

Surveillance sentinelle hospitalière du COVID-19

État des données au : 21.02.2022

1. Résumé introductif

Le système de surveillance sentinelle hospitalière du COVID-19 (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 au COVID-19 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. Les statistiques du CH-SUR indiquent le nombre et la durée des séjours en hôpital et en unité de soins intensifs (SI). Un patient peut être hospitalisé à plusieurs reprises ou nécessiter plusieurs admissions en SI pour une même hospitalisation liée au COVID-19.

Critères d'inclusion : CH-SUR collecte 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 PCR (Polymerase Chain Reaction) ou à un test rapide antigénique ainsi qu'un diagnostic 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 20 Février 2022 portent sur 27 504 patients hospitalisés. Certains d'entre eux ayant effectué plusieurs séjours à l'hôpital, le système CH-SUR a enregistré 28 524 hospitalisations ainsi que leur évolution. 3 616 patients (16.2%) ont été traités dans une unité de soins intensifs (période temporelle des données SI: entre le 26.2.2020 et le 31.12.2021) et 2 802 personnes (11.7%) sont décédées du COVID-19 pendant leur séjour à l'hôpital (décès intervenus entre le 26.2.2020 et le 20.02.2022). Durant cette même période, l'OFSP a été informé de 45 529 hospitalisations en lien avec 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 62.7% de toutes les hospitalisations déclarées en Suisse en lien avec le SARS-CoV-2.

Durant la dernière période pour laquelle suffisamment de données sont disponibles (du 01.11.2021 au 31.12.2021), 3 275 patients étaient hospitalisés. Parmi ceux-ci, 1 577 (48.2%) n'étaient pas immunisés et 1 012 (30.9%) étaient complètement immunisés (immunisation de base avec ou sans vaccination de rappel) (figure 1). Pendant la même période, parmi les 380 patients traités en SI, 268 (70.5%) n'étaient pas immunisés et 93 (24.5%) étaient complètement immunisés. 184 patients sont décédés du COVID-19 (5.6% des patients hospitalisés). 104 décès concernaient des patients non immunisés et 69 des patients complètement immunisés.

Aperçu CH-SUR des patients hospitalisés, des admissions en SI et des décès du 01 Novembre 2021 au 31 Décembre 2021

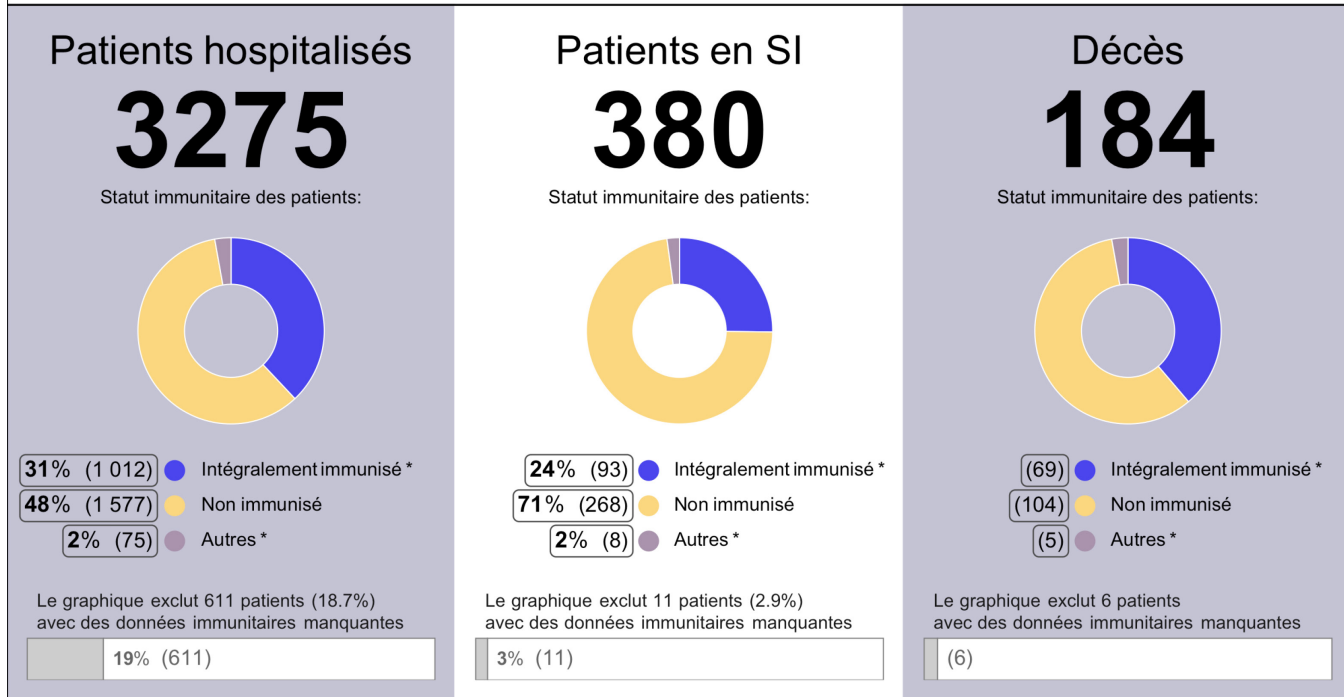


Figure 1: Vue d'ensemble des données les plus récentes. Les données des deux derniers mois sont considérées comme provisoires à cause des délais dans la saisie des données: elles ont donc été omises. (* intégralement immunisé : patients avec immunisation de base, avec ou sans vaccination de rappel. Autres : patients partiellement immunisés et patients ayant guéri d'une infection précédente au SARS-CoV-2)

2. Hospitalizations and demographic characteristics

Between the start of the epidemic in Switzerland and February 20, 2022 and among the 20 hospitals actively participating in CH-SUR, 27,504 patients were hospitalized, accounting for a total of 28,524 hospitalizations. There were more hospitalizations than patients because some patients were hospitalized multiple times. An overview of these rehospitalized patients is shown in Figure 2.

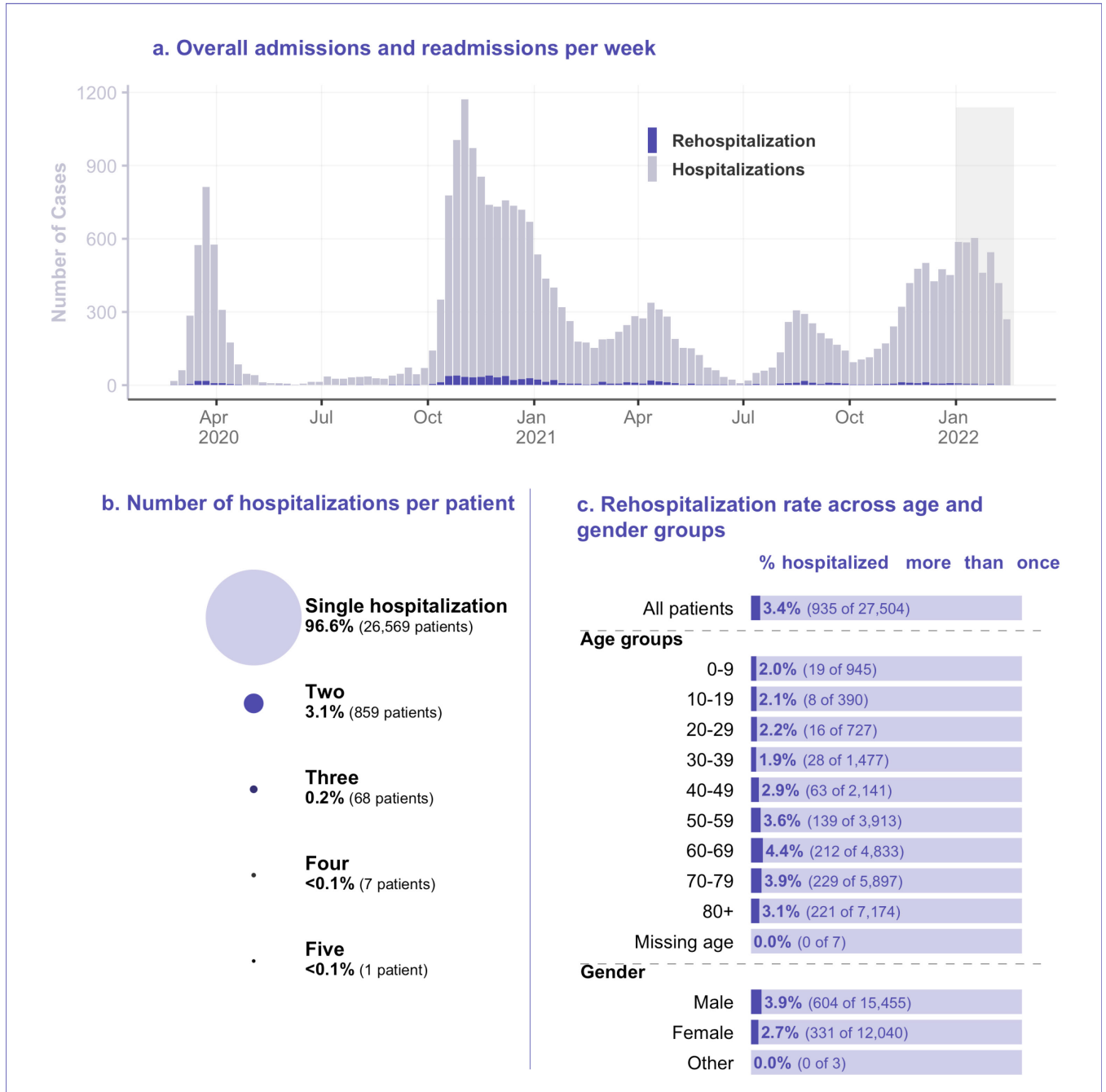


Figure 2: Hospitalizations per patient and rehospitalization rate across demographic groups. Includes records up to February 20, 2022.

Most patients (96.6% [26,569 of 27,504]) were hospitalized only once, but 3% of patients (934 of 27,504) were hospitalized two to four times, and one patient was hospitalized five times (Figure 2b).

The overall rate of rehospitalization was 3.4% (935 of 27,504) (Figure 2c). The 60-69 age group and the 70-79 age group had the highest rate of rehospitalization at respectively 4.4% (212 of 4,833) and 3.9% (229 of 5,897). Men had a higher rehospitalization rate than women, 3.9% (604 of 15,455) vs 2.7% (331 of 12,040) respectively.

Overall, the majority (56.2% [15,455 of 27,504]) of the hospitalized patients were men (Figure 3a), and the age distribution was skewed towards older persons (Figure 3b). The largest age category of patients were those aged 80 and above (26.0% [7,174]).

Figures 3c and 3d show the gender and age distribution ratio over time. Except for January 2022, 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: 89.1% (3,436 of 3,858) of patients first admitted in this month were 50 and above (Figure 3d). This peak in older age admissions mirrors a similarly-timed peak in admission severity and case fatality ratios described later. An increase in the percentage of patients aged 50 and above was observed again from September 2021 onwards, reaching a local peak of 77.1% (971 of 1,259) in November 2021.

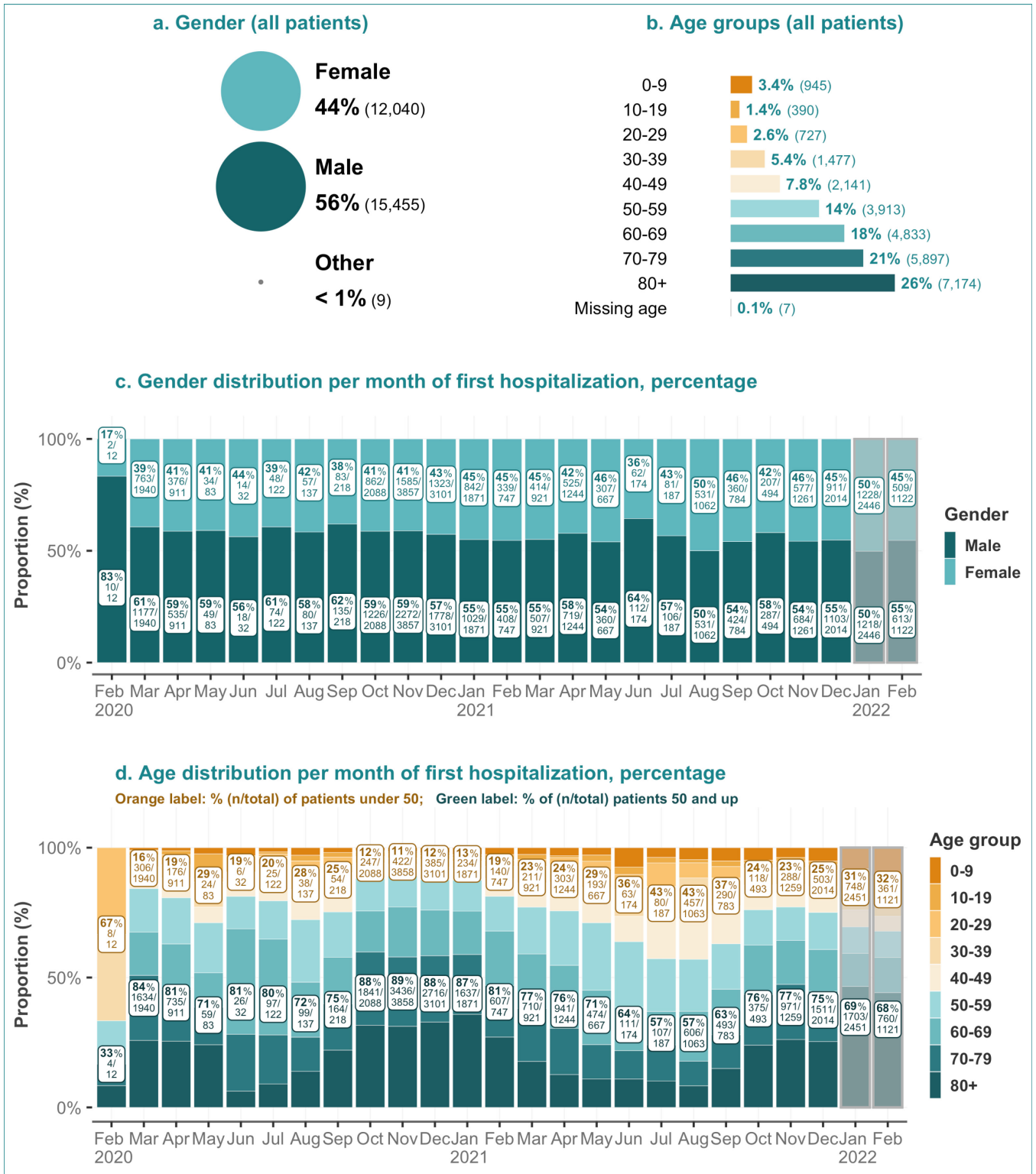


Figure 3: Demographic characteristics: gender and age distribution of admitted patients, overall and per month. For patients with multiple hospitalizations, the admission date of the first hospitalization was used. Data from the last two months (highlighted gray) is considered provisional due to entry delays. The 'other' gender category was removed from panel c, and the missing age group was removed from panel d.

3. Patient outcomes

3.1. Outcomes overview

Figure 4 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 for each CH-SUR-participating center. Cases where the cause of death was not certain, but there was a COVID-19 diagnosis (in conformity for complete inclusion criteria for CH-SUR) were counted as died of COVID or suspected death of COVID.

Patients “discharged” include patients who 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 during the most recent months, case fatality rates from these months should be interpreted with caution.

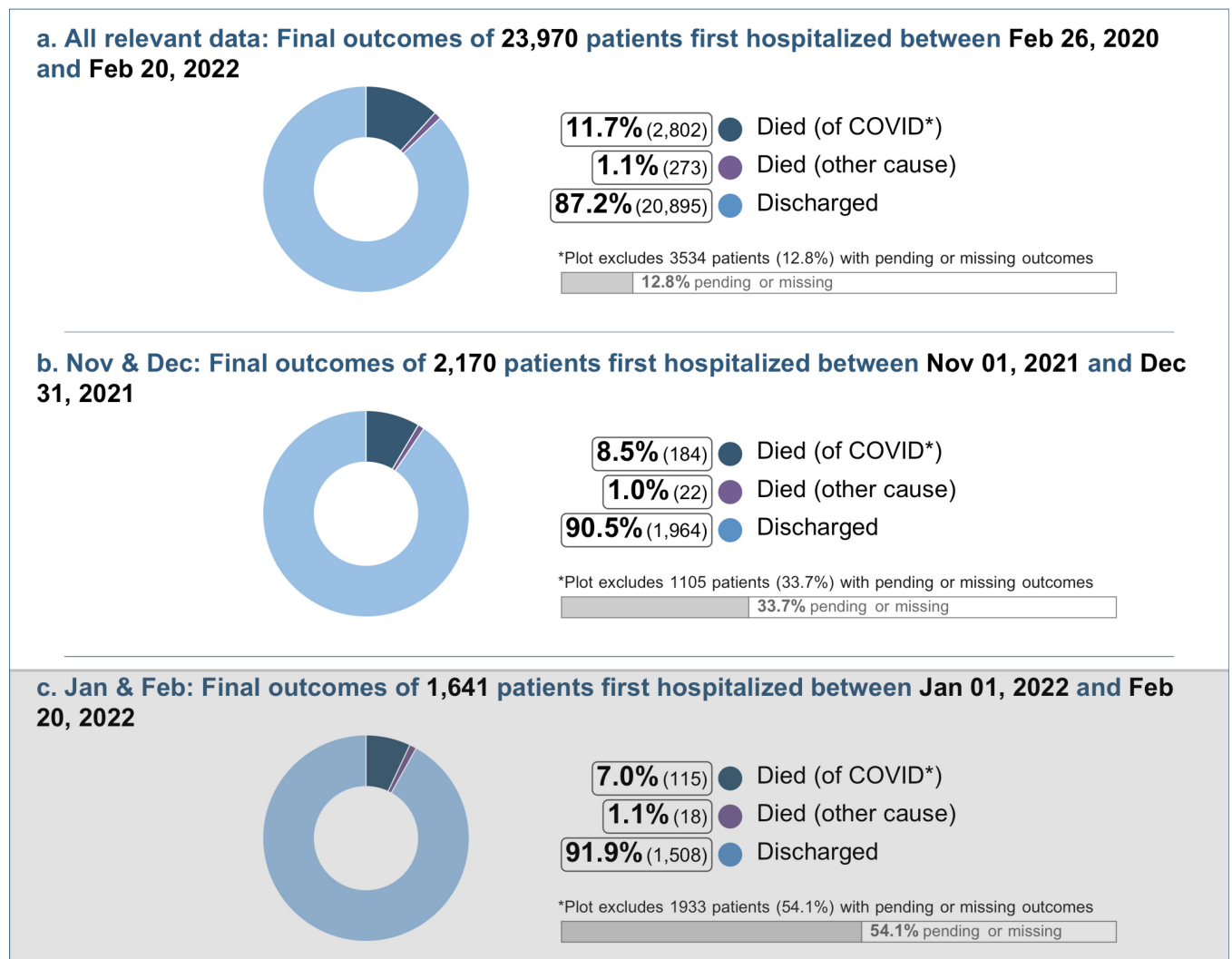


Figure 4: Outcomes for COVID-19 patients hospitalized in CH-SUR hospitals. Includes records up to February 20, 2022. For patients with multiple hospitalizations, only the final outcome is considered. Cases where the cause of death was not certain, but there was a COVID 19 diagnosis (in conformity for complete inclusion criteria for CH SUR) were counted as Died of COVID or suspected death of COVID. Data from the last two months (highlighted gray) is considered provisional due to entry delays. * Died of COVID as a confirmed or suspected cause of death

3.2. Outcomes over time

Figure 5 shows the final outcomes of hospitalized patients over time (Figure 5a & 5b), alongside the epidemic curve (Figure 5a) and the initial disease severity of those admitted over time (Figure 5c).

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 decreased after March 2020, but rose again between October 2020 and January 2021, with a peak in December 2020: 15.2% (466 of 3,071) of patients first admitted in December 2020 did not survive. An additional local peak of mortality was observed during the month October 2021, when 13.1% (55 of 420) of hospitalized patients died of COVID-19.

The high case fatality rates for those first admitted at the start of the epidemic, at the height of the period between October 2020 and January 2021 and during October 2021, are mirrored by the higher admission severity scores at these times (Figure 5c) and older patient's ages (Figure 3c) registered for these periods. Overall, 34.2% (664 of 1,940) of patients first admitted in March 2020 had a severity score above 2.¹ Over the months of October 2020 to January 2021, the proportion with severity scores of 2 and above was similarly high: 41% (1,270 of 3,101) 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.

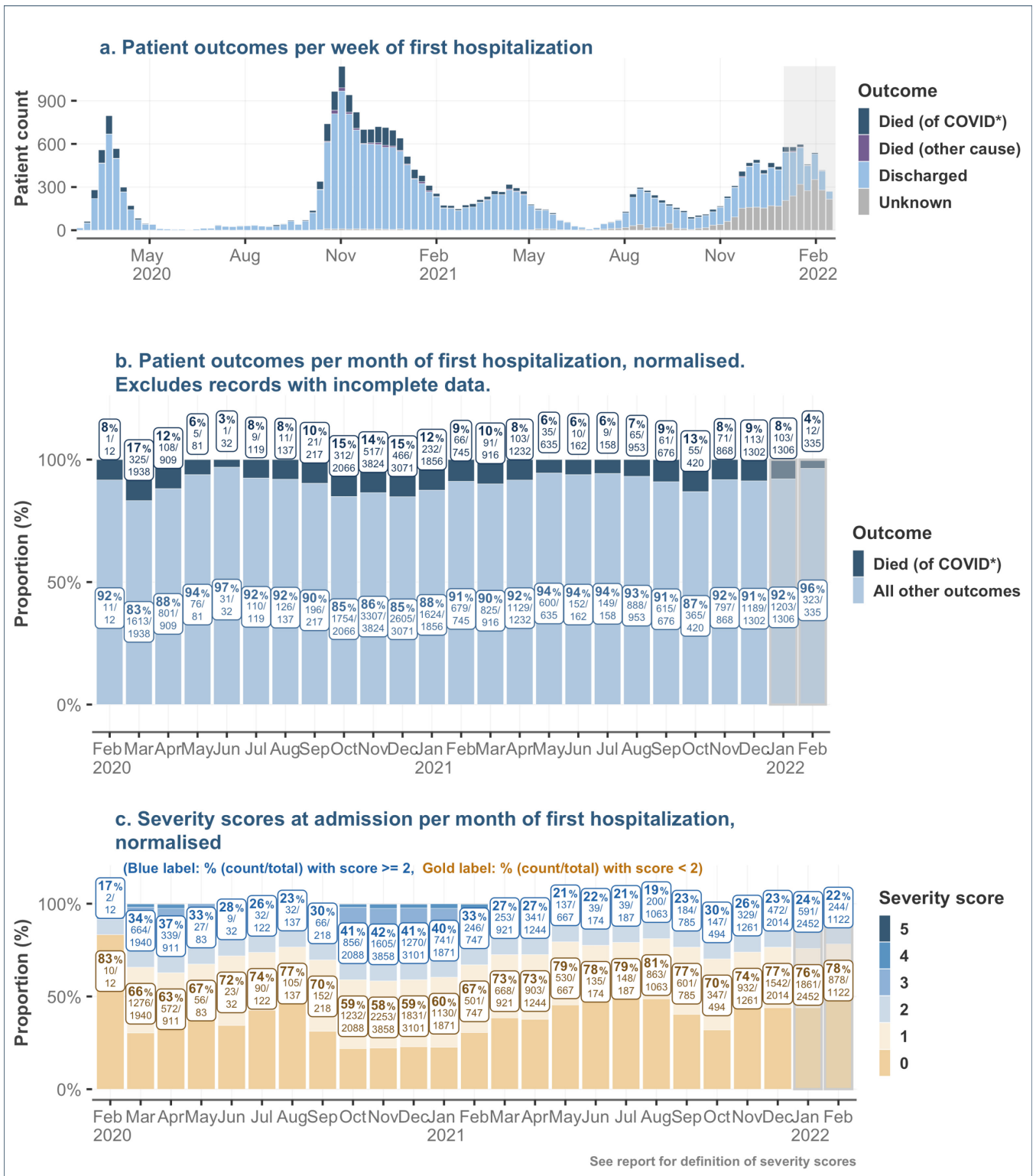


Figure 5: Epidemic curve, patient outcomes and severity scores at admission for COVID-19 patients over time. Includes records up to February 20, 2022. Data from the two last months (highlighted in gray) are considered provisional due to data entry delays. Cases where the cause of death was not certain, but there was a COVID 19 diagnosis (in conformity for complete inclusion criteria for CH SUR) were counted as Died of COVID or suspected death of COVID. (* Died of COVID as a confirmed or suspected cause of death)

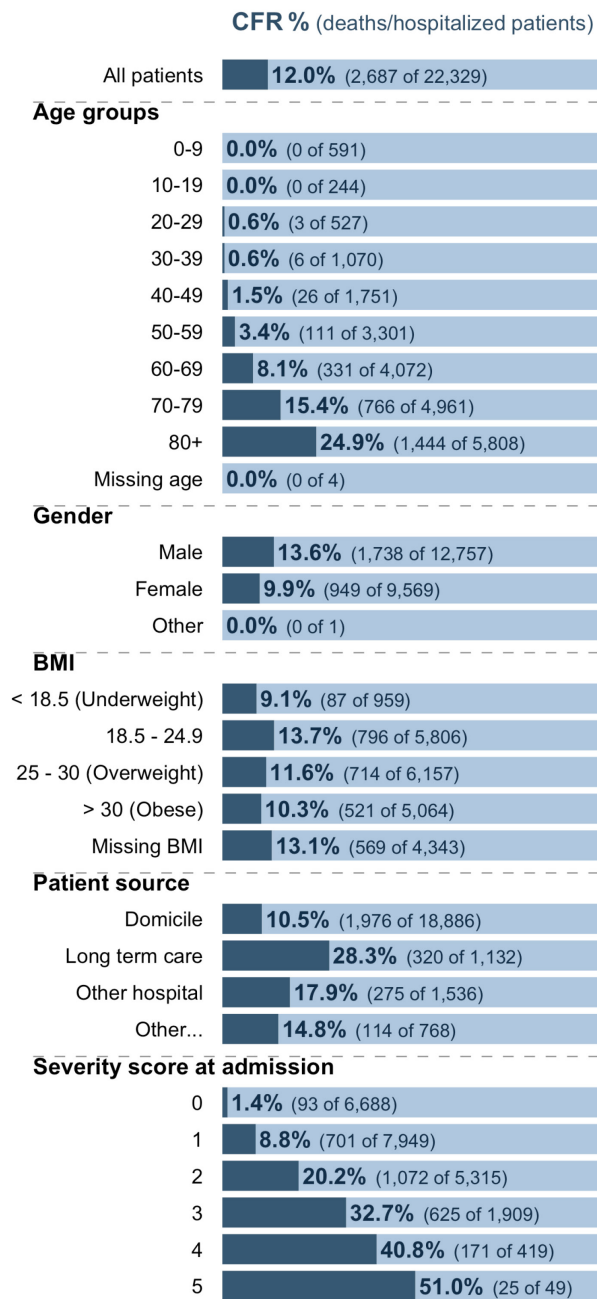
3.3. Case fatality rate (CFR) across demographic and risk groups

Since the beginning of the epidemic and until December 31, 2021, the case fatality rate (CFR) increased with increasing age, from 0% (0 of 591) in patients aged 0-9, to 3.4% (111 of 3,301) in patients aged 50-59, and to 24.9% (1,444 of 5,808) in patients aged 80+. CFR% was greater in men than in women: 13.6% (1,738 of 12,757) vs 9.9% (949 of 9,569) respectively. In addition, the CFR% was greater for patients with higher severity scores at admission: 1.4% (93 of 6,688) of patients with severity score 0 died of COVID-19, while 51% (25 of 49) of patients with severity score 5 died of COVID-19.

The overall CFR % of the most recent period for which enough data is available (months November and December 2021, Figure 6b) was lower than the CFR % of the whole epidemic period (8.5% vs. 12.0%). The CFR % of the age groups 70-79 and 80+ were also lower than over the whole epidemic (9.5% and 19.0% in the most recent period for each age group respectively).

Of note, there was no clear mortality difference across different BMI groups. Data regarding vaccination status can be found in section 4.

a. All data: CFR % for 22,329 patients first hospitalized between Feb 26 2020 and Dec 31 2021



b. November & December: CFR % for 2,170 patients first hospitalized between Nov 01 2021 and Dec 31 2021

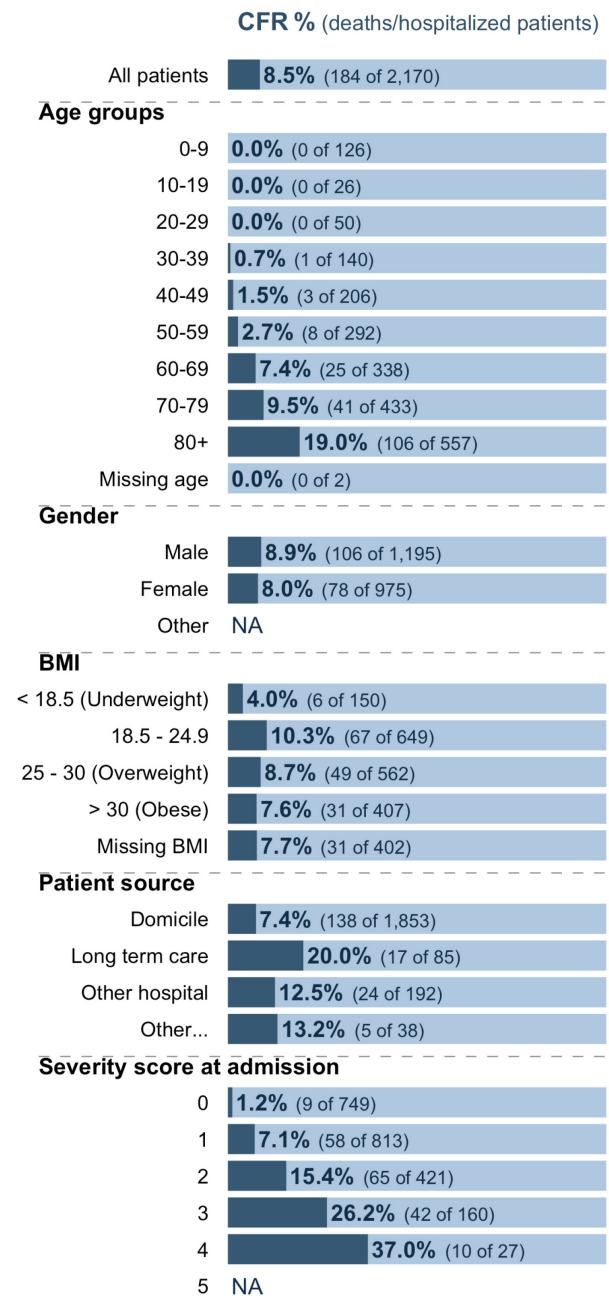


Figure 6: Case fatality rate (CFR) % among demographic and risk groups; percentage of patients in different demographic groups who were recorded as having died in hospital of COVID-19. Both figures include records up to Dec 31 2021 but records with incomplete data (patients still hospitalized or with a pending outcome in the database) were not included. Blank rows indicate a patient count of zero.

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 (combination category of base immunized and boosted) rose gradually after January 2021 (Figure 7 b). This is expected, given the rise in the proportion of the whole Swiss population that is fully vaccinated (Figure 7c, source: [FOPH Dashboard](#)).

During the months of November and December 2021, when between 66.6% and 68.2% of the Swiss population was fully immunized (Figure 7c), the base immunized and boosted made up only a minority (31.2% and 6.8% respectively) of hospitalizations recorded in CH-SUR (Figure 7b), 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) Partially immunized: Patients who received one dose of the vaccines from Moderna (Spikevax®), Pfizer/BioNTech (Comirnaty®), AstraZeneca (Vaxzevria®), Sinopharm®, Sinovac (CoronaVac®) or COVAXIN® before the positive test and have no proof of previous SARS-CoV-2 infection.
- c) Base immunized: Patients who received one dose of the Johnson & Johnson (Janssen®) vaccine or two doses of the Spikevax®, Comirnaty®, Vaxzevria®, Sinopharm®, CoronaVac® or COVAXIN® vaccines (FOPH/Federal Vaccination Commission vaccination recommendation). Patients with a prior infection (requiring hospitalisation or not) who received one vaccine dose of the vaccines listed before, independent of the time between disease recovery, date and brand of vaccine and positive test or hospitalization. Patients who have received a combination of the following vaccines: Comirnaty® and Spikevax®; Vaxzevria® and Comirnaty®; Vaxzevria® and Spikevax®. Excludes patients who received one additional booster vaccine (category boosted).
- d) Boosted: Patients with base immunization who received one or more additional vaccine doses (booster), independent of the time since last vaccine application (minimum 4 months since last vaccine application).
- e) 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).
- f) Unknown immune status: Patients for whom vaccination and immune information was not available.

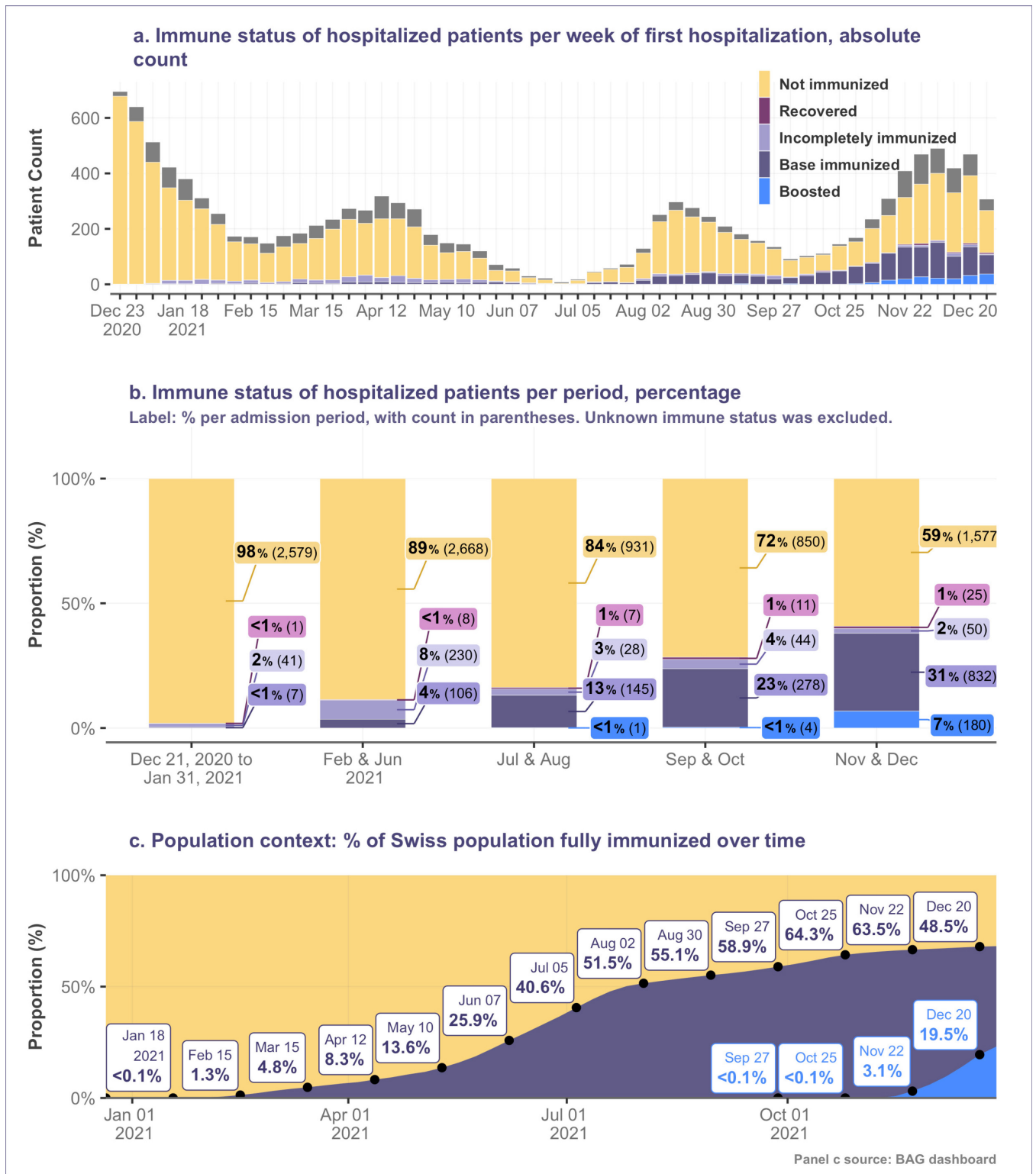


Figure 7: Immune status of hospitalized patients and overall vaccination rate in Switzerland (exported: February 20, 2022). See footnote for definitions of immune status categories. For patients with multiple hospitalizations, the immune status for the first hospitalization was considered. Panels a. and b. include patients hospitalized since the week vaccination began, Dec 21, 2020. (Vaccination began on Dec 23, 2020, but we include Dec 22 and 21 to cover a full week.) Patients first hospitalized after Dec 31, 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 (combination category of base immunized and boosted) were disproportionately older: since vaccination initiation, 41.3% of fully immunized patients (642 of 1,553) admitted to CH-SUR hospitals were aged 80 and above (Figure 8a, right panels). In contrast, only 18% of non-immunized patients (1,543 of 8,378) were aged 80 and above (Figure 8a, 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 (see [FOPH Dashboard](#)). Certain risk factors for hospitalization may also be more prevalent among the elderly.



a. All relevant data: immune status of 12,285 patients first hospitalized between Dec 23, 2020 and Dec 31, 2021



Not immunized:

Gender & age distribution of 8,378 patients

Gender	
Male	54% (4,556)
Female	46% (3,822)
Age	
0-9	5.3% (446)
10-19	1.8% (153)
20-29	3.0% (252)
30-39	7.2% (600)
40-49	11% (891)
50-59	17% (1,464)
60-69	19% (1,620)
70-79	17% (1,409)
80+	18% (1,543)

Incompletely immunized:

Gender & age distribution of 393 patients

Gender	
Male	56% (221)
Female	44% (172)
Age	
0-9	0.0% (0)
10-19	0.0% (0)
20-29	0.8% (3)
30-39	2.5% (10)
40-49	4.6% (18)
50-59	8.4% (33)
60-69	18% (70)
70-79	27% (106)
80+	39% (153)

Base immunized:

Gender & age distribution of 1,367 patients

Gender	
Male	59% (808)
Female	41% (559)
Age	
0-9	0.0% (0)
10-19	0.3% (4)
20-29	1.2% (17)
30-39	2.9% (39)
40-49	5.4% (74)
50-59	7.8% (107)
60-69	14% (191)
70-79	27% (375)
80+	41% (560)

Boosted:

Gender & age distribution of 186 patients

Gender	
Male	61% (114)
Female	39% (72)
Age	
0-9	0.0% (0)
10-19	0.5% (1)
20-29	1.6% (3)
30-39	1.1% (2)
40-49	3.2% (6)
50-59	6.5% (12)
60-69	15% (27)
70-79	28% (53)
80+	44% (82)

b. Sep & Oct: immune status of 1,275 patients first hospitalized between Sep 01, 2021 and Oct 31, 2021



Not immunized:

Gender & age distribution of 847 patients

Gender	
Male	53% (453)
Female	47% (394)
Age	
0-9	7.0% (59)
10-19	2.2% (19)
20-29	4.4% (37)
30-39	11% (96)
40-49	14% (121)
50-59	18% (156)
60-69	19% (158)
70-79	12% (99)
80+	12% (102)

Incompletely immunized:

Gender & age distribution of 44 patients

Gender	
Male	66% (29)
Female	34% (15)
Age	
0-9	0.0% (0)
10-19	0.0% (0)
20-29	6.8% (3)
30-39	6.8% (3)
40-49	16% (7)
50-59	14% (6)
60-69	18% (8)
70-79	14% (6)
80+	25% (11)

Base immunized:

Gender & age distribution of 277 patients

Gender	
Male	60% (165)
Female	40% (112)
Age	
0-9	0.0% (0)
10-19	0.0% (0)
20-29	0.4% (1)
30-39	1.1% (3)
40-49	4.7% (13)
50-59	7.6% (21)
60-69	18% (51)
70-79	29% (81)
80+	39% (107)

Boosted:

Gender & age distribution of 4 patients

Gender	
Male	50% (2)
Female	50% (2)
Age	
0-9	0.0% (0)
10-19	25% (1)
20-29	0.0% (0)
30-39	0.0% (0)
40-49	0.0% (0)
50-59	0.0% (0)
60-69	75% (3)
70-79	0.0% (0)
80+	0.0% (0)

c. Nov & Dec: immune status of 3,273 patients first hospitalized between Nov 01, 2021 and Dec 31, 2021



Not immunized:

Gender & age distribution of 1,575 patients

Gender	
Male	51% (804)
Female	49% (771)
Age	
0-9	9.3% (147)
10-19	2.1% (33)
20-29	2.6% (41)
30-39	8.4% (133)
40-49	12% (187)
50-59	17% (270)
60-69	17% (261)
70-79	15% (240)
80+	17% (263)

Incompletely immunized:

Gender & age distribution of 50 patients

Gender	
Male	46% (23)
Female	54% (27)
Age	
0-9	0.0% (0)
10-19	0.0% (0)
20-29	0.0% (0)
30-39	2.0% (1)
40-49	12% (6)
50-59	6.0% (3)
60-69	12% (6)
70-79	22% (11)
80+	46% (23)

Base immunized:

Gender & age distribution of 832 patients

Gender	
Male	60% (496)
Female	40% (336)
Age	
0-9	0.0% (0)
10-19	0.5% (4)
20-29	1.4% (12)
30-39	3.6% (30)
40-49	5.6% (47)
50-59	7.9% (66)
60-69	13% (105)
70-79	27% (225)
80+	41% (343)

Boosted:

Gender & age distribution of 180 patients

Gender	
Male	62% (112)
Female	38% (68)
Age	
0-9	0.0% (0)
10-19	0.0% (0)
20-29	1.7% (3)
30-39	1.1% (2)
40-49	3.3% (6)
50-59	6.1% (11)
60-69	13% (24)
70-79	29% (52)
80+	46% (82)

Figure 8: Demographic characteristics of patients hospitalized by immune status, over three different periods. Patients first hospitalized after Dec 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 are not included in the numbers.

4.3. Patient outcomes by immune status

Since the date vaccinations began, December 23, 2020, CH-SUR registered 131 deaths among fully immunized patients (Figure 9a, right panels: base immunized and boosted). Of these deaths, 75 were among individuals aged 80 and above. Over the same period, there were 696 COVID-caused deaths among non-immunized patients (Figure 9a, left panel).

During the months of November and December, CH-SUR registered 177 deaths due to COVID-19, of which the immune status is known. Of these, 104 (58.8% of deaths occurring in that period) happened among non-immunized patients, 4 deaths (2.3% of deaths occurring in that period) among partially immunized patients, and 69 deaths (39% of deaths occurring in that period) among fully immunized patients (Figure 9). Despite representing a smaller share of the population (33.4% of the whole Swiss population was non immunized at the time of data analysis, see Figure 7c)), the non-immunized population's death toll represents a larger portion (Figure 9c). Figure 9c excludes 6 deaths of which the immune status is unknown and deaths (1) for patients' whose immune status at admission was *recovered*.

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 in most cases lower but not substantially different to that of unvaccinated hospitalized people (Figure 9c, 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: 888 deaths among 9,405 patients first hospitalized between Dec 23, 2020 and Dec 31, 2021

Not immunized:
Age distribution of 696 deaths
in 7,766 patients

Age	Patients	Deaths	CFR %
0-9	414	0	0%
10-19	132	0	0%
20-29	233	3	1.3%
30-39	540	2	0.4%
40-49	813	13	1.6%
50-59	1350	38	2.8%
60-69	1508	115	7.6%
70-79	1325	185	14.0%
80+	1451	340	23.4%

Incompletely immunized:
Age distribution of 61 deaths
in 369 patients

Age	Patients	Deaths	CFR %
0-9	0	0	-
10-19	0	0	-
20-29	3	0	0%
30-39	9	0	0%
40-49	15	0	0%
50-59	30	3	10.0%
60-69	63	8	12.7%
70-79	102	16	15.7%
80+	147	34	23.1%

Base immunized:
Age distribution of 111 deaths
in 1,097 patients

Age	Patients	Deaths	CFR %
0-9	0	0	-
10-19	1	0	0%
20-29	9	0	0%
30-39	33	0	0%
40-49	58	0	0%
50-59	90	3	3.3%
60-69	167	13	7.8%
70-79	309	32	10.4%
80+	430	63	14.7%

Boosted:
Age distribution of 20 deaths
in 173 patients

Age	Patients	Deaths	CFR %
0-9	0	0	-
10-19	1	0	0%
20-29	3	0	0%
30-39	2	0	0%
40-49	4	0	0%
50-59	10	0	0%
60-69	24	1	4.2%
70-79	51	7	13.7%
80+	78	12	15.4%

b. Sep & Oct: 107 deaths among 1,013 patients first hospitalized between Sep 01, 2021 and Oct 31, 2021

Not immunized:
Age distribution of 65 deaths
in 741 patients

Age	Patients	Deaths	CFR %
0-9	55	0	0%
10-19	15	0	0%
20-29	34	0	0%
30-39	89	0	0%
40-49	104	2	1.9%
50-59	135	1	0.7%
60-69	133	16	12.0%
70-79	89	14	15.7%
80+	87	32	36.8%

Incompletely immunized:
Age distribution of 7 deaths
in 41 patients

Age	Patients	Deaths	CFR %
0-9	0	0	-
10-19	0	0	-
20-29	3	0	0%
30-39	2	0	0%
40-49	7	0	0%
50-59	6	0	0%
60-69	7	1	14.3%
70-79	6	0	0%
80+	10	6	60.0%

Base immunized:
Age distribution of 35 deaths
in 227 patients

Age	Patients	Deaths	CFR %
0-9	0	0	-
10-19	0	0	-
20-29	1	0	0%
30-39	3	0	0%
40-49	11	0	0%
50-59	17	1	5.9%
60-69	46	5	10.9%
70-79	64	13	20.3%
80+	85	16	18.8%

Boosted:
Age distribution of 0 deaths
in 4 patients

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

c. Nov & Dec: 177 deaths among 2,069 patients first hospitalized between Nov 01, 2021 and Dec 31, 2021

Not immunized:
Age distribution of 104 deaths
in 1,231 patients

Age	Patients	Deaths	CFR %
0-9	124	0	0%
10-19	17	0	0%
20-29	35	0	0%
30-39	102	1	1.0%
40-49	151	3	2.0%
50-59	210	6	2.9%
60-69	210	18	8.6%
70-79	183	22	12.0%
80+	199	54	27.1%

Incompletely immunized:
Age distribution of 4 deaths
in 37 patients

Age	Patients	Deaths	CFR %
0-9	0	0	-
10-19	0	0	-
20-29	0	0	-
30-39	1	0	0%
40-49	3	0	0%
50-59	3	0	0%
60-69	5	1	20.0%
70-79	7	0	0%
80+	18	3	16.7%

Base immunized:
Age distribution of 49 deaths
in 634 patients

Age	Patients	Deaths	CFR %
0-9	0	0	-
10-19	1	0	0%
20-29	6	0	0%
30-39	25	0	0%
40-49	35	0	0%
50-59	54	1	1.9%
60-69	88	3	3.4%
70-79	180	11	6.1%
80+	245	34	13.9%

Boosted:
Age distribution of 20 deaths
in 167 patients

Age	Patients	Deaths	CFR %
0-9	0	0	-
10-19	0	0	-
20-29	3	0	0%
30-39	2	0	0%
40-49	4	0	0%
50-59	9	0	0%
60-69	21	1	4.8%
70-79	50	7	14.0%
80+	78	12	15.4%

Figure 9: 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 base immunized, boosted, incompletely immunized or not immunized. Patients with missing age, missing gender, or missing immune status, as well as recovered patients were not included in the numbers. Counts of deaths only include patients who died because of COVID-19 (including those with COVID as suspected cause of death). Case-fatality rate (CFR), especially for the incompletely immunized and boosted categories, should be interpreted with caution due to small sample sizes.

5. Intensive care unit (ICU) admission

5.1. ICU admission across demographic and risk groups

Over the whole period of observation ICU admission probability across ages was roughly bimodal with a peak for the 10-19-year age group and for the 60-69 age group (Figure **10a**). The 60-69 age group had the highest probability of admission to the ICU, with 25.8% admitted (1,050 of 4,072). Notably, individuals aged 80 and above were least likely to be admitted to the ICU, with 6% admitted (350 of 5,808).

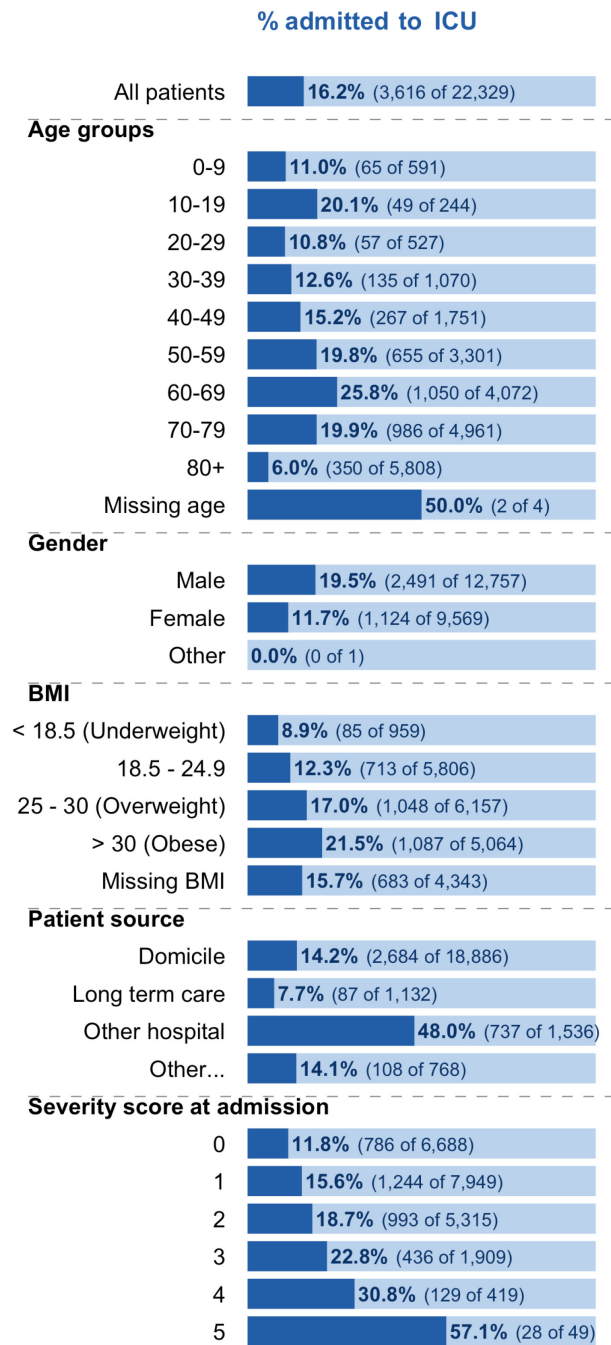
Males were more likely to be admitted to the ICU than females. Overall, 19.5% of the hospitalized males were admitted to the ICU, compared to 11.7% of the hospitalized females.

Patients transferred in from other hospitals had a high probability of ICU admission: 48% of such patients (737 of 1,536) were admitted to the ICU (Figure **10a**).

ICU admission probability also increased slightly with increasing BMI, and increased steeply with increasing admission severity scores (Figure **10a**).

Figure **10b** shows the ICU admissions for the most recent period with available data. The admissions to ICU across groups are roughly similar to what is observed across all hospitalized patients. Given the smaller sample size of this period of observation, larger oscillations in the percentages are expected, making the real trends difficult to identify.

a. All relevant data: Patients first hospitalized between Feb 26 2020 and Dec 31 2021



b. Nov & Dec: Patients first hospitalized between Nov 01 2021 and Dec 31 2021

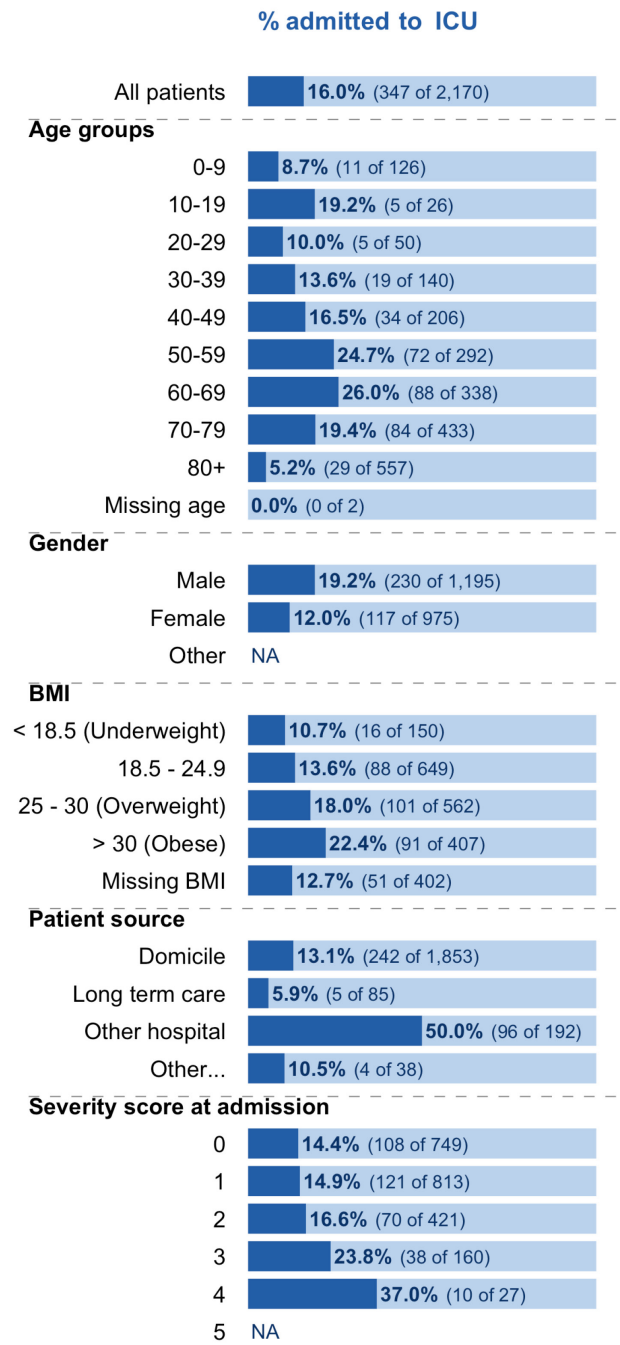


Figure 10: Percentage of patients admitted to ICU, grouped by demographic and risk factors, over two time intervals. For patients with multiple hospitalizations, we considered whether they were admitted to the ICU during any of their hospitalizations. Both panels include records up to Dec 31, 2021 due 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.

5.2. ICU admission by immune status

Due to a variance in vaccine coverage, only recent time periods were represented. Data for January and February 2022 are not meaningful due to their incompleteness and are therefore not yet released.

In both periods considered, the predominant immune status (see section 4 for definitions of immune status) to be admitted to ICU were non immunized patients (76% and 71% of all ICU admissions in each of the described periods respectively). For most immune status categories shown and in both periods, there were more men than women admitted to the ICU.

For fully immunized patients (base immunized and boosted), there is a skew towards older age groups being admitted to the ICU (Sep and Oct: 90.3% of patients were 50 and above and Nov and Dec: 89.2% of patients were 50 and above). In comparison, non immunized patients admitted to the ICU included proportionally more patients from younger age classes, as only 67.2% (Sep, Oct) and 73.9% (Nov, Dec) were aged above 50.

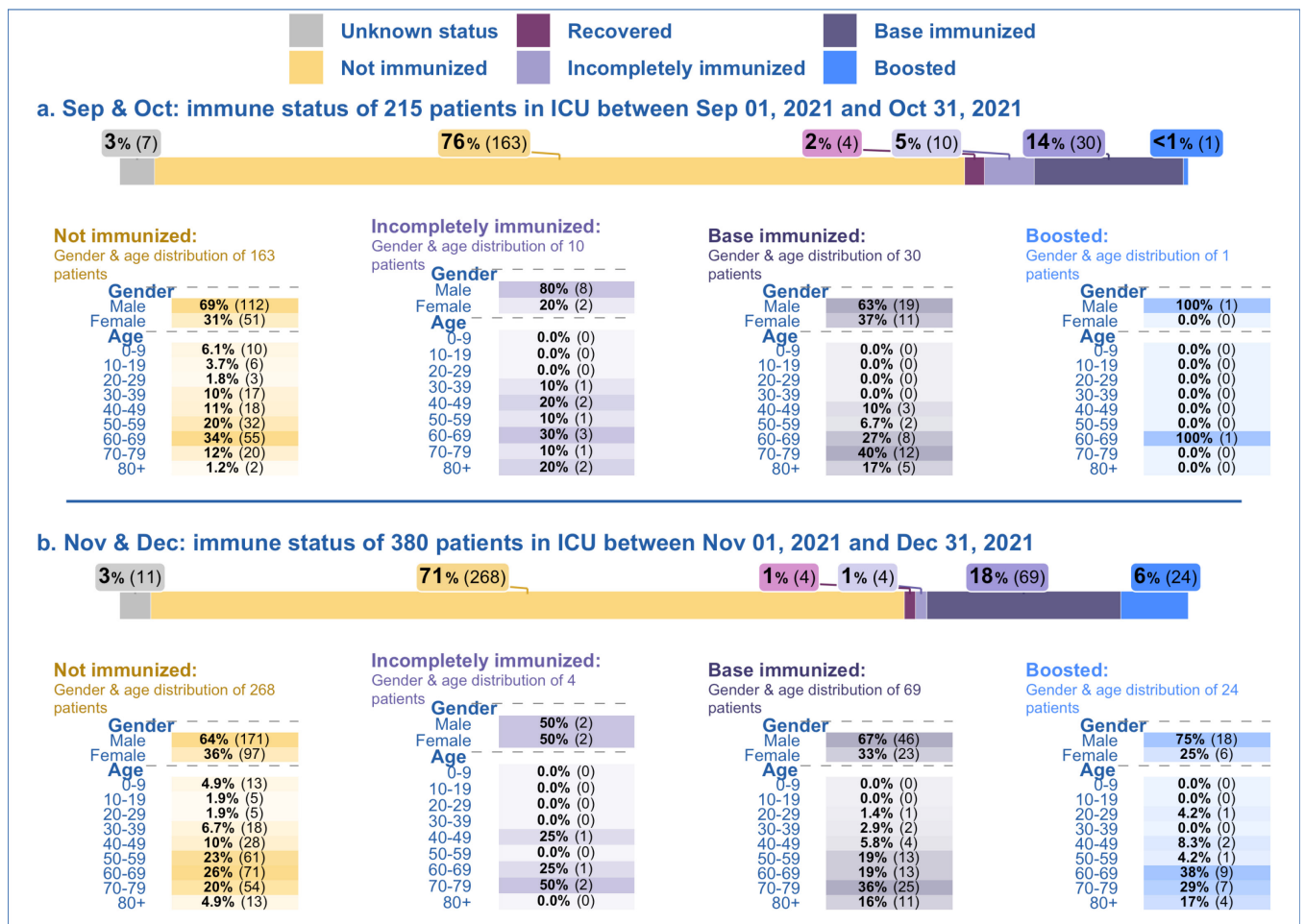


Figure 11: Demographic characteristics of patients in ICU by immune status, over two different periods. Patients in ICU after Dec 31, 2021 were excluded, as a large proportion of these records have not been completely filled in the database. Patients with missing ages and gender marked 'Other' are not shown. Data (% of share) on ICU admissions for the incompletely immunized and boosted categories should be interpreted with caution due to small sample sizes.

5.3. ICU admission over time

Figure 12 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.

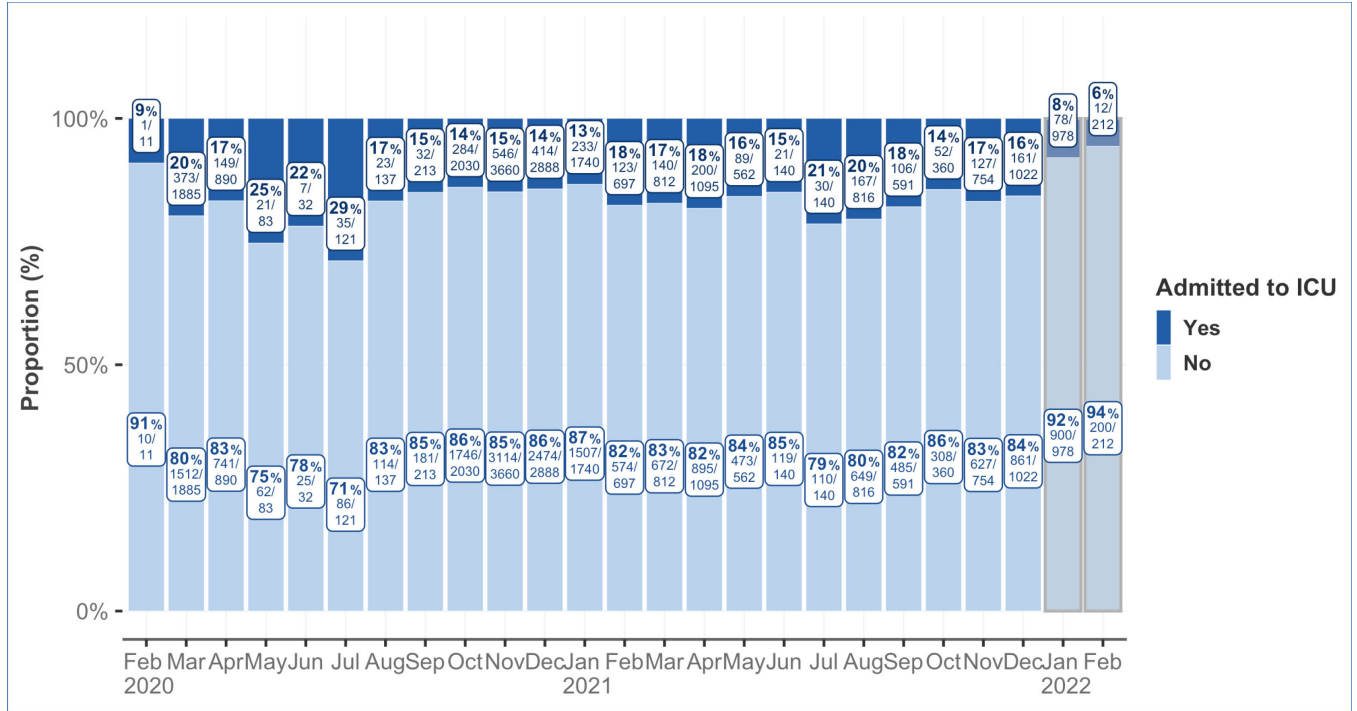


Figure 12: Percentage and proportion of patients admitted to the ICU over time. For patients with multiple hospitalizations, this report considers whether they were admitted to the ICU during any of the hospitalizations. Records with incomplete data (patients still hospitalized or with a pending outcome in the database) were not included. Data from the last two months (highlighted gray) are considered provisional due to data entry delays.

6. 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 13.0% (3,579 of 27,504) (Figure **13a**).

The proportion of nosocomial cases peaked in January 2021: 20.7% (373 of 1,801) of patients hospitalized in that month had infections of nosocomial origin (Figure **13c**). In recent months, this proportion rose again, accounting for 14.2% and 19.2% of the hospitalizations registered in CH-SUR over the months of December 2021 and January 2022 respectively.

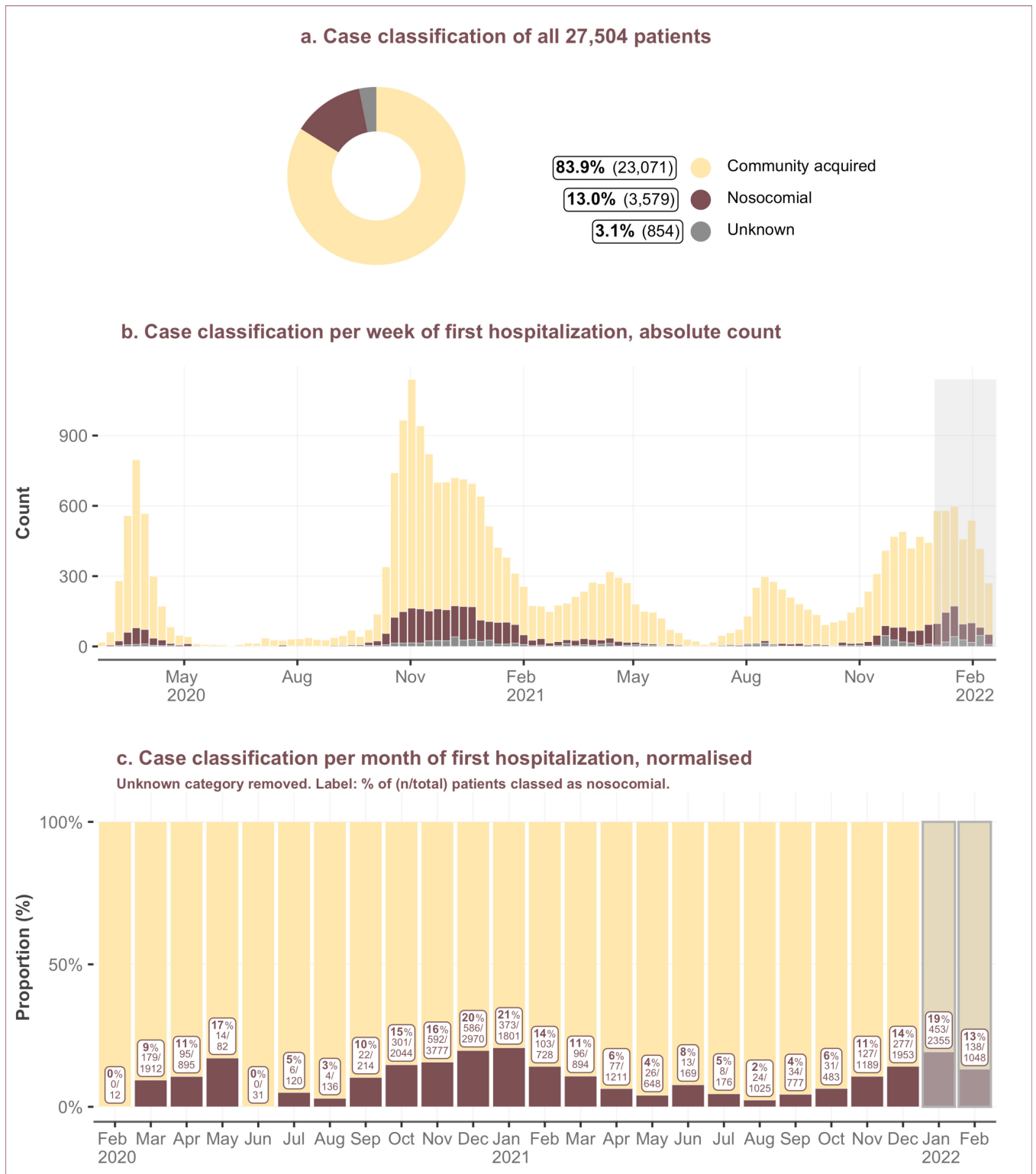


Figure 13: Case classification (infection source) of patients over time. Data from the last two months (highlighted gray) are considered provisional due to data entry delays.

7. Health Complications

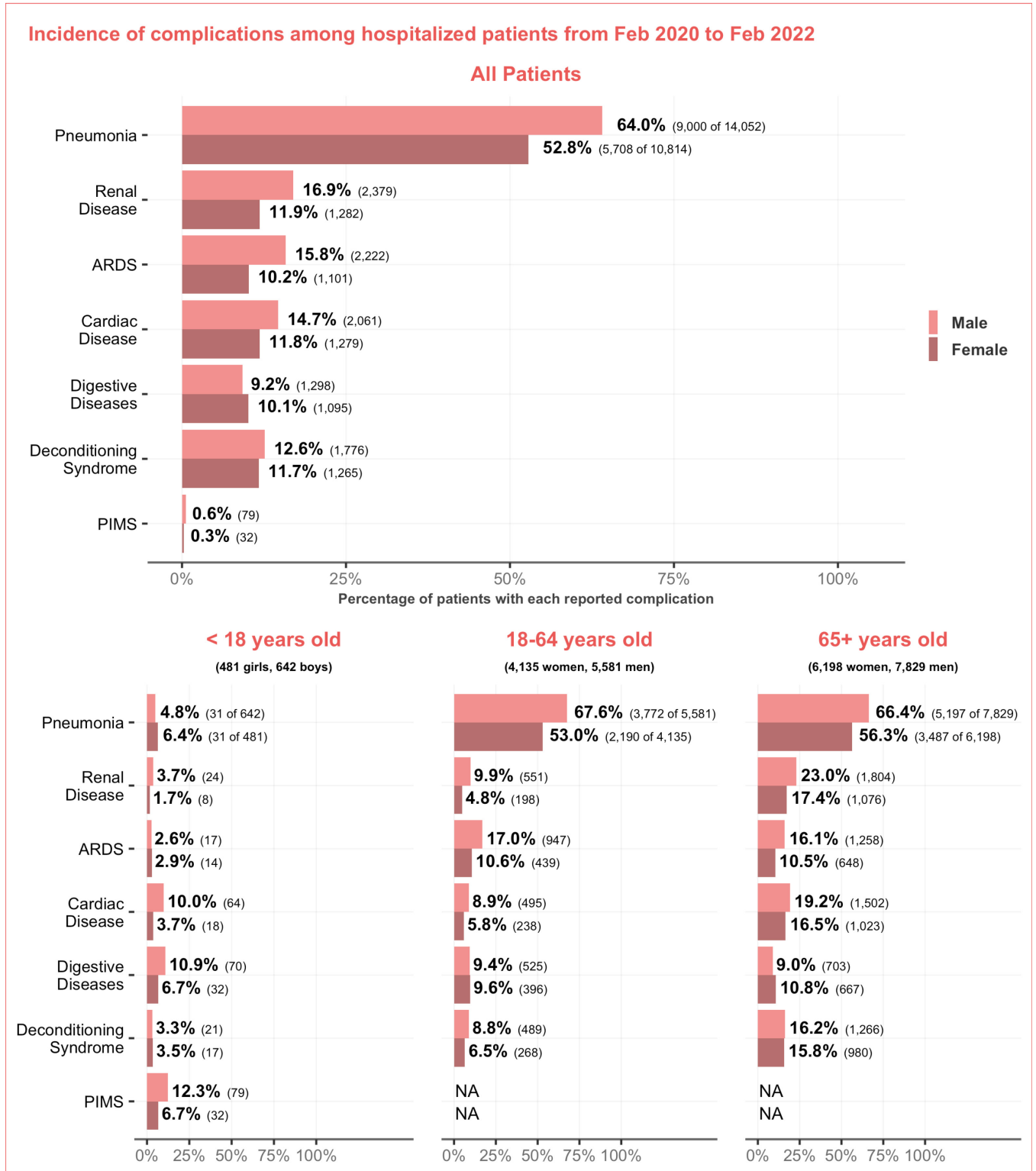


Figure 14: Incidence of complications arising during COVID infection. The reported complications are shown overall and per age group and gender.

Out of 24,866 patients with complete complications data record and known age and gender (10,814 women and 14,052 men) hospitalized from February 2020 to February 20, 2022, 19,592 patients had complications (78.8%).

Complications³ were more common among males: among hospitalized patients with at least one complication, 58.6% were male and 41.4% were female.

Pneumonia was the most common complication observed and was more common among men than women (64.0% men and 52.8% women, Figure 14). Children and adolescents had pneumonia less frequently than patients aged 18 years old and above. Pneumonia affected 4.8% of the male and 6.4% of the female patients aged under 18, but over 52% of the male and female patients aged 18 years old and above. Regarding the younger age group (younger than 18), PIMS is a relevant complication. PIMS was more common in boys than girls (affecting respectively 12.3% and 6.7% of the hospitalized patients, Figure 14).

Despite being the most common complication among hospitalized patients, pneumonia ranked fourth between the complications with the highest associated mortality among patients aged 65 and above (Figure 16). Acute respiratory distress syndrome (ARDS), especially for the older age group (65+), was the complication with the highest associated mortality: 47.0% of men and 42.7% of women aged 65+ affected by ARDS as a complication of COVID-19 died (Figure 16).

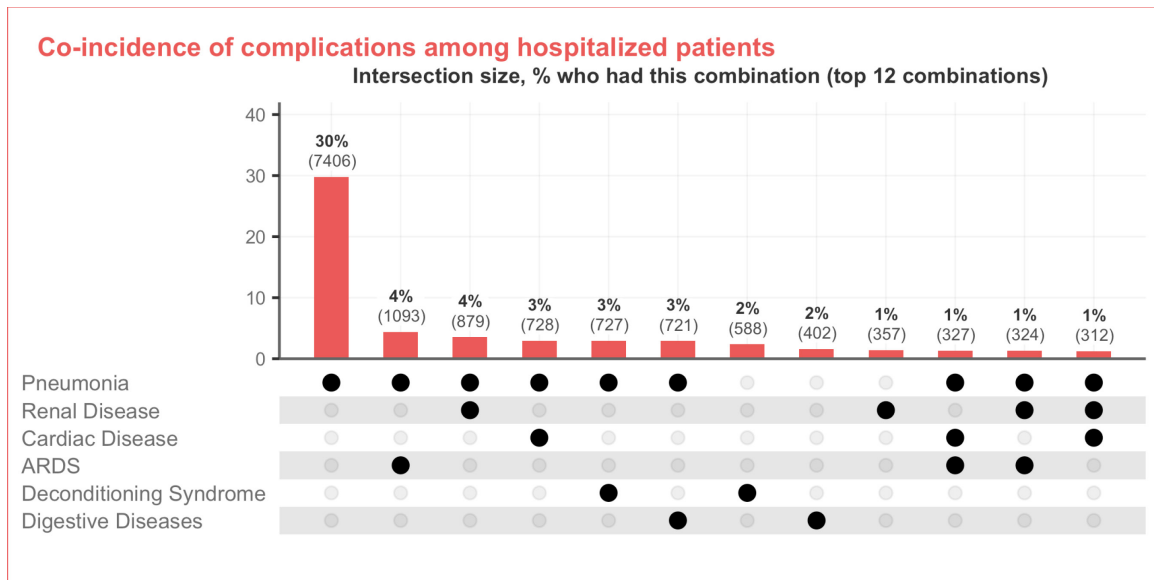


Figure 15: Complications are represented by their combinations (co-occurrences). The top 12 combinations are represented.

³ Only the top 9 most prevalent complications, and PIMS, are displayed. Other complications available in the database include: Acute Otitis Media, Encephalitis, Febrile Convulsion, Osteo-articular Disease, ENT, Non Bacterial Infections, Psychiatric Alteration, Other Respiratory Diseases (defined as a patient having a respiratory disease complication which was neither pneumonia nor ARDS).

Mortality by complications among hospitalized patients, per age group

Note: There were no deaths in the age group of below 18.

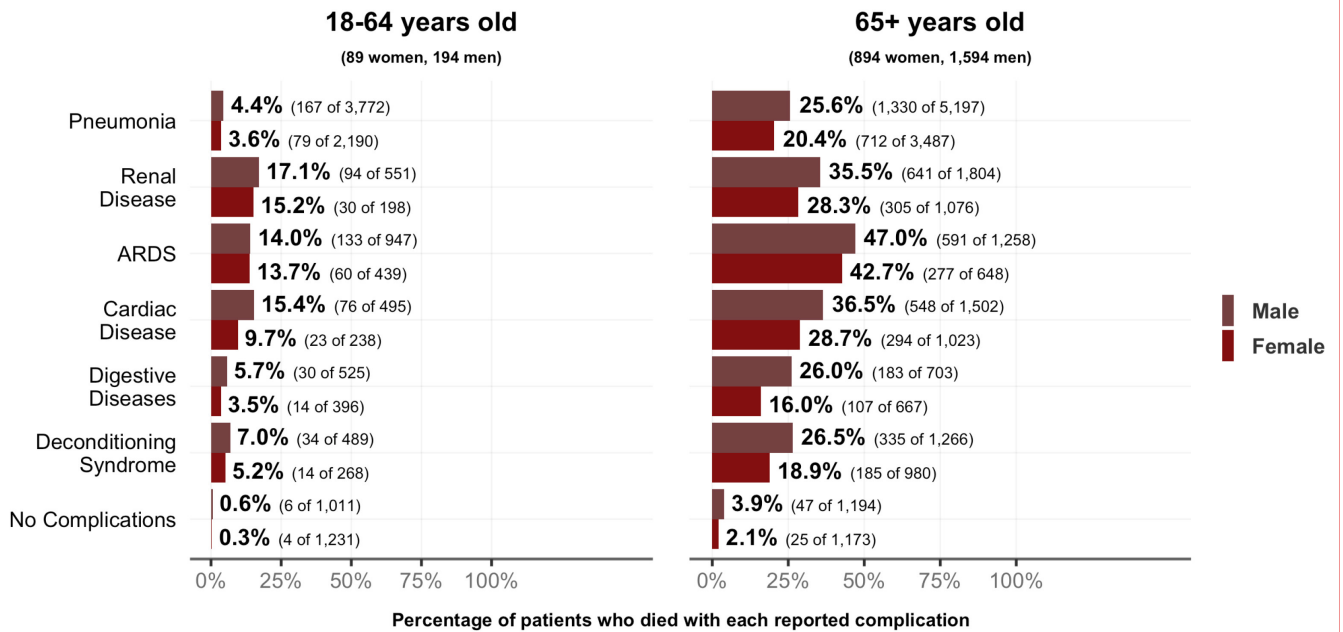


Figure 16: Mortality is depicted for each complication: showing the percentage of patients with the complication who died.

Report prepared by:

University of Geneva, Institute of Global Health (IGH): Vancauwenberghe, Laure; Nwosu, Kenechukwu; Thiabaud, Amaury; Roelens, Maroussia; Botero Mesa, Sara; Keiser, Olivia

Infection Control Program, University of Geneva Hospitals (HUG): Iten, Anne

Bundesamt für Gesundheit, Bern (BAG): Buchter, Valentin; Vonlanthen, Jasmin; Gardiol, Céline; Roder, Ursina