

## SURVEILLANCE & MONITORING

# Legionnaires' disease

## Annual Epidemiological Report for 2023

### Key facts

- In 2023, the notification rate of Legionnaires' disease increased to 3.2 cases per 100 000 population, up from the 2.6 cases per 100 000 population reported in 2022.
- Notification rates remained heterogenous across the European Union/European Economic Area (EU/EEA), varying from less than 0.5 per 100 000 population to 6.9 cases per 100 000 population (age-standardised rate) reported by Slovenia. Four countries (France, Germany, Italy, and Spain) accounted for 72% of all notified cases.
- Males aged 65 years and above were most affected (12.7 cases per 100 000 population versus 5.2 in females).
- The number of cases reported to the travel-associated surveillance scheme increased by 16% in 2023 compared with 2022.
- Seven countries reported a total of 39 community- or hospital-acquired outbreaks, with a total of 368 cases.

### Introduction

Legionnaires' disease is a multi-system disease that causes pneumonia due to an infection with the *Legionella* bacteria, most commonly of the species *Legionella pneumophila*. The bacteria are found in the natural environment, soil, and water. They can be a health risk when they become aerosolised into inhalable fine mists, usually through engineered water systems. Cooling towers, evaporative condensers, humidifiers, decorative fountains, hot tubs, and showers are examples of water systems with identified *Legionella* risks. Conditions that are favourable for *Legionella* growth are water temperatures in the range of 25 to 42 °C, stagnant water with sediment build-up and low biocide levels. The aerosolisation of the bacteria-contaminated water can cause sporadic cases or outbreaks.

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## Methods

This report is based on data for 2023 retrieved from The European Surveillance System (TESSy) on 31 March 2025 for annual data and on 12 May 2025 for travel-associated Legionnaires' disease and the outbreak reporting scheme. TESSy is a surveillance 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 all Legionnaires' disease (LD) cases reported in EU/EEA countries, Iceland, Liechtenstein and Norway; time periods in results presented are based on reported date for statistics.
- annual retrospective data collection of outbreak events detected and reported in EU/EEA countries, Iceland and Norway. The following thresholds for reporting outbreaks are used:
  - i.  $\geq$  five cases, if these are not exposed in same building, nor evidence of exposure to same aerosol-producing installation/device, nor microbiological evidence of linked cases;
  - ii.  $\geq$  three cases, if these are exposed in the same building, or if evidence for exposure to same aerosol-producing installation/device, or if microbiological evidence of linked cases;
- near-real-time reporting of Legionnaires' disease cases with a travel stay at commercial accommodation sites (travel-associated Legionnaires' disease (TALD)) [4]. This scheme aims primarily at identifying clusters of cases associated with accommodation sites such as hotels or camping sites, that may otherwise not be detected at the national level, to facilitate timely investigation and preventive control measures. Time periods in results presented are based on reported case illness onset.

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

## Epidemiology

In 2023, 28 countries reported 14 537 cases (Table 1), of which 13 493 (93%) were classified as confirmed. The number of notifications per 100 000 population increased to 3.2, being the highest observed rate for the EU/EEA since surveillance was coordinated at ECDC. Four countries, France, Germany, Italy and Spain, continue to account for most notified cases (72%), although their combined populations only represented approximately 50% of the EU/EEA population.

**Table 1. Legionnaires' disease cases and rates per 100 000 population by country and year, EU/EEA, 2019–2023**

Country	2019		2020		2021		2022		2023		
	Number	Rate	ASR								
Austria	255	2.9	249	2.8	278	3.1	305	3.4	325	3.6	3.2
Belgium	224	2.0	143	1.2	274	2.4	268	2.3	378	3.2	2.9
Bulgaria	5	0.1	7	0.1	1	0.0	3	<0.1	4	0.1	0.1
Croatia	NDR	NRC	NRC								
Cyprus	4	0.5	3	0.3	4	0.4	3	0.3	7	0.8	0.8
Czechia	277	2.6	231	2.2	219	2.1	296	2.8	346	3.2	2.7
Denmark	269	4.6	278	4.8	281	4.8	287	4.9	313	5.3	4.6
Estonia	12	0.9	18	1.4	10	0.8	14	1.1	20	1.5	1.3
Finland	44	0.8	24	0.4	34	0.6	43	0.8	54	1.0	0.9
France	1 816	2.7	1 328	2.0	2 039	3.0	1 863	2.7	2 172	3.2	2.8
Germany	1 554	1.9	1 270	1.5	1 530	1.8	1 456	1.7	2 155	2.6	2.1
Greece	45	0.4	29	0.3	25	0.2	48	0.5	59	0.6	0.5
Hungary	113	1.2	101	1.0	85	0.9	86	0.9	106	1.1	1.0
Iceland	4	1.1	4	1.1	10	2.7	2	0.5	NDR	NRC	NRC
Ireland	21	0.4	12	0.2	4	0.1	23	0.5	34	0.6	0.7
Italy	3 205	5.4	2 120	3.6	2 726	4.6	3 106	5.3	3 874	6.6	5.0
Latvia	42	2.2	27	1.4	61	3.2	66	3.5	78	4.1	3.7
Liechtenstein	NDR	NRC	NDR	NRC	2	5.1	1	2.5	2	5.0	4.2

Country	2019		2020		2021		2022		2023		
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	ASR
Lithuania	17	0.6	12	0.4	4	0.1	21	0.7	71	2.5	2.3
Luxembourg	14	2.3	10	1.6	17	2.7	12	1.9	22	3.3	3.4
Malta	5	1.0	16	3.1	8	1.6	9	1.7	13	2.4	2.3
Netherlands	566	3.3	461	2.6	658	3.8	623	3.5	882	5.0	4.4
Norway	65	1.2	39	0.7	43	0.8	70	1.3	72	1.3	1.3
Poland	74	0.2	46	0.1	46	0.1	109	0.3	424	1.2	1.0
Portugal	201	2.0	307	3.0	254	2.5	245	2.4	361	3.4	2.8
Romania	19	0.1	8	<0.1	8	<0.1	32	0.2	56	0.3	0.3
Slovakia	85	1.6	98	1.8	148	2.7	131	2.4	75	1.4	1.3
Slovenia	196	9.4	120	5.7	88	4.2	143	6.8	169	8.0	6.9
Spain	1 542	3.3	1 336	2.8	1 703	3.6	1 966	4.1	2 283	4.7	4.0
Sweden	182	1.8	135	1.3	168	1.6	216	2.1	182	1.7	1.6
<b>EU/EEA (30 countries)</b>	<b>10 856</b>	<b>2.4</b>	<b>8 432</b>	<b>1.9</b>	<b>10 728</b>	<b>2.4</b>	<b>11 447</b>	<b>2.6</b>	<b>14 537</b>	<b>3.2</b>	<b>2.7</b>
United Kingdom	517	0.8	NDR	NRC	NA	NA	NA	NA	NA	NA	NA
<b>EU/EEA (31 countries)</b>	<b>11 373</b>	<b>2.2</b>	<b>8 432</b>	<b>1.9</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>

Source: Country reports.

ASR: Age-standardised rate.

NDR: No data reported.

NRC: No rate calculated.

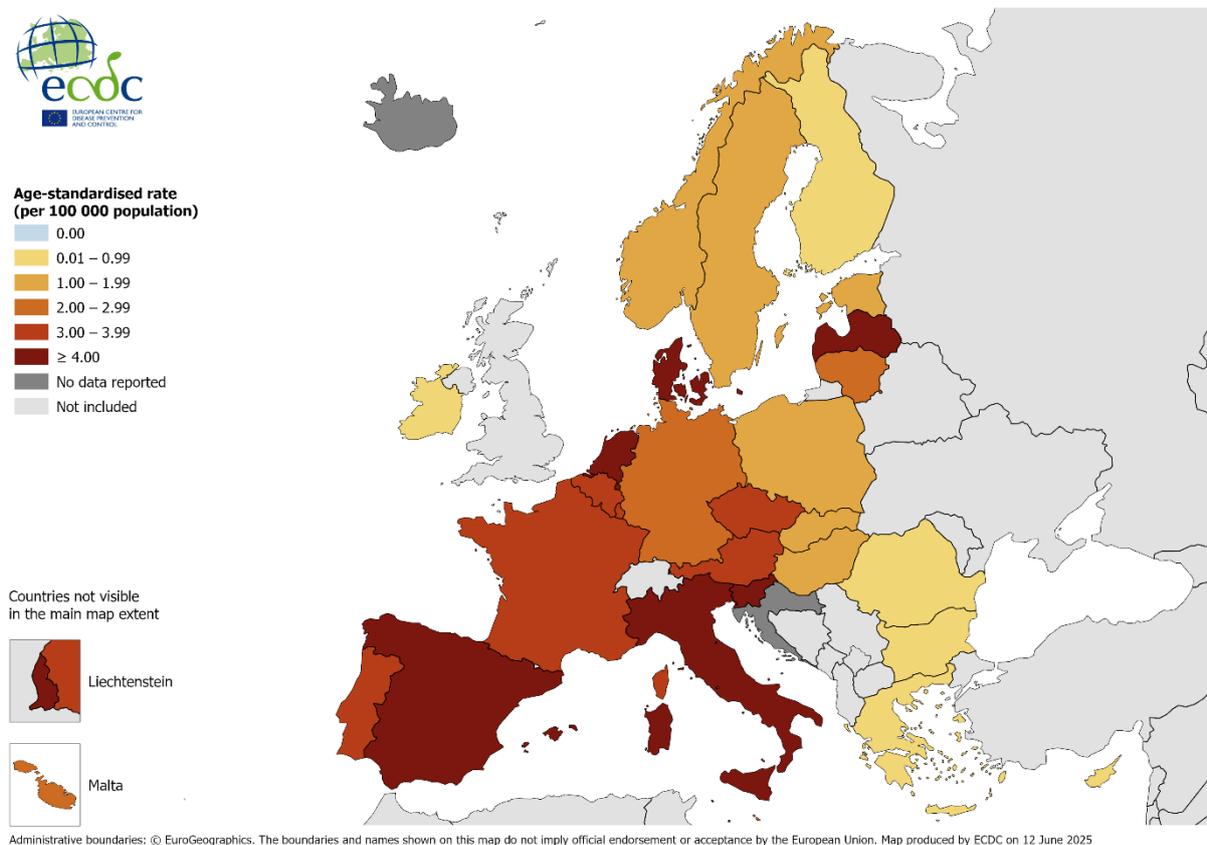
NA: Not applicable.

No data from 2020 onwards were reported by the United Kingdom, due to its withdrawal from the EU on 31 January 2020.

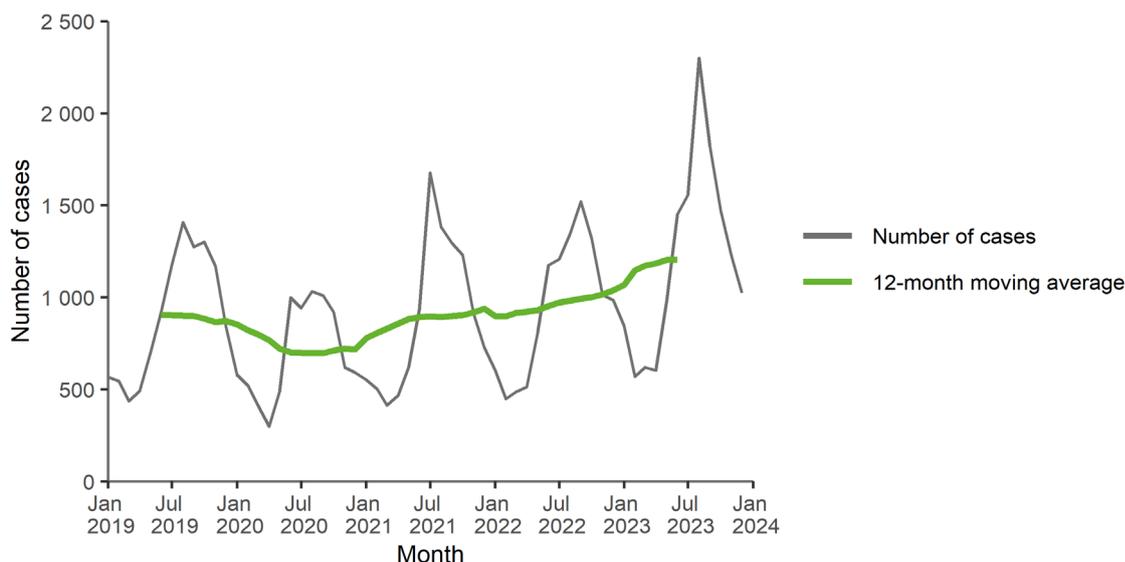
Of 10 797 cases with known outcome, 973 (9%) were reported to have a fatal outcome.

Age-adjusted notification rates ranged from fewer than 1.0 cases per 100 000 population in six countries (Bulgaria, Cyprus, Finland, Greece, Ireland, and Romania) to 4.0 cases per 100 000 population or more in six countries (Denmark, Italy, Liechtenstein, the Netherlands, Slovenia, and Spain); see Table 1 and Figure 1.

**Figure 1. Legionnaires' disease cases per 100 000 population by country, EU/EEA, 2023**



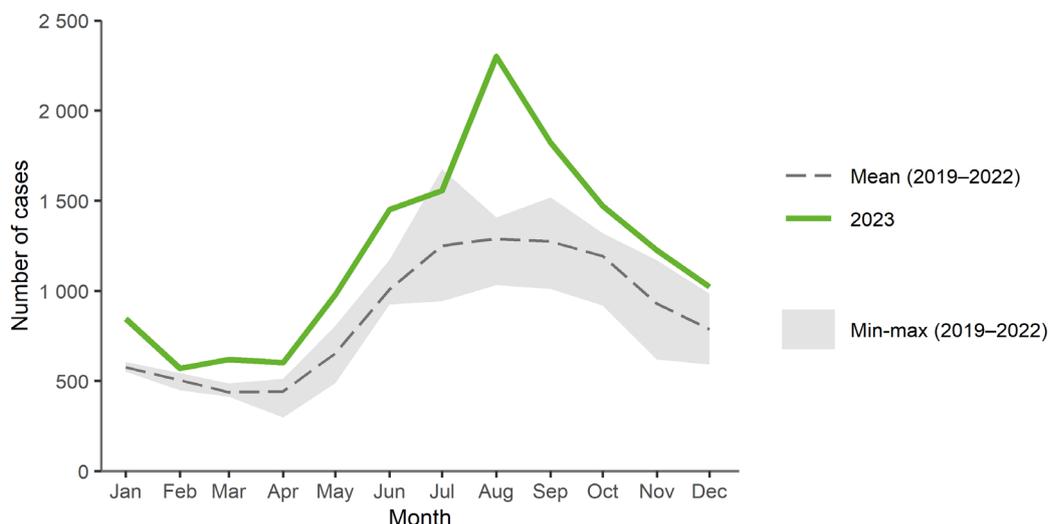
**Figure 2. Legionnaires' disease cases by month, EU/EEA, 2019–2023**



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

The distribution of cases per month (Figure 2) shows a seasonal trend, with most cases in the EU/EEA reported during the summer. The majority (8 621, 59%) of cases occurred between June and October, as in previous years (Figure 3). Except for the month of July, the distribution of cases per month under 2023 was consistently above the range and the peaks observed in the previous 4 years (Figure 3). The peak of 2 308 cases seen in August (representing 16% of annual total) was the highest monthly number recorded to date under EU/EEA surveillance and occurred in absence of any specific country outbreak event. The previous monthly maximum peak recorded was that of July 2021 with 1 676 (Figure 2 and 3), also representing 16% of total cases reported in that year.

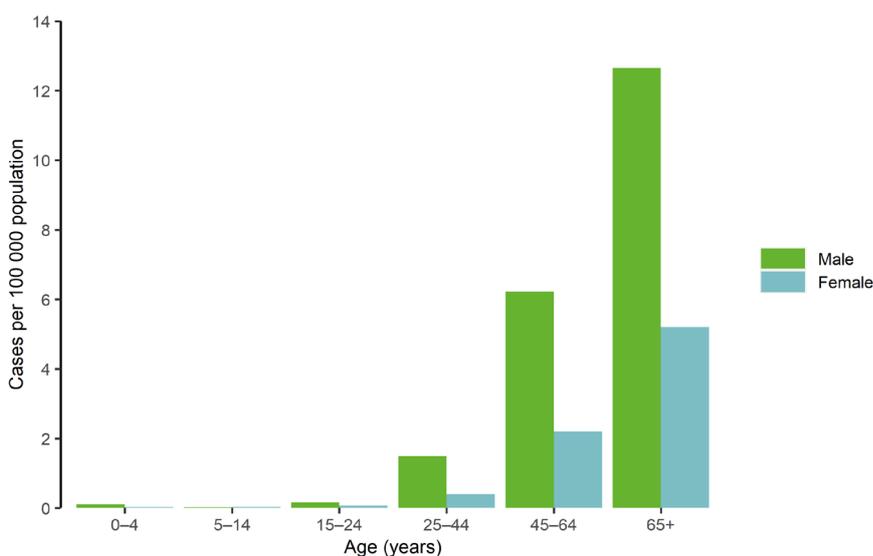
**Figure 3. Legionnaires' disease cases by month, EU/EEA, 2023 and 2019–2022**



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

In 2023, people aged 45 years and older accounted for 13 356 of 14 524 cases with known age (92%). The notification rate increased with age, from  $\leq 0.1$  cases per 100 000 population in those under 25 years of age to 8.5 cases per 100 000 population in persons aged 65 years and above (12.7 cases per 100 000 population in males and 5.2 in females, Figure 4). The overall male-to-female ratio remained stable compared to 2022 and was 2.2:1.

**Figure 4. Legionnaires' disease cases per 100 000 population, by age and gender, EU/EEA, 2023**



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

More than one test method may be used to establish a Legionnaires' disease diagnosis. Most cases in 2023 (1 541; 79%) were reported as diagnosed by urine antigen test (UAT). In comparison, few cases were reported having a culture test (1 416, 9.7%). This low percentage of culture reported to diagnose cases is also observed under 2019-2022 (range 10.1-11.0%). The use of polymerase chain reaction (PCR) method was reported for 12.7% (1 850) of cases in 2023 (2019-2022 range 10.1-13.5%).

Among culture-confirmed cases (1 416), 1 337 (94%) were reported as *L.pneumophila*. Table 2 further illustrates that although *Legionella pneumophila* isolates of all serogroups are detected and reported annually among culture-confirmed cases, over 80% are identified as serogroup 1.

**Table 2. Distribution of serogroups reported among culture-confirmed cases of *L. pneumophila*, EU/EEA, 2022 and 2023**

Serogroup (SG)	2022		2023	
	Number of cases	%	Number of cases	%
1	891	80	1 125	84
2	12	1	17	1
3	45	4	36	3
4	6	<1	2	<1
5	4	<1	8	<1
6	18	2	13	1
7	14	1	5	<1
8	4	<1	2	<1
9	1	<1	1	<1
10	6	<1	1	<1
11	0	-	0	-
12	0	-	0	-
13	0	-	2	<1
14	1	<1	0	-
15	1	<1	0	-
16	0	-	1	<1
Non-specified, <i>L. pneumophila</i> non-serogroup 1	8	<1	10	<1
<i>L. pneumophila</i> serogroup mixed	0	-	3	<1
<i>L. pneumophila</i> serogroup unknown	101	9	110	8
<b>TOTAL</b>	<b>1 112</b>		<b>1 337</b>	

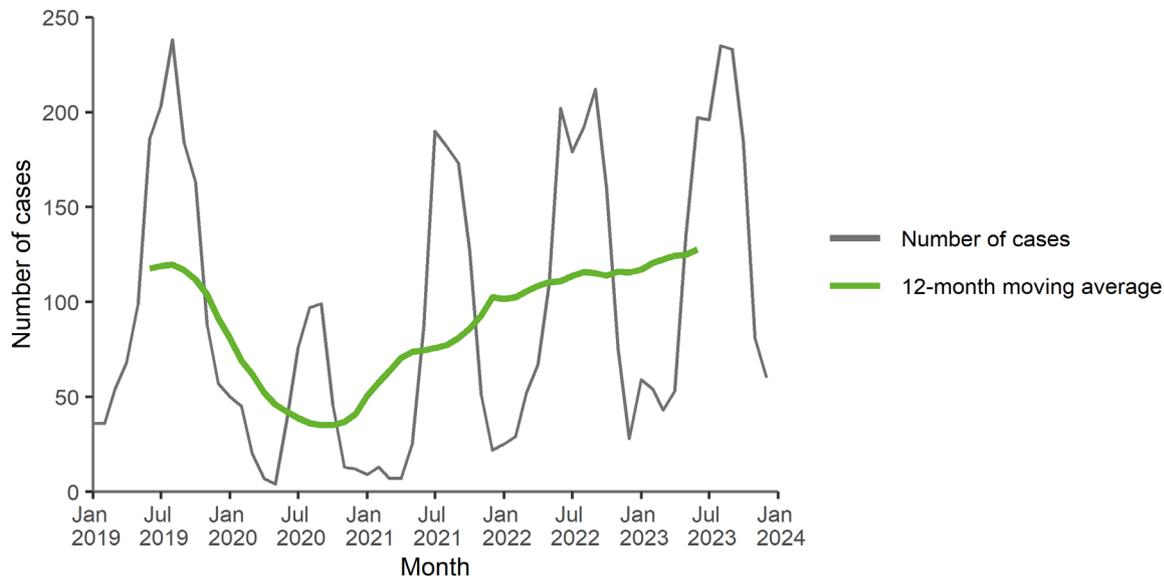
A total of 43 *Legionella* non-pneumophila species were reported (3%): *L. anisa* (3), *L. bozemanii* (4), *L. dumoffii* (1), *L. longbeachae* (29), *L. macaechernii* (1), *L. micdadei* (4), *L. saintelensi* (1), and *Legionella* other species (17). Of the 1 416 cases, 17 were reported as *Legionella* species unknown.

## Travel-associated Legionnaires' disease (TALD)

### TALD case reports

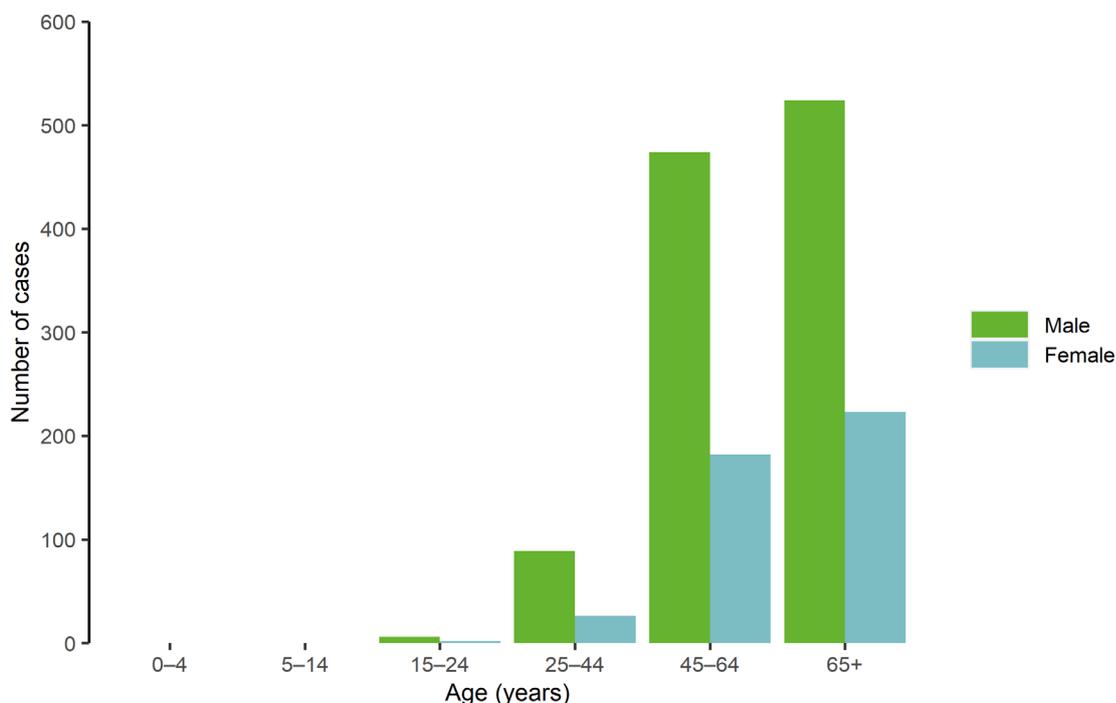
ELDSNet received reports of 1 501 cases of TALD with date of onset in 2023, more than in 2022 (1 291 cases) (Figure 5). This increase most likely reflects a return to pre-COVID-19 pandemic travel patterns.

**Figure 5. Travel-associated cases of Legionnaires' disease by month, EU/EEA, 2019-2023**



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, Slovakia, Slovenia, Spain, and Sweden.

**Figure 6. Travel-associated cases of Legionnaires' disease by age and gender, 2023**



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

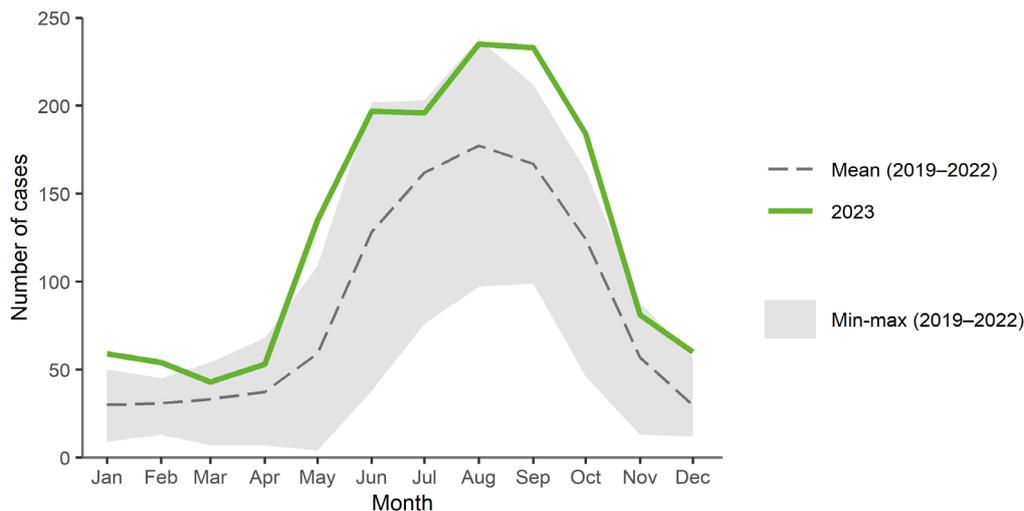
Cases were reported from 24 EU/EEA countries. The majority (72%; n=1 081) of all TALD cases were reported by only five countries: Germany (n=332; 22%), France (n=278; 19%), Italy (n=263; 18%), and the Netherlands (n=208; 14%).

A majority (71%; n=1 076) of reported TALD cases were male, which is consistent with previous years (72% in 2022, 68% in 2021) and that observed for all reported Legionnaires' disease cases. Cases had a median age of 64 years (IQR 18, range 16-99); 92% of cases occurred in people 45 years and older and no reports were made in people under the age of 15 years (Figure 6).

The median reporting time among countries (from date of illness onset to reporting to ELDSNet) was 16 days (IQR: 17 days) compared to 2022 (17 days, IQR: 20 days).

In 2023, most TALD cases fell ill between May and October (n=1 167; 85%). This was consistent with the known seasonality of Legionnaires' disease in Europe with the European summer (Figure 7).

**Figure 7. Travel-associated cases of Legionnaires' disease by month, EU/EEA, 2023 and 2019-2022**



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, Slovakia, Slovenia, Spain, and Sweden.

The disease outcome was provided for 693 (46%) TALD cases, with 15 (2.2%) known to have deceased by the time of reporting to ELDSNet. A total of 1 379 TALD cases (92%) were classified as confirmed; 122 (8%) were probable cases. More than one test method may be used to establish a Legionnaires' disease diagnosis. Of the 1 588 tests reported for the 1 379 TALD cases, 97% (1 336) cases were diagnosed including a UAT method, 13% (184) include a PCR test and 4% (58) had a culture test.

Most cases were reported as *Legionella pneumophila* serogroup 1 (1 309; 91%), with an additional 104 (7%) as *L. pneumophila* serogroup unknown. Few cases were infected with other *Legionella pneumophila* serogroups including serogroup 10 (two cases), serogroup 3 (two cases), serogroup 7 (one case), and non-serogroup 1 *Legionella pneumophila* (11 cases).

## TALD case travel destinations

TALD case destinations reflect trends in European travel and do not necessarily infer that the country nor the site was the source of infection.

In 2023, the 1 501 TALD cases made a total of 2 107 accommodation visits. Of these, 1 671 (79%) were within the EU/EEA, 411 (20%) were outside the EU/EEA, and 25 (1.1%) were on ships. The three destination countries with most TALD-associated visits were Italy (629, 30%), France (280, 13%), and Spain (233, 11%). Outside of the EU/EEA, the three destination countries with most TALD-associated visits were Türkiye (71, 3%), Mexico (44, 2%) and Thailand (44, 2%). By accommodation type, 78 percent (2 163) of the overnight stays were in hotels, 10% (207) were in campsites, 8% (170) were in commercial rentals, 1% (25) on ships, 3% (59) through online short rentals and 1% (32) were reported as other types of accommodation.

In 2023, ELDSNet detected 140 new TALD clusters. A TALD cluster is the event of two cases having visited the same accommodation site within a two-year period [4]. The clusters were associated with accommodations in 28 countries worldwide (14 within the EU/EEA and 14 outside the EU/EEA).

## Outbreaks

In 2023, through the annual outbreak reporting surveillance scheme, seven EU/EEA countries (Belgium, France, Germany, Lithuania, the Netherlands, Portugal, and Spain) reported at least one outbreak, and 15 countries did not detect any outbreak (Bulgaria, Denmark, Estonia, Finland, Greece, Iceland, Ireland, Italy, Latvia, Liechtenstein, Luxembourg, Malta, Norway, Romania, and Slovakia). Eight countries did not report data. The seven countries reporting outbreaks identified a total of 39 community- or hospital-acquired outbreaks, ranging from one to 24 outbreaks per reporting country. In total, 368 outbreak-related confirmed cases were reported, and the number of cases per reported outbreak ranged from three to 37 confirmed cases.

Three of the total 39 outbreaks were reported in association with a hospital, and two in a prison or similar institution. A cooling tower was found to be the source in one outbreak and the suspected source in four additional outbreaks. One outbreak with 23 cases in the Netherlands was associated with a specific type of water heater used in private homes. In total, a source was reported found in 10% of outbreaks (4/39).

## Discussion

The notification rate of Legionnaires' disease increased in 2023, reaching the highest notification rate reported in the last decade. This indicates a return to an increasing trend in Legionnaires' disease in the EU as observed in the years prior to the COVID-19 pandemic [5].

The cause for the higher notification rates observed in Europe in recent years remains unknown. Factors affecting this include changes in national testing policy and surveillance systems, an ageing EU/EEA population, the design and infrastructure maintenance in building water systems, and changes in climate and weather patterns across Europe and worldwide. All these factors can have an impact on both the ecology of *Legionella* in the environment and causes of exposure to water aerosols containing the bacteria.

Several 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 and the countries reporting the highest notification rates continue to be similar each year. The higher notification rates observed in these EU/EEA countries likely reflect a good awareness and testing approach for Legionnaires' disease in pneumonia patients but also likely reflect an increasing exposure risk from environmental sources driven by different factors such as climate and building infrastructures.

Main characteristics of Legionnaires' disease cases reported in 2023 were like those observed in 2022, with most cases being sporadic and from sources in the built or population-related environment (community-acquired) and the disease mostly affecting males aged 65 years and above. However, notification rates in older age groups among males and females are increasing. The type of tests reported continue to be dominated by rapid tests and particularly urine antigen testing, though surveillance systems may bias this observation considering the need for a timely reporting in national surveillance systems for public health action and the inclusion of at least one laboratory method for the surveillance case definition.

As fewer than 10% of cases are reported with a culture-confirmed diagnosis there is likely an underestimation of the burden of disease caused by *Legionella* species across the EU/EEA other than by *Legionella pneumophila*. As some *Legionella* non-pneumophila species are more associated with sources such as soil or compost mix, these Legionnaires' disease cases may go undetected leading to a reduced possibility for prevention action.

Legionnaires' disease outbreaks were reported by a third of EU/EEA countries in 2023, which was proportionally the same as previous years (approximately one third of countries had reported at least one outbreak between 2016 and 2021) but more than in 2022. However, the number of confirmed cases associated with outbreaks was 368, which was nearly double the average of the previous years (2016-2022, 209 cases). The identification of a source was reported in only 10% of outbreaks, fewer than reported in 2022. Challenges remain in identifying and controlling potential sources of *Legionella* bacteria in outbreak situations.

## Public health implications

EU/EEA notification rates for Legionnaires' disease were already rising in the years prior to the pandemic, and this continued in 2023 to reach 3.4 cases per 100 000 population. However, uncertainty remains regarding the true incidence of Legionnaires' disease in the EU/EEA.

Notification rates vary across EU/EEA countries, and the same four countries annually continue to report most cases. Over half of the EU/EEA countries report comparatively low notification rates. It is difficult to assess whether these differences reflect different population risks or disease prevention and control efforts, or under-diagnosis of the disease in some countries. It remains a priority for ECDC to assist all EU/EEA countries in improving both the diagnosis and reporting of Legionnaires' disease to public health authorities. Differential diagnosis in pneumonia cases to include Legionnaires' disease may be relevant.

Outbreaks of Legionnaires' disease with varying size and cause, continue to be identified and investigated by public health authorities in EU/EEA countries. The relatively high mortality among Legionnaires' disease cases reported in the EU/EEA (9% identified in 2023) means it remains important to detect and report cases and identify possible outbreaks to reduce the disease burden. Implementation of the recast EU directive on the quality of water intended for human consumption [6] contributes to Member States' assessment and monitoring for *Legionella* in priority buildings and drinking water distribution systems that may lead to aerosol sources.

The detection of TALD clusters through the ELDSNet surveillance scheme leads to investigations and preventive actions at accommodation sites by participating countries. Regular checks for the presence of *Legionella* bacteria and appropriate control measures applied to engineered water systems may prevent cases of Legionnaires' disease at tourist accommodation sites and other buildings or structures at higher risk for *Legionella* growth [7]. An understanding of the effect of climate change on factors that may influence the abundance of *Legionella* bacteria in engineered water systems and exposure risks to populations susceptible to disease is of increasing public health relevance.

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