COVID-19 Hospital Based Sentinel Surveillance Report

État des données au : 22 novembre 2021

Introduction

Le système de surveillance sentinelle hospitalière (CH-SUR) a été mis en place en 2018 afin de recenser les hospitalisations liées à la grippe. Le 1er mars 2020 déjà, soit quatre jours après l'annonce du premier cas confirmé de COVID-19 en Suisse, sa version adaptée était également prête à enregistrer les séjours hospitaliers découlant d'une infection au SARS-CoV-2 confirmée en laboratoire.

Actuellement, le programme compte 20 hôpitaux participants, dont la plupart sont des hôpitaux cantonaux ou universitaires qui couvrent une grande partie des patients, enfants et adultes, hospitalisés dans toute la Suisse. La statistique du CH-SUR indique le nombre et la durée des séjours en hôpital et en unité de soins intensifs (USI). Il arrive qu'une personne soit hospitalisée ou traitée dans une USI à plusieurs reprises.

CH-SUR saisit les données des patients hospitalisés pendant au moins 24 heures avec une infection au SARS-CoV-2 ainsi que les infections nosocomiales à SARS-CoV-2. Sont considérés comme des confirmations de l'infection un résultat positif à un test de réaction en chaîne par polymérase (PCR) ou à un test rapide antigénique ainsi qu'un résultat clinique pour le COVID-19. Le système CH-SUR indique également si le patient est décédé du COVID-19 lors de son hospitalisation.

Les données collectées entre le début de l'épidémie et le **22 novembre 2021** portent sur 20 906 patients hospitalisés. Certains d'entre eux ayant effectué plusieurs séjours à l'hôpital, le système CH-SUR a enregistré 21 736 hospitalisations, avec leur évolution. Sur les 19 586 patients hospitalisés pour lesquels des données de sortie détaillées sont disponibles, 3103 ont été traités dans une USI et 2414 (12,3 %) sont décédés du COVID-19 pendant leur séjour à l'hôpital. Durant cette même période, l'OFSP a été informé de 35 100 hospitalisations pour une infection au SARS-CoV-2 confirmée en laboratoire dans le cadre de la déclaration obligatoire applicable à l'échelle nationale. CH-SUR couvre ainsi quelque 62 % de toutes les hospitalisations déclarées en Suisse en lien avec le SARS-CoV-2.

1. Hospitalizations and demographic characteristics

Between the start of the epidemic in Switzerland and Nov 22, 2021 and among the 20 hospitals actively participating in the COVID-19 Hospital Based Surveillance project (CH-SUR), 20,906 patients were hospitalized, for a total of 21,736 hospitalizations. There were more hospitalizations than patients because some patients were hospitalized multiple times. An overview of these rehospitalized patients is shown in Figure 1.

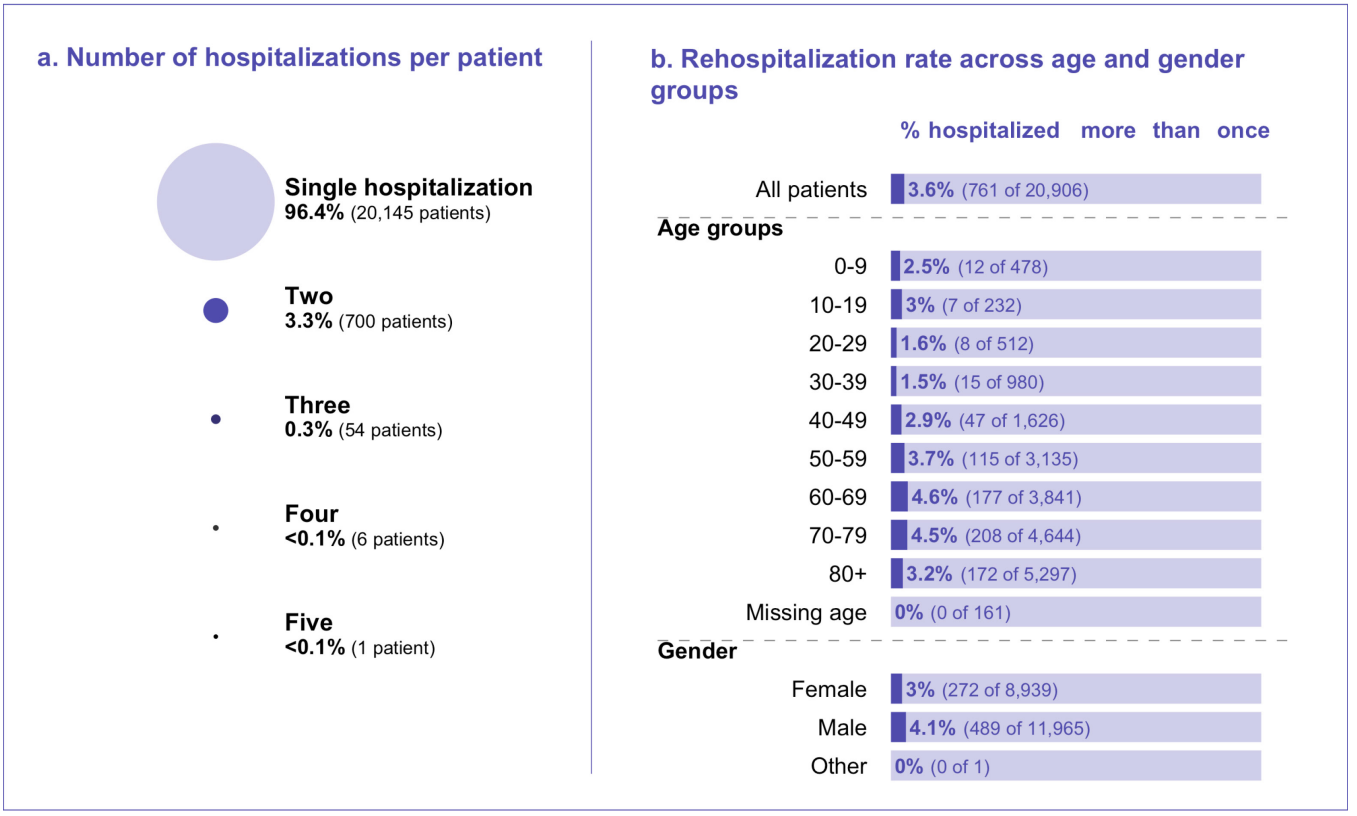

Figure 1: Hospitalizations per patient and rehospitalization rate across demographic groups. Includes records up to November 22, 2021.

Most patients (96.4% [20,145 of 20,906]) were hospitalized only once, but 4% of patients (760 of 20,906) were hospitalized two to four times, and one patient was hospitalized five times (Figure 1a).

The overall rate of rehospitalization was 3.6% (761 of 20,906) (Figure 1b). The 60-69 age group had the highest rate of rehospitalization at 4.6% (177 of 3,841), and men had a higher rehospitalization rate than women, 4.1% (489 of 11,965) vs 3% (272 of 8,939) respectively.

Overall, the majority (57.2% [11,965 of 20,906]) of patients hospitalized were men (Figure 2a), and the age distribution skewed older (Figure 2b). The largest age category of patients were those aged 80 and above (25% [5,297]).

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 was notably high between October 2020 and January 2021, with a peak in November 2020: 88.9% (3,363 of 3,781) of patients first admitted in this month were 50 and above (Figure 2d). This peak in older age admissions mirrors a similarly-timed peak in admission severity and case fatality ratios seen in Figures 4b and 4c.

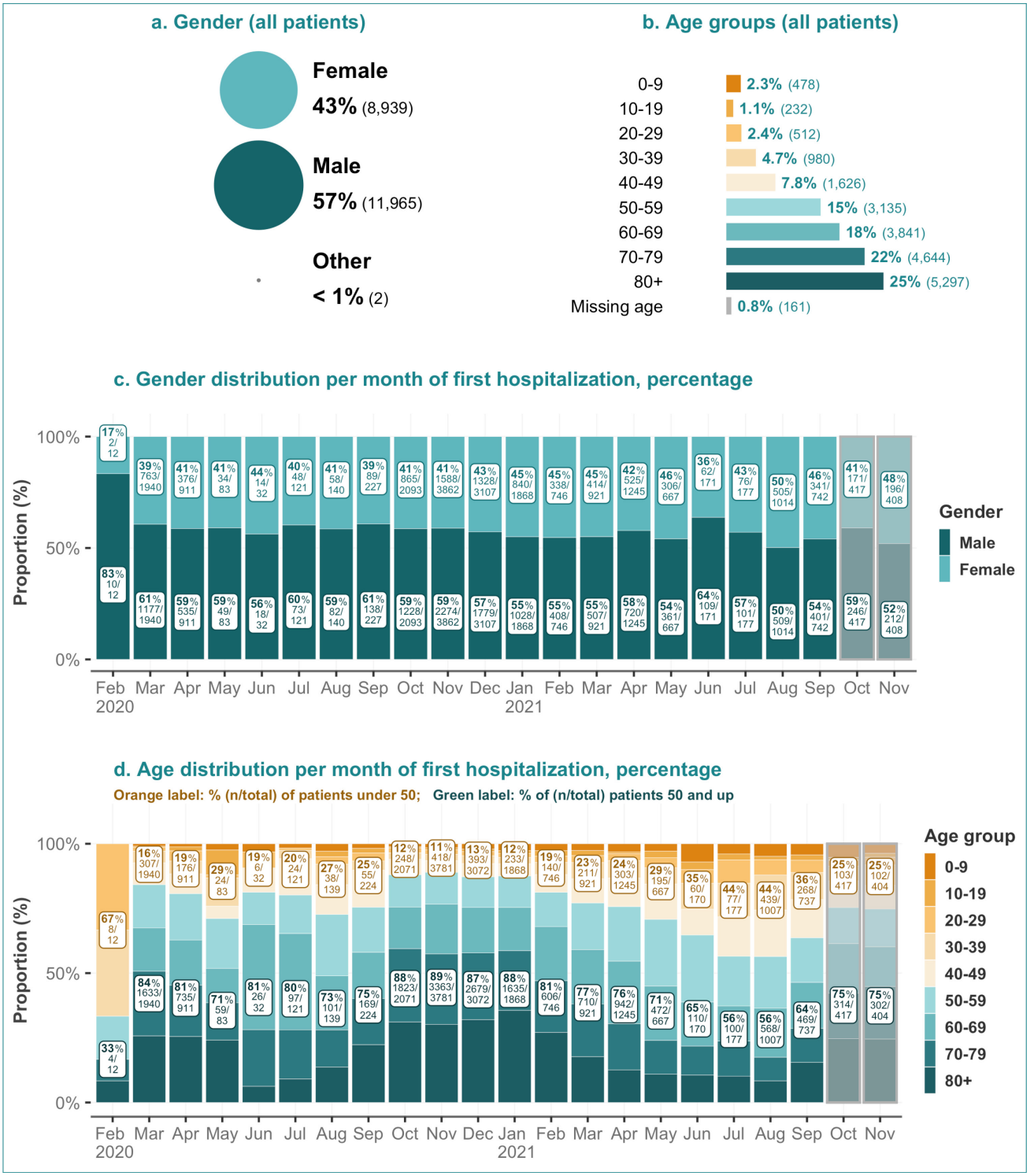

Figure 2: Demographic characteristics: gender and age distribution of admitted patients, overall and per month. For patients with multiple hospitalizations, the admission date of the first hospitalization was used. Data from the last two months (highlighted gray) is considered provisional due to entry 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 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 with uncertain cause of death (registered as "unknown" cause of death in the database) but with a proof of SARS-CoV-2 infection were classed as having died *because* of COVID.

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.

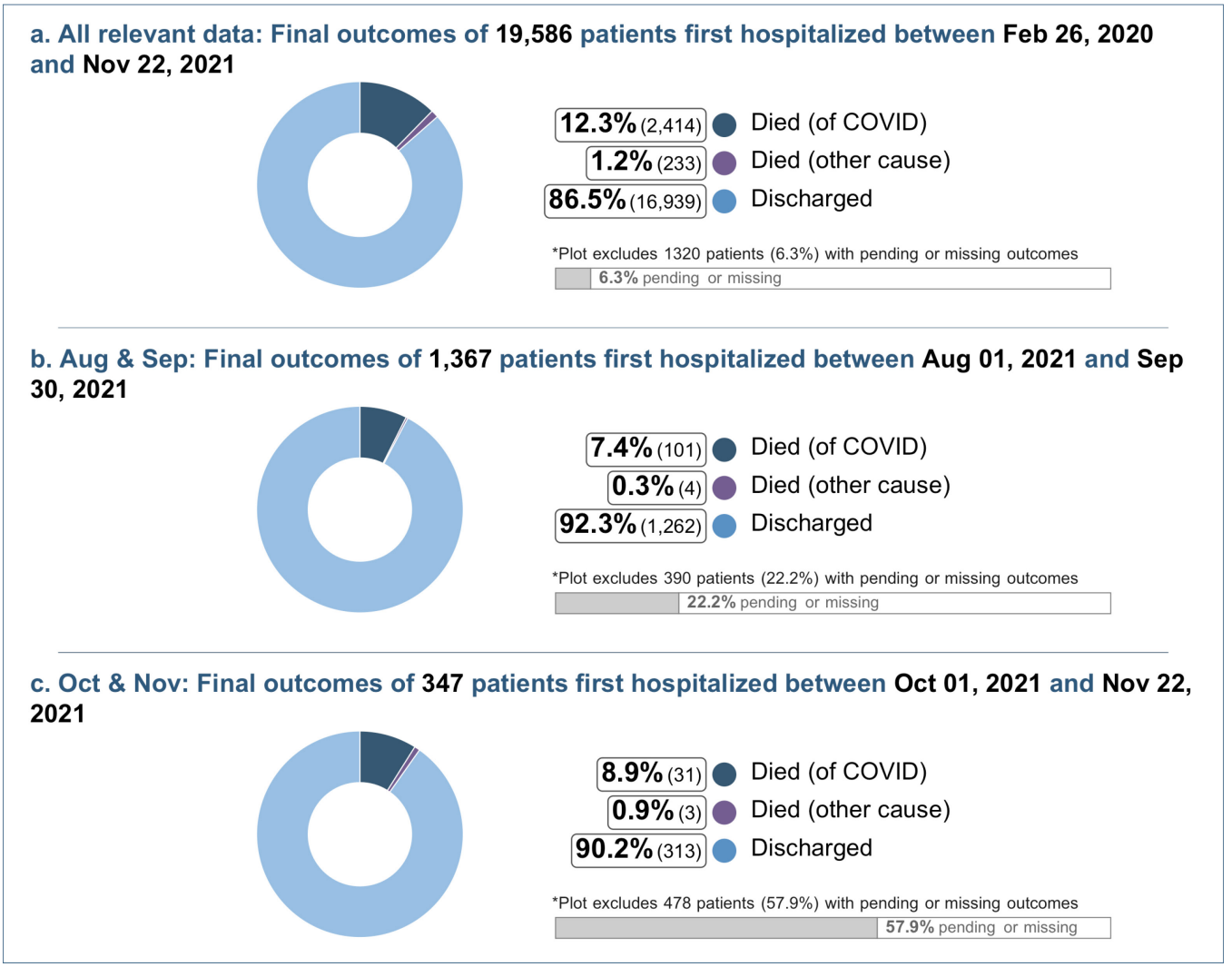

Figure 3: Outcomes for COVID-19 patients hospitalized in CH-SUR hospitals. Includes records up to November 22, 2021. For patients with multiple hospitalizations, only the final outcome is considered. Patients with uncertain cause of death (registered as "unknown" cause of death in the database) but with a proof of SARS-CoV-2 infection were classed as having died because *of COVID.*

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: 16.8% (325 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: 15.2% (460 of 3,022) 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 at these times (Figure 4c). 34.2% (664 of 1,940) of patients first admitted in March 2020 had a severity score above 2.[1] At the height of the winter months, the proportion with severity scores of 2 and above was similarly high: 40.8% (1,269 of 3,107) 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.

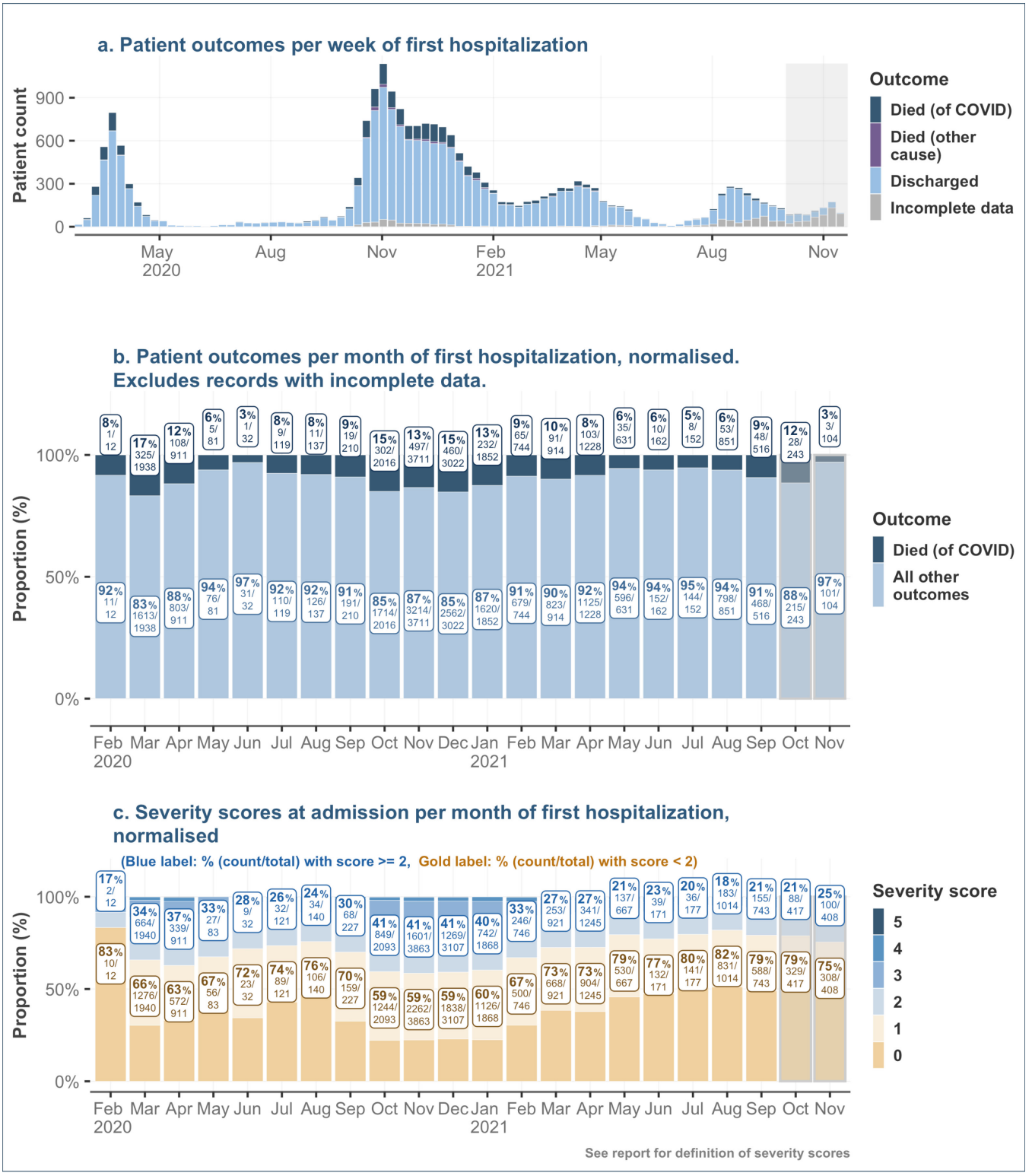

Figure 4: Epidemic curve, patient outcomes and severity scores at admission for COVID-19 patients over time. Includes records up to November 22, 2021. Data from the two last months (highlighted in gray) are considered provisional due to data entry delays. Patients with uncertain cause of death (registered as "unknown" cause of death in the database) but with a proof of SARS-CoV-2 infection were classed as having died because *of COVID.*

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 427) in patients aged 0-9, to 3.4% (98 of 2,896) in patients aged 50-59, and to 25.2% (1,251 of 4,974) in patients aged 80+. CFR% was greater in men than in women: 14.2% (1,563 of 11,032) vs 10% (820 of 8,205) respectively. In addition, the CFR% was greater for patients with higher severity scores at admission: 1.4% (81 of 5,627) of patients with severity score 0 died of COVID-19, while 51.1% (24 of 47) of patients with severity score 5 died of COVID-19.

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

Data regarding CFR% by vaccination status can be found in section 4.

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.

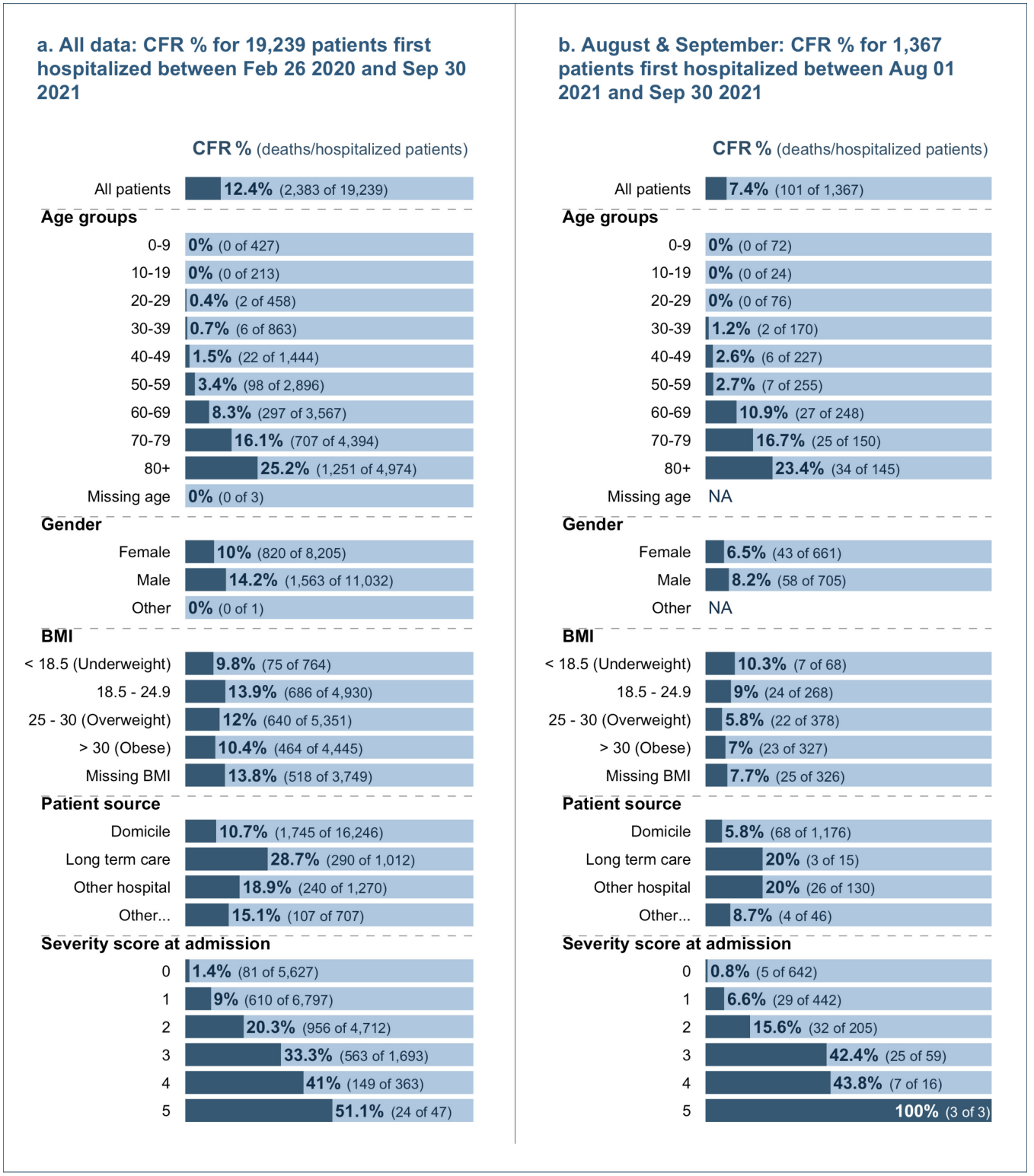

Figure 5: Case fatality rate (CFR) % among demographic and risk groups: percentage of patients in different demographic groups who were recorded as having died in hospital of COVID-19. Both figures include records up to Sep 30 2021 but records with incomplete data (patients still hospitalized or with 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 25.4% admitted (905 of 3,567). Notably, individuals aged 80 and above were least likely to be admitted to the ICU, with only 6.1% admitted (303 of 4,974).

Patients transferred in from other hospitals had a high probability of ICU admission: 47.6% of such patients (604 of 1,270) 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.

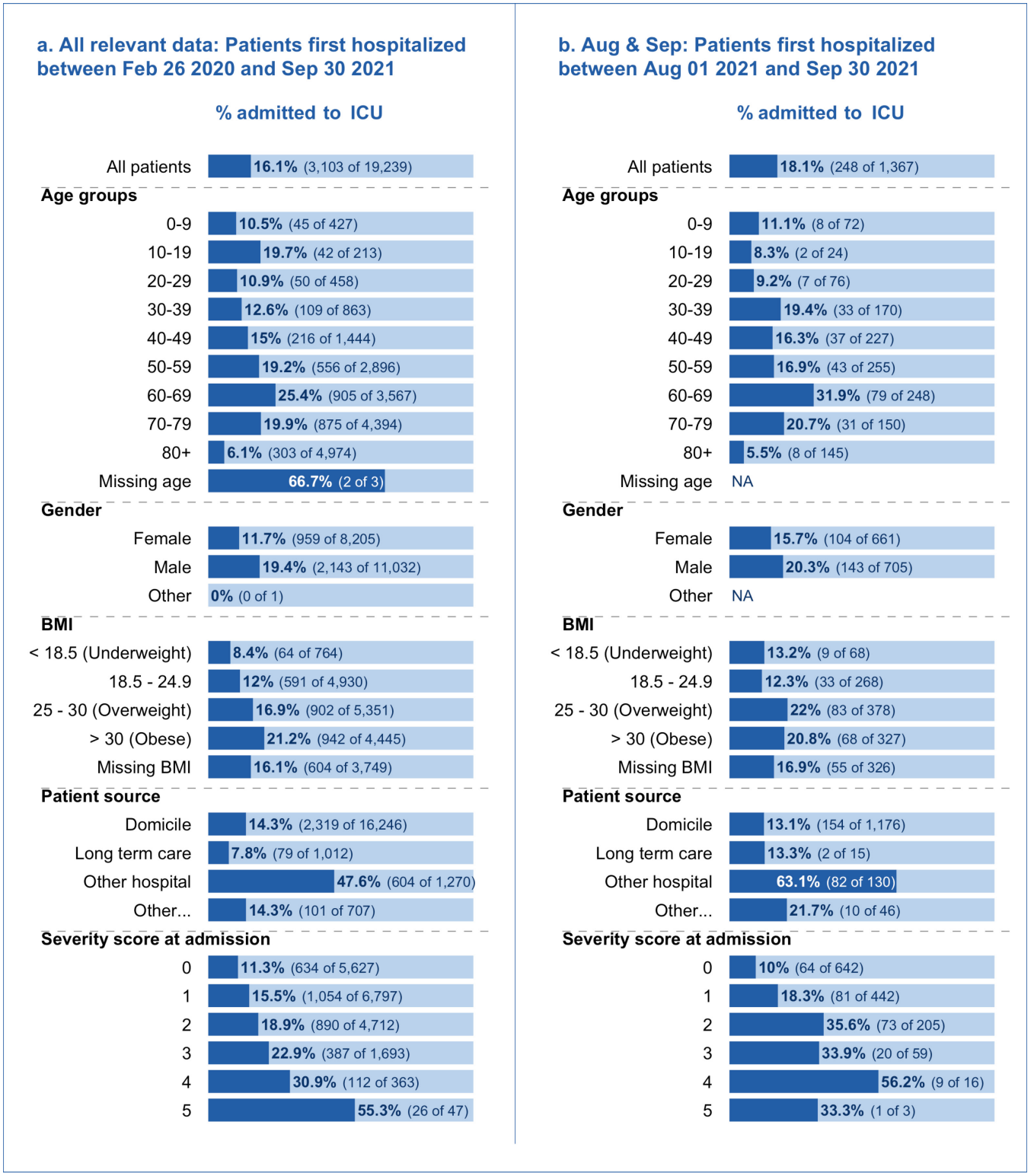

Figure 6: Percentage of patients admitted to ICU, grouped by demographic and risk factors, over two time intervals. For patients with multiple hospitalizations, we considered whether they were admitted to the ICU during any of their hospitalizations. Both panels include records up to Sep 30 2021 due to data completeness considerations. 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 during a period of low overall hospitalizations.

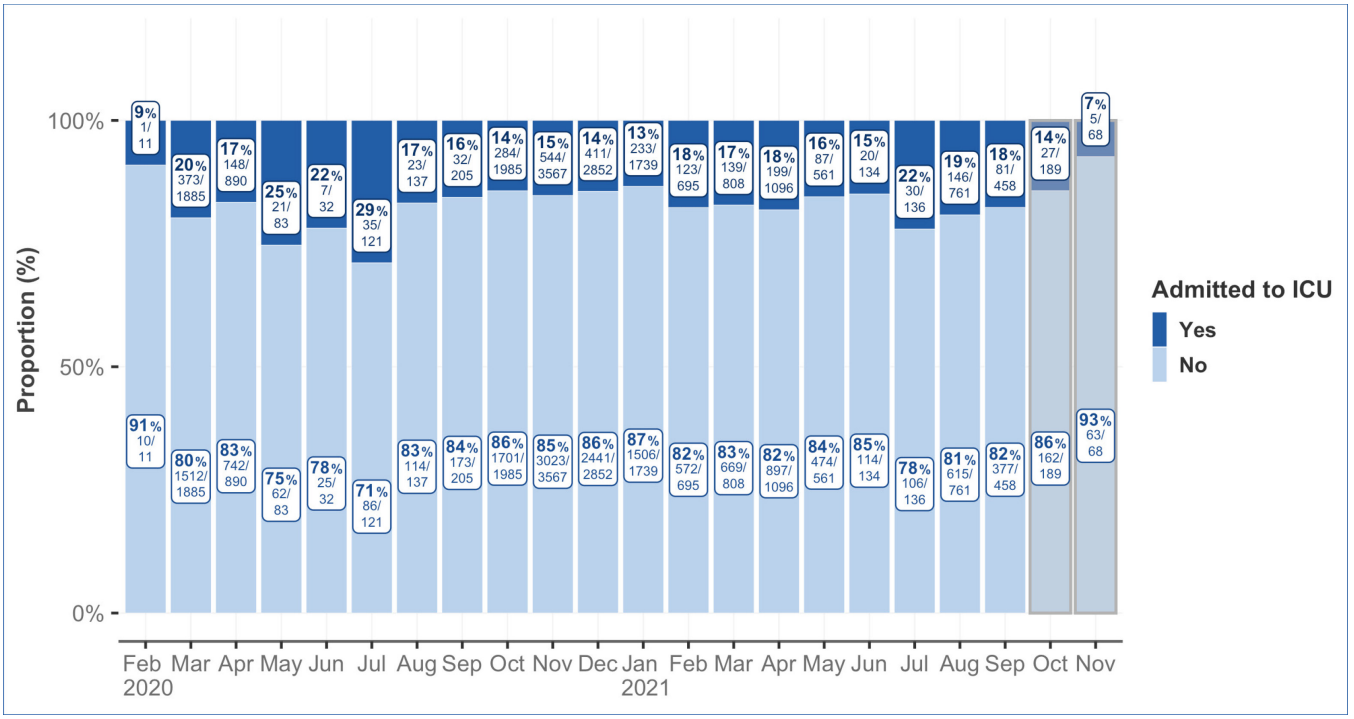

Figure 7: Percentage and proportion of patients admitted to the ICU over time. For patients with multiple hospitalizations, we considered whether they were admitted to the ICU during any of their hospitalizations. Records with incomplete data (patients still hospitalized or with a pending outcome in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

4. Immune/vaccination status

4.1. 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 8 b). This is expected, given the rise in the proportion of the whole Swiss population that is fully vaccinated (Figure 8c, source: BAG Dashboard).

During the months of August and September, when between 51% and 59% of the Swiss population was fully vaccinated (Figure 8c), the fully immunized made up only a minority (13.6%) of hospitalizations recorded in CH-SUR (Figure 8b), suggesting protection against hospitalization (and, consequently, death) 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 incompletely- 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.

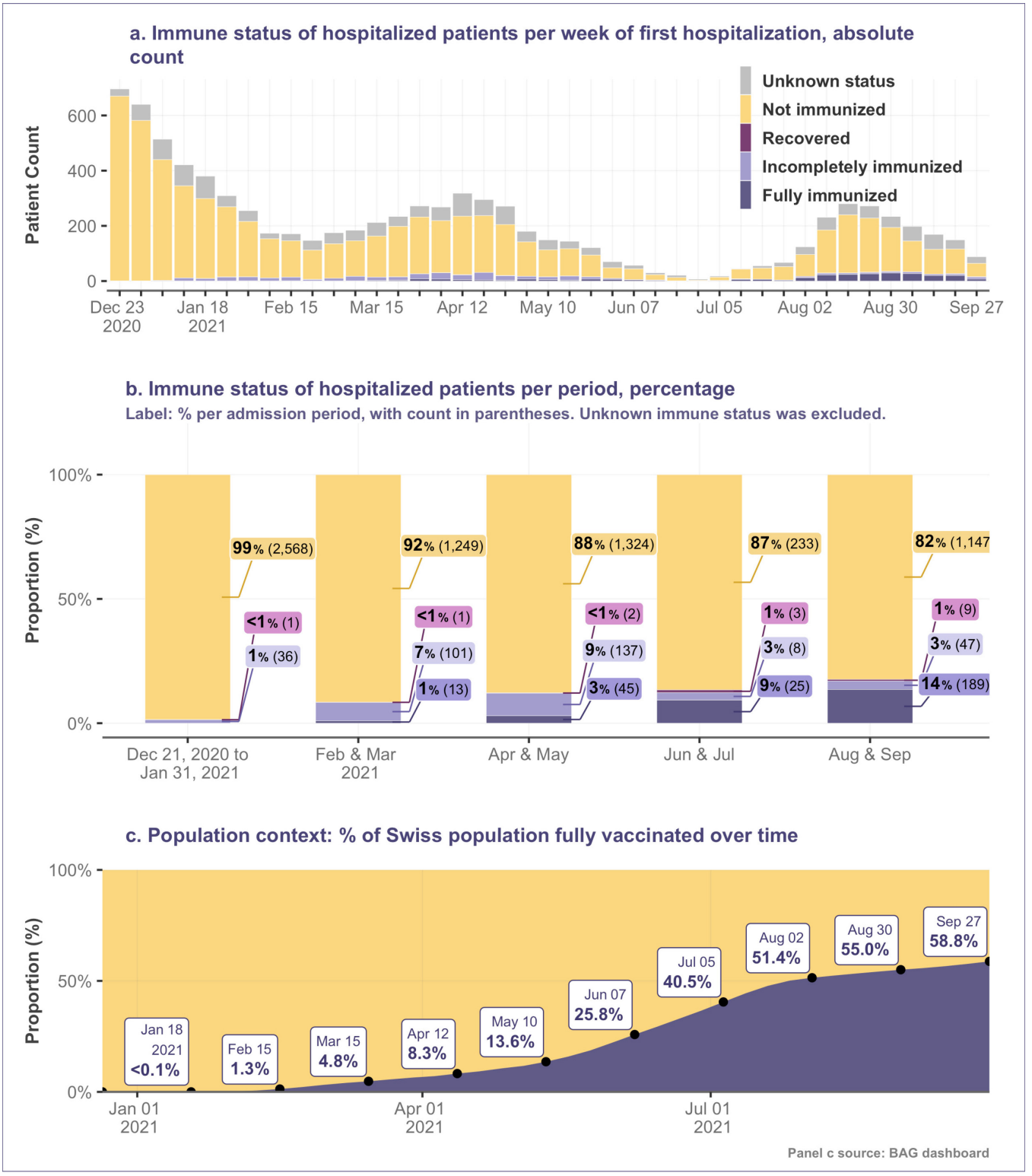

Figure 8: Immune status of hospitalized patients and overall vaccination rate in Switzerland. See footnote for definitions of immune status categories. For patients with multiple hospitalizations, the immune status for the first hospitalization was considered. Panels a and b include patients hospitalized 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 Sep 30 2021 were excluded, as a large proportion of these records have not been completely filled in the database.

4.2. Patient characteristics by immune status

Fully immunized patients (patients with breakthrough disease) were disproportionately older: since vaccination initiation, 41% of fully immunized patients (112 of 272) admitted to CH-SUR hospitals were aged 80 and above (Figure 9a, right panel). In contrast, only 19% of non-immunized patients (1,200 of 6,296) were aged 80 and above (Figure 9a, 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 larger share of non-immunized patients (Figures 9b and c, left panels). For example, when considering all data since vaccination initiation, individuals aged 30-39 made up only 6.5% of non-immunized patients (412 of 6,296; Figure 9a, left panel), but in August and September, they made up a larger share, 13% of non-immunized patients (154 of 1,144; Figure 9c, left panel). This is likely due to the fact that most of those in the older age classes had been vaccinated by this time.

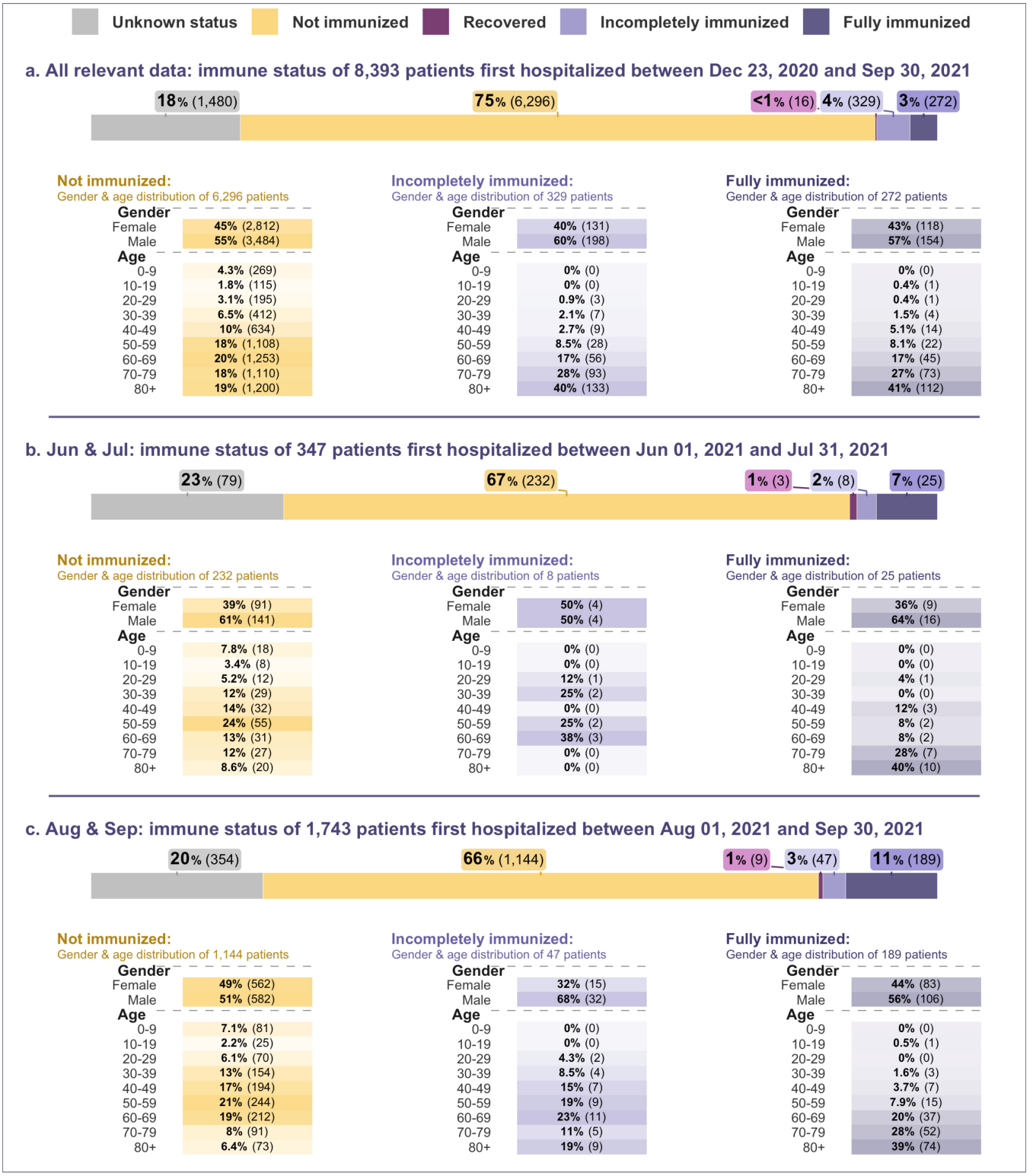

Figure 9: Demographic characteristics of patients hospitalized by immune status, over three different periods. Patients first hospitalized after Sep 30 2021 were excluded, as a large proportion of these records have not been completely filled in the database. Patients with missing ages and gender marked 'Other' are not shown.

4.3. Patient outcomes by immune status

Since the date vaccinations began, Dec 23, 2020, CH-SUR registered only 26 deaths among fully immunized patients (Figure 10a, right panel subtitle). Of these deaths, 11 were among individuals aged 80 and above. Over the same period, there were 551 COVID-caused deaths among non-immunized patients (Figure 10a, left panel).

During the months of August and September, there were 68 deaths among non-immunized patients, 16 deaths among partially immunized patients, and 16 deaths among fully immunized patients (Figure 10). Deaths among fully-immunized patients thus represented a minority of deaths in this period.

CH-SUR data highlights the protective effect of vaccination against hospitalization, and consequently death, due to COVID-19. Nevertheless, the CFR values by age show that the risk of death for the limited number of people who are hospitalized despite full vaccination is similar to that of unvaccinated hospitalized people (Figure 11a, 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: 629 deaths among 6,631 patients first hospitalized between Dec 23, 2020 and Sep 30, 2021

Not immunized: Age distribution of **551** deaths in **6,081** patients

Age	Patients	Deaths	CFR %
0-9	256	0	0%
10-19	112	0	0%
20-29	184	2	1.1%
30-39	392	2	0.5%
40-49	602	8	1.3%
50-59	1056	28	2.7%
60-69	1202	92	7.7%
70-79	1093	156	14.3%
80+	1184	263	22.2%

Incompletely immunized: Age distribution of **52** deaths in **316** patients

Age	Patients	Deaths	CFR %
0-9	0	0	-
10-19	0	0	-
20-29	3	0	0%
30-39	6	0	0%
40-49	8	0	0%
50-59	26	3	11.5%
60-69	51	6	11.8%
70-79	92	15	16.3%
80+	130	28	21.5%

Fully immunized: Age distribution of **26** deaths in **234** 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	11	0	0%
50-59	20	0	0%
60-69	42	8	19.0%
70-79	64	7	10.9%
80+	92	11	12.0%

b. Jun & Jul: 14 deaths among 241 patients first hospitalized between Jun 01, 2021 and Jul 31, 2021

Not immunized: Age distribution of **12** deaths in **209** patients

Age	Patients	Deaths	CFR %
0-9	16	0	0%
10-19	8	0	0%
20-29	11	0	0%
30-39	26	0	0%
40-49	27	1	3.7%
50-59	49	1	2.0%
60-69	28	1	3.6%
70-79	26	2	7.7%
80+	18	7	38.9%

Incompletely immunized: Age distribution of **1** death in **8** 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	0	0	-
50-59	2	0	0%
60-69	3	1	33.3%
70-79	0	0	-
80+	0	0	-

Fully immunized: Age distribution of **1** death in **24** 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	0	0%
50-59	2	0	0%
60-69	2	1	50.0%
70-79	7	0	0%
80+	9	0	0%

c. Aug & Sep: 88 deaths among 1,202 patients first hospitalized between Aug 01, 2021 and Sep 30, 2021

Not immunized: Age distribution of **68** deaths in **1,009** patients

Age	Patients	Deaths	CFR %
0-9	72	0	0%
10-19	22	0	0%
20-29	61	0	0%
30-39	138	1	0.7%
40-49	175	5	2.9%
50-59	210	6	2.9%
60-69	181	22	12.2%
70-79	85	16	18.8%
80+	65	18	27.7%

Incompletely immunized: Age distribution of **4** deaths in **38** patients

Age	Patients	Deaths	CFR %
0-9	0	0	-
10-19	0	0	-
20-29	2	0	0%
30-39	3	0	0%
40-49	6	0	0%
50-59	7	1	14.3%
60-69	7	0	0%
70-79	5	0	0%
80+	8	3	37.5%

Fully immunized: Age distribution of **16** deaths in **155** patients

Age	Patients	Deaths	CFR %
0-9	0	0	-
10-19	0	0	-
20-29	0	0	-
30-39	3	0	0%
40-49	5	0	0%
50-59	13	0	0%
60-69	34	5	14.7%
70-79	45	6	13.3%
80+	55	5	9.1%

Figure 10: 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, incompletely immunized 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 incompletely immunized and fully immunized categories, should be interpreted with caution due to small sample sizes.

5. 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% (2,564 of 20,906) (Figure 11a).

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 11c). Notably, this peak in nosocomial proportion roughly coincides with the peak of hospitalizations (Figure 11b).

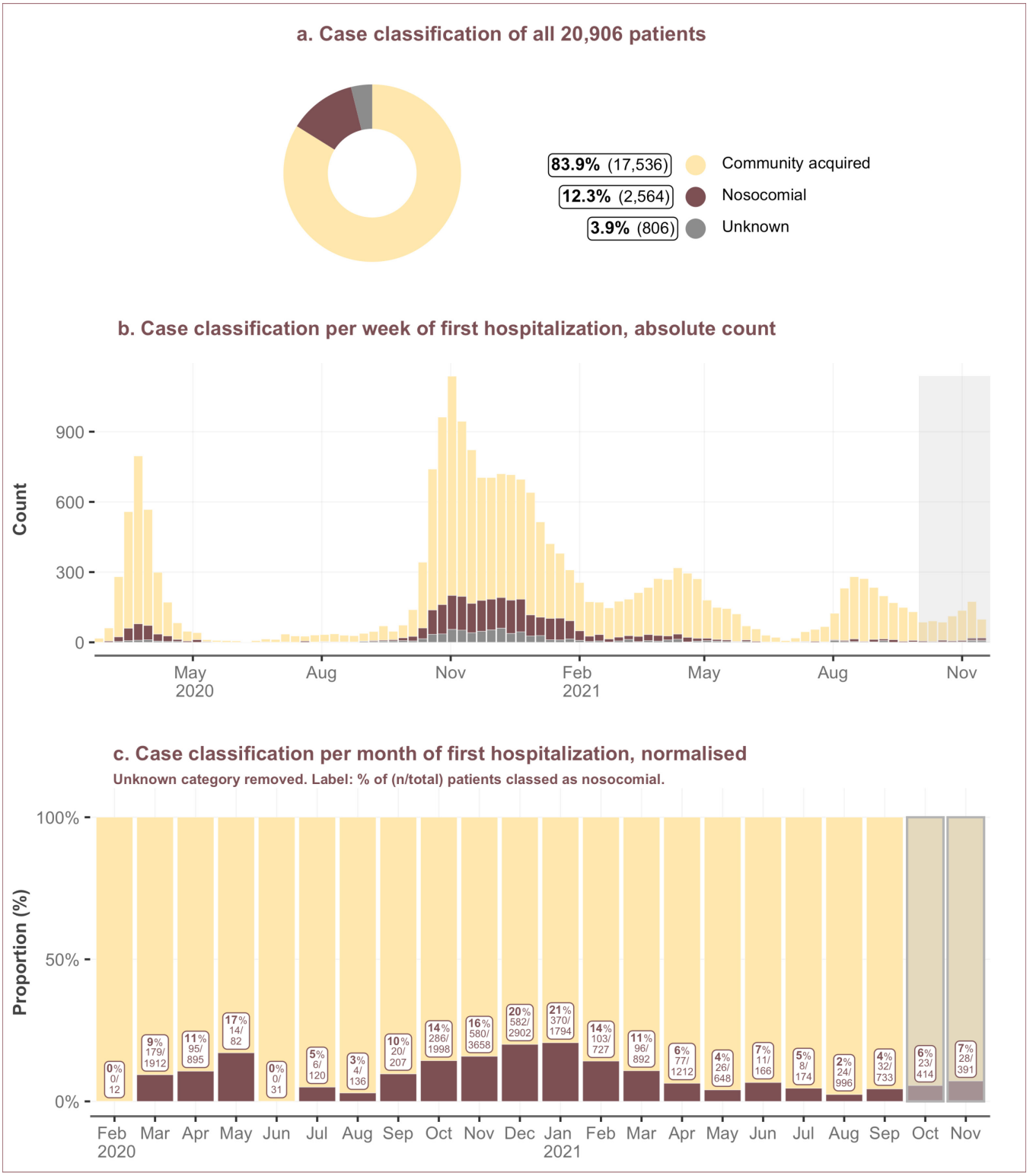

Figure 11: Case classification (infection source) for patients over time

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).

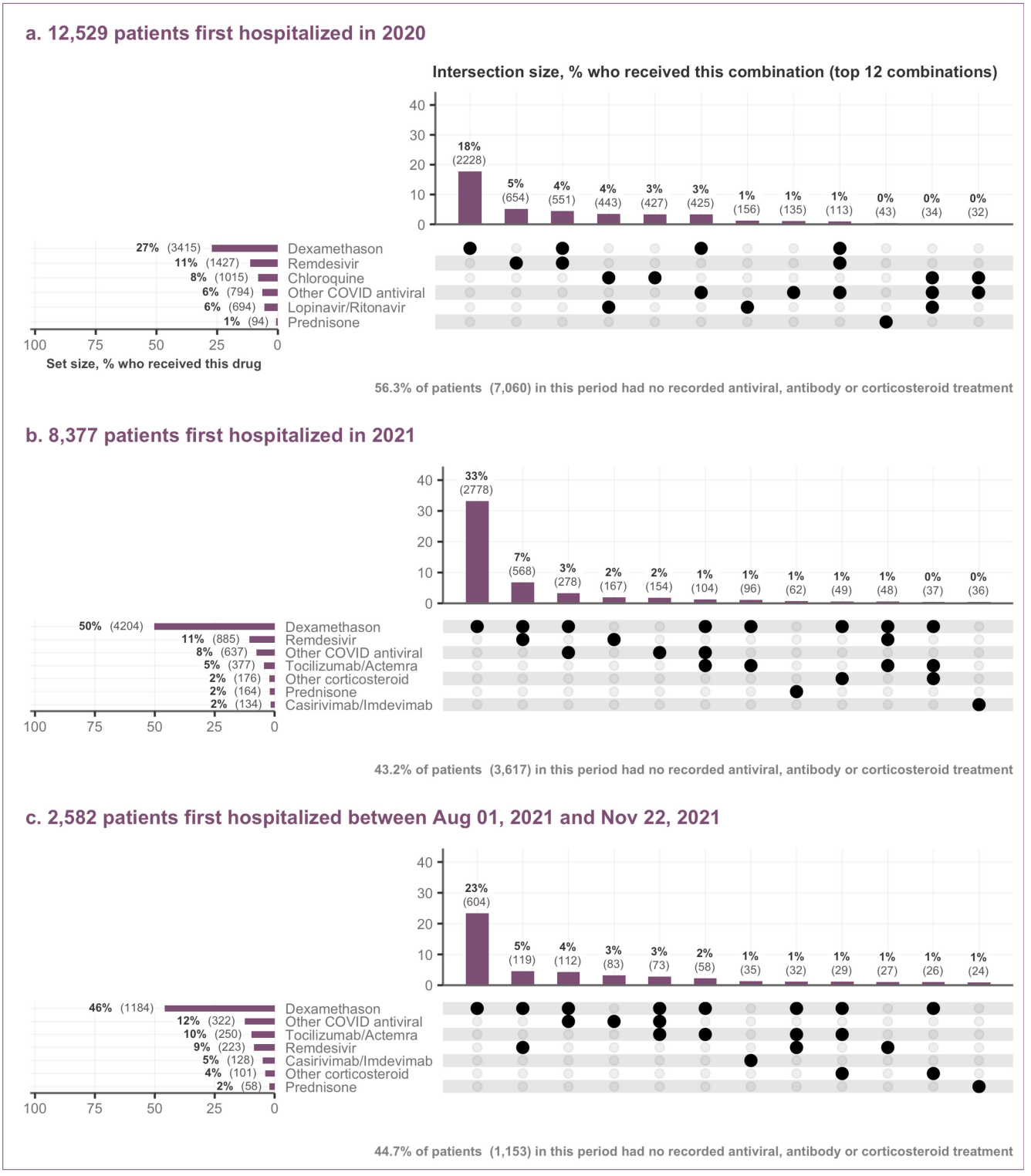

Figure 12: Antiviral, antibody treatments and corticosteroids administered over three periods. Horizontal bars to the left represent the % of patients who received a specific drug. Vertical bars show the % of patients who received the combination of drugs indicated with the black dot(s) directly below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

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