

Bericht zum spitalbasierten COVID-19-Sentinel- Überwachungssystem

Datenstand: 23. Mai 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 22. Mai 2022 wurden Daten von 33 466 **Hospitalisationsepisoden** erhoben. Im gleichen Zeitraum wurden dem BAG im Rahmen der Meldepflicht für die gesamte Schweiz 52 976 Episoden von Hospitalisationen mit einer laborbestätigten SARS-CoV-2-Infektion gemeldet. Das CH-SUR-System deckte somit ca. 63,2% 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 13,8% (4 631 von 33 466), während der Anteil der Episoden im Zusammenhang mit ambulant erworbenen Infektionen 82,6% (27 655 von 33 466) 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 14,6% einen Aufenthalt in einer IPS (3 862 von 24 585 Episoden, 26. Februar 2020 bis März 31, 2022) und 9,5% führten zum Tod an COVID-19 (2 339 von 24 585 Episoden, 26. Februar 2020 bis May 22, 2022).

Während des letzten Zeitraums, für den genügend Daten vorliegen (Feb 01, 2022 bis Mär 31, 2022), wurden 3 805 Episoden im Zusammenhang mit ambulant erworbenen Infektionen verzeichnet. Davon betrafen 1 337 (35,1%) nicht immunisierte Patientinnen und Patienten und 1 498 (39,4%) **vollständig immunisierte** Patientinnen und Patienten (grundimmunisiert mit oder ohne Auffrischimpfung) (Abbildung 2). Im gleichen Zeitraum waren 231 Episoden mit einem Aufenthalt auf einer Intensivpflegestation verbunden. Von diesen betrafen 100 (43,3%) nicht immunisierte und 93 (40,3%) vollständig immunisierte Patientinnen und Patienten. In 96 Episoden starben die Patientinnen und Patienten an COVID-19 (2,5% aller registrierten Episoden mit bekanntem Outcome), wobei 45 Todesfälle nicht immunisierte Patientinnen und Patienten und 33 vollständig immunisierte Patientinnen und Patienten betrafen.

Am 1. April 2022 kehrte die Schweiz in die normale Lage zurück. Seither besteht die Teststrategie in den Spitälern darin, nur noch Patienten mit Symptomen, welche mit einer SARS-CoV-2-Infektion vereinbar sind, zu testen. Diese Änderung der Teststrategie kann zu einer Verringerung der Zahl der registrierten Fälle führen, da nur noch Patienten mit typischen COVID-19-Symptomen identifiziert werden. Definitionen und weitere Informationen zu den Daten finden Sie im Kapitel **Glossar und ergänzende Informationen** am Schluss dieses Berichts.

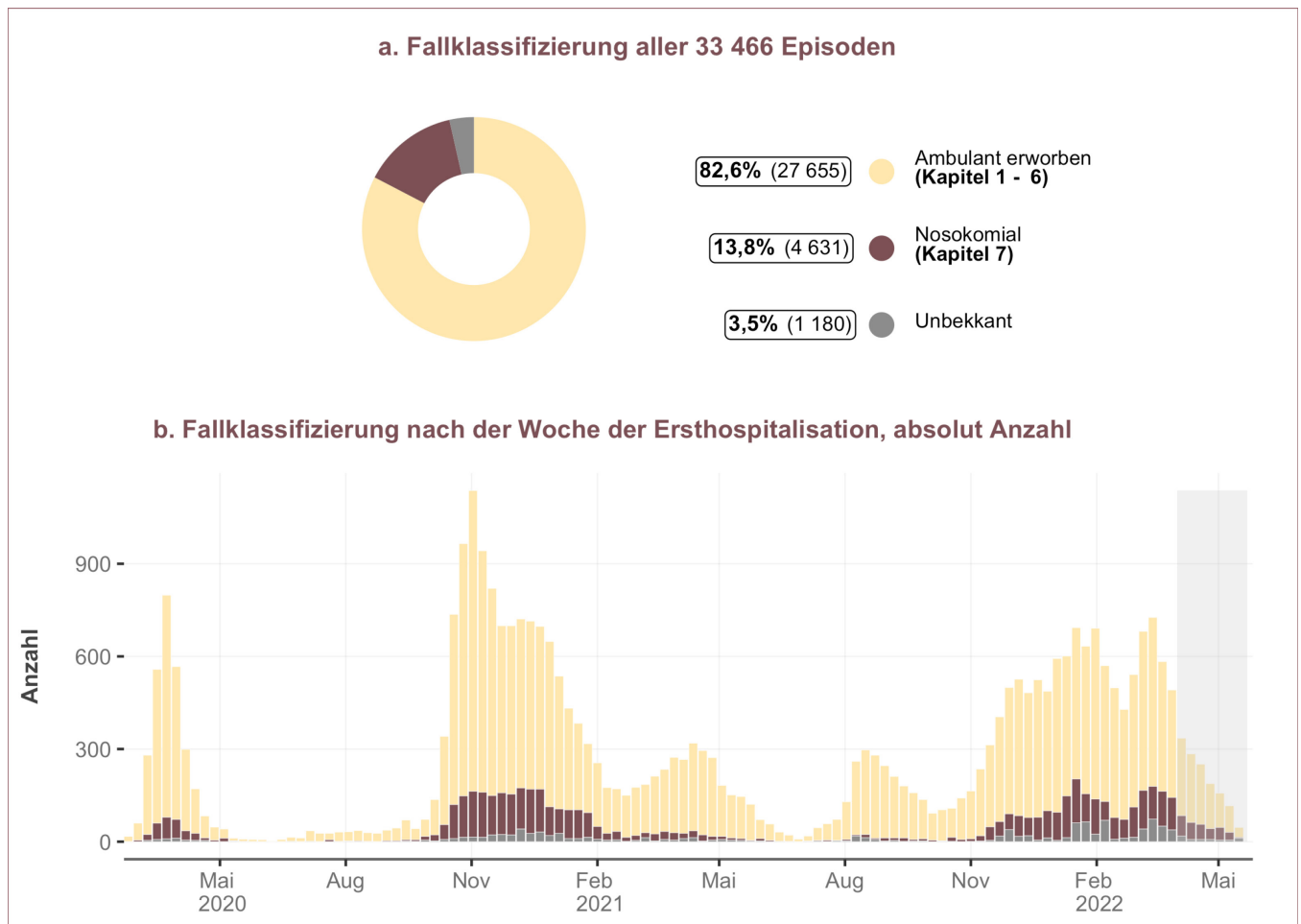


Figure 1: Episoden nach Fallklassifizierung (Infektionsquelle). Anteil (normalisiert in %) der Episoden nach Infektionsquelle (Diagramm a) und absolute Anzahl Episoden über die Zeit (Diagramm b). Bei Episoden mit Mehrfachhospitalisation wurde die Fallklassifizierung der Ersthospitalisation berücksichtigt.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

Übersicht über CH-SUR Hospitalisierte, in den IPS behandelte Episoden und Todesfälle vom 01. Februar 2022 bis 31. März 2022

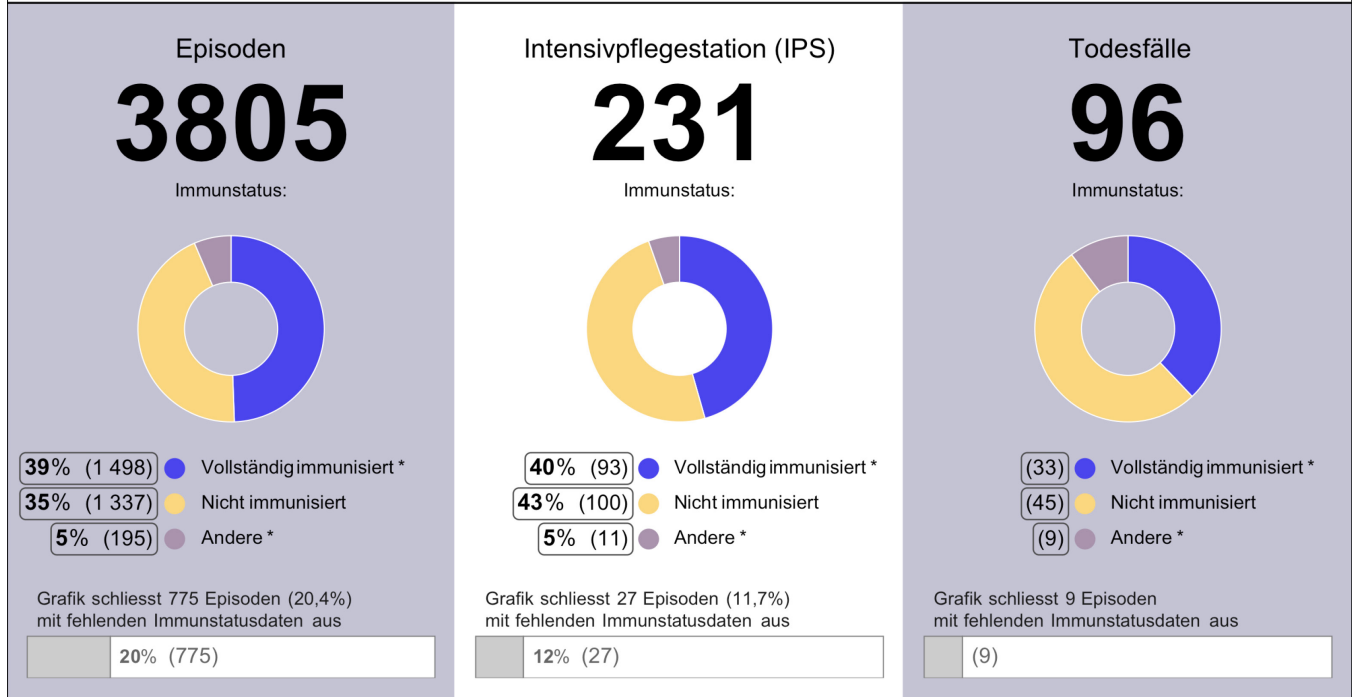


Figure 2: Übersicht über die neuesten Daten. Die Daten der letzten beiden Monate werden aufgrund von Verzögerungen bei der Dateneingabe als vorläufig betrachtet und wurden daher nicht berücksichtigt. (* vollständig immunisiert: Patient/innen mit einer Grundimmunisierung und Personen mit einer Auffrischimpfung. 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 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.

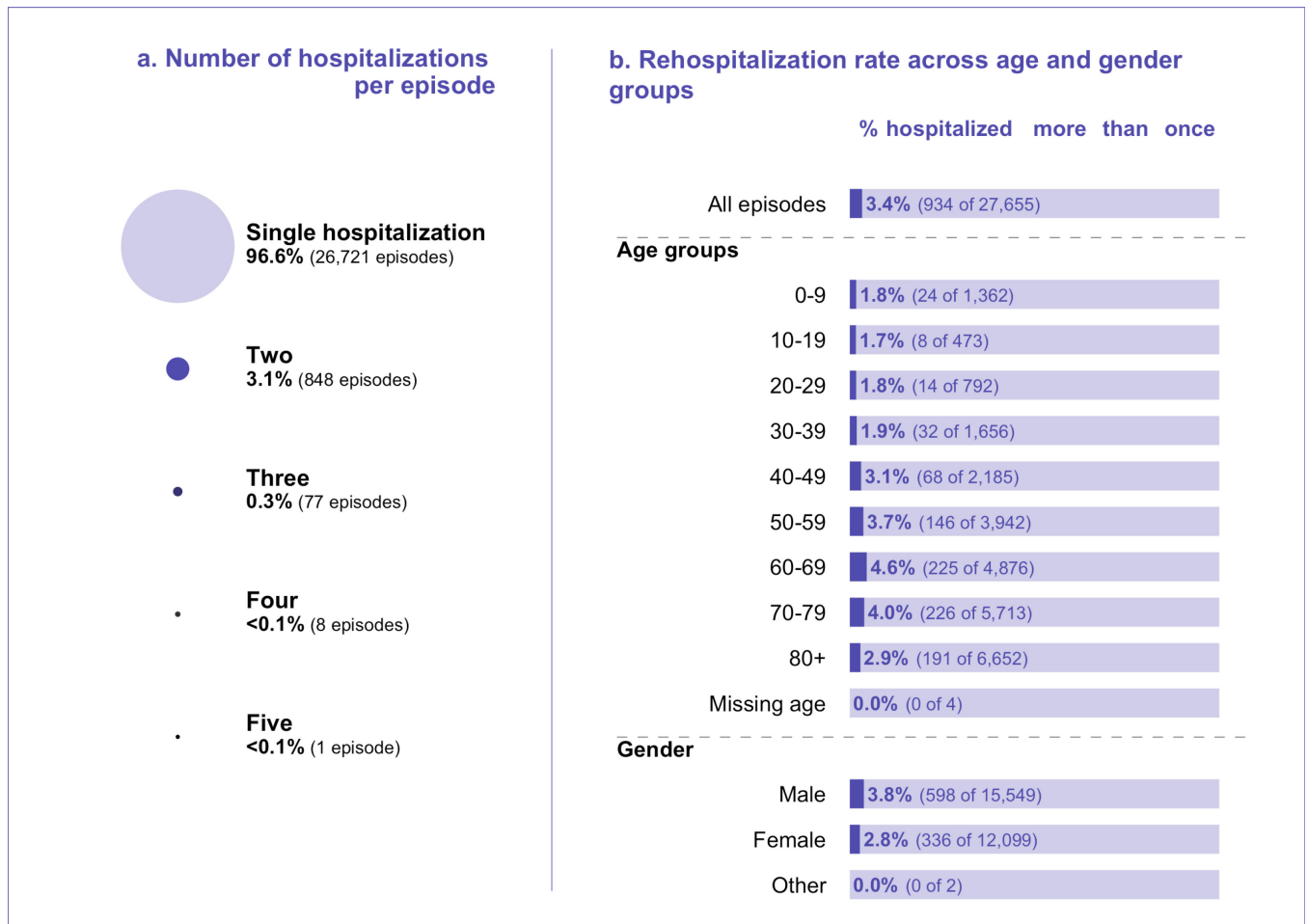


Figure 3: Hospitalizations per episode of hospitalization and rehospitalization rate across demographic groups. Includes records between March 2020 and May 22, 2022.

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 3b).

The overall rate of rehospitalization within the same episode was 3.4% (934 of 27,655) (Figure 3c). 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 4a), and the age distribution was skewed towards older persons (Figure 4b). The largest age category corresponded to patients aged 80 and above (24.0% [6,652]).

Figures 4c and 4d 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 4d). This peak in older age admissions mirrors a similarly-timed peak in admission severity and

case fatality ratios described later. An increase in the percentage of episodes of patients aged 50 and above was observed again from September 2021 to November 2021, reaching a local peak of 75.3% (816 of 1,084) in November 2021.

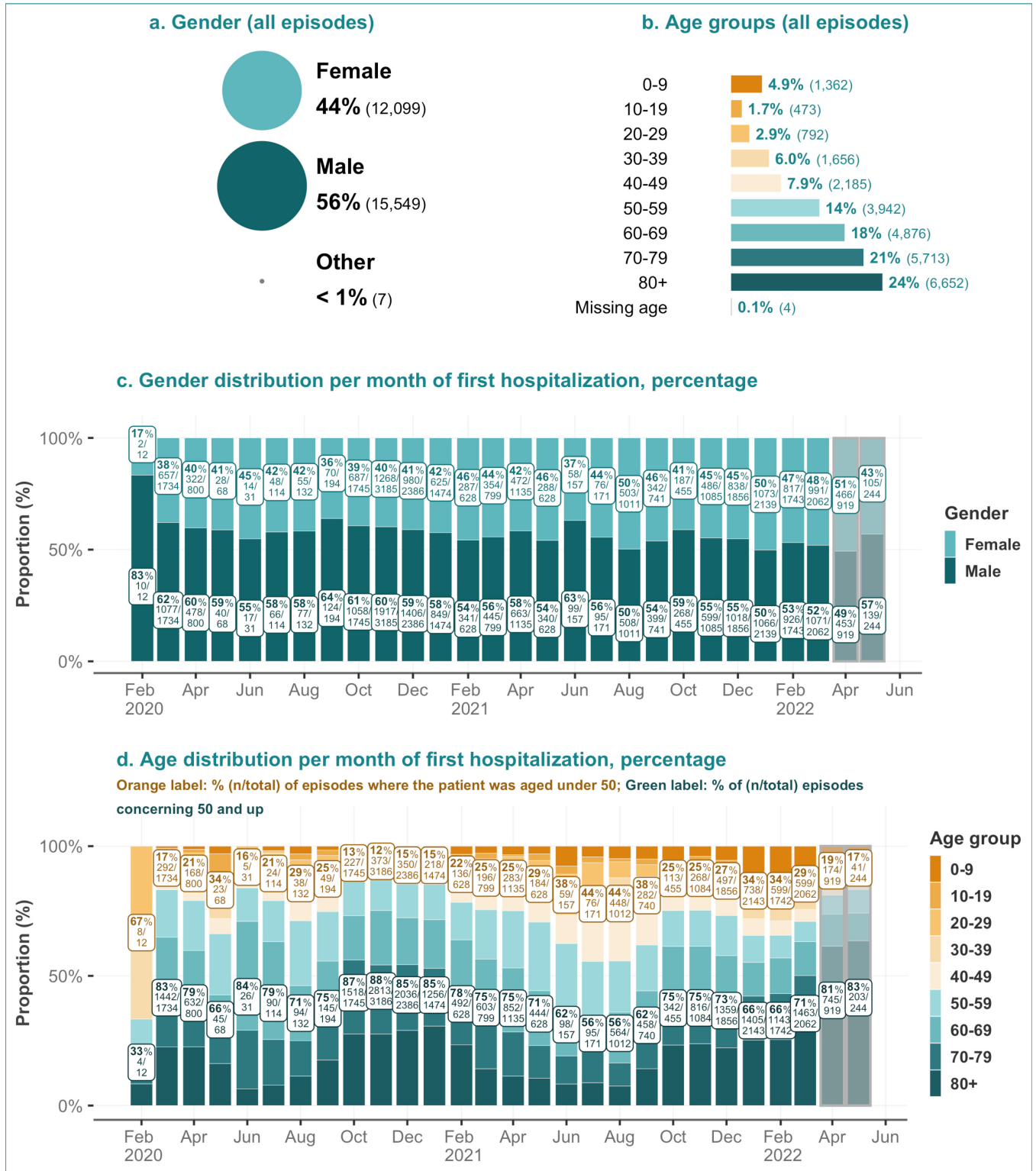


Figure 4: Demographic characteristics: gender and age distribution of admitted hospitalized patients, overall and per month. For episodes with multiple hospitalizations, the admission date of the first hospitalization was used. Data from the last two months (highlighted gray) is considered provisional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

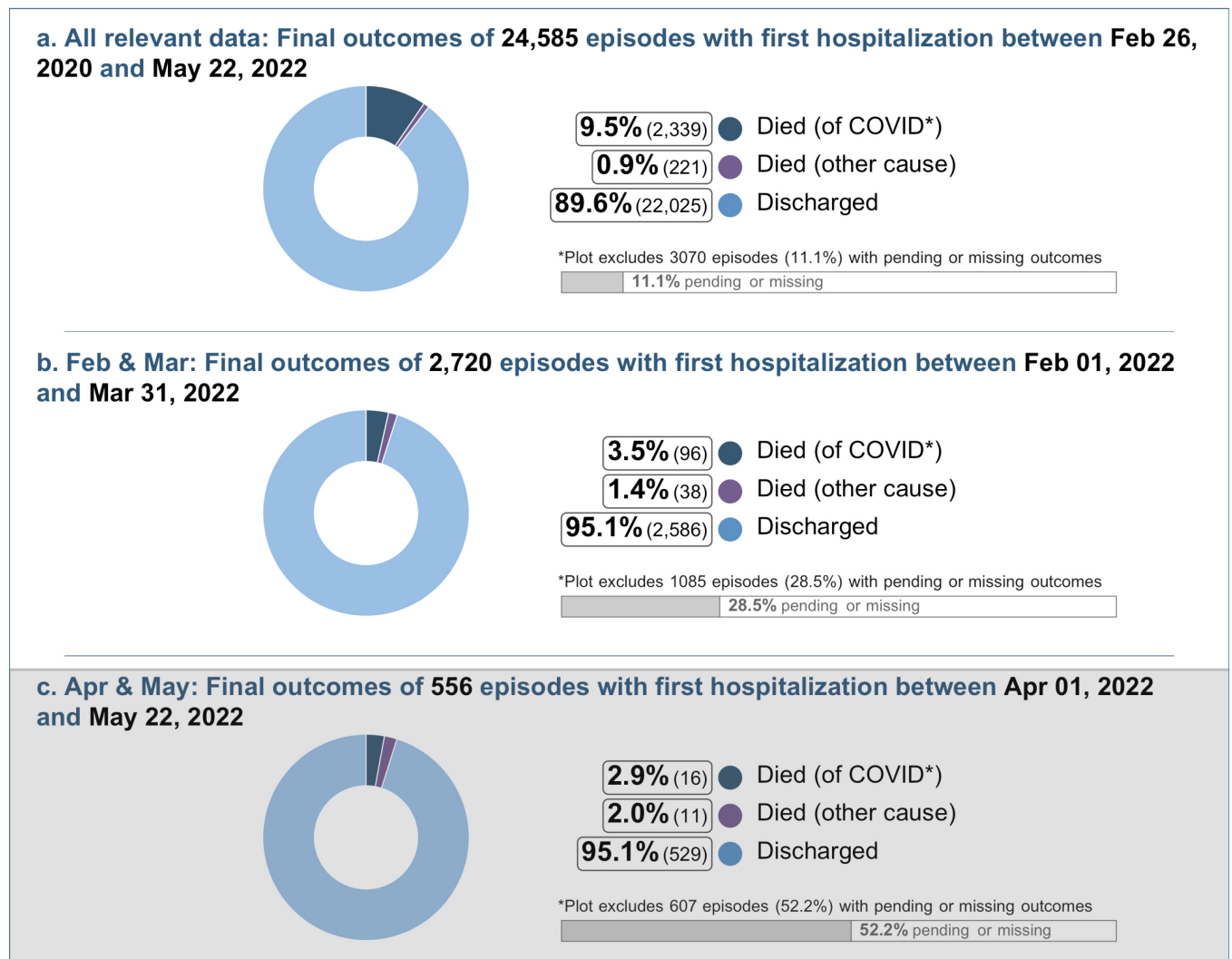


Figure 5: Outcomes for COVID-19 related episodes of hospitalization in CH-SUR hospitals. Includes records up to May 22, 2022. For episodes with multiple hospitalizations, only the final outcome is considered. Patients where the cause of death was not certain, but there was a COVID-19 diagnosis (in conformity 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 6a & 6b) and the disease severity score at admission as a function of time (Figure 6c).

The first mortality peak is seen for patients admitted around the beginning of the epidemic: 15.1% (262 of 1,732) of episodes of patients first admitted in March 2020 resulted in death. Mortality decreased after March 2020, but rose again between October 2020 and January 2021, with a peak in December 2020: 13.9% (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 6c) and older patients' ages (Figure 4c) during these periods. Overall, in 31.7% (550 of 1,734) of the episodes with admission date in March 2020, the severity score was above 2. Over the months of October 2020 to January 2021, the proportion of episodes with severity scores of 2 and above was higher as over the rest of the epidemic, representing more than 40% (955 of 2,386) of the admissions in that period.

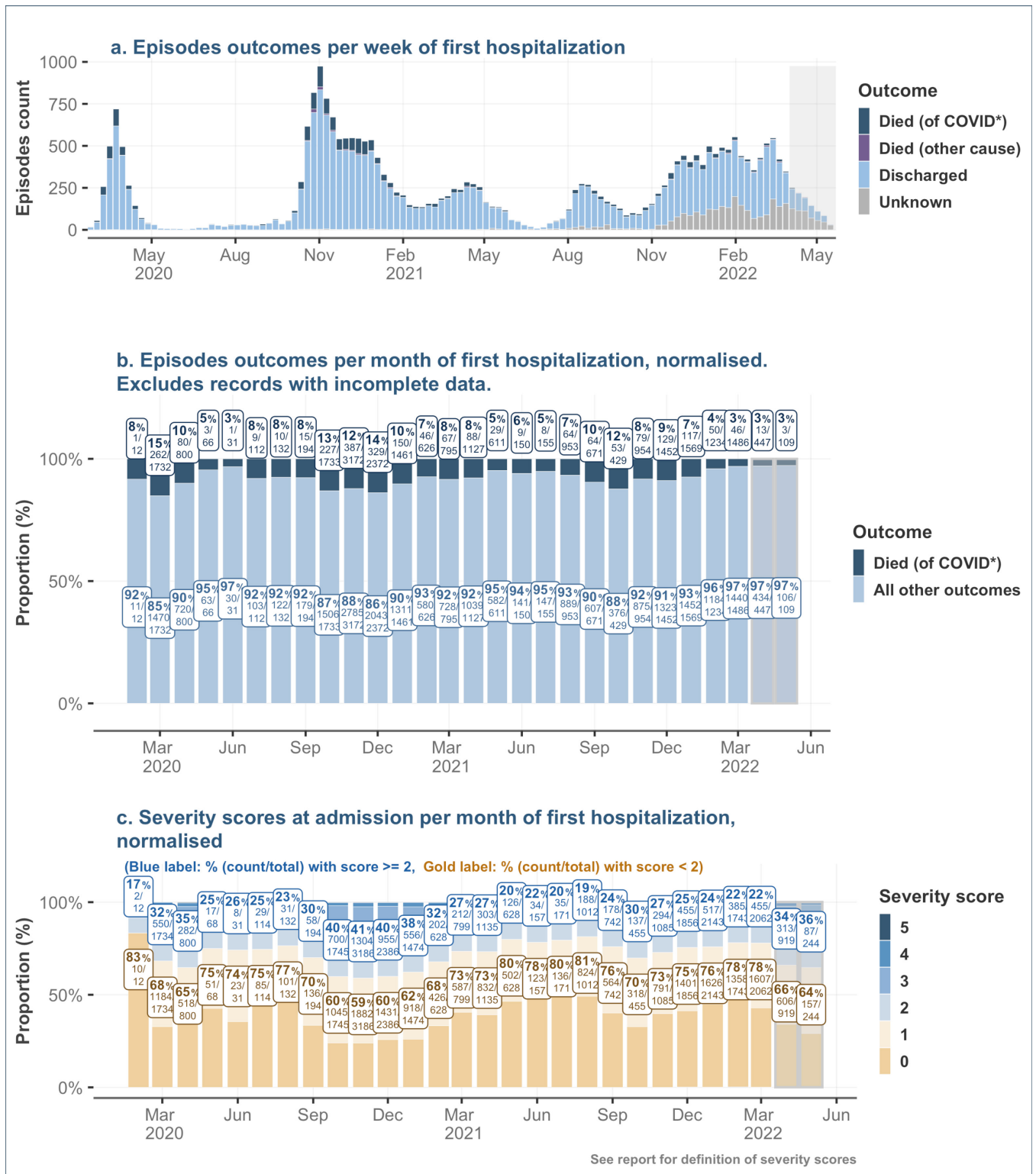


Figure 6: Epidemic curve, episodes' outcomes and severity scores at admission for COVID-19 hospitalizations over time. Includes records up to May 22, 2022. Data from the two last months (highlighted in gray) are considered provisional due to data entry delays. Episodes where the cause of death was not 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)

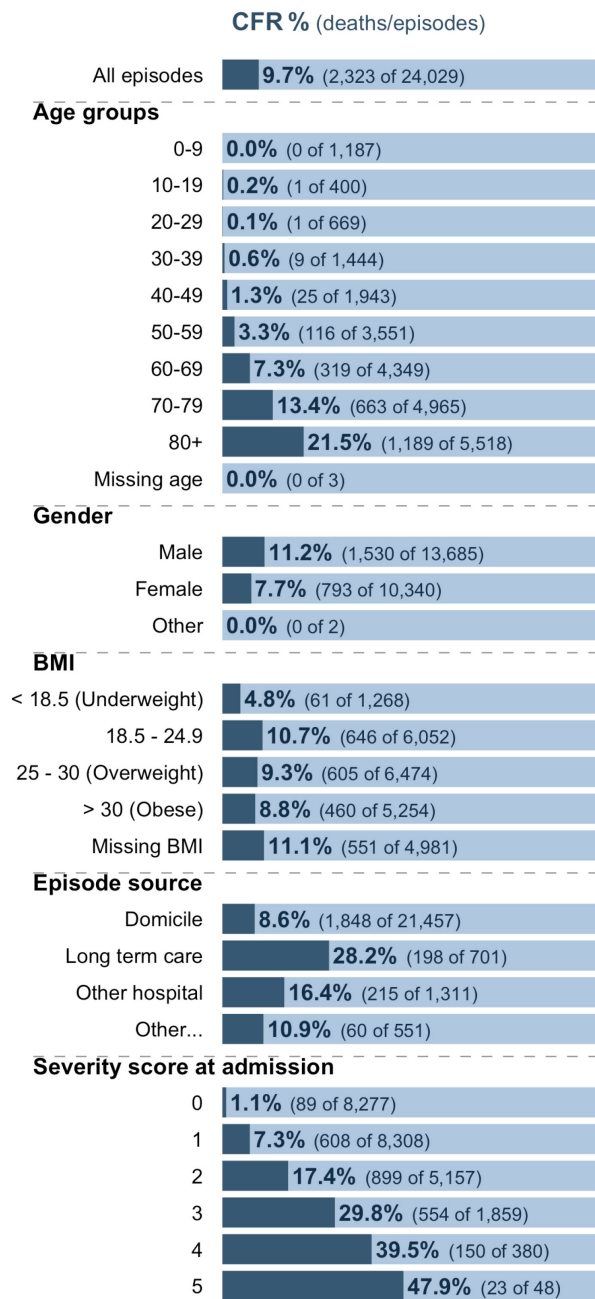
3.3. Case fatality rate (CFR) across demographic and risk groups

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 7b) 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.

a. All data: CFR % for 24,029 episodes with first hospitalization between Feb 26 2020 and Mar 31 2022



b. February & March: CFR % for 2,720 episodes with first hospitalization between Feb 01 2022 and Mar 31 2022

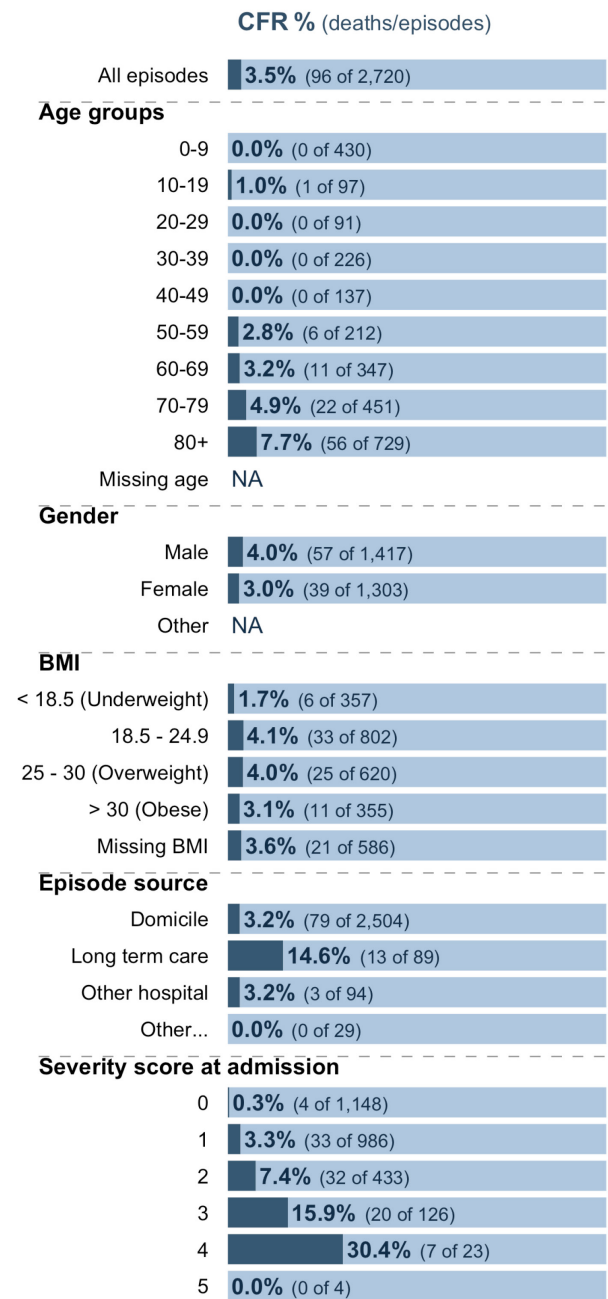


Figure 7: Case fatality rate (CFR) % among demographic and risk groups: percentage of hospitalization episodes in different demographic groups, which ended in the death of the patient of COVID-19 in hospital. Both figures include records up to Mar 31 2022 but records with incomplete data (ongoing hospitalization 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 **8b**). This is expected, given the rise in the proportion of the whole Swiss population that is fully vaccinated (Figure **8c**, 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 **8c**), the base immunized and boosted made up only a minority (18.8% and 30.6% respectively) of the episodes recorded in CH-SUR (Figure **8b**), suggesting protection against hospitalization (and, consequently, death) due to COVID-19.

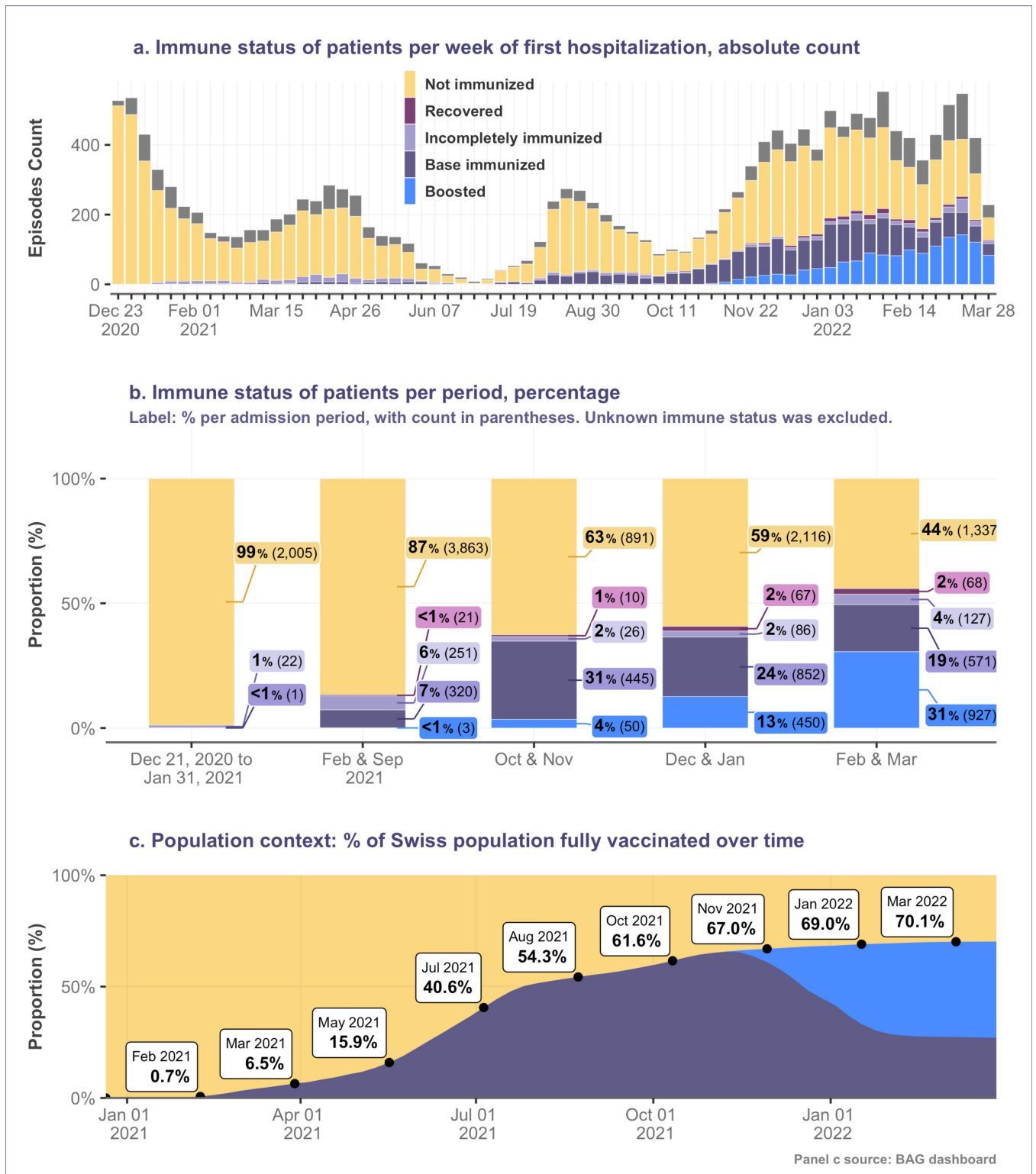
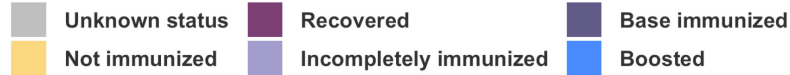


Figure 8: Immune status of patients and overall vaccination rate in Switzerland (exported: May 22, 2022). See glossary for definitions of immune status categories. For episodes with multiple hospitalizations, the immune status for the first hospitalization was considered. Panels a. and b. include episodes 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 9a, 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 9a, 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.



a. All relevant data: immune status of 16,762 episodes with first hospitalization between Dec 23, 2020 and Mar 31, 2022



Not immunized:
Gender & age distribution
among 10,041 episodes

Gender	Percentage	Count
Male	54%	(5,405)
Female	46%	(4,636)
Age		
0-9	11%	(1,075)
10-19	2.4%	(243)
20-29	3.3%	(327)
30-39	7.5%	(752)
40-49	9.8%	(980)
50-59	16%	(1,603)
60-69	18%	(1,821)
70-79	15%	(1,528)
80+	17%	(1,712)

Incompletely immunized:
Gender & age distribution
among 512 episodes

Gender	Percentage	Count
Male	55%	(284)
Female	45%	(228)
Age		
0-9	0.0%	(0)
10-19	1.0%	(5)
20-29	2.7%	(14)
30-39	5.9%	(30)
40-49	4.9%	(25)
50-59	9.6%	(49)
60-69	19%	(99)
70-79	24%	(122)
80+	33%	(168)

Base immunized:
Gender & age distribution
among 2,189 episodes

Gender	Percentage	Count
Male	55%	(1,206)
Female	45%	(983)
Age		
0-9	0.1%	(1)
10-19	1.1%	(25)
20-29	2.7%	(59)
30-39	6.4%	(141)
40-49	7.2%	(158)
50-59	11%	(232)
60-69	16%	(349)
70-79	24%	(517)
80+	32%	(707)

Boosted:
Gender & age distribution
among 1,431 episodes

Gender	Percentage	Count
Male	60%	(855)
Female	40%	(576)
Age		
0-9	0.0%	(0)
10-19	0.1%	(2)
20-29	1.3%	(19)
30-39	3.6%	(52)
40-49	4.1%	(59)
50-59	8.0%	(114)
60-69	14%	(207)
70-79	27%	(384)
80+	42%	(594)

b. Dec & Jan: immune status of 3,995 episodes with first hospitalization between Dec 01, 2021 and Jan 31, 2022



Not immunized:
Gender & age distribution
among 2,114 episodes

Gender	Percentage	Count
Male	51%	(1,072)
Female	49%	(1,042)
Age		
0-9	15%	(309)
10-19	3.2%	(68)
20-29	3.1%	(66)
30-39	7.9%	(166)
40-49	8.8%	(186)
50-59	14%	(296)
60-69	16%	(332)
70-79	14%	(305)
80+	18%	(386)

Incompletely immunized:
Gender & age distribution
among 86 episodes

Gender	Percentage	Count
Male	59%	(51)
Female	41%	(35)
Age		
0-9	0.0%	(0)
10-19	1.2%	(1)
20-29	9.3%	(8)
30-39	7.0%	(6)
40-49	9.3%	(8)
50-59	10%	(9)
60-69	12%	(10)
70-79	20%	(17)
80+	31%	(27)

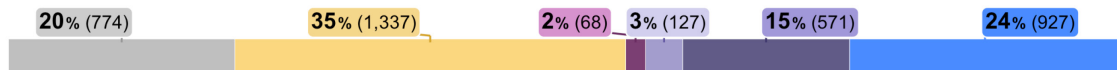
Base immunized:
Gender & age distribution
among 852 episodes

Gender	Percentage	Count
Male	54%	(457)
Female	46%	(395)
Age		
0-9	0.1%	(1)
10-19	1.4%	(12)
20-29	3.6%	(31)
30-39	7.2%	(61)
40-49	8.2%	(70)
50-59	13%	(109)
60-69	15%	(127)
70-79	23%	(194)
80+	29%	(247)

Boosted:
Gender & age distribution
among 450 episodes

Gender	Percentage	Count
Male	61%	(275)
Female	39%	(175)
Age		
0-9	0.0%	(0)
10-19	0.2%	(1)
20-29	1.3%	(6)
30-39	3.3%	(15)
40-49	4.0%	(18)
50-59	6.9%	(31)
60-69	13%	(60)
70-79	26%	(117)
80+	45%	(202)

c. Feb & Mar: immune status of 3,804 episodes with first hospitalization between Feb 01, 2022 and Mar 31, 2022



Not immunized:
Gender & age distribution
among 1,337 episodes

Gender	Percentage	Count
Male	51%	(683)
Female	49%	(654)
Age		
0-9	33%	(436)
10-19	3.7%	(49)
20-29	3.1%	(41)
30-39	5.7%	(76)
40-49	3.5%	(47)
50-59	6.3%	(84)
60-69	9.8%	(131)
70-79	13%	(170)
80+	23%	(303)

Incompletely immunized:
Gender & age distribution
among 127 episodes

Gender	Percentage	Count
Male	43%	(55)
Female	57%	(72)
Age		
0-9	0.0%	(0)
10-19	3.1%	(4)
20-29	2.4%	(3)
30-39	13%	(16)
40-49	3.9%	(5)
50-59	9.4%	(12)
60-69	17%	(22)
70-79	20%	(26)
80+	31%	(39)

Base immunized:
Gender & age distribution
among 571 episodes

Gender	Percentage	Count
Male	51%	(292)
Female	49%	(279)
Age		
0-9	0.0%	(0)
10-19	2.3%	(13)
20-29	4.0%	(23)
30-39	11%	(65)
40-49	7.7%	(44)
50-59	12%	(67)
60-69	18%	(101)
70-79	19%	(108)
80+	26%	(150)

Boosted:
Gender & age distribution
among 927 episodes

Gender	Percentage	Count
Male	59%	(550)
Female	41%	(377)
Age		
0-9	0.0%	(0)
10-19	0.0%	(0)
20-29	1.4%	(13)
30-39	4.0%	(37)
40-49	4.1%	(38)
50-59	8.4%	(78)
60-69	15%	(138)
70-79	27%	(248)
80+	40%	(375)

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 10a, 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 10a, 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 8c), the non-immunized population's death toll represents a larger portion in CH-SUR (Figure 10c). Figure 10c 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 10c, 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 **11a**). 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.

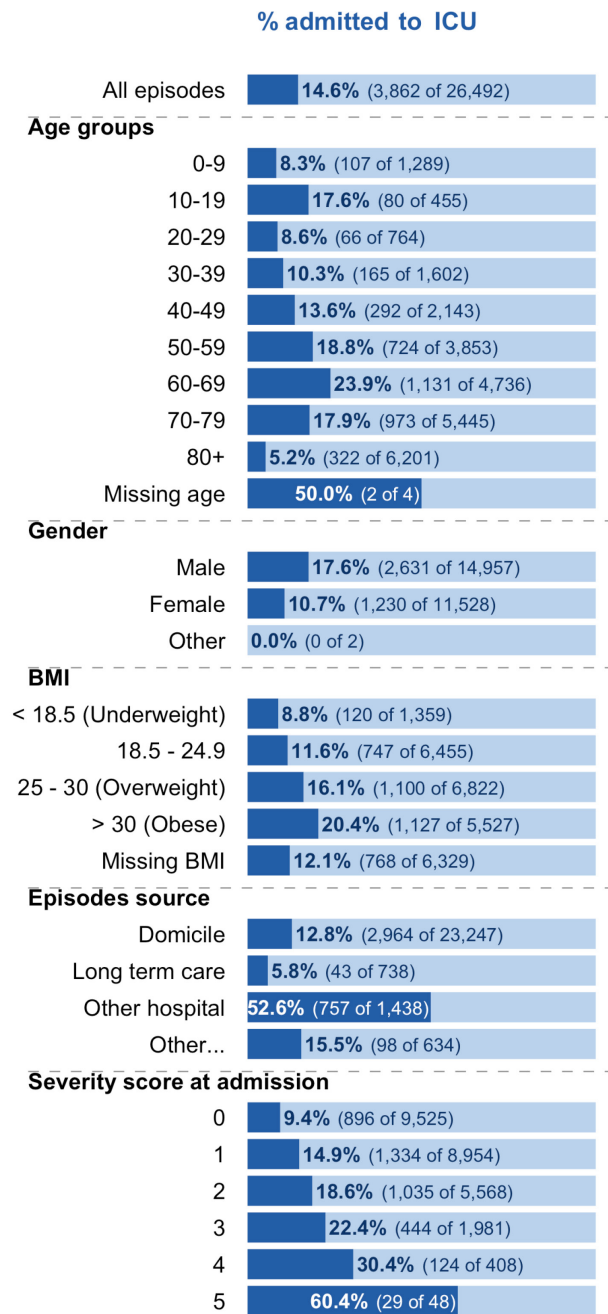
Males were more likely to be admitted to the ICU than females. Overall, admissions to the ICU were registered for 17.6% of the episodes concerning males, compared to 10.7% of the episodes concerning females.

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 **11a**), 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 **11a**).

Figure **11b** 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**).

a. All relevant data: Episodes with first hospitalization between Feb 26 2020 and Mar 31 2022



b. Feb & Mar: Episodes with first hospitalization between Feb 01 2022 and Mar 31 2022

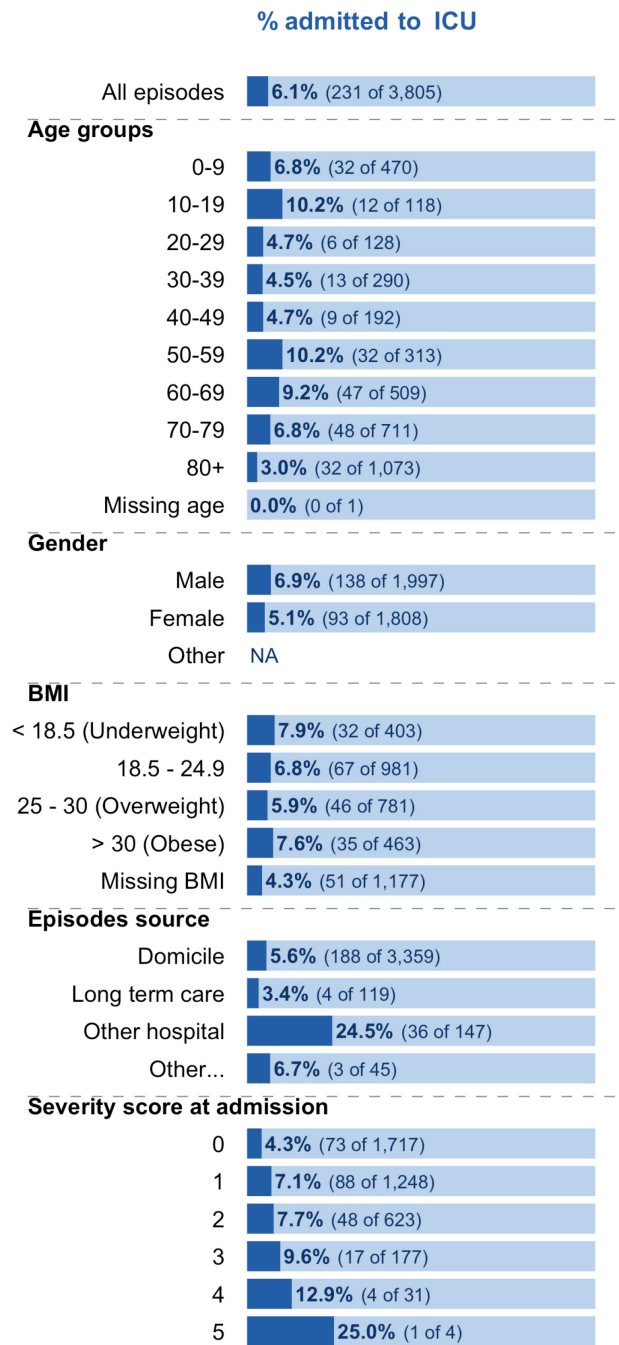


Figure 11: Percentage of hospitalization episodes with at least one ICU admission, grouped by demographic and risk factors, over two time intervals. For episodes with multiple hospitalizations, we considered whether they were admitted to the ICU during any of their hospitalizations. Both panels include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

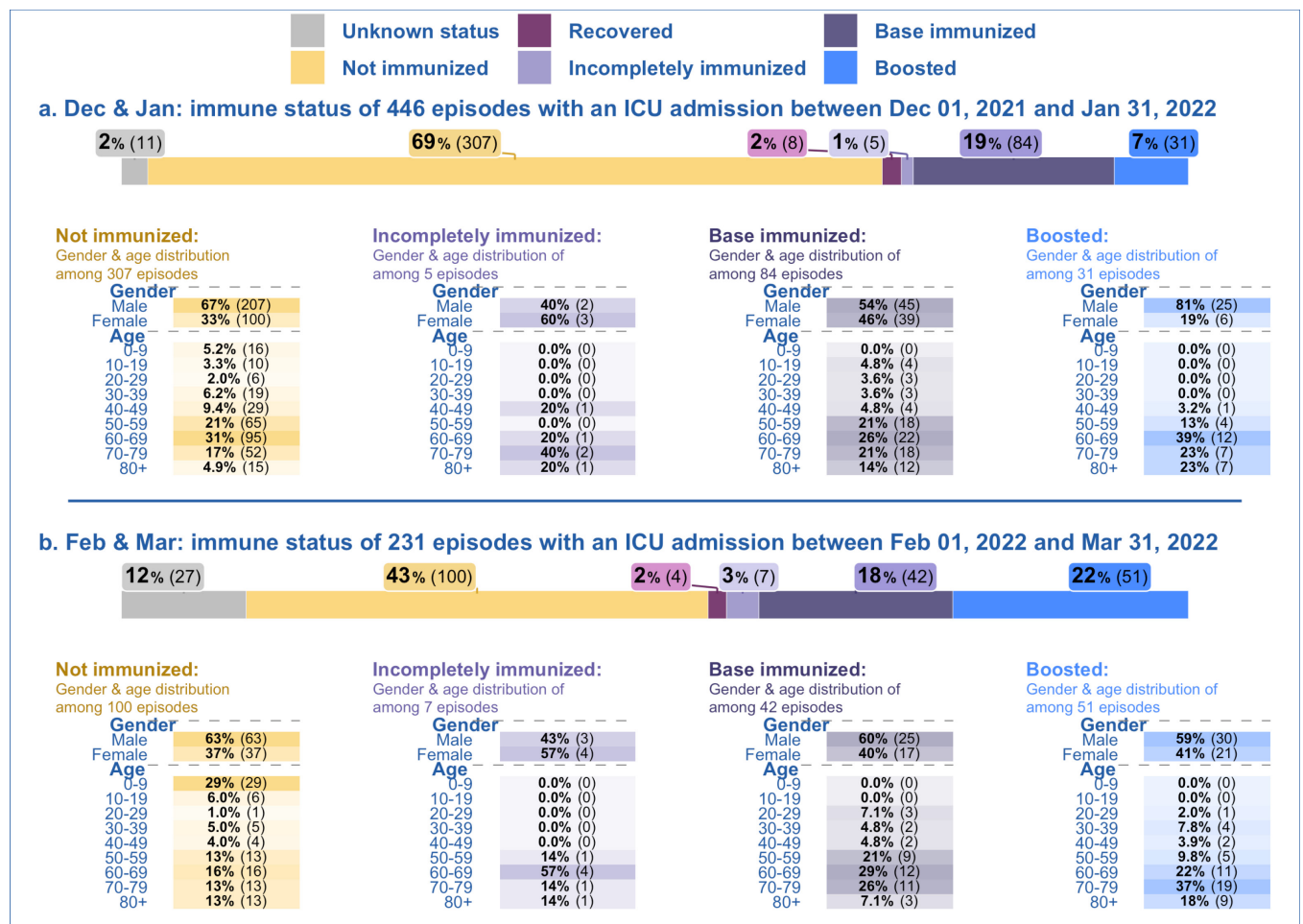


Figure 12: Demographic characteristics of patients in ICU by immune status and episode, over two different periods. Episodes with a first admission date after Mar 31, 2022 were excluded, as a large proportion of these records have not been completely filled in the database. Episodes with missing ages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

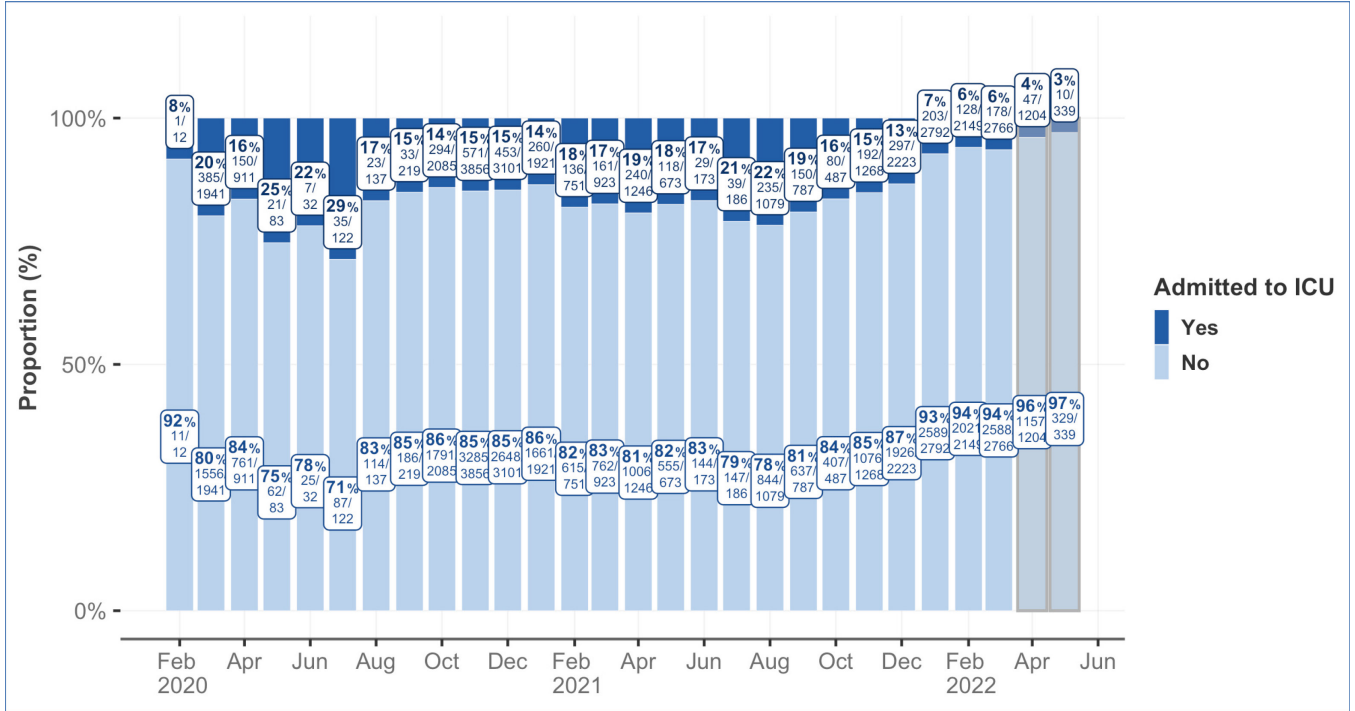


Figure 13: Percentage and proportion of episodes with at least one ICU admission over time. Records with incomplete data (ongoing episodes or with a pending outcome in the database) were not included. Data from the last two months (highlighted gray) are considered provisional due to data entry delays.

6. Health Complications

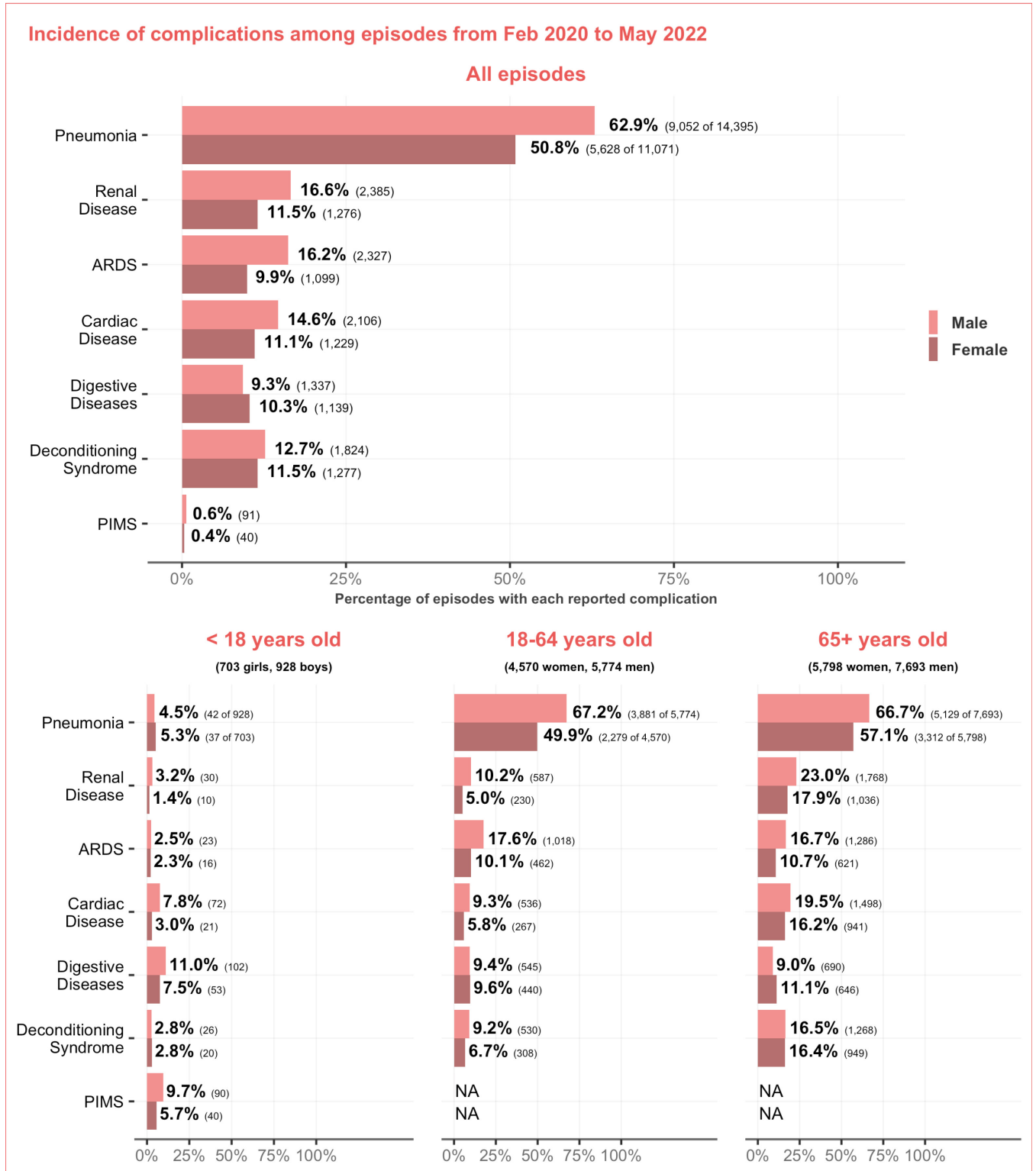


Figure 14: Incidence of complications arising during a hospitalization episode with a community acquired SARS-CoV-2 infection. The reported complications are shown overall and per age group and gender. Only the top 6 most prevalent complications, and PIMS, are displayed. Other complications available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

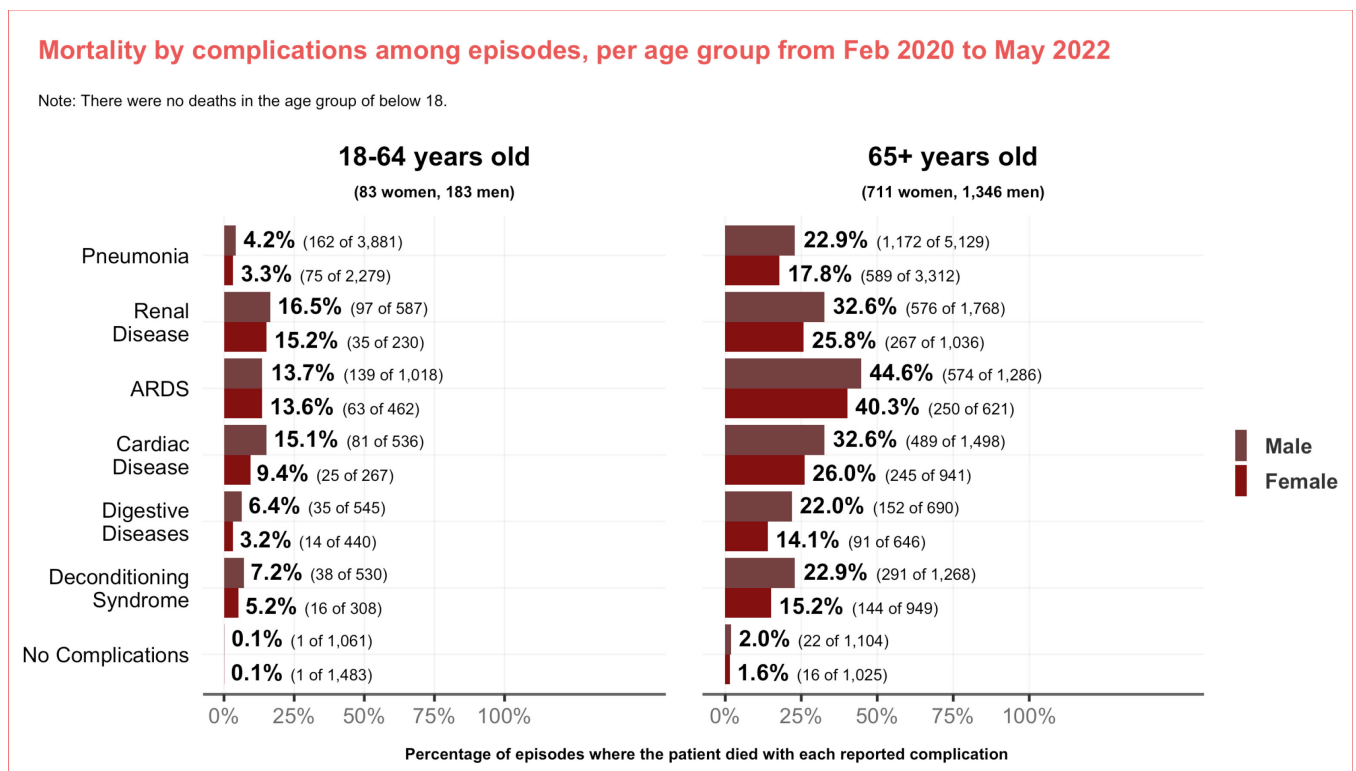


Figure 15: Mortality is depicted for each complication: showing the percentage of episodes where the patient with the complication died.

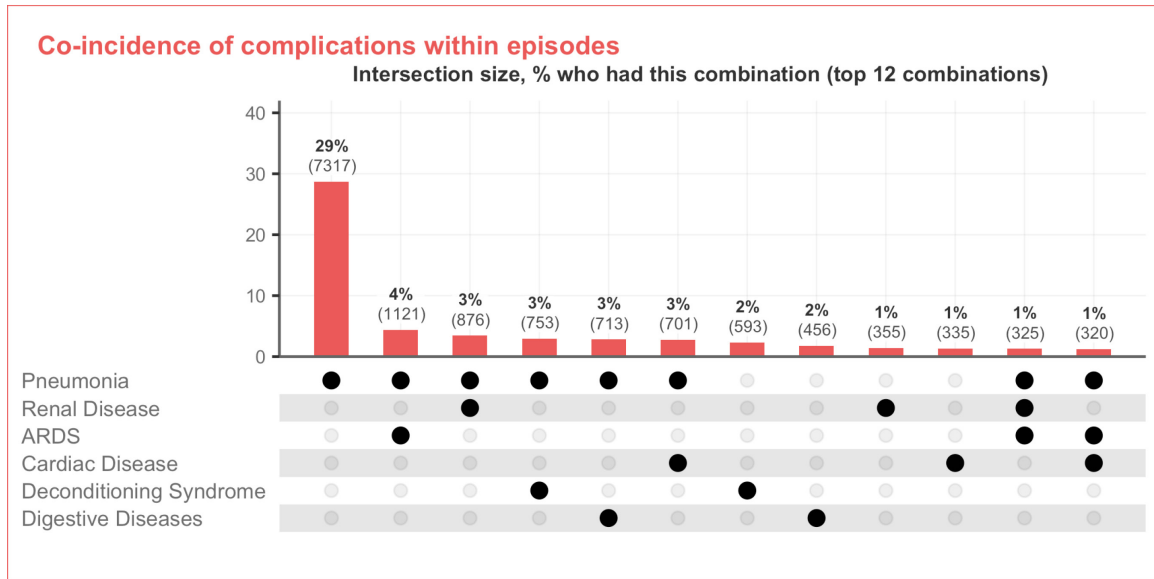


Figure 16: Complications are represented by their combinations (co-occurrences). The top 12 combinations are represented.

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 17c). In recent months, this proportion rose since August 2021, accounting for 14.0% of the episodes 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.

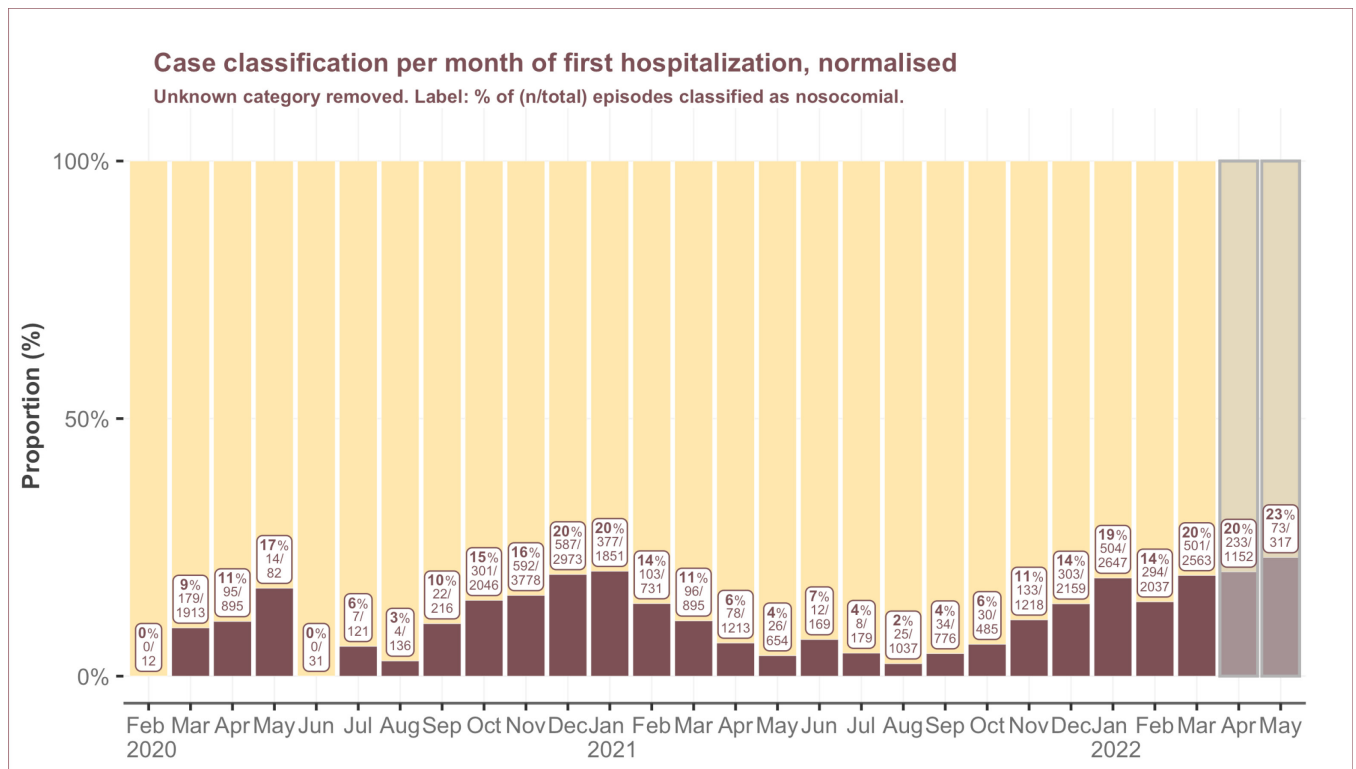


Figure 17: Classification (infection source) of hospitalization episodes over time. Data from the last two months (highlighted gray) are considered provisional due to data entry delays.

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.

Community acquired and nosocomial episodes from Feb 2020 to May 2022

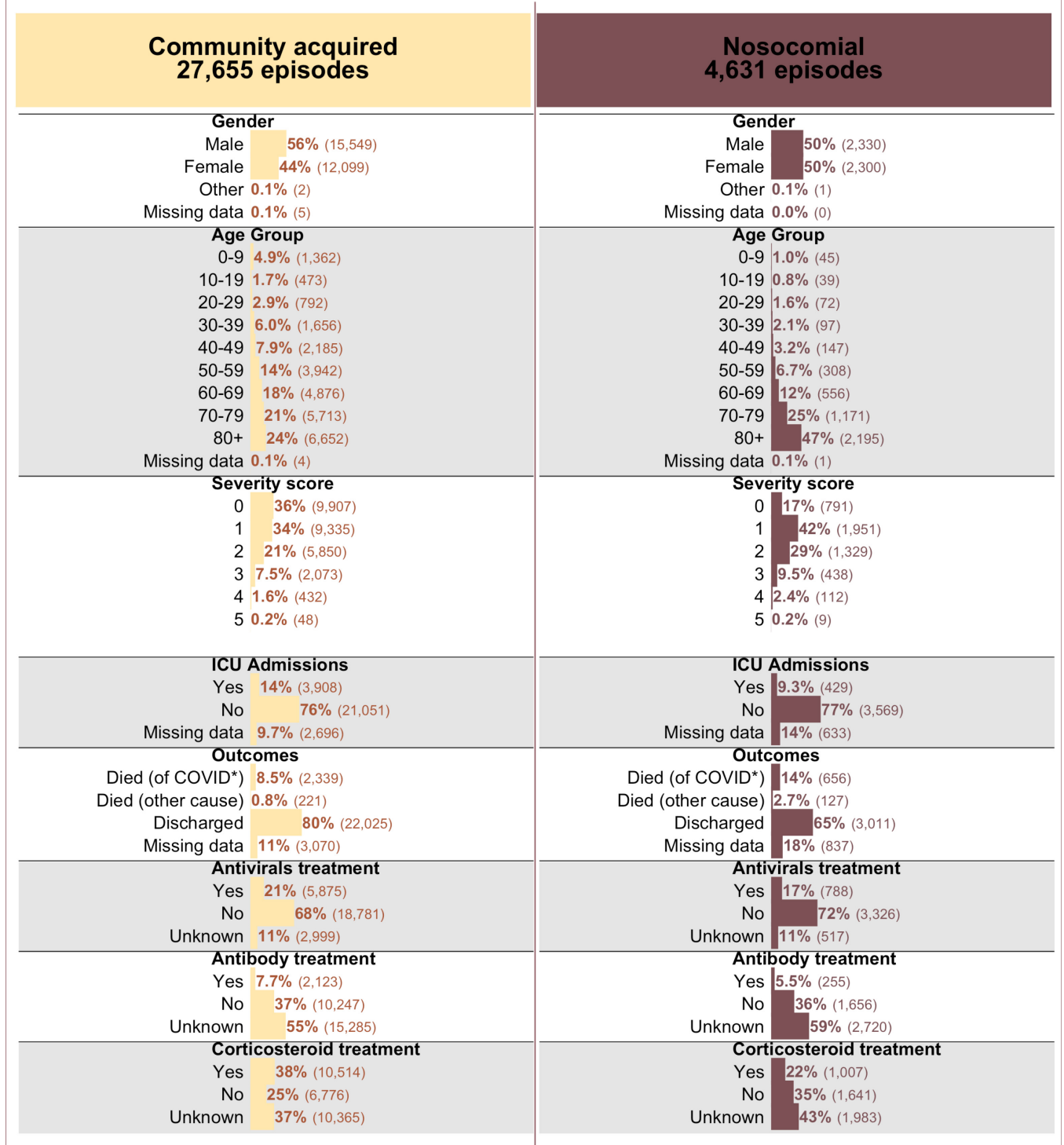


Figure 18: Case classification (infection source) of hospitalization episodes Comparison of community acquired and nosocomial cases by demographics, severity score, ICU, outcomes and treatments.

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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