# Bericht zum spitalbasierten COVID-19-Sentinel-Überwachungssystem

***Datenstand: 19. April 2022***

## 1. Einleitende Zusammenfassung

Das spitalbasierte COVID-19-Sentinel-Überwachungssystem (CH-SUR) wurde im Jahr 2018 gegründet, um grippebedingte Hospitalisationen zu erfassen. Bereits am 1. März 2020, vier Tage nach der Meldung des ersten bestätigten COVID-19 Falls in der Schweiz, stand das angepasste Programm bereit, um auch Hospitalisationen im Zusammenhang mit einer laborbestätigten SARS-CoV-2-Infektion zu registrieren.

Zurzeit nehmen 20 Spitäler aktiv teil, darunter die meisten Kantons- und Universitätsspitäler, welche einen grossen Teil der hospitalisierten pädiatrischen und erwachsenen Patientinnen und Patienten in der ganzen Schweiz abdecken. Die CH-SUR-Statistik gibt unter anderem die Anzahl und Dauer der Hospitalisationen sowie die Aufenthalte auf der Intensivpflegestation an. Eine Patientin oder ein Patient kann während einer Hospitalisationsepisode mehrfach hospitalisiert werden bzw. mehrere Aufnahmen in eine Intensivpflegestation (IPS) benötigen. Ersichtlich ist in CH-SUR ebenfalls, ob die Patientin oder der Patient während der Hospitalisation an oder mit COVID-19 verstorben ist.

Einschlusskriterien: CH-SUR erfasst Daten von Patientinnen und Patienten, welche mit einer dokumentierten Infektion mit SARS-CoV-2 hospitalisiert wurden und deren Spitalaufenthalt länger als 24 Stunden andauert. Nosokomiale SARS-CoV-2-Infektionen werden in der Datenbank ebenfalls erfasst und in einem separaten Kapitel am Schluss dieses Berichts aufgeführt. Als Bestätigung für eine Infektion gilt ein positiver PCR-Test (Polymerase Chain Reaction) oder ein positiver Antigen-Schnelltest, wie auch ein klinischer Befund für COVID-19.

Seit Beginn der Epidemie bis zum 18. April 2022 wurden Daten von 32 029 Hospitalisationsepisoden erhoben. Im gleichen Zeitraum wurden dem BAG im Rahmen der Meldepflicht für die gesamte Schweiz 51 631 Episoden von Hospitalisationen mit einer laborbestätigten SARS-CoV-2-Infektion gemeldet. Das CH-SUR-System deckte somit ca. 62,0% aller gemeldeten Hospitalisationen im Zusammenhang mit SARS-CoV-2 in der Schweiz ab.

Seit März 2022 konzentriert sich dieser Bericht auf Episoden, bei welchen die Infektion ausserhalb des Spitals stattgefunden hat (ambulant erworbene Infektionen, beschrieben in Kapitel 2 bis 6). Ein separates Kapitel befasst sich mit den nosokomialen Infektionen (Kapitel 7). Der Gesamtanteil der nosokomialen Infektionen unter allen dokumentierten Episoden lag bei 13,6% (4 347 von 32 029), während der Anteil der Episoden im Zusammenhang mit ambulant erworbenen Infektionen 82,9% (26 567 von 32 029) betrug (Abbildung **1**). 3,5% der Episoden konnten weder den nosokomialen noch den ambulant erworbenen Infektionen zugeordnet werden.

Von allen Episoden im Zusammenhang mit einer ambulant erworbenen Infektion, für welche vollständige relevante Daten vorliegen, erforderten 15,2% einen Aufenthalt in einer IPS (3 696 von 23 400 Episoden, 26. Februar 2020 bis Februar 28, 2022) und 9,7% führten zum Tod an COVID-19 (2 279 von 23 400 Episoden, 26. Februar 2020 bis April 18, 2022).

Während des letzten Zeitraums, für den genügend Daten vorliegen (Jan 01, 2022 bis Feb 28, 2022), wurden 3 834 Episoden im Zusammenhang mit ambulant erworbenen Infektionen verzeichnet. Davon betrafen 1 718 (44,8%) nicht immunisierte Patientinnen und Patienten und 1 316 (34,3%) vollständig immunisierte Patientinnen und Patienten (grundimmunisiert mit oder ohne Auffrischimpfung) (Abbildung **2**). Im gleichen Zeitraum waren 252 Episoden mit einem Aufenthalt auf einer Intensivpflegestation verbunden. Von diesen betrafen 135 (53,6%) nicht immunisierte und 87 (34,5%) vollständig immunisierte Patientinnen und Patienten. In 143 Episoden starben die Patientinnen und Patienten an COVID-19 (3,7% aller registrierten Episoden mit bekanntem Outcome), wobei 84 Todesfälle nicht immunisierte Patientinnen und Patienten und 45 vollständig immunisierte Patientinnen und Patienten betrafen.

Definitionen und weitere Informationen zu den Daten finden Sie im Kapitel Glossar und ergänzende Informationen am Schluss dieses Berichts.

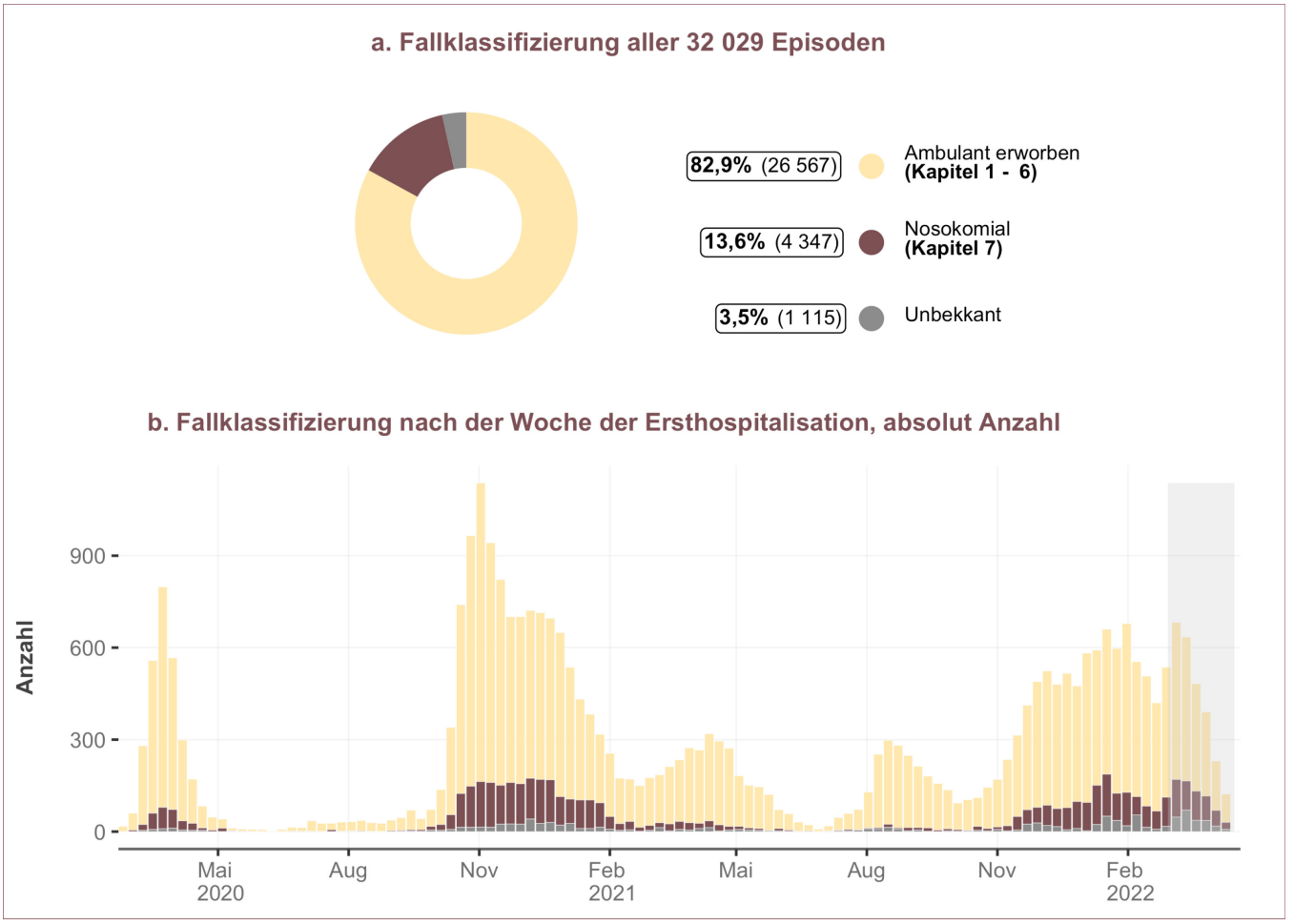


***Figure 1**: Episoden nach Fallklassifizierung (Infektionsquelle). Anteil (normalisiert in %) der Episoden nach Infektionsquelle (Diagramm a) und absolute Anzahl Episoden über die Zeit (Diagramm b). Bei Episoden mit Mehrfachhospitalisation wurde die Fallklassifizierung der Ersthospitalisation berücksichtigt. Aufgrund von Verzögerungen bei der Datenerfassung werden die Daten der letzten beiden Monate (grau markiert) als provisorisch betrachtet.*

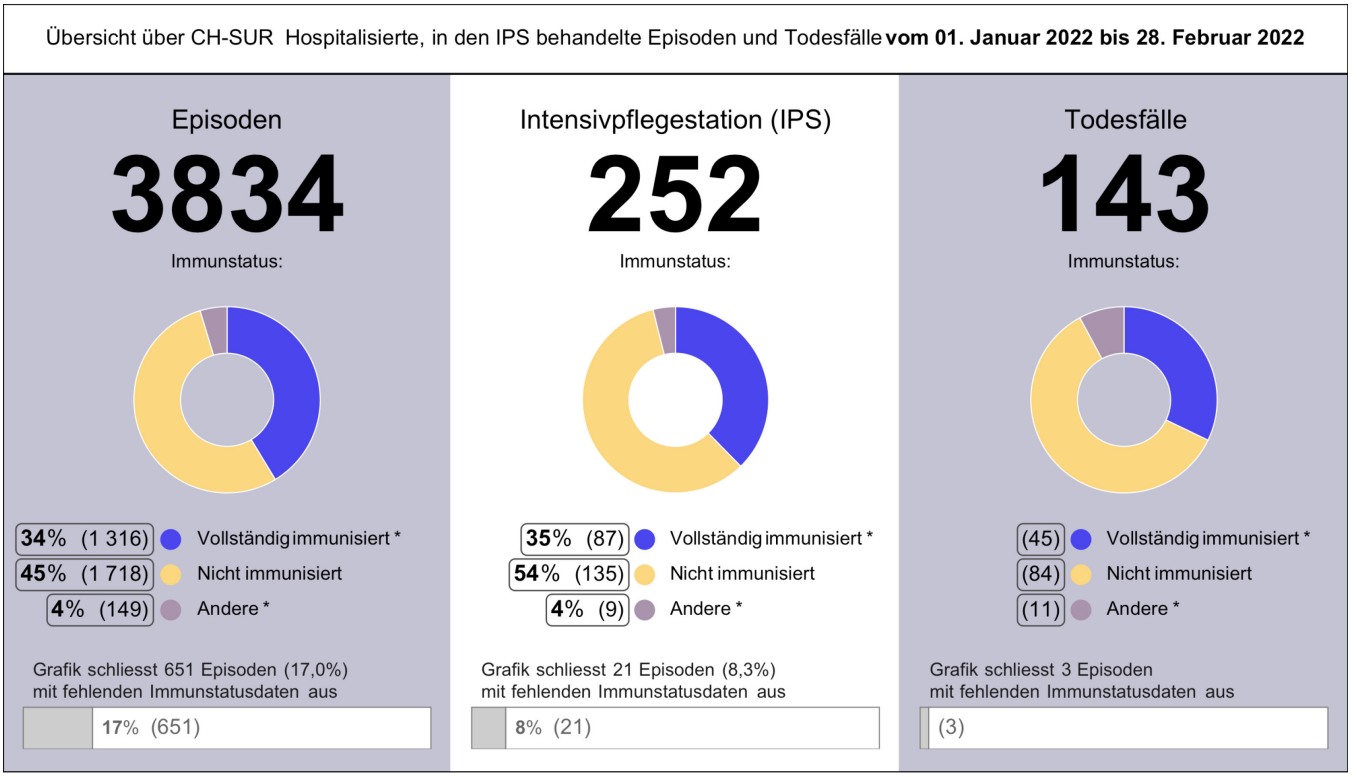


***Figure 2**: Übersicht über die neuesten Daten. Die Daten der letzten beiden Monate werden aufgrund von Verzögerungen bei der Dateneingabe als vorläufig betrachtet und wurden daher nicht berücksichtigt. (* vollständig immunisiert: Patient/innen mit einer Grundimmunisierung und Personen mit einer Auffrischimpfung. Andere: teilweise immunisierte Patient/innen und Personen, die von einer früheren SARS-CoV-2-Infektion genesen sind)*

# 2. Hospitalizations and demographic characteristics

Between the start of the epidemic in Switzerland and April 18, 2022 and among the 20 hospitals actively participating in CH-SUR, 26,567 episodes of community acquired infections were registered, accounting for a total of 27,544 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**.

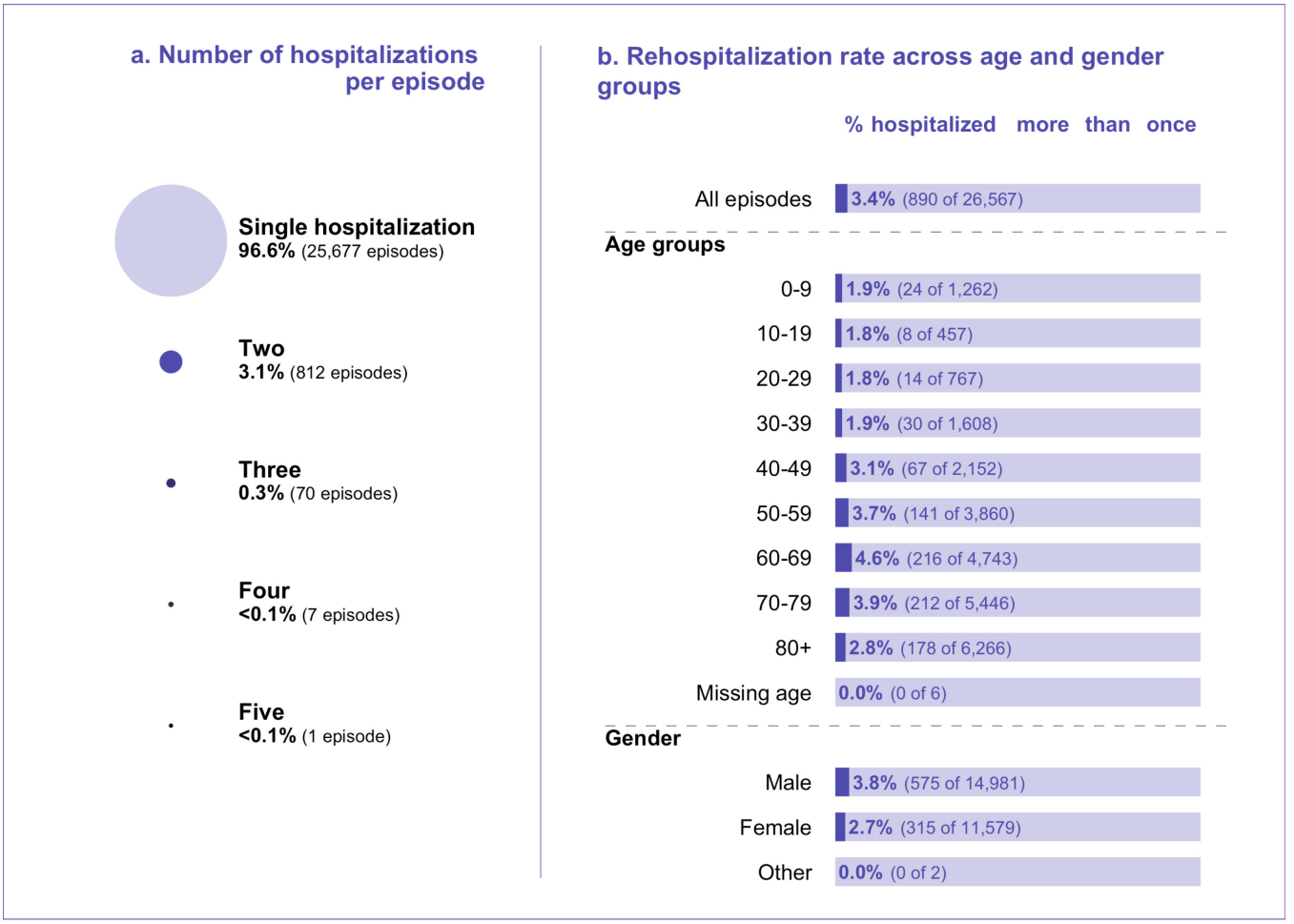


***Figure 3**: Hospitalizations per episode of hospitalization and rehospitalization rate across demographic groups. Includes records between March 2020 and April 18, 2022.*

Most patients (96.6% [25,677 of 26,567]) were hospitalized only once during an episode, while 3% of the registered episodes (889 of 26,567) 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% (890 of 26,567) (Figure **3**c). The 60-69 age group and the 70-79 age group had the highest rate of rehospitalization at respectively 4.6% (216 of 4,743) and 3.9% (212 of 5,446). Men had a higher rehospitalization rate than women, 3.8% (575 of 14,981) vs 2.7% (315 of 11,579) respectively.

Overall, the majority (56.4% [14,981 of 26,567]) 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% [6,266]).

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% (819 of 1,088) in November 2021.

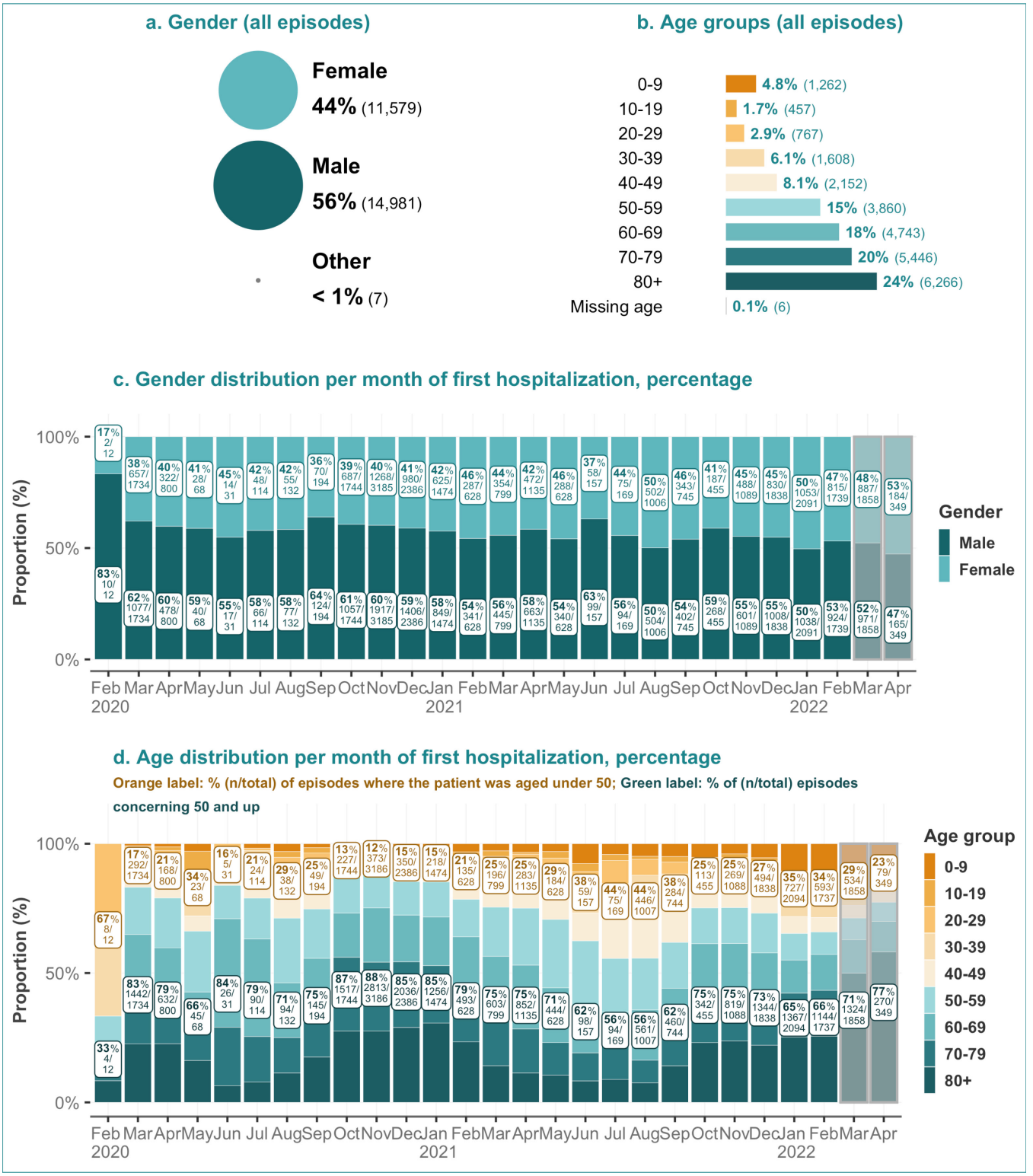


***Figure 4**: Demographic characteristics: gender and age distribution of admitted hospitalized patients, overall and per month. For episodes with multiple hospitalizations, the admission date of the first hospitalization was used. Data from the last two months (highlighted gray) is considered provisional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

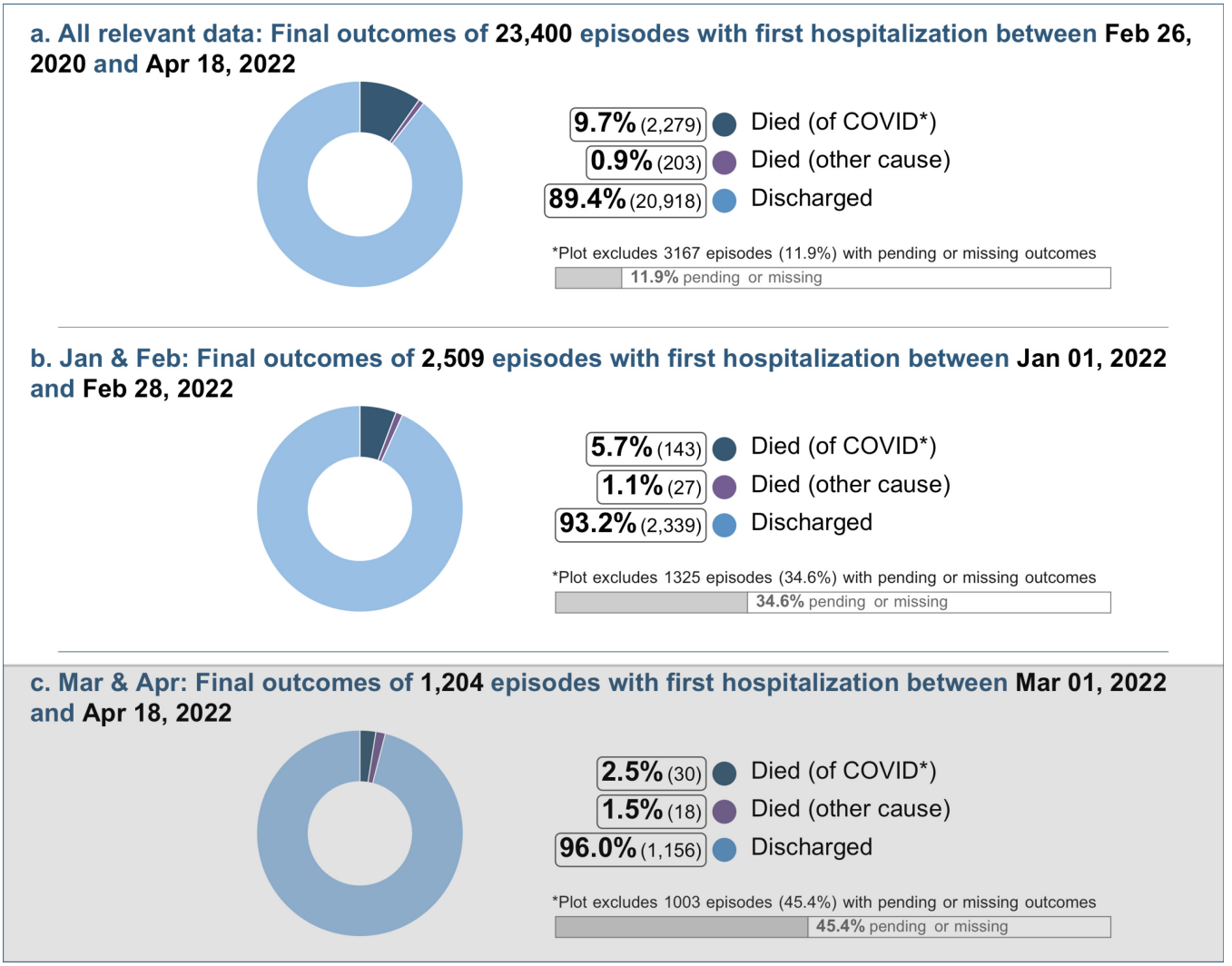


***Figure 5**: Outcomes for COVID-19 related episodes of hospitalization in CH-SUR hospitals. Includes records up to April 18, 2022. For episodes with multiple hospitalizations, only the final outcome is considered. Patients where the cause of death was not certain, but there was a COVID-19 diagnosis (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.

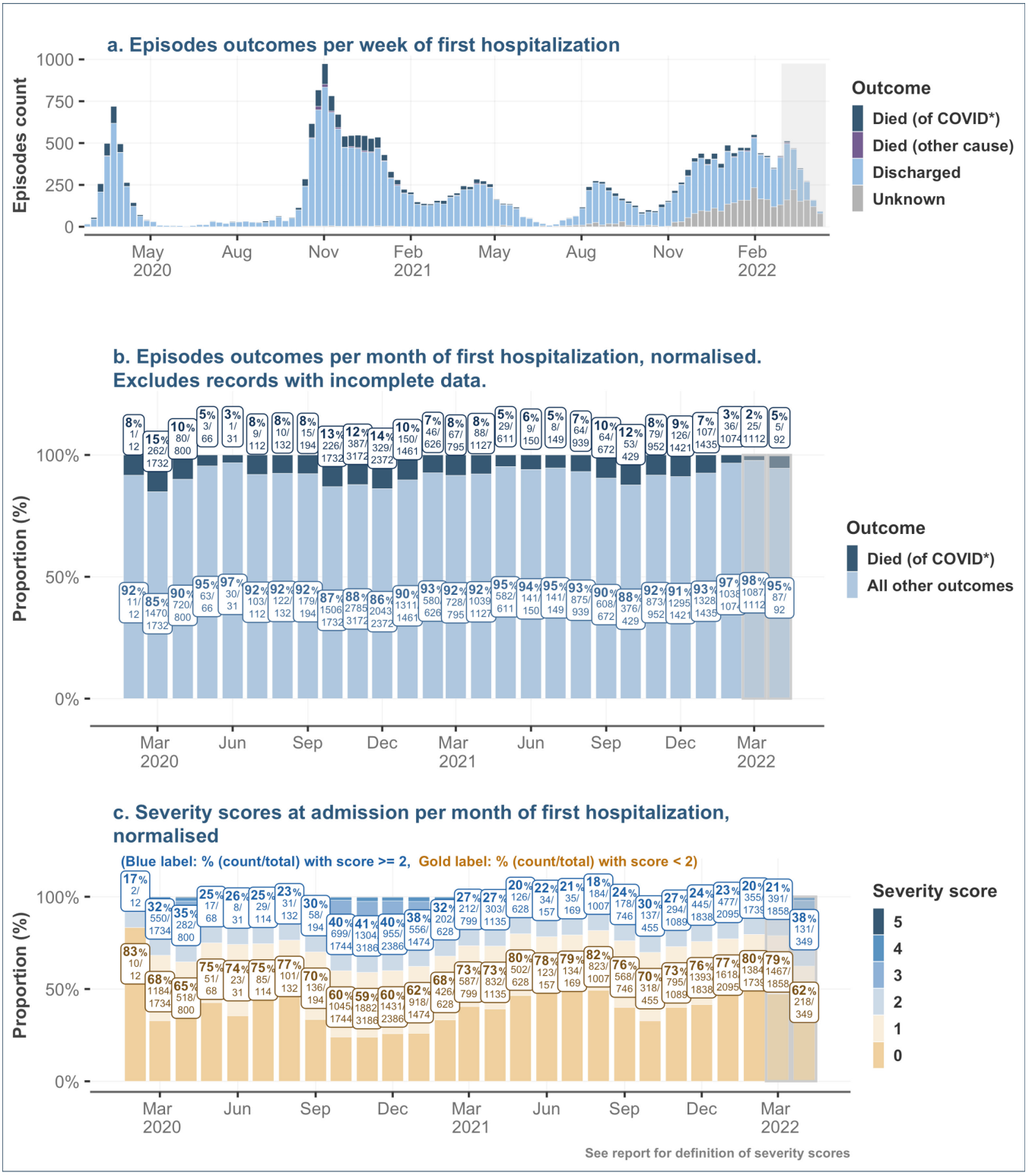


***Figure 6**: Epidemic curve, episodes' outcomes and severity scores at admission for COVID-19 hospitalizations over time. Includes records up to April 18, 2022. Data from the two last months (highlighted in gray) are considered provisional due to data entry delays. Episodes where the cause of death 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 February 28, 2022, the case fatality rate (CFR) for episodes with community acquired infections increased with increasing age, from 0% (0 of 919) in episodes of patients aged 0-9, to 3.2% (108 of 3,399) in episodes of patients aged 50-59, and to 23% (1,150 of 4,993) in episodes of patients aged 80+. CFR% was greater in men than in women: 11.7% (1,483 of 12,724) vs 8.1% (766 of 9,468) respectively. In addition, the CFR% was greater for episodes with higher severity scores at admission: in 1.1% (85 of 7,571) of the episodes with severity score 0 resulted in death of COVID-19, while 50% (23 of 46) 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 January and February 2022, Figure **7**b) was lower than the CFR% of the whole epidemic period (5.7% vs. 10.1%). The CFR% of the age groups 70-79 and 80+ were also lower than over the whole epidemic (Figure **7**).

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

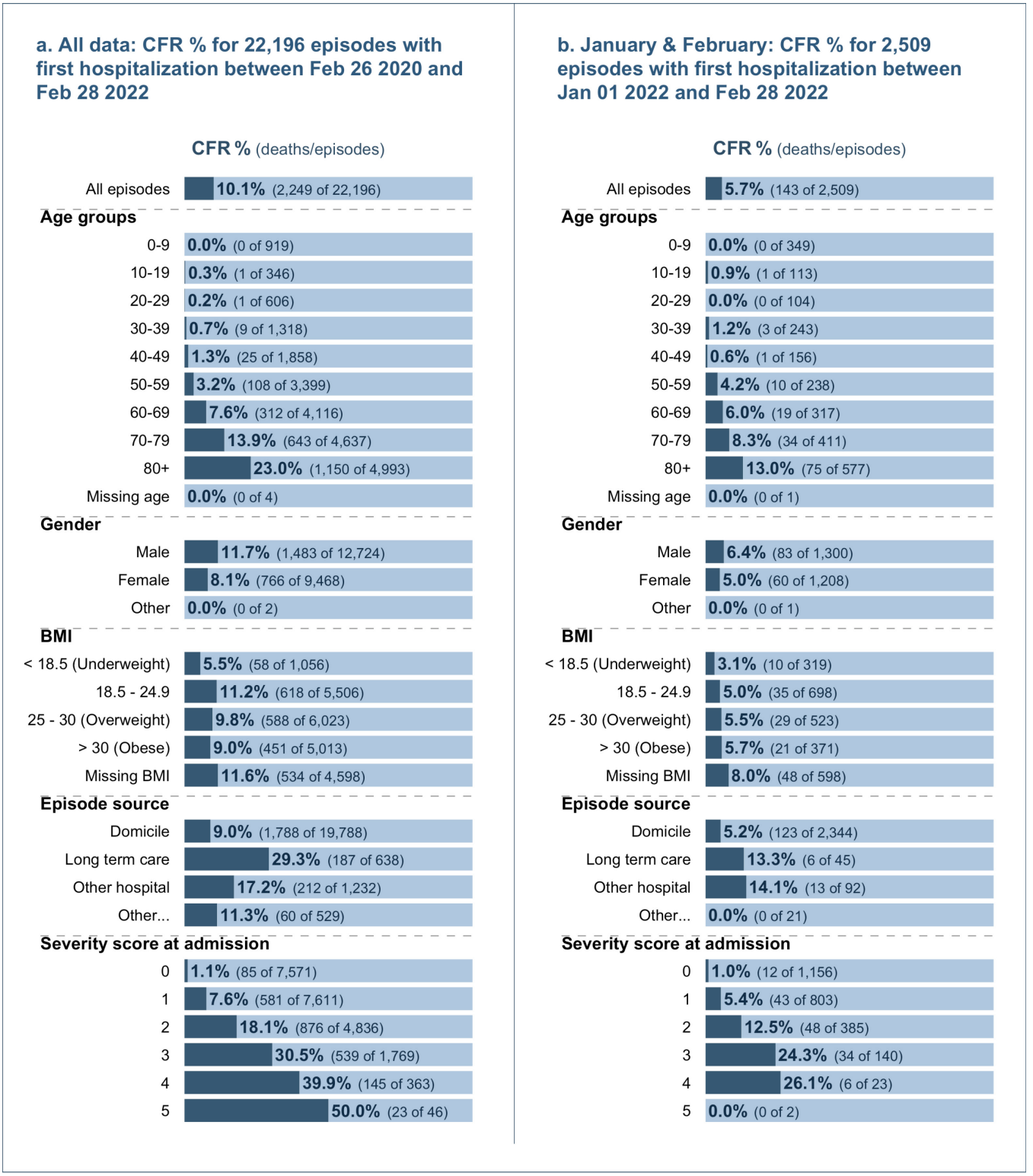


***Figure 7**: Case fatality rate (CFR) % among demographic and risk groups: percentage of hospitalization episodes in different demographic groups, which ended in the death of the patient of COVID-19 in hospital. Both figures include records up to Feb 28 2022 but records with incomplete data (ongoing 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 immunized (Figure**8**c, source: FOPH Dashboard).

During the months of January and February 2022, when between 69.0% and 70.1% of the Swiss population was fully immunized (Figure **8**c), the base immunized and boosted made up only a minority (24.1% and 17.3% respectively) of the episodes recorded in CH-SUR (Figure **8**b), suggesting protection against hospitalization (and, consequently, death) due to COVID-19.

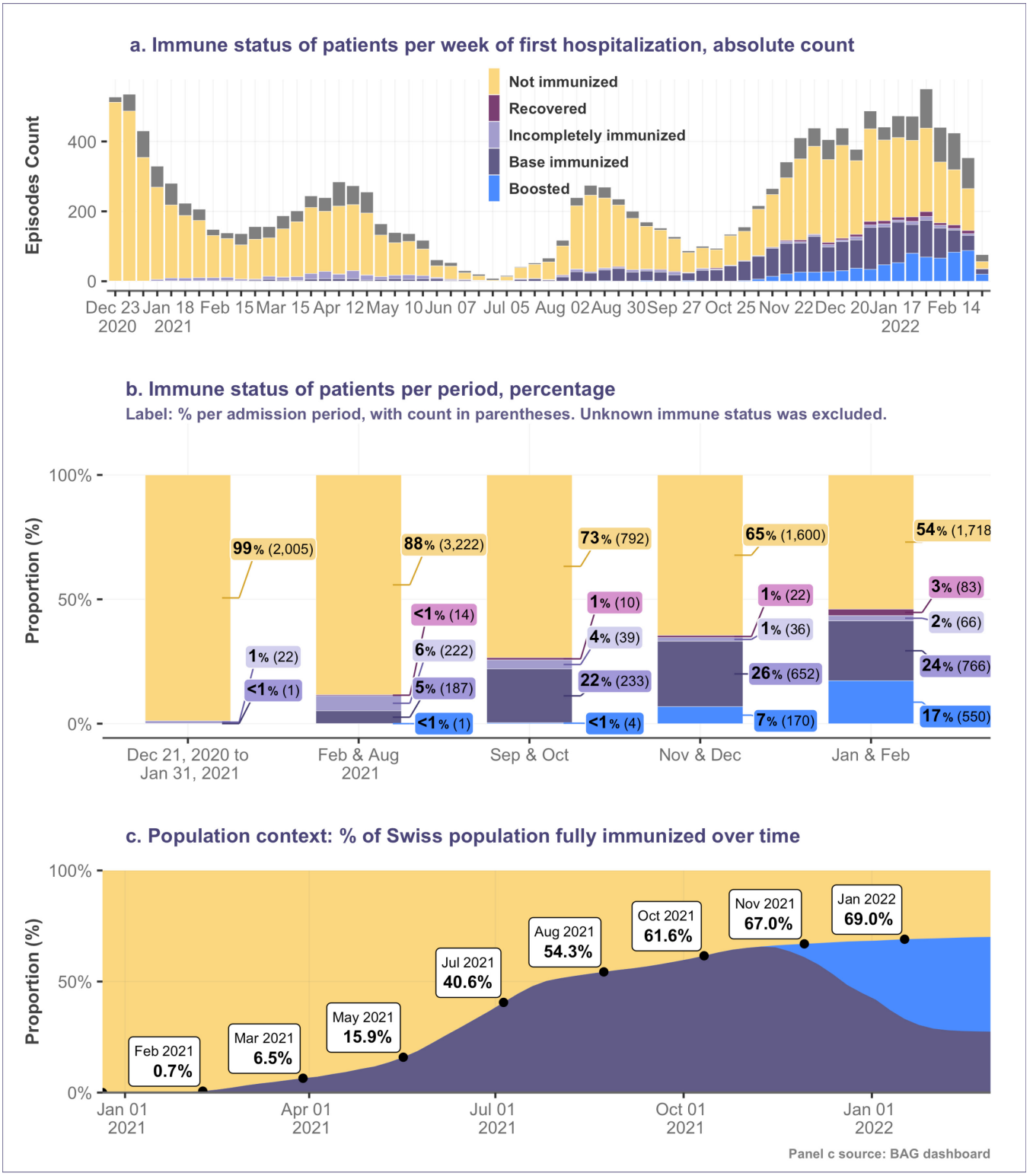


***Figure 8**: Immune status of patients and overall vaccination rate in Switzerland (exported: April 18, 2022). See glossary for definitions of immune status categories. For episodes with multiple hospitalizations, the immune status for the first hospitalization was considered. Panels a. and b. include 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 Feb 28, 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, 34.4% (908 of 2,636) of the episodes of fully immunized patients corresponded to patients aged 80 and above (Figure **9**a, right panels). In contrast, only 17% (1,582 of 9,369) 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.

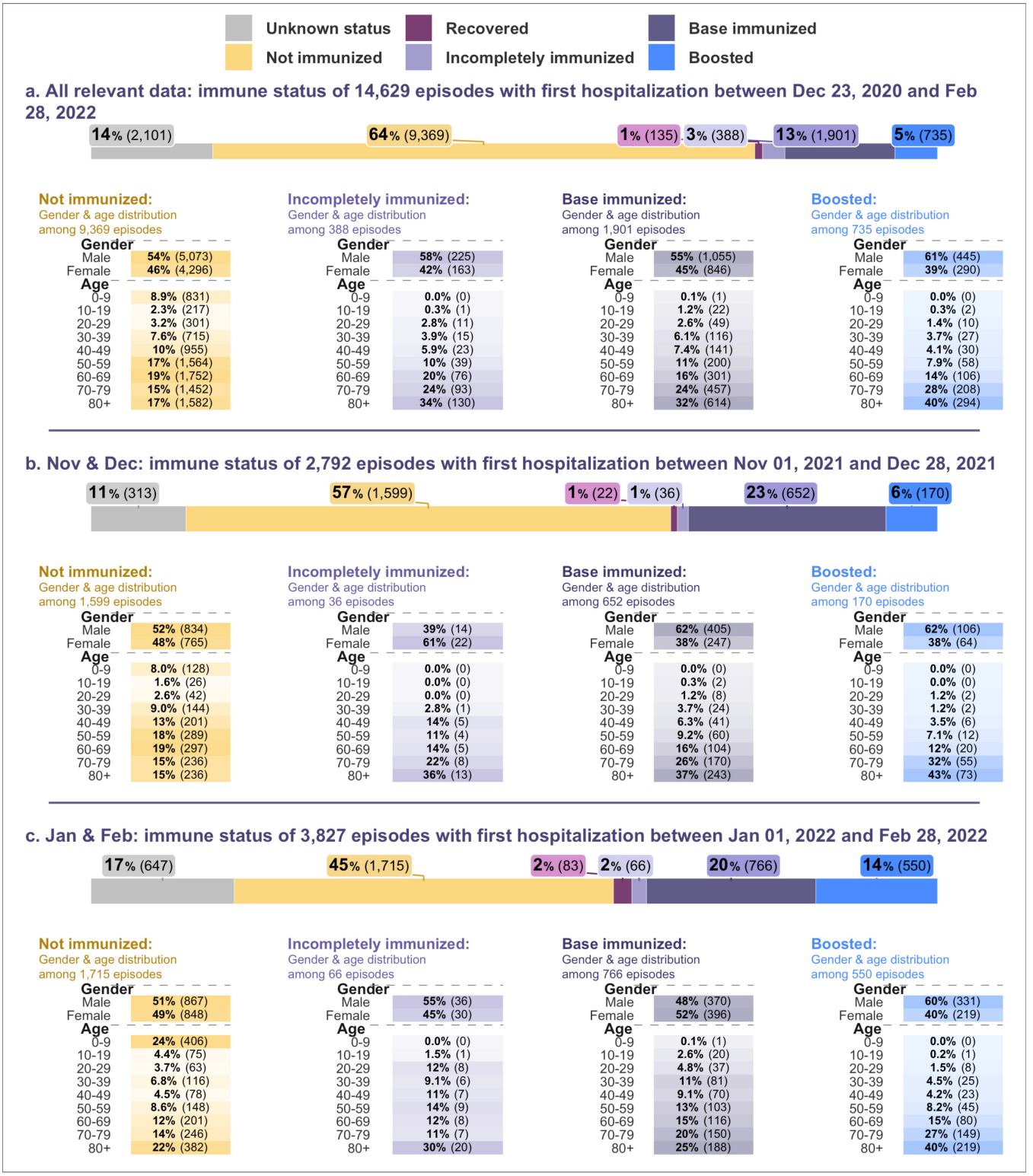


***Figure 9**: Demographic characteristics of hospitalized patients by immune status, over three different periods. Some patients may be counted more than once, as a single patient can have several episodes. Episodes with first admission date after Feb 28 2022 were excluded, as a large proportion of 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 2,142 episodes of fully immunized patients (community acquired infections), CH SUR registered 172 deaths because of COVID-19 (Figure **10**a, right panels: base immunized and boosted). 96 of them corresponded to patients aged 80 years old and above. Over the same period, 663 episodes ended in COVID-caused deaths among non-immunized patients (Figure **10**a, left panel).

During the months of January and February, CH-SUR registered 135 deaths due to COVID-19 of which the immune status was known. Of these, 84 (62.2%) happened among non-immunized patients, 6 deaths (4.4%) among partially immunized patients, and 45 deaths (33.3%) among fully immunized patients (Figure **10**). Despite representing a smaller share of the population (31.0% of the whole Swiss population was non immunized at the time of data analysis, see Figure **8**c), the non-immunized population's death toll represents a larger portion in CH-SUR (Figure **10**c). Figure **10**c excludes 3 deaths of which the immune status was unknown and 5 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: 889 deaths among 10,909 episodes with first hospitalization between Dec 23, 2020 and Feb 28, 2022

**Not immunized:**
Age distribution of **663** deaths in **8,405** episodes

| Age | Cases | Deaths | CFR % |
|---|---|---|---|
| 0-9 | 732 | 0 | 0% |
| 10-19 | 179 | 1 | 0.6% |
| 20-29 | 263 | 1 | 0.4% |
| 30-39 | 640 | 5 | 0.8% |
| 40-49 | 869 | 13 | 1.5% |
| 50-59 | 1431 | 45 | 3.1% |
| 60-69 | 1608 | 119 | 7.4% |
| 70-79 | 1314 | 173 | 13.2% |
| 80+ | 1369 | 306 | 22.4% |

**Incompletely immunized:**
Age distribution of **54** deaths in **362** episodes

| Age | Cases | Deaths | CFR % |
|---|---|---|---|
| 0-9 | 0 | 0 | - |
| 10-19 | 1 | 0 | 0% |
| 20-29 | 10 | 0 | 0% |
| 30-39 | 12 | 0 | 0% |
| 40-49 | 20 | 0 | 0% |
| 50-59 | 34 | 3 | 8.8% |
| 60-69 | 73 | 10 | 13.7% |
| 70-79 | 88 | 14 | 15.9% |
| 80+ | 124 | 27 | 21.8% |

**Base immunized:**
Age distribution of **134** deaths in **1,546** episodes

| Age | Cases | Deaths | CFR % |
|---|---|---|---|
| 0-9 | 0 | 0 | - |
| 10-19 | 15 | 0 | 0% |
| 20-29 | 33 | 0 | 0% |
| 30-39 | 96 | 0 | 0% |
| 40-49 | 109 | 1 | 0.9% |
| 50-59 | 161 | 7 | 4.3% |
| 60-69 | 250 | 20 | 8.0% |
| 70-79 | 381 | 31 | 8.1% |
| 80+ | 501 | 75 | 15.0% |

**Boosted:**
Age distribution of **38** deaths in **596** episodes

| Age | Cases | Deaths | CFR % |
|---|---|---|---|
| 0-9 | 0 | 0 | - |
| 10-19 | 2 | 0 | 0% |
| 20-29 | 8 | 0 | 0% |
| 30-39 | 24 | 0 | 0% |
| 40-49 | 24 | 0 | 0% |
| 50-59 | 44 | 0 | 0% |
| 60-69 | 84 | 4 | 4.8% |
| 70-79 | 167 | 13 | 7.8% |
| 80+ | 243 | 21 | 8.6% |

### b. Nov & Dec: 189 deaths among 2,166 episodes with first hospitalization between Nov 01, 2021 and Dec 28, 2021

**Not immunized:**
Age distribution of **119** deaths in **1,397** episodes

| Age | Cases | Deaths | CFR % |
|---|---|---|---|
| 0-9 | 115 | 0 | 0% |
| 10-19 | 17 | 0 | 0% |
| 20-29 | 38 | 0 | 0% |
| 30-39 | 126 | 1 | 0.8% |
| 40-49 | 174 | 3 | 1.7% |
| 50-59 | 248 | 9 | 3.6% |
| 60-69 | 267 | 18 | 6.7% |
| 70-79 | 204 | 28 | 13.7% |
| 80+ | 208 | 60 | 28.8% |

**Incompletely immunized:**
Age distribution of **3** deaths in **33** episodes

| Age | Cases | Deaths | CFR % |
|---|---|---|---|
| 0-9 | 0 | 0 | - |
| 10-19 | 0 | 0 | - |
| 20-29 | 0 | 0 | - |
| 30-39 | 1 | 0 | 0% |
| 40-49 | 4 | 0 | 0% |
| 50-59 | 4 | 0 | 0% |
| 60-69 | 5 | 1 | 20.0% |
| 70-79 | 7 | 1 | 14.3% |
| 80+ | 12 | 1 | 8.3% |

**Base immunized:**
Age distribution of **47** deaths in **576** episodes

| Age | Cases | Deaths | CFR % |
|---|---|---|---|
| 0-9 | 0 | 0 | - |
| 10-19 | 0 | 0 | - |
| 20-29 | 7 | 0 | 0% |
| 30-39 | 23 | 0 | 0% |
| 40-49 | 35 | 0 | 0% |
| 50-59 | 50 | 1 | 2.0% |
| 60-69 | 97 | 7 | 7.2% |
| 70-79 | 155 | 4 | 2.6% |
| 80+ | 209 | 35 | 16.7% |

**Boosted:**
Age distribution of **20** deaths in **160** episodes

| Age | Cases | Deaths | CFR % |
|---|---|---|---|
| 0-9 | 0 | 0 | - |
| 10-19 | 0 | 0 | - |
| 20-29 | 2 | 0 | 0% |
| 30-39 | 2 | 0 | 0% |
| 40-49 | 4 | 0 | 0% |
| 50-59 | 10 | 0 | 0% |
| 60-69 | 18 | 2 | 11.1% |
| 70-79 | 54 | 7 | 13.0% |
| 80+ | 70 | 11 | 15.7% |

### c. Jan & Feb: 135 deaths among 2,151 episodes with first hospitalization between Jan 01, 2022 and Feb 28, 2022

**Not immunized:**
Age distribution of **84** deaths in **1,149** episodes

| Age | Cases | Deaths | CFR % |
|---|---|---|---|
| 0-9 | 327 | 0 | 0% |
| 10-19 | 51 | 1 | 2.0% |
| 20-29 | 39 | 0 | 0% |
| 30-39 | 77 | 3 | 3.9% |
| 40-49 | 54 | 0 | 0% |
| 50-59 | 97 | 5 | 5.2% |
| 60-69 | 130 | 10 | 7.7% |
| 70-79 | 159 | 19 | 11.9% |
| 80+ | 215 | 46 | 21.4% |

**Incompletely immunized:**
Age distribution of **6** deaths in **49** episodes

| Age | Cases | Deaths | CFR % |
|---|---|---|---|
| 0-9 | 0 | 0 | - |
| 10-19 | 1 | 0 | 0% |
| 20-29 | 7 | 0 | 0% |
| 30-39 | 4 | 0 | 0% |
| 40-49 | 5 | 0 | 0% |
| 50-59 | 7 | 0 | 0% |
| 60-69 | 6 | 2 | 33.3% |
| 70-79 | 3 | 0 | 0% |
| 80+ | 16 | 4 | 25.0% |

**Base immunized:**
Age distribution of **27** deaths in **532** episodes

| Age | Cases | Deaths | CFR % |
|---|---|---|---|
| 0-9 | 0 | 0 | - |
| 10-19 | 15 | 0 | 0% |
| 20-29 | 23 | 0 | 0% |
| 30-39 | 64 | 0 | 0% |
| 40-49 | 49 | 1 | 2.0% |
| 50-59 | 76 | 4 | 5.3% |
| 60-69 | 79 | 4 | 5.1% |
| 70-79 | 98 | 8 | 8.2% |
| 80+ | 128 | 10 | 7.8% |

**Boosted:**
Age distribution of **18** deaths in **421** episodes

| Age | Cases | Deaths | CFR % |
|---|---|---|---|
| 0-9 | 0 | 0 | - |
| 10-19 | 1 | 0 | 0% |
| 20-29 | 6 | 0 | 0% |
| 30-39 | 22 | 0 | 0% |
| 40-49 | 19 | 0 | 0% |
| 50-59 | 33 | 0 | 0% |
| 60-69 | 60 | 2 | 3.3% |
| 70-79 | 109 | 6 | 5.5% |
| 80+ | 171 | 10 | 5.8% |

***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 24.7% (1,100 of 4,461) 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 5.4% (300 of 5,554) 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 18.3% of the episodes concerning males, compared to 11% of the episodes concerning females.

Episodes of patients transferred in from other hospitals had a high probability of ICU admission: 53.9% of such episodes (726 of 1,348) required at least one ICU admission (Figure **11**a), compared to an overall admission rate of 17.9% 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 (January 2022 and February 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 January and February than for the full epidemic period (Figure **11**).

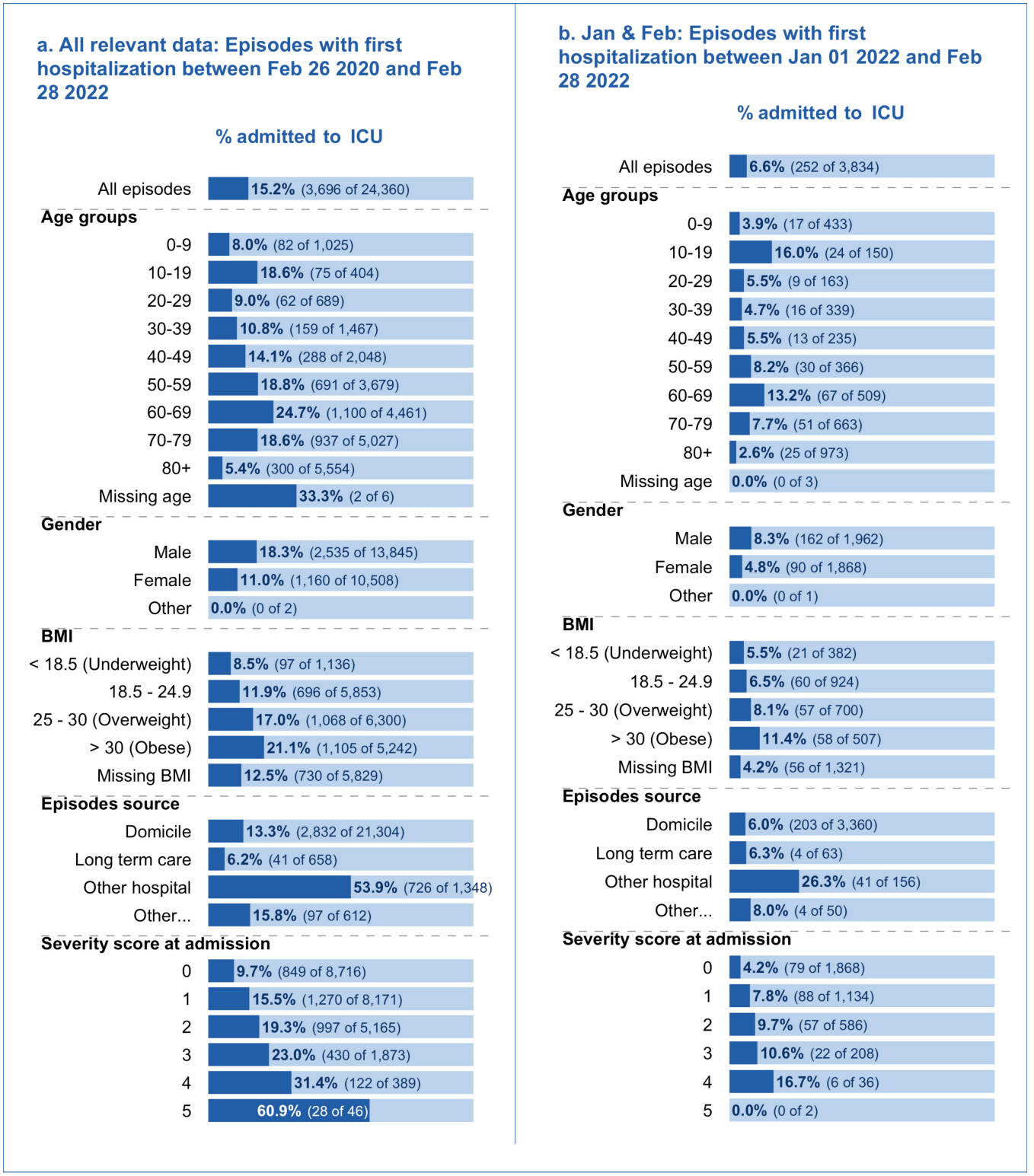


***Figure 11**: Percentage of hospitalization episodes with at least one ICU admission, grouped by demographic and risk factors, over two time intervals. For episodes with multiple hospitalizations, we considered whether they were admitted to the ICU during any of their hospitalizations. Both panels include records up to Feb 28, 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 March and April 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 (75% and 54% 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 Nov 2021 and Feb 2022 around 83% 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 73.5% (Nov, Dec) and 67.9% (Jan, Feb) of the episodes corresponded to patients aged 50 years and above.

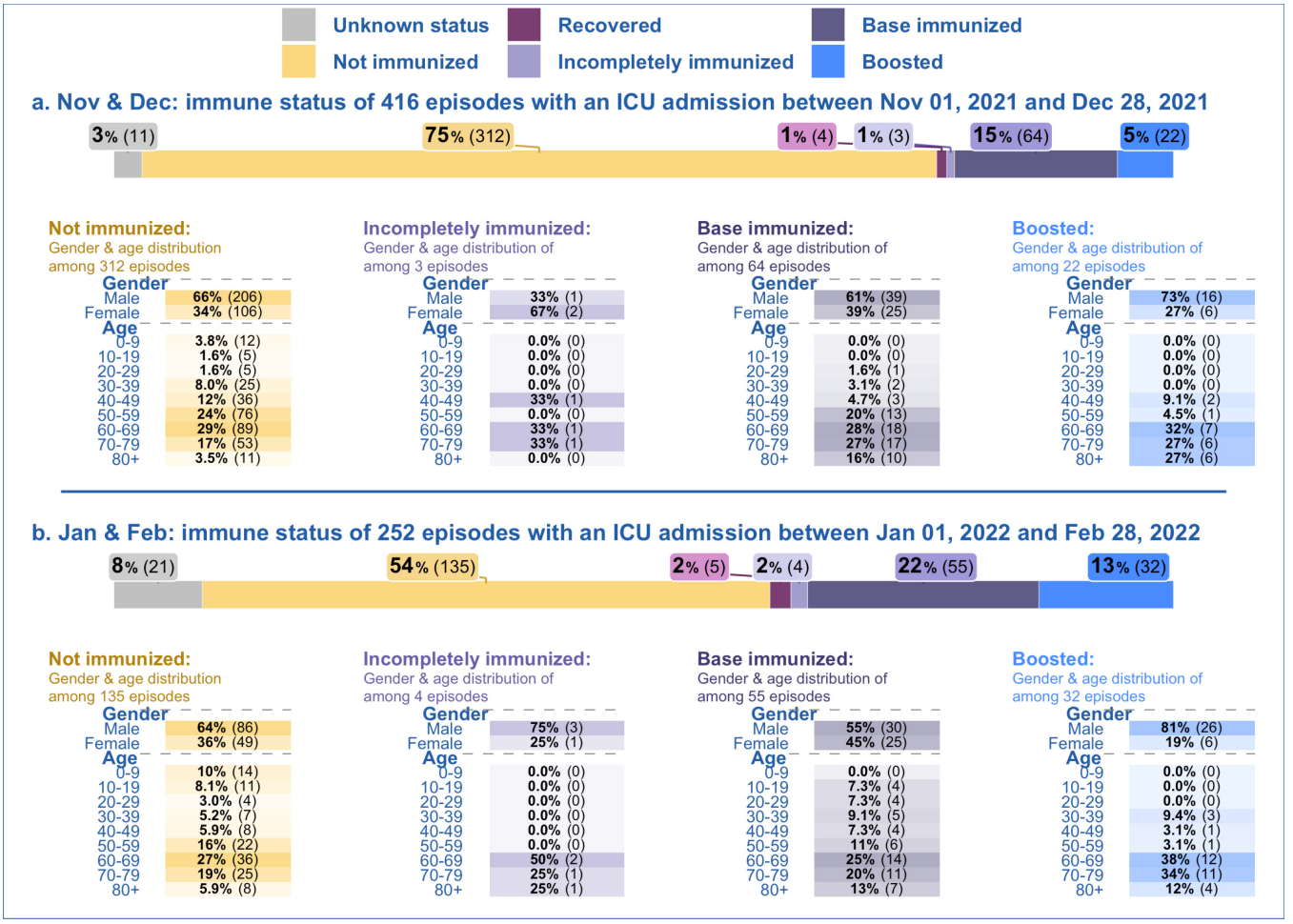


***Figure 12**: Demographic characteristics of patients in ICU by immune status and episode, over two different periods. Episodes with a first admission date after Feb 28, 2022 were excluded, as a large proportion of these records have not been completely filled in the database. Episodes with missing 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.

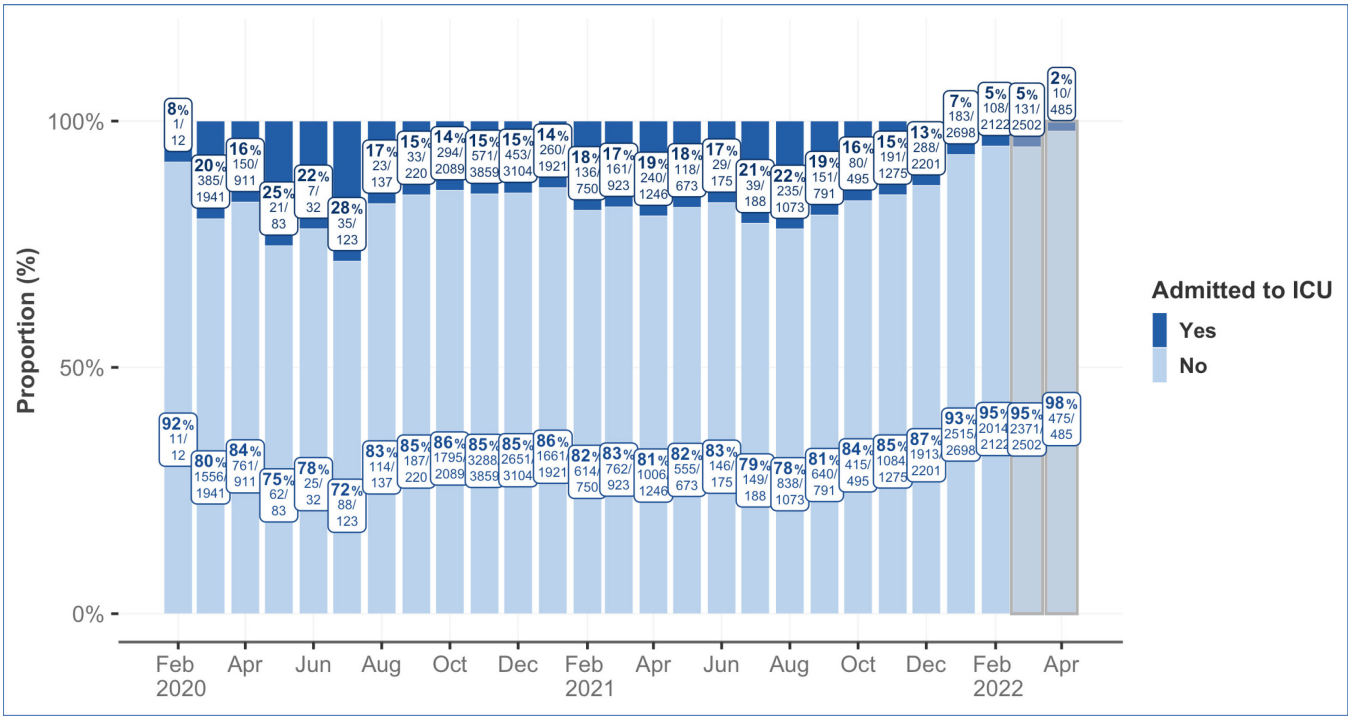


***Figure 13**: Percentage and proportion of episodes with at least one ICU admission over time. Records with incomplete data (ongoing episodes or with a pending outcome in the database) were not included. Data from the last two months (highlighted gray) are considered provisional due to data entry delays.*

# 6. Health Complications

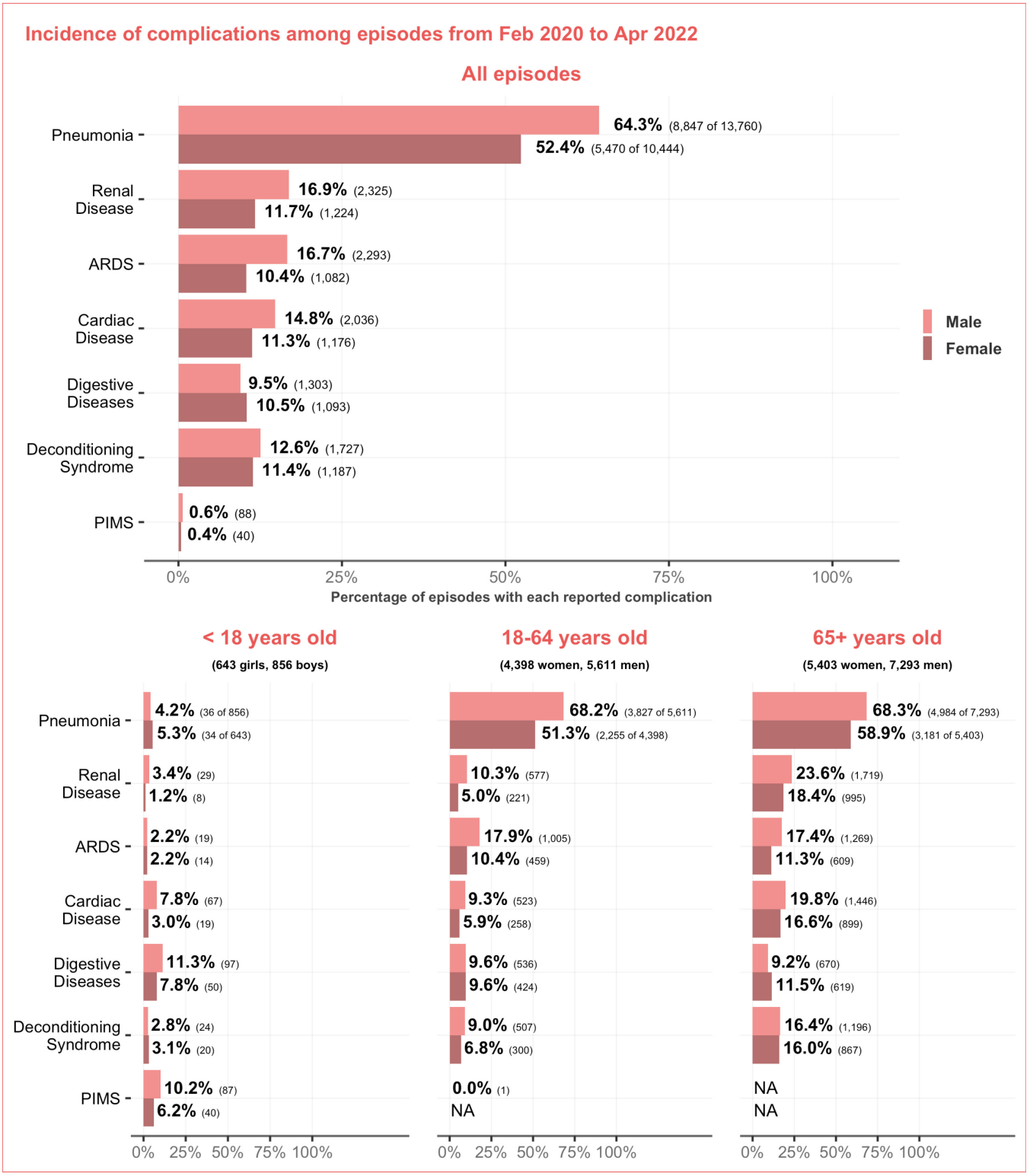


***Figure 14**: Incidence of complications arising during a hospitalization episode with a community acquired SARS-CoV-2 infection. The reported complications are shown overall and per age group and gender. Only the top 6 most prevalent complications, and PIMS, are displayed. Other complications available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

Overall, CH-SUR registered, 24,204 episodes linked to community acquired infections with complete complications data record and known age and gender (10,444 women and 13,760 men) hospitalized between February 2020 and April 18, 2022. For 19,025 (78.6%) of these episodes, at least one complication was registered. Complications were more common among males: among the episodes with at least one complication, 59.3% of patients were male and 40.7% were female.

Pneumonia was the most common complication observed and was more common among men than women (described in 64.3% of the male episodes and 52.4% of the female episodes, Figure **14**). Children and adolescents had pneumonia less frequently than patients aged 18 years and above. Pneumonia was recorded in 4.2% of the episodes concerning males and 5.3% of the episodes concerning females aged under 18. In contrast, pneumonia was documented in more than 51% male and female episodes of patients aged 18 years old and above. Among patients younger than 18, PIMS is a relevant complication. PIMS was more common in boys than girls, being registered in respectively 10.2% and 6.2% 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 40.1% of female episodes resulted in death. (Figure **15**).

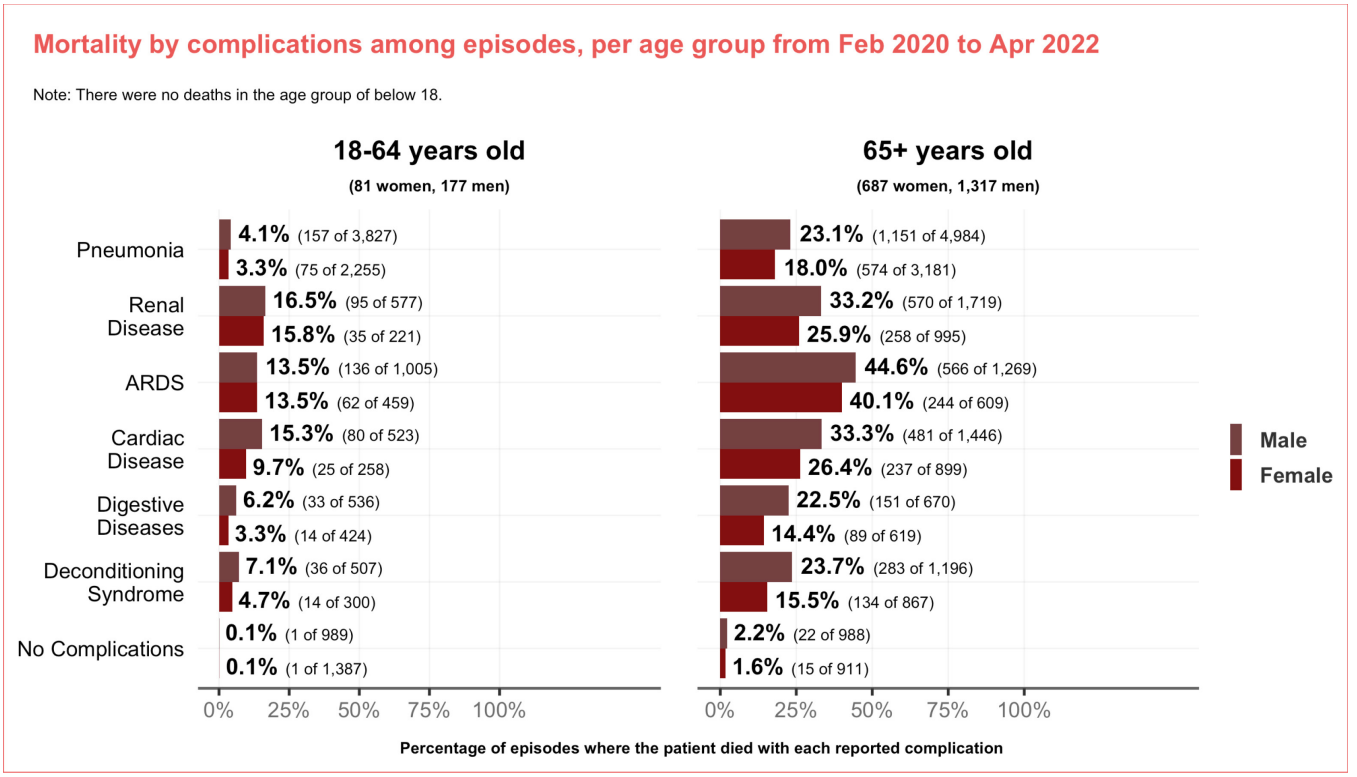


***Figure 15**: Mortality is depicted for each complication: showing the percentage of episodes where the patient with the complication died.*

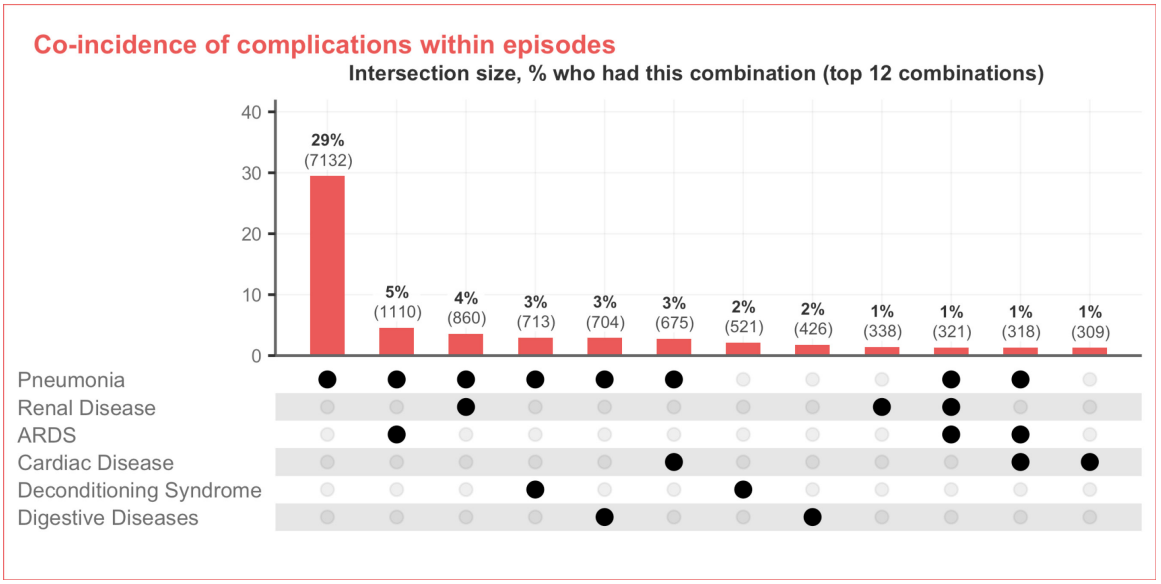


***Figure 16**: Complications are represented by their combinations (co-occurences). The top 12 combinations are represented.*

# 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, 18.9% in January 2022, 19.4% in March 2022 and 22.1% 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.

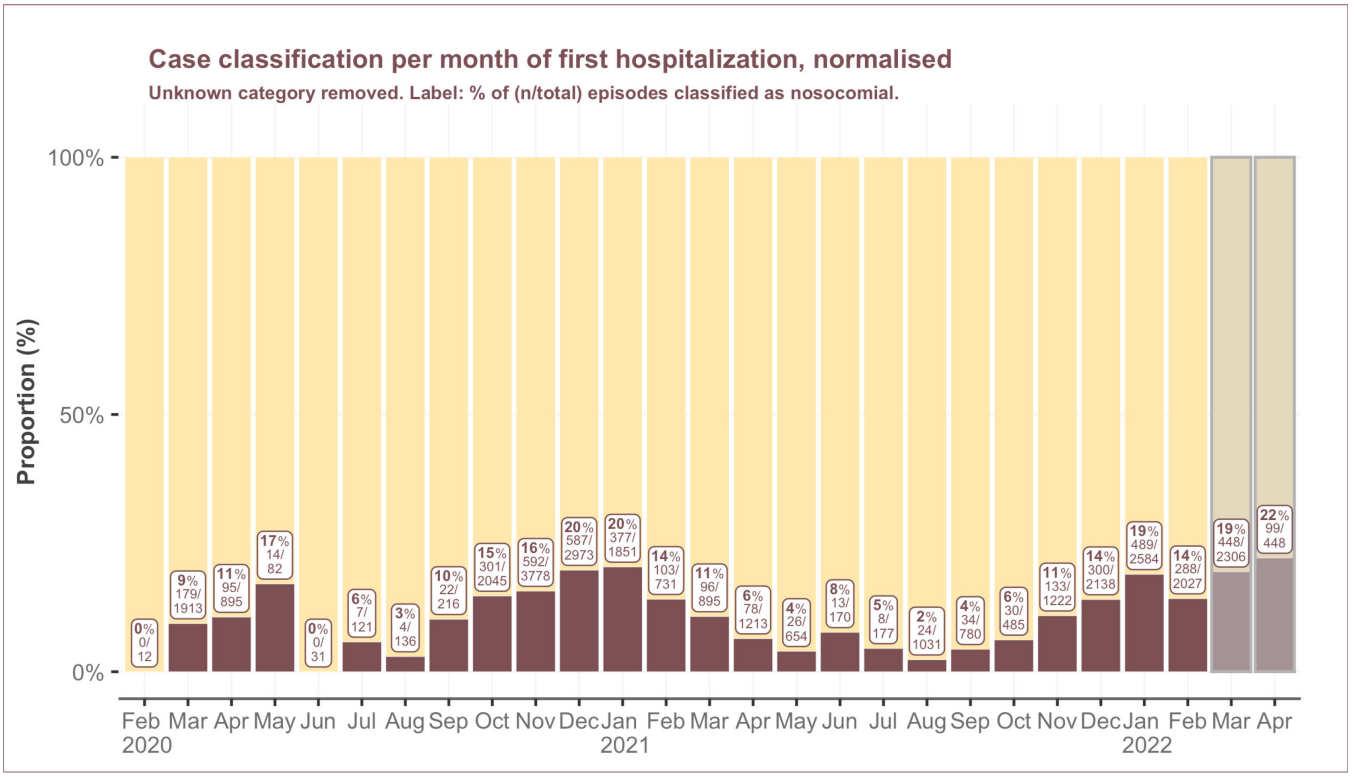


***Figure 17**: Classification (infection source) of hospitalization episodes over time. Data from the last two months (highlighted gray) are considered provisional due to data entry delays.*

Over the full course of the epidemic, the nosocomial infections affected principally an elderly population, with patients aged 80 years and above, accounting for 2,053 (47%) of the nosocomial episodes. In comparison, 6,266 (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: 631 (15%) vs 2,279 (8.6%). (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 10,224 (38%) episodes with community acquired infection and in 958 (22%) nosocomial episodes.

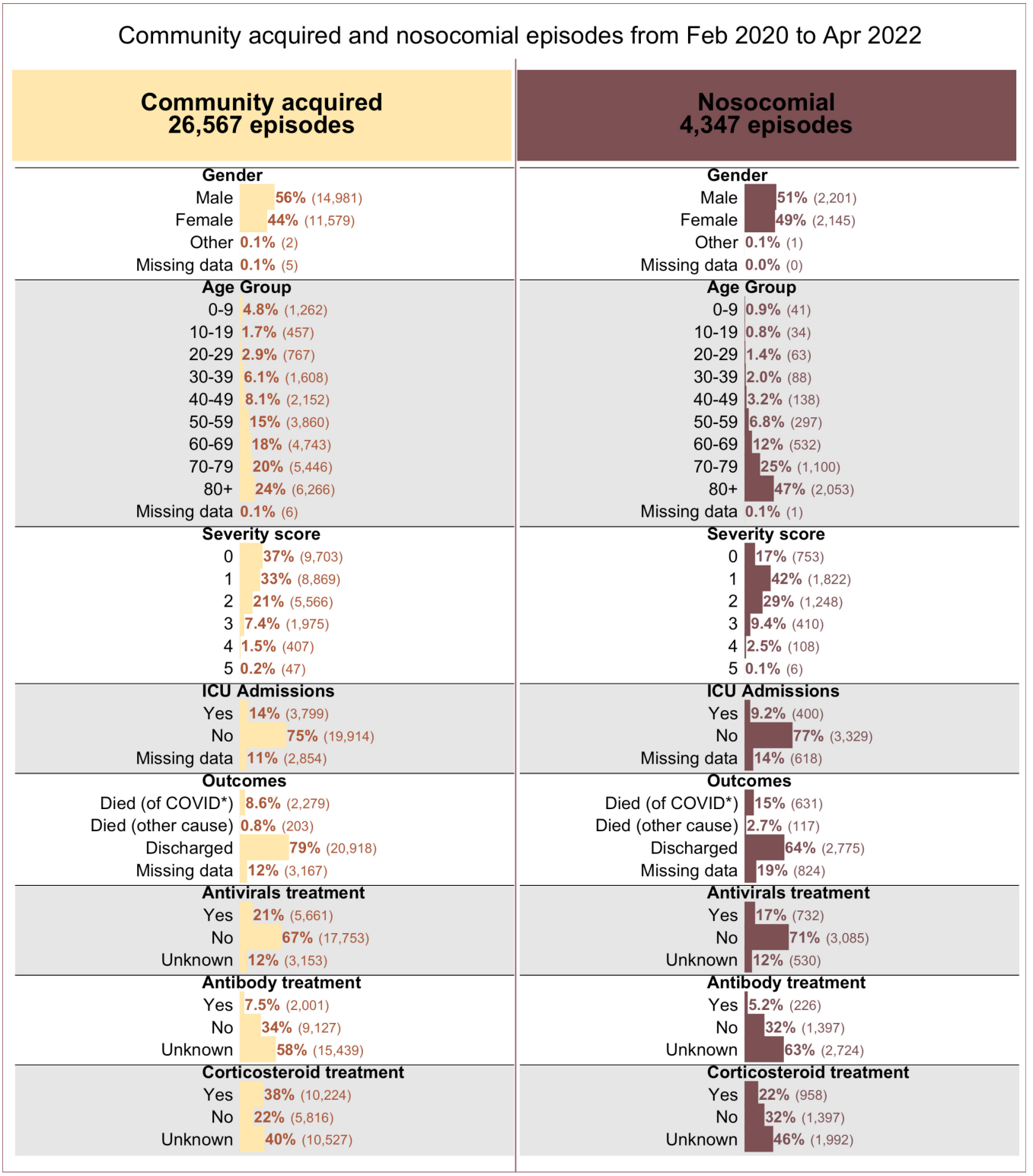


***Figure 18**: Case classification (infection source) of hospitalization episodes Comparison of community acquired and nosocomial cases by demographics, severity score, ICU, outcomes and treatments.*

# 8. Glossar und ergänzende Informationen

**Hospitalization / Hospitalisation**:

Bei der Hospitalisation handelt es sich um die kleinste Datenanalyseeinheit. Sie ergibt sich aus jeweils einem Ein- und Austritt in einem an CH-SUR teilnehmenden Spital, wenn der Aufenthalt länger als 24 Stunden andauert. Jede Aufnahme einer Person in ein Spital wird als neue Hospitalisation gezählt. Da es innerhalb desselben Krankheitsverlaufs (einer einzelnen Infektion) häufig zu mehreren Hospitalisationen (Wiedereintritten) kommt, erfolgt die Analyse in diesem Bericht anhand der Anzahl Episoden und nicht anhand der Anzahl Hospitalisationen.

**Episode / Episode**:

Bei jeder Neuaufnahme in ein Spital, die mindestens 30 Tage nach einer früheren Hospitalisation erfolgt und zu einem Aufenthalt von mehr als 24 Stunden führt, wird eine Episodennummer vergeben. Wird eine Person innerhalb von 30 Tagen nur einmal oder mehrfach hospitalisiert, wird in beiden Fällen nur eine Episode gezählt. Wird eine Person im Abstand von über 30 Tagen zweimal hospitalisiert, werden zwei unterschiedliche Episodennummern vergeben. Wird eine Person innerhalb von 30 Tagen nach der letzten Entlassung zwischen zwei an CH-SUR teilnehmenden Spitälern transferiert, werden diese Hospitalisationen zur selben Episode gezählt. Eine Episode kann deshalb mehrere Hospitalisationen und jede Hospitalisation kann mehrere IPS-Aufnahmen umfassen.

**Reason for the hospitalization / Hospitalisationsgrund**:

- *Hospitalization because of COVID-19 / Hospitalisation aufgrund von COVID-19*: Basierend auf den bei der Aufnahme verfügbaren Informationen wird die Person hospitalisiert, weil sie Symptome aufgrund von COVID-19 aufweist oder an einer offensichtlich durch COVID-19 verursachten Dekompensation einer chronischen Krankheit leidet.
- *Hospitalization with a SARS-CoV-2 infection / Hospitalisation mit einer SARS-CoV-2-Infektion*: Basierend auf den bei der Aufnahme verfügbaren Informationen weist die Person einen positiven SARS-CoV-2-Test auf, wird aber ohne COVID-19-Symptome aus einem nicht mit COVID-19 zusammenhängenden Grund hospitalisiert. Das Hauptproblem ist also ein Unfall oder eine Erkrankung, die nicht mit COVID-19 in Verbindung steht.

**Origin of the infection / Infektionsursprung**:

- *Community acquired infection: / Ambulant erworbene Infektion*: Die SARS-CoV-2 Infektion wurde vor der Aufnahme in das Spital oder innerhalb der ersten fünf Tage nach der Aufnahme festgestellt.
- *Nosocomial infection / Nosokomiale Infektion*: Eine Episode gilt als «nosokomial», wenn die SARS-CoV-2 Infektion nach fünf oder mehr Tagen nach der Aufnahme in das Spital festgestellt wird.

**Severity score at admission / Schweregrad bei der Aufnahme**:

Bei Erwachsenen wird zur Beurteilung des Schweregrads der CURB-65 Score angewendet. Für jedes der folgenden Kriterien wird jeweils 1 Punkt gezählt: Verwirrtheit (Abbreviated Mental Test Score < 9), Serumharnstoff > 19 mg/dl, Atemfrequenz > 30 pro Minute, tiefer Blutdruck (diastolisch < 60 oder systolisch < 90 mmHg), Alter > 65 Jahre. Bei Kindern wird je ein Punkt für folgende Kriterien gezählt: Atemnot, Sauerstoffsättigung < 92%, Anzeichen schwerer klinischer Dehydratation oder eines klinischen Schocks und ein veränderter Bewusstseinszustand. Der Schweregrad entspricht der Summe der jeweiligen gezählten Punkte.

**Intermediate care unit (intermediate care or IMC) / Intermediate Care Unit (IMC)**: Pflegestation für Personen, die an einer Störung einer lebenswichtigen Funktion leiden oder deren Pflegelast keine Rückkehr in eine Bettenstation erlaubt. Die Intermediate Care Unit bildet das Bindeglied zwischen Intensivpflegestation und Bettenstation.

**Intensive care unit (ICU) / Intensivpflegestation (IPS)**: Pflegestation für Personen, die eine schwerwiegende Störung einer oder mehrerer lebenswichtiger Funktionen haben oder bei denen das Risiko schwerer Komplikationen besteht.

**Immune status / Immunstatus**:

a) *Not immunized / Nicht immunisiert*: Personen, die zum Zeitpunkt des positiven SARS-CoV-2-Tests keine Dosis irgendeines Impfstoffs erhalten hatten und bei denen kein Nachweis einer Infektion mit dem Virus vor der Hospitalisationsepisode bestand.

b) *Partially immunized / Teilweise immunisiert*: Personen, die vor dem positiven Test eine Impfstoffdosis Moderna (Spikevax®), Pfizer/BioNTech (Comirnaty®), AstraZeneca (Vaxzevria®), Sinopharm®, Sinovac (CoronaVac®) oder COVAXIN® erhalten hatten und bei denen kein Nachweis einer früheren SARS-CoV-2-Infektion bestand.

c) *Base immunized / Grundimmunisiert*:

1. Personen, die eine Dosis des Impfstoffs Johnson & Johnson (Janssen®) oder zwei Dosen des Impfstoffs Spikevax®, Comirnaty®, Vaxzevria®, Sinopharm®, CoronaVac® oder COVAXIN® erhalten hatten (Impfempfehlung BAG / Eidgenössische Kommission für Impffragen).

2. Personen mit einer dokumentierten früheren Infektion oder einem positiven Test (die einen Spitalaufenthalt erfordert hatten oder nicht), die eine Dosis eines der oben aufgeführten Impfstoffe erhalten hatten, unabhängig von der Zeit seit der Genesung, dem Datum und der Marke des Impfstoffs, und einem positiven Test oder einer Hospitalisation.

3. Personen, die eine Kombination folgender Impfstoffe erhalten hatten: Comirnaty® und Spikevax®, Vaxzevria® und Comirnaty® oder Vaxzevria® und Spikevax®. Personen, die eine zusätzliche Auffrischimpfung erhalten hatten, werden hier nicht berücksichtigt (Kategorie Boosted / Mit Auffrischimpfung).

d) *Boosted / Mit Auffrischimpfung*: Grundimmunisierte Personen, die eine oder mehrere weitere Impfdosen (Auffrischimpfung) erhalten hatten, unabhängig von der Zeit seit der letzten Impfung (mindestens 4 Monate nach der letzten Impfung).

e) *Recovered from a SARS-CoV-2 infection / Von einer früheren SARS-CoV-2-Infektion genesen*: Personen, die mit keiner Dosis geimpft wurden und bei denen eine frühere SARS-CoV-2-Infektion bestätigt wurde, die in der Vergangenheit eine Hospitalisation erfordert hatte oder nicht; unabhängig von der Zeit seit der früheren Infektion. Achtung: Viele genesene Personen werden in der Datenbank nicht als solche identifiziert (erst seit Juni 2021 erhobene Information, nicht diagnostizierte Infektionen, fehlende Informationen im Dossier).

f) *Unknown immune status / Unbekannter Immunstatus*: Personen, für die keine Informationen über Impfungen und zur Immunität vorlagen.

e) *Fully immunized / Vollständig immunisiert*: Diese Kategorie ergibt sich durch die Kombination der beiden Kategorien Grundimmunisiert und Mit Auffrischimpfung (Kategorien Base immunized und Boosted).

**Discharge / Entlassung**: Ein Spitalaustritt gilt als «Entlassung», wenn die Person das Spital mit einem der folgenden Zielorte verlässt: 1. nach Hause; 2. Langzeitpflegeeinrichtung; 3. anderes Spital; 4. andere Einrichtung, die sich nicht am CH-SUR-Überwachungssystem beteiligt; 5. Rehabilitationseinrichtung; 6. unbekannter Zielort

**Reason of death / Todesursache**: : Personen, bei denen COVID-19 die Todesursache war (died of COVID-19 / verstorben an COVID-19), werden getrennt aufgeführt von den COVID-19-Patientinnen und -Patienten, die wegen anderer Todesursachen verstarben (died with COVID-19, but not of COVID-19 / verstorben mit COVID-19, aber nicht an COVID-19). Ob eine Person an COVID-19 oder aus einem anderen Grund verstarb, wird auf Spitalebene im betreffenden am CH-SUR-System teilnehmenden Zentrum von einer Ärztin oder einem Arzt beurteilt. Fälle, in denen die Todesursache nicht sicher ist, aber eine COVID-19-Diagnose vorliegt (in Übereinstimmung mit den Einschlusskriterien für CH-SUR), werden als «verstorben an COVID-19» oder «vermuteter COVID-19-Todesfall» gezählt.

**Dealing with missing data / Umgang mit fehlenden Daten**: Wenn im Text erwähnt, werden fehlende Daten von der Analyse ausgeschlossen. Andernfalls werden Datensätze mit fehlenden Daten in der Gesamtanzahl berücksichtigt und entsprechend analysiert. Dies kann dazu führen, dass die Denominatoren der verschiedenen analysierten Kategorien nicht dieselbe Gesamtsumme ergeben. In einigen Abbildungen werden die Daten der letzten beiden Monate aufgrund von Verzögerungen bei der Datenerfassung als provisorisch betrachtet und grau markiert, wobei dies jeweils angegeben wird.

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