Rapporto sul sistema di sorveglianza ospedaliero COVID-19-Sentinel

Stato: 23 Maggio 2022

1. Riassunto introduttivo

Il sistema di sorveglianza della COVID-19 negli ospedali svizzeri (CH-SUR) è stato istituto nel 2018 per tenere traccia delle ospedalizzazioni connesse all'influenza. Il 1° marzo 2020, quattro giorni dopo la segnalazione del primo caso confermato di COVID-19 in Svizzera, il programma adattato era pronto per rilevare anche le ospedalizzazioni collegate a infezioni da SARS-CoV-2 confermate in laboratorio.

Attualmente sono 20 gli ospedali che partecipano attivamente al sistema di sorveglianza, tra cui una buona percentuale degli ospedali cantonali e universitari, che coprono un'ampia fascia di pazienti pediatrici e adulti in tutta la Svizzera. Le statistiche di CH-SUR rilevano, tra l'altro, il numero e la durata delle ospedalizzazioni nonché le degenze nelle unità di terapia intensiva. Un paziente potrebbe essere ospedalizzato numerose volte o richiedere più ricoveri in un'unità di terapia intensiva (UTI) durante lo stesso episodio di ospedalizzazione. CH-SUR rileva inoltre se durante l'ospedalizzazione il paziente è deceduto per o con la COVID-19.

Criteri di inclusione: CH-SUR raccoglie dati di pazienti ospedalizzati con infezione da SARS-CoV-2 documentata e una degenza di durata superiore alle 24 ore. La conferma dell'infezione è data dal risultato positivo di un test PCR (reazione a catena della polimerasi) o di un test antigenico rapido, nonché da un referto clinico di COVID-19. Le infezioni nosocomiali da SARS-CoV-2 sono anch'esse rilevate nella banca dati e descritte in una sezione speciale in calce al presente rapporto.

Dall'inizio della pandemia fino al 22 Maggio 2022, sono stati raccolti dati relativi a episodi di ospedalizzazione. Durante lo stesso periodo, attraverso il sistema di dichiarazione obbligatorio sono stati comunicati all'UFSP per l'intera Svizzera 52 976 episodi di ospedalizzazione con infezione da SARS-CoV-2 confermata in laboratorio. Il sistema CH-SUR ha pertanto coperto il 63,2 % circa di tutte le ospedalizzazioni connesse al SARS-CoV-2 dichiarate in Svizzera.

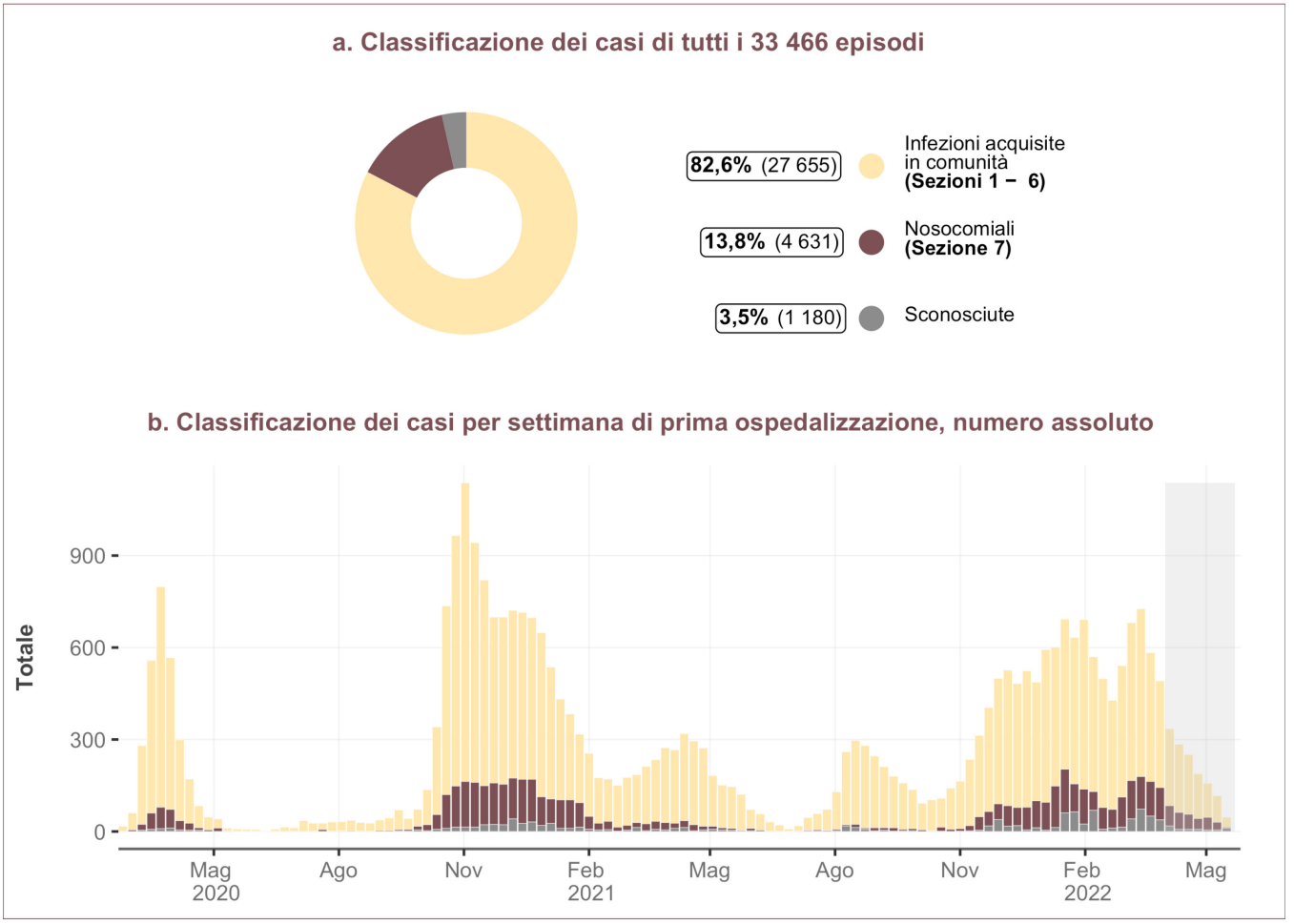
Dal marzo 2022 il presente rapporto si concentra sugli episodi collegati alle infezioni acquisite in comunità (descritte nelle sezioni da 2 a 6), mentre una sezione a parte è dedicata alle infezioni nosocomiali (sezione 7). La percentuale totale di infezioni nosocomiali tra tutti gli episodi documentati si attesta al 13,8% (4 631 su 33 466), mentre gli episodi collegati a infezioni acquisite in comunità spiegano l' 82,6% (27 655 su 33 466) dei casi (grafico **1**). Per il 3,5% degli episodi non è stato possibile effettuare l'attribuzione a casi ospedalieri o acquisiti in comunità.

Tra tutti gli episodi collegati a un'infezione acquisita in comunità per i quali sono disponibili dati completi e rilevanti, il 14,6% ha reso necessaria la degenza in un'unità di terapia intensiva (3 862 su 24 585 episodi dal 26 febbraio 2020 al 31 Marzo 2022) e nel 9,5% dei casi si è verificato un decesso per COVID-19 (2 339 su 24 585 episodi dal 26 febbraio 2020 al 23 Maggio 2022).

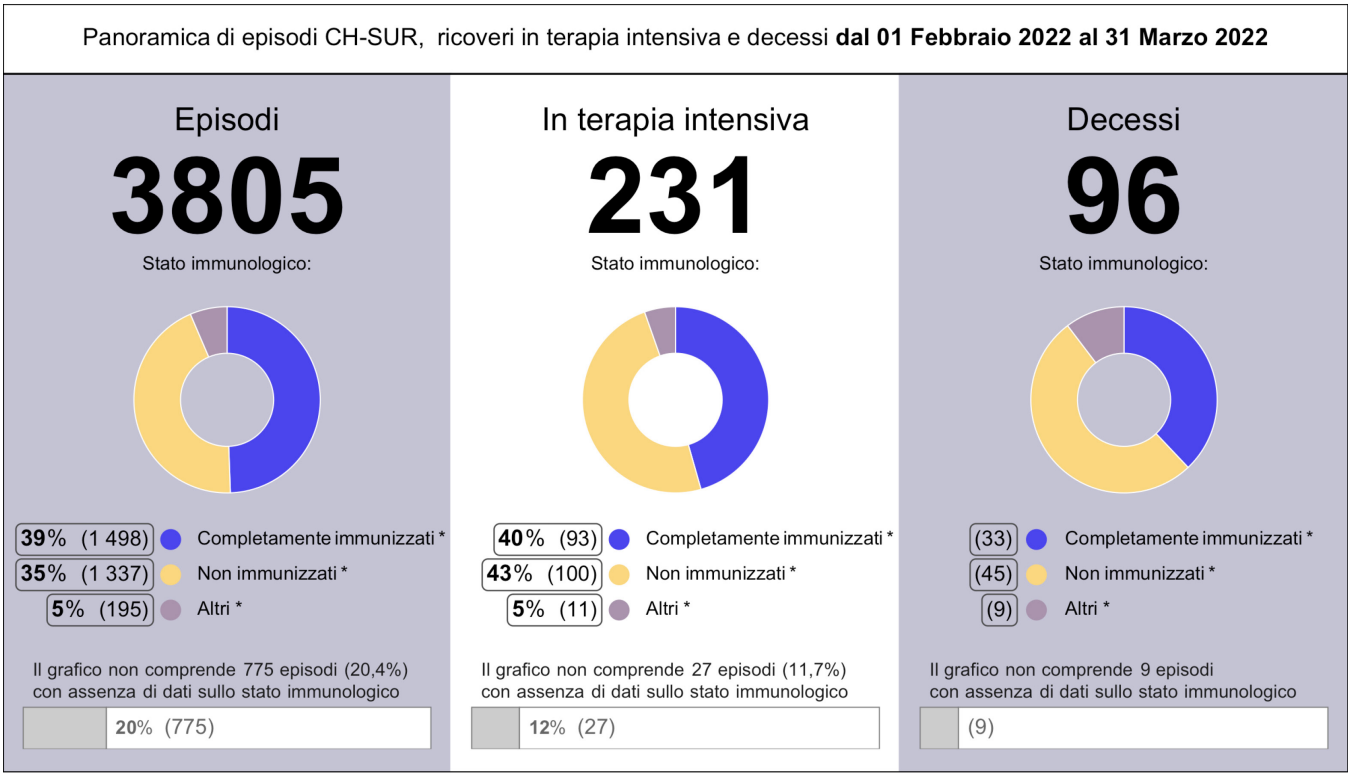
Durante l'ultimo periodo in cui erano disponibili dati sufficienti (dal 01 Febbraio 2022 al 31 Marzo 2022) sono stati rilevati episodi di infezioni acquisite in comunità. Di questi, (35,1%) interessavano pazienti non immunizzati e

(39,4%) pazienti completamente immunizzati (immunizzazione di base con o senza vaccinazione di richiamo) (grafico **2**). Nello stesso periodo, 231 episodi hanno richiesto la degenza in un'unità di terapia intensiva. Di questi, 100 (43,3%) interessavano pazienti non immunizzati e 93 (40,3%) pazienti completamente immunizzati. Si è verificato un decesso per COVID-19 in 96 casi (2,5% di tutti gli episodi rilevati con esito noto), 45 dei quali per pazienti non immunizzati e 33 per pazienti completamente immunizzati.

Il 1 aprile 2022 la Svizzera è tornata alla situazione epidemiologica normale. Da tale data la strategia di test negli ospedali prevede di testare unicamente i pazienti che hanno sintomi di un'infezione da COVID-19. Questa modifica della strategia di test potrebbe portare a un calo del numero di casi individuati, riducendo i pazienti identificati alle sole persone con sintomi tipici di COVID-19. Per ulteriori definizioni e dettagli sui dati, si veda la sezione Glossario e informazioni complementari in calce al presente rapporto.



***Graphic 1**: Classificazione (origine dell'infezione) dei casi. Proporzione (normalizzata in %) di episodi per origine dell'infezione (sezione a) e numero assoluto di casi nel tempo (sezione b). Per gli episodi con più ospedalizzazioni, è stata considerata la classificazione del caso relativa alla prima ospedalizzazione. I dati degli ultimi due mesi (evidenziati in grigio) sono considerati provvisori a causa di ritardi nell'immissione dei dati.*



***Graphic 2**: Panoramica dei dati più recenti su casi di ospedalizzazione collegati a infezioni acquisite in comunità. I dati degli ultimi due mesi sono considerati provvisori a causa di ritardi nell'immissione dei dati e sono pertanto stati omessi. (* Completamente immunizzati: pazienti con immunizzazione di base e pazienti con vaccinazione di richiamo. Altri: pazienti parzialmente immunizzati e pazienti guariti da una precedente infezione di SARS-CoV-2).*

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**.

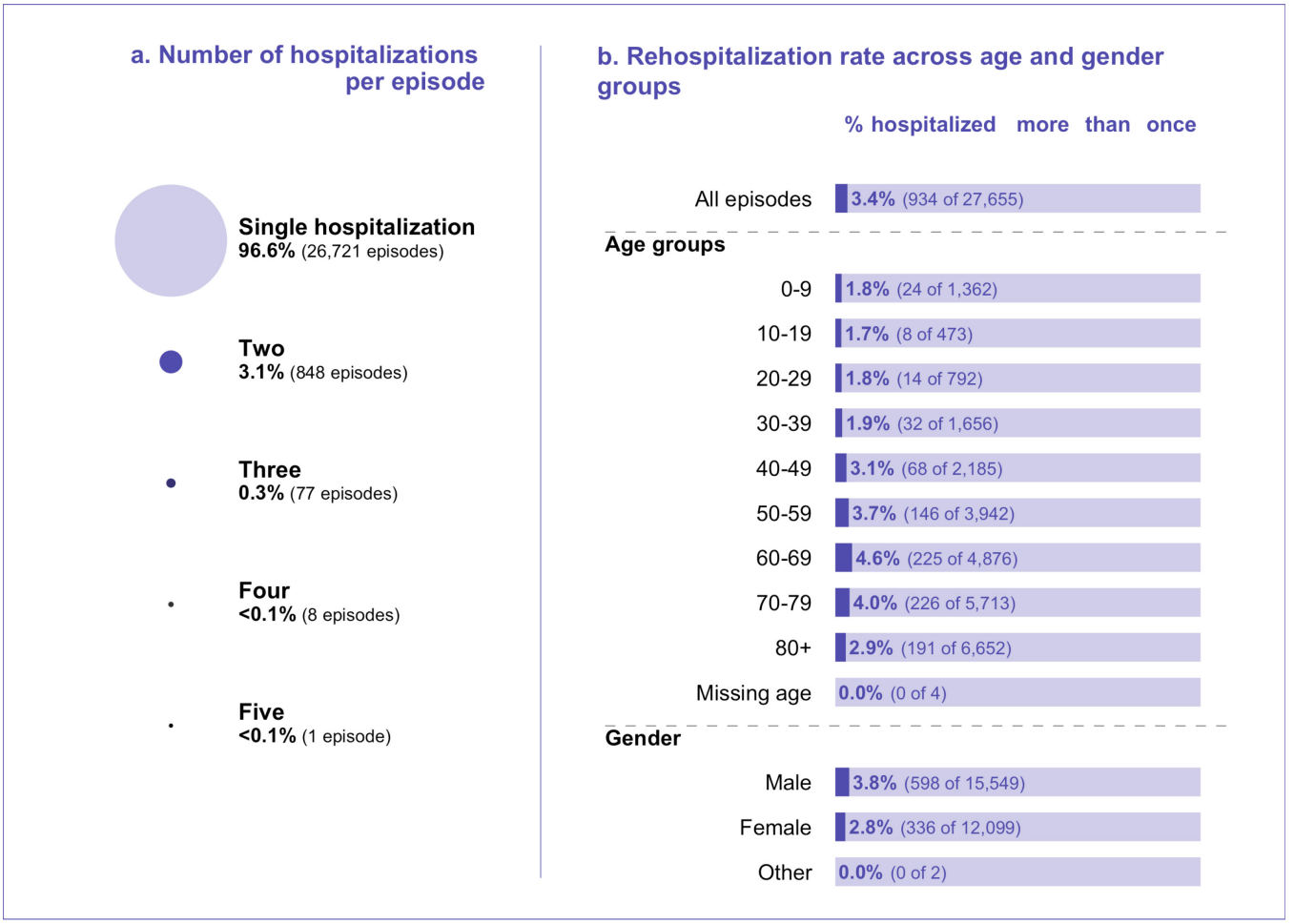


***Figure 3**: Hospitalizations per episode of hospitalization and rehospitalization rate across demographic groups. Includes records between March 2020 and May 22, 2022.*

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.

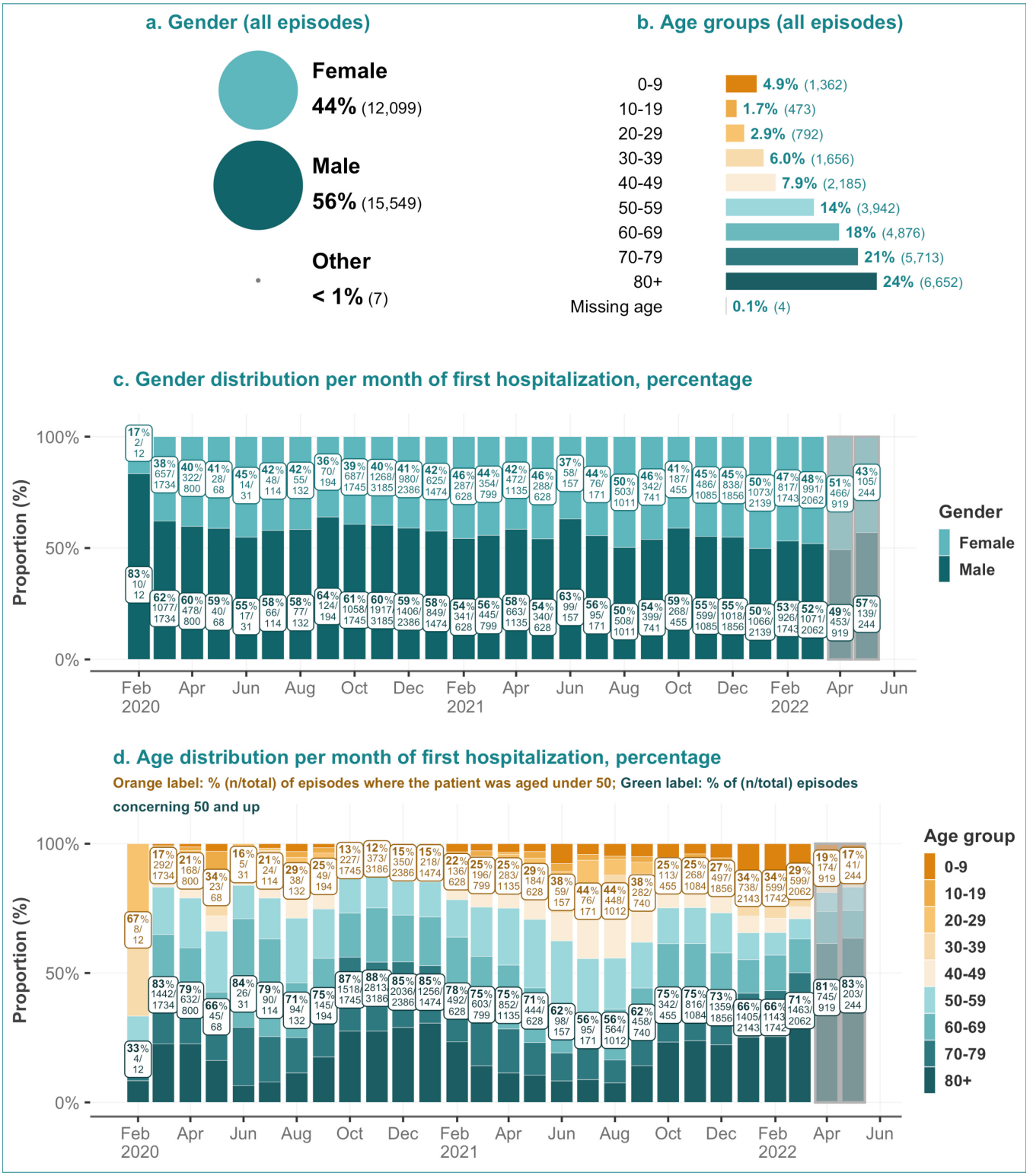


***Figure 4**: Demographic characteristics: gender and age distribution of admitted hospitalized patients, overall and per month. For episodes with multiple hospitalizations, the admission date of the first hospitalization was used. Data from the last two months (highlighted gray) is considered provisional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

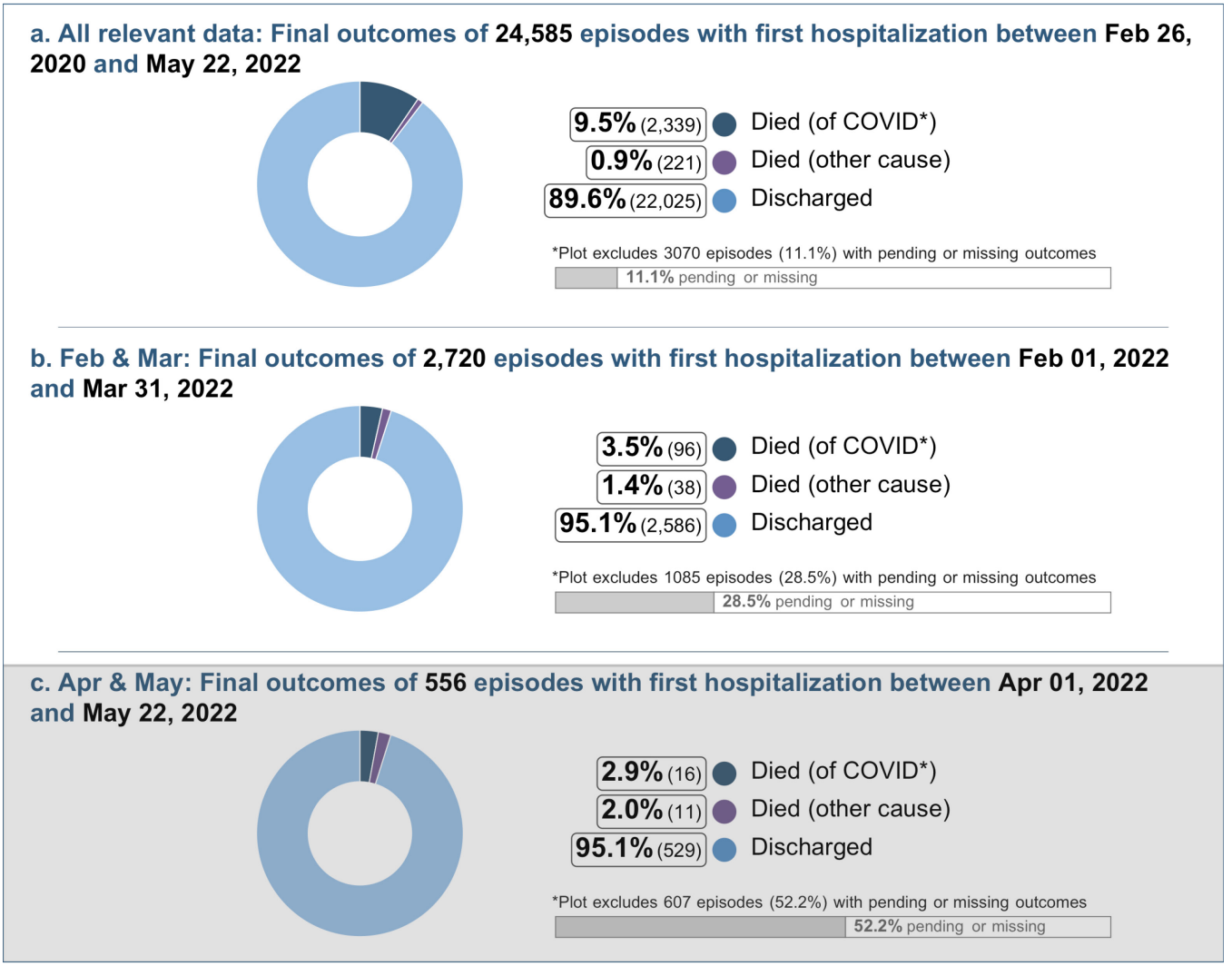


***Figure 5**: Outcomes for COVID-19 related episodes of hospitalization in CH-SUR hospitals. Includes records up to May 22, 2022. For episodes with multiple hospitalizations, only the final outcome is considered. Patients where the cause of death was not certain, but there was a COVID-19 diagnosis (in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

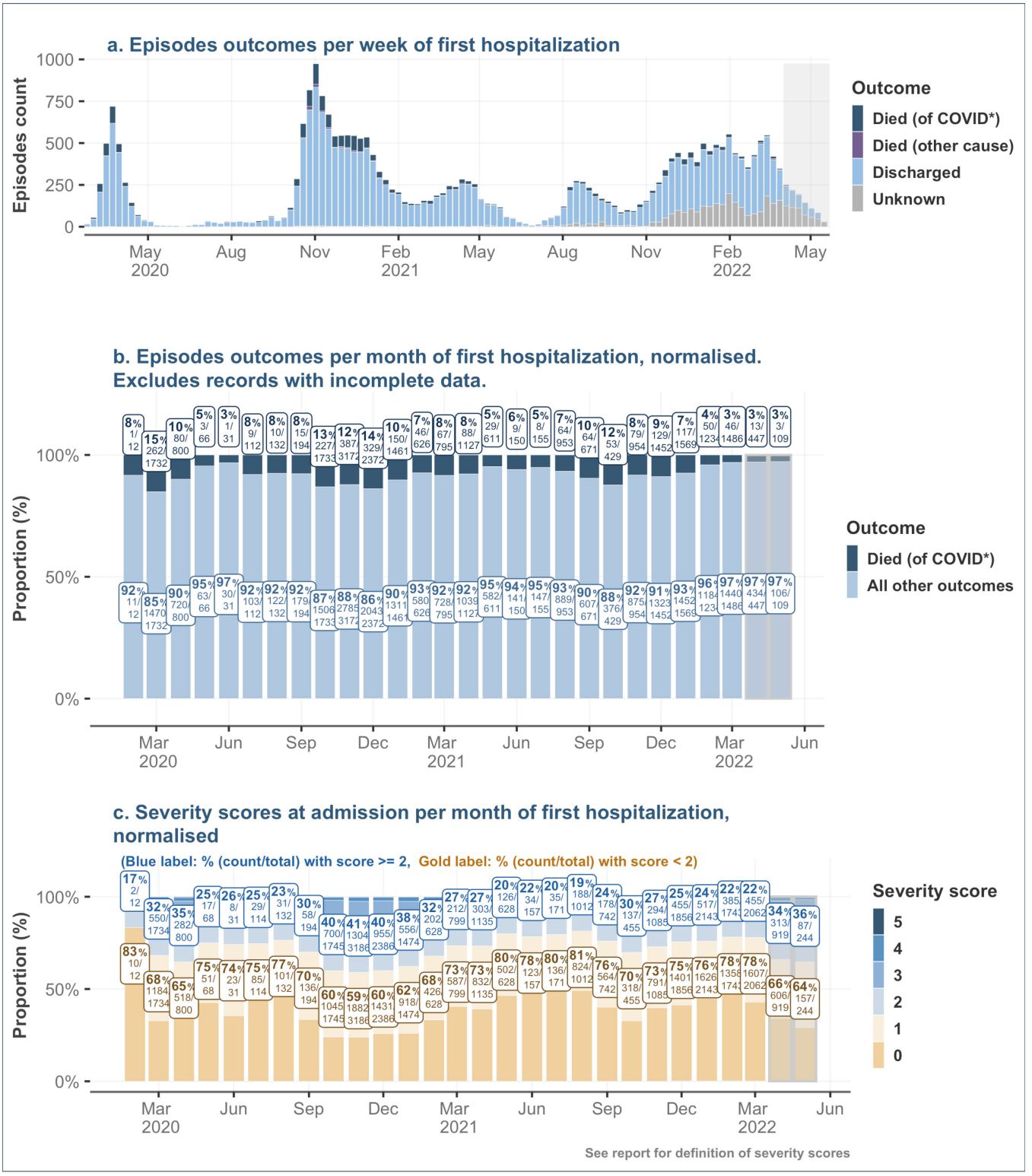


***Figure 6**: Epidemic curve, episodes' outcomes and severity scores at admission for COVID-19 hospitalizations over time. Includes records up to May 22, 2022. Data from the two last months (highlighted in gray) are considered provisional due to data entry delays. Episodes where the cause of death was 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.

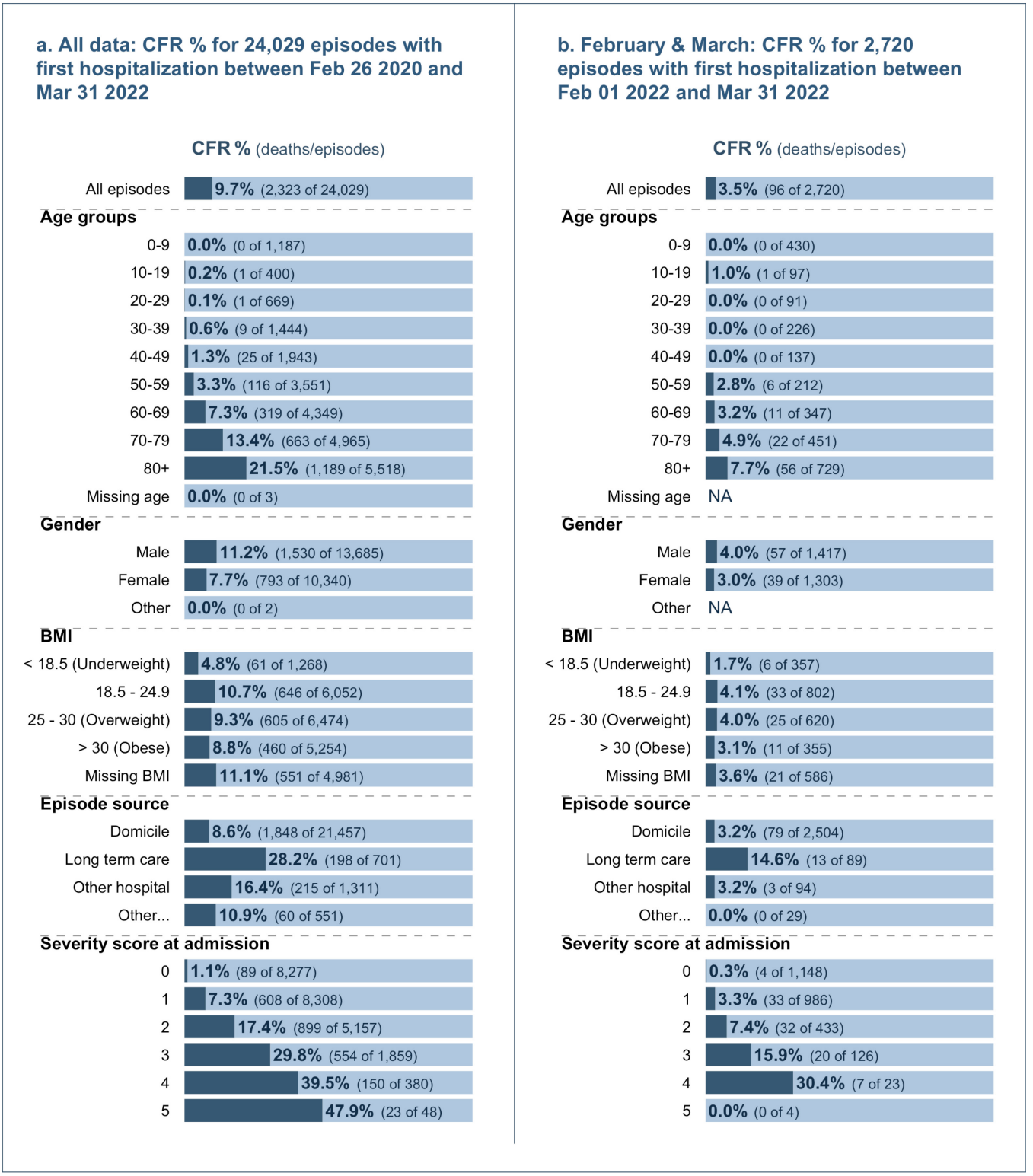


***Figure 7**: Case fatality rate (CFR) % among demographic and risk groups: percentage of hospitalization episodes in different demographic groups, which ended in the death of the patient of COVID-19 in hospital. Both figures include records up to Mar 31 2022 but records with incomplete data (ongoing 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.

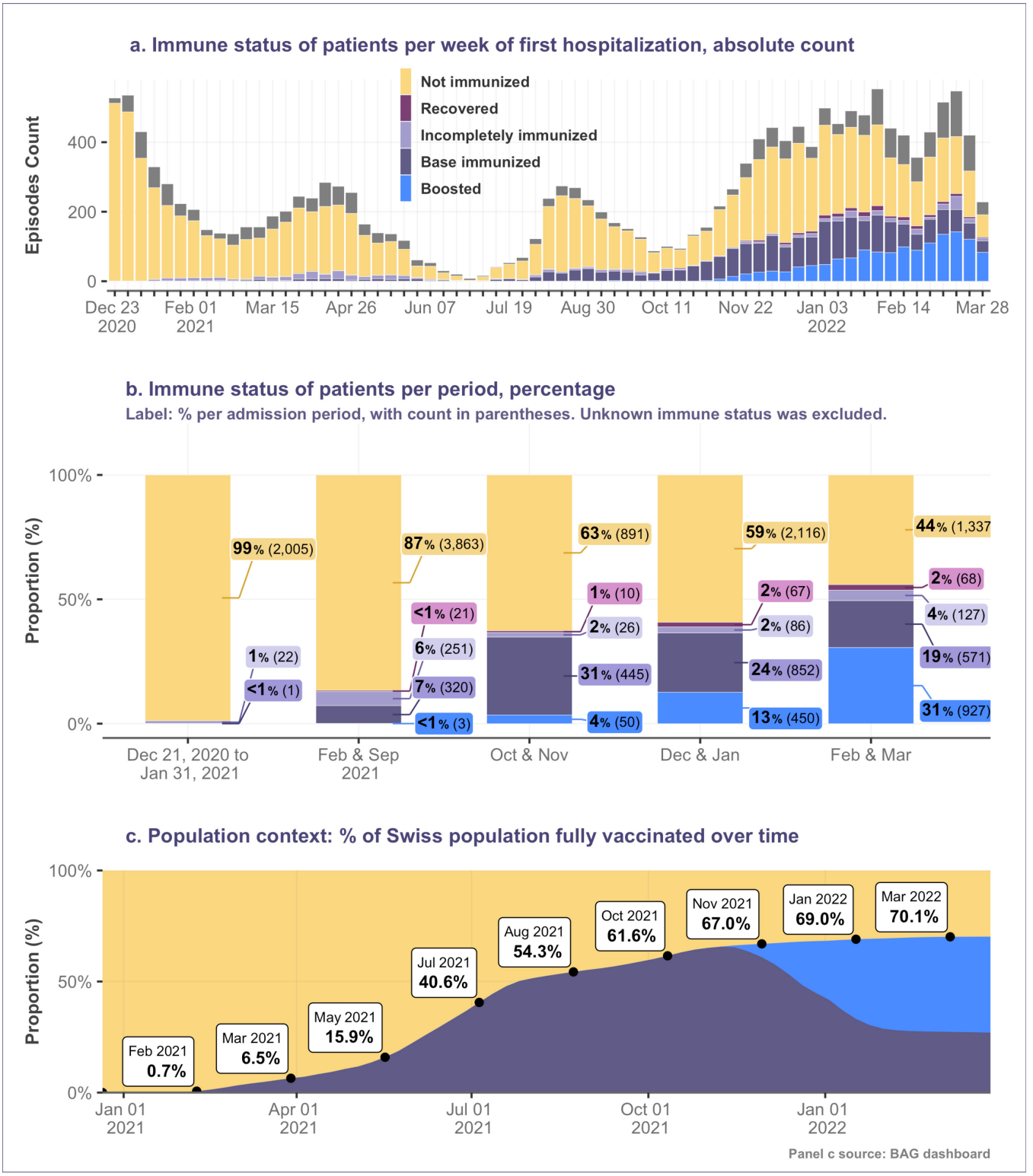


***Figure 8**: Immune status of patients and overall vaccination rate in Switzerland (exported: May 22, 2022). See glossary for definitions of immune status categories. For episodes with multiple hospitalizations, the immune status for the first hospitalization was considered. Panels a. and b. include 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.

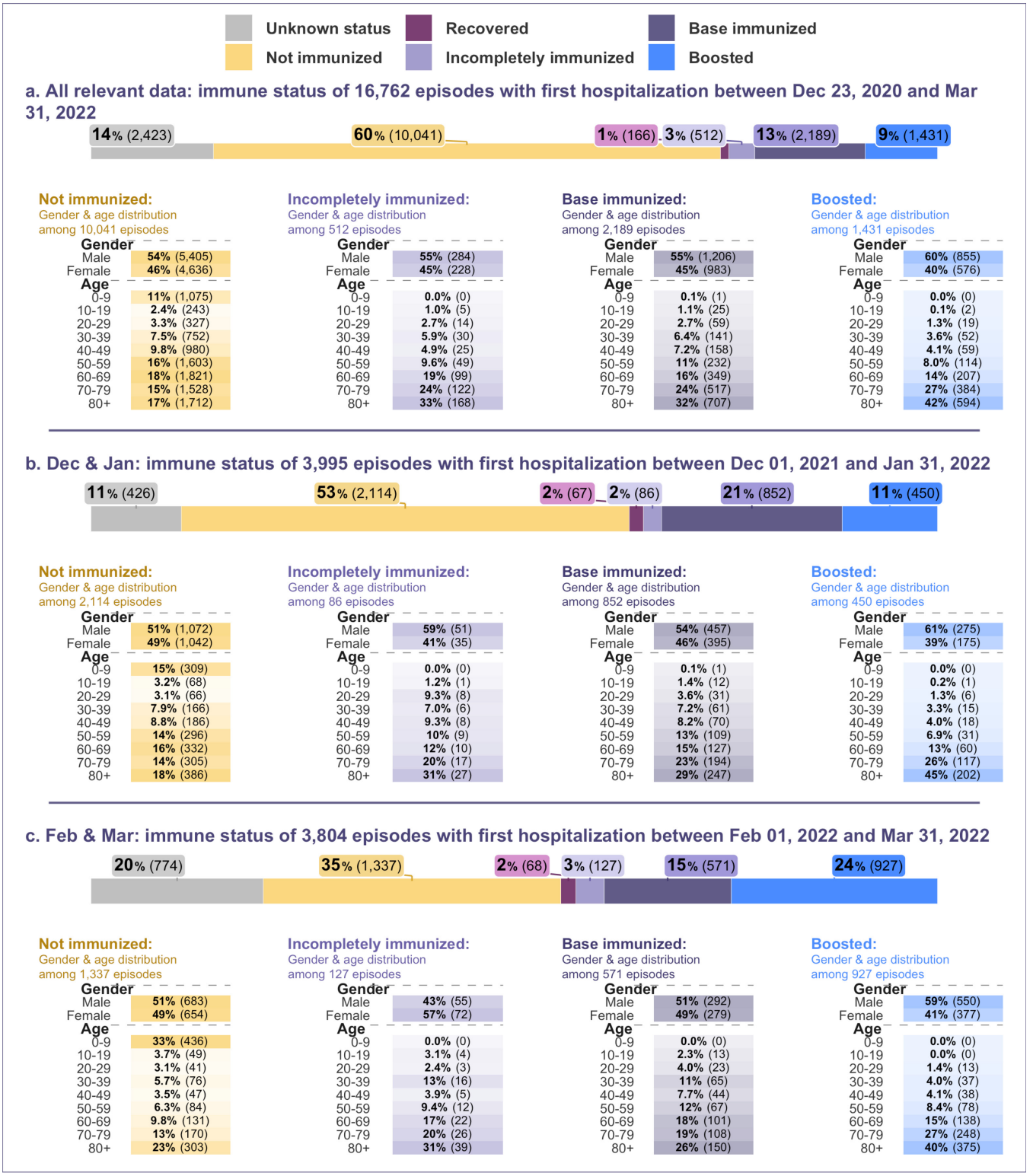


***Figure 9**: Demographic characteristics of hospitalized patients by immune status, over three different periods. Some patients may be counted more than once, as a single patient can have several episodes. Episodes with first admission date after Mar 31 2022 were excluded, as a large proportion of 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**).

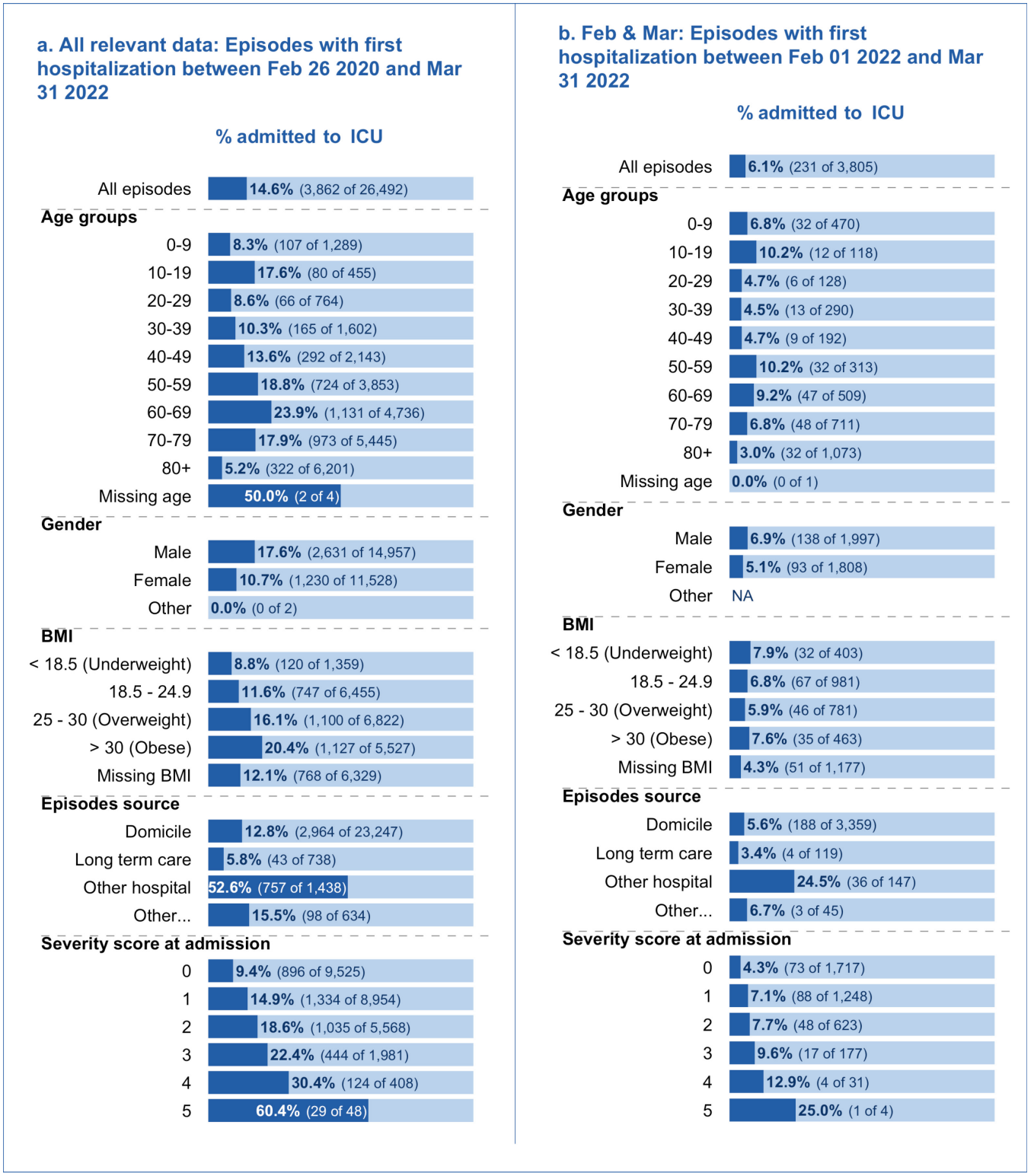


***Figure 11**: Percentage of hospitalization episodes with at least one ICU admission, grouped by demographic and risk factors, over two time intervals. For episodes with multiple hospitalizations, we considered whether they were admitted to the ICU during any of their hospitalizations. Both panels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

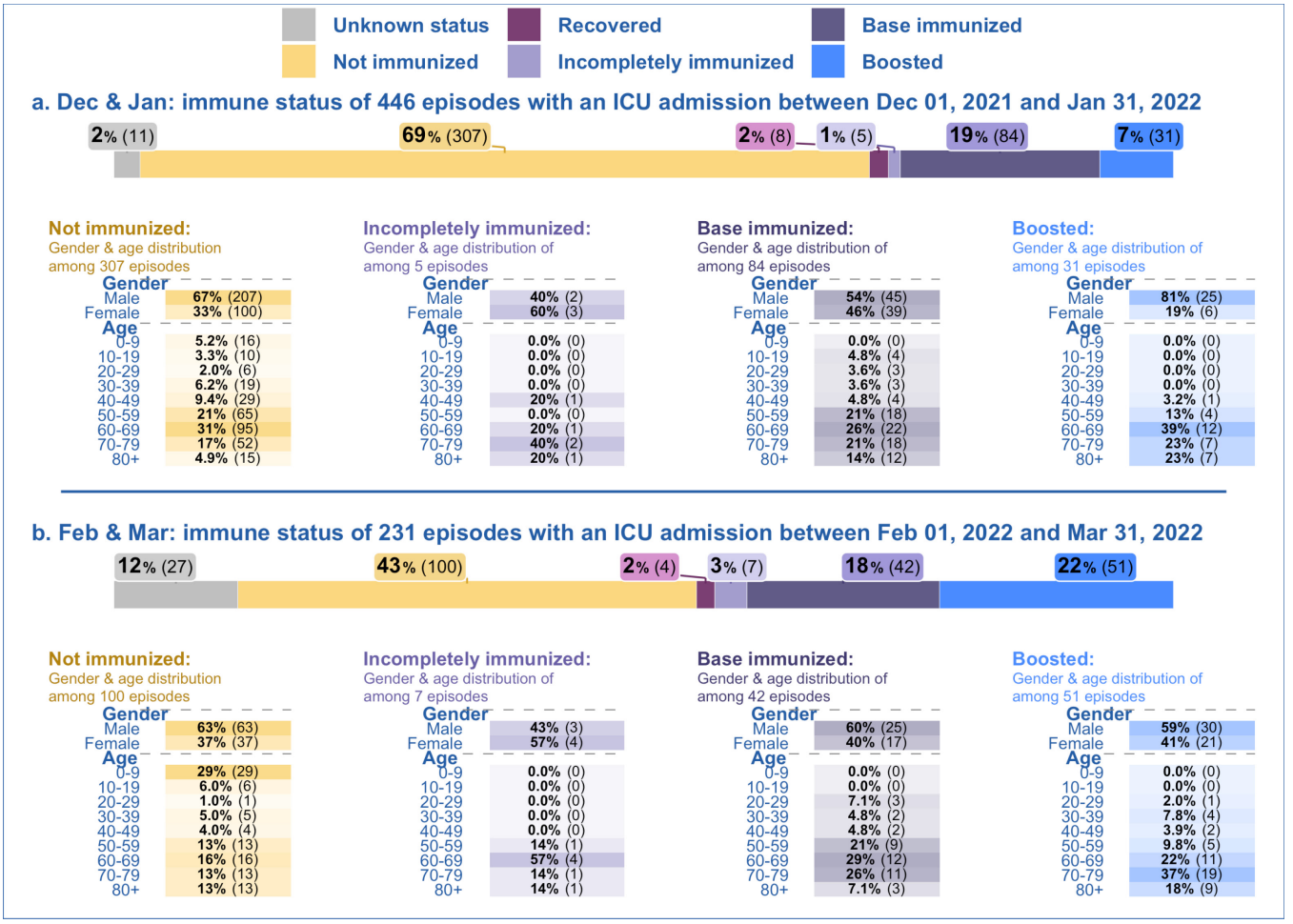


***Figure 12**: Demographic characteristics of patients in ICU by immune status and episode, over two different periods. Episodes with a first admission date after Mar 31, 2022 were excluded, as a large proportion of these records have not been completely filled in the database. Episodes with missing 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.

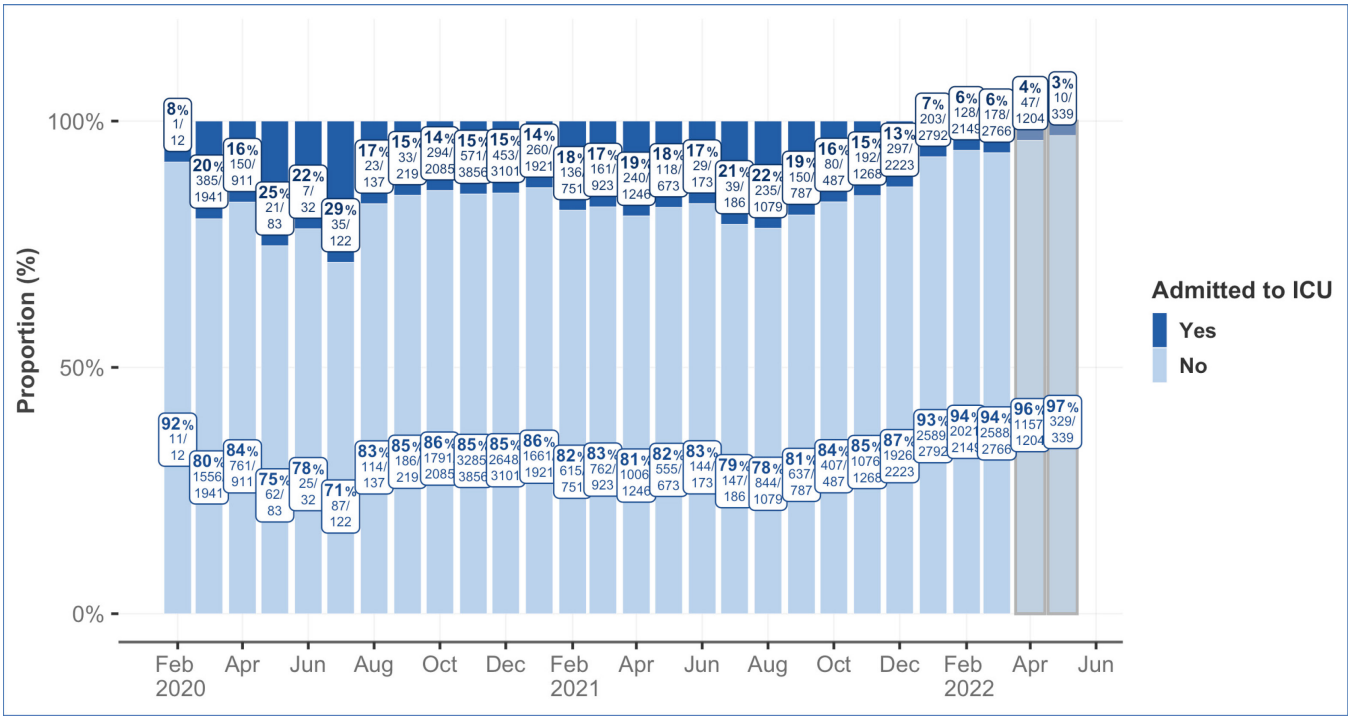


***Figure 13**: Percentage and proportion of episodes with at least one ICU admission over time. Records with incomplete data (ongoing episodes or with a pending outcome in the database) were not included. Data from the last two months (highlighted gray) are considered provisional due to data entry delays.*

6. Health Complications

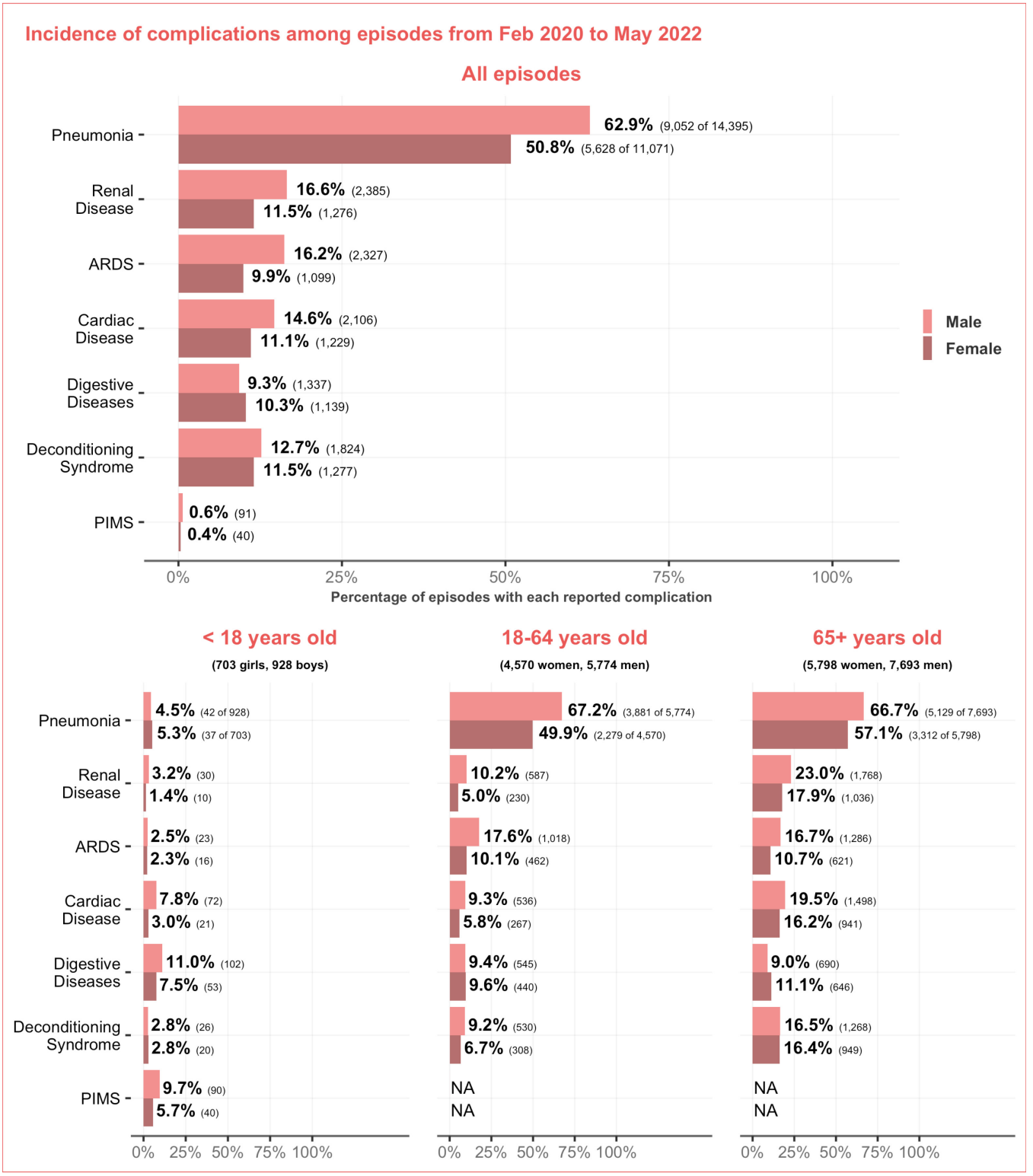


***Figure 14**: Incidence of complications arising during a hospitalization episode with a community acquired SARS-CoV-2 infection. The reported complications are shown overall and per age group and gender. Only the top 6 most prevalent complications, and PIMS, are displayed. Other complications available 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**).

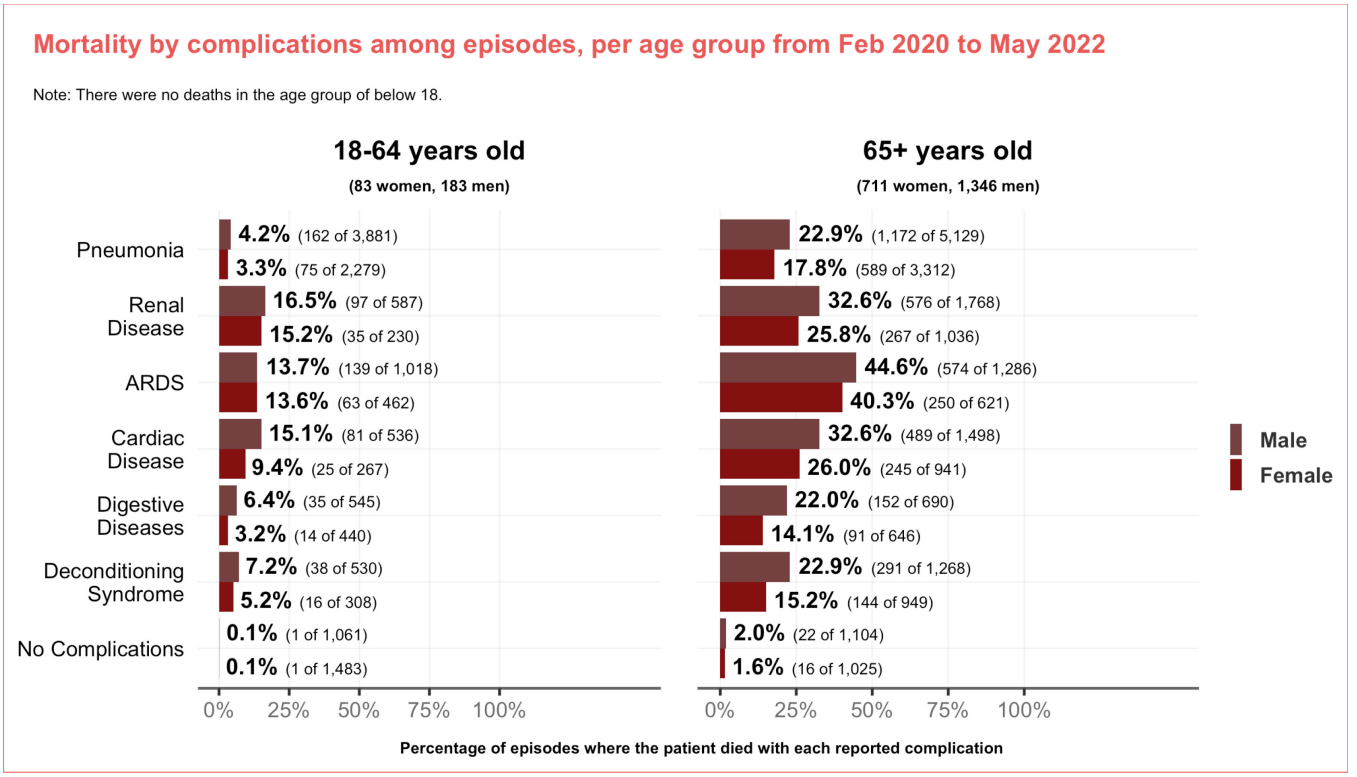


***Figure 15**: Mortality is depicted for each complication: showing the percentage of episodes where the patient with the complication died.*

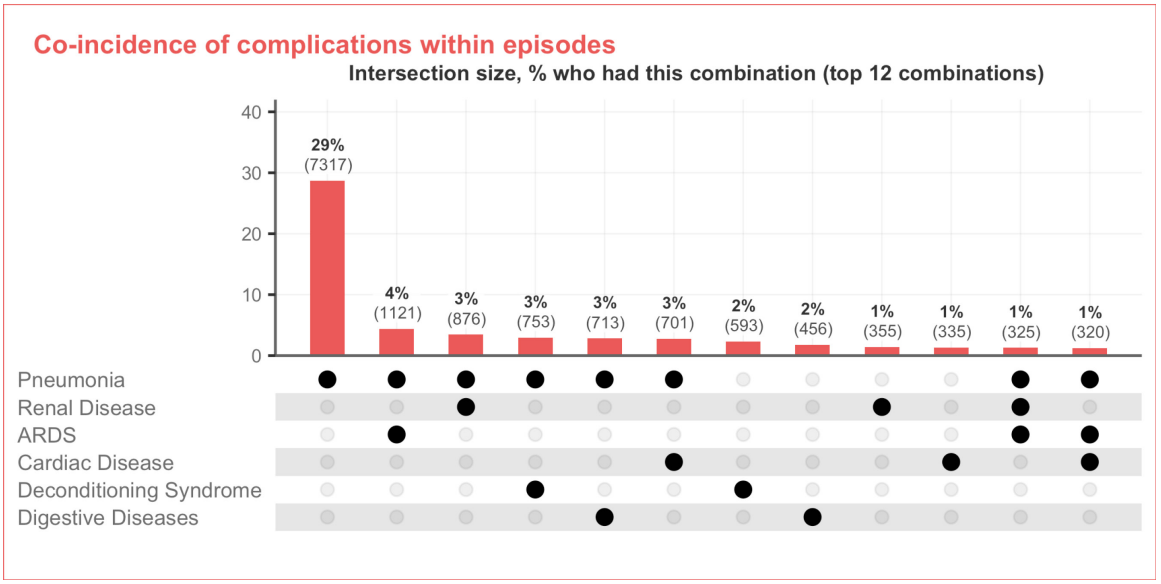


***Figure 16**: Complications are represented by their combinations (co-occurences). The top 12 combinations are represented.*

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.

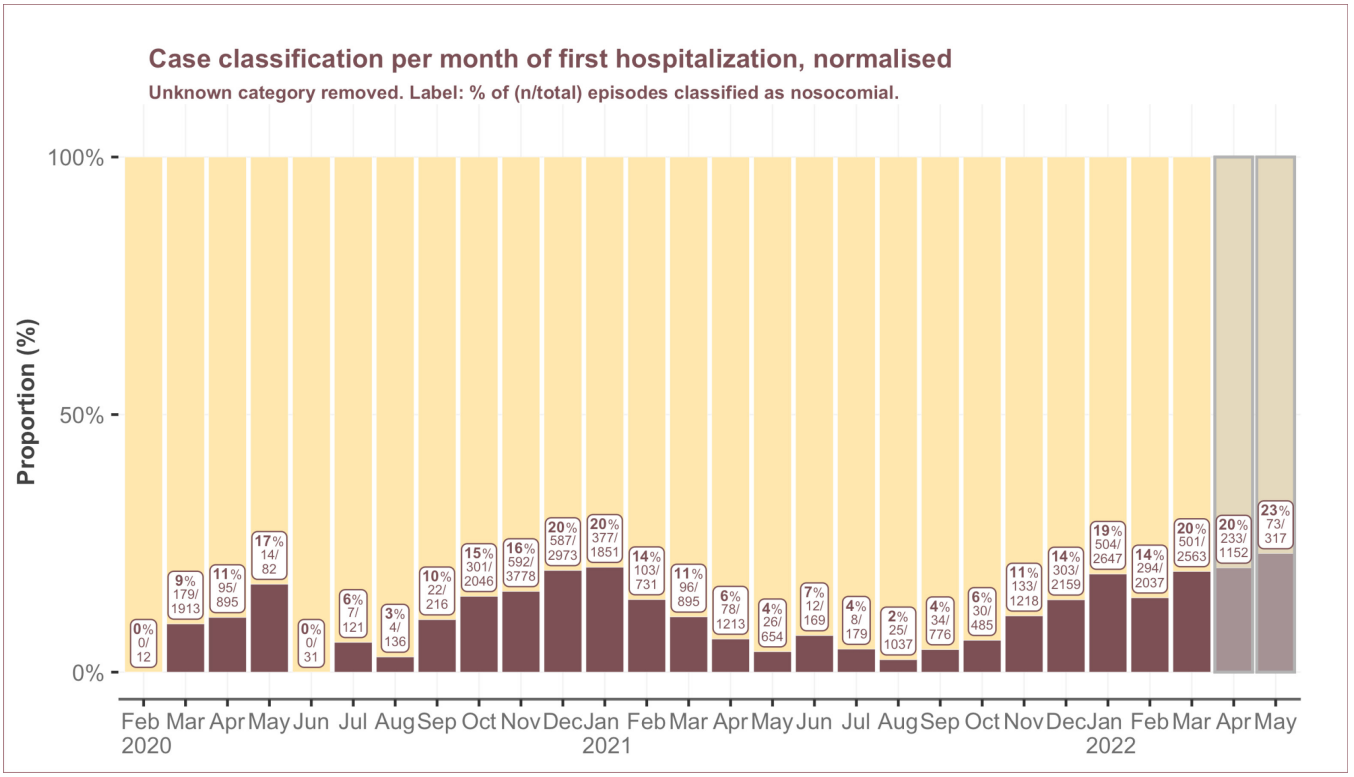


***Figure 17**: Classification (infection source) of hospitalization episodes over time. Data from the last two months (highlighted gray) are considered provisional due to data entry delays.*

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.

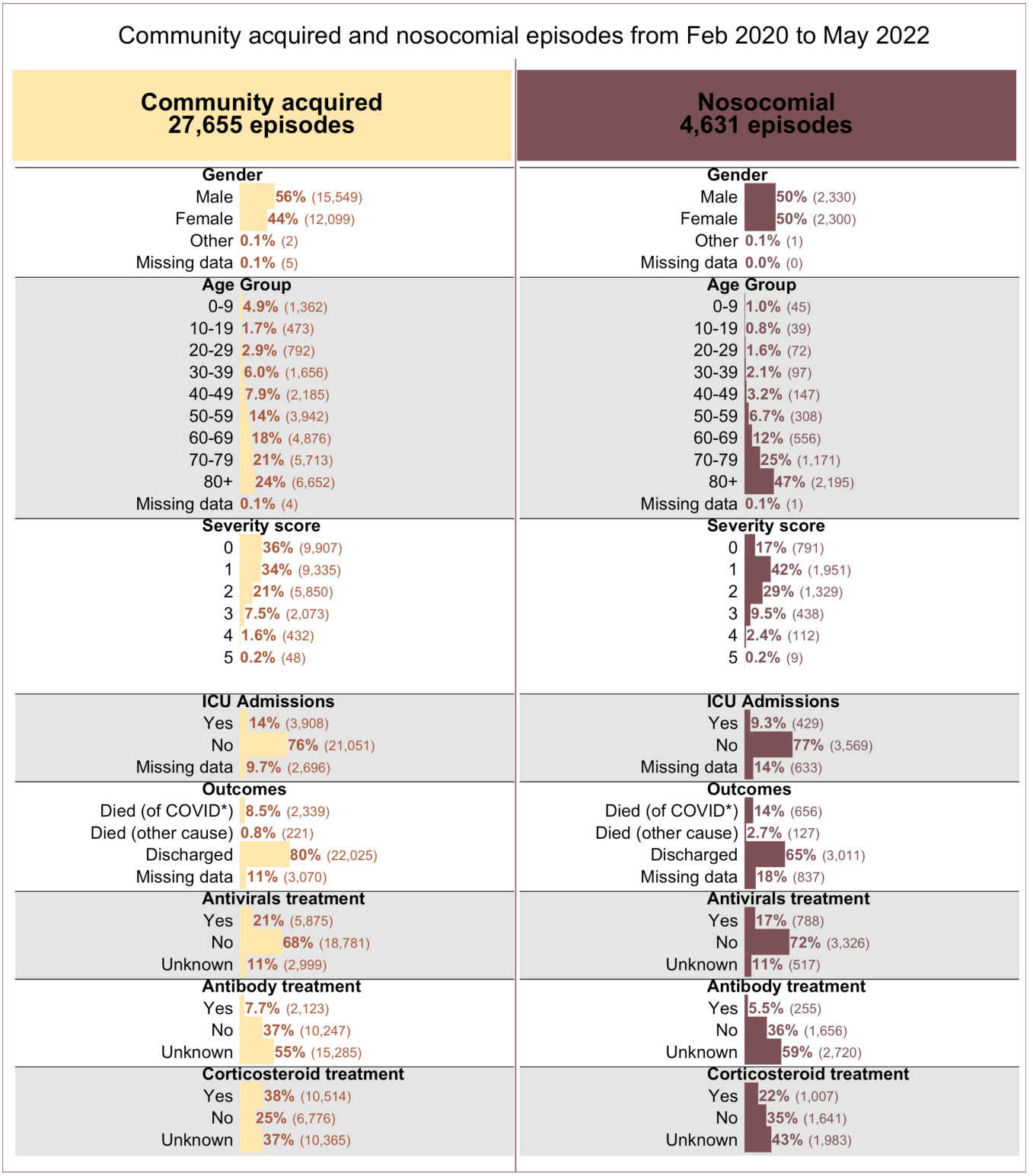


***Figure 18**: Case classification (infection source) of hospitalization episodes Comparison of community acquired and nosocomial cases by demographics, severity score, ICU, outcomes and treatments.*

8. Glossary and supplemental information

Ospedalizzazione / Hospitalization:

Si tratta della più breve unità di analisi dei dati e corrisponde al tempo intercorso tra ricovero e dimissioni da un qualsiasi ospedale partecipante a CH-SUR. L'intervallo deve avere durata superiore alle 24 ore per essere considerato un'ospedalizzazione. È rilevata una nuova ospedalizzazione ogni qualvolta la persona è ricoverata in ospedale. Considerati i frequenti nuovi ricoveri durante il decorso di un'unica malattia (singola infezione), il rapporto basa le proprie analisi sul numero di episodi e non sul numero di ospedalizzazioni.

Episodio / Episode:

È assegnato un numero di episodio a ogni nuovo ricovero in ospedale che ha una durata di almeno 24 ore avvenuto ad almeno 30 giorni di distanza da una precedente ospedalizzazione. Che il paziente sia ricoverato una sola volta o più volte nel corso di 30 giorni, in entrambi i casi è rilevato un solo episodio. Due ospedalizzazioni separate dello stesso paziente che si verificano a distanza di oltre 30 giorni determinano l'assegnazione di due diversi numeri di episodio. Se un paziente è trasferito da un ospedale a un altro (entrambi partecipanti a CH-SUR) entro un periodo di 30 giorni dalle ultime dimissioni, le due ospedalizzazioni contano come un episodio. Un episodio può pertanto comprendere numerose ospedalizzazioni, ciascuna delle quali può richiedere più ricoveri in unità di terapia intensiva.

Motivo dell'ospedalizzazione / Reason for the hospitalization:

- *Ospedalizzazione causata da COVID-19 / Hospitalization because of COVID-19*: sulla base delle informazioni disponibili al momento del ricovero, il paziente è ospedalizzato perché presenta sintomi di COVID-19 o soffre dello scompenso di una patologia cronica evidentemente causato dalla COVID-19.

- *Ospedalizzazione con infezione da SARS-CoV-2 / Hospitalization with a SARS-CoV-2 infection*: sulla base delle informazioni disponibili al momento del ricovero, il paziente è risultato positivo a un test per il SARS-CoV-2 ma viene ricoverato senza sintomi di COVID-19 per un problema che non ha a che vedere con la COVID-19. In altre parole, il problema predominante è una malattia diversa dalla COVID-19 o un infortunio.

Origine dell'infezione / Origin of the infection:

- *Infezione acquisita in comunità / Community acquired infection*: l'infezione da SARS-CoV-2 è stata rilevata prima del ricovero in ospedale o entro i primi 5 giorni dal ricovero.

- *Infezione nosocomiale / Nosocomial infection*: l'episodio è rilevato come «nosocomiale» se l'infezione da SARS-CoV-2 è rilevata 5 giorni dopo il ricovero in ospedale.

Punteggio di gravità al ricovero / Severity score at admission:

Per gli adulti, il punteggio di gravità utilizzato è il CURB-65 che assegna un punto per ciascuno dei seguenti sintomi: confusione (punteggio < 9 sul mental test abbreviato), azotemia nel sangue > 19 mg/dL, frequenza respiratoria > 30 al minuto, bassa pressione arteriosa (diastolica < 60 o sistolica < 95 mmHg), età > 65 anni. Per i bambini, è assegnato un punto per ciascuno dei seguenti sintomi: distress respiratorio, saturazione di ossigeno < 92 %, evidenza di grave disidratazione clinica o shock clinico e stato di coscienza alterato. Il punteggio di gravità corrisponde alla somma dei punti assegnati.

Unità di terapia intermedia / Intermediate care unit (intermediate care or IMC): Unità di terapia che si prende cura di pazienti con insufficienza di una funzione vitale o il cui onere di cura non consente il ritorno a un'unità di ospedalizzazione. Queste unità costituiscono l'anello di collegamento tra le unità di terapia intensiva e i posti letto normali.

Unità di terapia intensiva (UTI) / Intensive care unit (ICU): Unità che si fa carico dei pazienti con un'insufficienza grave di una o più funzioni vitali o che sono a rischio di sviluppare complicazioni gravi.

Stato immunologico / Immune status:

a) *Non immunizzati / Not immunized*: pazienti a cui non sono state somministrate dosi di vaccino prima del risultato positivo del test per il SARS-CoV-2 e che non avevano prove di precedenti infezioni con il virus prima dell'episodio di ospedalizzazione in corso.

b) *Parzialmente immunizzati / Partially immunized*: pazienti a cui è stata somministrata una dose dei vaccini di Moderna (Spikevax®), Pfizer/BioNTech (Comirnaty®), AstraZeneca (Vaxzevria®), Sinopharm®, Sinovac (CoronaVac®) o COVAXIN® prima del risultato positivo del test e che non hanno prove di precedenti infezioni da SARS-CoV-2.

c) *Con immunizzazione di base / Base immunized*:

1. pazienti a cui è stata somministrata una dose del vaccino di Johnson & Johnson (Janssen®) o due dosi dei vaccini Spikevax®, Comirnaty®, Vaxzevria®, Sinopharm®, CoronaVac® or COVAXIN® (raccomandazione di vaccinazione dell'UFSP / della Commissione federale per le vaccinazioni);

2. pazienti con una precedente infezione o il risultato positivo di un test documentati (con o senza ospedalizzazione) a cui è stata somministrata una dose dei vaccini summenzionati, indipendentemente dal periodo intercorso tra la guarigione e la data della vaccinazione;

3. pazienti a cui è stata somministrata una combinazione dei seguenti vaccini: Comirnaty® e Spikevax®; Vaxzevria® e Comirnaty®; Vaxzevria® e Spikevax®. Sono esclusi i pazienti a cui è stata somministrata una dose di richiamo aggiuntiva (categoria «Con vaccinazione di richiamo»).

d) *Con vaccinazione di richiamo / Boosted*: pazienti con immunizzazione di base a cui sono state somministrate una o più dosi di vaccino (vaccinazione di richiamo) a distanza di almeno quattro mesi dall'ultima somministrazione per l'immunizzazione di base.

e) *Guariti da un'infezione da SARS-CoV-2 / Recovered from a SARS-CoV-2 infection*: pazienti con precedente infezione da SARS-CoV-2 confermata che hanno avuto bisogno o no di essere ospedalizzati in passato e a cui non sono state somministrate dosi di vaccino, indipendentemente dal tempo trascorso dalla precedente infezione. Nota: molti pazienti guariti non sono identificati come tali nella banca dati (informazione raccolta solo a partire da giugno 2021, infezione non diagnosticata, informazione mancante nella cartella medica).

f) *Stato immunologico sconosciuto / Unknown immune status*: pazienti il cui stato immunologico e vaccinale non è disponibile.

e) *Completamente immunizzati / Fully immunized*: questa categoria risulta dalla combinazione delle categorie «Con immunizzazione di base» e «Con vaccinazione di richiamo». Dimissioni Quando il paziente lascia l'ospedale da vivo, la sua partenza è categorizzata come dimissioni se il paziente:

Dimissioni / Discharge: Quando il paziente lascia l'ospedale da vivo, la sua partenza è categorizzata come dimissioni se il paziente:

1. rientra al proprio domicilio;

2. è ricoverato in una struttura di lungodegenza;

3. è ricoverato in un altro ospedale;

4. è ricoverato in un'altra struttura che non partecipa alla sorveglianza CH-SUR;

5. è ricoverato in una struttura di riabilitazione;

6. si reca presso una destinazione sconosciuta.

Motivo del decesso / Reason of death: I pazienti per i quali la COVID-19 è stata la causa di morte (decesso per COVID-19) sono indicati separatamente dai pazienti di COVID-19 morti per altre cause (decesso con COVID-19 ma non per COVID-19). Per ogni struttura partecipante a CH-SUR è un medico a livello di ospedale ad accertare se un paziente COVID-19 è morto per COVID-19 o per un'altra causa. In presenza di una diagnosi di COVID-19 (conformemente ai criteri di inclusione di CH-SUR), i casi in cui la causa del decesso è incerta sono considerati decessi per COVID-19 effettivi o sospetti.

Gestione dei dati mancanti / Dealing with missing data: Se indicato nel testo, i dati mancanti sono esclusi dall'analisi. In caso contrario, le voci con dati mancanti sono incluse nei totali e analizzate di conseguenza. Questo potrebbe comportare che i denominatori di diverse categorie analizzate non diano, se addizionati, lo stesso totale. Ove indicato, i dati degli ultimi due mesi sono considerati provvisori a causa di ritardi nell'immissione dei dati ed evidenziati in grigio in alcuni grafici.

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