



European Union

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101003673



I-MOVE-COVID-19 Network

Multidisciplinary European network for research, prevention and control of the COVID-19 pandemic

COVID-19 European Hospital Surveillance: Fourth Bulletin

JUNE 2021

I-MOVE-COVID-19 Network

WP3 coordinated by Public Health Scotland

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DOI: 10.5281/zenodo.5084787

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Abbreviations

AL	Albania
BE	Belgium
COVID-19	Coronavirus disease 2019
EEA	European Economic Area
ECDC	European Centre for Disease Prevention and Control
EMCO	Extracorporeal membrane oxygenation
EN	England
ES	Spain (Region of Granada and Aragon)
EU	European Union
FR-V	France VIVI
FR-R	France I-REIVAC
GP	General Practitioner
HCW	Healthcare Worker
HDU	High Dependency Unit
ICD	International Classification of Diseases
ICU	Intensive Care Unit
ILI	Influenza-Like Illness
I-MOVE	Influenza – Monitoring Vaccine Effectiveness in Europe
LT	Lithuania
NA	Navarra region, Spain
PT	Portugal
RO	Romania
RT- PCR	Real-Time Polymerase Chain Reaction
SARI	Severe Acute Respiratory Infection
SARS-CoV-2	Severe Acute Respiratory Syndrome – Coronavirus 2
SC	Scotland
WP-3	Work Package 3

Summary

This fourth surveillance report summarises information from the Influenza – Monitoring Vaccine Effectiveness in Europe - Coronavirus Disease 2019 (I-MOVE-COVID-19) hospital surveillance network. The I-MOVE-COVID-19 hospital surveillance aims to reinforce and complement the COVID-19 epidemiological data in the EU/EEA and the UK that are compiled and reported by the European Centre for Disease Prevention and Control (ECDC).

Surveillance data are provided by 11 participating hospital surveillance sites in the nine European countries that are part of the I-MOVE-COVID-19 network. Hospitalised patients with confirmed, probable or suspected SARS-CoV-2 virus infection are included as COVID-19 cases. Data are collected following a generic protocol. Differences between countries occur in the range and completeness of data collected because of the differences in health care systems, hospital admission policy, or coding of data.

A total of 92,120 COVID-19 cases were reported to the surveillance system between 01 February 2020 and 31 March 2021 (90,161 (98%) laboratory confirmed, 258 (0.3%) probable and 1,701 (1.8%) suspected). Of these, 56,050 (61%) were reported from England and 23,264 (25%) from Scotland (both of which are the only sites to submit national data). For the purposes of this bulletin, hospitals were sampled randomly from the England and Scotland national submissions, to ensure that these countries are not over-represented in the dataset; this is in contrast to previous bulletins which analysed the entire pooled dataset.

This bulletin focuses on the second wave of the pandemic, starting in late summer 2020¹. Note that the start of the second wave varied by country, and week of start for each participating site has been defined by inspecting the graph for that site.

- Approximately 8,051 (54%) patients were male and 6,815 (46%) were female.
- The median age was 68 years, range 0–104 years (n=14,900).
- Patients with one underlying chronic condition represented a higher proportion of hospital admissions (N=2,745; 32%), ICU/HDU admissions (N=281; 27%), and deaths (N=353; 22%) vs patients with no conditions (N=899 (10%) hospital admissions; N=88 (8%) ICU/HDU admissions; N=30 (2%) deaths). These figures were higher still for patients with two or more underlying health conditions (N=5,072 (58%) hospital admissions; N=684 (65%) ICU/HDU admissions; N=1,230 (76%) deaths).

¹ Although the bulletin focuses on the second wave of the pandemic, patient outcomes in the first and second wave are compared in the last section.

- The most commonly reported underlying chronic conditions were hypertension (N=4,025; 42%), obesity (N= 2,241; 29%) and heart disease (N=2,742; 27%).
- Almost all confirmed COVID-19 cases from the 10 sites reporting symptoms presented with respiratory symptoms (at or pre-admission); (N=4,658; 97%). Febrile illness was also very common (N=2,496; 87%); while over two-thirds had neurological symptoms (N=1,874; 67%) and almost half experienced gastrointestinal symptoms (N=1,624; 49%).
- The most frequently reported symptom was shortness of breath (N=3,593; 71%), followed by cough (N=3,298; 69%) and general deterioration (N=2,252; 65%).
- Almost three-quarters of patients were admitted within 8 days of onset (76%). The median length of hospital stay was 9 days.
- 1,239 (12%) of COVID-19 cases required ICU/HDU admission and 1,818 (18%) were reported to have died in hospital.
- ICU admissions and deaths reduced significantly from the first wave to the second in both sexes and all age groups, apart from the under 14s and over 75s.

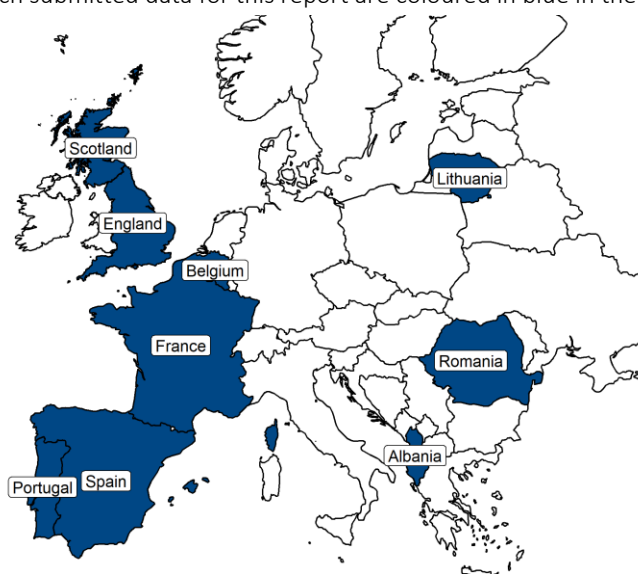
Background

Participating sites

The I-MOVE-COVID-19 Work Package 3 (WP3) hospital surveillance is coordinated by Public Health Scotland (PHS), in collaboration with Epiconcept. The network comprises 11 surveillance sites in nine European countries: Albania, England, Scotland, and six EU Member States (Belgium, France, Lithuania, Portugal, Romania, and Spain) (Figure 1). Both Spain and France have two separate participating sites in different areas/regions of the country.

Figure 1: Map of countries participating in I-MOVE-COVID-19 WP3 hospital surveillance

(Countries which submitted data for this report are coloured in blue in the map)



Data submission and selection

Sites submit surveillance data securely to Epiconcept every quarter for cleaning and pooling; the anonymised pooled dataset is then analysed by PHS. Table 1 describes the participating sites and the data they have contributed to the surveillance to date². Most sites generate the surveillance data using surveillance forms implemented at a small number of designated hospitals; however, surveillance data for both England and Scotland is generated through the linkage of routinely collected national datasets. For this reason, data contributed by England and Scotland consistently dominates the pooled dataset. In addition, in England, COVID-19 reporting is mandatory for patients admitted to ICU, but not mandatory for all hospitalised cases. For this reason, data from England tends to be skewed towards more severe outcomes (i.e. a higher percentage of ICU patients).

In past bulletins, these challenges have been addressed by presenting data analyses both including English data and excluding English data; however, this did not allow addressing the over-representation of Scottish data, and precluded having a balanced representation from both of these UK countries. For this bulletin, a different approach was taken, whereby random samples of both English and Scottish

²The period for which data were submitted do not necessarily reflect the total duration of the epidemic in that country.

data were selected for analysis. These samples may differ in each section of the report according to the surveillance theme being addressed.

Table 1 Countries participating in I-MOVE-COVID-19 (WP3) hospital surveillance and their respective contribution to this report between 01 Feb 2020 and 31 March 2021

Country	Region	Participating hospitals	Number of cases (%)	Admission of first reported case		Admission of last reported case	
				Date	Week	Date	Week
Albania (AL)	-	Two hospitals	1,308 (1.4%)	20 Feb 2020	8	28 Feb 2021	08
Belgium (BE)	-	One hospital	1,012 (1.1%)	21 Feb 2020	8	29 Mar 2021	13
England (EN)	Nationwide	All hospitals, including mandatory reporting from ICUs/HDUs	56,050 (60.8%)	15 Mar 2020	11	31 Mar 2021	13
France (FR)	Two sites:						
	FR-R (REIVAC)	Five hospitals	1,286 (1.4%)	01 Feb 2020	5	31 Mar 2021	13
	FR-V (ViVI)	Two hospitals,	20 (0.0%)	07 May 2020	19	22 Oct 2020	43
Lithuania (LT)	-	Two hospitals	627 (0.7%)	07 Mar 2020	10	30 Mar 2021	13
Portugal (PT)	-	Three hospitals	714 (0.8%)	13 Feb 2020	07	26 Mar 2021	12
Romania (RO)	-	Two hospitals,	395 (0.4%)	10 Mar 2020	11	31 Mar 2021	13
Scotland (SC)	Nationwide	All hospitals	23,264 (25.3%)	03 Mar 2020	10	31 Mar 2021	13
Spain (ES)	Two sites:						
	ES	Two hospitals	2,586 (2.8%)	20 Feb 2020	08	31 Mar 2021	13
	NA	Navarra region: six hospitals	4,858 (5.3%)	06 Feb 2020	6	31 Mar 2021	13
Total			92,120	01 Feb 2020	5	31 Mar 2021	13

Section One – Basic Epidemiology

Methodology

- **Cases included**

For this part of the analysis, confirmed, probable and suspected cases were included, and records missing key variables such as age, sex, or dates of onset/discharge were not dropped.

- **Selection of EN cases**

In order to address the problems of over-representation and of bias towards ICU admissions in the English dataset, the proportion of hospital admissions which were admitted to ICU was calculated for each contributing hospital. Hospitals reporting less than 6% and more than 29% ICU admissions (N=29,568) were discarded, due to the high likelihood that these hospitals were only contributing mandatorily reportable data or not contributing enough to represent the true ICU admissions overall (i.e. not representative of the average ICU admissions). This left 22 hospitals reporting an ICU admission rate of between 6% and 29%. Five of these hospitals were then randomly selected, and all cases reported by these hospitals included in the sample for analysis.

- **Selection of SC cases**

Twenty percent of the cases reported in the overall dataset supplied by Scotland were randomly selected for inclusion in the analysis.

- **Selection of second wave cases**

Case numbers were plotted over time for each site (January 2020–March 2021). Each graph was visually inspected to detect a resurgence of COVID-19 cases in the “second wave”, and the week this occurred noted for each site. For the subsequent analyses, only cases reported from these specific weeks onwards are included.

- **Final selection included for analysis**

The final selection comprised 14,905 cases, of which 13,263 (89%) were laboratory confirmed, 113 (1%) were probable and 1,529 (10 %) suspected. Table 2 describes details of the contribution of the data by site.

Table 2 Countries participating in I-MOVE-COVID-19 (WP3) hospital surveillance and their respective contribution to this report - Post Selection (Second Wave)

Country	Region	Participating hospitals	Number of cases (%)	Admission of first reported case		Admission of last reported case	
				Date	Week	Date	Week
Albania (AL)	-	Two hospitals	1,214 (8)	06 Jun 2020	23	28 Feb 2021	8
Belgium (BE)	-	One hospital	581 (4)	04 Aug 2020	32	29 Mar 2021	13
England (EN)	Nationwide ³	Five hospitals, randomly selected	3,400 (23)	03 Sep 2020	36	31 Mar 2021	13
France (FR)	Two site:						
	FR-R (REIVAC)	Five hospitals	234 (2)	01 Jan 2021	1	31 Mar 2021	13
	FR-V ⁴ (ViVI)	Two hospitals	20 (0.1)	07 May 2020	19	22 Oct 2020	43
Lithuania (LT)	-	Two hospitals	299 (2)	13 Jul 2020	29	30 Mar 2021	13
Portugal (PT)	-	Three hospitals	225 (2)	13 Oct 2020	42	26 Mar 2021	12
Romania (RO)	-	Two hospitals	232 (2)	15 Jul 2020	29	31 Mar 2021	13
Scotland (SC)	Nationwide ⁵	All hospitals	3,507 (24)	28 Jul 2020	31	31 Mar 2021	13
Spain	Two sites:						
	ES	Two hospital	2,240 (15)	01 Jun 2020	23	31 Mar 2021	13
	NA	Navarra region: six hospitals	2,953 (20)	21 Jul 2020	30	31 Mar 2021	13
Total			14,905	07 May 2020	19	31 Mar 2021	13

³ Randomly selected 3,400 cases from five hospitals having between 6% and 29% ICU cases.

⁴ All FR-V cases were included in second wave analysis due to the small number of cases submitted.

⁵ Randomly selected 20% of Scotland's sample.

Cases over time

The number of confirmed, probable and suspected cases reported overall by date of onset of symptoms and date of hospital admission are presented in Figures 2 and 3, respectively, categorised by ICU/HDU admission.

Figure 2 Number of confirmed, probable and suspected cases reported overall by week of symptom onset (Includes data for all sites (N=9,010; 5,895 missing onset date))

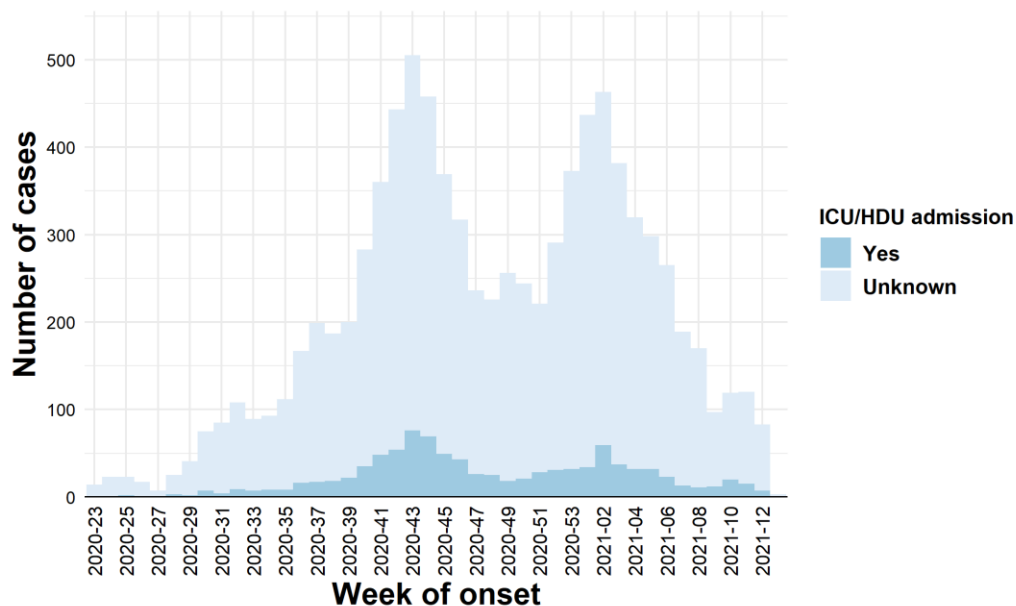
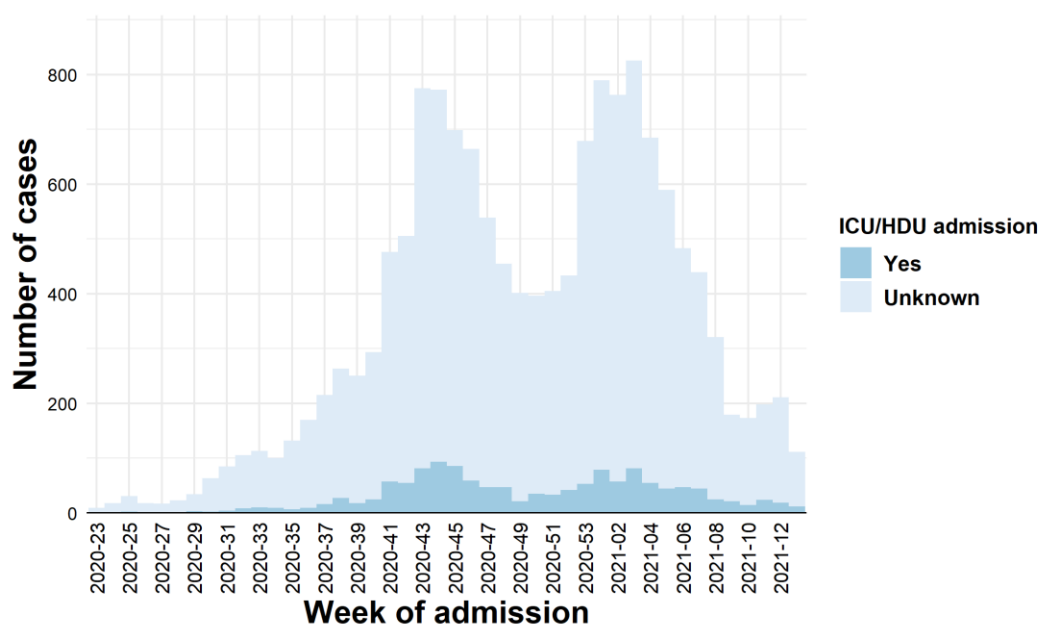


Figure 3 Number of confirmed, probable and suspected cases reported overall by week of hospital admission All sites (N=14,905)



Figures 4–13 present the numbers of confirmed, probable and suspected cases reported overall by week of hospital admission, for each participating site. Note that the data submitted by participating sites may reflect reporting constraints faced by those sites and do not necessarily reflect how the epidemic progressed in those countries/regions over time.

Figure 4: England (EN) (Second wave starts at week 36/2020, N=3,400)

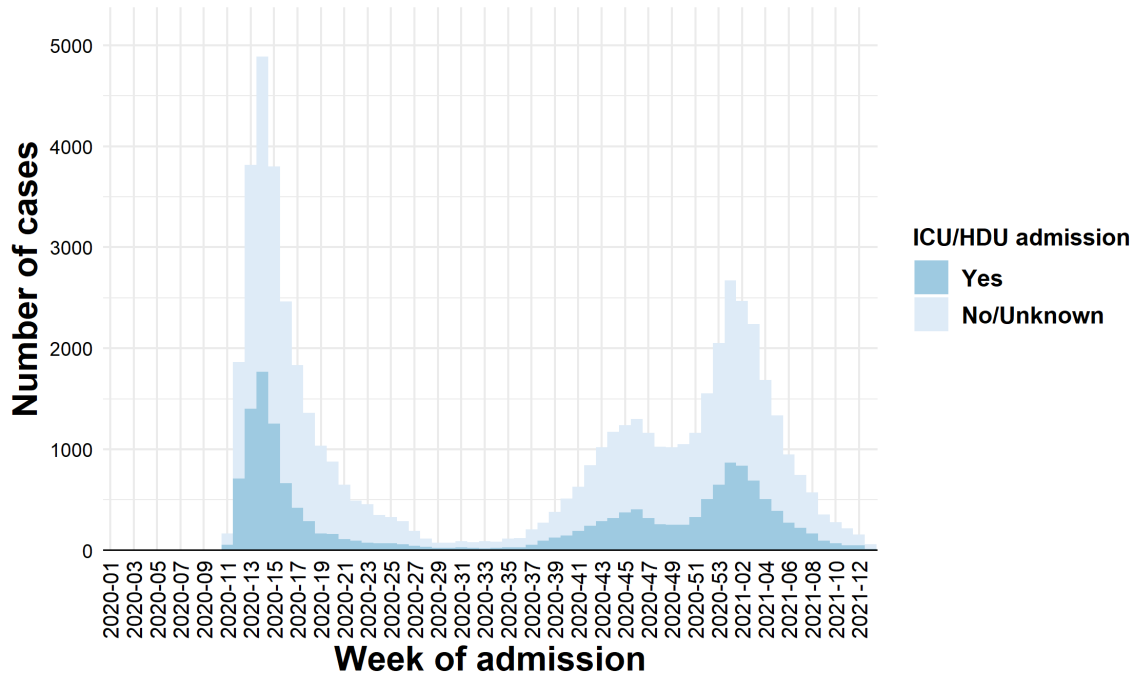


Figure 5: Scotland (SC) (Second wave starts at week 31 2020, N=3,507)

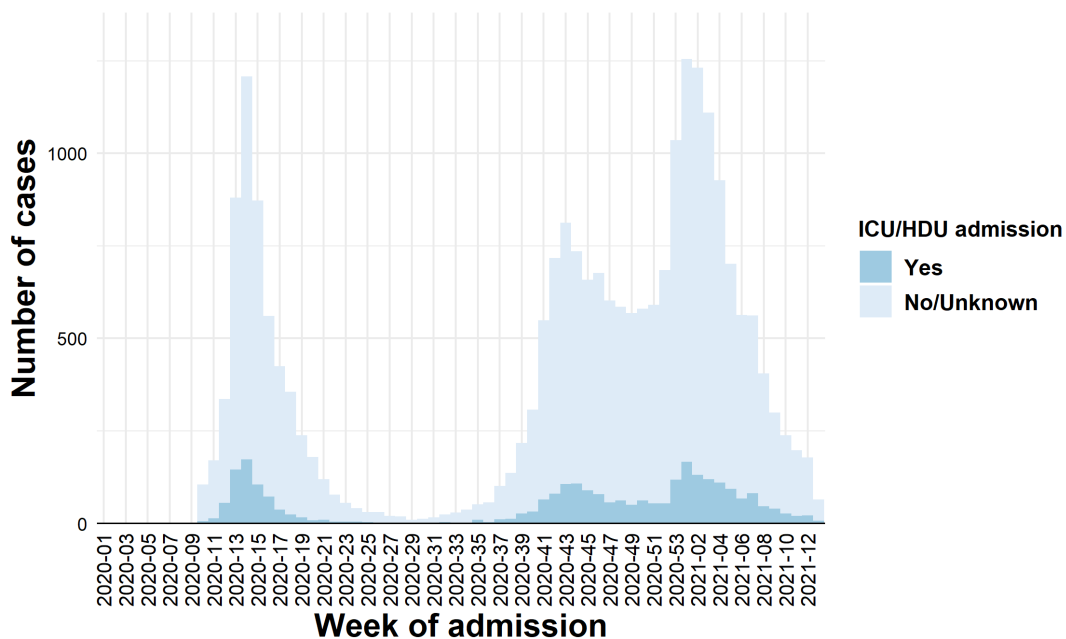


Figure 6: Belgium⁶ (BE) (Second wave starts at week 32/2020, N=581)

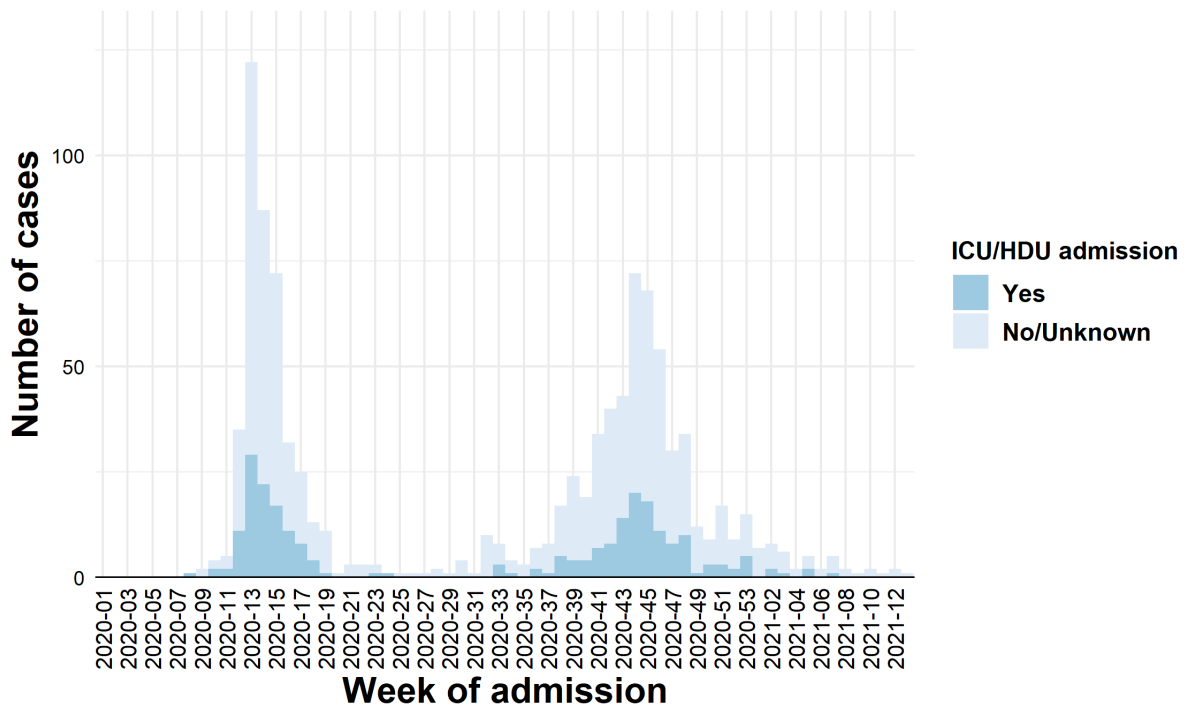
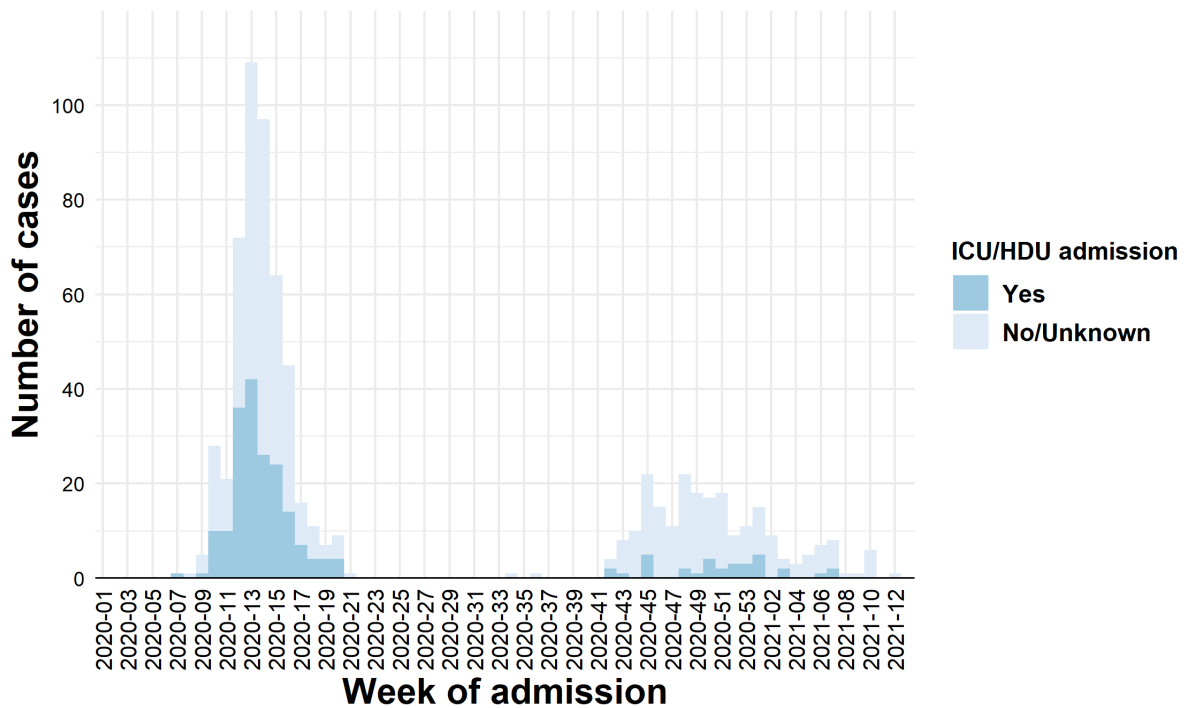


Figure 7: Portugal (PT) (Second wave starts at week 42/2020, N=225)



⁶ Third wave not represented in the bulletin as some cases were not reported in time (BE dataset is complete up to the end January 2021).

Figure 8: Spain⁷ (ES - Region of Granada and Aragon) (Second wave starts at week 23/2020, N=2,240)

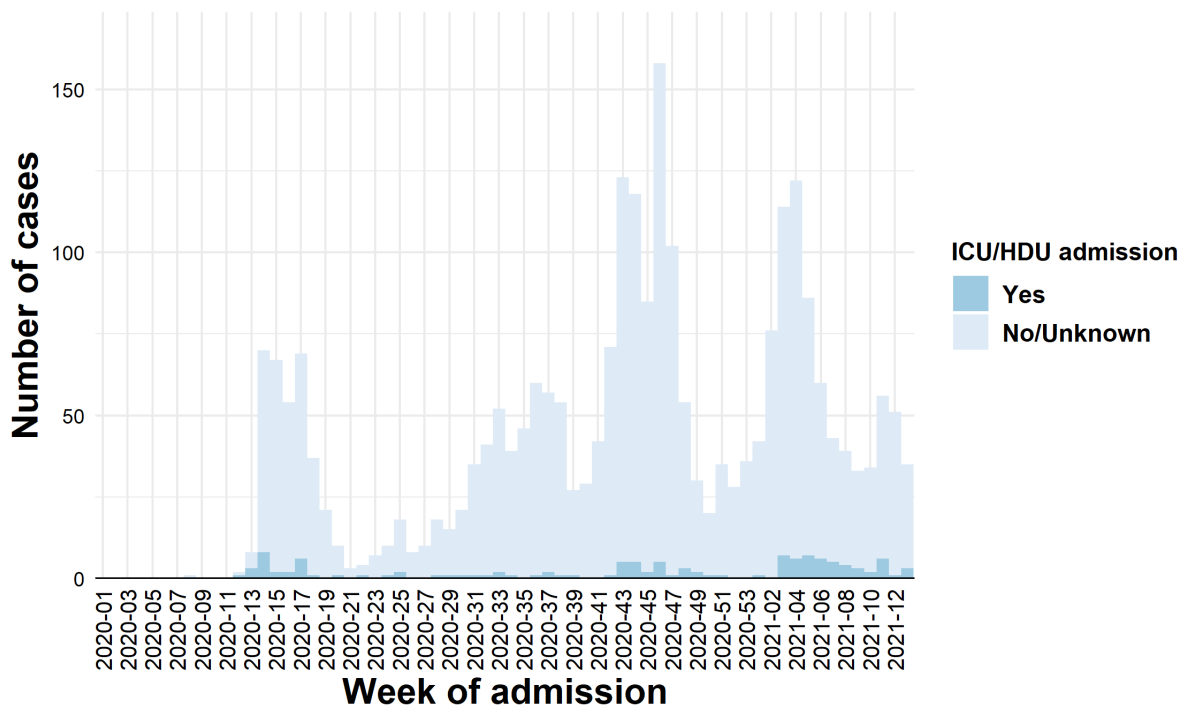
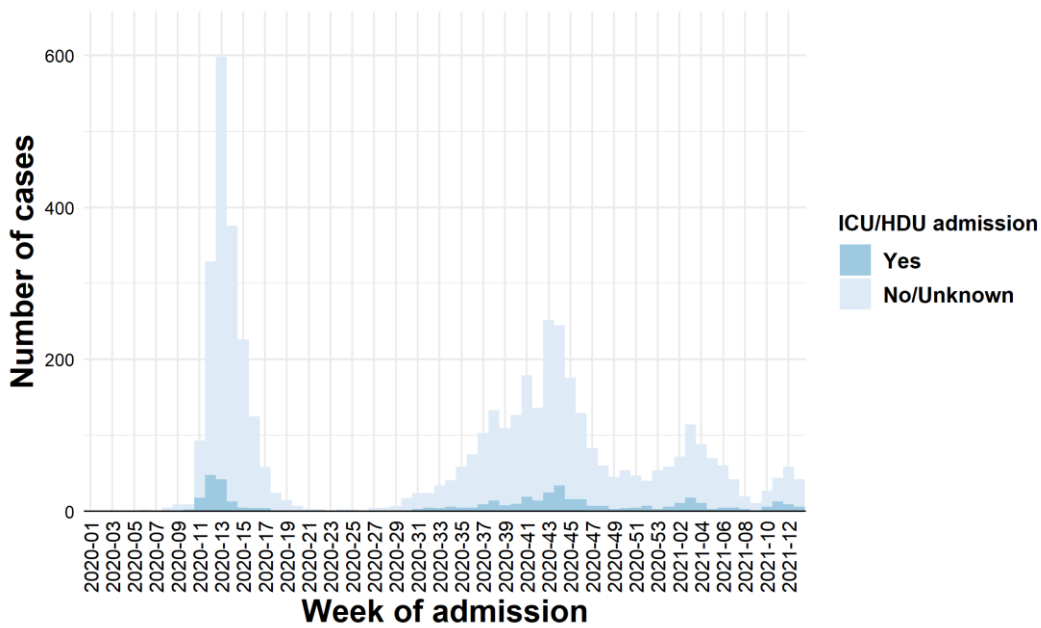


Figure 9: Spain (NA - Navarra Region) (Second wave starts at week 27/2020, N=2,953)



⁷ Wide heterogeneity in regions in Spain; but the shape of the second wave was overall representative of the shape at national level.

Figure 10: France I-REIVAC (FR-R) (Second wave starts at week 01/2021, N=234)

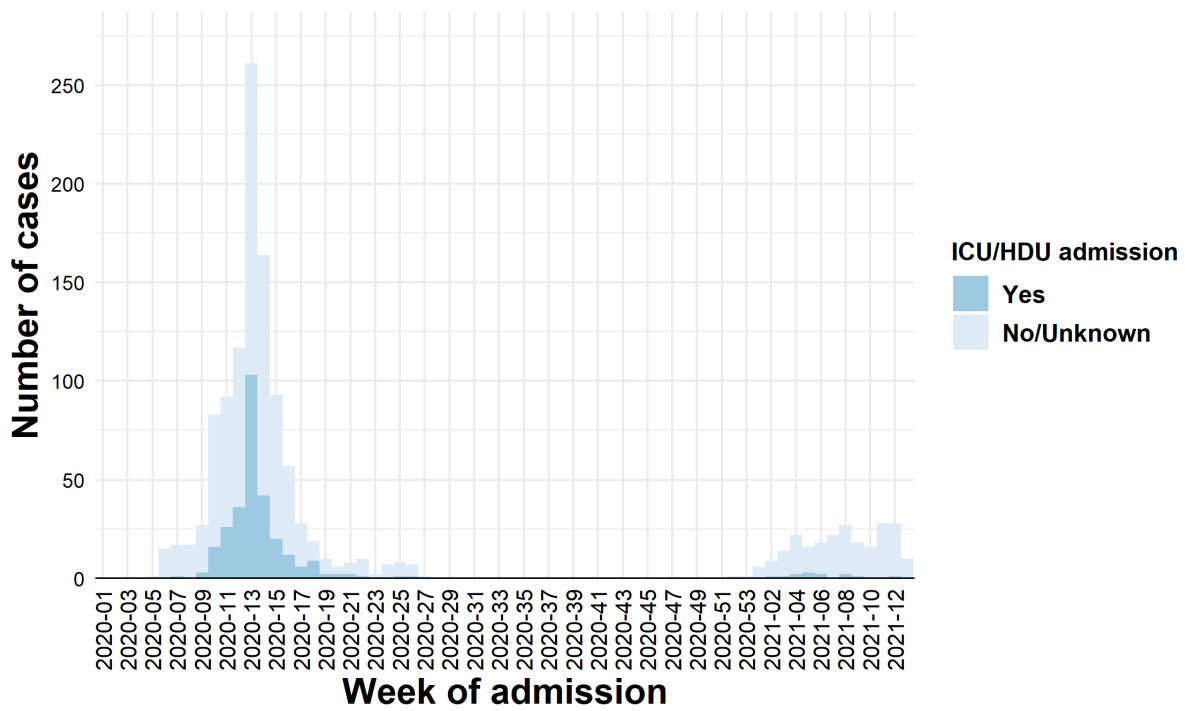


Figure 11: Albania (AL) (Second wave starts at week 24/2020, N=1,214)

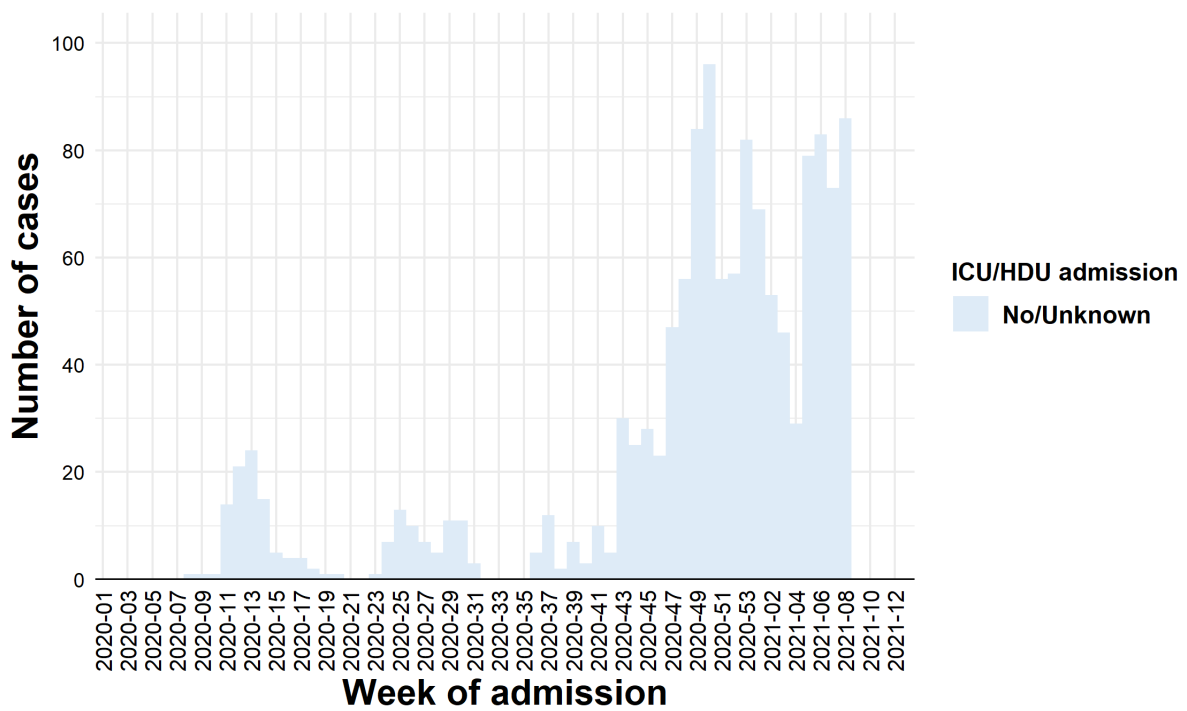


Figure 12: Lithuania (LT) (Second wave starts at week 29/2020, N=299)

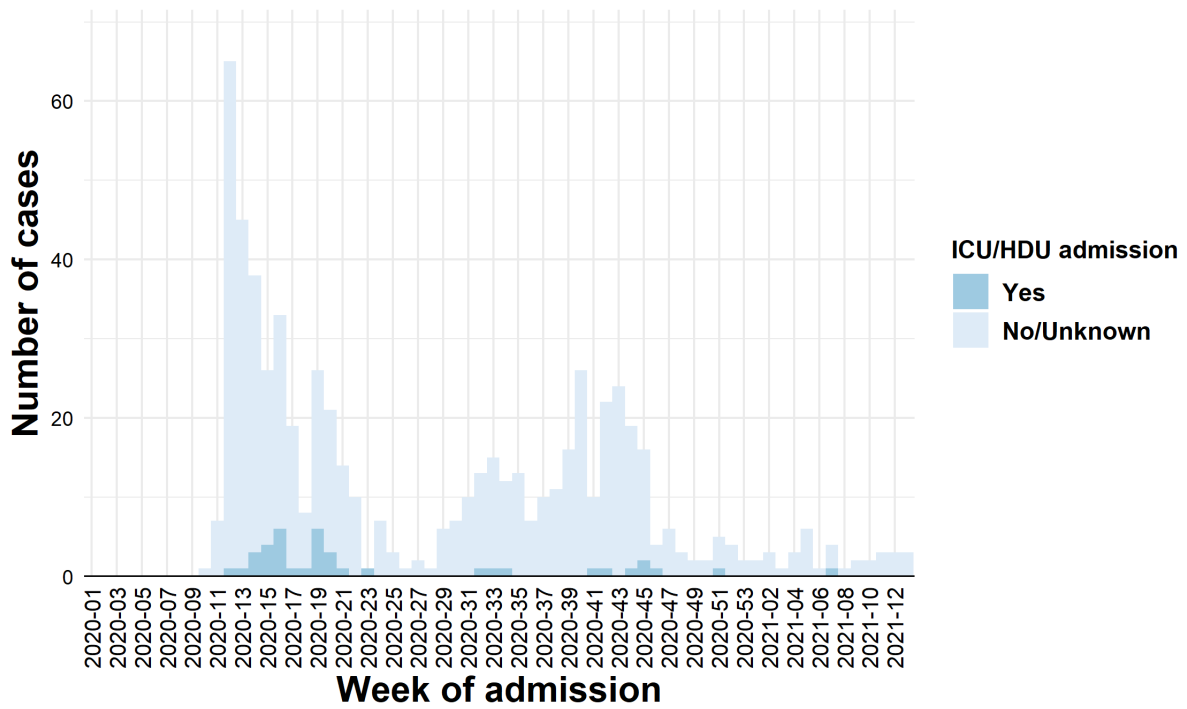
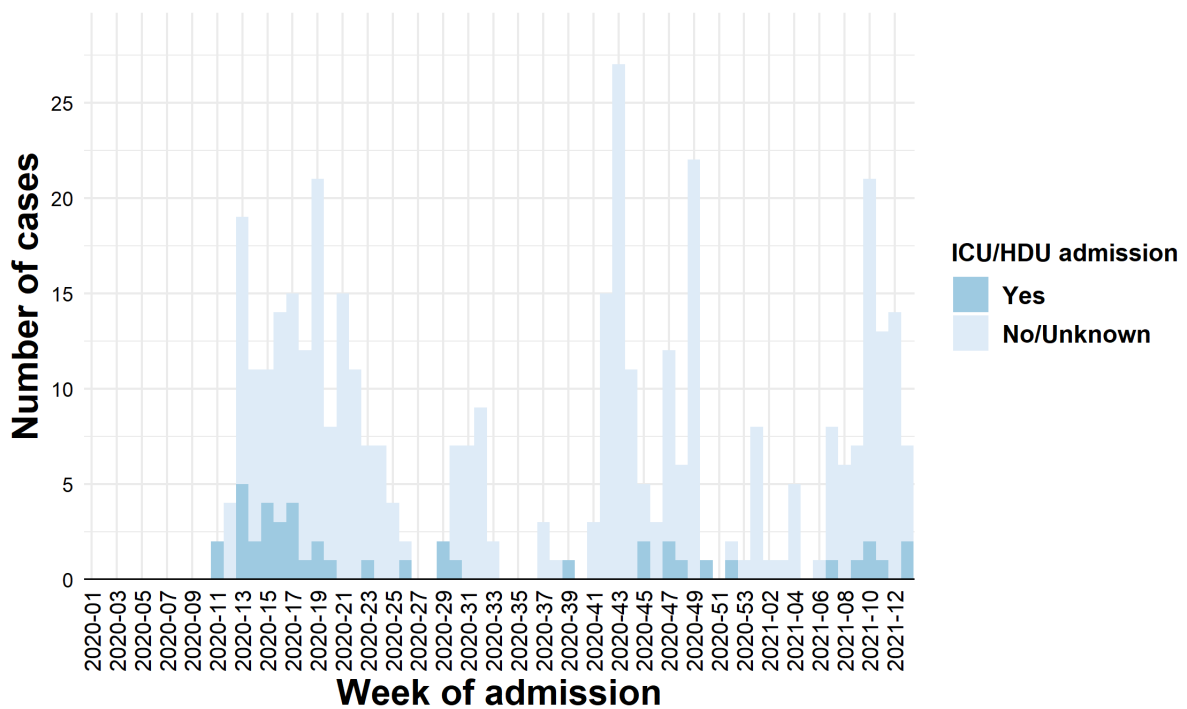


Figure 13: Romania (RO) (Second wave starts at week 29/2020, N=232)



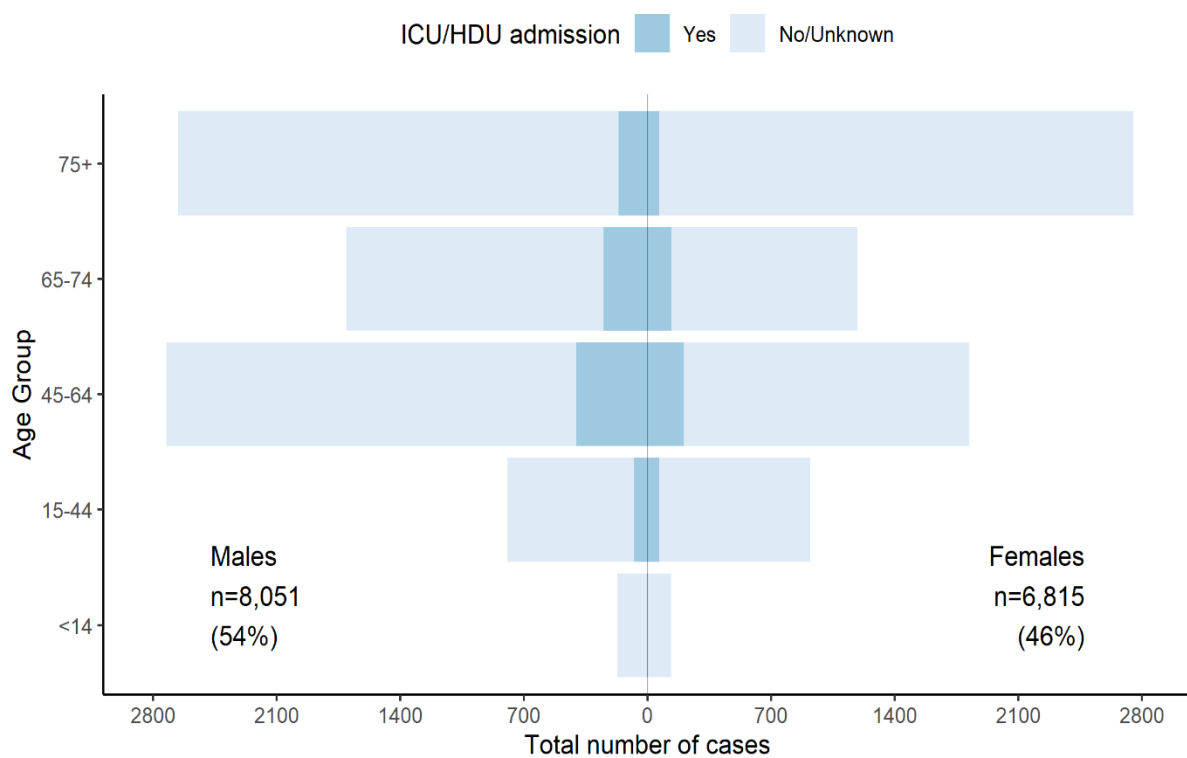
Demographics

The demographic characteristics of the patients in the surveillance dataset are presented below.

- Approximately 54% of cases were **male**; (8,051/14,886; 39 records missing).
- The median **age** of cases was 68 years, range 0–104 years (n=14,900; 5 records missing age).
- 10% of cases had **supported living arrangements**⁸ prior to admission (813/8,388; 6,517 records missing/unknown).

Figure 14 shows the sex and age distribution of confirmed, probable and suspected cases overall, categorised by Intensive care unit (ICU) and High Dependency Unit (HDU) admissions.

Figure 14: Age and sex distribution of confirmed, probable and suspected COVID-19 cases by ICU/HDU admission



⁸ Prior to admission, patient was either living at home with assistance from a carer, or was resident in a care home.

Figures 15–24⁹ show the age/sex distribution of cases by site. Note that these are absolute numbers that are not age-adjusted according to a country’s population structure, and that not all sites receive paediatric patients or collect data on paediatric cases (<18 years of age).

Figures 15-24: Age and sex distribution of confirmed, probable and suspected COVID-19 cases by ICU/HDU admission by countries

Figure 15: England (EN)

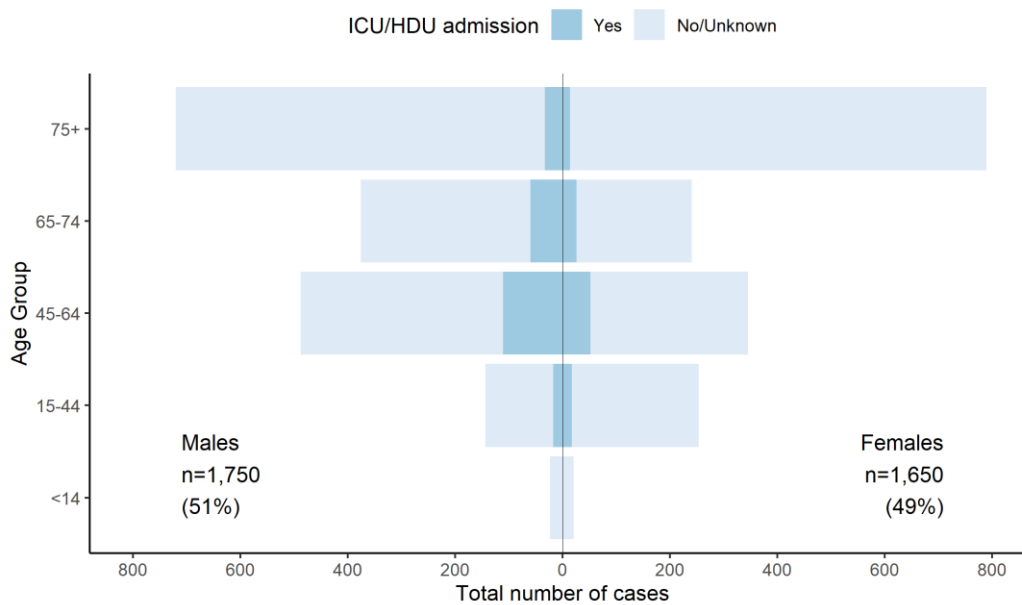
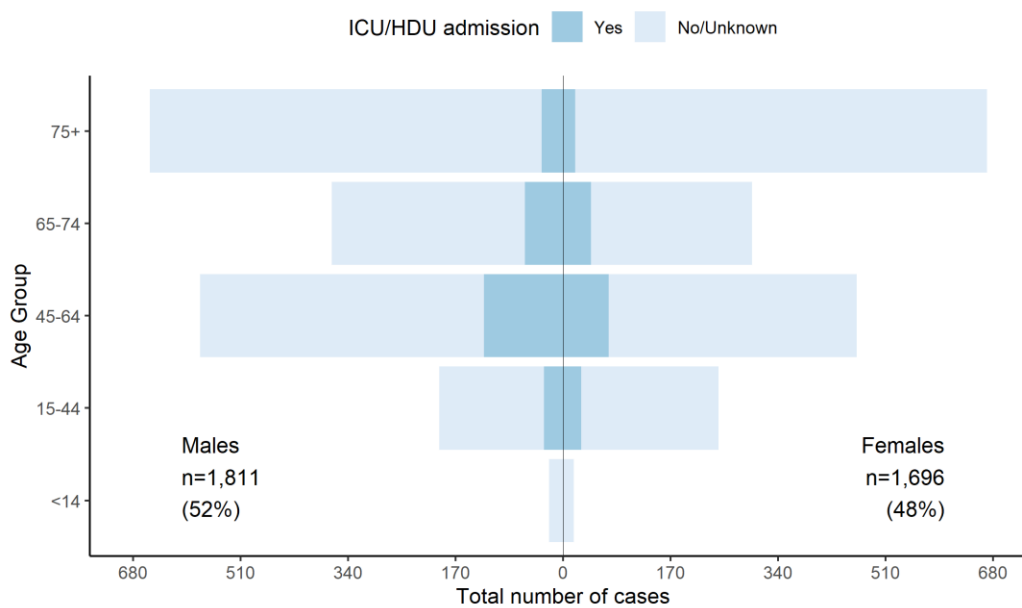


Figure 16: Scotland (SC)



⁹ Owing to the small number of cases, results are not presented for FR-V.

Figure 17: Belgium (BE)

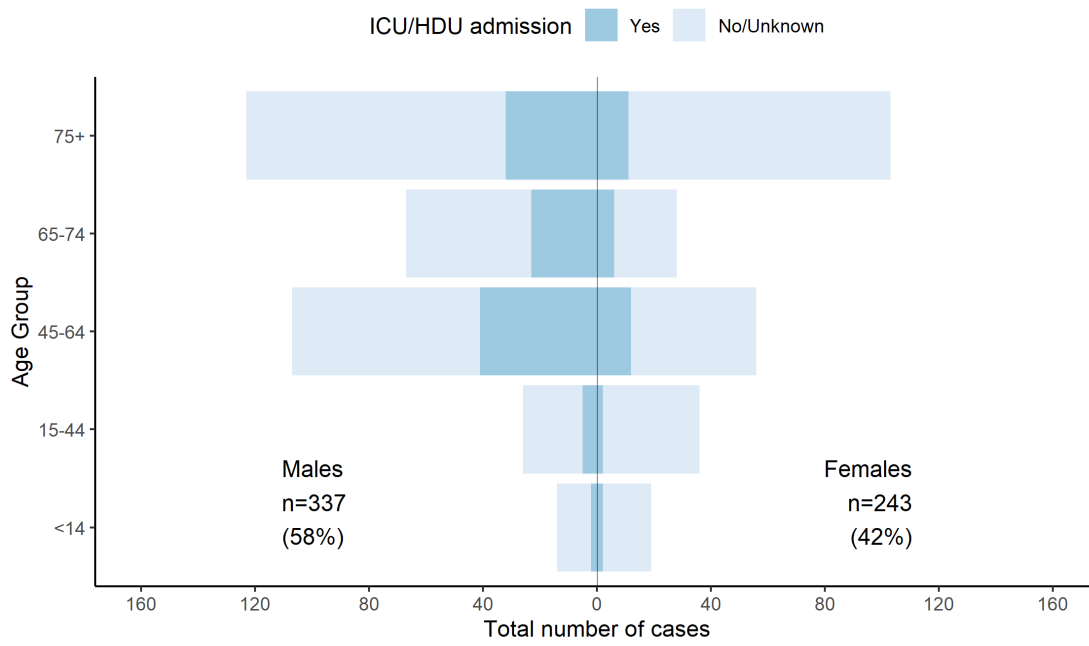


Figure 18: Portugal (PT)

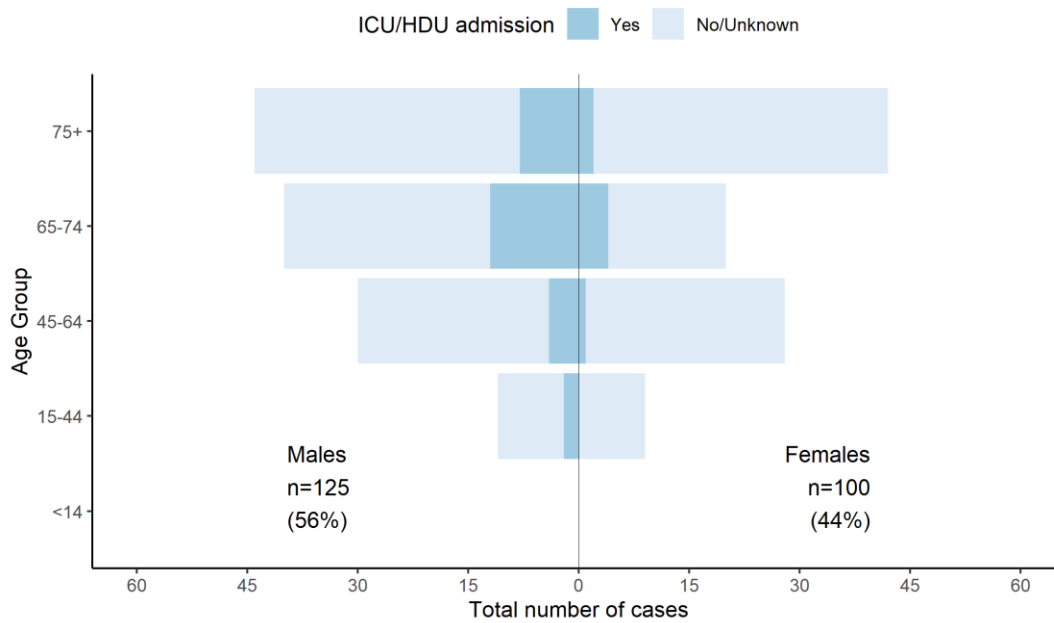


Figure 19: Spain (ES - Region of Granada and Aragon)

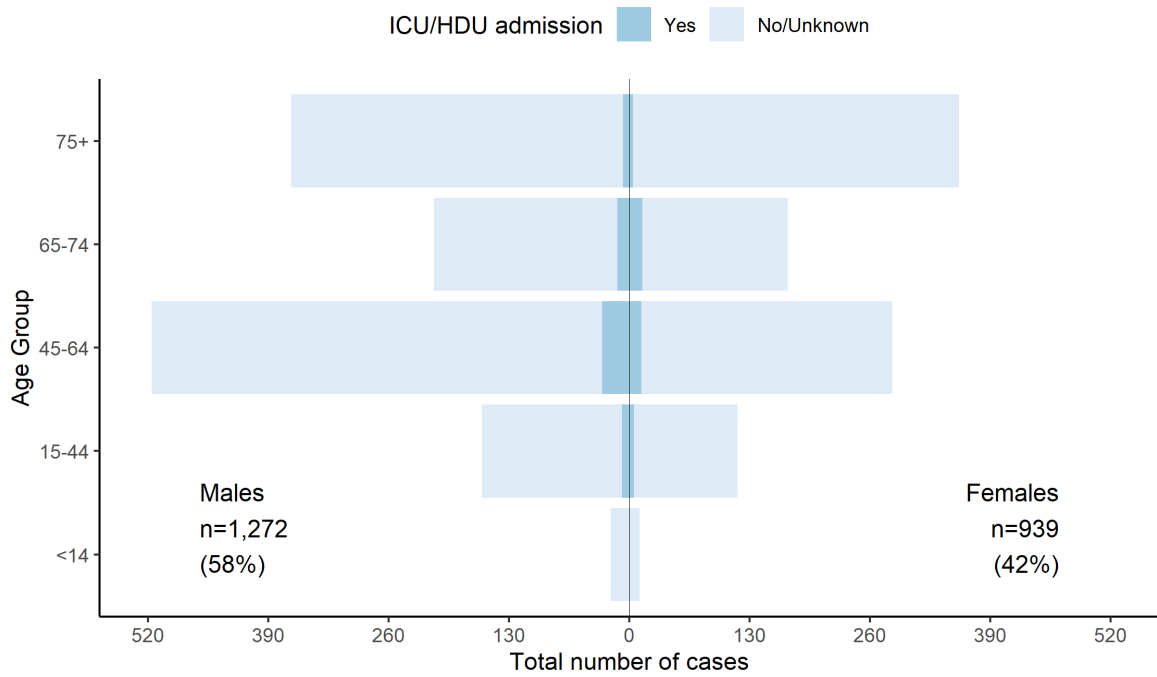


Figure 20: Spain (NA - Navarra Region)

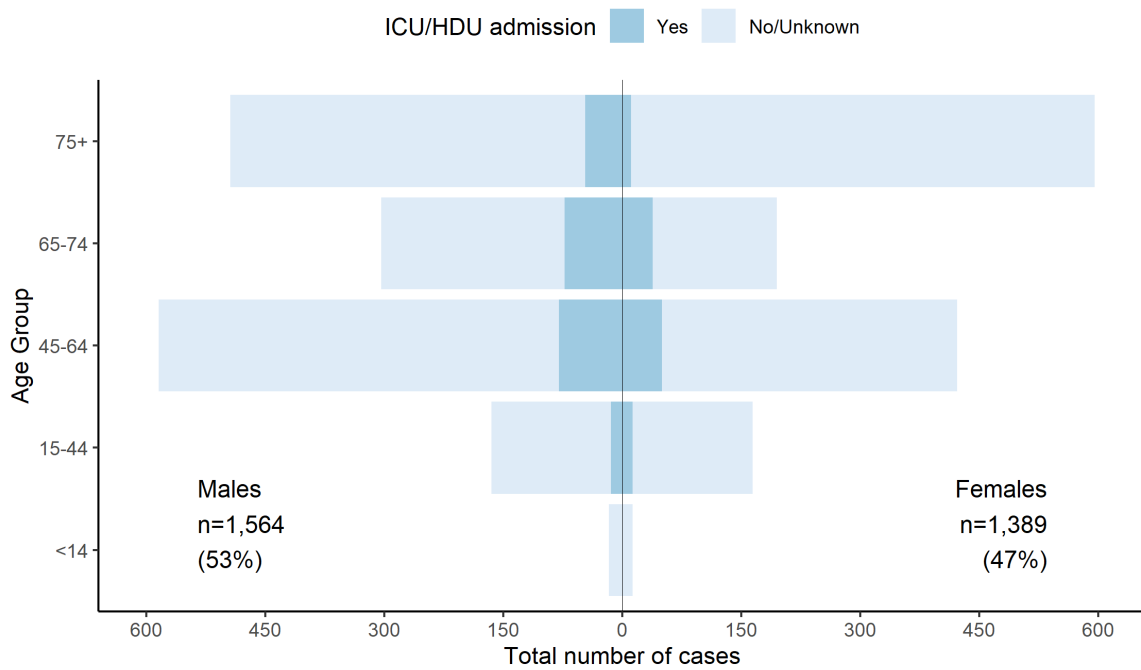


Figure 21: France I-REIVAC (FR-R)

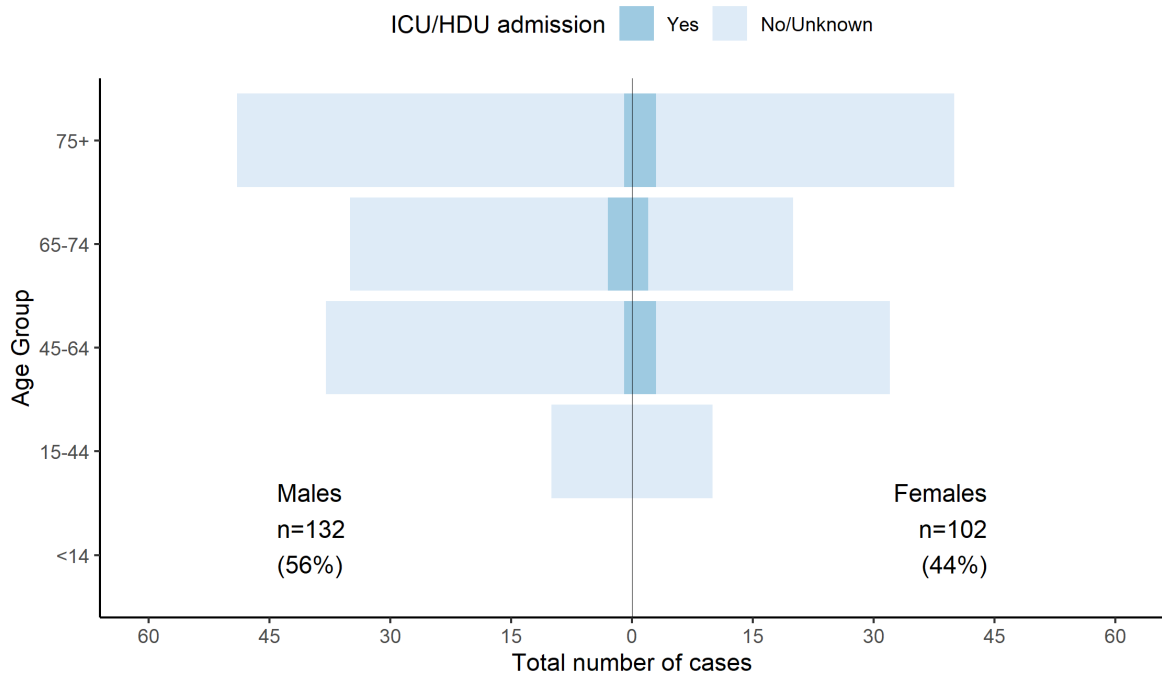


Figure 22: Albania (AL)

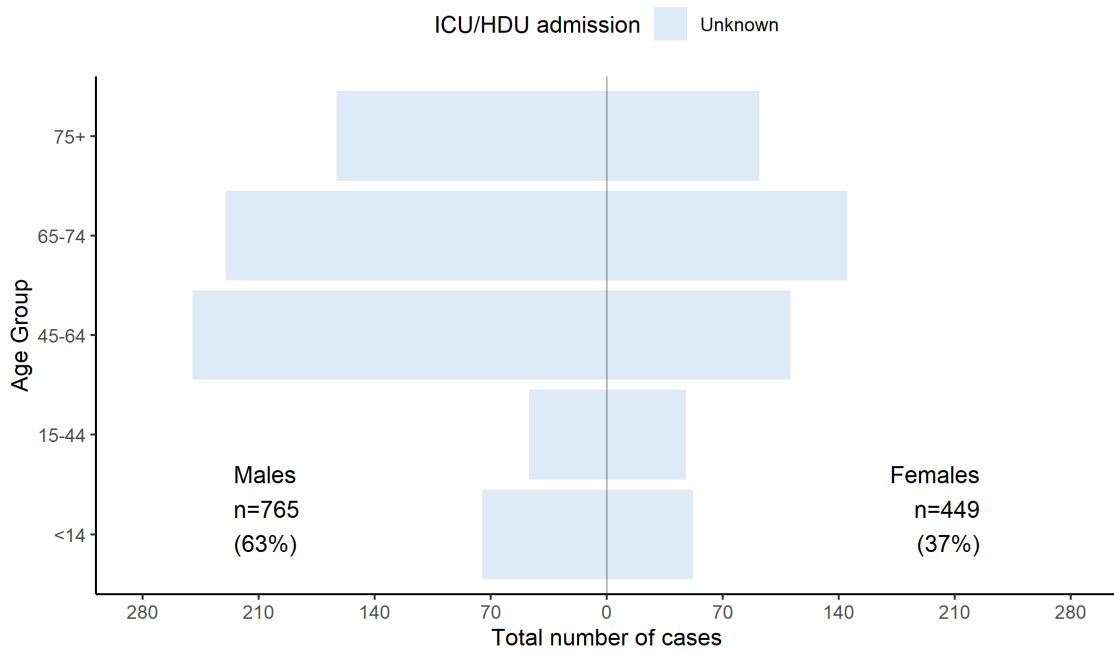


Figure 23: Lithuania (LT)

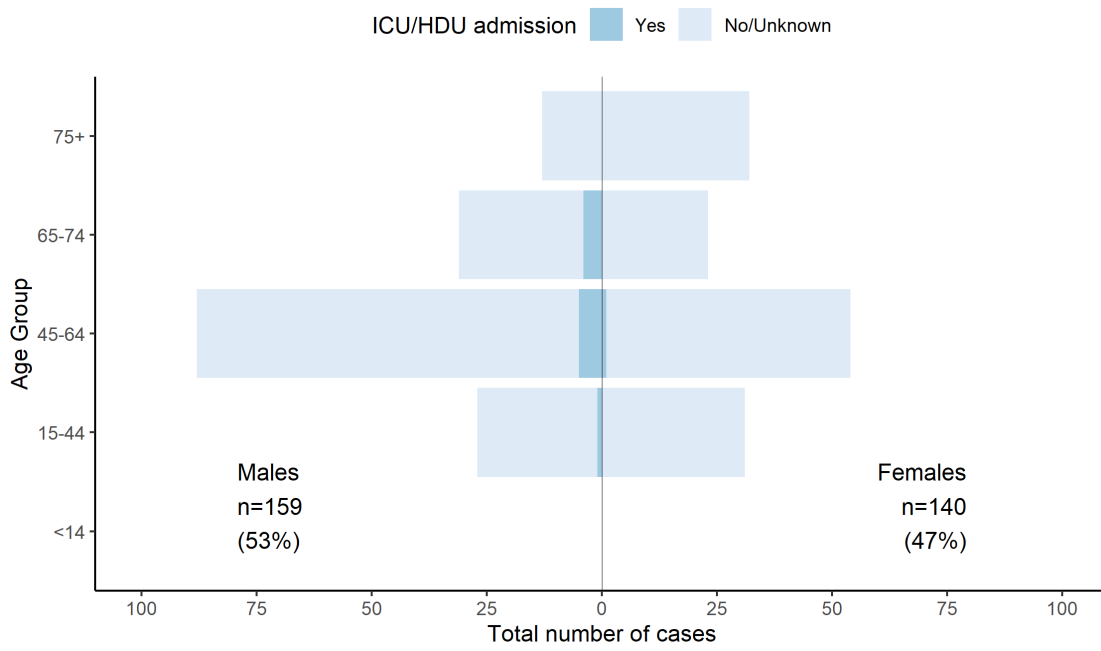
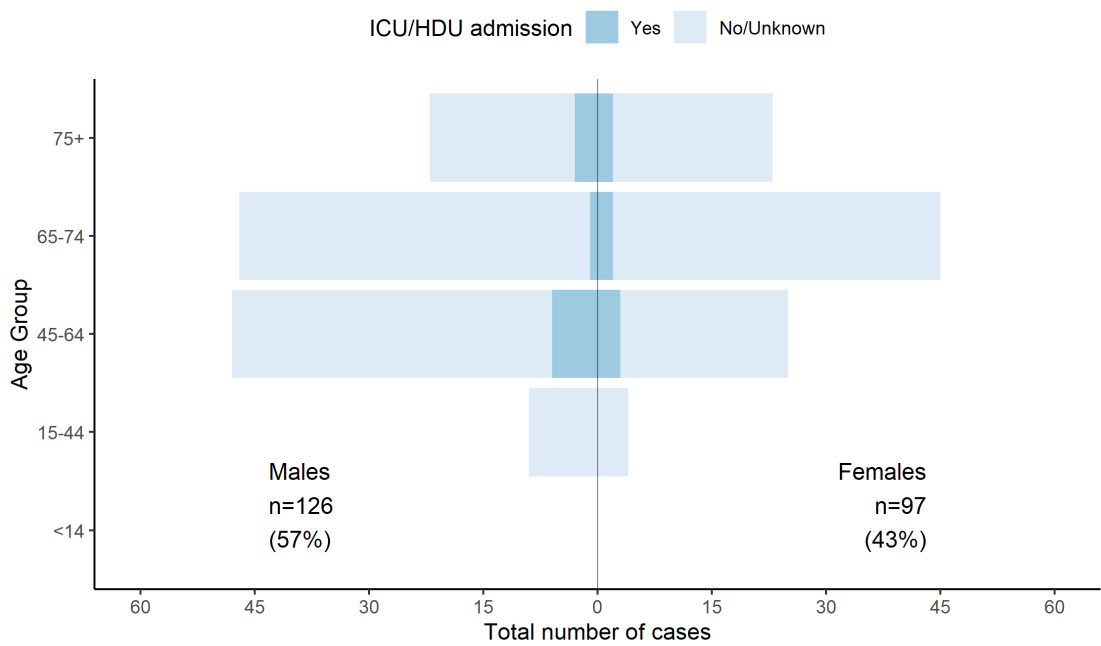


Figure 24: Romania (RO)



Section Two – Clinical Characteristics

Methodology

- **Cases included**

For this part of the bulletin, the analysis is limited to confirmed cases where key variables (age, sex and date of admission) were not missing.

- **Selection of EN cases**

Cases were selected as described in Section One; although limited to the dataset described above (ie confirmed cases where key variables were not missing). The same five hospitals are selected as in Section One.

- **Selection of SC cases**

The Scottish dataset is created through linkage of national-level, complete data registries and appending a smaller, enhanced COVID-19 surveillance dataset for a smaller proportion of cases (N=4,695; 20% of the entire Scottish dataset). The enhanced surveillance dataset was created for research purposes and includes granular data on patient characteristics, symptoms and treatments. These variables are only available for cases in the enhanced surveillance dataset. Therefore, for this analysis, all cases with enhanced surveillance data were selected; cases not in this dataset were dropped to avoid high levels of missing data.

- **Selection of second wave cases**

Second wave cases were selected following the same methodology described in Section One.

- **Final selection included for analysis**

The final selection comprised 11,563 confirmed cases. Table 3 describes the contribution of the data by site.

Table 3 European countries participating in I-MOVE-COVID-19 (WP3) hospital surveillance, second wave (07 May 2020–31 March 2021) and their respective contribution to this report

Country	Region	Participating hospitals	Number of cases (%)	Admission of first reported case		Admission of last reported case	
				Date	Week	Date	Week
Albania (AL)	-	Two hospitals	1,211 (10)	06 Jun 2020	23	28 Feb 2021	8
Belgium (BE)	-	One hospital	562 (5)	04 Aug 2020	32	29 Mar 2021	13
England (EN)	Nationwide	Five hospitals, randomly selected	3,372 (29)	03 Sep 2020	36	31 Mar 2021	13
France (FR)	Two site:						
	FR-R (REIVAC)	Five hospitals	222 (2)	01 Jan 2021	1	31 Mar 2021	13
	FR-V (ViVI)	Two hospitals	18 (0.2)	07 May 2020	19	22 Oct 2020	43
Lithuania (LT)	-	Two hospitals	296 (2)	13 Jul 2020	29	30 Mar 2021	13
Portugal (PT)	-	Three hospitals, all wards	178 (2)	13 Oct 2020	42	26 Mar 2021	12
Romania (RO)	-	Two hospitals, all wards	163 (1)	15 Jul 2020	29	31 Mar 2021	13
Scotland (SC)	Nationwide	All hospitals participating in enhanced surveillance (N=4695)	1,893 (16)	28 Jul 2020	31	31 Mar 2021	13
Spain	Two sites:						
	ES	Two hospitals	695 (6)	01 Jun 2020	23	31 Mar 2021	13
	NA	Navarra region: six hospitals	2,953 (26)	21 Jul 2020	30	31 Mar 2021	13
Total			11,563	07 May 2020	19	31 Mar 2021	13

Chronic conditions

Table 4 shows the number of cases in the second wave of the pandemic, by underlying chronic condition. Sites collect information on chronic conditions with varying degrees of data completeness and this is reflected in the results. The top five chronic conditions reported were hypertension, obesity, heart disease, diabetes and lung disease.

Table 4 Number (%) confirmed COVID-19 patients with underlying chronic conditions

	Number (%) of cases with information available	Number (%) of cases with chronic condition
Hypertension	9,684 (83.7)	4,025 (41.6)
Obese	7,675 (66.4)	2,241 (29.2)
Heart disease	10,196 (88.2)	2,742 (26.9)
Diabetes	9,989 (86.4)	2,285 (22.9)
Lung disease	8,335 (72.1)	1,198 (14.4)
Renal disease	9,916 (85.8)	1,248 (12.6)
Cancer	6,554 (56.7)	727 (11.1)
Asthma	9,730 (84.1)	1,038 (10.7)
Neuromuscular disorder	6,919 (59.8)	539 (7.8)
Rheumatic illness	6,546 (56.6)	500 (7.6)
Stroke	4,897 (42.4)	308 (6.3)
Dementia	6,534 (56.5)	391 (6.0)
Anaemia	4,893 (42.3)	203 (4.1)
Liver disease	9,902 (85.6)	328 (3.3)
Immunodeficient/organ transplant	6,517 (56.4)	94 (1.4)
Tuberculosis	3,340 (28.9)	23 (0.7)
Asplenia	2,645 (22.9)	4 (0.2)

Table 5 shows the number of cases (%) who had no; one; and two or more chronic conditions by hospital admissions, ICU/HDU admissions and death.

Table 5: Number (%) COVID-19 hospitalisations, ICU admissions and deaths amongst patients with no; one; and two or more underlying health conditions

	Number (%) All Admissions	Number (%) ICU/HDU Admissions	Number (%) Deaths
No underlying conditions	899 (10)	88 (8)	30 (2)
One underlying condition	2745 (32)	281 (27)	353 (22)
Two or more underlying conditions	5,072 (58)	684 (65)	1,230 (76)

Symptoms

Table 6 describes cases by their symptoms at or before presentation. Sites routinely collect information on symptoms with the exception of England, with varying degrees of data completeness.

Table 6 Clinical characteristics of patients hospitalised with confirmed COVID-19

	Total number (%) with information available (N=11,563)	Number (%) of cases with symptom
Symptom groups¹⁰		
Respiratory	4,803 (41.5)	4,658 (97.0)
Febrile illness	2,865 (24.8)	2,496 (87.1)
Neurological	2,799 (24.2)	1,874 (67.0)
Gastrointestinal	3,342 (28.9)	1,624 (48.6)
Other	3,886 (33.6)	3,589 (92.4)
Symptoms		
Shortness of breath	5,043 (43.6)	3,593 (71.2)
Cough	4,818 (41.7)	3,298 (68.5)
General deterioration	3,461 (29.9)	2,252 (65.1)
Fever	3,323 (28.7)	1,850 (55.7)
Malaise	3,928 (34.0)	1,883 (47.9)
Feverishness	2,678 (23.2)	1,221 (45.6)
Tachypnoea	2,034 (17.6)	824 (40.5)
Myalgia	4,270 (36.9)	1,259 (29.5)
Headache	4,223 (36.5)	1,043 (24.7)
Diarrhoea	4,300 (37.2)	1,029 (23.9)
Chills	1,622 (14.0)	323 (19.9)
Chest pain	3,270 (28.3)	632 (19.3)
Confusion	3,161 (27.3)	526 (16.6)
Vomit	4,125 (35.7)	563 (13.6)
Dizziness	1,630 (14.1)	212 (13.0)
Nausea	2,571 (22.2)	326 (12.7)
Coryza	1,746 (15.1)	221 (12.7)
Ageusia	3,719 (32.2)	462 (12.4)
Anosmia	3,746 (32.4)	452 (12.1)
Abdominal pain	4,129 (35.7)	374 (9.1)
Palpitations	1,688 (14.6)	123 (7.3)
Sore throat	3,723 (32.2)	265 (7.1)
Rash/other dermatological manifestation	2,782 (24.1)	49 (1.8)
Conjunctivitis	2,832 (24.5)	25 (0.9)

¹⁰ **Respiratory** (coryza, cough, sore throat, shortness of breath, tachypnoea, chest pain); **Neurological** (ageusia, anosmia, confusion, dizziness, headache); **Gastrointestinal** (abdominal pain, diarrhoea, nausea, vomiting); **Febrile illness** (Fever, feverishness, chills); **Other** (any other symptom listed).

Section Three - Patient Outcomes

Methodology

- **Cases included**

For this part of the bulletin, the analysis is also limited to confirmed cases where key variables (age, sex and date of admission) were not missing.

- **Selection of EN cases**

Cases were selected as described in Section One; although limited to the dataset described above (i.e. confirmed cases where key variables were not missing). The same five hospitals were selected as in Section One.

- **Selection of SC cases**

For Figures 25 and Table 7, cases were selected as described in Section One; although limited to the dataset described above (i.e. confirmed cases where key variables were not missing).

For Tables 8 and 9, cases were selected as described in Section Two; this is because many of the patient characteristics and outcomes variables presented are only available for cases that are included the enhanced surveillance dataset.

- **Selection of first/second wave cases**

Cases belonging to the first and second waves were ascertained using the site-specific definitions of first and second wave weeks described in Section One.

- **Final selection included for analysis**

The final selection for Figures 25 and Table 10 comprised 20,661 confirmed cases for both the first and second waves. Table 7 describes the contribution of the data by site for each wave.

Table 7 European countries participating in I-MOVE-COVID-19 (WP3) hospital surveillance, first and second waves (01 February 2020–31 March 2021) and their respective contribution to this report

Country	Region	Participating hospitals	Number of cases in first wave (%)	Number of cases in second wave (%)	Admission of first reported case: first wave		Admission of first reported case: second wave		Admission of last reported case	
					Date	Week	Date	Week	Date	Week
Albania (AL)	-	Two hospitals	94 (1)	1,211 (9)	20 Feb 2020	8	06 Jun 2020	23	28 Feb 2021	8
Belgium (BE)	-	One hospital	426 (6)	562 (4)	21 Feb 2020	8	04 Aug 2020	32	29 Mar 2021	13
England (EN)	Nationwide	Five hospitals, randomly selected	2,054 (27)	3,372 (26)	15 Mar 2020	11	03 Sept 2020	36	31 Mar 2021	13
France (FR)	Two site:									
	FR-R (REIVAC)	Five hospitals	1,049 (14)	222 (2)	01 Feb 2020	5	05 Jan 2021	1	31 Mar 2021	13
	FR-V (ViVI)	Two hospitals	0 (0)	18 (0)	-	-	10 May 2020	19	22 Oct 2020	43
Lithuania (LT)	-	Two hospitals	4 (0)	296 (2)	26 Jun 2020	26	13 Jul 2020	29	30 Mar 2021	13
Portugal (PT)	-	Three hospitals, all wards	474 (6)	178 (1)	13 Feb 2020	7	13 Oct 2020	42	26 Mar 2021	12
Romania (RO)	-	Two hospitals, all wards	161 (2)	163 (1)	10 Mar 2020	11	15 Jul 2020	29	31 Mar 2021	13
Scotland (SC)	Nationwide	All hospitals	1,135 (15)	3,484 (26)	03 Mar 2020	10	28 Jul 2020	31	31 Mar 2021	13

Spain	Two sites:									
	ES	Two hospitals	205 (3)	695 (5)	16 Mar 2020	12	08 Jun 2020	24	31 Mar 2021	13
	NA	Navarra region: six hospitals	1,905 (25)	2,953 (22)	06 Feb 2020	06	21 Jul 2020	30	31 Mar 2021	13
Total			7,507	13,154	01 Feb 2020	5	10 May 2020	19	31 Mar 2021	13

Length of stay, ICU admission and deaths

- Over all sites, the median **length of stay** in hospital was **10 days**, range 1–281 (n=14,861).
- Over all sites, **13%** cases required ICU/HDU admission.
- Over all sites, **21%** cases **died in hospital**.

Figure 25 shows patient outcome by sex. Note that all patients are included in the figure, even if outcome is yet to be determined (as may be the situation, for example, for more recent admissions).

Figure 25 Patient outcome by sex (N=20,661)

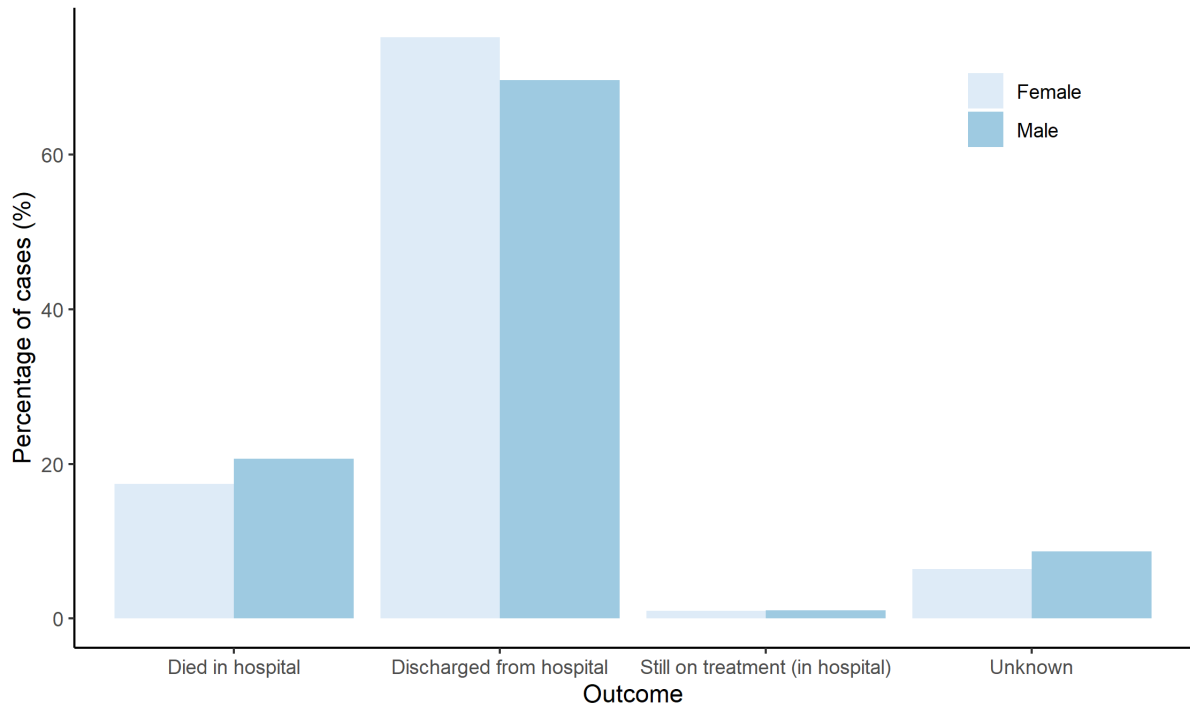


Table 8 describes patient outcomes (ICU/HDU admissions; deaths) by a range of potential risk/protective factors.

Table 8 Patient outcome by potential protective/risk factors (all sites)

Exposures (risk/protective factors)	Total cases		ICU/HDU admission		Deaths	
	N	%	N	%	N	%
All cases¹¹	11,563	-	1,239	12.2	1,818	17.7
Missing data	-	-	1,412	12.2	1,312	11.3
Age groups						
0–14	287	2.5	<10	<1.0	<10	<1.0
15–44	1,238	10.7	105	8.5	16	<1.0
45–64	3,474	30.0	540	43.6	197	10.8
65–74	2,302	19.9	357	28.8	324	17.8
≥ 75	4,262	36.9	233	18.8	1,279	70.4
Sex						
Female	5,305	45.9	410	33.1	776	42.7
Male	6,258	54.1	829	66.9	1,042	57.3
Healthcare worker						
Yes	218	2.3	32	2.9	12	<1.0
No	9,195	97.7	1,083	97.1	1,695	99.3
Missing data	2,150	18.6	2,321	-	2,236	-
Smoker						
Yes	1,143	34.6	165	41.7	158	36.5
No	2,157	65.4	231	58.3	275	63.5
Missing data	8,263	71.5	8,289	-	8,278	-
Pregnant (women only)						
Yes	88	2.5	<10	-	-	-
No	3,503	97.5	265	98.5	580	100
Missing data	1,714	32.3	1,809	-	1,742	-
Close contact setting¹²						
Yes	2,776	90.1	313	85.1	438	92.2
No	305	9.9	55	14.9	37	7.8
Missing data	8,482	73.4	8,514	-	8,510	-
Days between onset and hospitalisation						
0–4	3,360	38.4	379	32.5	781	50.0
5–9	3,288	37.6	537	46.0	469	30.0
10+	1,677	19.2	210	18.0	175	11.2
Onset in hospital	427	4.9	41	3.5	136	8.7
Missing data	2,811	24.3	2,930	-	2,903	-

¹¹ Only data for the confirmed cases where age, sex and date of admission are not missing

¹² If the patient is a contact of a COVID-19 case

Table 9 describes patient requirement for ventilation for a range of risk/protective factors, for all sites

Table 9 Level of mechanical ventilation required by risk/protective group (all sites)

Exposures (risk/protective factors)	Total	Any ventilation	Ventilator (non-invasive)	Ventilator (invasive)	High flow oxygen	ECMO	Other
	N(%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
All cases¹³	11,563	2,810 (42.5)	324 (4.9)	314 (4.7)	785 (11.6)	17 <(1.0)	1,387 (21.5)
Missing ventilation data	-	4,950 (42.8)	4,926 (42.6)	4,929 (42.6)	4,797 (41.5)	4,928 (42.6)	5,122 (44.3)
Age groups							
0–44	1,525 (13.2)	241 (8.6)	29 (9.0)	25 (8.0)	81 (10.3)	<10 (-)	106 (7.6)
45–64	3,474 (30.0)	893 (31.8)	129 (39.8)	149 (47.5)	263 (33.5)	<10 (-)	348 (25.1)
65–74	2,302 (19.9)	603 (21.5)	91 (28.1)	97 (30.9)	146 (18.6)	<10 (-)	274 (19.8)
75+	4,262 (36.9)	1,073 (38.2)	75 (23.1)	43 (13.7)	295 (37.6)	<10 (-)	659 (47.5)
Female	5,305 (45.9)	1,174 (41.8)	110 (34.0)	95 (30.3)	313 (39.9)	<10 (-)	657 (47.4)
Male	6,258 (54.1)	1,636 (58.2)	214 (66.0)	219 (69.7)	472 (60.1)	15 (88.2)	730 (52.6)
Healthcare worker							
Yes	218 (2.3)	41 (1.6)	<10 (2.4)	<10 (2.2)	17 (2.5)	<10 (-)	10 (-)
No	9,195 (97.7)	2,568 (98.4)	290 (97.6)	267 (97.8)	653 (97.5)	14 (93.3)	1,361 (99.3)
Smoker							
Yes	1,143 (34.6)	181 (37.2)	14 (51.9)	42 (57.5)	126 (33.6)	<10 (-)	<10 (-)
No	2,157 (65.4)	306 (62.8)	13 (48.1)	31 (42.5)	249 (66.4)	<10 (-)	15 (88.2)
Pregnant (women only)							
Yes	88 (2.5)	<10 (-)	<10 (-)	- (-)	<10 (-)	- (-)	<10 (-)
No	3,503 (97.5)	888 (99.3)	53 (98.1)	51 (100)	145 (98.6)	<10 (-)	640 (99.5)
Close contact setting¹⁴							
Yes	2,776 (90.1)	350 (79.7)	19 (70.4)	57 (78.1)	266 (81.1)	13 (92.9)	<10 (-)
No	305 (9.9)	89 (20.3)	<10 (-)	16 (21.9)	62 (18.9)	<10 (-)	<10 (-)
Days between onset hospitalisation							
0–4	3,360 (38.4)	1,012 (39.0)	117 (38.9)	110 (36.7)	273 (36.1)	<10 (40.0)	513 (41.5)
5–9	3,288 (37.6)	997 (38.5)	129 (42.9)	127 (42.3)	330 (43.6)	<10 (40.0)	412 (33.4)
10+	1,677 (19.2)	468 (18.1)	50 (16.6)	54 (18.0)	134 (17.7)	<10 (13.3)	230 (18.6)
Onset in hospital	427 (4.9)	115 (4.4)	<10 (1.7)	<10 (3.0)	20 (2.6)	<10 (6.7)	80 (6.5)

¹³ Only data for the confirmed cases where age, sex and date of admission are not missing

¹⁴ If the patient is a close contact of a COVID-19 case

Comparison of patient outcome in first vs second epidemic waves

Table 10 compares the percentage of ICU admissions and deaths amongst patient groups in the first versus the second wave, using a Chi-squared test of proportions to test for significance. As a percentage of all hospital admissions, ICU/HDU admissions dropped significantly overall, in both sexes, and across all age groups except the <15- and ≥75-year-olds. Deaths dropped significantly overall, in both sexes, and in age groups ≥45 years.

Table 10 First and second wave of the COVID-19 by hospital admissions, ICU/HDU admissions and deaths

	First wave			Second wave			P value (Chi-squared test of proportions, 1 st wave v. 2 nd wave)	
	Hospital admissions (N)	ICU/HDU (n/%)	Death (n/%)	Hospital admissions (N)	ICU/HDU (n/%)	Death (n/%)	ICU/HDU admissions	Deaths
OVERALL								
All cases¹⁵	7,221	1,092 (15)	1,758 (23)	9,619	1,086 (11)	1,913 (20)	<0.00001	<0.00001
SEX								
Male	3,856	741 (19)	1,044 (27)	5,070	716 (14)	1,085 (21)	<0.00001	<0.00001
Female	3,365	777 (10)	1,071 (21)	4,549	370 (8)	828 (18)	<0.00001	<0.00001
AGE GROUP								
0-14	45	<10 (-)	0 (0)	123	<10 (-)	<10 (-)	0.022378	0.971507
15-44	667	90 (13)	21 (3)	1,088	100 (9)	17 (2)	0.013843	0.166424
45-64	1,850	419 (23)	186 (10)	2,806	479 (17)	214 (8)	0.000038	<0.00001
65-74	1,348	332 (25)	297 (22)	1,740	307 (18)	336 (19)	<0.00001	0.029814
75+	3,311	246 (7)	1,254 (38)	3,862	196 (5)	1,343 (35)	0.104719	<0.00001

¹⁵ Only data for the confirmed cases where age, sex, ICU(status) and outcome are not missing

Strengths and limitations of I-MOVE-COVID19 hospital surveillance

The I-MOVE-COVID-19 hospital surveillance network complements and enhances national-level COVID-19 surveillance by the pooling of data from multiple surveillance sites across Europe. As sites follow the same protocol, this provides a relatively homogenous dataset of greater sample size, which in turn allows for more in-depth investigation of the data (e.g. by stratification into smaller sub-groups), facilitating epidemiological insights at a European regional level. Participation in the surveillance system also allows sites to share their experience with other European colleagues in the network, providing a wider context for their national data. Importantly, for some sites, network participation has led to improvements in national level data collection systems and practice, e.g. through data linkage or digitalisation of hospital data. Network members also report a positive effect of the regular surveillance bulletin meetings, which provide feedback on the data collected and the opportunity for discussion with other network members.

Nonetheless, the surveillance has a number of limitations. The definition of a confirmed case potentially includes patients who were hospitalised during the surveillance period for reasons other than COVID-19, but who were incidentally swab positive for SARS-CoV2 shortly prior to, during or after admission. This may bias the results e.g. in favour of less severe outcomes.

Intra- and inter-country/site reporting practice and completeness of data may vary over time, which means that comparisons both within and between sites should be interpreted with caution. The timeframe during which data were submitted by participating sites reflect the logistical constraints faced by those sites. This do not necessarily reflect how the epidemic progressed in those countries over time. In addition, containment, case management and mitigation strategies for the COVID-19 pandemic have differed between country, and within countries over time. For this reason, alongside the collection of dates of onset/admission/respiratory specimen collection, case-containment/mitigation strategies (including roll out of vaccine programmes) and dates of any changes should be considered for each country when interpreting the graphs.

Data for patient outcome have not been censored. This may introduce bias into the report findings by including recently hospitalised patients for whom outcome is not yet determined.

The selection of Scottish data in Sections Two and Three comes from an enhanced surveillance dataset set up for research purposes, which is only available for a small proportion (20%) of all patients hospitalised with COVID-19 in Scotland. These data have been shown to be biased towards older ages status and more severe outcomes (higher % ICU/HDU admissions and deaths) when compared to overall COVID-19 admissions in Scotland. Therefore, the clinical characteristics and patient outcomes may not be representative of all hospitalised Scottish patients, potentially introducing bias into the pooled sample.

Annexes

1.1. Annex A. The I-MOVE-COVID-19 project

1.1.1. Background

The I-MOVE (Influenza – Monitoring Vaccine Effectiveness in Europe) project was initiated in 2007 and was the first network to monitor influenza vaccine effectiveness (VE) within Europe. The network has two components: one for primary care practices, recruiting patients with influenza-like illness (ILI) and the other for hospitals, recruiting patients with severe acute respiratory illness (SARI).

The emergence of a novel coronavirus – (SARS-CoV-2) – occurred at the end of 2019, causing a new coronavirus disease, COVID-19. As of the 22nd June 2021 (the time of writing), there had been 179,661,027 confirmed cases of COVID-19 globally, including 3,890,926 deaths, reported to the World Health Organization.¹⁶

In February 2020, partners already involved in studies within the I-MOVE network came together as the I-MOVE-COVID-19 consortium and successfully bid for the European Commission H2020 call on “Advancing knowledge for the clinical and public health response to the novel coronavirus epidemic”. The expanded network includes primary care networks, hospitals, and national laboratory reference centres in 13 countries across the WHO European Region.¹⁷

The I-MOVE-COVID-19 consortium aims to obtain epidemiological and clinical information on patients with COVID-19 as well as virological information on SARS-CoV-2, and provide the following through different work packages (WPs): (a) provision of a flexible surveillance platform, adaptable to the epidemiological situation, through WP2 (primary care surveillance) and WP3 (hospital surveillance), (b) research studies, through WP4 and (c) evaluation of public health interventions (e.g. vaccination, antivirals) in WP2–4, in order to contribute to the knowledge base, guide patient management, and inform the public health response.

The WP3 hospital surveillance for COVID-19 is coordinated by Public Health Scotland (PHS) with Epiconcept support. The hospital network comprises 11 surveillance sites involving hospitals in six EU Member States,¹⁸ England, Scotland, and Albania (with two of the EU member state countries having two sites each). While each of the surveillance sites can analyse their data separately, pooling the data for overall analysis provides a sample size big enough to depict trends and generate hypotheses (surveillance) and answer study questions with reasonable precision (research).

This document presents the fourth surveillance bulletin for the hospital-based surveillance component of I-MOVE-COVID-19 for 2020. The specifics of each site’s COVID-19 data collection are detailed in the individual site protocol annexes.

¹⁶ Source: World Health Organization (WHO) Situation Report dashboard. Available at: <https://covid19.who.int/>. Accessed 22 June 2021.

¹⁷ Albania, Belgium, Croatia, France, Germany, Ireland, Lithuania, the Netherlands, Portugal, Romania, Spain, Sweden and the UK (England and Scotland).

¹⁸ Belgium, France, Lithuania, Portugal, Romania, and Spain

1.1.2. Objectives of the I-MOVE-COVID-19 WP3 Surveillance

Primary objectives

The main objective of the I-MOVE-COVID19 WP3 project is to describe, for nine European countries, clinical and epidemiological characteristics of patients hospitalised with COVID-19 and virological characteristics of SARS-CoV-2 in hospitalised patients, in order to contribute to the knowledge base, guide patient management, and inform the public health response.

Secondary objectives

Potential secondary objectives include:

- To strengthen preparedness to respond to COVID-19 through hospital surveillance.
- To describe COVID-19 suspected, probable and confirmed cases with severe disease by sex, age-group, and other potential risk or protective factors.
- To describe deaths from COVID-19 in hospital by country and pooled across the network.
- To measure the incidence of hospitalised COVID-19 patients, by participating region/country (where appropriate) in order to measure the impact of/inform decisions on mitigation measures, and to identify at-risk groups for severe disease.

1.2. Annex B. Methods

1.2.1. Active hospital-based surveillance of COVID-19 at European level

Type of surveillance

- Multi-centre population-based surveillance over several countries/regions

Population under surveillance

- The surveillance population consists of the entire population living in the catchment areas of the participating hospitals.

1.2.2. Surveillance and study period

The surveillance period started in February 2020. Participating hospitals carry out surveillance throughout the year. This fourth surveillance bulletin is for the period from 07 May 2020 to 31 March 2021.

1.2.3. Outcomes

The two primary outcomes of interest are laboratory-confirmed COVID-19 in patients hospitalised with suspected COVID-19, and severe COVID-19 in patients hospitalised with suspected COVID-19.

The secondary outcomes of interest are:

- Suspected COVID-19 cases
- Probable COVID-19 cases

1.3. Annex C. Case definitions

Hospitalised patient

A hospitalised patient is defined as a patient who has been admitted to one of the participating hospitals during the surveillance period, and has not been discharged home or home-equivalent before 24h.

Suspected COVID-19 patient

A suspected COVID-19 patient is defined as a hospitalised person with:

- at least one systemic symptom or sign: fever or feverishness, malaise, headache or myalgia or deterioration of general condition (asthenia or loss of weight or anorexia or confusion or dizziness)

AND

- at least one respiratory symptom or sign (cough, sore throat or shortness of breath; or tachypnoea or signs of low oxygen saturation)

at admission or within 48 hours after admission.

All patients fulfilling the above criteria, until they are re-classified as COVID-19 negative, probable or confirmed (see below), are considered as suspected COVID-19 patients.

Confirmed case of COVID-19 (confirmed case)

A confirmed COVID-19 is defined as a patient hospitalised during the surveillance period with a respiratory sample positive for SARS-CoV-2.

Probable case of COVID-19 (probable case)

A probable COVID-19 case will be defined as a patient hospitalised with suspected COVID-19 during the surveillance period for whom

- testing for virus causing COVID-19 is inconclusive (according to the test results reported by the laboratory)

OR

- testing was positive on a pan-coronavirus assay

OR

- no laboratory tests are available but there is clinical confirmation with suggestive radiology

Severe COVID-19 case

For the purposes of surveillance, all patients hospitalised due to confirmed COVID-19 disease are severe COVID-19 cases. However, these hospitalised patients will be further classified as “severe hospitalised COVID-19 patients” if they have any of the following clinically, analytically or radiologically significant alterations/outcomes mentioned in the admission or discharge diagnosis:

- Bilateral pneumonia with ground-glass opacities
- Admitted to ICU/HDU
- On ventilation
 - Invasive (i.e. with intubation)
 - non-invasive (e.g. high-flow oxygen; or those needing >6L)
- Extracorporeal membrane oxygenation (ECMO)
- Death

COVID-19 death

A COVID-19 death is defined as a confirmed COVID-19 case who died during hospitalisation.

1.3.1. Exclusion criteria for surveillance

All COVID-19 patients will be included in the surveillance unless the surveillance site/country requires consent and the patient:

- is unwilling to participate or unable to communicate and give consent (the consent may also be given by her/his legal representative, or by specific consent procedures, acceptable according to the local ethical review process)

Note: in some countries, individual patient consent is not required for routine surveillance.