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I-MOVE-COVID-19 Network

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

COVID-19 European hospital surveillance: Second bulletin

19 JANUARY 2021

I-MOVE-COVID-19 Network

WP3 coordinated by Public Health Scotland

Based on: current literature, I-MOVE-COVID-19 hospital surveillance protocol, v08.1

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Abbreviations

COVID-19	Coronavirus disease 2019
EEA	European Economic Area
ECDC	European Centre for Disease Prevention and Control
EU	European Union
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
MS	Member States
OR	Odds ratio
SARI	Severe acute respiratory infection
SARS-CoV-2	Severe acute respiratory syndrome – coronavirus 2
VE	Vaccine effectiveness

Summary

This surveillance report summarises the information from the I-MOVE-COVID-19 hospital surveillance network to monitor the COVID-19 pandemic in nine European countries. The I-MOVE-COVID-19 hospital surveillance aims to reinforce and complement the COVID-19 epidemiological data in the EU/EEA and the UK, compiled and reported by ECDC. Throughout this surveillance bulletin, persons who were hospitalised with confirmed, probable or suspected SARS-CoV-2 virus infection are referred to as COVID-19 "cases" or "patients".

From February to September, surveillance data were provided by nine participating hospital surveillance sites in seven countries. In two sites/countries, COVID-19 hospital surveillance is underway and clearance for data transmission to the I-MOVE-COVID-19 consortium is expected.

Data for I-MOVE-COVID-19 hospital surveillance is collected following a generic protocol. However, there may be differences between countries in the data collected, due to differences in health care systems, hospital admission policy, or coding of data.

A total of 34,809 COVID-19 cases were reported by the nine participating sites with hospital admission during for the period 01 February to 30 September. The majority of cases (72%) were reported by England (which, like Scotland, submits data from most or all hospitals nationwide; other countries submit data from one to seven participating hospitals).

- The distribution of cases reflects the course of the pandemic, with most cases reported in March and April (weeks 12–16) 2020. The number of cases decreased during the summer and stayed low until a small increasing trend began in mid-July 2020 (at the start of week 30)
- More male than female COVID-19 cases were reported in all age-groups, except for the 15–44-year-old age-group, where the ratio of females to males was approximately 1
- Almost all (99%) COVID-19 cases from the six sites reporting symptoms had febrile illness or respiratory symptoms, 88% had neurological symptoms and 86% experienced gastrointestinal symptoms
- The most frequently reported symptom was cough (71%), followed by shortness of breath (66%) and fever (62%). Less frequently reported symptoms were diarrhoea (24%), ageusia (6%) and anosmia (4%)
- Median length of hospital stay was 9 days

- About one-quarter (27%) of COVID-19 cases required ICU/HDU admission; however, for sites excluding England, this was 12%.[1] Most ICU/HDU admissions (52%) were in the 45–64 years age-group
- Approximately one-third (34%) of COVID-19 patients died in hospital. This was 23% for all sites excluding England.[1] More men died in hospital than women ($p<0.0001$) and most deaths (51%) occurred in the ≥75 years age-group (69% in sites excluding England).
- Where this information was known, 6% of COVID-19 patients were healthcare workers and 4% of female patients were pregnant
    - for patients with known fatal outcome, 3% were healthcare workers and 2% of female fatalities were in patients who were pregnant
- Just over half (57%) of the COVID-19 patients, in sites reporting this information (all except England), had never smoked
- For all sites,[2] 62% of hospitalised COVID-19 patients were hospitalised within 4 days of symptom onset, 17% between 5 and 9 days, 12% >9 days and 9% had onset of symptoms while in hospital
    - for all sites excluding England, 38% of hospitalised COVID-19 patients were hospitalised within 4 days of symptom onset, 32% between 5 and 9 days, 24% >9 days and 6% had onset of symptoms while in hospital

[1]*Note:* ICU/HDU reporting is mandatory in England, so these units may be over-represented in England's dataset (and, as England is reporting on almost all hospitals nationwide, data from this country comprise 72% of all cases).

[2]This discrepancy can be explained as some hospitals in England are known to use proxy dates for onset (mainly substituting missing values of onset date with admission/swab date), hence skewing results to the 0–4 days category.

1. Participating sites and data submission

The I-MOVE WP3 hospital surveillance for COVID-19 is coordinated by Public Health Scotland (PHS) with Epiconcept support. The hospital network comprises 11 surveillance sites in nine countries: six EU Member States (Belgium, two sites in France, Lithuania, Portugal, Romania, and two sites in Spain), Albania, England and Scotland (see Fig. 1).

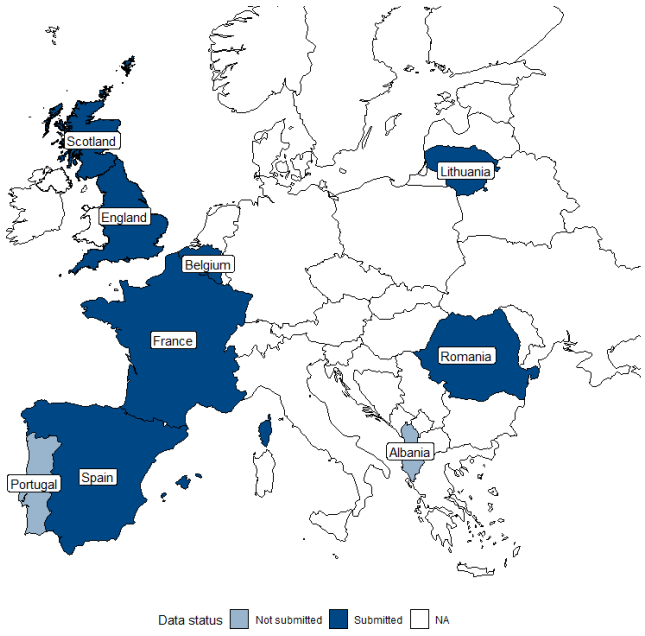
Table 1 describes participating sites and their contribution of data to this report. Note that the period for which data were submitted do not necessarily reflect the total duration of the epidemic in that country.

There were 42,324 records[3] received from eight participating sites (Fig. 1). After exclusions (n=4,059 patients[4]), there were 38,265 records eligible for inclusion. As this surveillance period included 01 February to 30 September 2020, a further 3,456 records were excluded (7 before 01 February and 3,449 after 30 September), for a total of 34,809 records.

The data presented in this report comprise confirmed (n=34,566) probable (n=143) and suspected cases[5] (n=100) received from participating sites with admission date from 01 February to 30 September, 2020.

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

Countries which were able to submit data for this report are coloured dark blue; those which are yet to submit data are coloured light blue. Note that ES and FR both have two separate sites in different areas/regions of the country.



[3]Excluding data from one site, which submitted <10 patients with hospital admission during this surveillance period.
[4]Exclusions: not COVID-19 (n=2,333), patients in England (by request) with admission before 15 March (n=1272) or missing laboratory results (n=358), patients missing admission date (n=44), other exclusions (n=30), patients with dates earlier than January 2020 or later than the date of analysis (n=10), duplicates (n=11) and erroneous age (1).
[5]See Annex C for case definitions.

Table 1: Countries participating in I-MOVE-COVID-19 WP3 hospital surveillance and their respective contribution to this bulletin, by week of hospital admission,* February–September 2020

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, all wards	-	-		-	
Belgium (BE)	-	One hospital, all wards	508 (1.5)	27 Feb 2020	9	30 Sep 2020	40
England (EN)	National	All hospitals, including mandatory reporting from ICUs/HDUs	24,995 (71.8)	15 Mar 2020	11	30 Sep 2020	40
France (FR)	Two sites:						
	FR-R (REIVAC)	Five hospitals, all wards	-	-		-	
	FR-V (ViVI)	Two hospitals, all wards	<10	07 May 2020	19	25 Sep 2020	39
Lithuania (LT)	-	Two hospitals	146 (0.4)	07 Mar 2020	10	30 Sep 2020	40
Portugal (PT)	-	Three hospitals, all wards	-		-	-	
Romania (RO)	-	Two hospitals, all wards	162 (0.5)	10 Mar 2020	10	13 Sep 2020	37
Scotland (SC)	National	All hospitals, all wards	6,461 (18.6)	01 Feb 2020	5	30 Sep 2020	40
Spain (ES)	Two sites:						
	NA	Navarra region: six hospitals, all wards	2,191 (6.3)	06 Feb 2020	6	18 Sep 2020	38
	ES	Two hospitals, all wards	346 (1.0)	16 Mar 2020	11	26 Sep 2020	39
All			**34,809**[†]	**01 Feb 2020**	**5**	**30 Sep 2020**	**40**

*Data were censored to remove cases with date of hospital admission prior to 01 February 2020 and post 30 September 2020 for data quality reasons.

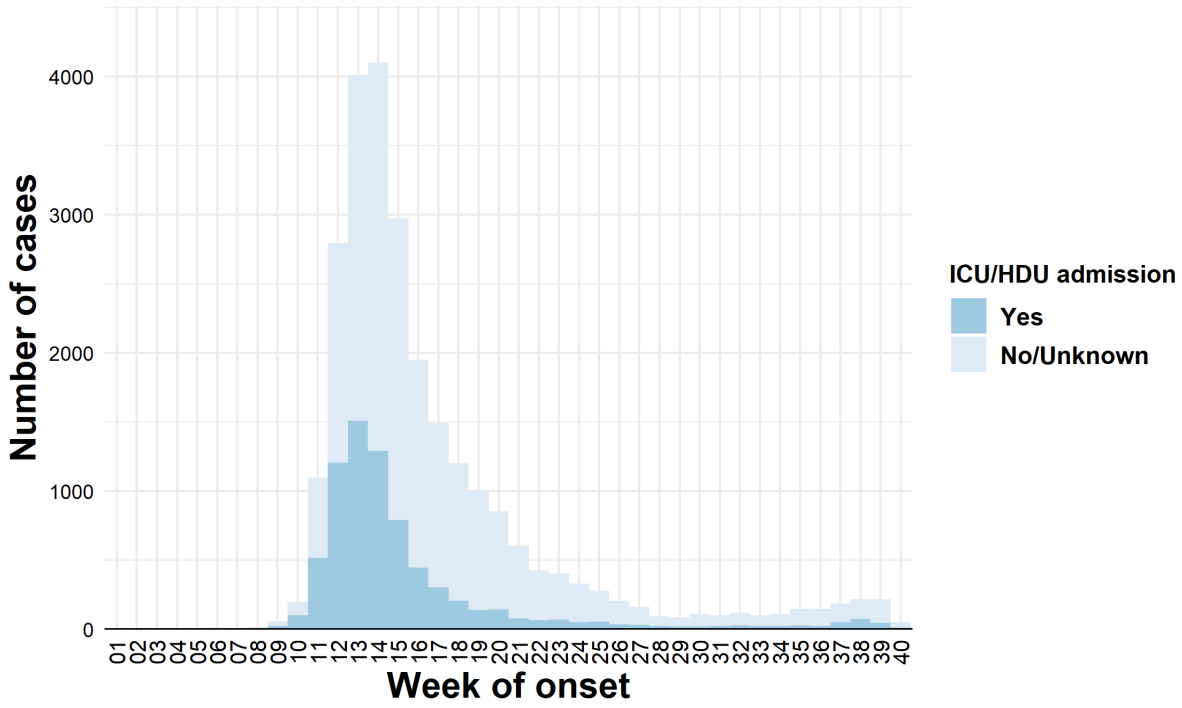
[†]Total does not include the FR-V site as this number was <10.

2. Cases over time

Figures 2 and 3 show the number of confirmed and probable cases reported overall by week of onset of symptoms and date of hospital admission, respectively, categorised by known ICU/HDU admission. Figures 4(a)–4(g) and 5(a)–5(g) present the same data by participating site. The y-axes differ between countries owing to the large difference in number of cases reported, and not all countries were able to submit data covering the entire surveillance period. Owing to the small number of cases, results are not presented for FR-V.

Figure 2: Number of confirmed, probable and suspected cases reported overall by week of onset of symptoms, showing ICU/HDU admission*

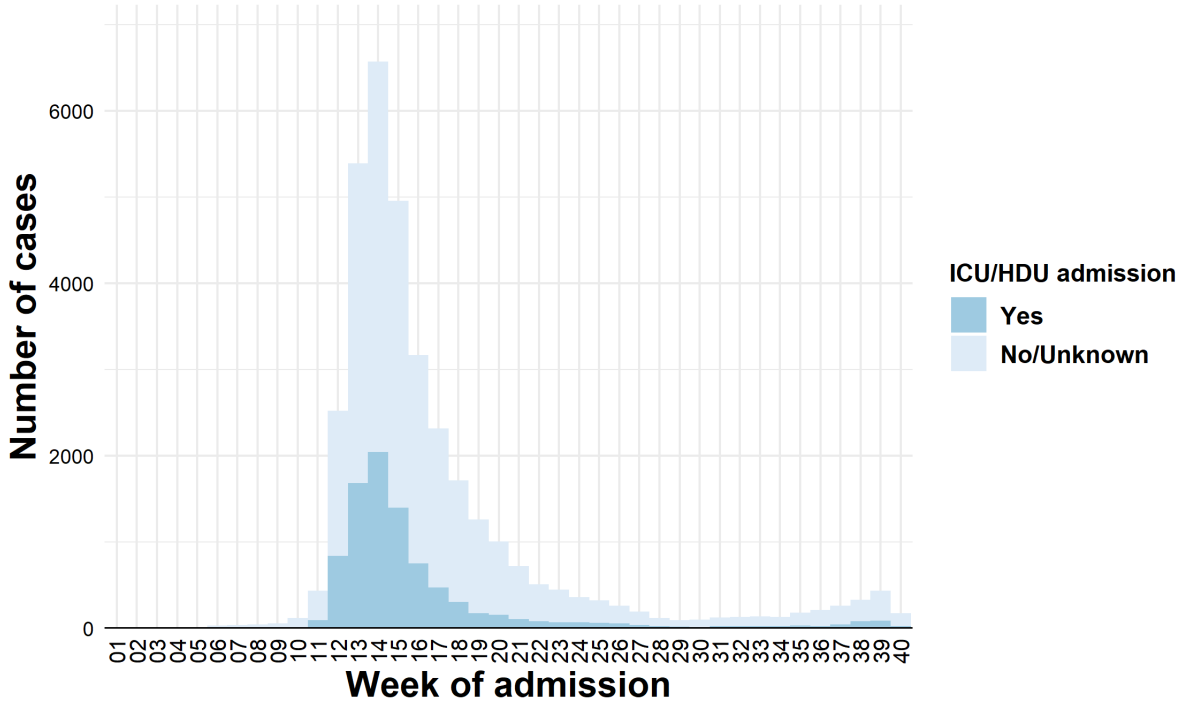
All sites (N=25,848*)



*Note: 8,961 records (26%) were missing date of onset. Fewer than 3% had unknown ICU/HDU admission.

Figure 3: Number of confirmed, probable and suspected cases reported overall by week of hospital admission, showing ICU/HDU admission*

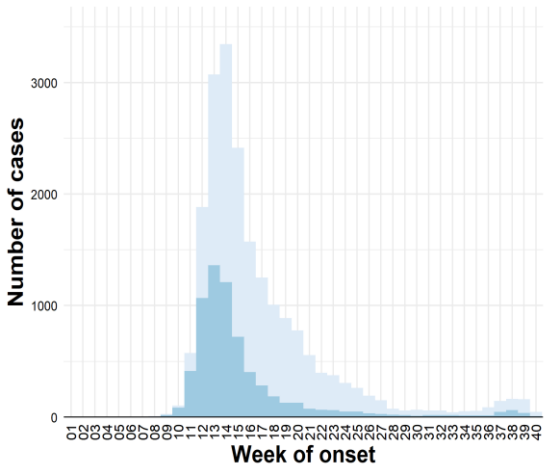
All sites (N=34,809*)



*All records had date of admission. Fewer than 3% had unknown ICU/HDU admission.

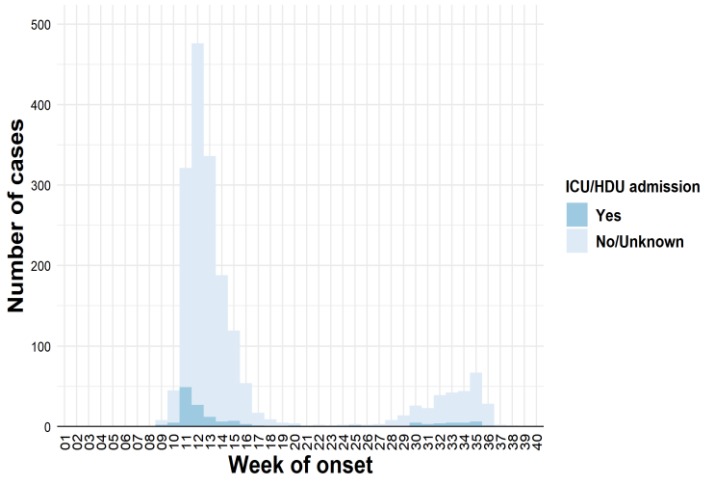
Figures 4(a)–4(g): Number of confirmed, probable and suspected cases reported by participating site by week of onset

(a) EN (n=24,247*)



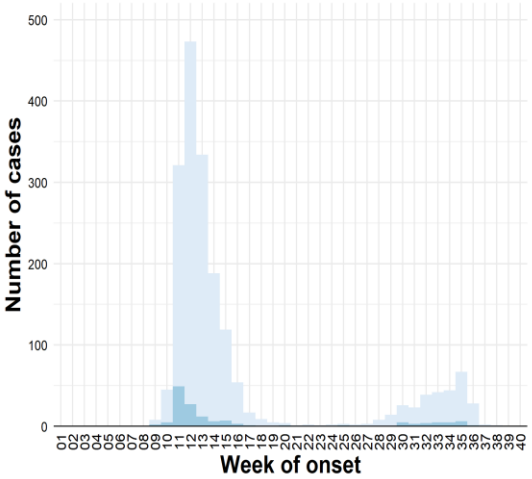
*4,748 records (19%) missing onset date in EN.

(b) SC (n=2,590*)



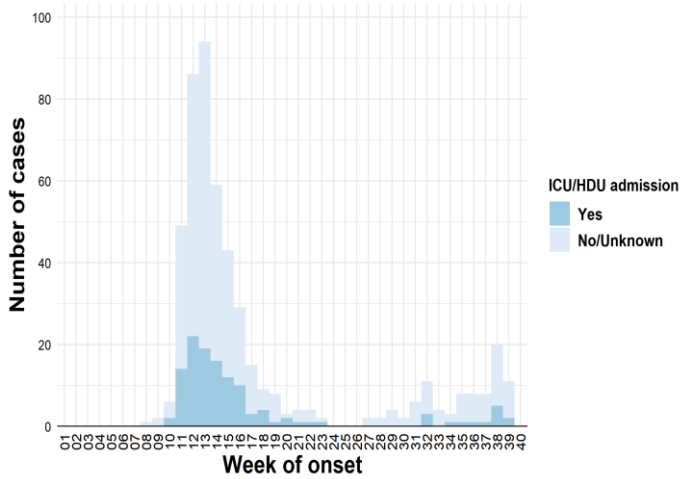
*3,871 records (60%) missing onset date in SC.

(c) NA (n=1,885*)



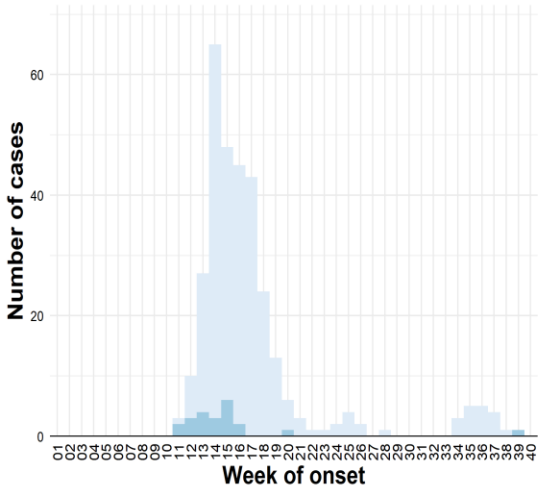
*306 records (16%) missing onset date in NA.

(d) BE (n=505*)



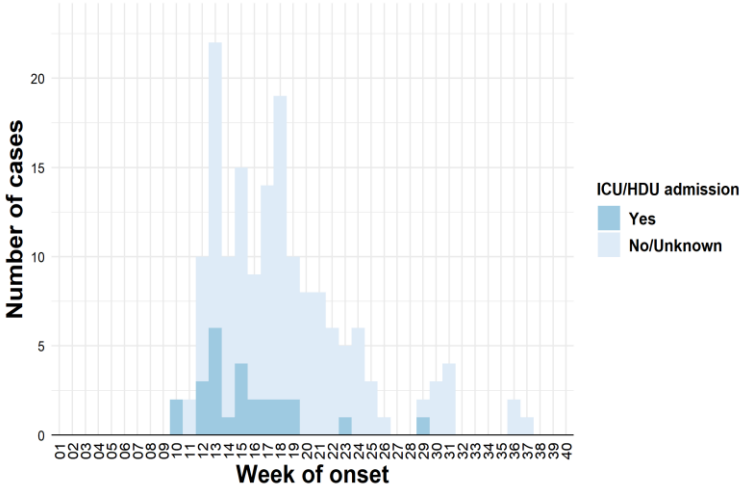
*3 records (0.6%) missing onset date in BE.

(e) ES (n=318*)



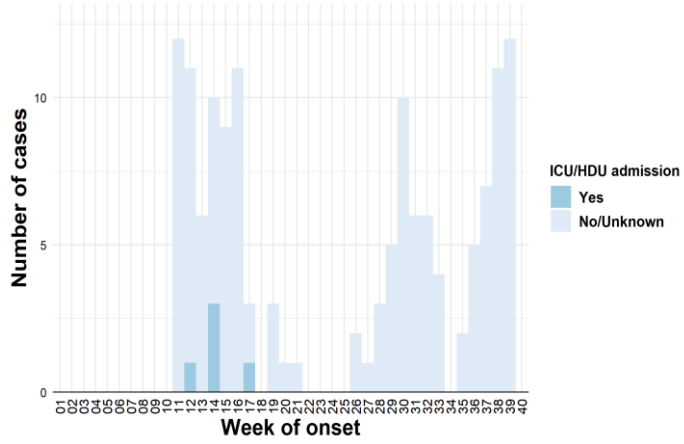
*28 records (8%) missing onset date in ES.

(f) RO (n=162*)



*No records missing onset date in RO.

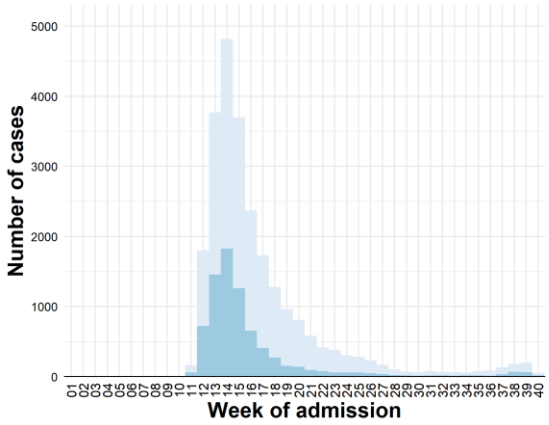
(g) LT (n=141*)



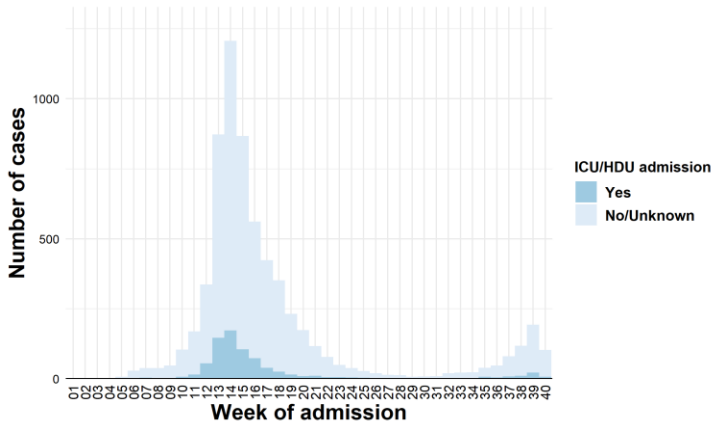
*5 records (3%) missing onset date in LT.

Figures 5(a)–5(g): Number of confirmed, probable and suspected cases reported by participating site by week of hospital admission

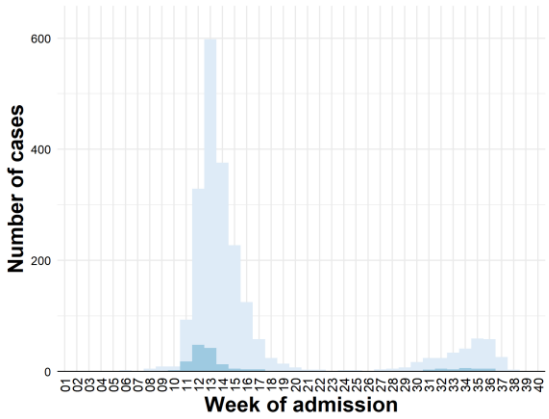
(a) EN (n=24,995)



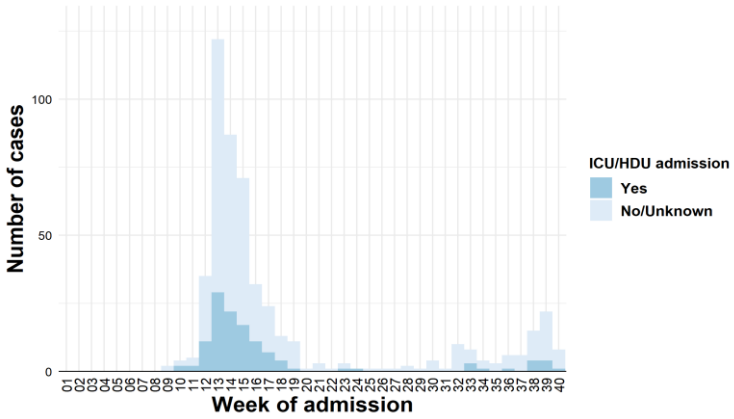
(b) SC (n=6,461)



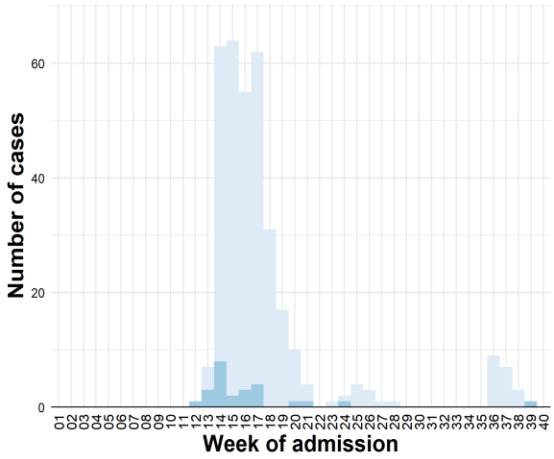
(c) NA (n=2,191)



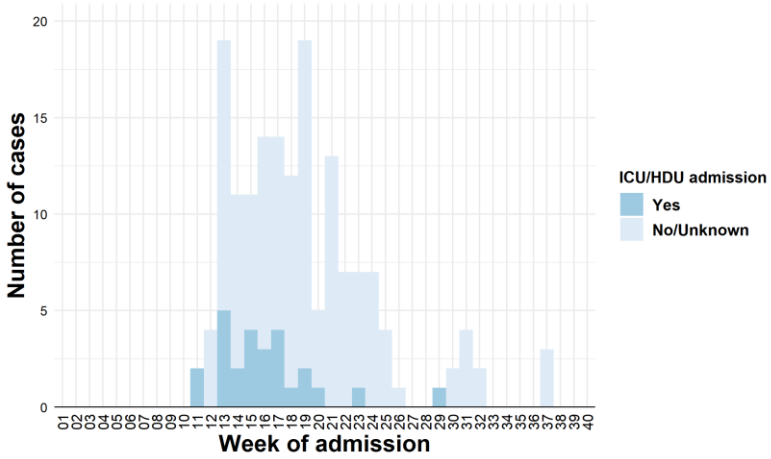
(d) BE (n=508)



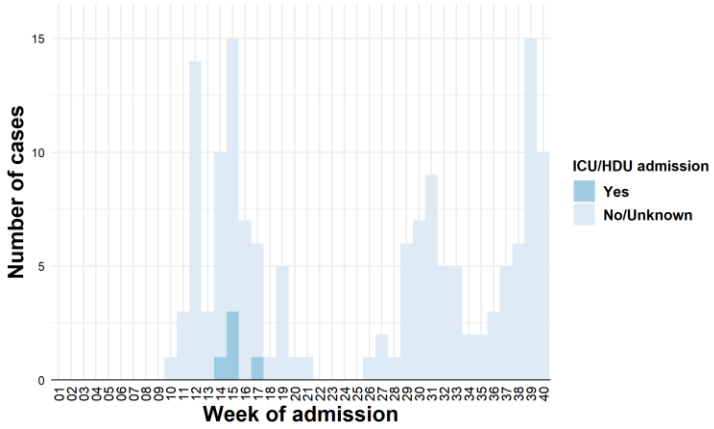
(e) ES (n=346)



(f) RO (n=162)



(g) LT (n=146)



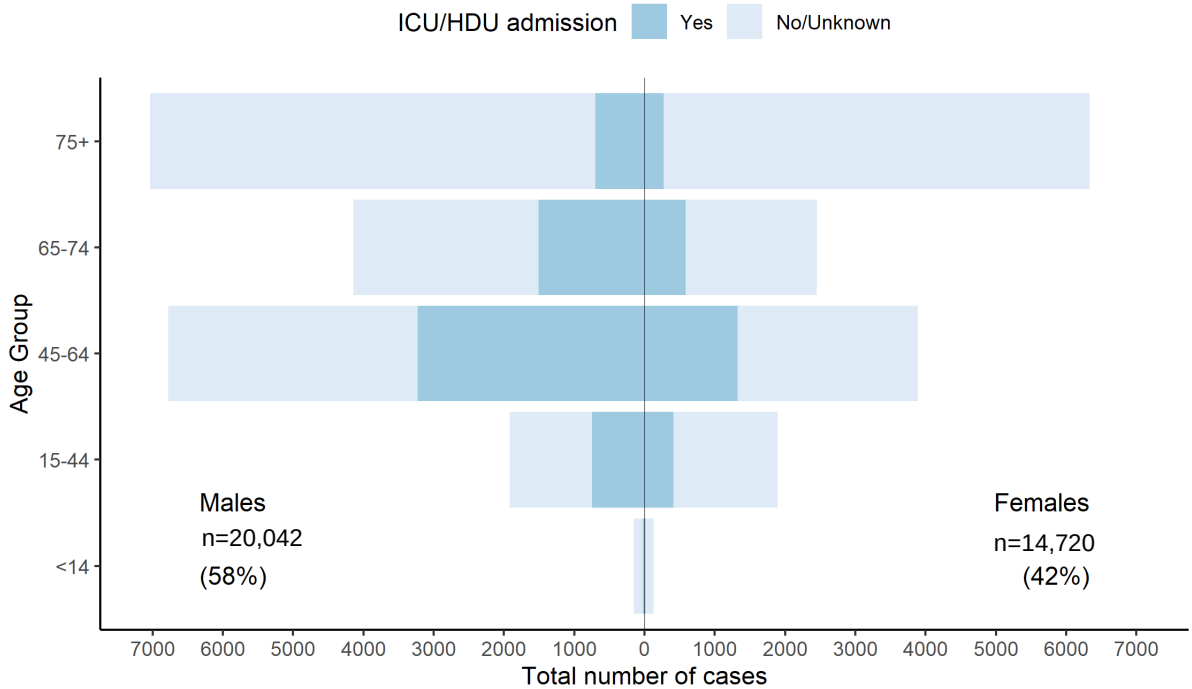
3. Demographics

- 57.6% of patients were **male** (20,042/34,762; 47 records missing sex)
- Median **age** of patients was 69 years, range 0–105 years (31 records missing age)
- 10.9% of patients had **supported living arrangements**[6] prior to admission (2,252/20,659; 14,150 records missing/unknown)

Figure 6 shows the sex and age distribution of confirmed and probable cases overall and in each participating site, categorised by known ICU/HDU admission. Note that these figures show absolute numbers and are not age-adjusted according to a country's population structure, and not all sites receive paediatric patients/collect data on paediatric patients (<18 years of age).

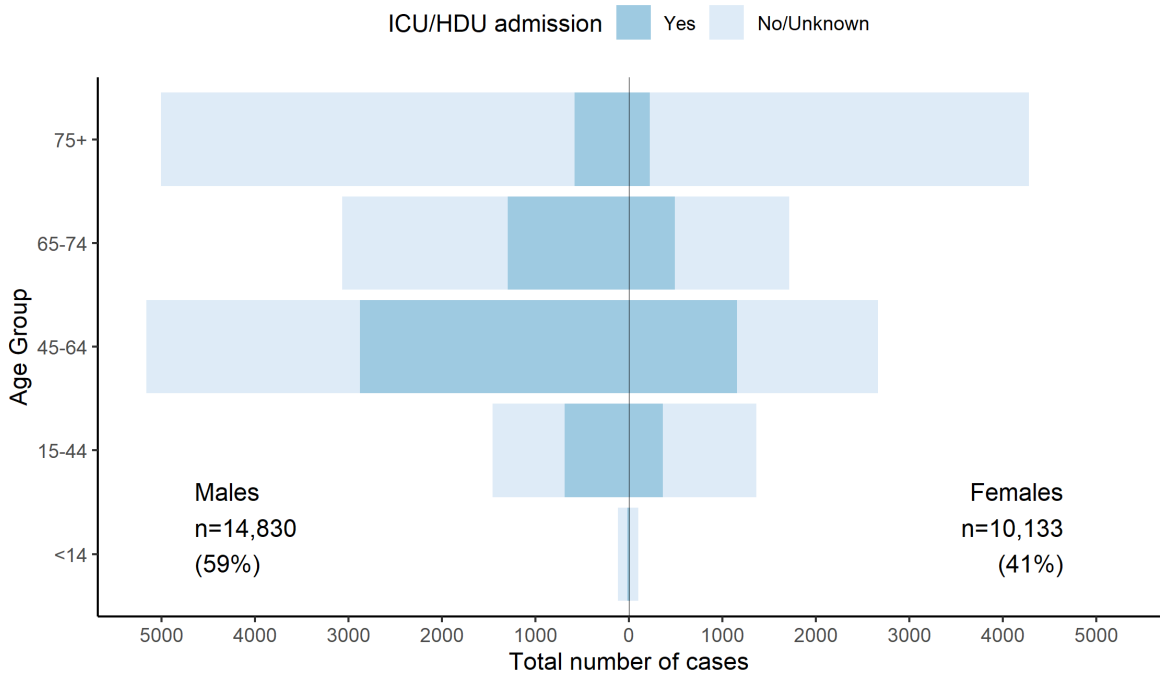
Figure 6: Age and sex distribution of confirmed, probable and suspected COVID-19 cases admitted to participating hospitals by country and ICU/HDU admission

All sites

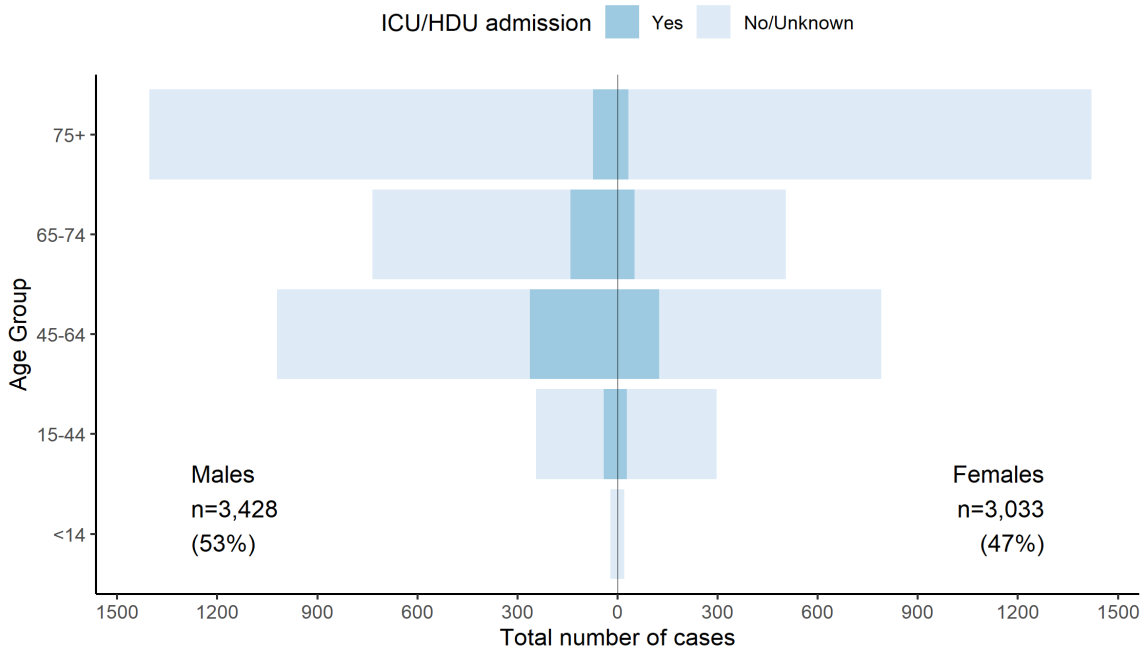


[6]Prior to admission, patient was either living at home with assistance from a carer, or resident in a care home.

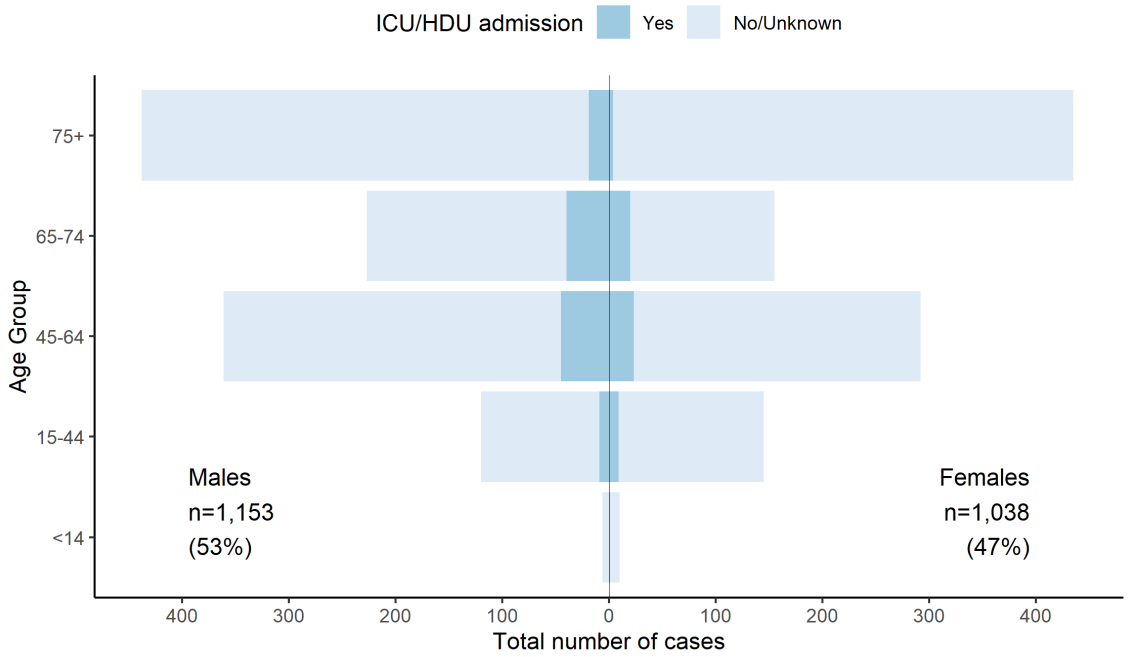
EN


ICU/HDU admission
Yes
No/Unknown
75+
65-74
45-64
15-44
<14
Age Group
Males
n=14,830
(59%)
Females
n=10,133
(41%)
5000
4000
3000
2000
1000
0
1000
2000
3000
4000
5000
Total number of cases

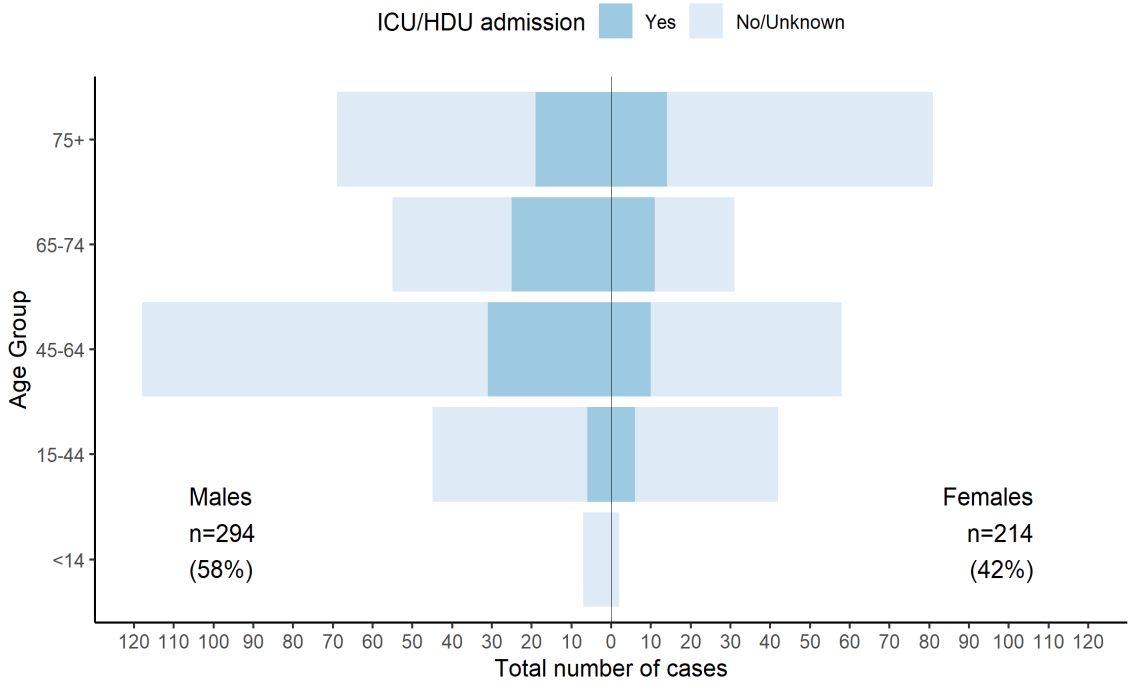
SC


ICU/HDU admission
Yes
No/Unknown
75+
65-74
45-64
15-44
<14
Age Group
Males
n=3,428
(53%)
Females
n=3,033
(47%)
1500
1200
900
600
300
0
300
600
900
1200
1500
Total number of cases

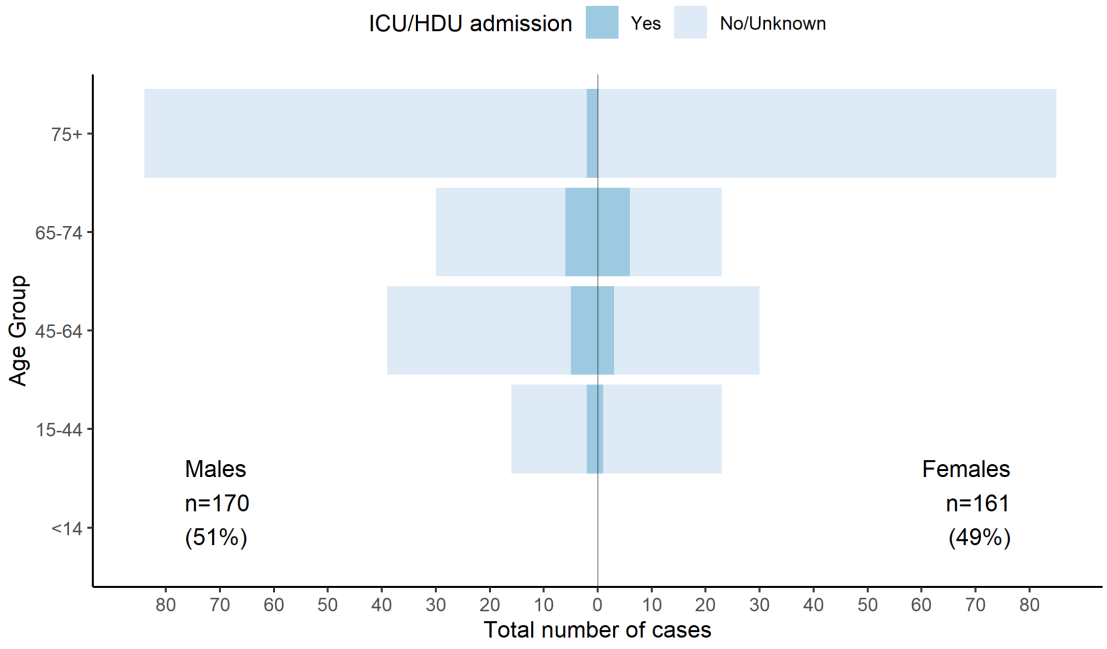
NA


ICU/HDU admission
Yes
No/Unknown
75+
65-74
45-64
15-44
<14
Age Group
Males
n=1,153
(53%)
Females
n=1,038
(47%)
400
300
200
100
0
100
200
300
400
Total number of cases

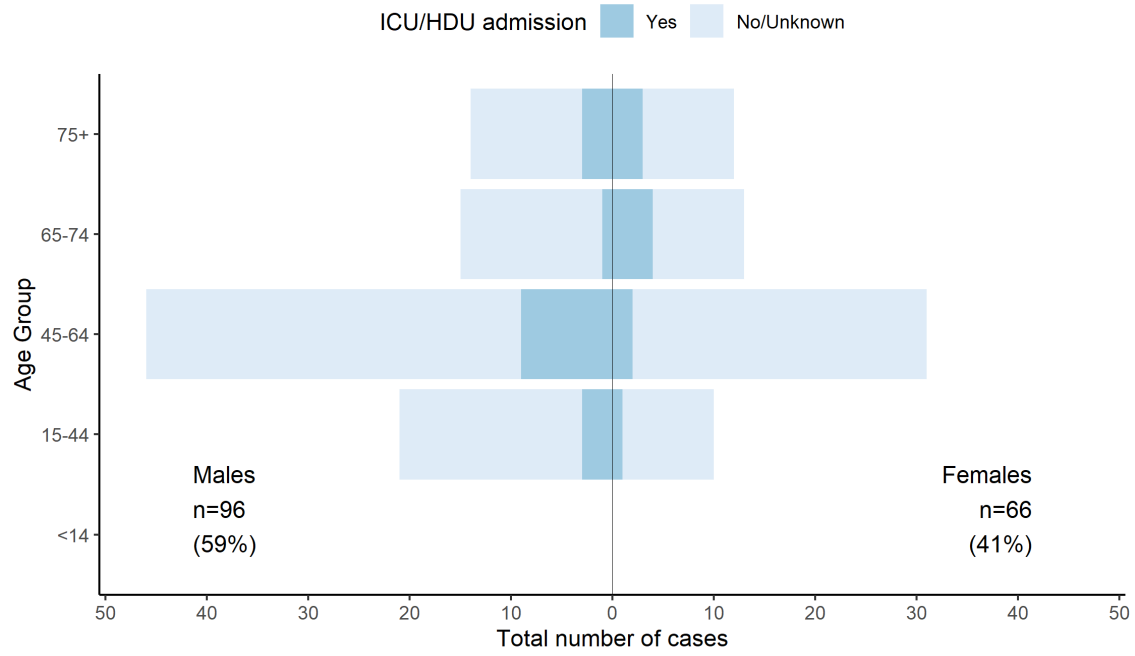
BE


ICU/HDU admission
Yes
No/Unknown
75+
65-74
45-64
15-44
<14
Age Group
Males
n=294
(58%)
Females
n=214
(42%)
120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120
Total number of cases

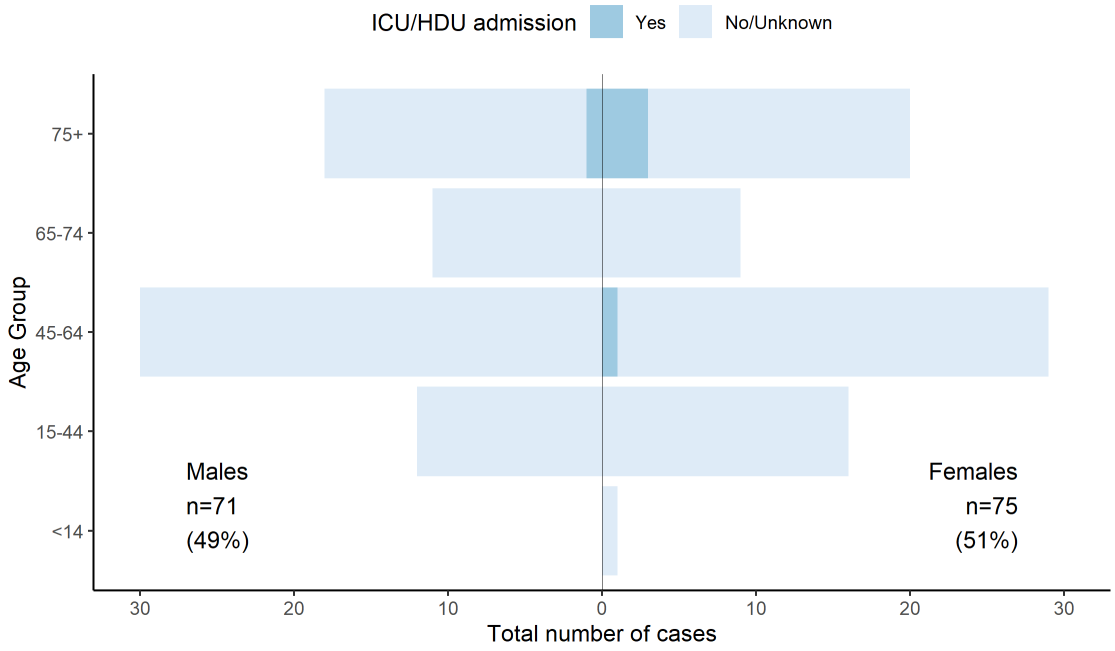
ES


ICU/HDU admission
Yes
No/Unknown
75+
65-74
45-64
15-44
<14
Age Group
Males
n=170
(51%)
Females
n=161
(49%)
80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80
Total number of cases

RO


ICU/HDU admission
Yes
No/Unknown
75+
65-74
45-64
15-44
<14
Age Group
Males
n=96
(59%)
Females
n=66
(41%)
50 40 30 20 10 0 10 20 30 40 50
Total number of cases

LT



Note: the remainder of this report pertains only to confirmed cases within the "first wave" (up the end of week 29: 19 July 2020) and excludes those with incoherent death dates (e.g. death before admission), and missing/incoherent key variables (age, sex); N=31,831

4. Clinical characteristics

Table 2 describes patients by their symptoms. Note that only six sites (BE, ES, FR-V, LT, RO, SC) routinely collect information on symptoms, with varying degrees of data completeness, hence only data from these countries are presented. Anosmia and ageusia were not recognised symptoms of COVID-19 at the outset of the pandemic and thus may not have been routinely collected in the first few weeks of surveillance.

Table 2: Symptoms of patients hospitalised with confirmed COVID-19 (from six sites: BE, ES, FR-V, LT RO, SC) (N=6,383)

	Total number (%) with information available (N=6,383)	**Number (%) with symptom**
*Symptom groups**		
Febrile illness	2,317 (36.3)	2,291 (98.9)
Respiratory	1,790 (28.0)	1,767 (98.7)
Neurological	1,048 (16.4)	919 (87.7)
Gastrointestinal	1,121 (17.6)	965 (86.1)
Other	1,417 (22.2)	1,334 (94.1)
Symptoms		
Cough	**2,718 (42.6)**	**1,918 (70.6)**
Shortness of breath	**2,667 (41.8)**	**1,752 (65.7)**
Fever	**2,782 (43.6)**	**1,726 (62.0)**
Feverishness	191 (3.0)	92 (48.2)
Malaise	2,423 (38.0)	1,087 (44.9)
General deterioration	223 (3.5)	99 (44.4)
Tachypnoea	260 (4.1)	99 (38.1)
Chills	203 (3.2)	56 (27.6)
Diarrhoea	2,513 (39.4)	601 (23.9)
Confusion	2,537 (39.7)	570 (22.5)
Myalgia	2,325 (36.4)	519 (22.3)
Vomiting	2,492 (39.0)	551 (22.1)
Headache	2,293 (35.9)	308 (13.4)
Nausea	210 (3.3)	26 (12.4)
Coryza	188 (2.9)	18 (9.6)
Chest pain	218 (3.4)	21 (9.6)
Abdominal pain	2,484 (38.9)	235 (9.5)
Dizziness	196 (3.1)	18 (9.2)
Sore throat	2,300 (36.0)	206 (9.0)
Ageusia	1,256 (19.7)	75 (6.0)
Anosmia	1,297 (20.3)	55 (4.2)
Palpitations	198 (3.1)	7 (3.5)
Rash or other dermatological manifestation	2,327 (36.5)	30 (1.3)
Conjunctivitis	2,281 (35.7)	11 (0.5)

*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 in table.

5. Outcomes

As England is over-represented in the dataset (74% of the 31,831 discussed in this section) and is biased towards patients with ICU/HDU admission (reporting from these wards is mandatory in England; there is incomplete coverage from all hospitals nationwide), outcomes in the pooled data may be skewed towards the most severe. Hence outcomes are presented for all sites, and then for all sites except England.

- Median **length of stay** in hospital
  - For all sites (n=31,831): **10 days**, range 1–221 (13,211 records missing discharge date)
  - For all sites except England (n=8,286): **9 days**, range 1–221 (613 records missing discharge date)

- **ICU/HDU** admission (Tables 3–4)
  - For all sites (n=31,831): 8,328; **26.9%** (848 records missing ICU/HDU admission)
  - For all sites except England (n=8,286): 961; **11.6%** (4 records missing ICU/HDU admission)

- In-hospital **death** (Tables 3–4)
  - For all sites (n=31,831): 9,021; **33.9%** (3,240 records missing outcome information; 1,983 patients still in hospital on treatment)
  - For all sites except England (n=8,286): 1,854; **22.6%** (49 records missing outcome information; 18 patients still in hospital on treatment)

Figure 7 depicts patient outcome by sex. There was a statistically significant difference in the proportion of men and women with completed outcomes (i.e. discharged or died; p=0.0000, test of proportions). Note that all patients are included in Figure 7, even if outcome is yet to be determined (as may be the situation, for example, for more recent admissions).

Figure 7: Patient outcome by sex

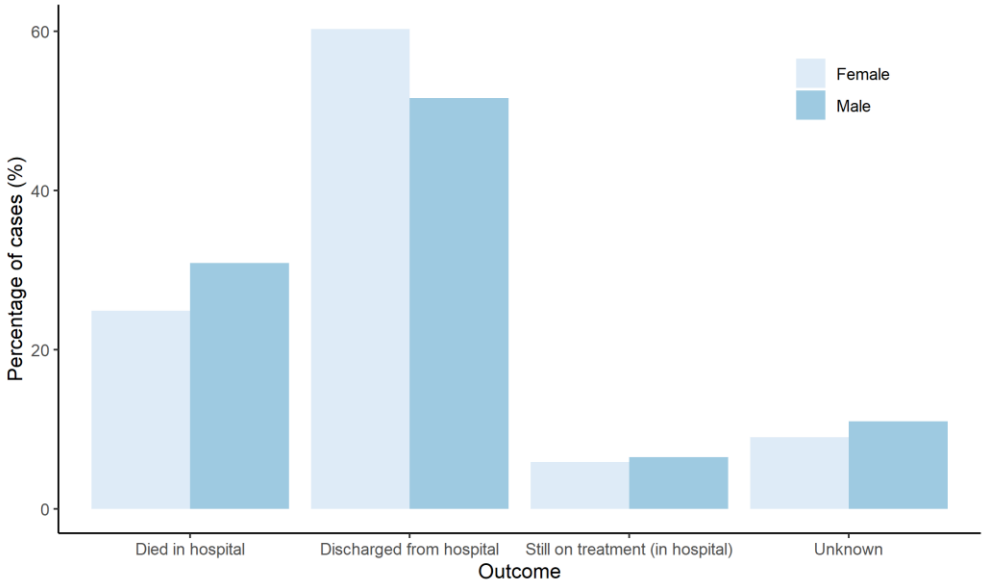


Table 3 shows patient outcomes by a range of potential risk/protective factors for two outcomes (ICU/HDU admission and death), for all sites, while Table 4 repeats this for all sites excluding England. Here, the proportion of deaths in each category is estimated only from those for whom outcome is known (i.e. the denominator for the proportion of deaths is the sum of those who have been discharged and those who have died).

Finally, the last two tables (Tables 5 and 6) show use of different ventilation types for a range of risk/protective factors; Table 5 for all sites and Table 6 for all sites excluding England. As above, the proportion of deaths is estimated in the same way.

The annexes provide background information on the I-MOVE-COVID-19 project (Annex 1), the methods for the surveillance (Annex 2) and case definitions used (Annex 3).

Table 3: Patient ICU/HDU admission and death by potential protective/risk factors (all sites)

Exposures (risk/protective factors)	Total cases		ICU/HDU admission		Deaths	
	N	%	N	%	N	%
All cases	31,831	-	8,328	26.9	9,021	33.9
Missing data	-	-	848	2.7	5,223	16.4
Age-group*						
0–44	3,647	11.5	1,116	13.4	421	4.7
45–64	9,850	30.9	4,323	51.9	2,016	22.4
65–74	6,081	19.1	1,984	23.8	1,945	21.6
≥ 75	12,253	38.5	905	10.9	4,639	51.4
Sex* Male	18,380	57.7	5,866	70.4	5,677	62.9
Healthcare worker	1,030	6.3	529	9.9	137	3.0
Missing data	15,377	48.3	15,431	-	17,362	-
Smoker	1,373	42.7	212	42.9	314	48.6
Missing data	28,619	89.9	28,621	-	28,648	-
Pregnant (women only)	197	3.5	22	1.4	29	2.1
Missing data†	1,518	48.1	1,521	-	1,674	-
Close contact setting‡	738	62.0	125	53.0	115	57.5
Missing data	30,641	96.3	30,643	-	30,649	-
Days between onset and hospitalisation§						
0–4	14,638	61.6	3,126	44.6	3,964	63.2
5–9	3,983	16.8	2,073	29.6	1,016	16.2
10+	2,917	12.3	1,396	19.9	656	10.5
Onset in hospital	2,243	9.4	421	6.0	632	10.1
Missing data	8,050	25.3	8,570	-	11,585	-

*Here, missing data have already been excluded (n=848 for ICU/HDU admission, n=5,223 for deaths).

†Here, missing data only provided for women aged 15–54 years.

‡Close contact setting: if the patient is a contact of a COVID-19 case.

§Some hospitals in England are known to use proxy dates for onset; substituting missing values of onset date with either admission date or swab date (note that in some hospitals, patients are swabbed on admission), resulting in a 0 value for delay from onset to admission. As patients from England comprise almost three-quarters of the dataset, the delay from onset to admission is skewed to the lowest category (0–4 days).

Table 4: Patient ICU/HDU admission and death by potential protective/risk factors (all sites excluding England)

Exposures (risk/protective factors)	Total cases		ICU/HDU admission		Deaths	
	N	%	N	%	N	%
All cases	8,286	-	961	11.6	1,854	22.6
Missing data	-	-	4	0.0	67	0.8
Age-group*						
0–44	847	10.2	91	9.5	19	1.0
45–64	2,420	29.2	461	48.0	202	10.9
65–74	1,527	18.4	266	27.7	362	19.5
≥ 75	3,492	42.1	143	14.9	1,271	68.6
Sex* Male	4,345	52.4	647	67.3	1,093	59.0
Healthcare worker	338	6.9	36	5.8	<10	-
Missing data	3,398	41.0	3,402	-	3,433	-
Smoker	1,373	42.8	212	42.9	314	48.6
Missing data	5,074	61.2	5,076	-	5,103	-
Pregnant (women only)	14	3.1	<10	-	0	0.0
Missing data†	598	68.0	643	-	600	-
Close contact setting‡	738	62.0	125	53.0	115	57.5
Missing data	7,096	85.6	7,098	-	7,104	-
Days between onset and hospitalisation						
0–4	1,847	38.3	180	27.8	406	50.4
5–9	1,547	32.1	268	41.4	196	24.3
10+	1,132	23.5	165	25.5	128	15.9
Onset in hospital	293	6.1	35	5.4	75	9.3
Missing data	3,467	41.8	3,471	-	3,500	-

*Here, missing data have already been excluded (n=4 for ICU admission, n=67 for deaths).

†Here, missing data only for women aged 15–54 years.

‡Close contact setting: if the patient is a contact of a COVID-19 case.

Table 5: Level of mechanical ventilation required by risk/protective group* (all sites)

Exposures (risk/protective factors)	All cases N (%)	Any ventilation N (%)	Ventilator (non-invasive) N (%)	Ventilator (invasive) N (%)	High flow oxygen N (%)	Other† N (%)	Unknown ventilation type N (%)
All cases	31,831	18,445 (57.9)	2,084 (6.6)	4,827 (15.2)	1,155 (3.6)	6,450 (20.6)	3,930 (12.4)
Missing ventilation data‡		-	100 (0.3)	100 (0.3)	93 (0.3)	525 (1.7)	-
Age-groups							
0–44	3,647 (11.5)	1,990 (10.8)	245 (11.8)	560 (11.6)	92 (8.0)	708 (11.0)	385 (9.8)
45-64	9,850 (30.9)	6,556 (35.5)	771 (37.0)	2,669 (55.3)	372 (32.2)	1,633 (25.3)	1,111 (28.3)
65–74	6,081 (19.1)	3,717 (20.1)	496 (23.8)	1,222 (25.3)	207 (17.9)	1,077 (16.7)	715 (18.2)
≥ 75	12,253 (38.5)	6,182 (33.5)	572 (27.4)	376 (7.8)	483 (41.9)	3,032 (47.0)	1,719 (43.7)
Male	18,380 (57.7)	11,241 (60.9)	1,394 (66.9)	3,516 (72.8)	684 (59.3)	3,635 (56.4)	2,012 (51.2)
Healthcare worker	1,030 (6.3)	711 (7.1)	120 (9.6)	309 (9.0)	49 (5.7)	156 (4.3)	77 (9.6)
Smoker	1,373 (42.7)	694 (43.6)	59 (48.0)	115 (40.6)	163 (42.7)	<10 -	352 (44.4)
Pregnant	197 (3.5)	39 (1.0)	<10 -	<10 -	<10 -	23 (1.2)	0 (0.0)
Onset to admission (days)							
0–4	14,638 (61.6)	9,261 (62.4)	1,184 (58.6)	2,092 (45.4)	678 (60.6)	4,956 (80.1)	351 (38.6)
5–9	3,983 (16.8)	2,749 (18.5)	468 (23.2)	1,385 (30.1)	205 (18.3)	424 (6.9)	267 (29.4)
10+	2,917 (12.3)	1,907 (12.9)	302 (15.0)	910 (19.7)	142 (12.7)	334 (5.4)	219 (24.1)
Onset in hospital	2,243 (9.4)	922 (6.2)	65 (3.2)	221 (4.8)	93 (8.3)	471 (7.6)	72 (7.9)

*Risk factors not included in this table if proportion of missing overall ≥75%. See Table 3 for numbers and overall proportions of missing data. Proportions not shown for any column group where one number in group <10.

† "Other" includes ECMO (very low numbers).

‡The results presented in the rest of this table exclude missing data.

Table 6: Level of mechanical ventilation required by risk/protective group* (all sites excluding England)

Exposures (risk/protective factors)	N (%)	Any ventilation n (%)	Ventilator (non-invasive) n (%)	Ventilator (invasive) n (%)	High flow oxygen n (%)	Other† n (%)	Unknown ventilation type n (%)
All cases	8,286	3,243 (39.1)	159 (1.9)	398 (4.9)	543 (6.6)	13 (0.2)	3,934 (100)
Missing ventilation data‡	-	-	100 (1.2)	100 (1.2)	93 (1.1)	525 (6.3)	4,352 (52.5)
Age-group							
0–44	847 (10.2)	467 (9.3)	<10 -	34 (8.5)	39 (7.2)	0 (0.0)	385 (9.8)
45-64	2,420 (29.2)	1,524 (30.2)	64 -	189 (47.5)	155 (28.5)	<10 -	1,113 (28.3)
65–74	1,527 (18.4)	983 (19.5)	40 -	129 (32.4)	97 (17.9)	<10 -	716 (18.2)
≥ 75	3,492 (42.1)	2,069 (41.0)	46 -	46 (11.6)	252 (46.4)	<10 -	1,720 (43.7)
Male	4,345 (52.4)	2,712 (53.8)	103 (64.8)	286 (71.9)	304 (56.0)	<10 -	2,015 (51.2)
Healthcare worker	338 (6.9)	131 (7.2)	6 (4.4)	22 (5.9)	26 (5.3)	0 (0.0)	77 (9.6)
Smoker	1,373 (42.7)	694 (43.6)	59 (48.0)	115 (40.6)	163 (42.7)	<10 -	353 (44.4)
Pregnant (women only)	14 (3.1)	<10 -	0 (0.0)	<10 -	0 (0.0)	0 (0.0)	0 (0.0)
Onset to admission (days)							
0–4	1,846 (38.3)	753 (38.1)	54 -	90 (24.2)	250 (47.3)	<10 -	354 (38.8)
5–9	1,544 (32.1)	650 (32.9)	53 -	176 (47.3)	149 (28.2)	<10 -	268 (29.4)
10+	1,132 (23.5)	453 (22.9)	44 -	95 (25.5)	95 (18.0)	0 (0.0)	219 (24.0)
Onset in hospital	293 (6.1)	122 (6.2)	<10 -	11 (3.0)	34 (6.4)	0 (0.0)	72 (7.9)

*Risk factors not included in this table if proportion of missing overall ≥75%. See Table 4 for numbers and overall proportions of missing data. Proportions not shown for any column group where one number in group <10.

† "Other" includes ECMO (very low numbers).

‡The results presented in the rest of this table exclude missing data.

6. Limitations in the representativeness of the surveillance data

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-CoV-2 shortly prior to, during or after admission. This may bias the results, e.g. in favour of less severe outcomes, although this does not appear to be the case (5% of probable/suspected cases in ICU/HDU, vs 24% or 10% of confirmed cases in ICU/HDU with and without inclusion of England's data, respectively).

Two-thirds of records received (24,997/38,286; 65%) were submitted from one site (England), which provided data from nearly all hospitals nationwide. As reporting of COVID-19 cases in ICU/HDU is mandatory in England, these patients have been over-represented in the pooled dataset (with 27% of all patients in the overall dataset admitted to ICU, dropping to 12% without England's data), biasing the results in favour of more severe outcomes. For this reason, some of the figures and tables presented in this bulletin exclude data from England.

During the peak of the first wave of the pandemic in different countries, logistical constraints in data collection or data entry were faced. Data provided do not therefore always reflect pandemic progression over time as, in some hospitals, case coverage may not have been complete. As we move in to the next phase of the pandemic, some sites are opting to systematically recruit cases on 1 or 2 days per week, rather than daily.

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. All estimates for proportion of deaths only included those with known outcome (discharge or death), in an attempt to mitigate some of this bias.

Containment and mitigation strategies and healthcare-seeking guidance during the COVID-19 pandemic have differed between country, and perhaps within countries over time. For example, recommendations could have been to contact primary care services by telephone on first observation of initial (milder) symptoms, or advice might be instead to stay at home and only contact emergency services when/if symptoms worsen. In some countries, the recommended management strategy, together with the individual's healthcare-seeking behaviour, might have had an impact on the delay between onset of symptoms and hospitalisation. This, in turn, may have an impact on the time lag between onset and respiratory specimen collection, which may affect positivity rates between surveillance sites, and at a particular surveillance site at different points in the epidemic. For this reason, going forward, alongside the collection of dates of onset/admission/respiratory specimen collection, case-containment/mitigation strategies and dates of any changes should be described for each country.

7. Annexes

7.1. Annex 1. The I-MOVE-COVID-19 project

7.1.1. Background

The end of 2019 saw the emergence of a novel severe acute respiratory syndrome – coronavirus 2 (SARS-CoV-2), which causes coronavirus disease 2019 (COVID-19). At the time of writing (7 September 2020) there had been 66,422,058 confirmed cases of COVID-19 globally, including 1,532,418 deaths, reported to the World Health Organization.[7]

I-MOVE (Influenza – Monitoring Vaccine Effectiveness in Europe), first established in 2007, was the first network to monitor influenza vaccine effectiveness (VE) within and across the seasons in the European Union (EU) and the European Economic Area (EEA). 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). In February 2020, many partners, already involved in studies within the I-MOVE network, came together as the I-MOVE-COVID-19 consortium, and were successful in a bid for the European Commission H2020 call on "Advancing knowledge for the clinical and public health response to the novel coronavirus epidemic".

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, 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. This is being achieved through adaptation and expansion of the existing I-MOVE network to include COVID-19. The network includes primary care networks, hospitals, and national laboratory reference centres in 13 countries across the WHO European Region.[8]

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

[7] *Source*: WHO Situation Report dashboard. https://covid19.who.int/?gclid=EAIaIQobChMIw5bL57HI6wIVkOvtCh0XQwZ9EAAYASAAEgL2qPD_BwE, accessed 7 September 2020.

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

(MS),[9] England, Scotland, and Albania (with two of the EU MS countries having two sites each). The laboratory component of the network includes regional and national reference centres from the participating countries. While each of the surveillance sites can analyse their data separately, pooling the data for overall analysis will provide a sample size big enough to depict trend and generate hypotheses (surveillance) and answer study questions with reasonable precision (research).

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

7.1.2. Objectives

Primary objectives

The primary objective 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.

[9]Belgium, France, Lithuania, Portugal, Romania, and Spain.

7.2. Annex 2. Methods

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

Type of surveillance

- Multicentre 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.

7.2.2. Surveillance and study period

The surveillance period started in March 2020, although some sites submitted data retrospectively from January 2020. Participating hospitals carry out surveillance throughout the year. This second report is for the period from 1 February 2020 to 30 September 2020.

7.2.3. 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
- Laboratory-confirmed SARS-CoV-2 by viral genetic clade (where possible).

7.3. Annex 3. Case definitions

7.3.1. 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.

7.3.2. 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.

7.3.3. 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.

7.3.4. 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

7.3.5. 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

7.3.6. COVID-19 death

A COVID-19 death is defined as a probable or confirmed COVID-19 case who died during his/her hospitalisation.

7.3.7. Exclusion criteria for surveillance

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

- 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.