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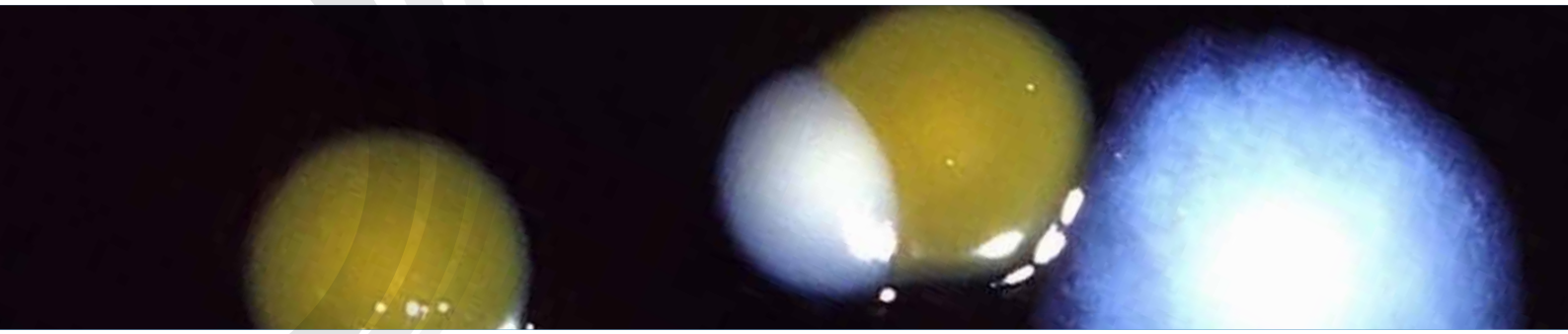

Legionnaires' disease in Europe

2013

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This report of the European Centre for Disease Prevention and Control (ECDC) was coordinated by Julien Beauté and Emmanuel Robesyn.

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Acknowledgements
We would like to thank all ELDSNet members for their hard work and dedication in reporting national Legionnaires' disease data and reviewing this report:
Gabriela El Belazi, Christine Hain, Robert Muchl, Daniela Schmid, Reinhild Strauss, Günther Wewalka (Austria), Olivier Denis, Sophie Maes, Denis Piérard, Sophie Quoilin (Belgium); Lili Marinova, Iskra Tomova (Bulgaria); Ioanna Gregoriou, Avgi Hadjilouka, Despo Pieridou Bagatzouni (Cyprus); Vladimir Drasar, Irena Martinkova (Czech Republic); Kåre Mølbak, Søren Anker Uldum (Denmark); Irina Dontsenko, Rita Peetso (Estonia); Outi Lyytikäinen, Silja Mentula (Finland); Dounia Bitar, Christine Campese, Didier Che, Sophie Jarraud (France); Bonita Brodhun, Christian Lück (Germany); Georgia Spala, Emanuel Velonakis (Greece); Judit Krisztina Horváth, Katalin Kaszas, Ildikó Ferenczné Paluska (Hungary); Haraldur Briem, Guðrún Sigmundsdóttir, Olafur Steingrimsson (Iceland); Mary Hickey, Tara Kelly, Joan O'Donnell (Ireland); Maria Grazia Caporali, Maria Luisa Ricci, Maria Cristina Rota (Italy); Jelena Galajeva (Latvia); Migle Janulaitiene, Simona Zukauskaite-Sarapajeviene (Lithuania); Paul Reichert (Luxembourg); Zahra Graziella, Jackie Maistre Melillo, Tanya Melillo Fenech (Malta); Petra Brandsema, Ed Ijzerman, Leslie Isken, Daan Notermans, Wim Van Der Hoek (Netherlands); Katrine Borgen, Dominique A. Caugant, Karin Ronning (Norway); Hanna Stypulkowska-Misiurewicz (Poland); Teresa Maria Alves Fernandes, Teresa Marques (Portugal); Daniela Badescu, Gratiana Chicin (Romania); Danka Simonyova, Margita Spalekova (Slovak Republic); Darja Kese, Maja Sočan (Slovenia); Rosa Cano-Portero, Carmen Pelaz Antolin (Spain); Sabina Andersson, Margareta Löfdahl (Sweden); Oliver Blatchford, Martin Donaghy, Giles Edwards, Tim Harrison, Falguni Naik, Nick Phin, Alison Potts, Brian Smyth (United Kingdom), Camilla Croneld, Catia Cunha, Birgitta de Jong, Lara Payne Hallström, Mikhail Nikiforov, Johanna Takkinen, Dana Ursut (ECDC).

Suggested citation: European Centre for Disease Prevention and Control. Legionnaires' disease in Europe, 2013. Stockholm: ECDC; 2015.

Stockholm, April 2015

ISBN 978-92-9193-631-1

doi 10.2900/203078

Catalogue number TQ-02-15-290-EN-N

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Abbreviations

CFR	Case–fatality ratio
CI	Confidence interval
ECDC	European Centre for Disease Prevention and Control
EEA	European Economic Area
ELDSNet	European Legionnaires' Disease Surveillance Network
ESCMID	European Society of Clinical Microbiology and Infectious Diseases
ESGLI	ESCMID Study Group for Legionella Infections
EU	European Union
EWGLI	European Working Group for *Legionella* Infections
IQR	Interquartile range
LD	Legionnaires' disease
MAb	Monoclonal antibodies
NUTS	Nomenclature of Territorial Units for Statistics
PCR	Polymerase chain reaction
PR	Prevalence ratio
TALD	Travel-associated Legionnaires' disease
TESSy	The European Surveillance System
UAT	Urinary antigen test

Executive summary

This surveillance report is based on surveillance data for Legionnaires' disease (LD) collected for 2013. Surveillance is carried out by the European Legionnaires' Disease Surveillance Network (ELDSNet) and coordinated by the European Centre for Disease Prevention and Control (ECDC) in Stockholm. Data for all European countries were collected by nominated ELDSNet experts and electronically reported to The European Surveillance System (TESSy) database.

Surveillance data were collected from two different schemes: the first scheme covers all cases reported from European Union (EU) Member States, Iceland and Norway; the second scheme covers all travel-associated cases of Legionnaires' disease (TALD), including reports from countries outside the EU/EEA.

The aims of these two schemes differ. The main objectives for collecting data on all nationally reported cases of LD are:

- to monitor trends over time and compare them across Member States;
- to provide evidence-based data for public health decisions and actions at EU and/or Member State level;
- to monitor and evaluate prevention and control programmes targeting LD at national and European levels; and
- to identify population groups at risk who are in need of targeted preventive measures.

The surveillance of TALD aims primarily at identifying clusters of cases that may otherwise not have been detected at the national level, and at enabling timely investigation and control measures at the implicated accommodation sites in order to prevent further infections.

All notified cases

For 2013, 5 851 cases of LD were reported by 28 EU Member States and Norway. The number of notifications per million inhabitants was 11.4, well within the 2005–2012 range. Six countries (France, Italy, Spain, Germany, the Netherlands and the United Kingdom) accounted for 83% of all notified cases. The number of notifications ranged from below 0.1 per million inhabitants in Bulgaria to 39.4 per million in Slovenia. Most cases were community-acquired (73%), 19% were travel-associated, and 8% were linked to healthcare facilities. People over 50 years of age accounted for 81% of all cases. The male-to-female ratio was 2.4:1. The case-fatality ratio was 10% in 2013, similar to previous years. Most cases (88%) were confirmed by urinary antigen test, but an increasing proportion of cases are reported to have been diagnosed by PCR. *L. pneumophila* serogroup 1 was the most commonly identified pathogen, accounting for 83% of culture-confirmed cases.

Priority should be given to assist countries with notification rates below one case per million inhabitants in order to improve both diagnosis and reporting of LD. The impact of the increasing use of PCR should be evaluated.

Travel-associated Legionnaires' disease

For 2013, 787 cases of TALD were reported by 30 EU/EEA countries, Canada, Israel, Thailand, Turkey, and the United States. This was 5% lower than the 831 cases reported in 2012, continuing a slightly decreasing trend since 2007. Five countries (France, Italy, the Netherlands, Spain, and the United Kingdom) reported three quarters of all TALD cases. The male-to-female ratio of 2.4:1 and the median age of 63 years were almost identical to the corresponding values in 2012. A total of 110 standard clusters[1] were detected in 2013, 10 percent more than in the previous year. Unlike previous years, when large travel-associated clusters were reported for Italy and Spain, there were no such large clusters in 2013. The names of two accommodation sites were published on the ECDC website after the national contact point indicated that control measures were inadequate.

In 2013, at least 58% of all detected standard clusters of travel-associated Legionnaires' disease would have been very unlikely to be detected without the international collaboration in ELDSNet.

[1] Clusters associated with only one accommodation site.

1 Background

Legionnaires' disease (LD) is a severe and sometimes fatal form of infection with *Legionella* spp. These gram-negative bacteria are found in freshwater and soil worldwide and tend to contaminate man-made water systems [1]. The disease was first described and named after a large outbreak among members of a US organisation of war veterans (American Legion) in the 1970s [2]. LD is not transmitted from person to person but through inhalation of contaminated aerosols or aspiration of contaminated water. LD is classically described as a severe pneumonia that may be accompanied by systemic symptoms such as fever, diarrhoea, myalgia, impaired renal and liver functions, and delirium. Known risk factors for LD include increasing age, male gender, smoking, chronic lung disease, diabetes and various conditions associated with immunodeficiency [3]. In Europe, most cases (approximately 70%) are community-acquired and sporadic [4]. Studies suggest that the incidence of LD may be higher under certain environmental conditions such as warm and wet weather [5–10].

Legionnaires' disease is notifiable in all EU and EEA countries, but is thought to be underreported for two main reasons. Firstly, it is underdiagnosed by clinicians who only rarely test patients for LD before empirically prescribing broad-spectrum antibiotics that are likely to cover *Legionella* spp. Secondly, some health professionals fail to notify cases to health authorities [1].

The situation in Europe is therefore heterogeneous, with a broad range of notification rates across countries reflecting both the sensitivity of the national surveillance system and the local risk for LD. Some countries (e.g. France, Italy or the Netherlands) have already assessed their systems' sensitivity, mainly through capture–recapture studies, and showed improvement over time [11–14]. For other countries such as Greece, a study using TALD notification and tourism denominator data strongly suggested substantial under-ascertainment [15]. In eastern and south-eastern countries (e.g. Bulgaria, Poland or Romania), the numbers of cases reported have remained very low and are unlikely to reflect the true burden of LD. Differences in laboratory practice may also partly explain these differences in notification rates [16–18].

Since 2010, the surveillance of LD in Europe has been operated by ELDSNet under the auspices of ECDC. Two distinct LD surveillance systems are currently in place. One is based on annual passive reporting of all LD cases, the other one on daily reporting of TALD cases. Since some countries are unable to link the TALD cases reported daily with those reported annually, it is not possible to merge the two databases.

The first annual Legionnaires' disease surveillance report published by ECDC reported on data collected in 2009 [19]. This is the fifth annual report presenting the analysis of disaggregated LD surveillance data in Europe and the fourth annual report covering both surveillance systems [16–18].

2 Methods

2.1 The European Legionnaires' Disease Surveillance Network

ELDSNet consists of 28 EU Member States, Iceland and Norway. The network aims to identify relevant public health risks, enhance prevention of cases through the detection of clusters, and monitor epidemiological trends. The latter objective includes the annual collection, analysis and reporting of all LD cases reported during the previous year.

2.2 Data collection

2.2.1 Legionnaires' disease (comprehensive notifications)

National data collected by nominated ELDSNet members in each European country were electronically reported to the TESSy database following a strict protocol. The deadline for 2013 data submission was 1 May 2014. Following data validation and cleaning, data for analysis were extracted on 1 July 2014. All LD cases in 2013 meeting the European case definition (see box below) were included. This case definition was amended in August 2012, and it is no longer possible to report probable cases with an epidemiological link only. TALD cases with a history of travelling abroad were reported by their country of residence. Cases were classified as travel-associated if they stayed at an accommodation site away from home during their incubation period (two to ten days prior to falling ill). Cases were reported as having formed part of a cluster if they were exposed to the same source as at least one other case with their dates of onset within a plausible time period.

EU case definition of Legionnaires' disease [20]

Clinical criteria

Any person with pneumonia

Laboratory criteria for case confirmation

At least one of the following three:

- Isolation of *Legionella* spp. from respiratory secretions or any normally sterile site
- Detection of *Legionella pneumophila* antigen in urine
- Significant rise in specific antibody level to *Legionella pneumophila* serogroup 1 in paired serum samples.

Laboratory criteria for a probable case

At least one of the following four:

- Detection of *Legionella pneumophila* antigen in respiratory secretions or lung tissue, e.g. by DFA staining using monoclonal-antibody-derived reagents
- Detection of *Legionella* spp. nucleic acid in respiratory secretions, lung tissue or any normally sterile site;
- Significant rise in specific antibody level to *Legionella pneumophila* other than serogroup 1 or other *Legionella* spp. in paired serum samples
- Single high level of specific antibody to *Legionella pneumophila* serogroup 1 in serum.

Case classification

Probable case: Any person meeting the clinical criteria AND at least one positive laboratory test for a probable case.

Confirmed case: Any person meeting the clinical AND the laboratory criteria for case confirmation.

2.2.2 Travel-associated Legionnaires' disease

Individual cases of TALD are reported to ECDC on a daily basis via TESSy. The reporting country is generally the country where the case is diagnosed. Therefore, the reporting country can differ from the case's country of residence. Case reports include age, sex, date of onset of disease, method of diagnosis and travel information for the different places where the case had stayed from two to ten days prior to onset of disease. Only cases who stayed at a commercial accommodation site are reported (as opposed to cases of LD who stayed with relatives or

friends). After receiving the report, each new case is classified as a single case or as part of a cluster, according to the definitions agreed upon by the network:

- a single case: a person who stayed at a commercial accommodation site in the two to ten days before onset of disease; the site has not been associated with any other case of Legionnaires' disease in the previous two years.
- a cluster: two or more cases who stayed at the same commercial accommodation site in the two to ten days before onset of disease, and whose onsets were within the same two-year period.

A clustering of three cases or more, with onset of disease within a three-month period, is called a 'rapidly evolving cluster' and a summary report is sent to tour operators. When a cluster is detected, an investigation by public health authorities is required at the accommodation site and preliminary results from the risk assessment and initiation of control measures should be reported back to ELDSNet by nationally nominated contact points, within two weeks of the alert, using the preliminary form (Form A). A final form (Form B) is then used to report – within a further four weeks – the final results of environmental sampling and control measures, allowing six weeks in total for all investigations to be completed. If the forms are not returned within the given deadlines, or if they contain unsatisfactory actions and control measures, ECDC publishes the details of the accommodation site associated with the cluster on its website, and informs tour operators about the accommodation site being made public. If a cluster is associated with more than one accommodation site, it is considered a 'complex cluster', and all sites within this cluster are subject to the same investigations as described above.

2.2.3 Event-based surveillance

ECDC identifies and monitors health threats through epidemic intelligence activities through a broad range of formal and informal sources on a daily basis. Threat detection is based on a standard protocol, and threats are documented in a dedicated database. Experts evaluate and select threats that may require further attention from the nationally nominated contact points and surveillance systems, depending on their importance and potential impact on the health of EU citizens. More details on tools used for threat detection and threat communication can be found on an ECDC webpage dedicated to epidemic intelligence [22].

2.3 Data analysis

2.3.1 Legionnaires' disease (comprehensive notifications)

Cases which were reported without specifying the laboratory method were excluded from the analysis. Since countries use various dates for national statistical purposes, TESSy collects the so-called 'date used for statistics', which can be the date of onset, diagnosis or notification. Only cases with a date used for statistics in 2013 were included in the analysis. Since environmental investigations are the responsibility of the Member States, we only analysed variables relating to investigations in domestic cases.

The distribution of all cases and subsets with a fatal outcome were described by relevant independent variables. Continuous variables were summarised as medians with interquartile ranges (IQRs [Q1–Q3]) and compared across strata by using the Mann-Whitney U test. Prevalence ratios were calculated to test possible associations between categorical variables. Prevalence ratios are presented with their 95% confidence intervals, assuming a Poisson distribution. Age-standardised rates were calculated using the direct method and the average age structure of the EU population for the period 2000–2010.

A linear regression was performed to assess the trend.

To identify outliers, a cyclic regression of cases by week of onset was carried out (log transformation, 52 weeks periodicity).

2.3.2 Travel-associated Legionnaires' disease

We analysed the TALD data reported on a daily basis at the level of cases, travel visits and accommodation sites, and clusters. All reported cases with a date of onset in 2013 and travel records were included in the analysis. When the country of residence was identical to the destination country, travel was considered domestic. We analysed the temporal and geographic distribution of TALD cases. Standard cluster frequencies in the EU/EEA were mapped at level 2 of the Nomenclature of Territorial Units for Statistics (NUTS 2).

3 Results

3.1 Legionnaires' disease (comprehensive notifications)

3.1.1 Cases

Case validation and data completeness

For 2013, 6 012 cases were reported by 29 countries. One hundred and sixty-one cases were excluded from analysis because they were reported without laboratory method. The remaining 5 851 cases were included in the analysis.

Overall, data completeness[2] was similar to previous years (Table 1). Since 2008, an increasing proportion of cases with known outcome or place of residence has been reported. Conversely, the proportion of clustered cases reported with a cluster ID has been decreasing over the years, reaching its lowest point in 2013.

Table 1. Completeness of reporting for Legionnaire' disease cases, selected variables, EU/EEA countries, 2009–2013

Variable	2009 %	2010 %	2011 %	2012 %	2013 %
Date of onset (complete date)	96	95	97	98	95
Outcome (not reported as unknown)	68	69	70	71	77
Cluster (not reported as unknown)	70	63	60	72	71
Cluster ID [a] (not missing)	>99	83	98	85	54
Probable country of infection [b] (not missing)	97	93	94	92	93
Place of residence (not missing)	21	30	35	36	44
Sequence type (not missing)	1	1	3	4	4
Setting of infection (not missing or reported as unknown)	89	89	87	88	89
Environmental investigation (not reported as unknown)	40	33	37	43	55
Legionella found [c] (not missing or reported as unknown)	94	96	92	90	98
Positive sampling site [d] (not missing or reported as unknown)	85	73	83	77	94

[a] *Completeness of cases reported as part of a cluster*

[b] *Completeness of cases reported as imported*

[c] *Completeness of cases reported to have prompted an environmental investigation*

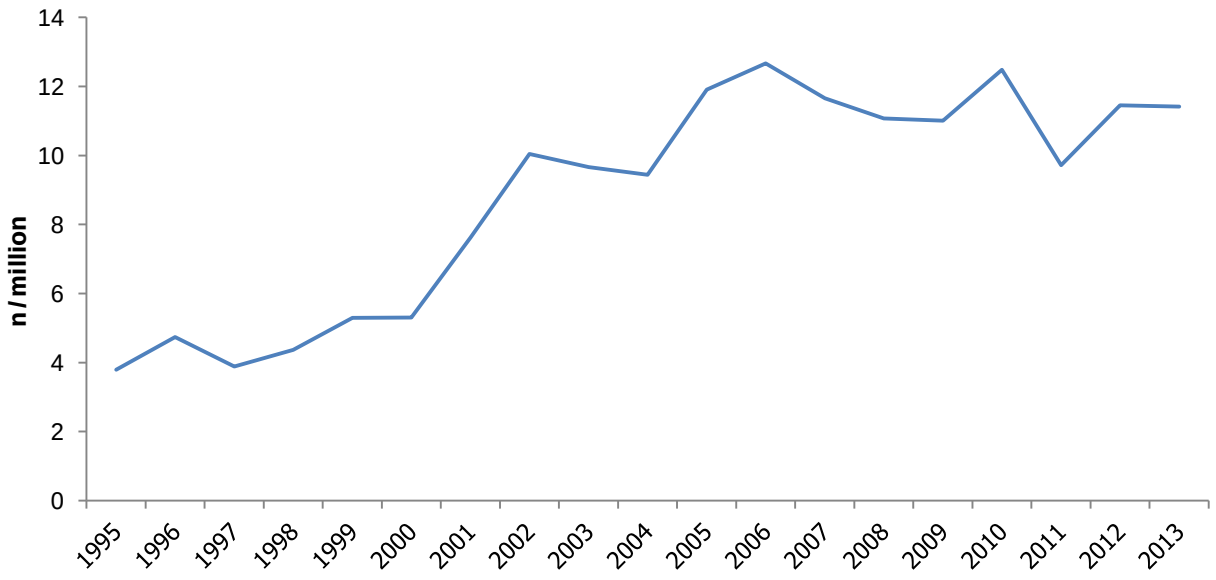
[d] *Completeness of cases for which positive findings in an environmental investigation were reported*

Case classification and notification rate

Of the 5 851 notified cases, 5 422 (93%) were classified as confirmed, and the remaining 429 (7%) as probable. Of 429 probable cases, 175 (41%) were reported by Germany. Estonia and Latvia had a large proportion of probable cases (70% and 62%, respectively). The number of notifications per million inhabitants was 11.4 in 2013, which was well within the 2005–2012 range (Figure 1).

[2] Data completeness was calculated at time of analysis. Since reporting countries have the possibility to update their data, completeness for earlier years might differ from what was presented in previous reports.

Figure 1. Notification rate of Legionnaires' disease in the EU/EEA* by year of reporting, 1995–2013



* EWGLINET member countries outside the EU/EEA were excluded for 1995–2008.

Seasonality and geographical distribution

Date of onset was reported for 5 518 cases in 2013. The distribution of cases by month of onset showed a peak during the warm season, with 38% of all cases reported between August and October (Figure 2). A slightly increasing linear trend was observed over the 2008–2013 period (p=0.03) (Figure 3). In 2013, weekly numbers of cases were within the expected values suggested by the cyclic regression model (Figure 4).

Figure 2. Reported cases of Legionnaires' disease by month of onset, EU/EEA, 2008–2013

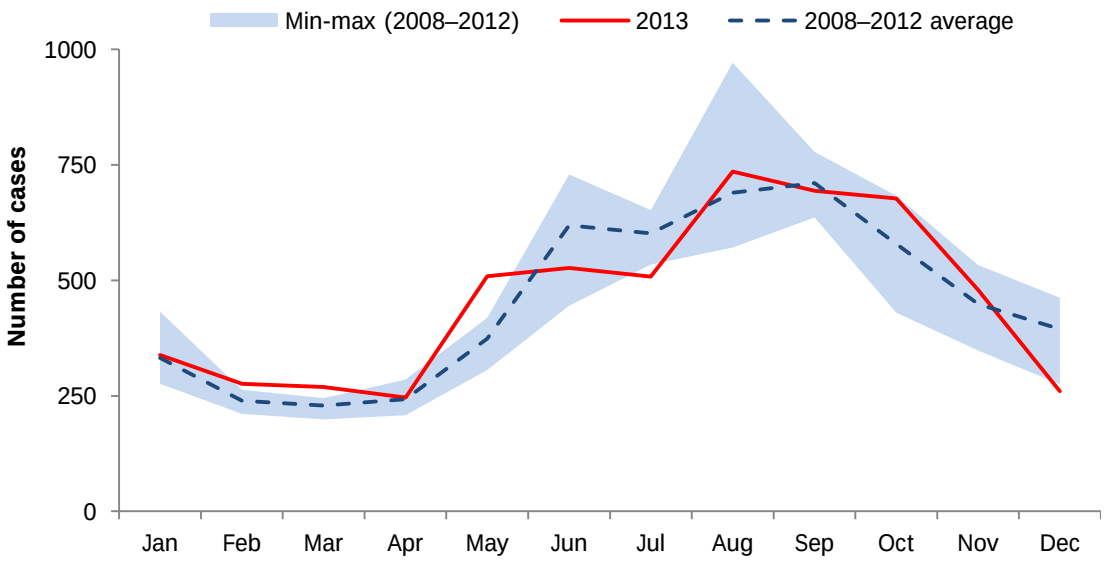


Figure 3. Reported cases of Legionnaires' disease by month of onset, EU/EEA, 2008–2013

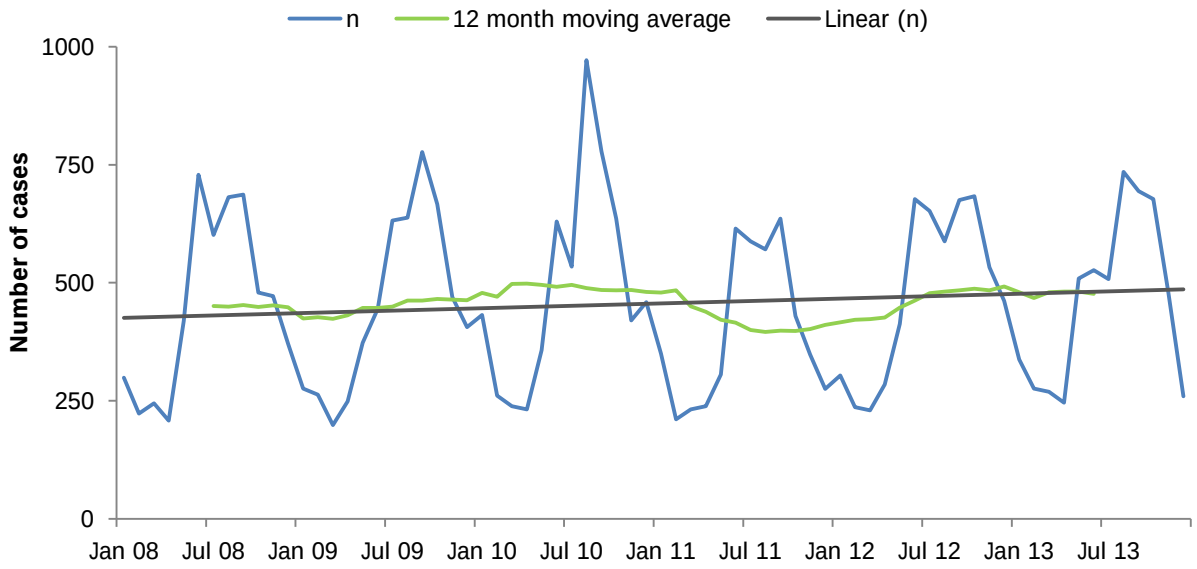
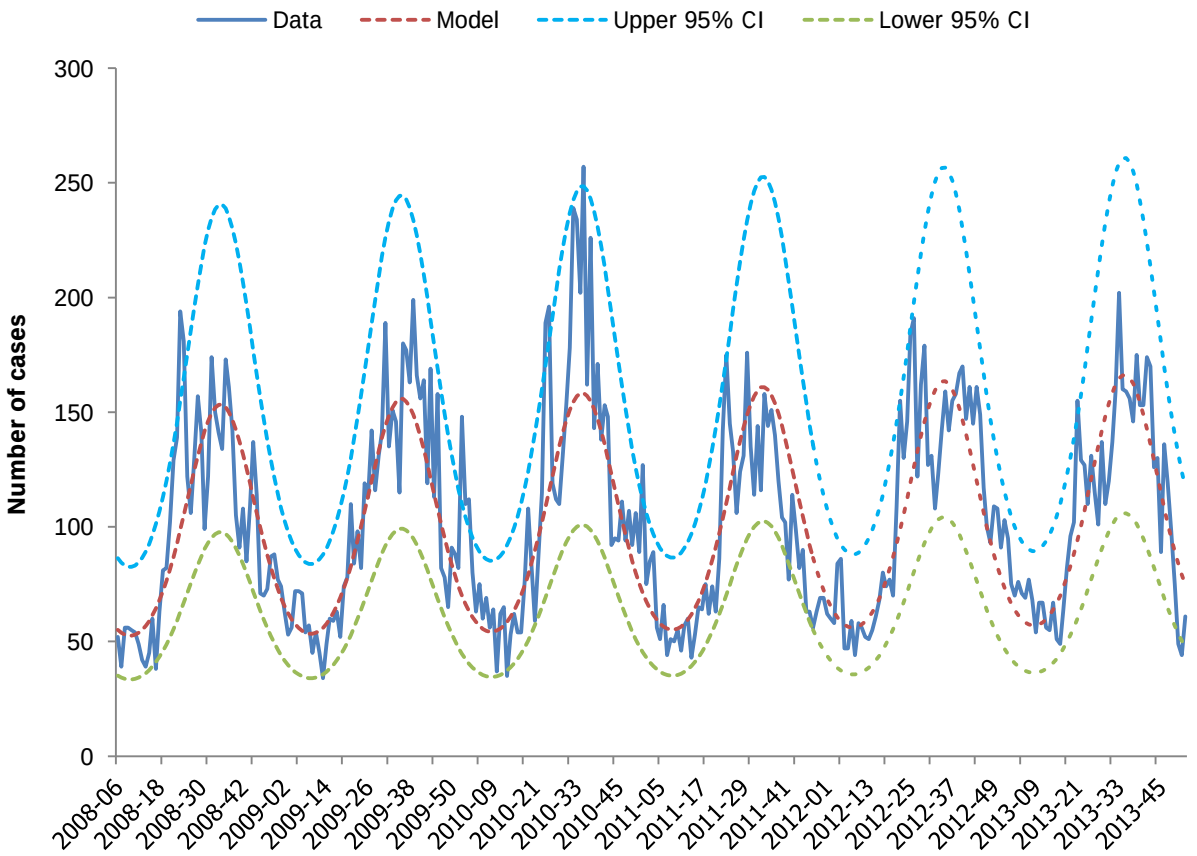


Figure 4. Reported cases of Legionnaires' disease by week of onset and cyclic regression model, EU/EEA, 2008–2013



Country-specific notification rates ranged from 0 per million inhabitants in Bulgaria to 37.4 per million in Slovenia (Figure 5 and Table 2). The three largest reporting countries (France, Italy and Spain) accounted for 58% of cases, and the six largest countries (France, Italy, Spain, Germany, the Netherlands and the United Kingdom) together reported 83% of cases. Conversely, the 15 smallest reporting countries merely accounted for 3% of all cases (Figure 5 and Table 2).

The proportion of cases reported by the three largest countries was at its lowest since 2008 when it peaked at 66%. Conversely, notification rates have substantially increased in some countries, for example Estonia, Latvia, and Slovenia. Age-standardised notification rates did not differ substantially from crude notification rates (Table 2).

Figure 5. Reported cases and notifications of Legionnaires' disease per million, by reporting country, EU/EEA, 2013

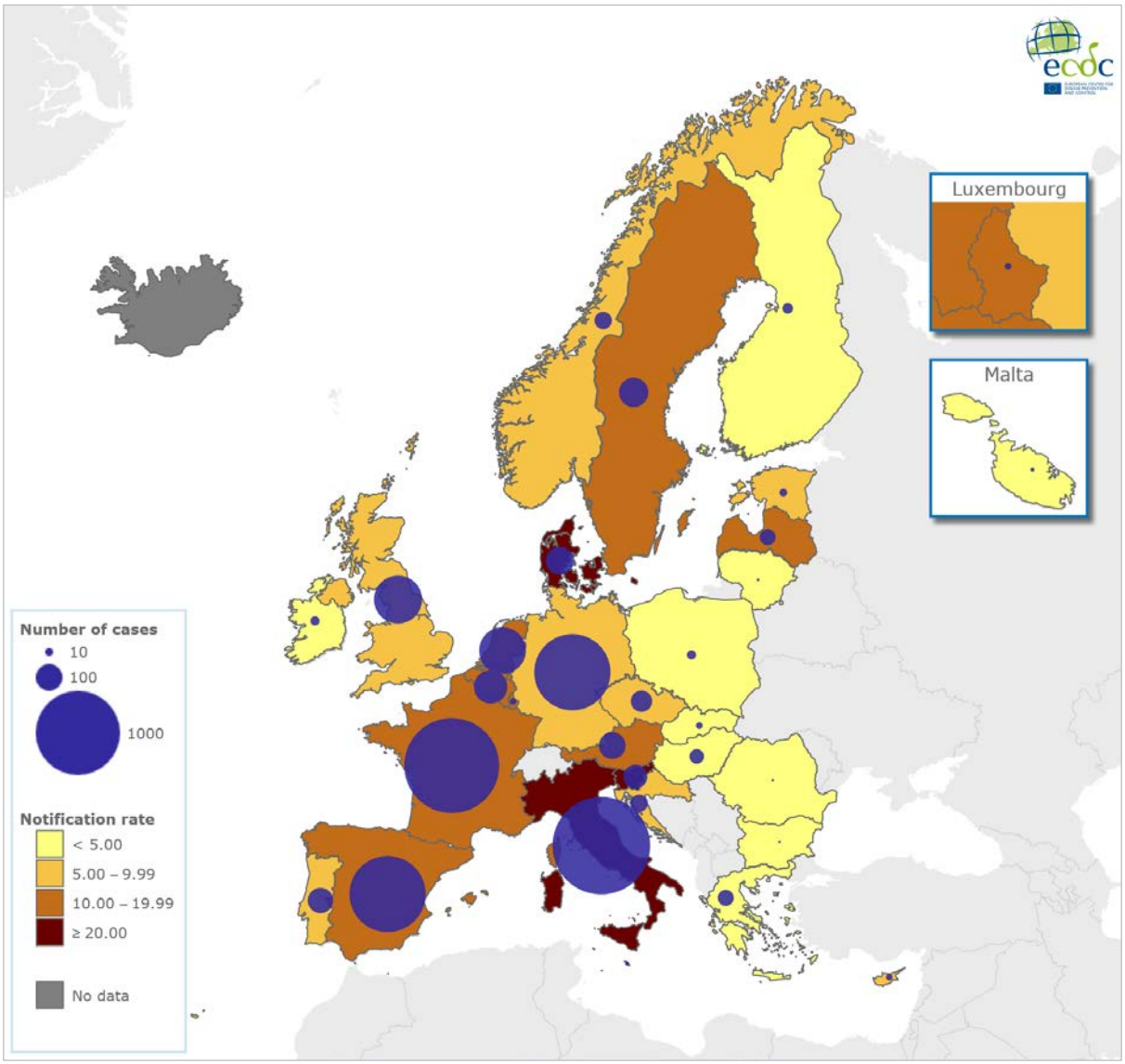


Table 2. Reported cases and notifications of Legionnaires' disease per million, by reporting country, EU/EEA, 2013

Country	Cases[a] (n)	Population (n)	Notification rate (n/million)	Average notification rate 2008–12 (n/million)	Age-standardised notification rate (n/million)
Austria	100	8 451 860	11.8	11.3	10.9
Belgium	151	11 161 642	13.5	6.5	12.9
Bulgaria	1	7 284 552	0.1	0.1	0.1
Croatia	41	4 195 881	9.8	0.0	9.1
Cyprus	6	865 771	6.9	5.4	7.4
Czech Republic	67	10 515 394	6.4	3.5	6.1
Denmark	115	5 602 628	20.5	23.0	19.4
Estonia	10	1 320 174	7.6	3.4	7.3
Finland	15	5 426 674	2.8	3.0	2.5
France	1 262	65 558 428	19.3	20.0	18.7

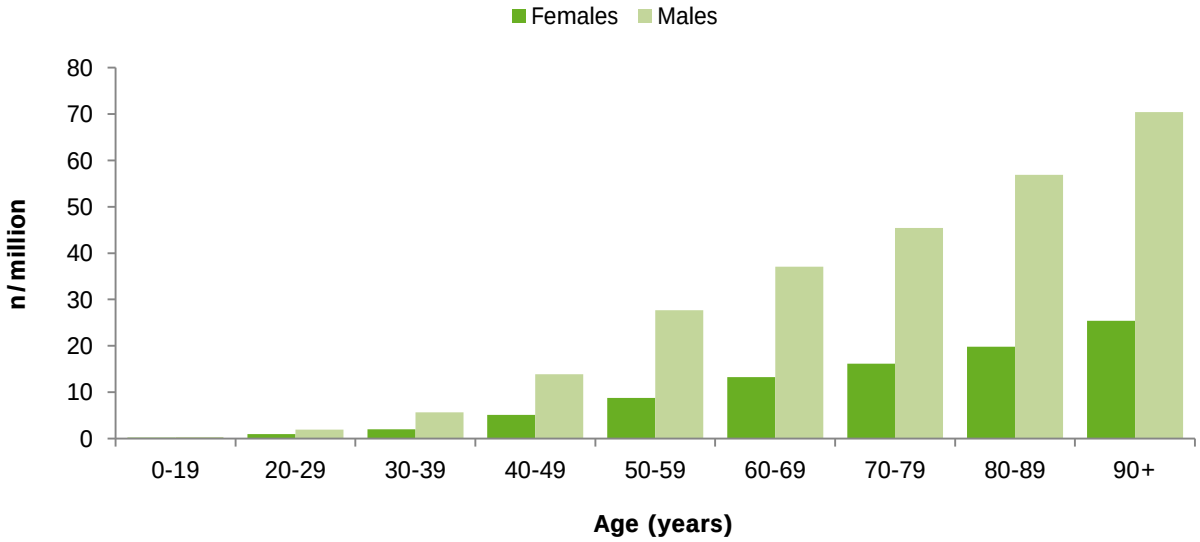
Country	Cases[a] (n)	Population (n)	Notification rate (n/million)	Average notification rate 2008–12 (n/million)	Age-standardised notification rate (n/million)
Germany	805	81 835 450	9.8	7.3	8.5
Greece	38	11 062 508	3.4	1.7	3.2
Hungary	29	9 860 935	2.9	4.5	2.9
Ireland	14	4 591 087	3.0	2.3	3.6
Italy	1 345	59 685 227	22.5	19.9	19.4
Latvia	34	2 023 657	16.8	10.7	16.5
Lithuania	1	2 971 511	0.3	1.5	0.3
Luxembourg	7	537 039	13.0	12.3	12.5
Malta	2	421 364	4.7	12.5	4.6
Netherlands	308	16 779 575	18.4	20.1	17.5
Norway	40	5 051 275	7.9	7.3	8.1
Poland	11	38 529 513	0.3	0.4	0.3
Portugal	94	10 484 679	9.0	8.7	8.3
Romania	1	20 019 041	<0.1	0.1	0.0
Slovakia	6	5 410 836	1.1	0.9	1.2
Slovenia	77	2 058 597	37.4	28.8	34.8
Spain	811	46 727 890	17.4	23.1	16.5
Sweden	122	9 555 893	12.8	12.8	12.0
United Kingdom	331	63 909 672	5.2	5.8	5.1
EU/EEA total	**5 844**	**512 257 085**	**11.4**	11.2	**10.7**

[a] *Cases with known age*

Age and sex

The median age at date of onset was 63 years (IQR 52–74). It was significantly higher in females (65 years, IQR 54–77) than in males (62 years, IQR 52–73) ($p<0.01$). Notification rates increased with age, with a maximum of 70.4 per million population in males aged 90 years and older (Figure 6). People older than 50 years of age accounted for 4 732 (81%) of the 5 840 cases with known age. In all age groups, LD was more common in males, with an overall male-to-female ratio of 2.4:1. The male-to-female ratio peaked at 3.1:1 in the 50–59-year age group.

Figure 6. Notification rates of Legionnaires' disease per million, by sex and age group, EU/EEA, 2013



Settings

Of 5 199 cases with reported setting of infection, 3 784 (73%) were reported as community-acquired (Table 3). In 2013, travel and healthcare-associated cases accounted for 19% and 8% of the total, respectively. The remaining cases (1%) were reported with other probable settings of infection. The distribution of cases by probable setting of infection has remained unchanged since 2008. Healthcare-associated cases represented a substantial proportion of cases in older age groups (Table 4).

Table 3. Reported cases of Legionnaires' disease by country and setting of infection, EU/EEA, 2013[a]

Country	Community n (%)	Nosocomial n (%)	Other healthcare n (%)	Travel abroad n (%)	Domestic travel n (%)	Other n (%)	Total n (%)
Austria	61 (61)	8 (8)	3 (3)	23 (23)	5 (5)	0	100 (100)
Belgium	16 (33)	5 (10)	8 (16)	18 (37)	0	2 (4)	49 (100)
Bulgaria	1 (100)	0	0	0	0	0	1 (100)
Croatia	34 (83)	1 (2)	5 (12)	1 (2)	0	0	41 (100)
Cyprus	0	0	0	1 (100)	0	0	1 (100)
Czech Republic	43 (88)	1 (2)	0	4 (8)	1 (2)	0	49 (100)
Denmark	55 (53)	8 (8)	7 (7)	33 (32)	0	0	103 (100)
Estonia	6 (60)	4 (40)	0	0	0	0	10 (100)
Finland	0	0	0	8 (100)	0	0	8 (100)
France	809 (64)	86 (7)	65 (5)	81 (6)	158 (13)	63 (5)	1 262 (100)
Germany	360 (76)	15 (3)	7 (1)	68 (14)	23 (5)	0	473 (100)
Greece	22 (58)	6 (16)	0	0	10 (26)	0	38 (100)
Hungary	0	13 (93)	0	0	1 (7)	0	14 (100)
Ireland	5 (36)	0	0	8 (57)	1 (7)	0	14 (100)
Italy	1 119 (83)	64 (5)	21 (2)	14 (1)	118 (9)	9	1 345 (100)
Latvia	34 (100)	0	0	0	0	0	34 (100)
Lithuania	1 (100)	0	0	0	0	0	1 (100)
Netherlands	167 (54)	1 (<1)	0	128 (42)	12 (4)	0	308 (100)
Norway	16 (40)	0	0	24 (60)	0	0	40 (100)
Poland	0	3 (43)	0	4 (57)	0	0	7 (100)
Portugal	61 (84)	0	1 (1)	6 (8)	5 (7)	0	73 (100)
Romania	1 (100)	0	0	0	0	0	1 (100)
Slovakia	5 (83)	0	0	1 (17)	0	0	6 (100)
Slovenia	72 (94)	0	0	5 (6)	0	0	77 (100)
Spain	717 (88)	49 (6)	14 (2)	13 (2)	19 (2)	1 (<1)	813 (100)
United Kingdom	179 (54)	2 (1)	2 (1)	111 (34)	37 (11)	0	331 (100)
EU/EEA total	**3 784 (73)**	**266 (5)**	**133 (3)**	**551 (11)**	**390 (8)**	**75 (1)**	**5 199 (100)**

[a] *Luxembourg, Malta, and Sweden did not report setting of infection.*

Table 4. Reported cases of Legionnaires' disease by setting of infection and age group, EU/EEA, 2013

Age (years)	Community n (%)	Nosocomial n (%)	Other healthcare n (%)	Travel abroad n (%)	Domestic travel n (%)	Other n (%)	Total n (%)
0–19	15 (79)	1 (5)	0	2 (11)	1 (5)	0	19 (100)
20–29	67 (87)	1 (1)	1 (1)	3 (4)	3 (4)	2 (3)	77 (100)
30–39	178 (75)	7 (3)	2 (1)	21 (9)	19 (8)	11 (5)	238 (100)
40–49	476 (74)	17 (3)	3 (< 1)	73 (11)	51 (8)	20 (3)	640 (100)
50–59	837 (76)	38 (3)	5 (< 1)	130 (12)	74 (7)	20 (2)	1 104 (100)
60–69	864 (69)	62 (5)	17 (1)	189 (15)	108 (9)	14 (1)	1 254 (100)
70–79	761 (71)	73 (7)	23 (2)	112 (11)	91 (9)	6 (1)	1 066 (100)
80–89	499 (74)	58 (9)	54 (8)	20 (3)	38 (6)	2 (< 1)	671 (100)
≥ 90	84 (66)	9 (7)	28 (22)	1 (1)	5 (4)	0	127 (100)
Total	**3 781 (73)**	**266 (5)**	**133 (3)**	**551 (11)**	**390 (8)**	**75 (1)**	**5 196 (100)**

Time to diagnosis

Both date of onset and date of diagnosis were available in only 22% of cases (1 298/5 851). The median time from date of onset to diagnosis was five days (IQR 4–8).

3.1.2 Clusters

Frequency and size

Of 4 166 cases with known cluster status, 351 (8%) were reported as part of a cluster. The information on cluster status was missing in 28% of all cases (Table 5). Of 1 685 cases reported with unknown cluster status, 1 262 (75%) were reported by France. A cluster identifier was provided for 189 cases forming 125 clusters, which resulted in an average size of 1.5 cases per cluster (range 1–10 cases) (Figure 7).

Table 5. Reported clustering of Legionnaires' disease by reporting country, EU/EEA, 2013

Country	Clusters n	Clustered cases[a] n (%)	Sporadic cases n (%)	Unknown n (%)	Total n
Austria	5	5 (5)	89 (89)	6 (6)	100
Belgium	Unknown	7 (5)	42 (27)	106 (68)	155
Bulgaria	0	0	1 (100)	0	1
Croatia	0	0	41 (100)	0	41
Cyprus	0	0	0	6 (100)	6
Czech Republic	0	0	66 (99)	1 (1)	67
Denmark	6	12 (10)	0	103 (90)	115
Estonia	1	2 (20)	8 (80)	0	10
Finland	Unknown	0	0	15 (100)	15
France	Unknown	0	0	1 262 (100)	1 262
Germany	Unknown	85 (11)	720 (89)	1 (< 1)	806
Greece	0	0	36 (95)	2 (5)	38
Hungary	2	11 (38)	18 (62)	0	29
Ireland	2	2 (14)	12 (86)	0	14
Italy	27	37 (3)	1 308 (97)	0	1 345
Latvia	1	2 (6)	32 (94)	0	34
Lithuania	0	0	1 (100)	0	1
Luxembourg	0	0	6 86)	1 (14)	7
Malta	0	0	2 (100)	0	2
Netherlands	31	51 (17)	257 (83)	0	308
Norway	0	0	40 (100)	0	40
Poland	0	0	11 (100)	0	11
Portugal	3	4 (4)	74 (79)	16 (17)	94
Romania	0	0	1 (100)	0	1
Slovakia	0	0	6 (100)	0	6
Slovenia	0	0	77 (100)	0	77
Spain	15	81 (10)	731 (90)	1 (< 1)	813
Sweden	Unknown	0	0	122 (100)	122
United Kingdom	39	52 (16)	236 (71)	43 (13)	331
Subtotal[b]	126	332 (8)	3 732 (90)	71 (2)	4 135
Total	**132**	**351**	**3 815**	**1 685**	**5 851**

[a] *Denominator: cases with known cluster status*

[b] *Includes only countries where cluster status was known for ≥ 75% of clusters*

Figure 7. Reported clusters of Legionnaires' disease and average number of cases per cluster, by year of reporting, EU/EEA, 2008–2013

Time and location

The proportion of clustered cases peaked in August when 124 (22%) of the 564 cases reported with a known cluster status were part of a cluster (Figure 8). Since only a few clustered cases were reported with cluster ID, it is impossible to determine whether these cases were part of larger outbreaks. The proportion of cases belonging to clusters was on average 8%, with substantial differences between countries. Of countries with an unknown cluster status of less than 25%, 12 reported 0 clustered cases, while Hungary reported that 38% of cases belonged to clusters (Table 5).

The largest cluster reported in 2013 occurred in the Netherlands where 10 cases were geographically clustered, including eight community-acquired cases and two cases with a recent travel history.

Of the 10 largest outbreaks reported over the 2008–2013 period, none were in 2013 (Table 6).

Figure 8. Reported clustering of Legionnaires' disease by month of onset, EU/EEA, 2013

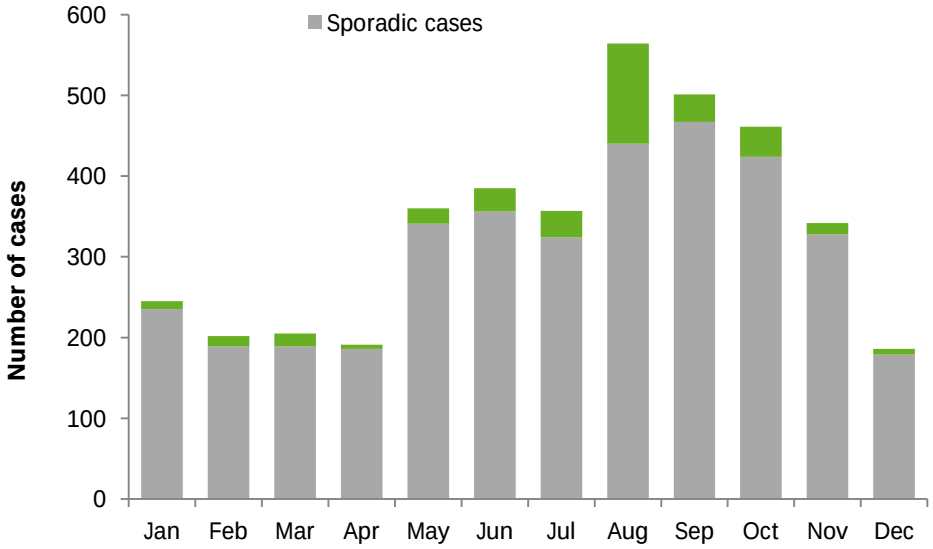


Table 6. Ten largest reported clusters of Legionnaires' disease, 2008–2013

Rank	Reporting country	Year of reporting	Number of cases	Probable setting of infection	Probable source
1	Spain	2010	51	Community-acquired	Cooling tower
2	Spain	2012	39	Community-acquired	Decorative fountain
3	Portugal	2012	36	Community-acquired	Unknown
4	Spain	2009	25	Community-acquired	Unknown
5	United Kingdom	2012	23	Community-acquired	Spa pool
6	Spain	2010	22	Community-acquired	Water system
7	Poland	2010	19	Community-acquired	Water system
8	Spain	2012	18	Travel-associated	Pool
9	United Kingdom	2010	15	Community-acquired	Multiple unknown sources
10	Spain	2008	14	Community-acquired	Unknown

Setting of infection

The proportion of cases by setting of infection reported as part of a cluster was highest in those with history of domestic travel. Travel-associated cases (domestic and abroad) were three times more likely to be part of a cluster than cases occurring in other settings (PR 2.9, 95% CI 2.4–3.6). This may reflect both a higher probability of clustering in travel-associated cases and the result of a traditional focus on TALD within ELDSNet.

3.1.3 Mortality

Time and location

The reported mortality rate of LD in 2013 was 0.9 per million inhabitants, which was consistent with the rates recorded since 2008, which have been hovering between 0.7 and 0.9 per million. Of 4 513 cases with a known outcome, 461 were reported to have died, resulting in a case–fatality ratio (CFR) of 10%. In countries that reported ten or more cases and less than 25% of cases with unknown outcome, the average CFR was also 10% (Table 7). The case-fatality ratio ranged from 7% in August to 18% in February. Cases with a date of onset during the winter period (November to March) were more likely to have died (PR 1.4, 95% CI 1.1–1.7).

Table 7. Reported outcome of Legionnaires' disease and case fatality, by reporting country, EU/EEA, 2013

Country	Survival n (%)	Death n (%)	Unknown n (%)	Total n	CFR [a] %
Austria	86 (86)	14 (14)	0	100	14
Belgium	45 (29)	8 (5)	102 (66)	155	NA[b]
Bulgaria	1 (100)	0	0	1	0
Croatia	40 (98)	1 (2)	0	41	2
Cyprus	6 (100)	0	0	6	0
Czech Rep.	64 (96)	3 (4)	0	67	4
Denmark	54 (47)	17 (15)	44 (38)	115	NA
Estonia	6 (60)	4 (40)	0	10	40
Finland	0	0	15 (100)	15	NA
France	1 040 (82)	143 (11)	79 (6)	1 262	12
Germany	762 (95)	44 (5)	0	806	5
Greece	32 (84)	4 (11)	2 (5)	38	11
Hungary	22 (76)	7 (24)	0	29	24
Ireland	12 (86)	0	2 (14)	14	0
Italy	543 (40)	70 (5)	732 (54)	1 345	NA
Latvia	32 (94)	2 (6)	0	34	6
Lithuania	0	0	1 (100)	1	NA
Luxembourg	7 (100)	0	0	7	0
Malta	2 (100)	0	0	2	0
Netherlands	289 (94)	17 (6)	2 (1)	308	6
Norway	26 (65)	4 (10)	10 (25)	40	13
Poland	6 (55)	5 (45)	0	11	45
Portugal	77 (82)	6 (6)	11 (12)	94	7
Romania	1 (100)	0	0	1	0
Slovakia	3 (50)	1 (17)	2 (33)	6	25
Slovenia	72 (94)	5 (6)	0	77	6
Spain	429 (53)	48 (6)	336 (41)	813	NA
Sweden	99 (81)	23 (19)	0	122	19
United Kingdom	296 (89)	35 (11)	0	331	11
Subtotal[c]	2 978 (88)	317 (9)	106 (3)	3 401	10
Total	**4 052 (69)**	**461 (8)**	**1 338 (23)**	**5 851**	**10**

[a] *Denominator: cases with known outcome (survivals and deaths)*

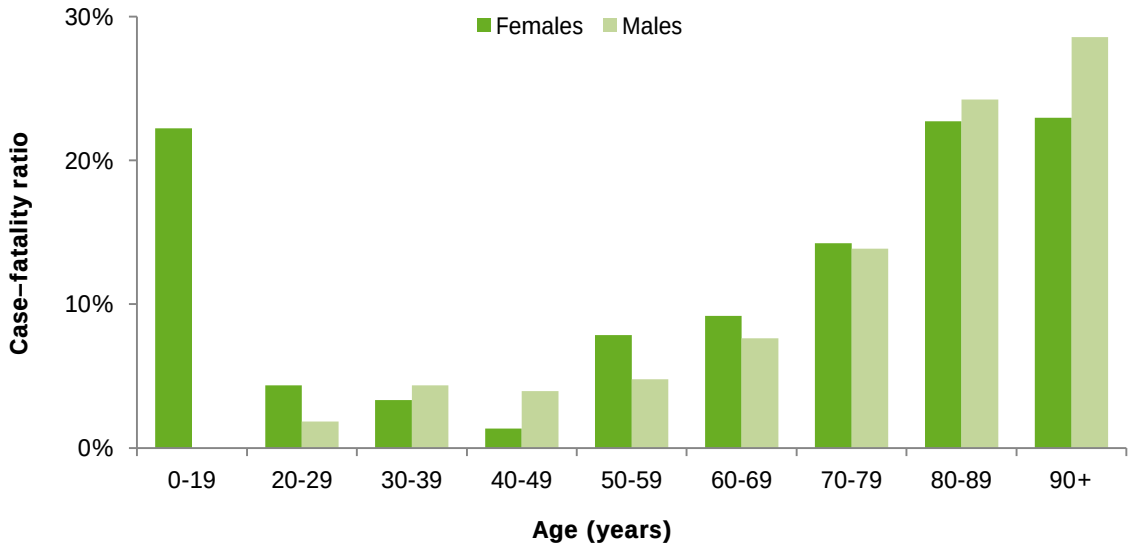
[b] *Not applicable where ≥ 25% of outcomes were unknown*

[c] *Includes only countries where < 25% of outcomes were unknown*

Age and sex

The case-fatality ratio was higher for older age groups in both sexes (Figure 9). Of nine female cases younger than 20 years of age, two died, giving a CFR of 22%. In the age group above 40 years, CFR increased with age, showing a similar pattern in both sexes.

Figure 9. Reported case-fatality of Legionnaires' disease by sex and age group, EU/EEA, 2013



Setting of infection

The CFR was more than two times higher in healthcare-associated cases (nosocomial and other healthcare settings) than in community-acquired cases (Table 8). Cases with a history of travel abroad had the lowest CFR.

Table 8. Reported case fatality of Legionnaires' disease by setting, EU/EEA, 2013

Setting	Deaths n	Total n	CFR %
Nosocomial	37	114	32
Other healthcare	49	194	25
Community	283	2 796	10
Domestic travel	18	295	6
Other	3	63	5
Travel abroad	22	498	4
Total	**412**	**3 960**	**10**

3.1.4 Clinical and environmental microbiology and pathogens

Laboratory methods

For the 5 851 cases reported, 6 601 laboratory tests were performed, 5 162 (78%) of which were urinary antigen detections. Of 29 countries reporting cases, eight reported more than one test per case, with an average of 1.3 tests per case. The distribution of tests varied greatly across countries (Table 9).

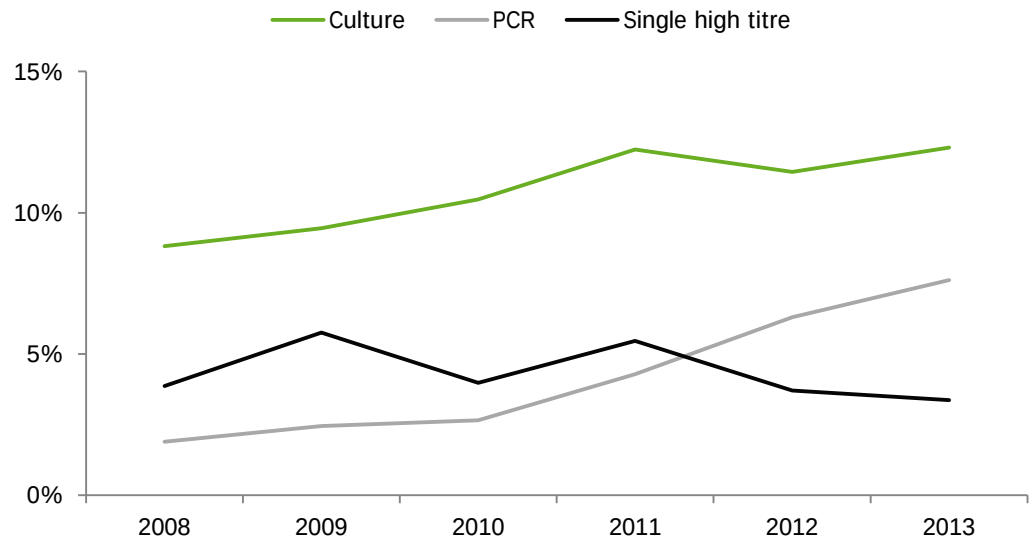
Culture confirmations were not reported by some countries, but accounted for 36% of diagnoses in Denmark. Of the 11 countries who did not report any culture confirmations in 2013, seven (Bulgaria, Cyprus, Latvia, Lithuania, Malta, Romania and Slovenia) have never reported any culture confirmations. Some large reporting countries such as Italy or Spain relied almost exclusively on urinary antigen tests (UAT). Latvia is the sole country relying on single high titres for the majority of its cases (62%). Of 5 851 cases, 5 162 (88%) were UAT-positive, a proportion similar to 2012. Over the past five years, the proportion of cases reported to have been diagnosed by PCR has continuously increased from less than 2% in 2008 to 7% in 2013 (Figure 10). In 2013, the proportion of PCR-ascertained cases was over 30% in five countries (the Czech Republic, Denmark, Estonia, Sweden and the United Kingdom).

Table 9. Reported laboratory methods by reporting country, EU/EEA, 2013 (more than one method per case possible)

Country	Laboratory method						
	Culture n (%)	Urinary antigen n (%)	Fourfold titre rise n (%)	PCR n (%)	Direct immunofluorescence n (%)	Single high titre n (%)	Total n
Austria	21 (21)	73 (73)	0	6 (6)	0	0	100
Belgium	17 (11)	115 (74)	5 (3)	14 (9)	0	4 (3)	155
Bulgaria	0	1 (100)	0	0	0	0	1

Country	Laboratory method						
	Culture n (%)	Urinary antigen n (%)	Fourfold titre rise n (%)	PCR n (%)	Direct immunofluorescence n (%)	Single high titre n (%)	Total n
Croatia	1 (2)	38 (93)	0	0	0	2 (5)	41
Cyprus	0	6 (100)	0	0	0	0	6
Czech Republic	32 (26)	61 (50)	0	21 (17)	0	8 (7)	122
Denmark	41 (36)	32 (28)	0	41 (36)	0	1 (1)	115
Estonia	0	3 (30)	0	7 (70)	0	0	10
Finland	3 (20)	9 (60)	0	0	0	3 (20)	15
France	323 (20)	1 06 (75)	16 (1)	52 (3)	0	13 (1)	1 610
Germany	37 (5)	589 (73)	10 (1)	101 (13)	0	69 (9)	806
Greece	0	31 (82)	0	1 (3)	0	6 (16)	38
Hungary	4 (11)	21 (55)	1 (3)	0	1 (3)	11 (29)	38
Ireland	2 (13)	14 (88)	0	0	0	0	16
Italy	20 (1)	1 294 (96)	11 (1)	8 (1)	0	12 (1)	1 345
Latvia	0	13 (38)	0	0	0	21 (62)	34
Lithuania	0	1 (100)	0	0	0	0	1
Luxembourg	2 (29)	4 (57)	0	1 (14)	0	0	7
Malta	0	2 (100)	0	0	0	0	2
Netherlands	49 (13)	283 (73)	5 (1)	43 (11)	1 (< 1)	7 (2)	388
Norway	2 (5)	28 (70)	0	9 (23)	0	1 (3)	40
Poland	0	7 (64)	1 (9)	0	0	3 (27)	11
Portugal	9 (10)	82 (87)	0	0	1 (1)	2 (2)	94
Romania	0	1 (100)	0	0	0	0	1
Slovakia	0	3 (50)	2 (33)	0	0	1 (17)	6
Slovenia	0	77 (100)	0	0	0	0	77
Spain	54 (6)	791 (92)	10 (1)	0	0	1 (< 1)	856
Sweden	16 (10)	71 (44)	3 (2)	38 (24)	0	32 (20)	160
United Kingdom	87 (17)	306 (60)	9 (2)	104 (21)	0	0	506
Total	**720 (11)**	**5 162 (78)**	**73 (1)**	**446 (7)**	**3 (<1)**	**197 (3)**	**6 601**

Figure 10. Proportion of cases reported with culture, PCR and single high titre, EU/EEA, 2008–2013



Pathogens

Of 720 culture-confirmed cases, 691 (96%) were due to *L. pneumophila* (Table 10). Serogroup 1 represented 601 (83%) of 720 culture-confirmed cases (Table 11). Four subtypes (Allentown/France, Benidorm, Knoxville and Philadelphia) accounted for nearly 90% of the 178 isolates that were subtyped using monoclonal antibodies (MAb) (Table 12). In addition, eight countries (Austria, the Czech Republic, Denmark, Hungary, the Netherlands, Portugal, Spain and the UK) reported results of sequence typing for 246 cases.

Table 10. Reported culture-confirmed cases of Legionnaires' disease and *Legionella* isolates by species, EU/EEA, 2013

Species	Culture-confirmed cases	
	n	%
L. pneumophila	691	96
L. longbeachae	10	1
L. bozemanii	2	<1
L. micdadei	2	<1
L. cincinnatiensis	1	<1
L. dumoffii	1	<1
L. other species	6	1
L. species unknown	7	1
Total	**720**	**100**

Table 11. Reported culture-confirmed cases of Legionnaires' disease and *L. pneumophila* isolates by serogroup, EU/EEA, 2013

	Culture-confirmed cases with *L. pneumophila*	
Serogroup	n	%
1	601	87
2	2	< 1
3	19	3
4	1	< 1
5	3	< 1
6	12	2
7	1	< 1
8	1	< 1
9	1	< 1
10	2	< 1
12	1	< 1
L. pneumophila serogroup unknown	47	7
Total	**691**	**100**

Table 12. Reported monoclonal subtype for *L. pneumophila* serogroup 1 isolates, EU/EEA, 2013

Monoclonal subtype	n	%
Allentown/France	40	22
Benidorm	35	20
Knoxville	38	21
Philadelphia	43	24
Subtotal MAb 3/1 positive[a]	**156**	**88**
Bellingham	9	5
OLDA	7	4
OLDA/Oxford	6	3
Subtotal MAb 3/1 negative	**22**	**12**
Total	**178**	**100**

[a] *Monoclonal types are grouped as having, or not having, the virulence-associated epitope recognised by the MAb 3/1 (Dresden Panel).*

Environment

Environmental investigation status was available for 2 878 (62%) of 4 648 cases known not to have travelled abroad within the incubation period (Table 13). An investigation was carried out for 636 (22%) of these 2 878 cases with known status. Such investigations were more likely in culture-confirmed (PR 2.2, 95% CI 1.9–2.6) and fatal cases (PR 1.3, 95% CI 1.1–1.6). *Legionella* was detected in 267 (43%) of 624 investigations for which environmental findings were reported (Table 14), with 279 sampling sites testing positive: 254 (91%) water systems (57 hot water systems, 28 cold water systems, and 169 non-specified water systems), nine pools (3%), three cooling towers (1%), and three sampling sites (1%) reported as 'other' (Figure 11). In 24 (9%) of the 267 cases with positive environmental findings, isolates could be matched to clinical isolates (12 hot water systems, 11 non-specified water systems, and one pool).

Table 13. Environmental follow-up status of reported domestic cases of Legionnaires' disease by reporting country, EU/EEA, 2013*

Country	Cases without investigation		Cases with investigation		Status unknown		Total
	n	%	n	%	n	%	n
Austria	7	9	70	91	0	0	77
Belgium	0	0	0	0	31	100	31
Bulgaria	1	100	0	0	0	0	1
Croatia	0	0	0	0	40	100	40
Czech Republic	5	11	40	89	0	0	45
Denmark	0	0	10	0	60	100	70
Estonia	10	100	0	0	0	0	10
France	0	0	0	0	1 181	100	1 181
Germany	0	0	0	0	405	100	405
Greece	3	8	12	32	23	61	38
Hungary	3	21	11	79	0	0	14
Ireland	3	50	3	50	0	0	6
Italy	1 009	76	322	24	0	0	1 331
Latvia	3	9	31	91	0	0	34
Lithuania	0	0	1	100	0	0	1
Netherlands	118	66	57	32	5	3	180
Norway	0	0	0	0	16	100	16
Poland	2	67	1	33	0	0	3
Portugal	48	72	10	15	9	13	67
Romania	1	100	0	0	0	0	1
Slovakia	5	100	0	0	0	0	5
Slovenia	72	100	0	0	0	0	72
Spain	798	100	2	0	0	0	800
UK	154	70	66	30	0	0	220
Total	**2 242**	**48**	**636**	**14**	**1 770**	**38**	**4 648**

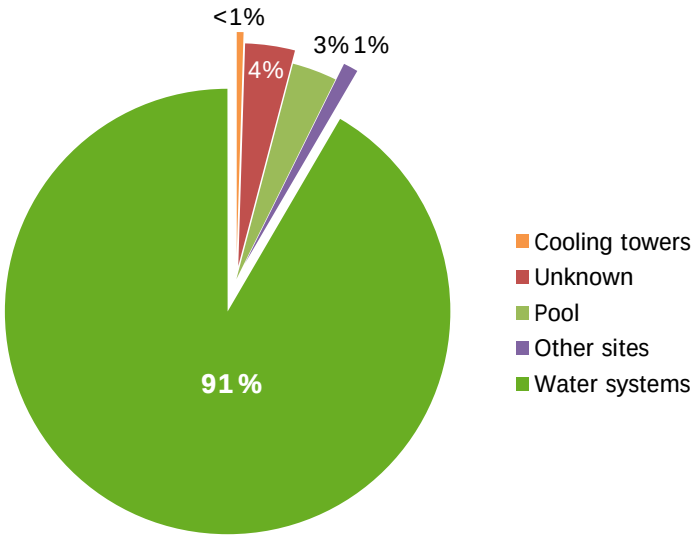
** Cases with setting reported as 'unknown' or 'travel abroad' were not included*

Table 14. *Legionella* findings of environmental investigations by reporting country, EU/EEA, 2013*

Country	Legionella detected		Legionella not detected		Result unknown		Total
	n	%	n	%	n	%	n
Austria	33	47	37	53	0	0	70
Czech Republic	25	63	15	38	0	0	40
Denmark	10	100	0	0	0	0	10
Greece	4	33	8	67	0	0	12
Hungary	11	100	0	0	0	0	11
Ireland	3	100	0	0	0	0	3
Italy	107	33	215	67	0	0	322
Latvia	18	58	13	42	0	0	31
Lithuania	1	100	0	0	0	0	1
Netherlands	26	46	29	51	2	4	57
Poland		0	1	100	0	0	1
Portugal	4	40	3	30	3	30	10
Spain	2	100	0	0	0	0	2
UK	23	35	36	55	7	11	66
Total	**267**	**41**	**357**	**57**	**12**	**2**	**636**

** Cases with setting reported as 'unknown' or 'travel abroad' were not included*

Figure 11. Distribution of sampling sites testing positive for *Legionella*, EU/EEA, 2013



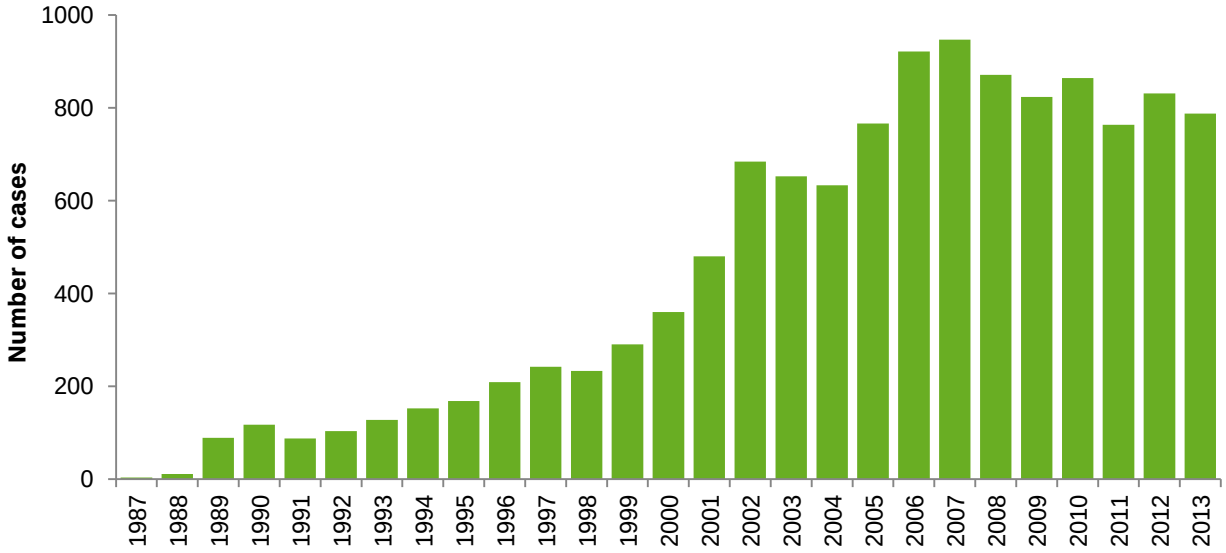
3.2 Travel-associated Legionnaires' disease

3.2.1 Cases

Notifications

ELDSNet received reports of 787 cases of TALD with date of onset in 2013. This was 5% lower than in 2012 (831 cases) and seems to continue a slightly decreasing trend observed since 2007 (Figure 12).

Figure 12. Number of travel-associated cases of Legionnaires' disease reported to ELDSNet, by year, 1987–2013



Cases were reported from 25 countries (Table 15): 20 EU/EEA Member States and five non-EU/EEA countries. In previous years, the United States had been the only non-EU/EEA country reporting. Germany reported 34 cases in 2013, compared with only one in 2012, which was the first year Germany reported travel-associated cases. Seventy-four percent of all TALD cases were reported – in decreasing order of frequency – by the following five countries: France, Italy, the United Kingdom, the Netherlands, and Spain.

Table 15. Number of travel-associated cases of Legionnaires' disease by reporting country[a], 2009–2013[b]

Reporting country	Number of reported cases				
	2009 n (%)	2010 n (%)	2011 n (%)	2012 n (%)	2013 n (%)
France	163 (20)	191 (22)	162 (21)	170 (20)	161 (20)
Italy	169 (21)	142 (16)	154 (20)	156 (19)	141 (18)
United Kingdom	173 (21)	154 (18)	116 (15)	135 (16)	115 (15)
Netherlands	109 (13)	148 (17)	120 (16)	113 (14)	109 (14)
Spain	65 (8)	67 (8)	67 (9)	68 (8)	55 (7)
Germany				1 (< 1)	34 (4)
Belgium	12 (1)	16 (2)	11 (1)	19 (2)	25 (3)
Denmark	34 (4)	32 (4)	32 (4)	41 (5)	25 (3)
Sweden	21 (3)	20 (2)	28 (4)	49 (6)	24 (3)
Austria	16 (2)	19 (2)	25 (3)	27 (3)	23 (3)
Norway	21 (3)	25 (3)	18 (2)	13 (2)	20 (3)
Finland	6 (1)	8 (1)	5 (1)	6 (1)	9 (1)
United States	10 (1)	11 (1)	5 (1)	6 (1)	9 (1)
Greece	0	0	4 (1)	1 (< 1)	8 (1)
Ireland	2 (< 1)	7 (1)	4 (1)	7 (1)	8 (1)
Czech Republic	5 (1)	5 (1)	7 (1)	5 (1)	5 (1)
Slovenia	2 (< 1)	1 (< 1)	1 (< 1)	2 (< 1)	5 (1)
Turkey					3 (< 1)
Canada					2 (< 1)
Cyprus				1 (< 1)	1 (< 1)
Israel					1 (< 1)
Latvia	0	1 (< 1)	1 (<1)	0	1 (< 1)
Luxembourg				1 (< 1)	1 (< 1)
Malta	0	5 (1)	1 (< 1)	0	1 (< 1)
Thailand					1 (< 1)
Hungary	2 (< 1)	2 (< 1)	2 (< 1)	4 (< 1)	0
Croatia				4 (< 1)	0
Portugal				2 (< 1)	0
Others	8 (1)	10 (1)	0	0	0
Total	**818 (100)**	**864 (100)**	**763 (100)**	**831 (100)**	**787 (100)**

[a] The reporting country is generally the country where the case is diagnosed; it can differ from the country of residence.

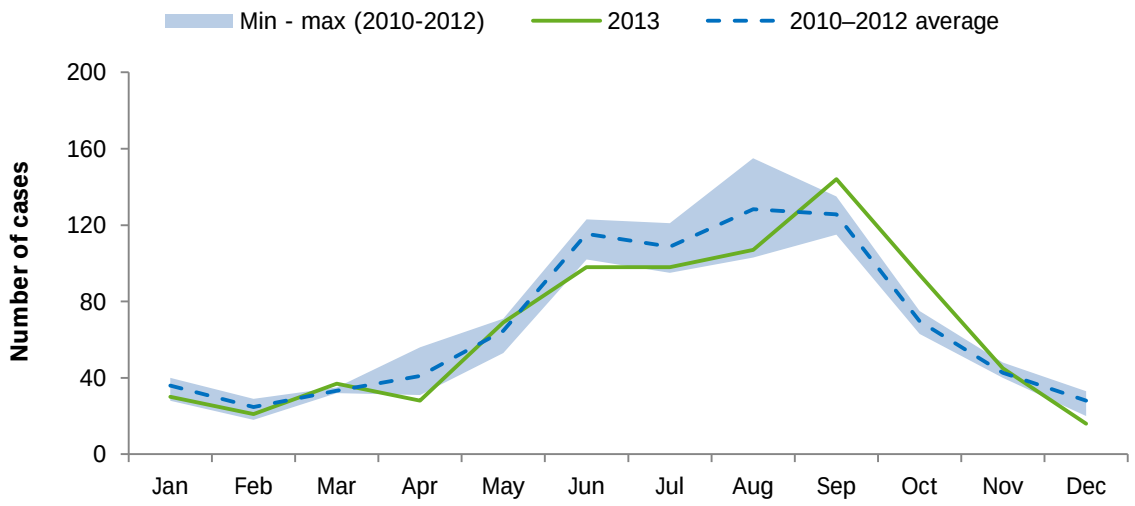
[b] 10 EU/EEA countries did not report any cases in 2013: Bulgaria, Croatia, Estonia, Hungary, Iceland, Lithuania, Poland, Portugal, Romania and Slovakia.

ELDSNet reported on TALD cases resident in 30 countries. The majority of cases were resident in the countries reporting most cases, and 24 (3%) were non-EU/EEA residents.

Seasonality

Cases reported in 2013 showed the usual seasonal variations, with 69% of all cases occurring in June–October. In each of those five months, over 90 TALD cases were reported to ELDSNet (with a peak of 144 in September). The season was longer than in previous years, with 94 cases occurring as late as in October (Figure 13). At the other extreme, in December, a monthly minimum of only 16 cases were reported.

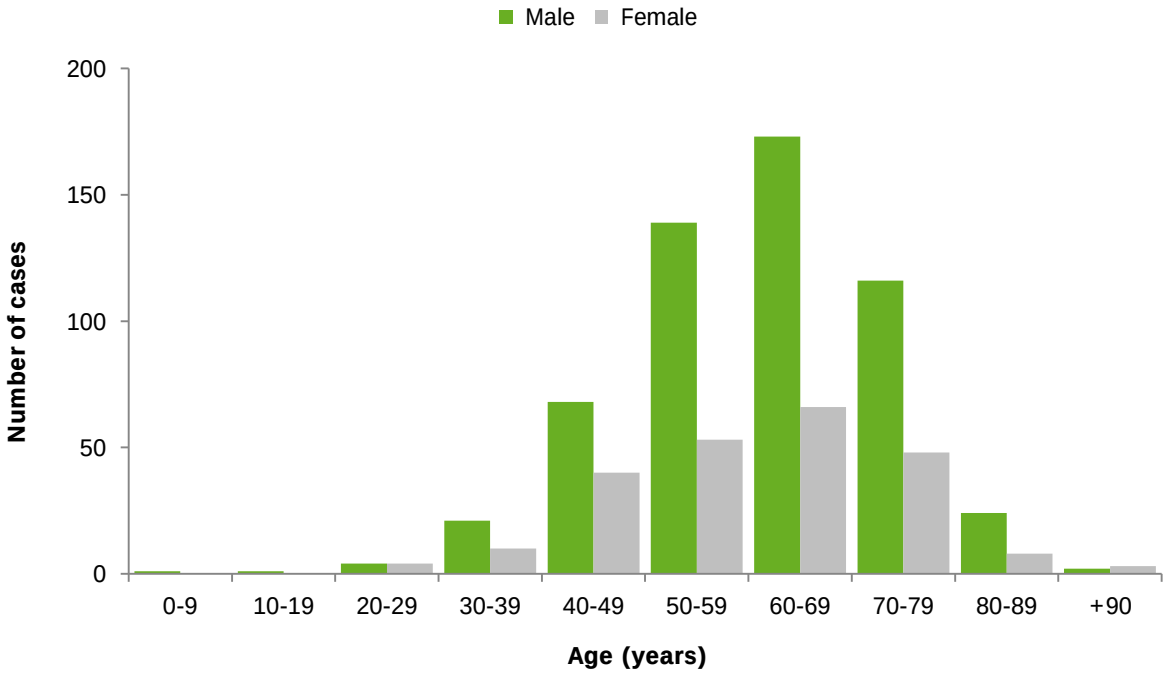
Figure 13. Number of travel-associated cases of Legionnaires' disease by month of disease onset, 2010–2013



Age and sex

Of the reported TALD cases, 555 were male (70%, male–female ratio 2.4:1), similar to previous years and in line with overall Legionnaires' disease surveillance data. Cases had a median age of 62 years (range 3–94 years), with 90% of the cases being over 50 years old at the time of illness (Figure 14). Two cases were below 20 years of age: one probable case of a three-year old with a single high serological titre and reported as Legionella non-*pneumophila* ('other species'), and one 11-year-old case who was confirmed by urinary antigen test.

Figure 14. Number of travel-associated cases of Legionnaires' disease, by age group and sex, 2013



Outcome

Outcome was provided in 426 (54%) of the cases, of whom 18 (4%) had died. Fatal cases were between 41 and 90 years old, and 14 were male.

3.2.2 Clinical microbiology and pathogens

Seven hundred and forty-two TALD cases (94%) were classified as confirmed, and 45 (6%) as probable.

Of 866 laboratory tests, 84% were UAT, 4% culture, and 9% PCR. The latter remained at the 2012 level after an increase of 6% in 2011 (Table 16).

Table 16. Reported diagnostic methods in travel-associated cases of Legionnaires' disease, EU/EEA, 2013 (more than one method per case possible)

Laboratory method	n	%
Urinary antigen	731	84
Nucleic acid amplification, e.g. PCR	80	9
Culture	38	4
Single high titre	13	2
Fourfold titre rise	4	<1
Total	**866**	**100**

In 642 cases (82%), *L. pneumophila* serogroup 1 was reported as the causative microorganism (Table 17). Compared to 2012, the Member States reported 7% less unknown pathogens or missing values, while there were 9% more *L. pneumophila* serogroup 1 isolates.

Table 17. Reported species or *L. pneumophila* serogroup in travel-associated cases of Legionnaires' disease, EU/EEA, 2013

L. pneumophila serogroup/*L.* species	Number/proportion of TALD cases	
	n	%
1	642	82
3	2	<1
6	1	<1
Mix of serogroups	2	<1
L. bozemanii	1	<1
Pathogen unknown or not reported	139	18
Total	**787**	**100**

Monoclonal subtyping results were reported for 22 cases (3%) (Table 18).

Table 18. Reported monoclonal subtype for *L. pneumophila* serogroup 1 in travel-associated cases of Legionnaires' disease, EU/EEA, 2013

Monoclonal subtype	n
Allentown/France	4
Benidorm	6
Knoxville	7
Philadelphia	5
Total	**22**

The sequence type was reported for 27 cases (3%) from seven countries. For comparison, in 2012 there were 22 cases from six countries.

3.2.3 Travel: visits and sites

The TALD cases had made 1 142 visits to 1 031 unique commercial accommodation sites around the world. Of these 1 142 visits, 835 were within the EU/EEA, 283 were outside the EU/EEA (Figures 15 and 16) and 24 were to ships. Altogether, the cases had visited 65 countries and ships in the 2–10 days before the date of onset. The four destination countries with the most TALD-associated accommodation sites were Italy (n=324, 28%), France (n=205, 18%), Turkey (n=98, 9%), and Spain (n=89, 8%). Of the 1 129 travel visits for which the accommodation type was reported, 83% involved hotels, 7% camping sites, 5% apartments, 2% ships, and 3% other types of accommodation. The proportion of domestic travel among the reported cases varies greatly by country (Table 19).

Figure 15. Number of accommodation site visits connected with travel-associated cases of Legionnaires' disease per destination country, EU/EEA and neighbouring countries, 2013 (n=835)

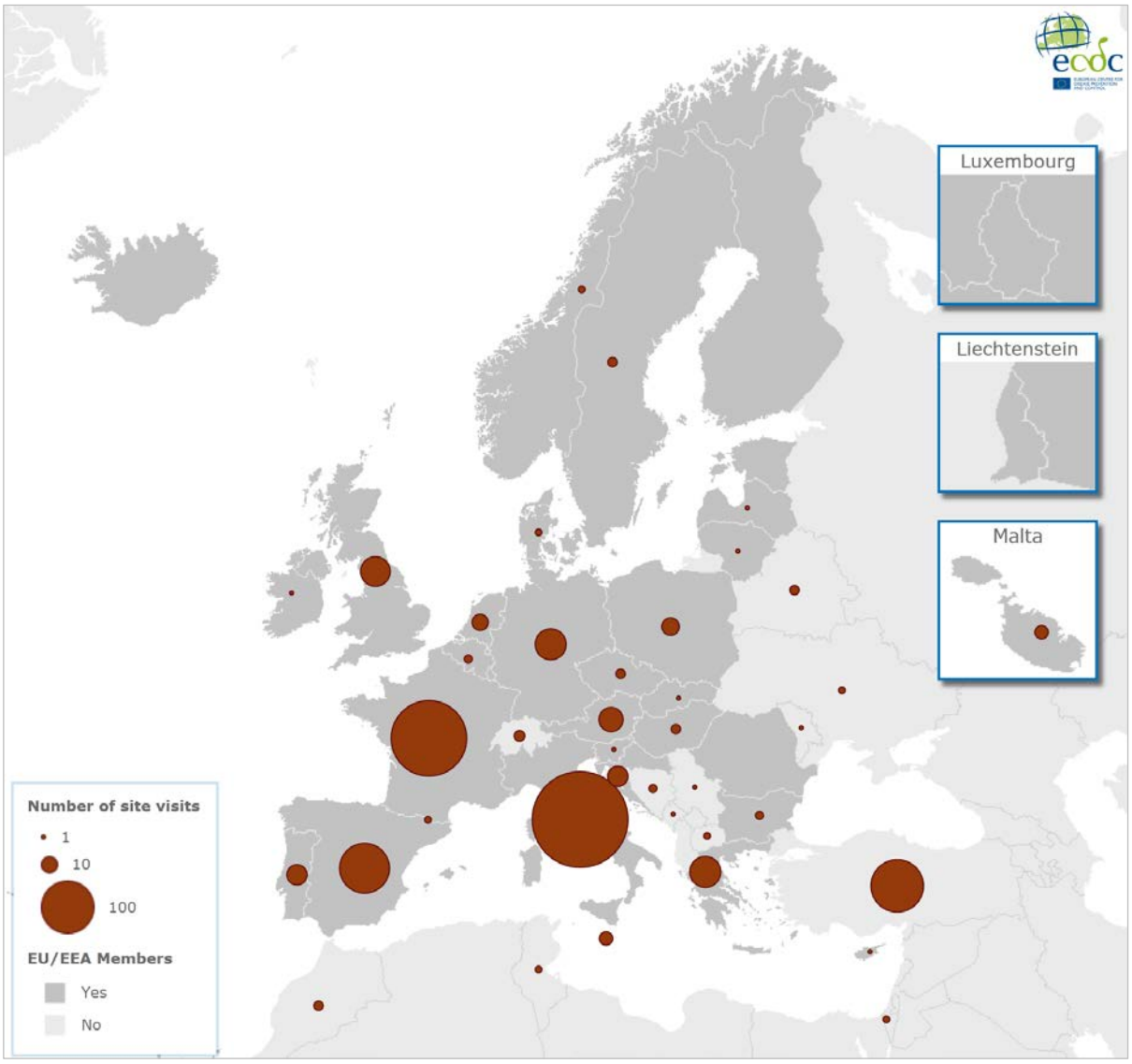


Figure 16. Number of accommodation site visits connected with travel-associated cases of Legionnaires' disease per destination country, worldwide, 2013 (n=1 118)

Table 19. Proportion of domestic travel visits by residence country among cases with travel-associated Legionnaires' disease, 2013

Residence country	Number of domestic travels	Number of outbound travels	Total	Proportion of domestic travel (%)
Greece	3	0	3	100
Italy	124	21	145	86
Spain	41	24	65	63
France	115	104	219	53
Czech Republic	1	4	5	20
United Kingdom	30	133	163	18
Austria	4	24	28	14
Ireland	1	6	7	14
Germany	7	56	63	11
Netherlands	7	187	194	4
Sweden	1	28	29	3
Australia	0	3	3	0
Belgium	0	42	42	0
Cyprus	0	2	2	0
Denmark	0	48	48	0
Finland	0	15	15	0
Lithuania	0	1	1	0
Luxembourg	0	1	1	0
Latvia	0	6	6	0
Malta	0	1	1	0
Norway	0	36	36	0
Poland	0	1	1	0
Slovenia	0	4	4	0

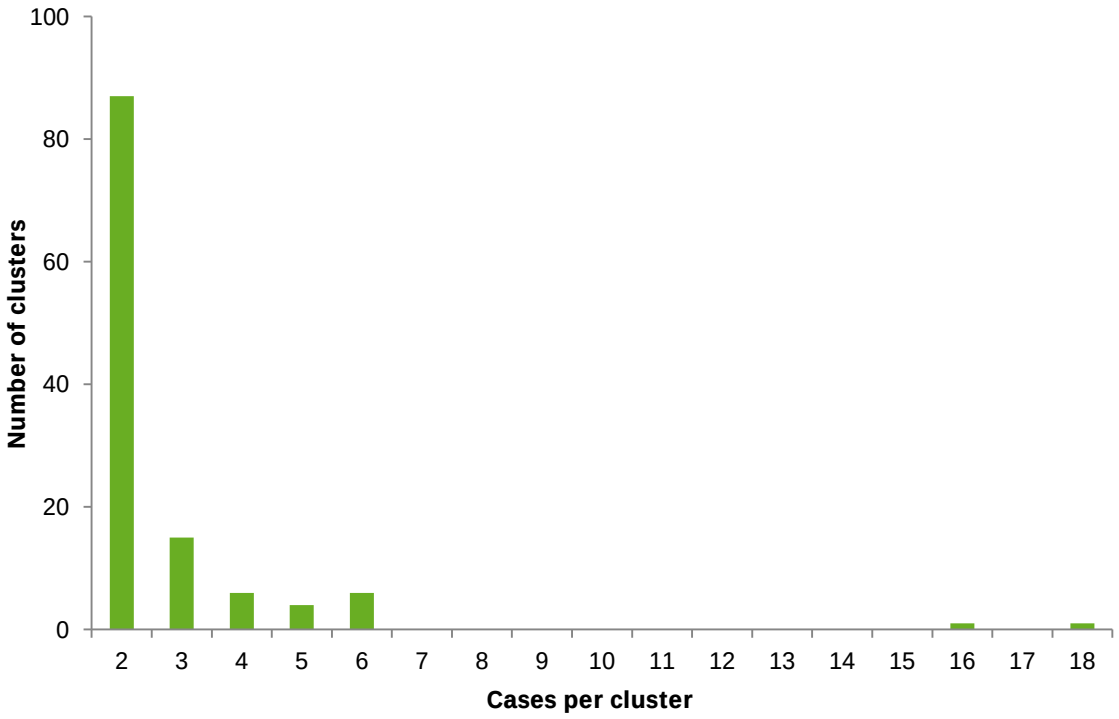
3.2.4 Clusters

In 2013, 110 new standard clusters were detected, 82 in 12 EU Member States, 26 in nine non-EU countries, and two on board ships. In addition, there were 10 complex clusters, five in EU Member States, four outside the EU, and one with accommodations in and outside the EU.

Altogether, 333 (42%) of all TALD cases were involved in clusters during 2013. The clusters in the EU comprised 233 cases, the clusters outside the EU amounted to 96 cases, and four cases were on ships. There were 261 cases involved in standard clusters, and 72 cases in complex clusters

Of the 120 clusters reported, 87 (73%) comprised only two cases (Figure 17). Further, there were 15 clusters (13%) of three cases, six clusters (5%) of four cases, four clusters (3%) of five cases and six clusters (5%) of six cases. There were also two complex clusters of 16 and 18 cases, respectively.

Figure 17. Number of cases of travel-associated Legionnaires' disease per cluster, 2013



In 58% of the clusters, the first two reported cases were from different countries and these clusters would have therefore been very unlikely to be detected as rapidly without ELDSNet.

The number of TALD clusters per country is shown in Figures 18 and 19.

Figure 18. Number of standard clusters of travel-associated Legionnaires' disease per destination area (NUTS 2), EU/EEA and neighbouring countries, 2013

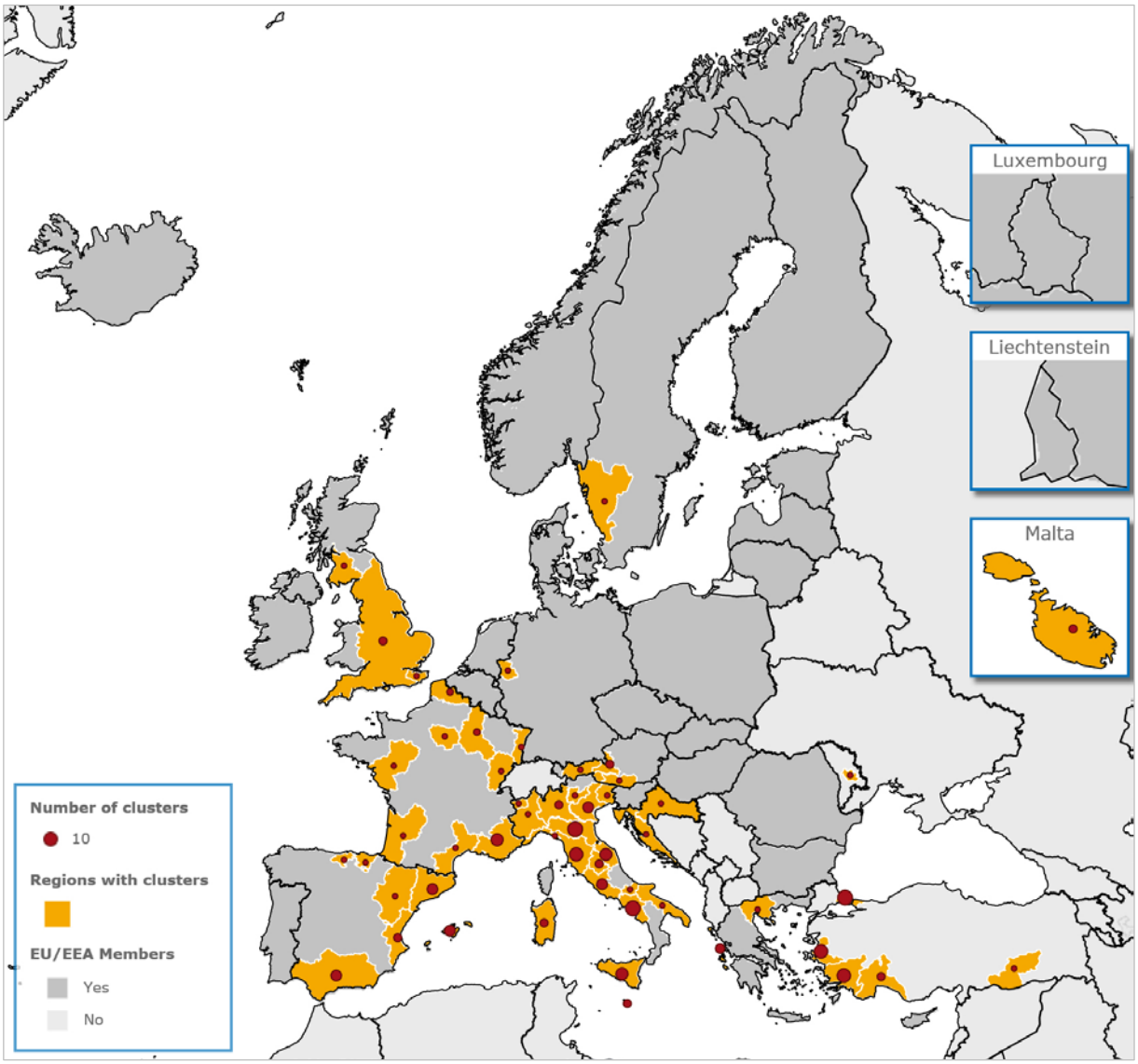


Figure 19. Number of standard clusters of travel-associated Legionnaires' disease per destination country, worldwide, 2013

3.2.5 Investigations and publication of accommodation sites

All cluster-associated accommodations were investigated by local public health authorities, and in 60% of all investigations, *Legionella* was found in the water system. For two clusters, one in Greece and one in Italy, the site assessment form stated that no satisfactory control measures had been taken. The names of the accommodations were therefore released on the ECDC website until ECDC was informed that the control measures were satisfactory.

3.3 Event-based surveillance

Of the five ECDC-monitored threats related to Legionnaires' disease in 2013, four were travel-associated clusters. There was a rapidly evolving cluster of four cases in an Italian hotel (Sardinia) which had been associated with two cases the year before. Further, there were rapidly evolving clusters in Portugal, Turkey and Spain. However, there were no major travel-associated Legionnaires' disease outbreaks in 2013.

The largest community outbreak of Legionnaires' disease (78 confirmed cases) in 2013 was reported from Warstein, Germany. During the August 2013 outbreak, a mass gathering was cancelled, and at least two people died. The causative agent was *L. pneumophila* serogroup 1, Knoxville, sequence type 345.

4 Discussion

With 5 851 cases reported, the notification rate of LD in the EU/EEA in 2013 was 11.4 cases per million population, well within the range observed in the past five years. Six countries (France, Italy, Spain, Germany, the UK, and the Netherlands) have continuously reported the majority of LD cases (accounting for approximately 80%), while only representing two-thirds of the EU/EEA population.

Interestingly, the share of the three largest reporting countries (France, Italy and Spain) has slightly decreased over time, while in many countries the notification rate has remained unchanged over the past five years (below one and five cases per million population). As a recent article pointed out, the need for better estimates of LD disease incidence remains one of the first research priorities [3].

The main characteristics of the cases reported in 2013 were very similar to those reported in previous years: most cases were sporadic and community-acquired, and the disease affected mostly older males. At 10%, the case-fatality ratio was also at the same level as observed in previous years.

The unusually low proportion of clustered cases reported with a cluster ID (54%) highlights the difficulty of interpreting cluster data in the annual LD dataset (comprehensive notifications). First, missing information (cluster status, cluster ID) hinders any serious attempt to accurately describe the reported clusters in terms of number or size. Second, the very nature of these clusters – potentially involving cases over different years – makes yearly analyses difficult. Finally, in the absence of any agreed definition of 'cluster' for non-TALD cases, a 'cluster' may describe very different situations across countries.

The proportion of cases reported as 'detected by PCR' continued to increase to 7% in 2013. Since the use of PCR is yet to be harmonised and protocols and practices probably vary considerably across laboratories [21], this should be further explored and evaluated.

In 2013, 787 travel-associated cases of LD were reported, 5% below the number of cases reported in 2012 [18] – despite the fact that Germany started to actively report cases in 2013. This decrease is in line with a slight declining trend in TALD observed since 2007.

A hundred and ten new standard travel-associated clusters were identified, compared with 99 in 2012 and 100 in 2011.

The proportion of TALD clusters that would most likely have not been detected without international collaboration was at a new all-time high in 2013 (58%), confirming the added value of ELDSNet daily TALD surveillance in protecting the health of travellers in the EU/EEA and other collaborating countries.

5 Conclusion

Legionnaires' disease remains an important cause of potentially preventable morbidity and mortality in Europe. Priority should be given to assisting countries with notification rates below one per million inhabitants to improve clinical awareness, laboratory diagnosis and reporting of LD.

The use of laboratory tests for diagnosis is changing, with an increasing number of PCR tests performed in several countries.

In 2013, ELDSNET has continued to demonstrate its effectiveness in daily surveillance of TALD, early detection and follow-up of clusters.

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