Public Health England

Protecting and improving the nation's health

Legionnaires' disease in residents of England and Wales: 2016

Official statistics

About Public Health England

Public Health England exists to protect and improve the nation's health and wellbeing, and reduce health inequalities. We do this through world-leading science, knowledge and intelligence, advocacy, partnerships and the delivery of specialist public health services. We are an executive agency of the Department of Health, and a distinct delivery organisation with operational autonomy to advise and support government, local authorities and the NHS in a professionally independent manner.

Public Health England
Wellington House
133-155 Waterloo Road
London SE1 8UG
Tel: 020 7654 8000
www.gov.uk/phe
Twitter: @PHE_uk
Facebook: www.facebook.com/PublicHealthEngland

Prepared by: F Naik and G Dabrera
For queries relating to this document, please contact: legionella@phe.gov.uk

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Information

Legionnaires' disease is a severe atypical pneumonia that can potentially be fatal. It is caused by exposure to bacteria of the genus Legionella which are ubiquitous and inhabit natural water systems such as streams, rivers and lakes. However Legionella bacteria are also able to survive in artificial water systems, for example cooling towers, evaporative condensers, spa pools and hot/cold water systems. Such man-made water systems mimic the organism's natural habitat thereby providing an ideal environment for growth.

The principal route of infection is through direct exposure to aerosols generated and dispersed from colonised man-made sources. Inhalation of these aerosols in high enough concentrations by individuals with risk factors, such as age, gender, smoking status, immunosuppression, can result in Legionnaires' disease. A colonised water system which is not appropriately managed has the potential to be a source of major outbreaks.

Prevention of Legionnaires' disease is principally through the implementation of stringent legislation for the control and management of man-made water systems.

Case definitions

Cases of Legionnaires' disease are defined as confirmed or presumptive based on their microbiology. The definitions are as follows:

Confirmed case of Legionnaires' disease

A clinical and/or radiological diagnosis of pneumonia with microbiological evidence of one or more of the following:

- isolation (culture) of *Legionella spp.* from clinical specimens
- the presence of *L. pneumophila* urinary antigen determined using validated reagents/kits

Presumptive case of Legionnaires' diseases

A clinical and/or radiological diagnosis of pneumonia with microbiological evidence of one or more of the following:

- detection of *Legionella spp.* nucleic acid (e.g. PCR) in a clinical specimen
- a positive direct fluorescence (DFA) on a clinical specimen using validated *L. pneumophila* monoclonal antibodies (also referred to as a positive result by direct immunofluorescence (DIF).

Cluster/outbreak definitions

Cluster

Two or more cases that initially appear to be linked by area of residence or work, including healthcare or other type of community setting and which have sufficient proximity in dates of onset of illness (for example, 6 months) to warrant further investigation. (This is a working definition: the decision to follow up cases is made locally).

- the area of residence should take account of population size and density when investigations are planned
- consideration should be given to convening an incident control team if a cluster is identified
- if, after investigation, no common exposures to a potential source of infection are identified for the cases, other than the links mentioned above, then they should be classified as sporadic community acquired cases

Outbreak

Two or more cases where the onset of illness is closely linked in time (weeks rather than months) and where there is epidemiological evidence of a common source of infection, with or without microbiological evidence.

An incident control team should always be convened to investigate outbreaks.

It should be noted that the definitions for cases, clusters and outbreaks shown here were those that were in effect during 2016. Current definitions have been reviewed after 2016 and will therefore differ from those used in this report.

National Enhanced Legionnaires' disease surveillance scheme

The national enhanced Legionnaires' disease surveillance scheme (NELSS) for residents in England and Wales was established in 1980 in order to collect enhanced surveillance data on all cases of Legionnaires' disease. The scheme is managed by the Respiratory Diseases Department, National Infections Service, Public Health England.

The primary objectives of NELSS is to identify clusters and outbreak, collaborate with the European Legionnaires' disease Surveillance Network (ELDSNet) and support the management and control of outbreaks and incidents nationally and internationally.

Methodology

The data presented in this report is extracted from the national surveillance scheme database, which holds data on all reported cases of Legionellosis in residents of England and Wales. Cases are reported through the submission of a national surveillance form which requests detailed information on each case's activities in the 14 days prior to onset of symptoms and information on potential exposures. The reported data is assessed and verified; once the case definition has been met the case is analysed against the national dataset for risk factors and potential associations with previously reported cases.

The national Legionella official statistics are organised by date of onset of symptoms across a calendar year, January to December. The data presented in this report is for cases with onset of symptoms reported from 1 January 2016 to 31 December 2016 in residents of England and Wales. Data from previous years (2007 to 2015) are presented for comparative purposes; please note that some data may differ from previous publications as further information may come to light and updated.

All population data has been obtained from the Office of National Statistics (ONS):

- incidence rates: use ONS mid 2016 population estimates for England and Wales
- travel rates: use ONS travel trends for 2016

All statistical analysis was carried out using the statistical computer program, STATA, version 13.

Official statistics

Table 1: Number of cases of Legionellosis (including presumptive) by disease type and year of symptoms onset, 2014-2016

	Number of confirmed (presumptive*) cases		
	2014	**2015**	**2016**
Legionnaires' disease	331 (7)	384 (1)	355 (2)
Non-pneumonic Legionellosis	4	5	2
Pontiac Fever	-	-	-
Total	**342** (335 confirmed, 7 presumptive)	**390** (389 confirmed, 5 presumptive)	**359** (357 confirmed, 2 presumptive)

( ) additional presumptive cases (ie cases with a serological diagnosis (a single high titre) or PCR result)

Figure 1: Number of cases of Legionellosis (including presumptive) by year of onset of symptoms, 2007-2016

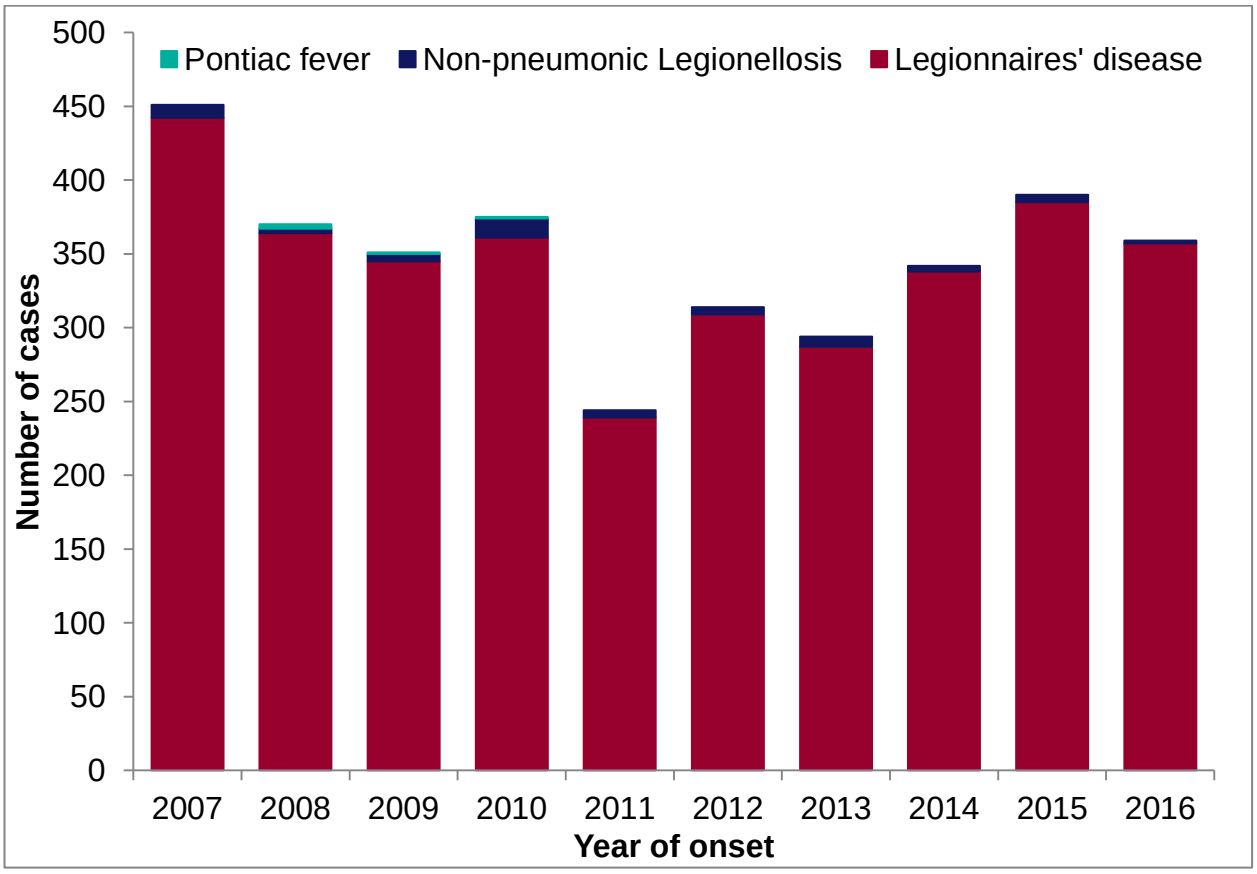


Table 2a: Number and proportion (%) of confirmed cases of Legionnaires' disease by gender and age group, 2014-2016

	2014		2015		2016		Total	
	Females	**Males**	**Females**	**Males**	**Females**	**Males**	**Females**	**Males**
< 50 yrs	11 (22.0)	39 (78.0)	13 (18.8)	56 (81.2)	12 (24.5)	37 (75.5)	36 (21.4)	132 (78.6)
50-59 yrs	27 (32.5)	56 (67.5)	25 (25.5)	73 (74.5)	23 (25.6)	67 (74.4)	75 (27.7)	196 (72.3)
60-69 yrs	31 (31.3)	68 (68.7)	32 (29.1)	78 (70.9)	29 (25.4)	85 (74.6)	92 (28.5)	231 (71.5)
70+ yrs	32 (32.3)	67 (67.7)	25 (23.4)	82 (76.6)	41 (40.2)	61 (59.8)	98 (31.8)	210 (68.2)
All Ages	**101 (30.5)**	**230 (69.5)**	**95 (24.7)**	**289 (75.3)**	**105 (29.6)**	**250 (70.4)**	**301 (28.1)**	**769 (71.9)**

Table 2b: Number and proportion (%) of confirmed cases of Legionnaires' disease by year of symptom onset and age group, 2014-2016

	2014 (%)	**2015** (%)	**2016** (%)	**Total**
< 50 yrs	50 (15.1)	69 (18.0)	49 (13.8)	168 (15.7)
50-59 yrs	83 (25.1)	98 (25.5)	90 (25.4)	271 (25.3)
60-69 yrs	99 (29.9)	110 (28.6)	114 (32.1)	323 (30.2)
70+ yrs	99 (29.9)	107 (27.9)	102 (28.7)	308 (28.8)

Figure 2: Number of confirmed cases of Legionnaires' disease by month and year of onset of symptoms; 2014-2016

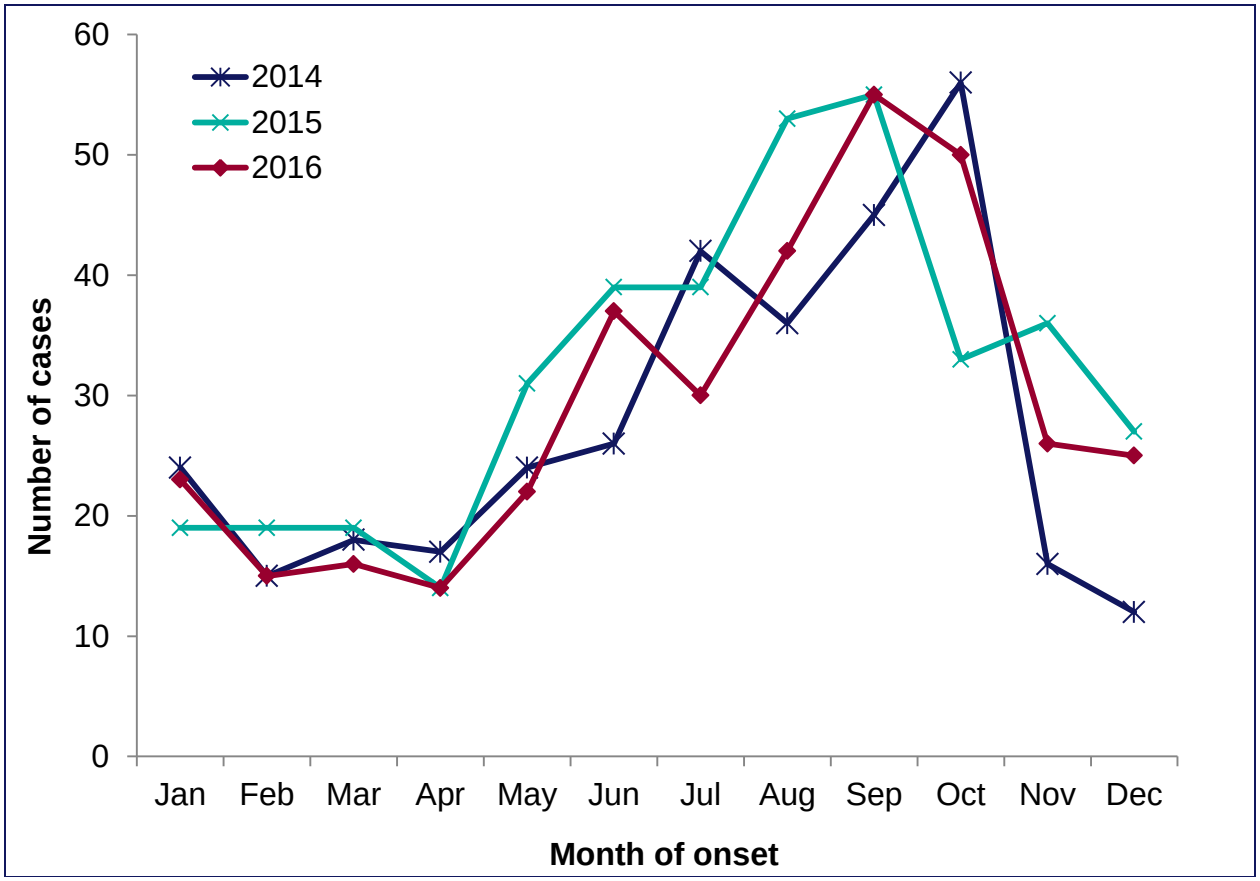
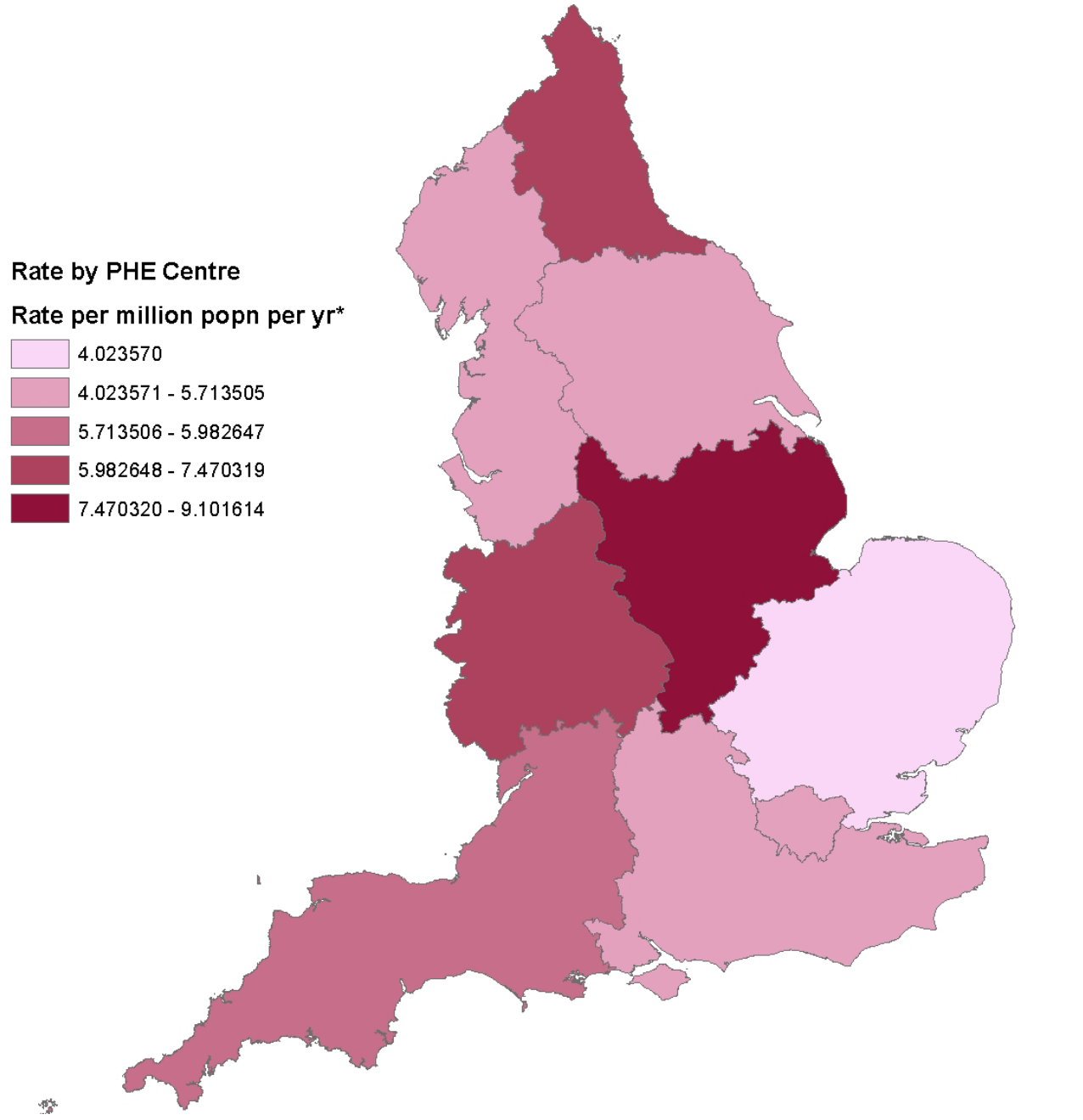


Figure 3: Incidence rate per million population† of confirmed Legionnaires' disease cases by PHE centre of residence (and Wales) and year of onset, 2014-2016



* Population denominators based on mid-2016 population estimates from office of national statistics.

Table 3: Average rate (million population†) of confirmed cases of Legionnaires' disease by PHE centre (and Wales) and year of symptom onset, 2014-2016

Public Health England centres and Wales	2014	2015	2016	Total	Rate per million popn per yr*
East Midlands	46	33	50	129	**9.10**
East of England	14	26	34	74	**4.02**
London	48	57	45	150	**5.69**
North East	15	27	14	56	**7.08**
North West	41	45	34	120	**5.54**
South East	46	54	53	153	**5.65**
South West	34	38	27	99	**5.98**
Wales	26	19	18	63	**6.75**
West Midlands	38	43	49	130	**7.47**
Yorkshire and Humber	22	40	31	93	**5.71**
Other	1	2	0	3	**-**
Total	**331**	**384**	**355**	**1070**	**6.11**

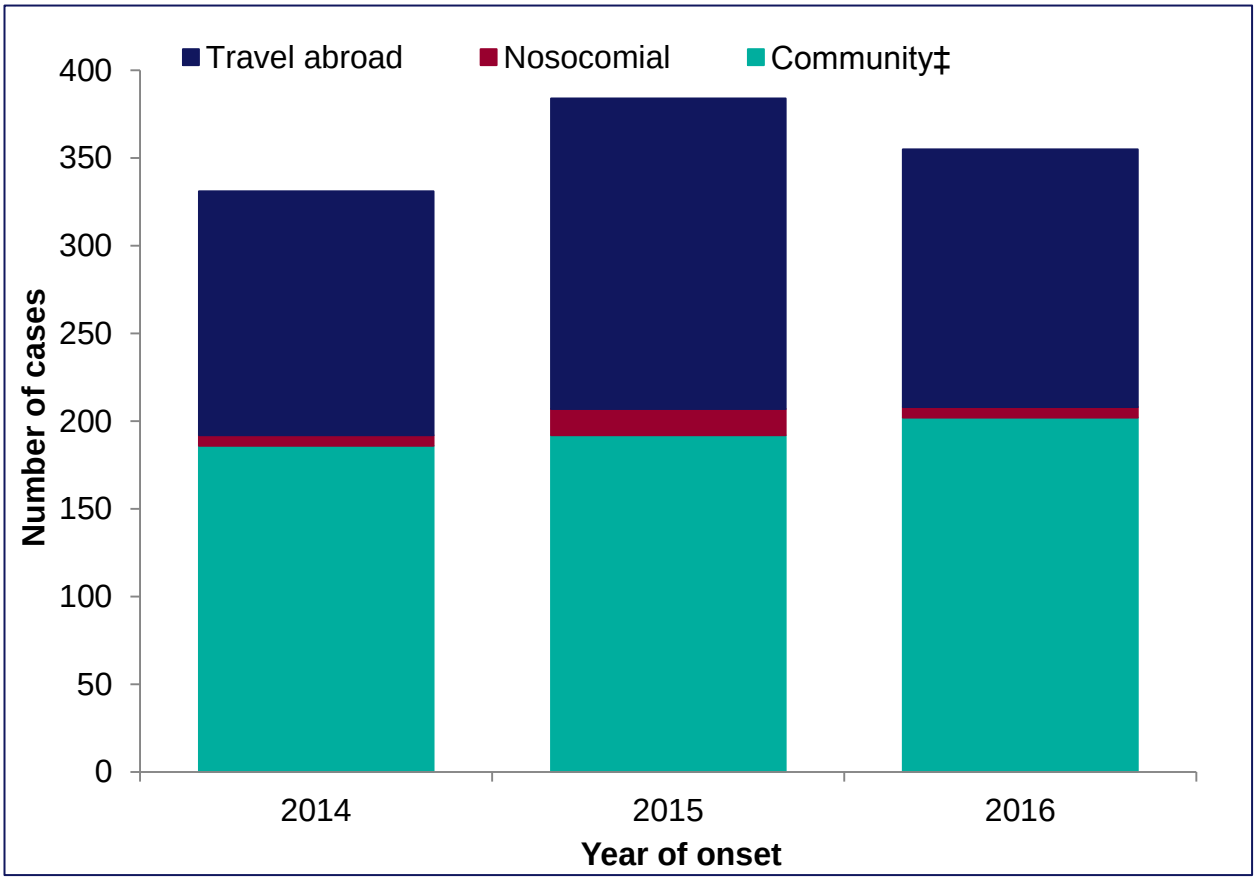
† Population denominators based on mid-2016 population estimates from office of national statistics.

Table 4: Number of confirmed cases of Legionnaires' disease by principal exposure category and year of onset, 2014 - 2016

Category	Community‡ (%)	Nosocomial (%)	Travel abroad (%)
2014	186 (56.2)	6 (1.8)	139 (42.0)
2015	192 (50.0)	15 (3.9)	177 (46.1)
2016	202 (56.9)	6 (1.7)	147 (41.4)

‡ includes travel UK cases

Figure 4: Number of confirmed Legionnaires' disease cases by year of onset and principal category of exposure, 2014-2016



‡ includes travel UK cases

Table 5: Underlying medical conditions and risk factors reported in confirmed cases of Legionnaires' disease, 2014 - 2016

	2014 (%)	**2015** (%)	**2016** (%)
Any underlying condition	**242 (73.1)**	**286 (74.5)**	**265 (74.6)**
Diabetes	50 (15.1)	67 (17.4)	46 (13.0)
Heart conditions	96 (29.0)	122 (31.8)	101 (28.5)
Immunosuppression^	40 (12.1)	45 (11.7)	46 (13.0)
Liver conditions	12 (3.6)	15 (3.9)	16 (4.5)
Neoplasms	26 (7.9)	28 (7.3)	25 (7.0)
Renal disorders	12 (3.6)	19 (4.9)	13 (3.7)
Respiratory conditions	26 (7.9)	52 (13.5)	43 (12.1)
Smoking	109 (32.9)	110 (28.6)	115 (32.4)

^ immunosuppression due to other conditions or clinical treatments
NB: Individual cases may have reported more than one underlying condition/risk factor

Figure 5: Case fatality rates for Legionnaires' disease by year of symptoms onset, 2007-2016

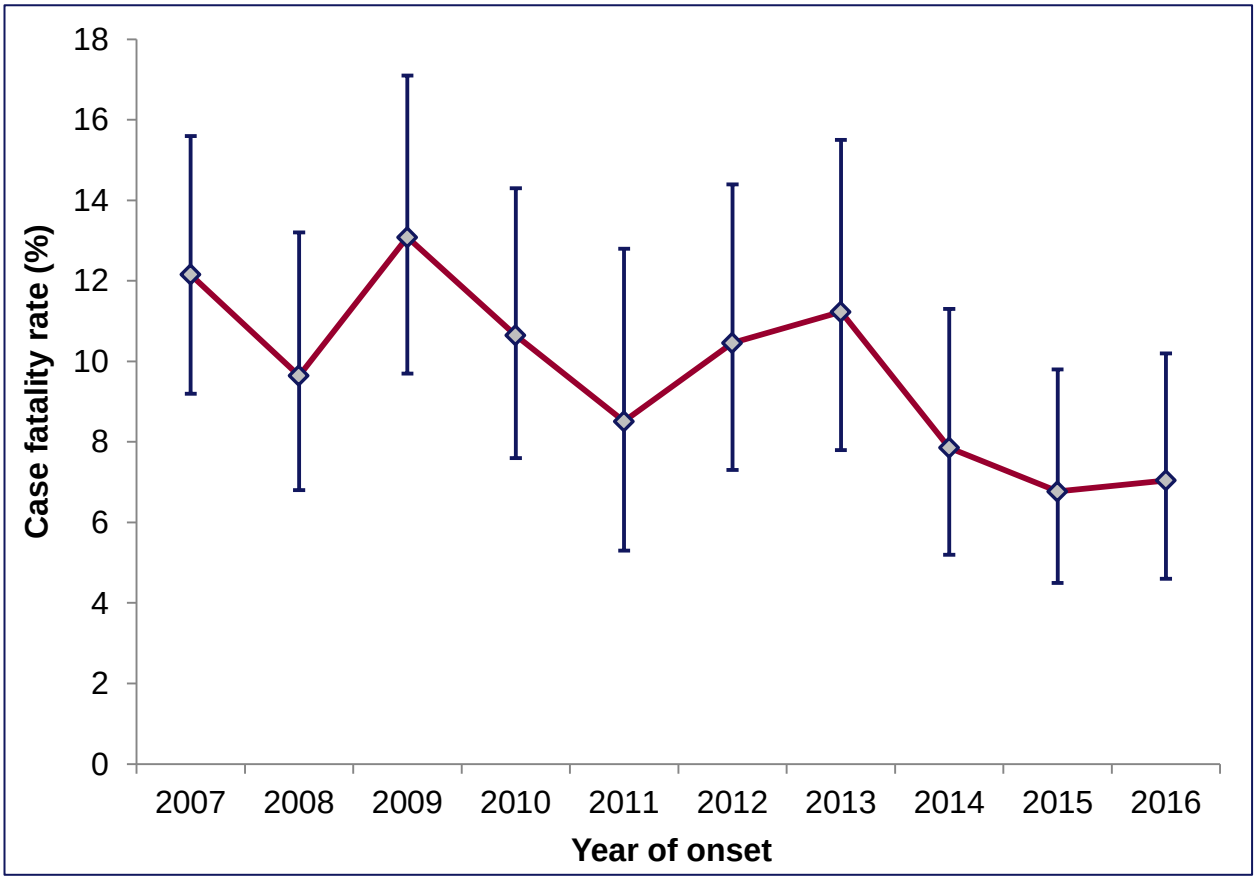


Table 6: Case fatality rates for confirmed cases of Legionnaires' disease by principal category of exposure, 2014 - 2016

	Cases	Deaths	Case Fatality Rate (%) (95% CI)
Community‡	580	57	9.8 (7.5 - 12.5)
Nosocomial	27	6	22.2 (8.6 - 42.3)
Travel Abroad	463	14	3.0 (1.7 - 5.0)
Total	**1070**	**77**	**7.2 (5.7 - 8.9)**

‡ includes travel UK cases

Figure 6: Number of confirmed cases of Legionnaires' disease by age and gender, with case fatality rate (%) and 95% CI, 2014-2016

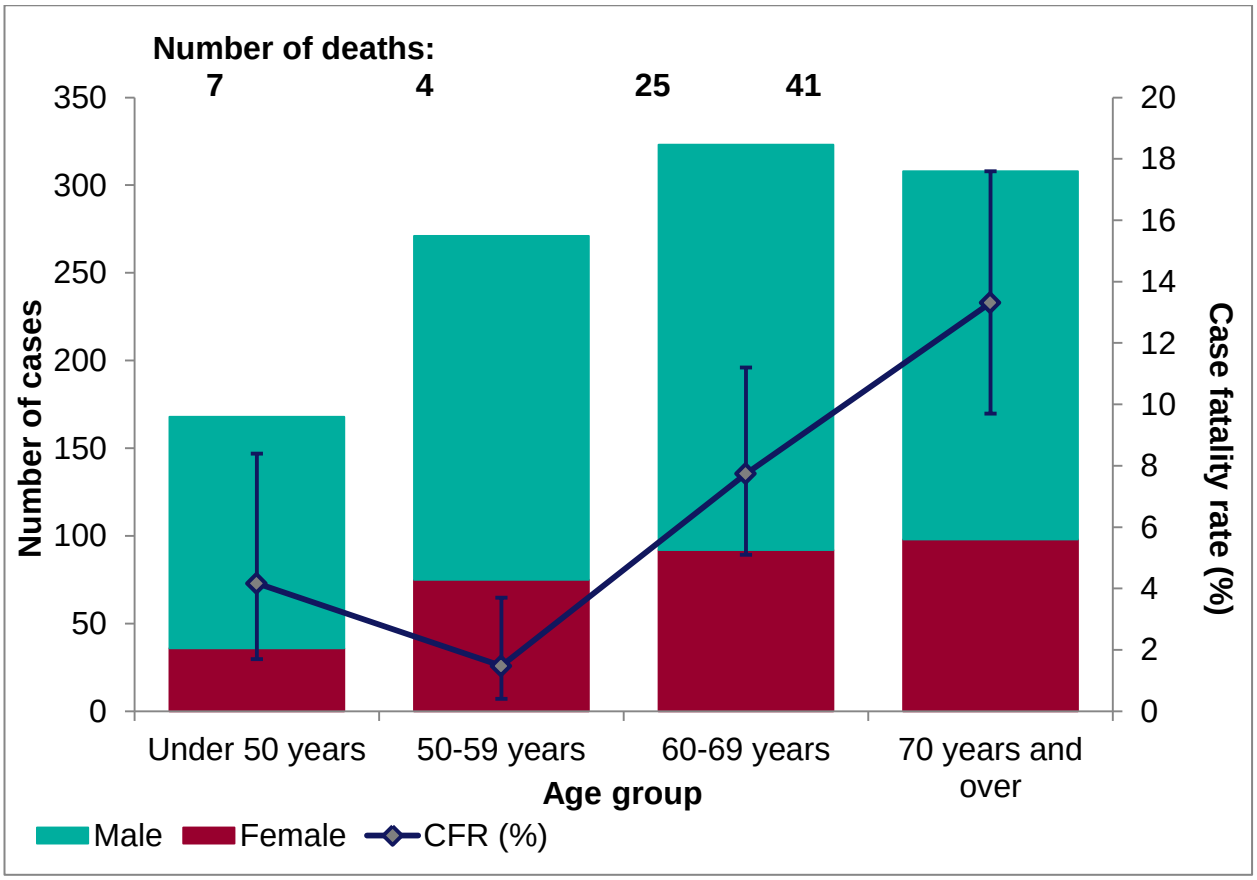


Table 7: Number of confirmed cases of Legionnaires' disease by age group with case fatality rate (%) and 95% CI, 2014-2016

Age group	Cases	Deaths	Case Fatality Rate (%) (95% CI)
Under 50 yrs.	168	7	4.2 (2.5 - 40.2)
50 - 59 yrs.	271	4	1.5 (1.1 - 2.2)
60 - 69 yrs.	323	25	7.7 (2.6 - 3.5)
70 yrs. and over	308	41	13.3 (3.6 - 4.3)

Table 8: Legionnaires' disease cases by diagnostic test and year of onset, 2014-2016

Diagnostic test	**2014** (%)	**2015** (%)	**2016** (%)
Culture	82 (24.8)	89 (23.2)	70 (19.7)
Urinary antigen	321 (97.0)	375 (97.7)	348 (98.0)
Four-fold rise - (serology)	-	-	-
Single High Titre - (serology)	-	-	-
Polymerase Chain Reaction[º]	85 (25.7)	117 (30.5)	104 (29.3)

º includes positive tests with complete and partial sequence-based types deduced
NB: Individual cases may have been tested using one or more of the methods of diagnosis.

Table 9: Legionnaires' disease cases by causative organism, 2014-2016

	2014 (% total cases)	**2015** (% total cases)	**2016** (% total cases)
L.pneumophila **serogoup 1**	215 (65.0)	122 (31.8)	106 (29.9)
L.pneumophila **serogoup 2-14**	4 (1.2)	6 (1.6)	4 (1.1)
L.pneumophila **serogoup unknown**	110 (33.2)	255 (66.4)	245 (69.0)
Legionella **species (non- pneumophila)**	2 (0.6)	1 (0.3)	-
Total	**331**	**384**	**355**

Table 10: Most prevalent strains/sequence types of L. pneumophila identified in clinical isolates from confirmed cases of Legionnaires' disease, 2014-2016

Sequence type (ST)	**Number of cases with isolates**			
	2014 (%)	**2015** (%)	**2016** (%)	**Total** (%)
47	13 (3.9)	13 (3.4)	12 (3.4)	**38 (3.6)**
42	9 (2.7)	15 (3.9)	6 (1.7)	**30 (2.8)**
1	5 (1.5)	9 (2.3)	6 (1.7)	**20 (1.9)**
37	2 (0.6)	5 (1.3)	4 (1.1)	**11 (1.0)**
616	5 (1.5)	1 (0.3)	5 (1.4)	**11 (1.0)**
23	2 (0.6)	6 (1.6)	2 (0.6)	**10 (0.9)**
62	4 (1.2)	3 (0.8)	3 (0.8)	**10 (0.9)**
82	3 (0.9)	3 (0.8)	3 (0.8)	**9 (0.8)**
74	3 (0.9)	3 (0.8)	-	**6 (0.6)**
117	1 (0.3)	1 (0.3)	3 (0.8)	**5 (0.5)**

Figure 7: Sequence-based type by principal category of exposure, 2016

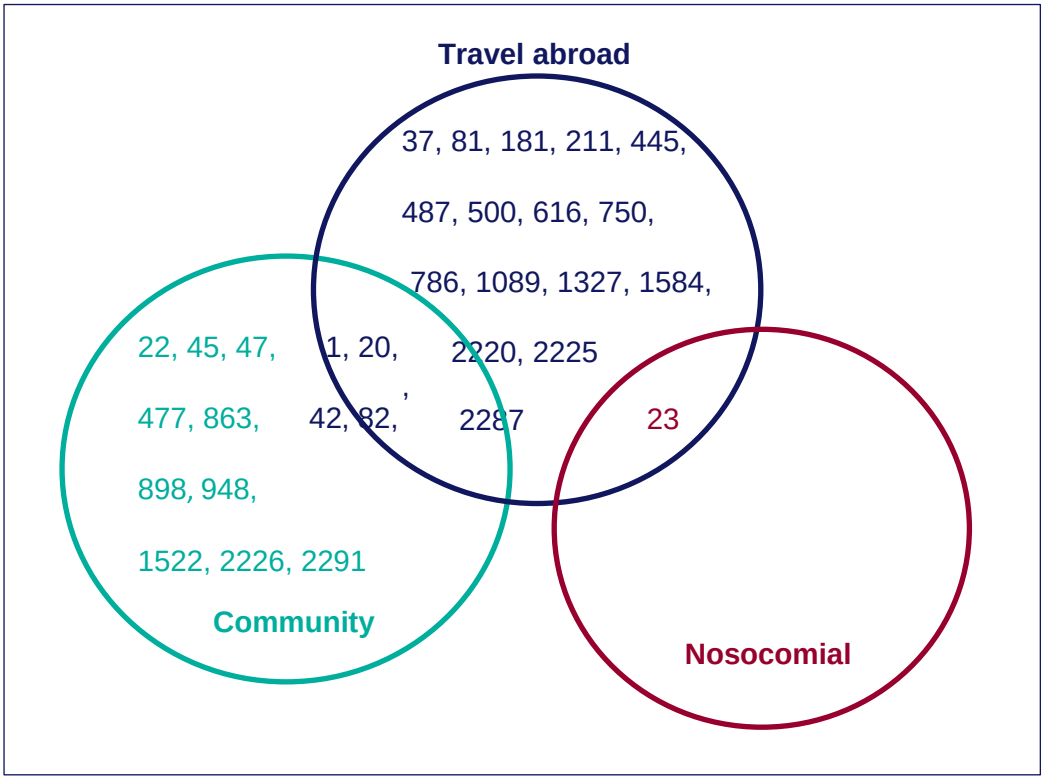


Table 11: Number and proportion (%), of confirmed cases of Legionnaires' disease with complete sequence-based type (SBT) identified by principal category of exposure; 2014-2016

Category	2014 (%)	2015 (%)	2016 (%)
Community‡	53 (28.5)	55 (28.6)	48 (23.8)
Nosocomial	2 (33.3)	6 (40.0)	1 (16.7)
Travel abroad	29 (20.9)	35 (19.8)	30 (20.4)
Total cases with complete SBT	**84 (25.4)**	**96 (25.0)**	**79 (22.3)**

‡ includes travel UK cases
SBT: sequence-based type

Table 12: Sequence-based type by country of travel, 2016

Strain	New Strain[i]	Country of travel
750	Yes	Greece
2220	Yes	Greece
1089	No	India
445	Yes	Italy
786	Yes	Mexico
181	No	Spain
1584	Yes	Spain
2287	Yes	Spain
81	No	Turkey
487	Yes	Turkey
2225	Yes	Turkey
616	No	United Arab Emirates

[i] New strain refers to any SBT not previously identified in a case from England and Wales in association with that country of travel

NB: This table only presents SBT's identified in cases associated with travel to a single country.

Table 13: Number of outbreaks/clusters involving cases of Legionnaires' disease in residents of England and Wales by category of exposure, 2014-2016

	2014		2015		2016	
	OB/Cl	Cases	OB/Cl	Cases	OB/Cl	Cases
Community	5	28 (2)	13	57 (3)	10	26
Nosocomial	-	-	3	9 (2)	2	4
Travel Abroadǂ	18	45 (9)	19	44 (9)	10	20 (9)
Travel UK	2	4	2	5 (1)	3	6 (2)
Total	**25**	**77 (11)**	**37**	**115 (15)**	**25**	**56 (11)**

( ) cases with onset of symptoms in previous years that are included in the cluster/outbreak
ǂ clusters with two or more cases of Legionnaires' disease in residents of England and Wales

Figure 8: Number of confirmed cases of Legionnaires' disease associated with travel by year of onset of symptoms, 2007-2016

Table 14: Most prevalent travel destinations visited by the greatest number of confirmed cases of Legionnaires' disease in residents of England and Wales with onset of symptoms in 2016

Country	LD cases	Visits by UK residents	Rate of cases (per million visits)
Spain	28	14,676,000	1.91
United Arab Emirates	24	922,000	26.03
Italy	14	4,089,000	3.42
Greece	9	2,480,000	3.63
France	8	8,542,000	0.94
Turkey	8	1,057,000	7.57
Indonesia	6	882,000	6.80
Thailand	6	467,000	12.85
India	4	990,000	4.04
Bulgaria	3	429,000	6.99
Cruise	3	642,000	4.67
Germany	3	2,732,000	1.10
Malta	3	651,000	4.61
Mexico	3	502,000	5.98

Table 13: Destinations associated with clusters involving residents of England and Wales with onset of symptoms during 2016

Country of Travel	No. Clusters[ɤ]	No. Associated EAW Cases
Belgium	1	1
Bulgaria	1	6
China	1	1
Croatia	1	1
Greece	3	4
Italy	5	6
Malaysia	1	1
Mauritius	2	4
Russia	1	1
Spain	4	6
Thailand	2	3
Turkey	1	1
United Arab Emirates	7	14
United Kingdom	2	4

ɤ clusters assocaietd with a least one resident of England and Wales