COVID-19 Hospital Based Sentinel Surveillance Report

Data status: May 23, 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, 20 hospitals are actively participating, including most cantonal and university hospitals, which cover a large proportion of paediatric 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 May 22, 2022, data were collected from 33,466 episodes of hospitalization. During the same period, 52,976 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 63.2% of all hospitalizations related to SARS-CoV-2 reported in Switzerland.

Since March 2022 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 13.8% (4,631 of 33,466) while episodes linked to community acquired infections accounted for 82.6% (27,655 of 33,466) (Figure **1**). 3.5% 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, 14.6% included an ICU stay (3,862 of 24,585 episodes, February 26, 2020 to March 31, 2022) and 9.5% resulted in death of COVID-19 (2,339 of 24,585 episodes, February 26, 2020 to May 22, 2022).

During the latest period for which enough data is available (Feb 01, 2022 to Mar 31, 2022), 3,805 community acquired episodes were registered. Of these, 1,337 (35.1%) concerned non-immunized and 1,498 (39.4%) fully immunized patients (base immunized with or without booster)(Figure **2**). During the same period, 231 episodes included an ICU stay. Of these, 100 (43.3%) concerned non-immunized and 93 (40.3%) fully

immunized patients. 96 episodes resulted in death of COVID-19 (2.5% of all registered episodes with known outcome), 45 of them were among non-immunized patients and 33 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.

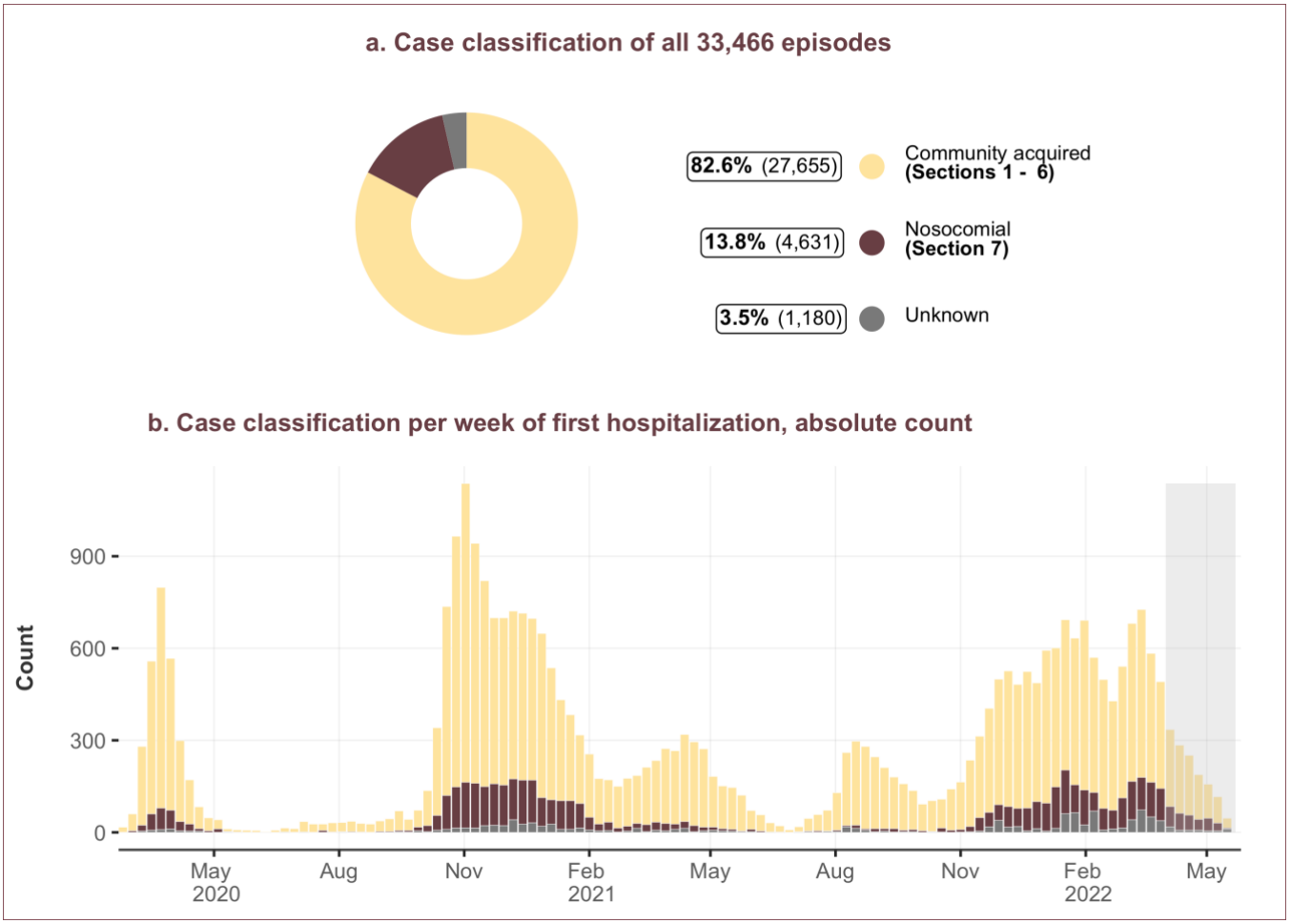

***Figure 1**: Case classification (infection source) of the episodes. Proportion (normalized in %) of episodes by infection source (panel a) and the absolute count of episodes over time (panel b). For episodes with multiple hospitalizations, the case classification of the first hospitalization was considered.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

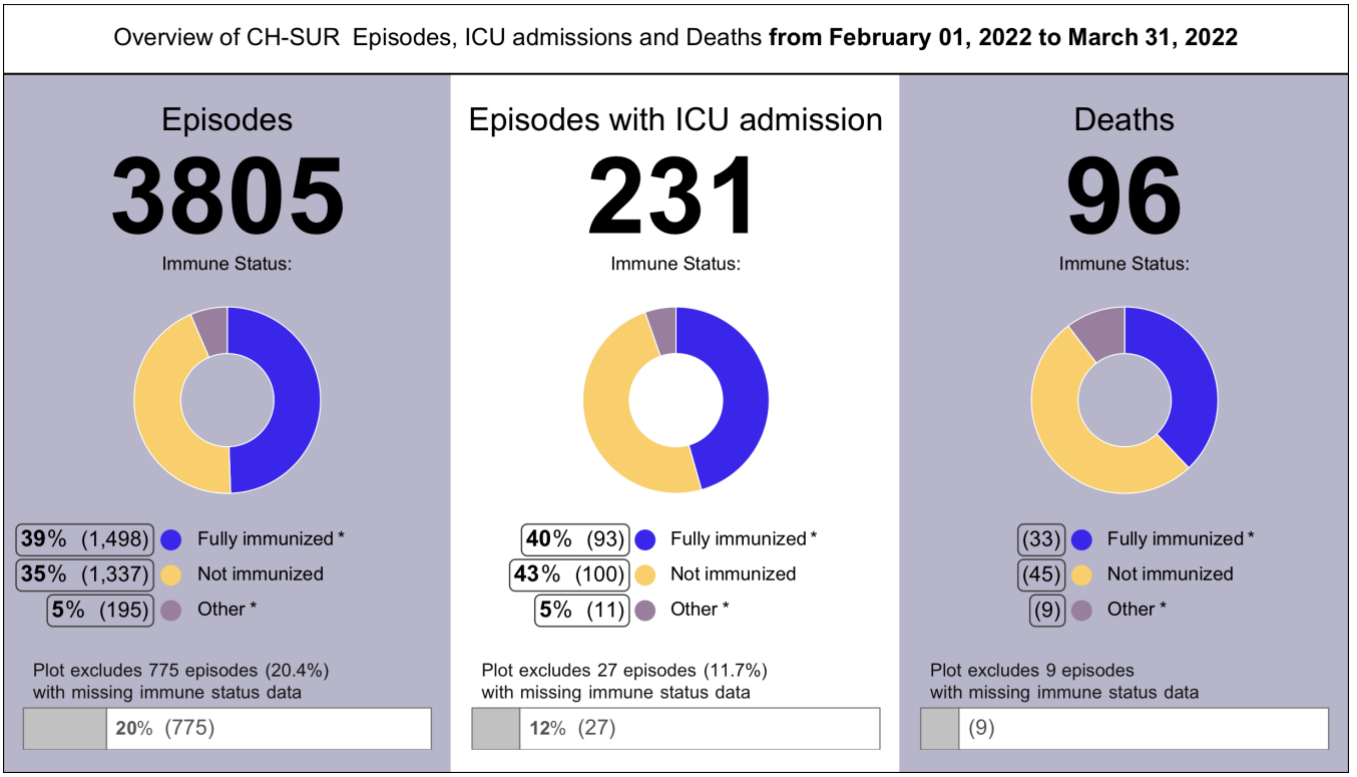

***Figure 2**: Overview information of the most recent data on episodes of hospitalization linked to community acquired infections. Data from the last two months are considered provisional due to data entry delays hence they have been omitted. (* Fully immunized: patients with a base immunization and those with a booster. Other: partially immunized patients and those recovered from a previous SARS-CoV-2 infection.)*

2. Hospitalizations and demographic characteristics

Between the start of the epidemic in Switzerland and May 22, 2022 and among the 20 hospitals actively participating in CH-SUR, 27,655 episodes of community acquired infections were registered, accounting for a total of 28,685 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**.

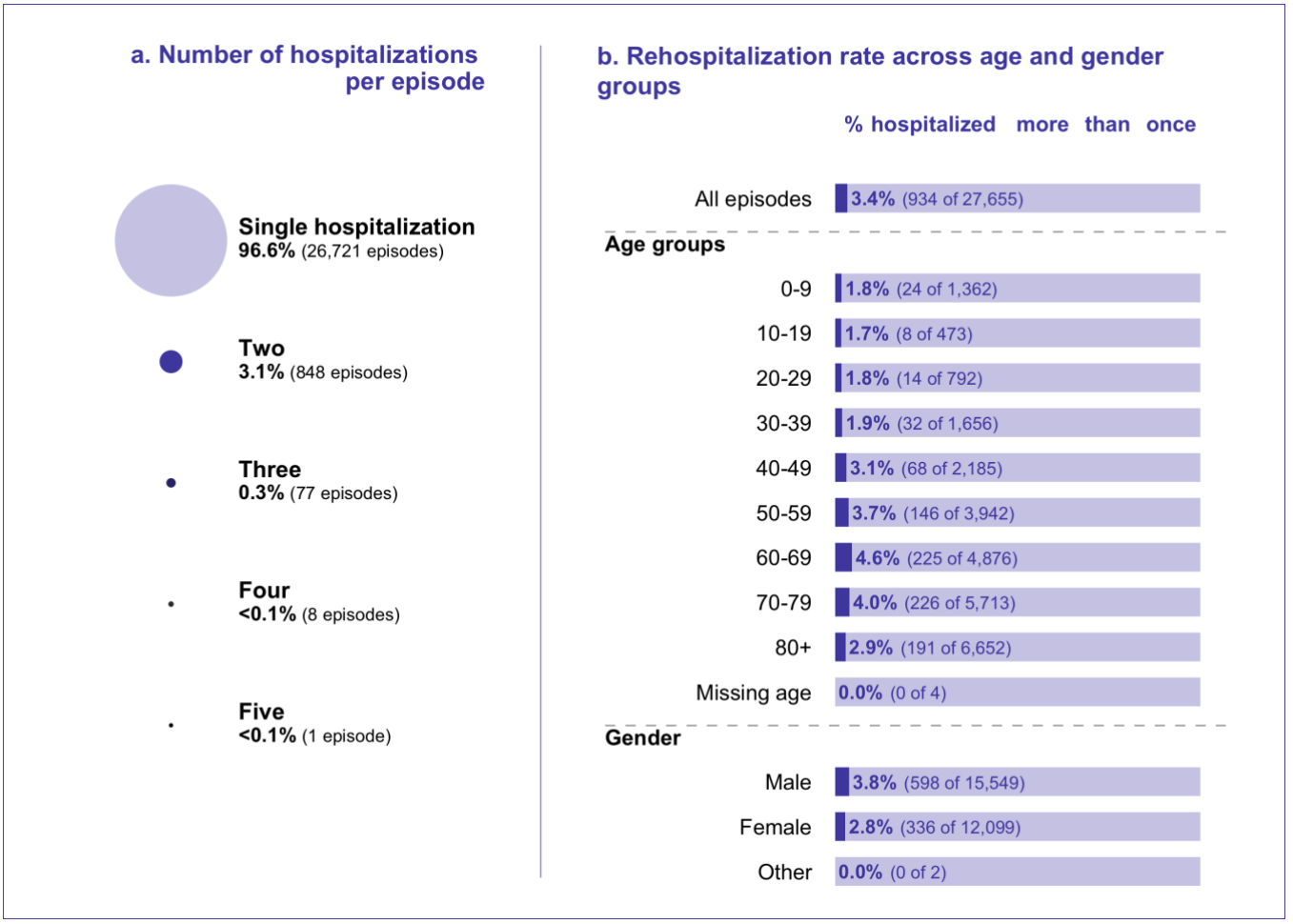

***Figure 3**: Hospitalizations per episode of hospitalization and rehospitalization rate across demographic groups. Includes records between March 2020 and May 22, 2022.*

Most patients (96.6% [26,721 of 27,655]) were hospitalized only once during an episode, while 3% of the registered episodes (933 of 27,655) 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% (934 of 27,655) (Figure **3**c). The 60-69 age group and the 70-79 age group had the highest rate of rehospitalization at respectively 4.6% (225 of 4,876) and 4.0% (226 of 5,713). Men had a higher rehospitalization rate than women, 3.8% (598 of 15,549) vs 2.8% (336 of 12,099) respectively.

Among all episodes with community acquired infections, the majority (56.2% [15,549 of 27,655]) 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 (24.0% [6,652]).

Figures **4**c and **4**d 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 episodes

concerning patients aged 50 and above was notably high between October 2020 and January 2021, with a peak in November 2020: 88.3% (2,813 of 3,186) 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 75.3% (816 of 1,084) in November 2021.

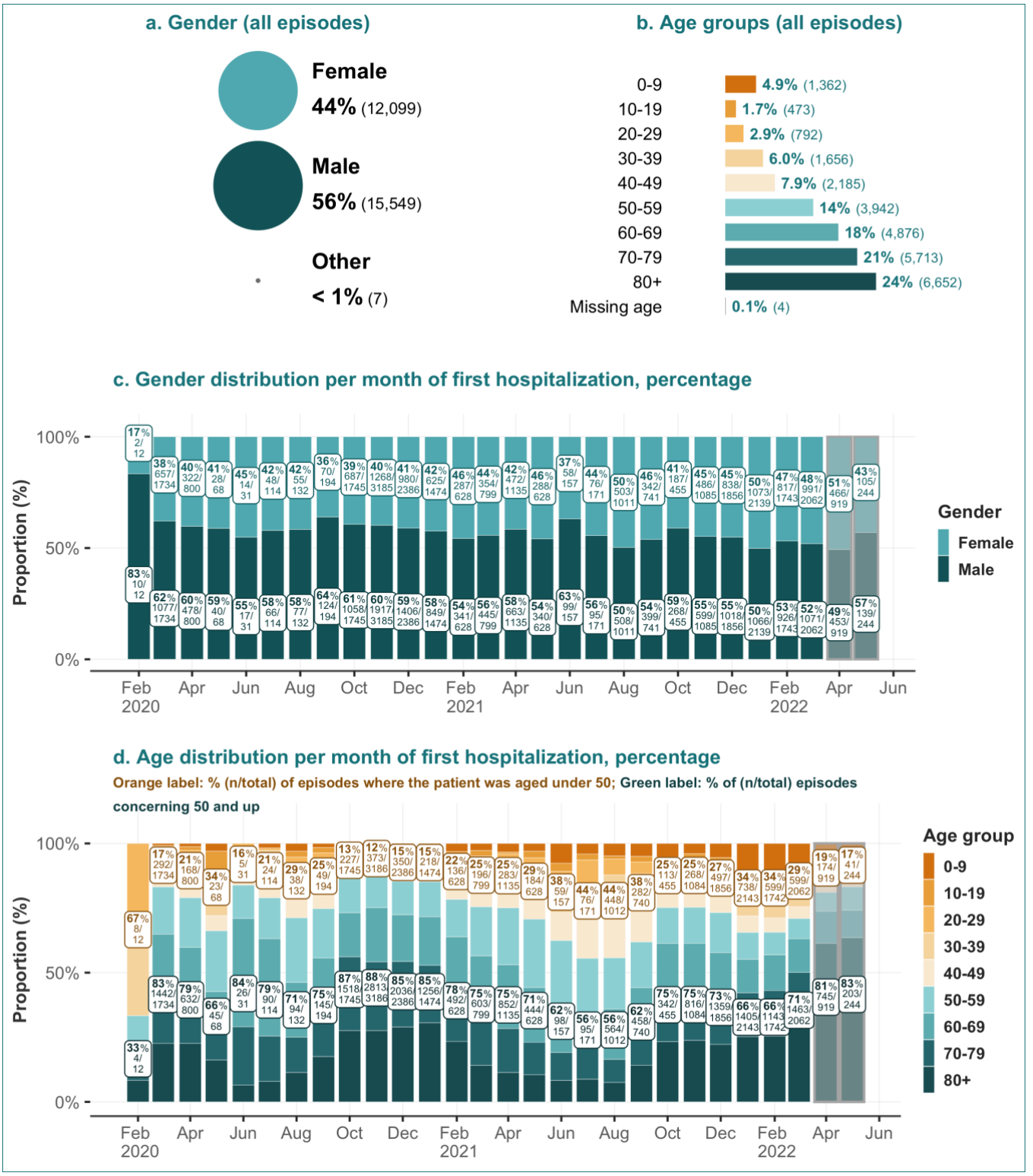

***Figure 4**: Demographic characteristics: gender and age distribution of admitted hospitalized patients, overall and per month. For episodes with multiple hospitalizations, the admission date of the first hospitalization was used.*

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). This determination of whether a patient died of COVID or another cause was done by a medical doctor at the hospital for each CH-SUR-participating center. 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.

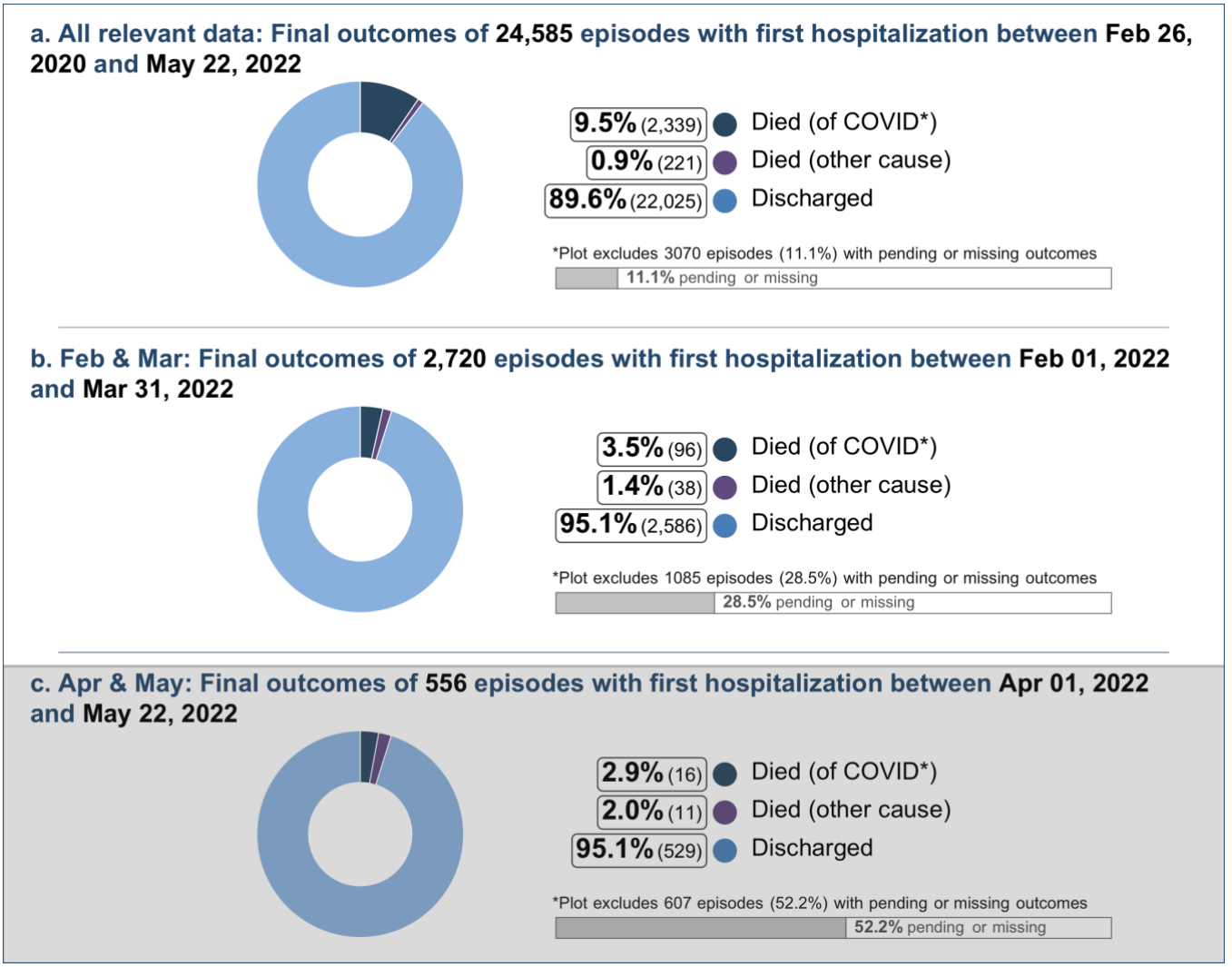

***Figure 5**: Outcomes for COVID-19 related episodes of hospitalization in CH-SUR hospitals. Includes records up to May 22, 2022. For episodes with multiple hospitalizations, only the final outcome is considered. Patients where the cause of death was not certain, but there was a COVID-19 diagnosis (in 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 2,372) 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 12.4% (53 of 429) 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% (955 of 2,386) of the admissions in that period.

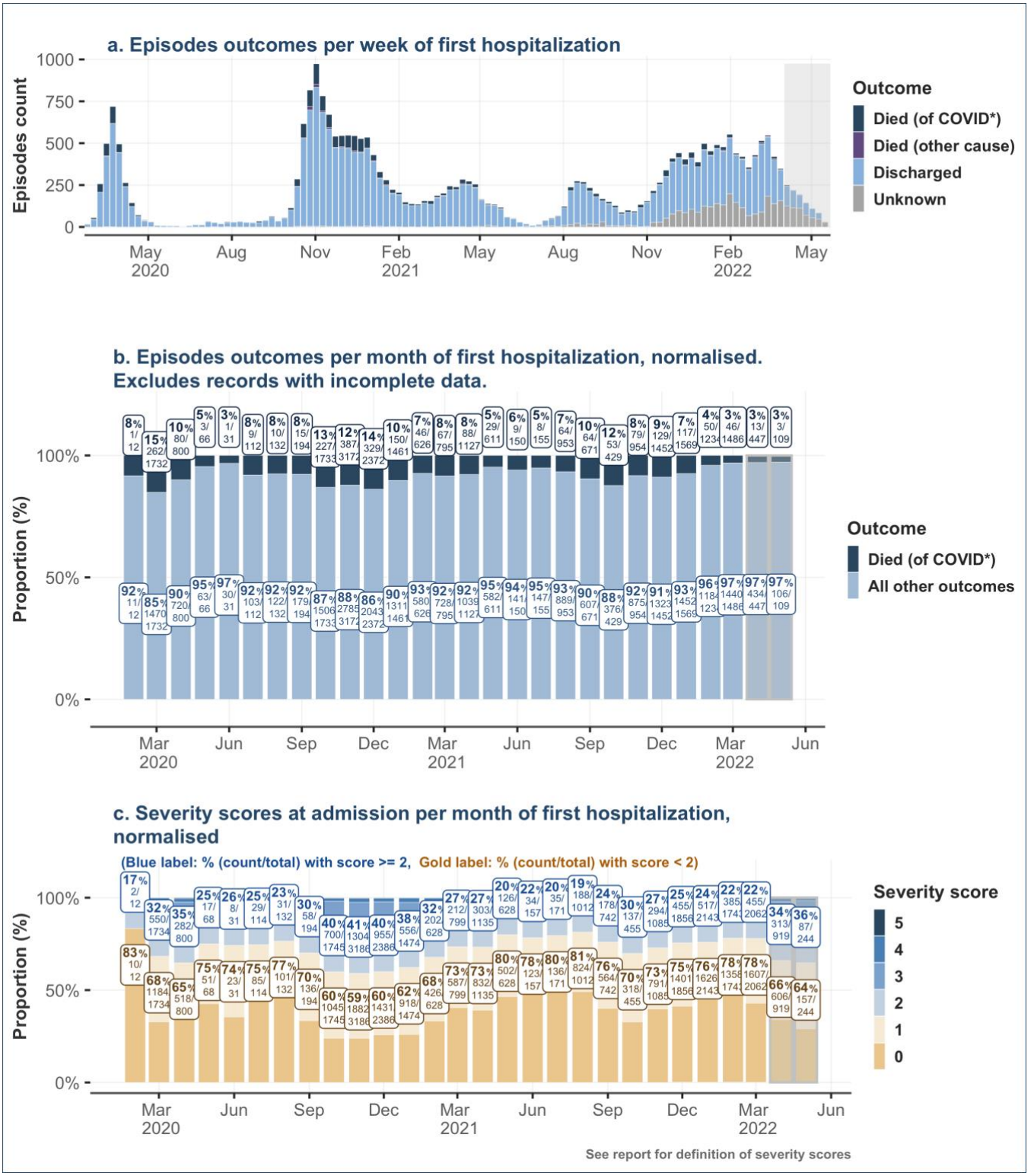

***Figure 6**: Epidemic curve, episodes' outcomes and severity scores at admission for COVID-19 hospitalizations over time. Includes records up to May 22, 2022. Data from the two last months (highlighted in gray) are considered provisional due to data entry delays. Episodes where the cause of death was 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 March 31, 2022, the case fatality rate (CFR) for episodes with community acquired infections increased with increasing age, from 0% (0 of 1,187) in episodes of patients aged 0-9, to 3.3% (116 of 3,551) in episodes of patients aged 50-59, and to 21.5% (1,189 of 5,518) in episodes of patients aged 80+. CFR% was greater in men than in women: 11.2% (1,530 of 13,685) vs 7.7% (793 of 10,340) respectively. In addition, the CFR% was greater for episodes with higher severity scores at admission: 1.1% (89 of 8,277) 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.

The overall CFR% of the most recent period for which enough data is available (months February and March 2022, Figure **7**b) was lower than the CFR% of the whole epidemic period (3.5% vs. 9.7%). 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.

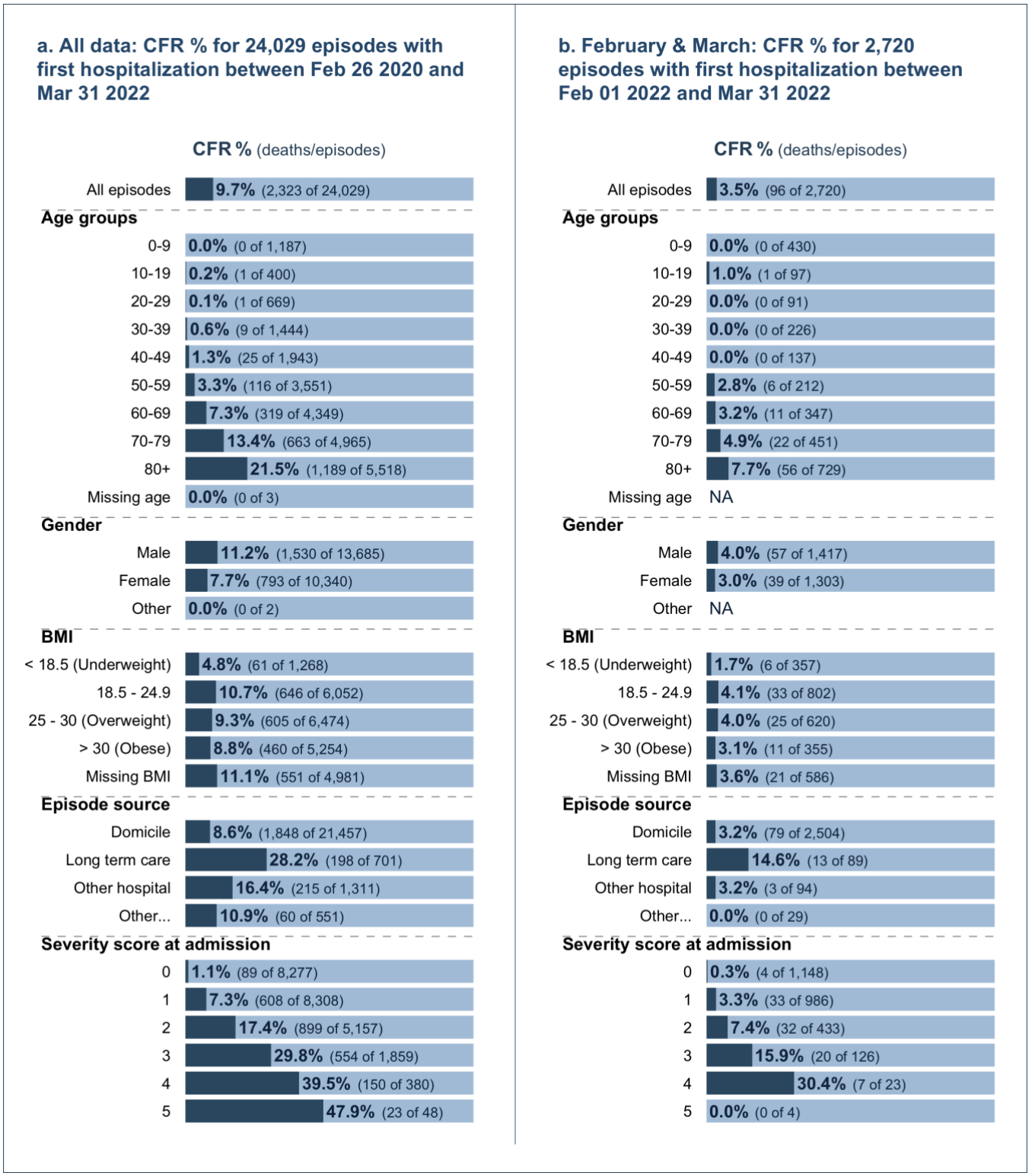

***Figure 7**: Case fatality rate (CFR) % among demographic and risk groups: percentage of hospitalization episodes in different demographic groups, which ended in the death of the patient of COVID-19 in hospital. Both figures include records up to Mar 31 2022 but records with incomplete data (ongoing 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 (combination category of base immunized and boosted) 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 whole Swiss population that is fully vaccinated (Figure**8**c, source: FOPH Dashboard).

During the months of February and March 2022, when between 69.8% and 70.2% of the Swiss population was fully vaccinated (Figure **8**c), the base immunized and boosted made up only a minority (18.8% and 30.6% respectively) of the episodes recorded in CH-SUR (Figure **8**b), suggesting protection against hospitalization (and, consequently, death) due to COVID-19.

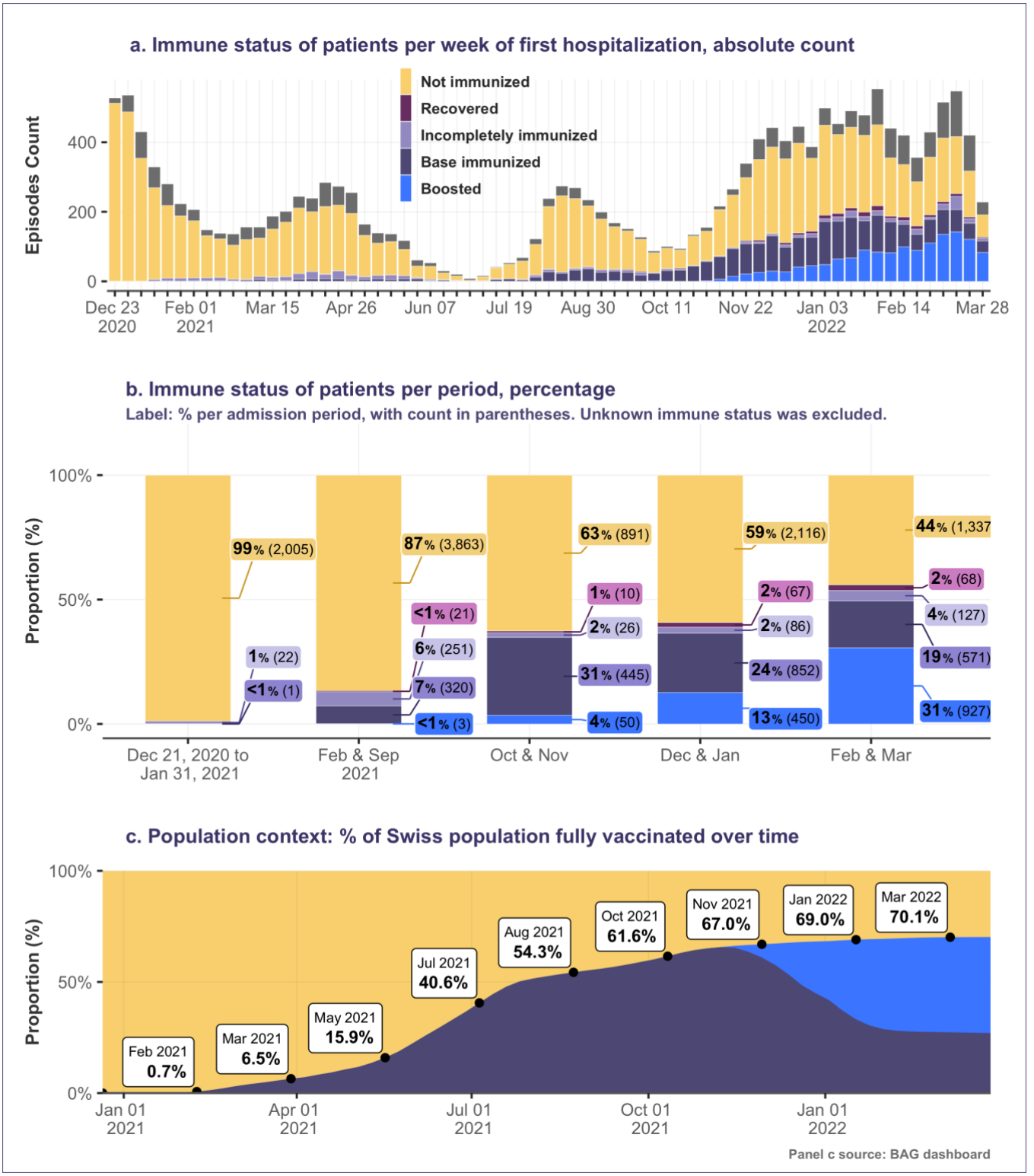

***Figure 8**: Immune status of patients and overall vaccination rate in Switzerland (exported: May 22, 2022). See glossary for definitions of immune status categories. For episodes with multiple hospitalizations, the immune status for the first hospitalization was considered. Panels a. and b. include 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 Mar 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, 35.9% (1,301 of 3,620) of the episodes of fully immunized patients corresponded to patients aged 80 and above (Figure **9**a, right panels). In contrast, only 17% (1,712 of 10,041) of the episodes of non-immunized patients corresponded to patients aged 80 and above (Figure **9**a, 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.

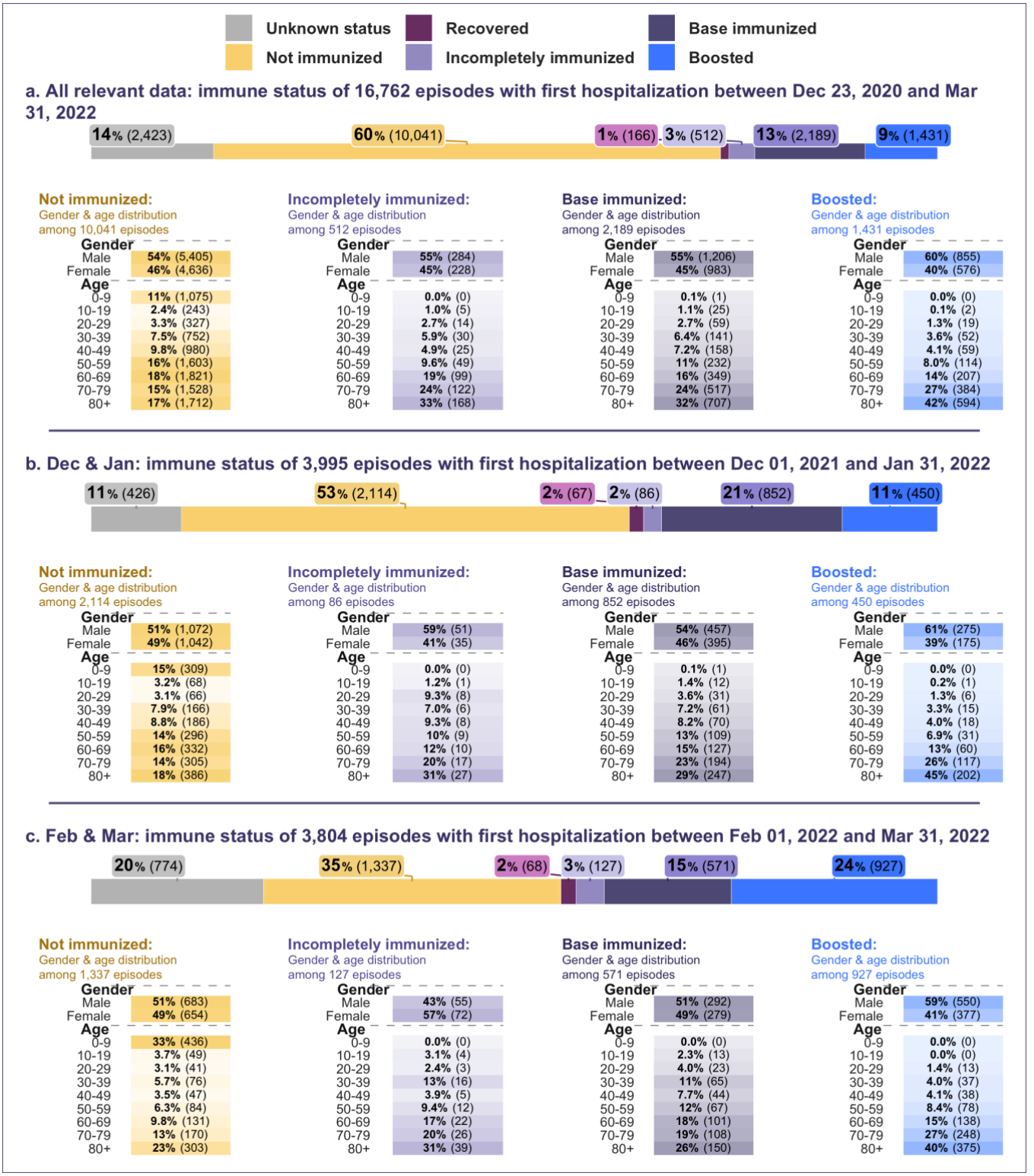

***Figure 9**: Demographic characteristics of hospitalized patients by immune status, over three different periods. Some patients may be counted more than once, as a single patient can have several episodes. Episodes with first admission date after Mar 31 2022 were excluded, as a large proportion of 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 2,881 episodes of fully immunized patients (community acquired infections), CH SUR registered 200 deaths because of COVID-19 (Figure **10**a, right panels: base immunized and boosted). 115 of them corresponded to patients aged 80 years old and above. Over the same period, 695 episodes ended in COVID-caused deaths among non-immunized patients (Figure **10**a, left panel).

During the months of February and March, CH-SUR registered 84 deaths due to COVID-19 of which the immune status was known. Of these, 45 (53.6%) happened among non-immunized patients, 6 deaths (7.1%) among partially immunized patients, and 33 deaths (39.3%) among fully immunized patients (Figure **10**). Despite representing a smaller share of the population (Figure **8**c), the non-immunized population's death toll represents a larger portion in CH-SUR (Figure **10**c). Figure **10**c excludes 9 deaths of which the immune status was unknown and 3 deaths 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 **10**c, 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. Moreover, in the latest period, boosted patients have a substantially lower CFR across all age groups.

a. All relevant data: 956 deaths among 12,482 episodes with first hospitalization between Dec 23, 2020 and Mar 31, 2022

Not immunized:
Age distribution of **695** deaths in **9,118** episodes

Age	Cases	Deaths	CFR %
0-9	980	0	0%
10-19	209	1	0.5%
20-29	285	1	0.4%
30-39	685	5	0.7%
40-49	897	13	1.4%
50-59	1475	49	3.3%
60-69	1679	124	7.4%
70-79	1390	181	13.0%
80+	1518	321	21.1%

Incompletely immunized:
Age distribution of **61** deaths in **483** episodes

Age	Cases	Deaths	CFR %
0-9	0	0	-
10-19	4	0	0%
20-29	13	0	0%
30-39	26	0	0%
40-49	22	0	0%
50-59	43	3	7.0%
60-69	96	10	10.4%
70-79	118	17	14.4%
80+	161	31	19.3%

Base immunized:
Age distribution of **139** deaths in **1,787** episodes

Age	Cases	Deaths	CFR %
0-9	0	0	-
10-19	18	0	0%
20-29	40	0	0%
30-39	114	0	0%
40-49	123	1	0.8%
50-59	193	8	4.1%
60-69	287	20	7.0%
70-79	433	32	7.4%
80+	579	78	13.5%

Boosted:
Age distribution of **61** deaths in **1,094** episodes

Age	Cases	Deaths	CFR %
0-9	0	0	-
10-19	2	0	0%
20-29	15	0	0%
30-39	38	0	0%
40-49	47	0	0%
50-59	85	1	1.2%
60-69	158	6	3.8%
70-79	293	17	5.8%
80+	456	37	8.1%

b. Dec & Jan: 240 deaths among 2,793 episodes with first hospitalization between Dec 01, 2021 and Jan 31, 2022

Not immunized:
Age distribution of **153** deaths in **1,688** episodes

Age	Cases	Deaths	CFR %
0-9	260	0	0%
10-19	48	0	0%
20-29	46	0	0%
30-39	130	4	3.1%
40-49	151	3	2.0%
50-59	243	13	5.3%
60-69	270	28	10.4%
70-79	241	32	13.3%
80+	299	73	24.4%

Incompletely immunized:
Age distribution of **9** deaths in **78** episodes

Age	Cases	Deaths	CFR %
0-9	0	0	-
10-19	1	0	0%
20-29	7	0	0%
30-39	6	0	0%
40-49	8	0	0%
50-59	8	0	0%
60-69	9	1	11.1%
70-79	16	3	18.8%
80+	23	5	21.7%

Base immunized:
Age distribution of **47** deaths in **665** episodes

Age	Cases	Deaths	CFR %
0-9	0	0	-
10-19	8	0	0%
20-29	20	0	0%
30-39	50	0	0%
40-49	52	1	1.9%
50-59	92	5	5.4%
60-69	99	8	8.1%
70-79	159	8	5.0%
80+	185	25	13.5%

Boosted:
Age distribution of **31** deaths in **362** episodes

Age	Cases	Deaths	CFR %
0-9	0	0	-
10-19	1	0	0%
20-29	6	0	0%
30-39	11	0	0%
40-49	15	0	0%
50-59	22	1	4.5%
60-69	47	2	4.3%
70-79	101	10	9.9%
80+	159	18	11.3%

c. Feb & Mar: 84 deaths among 2,264 episodes with first hospitalization between Feb 01, 2022 and Mar 31, 2022

Not immunized:
Age distribution of **45** deaths in **1,050** episodes

Age	Cases	Deaths	CFR %
0-9	400	0	0%
10-19	40	1	2.5%
20-29	29	0	0%
30-39	65	0	0%
40-49	37	0	0%
50-59	56	2	3.6%
60-69	92	4	4.3%
70-79	114	11	9.6%
80+	217	27	12.4%

Incompletely immunized:
Age distribution of **6** deaths in **113** episodes

Age	Cases	Deaths	CFR %
0-9	0	0	-
10-19	3	0	0%
20-29	3	0	0%
30-39	13	0	0%
40-49	3	0	0%
50-59	10	0	0%
60-69	21	1	4.8%
70-79	23	1	4.3%
80+	37	4	10.8%

Base immunized:
Age distribution of **9** deaths in **418** episodes

Age	Cases	Deaths	CFR %
0-9	0	0	-
10-19	10	0	0%
20-29	16	0	0%
30-39	49	0	0%
40-49	33	0	0%
50-59	49	1	2.0%
60-69	72	2	2.8%
70-79	74	3	4.1%
80+	115	3	2.6%

Boosted:
Age distribution of **24** deaths in **683** episodes

Age	Cases	Deaths	CFR %
0-9	0	0	-
10-19	0	0	-
20-29	9	0	0%
30-39	27	0	0%
40-49	30	0	0%
50-59	58	0	0%
60-69	103	3	2.9%
70-79	174	4	2.3%
80+	282	17	6.0%

***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, boosted, incompletely immunized or not immunized. Episodes with missing age, missing gender, or missing as well as recovered immune status 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 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, 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 **11**a). The 60-69 age group had the highest probability of admission to the ICU, with 23.9% (1,131 of 4,736) 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 5.2% (322 of 6,201) 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 17.6% of the episodes concerning males, compared to 10.7% of the episodes concerning females.

Episodes of patients transferred from other hospitals had a high probability of ICU admission: 52.6% of such episodes (757 of 1,438) required at least one ICU admission (Figure **11**a), compared to an overall admission rate of 17.1% for all (community acquired) episodes.

ICU admission probability also increased slightly with increasing BMI and steeply with increasing admission severity scores (Figure **11**a).

Figure **11**b shows the ICU admissions for the most recent period with available data (February 2022 and March 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 February and March than for the full epidemic period (Figure **11**).

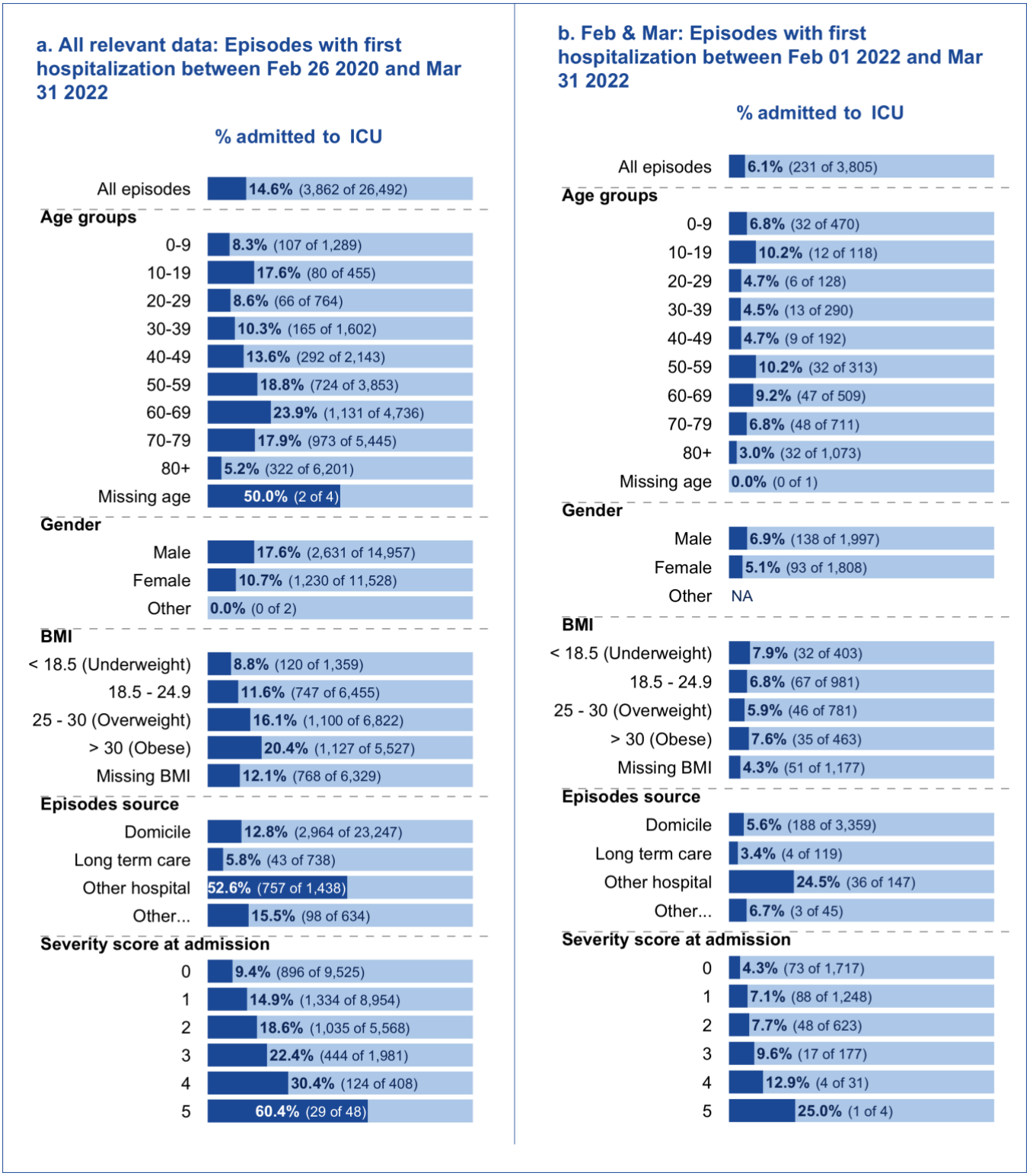

***Figure 11**: Percentage of hospitalization episodes with at least one ICU admission, grouped by demographic and risk factors, over two time intervals. For episodes with multiple hospitalizations, we considered whether they were admitted to the ICU during any of their hospitalizations. Both panels include records up to Mar 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.*

5.2. ICU admission by immune status

Due to a variance in vaccine coverage, only the recent evolution is represented. Data for April and May 2022 are not meaningful due to their incompleteness and are therefore not yet released.

In both periods considered, the majority of (community acquired) episodes with an ICU admission concerned non-immunized patients (69% and 43% 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 **12**).

For episodes of fully immunized patients (base immunized and boosted), there is a skew towards older age groups being admitted to the ICU (between Dec 2021 and Mar 2022 around 86% 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 classes, as only 73.9% (Dec, Jan) and 55% (Feb, Mar) of the episodes corresponded to patients aged 50 years and above.

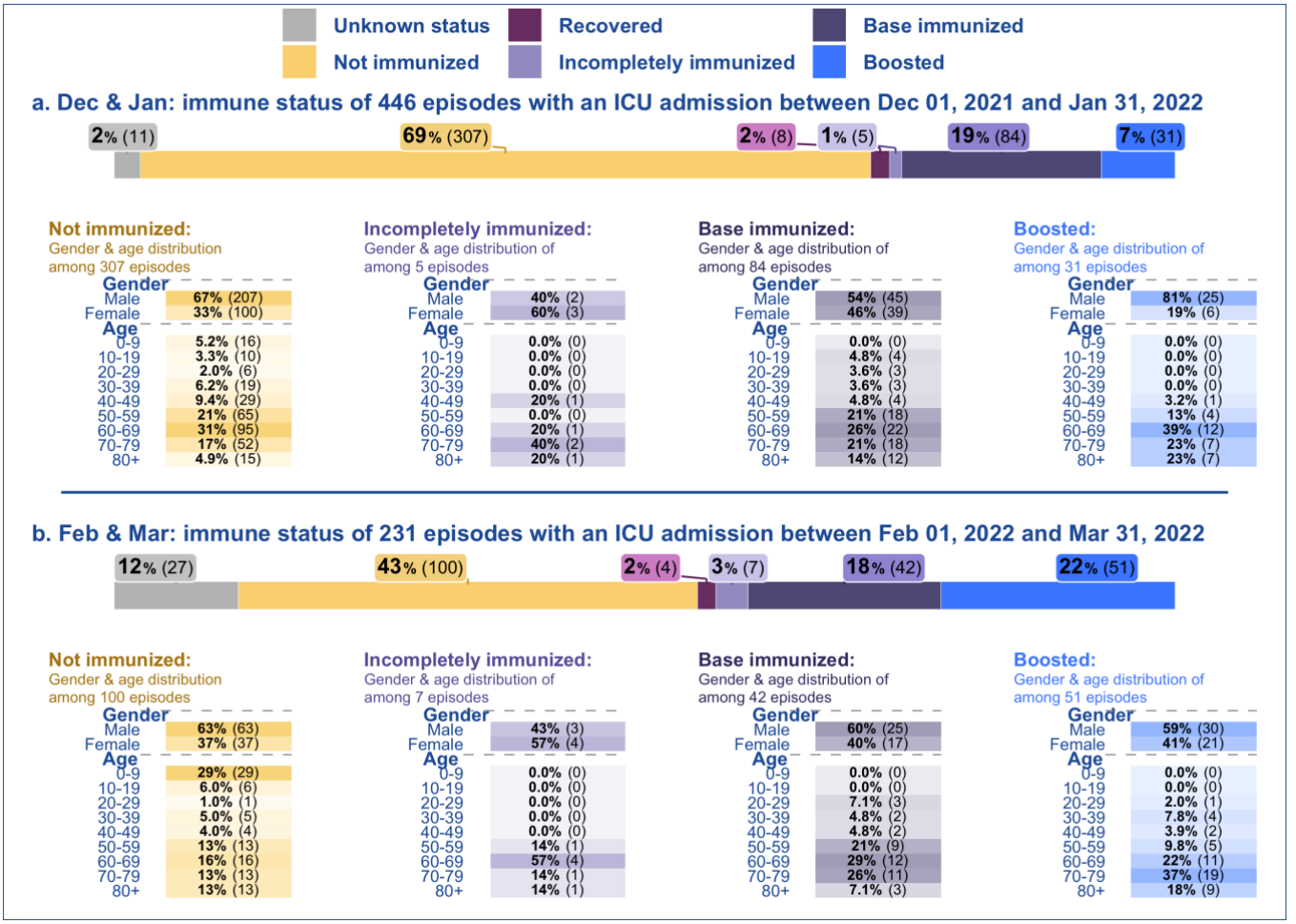

***Figure 12**: Demographic characteristics of patients in ICU by immune status and episode, over two different periods. Episodes with a first admission date after Mar 31, 2022 were excluded, as a large proportion of these records have not been completely filled in the database. Episodes with missing ages or gender marked as 'Other' are not shown. Data on ICU admissions for the incompletely immunized and boosted categories should be interpreted with caution due to small sample sizes.*

5.3. ICU admission over time

Figure **13** 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.

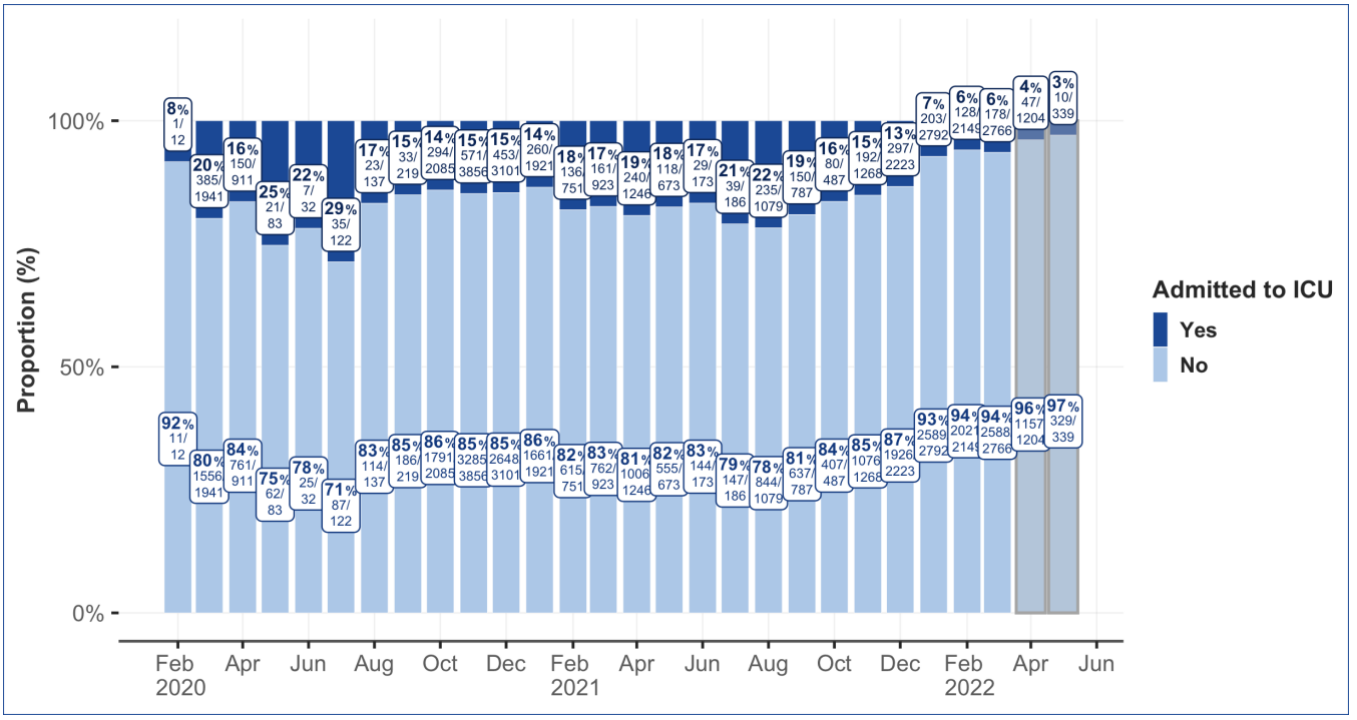

***Figure 13**: Percentage and proportion of episodes with at least one ICU admission over time. Records with incomplete data (ongoing episodes or with a pending outcome in the database) were not included. Data from the last two months (highlighted gray) are considered provisional due to data entry delays.*

6. Health Complications

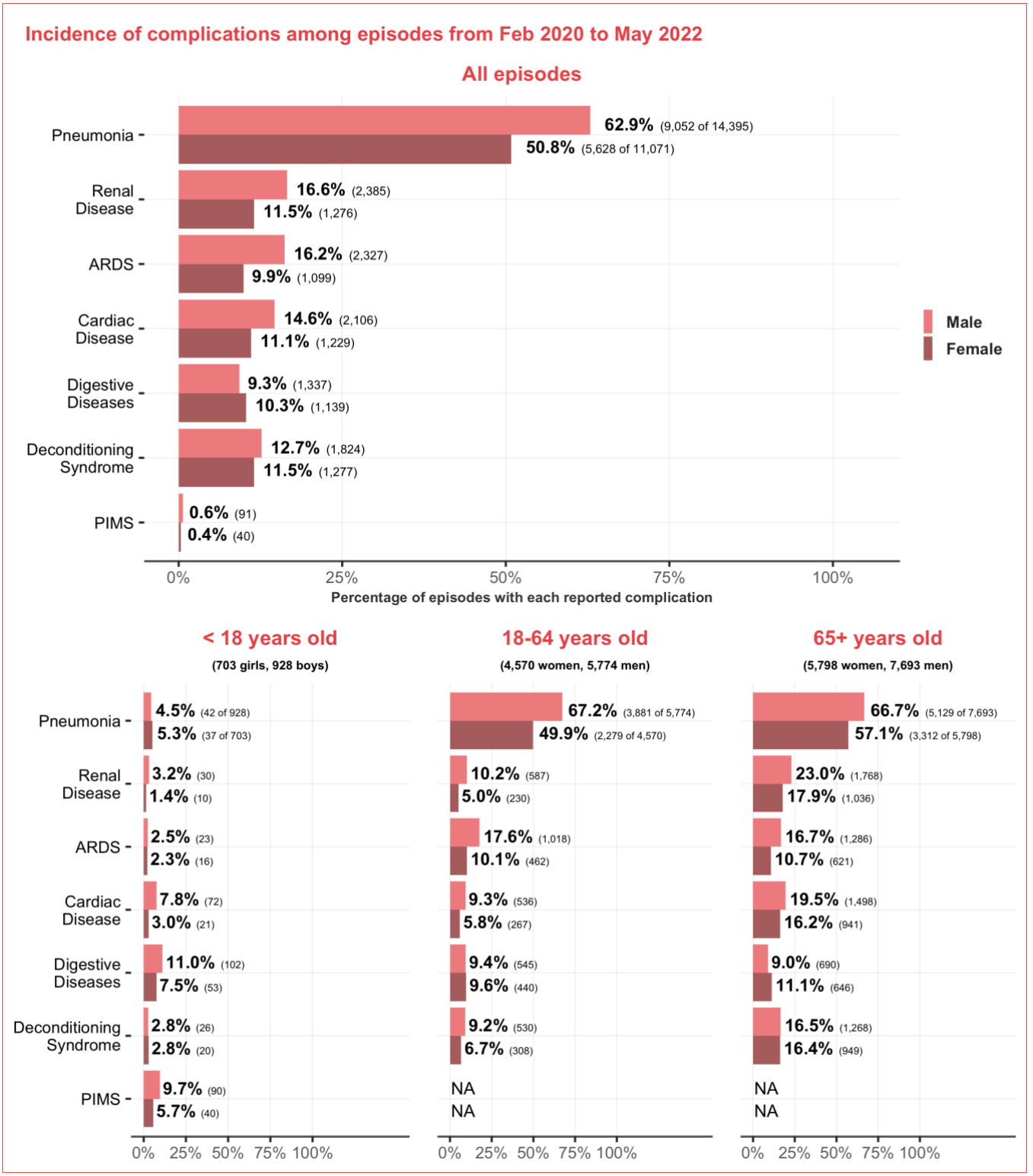

***Figure 14**: Incidence of complications arising during a hospitalization episode with a community acquired SARS-CoV-2 infection. The reported complications are shown overall and per age group and gender. Only the top 6 most prevalent complications, and PIMS, are displayed. Other complications available 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 hospitalized case having a respiratory disease complication which was neither pneumonia nor ARDS).*

CH-SUR registered, 25,466 episodes linked to community acquired infections with complete complications data record and known age and gender (11,071 women and 14,395 men) hospitalized between February 2020 and May 22, 2022. For 19,803 (77.8%) of these episodes, at least one complication was registered. Complications were more common among males: among the episodes with at least one complication, 59.0% of patients were male and 41.0% were female.

Pneumonia was the most common complication observed and was more common among men than women (described in 62.9% of the male episodes and 50.8% of the female episodes, Figure **14**). Children and adolescents had pneumonia less frequently than patients aged 18 years and above. This complication was recorded in 4.5% and 5.3% of the episodes concerning respectively boys and girls. In contrast, pneumonia was documented in more than 49% male and female episodes of patients aged 18 years old and above. Among children and adolescents, PIMS is a relevant complication. PIMS was more common in boys than girls, being registered in respectively 9.7% and 5.7% of the boys' and girls' episodes (Figure **14**).

Despite being the most common complication, pneumonia ranked low between the complications with the highest associated mortality among episodes of patients aged 65 and above (Figure **15**). Acute respiratory distress syndrome (ARDS), especially for the older age group (65+), was the complication with the highest associated mortality. Among patients aged 65 and older who were affected by ARDS as a complication of COVID-19, 44.6% of male and 40.3% of female episodes resulted in death. (Figure **15**).

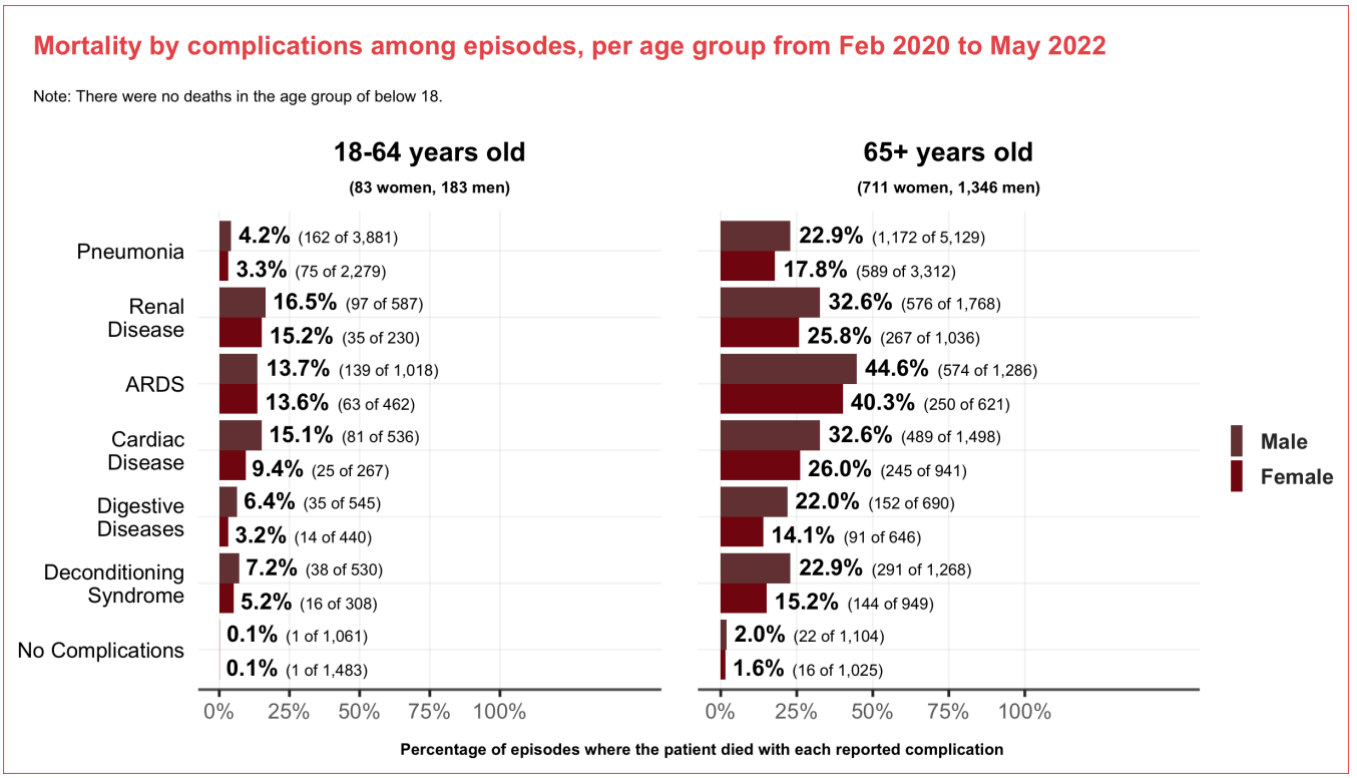

***Figure 15**: Mortality is depicted for each complication: showing the percentage of episodes where the patient with the complication died.*

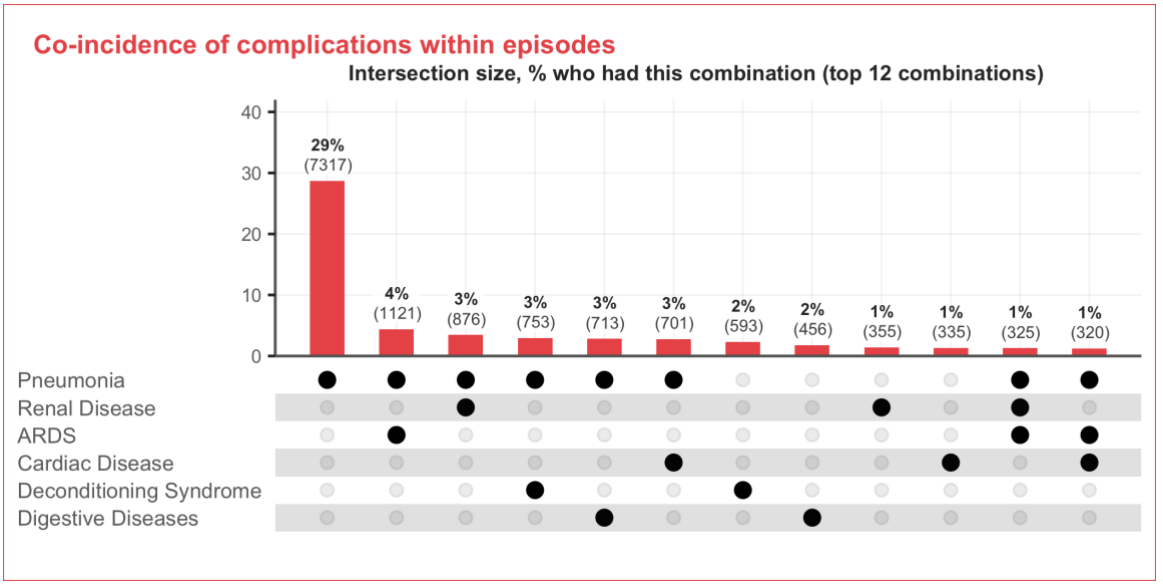

***Figure 16**: Complications are represented by their combinations (co-occurences). The top 12 combinations are represented.*

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 **17**c). In recent months, this proportion rose since August 2021, accounting for 14.0% of the pisodes registered in CH-SUR over the month of December 2021, 19.0% in January 2022, 19.5% in March 2022 and 20.2% in April 2022. This observation might be partially explained by an increase in nosocomial systematic testing in some hospitals and periods of higher virus circulation. However, changes in the testing strategy among hospitals are expected for the coming period, therefore, these data should be interpreted with caution.

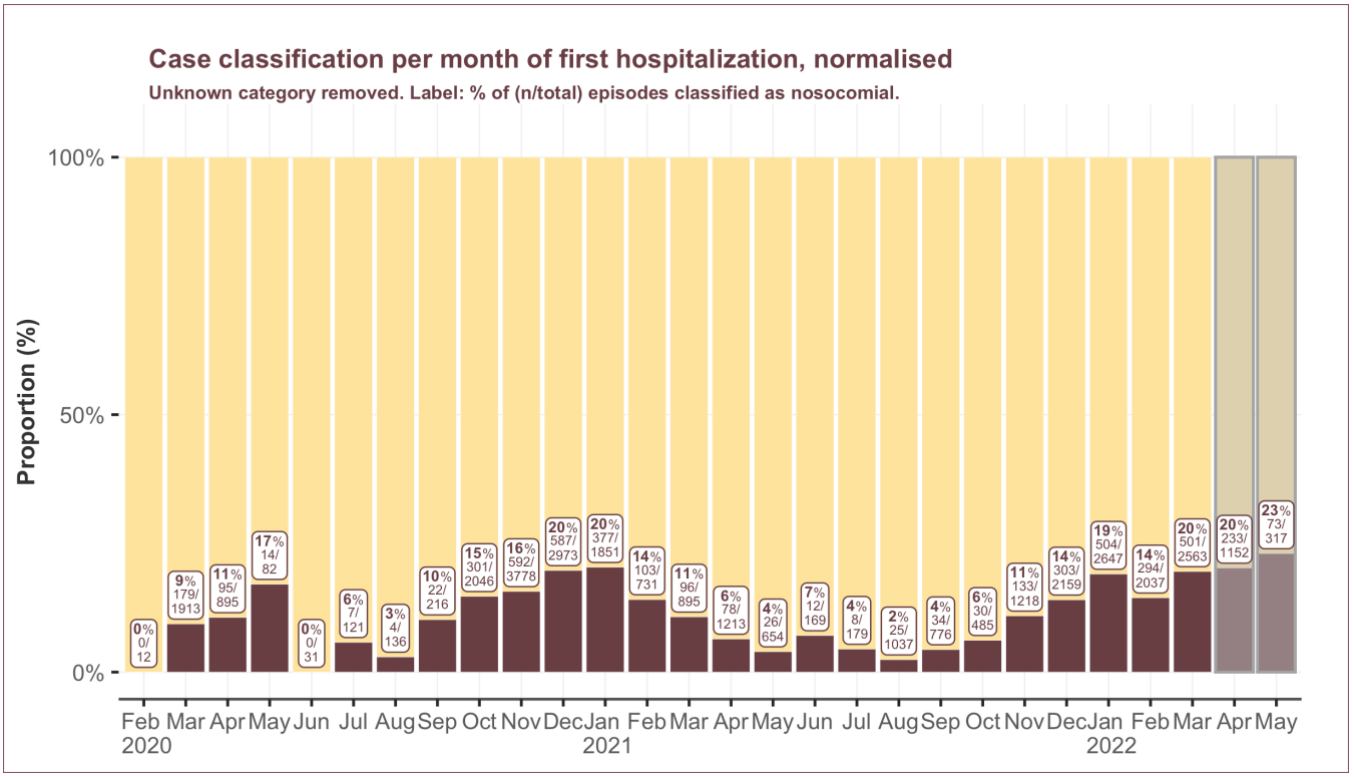

***Figure 17**: Classification (infection source) of hospitalization episodes over time. Data from the last two months (highlighted gray) are considered provisional due to data entry delays.*

Over the full course of the epidemic, the nosocomial infections affected principally an elderly population, with patients aged 80 years and above, accounting for 2,195 (47%) of the nosocomial episodes. In comparison, 6,652 (24%) 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: 656 (14%) vs 2,339 (8.5%). (Figure **18**)

ICU admissions were slightly less common among episodes of patients with nosocomial infections, when compared to community-acquired infections (Figure **18**). 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 10,514 (38%) episodes with community acquired infection and in 1,007 (22%) nosocomial episodes.

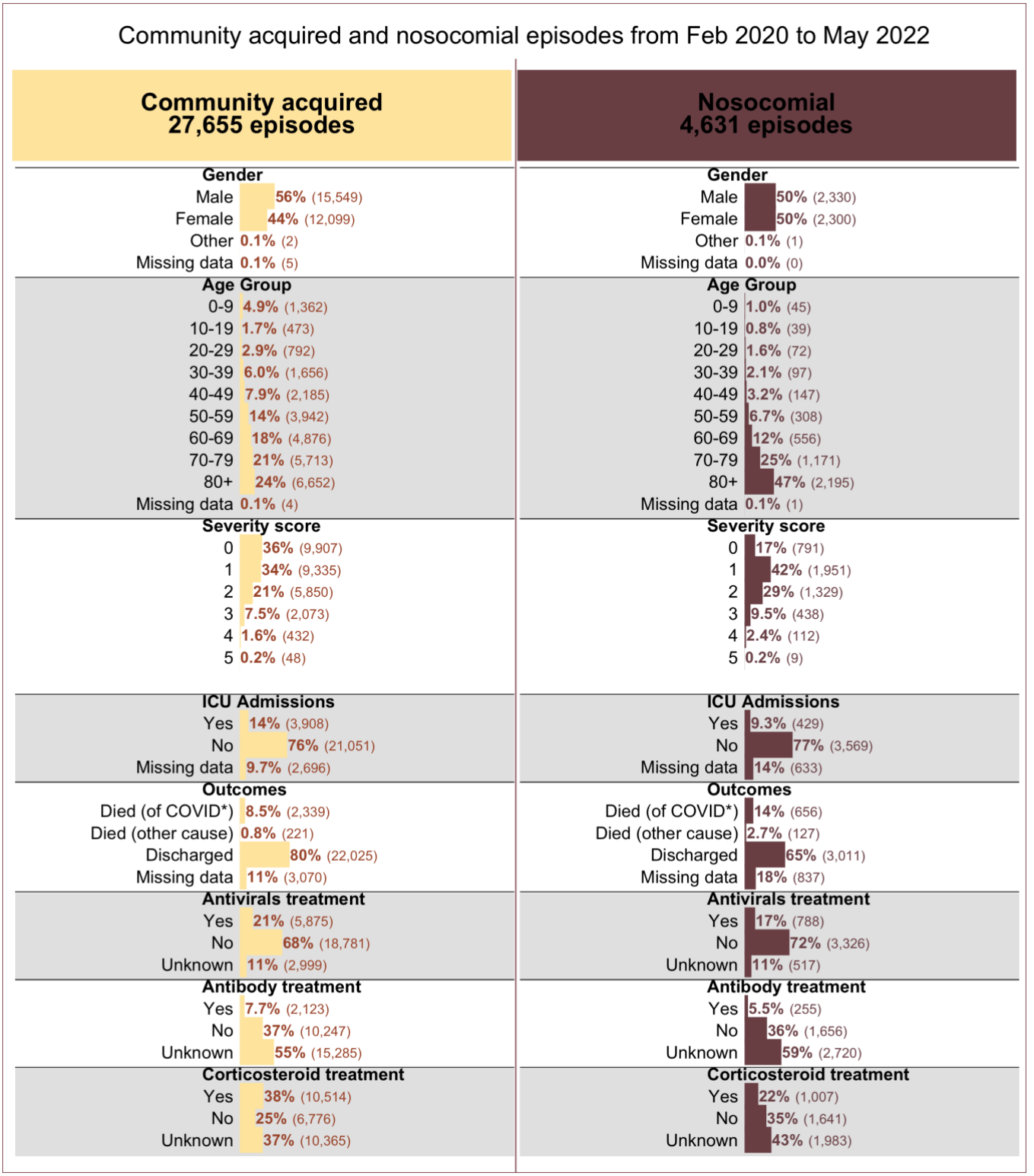

***Figure 18**: Case classification (infection source) of hospitalization episodes Comparison of community acquired and nosocomial cases by demographics, severity score, ICU, outcomes and treatments.*

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:

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*: 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*:

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, independent of the time between disease recovery and date of vaccination.

3. 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) with a minimum 4 months since the last vaccine application for the base immunization.

e) *Recovered from a SARS-CoV-2 infection*: Patients with confirmed previous SARS CoV 2 infection, which required or not hospitalization 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.

e) *Fully immunized*: This category results from the combination of the base immunized and the boosted categories.

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). This determination of whether a COVID patient died of COVID or another cause is done by a medical doctor at the hospital level for each CH-SUR-participating center. 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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