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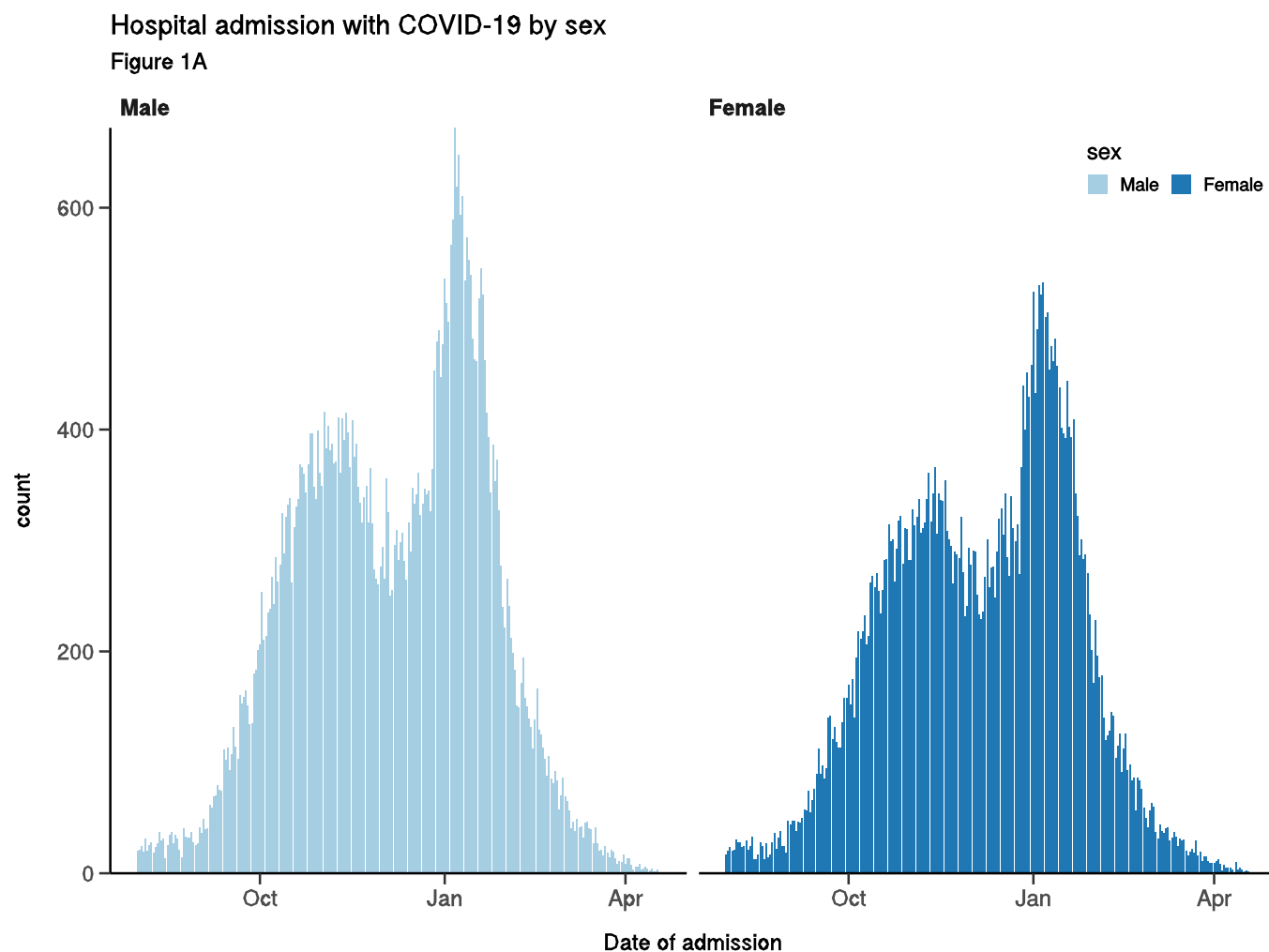
Executive summary

Includes patients admitted after 01 August 2020

There are 101428 patients included in CO-CIN. Of these, 20349 patient(s) have died and 17457 required ICU. 60236 have been discharged home.
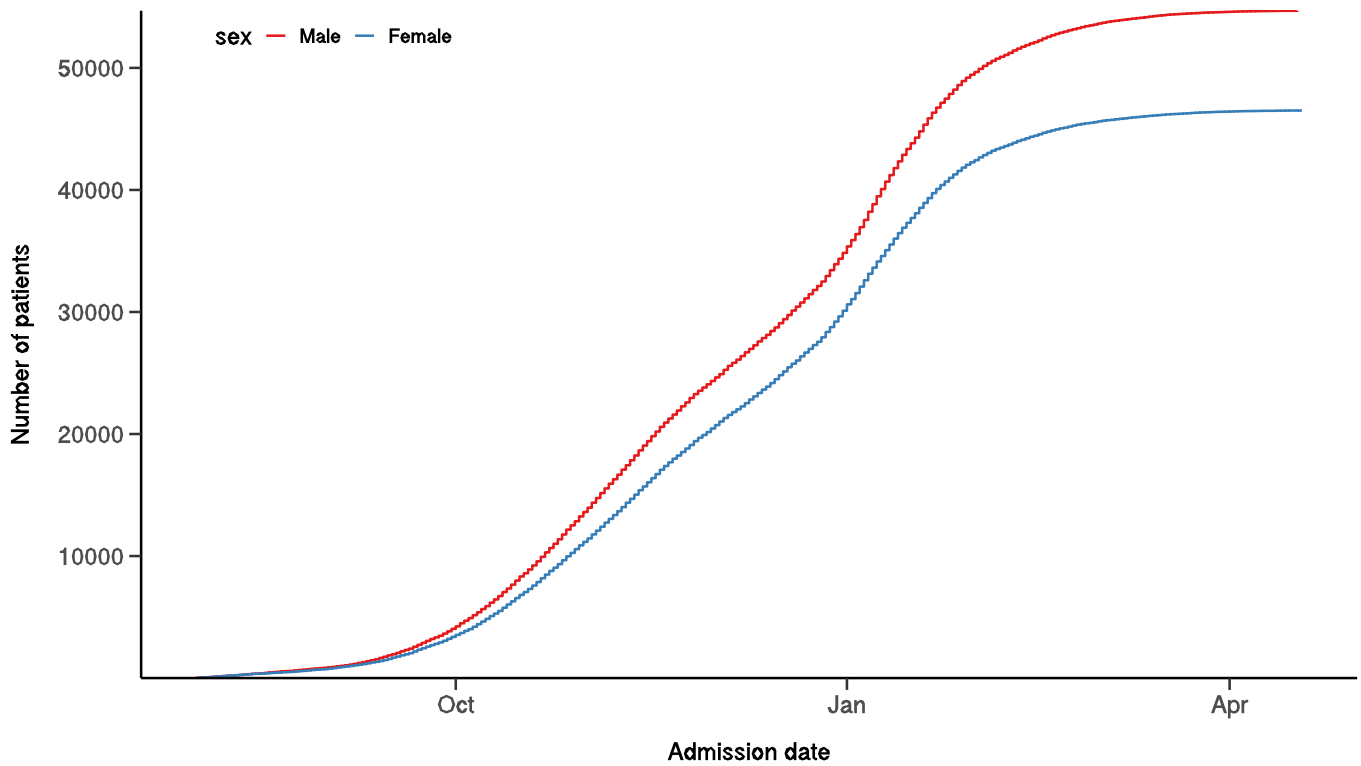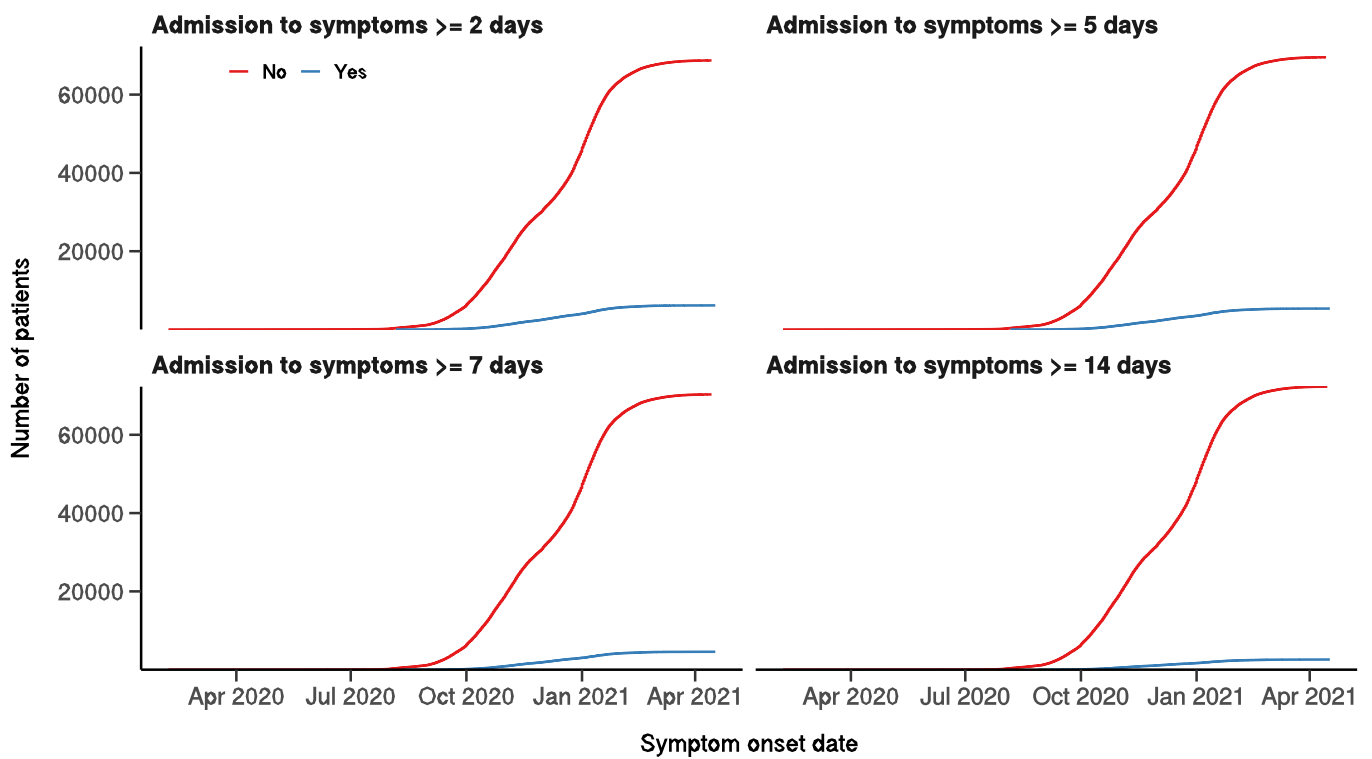
Admission

Figure 1

Hospital admission with COVID-19 by sex

Figure 1A

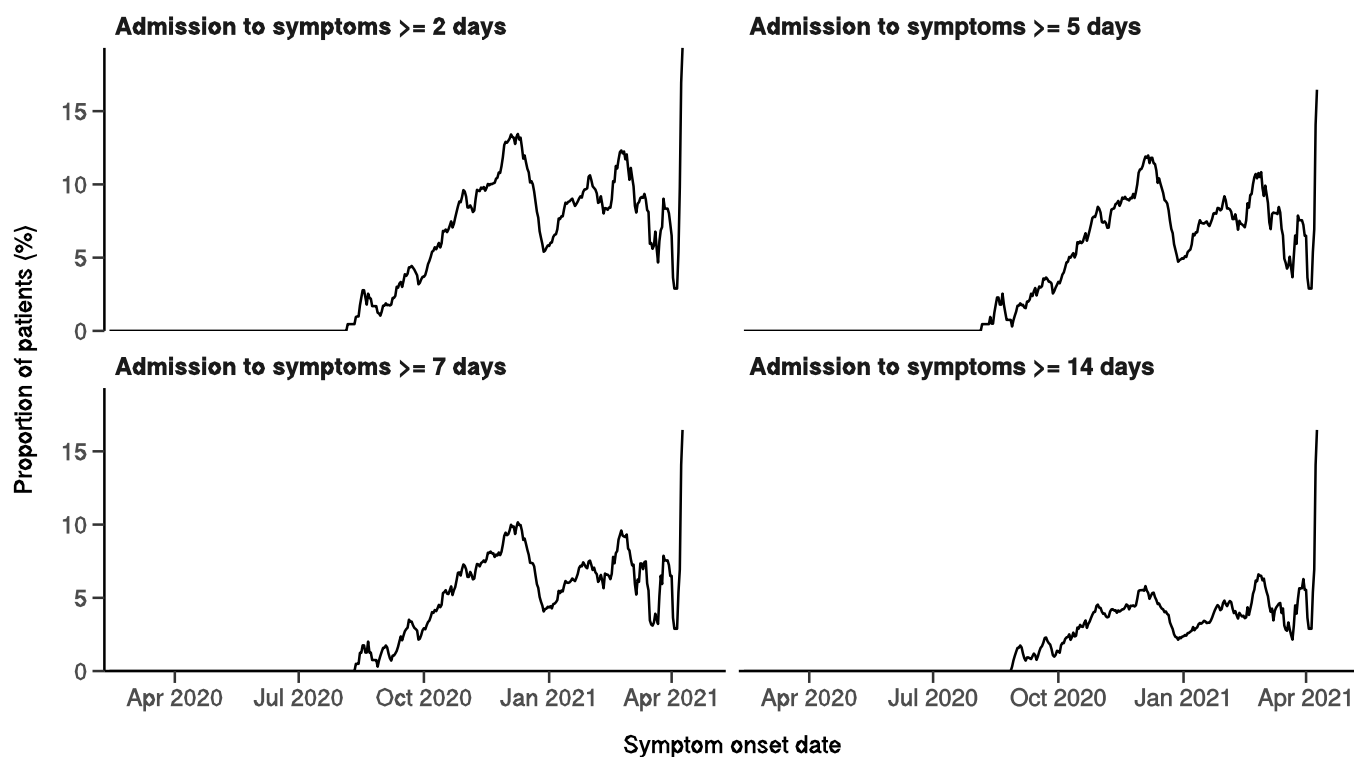## Hospital admission with COVID-19 by sex
Figure 1B

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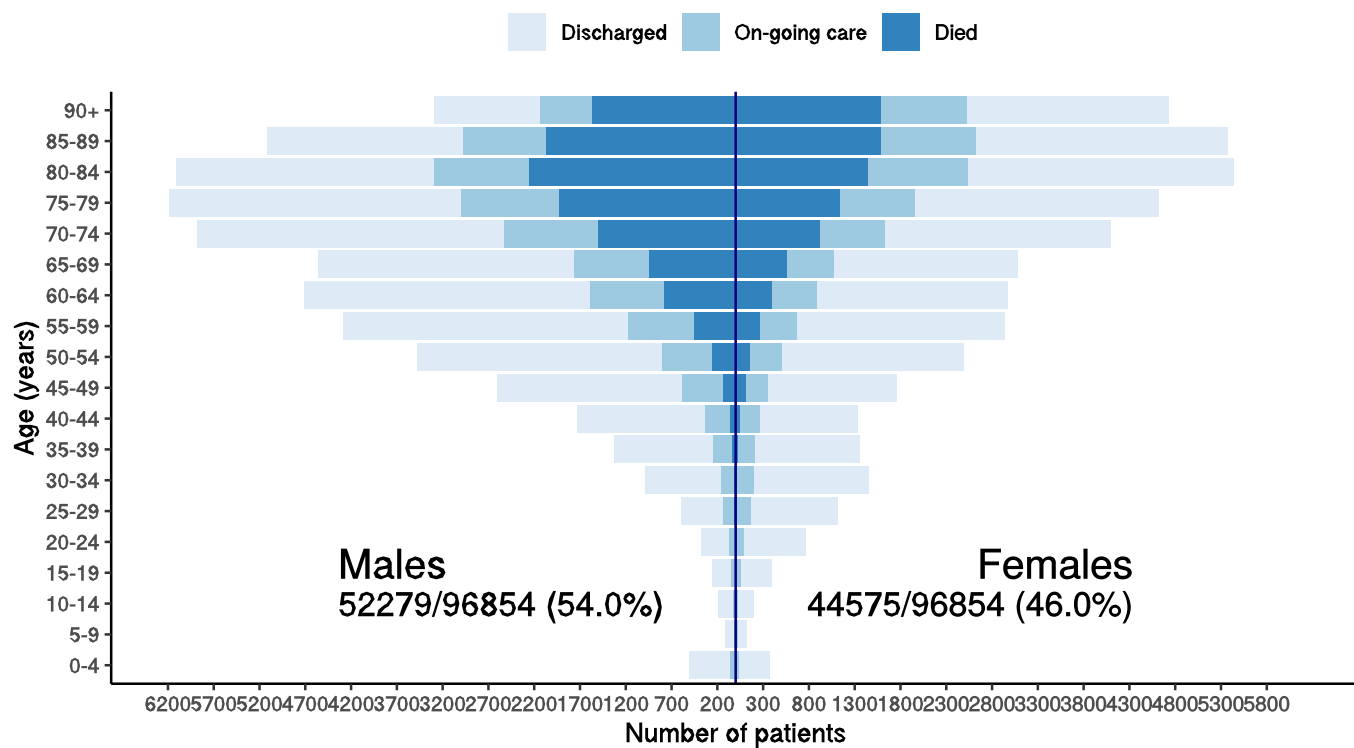### Figure 1C

Proportion with symptom onset occuring after hospital admission

Figure 1D - 7-day rolling percentage. n = 74879
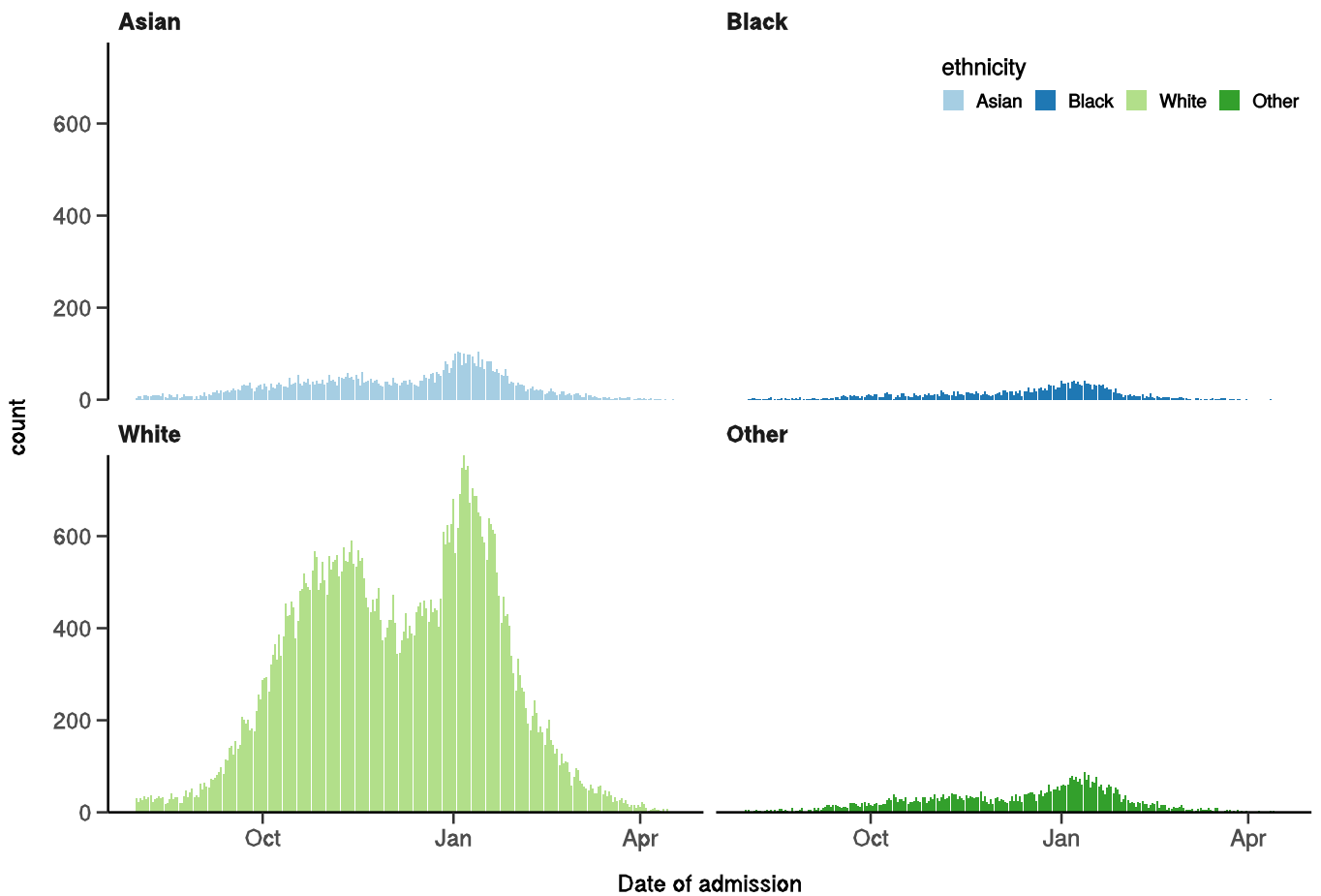

Patients with outcome stratified by age, and sex

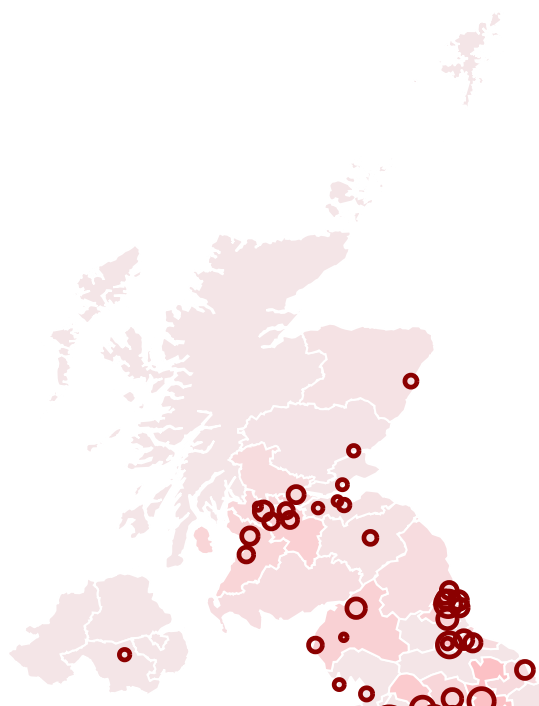Figure 1E

Hospital admission with COVID-19 by ethnicity
Figure 1F
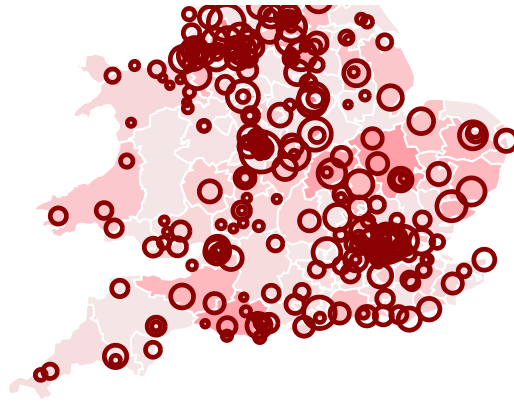

Location by CCG / Healthboard

Figure 2

Click and drag on map to zoom into area. Reset via toolbar at top of map.
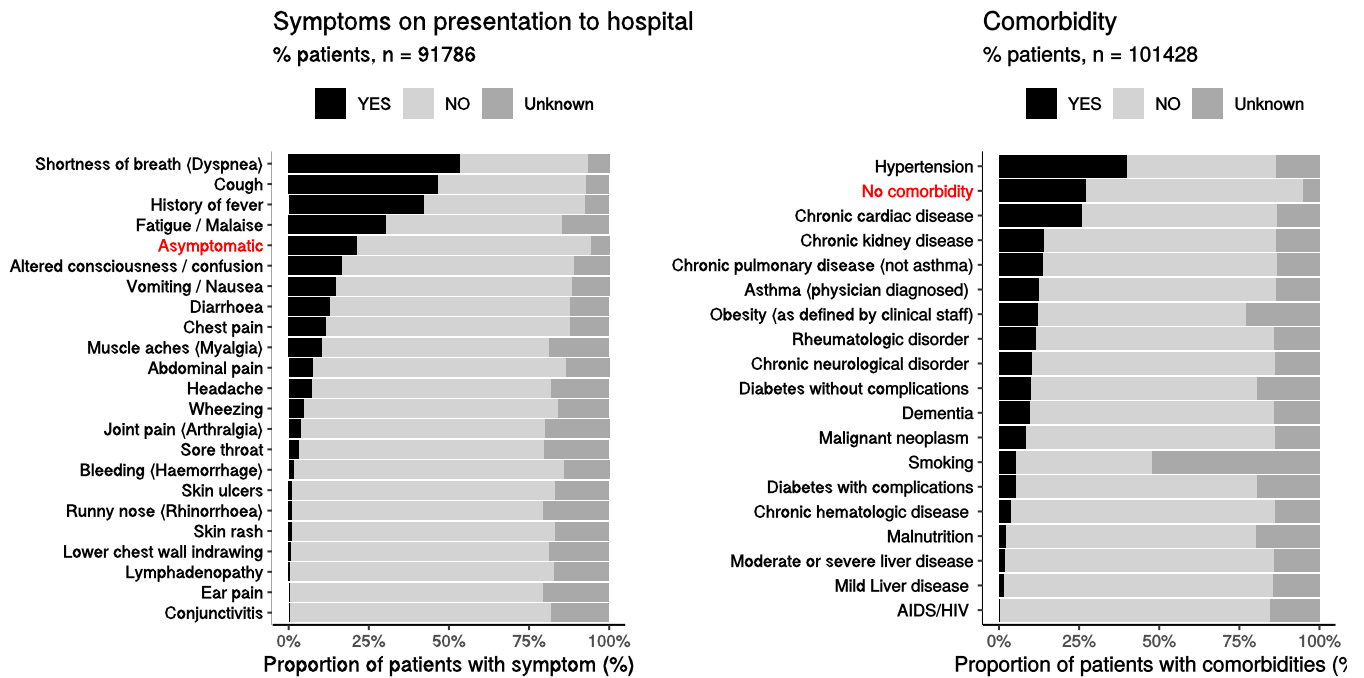
n = 100747

Symptoms and comorbidity

Figure 3A

Symptoms on presentation to hospital
% patients, n = 91786

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

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

Comorbidity
% patients, n = 101428

YES ■ NO ▢ Unknown ▨

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

0% 25% 50% 75% 100%
Proportion of patients with comorbidities (%
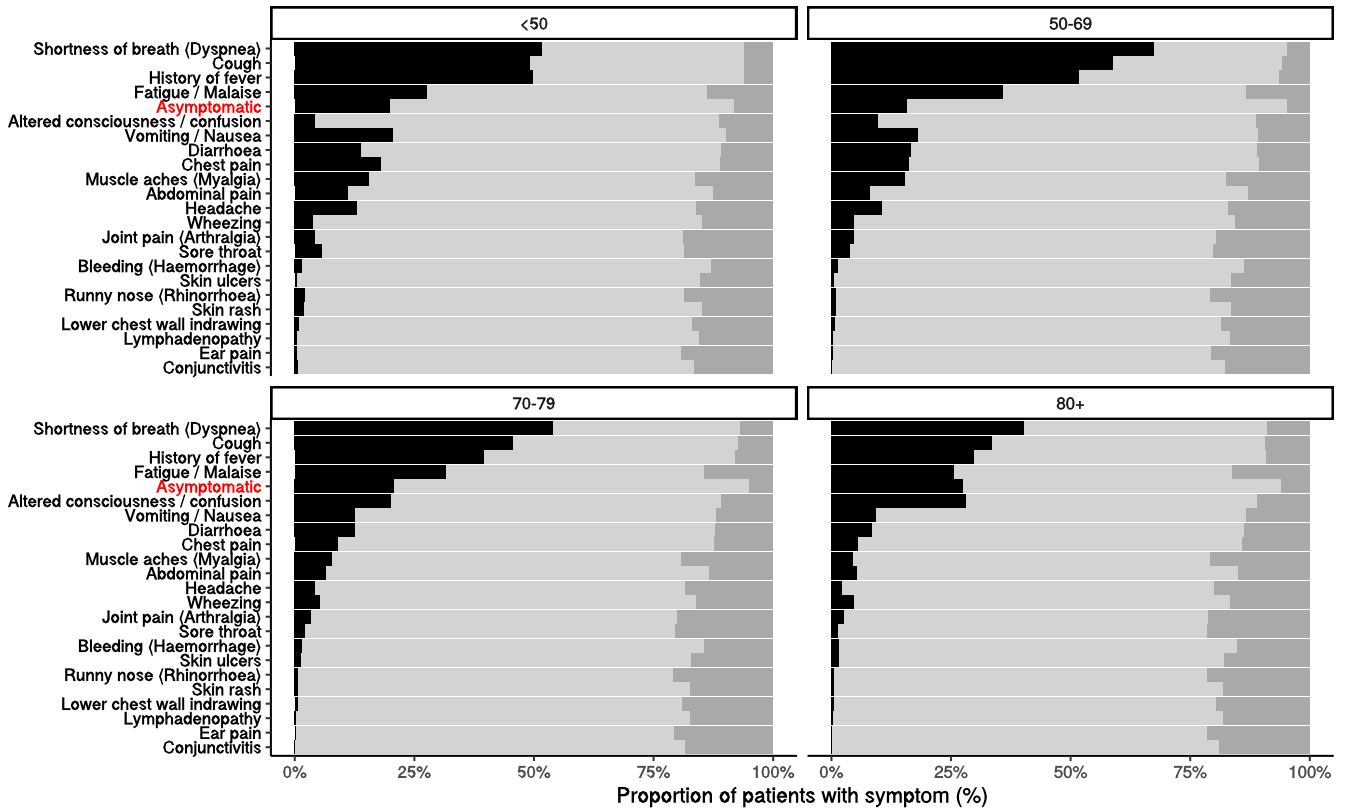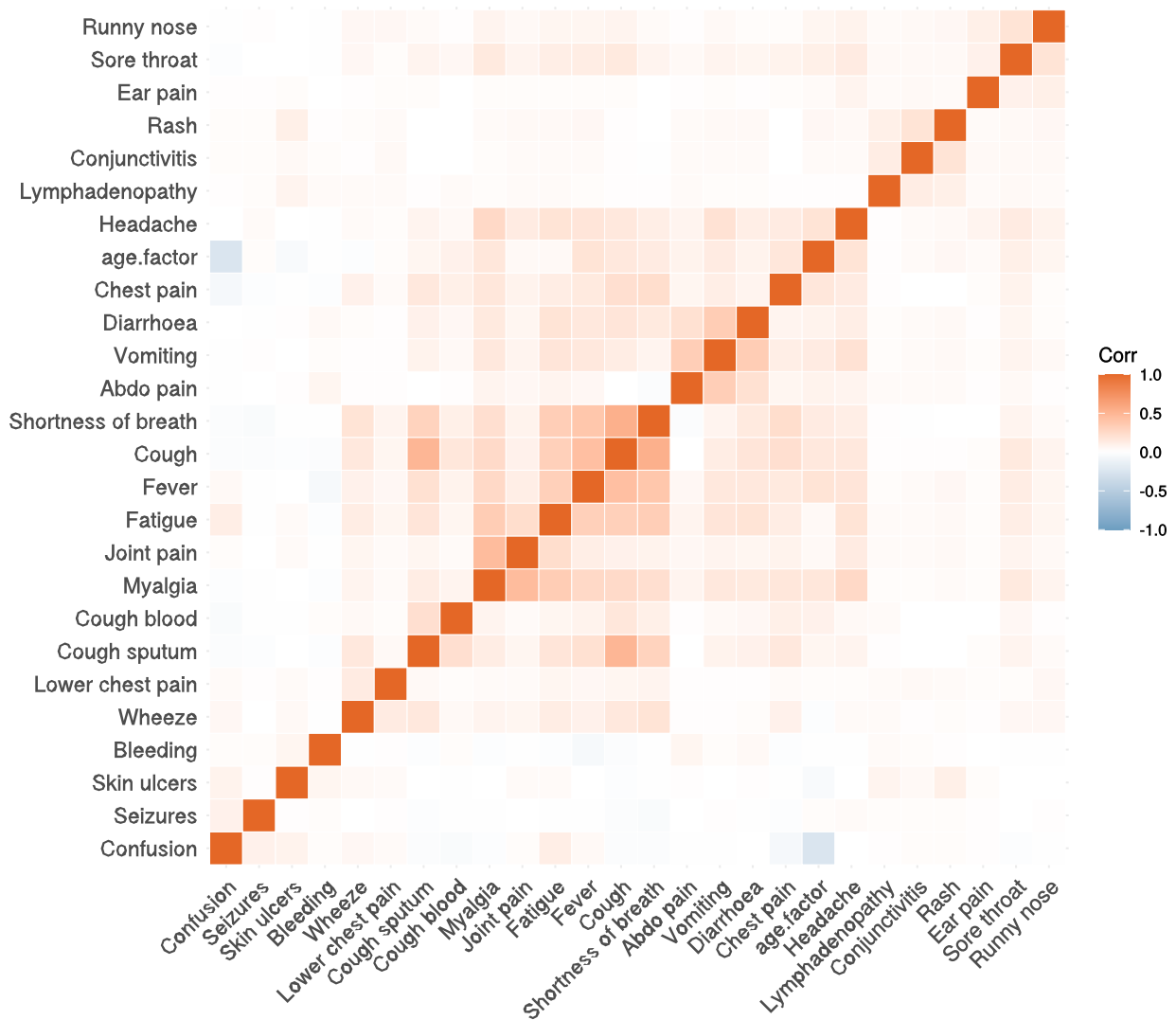
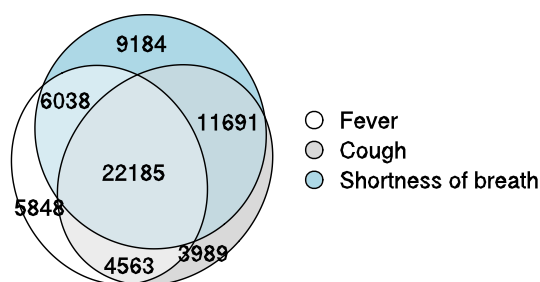## Figure 3B - Symptoms by Age

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 = 91786

Symptoms (most common)

Figure 4B

n = 91786
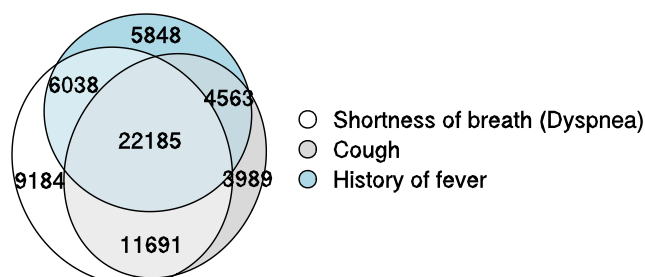
Comorbidity (most common)

Figure 4C

n = 101428

○ Hypertension
◯ Chronic cardiac disease
⬤ Chronic kidney disease
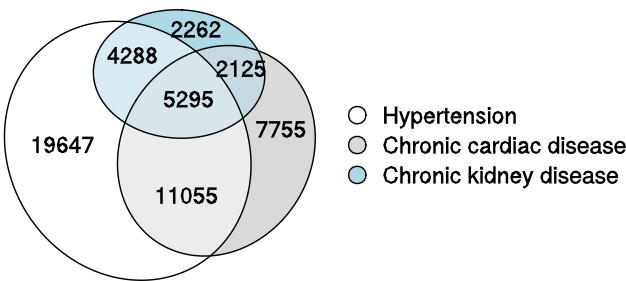
Medication prior to illness

Figure 5

Number of medications prior to admission
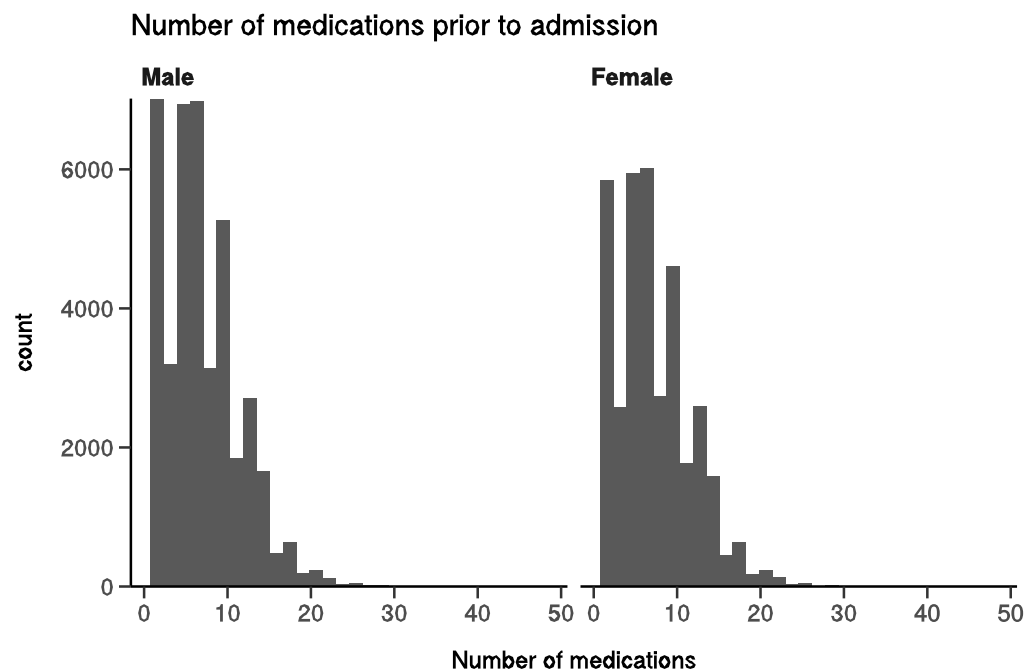
Preadmission treatment

Figure 6

Pre-admission treatment

Anti-infectives for illness episode (left) immunosuppressants including oral (not
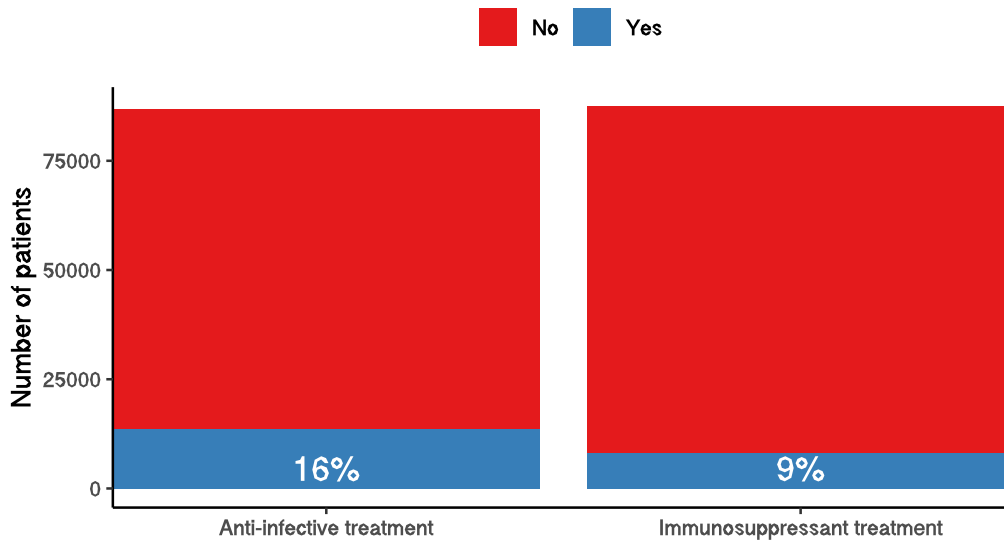
Patient flow

Figure 7A - All patients

N = 97922
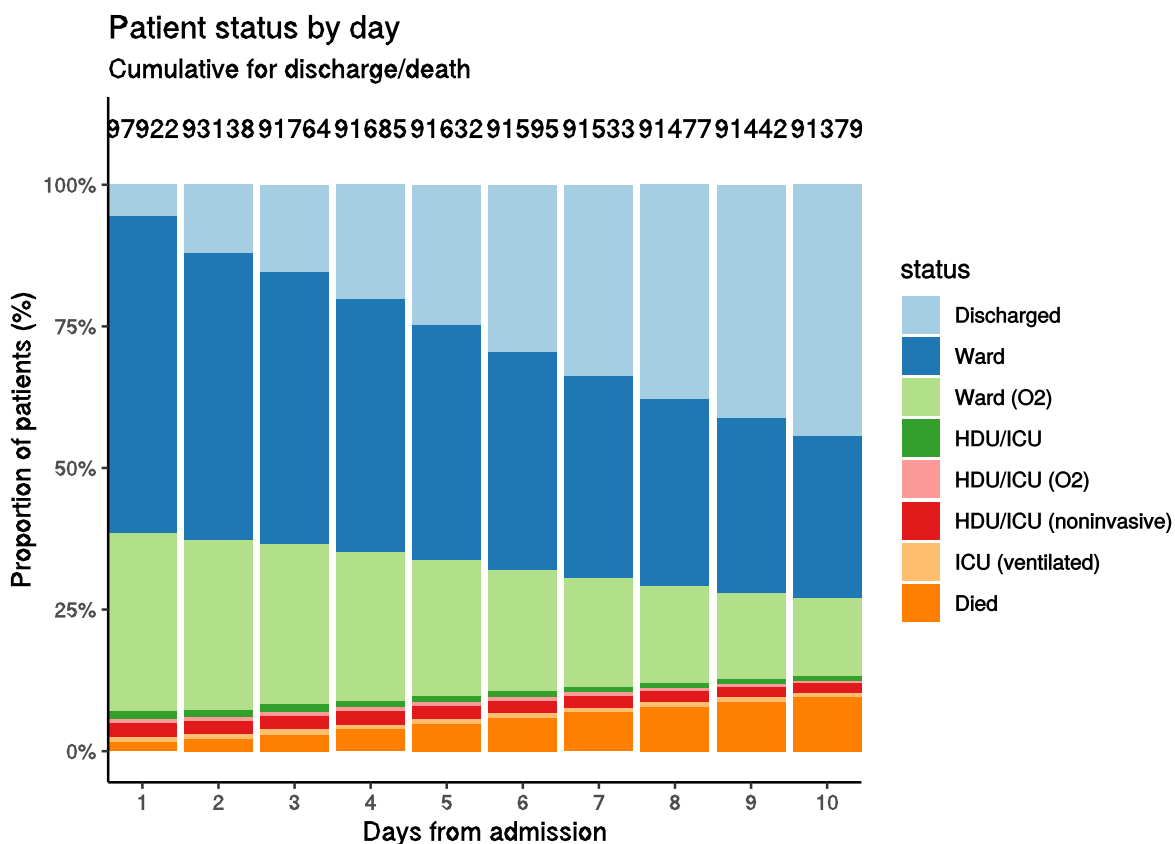
Figure 7B - Patients admitted >=14 days and <=28 days ago

N = 349

Patient status by day

Cumulative for discharge/death
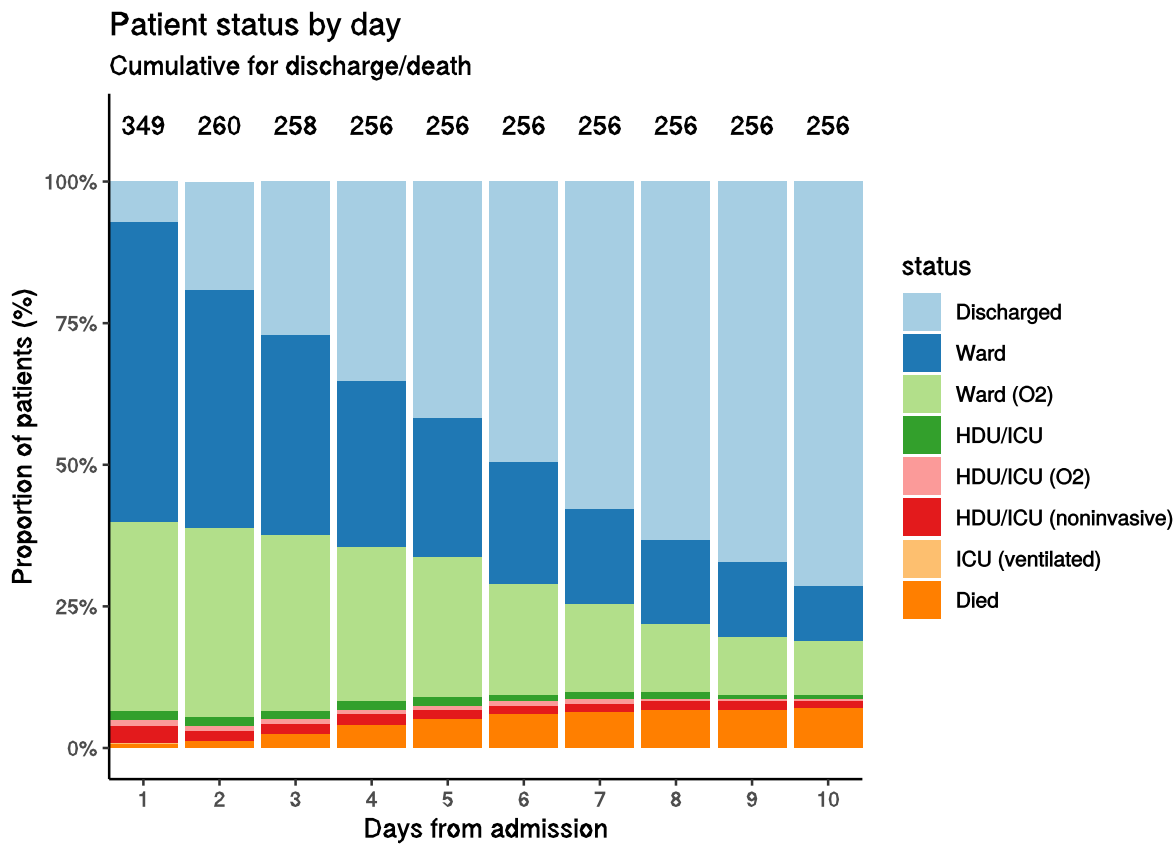
Oxygen requirement

Figure 8A - All patients

N = 92423
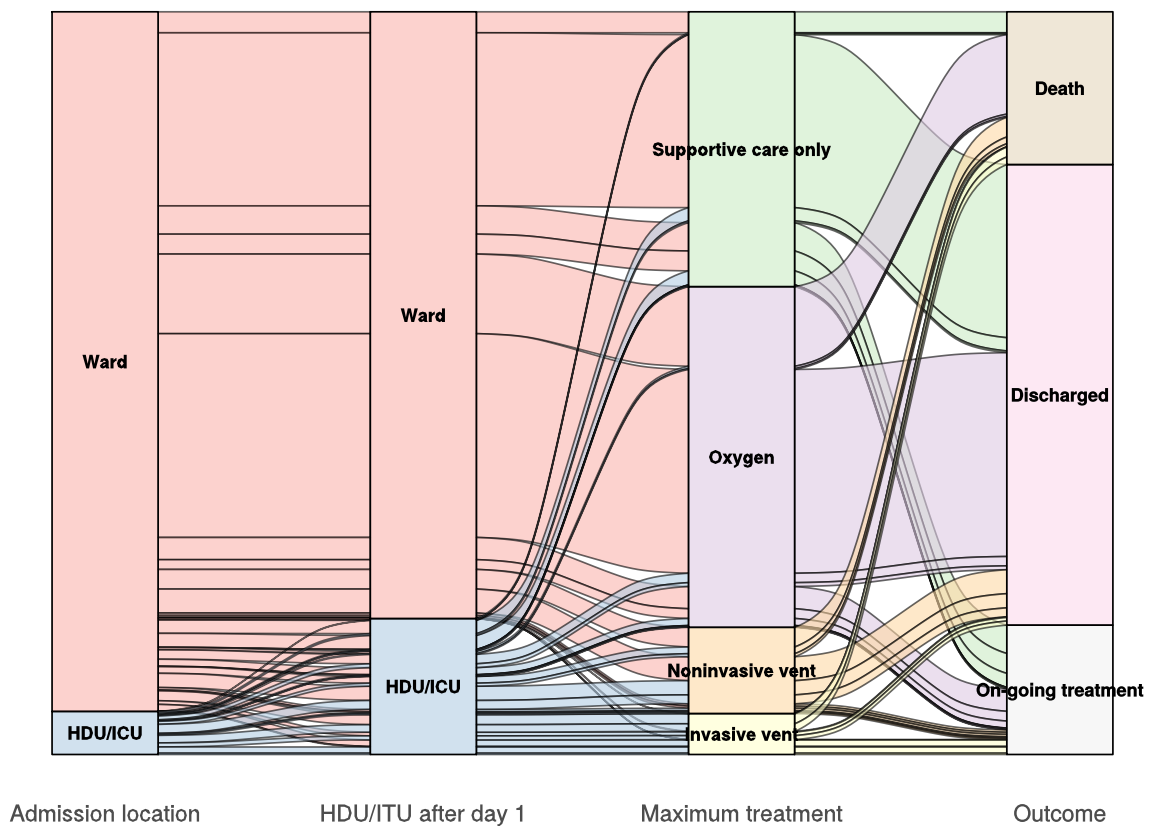
Figure 8B - Patients admitted >=14 days and <=28 days ago

N = 339

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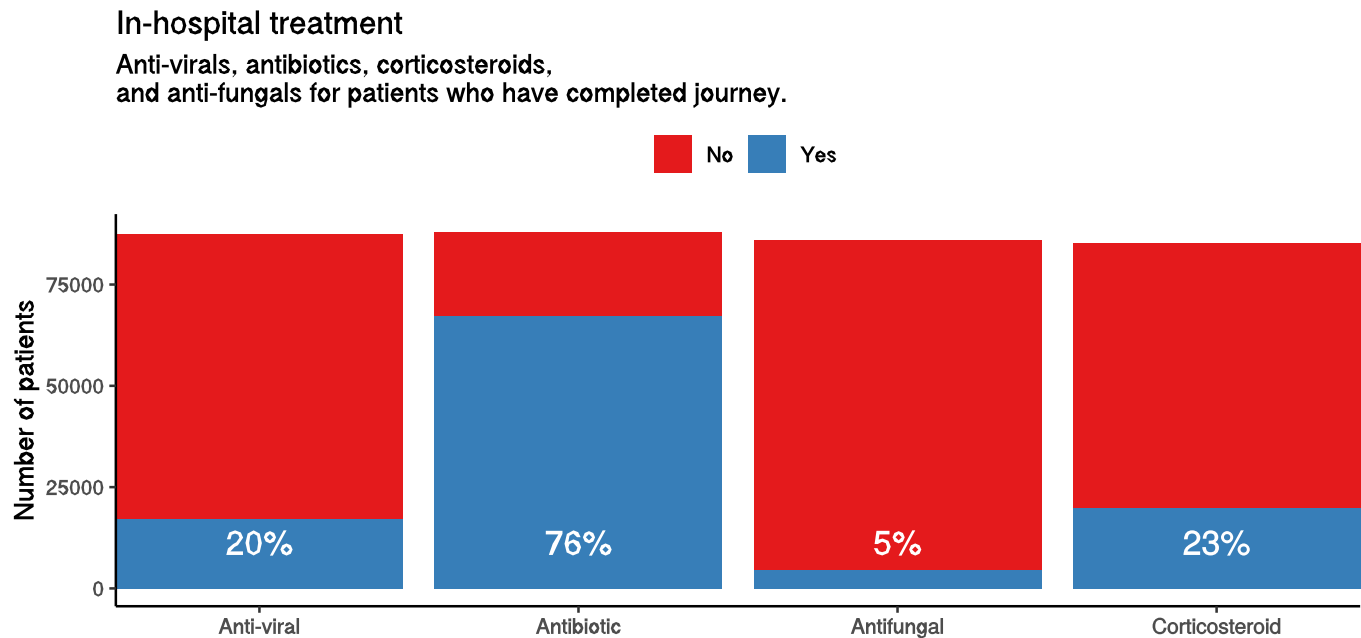
Invasive ventilation
Figure 10D
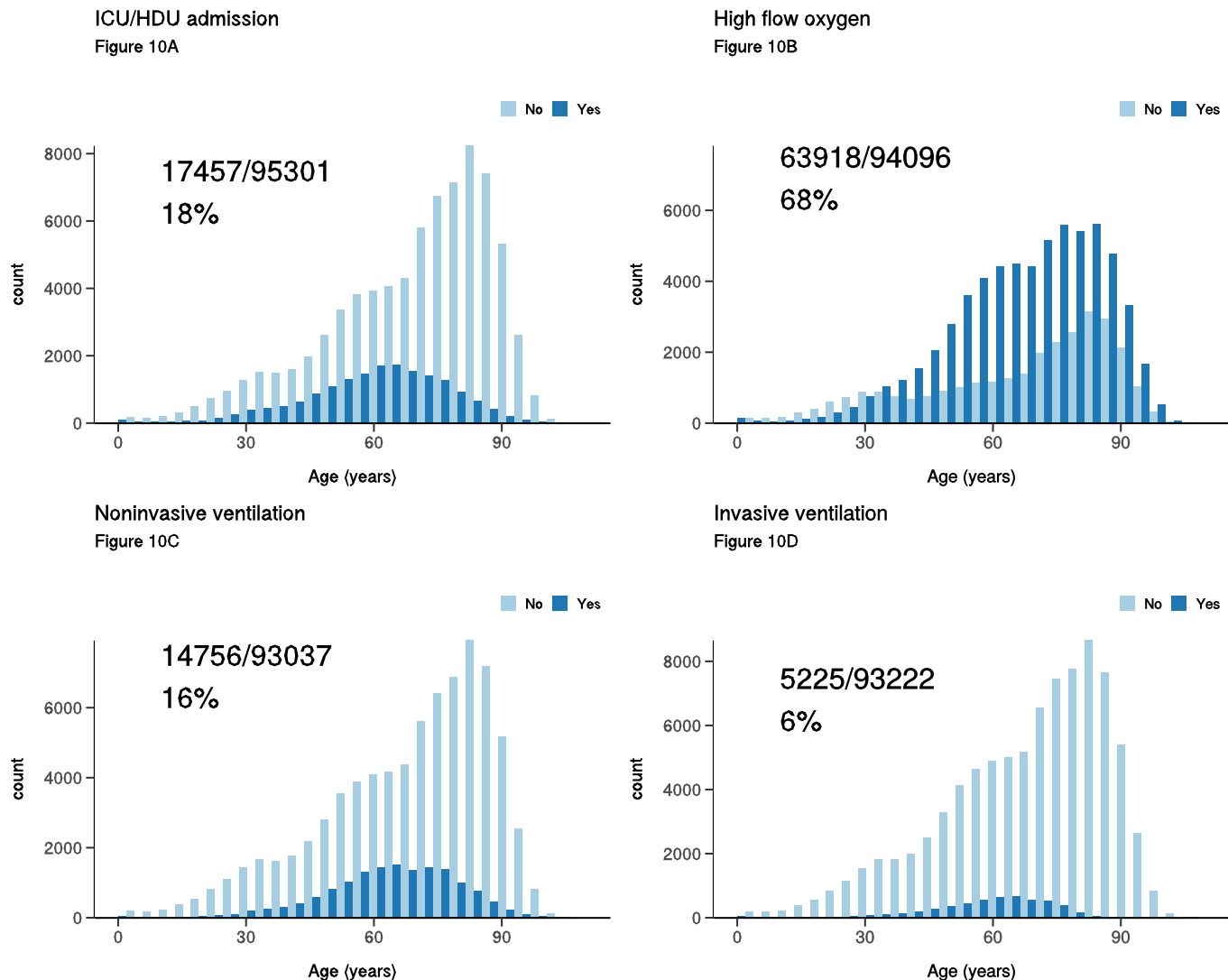
Status in patients admitted >=14 days from today

Figure 11

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

Died
20345/97085
21%

On-going care
16380/97085
17%

Discharged alive
60210/97085
62%
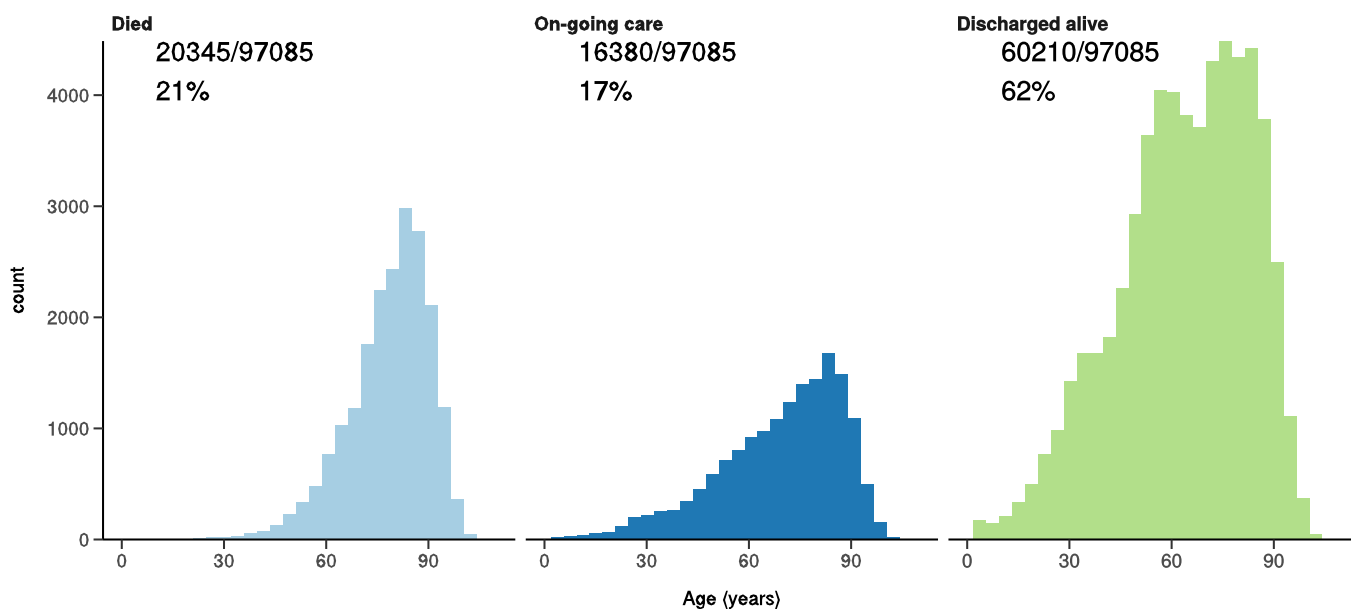
ICU/HDU admissions: status in patients admitted >=14 days ago
Figure 11B

Died
4136/17185
24%

On-going care
5526/17185
32%

Discharged alive
7507/17185
44%
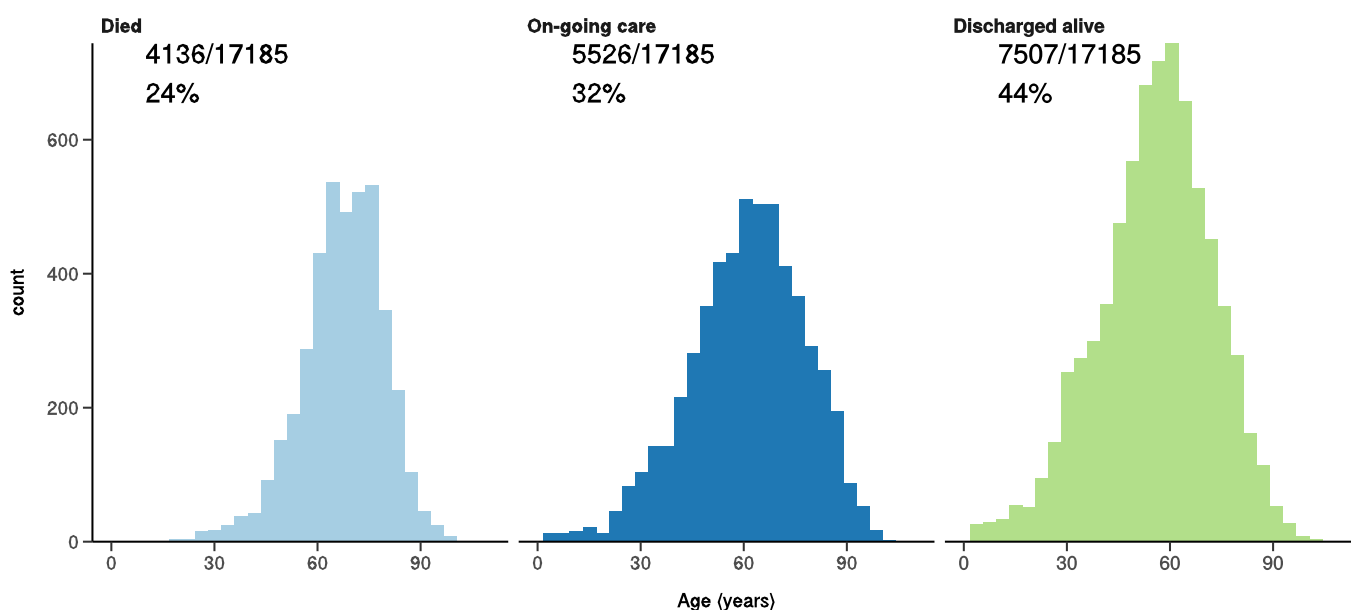
Invasive ventilation: status in patients admitted >=14 days ago
Figure 11c

Died
2259/5126
44%

On-going care
1804/5126
35%

Discharged alive
1058/5126
21%

Length of stay stratified by age

Figure 12

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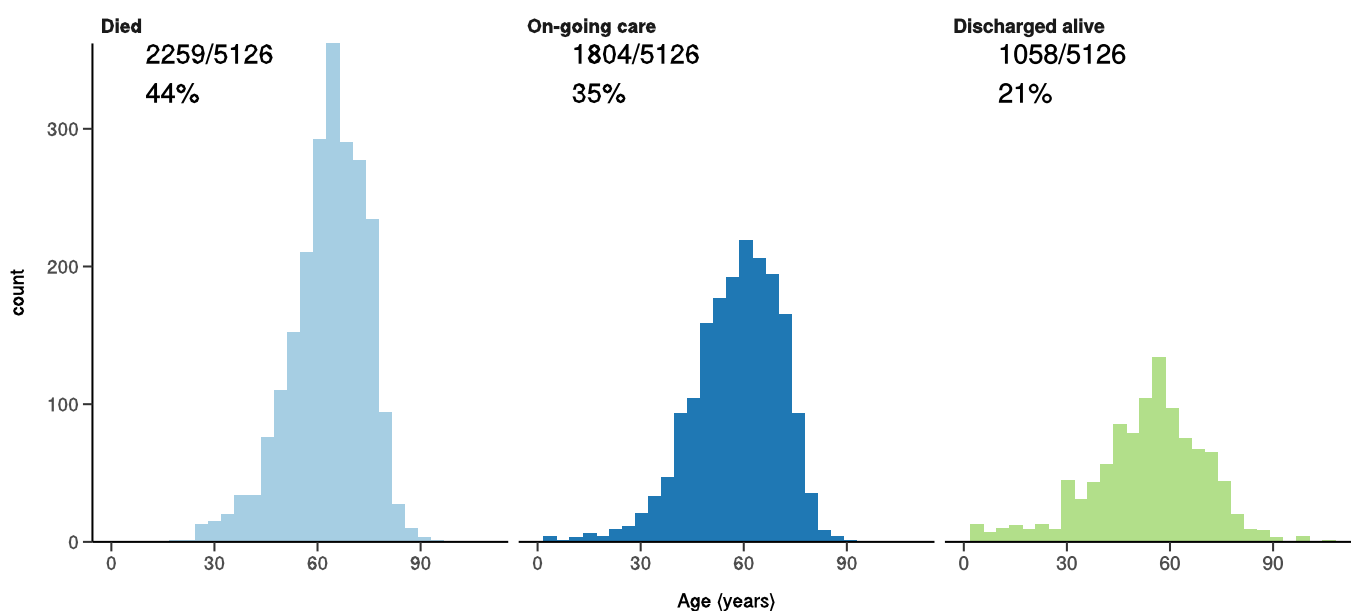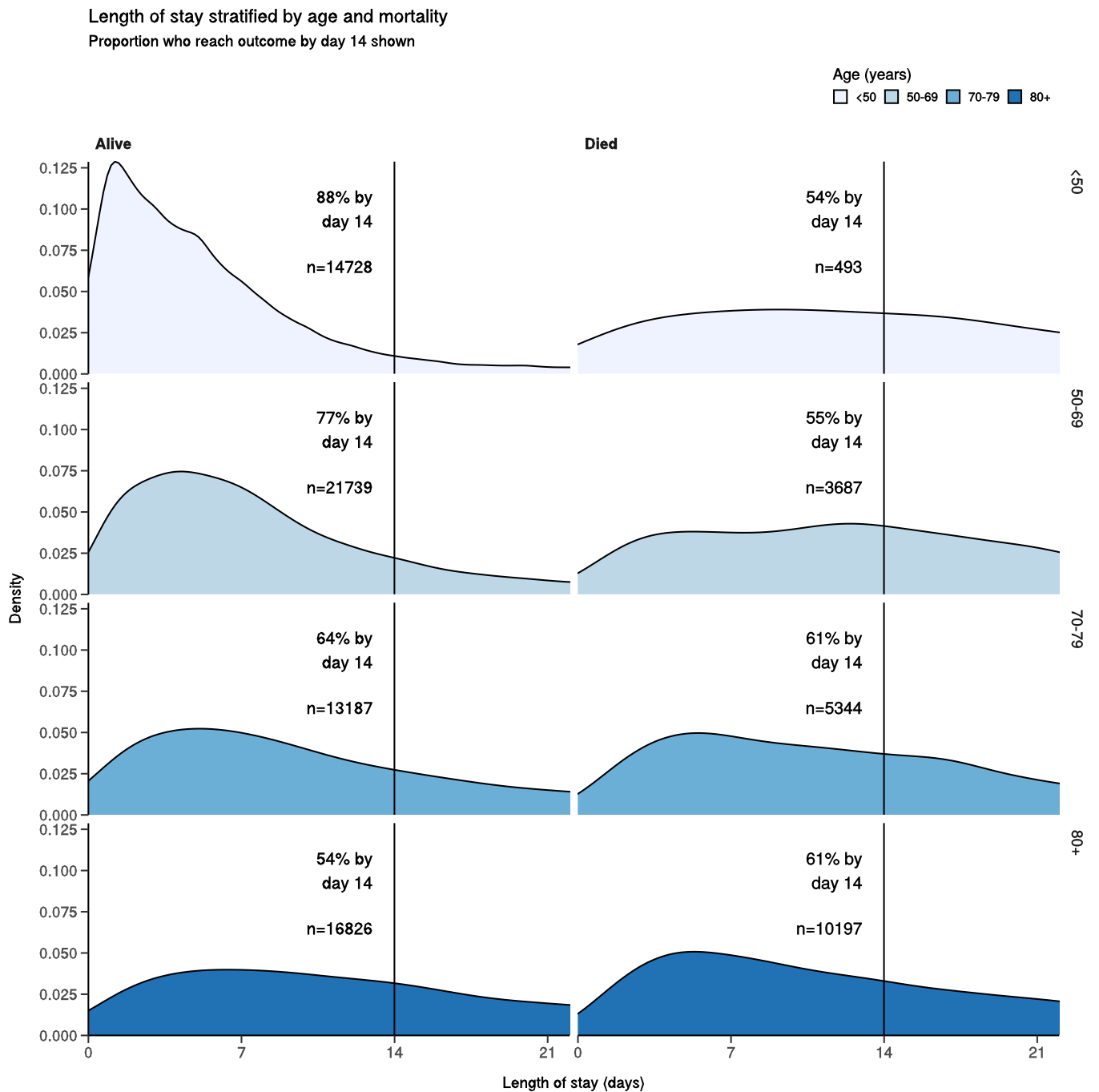
Predictors of death: logistic regression multivariable model

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	16298 (97.0)	510 (3.0)	•	•
	50-69	23378 (86.0)	3793 (14.0)	5.18 (4.72-5.71, p<0.001)	4.33 (3.90-4.81, p<0.001)

Dependent: death		No	Yes	OR (univariable)	OR (multivariable)
	70-79	14295 (72.3)	5485 (27.7)	12.26 (11.18-13.48, p<0.001)	8.87 (7.98-9.87, p<0.001)
	80+	18191 (63.4)	10504 (36.6)	18.45 (16.86-20.24, p<0.001)	13.04 (11.75-14.52, p<0.001)
Sex at Birth	Male	37823 (75.8)	12051 (24.2)	•	•
	Female	34368 (80.6)	8252 (19.4)	0.75 (0.73-0.78, p<0.001)	0.69 (0.67-0.72, p<0.001)
	Not specified	0 (NaN)	0 (NaN)	•	•
Chronic cardiac disease	NO	48138 (82.9)	9951 (17.1)	•	•
	YES	16625 (67.3)	8078 (32.7)	2.35 (2.27-2.43, p<0.001)	1.21 (1.16-1.26, p<0.001)
Chronic pulmonary disease (not asthma)	NO	56389 (80.6)	13579 (19.4)	•	•
	YES	8399 (65.5)	4422 (34.5)	2.19 (2.10-2.28, p<0.001)	1.55 (1.47-1.63, p<0.001)
Chronic neurological disorder	NO	57417 (79.1)	15155 (20.9)	•	•
	YES	7041 (72.5)	2677 (27.5)	1.44 (1.37-1.51, p<0.001)	1.03 (0.97-1.09, p=0.319)
Chronic hematologic disease	NO	61971 (78.6)	16889 (21.4)	•	•
	YES	2421 (72.2)	930 (27.8)	1.41 (1.30-1.52, p<0.001)	0.92 (0.84-1.01, p=0.096)
Chronic kidney disease	NO	56132 (80.9)	13259 (19.1)	•	•
	YES	8509 (64.6)	4669 (35.4)	2.32 (2.23-2.42, p<0.001)	1.34 (1.27-1.41, p<0.001)
Dementia	NO	58533 (80.5)	14202 (19.5)	•	•
	YES	5749 (62.5)	3448 (37.5)	2.47 (2.36-2.59, p<0.001)	1.37 (1.29-1.45, p<0.001)
Obesity (as defined by clinical staff)	NO	48771 (78.3)	13502 (21.7)	•	•
	YES	9325 (81.7)	2092 (18.3)	0.81 (0.77-0.85, p<0.001)	1.17 (1.10-1.24, p<0.001)

Dependent: death		No	Yes	OR (univariable)	OR (multivariable)
Malignant neoplasm	NO	59379 (79.9)	14922 (20.1)	•	•
	YES	5044 (63.2)	2937 (36.8)	2.32 (2.21-2.43, p<0.001)	1.66 (1.56-1.76, p<0.001)

Number in dataframe = 101106, Number in model = 70522, Missing = 30584, AIC = 63248.2, C-statistic = 0.741, H&L = Chi-sq(8) 214.78 (p<0.001)

Figure 13 - Adjusted odds ratio plot

Death

Age on admission (years)	<50	-	
	50-69	4.33 (3.90-4.81, p<0.001)	
	70-79	8.87 (7.98-9.87, p<0.001)	
	80+	13.04 (11.75-14.52, p<0.001)	
Sex at Birth	Male	-	
	Female	0.69 (0.67-0.72, p<0.001)	
	Not specified	-	
Chronic cardiac disease	YES	1.21 (1.16-1.26, p<0.001)	
Chronic pulmonary disease (not asthma)	YES	1.55 (1.47-1.63, p<0.001)	
Chronic neurological disorder	YES	1.03 (0.97-1.09, p=0.319)	
Chronic hematologic disease	YES	0.92 (0.84-1.01, p=0.096)	
Chronic kidney disease	YES	1.34 (1.27-1.41, p<0.001)	
Dementia	YES	1.37 (1.29-1.45, p<0.001)	
Obesity (as defined by clinical staff)	YES	1.17 (1.10-1.24, p<0.001)	
Malignant neoplasm	YES	1.66 (1.56-1.76, p<0.001)	

Odds ratio (95% CI, log scale)

Figure 14 - ROC

AUC: 0.741
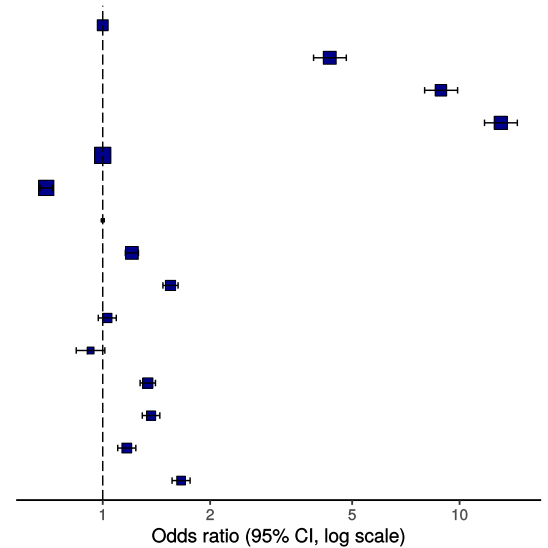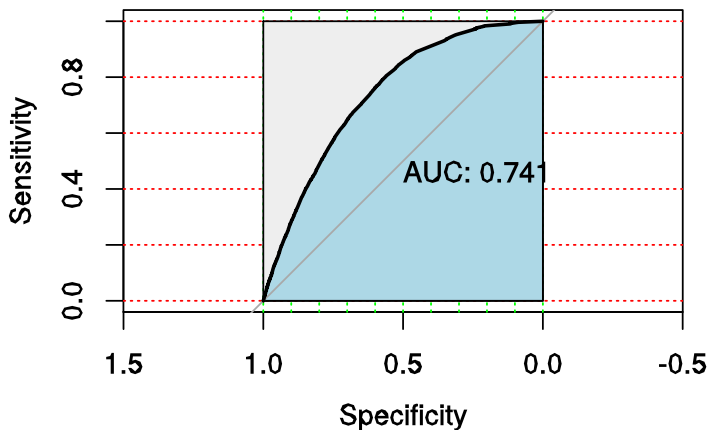
Survival models

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

Figure 15

P-value is log-rank test.

Survival plots (left: by age factor; right: by sex)

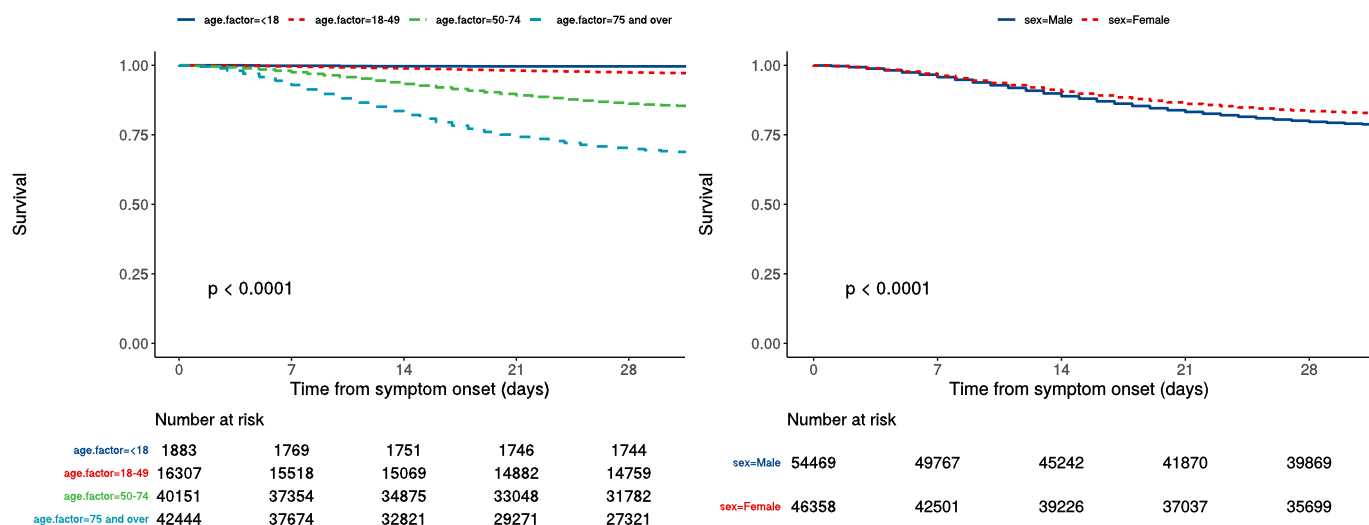Left plot legend: age.factor=<18, age.factor=18-49, age.factor=50-74, age.factor=75 and over
Right plot legend: sex=Male, sex=Female

Left plot: y-axis Survival (0.00–1.00), x-axis Time from symptom onset (days) 0, 7, 14, 21, 28. p < 0.0001

Right plot: y-axis Survival (0.00–1.00), x-axis Time from symptom onset (days) 0, 7, 14, 21, 28. p < 0.0001

Number at risk (left):

age.factor=<18	1883	1769	1751	1746	1744
age.factor=18-49	16307	15518	15069	14882	14759
age.factor=50-74	40151	37354	34875	33048	31782
age.factor=75 and over	42444	37674	32821	29271	27321

Number at risk (right):

sex=Male	54469	49767	45242	41870	39869
sex=Female	46358	42501	39226	37037	35699

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	18190 (18.0)	•	•
	50-69	29748 (29.5)	4.82 (4.40-5.29, p<0.001)	4.11 (3.68-4.58, p<0.001)
	70-79	21692 (21.5)	10.49 (9.58-11.49, p<0.001)	8.59 (7.71-9.58, p<0.001)
	80+	31176 (30.9)	14.92 (13.65-16.31, p<0.001)	12.07 (10.83-13.44, p<0.001)
Sex at Birth	Male	54469 (54.0)	•	•
	Female	46358 (46.0)	0.79 (0.76-0.81, p<0.001)	0.76 (0.74-0.79, p<0.001)
qSOFA score on admission	0	41407 (50.1)	•	•
	1	35163 (42.6)	1.57 (1.52-1.62, p<0.001)	1.76 (1.70-1.83, p<0.001)
	2	5599 (6.8)	3.07 (2.92-3.22, p<0.001)	2.99 (2.83-3.16, p<0.001)
	3	408 (0.5)	4.61 (4.02-5.30, p<0.001)	4.32 (3.71-5.04, p<0.001)
Symptomatic at presentation	No symptoms	15175 (16.5)	•	•
	Symptoms	76751 (83.5)	1.48 (1.42-1.55, p<0.001)	•

Dependent: Surv(time, status)		all	HR (univariable)	HR (multivariable)
Chronic cardiac disease	NO	61528 (70.2)	•	•
	YES	26130 (29.8)	2.13 (2.07-2.19, p<0.001)	1.21 (1.17-1.25, p<0.001)
Chronic kidney disease	NO	73509 (84.1)	•	•
	YES	13915 (15.9)	2.08 (2.01-2.15, p<0.001)	1.25 (1.20-1.30, p<0.001)
Moderate or severe liver disease	NO	85127 (98.1)	•	•
	YES	1645 (1.9)	1.56 (1.42-1.70, p<0.001)	1.60 (1.44-1.79, p<0.001)
Chronic neurological disorder	NO	76898 (88.3)	•	•
	YES	10203 (11.7)	1.39 (1.33-1.45, p<0.001)	
Malignant neoplasm	NO	78664 (90.3)	•	•
	YES	8435 (9.7)	2.05 (1.97-2.13, p<0.001)	1.49 (1.42-1.56, p<0.001)
Chronic hematologic disease	NO	83490 (96.0)	•	•
	YES	3499 (4.0)	1.37 (1.28-1.46, p<0.001)	•
Obesity (as defined by clinical staff)	NO	65810 (84.6)	•	•
	YES	12013 (15.4)	0.83 (0.79-0.87, p<0.001)	1.09 (1.03-1.15, p=0.001)
Diabetes without complications	NO	71324 (87.8)	•	•
	YES	9945 (12.2)	1.17 (1.12-1.23, p<0.001)	•
Rheumatologic disorder	NO	75261 (86.7)	•	•
	YES	11552 (13.3)	1.24 (1.19-1.29, p<0.001)	•
Dementia	NO	77027 (88.8)	•	•
	YES	9733 (11.2)	2.20 (2.12-2.28, p<0.001)	1.19 (1.14-1.25, p<0.001)
Malnutrition	NO	79045 (97.6)	•	•

Dependent: Surv(time, status)		all	HR (univariable)	HR (multivariable)
	YES	1965 (2.4)	1.78 (1.64-1.92, p<0.001)	•
smoking_mhyn_2levels	NO	42994 (47.0)	•	•
	YES	5276 (5.8)	0.90 (0.85-0.97, p=0.004)	•
	N/K	43205 (47.2)	1.19 (1.15-1.22, p<0.001)	•

Number in dataframe = 101054, Number in model = 67054, Missing = 34000, Number of events = 13399, Concordance = 0.738 (SE = 0.002), R-squared = 0.134(Max possible = 0.988), Likelihood ratio test = 9652.892 (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	4.11 (3.68-4.58, p<0.001)
	70-79	8.59 (7.71-9.58, p<0.001)
	80+	12.07 (10.83-13.44, p<0.001)
Sex at Birth	Female	0.76 (0.74-0.79, p<0.001)
qSOFA score on admission	0	-
	1	1.76 (1.70-1.83, p<0.001)
	2	2.99 (2.83-3.16, p<0.001)
	3	4.32 (3.71-5.04, p<0.001)
Chronic cardiac disease	YES	1.21 (1.17-1.25, p<0.001)
Chronic kidney disease	YES	1.25 (1.20-1.30, p<0.001)
Moderate or severe liver disease	YES	1.60 (1.44-1.79, p<0.001)
Malignant neoplasm	YES	1.49 (1.42-1.56, p<0.001)
Obesity (as defined by clinical staff)	YES	1.09 (1.03-1.15, p=0.001)
Dementia	YES	1.19 (1.14-1.25, p<0.001)

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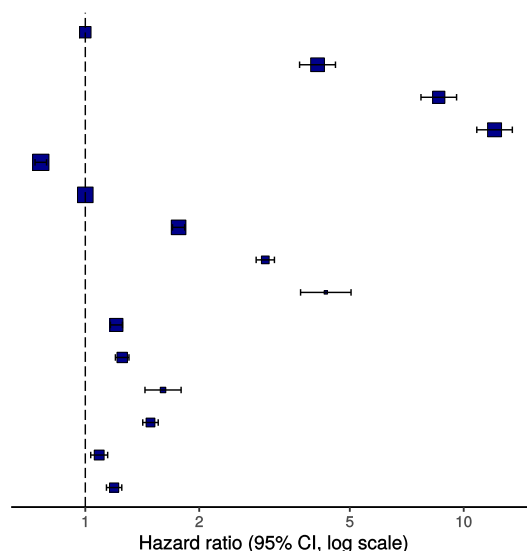
Figure 16b - Multivariable Cox proportional hazards model (age, sex, comorbidities only)

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

Age on admission (years)	<50	-
	50-69	4.17 (3.76-4.62, p<0.001)
	70-79	8.01 (7.23-8.88, p<0.001)
	80+	11.09 (10.02-12.28, p<0.001)
Sex at Birth	Female	0.74 (0.72-0.77, p<0.001)
Chronic cardiac disease	YES	1.18 (1.14-1.22, p<0.001)
Chronic pulmonary disease (not asthma)	YES	1.41 (1.36-1.47, p<0.001)
Chronic kidney disease	YES	1.25 (1.20-1.30, p<0.001)
Malignant neoplasm	YES	1.45 (1.39-1.52, p<0.001)
Obesity (as defined by clinical staff)	YES	1.13 (1.07-1.18, p<0.001)
Dementia	YES	1.29 (1.23-1.35, p<0.001)

Hazard ratio (95% CI, log scale)
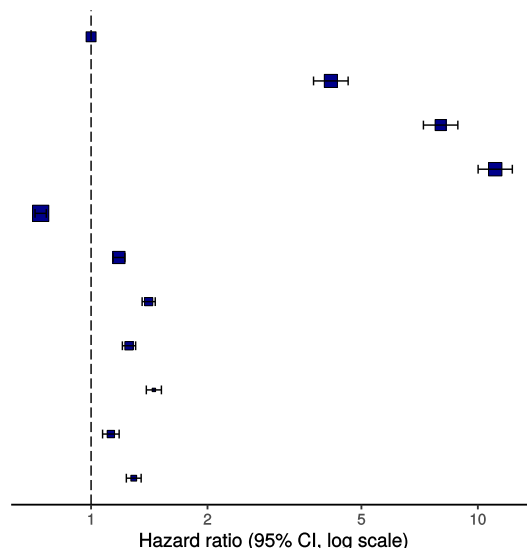
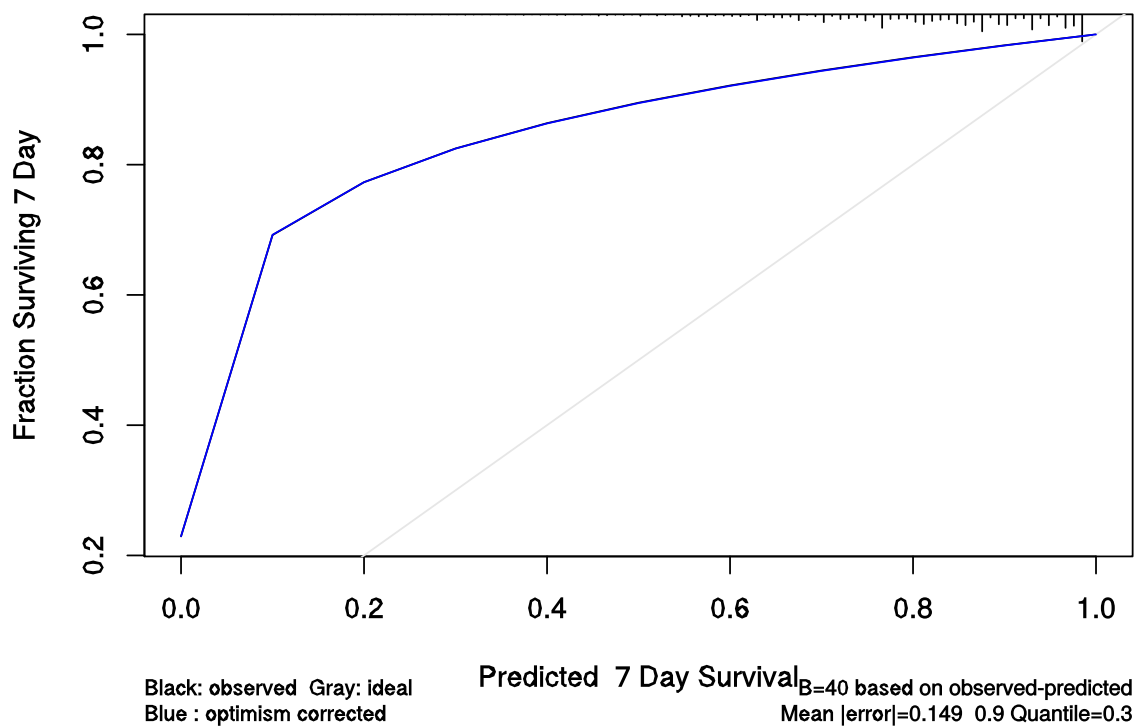ROC = 0.7397631

Figure 17 - Predictions calibration plot

Figure 18 - Prognostic model predictions

Again, for demonstration of methods.
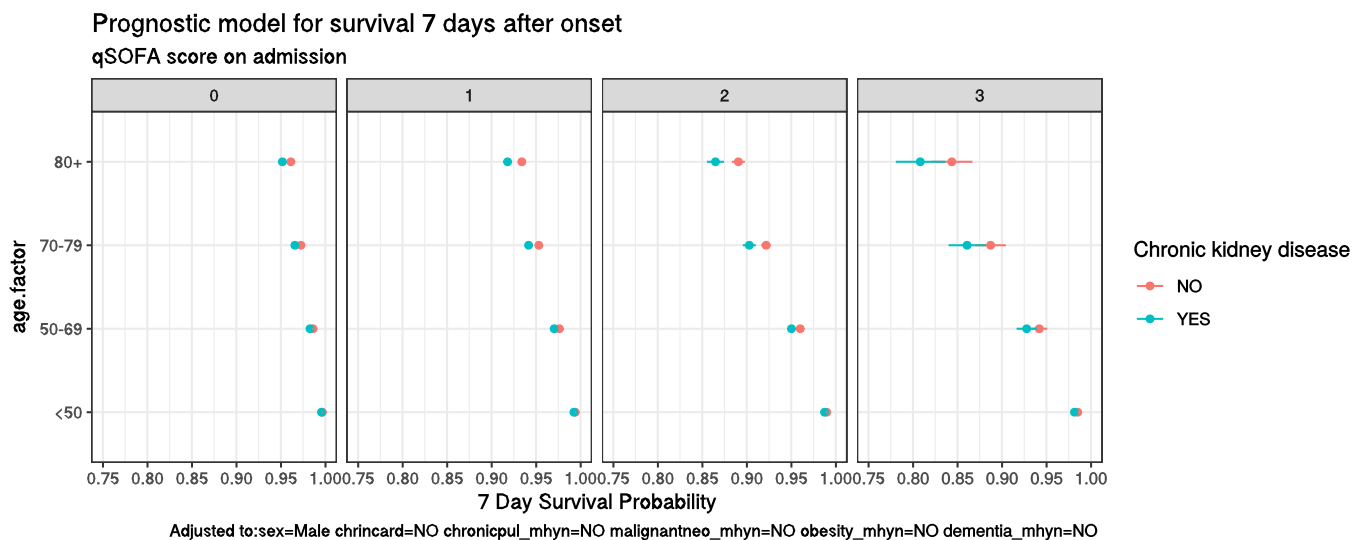

Figure 19 - Death by severity (NEWS) on admission
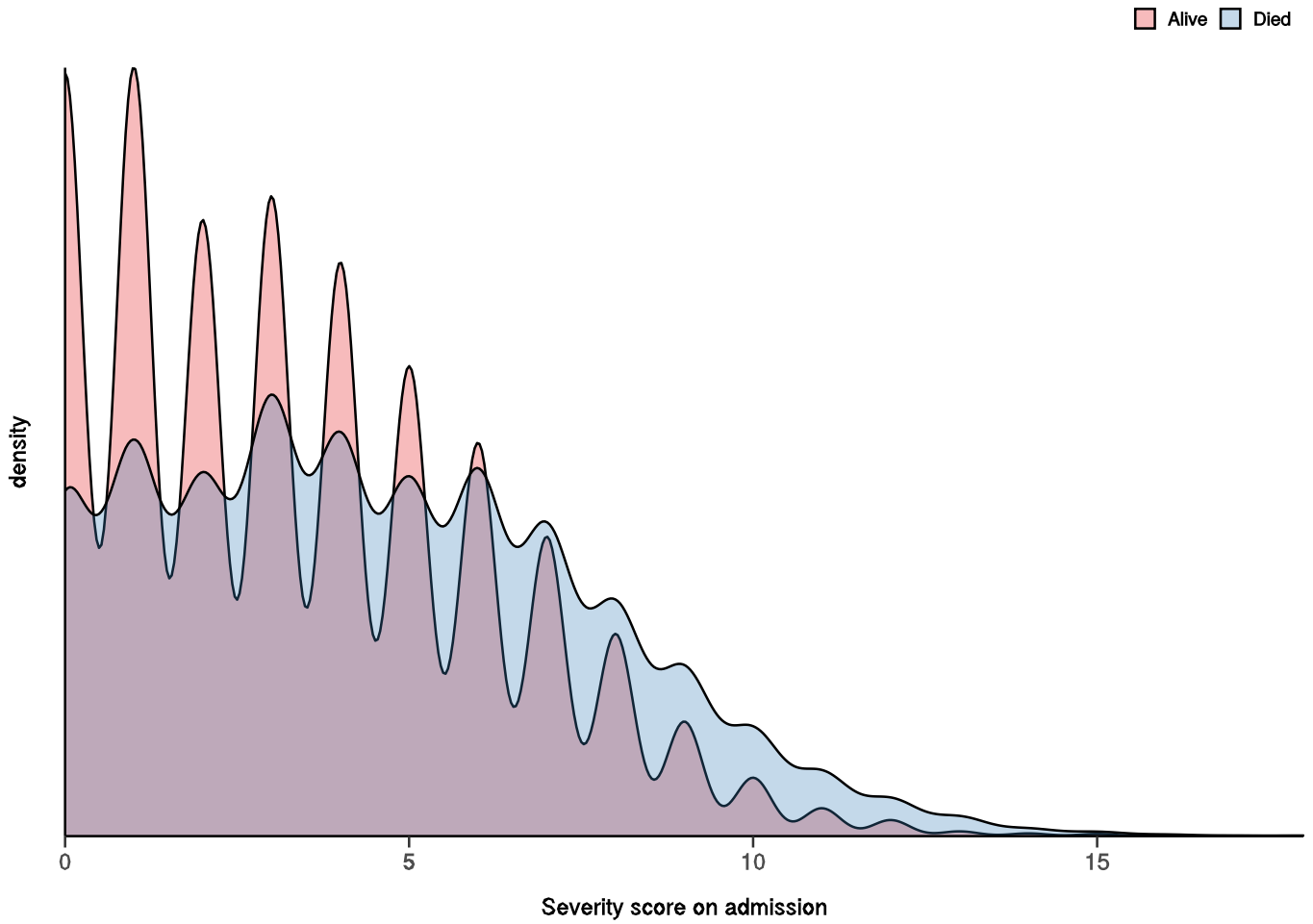
Number of deaths by NEWS score at admission

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

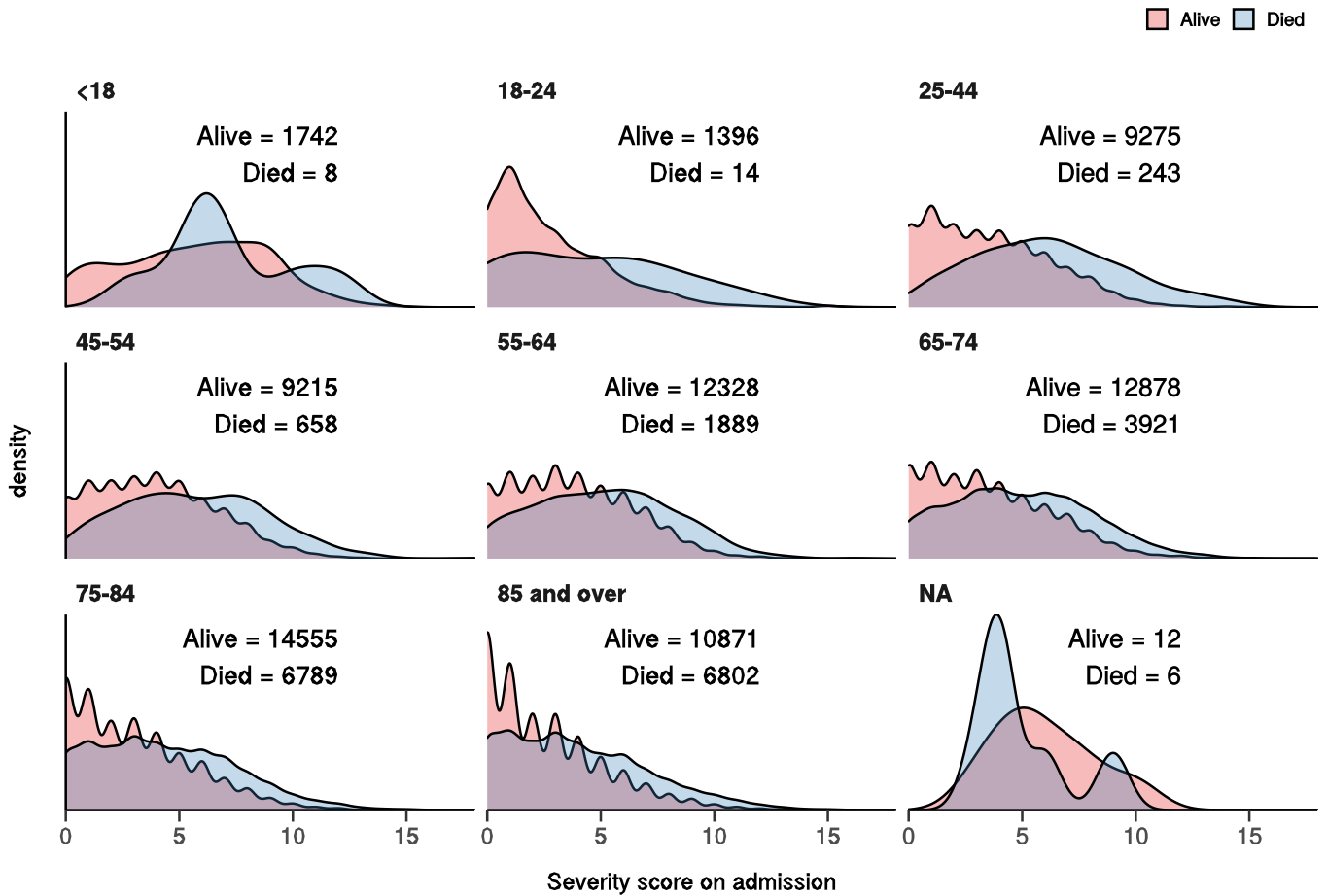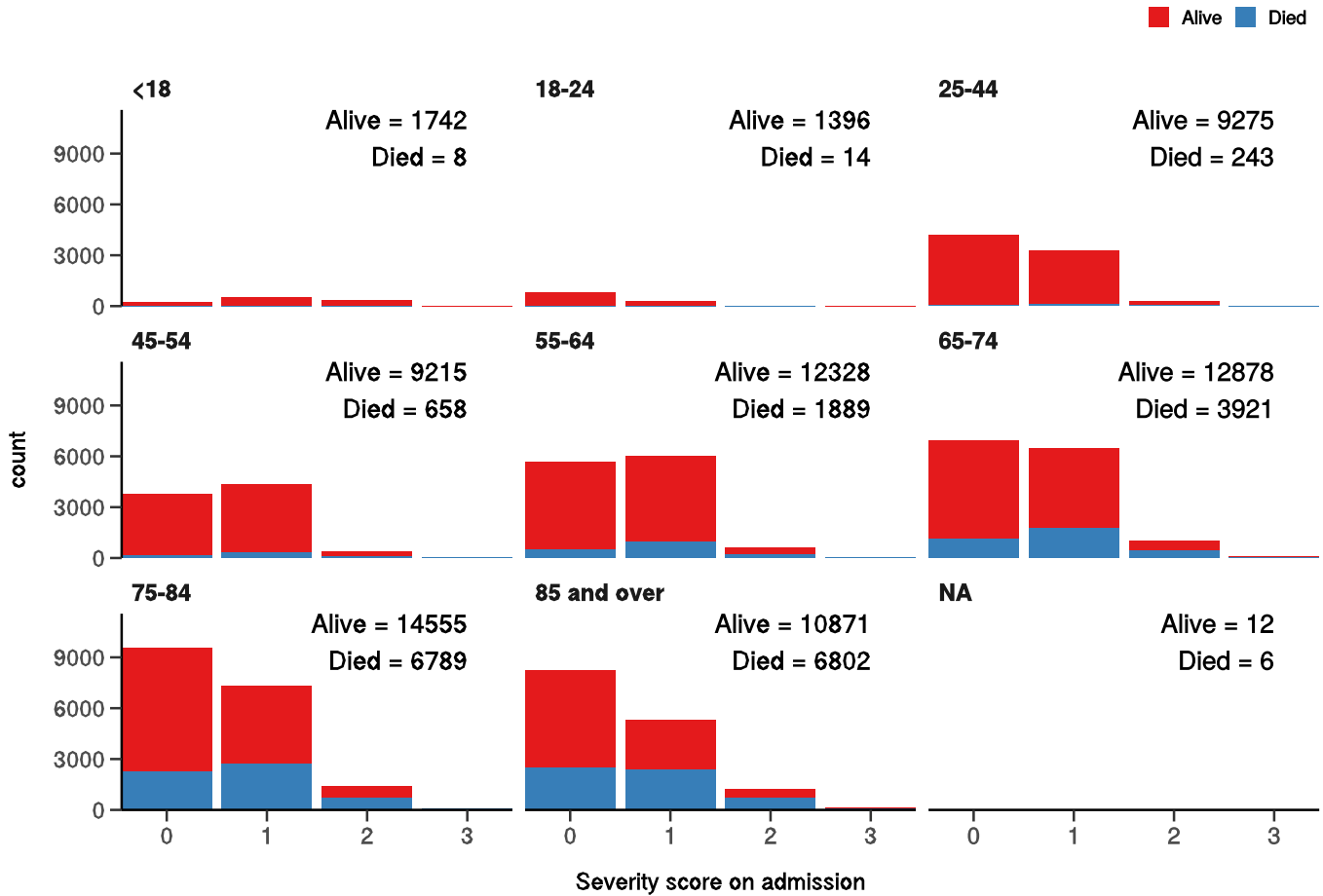Number of deaths by NEWS score at admission
Stratified by age

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 (%)		77394 (97.4)	2049 (2.6)	
NEWS score on admission	Median (IQR)	3.0 (4.0)	4.0 (4.0)	<0.001
Death	No	53743 (75.3)	1785 (93.2)	<0.001
	Yes	17624 (24.7)	131 (6.8)	