

Legionellosis in Queensland

2017

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1. Introduction

Legionellosis is an infection caused by Legionella bacteria. Legionella bacteria are Gram negative bacilli with among 60 species and at least 70 serogroups recognised (1, 2). Legionella bacteria are widespread in the environment, including natural and man-made aquatic environments (3, 4). They can be found in creeks, ponds, and soil, and have been isolated from hot water systems, cooling towers, evaporative condensers, humidifiers, whirlpool spas, respiratory therapy devices, decorative fountains, shower heads, and hot and cold water taps (4, 5). The most common pathogenic species in Australia are *Legionella pneumophila* and *Legionella longbeachae*, with these two species accounting for 99 per cent of all notified cases of legionellosis in 2014 (6). Whilst Legionella bacteria have strict requirements for growth, they may be resistant in their ecological niches to many of the usual mechanisms of disinfecting water supplies, and when protected by biofilm can survive the level of chlorination in drinking water that would eliminate many enteric pathogens (7).

Legionellosis is acquired through airborne transmission, involving inhalation of Legionella-containing aerosols by susceptible people (1). Most *Legionella* species are associated with water, with the exception of *L. longbeachae*, which has been associated with soil, gardening, and potting mixes (8, 9). In addition to airborne transmission from the environment, other modes of transmission are possible. For example, aspiration of water contaminated with Legionella bacteria has been described, but is uncommon and predominantly occurs in persons with swallowing disorders or in conjunction with nasogastric feeding (10).

Legionella is known as an opportunistic pathogen; exposure to the Legionella bacteria will not cause serious illness in most healthy people. Risk factors for developing legionellosis include being a smoker, having an underlying chronic medical condition/s (including diabetes, chronic heart disease, chronic renal failure), immunosuppression (from certain types of cancers such as leukaemia and lymphoma, post transplantation, or use of immunosuppressant drugs including glucocorticosteroids), being male, and being aged 50 years or older (1, 5, 11).

There are two clinical presentations of legionellosis with differing severity, Pontiac fever and Legionnaires' disease. Pontiac fever is generally a mild, self-limiting febrile illness and Legionnaires' disease is typically a more severe, and potentially fatal pneumonic form (5). Symptoms of the disease may include malaise, myalgia, anorexia, headache, and fever, with a non-productive cough and gastrointestinal symptoms such as abdominal pain and diarrhoea (1). The case fatality rate of Legionnaires' disease is estimated at 10–15 per cent (1, 5); more recent European Union Legionnaires' Disease surveillance indicates case fatality rates of nine per cent (12). In large community outbreaks, where active case finding may identify mild cases of legionellosis, the case fatality rate may be as low as one per cent (13).

This report describes the profile of legionellosis cases, including basic demographic data, clinical details, laboratory testing, risk factors, and exposures collected through the public health follow up of cases in Queensland. An overview is provided for the period 1 January 2008 – 31 December 2017 along with a more detailed analysis of the notifications between 1 January 2017 and 31 December 2017.

2. Methods

Legionellosis is a notifiable condition on pathological diagnosis under the Queensland *Public Health Regulation 2005*. This requires pathology providers to notify the Department of Health of any positive tests for *Legionella spp.* according to the Queensland notification criteria guidelines for laboratories (14). Cases were classified using the national case definition for legionellosis (see Box 1) as confirmed (valid) or probable cases (15). Notified cases are followed up by public health physicians, nurses and/or environmental health officers to establish clinical symptoms, risk factors, and exposure history.

Box 1: Legionellosis case definition (effective 1 January 2013)

CONFIRMED CASE

A **confirmed case** requires **laboratory definitive evidence** AND **clinical evidence**.

Laboratory definitive evidence

Isolation of *Legionella* OR detection of *Legionella* urinary antigen OR seroconversion or a significant increase in antibody level or a fourfold or greater rise in titre to *Legionella*.

Clinical evidence for confirmed cases

Fever OR cough OR pneumonia

PROBABLE CASE

A **probable case** requires **laboratory suggestive evidence** AND **clinical evidence**.

Laboratory suggestive evidence

Single high antibody titre to *Legionella* OR detection of *Legionella* by nucleic acid testing OR detection of *Legionella* by direct fluorescence assay.

Clinical evidence for probable cases

Fever AND cough OR pneumonia

Data were extracted from the Queensland Notifiable Conditions System on 23 April 2018 for all confirmed and probable cases of legionellosis with onset of disease between 1 January 2008 and 31 December 2017. Cases were assigned to a geographic Hospital and Health Service (HHS) area based on their residential address at the time of notification. Whilst Children's Health Queensland is a Queensland HHS, it has neither a geographic area nor population assigned to it and so has not been reported in the HHS of residence tables in this report.

Descriptive analyses were performed using Microsoft Excel™ and Stata 14.1. Geographic distribution analyses used Queensland Hospital and Health Service (HHS) boundaries. All rates were calculated using the Queensland Estimated Resident Population (ERP) 2008-2016. The 2016 population was used to calculate 2017 rates as 2017 ERP was not available at the time of preparing this report.

3. Results

3.1 Demographic data

There were 65 cases of legionellosis notified in Queensland in 2017, consisting of 42 confirmed cases and 23 probable cases (Table 1). The notification rate in 2017 was 1.3 cases per 100,000 population per year, compared to 1.0 and 3.5 cases per 100,000 population per year in 2016 and 2013, respectively. The number of notified cases of legionellosis in 2017 continued the decreasing trend following the peak in 2013. The 2:1 ratio of confirmed to probable cases has remained relatively consistent since 2015, following a change from a 1:1 ratio during 2013 and 2014 (Figure 1).

Table 1: Number of cases of legionellosis by confirmation status, Queensland, 2008-2017

Year of onset	Confirmed n (%)	Probable n (%)	Total N(%)	Notification rate*
2008	30 (100%)	0 (0%)	30 (100%)	0.7
2009	50 (93%)	4 (7%)	54 (100%)	1.2
2010	34 (81%)	8 (19%)	42 (100%)	1.0
2011	43 (93%)	3 (7%)	46 (100%)	1.0
2012	46 (66%)	24 (34%)	70 (100%)	1.5
2013	83 (51%)	81 (49%)	164 (100%)	3.5
2014	46 (49%)	47 (51%)	93 (100%)	2.0
2015	50 (63%)	30 (37%)	80 (100%)	1.7
2016	32 (65%)	17 (35%)	49 (100%)	1.0
2017	42 (65%)	23 (35%)	65 (100%)	1.3

* Notification rate per 100,000 population per year

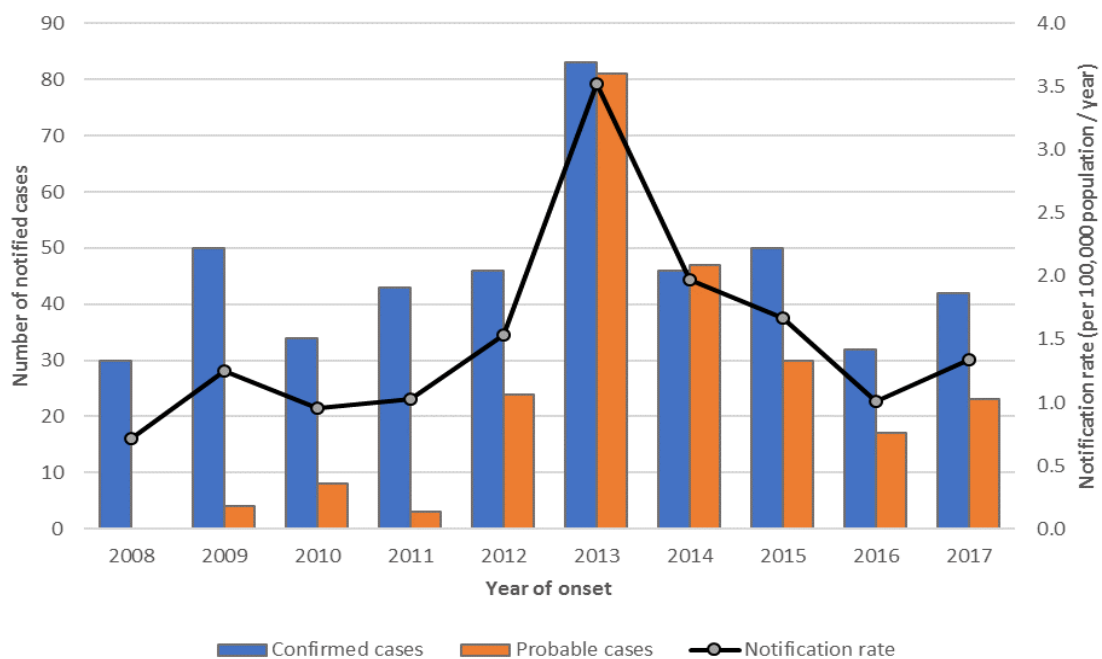


Figure 1: Notified cases of legionellosis by confirmation status and notification rate of legionellosis (confirmed and probable), Queensland, 2008-2017

The 2017 legionellosis notifications comprised 45 males (69%) and 20 females (31%). The age range of cases was 30 to 90 years, with a median age of 67 years for all cases. The median age for males was 65 years and 69 years for females. The modal (most frequently notified) age group was the 65-69 group (15 notifications), while notification rates were highest in the 80-84 age group for males (8.0 cases per 100,000 population) and >85 age group for females (5.6 cases per 100,000 population) (Figure 2).

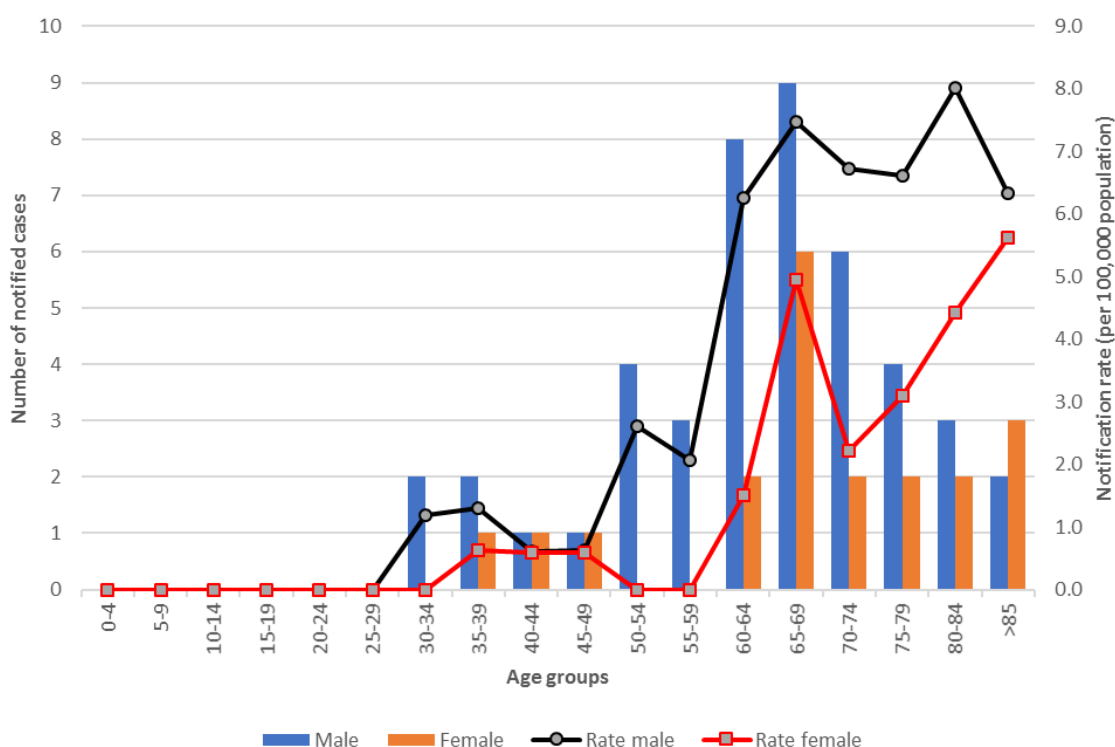


Figure 2: Notified cases and notification rate by age group and sex, Queensland, 2017

In 2017, 33 notified cases (51%) were found to be caused by *L. pneumophila*, 30 cases (46%) caused by *L. longbeachae*, and two cases (3%) were unspecified Legionella. No other species were notified in Queensland during 2017. Over the ten-year period from 2008–2017, there were 318 cases (46%) of *L. pneumophila*, 274 cases (39%) of *L. longbeachae*, and 101 cases (15%) of unspecified Legionella (Figure 3).

In 2017, the highest notification rate for all cases of legionellosis was for the Sunshine Coast HHS with 2.9 notified cases per 100,000 population per year (12 cases), followed by Cairns and Hinterland HHS (2.0 notified cases per 100,000 population per year; 5 cases), and Metro South HHS (1.9 notified cases per 100,000 population per year; 21 cases) (Table 2). These rates are based on small numbers and are not age-standardised, so do not necessarily indicate any change in legionellosis risk in these HHSs over time. Geographic distribution is based on a case’s usual place of residence at the time of diagnosis and does not necessarily indicate their place of exposure.

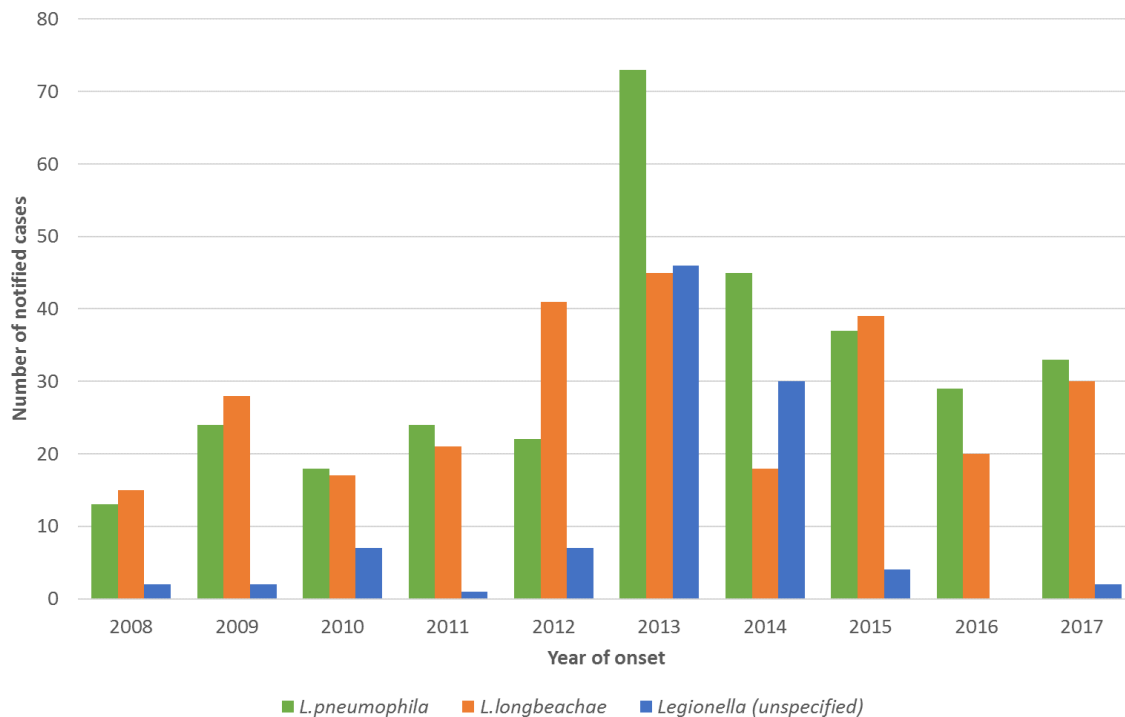


Figure 3: Number of notified cases of legionellosis by species, Queensland, 2008-2017

Table 2: Number of cases by species and confirmation status, and notification rate of legionellosis by Hospital and Health Service of residence, Queensland, 2017

HHS	<i>L. pneumophila</i>		<i>L. longbeachae</i>		Unspecified <i>Legionella</i>		Total cases	Notification rate *
	Confirmed	Probable	Confirmed	Probable	Confirmed	Probable		
Torres and Cape	0	0	0	0	0	0	0	0.0
Cairns and Hinterland	3	0	2	0	0	0	5	2.0
North West	0	0	0	0	0	0	0	0.0
Townsville	0	0	0	0	0	0	0	0.0
Mackay	0	0	0	0	0	0	0	0.0
Central QLD	0	0	1	2	0	0	3	1.4
Central West	0	0	0	0	0	0	0	0.0
Wide Bay	1	0	0	2	0	0	3	1.4
Sunshine Coast	6	1	1	3	0	1	12	2.9
Metro North	7	0	2	3	0	1	13	1.3
Metro South	9	3	3	6	0	0	21	1.9
Darling Downs	0	0	1	0	0	0	1	0.4
West Moreton	1	0	1	1	0	0	3	1.1
South West	0	0	0	0	0	0	0	0.0
Gold Coast	2	0	2	0	0	0	4	0.7
Total	29	4	13	17	0	2	65	1.3

* Notification rate per 100,000 population per year

3.2 Laboratory testing

Laboratory definitive evidence (culture, urinary antigen testing, or seroconversion or fourfold rise in serological titre) was obtained for 42 confirmed cases (65%), with laboratory suggestive evidence only (PCR or single high serological titre) obtained for the remaining 23 probable cases (35%). Confirmed cases of *L. pneumophila* were most frequently identified from urinary antigen testing (90%); five of which also had a culture positive result. It is important to note that urinary antigen testing is specific for *L. pneumophila* serogroup 1 and cannot be used to diagnose other species of Legionella. Confirmed cases of *L. longbeachae* were most frequently identified from a seroconversion or a four-fold serological rise (92%), while probable cases were most frequently identified from single high serological titres (82%) (Tables 3 and 4). Of note, laboratory suggestive evidence obtained for confirmed cases has been excluded from the calculations in Table 4.

Table 3: Number and percentage of confirmed legionellosis cases with positive laboratory results by test type and species, 2017

	Laboratory definitive evidence			Total cases n (%)
	Culture n (%)	Urinary antigen n (%)	4 fold serological rise n (%)	
<i>L. pneumophila</i> [#]	7 (24%)*	26(90%)*	1 (3%)	29 (100%)
<i>L. longbeachae</i> [^]	1 (8%)	n/a	12 (92%)	13 (100%)
Unspecified <i>Legionella</i>	0 (0%)	n/a	0 (0%)	0 (100%)
Total	8 (19%)	26 (62%)	13 (31%)	42 (100%)

[#] In addition, 6 cases also had a positive PCR test and 1 has a single high serological titre

* Cases may report more than one laboratory test, with cases represented in more than one cell

[^] In addition, 1 cases also had a positive PCR test, and 8 has a single high serological titre

Table 4: Number and percentage of probable legionellosis cases with positive laboratory results by test type and species, 2017

	Laboratory suggestive evidence		Total cases n (%)
	PCR n (%)	Single high serological titre n (%)	
<i>L. pneumophila</i>	2 (50%)	2 (50%)	4 (100%)
<i>L. longbeachae</i>	3 (18%)	14 (82%)	17 (100%)
Unspecified <i>Legionella</i>	2 (100%)	0 (0%)	2 (100%)
Total	7 (30%)	16 (70%)	23 (100%)

3.3 Clinical presentation

In 2017, 82 per cent (n=53) of all legionellosis cases notified reported pneumonia, with 81 per cent (n=43) of these 53 cases reported as having pneumonia confirmed by chest x-ray (CXR). Legionnaires' disease (or legionellosis pneumonia) was reported in 30 *L. pneumophila* cases (91%), with the remaining three cases (9%) reported as having a non-pneumonic form of legionellosis. For *L. longbeachae*, 22 cases (73%) reported pneumonia, with the remaining eight cases (27%) reported not to have pneumonia. The key clinical features of fever, cough and pneumonia have been reported separately for both confirmed and probable cases (Table 5 and 6).

The most common clinical features in addition to fever, cough, and pneumonia, were malaise, headache, anorexia, and diarrhoea (Table 7).

Table 5: Notified cases of confirmed legionellosis by key clinical features* and species, Queensland, 2017

	Fever n (%)	Cough n (%)	Pneumonia n (%)	Pneumonia (confirmed by CXR) n (%)	Pneumonia (unconfirmed) n (%)	Total cases n (%)
<i>L. pneumophila</i>	26 (90%)	24 (83%)	27 (93%)	25 (86%)	2 (7%)	29 (100%)
<i>L. longbeachae</i>	12 (92%)	9 (69%)	10 (77%)	7 (54%)	3 (23%)	13 (100%)
Unspecified <i>Legionella</i>	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Total	38 (90%)	33 (79%)	37 (88%)	32 (76%)	5 (12%)	42 (100%)

*Cases may report more than one clinical feature or symptom, with cases represented in more than one cell

Table 6: Notified cases of probable legionellosis by key clinical features* and species, Queensland, 2017

	Fever n (%)	Cough n (%)	Pneumonia n (%)	Pneumonia (confirmed by CXR) n (%)	Pneumonia (unconfirmed) n (%)	Total cases n (%)
<i>L. pneumophila</i>	3 (75%)	4 (100%)	3 (75%)	1 (25%)	2 (50%)	4 (100%)
<i>L. longbeachae</i>	16 (94%)	17 (100%)	12 (71%)	9 (53%)	3 (18%)	17 (100%)
Unspecified <i>Legionella</i>	1 (50%)	0 (0%)	1 (50%)	1 (50%)	0 (0%)	2 (100%)
Total	20 (87%)	21 (91%)	16 (70%)	11 (48%)	5 (22%)	23 (100%)

*Cases may report more than one clinical feature or symptom, with cases represented in more than one cell

Table 7: Notified cases of legionellosis by additional clinical features* and species, Queensland, 2017

	<i>L. pneumophila</i> n (%)		<i>L. longbeachae</i> n (%)		Unspecified <i>Legionella</i> n (%)		Total cases N (%)
	Confirmed (N=29)	Probable (N=4)	Confirmed (N=13)	Probable (N=17)	Confirmed (N=0)	Probable (N=2)	All (N=65)
Headache	11 (38%)	1 (25%)	3 (23%)	4 (24%)	0 (0%)	1 (50%)	20 (31%)
Anorexia	10 (34%)	0 (0%)	2 (15%)	5 (29%)	0 (0%)	1 (50%)	18 (28%)
Malaise	13 (45%)	1 (25%)	6 (46%)	13 (76%)	0 (0%)	1 (50%)	34 (52%)
Abdominal pain	2 (7%)	0 (0%)	1 (8%)	3 (18%)	0 (0%)	1 (50%)	7 (11%)
Myalgia	7 (24%)	0 (0%)	2 (15%)	5 (29%)	0 (0%)	1 (50%)	15 (23%)
Diarrhoea	10 (34%)	1 (25%)	2 (15%)	4(24%)	0 (0%)	1 (50%)	18 (28%)

*Cases may report more than one clinical feature or symptom, with cases represented in more than one cell. The proportion of cases not reported to have an additional symptom may be because they did not have the symptom, or the information was unknown

In 2017, 52 (80%) of all notified cases were hospitalised for legionellosis, with the highest proportion of hospitalised cases in those diagnosed with *L. pneumophila* (Table 8).

Hospital length of stay was known for 23 (44%) of the 52 cases reported to have been hospitalised. The median length of stay was 8 days, with a range of 2 days to 42 days. The median length of stay for cases hospitalised due to *L. pneumophila* was 10 days, and 8 days for *L. longbeachae*. Complications were reported for 20 cases, of which, 16 cases were infected with *L. pneumophila*, and 4 cases with *L. longbeachae*. There were four legionellosis associated deaths due to *L. pneumophila* (2) and *L. longbeachae* (2).

Table 8: Hospitalisation of notified cases of legionellosis by species and confirmation status, Queensland, 2017

Species	Confirmation status	Hospitalised n (%)	Not hospitalised n (%)	Unknown n (%)	Total cases N (%)
<i>L. pneumophila</i>	Confirmed	28 (97%)	1 (3%)	0 (0%)	29 (100%)
	Probable	3 (75%)	1 (25%)	0 (0%)	4 (100%)
	Total	31 (94%)	2 (6%)	0 (0%)	33 (100%)
<i>L. longbeachae</i>	Confirmed	10 (77%)	3 (23%)	0 (0%)	13 (100%)
	Probable	10 (59%)	7 (41%)	0 (0%)	17 (100%)
	Total	20 (67%)	10 (33%)	0 (0%)	30 (100%)
Unspecified <i>Legionella</i>	Confirmed	0 (0%)	0 (0%)	0 (0%)	0 (100%)
	Probable	1 (50%)	0 (0%)	1 (50%)	2 (100%)
	Total	1 (50%)	0 (0%)	1 (50%)	2 (100%)
Total (all cases)		52 (80%)	12 (18%)	1 (2%)	65 (100%)

3.4 Risk factors

Risk factors for legionellosis include increasing age, cigarette smoking, diabetes, chronic lung disease, renal disease, malignancy, and compromised immunity (1, 5). Fifty-six cases (86%) notified in 2017 were aged 50 years or older, with 24 cases (37%) aged 70 years or older. Sixteen cases (25%) reported smoking, 42 cases (65%) were reported as non-smokers, and seven cases (10%) were of unknown smoking status.

Forty-two cases (65%) reported having at least one chronic disease, with 12 (18%) reporting respiratory disease, five (8%) reporting chronic renal disease, 17 (26%) reporting cardiac disease, and 10 (15%) reporting diabetes (Table 9).

Eleven cases (17%) reported being immunocompromised, with the most common reason being the use of immunosuppressive medications (Table 10).

Table 9: Notified cases of legionellosis by selected chronic disease risk factors* and species, Queensland, 2017

	<i>L. pneumophila</i> (N=33) n (%)	<i>L. longbeachae</i> (N=30) n (%)	Unspecified Legionella (N=2) n (%)	Total cases (N=65) n (%)
Respiratory disease	6 (18%)	6 (20%)	0 (0%)	12 (18%)
Chronic renal disease	2 (6%)	3 (10%)	0 (0%)	5 (8%)
Cardiac disease	11 (33%)	6 (20%)	0 (0%)	17 (26%)
Diabetes	5 (15%)	5 (17%)	0 (0%)	10 (15%)

* Cases may report more than one chronic condition, with cases represented in more than one cell

Table 10: Notified cases of legionellosis by immunocompromised condition risk factors* and species, Queensland, 2017

	<i>L. pneumophila</i> (N=33) n (%)	<i>L. longbeachae</i> (N=30) n (%)	Unspecified Legionella (N=2) n (%)	Total cases (N=65) n (%)
Immunosuppressive medications	6 (18%)	3 (10%)	0 (0%)	9 (14%)
Oncology treatment	1 (3%)	1 (3%)	1 (50%)	3 (5%)
Transplant recipient	0 (0%)	0 (0%)	0 (0%)	0 (0%)

* Cases may report more than one immunocompromised condition, with cases represented in more than one cell

3.5 Exposures

Legionella pneumophila

Twenty-nine of the 33 *Legionella pneumophila* cases (88%) were considered to be Queensland acquired, as they did not report travel interstate or overseas during their exposure period. The remaining four cases (12%) reported overseas travel during their exposure period and were considered to have been likely overseas acquired; one case each in China, Colombia, Papua New Guinea, and Thailand.

There were no common source clusters identified in Queensland during 2017.

The most frequent potential exposure reported by *L. pneumophila* cases was being in the vicinity of cooling towers (12 cases, 36%), followed by being in the vicinity of fountains (5 cases, 15%). Other known potential exposure risks for *L. pneumophila* were reported for a small number of cases only (Table 11).

Table 11: Notified cases of *L. pneumophila* by self-reported potential exposures*, Queensland, 2017

	Yes n (%)	No n (%)	Unknown n (%)	Total n (%)
Cooling towers	12 (36%)	10 (30%)	11 (33%)	33 (100%)
Spa pool	1 (3%)	24 (73%)	8 (24%)	33 (100%)
Fountains	5 (15%)	19 (58%)	9 (27%)	33 (100%)
Humidifier	0 (0%)	24 (73%)	9 (27%)	33 (100%)
Respiratory device	2 (6%)	22 (67%)	9 (27%)	33 (100%)

* Cases may report more than one potential exposure, with cases represented in more than one cell

Three cases (9%) were reported to having been hospitalised during their exposure period in 2017; 29 cases (88%) were not hospitalised during their exposure period, and one had unknown hospitalisation status during their exposure period. The three cases noted above were hospitalised for only a small proportion of their exposure period; two of the three cases reported other possible environmental exposures during their exposure period, and information on possible environmental exposures was unavailable for the third case.

Legionella longbeachae

For *L. longbeachae* cases, 18 of the 30 cases (60%) reported gardening activities during their exposure period. Eleven of these 18 cases (61%) reported using potting mix, though no common specific brand was identified. Twenty-eight cases (93%) were considered to have been acquired in Queensland; travel history during their exposure period was unknown for two of the cases.

4. Discussion

During 2017, the notification rate of legionellosis cases in Queensland remained low at around 1.3 case per 100,000 population per year. While the notification rate increased slightly from 2016 (1.0 cases per 100,000 population per year), it continues to remain below the peak of 2013. The peak in 2013 was the result of a large increase in notifications in June–October 2013, which was likely the result of increased testing due to public awareness following the widespread coverage of the legionellosis cases at the Wesley Hospital in June 2013 (16, 17). Urinary antigen testing was used to identify 90 per cent of *L. pneumophila* confirmed cases during 2017, while a fourfold serological rise identified 92 per cent of *L. longbeachae* confirmed cases. A single high serological titre identified 70 per cent of all probable cases during 2017.

As reported previously, the increase in probable cases in the past six years compared to pre-2009 was the result of a change to the national probable case definition. Historically, probable cases required laboratory suggestive evidence and clinical evidence and an epidemiological link to a confirmed case. The removal of an epidemiological link from the probable case definition may have resulted in the identification of more cases with milder disease, the potential to capture false positive cases with non-specific symptoms that had an existing high Legionella titre, and increased the case ascertainment for sporadic cases (not linked to a confirmed case).

Single titre serology results for Legionella in combination with non-specific symptoms such as fever and cough can make a diagnosis of legionellosis difficult without follow up laboratory testing. A proportion of the general population have measurable serological titres to Legionella, as reported by a small number of serological studies undertaken. Antibodies to *L. pneumophila* serogroup 1, at a titre of 1:128 were found in up to 20 per cent of the general population (1), and greater than or equal to 1:256 in approximately 5–10 per cent of the population (*Legionella* species not specified) (18). Cross-reactive antibodies have been found occasionally in patients with infections caused by non-*Legionella* bacteria (19).

The high proportion of confirmed cases reporting a clinical presentation that includes pneumonia (88%), along with the high proportion of all cases hospitalised following their onset of illness (80%) indicates that most cases notified have a clinically significant illness, and are diagnosed through investigation of predominantly community-acquired pneumonia or pneumonia-like illness. This is similar to data published for 2015 (20). Confirmed cases were more likely to be hospitalised than probable cases. However, it is possible that more intensive laboratory methods were used for diagnosis when a case was hospitalised (e.g. isolation from bronchial lavage or lung tissue). Risk factor data for Queensland for 2017 remain consistent with those published in 2016 and other published information on legionellosis.

Notification relies on passive transfer of notification data from laboratories. It is likely the counts reported here underestimate the total number of legionellosis infections in Queensland, given not all cases of legionellosis will be tested, especially those with mild symptoms. Changes in the number of notified cases from year to year could be the result of many factors including the availability of new tests over time (such as the introduction of urinary antigen testing in 2008 in Queensland), changes in testing by medical practitioners, and a possible increase or decrease in the frequency of infections.

Where confirmation of diagnosis cannot be achieved by culture or urinary antigen testing, paired acute and convalescent sera to determine seroconversion or significant increase are ideal. However, serological testing of culture-proven cases with Legionnaires' disease has shown approximately 25 per cent of cases will not seroconvert at all (5). This, in combination with the non-specific symptoms, such as with Pontiac fever, may result in the misclassification of a small proportion of true cases as non-cases using the current Legionella case definition.

Information on potential exposures is collected to assist in environmental investigations if required. These do not necessarily reflect whether an actual source was identified. Environmental investigations may be conducted by public health units depending on the findings of an initial interview. Information on the outcomes of community environmental investigations is not currently recorded or collated systematically state wide for surveillance purposes.

Notified cases of legionellosis in Queensland remained low in 2017, continuing the trend seen since 2013. Cases of Legionnaires' disease, especially those caused by *L. pneumophila*, continued to be the predominant form of legionellosis notified. Legionella infection remains a small, but potentially serious cause of community acquired pneumonia, with 80 per cent of cases hospitalised during 2017. It remains of public health importance because of a potential high mortality rate, particularly in untreated, immunocompromised patients; potential for outbreaks in community setting; and the potential for nosocomial transmission to immunocompromised patients in rare circumstances.

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