

COVID-19 Hospital Based Sentinel Surveillance Report

Data status: September 27, 2022

1. Introductory Summary

The COVID-19 Hospital Based Surveillance system (CH-SUR) was established in 2018 to capture influenza-related hospitalizations. By March 1, 2020, four days after the first confirmed COVID-19 case was reported in Switzerland, the adapted program was ready to also register hospitalizations related to laboratory-confirmed SARS-CoV-2 infections.

Currently, 19 hospitals are actively participating, including most cantonal and university hospitals, which cover a large proportion of pediatric and adult hospitalized patients throughout Switzerland. The CH-SUR statistics register, among other, the number and duration of hospitalizations as well as intensive care unit stays. A patient may be **hospitalized** multiple times or require multiple intensive care unit (ICU) admissions during the same hospitalization **episode**. CH-SUR also registers whether the patient died during hospitalization **of or with COVID-19**.

Inclusion criteria: CH-SUR collects data of patients hospitalized with a documented SARS-CoV-2 infection and a duration of stay longer than 24 hours. Confirmation of infection is a positive PCR (polymerase chain reaction) test or a positive rapid antigen test, as well as a clinical finding for COVID-19. **Nosocomial** SARS-CoV-2 infections are also registered in the database and are described in a special section at the end of this report.

From the beginning of the epidemic until September 26, 2022, data were collected from 38,113 **episodes** of hospitalization. During the same period, 58,114 hospitalization episodes with laboratory-confirmed SARS-CoV-2 infection were reported to the FOPH under **the mandatory reporting system** for all of Switzerland. The CH-SUR system thus covered approximately 65.6% of all hospitalizations related to SARS-CoV-2 reported in Switzerland.

This report focuses on episodes linked to **community acquired** infections (described in sections 2 to 6), while a separate section informs on **nosocomial** infections (described in section 7). The overall percentage of nosocomial infections among all documented episodes was 14.8% (5,655 of 38,113) while episodes linked to community acquired infections accounted for 82.6% (31,464 of 38,113) (Figure 1). 2.6% of the episodes could not be classified either as nosocomial or community acquired.

Of all episodes linked to a community acquired infection, for which complete relevant data is available, 13.9% included an ICU stay (4,259 of 30,550 episodes, February 26, 2020 to July 31, 2022) and 8.9% resulted in death of COVID-19 (2,604 of 29,118 episodes, February 26, 2020 to September 26, 2022).

During the latest period for which enough data is available (Jun 01, 2022 to Jul 31, 2022), 1,988 community acquired episodes were registered. Of these, 396 (19.9%) concerned non-immunized and 769 (38.7%) **fully immunized** patients (Figure 2). During the same period, 128 episodes included an ICU stay. Of these, 23 (18.0%) concerned non-immunized and 50 (39.1%) fully immunized patients. 47 episodes resulted in death of COVID-

19 (2.4% of all registered episodes with known outcome), 15 of them were among non-immunized patients and 13 deaths among fully immunized patients.

On April 1, 2022, Switzerland returned to the normal epidemiological situation. Since then, the testing strategy in hospitals consists in only testing patients who are symptomatic for a SARS-CoV-2 infection. This change in testing strategy may lead to a reduction in the number of cases detected, narrowing the patients identified to only those with typical COVID-19 symptoms. For further definitions and details on the data, please check the [glossary and supporting information section](#) at the end of this report.

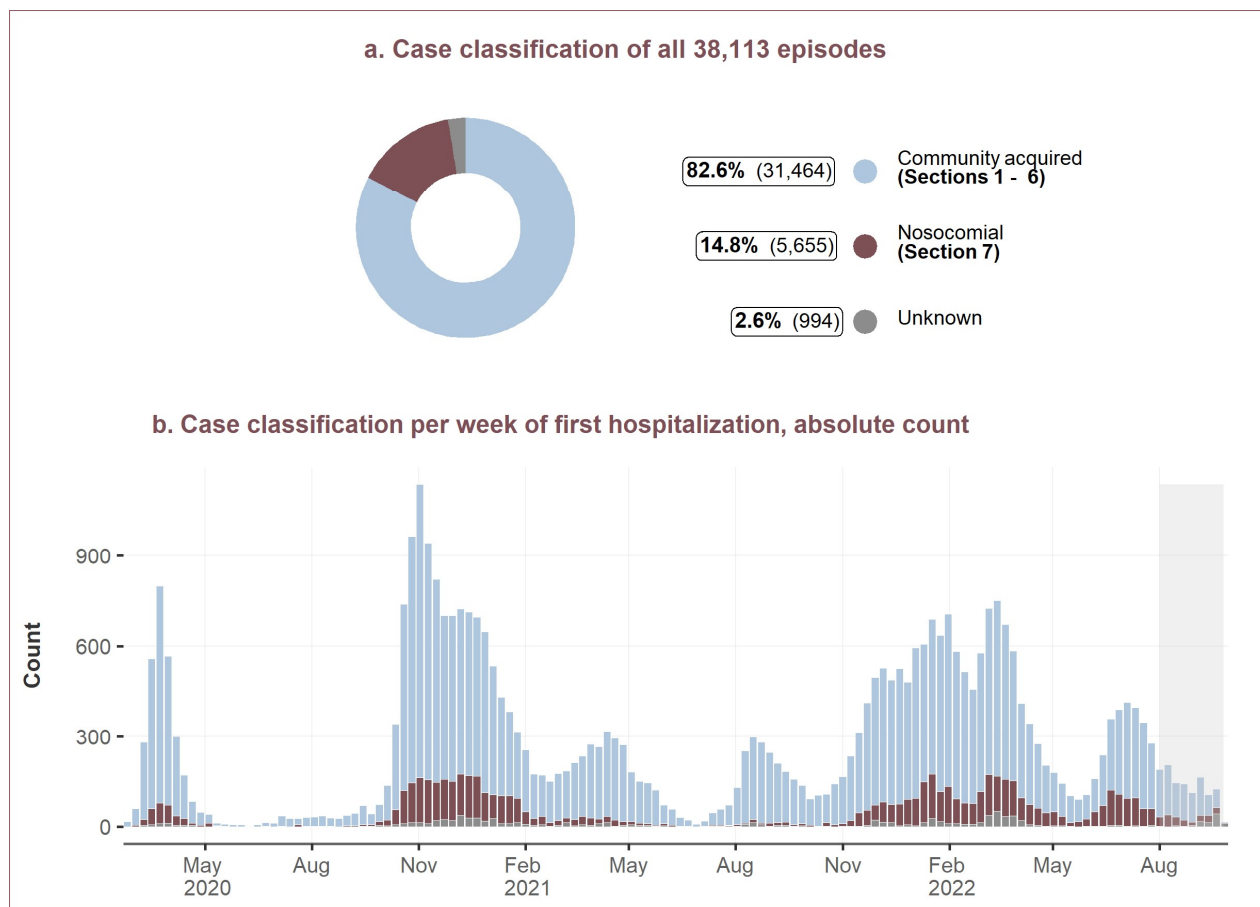


Figure 1: Case classification (infection source) of the episodes. Proportion (normalized in %) of episodes by infection source (panel a) and the absolute count of episodes over time (panel b). For episodes with multiple hospitalizations, the case classification of the first hospitalization was considered. Data from the last two months (highlighted gray) are considered provisional due to data entry delays.

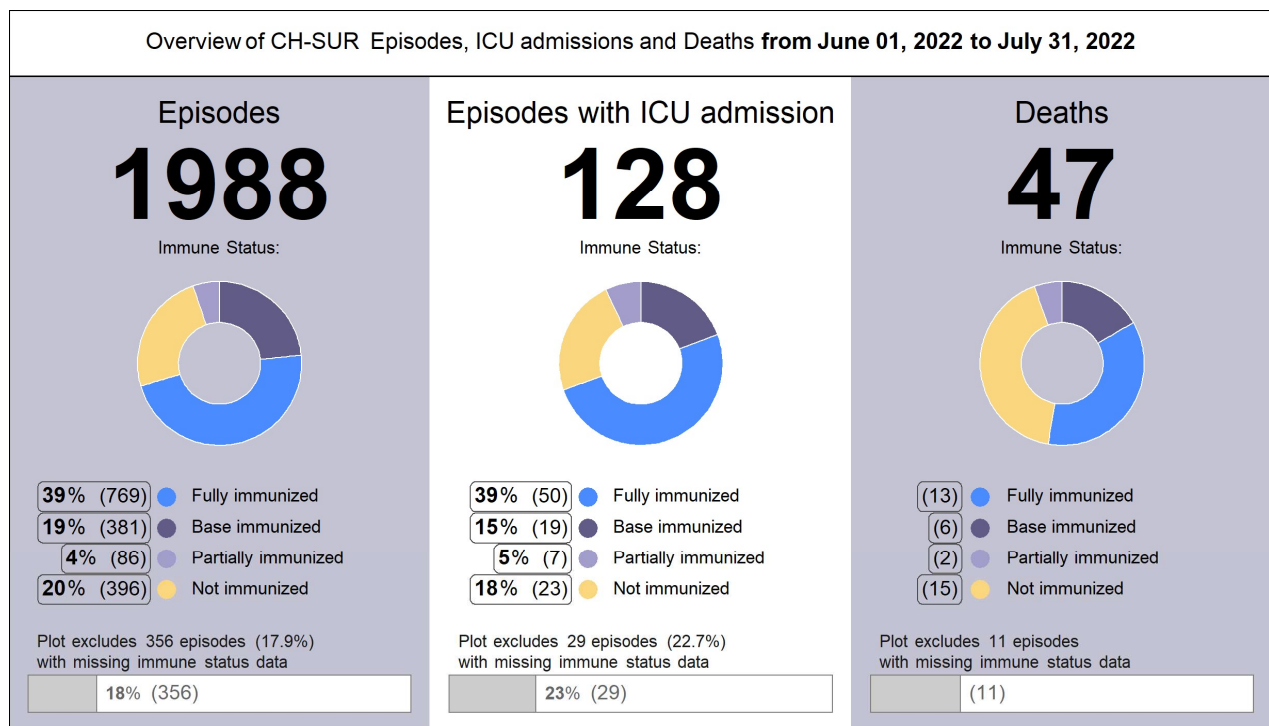


Figure 2: Overview information of the most recent data on episodes of hospitalization linked to community acquired infections. Data from the last two months are considered provisional due to data entry delays hence they have been omitted.

2. Hospitalizations and demographic characteristics

Between the start of the epidemic in Switzerland and September 26, 2022 and among the 19 hospitals actively participating in CH-SUR, 31,464 **episodes** were registered, accounting for a total of 32,642 hospitalizations. There were more hospitalizations than **episodes** because some episodes include multiple **hospitalizations** (for more details see section **glossary and supplemental information**). An overview of these rehospitalizations is shown in Figure 3.

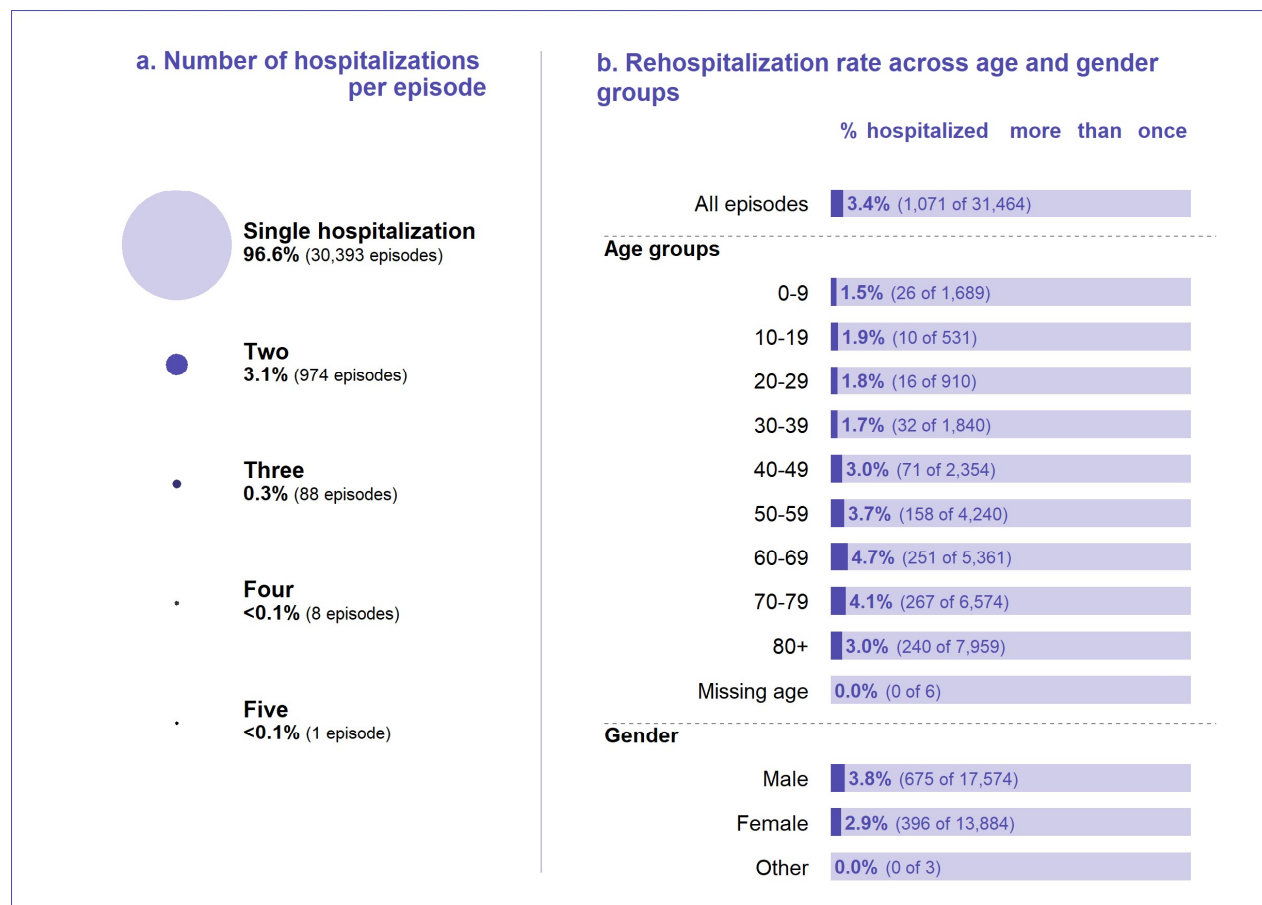


Figure 3: Hospitalizations per episode of hospitalization and rehospitalization rate across demographic groups. Includes records between March 2020 and September 26, 2022.

Most patients (96.6% [30,393 of 31,464]) were hospitalized only once during an episode, while 3% of the registered episodes (1,070 of 31,464) included two to four hospitalizations. Only one episode included five hospitalizations (Figure 3b).

The overall rate of rehospitalization within the same episode was 3.4% (1071 of 31,464) (Figure 3b). The 60-69 age group and the 70-79 age group had the highest rate of rehospitalization at respectively 4.7% (251 of 5,361) and 4.1% (267 of 6,574). Men had a higher rehospitalization rate than women, 3.8% (675 of 17,574) vs 2.9% (396 of 13,884) respectively.

Among all episodes, the majority (55.9% [17,574 of 31,464]) of the episodes concerned male patients (Figure 4a), and the age distribution was skewed towards older persons (Figure 4b). The largest age category corresponded to patients aged 80 and above (25.0% [7,959]).

Figures 4c and 4d show the gender and age distribution ratio over time. Except for January and April 2022, more men than women were admitted in each month for the entire period of observation. The proportion of

episodes concerning patients aged 50 and above was notably high between October 2020 and January 2021, with a peak in November 2020: 88.3% (2,823 of 3,197) of the episodes of patients admitted in this month concerned patients 50 years old and above (Figure 4d). 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 episodes of patients aged 50 and above was observed again from September 2021 to November 2021, reaching a local peak of 75.2% (840 of 1,117) in November 2021. Over the month of July 2022, 81.3% (357 of 439) of episodes concerned patients aged 50 and above. Notably, in this last period, we are seeing an increase in the elderly population being admitted with 27.3% [120 of 439] of episodes pertaining to patients aged between 70 and 80 years old and 37.1% [402 of 1,083] of episodes pertaining to patients over 80 years old.

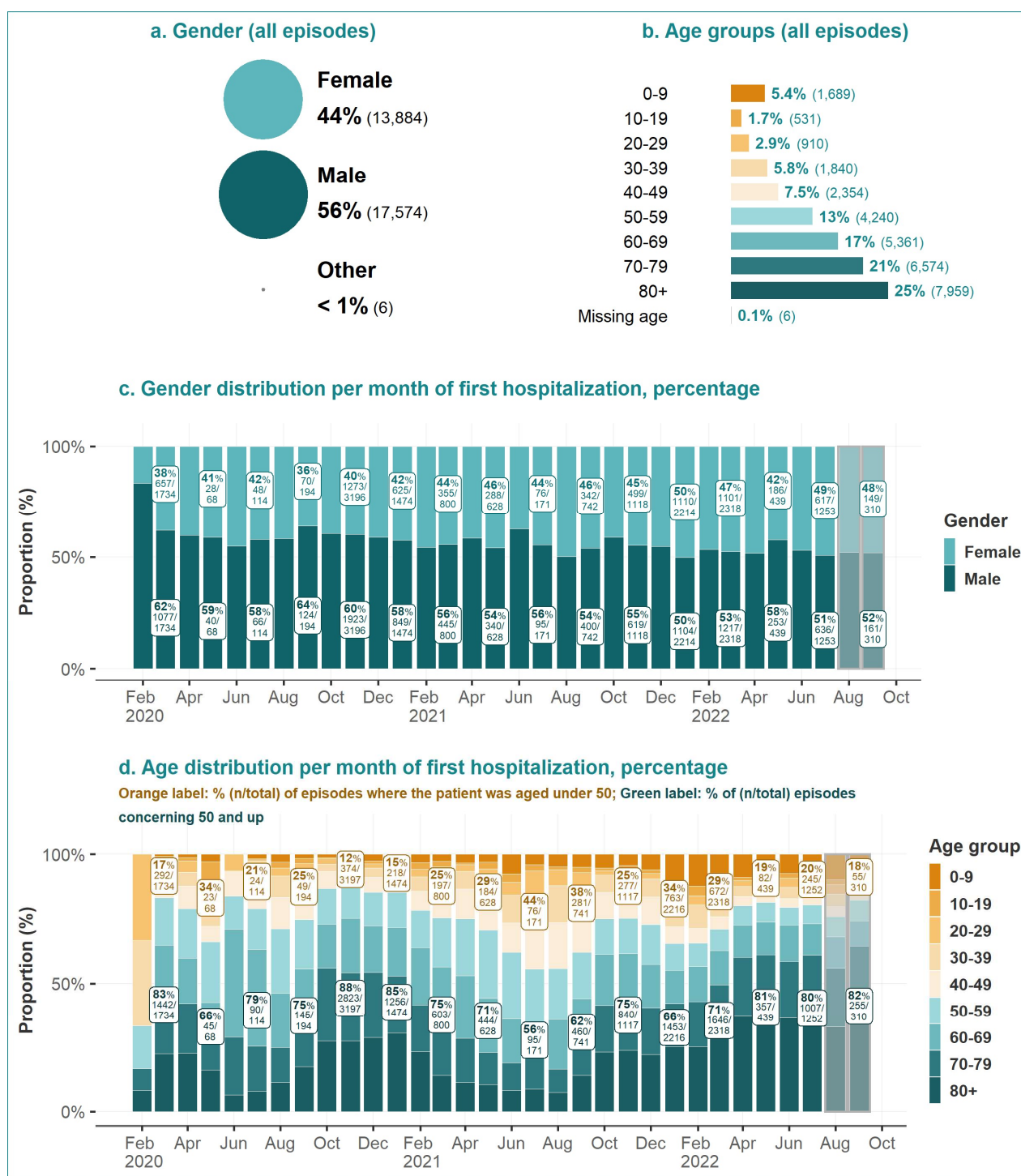


Figure 4: Demographic characteristics: gender and age distribution of admitted hospitalized patients, overall and per month. For episodes with multiple hospitalizations, the admission date of the first hospitalization was used. Data from the last two months (highlighted gray) is considered provisional due to entry delays. The 'other' gender category was removed from panel c, and the missing age group was removed from panel d.

3. Outcomes

3.1. Outcomes overview

Figure 5 shows the final outcomes of CH-SUR episodes over three time intervals. Episodes resulting in death, for which COVID-19 was the **cause of death** (died of COVID-19) are shown separately from those with a different cause of death (died *with* COVID-19, but not *of* COVID-19). A medical doctor at the hospital for each CH-SUR-participating center determined whether a patient died of COVID or another cause. Episodes 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. The outcome “**discharged**” includes patients who were transferred out of the CH-SUR system. Episodes with “pending or missing outcomes” correspond to either patients who were still hospitalized or whose outcomes were not yet recorded in the database at the date of data extraction. Because of the higher proportion of incomplete data during the most recent months, case fatality rates from these months should be interpreted with caution.

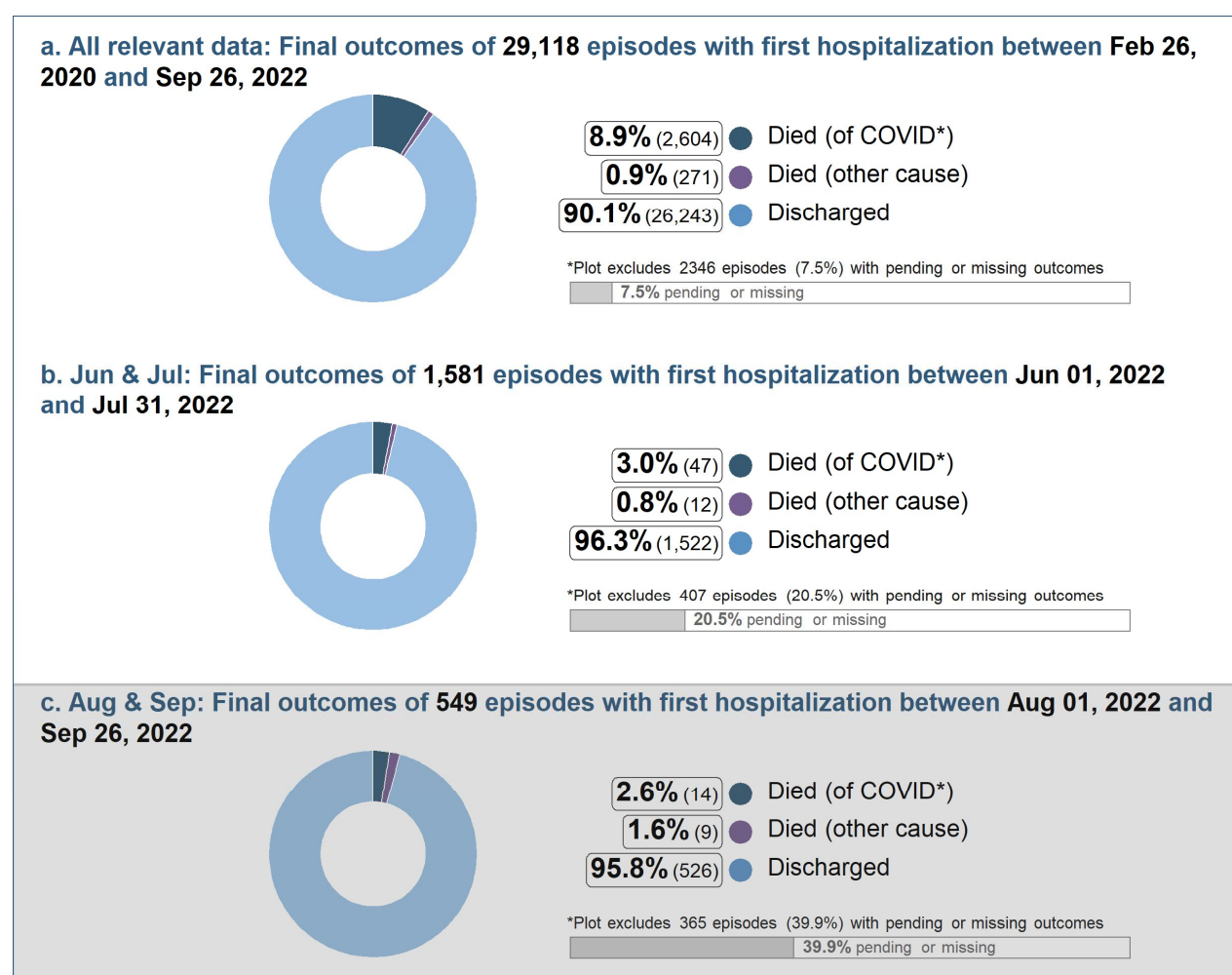


Figure 5: Outcomes for COVID-19 related episodes of hospitalization in CH-SUR hospitals. Includes records up to September 26, 2022. For episodes with multiple hospitalizations, only the final outcome is considered. Patients where the cause of death was not certain, but there was a COVID-19 diagnosis (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 6 shows the final outcomes of **episodes** over time (Figure 6a & 6b) and the disease severity score at admission as a function of time (Figure 6c).

The first mortality peak is seen for patients admitted around the beginning of the epidemic: 15.1% (262 of 1,732) of episodes of patients first admitted in March 2020 resulted in death. Mortality decreased after March 2020, but rose again between October 2020 and January 2021, with a peak in December 2020: 13.9% (330 of 2,374) of episodes of patients first admitted in December 2020 resulted in death. An additional local peak of mortality was observed during the month October 2021, when 12.2% (53 of 433) of episodes resulted in death of COVID-19.

The high case fatality rates of patients with episodes of hospitalization in March 2020, between October 2020 and January 2021 and during October 2021, are mirrored by the higher admission **severity scores** (Figure 6c) and older patients' ages (Figure 4c) during these periods. Overall, in 31.7% (550 of 1,734) of the episodes with admission date in March 2020, the severity score was above 2. Over the months of October 2020 to January 2021, the proportion of episodes with severity scores of 2 and above was higher as over the rest of the epidemic, representing more than 40% (958 of 2,394) of the admissions in that period. Most recently, during May 2022, 33% (145 of 439) of the episodes had a severity score above 2, but this is not mirrored by higher case fatality rates (Figure 5)

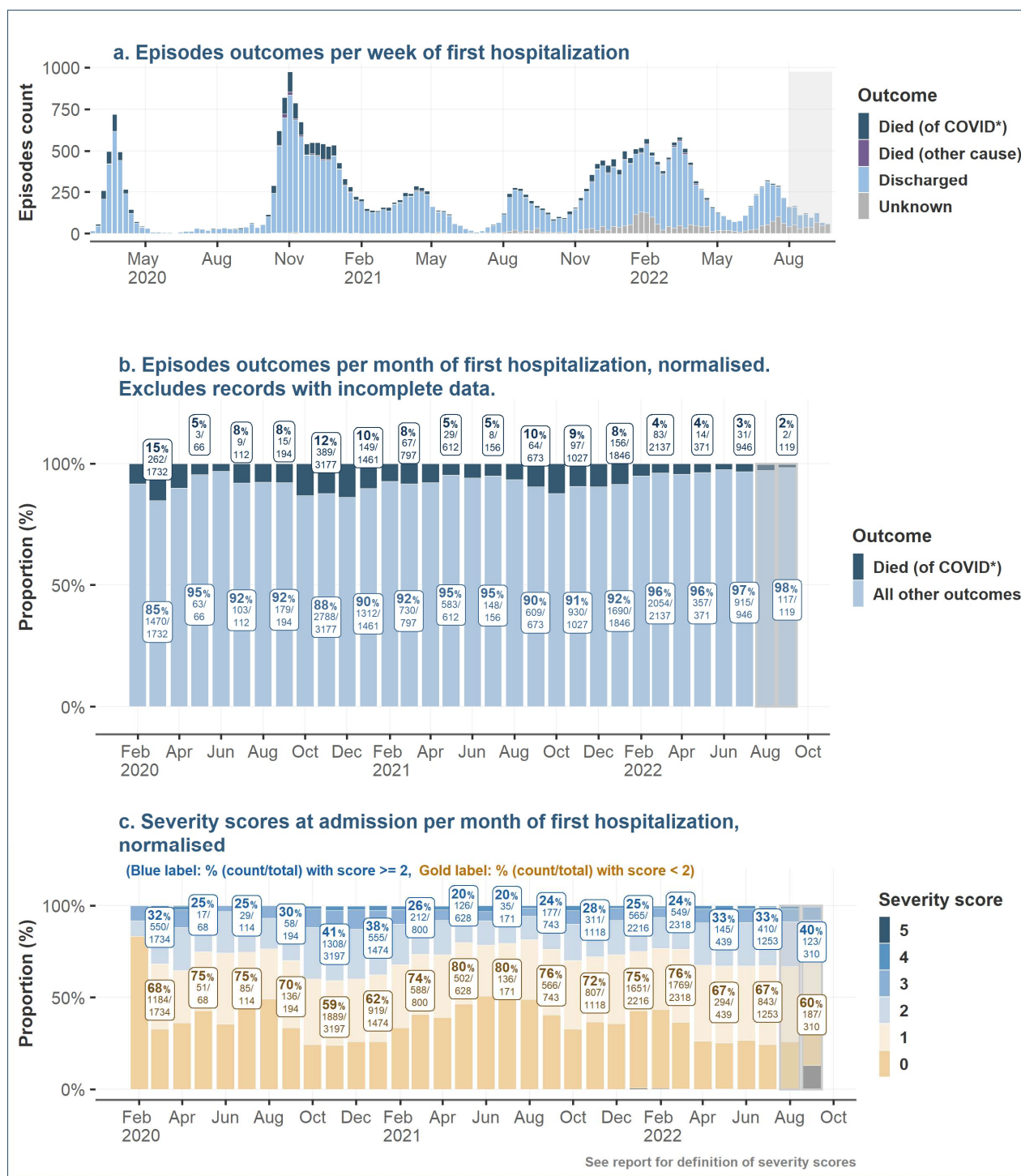


Figure 6: Epidemic curve, episodes' outcomes and severity scores at admission for COVID-19 hospitalizations over time. Includes records up to September 26, 2022. Data from the two last months (highlighted in gray) are considered provisional due to data entry delays. Episodes where the cause of death 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)

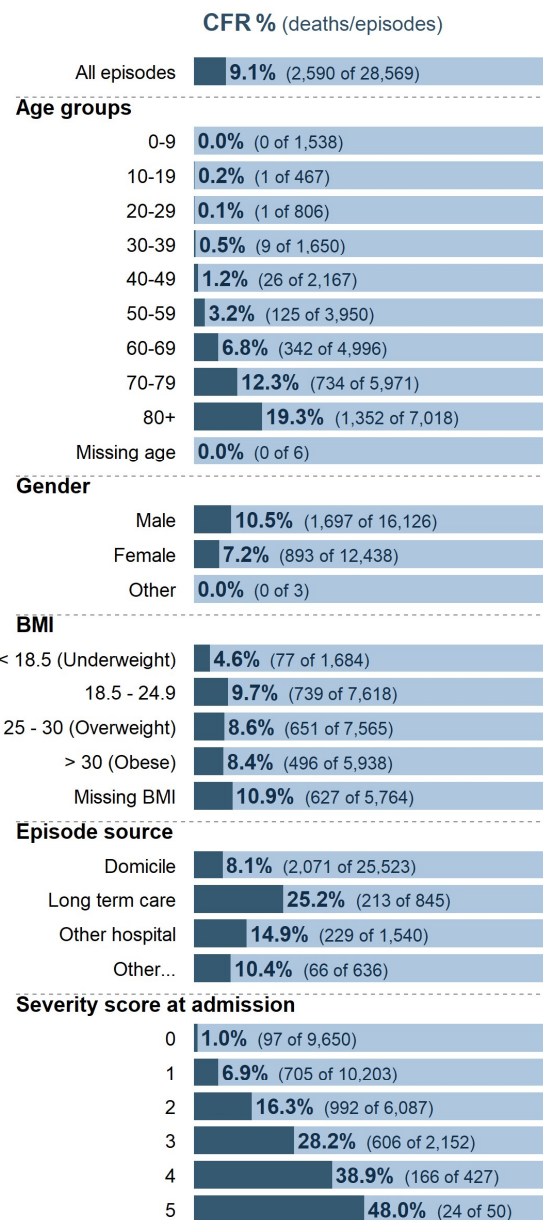
3.3. Case fatality rate (CFR) across demographic and risk groups

Since the beginning of the epidemic and until July 31, 2022, the case fatality rate (CFR) increased with increasing age, from 0% (0 of 1,538) in episodes of patients aged 0-9, to 3.2% (125 of 3,950) in episodes of patients aged 50-59, and to 19.3% (1,352 of 7,018) in episodes of patients aged 80+. CFR% was greater in men than in women: 10.5% (1,697 of 16,126) vs 7.2% (893 of 12,438) respectively. In addition, the CFR% was greater for episodes with higher severity scores at admission: 1% (97 of 9,650) of the episodes with severity score 0 resulted in death of COVID-19, while 48% (24 of 50) of the episodes with severity score 5 resulted in death of COVID-19 (Figure 7a).

The overall CFR% of the most recent period for which enough data is available (months June and July 2022, Figure 7b) was lower than the CFR% of the whole epidemic period (3.0% vs. 9.1%). The CFR% of the age groups 70-79 and 80+ were also lower than over the whole epidemic (Figure 7).

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 28,569 episodes with first hospitalization between Feb 26 2020 and Jul 31 2022



b. June & July: CFR % for 1,581 episodes with first hospitalization between Jun 01 2022 and Jul 31 2022

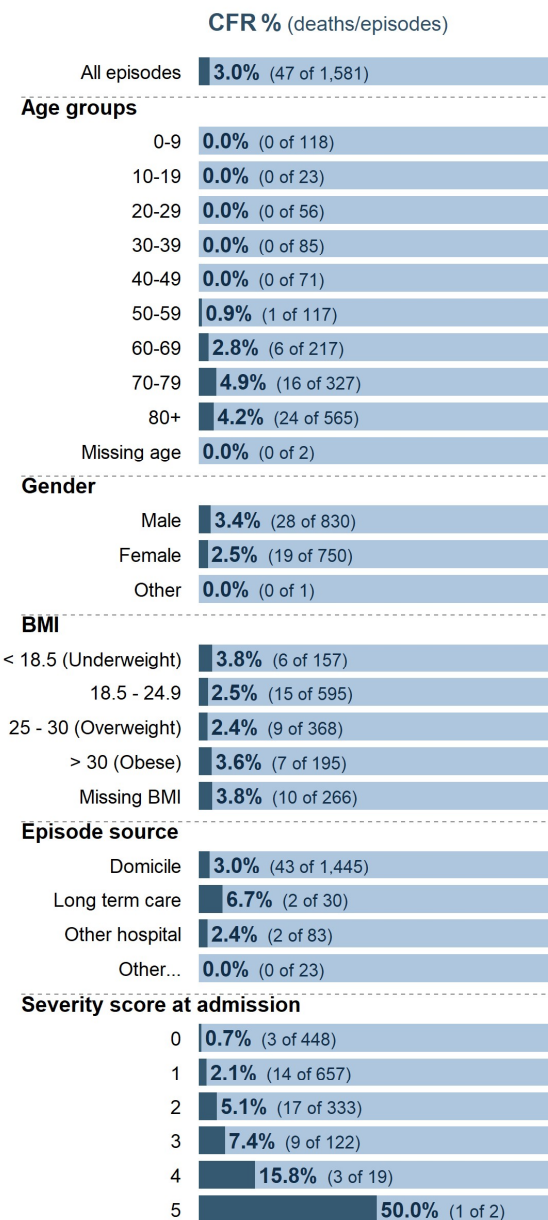


Figure 7: Case fatality rate (CFR) % among demographic and risk groups: percentage of hospitalization episodes in different demographic groups, which ended in the death of the patient of COVID-19 in hospital. Both figures include records up to Jul 31 2022 but records with incomplete data (ongoing hospitalization episodes or with a pending outcome in the database) were not included. Blank rows indicate a count of zero.

4. Immune/vaccination status

4.1. Immune status over time

For these analyses, the **immune status** of a patient considers the previous COVID-19 infections and the 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.

The proportion of **fully immunized** patients rose gradually after January 2021 (Figure 8b). This is expected, given the rise in the proportion of the fully vaccinated Swiss population (Figure 8c, source: **FOPH Dashboard**).

During the months of July 2022, 70.4% of the Swiss population was fully vaccinated (Figure 8c). It is important to note that we can know the percentage of the population which is vaccinated (through administrative records), but only approximate the proportion of the population which is immunized. Recent studies from **Corona Immunitas** are indicating that **the population immunization (by vaccination and/or previous infection) is nearing the 100%**. The higher percentage of base immunized and fully immunized of recent months (23.3% and 47.1% respectively) within the episodes recorded in CH-SUR (Figure 8b), may therefore be partly linked to the decreasing number of non-immunized persons in the population.

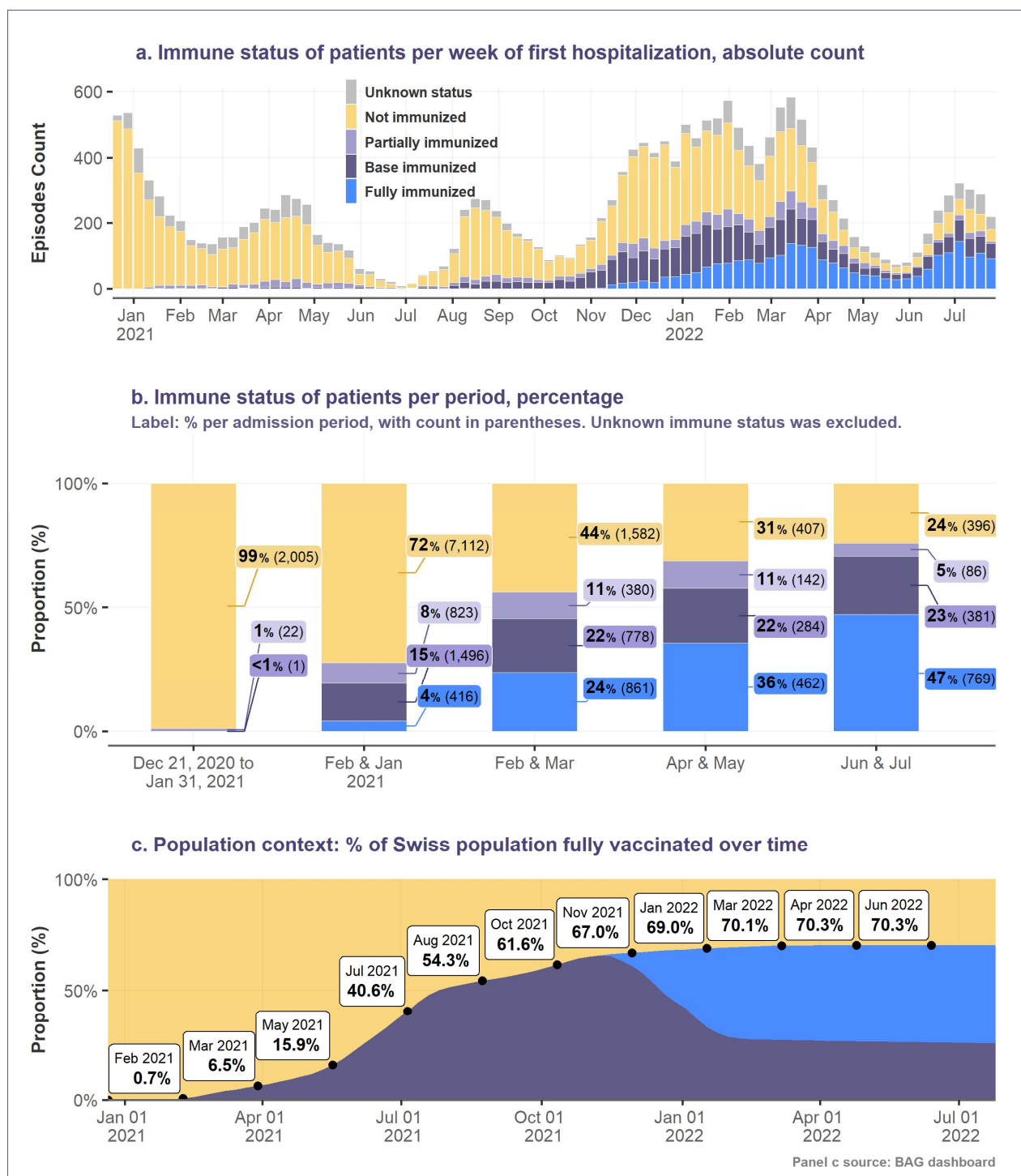


Figure 8: Immune status of patients and overall vaccination rate in Switzerland (exported: September 26, 2022). See glossary for definitions of immune status categories. For episodes with multiple hospitalizations, the immune status for the first hospitalization was considered. Panels a. and b. include episodes 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.) Episodes with first admission date after Jul 31, 2022 were excluded, as a large proportion of these records have not been completely filled in the database.

4.2. Demographic characteristics by immune status

Fully immunized hospitalized patients were disproportionately older. Since vaccination initiation, 48% of the episodes of fully immunized patients corresponded to patients aged 80 and above (Figure 9a, right panels). In contrast, only 18% (2,047 of 11,334) of the episodes of non-immunized patients corresponded to patients aged 80 and above (Figure 9a, left panel).

However, in more recent data, we see an augmentation in the proportion of older (aged 80+) as well as younger patients (0 to 9 years old) among the non-immunized episodes. From April 2022 to May 2022, among the episodes of non-immunized patients aged 0 to 9 years old, 28% (112 of 407) concerned patients aged 0 to 9 years old and 31% (128 of 407) concerned patients aged 80 and above. In the most recent data, from June 2022 to July 2022, 30% (117 of 396) of non-immunized episodes involved patients aged 0 to 9 years and 27% (107 of 396) involved patients aged 80 years and above.

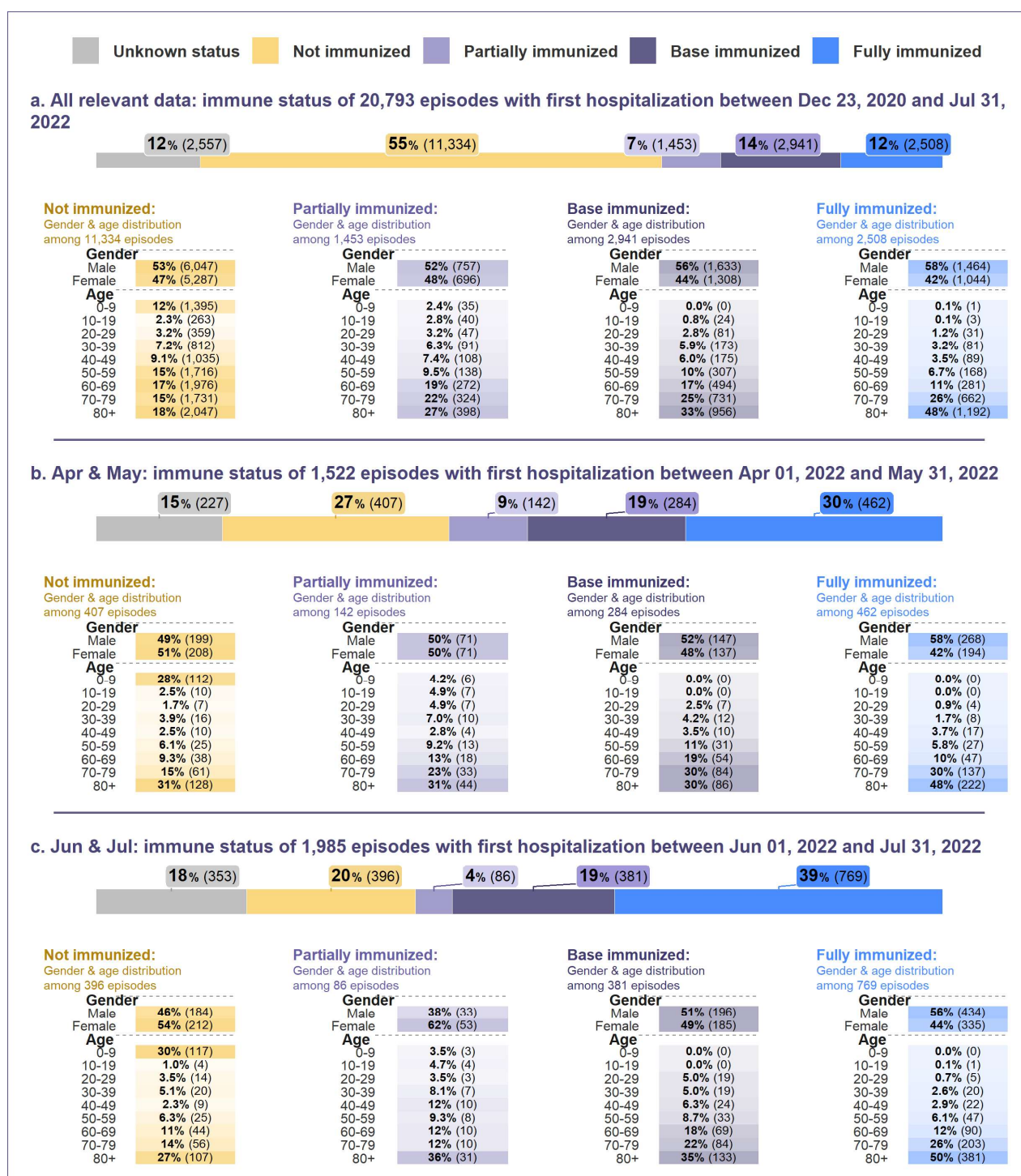


Figure 9: Demographic characteristics of hospitalized patients by immune status, over three different periods. Some patients may be counted more than once, as a single patient can have several episodes. Episodes with first admission date after Jul 31 2022 were excluded, as a large proportion of these records have not been completely filled in the database. Episodes with missing ages or gender are not included in the analysis.

4.3. Outcomes by immune status

Since the date vaccinations began, December 23, 2020, among the 2,064 **episodes** of **fully immunized** patients, CH SUR registered 89 deaths because of COVID-19 (Figure **10a**, right panels: fully immunized). 59 of them corresponded to patients aged 80 years old and above. Over the same period, 817 episodes ended in COVID-caused deaths among non-immunized patients (Figure **10a**, left panel).

During the months of June and July, CH-SUR registered 36 deaths due to COVID-19 of which the immune status was known. Of these, 15 (41.7%) happened among non-immunized patients, 2 deaths (5.6%) among partially immunized patients, 6 deaths (16.7%) among base immunized patients, and 13 deaths (36.1%) among fully immunized patients (Figure **10**). This may be linked to the increasingly low number of non-immunized patients in the population (see section 4.1.)

However, the CFR values by age show that the risk of death for the limited number of people who are hospitalized despite full vaccination is lower than that of unvaccinated hospitalized people across all age groups. This is specifically true for episodes concerning patients aged over 80 (21.1% CFR for non-immunized episodes compared to 6.1% for fully immunized episodes) (Figure **10c**, left and right panel). This reflects the protective effect of vaccination on the risk of death.

a. All relevant data: 1,202 deaths among 16,427 episodes with first hospitalization between Dec 23, 2020 and Jul 31, 2022

Not immunized:

Age distribution of 817 deaths
in 10,527 episodes

Age	Cases	Deaths	CFR %
0-9	1321	0	0%
10-19	233	1	0.4%
20-29	322	1	0.3%
30-39	740	5	0.7%
40-49	962	13	1.4%
50-59	1608	53	3.3%
60-69	1861	136	7.3%
70-79	1609	214	13.3%
80+	1871	394	21.1%

Partially immunized:

Age distribution of 118 deaths
in 1,347 episodes

Age	Cases	Deaths	CFR %
0-9	35	0	0%
10-19	36	0	0%
20-29	41	0	0%
30-39	82	0	0%
40-49	95	0	0%
50-59	123	6	4.9%
60-69	258	22	8.5%
70-79	307	30	9.8%
80+	370	60	16.2%

Base immunized:

Age distribution of 178 deaths
in 2,489 episodes

Age	Cases	Deaths	CFR %
0-9	0	0	-
10-19	19	0	0%
20-29	61	0	0%
30-39	137	0	0%
40-49	148	2	1.4%
50-59	259	9	3.5%
60-69	430	21	4.9%
70-79	641	42	6.6%
80+	794	104	13.1%

Fully immunized:

Age distribution of 89 deaths
in 2,064 episodes

Age	Cases	Deaths	CFR %
0-9	1	0	0%
10-19	2	0	0%
20-29	30	0	0%
30-39	61	0	0%
40-49	73	0	0%
50-59	144	0	0%
60-69	238	4	1.7%
70-79	542	26	4.8%
80+	973	59	6.1%

b. Apr & May: 50 deaths among 1,070 episodes with first hospitalization between Apr 01, 2022 and May 31, 2022

Not immunized:

Age distribution of 24 deaths
in 339 episodes

Age	Cases	Deaths	CFR %
0-9	105	0	0%
10-19	5	0	0%
20-29	5	0	0%
30-39	12	0	0%
40-49	4	0	0%
50-59	21	0	0%
60-69	32	2	6.2%
70-79	55	4	7.3%
80+	100	18	18.0%

Partially immunized:

Age distribution of 0 deaths
in 123 episodes

Age	Cases	Deaths	CFR %
0-9	6	0	0%
10-19	5	0	0%
20-29	5	0	0%
30-39	8	0	0%
40-49	4	0	0%
50-59	12	0	0%
60-69	16	0	0%
70-79	32	0	0%
80+	35	0	0%

Base immunized:

Age distribution of 8 deaths
in 231 episodes

Age	Cases	Deaths	CFR %
0-9	0	0	-
10-19	0	0	-
20-29	4	0	0%
30-39	7	0	0%
40-49	9	0	0%
50-59	26	1	3.8%
60-69	46	2	4.3%
70-79	73	1	1.4%
80+	66	4	6.1%

Fully immunized:

Age distribution of 18 deaths
in 377 episodes

Age	Cases	Deaths	CFR %
0-9	0	0	-
10-19	0	0	-
20-29	4	0	0%
30-39	4	0	0%
40-49	13	0	0%
50-59	23	0	0%
60-69	43	0	0%
70-79	112	6	5.4%
80+	178	12	6.7%

c. Jun & Jul: 36 deaths among 1,254 episodes with first hospitalization between Jun 01, 2022 and Jul 31, 2022

Not immunized:

Age distribution of 15 deaths
in 339 episodes

Age	Cases	Deaths	CFR %
0-9	112	0	0%
10-19	4	0	0%
20-29	13	0	0%
30-39	15	0	0%
40-49	8	0	0%
50-59	22	0	0%
60-69	38	2	5.3%
70-79	40	3	7.5%
80+	80	10	12.5%

Partially immunized:

Age distribution of 2 deaths
in 66 episodes

Age	Cases	Deaths	CFR %
0-9	3	0	0%
10-19	4	0	0%
20-29	3	0	0%
30-39	5	0	0%
40-49	9	0	0%
50-59	6	0	0%
60-69	8	0	0%
70-79	5	1	20.0%
80+	23	1	4.3%

Base immunized:

Age distribution of 6 deaths
in 277 episodes

Age	Cases	Deaths	CFR %
0-9	0	0	-
10-19	0	0	-
20-29	14	0	0%
30-39	16	0	0%
40-49	20	0	0%
50-59	24	1	4.2%
60-69	56	2	3.6%
70-79	58	1	1.7%
80+	89	2	2.2%

Fully immunized:

Age distribution of 13 deaths
in 679 episodes

Age	Cases	Deaths	CFR %
0-9	0	0	-
10-19	0	0	-
20-29	5	0	0%
30-39	14	0	0%
40-49	19	0	0%
50-59	39	0	0%
60-69	75	1	1.3%
70-79	154	5	3.2%
80+	273	7	2.6%

Figure 10: Mortality of CH-SUR hospitalized patients by immune status, age group and hospitalization episode, over three different periods. The total counts of episodes in the subtitles include episodes with a final patient outcome known (discharged, died of any cause, or transferred out of CH-SUR), and where the patient's immune status was base immunized, fully immunized, partially immunized or not immunized. Episodes with missing age, missing gender, or missing were not included in the analysis. Counts of deaths only include episodes resulting in death because of COVID-19 (including those with COVID as suspected cause of death). Case-fatality rate (CFR), especially for the partially immunized and fully immunized categories, should be interpreted with caution due to small sample sizes.

5. Intensive care unit (ICU) admission

5.1. ICU admission over time

Figure 11 shows the proportion (in %) of ICU admission over time. The proportion of episodes with ICU admissions peaked between May and July 2020. Notably, this was during a period of low overall hospitalizations. In contrast, the lowest proportion was observed in most recent months since January 2022.

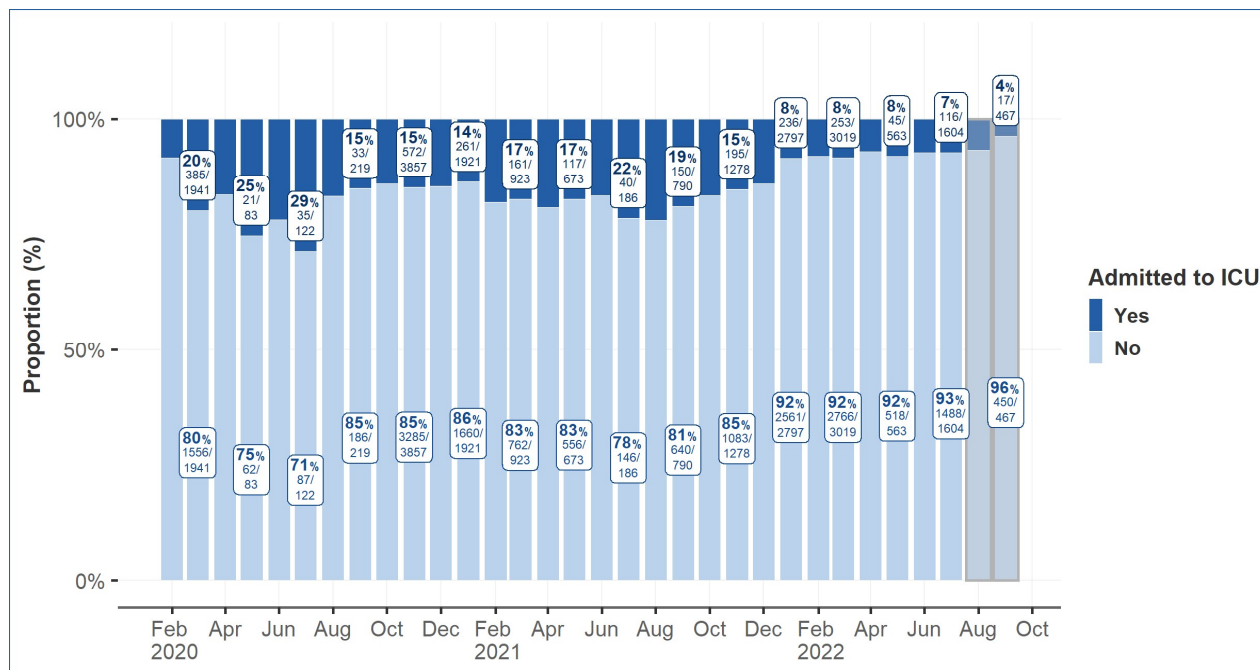


Figure 11: Percentage and proportion of episodes with at least one ICU admission over time. Records with incomplete data (ongoing episodes or with a pending outcome in the database) were not included. Data from the last two months (highlighted gray) are considered provisional due to data entry delays.

5.2. 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 **12a**). The 60-69 age group had the highest probability of admission to the ICU, with 23.2% (1,220 of 5,258) of the episodes including at least one ICU admission. Notably, individuals aged 80 and above were least likely to be admitted to the ICU, with 5.1% (392 of 7,643) of the episodes including at least one ICU admission.

Males were more likely to be admitted to the ICU than females. Overall, admissions to the ICU were registered for 16.9% of the episodes concerning males, compared to 10.1% of the episodes concerning females.

Episodes of patients transferred from other hospitals had a high probability of ICU admission: 49.7% of such episodes (818 of 1,646) required at least one ICU admission (Figure **12a**), compared to an overall admission rate of 16.2%.

ICU admission probability also increased slightly with increasing BMI and steeply with increasing admission **severity scores** (Figure **12a**).

Figure **12b** shows the ICU admissions for the most recent period with available data (June 2022 and July 2022). The distribution of ICU admissions across different population groups during the latest period was roughly similar to the frequencies observed for the whole observation period. Given the smaller sample size of this period of observation, larger oscillations in the percentages are expected, making the real trends difficult to identify. For the overall frequency of admission to ICU and all population groups observed, the frequency of admission to ICU was smaller for the months of June and July than for the full epidemic period (Figure **12**).

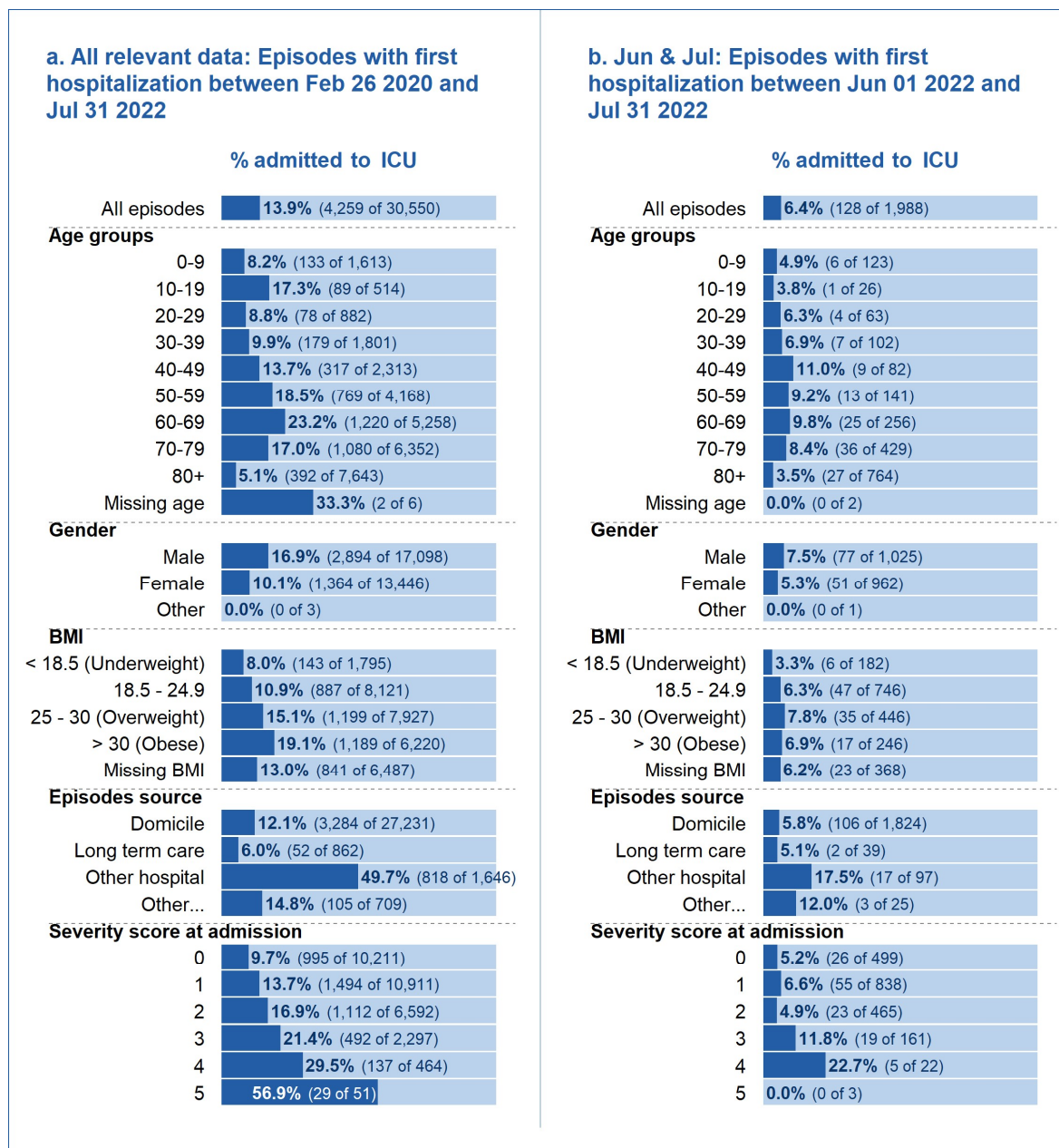


Figure 12: Percentage of hospitalization episodes with at least one ICU admission, grouped by demographic and risk factors, over two time intervals. For episodes with multiple hospitalizations, we considered whether they were admitted to the ICU during any of their hospitalizations. Both panels include records up to Jul 31, 2022 due to data completeness considerations. Records with incomplete data (ongoing episodes or with a pending outcome in the database) were not included. A blank row indicates a count of zero.

5.3. ICU admission rate by immune status

Figure **13** shows the ICU admission rate (number of episodes requiring an admission to the ICU over all episodes registered), stratified by age.

In recent data, from June and July, although episodes include 36.1% of people aged over 80 years old, these episodes did not have a high ICU rate (i.e. not many included an ICU stay).

a. All relevant data: 2,344 ICU admissions among 16,892 episodes with first hospitalization between Dec 23, 2020 and Jul 31, 2022

Not immunized:

Age distribution of 1,746
ICU admissions in 10,773
episodes

Age	Episodes	ICU	ICU %
0-9	1348	111	8.2%
10-19	251	51	20.3%
20-29	334	34	10.2%
30-39	766	103	13.4%
40-49	988	161	16.3%
50-59	1639	341	20.8%
60-69	1893	533	28.2%
70-79	1647	307	18.6%
80+	1907	105	5.5%

Partially immunized:

Age distribution of 155
ICU admissions in 1,376 episodes

Age	Episodes	ICU	ICU %
0-9	35	6	17.1%
10-19	36	2	5.6%
20-29	42	3	7.1%
30-39	87	6	6.9%
40-49	100	12	12.0%
50-59	131	16	12.2%
60-69	264	54	20.5%
70-79	307	38	12.4%
80+	374	18	4.8%

Base immunized:

Age distribution of 275
ICU admissions in 2,592 episodes

Age	Episodes	ICU	ICU %
0-9	0	0	-
10-19	19	4	21.1%
20-29	74	11	14.9%
30-39	158	12	7.6%
40-49	155	15	9.7%
50-59	271	46	17.0%
60-69	449	65	14.5%
70-79	648	85	13.1%
80+	818	37	4.5%

Fully immunized:

Age distribution of 168
ICU admissions in 2,151 episodes

Age	Episodes	ICU	ICU %
0-9	1	0	0%
10-19	3	1	33.3%
20-29	30	3	10.0%
30-39	67	4	6.0%
40-49	76	4	5.3%
50-59	150	17	11.3%
60-69	243	41	16.9%
70-79	570	60	10.5%
80+	1011	38	3.8%

b. Apr & May: 99 ICU admissions among 1,120 episodes with first hospitalization between Apr 01, 2022 and May 31, 2022

Not immunized:

Age distribution of 32
ICU admissions in 352 episodes

Age	Episodes	ICU	ICU %
0-9	105	10	9.5%
10-19	7	3	42.9%
20-29	5	0	0%
30-39	14	1	7.1%
40-49	6	0	0%
50-59	21	2	9.5%
60-69	33	6	18.2%
70-79	56	8	14.3%
80+	105	2	1.9%

Partially immunized:

Age distribution of 7
ICU admissions in 128 episodes

Age	Episodes	ICU	ICU %
0-9	6	0	0%
10-19	5	0	0%
20-29	5	0	0%
30-39	9	1	11.1%
40-49	4	0	0%
50-59	13	1	7.7%
60-69	17	3	17.6%
70-79	32	1	3.1%
80+	37	1	2.7%

Base immunized:

Age distribution of 33
ICU admissions in 249 episodes

Age	Episodes	ICU	ICU %
0-9	0	0	-
10-19	0	0	-
20-29	7	1	14.3%
30-39	9	1	11.1%
40-49	9	1	11.1%
50-59	26	5	19.2%
60-69	50	9	18.0%
70-79	74	11	14.9%
80+	74	5	6.8%

Fully immunized:

Age distribution of 27
ICU admissions in 391 episodes

Age	Episodes	ICU	ICU %
0-9	0	0	-
10-19	0	0	-
20-29	4	0	0%
30-39	5	0	0%
40-49	15	1	6.7%
50-59	22	2	9.1%
60-69	41	6	14.6%
70-79	115	7	6.1%
80+	189	11	5.8%

c. Jun & Jul: 99 ICU admissions among 1,382 episodes with first hospitalization between Jun 01, 2022 and Jul 31, 2022

Not immunized:

Age distribution of 23
ICU admissions in 355 episodes

Age	Episodes	ICU	ICU %
0-9	115	5	4.3%
10-19	4	0	0%
20-29	14	1	7.1%
30-39	18	2	11.1%
40-49	8	0	0%
50-59	24	2	8.3%
60-69	40	8	20.0%
70-79	48	1	2.1%
80+	84	4	4.8%

Partially immunized:

Age distribution of 7
ICU admissions in 76 episodes

Age	Episodes	ICU	ICU %
0-9	3	1	33.3%
10-19	4	0	0%
20-29	3	1	33.3%
30-39	7	1	14.3%
40-49	10	1	10.0%
50-59	8	1	12.5%
60-69	9	0	0%
70-79	6	0	0%
80+	26	2	7.7%

Base immunized:

Age distribution of 19
ICU admissions in 316 episodes

Age	Episodes	ICU	ICU %
0-9	0	0	-
10-19	0	0	-
20-29	18	2	11.1%
30-39	19	1	5.3%
40-49	23	2	8.7%
50-59	27	1	3.7%
60-69	60	4	6.7%
70-79	64	7	10.9%
80+	105	2	1.9%

Fully immunized:

Age distribution of 50
ICU admissions in 635 episodes

Age	Episodes	ICU	ICU %
0-9	0	0	-
10-19	1	1	100.0%
20-29	5	0	0%
30-39	15	1	6.7%
40-49	20	1	5.0%
50-59	42	6	14.3%
60-69	79	11	13.9%
70-79	171	22	12.9%
80+	302	8	2.6%

Figure 13: ICU admission over all episodes of CH-SUR hospitalized patients by immune status and age group over three different periods. Episodes with missing age, or missing ICU stay were not included in the analysis. ICU admission rates (ICU%), especially for the partially immunized and fully immunized categories, should be interpreted with caution due to small sample sizes.

5.4. ICU admissions contrasted by immune status

Due to a variance in vaccine coverage, only the recent evolution is represented. Data for August and September 2022 are not meaningful due to their **incompleteness** and are therefore not yet shown.

In both periods considered, the largest group of **episodes** with an **ICU** admission concerned non-immunized patients (28% and 18% of all episodes with ICU admissions in each of the described periods respectively). For most immune status categories shown and in both periods considered, there were more men than women admitted to the ICU (Figure 14).

For episodes of **fully immunized** patients, there is a skew towards older age groups being admitted to the ICU (between Apr 2022 and Jul 2022 around 95% of these episodes concerned patients aged 50+). In comparison, episodes of non-immunized patients admitted to the ICU included proportionally more patients from younger age groups, as only 56.4% (Apr, May) and 65% (Jun, Jul) of the episodes corresponded to patients aged 50 years and above.

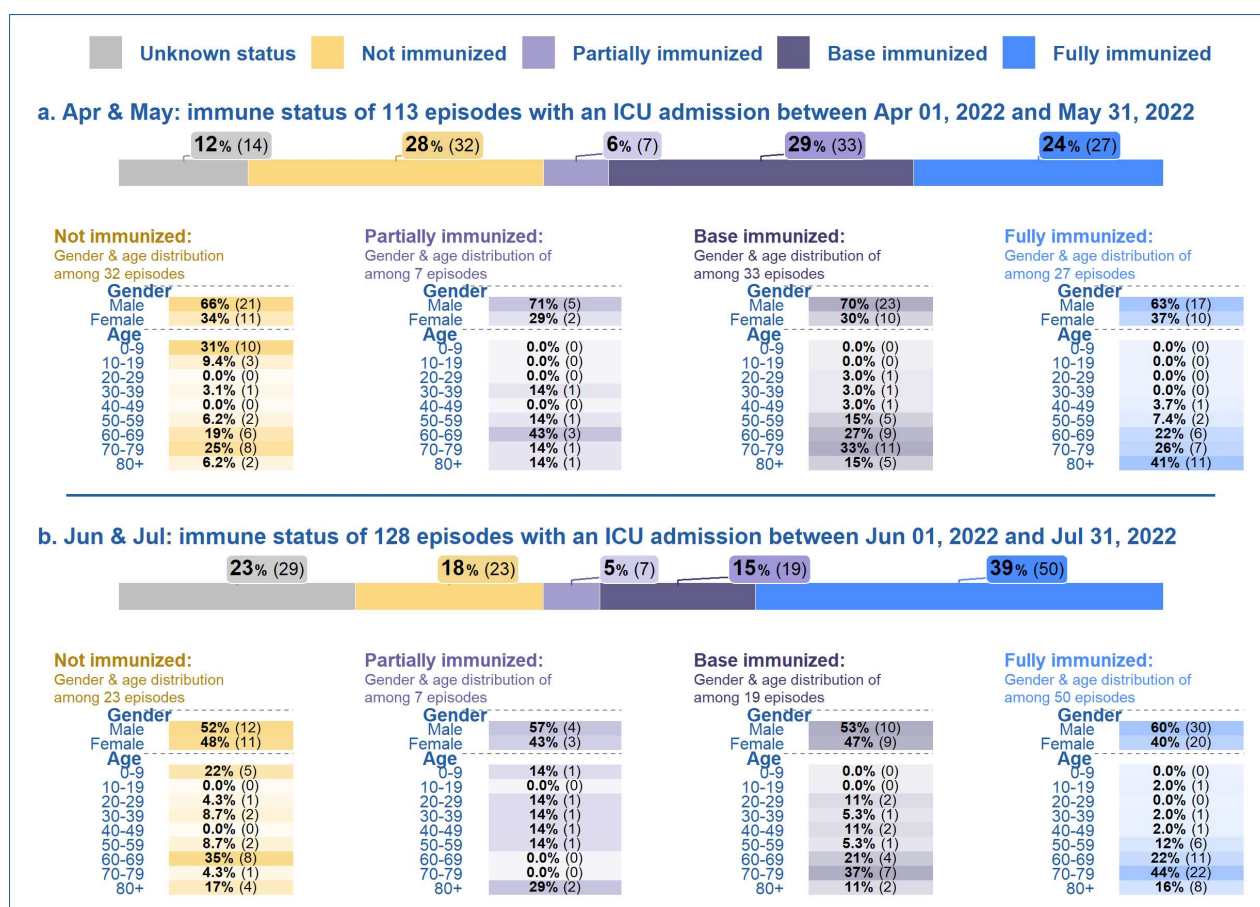


Figure 14: Demographic characteristics of patients in ICU by immune status and episode, over two different periods. Episodes with a first admission date after Jul 31, 2022 were excluded, as a large proportion of these records have not been completely filled in the database. Episodes with missing ages or gender marked as 'Other' are not shown. Data on ICU admissions for the partially immunized and fully immunized categories should be interpreted with caution due to small sample sizes.

6. Comorbidities

Chronic cardiovascular disease, hypertension, chronic renal disease, diabetes, chronic respiratory disease, and immunosuppression ¹ were chosen out of all comorbidities registered in CH-SUR ², to explore the risk factors tied to SARS-COV-2 hospitalization.

Most notably, episodes feature a predominance of males having a chronic cardiovascular disease comorbidity. Men and women both have a high incidence of hypertension as comorbidity (respectively 66.1% for men and 69.7% for women).

¹ Immunosuppression was defined as a patient having one or more of the following comorbidities: a hematological pathology with immuno-suppression, a rheumatological and auto-immune pathology with immuno-suppression, receiving a transplant (solid organs), and/or receiving an immuno-suppressive treatment.

² Chronic respiratory disease, Asthma, Diabetes, Hypertension, Chronic cardiovascular disease, Chronic renal disease, Chronic liver disease, Chronic neurological impairment, Hematological pathology with immuno-suppression, Oncological pathologies, Rheumatological and auto-immune pathology with immuno-suppression, Dementia, Transplant (solid organs), HIV-positive, Immuno-suppressive treatment, History of prematurity, Tuberculosis, Smoking, Obesity

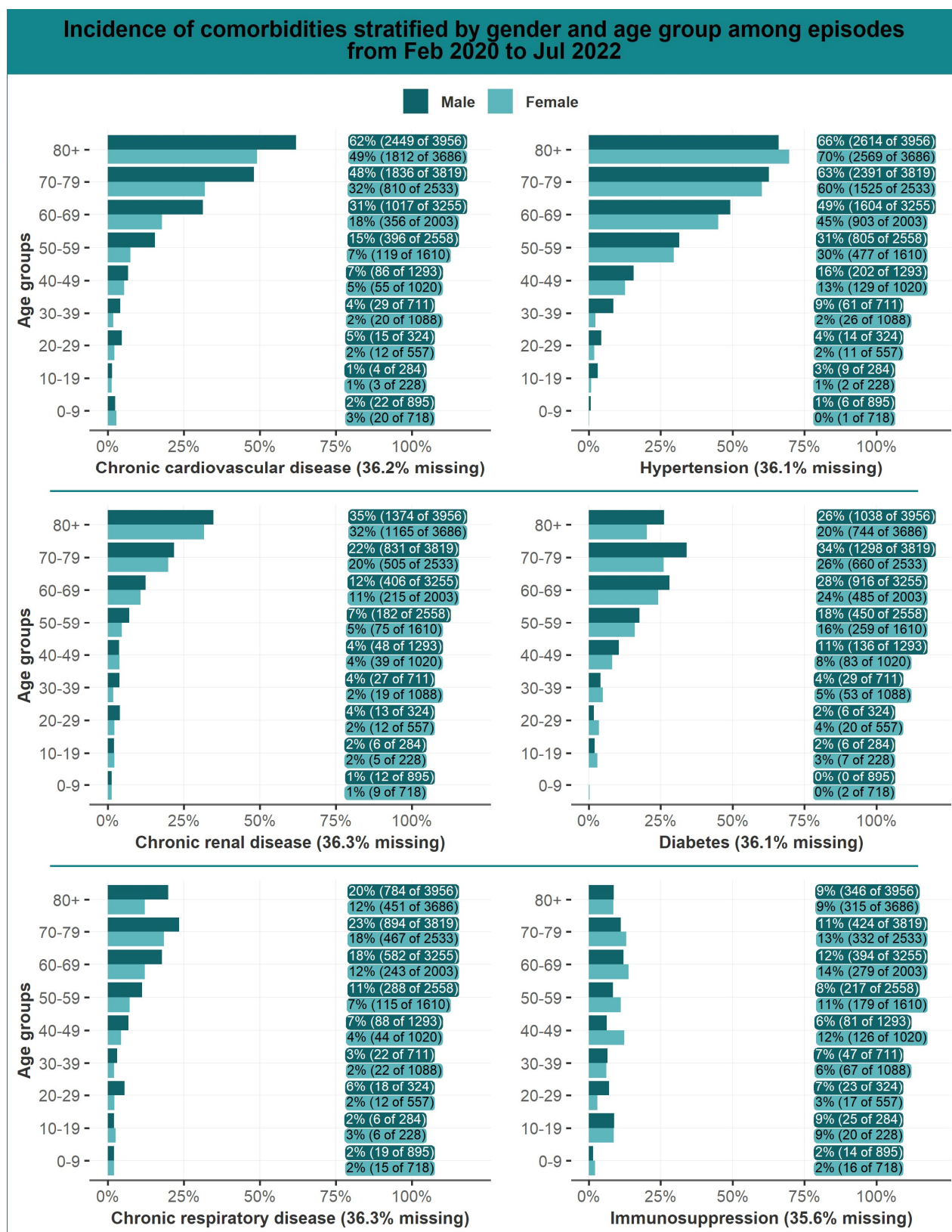


Figure 15: Comorbidities incidence stratified by age group and by gender. Records with incomplete data for age or gender were not included. Data from the last two months was excluded due to potential data delay.

7. Nosocomial cases

The proportion of **episodes** with nosocomial infections peaked in January 2021 and again in March and April 2022: 20% or more of the episodes in these periods were linked to infections of nosocomial origin (Figure 16c). In recent months, this proportion rose since August 2021, accounting for 13.7% of the episodes registered in CH-SUR over the month of December 2021, 19.0% in January 2022, 19.0% in March 2022, 20.4% in April 2022, and 29.9% in June 2022. This observation might be partially explained by periods of higher virus circulation and an increase in nosocomial systematic testing in some hospitals. However, changes in the testing strategy among hospitals are expected for the coming period, therefore, these data should be interpreted with caution.

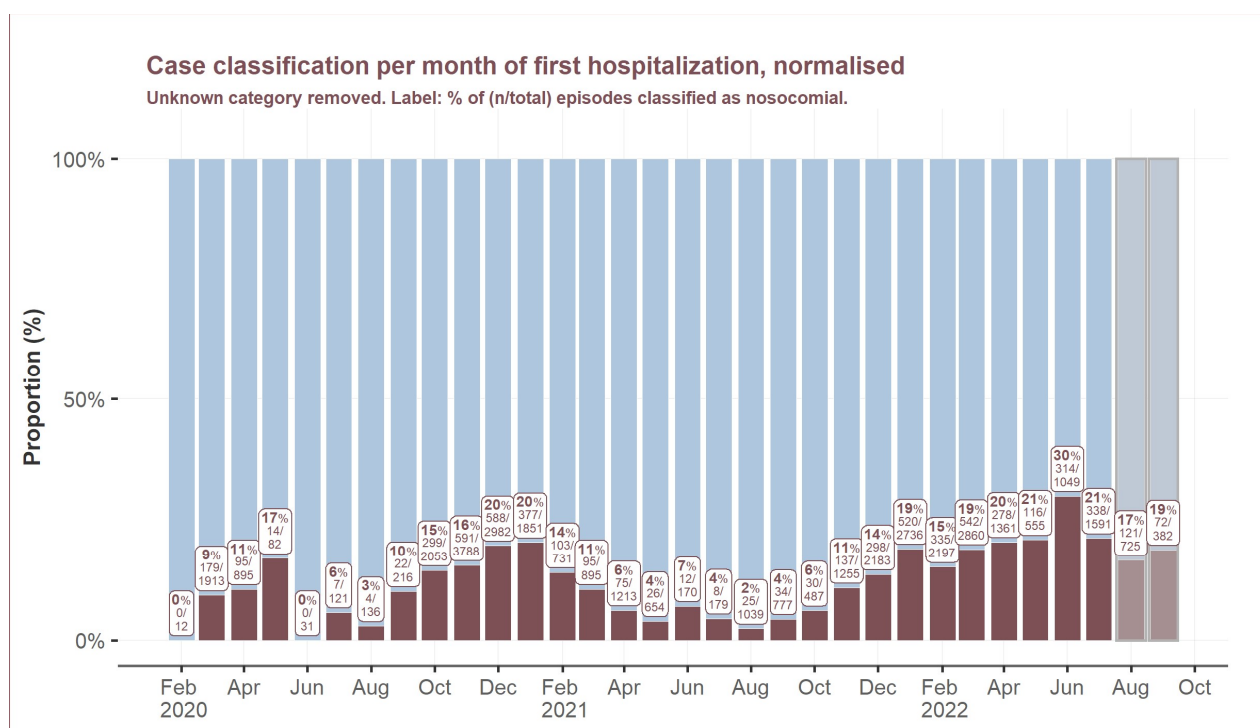


Figure 16: Classification (infection source) of hospitalization episodes over time. Data from the last two months (highlighted grey) are considered provisional due to data entry delays.

Over the full course of the epidemic, the **nosocomial** infections affected principally an elderly population, with patients aged 80 years and above, accounting for 2,674 (47%) of the nosocomial episodes. In comparison, 7,959 (25%) of episodes with **community-acquired** infections corresponded to patients aged 80 years and above.

Community acquired and nosocomial episodes from Feb 2020 to Sep 2022

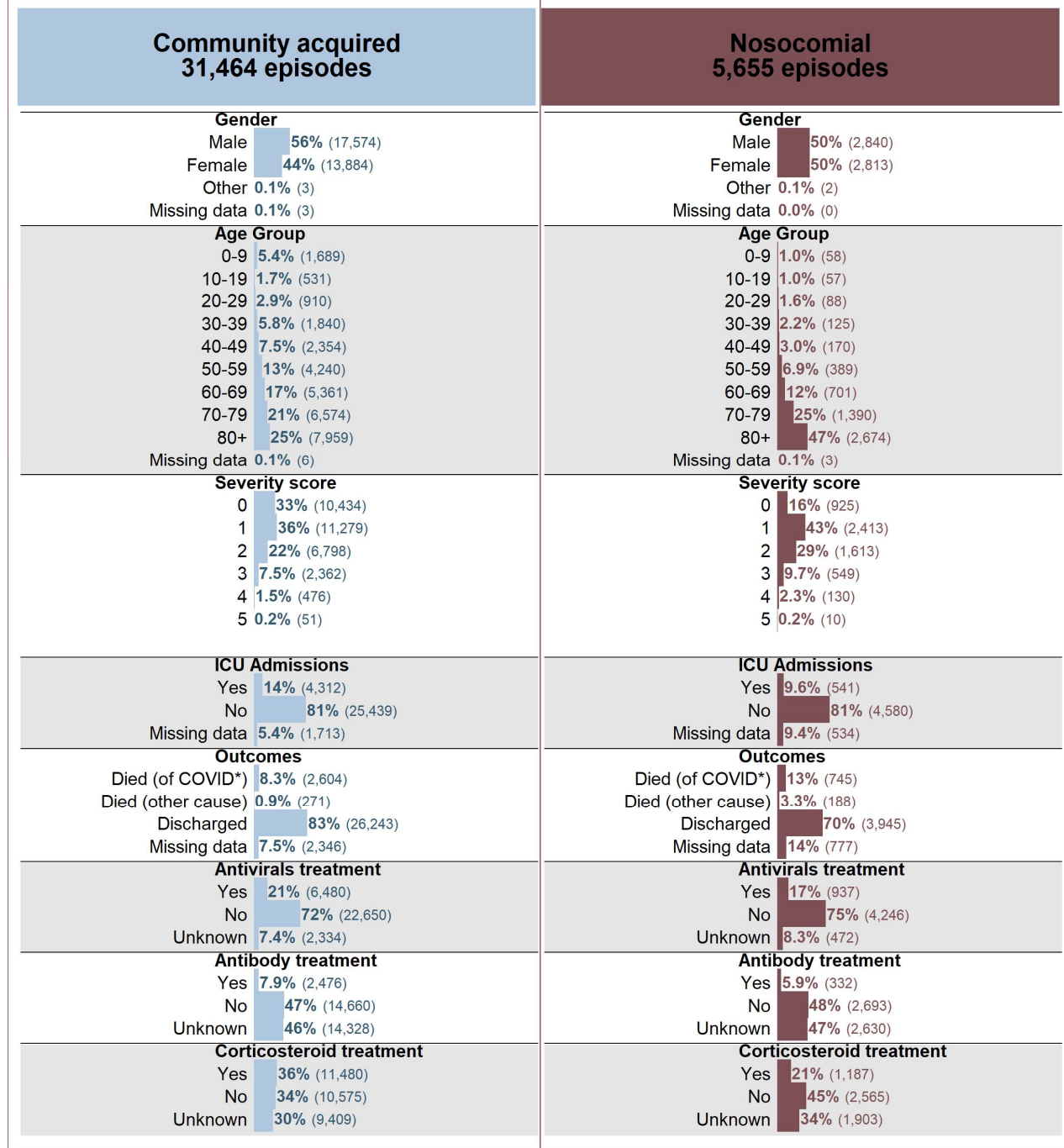


Figure 17: Comparison of community acquired and nosocomial cases by demographics, severity score, ICU, outcomes and treatments.

8. Glossary and supplemental information

Hospitalization:

This is the shortest unit of analysis of the data and corresponds to the time between admission and discharge from any hospital participating in CH SUR. This interval must be longer than 24 hours to be counted as an hospitalization. A new hospitalization is registered each time a person is admitted to hospital. Given the frequent re-admissions within one single course of the disease (one single infection), this report bases its analysis in the number of episodes and not in the number of hospitalizations.

Episode:

An episode number is given to each new admission to hospital, which is separated by at least 30 days from a prior hospitalization and lasts for more than 24 hours. Therefore, if a patient is hospitalized only once, or several times within 30 days, then both scenarios account for only one episode. Two different hospitalizations of the same patient that happen separated by 30 days result in two different episode numbers. If a patient is transferred between two hospitals participating in CH SUR within the period of 30 days after last discharge, then these hospitalizations account for the same episode. One episode can therefore include multiple hospitalizations and each hospitalization can include multiple ICU admissions.

Reason for the hospitalization:

- *Hospitalization because of COVID-19:* on the basis on the information available at admission, the patient is hospitalized because the patient has symptoms due to COVID-19 or the patient suffers from a decompensation of a chronic disease, evidently caused by COVID-19.
- *Hospitalization with a SARS-CoV-2 infection:* on the basis on the information available at admission, the patient has a positive test for SARS-CoV2 but is hospitalized without COVID-19 symptoms for a problem other than COVID-19. In other words, the predominant problem is a non-COVID-19 disease or accident.

Origin of the infection:

- *Community acquired infection:* the SARS-CoV-2 infection was detected before the admission into the hospital or within the first 5 days after admission.
- *Nosocomial infection:* the episode is registered as "Nosocomial" if the SARS-CoV-2 is detected 5 days after admission into the hospital.

Severity score at admission:

For adults, the severity score used is the CURB-65 score. One point is 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 is given for each of the following: respiratory distress, oxygen saturation < 92%, evidence of severe clinical dehydration or clinical shock and an altered consciousness level. The severity score corresponds to the sum of the given points.

Intermediate care unit (intermediate care or IMC): care unit caring for patients who have a failure of a vital function or whose burden of care does not allow a return to a hospitalization unit. These units are the link between an intensive care unit and a beds service.

Intensive care unit (ICU): care unit caring for patients who have a serious failure of one or more vital functions or who are at risk of developing severe complications.

Immune status:

The immune status definition is based on the consideration of both vaccination and previous confirmed SARS-CoV-2 infection. The immunization status is 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 hospitalization episode.

b) *Partially immunized*:

1. 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.
2. Patients with confirmed previous SARS CoV 2 infection, which required or not hospitalization in the past and are not vaccinated with any dose. 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).

c) *Base immunized*:

3. 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).
4. Patients with a documented prior infection or positive test (requiring hospitalization or not) who received one vaccine dose of the vaccines listed before. 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 fully immunized).

d) *Fully immunized*: Patients with base immunization who received one or more additional vaccine doses (booster) with a minimum 4 months since the last vaccine application for the base immunization.

e) *Unknown immune status*: Patients for whom vaccination and immune information was not available.

Important notes: Special populations

Children aged 5 to 11 years old: Children aged 5 to 11 years old require one dose less than the previously mentioned categories to be counted as base immunized. The application of the booster vaccine is not recommended for children below 12 years old. Example: a patient aged between 5 and 11 years old who received only one dose of Comirnaty is counted as base immunized.

Immunosuppressed patients are considered base immunized or fully immunized: if received one additional dose than those considered in the previous definitions. Example: an immunosuppressed person is counted as base immunised if the person received three doses of the vaccines Comirnaty® and Spikevax®; Vaxzevria® and Comirnaty®; Vaxzevria® and Spikevax® (instead of 2 for non-immunosuppressed patients) or if the person received two doses of the vaccines Comirnaty® and Spikevax®; Vaxzevria® and Comirnaty®; Vaxzevria® and Spikevax® and has recovered from a previous SARS-CoV-2 infection.

Immunosuppressed patients are counted as fully immunized if they got four doses of the vaccines Comirnaty® and Spikevax®; Vaxzevria® and Comirnaty®; Vaxzevria® and Spikevax® or three doses of any combination of these vaccines and are recovered from a previous SARS-COV-2 infection. If this amount of doses has not been administrated, then the patient is considered as non-immunized or partially immunized.

Discharge: When the patient leaves the hospital alive, the departure is qualified as “discharge” if the patient goes to:

5. his/her domicile

6. a long term care facility
7. another hospital
8. another institution not participating in the CH SUR surveillance
9. a rehabilitation establishment
10. destination unknown

Reason of death: 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). A medical doctor at the hospital for each CH-SUR-participating center determined of whether a patient died of COVID or another cause. Cases where the cause of death is not certain, but there was a COVID-19 diagnosis (in conformity with inclusion criteria for CH-SUR) are counted as Died of COVID or suspected death of COVID.

Dealing with missing data: When mentioned in the text, missing data are excluded from the analysis. Otherwise, records with missing data are included in the total numbers and analyzed accordingly. This may lead to the situation where the denominators of different categories analyzed do not sum up to the same total. Where indicated, Data from the last two months are considered provisional due to entry delays and are highlighted in gray in certain figures.

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