

Legionnaires' disease

Annual Epidemiological Report for 2020

Key facts

- Legionnaires' disease remains an uncommon and mainly sporadic respiratory infection with an overall notification rate of 1.9 cases per 100 000 population for the EU/EEA in 2020.
- A small decrease in the annual notification rate was observed, down from the 2.2 cases per 100 000 population reported in 2019.
- Notification rates remained heterogenous across the EU/EEA, varying from fewer than 0.5 cases per 100 000 population to 5.7 cases per 100 000 population, with the highest rate reported by Slovenia.
- Four countries (France, Germany, Italy and Spain) accounted for 72% of all notified cases.
- Males aged 65 years and older were most affected (7.1 cases per 100 000 population).
- The number of reported cases to the travel-associated surveillance scheme decreased by 67% in 2020 compared with 2019.
- Only 10% of cases were culture confirmed (10%), likely leading to underestimation of disease caused by *Legionella* species other than *Legionella pneumophila*.

Methods

This report is based on data for 2020 retrieved from The European Surveillance System (TESSy) on 25 October 2021. TESSy is a system for the collection, analysis and dissemination of data on communicable diseases.

The methods used to produce this report are published online by ECDC [1] together with an overview of the national surveillance systems [2]. A subset of the data used for this report is available through ECDC's online *Surveillance atlas of infectious diseases* [3].

The surveillance data were collected through three different schemes:

- Annual retrospective data collection of Legionnaires' disease cases reported in EU/EEA countries.
- Annual retrospective data collection of outbreak events detected and reported in EU/EEA countries. The following thresholds for reporting outbreaks were used:
 - Five or more cases, if these were not exposed in same building, there is no evidence of exposure to the same aerosol-producing installation/device and there is no microbiological evidence of linked cases.
 - Three or more cases, if these were exposed in the same building, there is evidence of exposure to the same aerosol-producing installation/device or there is microbiological evidence of linked cases.
- Near-real-time reporting of travel-associated cases of Legionnaires' disease (TALD) through the European Legionnaires' disease surveillance network (ELDSNet) [4], including reports from countries outside the EU/EEA. This scheme primarily aims to identify clusters of cases that may otherwise not be detected at the national level, in order to quickly investigate them and take control measures at the implicated commercial accommodation sites to prevent further infections.

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Legionnaires' disease cases should be reported to these surveillance schemes in accordance with the 2018 EU/EEA case definition for a confirmed or probable case (i.e. at least one positive laboratory test and a clinical diagnosis of pneumonia).

The United Kingdom (UK) left the EU on 31 January 2020. TALD cases reported by the UK during the transition period (until 31 December 2020) are included in the TALD surveillance analyses. Data from the UK was not reported for the annual retrospective data collection of Legionnaires' disease cases or outbreak events in 2020, as this reporting occurred in 2021.

Annual case surveillance

Epidemiology

In 2020, 27 countries reported 8 372 cases of Legionnaires' disease (Table 1), of which 7 712 (92%) were classified as confirmed. The number of notifications decreased to 1.9 per 100 000 population, which was lower than in the two preceding years. However, from 2016 to 2019, notification rates in the EU/EEA increased yearly, from 1.4 per 100 000 population in 2016 to 2.2 in 2019. Four countries (France, Germany, Italy and Spain) continued to account for the majority of notified cases (72%), although their combined populations only represented approximately 50% of the EU/EEA population. Of 6 299 cases with known outcome, 551 (9%) were reported to have been fatal.

Notification rates ranged from fewer than 1.0 case per 100 000 population in eight countries (Bulgaria, Finland, Greece, Ireland, Lithuania, Norway, Poland, Romania) to 3.0 or more cases per 100 000 population in three countries (Denmark, Malta and Slovenia; Table 1 and Figure 1).

Table 1. Number of Legionnaires' disease cases and rates per 100 000 population by country and year, EU/EEA, 2016–2020

Country	2016		2017		2018		2019		2020		
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	ASR
Austria	161	1.9	219	2.5	237	2.7	255	2.9	249	2.8	2.5
Belgium	157	1.4	235	2.1	270	2.4	224	2.0	143	1.2	1.1
Bulgaria	0	0.0	2	0.0	11	0.2	5	0.1	7	0.1	0.1
Croatia	31	0.7	33	0.8	43	1.0	ND	NR	ND	NR	NR
Cyprus	3	0.4	1	0.1	5	0.6	4	0.5	3	0.3	NR
Czechia	147	1.4	217	2.1	231	2.2	277	2.6	231	2.2	2.0
Denmark	170	3.0	278	4.8	264	4.6	269	4.6	278	4.8	4.3
Estonia	14	1.1	16	1.2	18	1.4	12	0.9	18	1.4	1.2
Finland	15	0.3	27	0.5	24	0.4	44	0.8	24	0.4	0.4
France	1 218	1.8	1 630	2.4	2 133	3.2	1 816	2.7	1 328	2.0	1.8
Germany	974	1.2	1 279	1.5	1 448	1.7	1 557	1.9	1 263	1.5	1.3
Greece	31	0.3	43	0.4	65	0.6	45	0.4	29	0.3	0.2
Hungary	66	0.7	62	0.6	74	0.8	113	1.2	101	1.0	1.0
Iceland	3	0.9	3	0.9	5	1.4	ND	NR	ND	NR	NR
Ireland	10	0.2	25	0.5	25	0.5	21	0.4	12	0.2	0.3
Italy	1 733	2.9	2 037	3.4	3 018	5.0	3 205	5.3	2 071	3.5	2.8
Latvia	24	1.2	31	1.6	37	1.9	42	2.2	27	1.4	1.3
Liechtenstein	ND	NR	ND	NR	ND	NR	ND	NR	ND	NR	NR
Lithuania	11	0.4	14	0.5	21	0.7	17	0.6	12	0.4	0.4
Luxembourg	3	0.5	9	1.5	10	1.7	14	2.3	10	1.6	1.6
Malta	8	1.8	11	2.4	13	2.7	5	1.0	16	3.1	3.0
Netherlands	454	2.7	561	3.3	584	3.4	566	3.3	461	2.6	2.4
Norway	43	0.8	52	1.0	69	1.3	65	1.2	39	0.7	0.7
Poland	24	0.1	38	0.1	70	0.2	74	0.2	46	0.1	0.1
Portugal	197	1.9	232	2.3	211	2.1	201	2.0	307	3.0	2.5
Romania	2	0.0	19	0.1	62	0.3	19	0.1	8	0.0	0.0
Slovakia	14	0.3	14	0.3	54	1.0	85	1.6	98	1.8	1.8
Slovenia	93	4.5	117	5.7	160	7.7	196	9.4	120	5.7	5.2
Spain	951	2.0	1 363	2.9	1 513	3.2	1 542	3.3	1 336	2.8	2.5
Sweden	145	1.5	189	1.9	198	2.0	182	1.8	135	1.3	1.2
UK	383	0.6	504	0.8	532	0.8	517	0.8	ND	NR	NR
EU/EEA	7 085	1.4	9 261	1.8	11 405	2.2	11 372	2.2	8 372	1.9	1.6

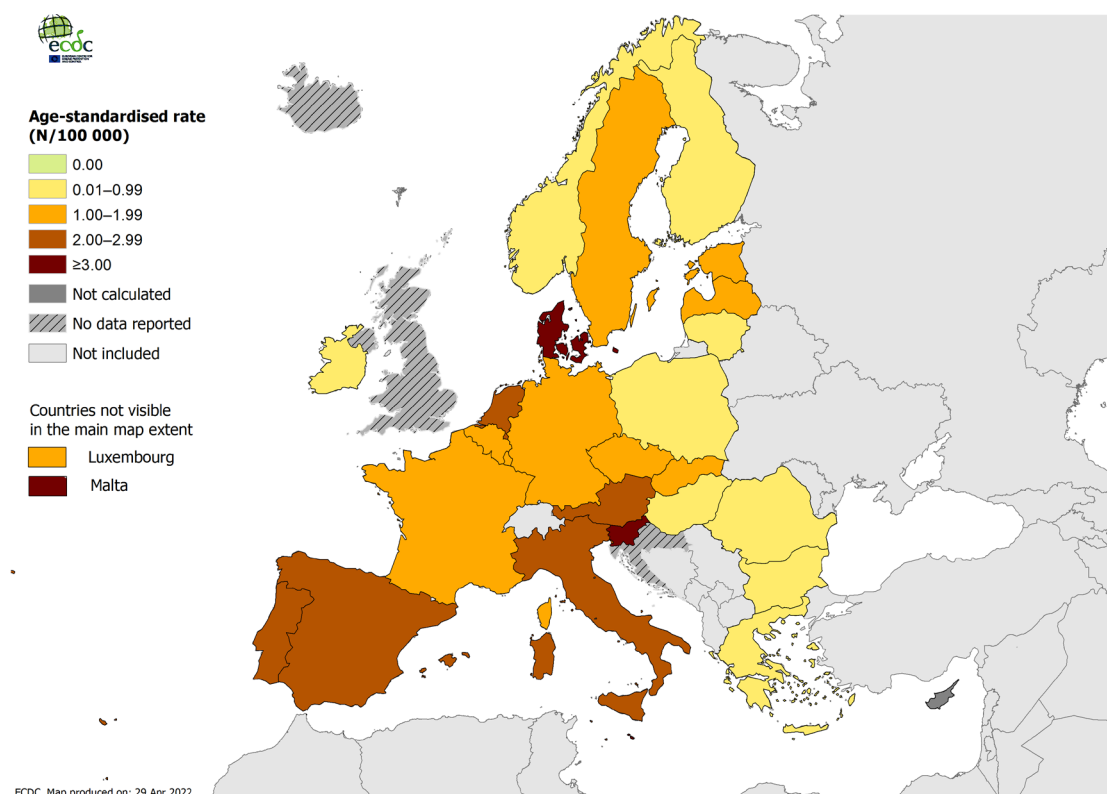
Source: Country reports

ASR: age-standardised rate

ND: no data reported

NR: no rate calculated

Data were not collected from the UK in 2020, as the country left the EU on 31 January 2020.

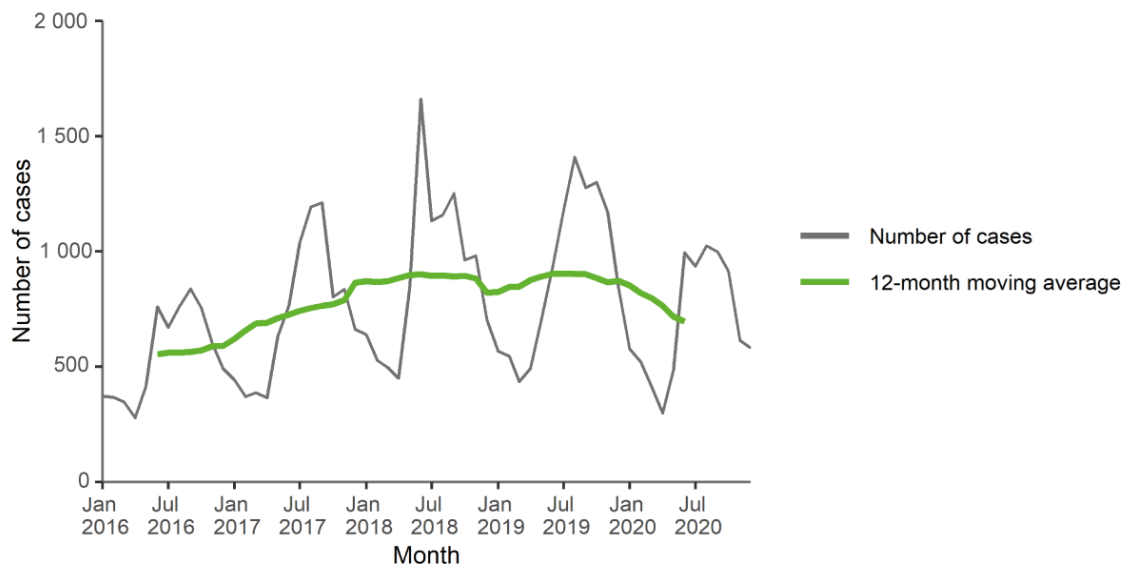
Figure 1. Distribution of Legionnaires' disease cases per 100 000 population by country, EU/EEA, 2020

Source: Country reports from Austria, Belgium, Bulgaria, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden

From 2016 to 2019, there was a general trend of an increasing number of reported cases in the EU/EEA (Table 1 and Figure 2); however, the number of reported cases decreased in 2020 compared with 2019. The COVID-19 pandemic may have influenced this observed decrease. Travel restrictions and societal changes may have led to differences in population exposure to *Legionella* risk sources, changes to testing protocols could have affected the reported numbers and underreporting may have occurred due to strains on healthcare systems.

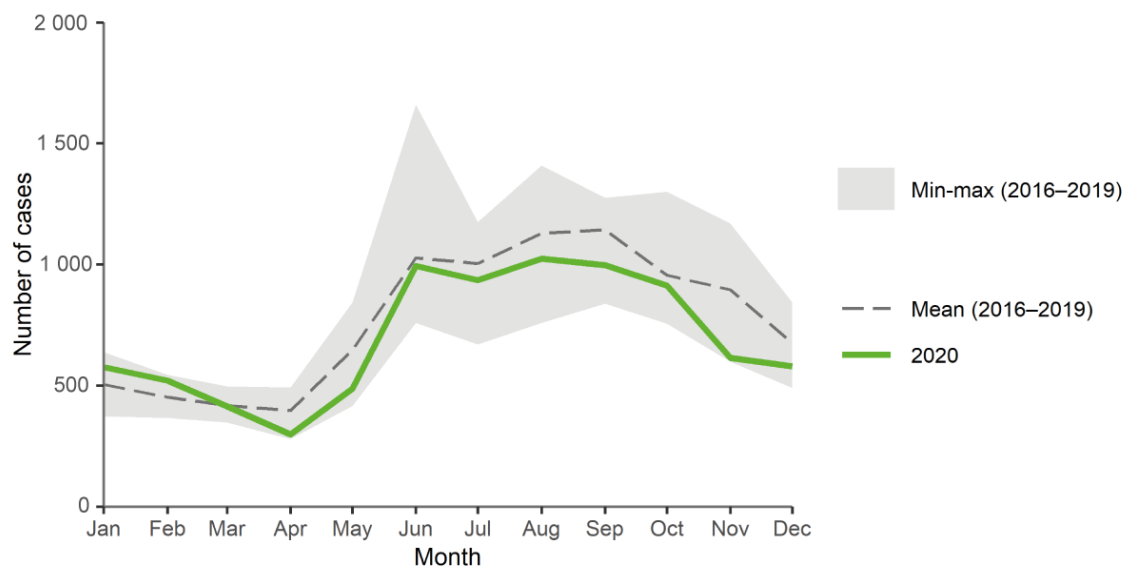
The distribution of cases by month of reporting shows that the majority (4 866; 58%) of cases occurred between June and October, similar to previous years (Figure 3) and in line with the known seasonality of Legionnaires' disease in Europe, which peaks in summer. The overall distribution per month was also within the range of the previous five years. To date, the highest monthly number of cases (1 743 cases) recorded under EU/EEA surveillance occurred in June 2018 in the absence of any specific outbreak event.

Figure 2. Distribution of Legionnaires' disease cases by month, EU/EEA, 2016–2020



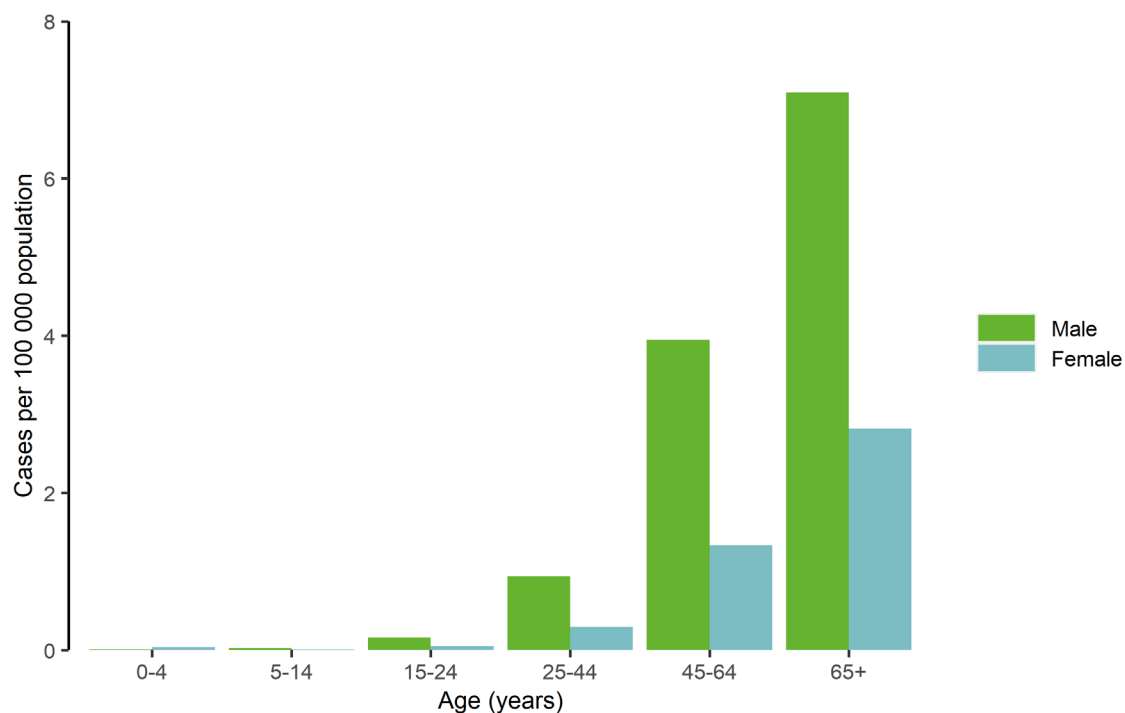
Source: Country reports from Austria, Belgium, Bulgaria, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden

Figure 3. Distribution of Legionnaires' disease cases by month, EU/EEA, 2020 and 2016–2019



Source: Country reports from Austria, Belgium, Bulgaria, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden

In 2020, people aged 45 years and older accounted for 7 580 of 8 366 cases with known age (91%). The notification rate increased with age, from 0.1 or fewer cases per 100 000 population in those aged under 25 years to 4.7 cases per 100 000 population in those aged 65 years and older. The overall male-to-female ratio remained unchanged compared with 2019 and was 2.3:1, with 7.1 cases per 100 000 population in males and 2.8 in females (Figure 4).

Figure 4. Distribution of Legionnaires' disease cases per 100 000 population, by age and sex, EU/EEA, 2020

The majority of cases in 2020 (7 284; 87%) were reported as diagnosed with a urine antigen test (UAT). The number of cases diagnosed with a UAT test was similar to previous years (88-90% from 2012 to 2019). In comparison, few cases were reported as diagnosed with a culture test (885 cases; 11%) or a polymerase chain reaction (PCR) test (933 cases; 11%).

Among the 885 culture-confirmed cases, 42 (5%) *Legionella* non-pneumophila species were reported: *L. anisa* (1), *L. bozemanii* (6), *L. longbeachae* (17), *L. micdadei* (7) and other *Legionella* species (11). Fifteen were reported as '*Legionella* species unknown'.

Although *Legionella pneumophila* isolates of all serogroups are detected and reported annually among culture-confirmed cases, over 80% are reported as serogroup 1 (Table 2).

Table 2. Serogroups reported for culture-confirmed cases of *L. pneumophila*, EU/EEA, 2019–2020

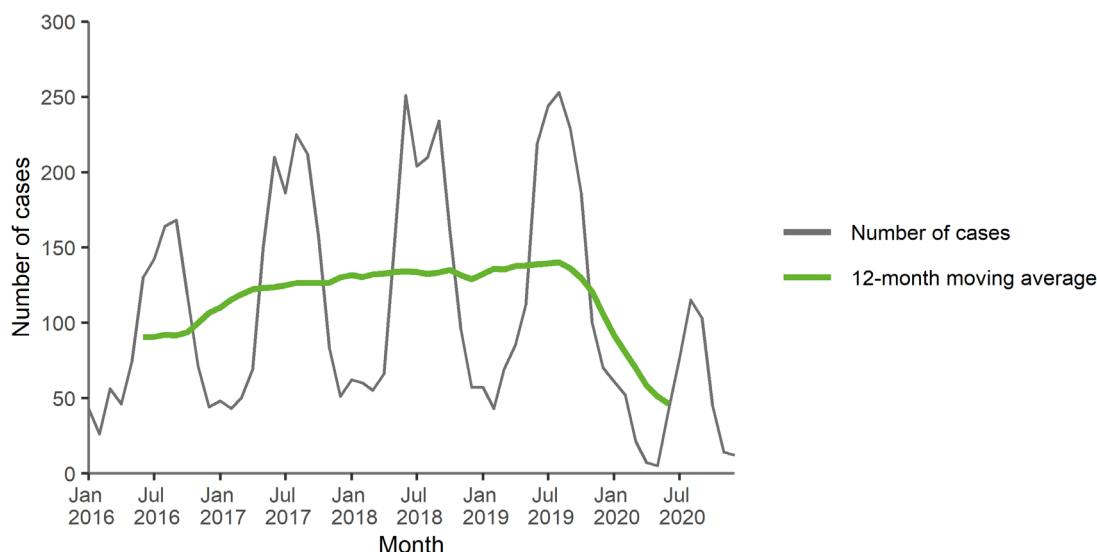
<i>L. pneumophila</i> Serogroup (SG)	2019		2020	
	Number	%	Number	%
1	923	83	685	83
2	9	<1	5	<1
3	35	3	22	3
4	2	<1	0	<1
5	8	<1	4	<1
6	17	2	16	2
7	5	<1	3	<1
8	6	<1	5	<1
9	1	<1	3	<1
10	9	<1	1	<1
11	0	-	0	-
12	0	-	1	<1
13	1	<1	2	<1
14	1	<1	0	-
15	3	<1	2	<1
16	0	-	1	<1
Unspecified non-serogroup 1	7	<1	5	<1
Mixed	3	<1	3	<1
Unknown	76	7	70	8
Total	1 106	-	828	-

Travel-associated Legionnaires' disease (TALD)

TALD case reports

ELDSNet received reports of 551 TALD cases with date of onset in 2020, which was 67% fewer than in 2019. This proportion has not been so low since 2001 and likely reflects the reduction in travel that occurred during the COVID-19 pandemic, when travel restrictions were implemented globally (Figure 5).

Figure 5. Distribution of travel-associated cases of Legionnaires' disease by month, EU/EEA and the United Kingdom (UK), 2016-2020

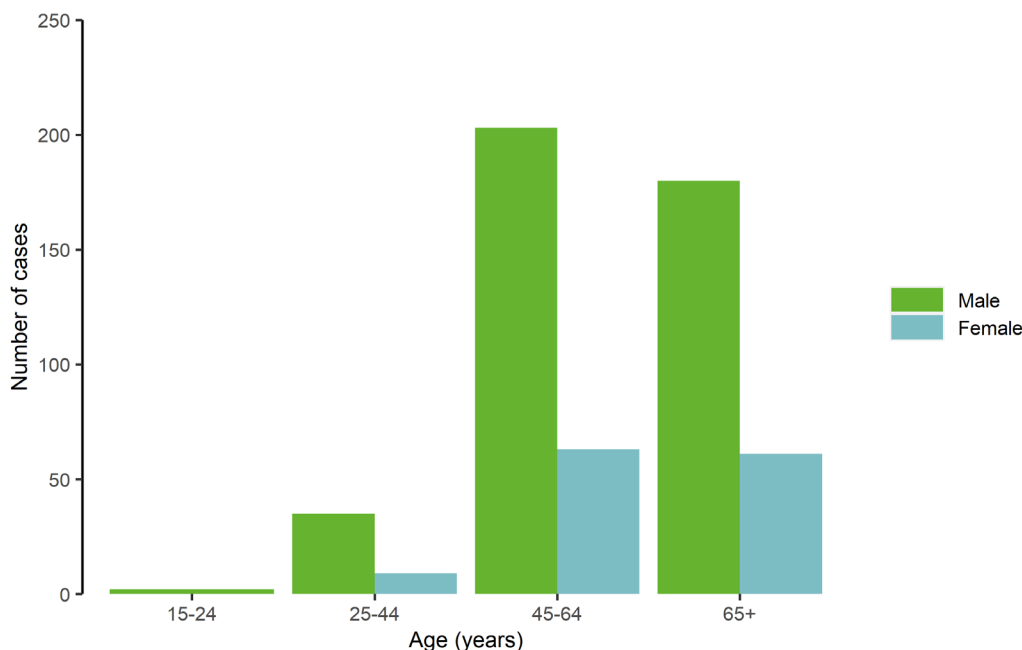


Source: Country reports from Austria, Belgium, Bulgaria, Croatia, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovenia, Spain, Sweden and the UK

TALD cases were reported from 19 countries: 17 EU/EEA countries and two non-EU/EEA countries (United Kingdom (50 cases) and Switzerland (10 cases)). The majority (82%) of all TALD cases were reported by only five countries: Italy, France, Germany, the Netherlands and the United Kingdom.

About three quarters (76%) of reported TALD cases were male, which is more than the usual two thirds. Cases had a median age of 62 years (IQR: 54-70; range: 22-92); 91% of cases occurred in people aged 45 years and older (Figure 6).

Figure 6. Distribution of travel-associated cases of Legionnaires' disease by age and sex, EU/EEA, 2020



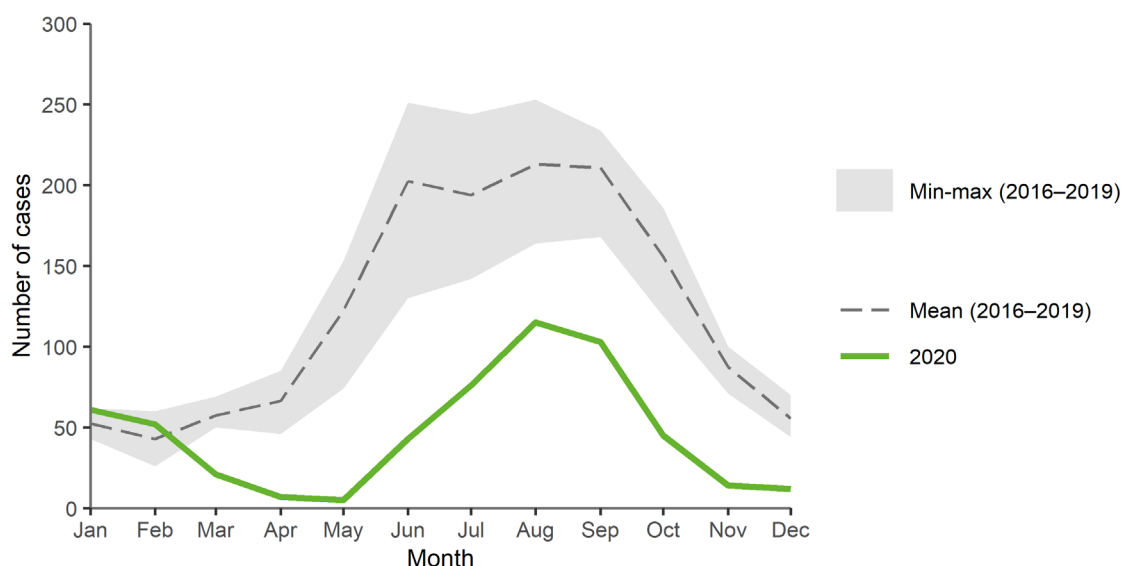
Source: Country reports from Austria, Belgium, Bulgaria, Croatia, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovenia, Spain and Sweden

The reported TALD cases were resident in 20 countries. The majority of cases resided in the countries that reported the most cases (Italy, France, Germany, the Netherlands and the United Kingdom), but 67 (12.2%) of the cases were non-EU/EEA residents, from the United Kingdom (54), Switzerland (11), and Canada (2).

The median reporting time (from date of illness onset to reporting to ELDSNet) across countries was 24 days (compared with 18 days in 2019), ranging from a minimum of 9 to 10 days (Lithuania, Norway and Austria) to a maximum of 273 days (Czechia).

In 2020, half of all TALD cases became ill between July and October, which is in line with the known seasonality of Legionnaires' disease in Europe. However, the start of the summer peak season may have been delayed by the travel restrictions imposed during the COVID-19 pandemic (Figure 7).

Figure 7. Distribution of travel-associated cases of Legionnaires' disease by month, EU/EEA and the United Kingdom (UK), 2020 and 2016-2019



Source: Country reports from Austria, Belgium, Bulgaria, Croatia, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovenia, Spain, Sweden and the UK

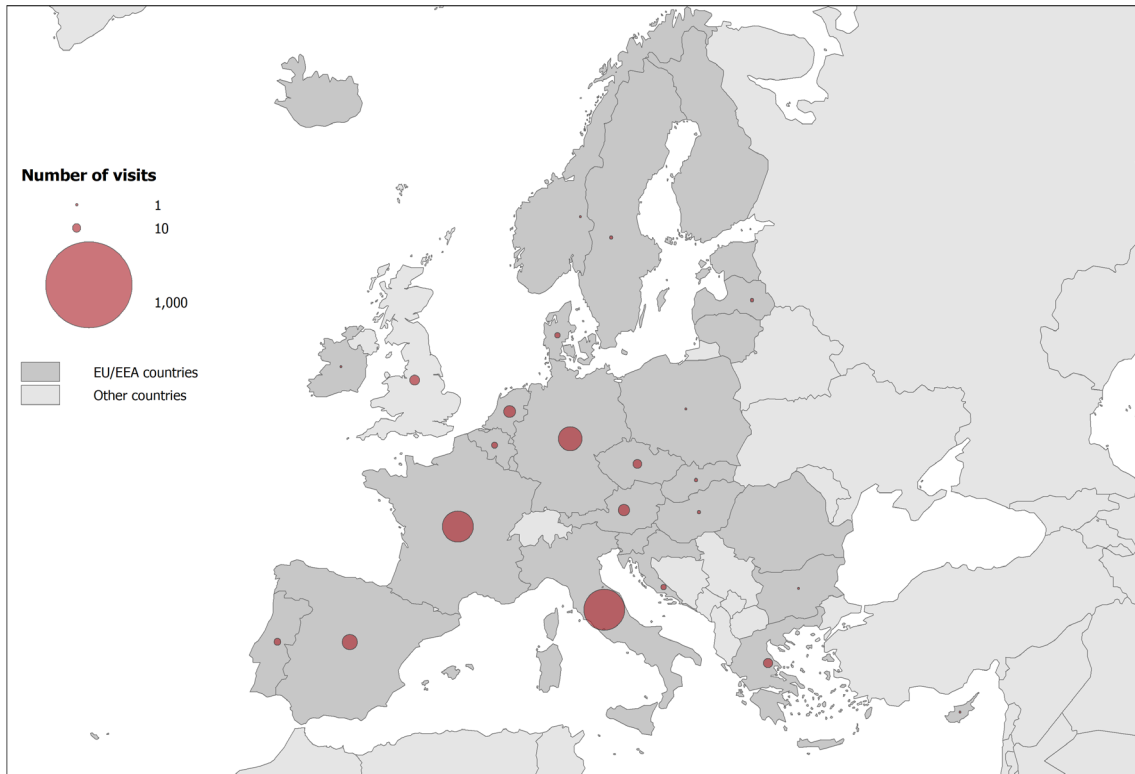
The disease outcome was provided for 331 (60%) TALD cases, 6 (1.8%) of which were known to have died by the time of reporting to ELDSNet. Deceased cases were between 57 and 92 years old, and four were male. A total of 525 (95%) TALD cases were classified as confirmed; 26 (5%) were probable cases.

Of the 593 laboratory tests reported in the diagnosis of 551 cases, 87.2% were UATs, 8.8% were molecular tests (PCR), 3.9% were cultures and fewer than 1% were serologic tests. The majority of pathogens were labelled as serogroup 1 *L. pneumophila* (n = 455; 82.6%), but for many cases the serogroup was unknown (n = 87; 15.8%). Few cases were reportedly infected with other *L. pneumophila* serogroups, including serogroup 10 (one case), serogroup 2 (one case), mixed serogroup (one case), and non-serogroup 1 *L. pneumophila* (four cases). Two cases of *Legionella longbeachae* were also reported. Monoclonal subtyping results were reported for five cases with *L. pneumophila* serogroup 1: Philadelphia (three cases) and Benidorm (two cases). The sequence type was reported to ELDSNet for only 10 TALD cases from four countries: United Kingdom (5), Denmark (2), the Netherlands (2), and Sweden (1). Two of the reported sequence types were ST1, two were ST1045, and the others were a variety of single sequence types.

TALD case travel destinations

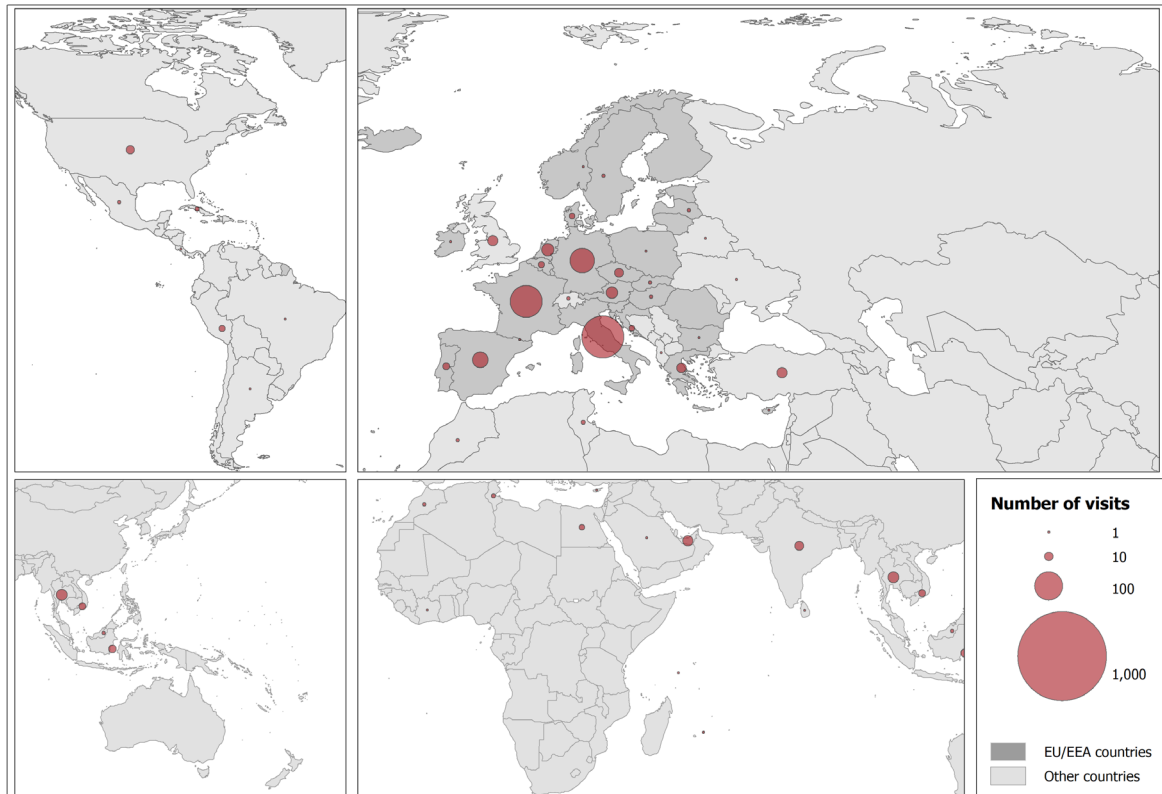
The 551 TALD cases made a total of 704 visits to accommodation sites. Of these, 578 (82.1%) were within the EU/EEA, 116 (16.5%) were outside the EU/EEA (Figure 8 and Figure 9), and 10 (1.4%) were on ships. The three destination countries with the most TALD-associated accommodation site visits were Italy (n = 228, 32.9%), France (n = 132; 19.0%), and Germany (n = 77; 11.1%). 73% of overnight stays were in hotels, 8% were in apartments, 11% were at camping sites, 1% were on ships, and 6% were reported as other types of accommodation.

Figure 8. Distribution of accommodation site visits made by travel-associated Legionnaires' disease cases, by destination country, EU/EEA and the United Kingdom (UK), 2020



Administrative boundaries: © EuroGeographics The boundaries and names shown on this map do not imply official endorsement or acceptance by the European Union.

Figure 9. Distribution of accommodation site visits made by travel-associated Legionnaires' disease cases, by destination country, worldwide, 2020



Administrative boundaries: © EuroGeographics The boundaries and names shown on this map do not imply official endorsement or acceptance by the European Union. Countries shown at different scales for visualization purposes

In 2020, ELDSNet detected 66 new TALD clusters. A TALD cluster occurs when two cases have visited the same accommodation site within a two-year period [4]. The clusters were associated with accommodations in 19 countries worldwide (10 within the EU/EEA and 9 outside the EU/EEA). Of the 66 new clusters, 56 (85%) were comprised of only two cases and 10 had from three to six cases. ELDSNet shared 28 summary reports of non-EU/EEA clusters (type 1) and seven of rapidly evolving clusters that comprise three or more associated cases within three months (type 2) with tour operators.

In 2020, the names of three accommodation sites were published on the ECDC website because assessment reports stated that recommendations from the competent authorities were not implemented in a satisfactory way.

Outbreaks

In 2020, through the annual outbreak reporting surveillance scheme, six EU/EEA countries (Germany, Italy, the Netherlands, Norway, Portugal and Spain) reported a total of 19 community- or hospital-acquired outbreaks, ranging from one to nine outbreaks per reporting country. In total, 197 outbreak-related cases were reported and the number of cases per reported outbreak ranged from 3 to 88 confirmed cases. The largest reported outbreak with 88 cases occurred in the North Region of Portugal between October and November 2020. The source of the outbreak was not identified.

Nine outbreaks (47%) were reported in association with hospitals, which was proportionally more than in previous years. From 2016 to 2019, the number of reported hospital outbreaks ranged from one to eight, comprising less than 28% of outbreaks annually. One outbreak was reported as associated with a geriatric residence. Fifteen of the nineteen outbreaks reported in 2020 included information on environmental samples. Only 3 of the 15 outbreaks had a positive match with environmental samples. Seventeen EU/EEA countries reported no outbreaks of Legionnaires' disease in 2020.

Discussion

The notification rate of Legionnaires' disease in the EU/EEA decreased in 2020, with the number of reported travel-associated cases likely reduced due to the impact of travel restrictions during the COVID-19 pandemic. The decrease in notifications was in contrast to the increasing trend observed in recent years. As the risk for Legionnaires' disease is due to exposure to *Legionella* bacteria present in aerosols from environmental sources, the decrease in notifications during the pandemic is not as marked as that observed for other respiratory diseases such as influenza or other viral infections that are transmitted from person to person.

The main characteristics of Legionnaires' disease cases reported in 2020 were very similar to 2019, with most cases being sporadic and community-acquired, male and aged 65 years and older.

A number of countries continue to have very low notification rates of below 0.5 cases per 100 000 population, which likely represents an underestimation of the incidence in these countries. As only 10% of cases are reported with a culture-confirmed diagnosis, there is likely an underestimation of the burden of disease caused by *Legionella* species other than *Legionella pneumophila* across the EU/EEA.

Notification rates of Legionnaires' disease decreased during the COVID-19 pandemic in 2020, but several countries still detected and investigated outbreaks. In 2020, proportionally more outbreaks were reported as associated with hospitals compared with previous years, though the numbers were similar to previous years.

The cause of the higher notification rates observed in Europe in previous years remains unknown. Contributing factors may include: changes in national testing policies and surveillance systems, an aging EU/EEA population, the design and infrastructure maintenance in building water systems, and changes in climate and weather patterns across Europe and worldwide, which can impact both the ecology of *Legionella* in the environment and causes of exposure to water aerosols containing the bacteria.

Public health implications

Legionnaires' disease remains an important cause of potentially preventable morbidity and mortality in Europe.

Although the overall EU/EEA notification rate has risen in previous years, a decrease was observed in 2020 during the COVID-19 pandemic. The reduction in cases may be due to reduced travel, but other restrictive measures may also have had an impact on *Legionella* ecology and the production and exposure to environmental aerosols. It is also possible that changes implemented to clinical diagnostic and testing protocols during the pandemic had an impact on the number of cases detected and reported in each country. Variation in notification rates across EU/EEA countries remain, likely reflecting under-diagnosis of this disease in many countries. Assisting countries with very low notification rates to improve both the diagnosis and reporting of Legionnaires' disease to public health authorities continues to be a priority.

Outbreaks of Legionnaires' disease of varying sizes and causes continue to be identified and investigated by public health authorities in EU/EEA countries. Due to the relatively high mortality associated with the disease and considerable challenges for the rapid identification and control of environmental sources, it remains important to be vigilant through surveillance for the detection of clusters and outbreak events.

As detection of TALD clusters through the ELDSNet surveillance scheme leads to investigations and preventive actions at accommodation sites, the continuing detection of clusters primarily through this multi-country joint surveillance scheme shows its value for public health.

With the aim of strengthening surveillance and outbreak investigation capacity in countries in Europe, ECDC started an annual EQA scheme on clinical and environmental samples of *Legionella* spp. in 2019. Annual summary reports for the results of this EQA scheme are published on the ECDC website [5].

Conducting regular checks for the presence of *Legionella* bacteria and applying appropriate control measures to engineered water systems [6] may prevent cases of Legionnaires' disease at accommodation sites and in hospitals, long-term care facilities or other settings where sizeable higher risk populations may be exposed.

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