COVID-19 Hospital Based Sentinel Surveillance Report

Datenstand: 18. Oktober 2021

Einführung

Das CH-SUR-Überwachungssystem «COVID-19 Hospital Based Surveillance» wurde im Jahr 2018 eingerichtet, um grippebedingte Hospitalisierungen zu erfassen. Bereits am 1. März 2020, vier Tage nach der Meldung des ersten bestätigten COVID-19 Falls in der Schweiz, stand das angepasste Programm bereit, um auch Hospitalisierungen im Zusammenhang mit einer laborbestätigten SARS-CoV-2-Infektion zu registrieren.

Zurzeit nehmen 20 Spitäler aktiv teil, darunter die meisten Kantons- und Universitätsspitäler, welche einen grossen Teil der hospitalisierten pädiatrischen und erwachsenen Patientinnen und Patienten in der ganzen Schweiz abdecken. Die CH-SUR-Statistik gibt die Anzahl und Dauer der Hospitalisierungen sowie die Aufenthalte auf der Intensivpflegestation an. Eine Patientin oder ein Patient kann mehrfach hospitalisiert werden bzw. Behandlungen in einer Intensivpflegestation (IPS) benötigen.

CH-SUR erfasst Daten von Patientinnen und Patienten, welche mit einer Infektion mit SARS-CoV-2 hospitalisiert wurden, und deren Spitalaufenthalt länger als 24 Stunden andauert, sowie nosokomiale SARS-CoV-2 Infektionen. Als Bestätigung für eine Infektion gilt ein positiver PCR-Test (Polymerase Chain Reaction) oder ein positiver Antigen-Schnelltest, wie auch ein klinischer Befund für COVID-19. Ersichtlich ist in CH-SUR ebenfalls, ob der Patient oder die Patientin während der Hospitalisierung aufgrund der COVID-19-Infektion verstorben ist.

Seit Beginn der Epidemie bis zum 18. Oktober 2021 wurden Daten von 20’168 hospitalisierten Patienten und Patientinnen erhoben. Da gewisse Personen mehrfach hospitalisiert wurden, hat das CH-SUR-System 20’966 Hospitalisierungen und deren Verlauf registriert. Von 18’828 hospitalisierten Patientinnen und Patienten liegen detaillierte Austrittsdaten vor. Davon wurden 3472 Patientinnen und Patienten in einer IPS gepflegt und 2032 Personen (10,8 %) sind während ihres Spitalaufenthaltes an COVID-19 verstorben. Im gleichen Zeitraum wurden dem BAG im Rahmen der Meldepflicht für die gesamte Schweiz 33’370 Hospitalisierungen mit einer laborbestätigten SARS-CoV-2-Infektion gemeldet. Das CH-SUR-System deckte somit ca. 63% aller gemeldeten Hospitalisierungen im Zusammenhang mit SARS-CoV-2 in der Schweiz ab.

1. Hospitalizations and demographic characteristics

Between the start of the epidemic in Switzerland and Oct 18, 2021 and among the 20 hospitals actively participating in the CH-SUR, 20,168 patients were hospitalized, for a total of 20,966 hospitalizations. There were more hospitalizations than patients because some patients were hospitalized more than once. An overview of these rehospitalized patients is shown in Figure 1.

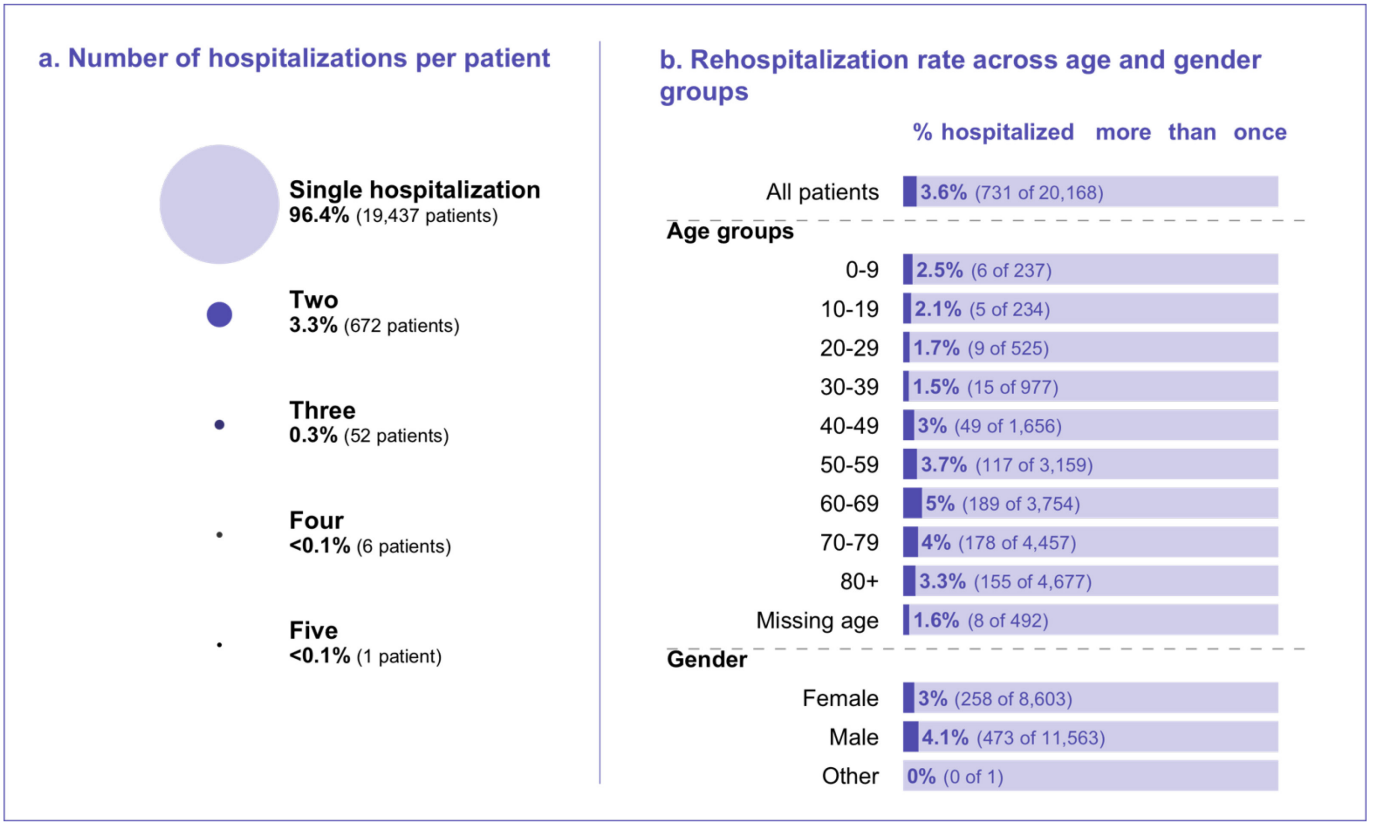

Figure 1: Hospitalizations per patient and rehospitalization rate across demographic groups. Includes records up to October 18, 2021.

Most patients (96.4% [19,437 of 20,168]) were hospitalized only once, but 730 were hospitalized two to four times, and one patient was hospitalized five times (Figure 1a).

The overall rate of rehospitalization was 3.6% (731 of 20,168) (Figure 1b). The 60-69 age group had the highest rate of rehospitalization at 5.1% (189 of 3,754), and men had a higher rehospitalization rate than women, 4.1% (473 of 11,563) vs 3% (258 of 8,603) respectively.

The majority (57.3% [11,563 of 20,168]) of patients were men (Figure 2a), and the age distribution skewed older (Figure 2b). The largest age category of patients were those aged 80 and above (23% [4677]).

Figures 2c and 2d show the gender and age ratio over time, respectively. More men than women were admitted in each month for the entire period of observation. The proportion of patients aged 50 and above is notably high between October 2020 and January 2021, with a peak in November 2020: 89.7% (3286 of 3664) of patients first admitted in this month were 50 and above. This peak in older age admissions mirrors a similarly-timed peak in admission severity and case fatality ratios seen in Figures 4b and 4c.

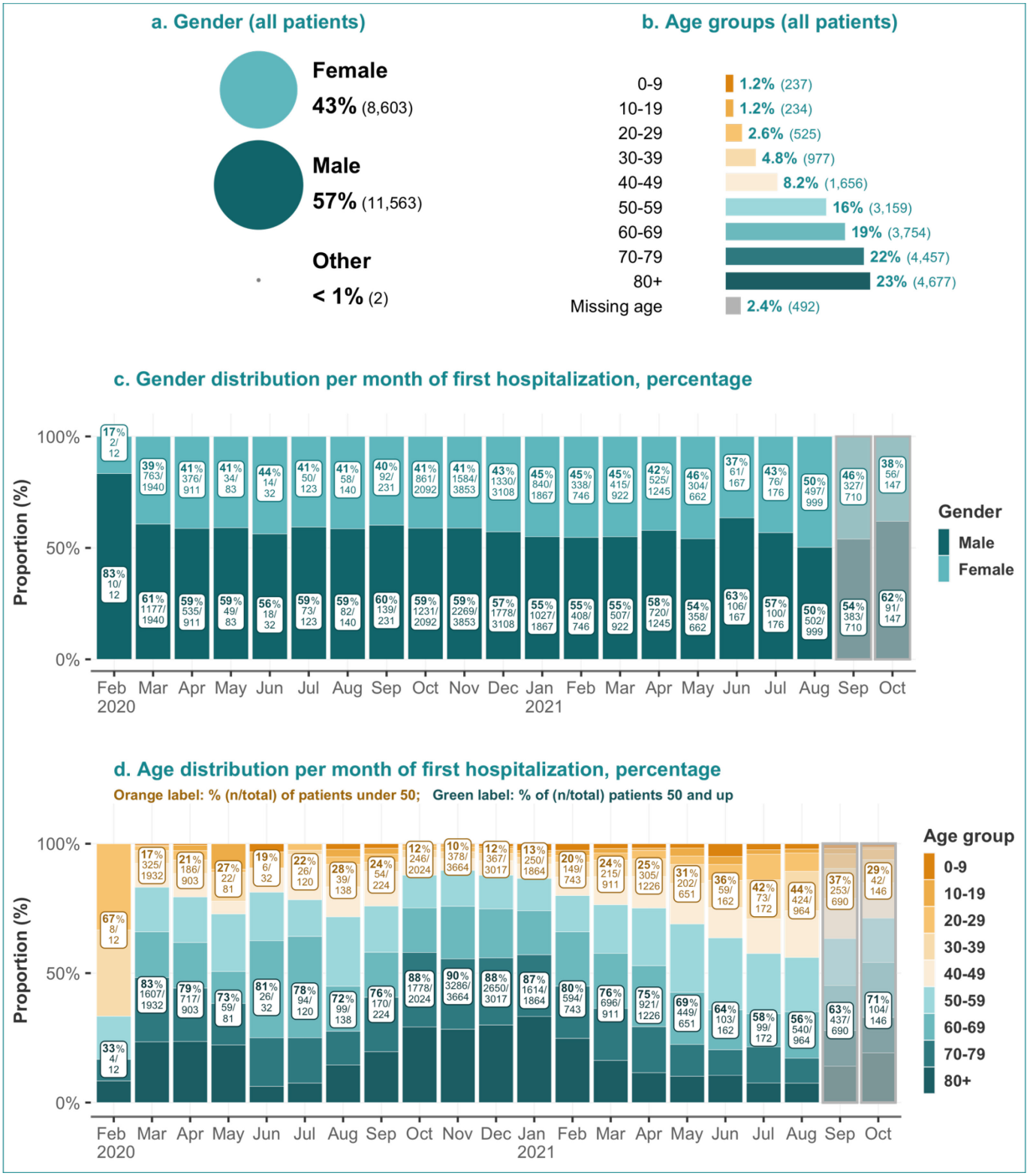

Figure 2: Demographic characteristics: gender and age distribution of admitted patients, overall and per month. For patients with multiple hospitalizations, the admission date of the first hospitalization was used. Data from the last two months (highlighted gray) is considered provisional due to data entry delays. The 'other' gender category was removed from panel c, and the missing age group was removed from panel d.

2. Patient outcomes

2.1. Outcomes overview

Figure 3 shows the final outcomes of CH-SUR patients over three time intervals. Patients for whom COVID-19 was the cause of death (died *of* COVID-19) are shown separately from COVID-19 patients who died of other or unknown causes (died *with* COVID-19, but *not of* COVID-19). This determination of whether a COVID patient died of COVID or another cause was done by a medical doctor at the hospital level for each CH-SUR-participating center.

Patients "discharged" include patients that were transferred out of the CH-SUR system. Patients with "pending or missing outcomes" are either patients who were still hospitalized or patients who were no longer hospitalized but whose outcomes were yet to be recorded in the database. Because of the higher proportion of incomplete data registries during the most recent months, case fatality rates from these months should be interpreted with caution.

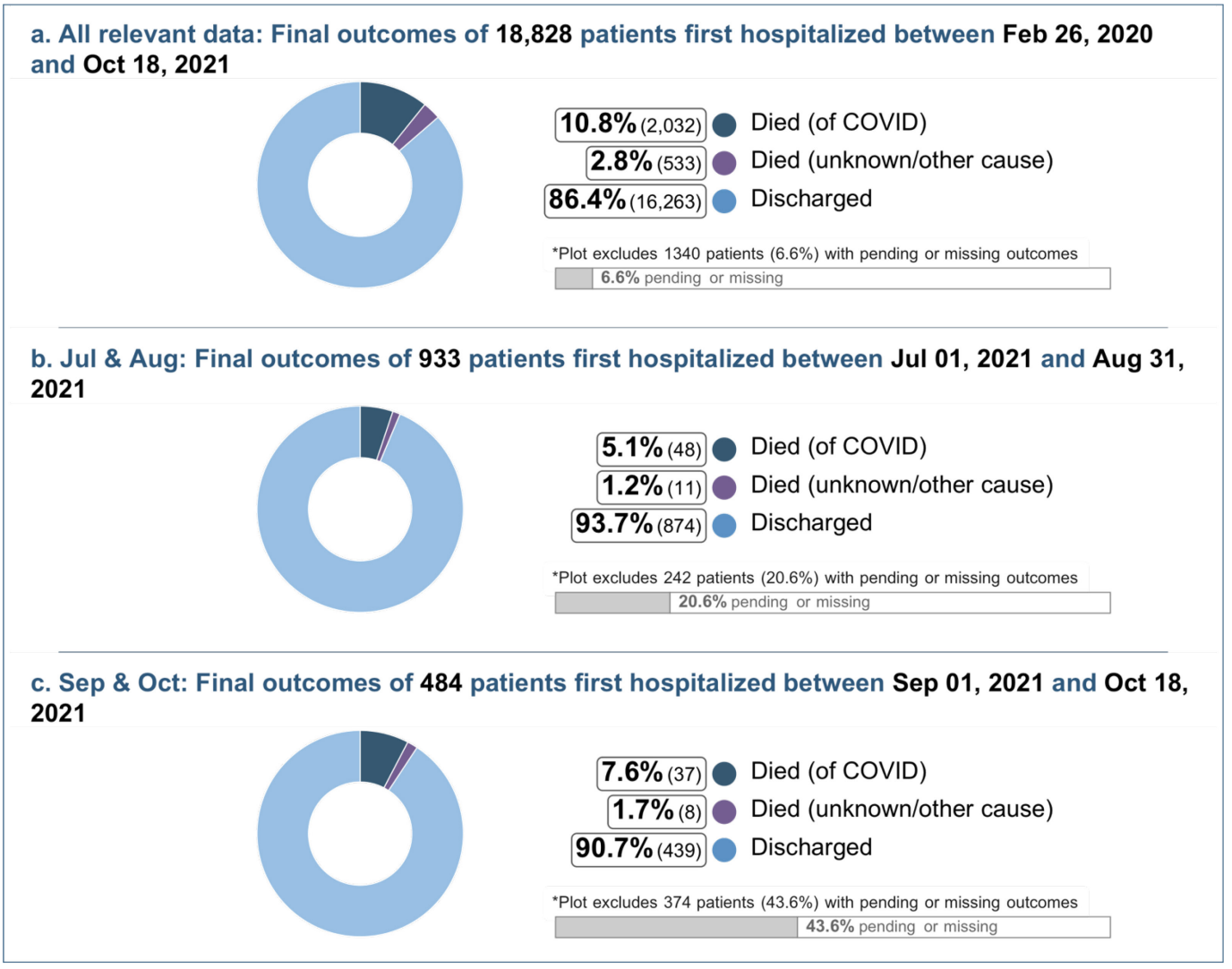

Figure 3: Outcomes for COVID-19 patients hospitalized in CH-SUR hospitals. Includes records up to October 18, 2021. For patients with multiple hospitalizations, only the final outcome is considered.

2.2. Outcomes over time

Figure 4 shows the final outcomes of hospitalized patients over time (Figure 4a & 4b), alongside the epidemic curve (Figure 4a) and the initial disease severity of those admitted over time (Figure 4c).

The first mortality peak is seen for patients admitted around the beginning of the epidemic: 15.8% (306 of 1,938) of patients first admitted in March 2020 did not survive. Mortality fell after March 2020, but rose again between October 2020 and January 2021, with a peak in December 2020: 12.7% (379 of 2,989) of patients first admitted in December 2020 did not survive.

The high mortality for those first admitted at the start of the epidemic and at the height of the winter months are mirrored by the higher admission severity scores[1] at these times (Figure 4c). 34.2% (664 of 1,940) of patients first admitted in March 2020 had a severity score above 2. At the height of the winter months, the proportion with severity scores of 2 and above was similarly high: 40.9% (1,270 of 3,108) in December 2020.

[1] For adults, the severity score used was the CURB-65 score. One point was given for each of the following symptoms: confusion (abbreviated Mental Test Score < 9), blood urea nitrogen > 19 mg/dL, respiratory rate > 30 per minute, low blood pressure (diastolic < 60 or systolic < 90 mmHg), age > 65 years. For children, one point was given for each of the following: respiratory distress, oxygen saturation < 92%, evidence of severe clinical dehydration or clinical shock and an altered consciousness level.

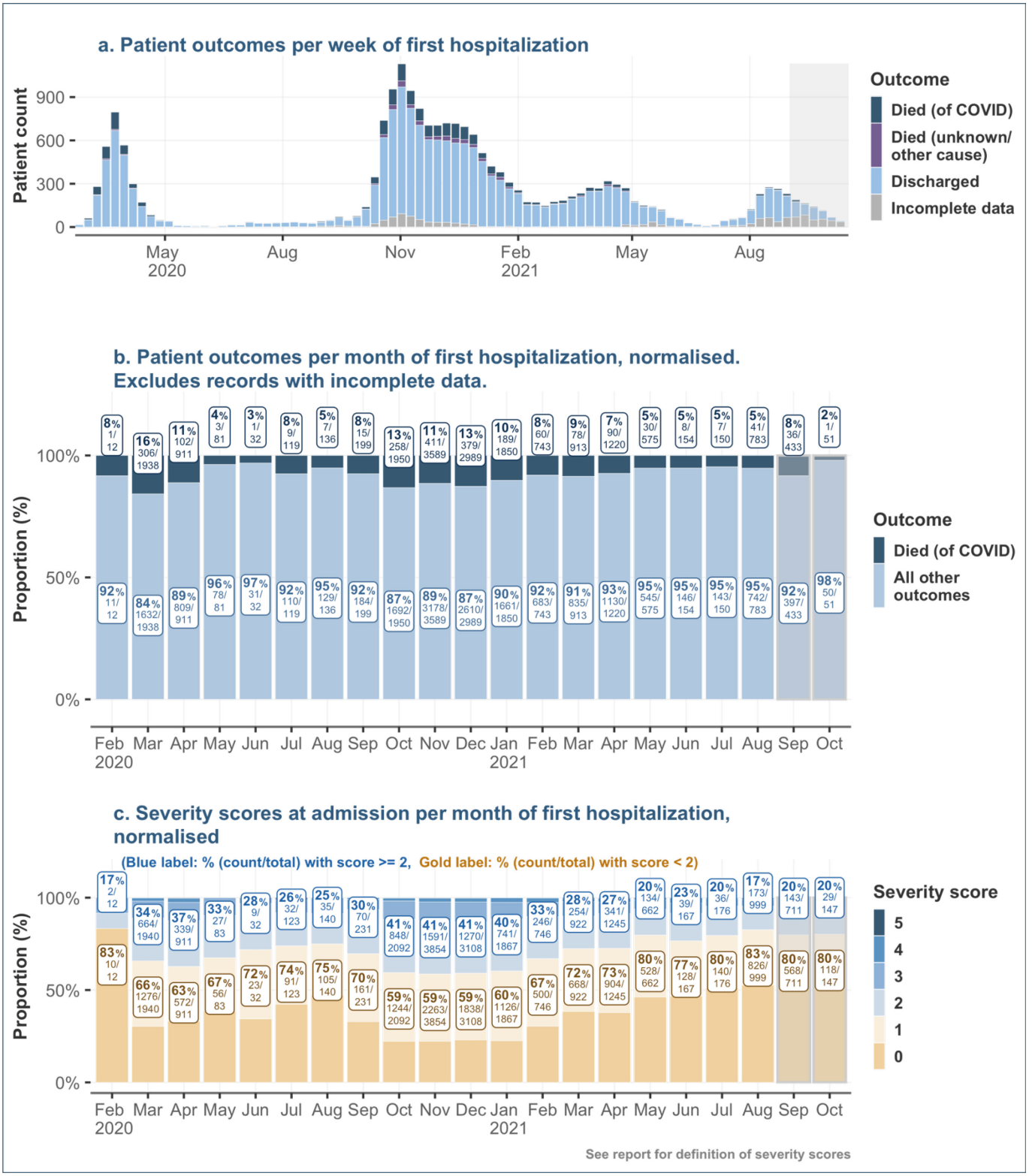

Figure 4: Epidemic curve, patient outcomes and severity scores at admission for COVID-19 patients over time. Includes records up to October 18, 2021. Data from the two last months (highlighted in gray) are considered provisional due to data entry delays.

2.3. Case fatality rate (CFR) across demographic and risk groups

The case fatality rate (CFR) increased exponentially with increasing age, from 0% (0 of 212) in patients aged 0-9, to 3.1% (90 of 2,878) in patients aged 50-59, and to 22.4% (993 of 4,438) in patients aged 80+. The CFR was greater in men than in women: 12.4% (1305 of 10561) vs 8.9% (690 of 7782) respectively. In addition, the CFR was greater for patients with higher severity scores at admission: 1.1% (59 of 5254) of patients with severity score 0 died of COVID-19, while 50% (22 of 44) of patients with severity score 5 died of COVID-19.

Of note, there was no clear mortality difference across different BMI groups.

Figure 5b shows the COVID-19 CFR across groups for a subset of recently hospitalized patients. The trends across age, gender and other groups are broadly similar between the periods compared.

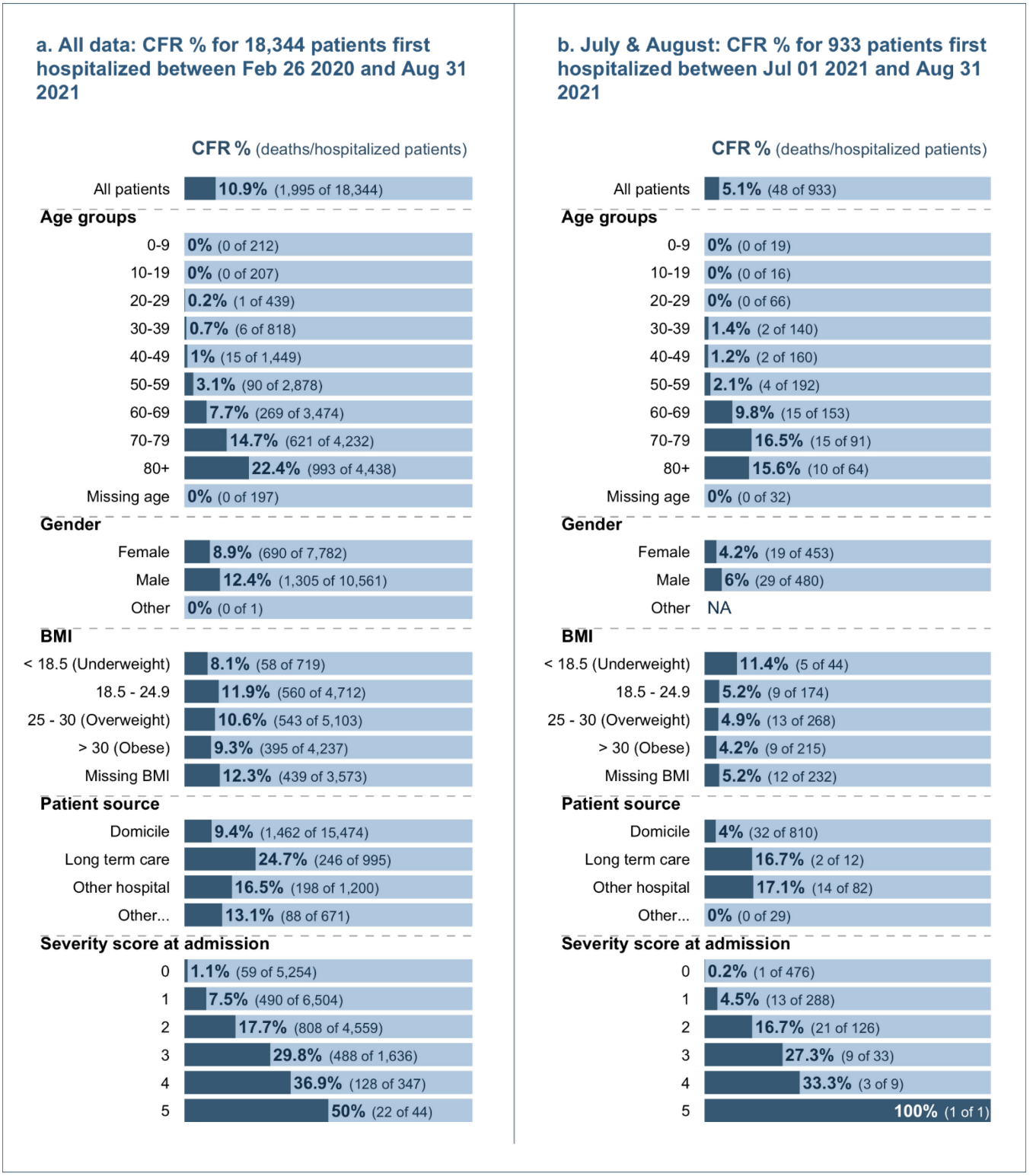

Figure 5: Case fatality rate (CFR) % among demographic and risk groups: percentage of patients in different demographic groups who were recorded as having died in hospital of COVID-19. Both figures include records up to Aug 31 2021 but records with incomplete data (patients still hospitalized or with a pending outcome in the database) were not included. Blank rows indicate a patient count of zero.

3. Intensive care unit (ICU) admission

3.1. ICU admission across demographic and risk groups

ICU admission probability across ages was roughly bimodal with a peak for the 10 - 19 year age group and another for the 60 - 69 age group (Figure 6a). The 60 - 69 age group had the highest probability of admission to the ICU, with 25.6% admitted (890 of 3,474). Notably, individuals aged 80 and above were least likely to be admitted to the ICU, with only 5.8% admitted (258 of 4,438).

Patients transferred in from other hospitals had a high probability of ICU admission: 47.2% of such patients (566 of 1200) were admitted to the ICU (Figure 6a).

ICU admission probability also increased slightly with increasing BMI, and increased steeply with increasing admission severity scores (Figure 6a).

Figure 6b shows the same information but for a recently hospitalized subset of patients. The trends across groups are roughly similar to what is observed across all hospitalized patients.

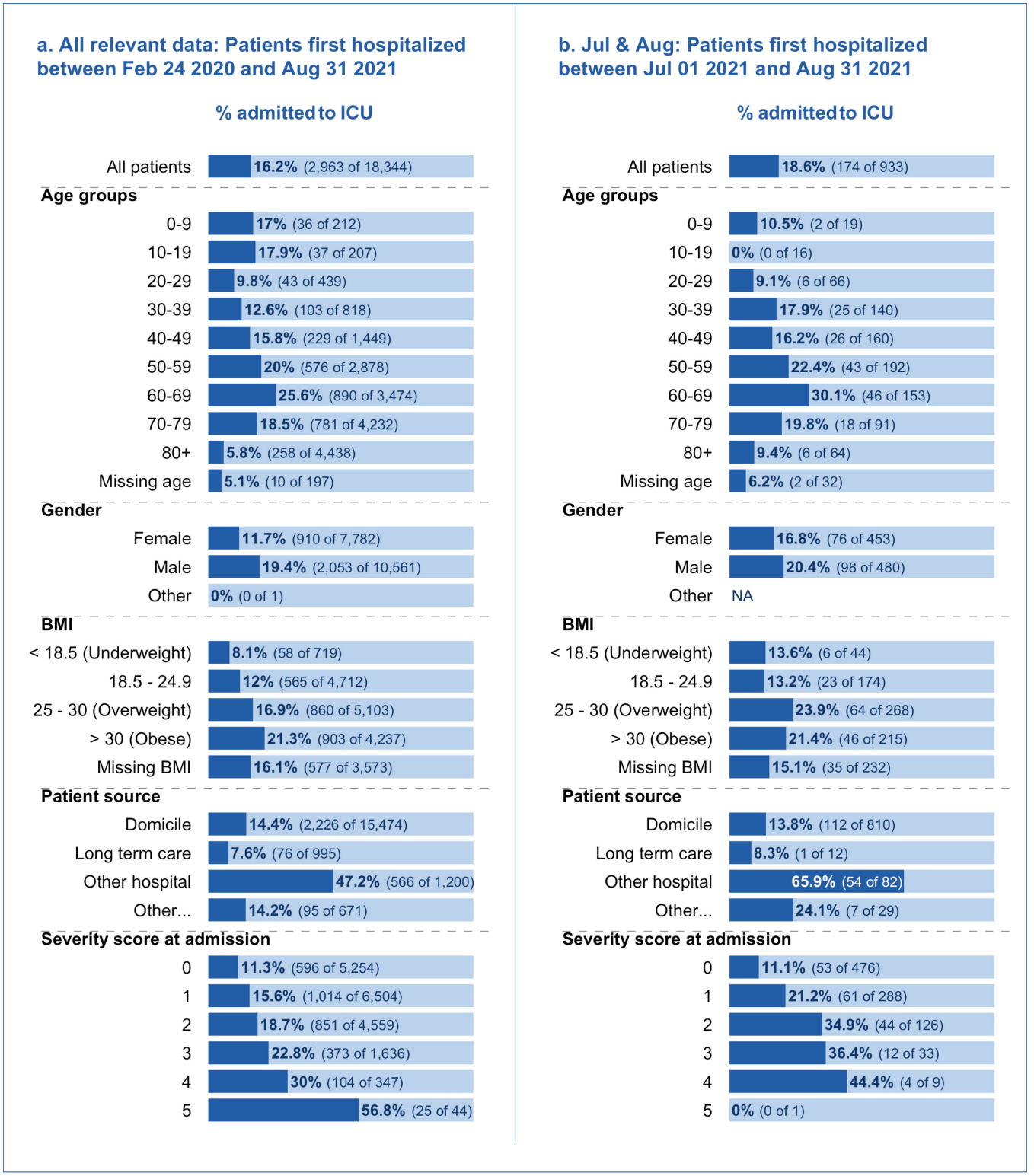

Figure 6: Percentage of patients admitted to ICU, grouped by demographic and risk factors, over two time intervals. For patients with multiple hospitalizations, we considered whether they were admitted to the ICU during any of their hospitalizations. Both figures include records up to Aug 31 2021 due to data completeness issues. Records with incomplete data (patients still hospitalized or with a pending outcome in the database) were not included. A blank row indicates a patient count of zero.

3.2. ICU admission over time

Figure 7 shows the trend of ICU admission over time. The proportion of patients admitted to the ICU peaked between May and July 2020. Notably, this was when the number of hospitalizations was very low (Figure 4).

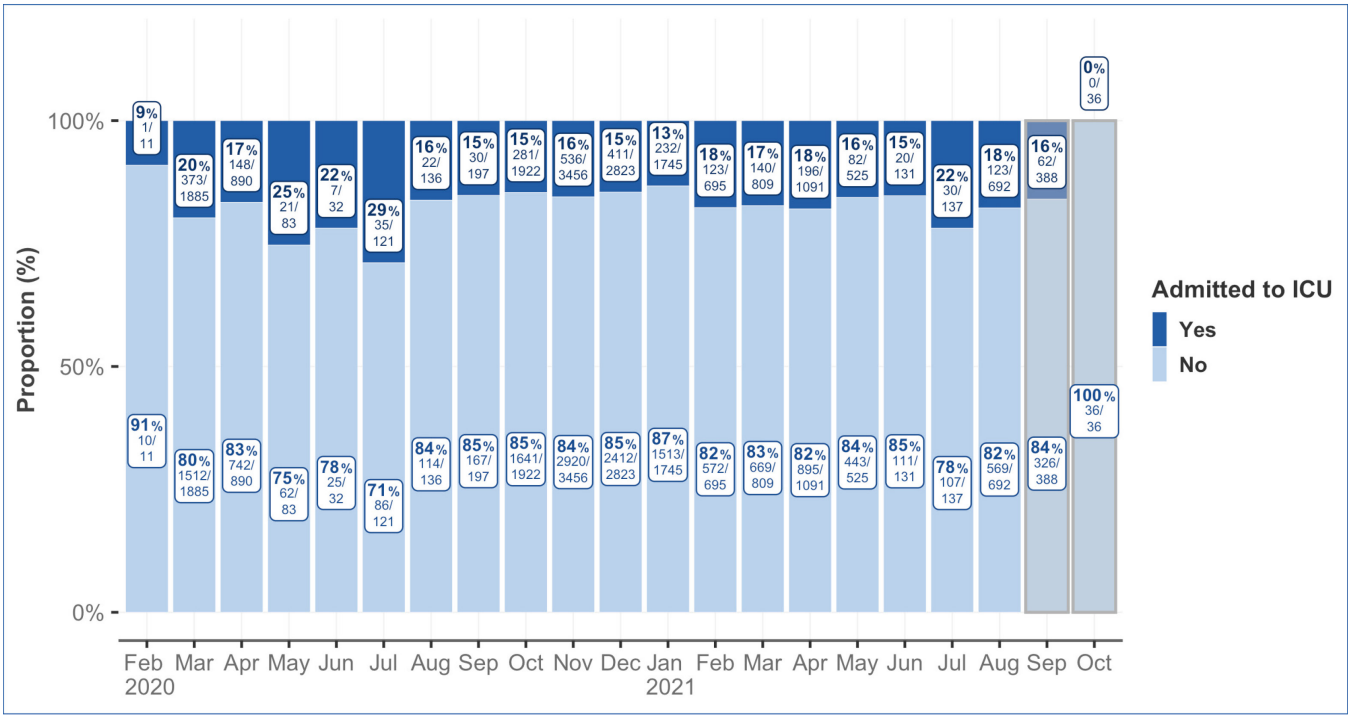

Figure 7: Percentage and proportion of patients admitted to the ICU over time. For patients with multiple hospitalizations, we considered whether they were admitted to the ICU during any of their hospitalizations. Records with incomplete data (patients still hospitalized or with a pending outcome in the database) were not included. Data from the last two months (highlighted gray) are considered provisional due to data entry delays.

4. Nosocomial cases

In the CH-SUR database, a patient's infection is classified as nosocomial when the patient tests positive for SARS CoV-2 five or more days after they were admitted to the hospital for non-COVID-related reasons.

The overall percentage of nosocomial cases among patients in the database was 12.3% (2,490 of 20,168) (Figure 8a).

The proportion of nosocomial cases peaked in January 2021: 20.6% (370 of 1,794) of patients hospitalized in that month had infections of nosocomial origin (Figure 8c). Notably, this peak in nosocomial proportion roughly coincides with the peak of hospitalizations (Figure 8b).

This proportion then declined sharply to 2% (23 of 983) in August 2021.

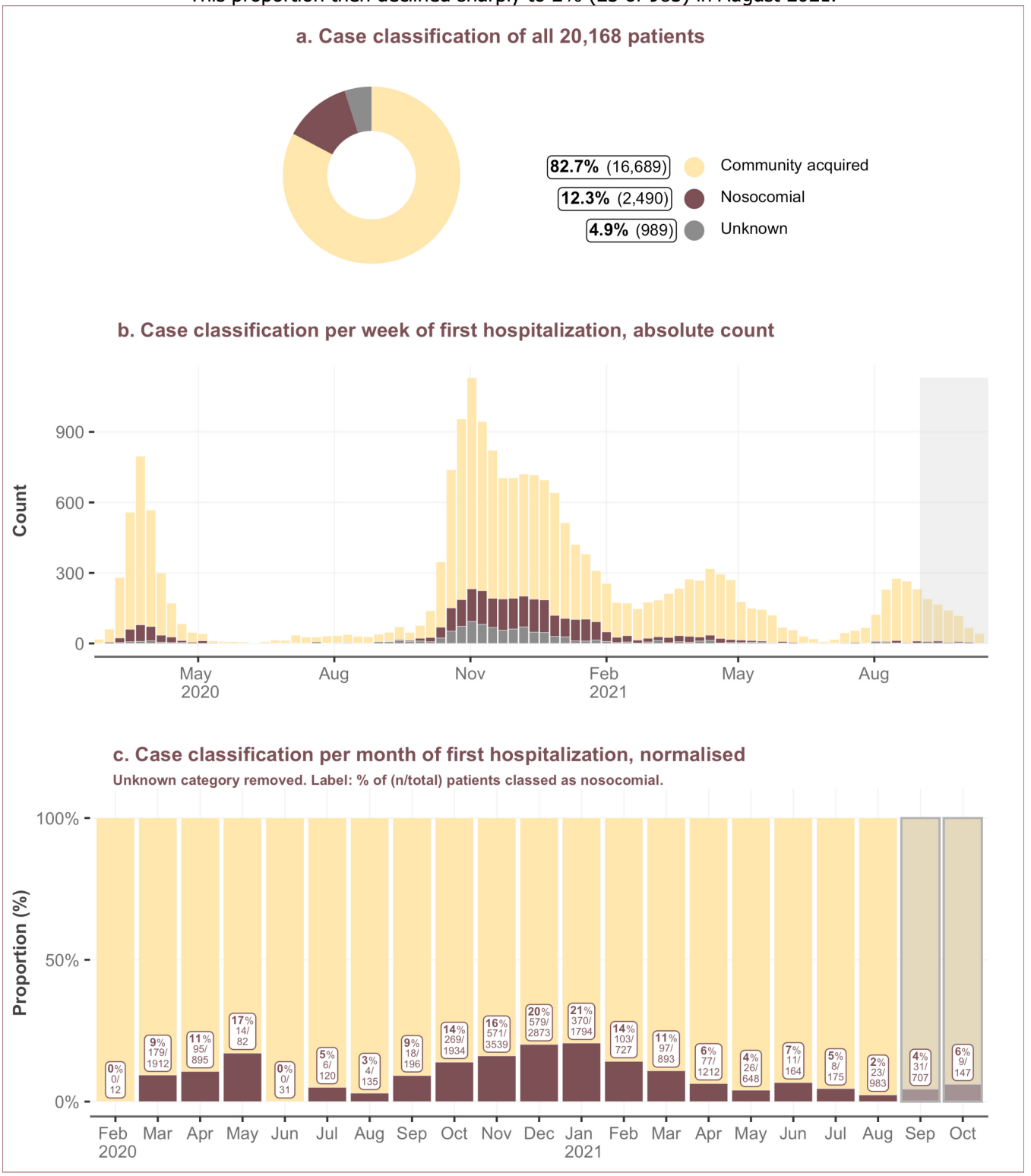

Figure 8: Case classification (infection source) for patients over time

5. Immune/vaccination status

5.1. Immune status over time

For these analyses, a patient's immune status considers the patient's previous COVID-19 infections and their vaccine doses received up to the time of a positive COVID-19 test, specifically up to the time when the sample for the test was collected.[2]

The proportion of hospitalized patients who were fully immunized rose gradually after January 2021 (Figure 9 b). This is expected, given the rise in the proportion of the whole Swiss population that is fully vaccinated (Figure 9c, source: BAG-dashboard).

During the months of July and August, 38%, respectively 53% of the Swiss population was fully immunized (figure 9c). The percentage of fully immunized hospitalized patients over this same period ranged from 9% to 12% (figure 9b), suggesting a protection against hospitalization and following deaths due to COVID-19.

[2] Immune status categories were defined as follows:

a) Not immunized: Patients who had not received a single dose of any vaccine by the time of the positive SARS-CoV-2 test and had no proof of previous infection with this virus before this hospitalisation.

b) Incompletely immunized: Patients who received one vaccine dose of Moderna or Comirnaty before the positive test and have no previous SARS-CoV-2 infection. Patients who received two doses of the vaccines Moderna or Comirnaty but tested positive within 13 days of this second dose and had no previous SARS-CoV-2 infection before this hospitalisation. Patients who received one dose with the Janssen vaccine and were tested positive for SARS-CoV-2 within 21 days after vaccine application date and have no previous SARS-CoV-2 infection.*

c) Fully immunized: Patients who received two or more doses of the vaccines Moderna or Comirnaty and tested positive 14 days or more after the second dose. Patients who received one dose of the Janssen vaccine and were tested positive for SARS CoV-2 22 or more days after vaccination date. Patients with a prior infection (requiring hospitalisation or not) who received at least one vaccine dose, independent of the time between disease recovery, date and brand of vaccine and positive test or hospitalization.

d) Recovered from a SARS-CoV-2 infection: Patients with confirmed previous SARS-CoV-2 infection, which required or not hospitalisation in the past and are not vaccinated with any dose; independent of the time since previous infection. CAVEAT: Many recovered patients are not identified as such in the database (information collected only since June 2021, undiagnosed infection, information missing from the medical record).

e) Unknown immune status: Patients for whom vaccination and immune information was not available and patients with previous infection status known but unknown vaccination status.

* The definition of the partially- and fully- immunized patients is different for the CH SUR reports as from the BAG-dashboard. This is due to the different data sources that each of the reporting systems is using. While CH SUR considers a time window of 14 days from last vaccine application to consider the patient fully immunized, the definition of the immune status showed in the BAG-dashboard does not consider this time window. In addition, the latter only documents vaccination status stricto sensu and not immune status.

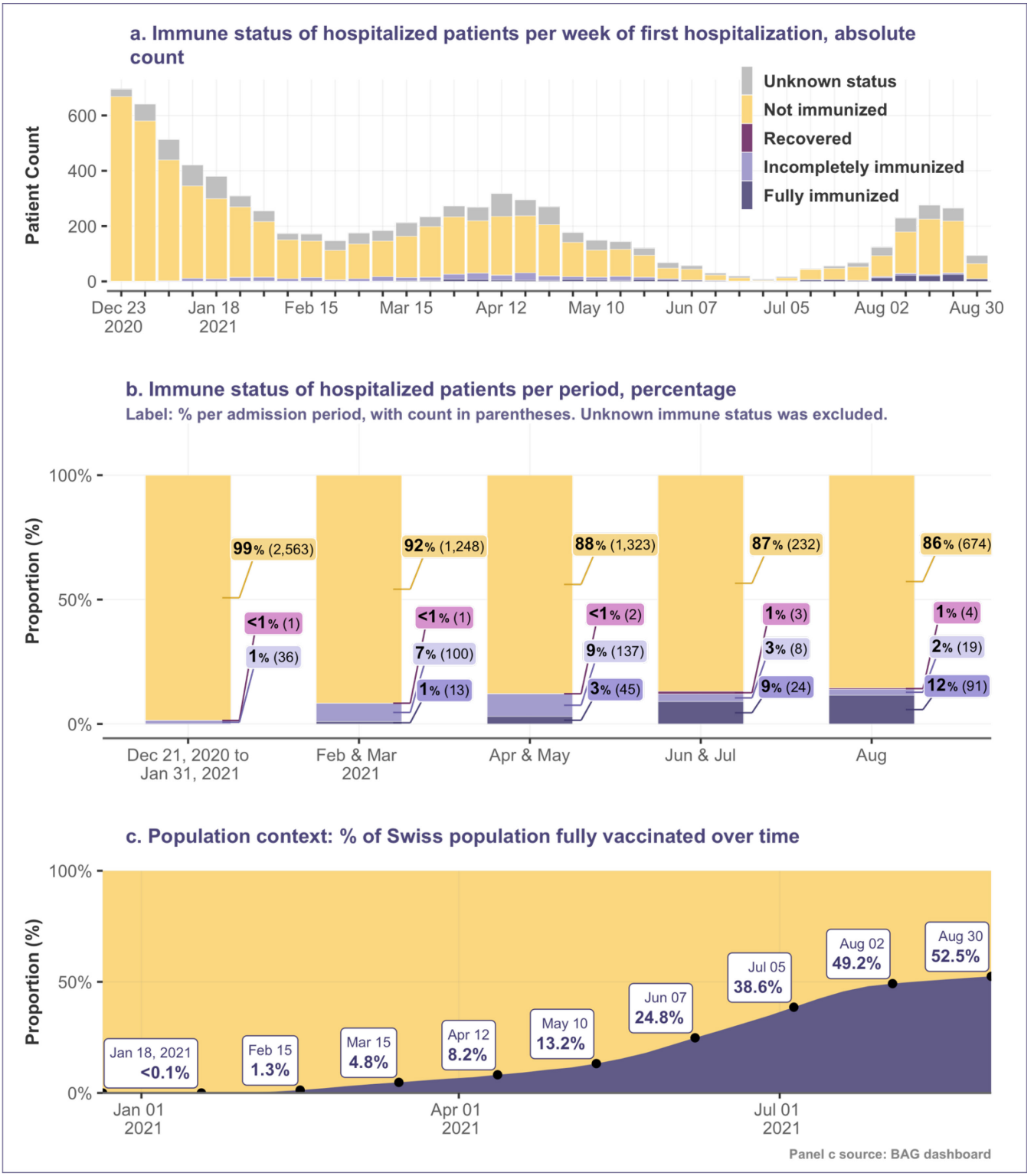

Figure 9: Immune status of hospitalized patients and overall vaccination rate in Switzerland. See footnote for definitions of immune status categories. For patients with multiple hospitalizations, the immune status for the first hospitalization was considered. Panels a and b include patients hospitalized since the week vaccination began, Dec 21 2020. (Vaccination began on December 23 2020, but we include December 22 and 21 to cover a full week.) Patients first hospitalized after Aug 31 2021 were excluded, as a large proportion of these records have not been completely filled in the database.

5.2. Patient characteristics by immune status

Fully immunized patients (patients with breakthrough disease) were disproportionately elderly: since vaccination initiation, 36% of fully immunized patients (63 of 173) admitted to CH-SUR hospitals were aged 80 and above (Figure 10a, right panel). In contrast, only 19% of non-immunized patients (1,068 of 5,720) were aged 80 and above (Figure 10a, left panel).

This older-skewed age distribution for breakthrough hospitalizations may be related to the vaccination strategy applied in Switzerland, where the elderly population was vaccinated as a first priority. In addition, even after the opening of vaccination to all ages, vaccination coverage remains higher among older age groups. Certain risk factors for hospitalization may also be more prevalent among the elderly.

It is also notable that in more recent months, younger patients make up an increasing share of non-immunized patients (Figures 10b and c, left panels). For example, when considering all data since vaccination initiation, individuals aged 20 - 29 made up only 3.2% of non-immunized patients (182 of 5,720) (Figure 10a, left panel), but in July & August, they made up a larger share, 7.5% of non-immunized patients (58 of 769) (Figure 10c, left panel). This is likely due to the fact that most of those in the older age classes had been vaccinated by this time.

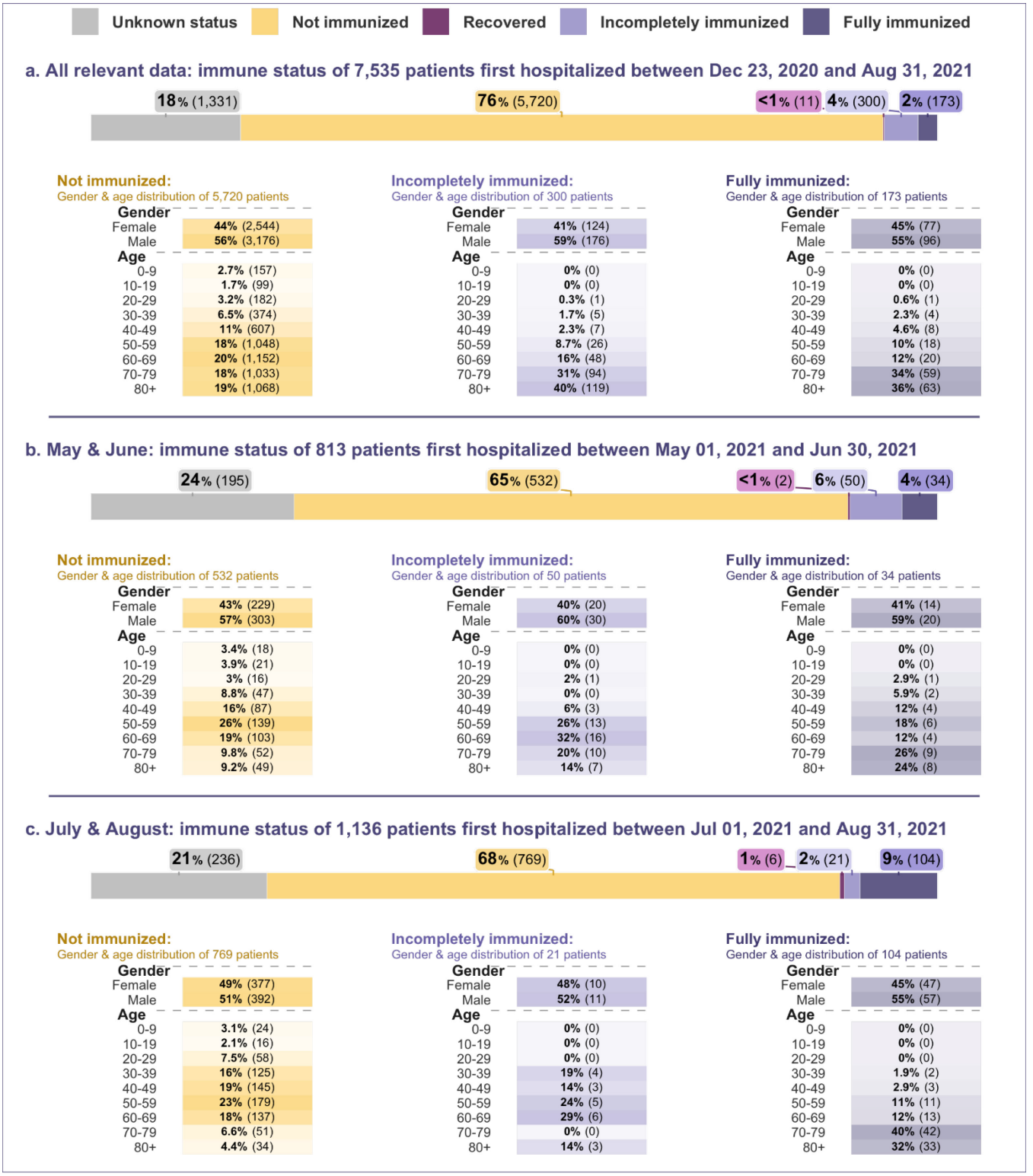

Figure 10: Demographic characteristics of patients hospitalized by immune status, over three different periods. Patients first hospitalized after Aug 31 2021 were excluded, as a large proportion of these records have not been completely filled in the database. Patients with missing ages and gender marked 'Other' are not shown.

5.3. Patient outcomes by immune status

Since the vaccinations began, Dec 23, 2020, CH SUR registered only 14 COVID-caused deaths among fully immunized patients (Figure 11a, right panel). Of these deaths, 5 were among individuals aged 80 and above. Over the same period, there were 437 COVID-caused deaths among non-immunized patients (Figure 11, left panel).

During the months of July and August 41 deaths were recorded (Figure 11c): 7 among fully-immunized patients, 1 among partially immunized patients and 33 among non-immunized patients. Deaths among fully-immunized patients represented 17% of all deaths.

Vaccination protects the population against hospitalizations and therefore also deaths due to COVID-19. Nevertheless, the CFR by age show that the risk of death for the limited number of people who are hospitalized despite a complete immunization is similar to that of non-immunized hospitalized patients (Figure 11c, left and right panel). This must be balanced by the very positive effect of vaccination on the risk of hospitalization and therefore on the risk of death.

a. All relevant data: 495 deaths among 5,928 patients first hospitalized between Dec 23, 2020 and Aug 31, 2021

Not immunized: Age distribution of 437 deaths in 5,488 patients

Age	Patients	Deaths	CFR %
0-9	149	0	0%
10-19	95	0	0%
20-29	168	1	0.6%
30-39	345	2	0.6%
40-49	579	5	0.9%
50-59	989	25	2.5%
60-69	1096	72	6.6%
70-79	1013	131	12.9%
80+	1054	201	19.1%

Incompletely immunized: Age distribution of 44 deaths in 287 patients

Age	Patients	Deaths	CFR %
0-9	0	0	-
10-19	0	0	-
20-29	1	0	0%
30-39	5	0	0%
40-49	7	1	14.3%
50-59	23	3	13.0%
60-69	43	5	11.6%
70-79	92	14	15.2%
80+	116	21	18.1%

Fully immunized: Age distribution of 14 deaths in 153 patients

Age	Patients	Deaths	CFR %
0-9	0	0	-
10-19	0	0	-
20-29	1	0	0%
30-39	4	0	0%
40-49	7	0	0%
50-59	15	0	0%
60-69	19	4	21.1%
70-79	52	5	9.6%
80+	55	5	9.1%

b. May & June: 24 deaths among 536 patients first hospitalized between May 01, 2021 and Jun 30, 2021

Not immunized: Age distribution of 18 deaths in 459 patients

Age	Patients	Deaths	CFR %
0-9	16	0	0%
10-19	19	0	0%
20-29	11	0	0%
30-39	43	0	0%
40-49	79	1	1.3%
50-59	117	2	1.7%
60-69	82	5	6.1%
70-79	49	4	8.2%
80+	43	6	14.0%

Incompletely immunized: Age distribution of 4 deaths in 47 patients

Age	Patients	Deaths	CFR %
0-9	0	0	-
10-19	0	0	-
20-29	1	0	0%
30-39	0	0	-
40-49	3	1	33.3%
50-59	12	0	0%
60-69	14	1	7.1%
70-79	10	0	0%
80+	7	2	28.6%

Fully immunized: Age distribution of 2 deaths in 30 patients

Age	Patients	Deaths	CFR %
0-9	0	0	-
10-19	0	0	-
20-29	1	0	0%
30-39	2	0	0%
40-49	3	0	0%
50-59	5	0	0%
60-69	4	1	25.0%
70-79	7	0	0%
80+	8	1	12.5%

c. July & August: 41 deaths among 762 patients first hospitalized between Jul 01, 2021 and Aug 31, 2021

Not immunized: Age distribution of 33 deaths in 658 patients

Age	Patients	Deaths	CFR %
0-9	19	0	0%
10-19	15	0	0%
20-29	49	0	0%
30-39	104	1	1.0%
40-49	129	2	1.6%
50-59	151	3	2.0%
60-69	118	12	10.2%
70-79	44	7	15.9%
80+	29	8	27.6%

Incompletely immunized: Age distribution of 1 death in 16 patients

Age	Patients	Deaths	CFR %
0-9	0	0	-
10-19	0	0	-
20-29	0	0	-
30-39	4	0	0%
40-49	3	0	0%
50-59	3	1	33.3%
60-69	3	0	0%
70-79	0	0	-
80+	3	0	0%

Fully immunized: Age distribution of 7 deaths in 88 patients

Age	Patients	Deaths	CFR %
0-9	0	0	-
10-19	0	0	-
20-29	0	0	-
30-39	2	0	0%
40-49	3	0	0%
50-59	9	0	0%
60-69	12	2	16.7%
70-79	37	5	13.5%
80+	25	0	0%

Figure 11: Mortality of CH-SUR patients by immune status and age group, over three different periods. The total counts of patients in the subtitles include patients with a final outcome (discharged, died of any cause, or transferred out of CH-SUR), and whose immune status was fully immunized, recovered or not immunized. Missing age and partially immunized patients' records were removed. Counts of deaths only include patients who died because of COVID-19. Case-fatality rate (CFR), especially for the recovered and fully immunized categories, should be interpreted with caution due to small simple sizes.

6. Treatments administered to patients over time

Within each period, the most common drug administered was dexamethasone. Of note, the administration of dexamethasone has increased over time: while this corticosteroid was administered during around a quarter of hospitalizations in 2020 (Figure 12a), it was administered during around half of hospitalizations in 2021 (Figure 12b).

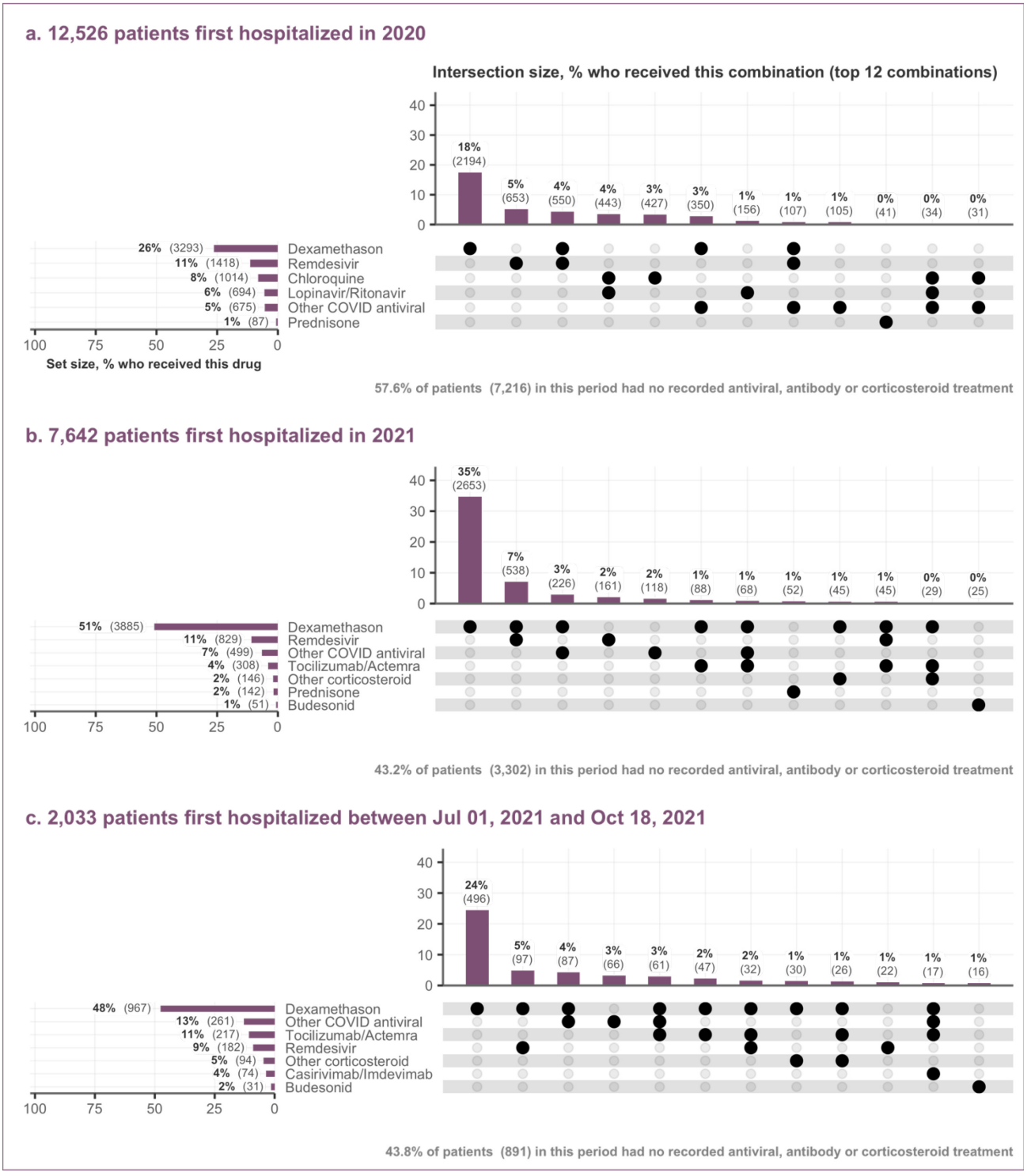

Figure 12: Antiviral, antibody treatments and corticosteroids administered over three periods. Horizontal bars to the left represent the % of patients who received a specific drug. Vertical bars show the % of patients who received the combination of drugs indicated with the black dot(s) directly below the bar. Only the top 12 combinations are shown for each time period.

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