COVID-19 Hospital Based Sentinel Surveillance Report

Data status: August 29, 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 August 28, 2022, data were collected from 37,286 episodes of hospitalization. During the same period, 57,122 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 65.3% 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% (5,482 of 37,286) while episodes linked to community acquired infections accounted for 82.2% (30,640 of 37,286) (Figure **1**). 3.1% 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, 14.4% included an ICU stay (4,169 of 29,029 episodes, February 26, 2020 to June 30, 2022) and 9.1% resulted in death of COVID-19 (2,568 of 28,214 episodes, February 26, 2020 to August 28, 2022).

During the latest period for which enough data is available (May 01, 2022 to Jun 30, 2022), 1,156 community acquired episodes were registered. Of these, 243 (21.0%) concerned non-immunized and 431 (37.3%) fully immunized patients (Figure **2**). During the same period, 86 episodes included an ICU stay. Of these, 14 (16.3%) concerned non-immunized and 27 (31.4%) fully immunized patients. 29 episodes resulted in death of COVID-

19 (2.5% of all registered episodes with known outcome), 9 of them were among non-immunized patients and 12 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.

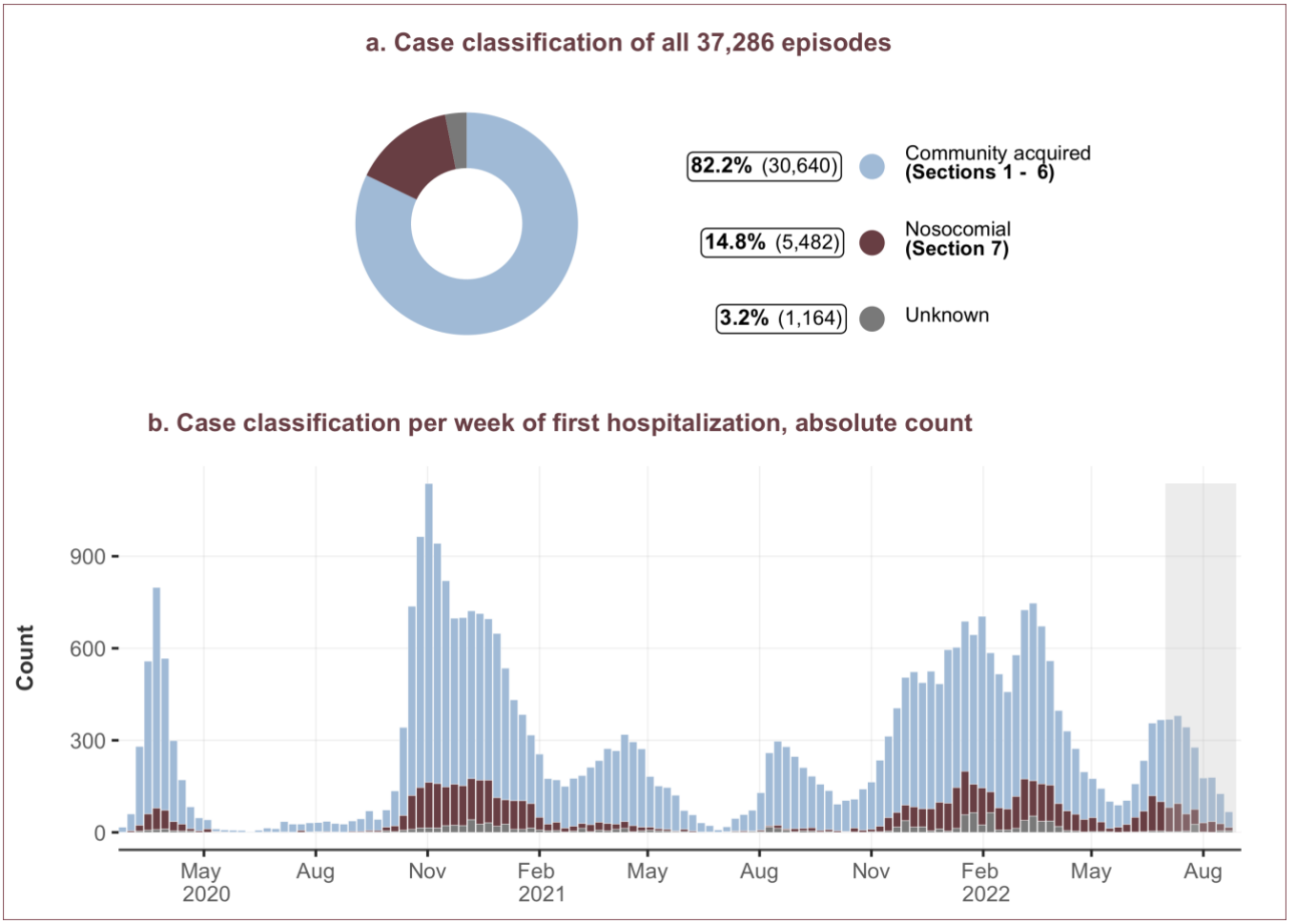

***Figure 1**: Case classification (infection source) of the episodes. Proportion (normalized in %) of episodes by infection source (panel a) and the absolute count of episodes over time (panel b). For episodes with multiple hospitalizations, the case classification of the first hospitalization was considered.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

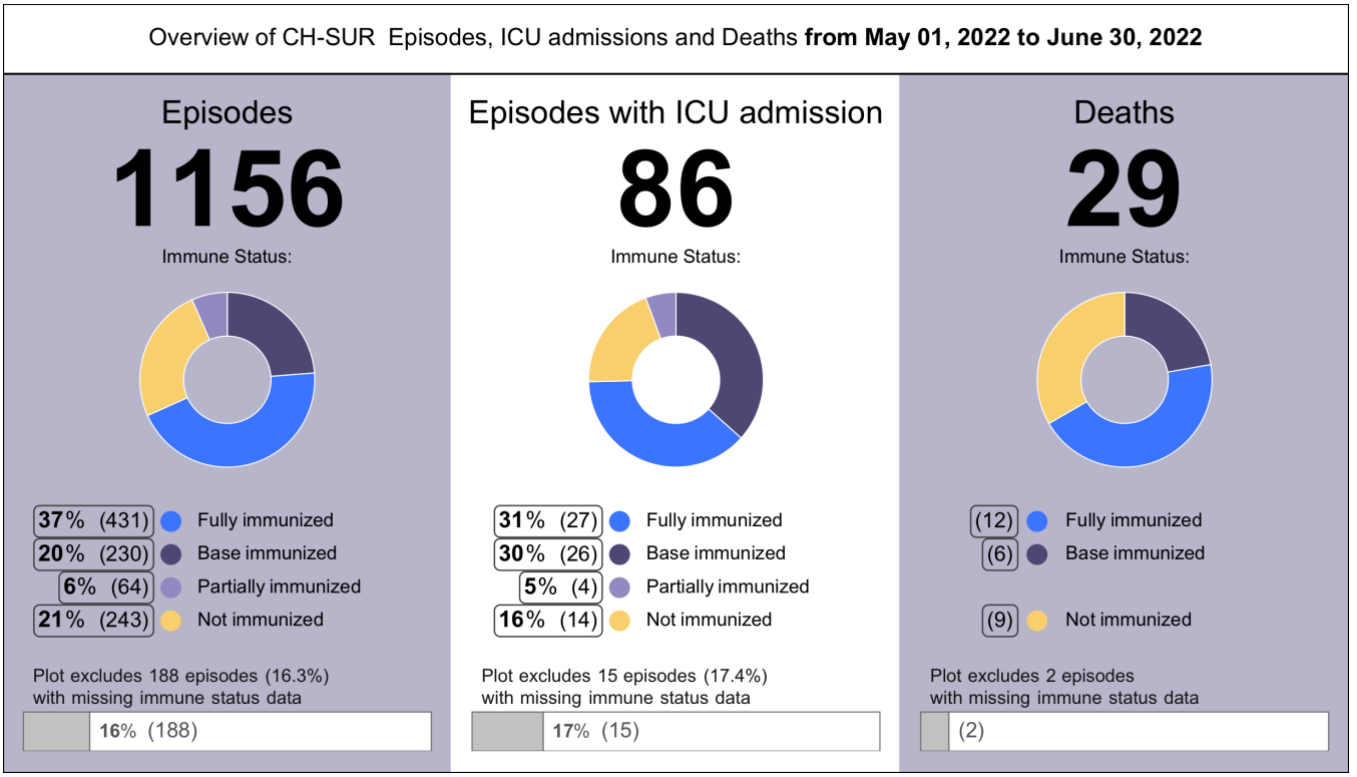

***Figure 2**: Overview information of the most recent data on episodes of hospitalization linked to community acquired infections. Data from the last two months are considered provisional due to data entry delays hence they have been omitted.*

2. Hospitalizations and demographic characteristics

Between the start of the epidemic in Switzerland and August 28, 2022 and among the 19 hospitals actively participating in CH-SUR, 30,640 episodes of community acquired infections were registered, accounting for a total of 31,794 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**.

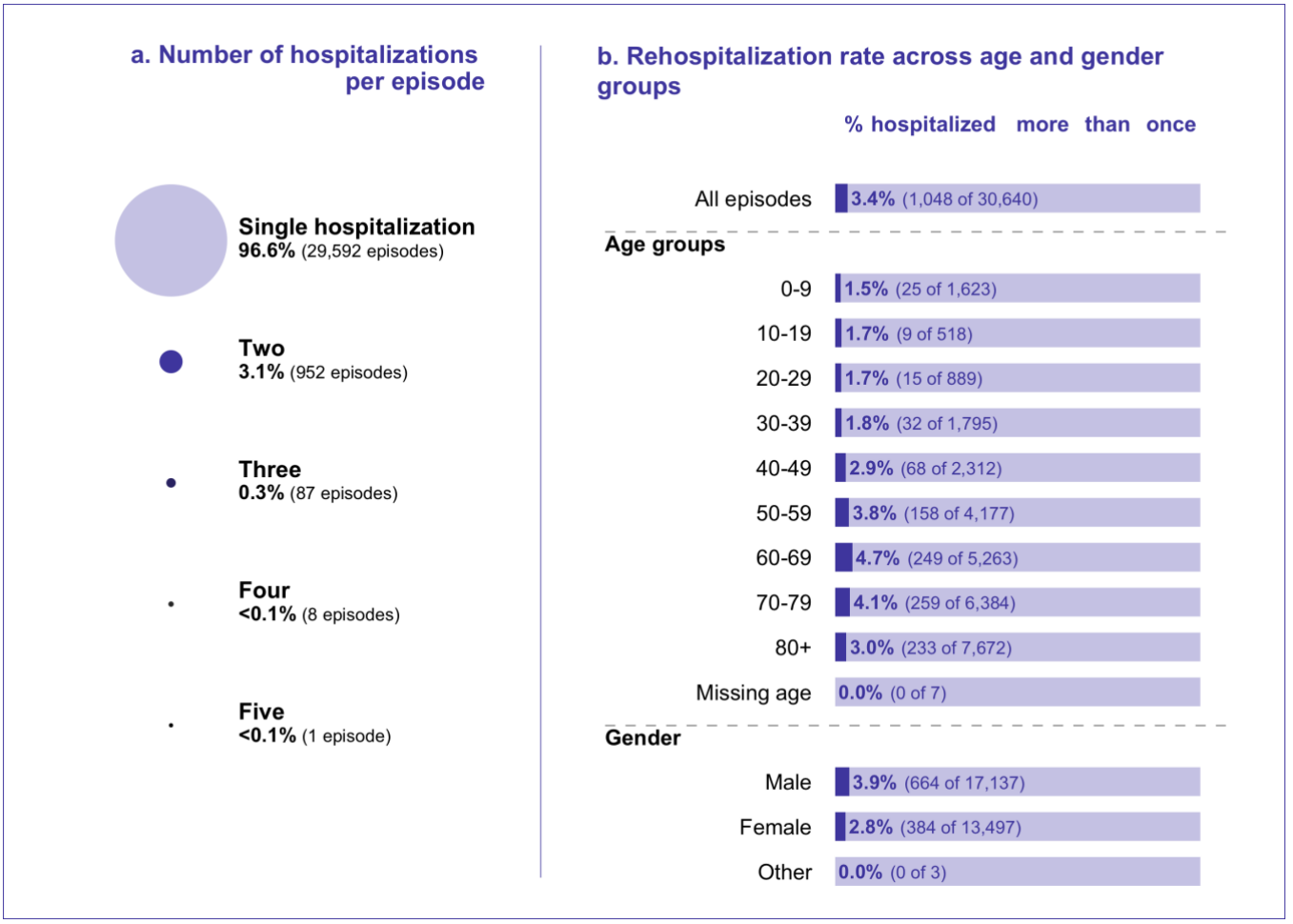

***Figure 3**: Hospitalizations per episode of hospitalization and rehospitalization rate across demographic groups. Includes records between March 2020 and August 28, 2022.*

Most patients (96.6% [29,592 of 30,640]) were hospitalized only once during an episode, while 3% of the registered episodes (1,047 of 30,640) included two to four hospitalizations. Only one episode included five hospitalizations (Figure **3**b).

The overall rate of rehospitalization within the same episode was 3.4% (1048 of 30,640) (Figure **3**b). The 60-69 age group and the 70-79 age group had the highest rate of rehospitalization at respectively 4.7% (249 of 5,263) and 4.1% (259 of 6,384). Men had a higher rehospitalization rate than women, 3.9% (664 of 17,137) vs 2.8% (384 of 13,497) respectively.

Among all episodes with community acquired infections, the majority (55.9% [17,137 of 30,640]) of the episodes concerned male patients (Figure **4**a), and the age distribution was skewed towards older persons (Figure **4**b). The largest age category corresponded to patients aged 80 and above (25.0% [7,672]).

Figures **4**c and **4**d 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% (2,815 of 3,188) of the episodes of patients admitted in this month concerned patients 50 years old and above (Figure **4**d). 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% (817 of 1,086) in November 2021. Over the month of June 2022, 81.6% (354 of 434) 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 27.6% [120 of 434] of episodes pertaining to patients aged between 70 and 80 years old and 37.1% [389 of 1,048] of episodes pertaining to patients over 80 years old.

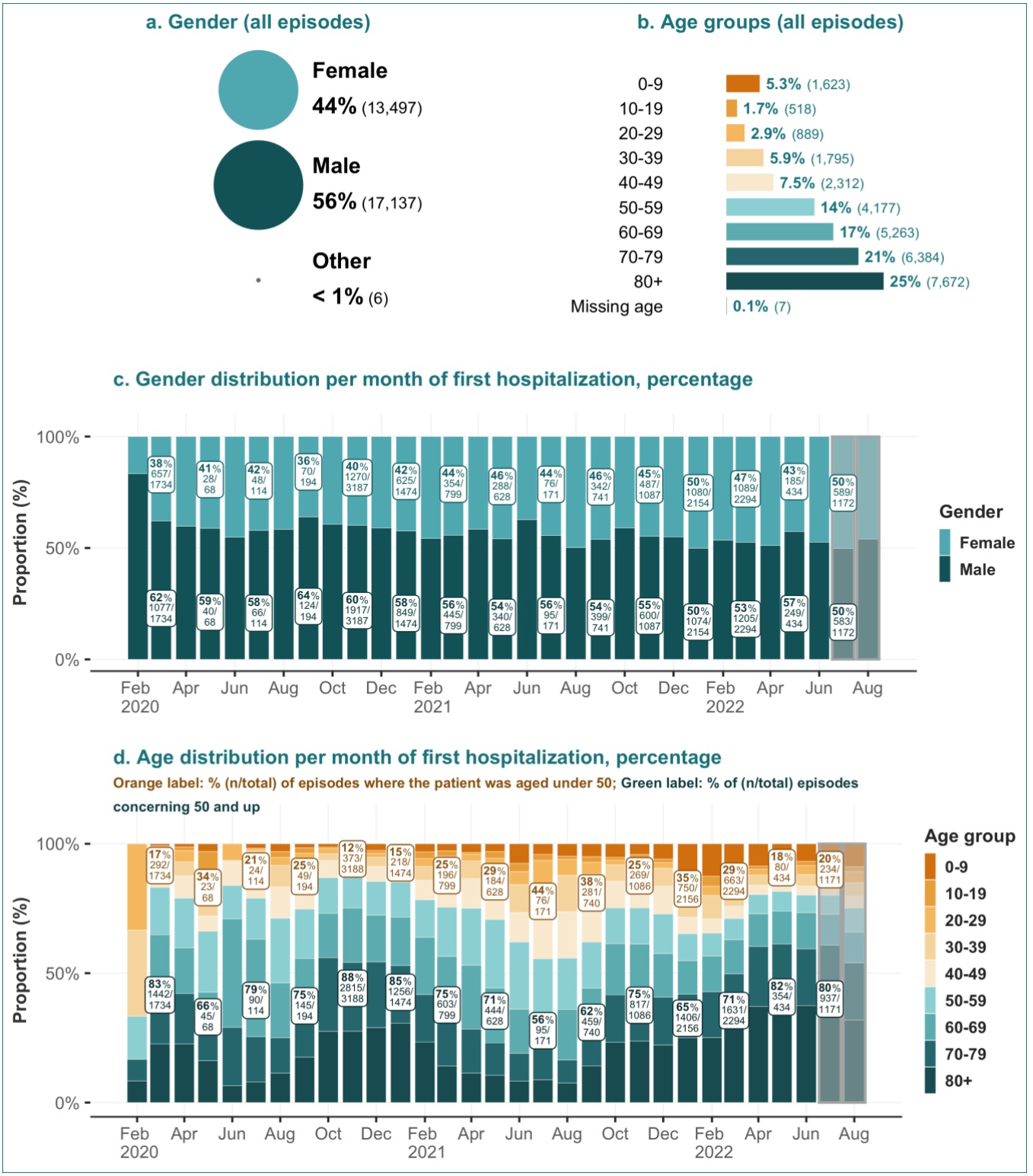

***Figure 4**: Demographic characteristics: gender and age distribution of admitted hospitalized patients, overall and per month. For episodes with multiple hospitalizations, the admission date of the first hospitalization was used. Data from the last two months (highlighted gray) is considered provisional 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 with community acquired infections 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 of 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.

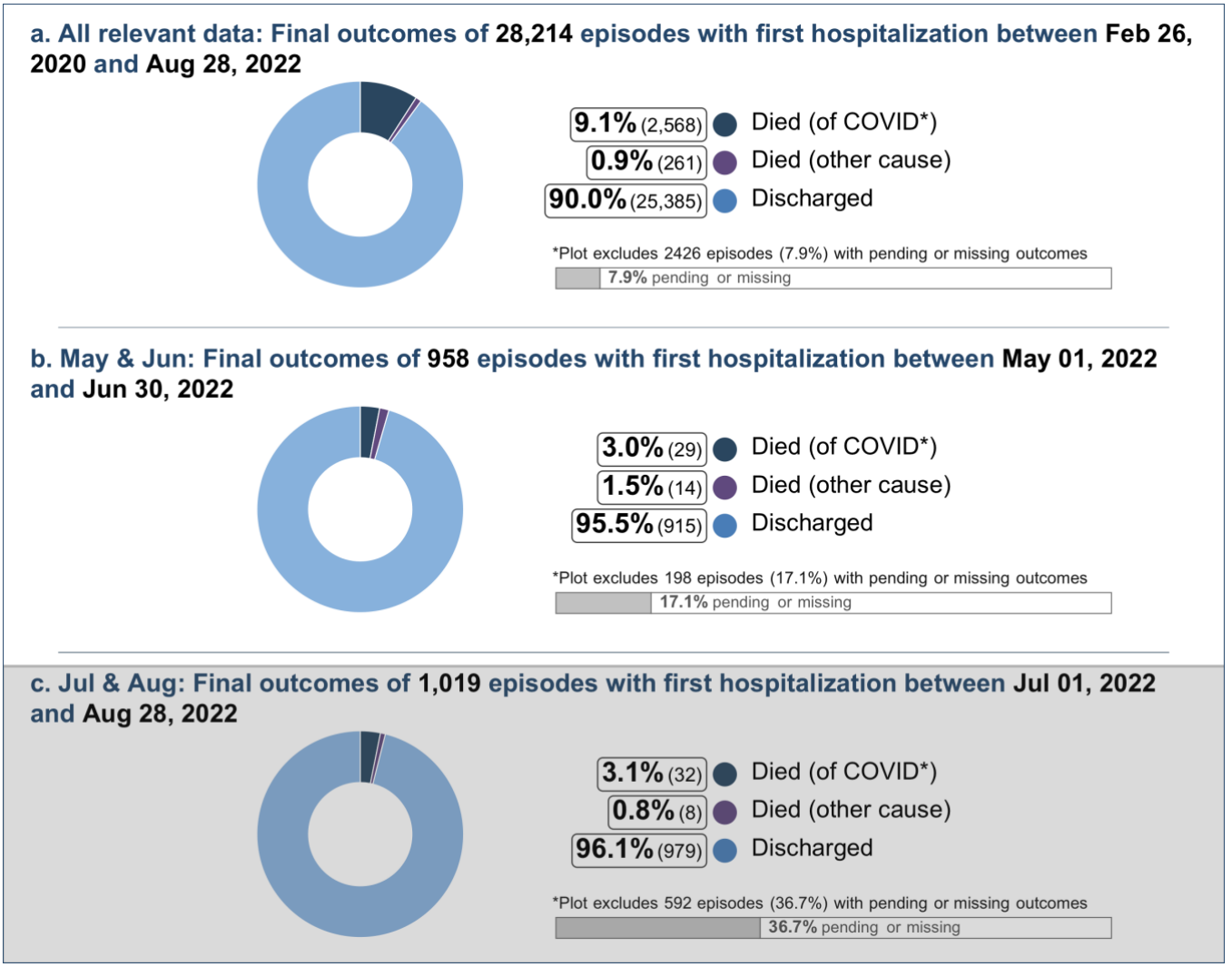

***Figure 5**: Outcomes for COVID-19 related episodes of hospitalization in CH-SUR hospitals. Includes records up to August 28, 2022. For episodes with multiple hospitalizations, only the final outcome is considered. Patients where the cause of death was not certain, but there was a COVID-19 diagnosis (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 linked to community acquired SARS-CoV-2 infections over time (Figure **6**a & **6**b) and the disease severity score at admission as a function of time (Figure **6**c).

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% (329 of 2,373) 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 **6**c) and older patients' ages (Figure **4**c) 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 40.1% (956 of 2,387) of the admissions in that period. Most recently, during May 2022, 32.9% (143 of 434) of the episodes had a severity score above 2, but this is not mirrored by higher case fatality rates (Figure **5**)

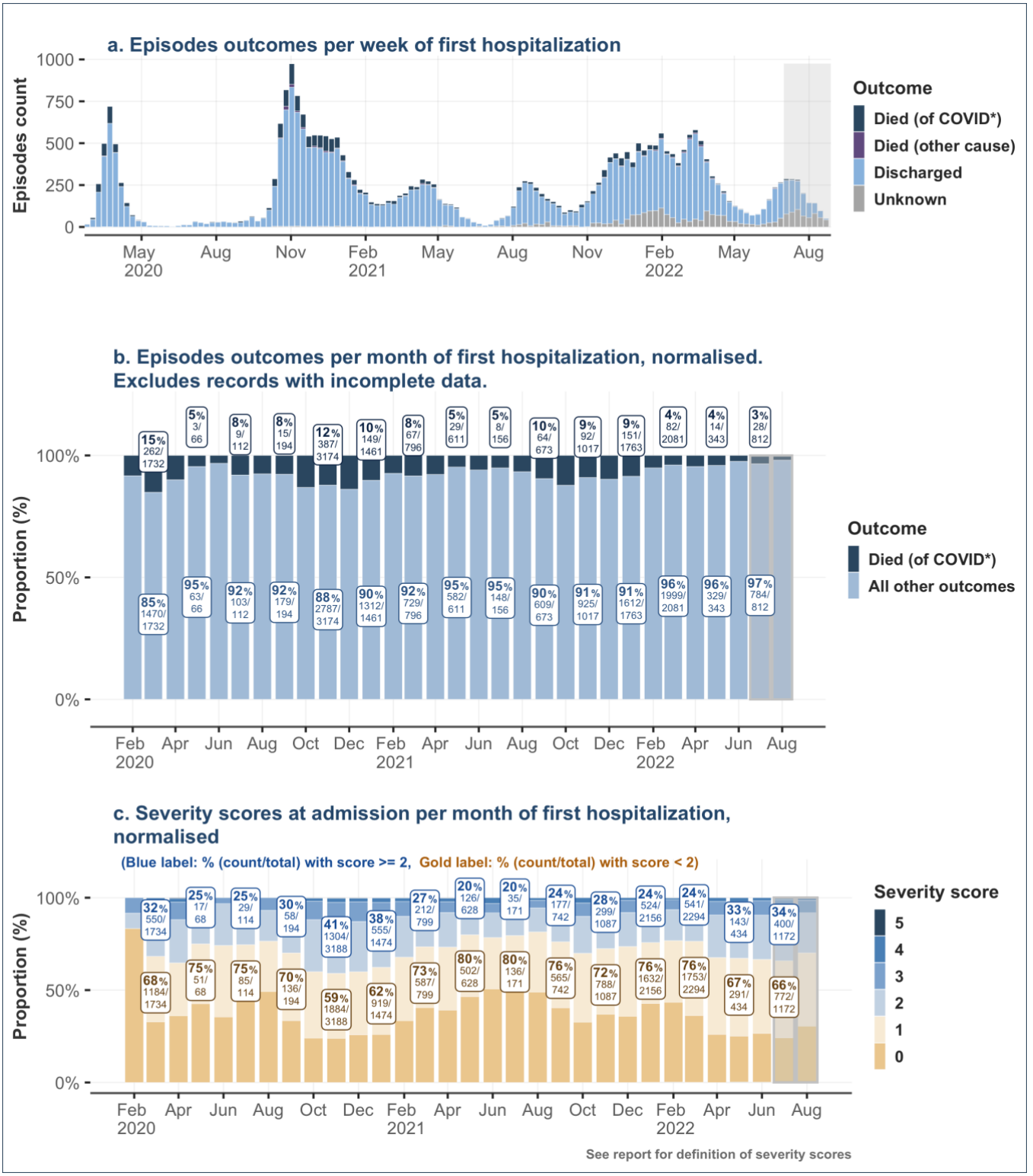

***Figure 6**: Epidemic curve, episodes' outcomes and severity scores at admission for COVID-19 hospitalizations over time. Includes records up to August 28, 2022. Data from the two last months (highlighted in gray) are considered provisional due to data entry delays. Episodes where the cause of death 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 June 30, 2022, the case fatality rate (CFR) for episodes with community acquired infections increased with increasing age, from 0% (0 of 1,446) in episodes of patients aged 0-9, to 3.2% (124 of 3,850) in episodes of patients aged 50-59, and to 20.3% (1,322 of 6,505) in episodes of patients aged 80+. CFR% was greater in men than in women: 10.8% (1,664 of 15,401) vs 7.4% (872 of 11,789) respectively. In addition, the CFR% was greater for episodes with higher severity scores at admission: 1% (94 of 9,289) of the episodes with severity score 0 resulted in death of COVID-19, while 47.9% (23 of 48) of the episodes with severity score 5 resulted in death of COVID-19 (Figure **7**a).

The overall CFR% of the most recent period for which enough data is available (months May and June 2022, Figure **7**b) was lower than the CFR% of the whole epidemic period (3.0% vs. 9.3%). 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.

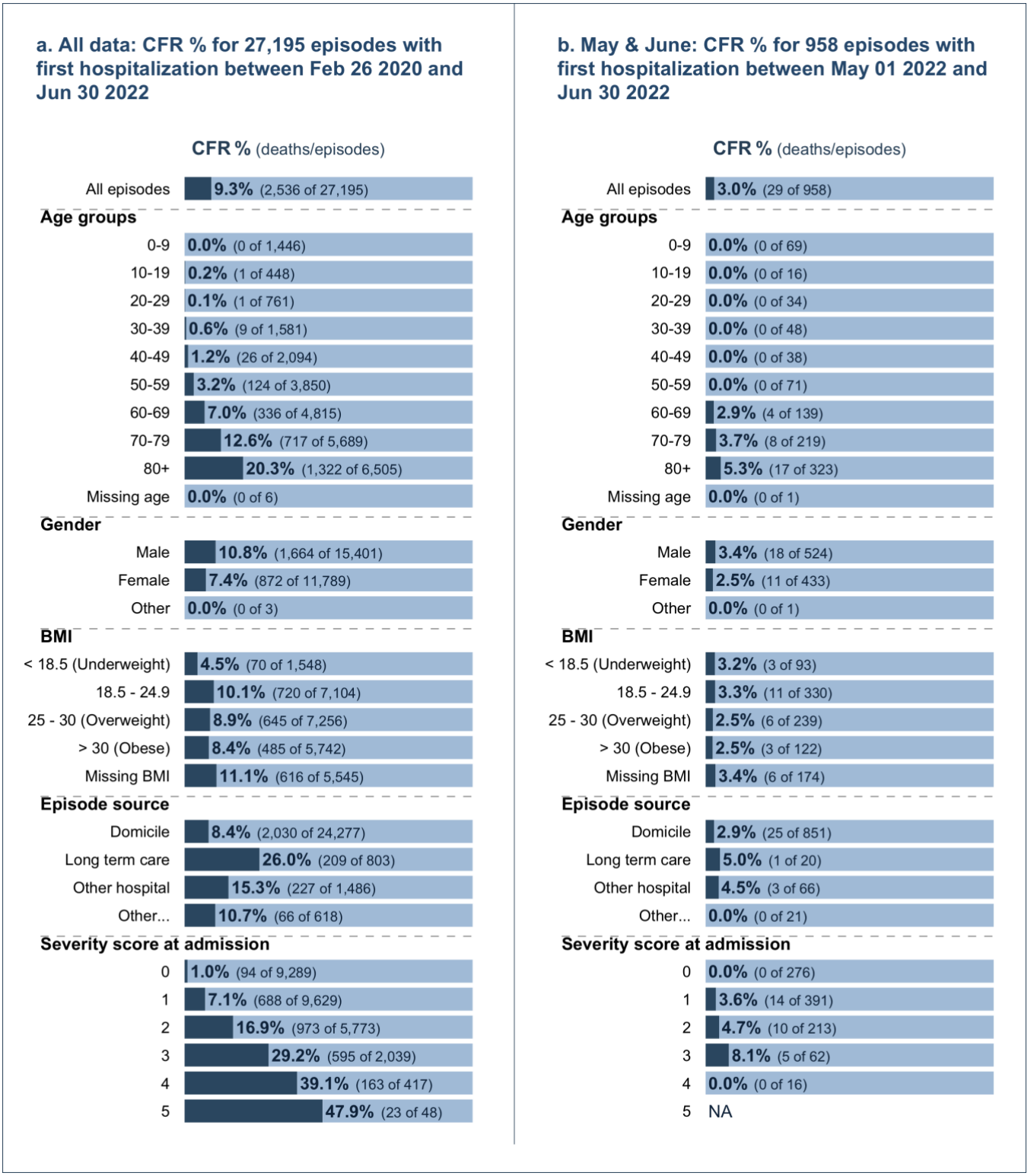

***Figure 7**: Case fatality rate (CFR) % among demographic and risk groups: percentage of hospitalization episodes in different demographic groups, which ended in the death of the patient of COVID-19 in hospital. Both figures include records up to Jun 30 2022 but records with incomplete data (ongoing 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 among episodes with community acquired infections rose gradually after January 2021 (Figure **8**b). This is expected, given the rise in the proportion of the fully vaccinated Swiss population (Figure **8**c, source: FOPH Dashboard).

During the months of June 2022, 70.4% of the Swiss population was fully vaccinated (Figure **8**c). 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 (23.8% and 44.5% respectively) within the episodes recorded in CH-SUR (Figure **8**b), may therefore be partly linked to the decreasing number of non-immunized persons in the population.

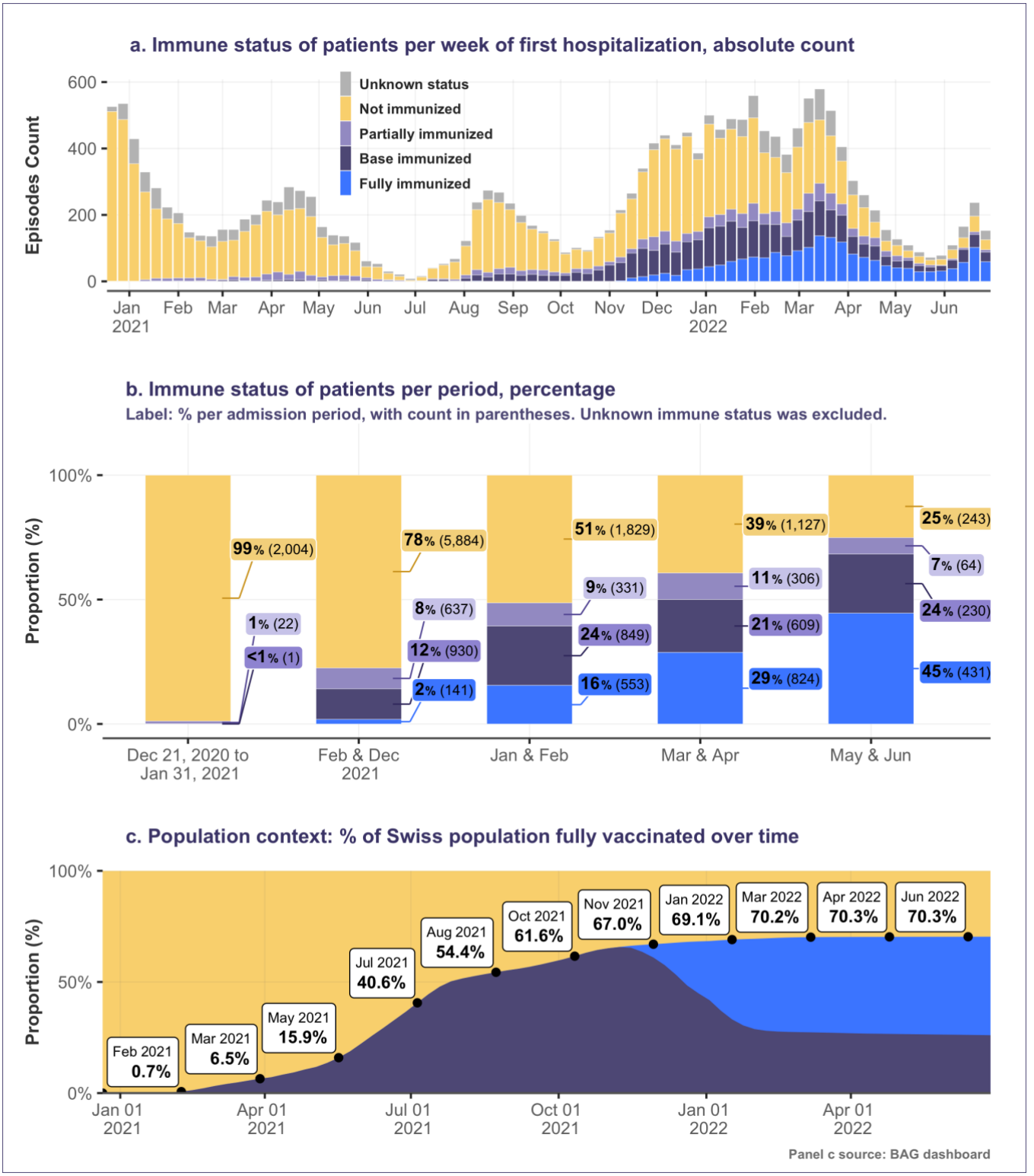

***Figure 8**: Immune status of patients and overall vaccination rate in Switzerland (exported: August 28, 2022). See glossary for definitions of immune status categories. For episodes with multiple hospitalizations, the immune status for the first hospitalization was considered. Panels a. and b. include 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 Jun 30, 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, 47% of the episodes of fully immunized patients corresponded to patients aged 80 and above (Figure **9**a, right panels). In contrast, only 18% (1,965 of 11,003) of the episodes of non-immunized patients corresponded to patients aged 80 and above (Figure **9**a, 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 March 2022 to April 2022, among the episodes of non-immunized patients aged 0 to 9 years old, 31% (351 of 1,127) concerned patients aged 0 to 9 years old and 25% (283 of 1,127) concerned patients aged 80 and above. In the most recent data, from May 2022 to June 2022, 29% (71 of 243) of non-immunized episodes involved patients aged 0 to 9 years and 28% (67 of 243) involved patients aged 80 years and above.

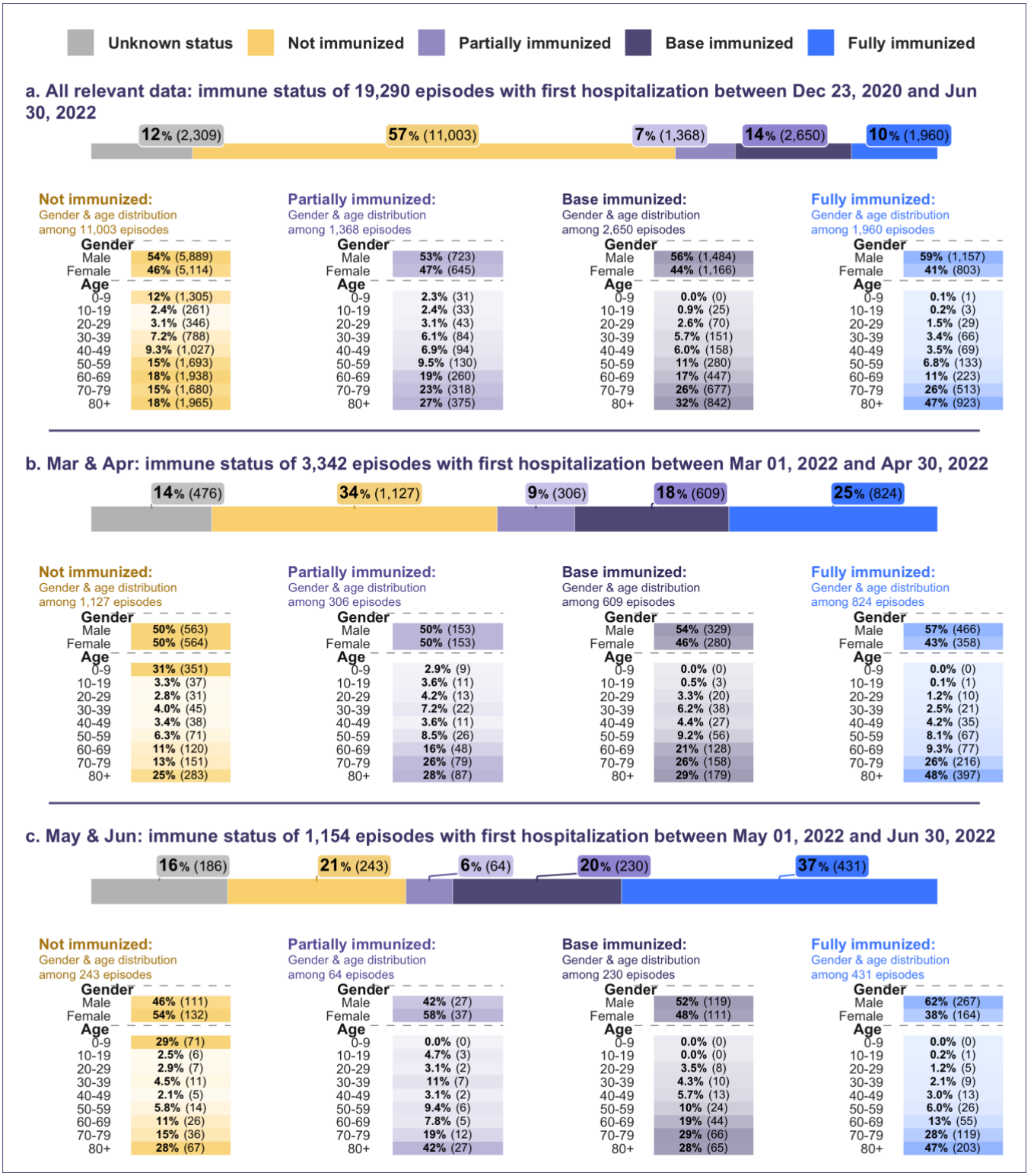

***Figure 9**: Demographic characteristics of hospitalized patients by immune status, over three different periods. Some patients may be counted more than once, as a single patient can have several episodes. Episodes with first admission date after Jun 30 2022 were excluded, as a large proportion of 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 1,601 episodes of fully immunized patients (community acquired infections), CH SUR registered 75 deaths because of COVID-19 (Figure **10**a, right panels: fully immunized). 50 of them corresponded to patients aged 80 years old and above. Over the same period, 801 episodes ended in COVID-caused deaths among non-immunized patients (Figure **10**a, left panel).

During the months of May and June, CH-SUR registered 27 deaths due to COVID-19 of which the immune status was known. Of these, 9 (33.3%) happened among non-immunized patients, 0 deaths (0%) among partially immunized patients, 6 deaths (22.2%) among base immunized patients, and 12 deaths (44.4%) 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 (21.6% CFR for non-immunized episodes compared to 6.7% for fully immunized episodes) (Figure **10**c, left and right panel). This reflects the protective effect of vaccination on the risk of death.

a. All relevant data: 1,161 deaths among 15,289 episodes with first hospitalization between Dec 23, 2020 and Jun 30, 2022

Not immunized:
Age distribution of **801** deaths in **10,195** episodes

Age	Cases	Deaths	CFR %
0-9	1234	0	0%
10-19	228	1	0.4%
20-29	306	1	0.3%
30-39	726	5	0.7%
40-49	948	13	1.4%
50-59	1585	53	3.3%
60-69	1820	134	7.4%
70-79	1567	209	13.3%
80+	1781	385	21.6%

Partially immunized:
Age distribution of **115** deaths in **1,272** episodes

Age	Cases	Deaths	CFR %
0-9	31	0	0%
10-19	29	0	0%
20-29	36	0	0%
30-39	78	0	0%
40-49	80	0	0%
50-59	117	6	5.1%
60-69	248	22	8.9%
70-79	304	29	9.5%
80+	349	58	16.6%

Base immunized:
Age distribution of **170** deaths in **2,221** episodes

Age	Cases	Deaths	CFR %
0-9	0	0	-
10-19	19	0	0%
20-29	53	0	0%
30-39	122	0	0%
40-49	132	2	1.5%
50-59	238	8	3.4%
60-69	380	19	5.0%
70-79	581	40	6.9%
80+	696	101	14.5%

Fully immunized:
Age distribution of **75** deaths in **1,601** episodes

Age	Cases	Deaths	CFR %
0-9	1	0	0%
10-19	2	0	0%
20-29	28	0	0%
30-39	51	0	0%
40-49	56	0	0%
50-59	115	0	0%
60-69	185	3	1.6%
70-79	417	22	5.3%
80+	746	50	6.7%

b. Mar & Apr: 103 deaths among 2,394 episodes with first hospitalization between Mar 01, 2022 and Apr 30, 2022

Not immunized:
Age distribution of **51** deaths in **976** episodes

Age	Cases	Deaths	CFR %
0-9	336	0	0%
10-19	31	0	0%
20-29	23	0	0%
30-39	36	0	0%
40-49	29	0	0%
50-59	59	1	1.7%
60-69	102	3	2.9%
70-79	130	17	13.1%
80+	230	30	13.0%

Partially immunized:
Age distribution of **8** deaths in **279** episodes

Age	Cases	Deaths	CFR %
0-9	9	0	0%
10-19	9	0	0%
20-29	12	0	0%
30-39	19	0	0%
40-49	8	0	0%
50-59	22	0	0%
60-69	47	0	0%
70-79	76	1	1.3%
80+	77	7	9.1%

Base immunized:
Age distribution of **16** deaths in **478** episodes

Age	Cases	Deaths	CFR %
0-9	0	0	-
10-19	2	0	0%
20-29	14	0	0%
30-39	27	0	0%
40-49	23	1	4.3%
50-59	47	2	4.3%
60-69	104	2	1.9%
70-79	129	3	2.3%
80+	132	8	6.1%

Fully immunized:
Age distribution of **28** deaths in **661** episodes

Age	Cases	Deaths	CFR %
0-9	0	0	-
10-19	1	0	0%
20-29	10	0	0%
30-39	16	0	0%
40-49	29	0	0%
50-59	60	0	0%
60-69	64	1	1.6%
70-79	169	7	4.1%
80+	312	20	6.4%

c. May & Jun: 27 deaths among 788 episodes with first hospitalization between May 01, 2022 and Jun 30, 2022

Not immunized:
Age distribution of **9** deaths in **206** episodes

Age	Cases	Deaths	CFR %
0-9	67	0	0%
10-19	4	0	0%
20-29	7	0	0%
30-39	11	0	0%
40-49	4	0	0%
50-59	14	0	0%
60-69	25	2	8.0%
70-79	29	2	6.9%
80+	45	5	11.1%

Partially immunized:
Age distribution of **0** deaths in **51** episodes

Age	Cases	Deaths	CFR %
0-9	0	0	-
10-19	2	0	0%
20-29	1	0	0%
30-39	6	0	0%
40-49	2	0	0%
50-59	6	0	0%
60-69	3	0	0%
70-79	9	0	0%
80+	22	0	0%

Base immunized:
Age distribution of **6** deaths in **186** episodes

Age	Cases	Deaths	CFR %
0-9	0	0	-
10-19	0	0	-
20-29	8	0	0%
30-39	10	0	0%
40-49	13	0	0%
50-59	17	0	0%
60-69	40	2	5.0%
70-79	48	0	0%
80+	50	4	8.0%

Fully immunized:
Age distribution of **12** deaths in **345** episodes

Age	Cases	Deaths	CFR %
0-9	0	0	-
10-19	0	0	-
20-29	5	0	0%
30-39	6	0	0%
40-49	11	0	0%
50-59	22	0	0%
60-69	48	0	0%
70-79	94	4	4.3%
80+	159	8	5.0%

***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 among episodes with community acquired infections. 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.

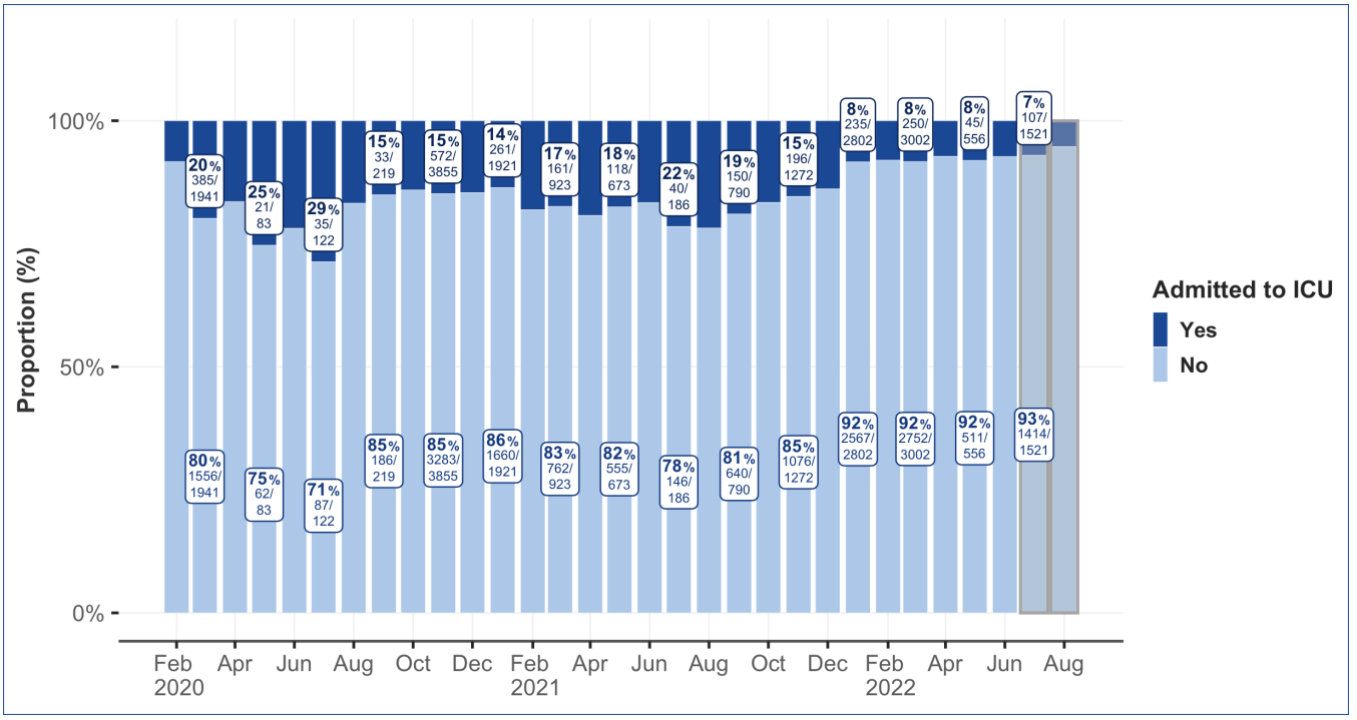

***Figure 11**: Percentage and proportion of episodes with at least one ICU admission over time. Records with incomplete data (ongoing episodes or with a pending outcome in the database) were not included. Data from the last two months (highlighted gray) are considered provisional due to data entry delays.*

5.2. ICU admission across demographic and risk groups

Over the whole period of observation, for episodes linked to community acquired infections, 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 **12**a). The 60-69 age group had the highest probability of admission to the ICU, with 23.7% (1,203 of 5,071) 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 5.3% (374 of 7,073) 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 17.4% of the episodes concerning males, compared to 10.4% of the episodes concerning females.

Episodes of patients transferred from other hospitals had a high probability of ICU admission: 50.8% of such episodes (807 of 1,589) required at least one ICU admission (Figure **12**a), compared to an overall admission rate of 16.8% for all (community acquired) episodes.

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

Figure **12**b shows the ICU admissions for the most recent period with available data (May 2022 and June 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 May and June than for the full epidemic period (Figure **12**).

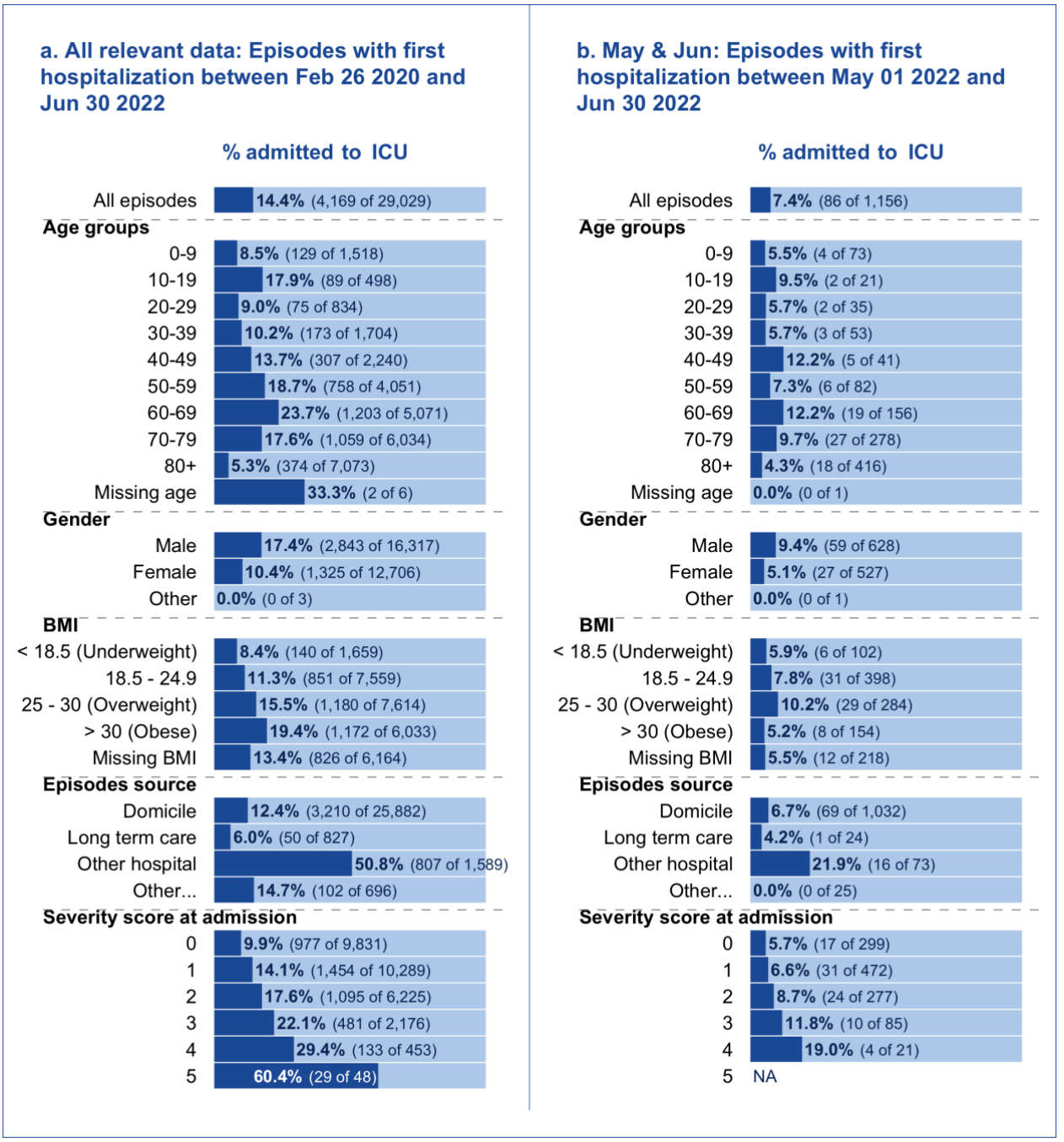

***Figure 12**: Percentage of hospitalization episodes with at least one ICU admission, grouped by demographic and risk factors, over two time intervals. For episodes with multiple hospitalizations, we considered whether they were admitted to the ICU during any of their hospitalizations. Both panels include records up to Jun 30, 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

This figure (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 May and June, 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: 2,270 ICU admissions among 15,668 episodes with first hospitalization between Dec 23, 2020 and Jun 30, 2022

Not immunized:
Age distribution of **1,729**
ICU admissions in **10,425** episodes

Age	Episodes	ICU	ICU %
0-9	1259	108	8.6%
10-19	247	51	20.6%
20-29	316	33	10.4%
30-39	749	102	13.6%
40-49	972	159	16.4%
50-59	1615	340	21.1%
60-69	1853	528	28.5%
70-79	1600	306	19.1%
80+	1814	102	5.6%

Partially immunized:
Age distribution of **147**
ICU admissions in **1,296** episodes

Age	Episodes	ICU	ICU %
0-9	31	5	16.1%
10-19	29	2	6.9%
20-29	37	2	5.4%
30-39	81	5	6.2%
40-49	85	9	10.6%
50-59	123	15	12.2%
60-69	253	54	21.3%
70-79	303	38	12.5%
80+	354	17	4.8%

Base immunized:
Age distribution of **262**
ICU admissions in **2,298** episodes

Age	Episodes	ICU	ICU %
0-9	0	0	-
10-19	19	4	21.1%
20-29	62	10	16.1%
30-39	139	10	7.2%
40-49	137	13	9.5%
50-59	247	44	17.8%
60-69	399	62	15.5%
70-79	584	83	14.2%
80+	711	36	5.1%

Fully immunized:
Age distribution of **132**
ICU admissions in **1,649** episodes

Age	Episodes	ICU	ICU %
0-9	1	0	0%
10-19	3	1	33.3%
20-29	28	3	10.7%
30-39	56	3	5.4%
40-49	59	4	6.8%
50-59	118	12	10.2%
60-69	187	33	17.6%
70-79	431	44	10.2%
80+	766	32	4.2%

b. Mar & Apr: 233 ICU admissions among 2,531 episodes with first hospitalization between Mar 01, 2022 and Apr 30, 2022

Not immunized:
Age distribution of **106**
ICU admissions in **1,028** episodes

Age	Episodes	ICU	ICU %
0-9	341	34	10.0%
10-19	34	6	17.6%
20-29	27	0	0%
30-39	41	3	7.3%
40-49	34	4	11.8%
50-59	64	11	17.2%
60-69	107	19	17.8%
70-79	140	20	14.3%
80+	240	9	3.8%

Partially immunized:
Age distribution of **18**
ICU admissions in **288** episodes

Age	Episodes	ICU	ICU %
0-9	9	1	11.1%
10-19	8	1	12.5%
20-29	12	0	0%
30-39	21	0	0%
40-49	11	1	9.1%
50-59	24	1	4.2%
60-69	47	7	14.9%
70-79	76	3	3.9%
80+	80	4	5.0%

Base immunized:
Age distribution of **55**
ICU admissions in **521** episodes

Age	Episodes	ICU	ICU %
0-9	0	0	-
10-19	2	0	0%
20-29	18	4	22.2%
30-39	34	1	2.9%
40-49	24	3	12.5%
50-59	51	12	23.5%
60-69	113	12	10.6%
70-79	133	17	12.8%
80+	146	6	4.1%

Fully immunized:
Age distribution of **54**
ICU admissions in **694** episodes

Age	Episodes	ICU	ICU %
0-9	0	0	-
10-19	1	0	0%
20-29	10	3	30.0%
30-39	18	0	0%
40-49	30	1	3.3%
50-59	64	7	10.9%
60-69	68	9	13.2%
70-79	178	18	10.1%
80+	325	16	4.9%

c. May & Jun: 71 ICU admissions among 805 episodes with first hospitalization between May 01, 2022 and Jun 30, 2022

Not immunized:
Age distribution of **14**
ICU admissions in **212** episodes

Age	Episodes	ICU	ICU %
0-9	67	4	6.0%
10-19	5	1	20.0%
20-29	7	0	0%
30-39	11	0	0%
40-49	4	0	0%
50-59	14	1	7.1%
60-69	24	4	16.7%
70-79	30	3	10.0%
80+	50	1	2.0%

Partially immunized:
Age distribution of **4**
ICU admissions in **53** episodes

Age	Episodes	ICU	ICU %
0-9	0	0	-
10-19	2	0	0%
20-29	1	0	0%
30-39	6	1	16.7%
40-49	2	0	0%
50-59	6	0	0%
60-69	5	1	20.0%
70-79	9	0	0%
80+	22	2	9.1%

Base immunized:
Age distribution of **26**
ICU admissions in **189** episodes

Age	Episodes	ICU	ICU %
0-9	0	0	-
10-19	0	0	-
20-29	8	1	12.5%
30-39	10	1	10.0%
40-49	13	1	7.7%
50-59	16	2	12.5%
60-69	42	7	16.7%
70-79	48	10	20.8%
80+	52	4	7.7%

Fully immunized:
Age distribution of **27**
ICU admissions in **351** episodes

Age	Episodes	ICU	ICU %
0-9	0	0	-
10-19	1	1	100.0%
20-29	5	0	0%
30-39	6	0	0%
40-49	12	2	16.7%
50-59	20	2	10.0%
60-69	45	6	13.3%
70-79	97	9	9.3%
80+	165	7	4.2%

***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, missing gender, or missing 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 July and August 2022 are not meaningful due to their incompleteness and are therefore not yet shown.

In both periods considered, the largest group of (community acquired) episodes with an ICU admission concerned non-immunized patients (41% and 16% 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 Mar 2022 and Jun 2022 around 91% 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 55.5% (Mar, Apr) and 64.2% (May, Jun) 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 Jun 30, 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 immunosupression [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 66.6% for men and 70.5% 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

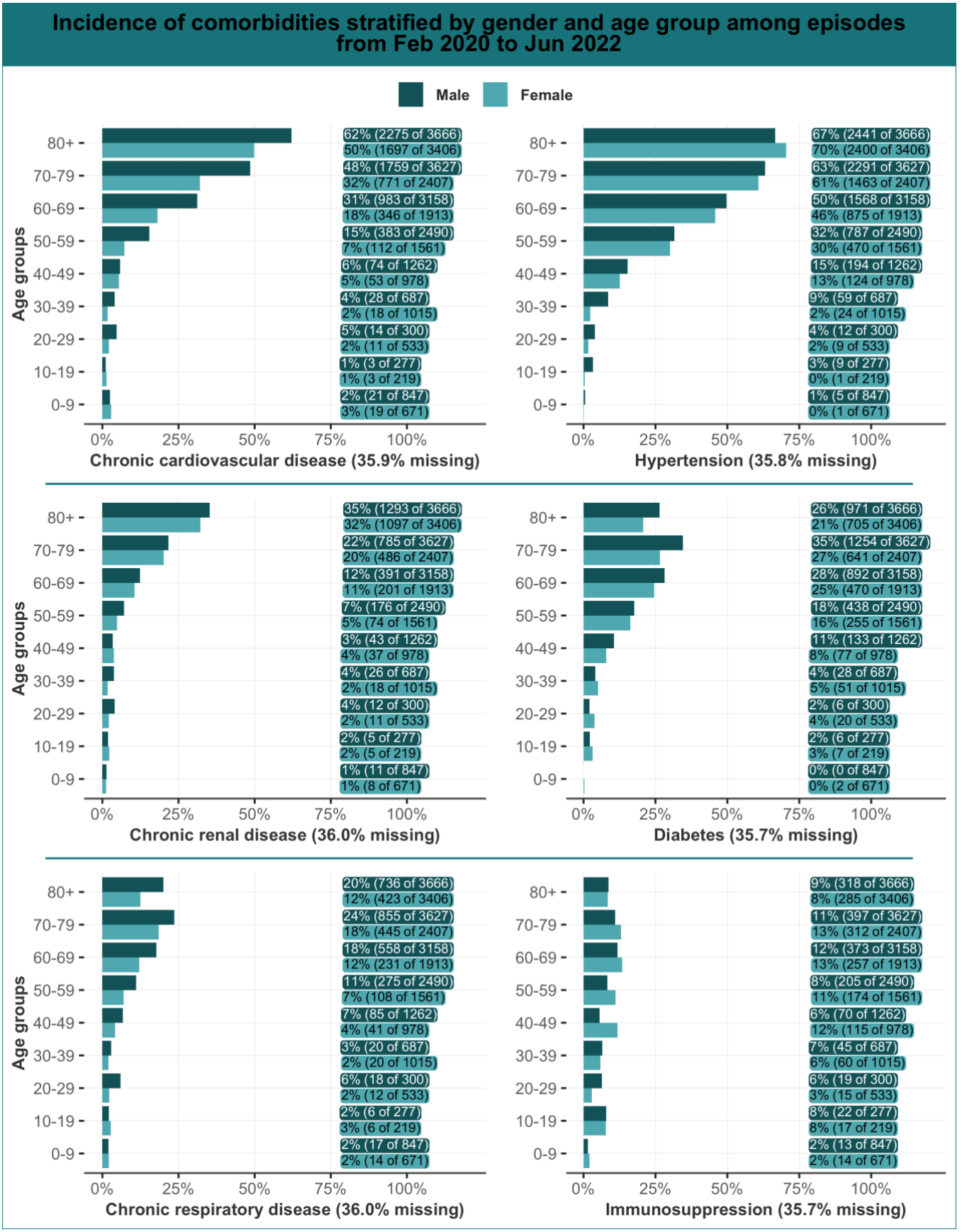

***Figure 15**: Comorbidities incidence stratified by age group and by gender.Records with incomplete data for age or gender were not included. Data from the last two months was excluded due to potential data delay.*

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 **16**c). In recent months, this proportion rose since August 2021, accounting for 13.8% of the pisodes registered in CH-SUR over the month of December 2021, 19.0% in January 2022, 19.1% in March 2022, 20.3% in April 2022, and 29.8% 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.

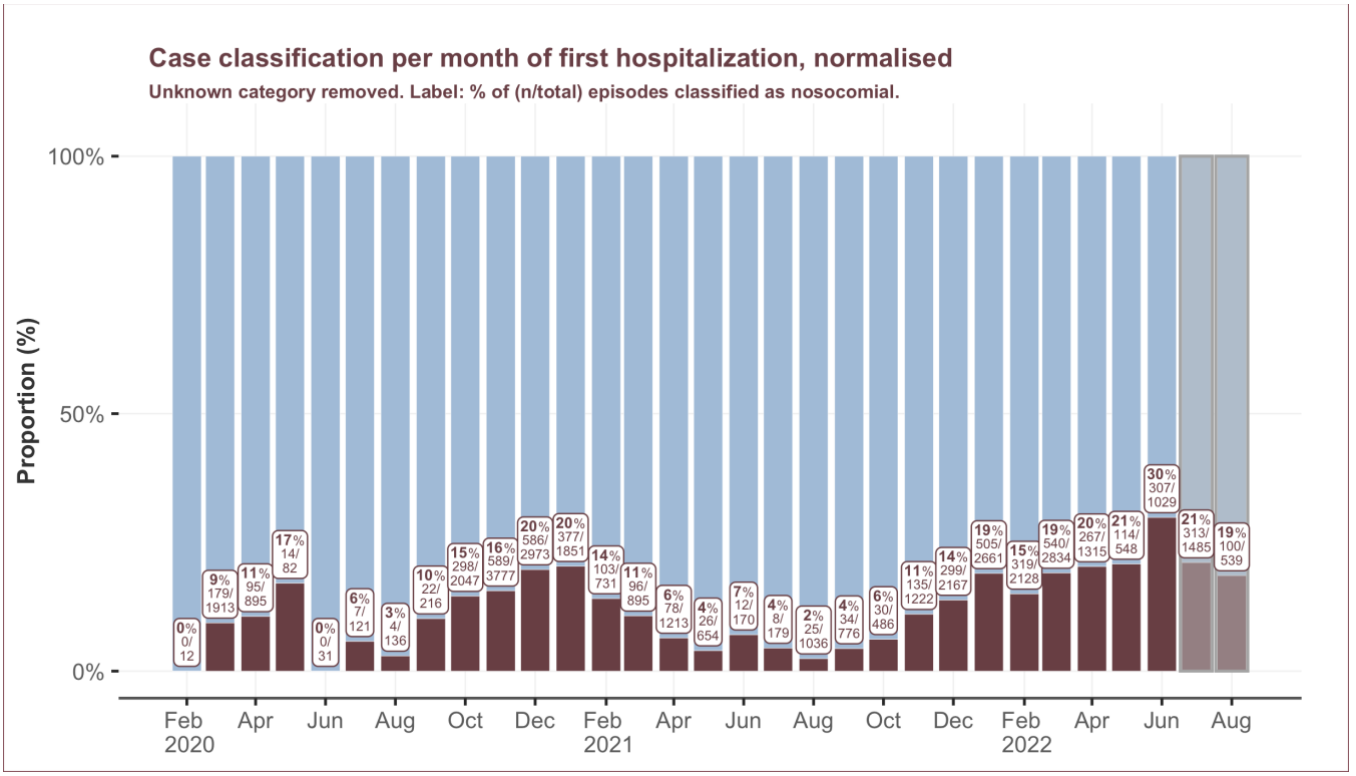

***Figure 16**: Classification (infection source) of hospitalization episodes over time. Data from the last two months (highlighted gray) are considered provisional due to data entry delays.*

Over the full course of the epidemic, the nosocomial infections affected principally an elderly population, with patients aged 80 years and above, accounting for 2,582 (47%) of the nosocomial episodes. In comparison, 7,672 (25%) of episodes with community acquired infections corresponded to patients aged 80 years and above. Possibly linked to this demographic characteristic, there were proportionally more deaths among the nosocomial compared to the community acquired episodes: 738 (13%) vs 2,568 (8.4%). (Figure **17**)

ICU admissions were slightly less common among episodes of patients with nosocomial infections, when compared to community-acquired infections (Figure **17**). Another noteworthy difference lies in the treatments administered. During community acquired episodes a corticosteroid treatment was administered more frequently than during nosocomial episodes: the treatment was administered in 11,305 (37%) episodes with community acquired infection and in 1,164 (21%) nosocomial episodes.

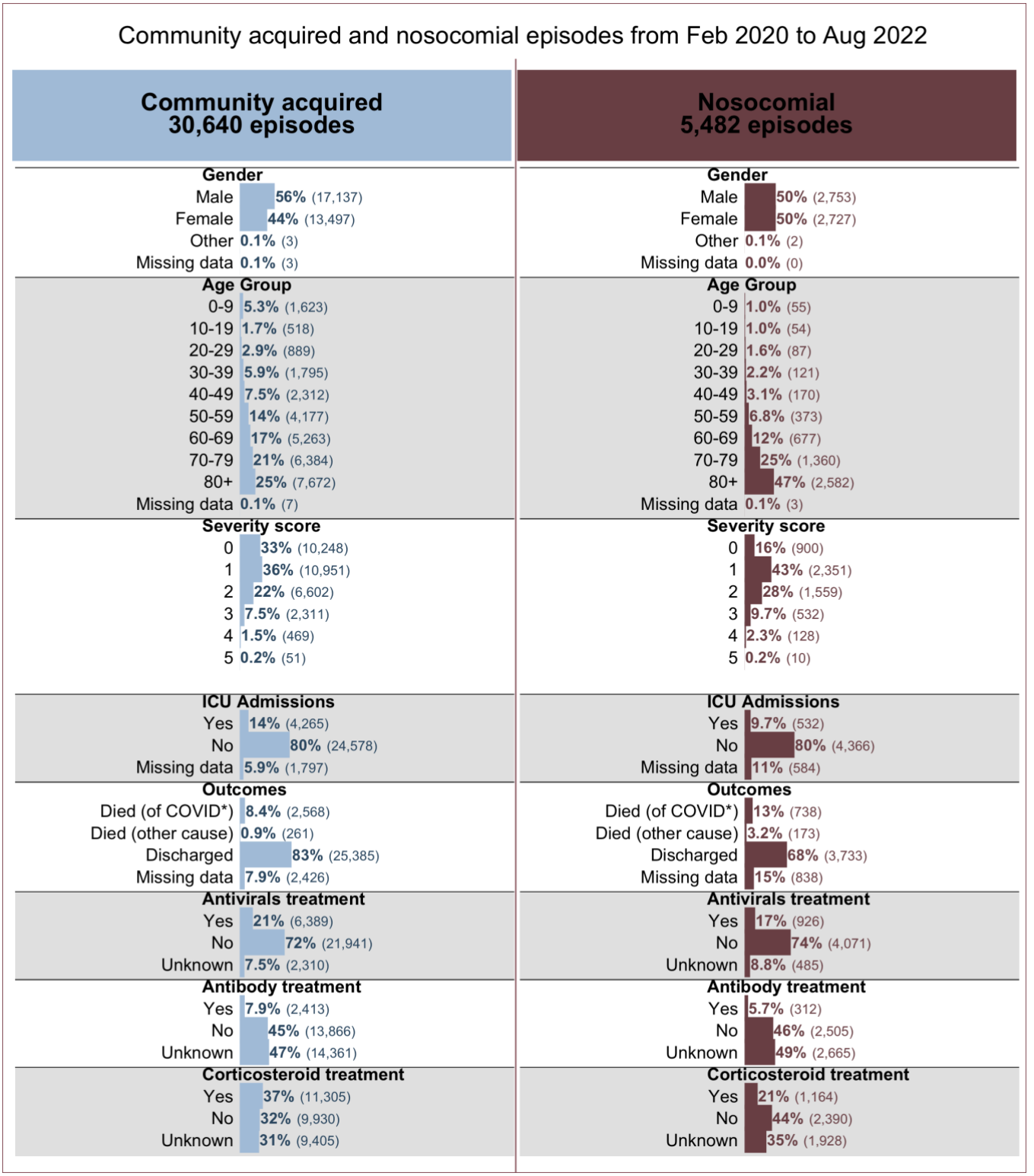

***Figure 17**: Case classification (infection source) of hospitalization episodes Comparison of community acquired and nosocomial cases by demographics, severity score, ICU, outcomes and treatments.*

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 hospitalisation 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*:

1. 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).

2. 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:

1. his/her domicile

2. a long term care facility
3. another hospital
4. another institution not participating in the CH SUR surveillance
5. a rehabilitation establishment
6. 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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