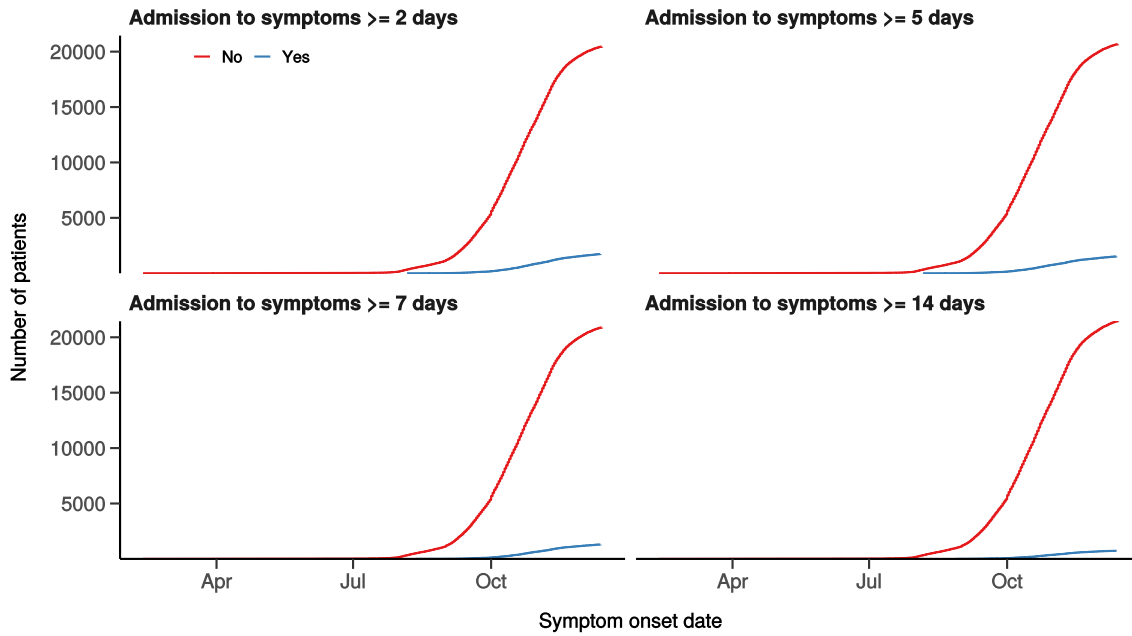
Admission

Figure 1

Hospital admission with COVID-19 by sex

Figure 1A

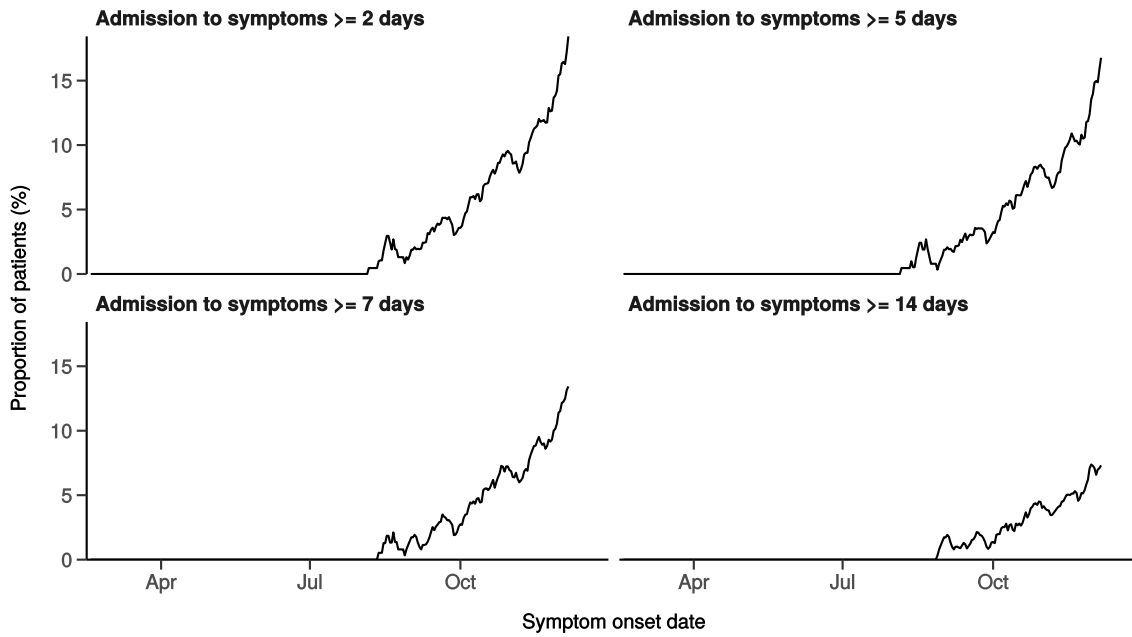## Hospital admission with COVID-19 by sex
Figure 1B

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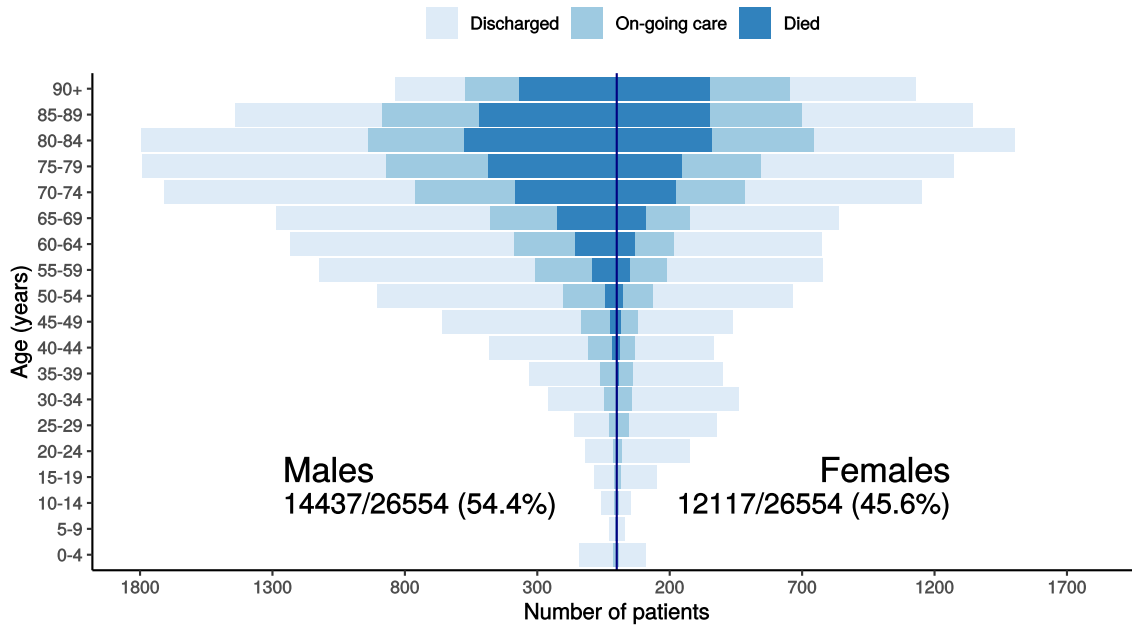### Figure 1C

Proportion with symptom onset occuring after hospital admission
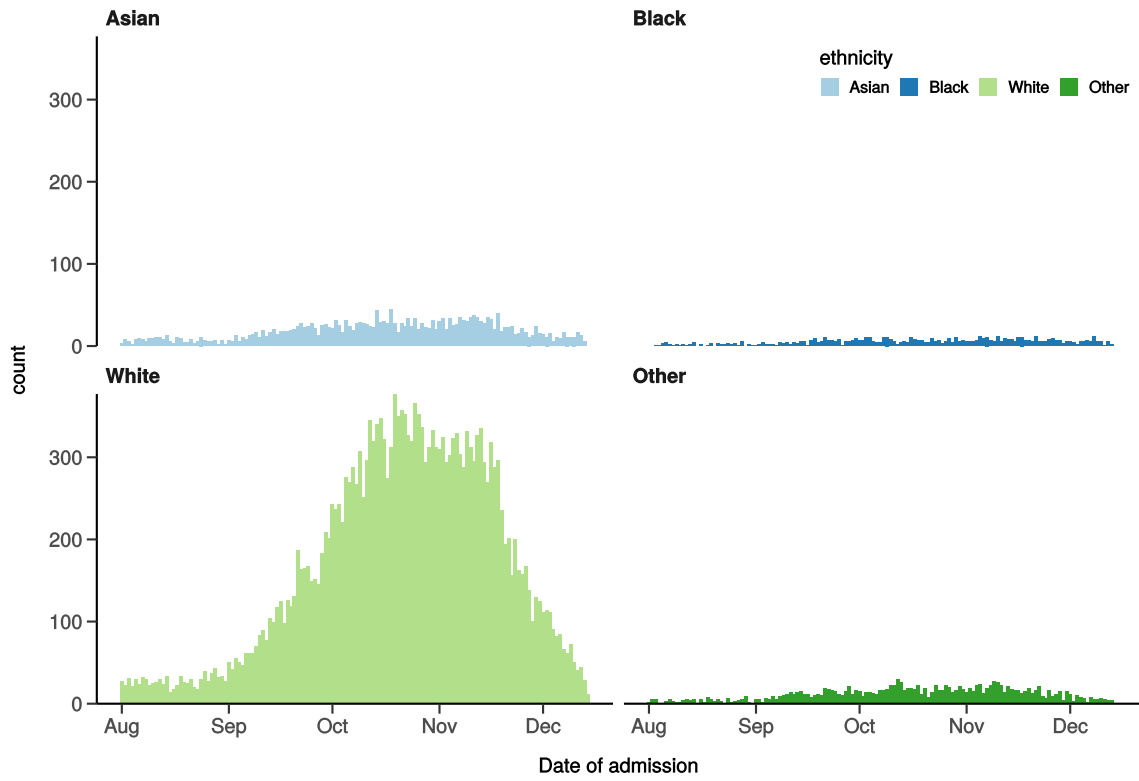
Figure 1D - 7-day rolling percentage. n = 22175

Patients with outcome stratified by age, and sex

Figure 1E

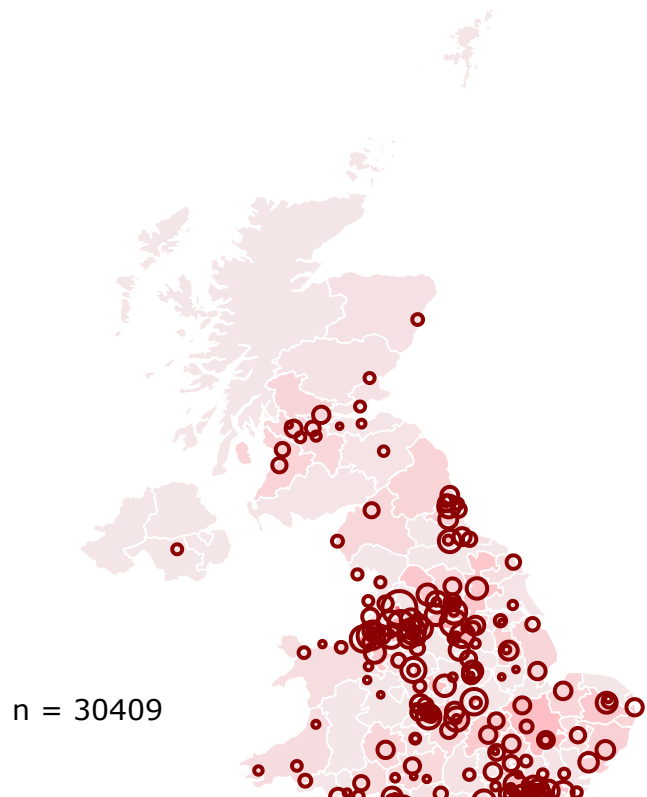## Hospital admission with COVID-19 by ethnicity
Figure 1F

Location by CCG / Healthboard

Figure 2

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

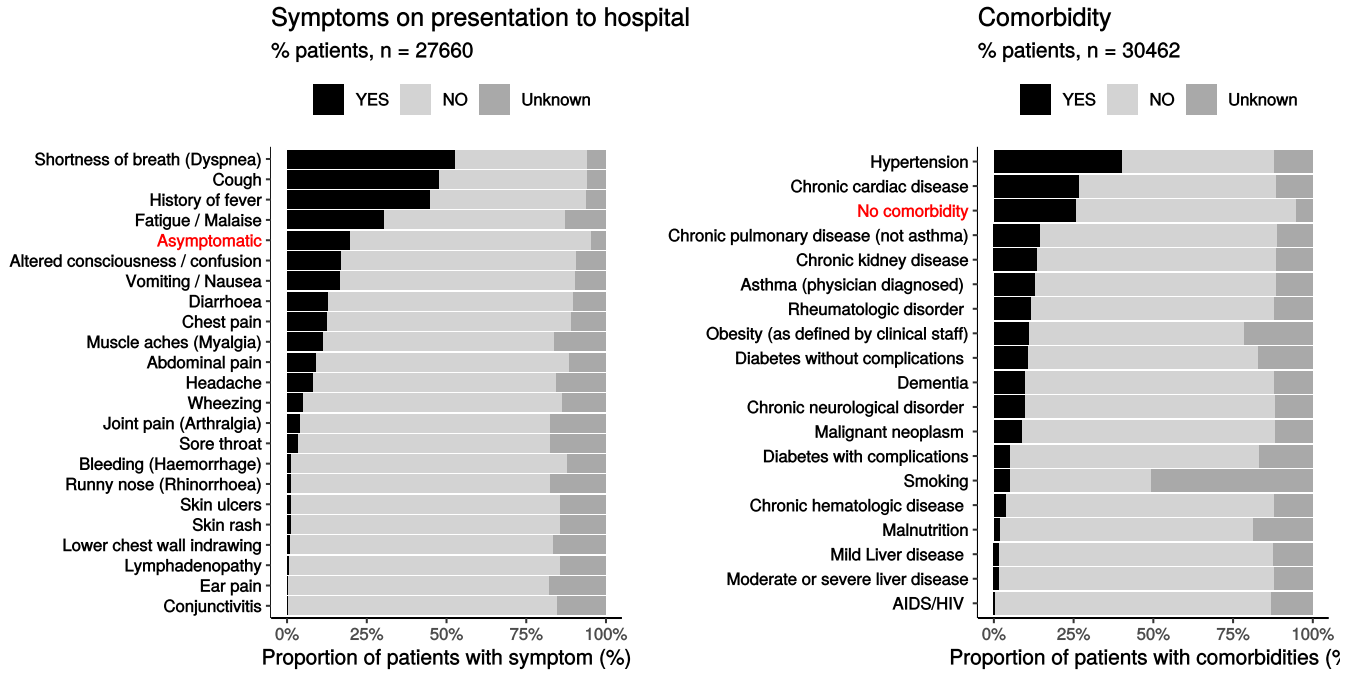n = 30409

Symptoms and comorbidity

Figure 3A

Symptoms on presentation to hospital
% patients, n = 27660

YES   NO   Unknown

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)
Runny nose (Rhinorrhoea)
Skin ulcers
Skin rash
Lower chest wall indrawing
Lymphadenopathy
Ear pain
Conjunctivitis

0%   25%   50%   75%   100%
Proportion of patients with symptom (%)

Comorbidity
% patients, n = 30462

YES   NO   Unknown

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

0%   25%   50%   75%   100%
Proportion of patients with comorbidities (%

Figure 3B - Symptoms by Age

Symptoms on presentation to hospital
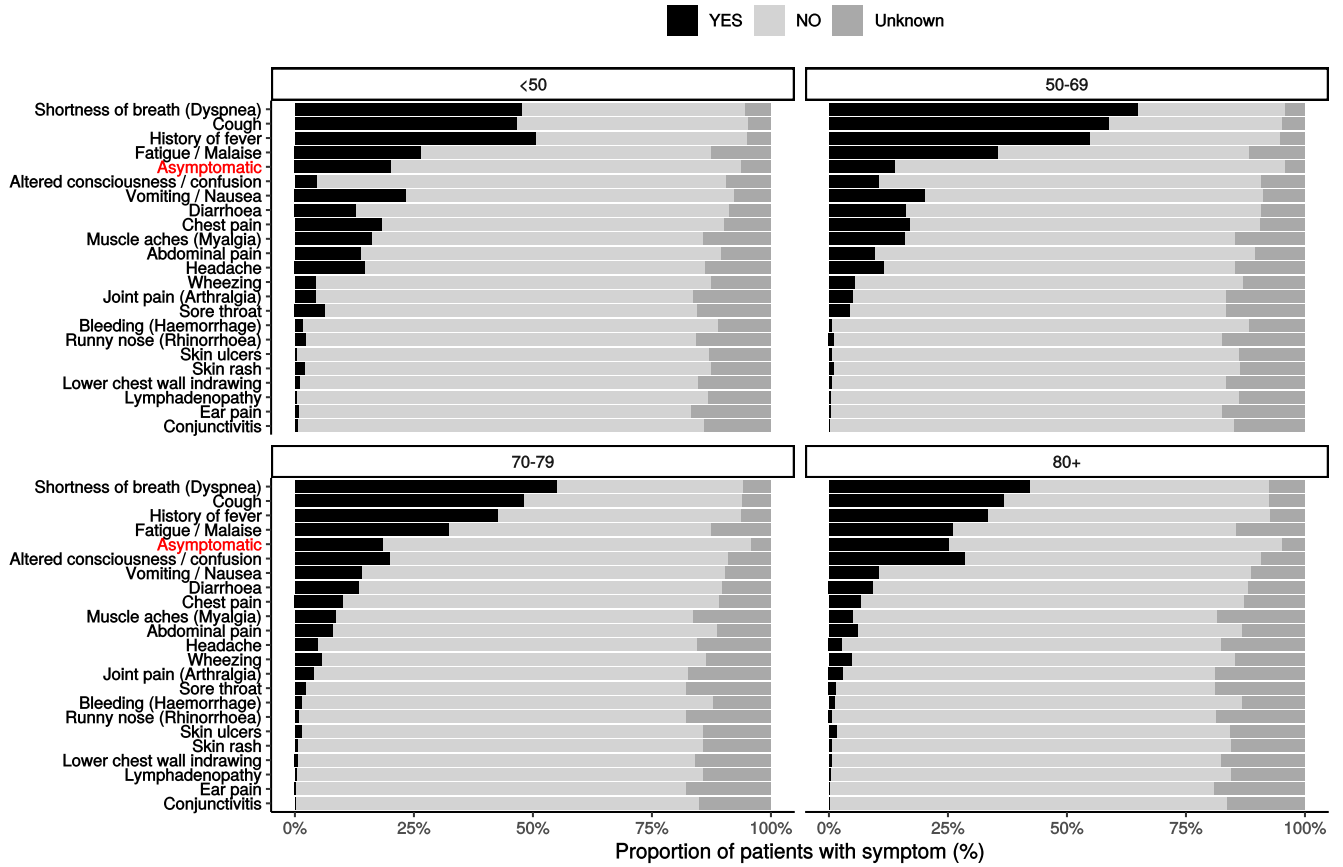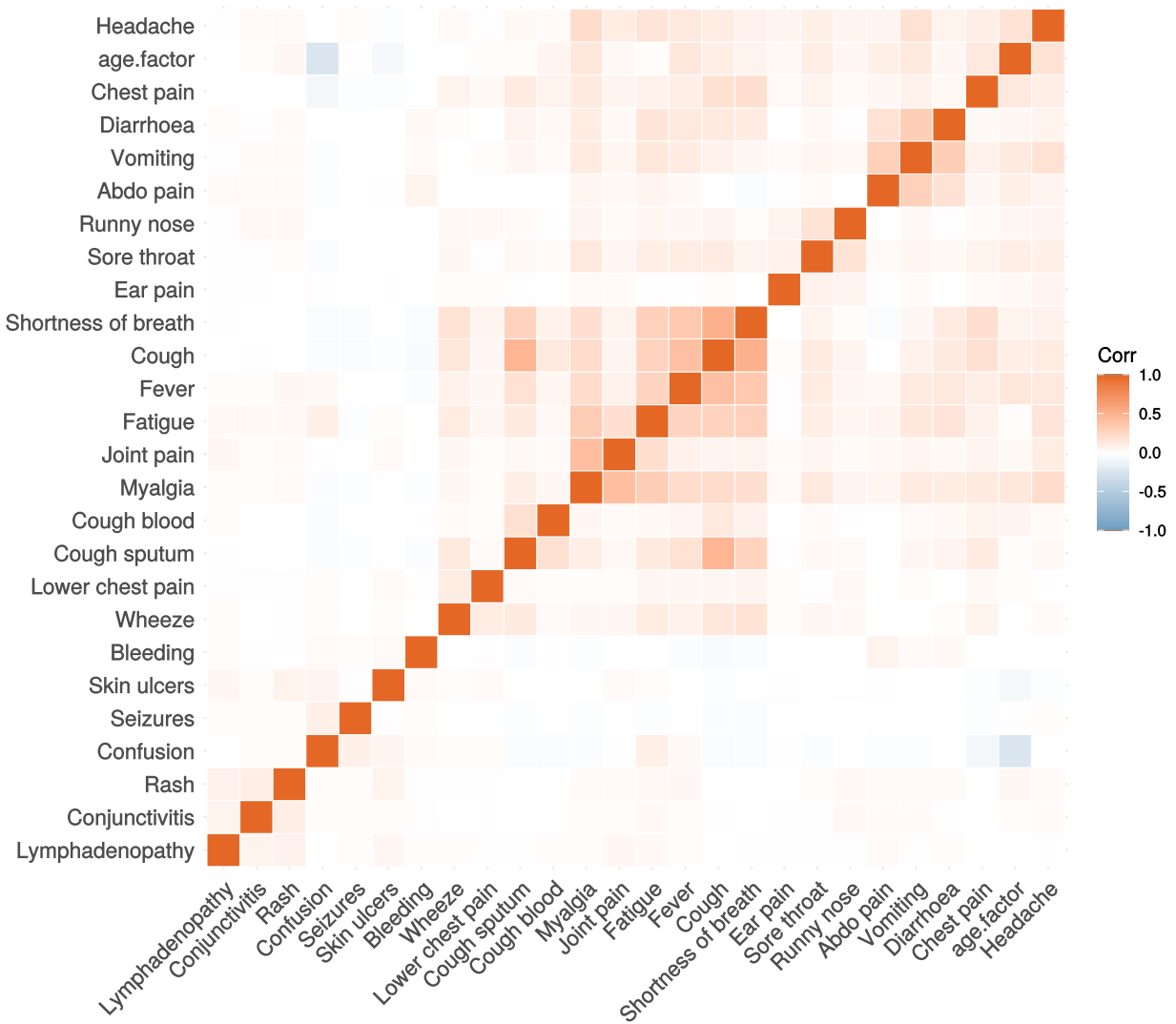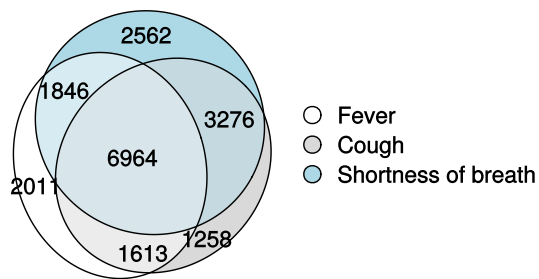### Stratifed by age

Figure 3C

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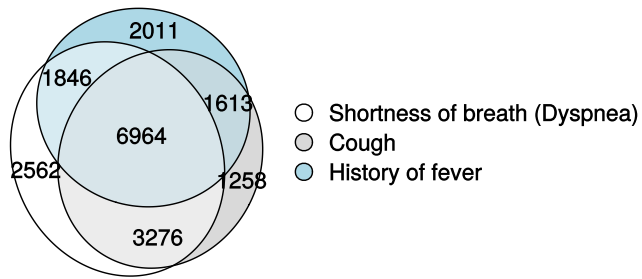
Symptoms (diagnostic criteria)

Figure 4A

n = 27660

- ○ Fever
- ○ Cough
- ○ Shortness of breath

Symptoms (most common)

Figure 4B

n = 27660

- ○ Shortness of breath (Dyspnea)
- ○ Cough
- ○ History of fever

Comorbidity (most common)

Figure 4C

n = 30462

- ○ Hypertension
- ○ Chronic cardiac disease
- ○ Chronic pulmonary disease (not asthma)
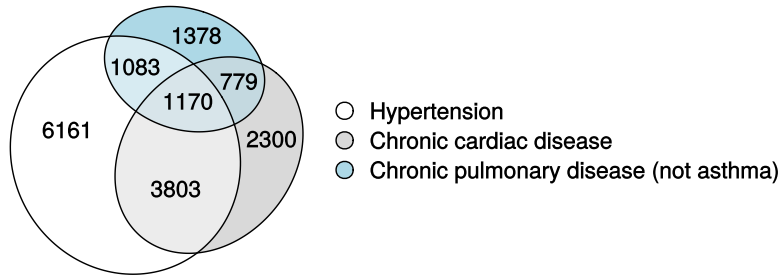
Medication prior to illness

Figure 5

Number of medications prior to admission

Preadmission treatment

Figure 6

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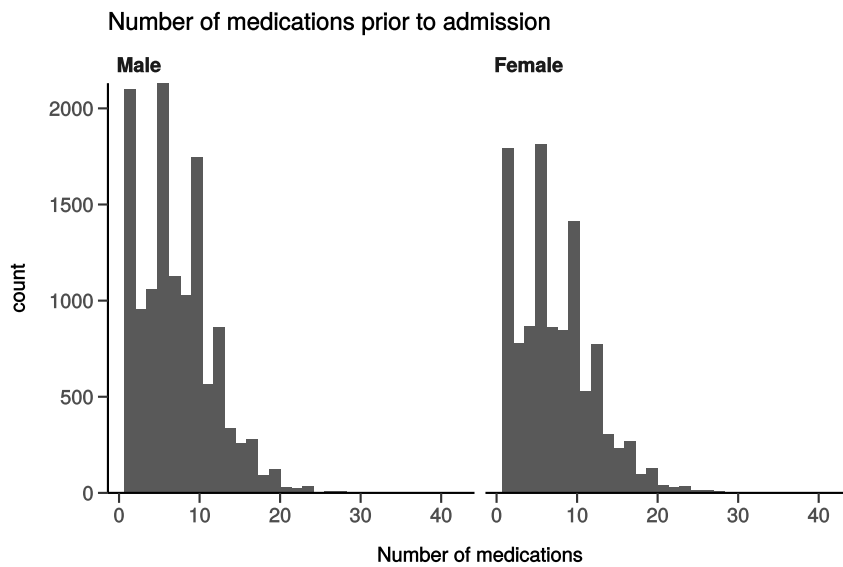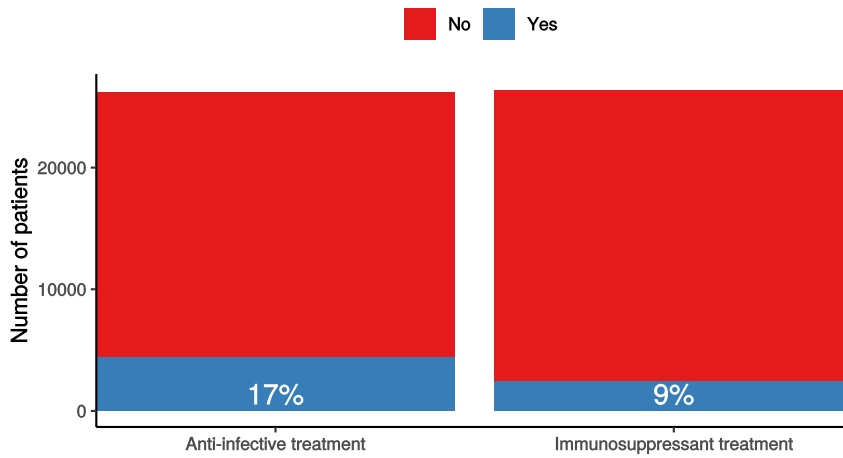
Anti-infectives for illness episode (left) immunosuppressants including oral (not

Patient flow

Figure 7A - All patients

N = 28291
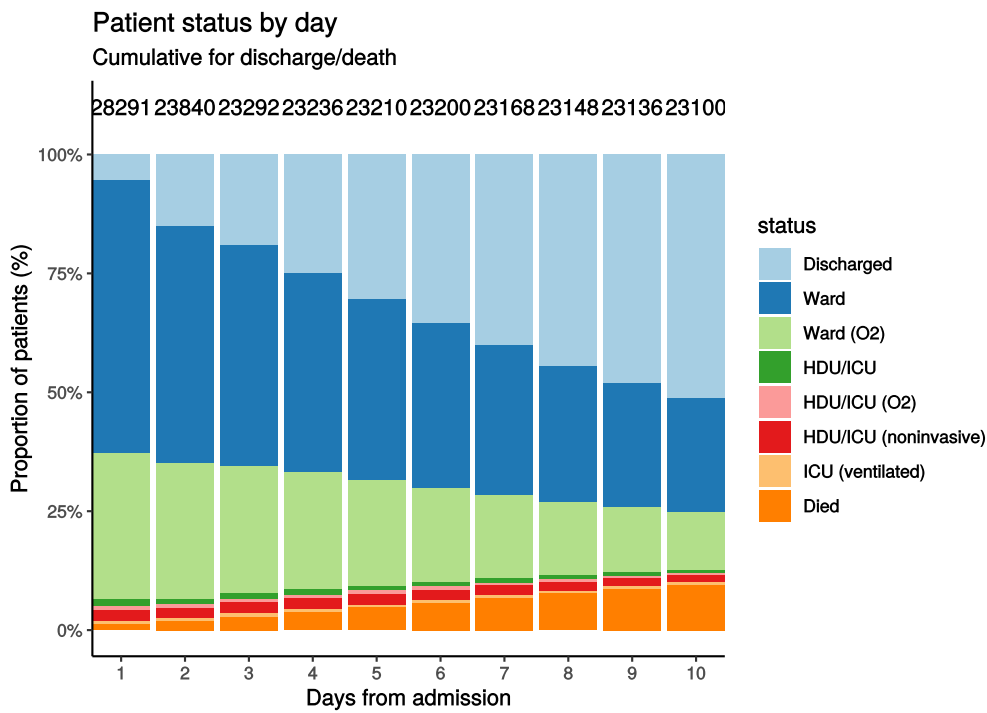
Figure 7B - Patients admitted >=14 days and <=28 days ago

N = 3125

Patient status by day

Cumulative for discharge/death

3125 2132 2026 2019 2015 2015 2007 2005 2001 1996
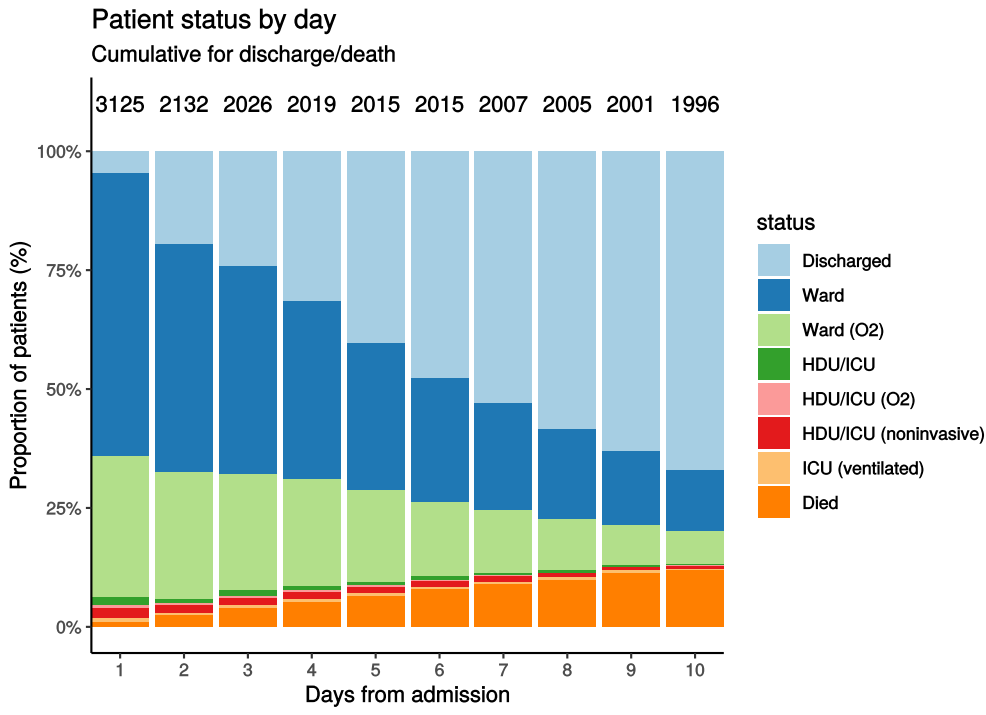
Oxygen requirement

Figure 8A - All patients

N = 26943
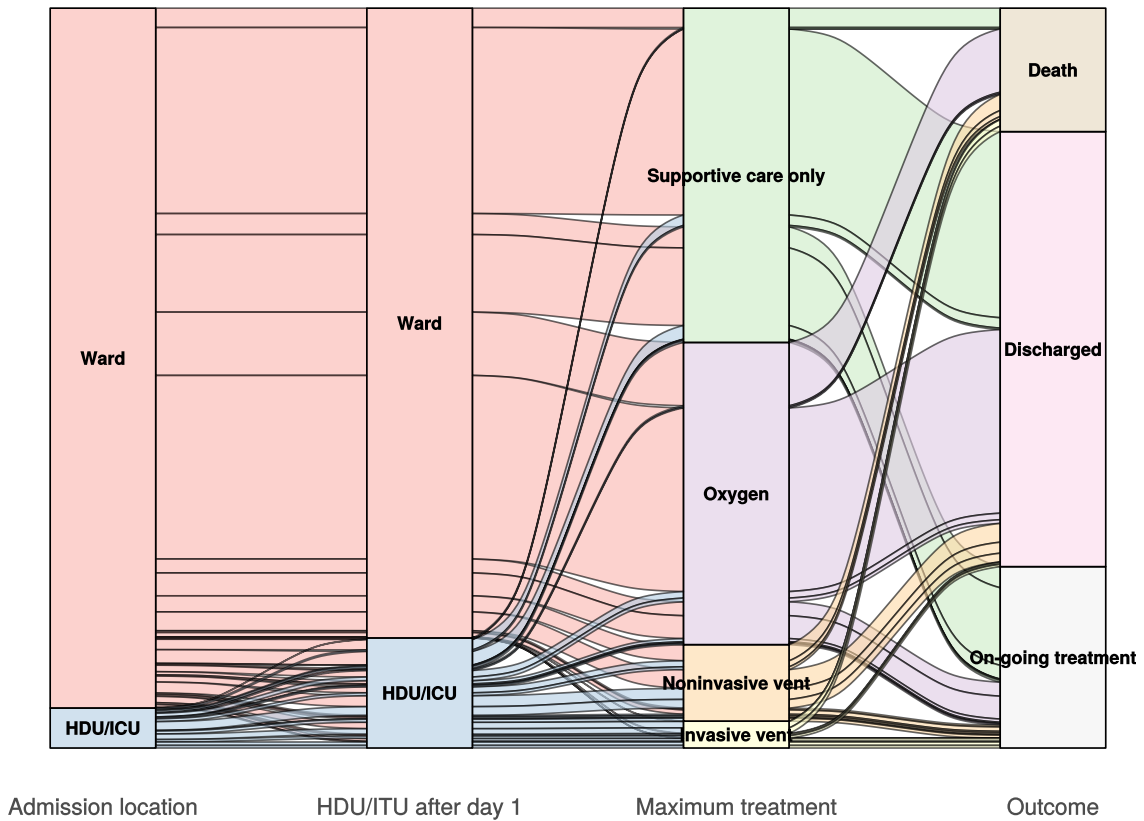
Figure 8B - Patients admitted >=14 days and <=28 days ago

N = 3019

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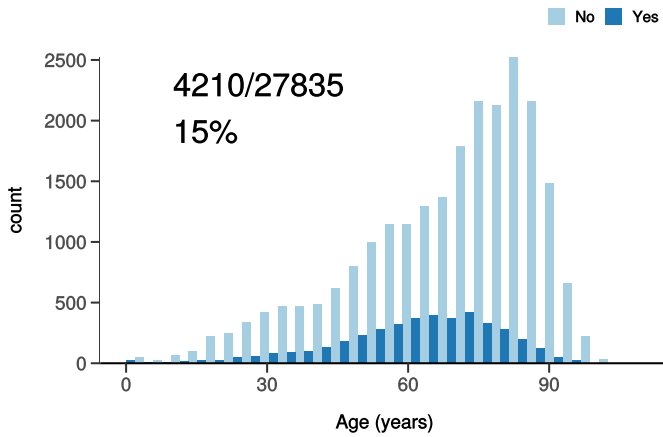
High flow oxygen
Figure 10B
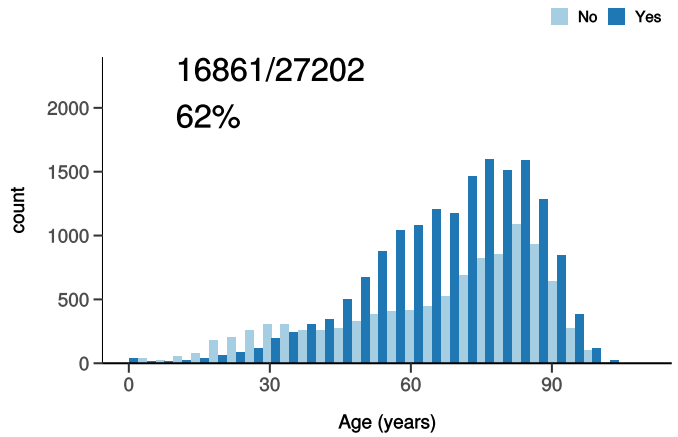
Noninvasive ventilation
Figure 10C
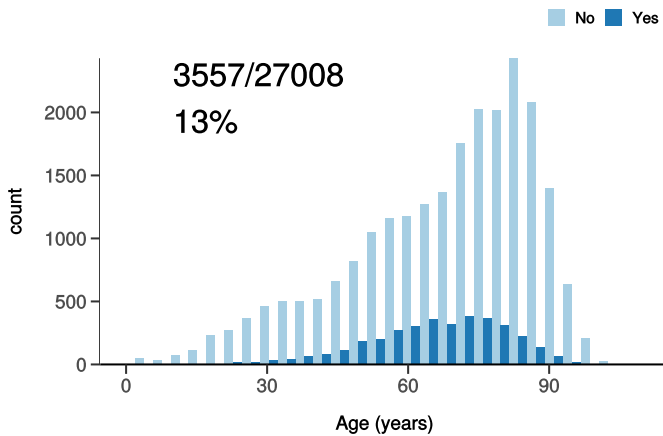
Invasive ventilation
Figure 10D
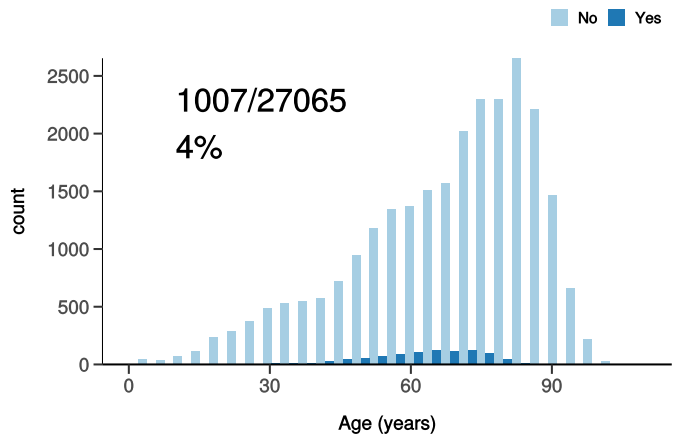
Status in patients admitted >=14 days from today

Figure 11

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

Died
4701/25853
18%

On-going care
4917/25853
19%

Discharged alive
16203/25853
63%

Age (years)
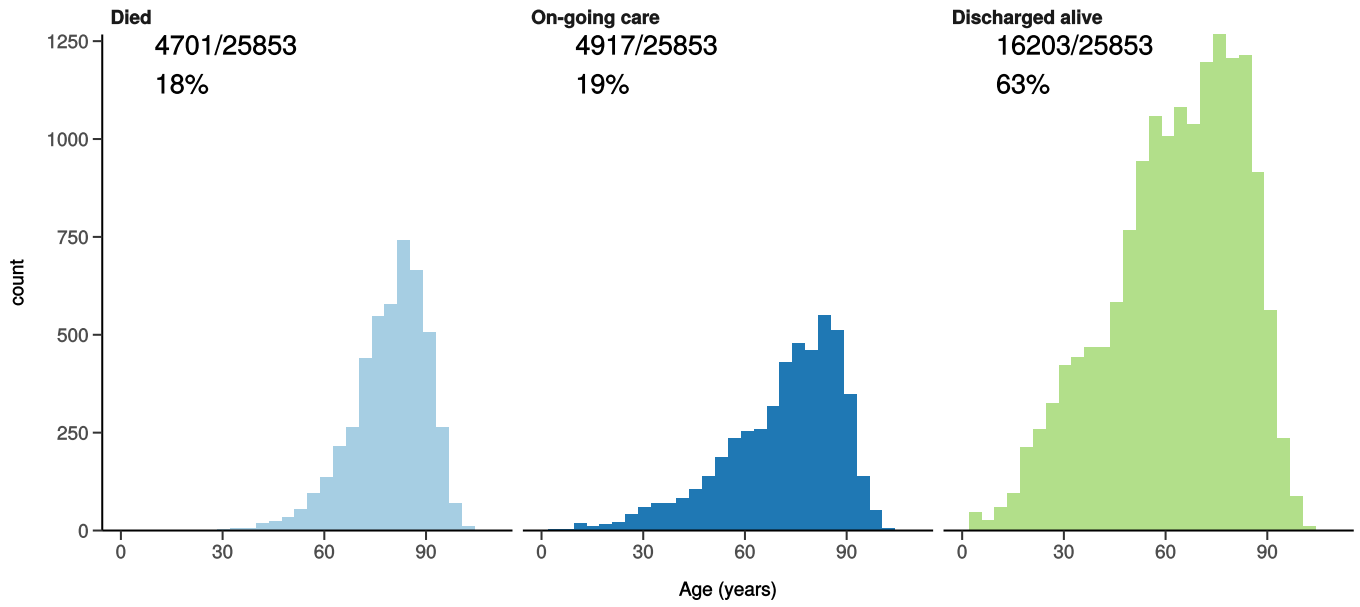
ICU/HDU admissions: status in patients admitted >=14 days ago
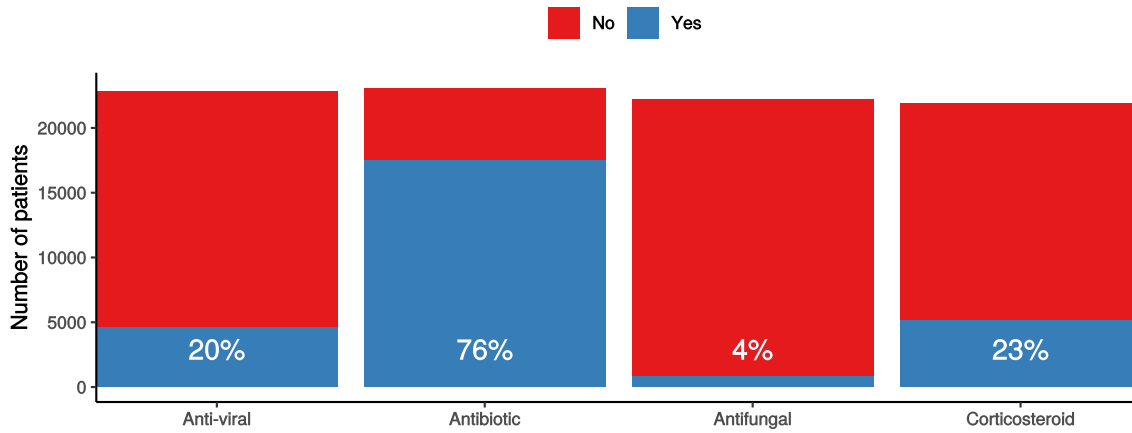Figure 11B

Died
908/3686
25%

On-going care
1133/3686
31%

Discharged alive
1643/3686
45%

Age (years)
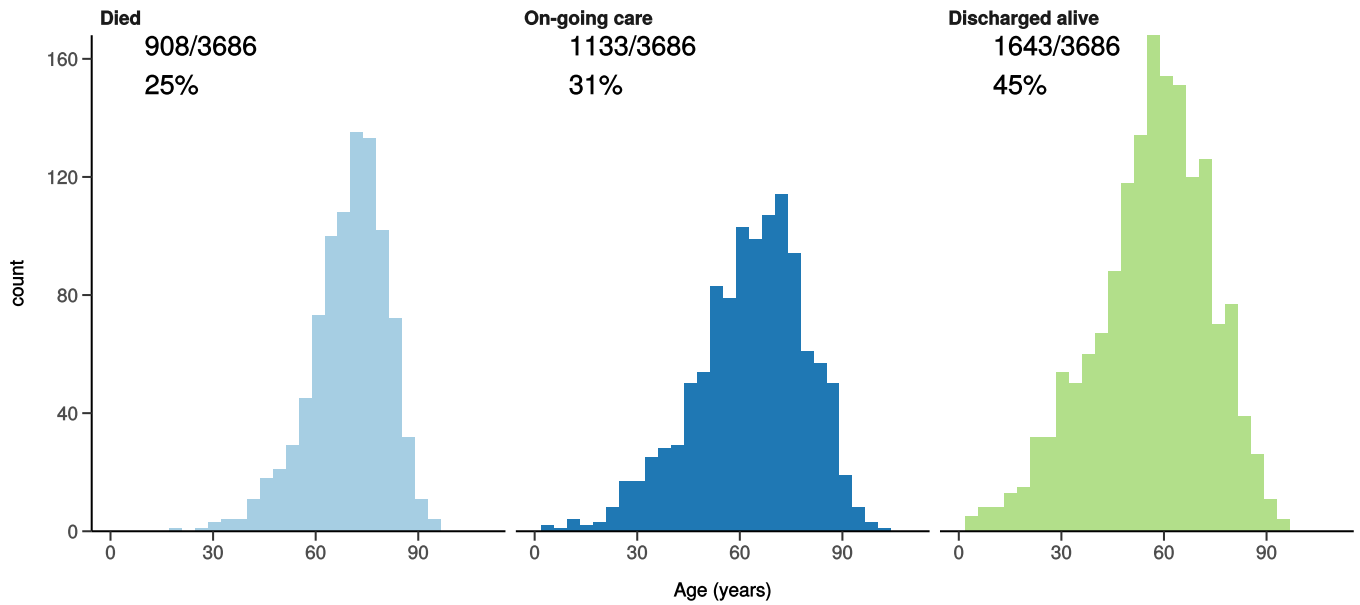
Invasive ventilation: status in patients admitted >=14 days ago
Figure 11c

Died
449/961
47%

On-going care
332/961
35%

Discharged alive
179/961
19%
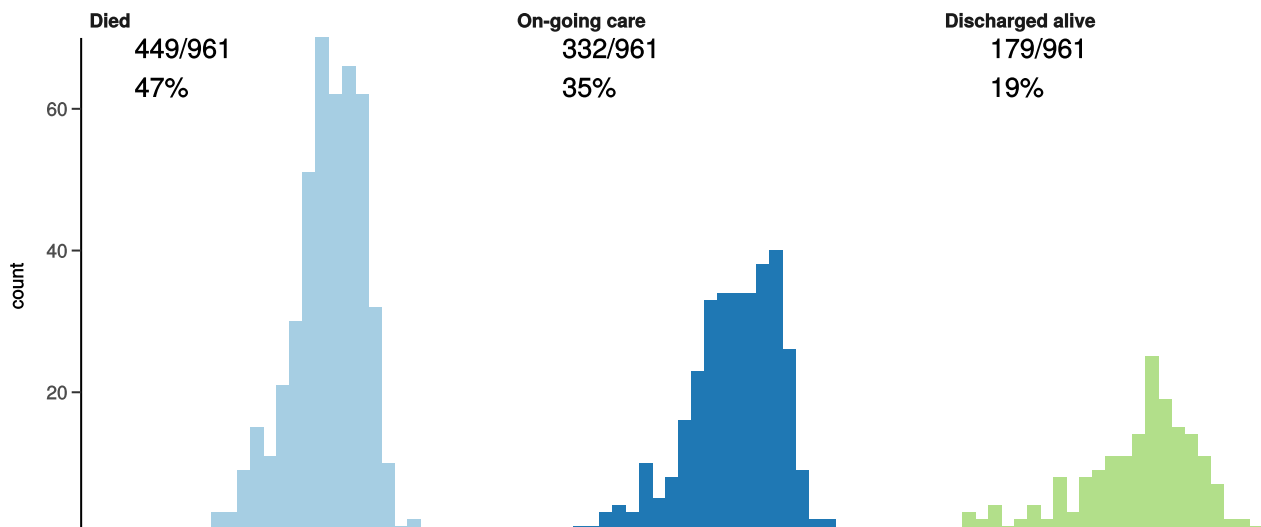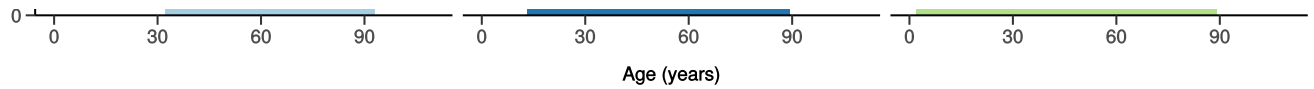
Length of stay stratified by age

Figure 12

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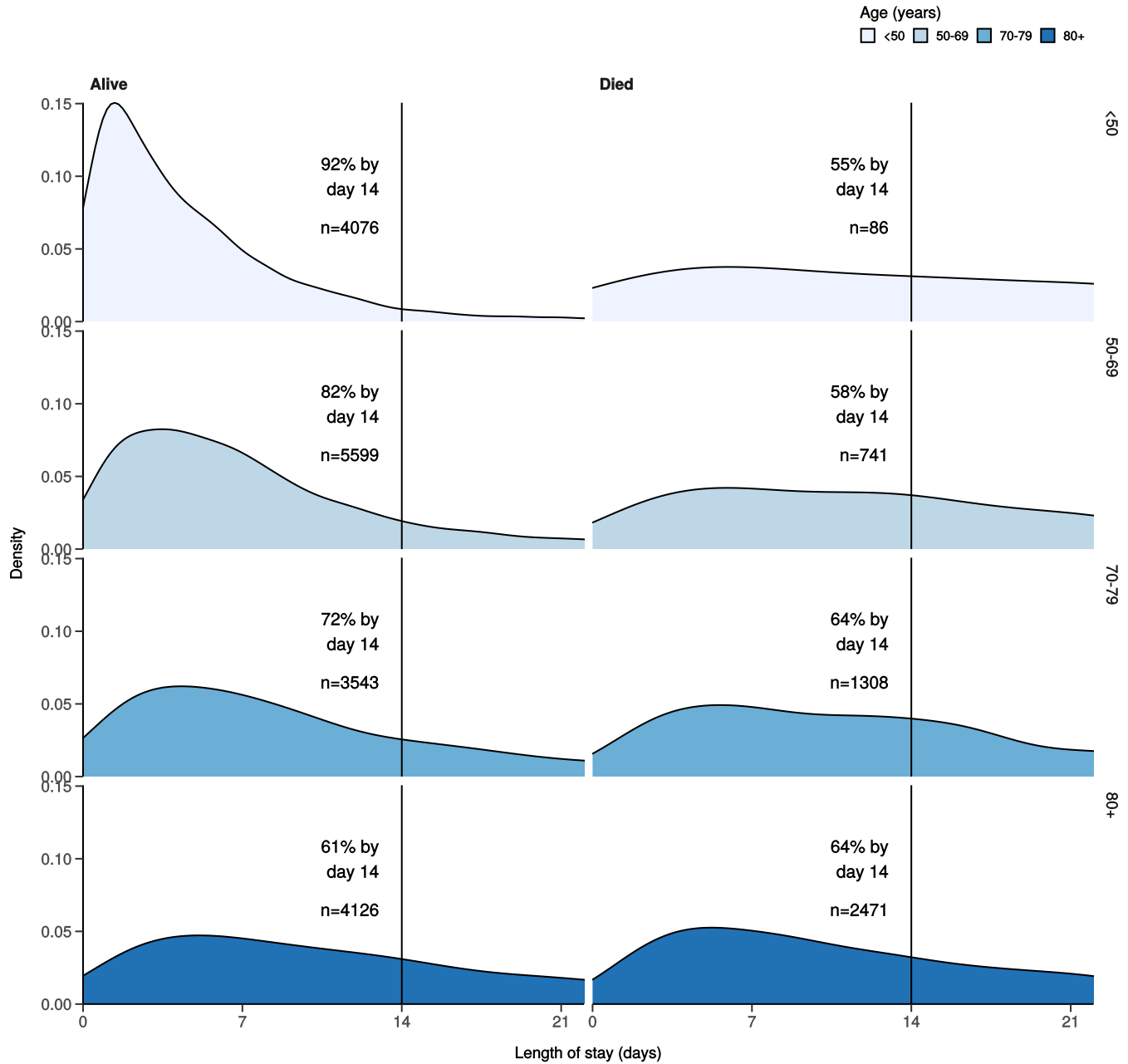
Predictors of death: logistic regression multivariable model

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	4353 (98.0)	90 (2.0)	•	•
	50-69	5873 (88.6)	759 (11.4)	6.25 (5.04-7.85, p<0.001)	5.16 (4.06-6.66, p<0.001)

Dependent: death		No	Yes	OR (univariable)	OR (multivariable)
	70-79	3759 (73.8)	1332 (26.2)	17.14 (13.87-21.45, p<0.001)	12.32 (9.71-15.87, p<0.001)
	80+	4386 (63.6)	2506 (36.4)	27.63 (22.44-34.48, p<0.001)	19.56 (15.43-25.16, p<0.001)
Sex at Birth	Male	9642 (77.0)	2881 (23.0)	•	•
	Female	8736 (82.9)	1808 (17.1)	0.69 (0.65-0.74, p<0.001)	0.65 (0.60-0.71, p<0.001)
	Not specified	0 (NaN)	0 (NaN)	•	•
Chronic cardiac disease	NO	13014 (84.8)	2335 (15.2)	•	•
	YES	4371 (67.9)	2064 (32.1)	2.63 (2.46-2.82, p<0.001)	1.30 (1.19-1.41, p<0.001)
Chronic pulmonary disease (not asthma)	NO	15021 (82.2)	3255 (17.8)	•	•
	YES	2382 (67.4)	1150 (32.6)	2.23 (2.06-2.41, p<0.001)	1.50 (1.36-1.65, p<0.001)
Chronic neurological disorder	NO	15634 (80.8)	3724 (19.2)	•	•
	YES	1692 (72.5)	643 (27.5)	1.60 (1.45-1.76, p<0.001)	1.09 (0.97-1.23, p=0.140)
Chronic hematologic disease	NO	16661 (80.3)	4096 (19.7)	•	•
	YES	642 (71.6)	255 (28.4)	1.62 (1.39-1.87, p<0.001)	1.09 (0.91-1.31, p=0.329)
Chronic kidney disease	NO	15209 (82.3)	3271 (17.7)	•	•
	YES	2170 (66.0)	1117 (34.0)	2.39 (2.21-2.60, p<0.001)	1.31 (1.19-1.45, p<0.001)
Dementia	NO	15838 (81.9)	3498 (18.1)	•	•
	YES	1495 (64.4)	827 (35.6)	2.50 (2.28-2.75, p<0.001)	1.28 (1.14-1.44, p<0.001)
Obesity (as defined by clinical staff)	NO	13152 (79.6)	3366 (20.4)	•	•
	YES	2333 (83.9)	448 (16.1)	0.75 (0.67-0.84, p<0.001)	1.03 (0.91-1.17, p=0.610)
Malignant neoplasm	NO	15989 (81.5)	3640 (18.5)	•	•
	YES	1336 (64.7)	729 (35.3)	2.40 (2.17-2.64, p<0.001)	1.69 (1.50-1.90, p<0.001)

Number in dataframe = 29166, Number in model = 18500, Missing = 10666, AIC = 15507.5, C-statistic = 0.765, H&L = Chi-sq(8) 28.97 (p<0.001)

Figure 13 - Adjusted odds ratio plot

Death

		Odds ratio (95% CI)	
Age on admission (years)	<50	-	
	50-69	5.16 (4.06-6.66, p<0.001)	
	70-79	12.32 (9.71-15.87, p<0.001)	
	80+	19.56 (15.43-25.16, p<0.001)	
Sex at Birth	Male	-	
	Female	0.65 (0.60-0.71, p<0.001)	
	Not specified	-	
Chronic cardiac disease	YES	1.30 (1.19-1.41, p<0.001)	
Chronic pulmonary disease (not asthma)	YES	1.50 (1.36-1.65, p<0.001)	
Chronic neurological disorder	YES	1.09 (0.97-1.23, p=0.140)	
Chronic hematologic disease	YES	1.09 (0.91-1.31, p=0.329)	
Chronic kidney disease	YES	1.31 (1.19-1.45, p<0.001)	
Dementia	YES	1.28 (1.14-1.44, p<0.001)	
Obesity (as defined by clinical staff)	YES	1.03 (0.91-1.17, p=0.610)	
Malignant neoplasm	YES	1.69 (1.50-1.90, p<0.001)	

Odds ratio (95% CI, log scale)

Figure 14 - ROC

AUC: 0.765
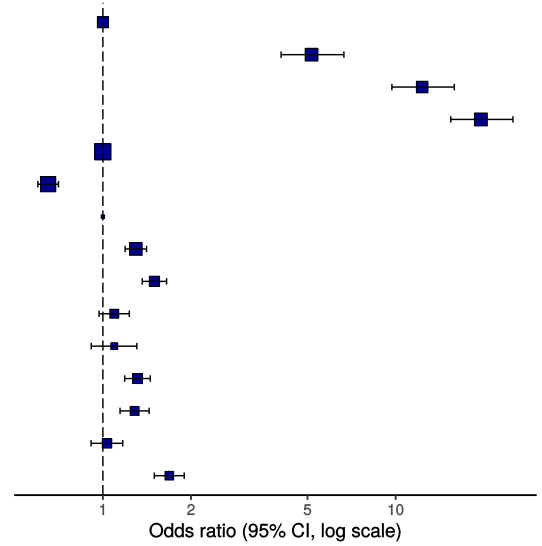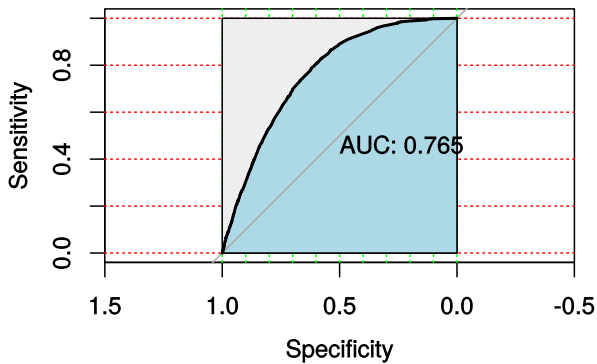
Survival models

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

Figure 15

P-value is log-rank test.

Number at risk (left, age):

	0	7	14	21	28
age.factor=<18	570	500	490	486	484
age.factor=18-49	4912	4370	4159	4107	4069
age.factor=50-74	11839	10072	9062	8529	8203
age.factor=75 and over	12836	10047	8442	7429	6930

Number at risk (right, sex):

	0	7	14	21	28
sex=Male	16399	13545	11890	10923	10408
sex=Female	13745	11429	10249	9616	9267
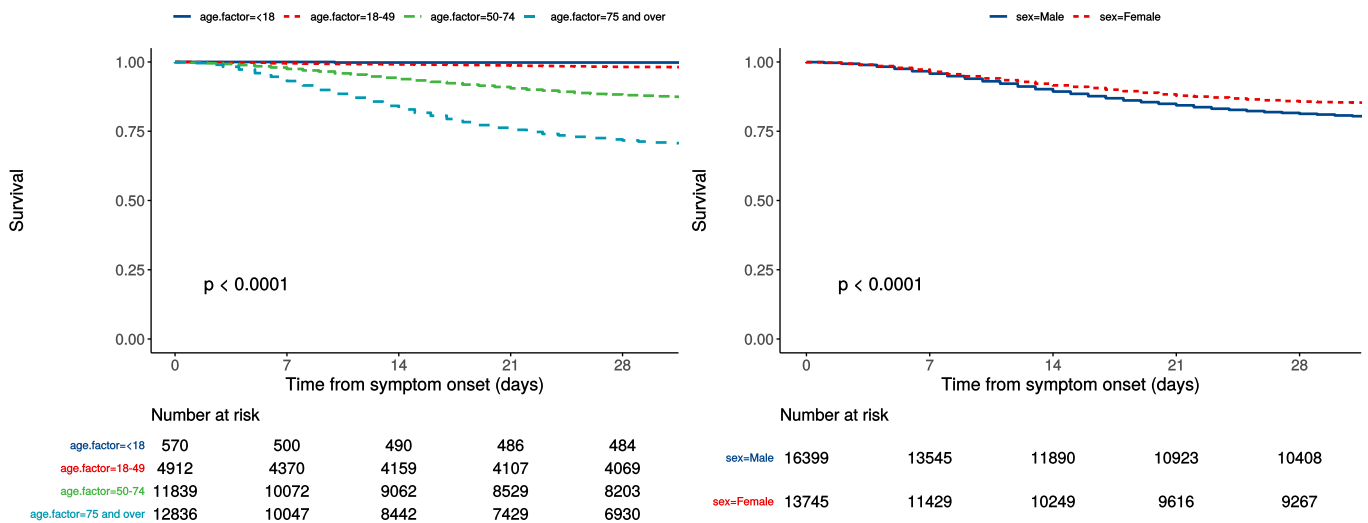
Cox proportional hazards model

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	5494 (18.2)	•	•
	50-69	8572 (28.4)	5.97 (4.79-7.44, p<0.001)	4.69 (3.64-6.05, p<0.001)
	70-79	6815 (22.6)	14.91 (12.03-18.47, p<0.001)	11.07 (8.62-14.22, p<0.001)
	80+	9293 (30.8)	22.53 (18.23-27.83, p<0.001)	16.99 (13.24-21.81, p<0.001)
Sex at Birth	Male	16411 (54.4)	•	•
	Female	13745 (45.6)	0.73 (0.68-0.77, p<0.001)	0.73 (0.68-0.78, p<0.001)
qSOFA score on admission	0	12590 (51.6)	•	•
	1	10178 (41.7)	1.77 (1.65-1.89, p<0.001)	1.94 (1.80-2.09, p<0.001)
	2	1568 (6.4)	3.79 (3.44-4.18, p<0.001)	3.42 (3.06-3.82, p<0.001)
	3	82 (0.3)	7.92 (5.91-10.62, p<0.001)	7.15 (5.15-9.94, p<0.001)
Symptomatic at presentation	No symptoms	4281 (15.3)	•	•
	Symptoms	23615 (84.7)	1.53 (1.40-1.68, p<0.001)	•
Chronic cardiac disease	NO	18883 (70.2)	•	•
	YES	8014 (29.8)	2.36 (2.22-2.50, p<0.001)	1.28 (1.19-1.37, p<0.001)
Chronic kidney disease	NO	22779 (84.8)	•	•
	YES	4095 (15.2)	2.13 (1.99-2.28, p<0.001)	1.27 (1.17-1.38, p<0.001)
Moderate or severe liver disease	NO	26171 (98.2)	•	•
	YES	483 (1.8)	1.59 (1.32-1.91, p<0.001)	1.44 (1.15-1.81, p=0.002)
Chronic neurological disorder	NO	23821 (89.1)	•	•
	YES	2926 (10.9)	1.48 (1.36-1.60, p<0.001)	•
Malignant neoplasm	NO	24142 (90.3)	•	•
	YES	2601 (9.7)	2.11 (1.95-2.29, p<0.001)	1.59 (1.45-1.75, p<0.001)
Chronic hematologic disease	NO	25570 (95.9)	•	•
	YES	1103 (4.1)	1.51 (1.33-1.71, p<0.001)	•
Obesity (as defined by clinical staff)	NO	20472 (86.0)	•	•
	YES	3329 (14.0)	0.78 (0.71-0.86, p<0.001)	1.04 (0.93-1.16, p=0.504)

Dependent: Surv(time, status)		all	HR (univariable)	HR (multivariable)
Diabetes without complications	NO	22018 (87.4)	•	•
	YES	3179 (12.6)	1.20 (1.10-1.30, p<0.001)	•
Rheumatologic disorder	NO	23200 (86.9)	•	•
	YES	3491 (13.1)	1.26 (1.16-1.37, p<0.001)	•
Dementia	NO	23783 (89.0)	•	•
	YES	2929 (11.0)	2.21 (2.04-2.38, p<0.001)	1.11 (1.01-1.22, p=0.027)
Malnutrition	NO	24156 (97.8)	•	•
	YES	550 (2.2)	1.84 (1.56-2.17, p<0.001)	•
smoking_mhyn_2levels	NO	13467 (48.4)	•	•
	YES	1496 (5.4)	0.95 (0.82-1.09, p=0.453)	•
	N/K	12858 (46.2)	1.26 (1.18-1.33, p<0.001)	•

Number in dataframe = 30300, Number in model = 19983, Missing = 10317, Number of events = 3266, Concordance = 0.765 (SE = 0.004), R-squared = 0.139(Max possible = 0.958), Likelihood ratio test = 2986.738 (df = 13, p = 0.000)

Figure 16a - Multivariable Cox proportional hazards model
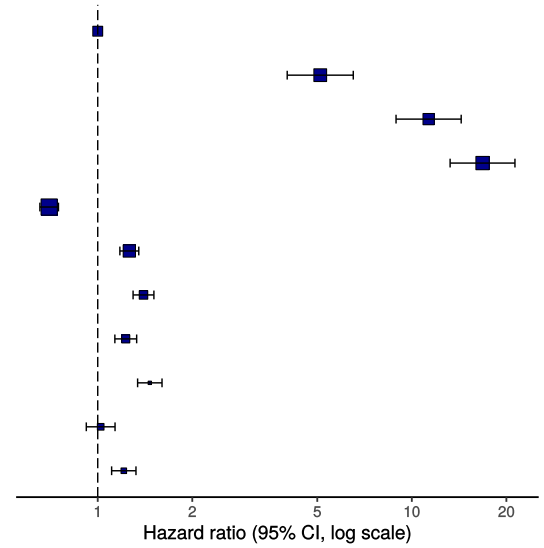

Survival: HR (95% CI, p-value)

Age on admission (years)	<50	-
	50-69	4.69 (3.64-6.05, p<0.001)
	70-79	11.07 (8.62-14.22, p<0.001)
	80+	16.99 (13.24-21.81, p<0.001)
Sex at Birth	Female	0.73 (0.68-0.78, p<0.001)
qSOFA score on admission	0	-
	1	1.94 (1.80-2.09, p<0.001)
	2	3.42 (3.06-3.82, p<0.001)
	3	7.15 (5.15-9.94, p<0.001)
Chronic cardiac disease	YES	1.28 (1.19-1.37, p<0.001)
Chronic kidney disease	YES	1.27 (1.17-1.38, p<0.001)
Moderate or severe liver disease	YES	1.44 (1.15-1.81, p=0.002)
Malignant neoplasm	YES	1.59 (1.45-1.75, p<0.001)
Obesity (as defined by clinical staff)	YES	1.04 (0.93-1.16, p=0.504)
Dementia	YES	1.11 (1.01-1.22, p=0.027)

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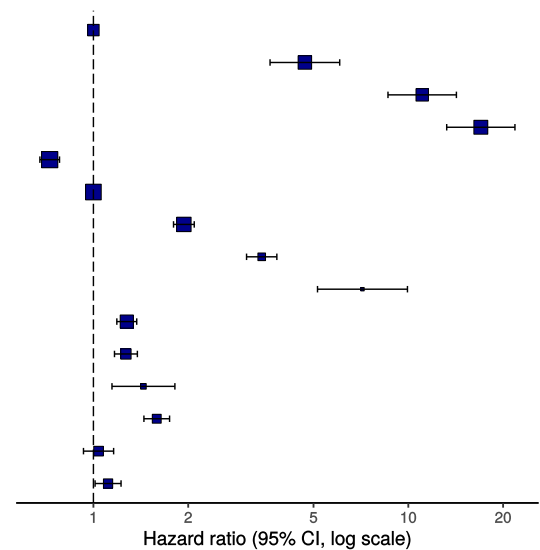
Figure 16b - Multivariable Cox proportional hazards model (age, sex, comorbidities only)

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

Age on admission (years)	<50	-
	50-69	5.11 (4.01-6.51, p<0.001)
	70-79	11.31 (8.91-14.36, p<0.001)
	80+	16.79 (13.24-21.30, p<0.001)
Sex at Birth	Female	0.70 (0.65-0.75, p<0.001)
Chronic cardiac disease	YES	1.26 (1.18-1.35, p<0.001)
Chronic pulmonary disease (not asthma)	YES	1.40 (1.30-1.51, p<0.001)
Chronic kidney disease	YES	1.23 (1.13-1.33, p<0.001)
Malignant neoplasm	YES	1.46 (1.34-1.60, p<0.001)
Obesity (as defined by clinical staff)	YES	1.02 (0.92-1.14, p=0.688)
Dementia	YES	1.21 (1.11-1.32, p<0.001)

Hazard ratio (95% CI, log scale)

ROC = 0.7658924

Figure 17 - Predictions calibration plot

Black: observed Gray: ideal
Blue : optimism corrected

Predicted 7 Day Survival$_{B=40}$ based on observed-predicted
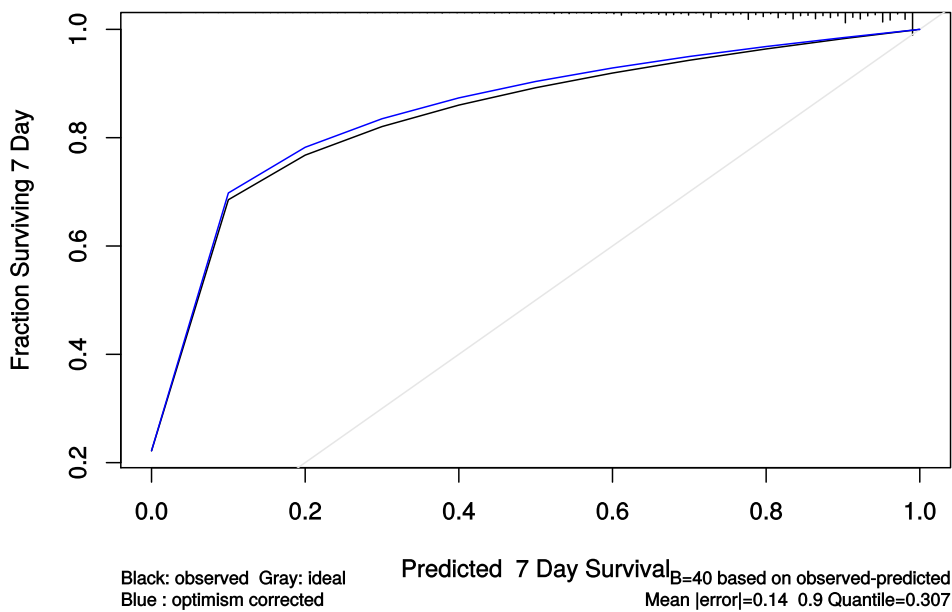Mean |error|=0.14 0.9 Quantile=0.307

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
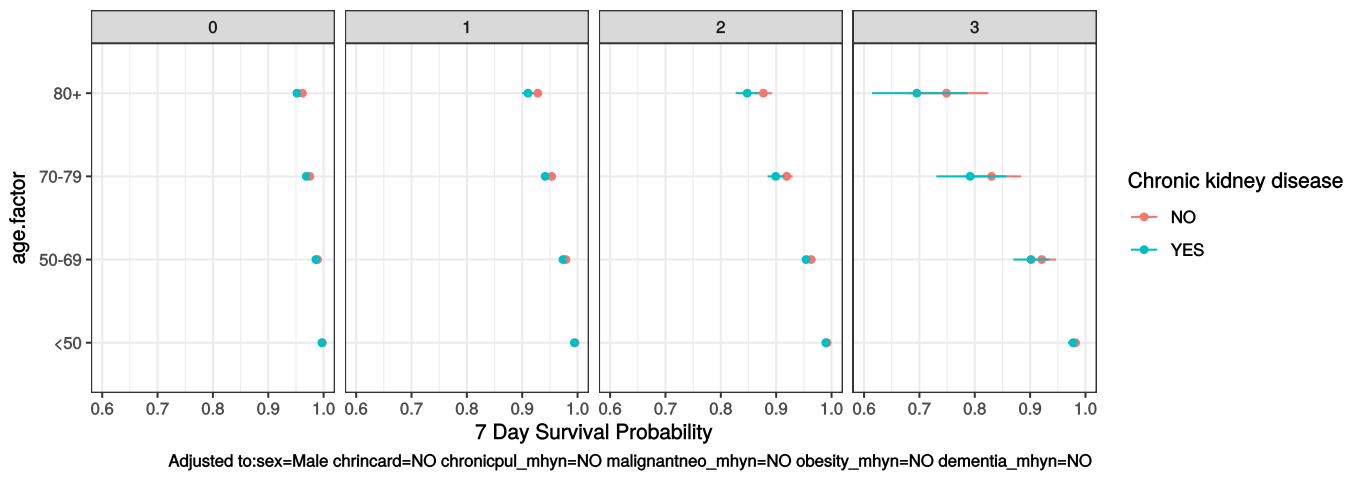
Figure 19 - Death by severity (NEWS) on admission

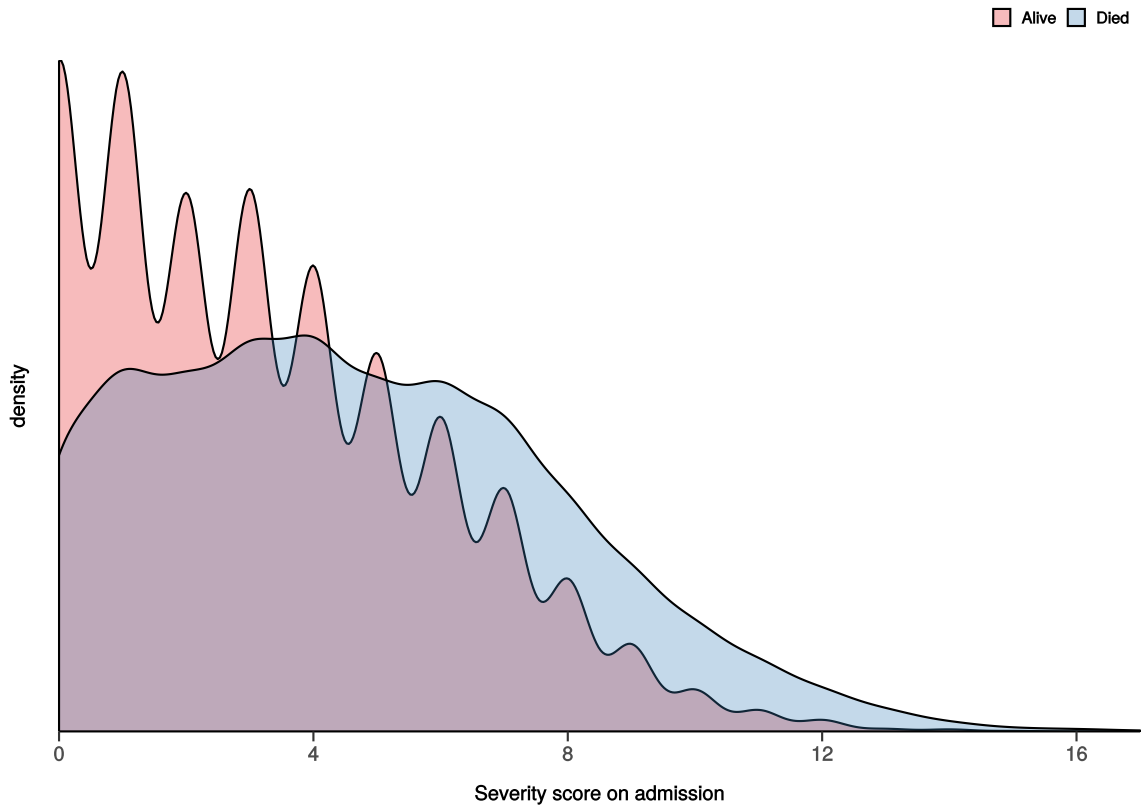### Number of deaths by NEWS score at admission

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

Number of deaths by NEWS score at admission
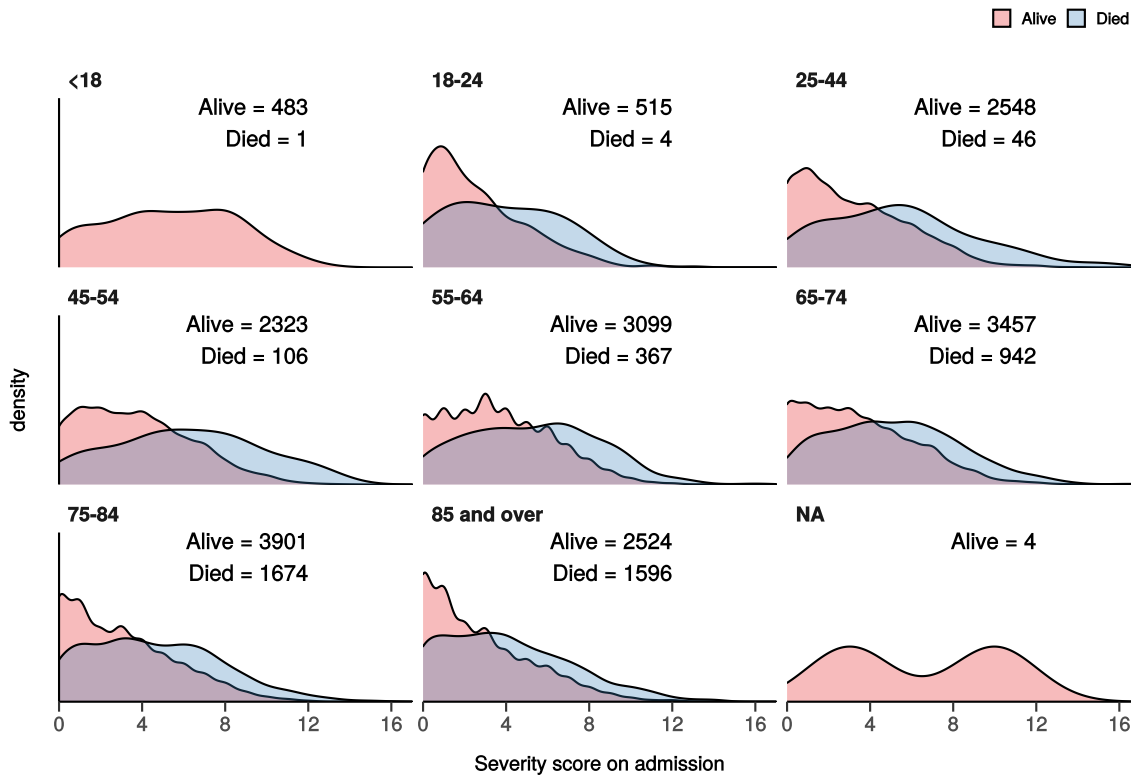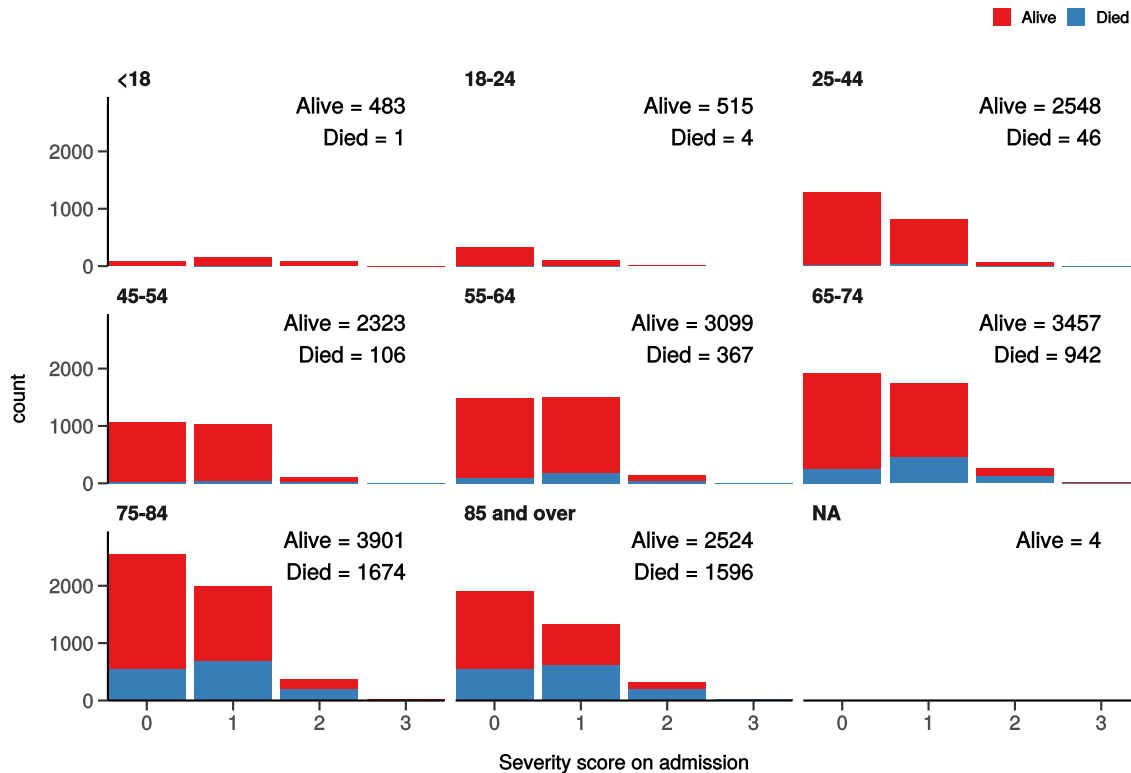Stratified by age

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

Employed as a healthcare worker?		NO	YES	p
Total N (%)		24466 (97.7)	585 (2.3)	
NEWS score on admission	Median (IQR)	3.0 (4.0)	3.0 (5.0)	0.025
Death	No	14815 (77.5)	469 (95.9)	<0.001
	Yes	4293 (22.5)	20 (4.1)	