

Legionnaires' Disease Surveillance Summary Report, United States

2016–2017



**Centers for Disease
Control and Prevention**
National Center for Immunization
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The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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* Cases of disease due to *Legionella* are reported to NNDSS as legionellosis, which includes Legionnaires' disease, Pontiac fever, and extrapulmonary legionellosis, but are referred to as Legionnaires' disease in this figure or table (because almost all legionellosis cases reported in the United States are Legionnaires' disease cases).

§ Only cases of Legionnaires' disease reported to SLDSS are included in this figure or table.

± All cases of legionellosis (i.e., Legionnaires' disease, Pontiac fever, and extrapulmonary legionellosis) reported to SLDSS are included in this figure.

Background

The objective of this report is to provide a descriptive summary of the reporting and burden of Legionnaires' disease within the United States in 2016 and 2017. Legionellosis is an illness caused by the bacterium *Legionella* that most commonly presents as Legionnaires' disease, a severe pneumonia. Pontiac fever, a milder illness without pneumonia, is less commonly reported. Extrapulmonary legionellosis, infection with *Legionella* outside the lungs, is rare. Legionnaires' disease is confirmed by appropriate laboratory testing in a patient with compatible clinical findings. Most Legionnaires' disease cases are confirmed with a positive urinary antigen test (UAT); fewer cases are confirmed through other methods, including isolation of *Legionella* by culture (1,2).

Legionella typically is transmitted to people through inhalation of aerosolized water containing *Legionella*, or less commonly via aspiration of water containing *Legionella* (3,4). People most susceptible to Legionnaires' disease include those with advanced age, weakened immune systems, or chronic medical conditions (5). Collecting and reporting information about potential exposures in patients with Legionnaires' disease is important for finding the source of infection and helping to prevent additional cases. Exposure to large, complex building water systems that are not adequately managed increases a person's risk for acquiring Legionnaires' disease (6,7).

The majority of recognized Legionnaires' disease outbreaks are associated with travel accommodations (e.g., hotels, resorts, cruise ships) or healthcare settings (e.g., hospitals, long-term care facilities) (7). Travel, particularly lodging in public accommodations, has been shown to be a risk factor for Legionnaires' disease (8,9). Healthcare facilities frequently undergo construction and plumbing changes, and they often have aerosol-producing devices such as cooling towers, decorative fountains, and other devices unique to healthcare facilities (e.g., respiratory therapy equipment, hydrotherapy tubs, heater-cooler units) (6). Other potential settings for exposure to *Legionella* include assisted or senior living facilities, workplace environments, and the general community. The number of outbreaks reported annually to the National Outbreak Reporting System nearly quadrupled from 2009 through 2017 (10).

Case definition

Legionellosis case criteria defined in the 2009 Council of State and Territorial Epidemiologists (CSTE) Position Statement were in effect during 2016–2017 (1). Legionnaires' disease is characterized by fever, myalgia, cough, and clinical or radiographic pneumonia. Pontiac fever is characterized by a milder influenza-like illness without pneumonia. Extrapulmonary legionellosis indicates *Legionella* infection outside the lungs, such as endocarditis or a wound infection. To be considered confirmed, a case must be clinically compatible and fulfill at least one of the confirmatory laboratory criteria (i.e., positive UAT, isolation of *Legionella* by culture, or a 4-fold or greater rise in specific serum antibody titer to *Legionella pneumophila* serogroup 1). Please refer to **Definitions** in the Technical Notes for additional case status and laboratory criteria.

Note: The Centers for Disease Control and Prevention's case report form captures legionellosis syndrome (i.e., Legionnaires' disease, Pontiac fever, or extrapulmonary legionellosis). Because no standardized name or case definition for extrapulmonary legionellosis existed prior to the 2019 CSTE case definition change, some cases that are not extrapulmonary legionellosis are incorrectly reported here as such.

Data sources

For this surveillance summary, data from two surveillance systems (the National Notifiable Diseases Surveillance System (NNDSS) and the Supplemental Legionnaires' Disease Surveillance System (SLDSS)) were combined to provide a more comprehensive understanding of the national burden of Legionnaires' disease.

NNDSS

The Centers for Disease Control and Prevention (CDC) coordinates collection of data on all notifiable diseases, including Legionnaires' disease, from across the United States through NNDSS. NNDSS is a passive surveillance system for case-level data. Clinicians and laboratories report cases to local or state health departments, who then investigate the cases and report selected data to CDC. For this report, NNDSS data are limited to Legionnaires' disease case counts, basic demographics, date of disease occurrence, and jurisdiction of residence.

The Summary of Notifiable Infectious Diseases—United States (hereafter referred to as the *MMWR* annual report) reports the official statistics for U.S. Legionnaires' disease cases reported to NNDSS prior to 2016 (https://www.cdc.gov/mmwr/mmwr_nd/index.html). Provisional NNDSS data on reported notifiable infectious diseases for all years are published weekly on CDC WONDER (https://wonder.cdc.gov/nndss/nndss_weekly_tables_menu.asp), and finalized, yearly summary data for years after 2015 are published annually on CDC WONDER (https://wonder.cdc.gov/nndss/nndss_annual_tables_menu.asp). Jurisdictions may report cases of any case status (i.e., confirmed, probable, suspected, and unknown) to NNDSS, but only confirmed cases of Legionnaires' disease from the 50 U.S. states, the District of Columbia, and New York City were included in *MMWR* annual reports and on CDC WONDER from 2000 through 2017, with the following exceptions:

- During 2000, 2002, and 2003, Legionnaires' disease cases with probable, suspect, and unknown case status were also included.
- During 2001, Legionnaires' disease cases with probable and unknown case status were also included.
- During 2000–2001, Legionnaires' disease cases were not reportable in Oregon and West Virginia.
- During 2004–2012, Legionnaires' disease cases with unknown case status reported from California were also included.
- During 2011–2012, Legionnaires' disease cases were not reportable in the District of Columbia.

Learn more about reported cases of Legionnaires' disease at <https://wwwn.cdc.gov/nndss/infectious-tables.html>.

SLDSS

SLDSS, a voluntary, passive surveillance system for case-level data, includes additional information not reported to NNDSS. SLDSS captures disease severity indicators, exposure history information, and laboratory diagnostic test results. While not all jurisdictions consistently report to SLDSS, reporting completeness has improved over time (13). SLDSS facilitates rapid recognition of clusters of cases among persons from different jurisdictions who have recently dispersed from a point source of *Legionella* and became ill in their respective jurisdictions of residence.

LEGIONNAIRES' DISEASE VS. LEGIONELLOSIS

Because NNDSS does not capture type of legionellosis diagnosis, it cannot distinguish clinical syndromes (Legionnaires' disease vs Pontiac fever vs extrapulmonary legionellosis). For this reason, CDC has used the term "legionellosis" historically for surveillance purposes (when referring to NNDSS data). However, approximately 98% of legionellosis cases reported to SLDSS are Legionnaires' disease (11,12). Furthermore, because Legionnaires' disease can be associated with substantial mortality (while Pontiac fever is self-limited), prevention efforts are often designed with Legionnaires' disease in mind. Accordingly, we refer here to cases of legionellosis reported to NNDSS as "Legionnaires' disease" instead of "legionellosis," and, unless otherwise specified, SLDSS data in this report are limited to cases of Legionnaires' disease.

However, this decision does not indicate that Pontiac fever is considered inconsequential. Outbreaks of Pontiac fever can be large and can place burden on the medical system. Furthermore, Pontiac fever can signal the presence of conditions that support *Legionella* growth and transmission, and environmental sources that lead to cases of Pontiac fever are often also associated with cases of Legionnaires' disease.

Highlights

Case count and incidence

From 2000 through 2017, a total of 63,529 confirmed Legionnaires' disease cases were reported to NNDSS from 52 U.S. jurisdictions. The crude national incidence rate increased 5.5-fold from 0.42 per 100,000 persons in 2000 to 2.29 per 100,000 persons in 2017 (Figure 1). There were 6,141 confirmed Legionnaires' disease cases (1.90/100,000 persons) reported to NNDSS in 2016 and 7,458 cases (2.29/100,000 persons) reported in 2017.

Seasonality and geographic distribution

Case month was based on *MMWR* week (assigned variably by reporting jurisdictions based on disease onset date, date of case report to state or local public health, date of case report to CDC, or some other jurisdiction-defined date), and was unevenly distributed, with more cases assigned to weeks in summer and fall versus winter and spring (Figure 2). For 2016 and 2017, the incidence of reported Legionnaires' disease cases tended to be higher in jurisdictions in the East North-Central (Illinois, Indiana, Michigan, Ohio, Wisconsin) and Mid-Atlantic (New York City, New York State, New Jersey, Pennsylvania) regions. (Figures 3a/3b).

- **2016:** The jurisdictions with the highest number of confirmed Legionnaires' disease cases reported to NNDSS included, in order, California, Ohio, New York (state), Pennsylvania, and Florida (Table 1).
- **2017:** The jurisdictions with the highest number of confirmed Legionnaires' disease cases reported to NNDSS included, in order, Ohio, New York (state), California, Pennsylvania, and Florida tied with New York City (Table 1).

Demographic characteristics

Age

Most cases occurred in persons ≥ 50 years of age, and incidence increased with age (Table 2 and Figure 4a).

- **2016:** The majority (81%) of reported cases occurred in persons ≥ 50 years of age; persons ≥ 85 years of age had the highest rate of disease, with an incidence rate of 8.37 cases per 100,000 persons (Table 2).
- **2017:** Similar to 2016, the majority (81%) of reported cases occurred in persons ≥ 50 years of age, and the highest rate of disease was in persons ≥ 85 years of age (9.24 per 100,000 persons) (Table 2).

Sex

Males accounted for the majority of the confirmed cases reported to NNDSS and also had a higher rate of disease (Table 2 and Figure 4b).

- **2016:** Males accounted for 60% of cases, with a rate of 2.31 per 100,000 persons (Table 2).
- **2017:** Males accounted for 62% of cases, with a rate of 2.86 per 100,000 persons (Table 2).

Race

Most cases reported to NNDSS occurred in persons reporting white race; however, incidence was higher in persons reporting black or African-American race (Table 2 and Figure 4c).

- **2016:** 63% of reported cases were in persons of white race, with an incidence rate of 1.54 per 100,000 persons. In contrast, 17% were in those of black or African-American race, with an incidence rate of 2.36 per 100,000 persons (Table 2).
- **2017:** 63% of reported cases were in persons of white race, with an incidence rate of 1.85 per 100,000 persons. In contrast, 21% were in those of black or African-American race, with an incidence rate of 3.44 per 100,000 persons (Table 2).

Ethnicity

Of cases reported to NNDSS from the 52 jurisdictions in 2016 and 2017, 20% were missing ethnicity data. Non-Hispanic persons accounted for the majority of the cases for which this information was available (Table 2 and Figure 4d). Among all cases, including those missing ethnicity data:

- **2016:** 73% were in persons of non-Hispanic ethnicity (Table 2).
- **2017:** 74% were in persons of non-Hispanic ethnicity (Table 2).

The distributions of demographic characteristics were similar for persons with confirmed Legionnaires' disease reported to NNDSS compared to those reported to SLDSS (Figures 4a–4d).

Legionellosis syndrome

Nearly all cases submitted to SLDSS were categorized as Legionnaires' disease (97% in 2016, and 98% in 2017) rather than Pontiac fever or extrapulmonary legionellosis (Figures 5a/5b).

- **2016:** 4,926 confirmed legionellosis cases were reported to SLDSS from 52 jurisdictions; 4,780 (97%) were Legionnaires' disease, 117 (2%) were Pontiac fever, 28 (<1%) were extrapulmonary legionellosis, and 1 (<1%) did not specify legionellosis syndrome (Figure 5a).
 - The case fatality rate (CFR) was 7% for Legionnaires' disease cases, 2% for Pontiac fever cases, 14% for extrapulmonary legionellosis cases, and 0% for cases that did not specify legionellosis syndrome (Figure 5a).
- **2017:** 6,319 confirmed legionellosis cases were reported to SLDSS from 52 jurisdictions; 6,221 (98%) were Legionnaires' disease, 64 (1%) were Pontiac fever, 32 (<1%) were extrapulmonary legionellosis, and 2 (<1%) did not specify legionellosis syndrome (Figure 5b).
 - The CFR was 7% for Legionnaires' disease cases, 5% for Pontiac fever cases, 16% for extrapulmonary legionellosis cases, and 50% for cases that did not specify legionellosis syndrome (Figure 5b).

Complete reporting jurisdictions

- **2016:** The following 35 jurisdictions reported ≥90% of their confirmed NNDSS legionellosis cases to SLDSS: Alabama, Alaska, Arkansas, Arizona, Colorado, Connecticut, Delaware, Florida, Georgia, Hawaii, Iowa, Illinois, Kansas, Kentucky, Maine, Michigan, Minnesota, Mississippi, Missouri, Montana, New Hampshire, New Jersey, New York City, New York (state), Ohio, Pennsylvania, Rhode Island, South Carolina, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, and Wyoming.
 - 4,150 confirmed Legionnaires' disease cases were reported to SLDSS from these 35 complete reporting jurisdictions, accounting for 87% of all 4,780 confirmed Legionnaires' disease cases reported to SLDSS from the 52 U.S. jurisdictions in 2016 (Figure 5a).
- **2017:** The following 39 jurisdictions reported ≥90% of their confirmed NNDSS legionellosis cases to SLDSS: Alabama, Alaska, Arkansas, Colorado, Connecticut, Florida, Georgia, Iowa, Illinois, Kansas, Kentucky, Maryland, Maine, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York City, New York (state), North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Utah, Vermont, Washington, West Virginia, Wisconsin, and Wyoming.
 - 5,898 confirmed Legionnaires' disease cases were reported to SLDSS from these 39 complete reporting jurisdictions, accounting for 95% of all 6,221 confirmed Legionnaires' disease cases reported to SLDSS from the 52 U.S. jurisdictions in 2017 (Figure 5b).

Sources of exposure

SLDSS captures detailed exposure history within the 10 days before symptom onset, including exposure to a healthcare setting, travel history, and exposure to an assisted or senior living facility (See **Definitions** in the Technical Notes for more detail).

- **2016:** 4,150 confirmed Legionnaires' disease cases were reported to SLDSS from the 35 complete reporting jurisdictions: 835 patients (20%) had a healthcare exposure, 616 patients (15%) had a travel exposure, 152 patients (4%) had assisted or senior living exposure, and 2,693 patients (65%) had "none of these" exposures (Figure 6a and Table 3).
 - Distribution of demographic characteristics varied by exposure category (Table 4a).
- **2017:** 5,898 confirmed Legionnaires' disease cases were reported to SLDSS from the 39 complete reporting jurisdictions: 1,255 patients (21%) had a healthcare exposure, 931 patients (16%) had a travel exposure, 211 patients (4%) had assisted or senior living exposure, and 3,733 patients (63%) had "none of these" exposures (Figure 6b and Table 3).
 - Distribution of demographic characteristics varied by exposure category (Table 4b).

Healthcare exposure

Of the Legionnaires' disease cases reported to SLDSS from the 35 complete reporting jurisdictions in 2016 and 39 complete reporting jurisdictions in 2017, 20%–21% were in patients who reported healthcare exposure (Figure 6a, Figure 6b, and Table 3) (See **Definitions** in the Technical Notes for more detail).

- **2016:** Of the 835 confirmed Legionnaires' disease cases in patients with any healthcare exposure reported to SLDSS from the 35 complete reporting jurisdictions, 178 (21%) were definite healthcare-associated cases, and 657 (79%) were possible healthcare-associated cases (Figure 6a and Table 5a).
 - Of the 178 confirmed Legionnaires' disease cases in patients with definite healthcare association, 110 (62%) were in patients who reported exposure to a long-term care facility, and 31 (17%) were in patients who reported exposure to a hospital (Table 5a).
 - Of the 657 confirmed Legionnaires' disease cases in patients with possible healthcare association, 294 (45%) were in patients who reported exposure to a hospital, 196 (30%) were in patients who reported exposure to a clinic, and 87 (13%) were in patients who reported exposure to a long-term care facility (Table 5a).
- **2017:** Of the 1,255 confirmed Legionnaires' disease cases in patients with any healthcare exposure reported to SLDSS from the 39 complete reporting jurisdictions, 232 (18%) were definite healthcare-associated cases, and 1,023 (82%) were possible healthcare-associated cases (Figure 6b and Table 5b).
 - Of the 232 confirmed Legionnaires' disease cases in patients with definite healthcare association, 137 (59%) were in patients who reported exposure to a long-term care facility, and 43 (19%) were in patients who reported exposure to a hospital (Table 5b).
 - Of the 1,023 confirmed Legionnaires' disease cases in patients with possible healthcare association, 400 (39%) were in patients who reported exposure to a hospital, 335 (33%) were in patients who reported exposure to a clinic, and 145 (14%) were in patients who reported exposure to a long-term care facility (Table 5b).

Travel exposure

Of the Legionnaires' disease cases reported to SLDSS from 35 complete reporting jurisdictions in 2016 and 39 complete reporting jurisdictions in 2017, 15–16% were in patients who reported travel exposure (Figure 6a, Figure 6b, and Table 3) (see **Definitions** in the Technical Notes for more detail).

- **2016:** Of the 616 confirmed Legionnaires' disease cases in patients with travel exposure reported by the 35 complete reporting jurisdictions, 417 patients (68%) reported at least one public accommodation, 181 patients (29%) reported private accommodations only, and 18 patients (3%) reported travel to accommodations of unknown type (Table 3).
- **2017:** Of the 931 confirmed Legionnaires' disease cases in patients with travel exposure reported by the 39 complete reporting jurisdictions, 585 patients (63%) reported at least one public accommodation, 239 patients (26%) reported private accommodations only, and 107 patients (12%) reported travel to accommodations of unknown type (Table 3).

Assisted or senior living exposure

Of the Legionnaires' disease cases reported to SLDSS from the 35 complete reporting jurisdictions in 2016 and 39 complete reporting jurisdictions in 2017, 4% were in patients who reported assisted or senior living exposure (Figure 6a, Figure 6b, and Table 3) (see Definitions in the Technical Notes for more detail).

- **2016:** Of the 152 confirmed Legionnaires' disease cases in patients with assisted or senior living exposure reported to SLDSS from the 35 complete reporting jurisdictions, 90 patients (59%) had exposure to an assisted living facility, and 48 patients (32%) had exposure to a senior living facility (Table 3).
- **2017:** Of the 211 confirmed Legionnaires' disease cases in patients with assisted or senior living exposure reported to SLDSS from the 39 complete reporting jurisdictions, 121 patients (57%) had exposure to an assisted living facility, and 64 patients (30%) had exposure to a senior living facility (Table 3).

Hospitalizations and outcomes

Overall, nearly all patients diagnosed with Legionnaires' disease were hospitalized for treatment regardless of age or exposure (Tables 6a/6b and Figure 7). Overall, the CFR for Legionnaires' disease was 7% (Figures 5a/5b) and varied by age and exposure (Figures 6a/6b, Tables 6a/6b, and Figure 8).

Hospitalizations

By exposure category

- **2016:** The rate of hospitalization for treatment of Legionnaires' disease ranged from 91–96% by exposure category (Table 6a).
- **2017:** The rate of hospitalization for treatment of Legionnaires' disease ranged from 95–97% by exposure category (Table 6b).

By age group

- **2016:** Of the 4,150 confirmed Legionnaires' disease cases reported to SLDSS from the 35 complete reporting jurisdictions in 2016, 3,946 (95%) patients were hospitalized for Legionnaires' disease treatment; percentage of patients hospitalized ranged from 78%–97% across different age groups (Figure 7).
- **2017:** Of the 5,898 confirmed Legionnaires' disease cases reported to SLDSS from the 39 complete reporting jurisdictions in 2017, 5,668 (96%) patients were hospitalized for Legionnaires' disease treatment; percentage of patients hospitalized ranged from 93%–100% across different age groups (Figure 7).

Outcomes

By exposure category

- **2016:** The CFR was 10% for Legionnaires' disease cases in patients with a healthcare exposure (17% for definite and 9% for possible healthcare-associated Legionnaires' disease), 5% for Legionnaires' disease cases in patients with a travel exposure, 9% for Legionnaires' disease cases in patients with an assisted or senior living exposure, and 6% for Legionnaires' disease cases in patients with "none of these" exposures (Figure 6a, Table 6a).
- **2017:** The CFR was 11% for Legionnaires' disease cases in patients with a healthcare exposure (20% for definite and 9% for possible healthcare-associated Legionnaires' disease), 3% for Legionnaires' disease cases in patients with a travel exposure, 10% for Legionnaires' disease cases in patients with an assisted or senior living exposure, and 7% for Legionnaires' disease cases in patients with "none of these" exposures (Figure 6b, Table 6b).

By age group

- **2016:** Of the 4,150 confirmed Legionnaires' disease cases reported to SLDSS from the 35 complete reporting jurisdictions in 2016, the overall CFR was 7% (Figure 5a), ranging from 0%–14% across different age groups (Figure 8).
- **2017:** Of the 5,898 confirmed Legionnaires' disease cases reported to SLDSS from the 39 complete reporting jurisdictions in 2017, the overall CFR was 7% (Figure 5b), ranging from 0%–16% across different age groups (Figure 8).

Diagnostic methods

Most confirmed Legionnaires' disease cases (98%) were diagnosed by UAT (Table 7). Among the Legionnaires' disease cases confirmed through positive culture, *L. pneumophila* was the most common species identified.

Technical Notes

Table and figure organization

Tables and figures in this report are organized by surveillance system and content. Tables 1–2 and Figures 1–3 were created using data from NNDSS exclusively. Cases of legionellosis in these tables and figures are referred to as Legionnaires' disease (for further explanation refer to text box in the **Background**). Figures 4a–4d were created using data from both NNDSS and SLDSS. Cases of legionellosis from NNDSS in Figures 4a–4d are referred to as Legionnaires' disease for the reasons discussed above; because syndrome of legionellosis is specified for SLDSS, data for SLDSS in Figures 4a–4d are limited to cases of Legionnaires' disease. Figures 5–8 and Tables 3–7 were created using data from SLDSS exclusively. These tables and figures present SLDSS data limited to cases of Legionnaires' disease except where noted. Only data for confirmed cases are presented in this report.

Figures 5a–5b include all cases of legionellosis (i.e., Legionnaires' disease, Pontiac fever, and extrapulmonary legionellosis) to illustrate the distribution of reporting by cases of different legionellosis syndrome and by completeness of reporting by jurisdiction.

Methods

Data collection

This surveillance report presents descriptive epidemiologic findings from NNDSS and SLDSS. Data were compiled from cases reported to either surveillance system from the 50 U.S. state, District of Columbia, and New York City health departments. The surveillance population includes residents of these 52 U.S. jurisdictions diagnosed with Legionnaires' disease in 2016 and 2017.

Public health officials electronically report cases to NNDSS. For 2016 and 2017, NNDSS includes data from cases reported as of June 30 the following year (i.e., data close out for 2016 cases occurred on June 30, 2017). Cases reported after June 30 contribute to case counts for the following year regardless of the year in which they occurred (i.e., cases with symptom onset in 2016 reported to CDC after June 30, 2017 contributed to the 2017 case count).

Public health officials use the SLDSS Legionellosis Case Report Form (available at <https://www.cdc.gov/legionella/downloads/case-report-form.pdf>), or the equivalent state-specific case report form, to capture demographic, clinical, exposure, and reporting details for routine surveillance purposes. For 2016 and 2017, SLDSS includes data from cases reported as of June 19, 2019.

Data from NNDSS are used to describe Legionnaires' disease trends by year, seasonal patterns by month, regional differences by state or jurisdiction of residence, and incidence rates by demographic characteristics. Incidence rate was calculated by dividing the number of confirmed Legionnaires' disease cases reported to NNDSS by the total resident population estimate or by a specific demographic population estimate as the denominator for 2016 or 2017, multiplied by 100,000. CDC's National Center for Health Statistics, in collaboration with the U.S. Census Bureau, determines postcensal estimates of resident population by year, jurisdiction, county, age, sex, race, and ethnicity. Population estimates for jurisdictions as of June 27, 2018, are available through the National Vital Statistics System (available at https://www.cdc.gov/nchs/nvss/bridged_race/data_documentation.htm).

Data from SLDSS are used to describe exposure settings that are potential sources of Legionnaires' disease infections (i.e., healthcare, travel, assisted or senior living) during the 10 days before symptom onset; clinical categorization of legionellosis (i.e., Legionnaires' disease, Pontiac fever, and extrapulmonary legionellosis); CFRs;

hospitalization; patient outcome; and diagnostic methods. CFRs were calculated as the number of reported confirmed Legionnaires' disease case deaths divided by the number of patients with Legionnaires' disease and the same exposure history (See **Definitions** in the Technical Notes for more detail).

SAS 9.4 was used for data analysis for both systems (SAS Institute, Cary, NC).

Complete reporting jurisdictions

NNDSS is considered the “gold standard” for case counts because almost all diagnosed Legionnaires' disease cases are reported to NNDSS (5); however, NNDSS captures only basic demographic information. SLDSS collects additional data including exposure history, disease severity indicators, and diagnostic laboratory testing results. Completeness of reporting of cases to SLDSS varies by jurisdiction. Because data from the jurisdictions with more complete reporting are more representative, this report restricts most SLDSS analyses to jurisdictions that reported at least 90% of confirmed NNDSS cases to SLDSS (Figures 6–8, Tables 3–6). These jurisdictions are referred to as complete reporting jurisdictions.

Time period and setting

Reported confirmed cases of Legionnaires' disease in NNDSS are based on case entry into the database as of June 30 of the following year (Figures 1–2). Cases reported after a given year's NNDSS database is closed can no longer be added to that year's database and can only contribute to case counts for the following year, regardless of the year in which that case occurred. In NNDSS, month is calculated based on the *MMWR* week assigned to that case by the reporting jurisdiction (available at http://wwwn.cdc.gov/nndss/document/MMWR_Week_overview.pdf) (Figure 2).

Reported cases in SLDSS are based on case year, defined as the year of symptom onset, when available. Date of symptom onset is self-reported by the patient as the date signs and symptoms of Legionnaires' disease first occurred, or deferred to the judgement of the clinicians providing care and the public health officials performing the interviews. If onset date is not stated, case year for confirmed cases is determined by the following dates (in order of reporting): date of positive laboratory test (by either UAT, culture, or 4-fold rise in antibody titer to *Legionella pneumophila* serogroup 1); date patient was hospitalized for treatment of Legionnaires' disease; or date case was first reported to public health at any level.

The population for this report includes residents from 52 U.S. jurisdictions (50 U.S. states, New York City, and District of Columbia). Resident jurisdiction is defined as the state, or jurisdiction, of usual residence of each case at the time of disease onset as reported to NNDSS (Figures 3a/3b) (available at <https://wwwn.cdc.gov/nndss/document/11-SI-04.pdf>). New York City and New York State health departments report independently to both surveillance systems; data from these jurisdictions are mutually exclusive in this report, such that New York City data are not included in the New York State data. Map shading of confirmed cases of Legionnaires' disease reported to NNDSS by resident jurisdiction was determined by calculating individual jurisdictions' incidence rates and shading by quintile of the distribution (Figures 3a/3b).

Definitions

Case status

CSTE criteria in effect during 2016 and 2017 were used to define and classify cases (1). This report includes confirmed cases only. To be considered confirmed, a case must occur in a person with a clinically compatible illness and at least one of the confirmatory laboratory criteria (i.e., positive UAT, isolation of *Legionella* by culture, or a 4-fold or greater rise in specific serum antibody titer to *Legionella pneumophila* serogroup 1) (1). CSTE defines a suspect case as a clinically compatible illness that meets at least one of the presumptive (suspect) laboratory

criteria (i.e., a 4-fold or greater rise in antibody titer to multiple species or specific species or serogroups of *Legionella* other than *Legionella pneumophila* serogroup 1, or a positive detection of specific *Legionella* antigen or staining of the organism by direct fluorescent antibody staining or immunohistochemistry, or by a validated nucleic acid assay) (1). Most cases submitted to NNDSS and SLDSS were categorized as confirmed (98%–99%).

Demographic characteristics

Selected demographic characteristics include age, sex, race, and ethnicity. For both surveillance systems, age is categorized in 10-year periods until age 85 (Tables 2 and 4a/4b and Figure 4a). Sex is reported by the health department completing the case investigation as either female or male (Tables 2 and 4a/4b and Figure 4b). NNDSS uses bridged-race categories that include American Indian or Alaska Native, Asian or Pacific Islander, black or African American, or white (Table 2 and Figure 4d) (available at https://www.cdc.gov/nchs/nvss/bridged_race/data_documentation.htm). SLDSS categorizes race as American Indian or Alaska Native, Asian, black or African American, Hawaiian Islander or Pacific Islander, white, or multiple races (Figure 4c). For both systems, Hispanic ethnicity is restricted to Hispanic or Latino, or not Hispanic or Latino, and is independent of race (Tables 2, Table 4a/4b, and Figure 4d).

Exposure categories

To assess potential sources of *Legionella* infection, SLDSS data were limited to reported confirmed Legionnaires' disease cases from complete reporting jurisdictions in 2016 and 2017 (Table 3).

SLDSS captures Legionnaires' disease-specific data including exposure history within the 10 days before symptom onset. Exposure to a healthcare setting, travel history, and exposure to an assisted or senior living facility are captured. The exposures are not mutually exclusive; multiple exposure types can occur during the exposure period. Cases without reported exposure to a healthcare setting, travel history, and exposure to an assisted or senior living facility are categorized as “none of these” (Figures 6a/6b and Table 3).

Healthcare exposure

Cases in patients who reported visiting, working in, or staying in a healthcare setting during the 10 days before date of symptom onset are classified as cases with a healthcare exposure. Because healthcare facilities often have large, complex water systems and aerosol-generating devices, healthcare exposure is a risk factor for Legionnaires' disease. Patients in healthcare settings often also have personal risk factors for Legionnaires' disease, such as advanced age, weakened immune systems, and chronic medical conditions (11). For the purpose of Legionnaires' disease surveillance, the CDC definition for healthcare facility does not include assisted living facilities, senior living facilities, prisons, or group homes.

Cases in patients with healthcare exposure are categorized by healthcare setting and exposure type. Healthcare setting includes the following mutually exclusive categories: hospital, long-term care facility, clinic, other, or more than one type of setting. Examples of “Other” healthcare settings include diagnostic centers, disability service centers, eye centers, laboratories, and pharmacies. Healthcare exposure type includes the following mutually exclusive categories: inpatient, outpatient, visitor or volunteer, employee, or more than one type of healthcare exposure (Figures 6a/6b and Table 3).

For confirmed Legionnaires' disease cases in patients with healthcare exposure, cases are classified as definite or possible healthcare-associated. Definite healthcare-associated cases include Legionnaires' disease in those who spent the entire 10 days before date of symptom onset in a healthcare facility. Possible healthcare-associated cases include Legionnaires' disease in those who spent a portion of the 10 days before date of symptom onset in a healthcare facility, and thus another setting could have been the source (Tables 5a/5b).

A patient with Legionnaires' disease who spent the entire exposure period in multiple healthcare facilities (i.e., someone transferred between healthcare facilities) would be considered a definite healthcare-associated case for

surveillance purposes. Cases in patients who reported a visit to a healthcare setting in the 10 days before date of symptom onset and did not indicate definite or possible healthcare associations were categorized as possible healthcare-associated.

Travel exposure

Cases in persons who reported spending at least one night away from home (e.g., in the state of residence, another state, or another country) in the 10 days before date of symptom onset, not including nights spent in a healthcare facility or congregate living setting, are classified as having a travel exposure.

Travel exposure is further classified at CDC as either public or private. Public travel includes spending at least one night away from home in the 10 days before symptom onset in a public accommodation (e.g., hotel, motel, resort, cruise, short-term vacation rental, RV park). Because hotels, resorts, and cruise ships often use large, complex water systems and aerosol-generating devices, travel to public accommodations is a known risk factor for exposure to *Legionella*. Private travel includes spending at least one night away from home in the 10 days before symptom onset in a private accommodation (e.g., in the home of family or friends).

Cases may occur in patients with multiple travel locations during the exposure period. If any exposure to a public accommodation occurs, the case is categorized as public travel. Private travel represents exposure to private accommodations only. If a patient has exposure to both private and unknown accommodations, the case is categorized as unknown travel (Figures 6a/6b and Table 3).

Assisted or senior living exposure

Cases in patients who reported visiting or staying in an assisted or senior living facility in the 10 days before symptom onset are classified as having assisted or senior living exposure. Assisted living facilities, by the SLDSS case report form definition, provide custodial care without skilled nursing (e.g., assistance with activities of daily living, like bathing and dressing). Senior living facilities provide independent living for the elderly. Although assisted and senior living facilities are not considered healthcare facilities for Legionnaires' disease surveillance purposes, they often house populations at increased risk for Legionnaires' disease and can have large, complex water systems. For those reasons, these facilities should be considered as likely sources in outbreak investigations and should have water management programs in place.

Assisted or senior living cases are categorized by assisted or senior living setting and exposure type. Setting includes the following mutually exclusive categories: assisted living facility, senior living facility, or both. Exposure type includes the following mutually exclusive categories: resident, visitor or volunteer, or employee. No confirmed Legionnaires' disease cases from complete reporting jurisdictions occurred in patients who reported more than one type of assisted or senior living facility exposure in 2016 or 2017 (Figures 6a/6b and Table 3).

“None of these”

“None of these” exposures includes confirmed Legionnaires' disease cases in patients who did not report healthcare, travel, or assisted or senior living facility exposures in the 10 days before symptom onset (Figures 6a/6b and Table 3).

Hospitalization

Health department staff indicate on the SLDSS case report form whether the patient was hospitalized during treatment for Legionnaires' disease as yes, no, or unknown (Tables 6a/6b and Figures 6 and 7). If the patient was admitted to a hospital prior to date of Legionnaires' disease symptom onset, the hospitalization information also contributed to the case having a healthcare exposure.

Outcome

Health department staff indicate on the SLDSS case report form if the patient survived, died, or was still ill at time of reporting. If this information is unknown, case outcome is indicated as “unknown” (Tables 6a/6b and

Figures 7 and 8). This data element may not represent the final case outcome, as a patient's condition may change after submission of case data to SLDSS. Deaths may not have resulted from Legionnaires' disease or Legionnaires' disease alone. CFR refers to the number of reported deaths at time of case report divided by the number of patients with Legionnaires' disease and the same exposure history.

Diagnostic methods

Frequencies for the three diagnostic methods used to confirm cases of Legionnaires' disease (i.e., UAT, culture, and serology) according to the CSTE definition are listed in Table 7. The preferred diagnostic tests for Legionnaires' disease are the *Legionella* UAT in concert with a culture of lower respiratory secretions (e.g., sputum, bronchoalveolar lavage) on selective media.

Interpreting data

The purpose of this surveillance report is to present descriptive information regarding Legionnaires' disease. Some data from this report can be used to assess disease trends and case counts, but they are not intended to suggest a causal relationship between exposures and Legionnaires' disease. NNDSS data were reported by the jurisdiction of the patient's usual residence at the time of disease onset, which does not necessarily represent the source of exposure to *Legionella*. Since NNDSS and SLDSS are separately managed surveillance systems, state public health offices report Legionnaires' disease cases separately to both systems. Data published in this report may be different from previously published data in *MMWR* for many reasons, including differences in the timing of reports, the data source, or methodology of surveillance.

While the incidence of reported cases of Legionnaires' disease in the United States has increased 5.5-fold from 2000 through 2017, these numbers may underestimate the true incidence, because Legionnaires' disease is likely underdiagnosed. Incomplete reporting to SLDSS makes interpretation of data difficult; findings may not represent the entire country. Only the numbers of cases reported to NNDSS and SLDSS were considered when determining which jurisdictions reported $\geq 90\%$ of their NNDSS cases to SLDSS. It was assumed that SLDSS data were a subset of NNDSS data; this assumption was not verified for all jurisdictions. Determining complete reporting jurisdictions in SLDSS reduced potential bias in SLDSS data. However, due to the different number of jurisdictions that were considered to have complete reporting in 2016 and 2017, interpretations of trends in SLDSS data are challenging, and data may not be directly comparable from year to year. More complete reporting to SLDSS would enhance surveillance quality.

In addition to incomplete reporting, another limitation is the timing of reporting to NNDSS and SLDSS. For cases reported to NNDSS, the case year is determined by the year's dataset to which the case is reported, whereas for SLDSS, the case year is determined by the onset date. To remain consistent with case counts published in the *MMWR*, NNDSS analyses in this report include cases by the year of the dataset to which they were reported, rather than the earliest year associated with the case. However, the rate at which cases contributed to the following year's case counts in NNDSS was consistent over the years, and so this may not result in a significant skewing of data. In addition, SLDSS case reports are usually submitted at the time of investigation and are not consistently updated for time-dependent variables such as case outcome.

Importance of reporting

Strong surveillance is critical for public health response and understanding the epidemiology as the reported incidence of Legionnaires' disease continues to increase. Prompt reporting of cases with complete exposure information facilitates timely identification of clusters of cases. CDC is uniquely positioned to identify connections among cases that occur in residents of different jurisdictions. However, state and local public health officials are best positioned to systematically track Legionnaires' disease cases and efficiently detect outbreaks among residents of their respective jurisdictions. Early detection of clusters can lead to faster transmission source

identification and expedite interventions to prevent additional cases. Most cases of Legionnaires' disease are not associated with a known outbreak. Complete reporting renders a fuller picture of disease burden and trends and may suggest novel sources of transmission.

Prevention

Regardless of setting or source of exposure to *Legionella*, a comprehensive approach to prevention requires an understanding of the mechanisms by which *Legionella* growth and transmission can occur in building water systems (6). Implementing and maintaining effective water management programs are the principal prevention measures. Rapid case identification with appropriate laboratory testing and prompt intervention may prevent additional cases from occurring (11).

Future steps

Future reports may be modified with additional data from enhanced surveillance systems, with the goal of allowing the public and CDC's partners to better understand the burden, impact, and trends of Legionnaires' disease over time. Beginning in 2020, cases will be defined and classified according to CSTE position statement 19-ID-04.

Acknowledgements

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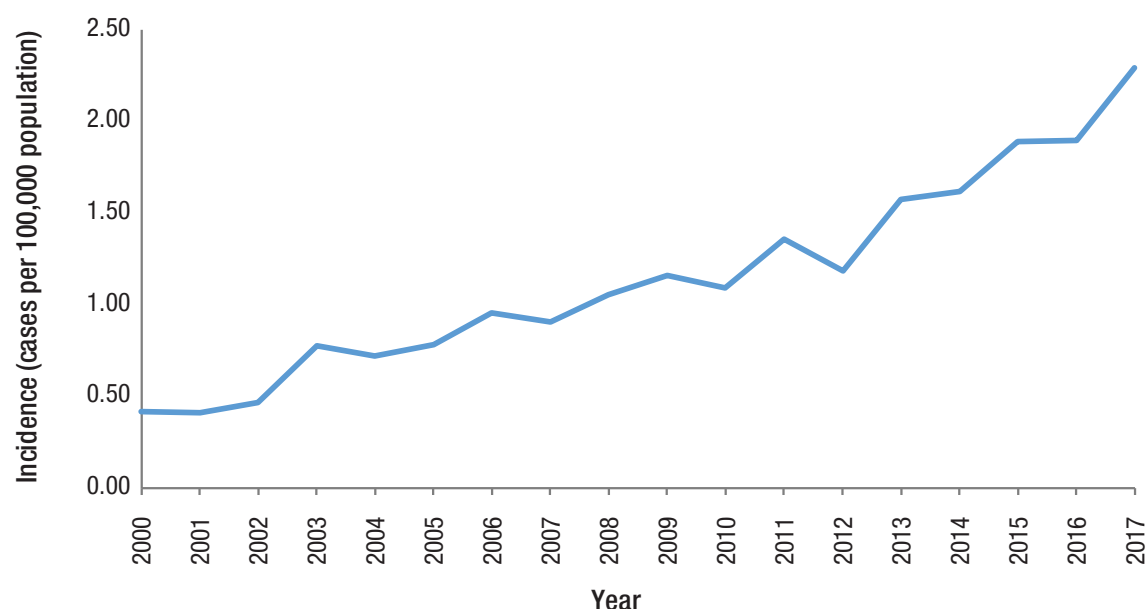
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Section 1: National Notifiable Diseases Surveillance System

NOTE: For accessible versions of tables and figures in this report, visit
<https://www.cdc.gov/legionella/health-depts/surv-reporting/2016-17-report-tables/>

Figure 1. Crude incidence^a of reported confirmed cases of Legionnaires' disease^b by year^c—NNDSS,^{d,e} United States, 2000–2017.



^a Crude incidence of cases per 100,000 population (number of confirmed Legionnaires' disease cases reported that year divided by postcensal population estimate for that year times 100,000 population).

^b Cases of disease due to *Legionella* are reported to NNDSS as legionellosis, which includes Legionnaires' disease, Pontiac fever, and extrapulmonary legionellosis, but are referred to as Legionnaires' disease in this figure (because almost all legionellosis cases reported in the United States are due to Legionnaires' disease).

^c Based on year the case was reported to CDC.

^d National Notifiable Diseases Surveillance System (NNDSS).

^e Jurisdictions may report cases of any case status to NNDSS, but only confirmed cases of Legionnaires' disease from the 50 U.S. states, the District of Columbia, and New York City are included in this figure, with the exceptions noted below. National case counts published in the *MMWR* use the same criteria and exceptions.

2000, 2002, and 2003: Legionnaires' disease cases with probable, suspect, and unknown case status were also included.

2001: Legionnaires' disease cases with probable and unknown case status were also included.

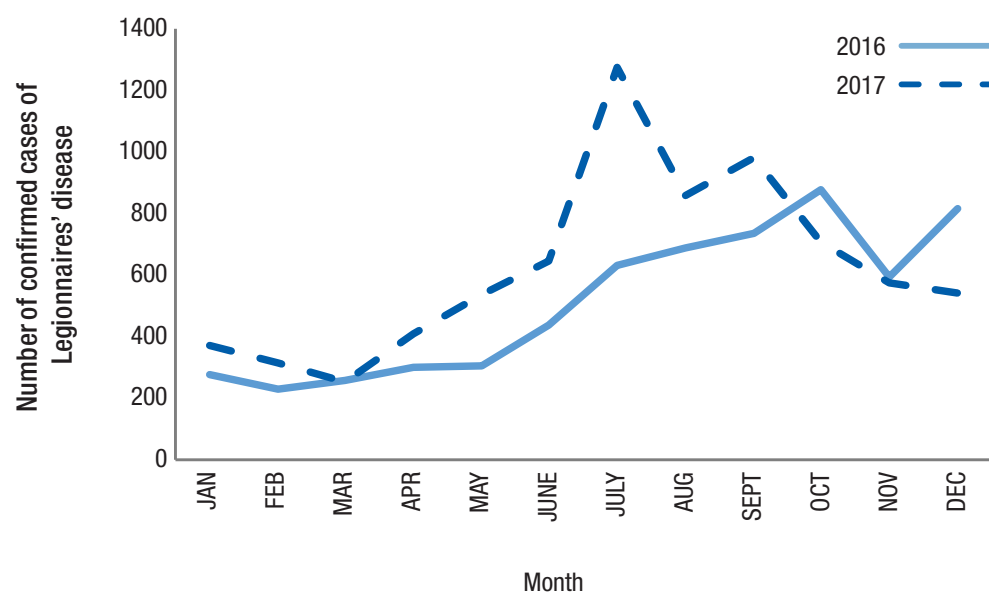
2000–2001: Legionnaires' disease cases were not reportable in Oregon and West Virginia.

2004–2012: Legionnaires' disease cases with unknown case status reported from California were also included.

2011–2012: Legionnaires' disease cases were not reportable in the District of Columbia.

Accessible version at: <https://www.cdc.gov/legionella/health-depts/surv-reporting/2016-17-report-tables/index.html#figure1>

Figure 2. Number of reported confirmed cases of Legionnaires' disease^a by month^b and year^c—NNDSS,^d United States, 2016 and 2017.



^a Cases of disease due to *Legionella* are reported to NNDSS as legionellosis, which includes Legionnaires' disease, Pontiac fever, and extrapulmonary legionellosis, but are referred to as Legionnaires' disease in this figure (because almost all legionellosis cases reported in the United States are due to Legionnaires' disease).

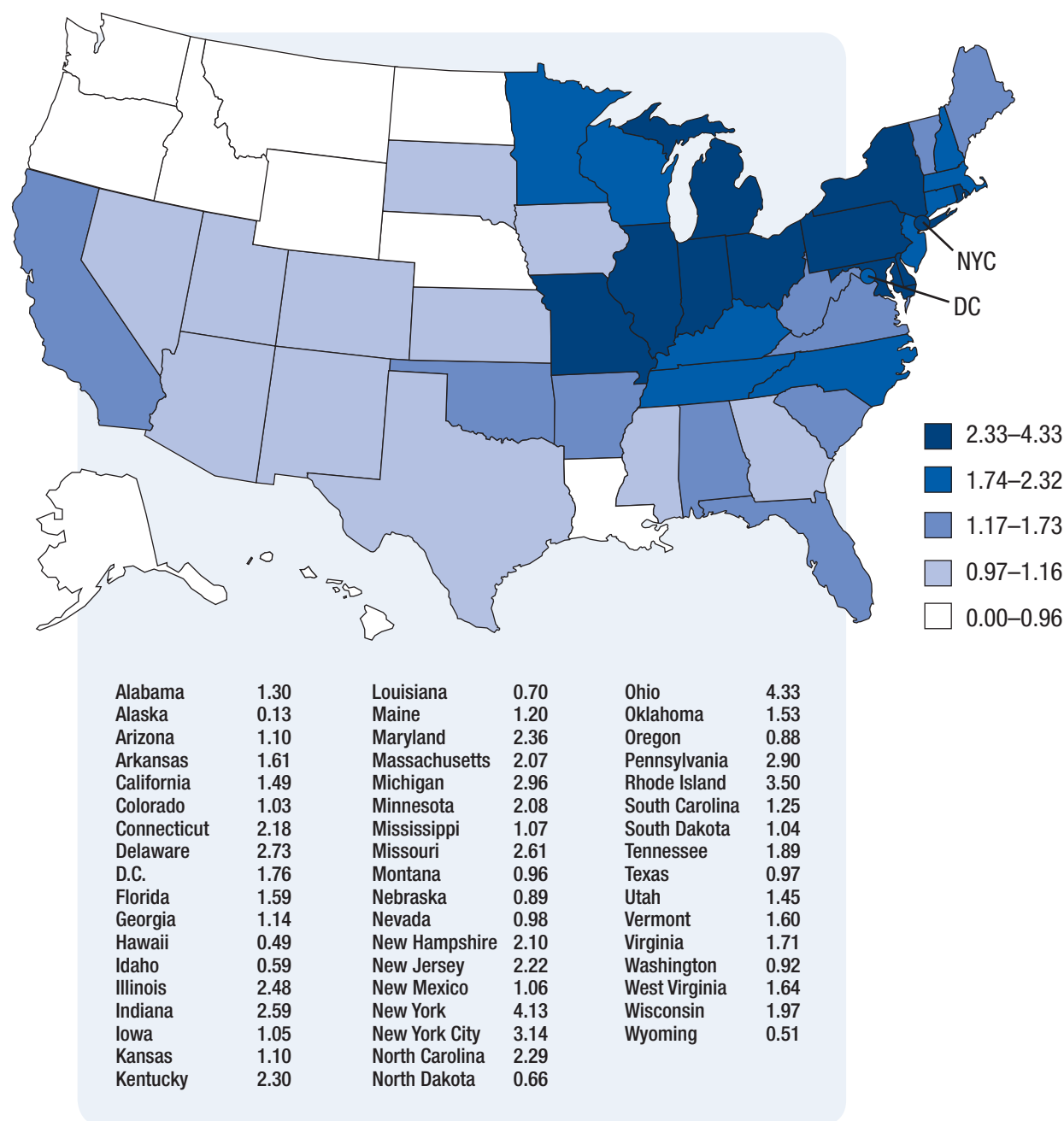
^b Month is based upon *Morbidity and Mortality Weekly Report* year and week (available at http://www.cdc.gov/nndss/document/MMWR_Week_overview.pdf).

^c Based on year the case was reported to CDC.

^d National Notifiable Diseases Surveillance System (NNDSS).

Accessible version at: <https://www.cdc.gov/legionella/health-depts/surv-reporting/2016-17-report-tables/index.html#figure2>

Figure 3a. Crude incidence^a of reported confirmed cases of Legionnaires' disease^b by jurisdiction of residence^c—NNDSS,^d United States, 2016.^{e,f}



^a Crude incidence of cases per 100,000 population (number of confirmed Legionnaires' disease cases reported that year divided by postcensal resident jurisdiction population estimate for that year times 100,000 population).

^b Cases of disease due to *Legionella* are reported to NNDSS as legionellosis, which includes Legionnaires' disease, Pontiac fever, and extrapulmonary legionellosis, but are referred to as Legionnaires' disease in this figure (because almost all legionellosis cases reported in the United States are due to Legionnaires' disease).

^c Jurisdiction of the patient's "usual residence" at the time of disease onset.

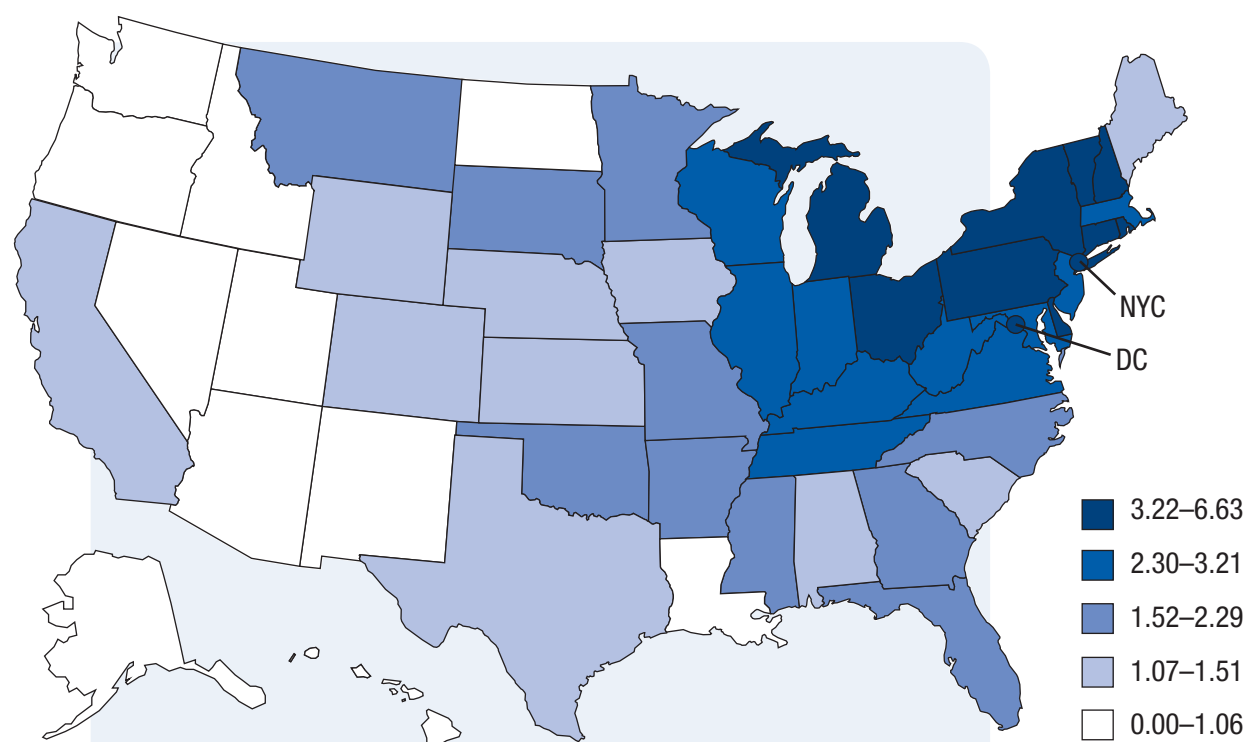
^d National Notifiable Diseases Surveillance System (NNDSS).

^e Based on year the case was reported to CDC.

^f Shading represents quintiles of incidence rates.

Accessible version at: <https://www.cdc.gov/legionella/health-depts/surv-reporting/2016-17-report-tables/index.html#figure3a>

Figure 3b. Crude incidence^a of reported confirmed cases of Legionnaires' disease^b by jurisdiction of residence^c—NNDSS,^d United States, 2017.^{e,f}



Alabama	1.35	Louisiana	1.05	North Dakota	0.93
Alaska	0.81	Maine	1.20	Ohio	5.15
Arizona	1.05	Maryland	3.09	Oklahoma	1.65
Arkansas	1.86	Massachusetts	2.93	Oregon	0.89
California	1.35	Michigan	3.48	Pennsylvania	3.90
Colorado	1.46	Minnesota	1.76	Rhode Island	4.72
Connecticut	3.34	Mississippi	1.74	South Carolina	1.09
Delaware	3.53	Missouri	2.26	South Dakota	1.72
D.C.	6.63	Montana	1.62	Tennessee	3.08
Florida	2.07	Nebraska	1.51	Texas	1.16
Georgia	1.52	Nevada	0.47	Utah	1.03
Hawaii	0.56	New Hampshire	4.69	Vermont	3.53
Idaho	0.70	New Jersey	2.76	Virginia	2.33
Illinois	2.59	New Mexico	0.62	Washington	0.76
Indiana	2.97	New York	5.23	West Virginia	2.70
Iowa	1.11	New York City	5.04	Wisconsin	3.04
Kansas	1.17	North Carolina	2.06	Wyoming	1.21
Kentucky	2.60				

^a Crude incidence of cases per 100,000 population (number of confirmed Legionnaires' disease cases reported that year divided by postcensal resident jurisdiction population estimate for that year times 100,000 population).

^b Cases of disease due to *Legionella* are reported to NNDSS as legionellosis, which includes Legionnaires' disease, Pontiac fever, and extrapulmonary legionellosis, but are referred to as Legionnaires' disease in this figure (because almost all legionellosis cases reported in the United States are due to Legionnaires' disease).

^c Jurisdiction of the patient's "usual residence" at the time of disease onset.

^d National Notifiable Diseases Surveillance System (NNDSS).

^e Based on year the case was reported to CDC.

^f Shading represents quintiles of incidence rates.

Accessible version at: <https://www.cdc.gov/legionella/health-depts/surv-reporting/2016-17-report-tables/index.html#figure3b>

Table 1. Number of reported confirmed cases of Legionnaires' disease^a by jurisdiction of residence^b and year^c—NNDSS,^d United States, 2016 and 2017.

Jurisdiction	2016 (Total= 6,141)		2017 (Total= 7,458)	
	N	%	N	%
Alabama	63	1.0	66	0.9
Alaska	1	0.0	6	0.1
Arizona	76	1.2	74	1.0
Arkansas	48	0.8	56	0.8
California	586	9.5	535	7.2
Colorado	57	0.9	82	1.1
Connecticut	78	1.3	120	1.6
Delaware	26	0.4	34	0.5
D.C.	12	0.2	46	0.6
Florida	328	5.3	435	5.8
Georgia	118	1.9	159	2.1
Hawaii	7	0.1	8	0.1
Idaho	10	0.2	12	0.2
Illinois	318	5.2	332	4.5
Indiana	172	2.8	198	2.7
Iowa	33	0.5	35	0.5
Kansas	32	0.5	34	0.5
Kentucky	102	1.7	116	1.6
Louisiana	33	0.5	49	0.7
Maine	16	0.3	16	0.2
Maryland	142	2.3	187	2.5
Massachusetts	141	2.3	201	2.7
Michigan	294	4.8	347	4.7
Minnesota	115	1.9	98	1.3
Mississippi	32	0.5	52	0.7
Missouri	159	2.6	138	1.9
Montana	10	0.2	17	0.2
Nebraska	17	0.3	29	0.4
Nevada	26	0.4	14	0.2
New Hampshire	28	0.5	63	0.8
New Jersey	199	3.2	249	3.3
New Mexico	22	0.4	13	0.2
New York City	268	4.4	435	5.8
New York State	463	7.5	587	7.9
North Carolina	232	3.8	212	2.8

Jurisdiction	2016 (Total= 6,141)		2017 (Total= 7,458)	
	N	%	N	%
North Dakota	5	0.1	7	0.1
Ohio	503	8.2	601	8.1
Oklahoma	60	1.0	65	0.9
Oregon	36	0.6	37	0.5
Pennsylvania	371	6.0	500	6.7
Rhode Island	37	0.6	50	0.7
South Carolina	62	1.0	55	0.7
South Dakota	9	0.2	15	0.2
Tennessee	126	2.1	207	2.8
Texas	270	4.4	327	4.4
Utah	30	0.5	32	0.4
Vermont	10	0.2	22	0.3
Virginia	144	2.3	197	2.6
Washington	67	1.1	56	0.8
West Virginia	30	0.5	49	0.7
Wisconsin	114	1.9	176	2.4
Wyoming	3	0.1	7	0.1
TOTAL	6,141	100.0	7,458	100.0

^a Cases of disease due to *Legionella* are reported to NNDSS as legionellosis, which includes Legionnaires' disease, Pontiac fever, and extrapulmonary legionellosis, but are referred to as Legionnaires' disease in this figure (because almost all legionellosis cases reported in the United States are Legionnaires' disease cases).

^b Jurisdiction of the patient's "usual residence" at the time of disease onset.

^c Based on year the case was reported to CDC.

^d National Notifiable Diseases Surveillance System (NNDSS).

Accessible version at: <https://www.cdc.gov/legionella/health-depts/surv-reporting/2016-17-report-tables/index.html#table1>

Table 2. Number, percent, and crude incidence^a rates of reported confirmed cases of Legionnaires' disease^b by demographic characteristics and year^c—NNDSS,^d United States, 2016 and 2017

Characteristic	2016			2017		
	N	%	Rate ^a	N	%	Rate ^a
Age						
0–9	8	0.1	0.02	5	0.1	0.01
10–19	19	0.3	0.05	11	0.2	0.03
20–29	112	1.8	0.25	154	2.1	0.34
30–39	330	5.4	0.78	421	5.6	0.97
40–49	675	11.0	1.66	789	10.6	1.94
50–59	1,433	23.3	3.27	1,683	22.6	3.88
60–69	1,584	25.8	4.36	1,919	25.7	5.21
70–79	1,057	17.2	5.24	1,418	19.0	6.57
80–84	388	6.3	6.61	459	6.2	7.69
85+	534	8.7	8.37	598	8.0	9.24
Not stated	1	0.0	N/A	1	0.0	N/A
Sex						
Female	2,458	40.0	1.50	2,865	38.4	1.73
Male	3,679	59.9	2.31	4,589	61.5	2.86
Not stated	4	0.1	N/A	4	0.1	N/A
Race						
American Indian/Alaska Native	26	0.4	0.56	28	0.4	0.60
Asian/Pacific Islander	99	1.6	0.48	103	1.4	0.49
African American/Black	1,068	17.4	2.36	1,579	21.2	3.44
White	3,891	63.4	1.54	4,706	63.1	1.85
Other ^e	242	3.9	N/A	215	2.9	N/A
Not stated	815	13.3	N/A	827	11.1	N/A
Ethnicity						
Hispanic	397	6.5	0.69	435	5.8	0.74
Non-Hispanic	4,506	73.4	1.70	5,500	73.8	2.06
Not stated	1,238	20.2	N/A	1,523	20.4	N/A
Total	6,141	100.0	1.90	7,458	100.0	2.29

^a Crude incidence of cases per 100,000 population (number of confirmed Legionnaires' disease cases reported that year divided by postcensal population estimate for that year times 100,000 population).

^b Cases of disease due to *Legionella* are reported to NNDSS as legionellosis, which includes Legionnaires' disease, Pontiac fever, and extrapulmonary legionellosis, but are referred to as Legionnaires' disease in this figure (because almost all legionellosis cases reported in the United States are Legionnaires' disease cases).

^c Based on year the case was reported to CDC.

^d National Notifiable Diseases Surveillance System (NNDSS).

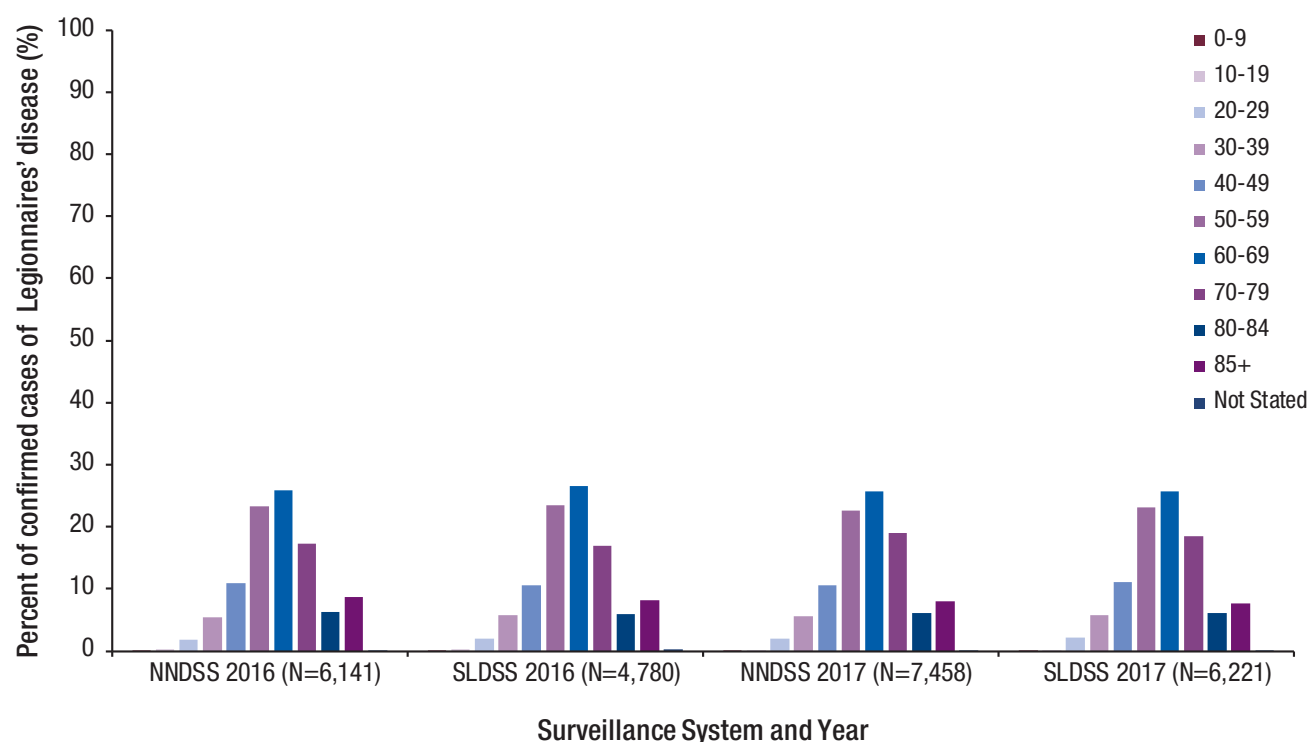
^e Other race includes individuals that did not identify with races listed.

Accessible version at: <https://www.cdc.gov/legionella/health-depts/surv-reporting/2016-17-report-tables/index.html#table2>

Section 2: National Notifiable Diseases Surveillance System comparison with Supplemental Legionnaires' Disease Surveillance System

NOTE: For accessible versions of tables and figures in this report, visit
<https://www.cdc.gov/legionella/health-depts/surv-reporting/2016-17-report-tables/>

Figure 4a. Percent of reported confirmed cases of Legionnaires' disease^a by age group and year^b—NNDSS^c and SLDSS,^d United States, 2016 and 2017.



^a Cases of disease due to *Legionella* are reported to NNDSS as legionellosis, which includes Legionnaires' disease, Pontiac fever, and extrapulmonary legionellosis, but are referred to as Legionnaires' disease in this figure (because almost all legionellosis cases reported in the United States are Legionnaires' disease cases). SLDSS data are limited to cases of Legionnaires' disease in this figure.

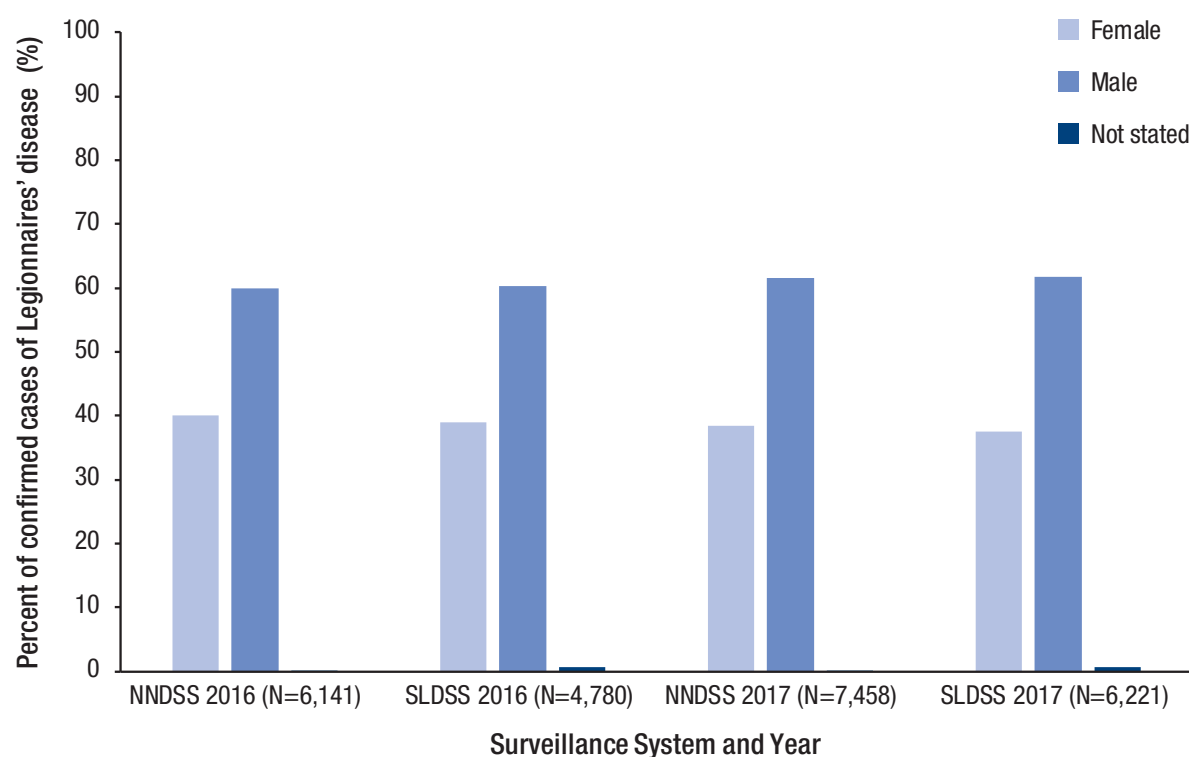
^b Based on year the case was reported to CDC in NNDSS and year of symptom onset in SLDSS. If onset date was not stated in SLDSS, case year for confirmed cases was determined by the following dates (in order of reporting): positive laboratory date (by either urinary antigen testing, culture, or fourfold rise of antibody titer against *Legionella pneumophila* serogroup 1); date patient was hospitalized during treatment for Legionnaires' disease; or date case was first reported to public health at any level.

^c National Notifiable Diseases Surveillance System (NNDSS).

^d Supplemental Legionnaires' Disease Surveillance System (SLDSS).

Accessible version at: <https://www.cdc.gov/legionella/health-depts/surv-reporting/2016-17-report-tables/index.html#figure4a>

Figure 4b. Percent of reported confirmed cases of Legionnaires' disease^a by sex and year^b—NNDSS^c and SLDSS,^d United States, 2016 and 2017.



^a Cases of disease due to *Legionella* are reported to NNDSS as legionellosis, which includes Legionnaires' disease, Pontiac fever, and extrapulmonary legionellosis, but are referred to as Legionnaires' disease in this figure (because almost all legionellosis cases reported in the United States are Legionnaires' disease cases). SLDSS data are limited to cases of Legionnaires' disease in this figure.

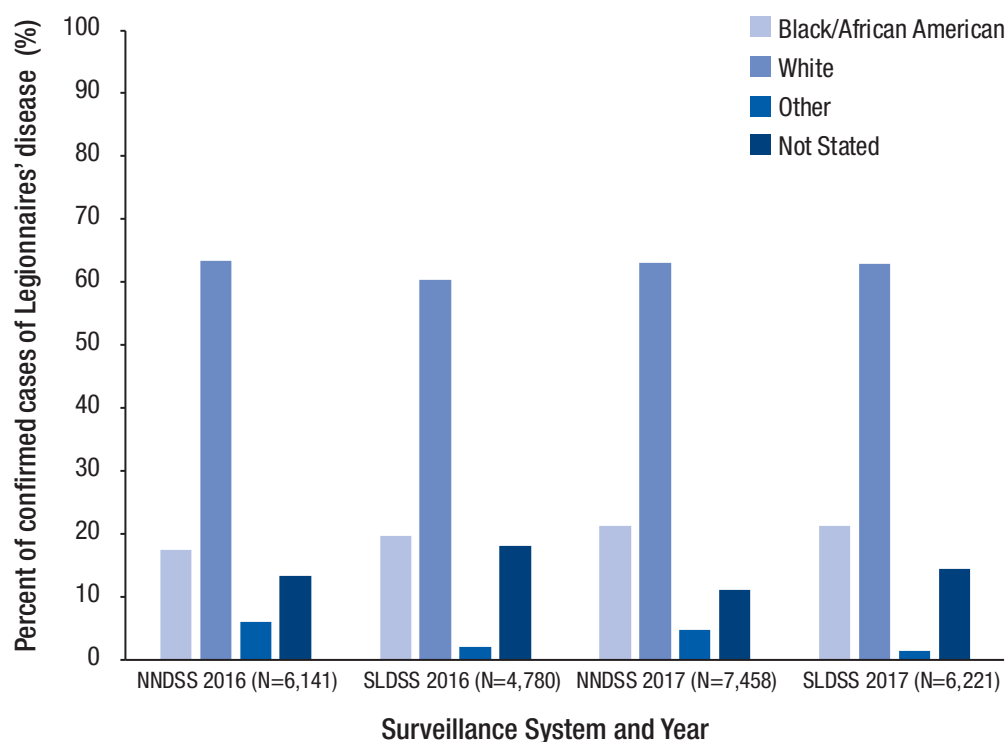
^b Based on year the case was reported to CDC in NNDSS and year of symptom onset in SLDSS. If onset date was not stated in SLDSS, case year for confirmed cases was determined by the following dates (in order of reporting): positive laboratory date (by either urinary antigen testing, culture, or fourfold rise of antibody titer against *Legionella pneumophila* serogroup 1); date patient was hospitalized during treatment for Legionnaires' disease; or date case was first reported to public health at any level.

^c National Notifiable Diseases Surveillance System (NNDSS).

^d Supplemental Legionnaires' Disease Surveillance System (SLDSS).

Accessible version at: <https://www.cdc.gov/legionella/health-depts/surv-reporting/2016-17-report-tables/index.html#figure4b>

Figure 4c. Percent of reported confirmed cases of Legionnaires' disease^a by race^b and year^c—NNDSS^d and SLDSS,^e United States, 2016 and 2017.



^a Cases of disease due to *Legionella* are reported to NNDSS as legionellosis, which includes Legionnaires' disease, Pontiac fever, and extrapulmonary legionellosis, but are referred to as Legionnaires' disease in this figure (because almost all legionellosis cases reported in the United States are Legionnaires' disease cases). SLDSS data are limited to cases of Legionnaires' disease in this figure.

^b In NNDSS, Other includes American Indian/Alaska Native, Asian/Pacific Islander, and individuals that did not identify with either race in NNDSS. In SLDSS, Other includes American Indian/Alaska Native, Asian, Hawaii/Pacific Islander, and individuals that identified with multiple races.

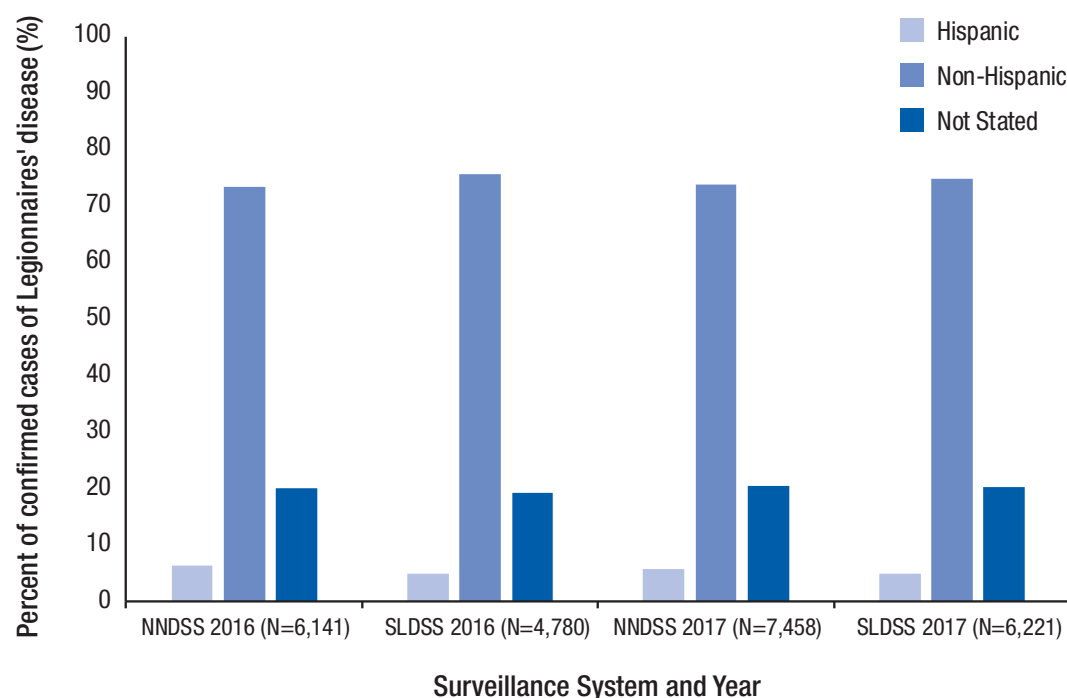
^c Based on year the case was reported to CDC in NNDSS and year of symptom onset in SLDSS. If onset date was not stated in SLDSS, case year for confirmed cases was determined by the following dates (in order of reporting): positive laboratory date (by either urinary antigen testing, culture, or fourfold rise of antibody titer against *Legionella pneumophila* serogroup 1); date patient was hospitalized during treatment for Legionnaires' disease; or date case was first reported to public health at any level.

^d National Notifiable Diseases Surveillance System (NNDSS).

^e Supplemental Legionnaires' Disease Surveillance System (SLDSS).

Accessible version at: <https://www.cdc.gov/legionella/health-depts/surv-reporting/2016-17-report-tables/index.html#figure4c>

Figure 4d. Percent of reported confirmed cases of Legionnaires' disease^a by ethnicity and year^b—NNDSS^c and SLDSS,^d United States, 2016 and 2017.



^a Cases of disease due to *Legionella* are reported to NNDSS as legionellosis, which includes Legionnaires' disease, Pontiac fever, and extrapulmonary legionellosis, but are referred to as Legionnaires' disease in this figure (because almost all legionellosis cases reported in the United States are Legionnaires' disease cases). SLDSS data are limited to cases of Legionnaires' disease in this figure.

^b Based on year the case was reported to CDC in NNDSS and year of symptom onset in SLDSS. If onset date was not stated in SLDSS, case year for confirmed cases was determined by the following dates (in order of reporting): positive laboratory date (by either urinary antigen testing, culture, or fourfold rise of antibody titer against *Legionella pneumophila* serogroup 1); date patient was hospitalized during treatment for Legionnaires' disease; or date case was first reported to public health at any level.

^c National Notifiable Diseases Surveillance System (NNDSS).

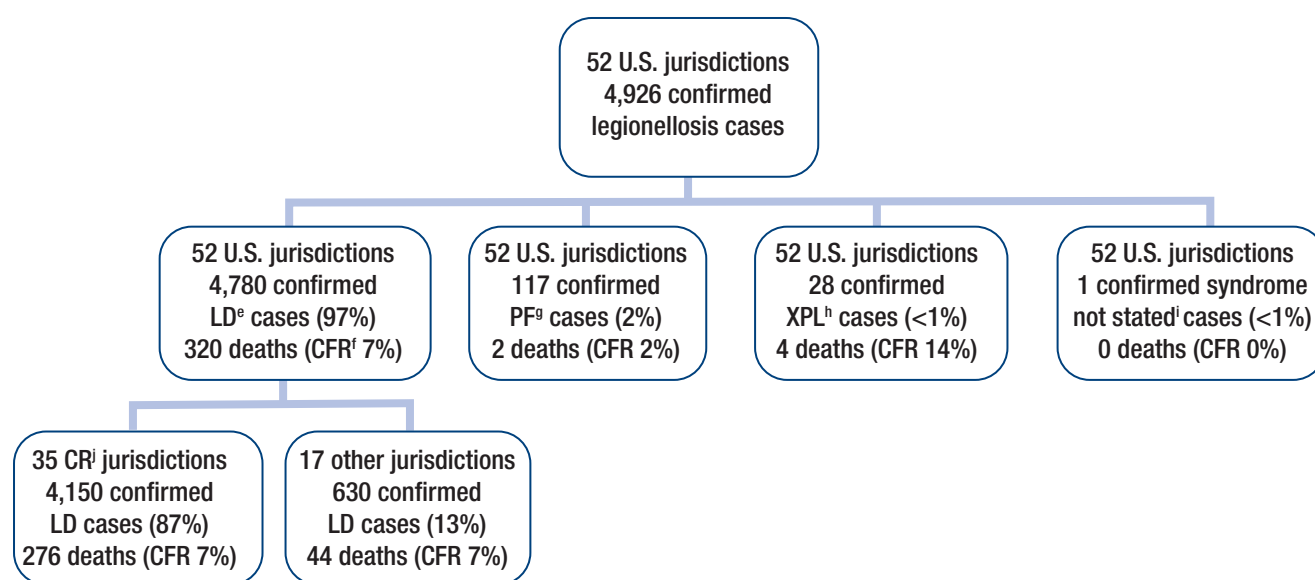
^d Supplemental Legionnaires' Disease Surveillance System (SLDSS).

Accessible version at: <https://www.cdc.gov/legionella/health-depts/surv-reporting/2016-17-report-tables/index.html#figure4d>

Section 3: Supplemental Legionnaires' Disease Surveillance System

NOTE: For accessible versions of tables and figures in this report, visit
<https://www.cdc.gov/legionella/health-depts/surv-reporting/2016-17-report-tables/>

Figure 5a. Reported confirmed cases of legionellosis^a by syndrome and completeness of jurisdictional reporting^b—SLDSS,^c United States, 2016.^d



^a Legionellosis includes Legionnaires' disease, Pontiac fever, and extrapulmonary legionellosis.

^b 35 complete reporting jurisdictions reported at least 90% of confirmed NNDSS cases to SLDSS in 2016: Alabama, Alaska, Arkansas, Arizona, Colorado, Connecticut, Delaware, Florida, Georgia, Hawaii, Iowa, Illinois, Kansas, Kentucky, Maine, Michigan, Minnesota, Mississippi, Missouri, Montana, New Hampshire, New Jersey, New York City, New York (state), Ohio, Pennsylvania, Rhode Island, South Carolina, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, and Wyoming.

^c Supplemental Legionnaires' Disease Surveillance System (SLDSS).

^d Based on year of symptom onset in SLDSS. If onset date was not stated in SLDSS, case year for confirmed cases was determined by the following dates (in order of reporting): positive laboratory date (by either urinary antigen testing, culture, or fourfold rise of antibody titer against *Legionella pneumophila* serogroup 1); date patient was hospitalized during treatment for Legionnaires' disease; or date case was first reported to public health at any level.

^e Legionnaires' disease.

^f CFR: Case fatality rate calculated as the number of reported confirmed case deaths divided by the number of patients with the same legionellosis syndrome.

^g Pontiac fever.

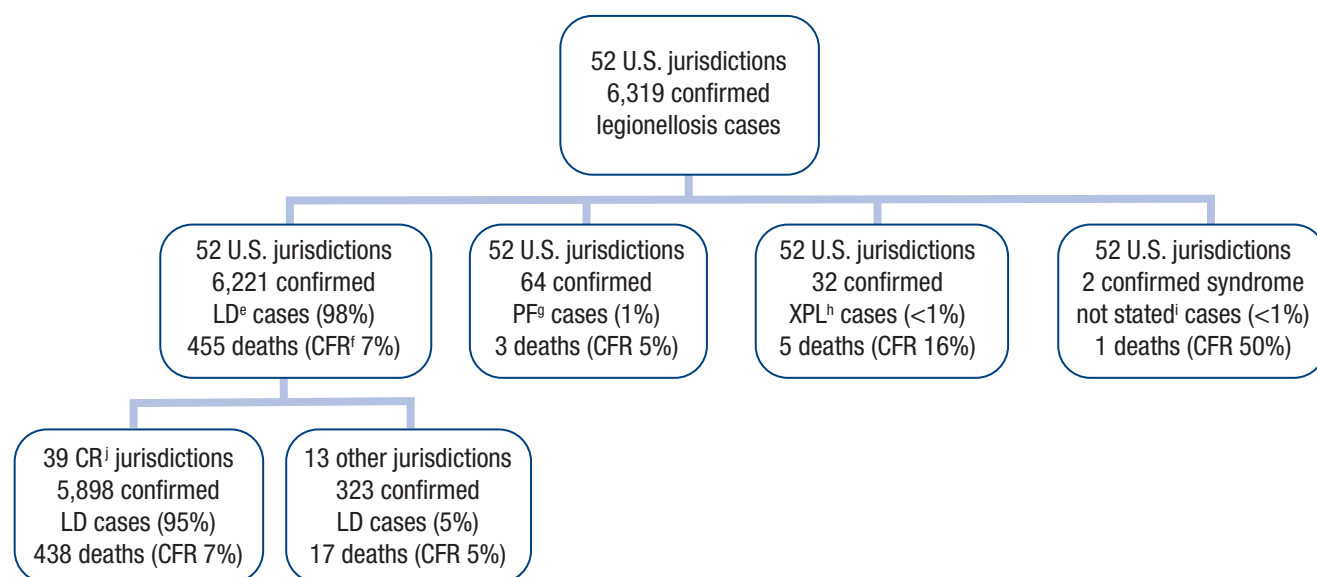
^h Extrapulmonary legionellosis.

ⁱ While legionellosis consists of Legionnaires' disease, Pontiac fever, and extrapulmonary legionellosis, syndrome was not specified for some cases.

^j Complete reporting.

Accessible version at: <https://www.cdc.gov/legionella/health-depts/surv-reporting/2016-17-report-tables/index.html#figure5a>

Figure 5b. Reported confirmed cases of legionellosis^a by syndrome and completeness of jurisdictional reporting^b—SLDSS,^c United States, 2017.^d



^a Legionellosis includes Legionnaires' disease, Pontiac fever, and extrapulmonary legionellosis.

^b 39 complete reporting jurisdictions reported at least 90% of confirmed NNDSS cases to SLDSS in 2017: Alabama, Alaska, Arkansas, Colorado, Connecticut, Florida, Georgia, Iowa, Illinois, Kansas, Kentucky, Maryland, Maine, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York City, New York (state), North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Utah, Vermont, Washington, West Virginia, Wisconsin, and Wyoming.

^c Supplemental Legionnaires' Disease Surveillance System (SLDSS).

^d Based on year of symptom onset in SLDSS. If onset date was not stated in SLDSS, case year for confirmed cases was determined by the following dates (in order of reporting): positive laboratory date (by either urinary antigen testing, culture, or fourfold rise of antibody titer against *Legionella pneumophila* serogroup 1); date patient was hospitalized during treatment for Legionnaires' disease; or date case was first reported to public health at any level.

^e Legionnaires' disease.

^f CFR: Case fatality rate calculated as the number of reported confirmed case deaths divided by the number of patients with the same legionellosis syndrome.

^g Pontiac fever.

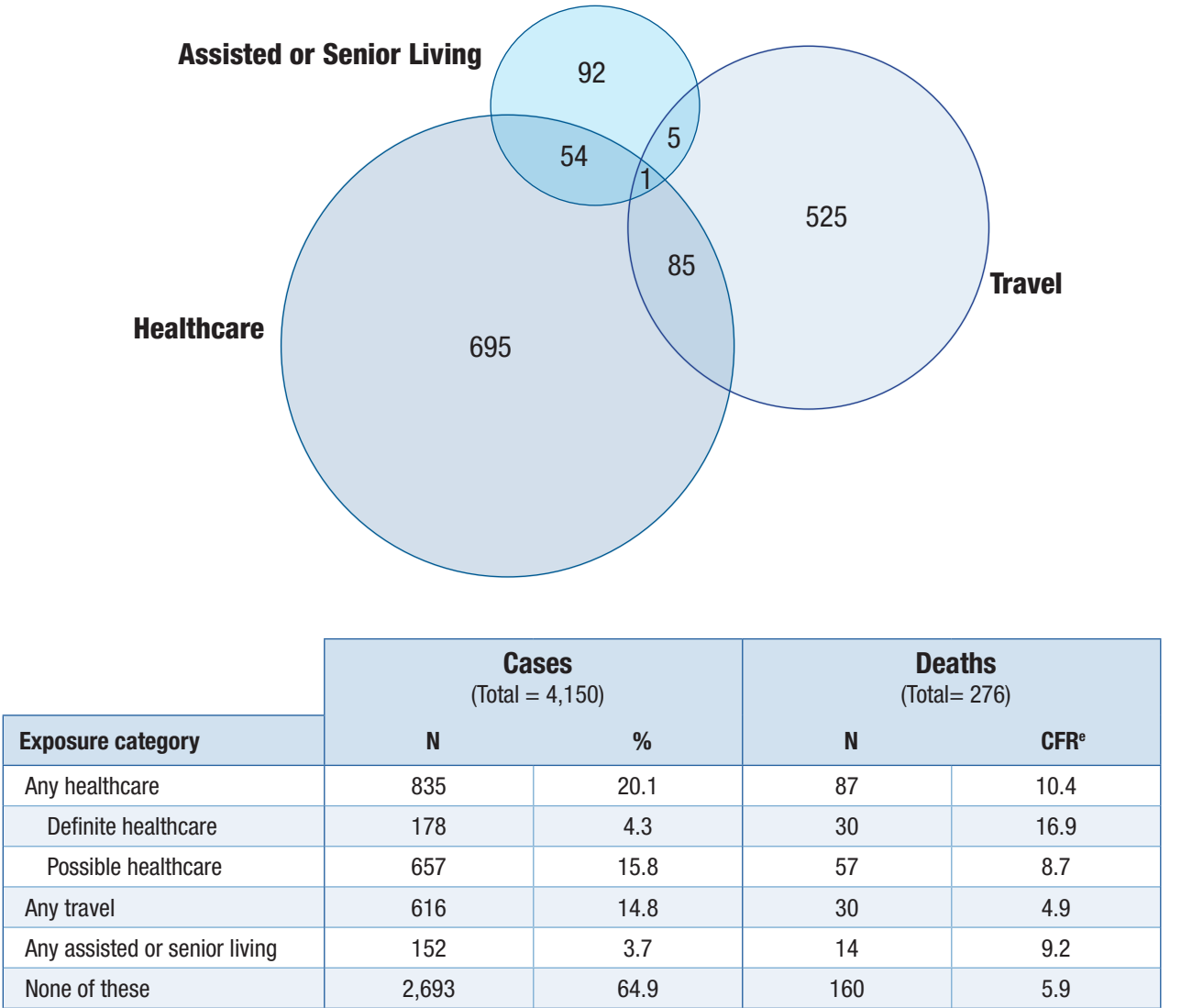
^h Extrapulmonary legionellosis.

ⁱ While legionellosis consists of Legionnaires' disease, Pontiac fever, and extrapulmonary legionellosis, syndrome was not specified for some cases.

^j Complete reporting.

Accessible version at: <https://www.cdc.gov/legionella/health-depts/surv-reporting/2016-17-report-tables/index.html#figure5b>

Figure 6a. Number of reported confirmed cases and deaths of Legionnaires’ disease by exposure category^a—SLDSS,^b complete reporting jurisdictions,^c 2016.^d



^a Exposure categories are not mutually exclusive. A patient may report multiple exposures in the 10 days before date of symptom onset. Exposure categories:
Healthcare: A patient who visited, worked, or stayed in a healthcare setting in the 10 days before date of symptom onset.
Travel: A patient with a history of spending at least one night away from home (in the state of residence, another state, or another country) in the 10 days before date of symptom onset, not including nights spent in a healthcare facility.
Assisted or senior living: A patient who visited, worked, or stayed in a senior or assisted living facility in the 10 days before date of symptom onset.
None of these: A patient without reported healthcare setting, travel, or senior or assisted living facility exposure in the 10 days before date of symptom onset.

^b Supplemental Legionnaires’ Disease Surveillance System (SLDSS).

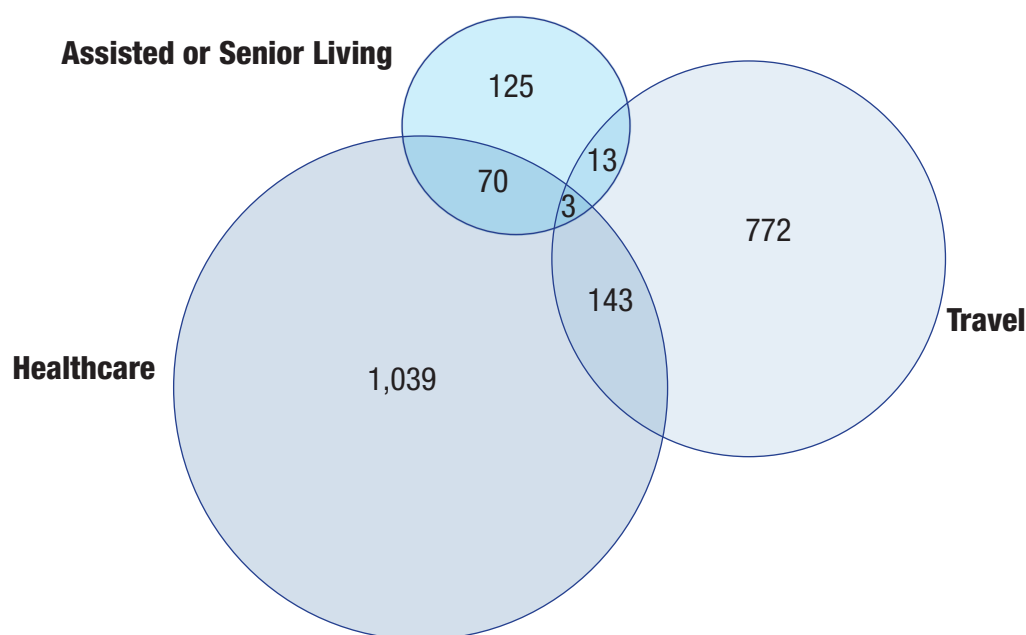
^c Complete reporting jurisdictions in 2016: 35 complete reporting jurisdictions reported at least 90% of confirmed NNDSS cases to SLDSS: Alabama, Alaska, Arkansas, Arizona, Colorado, Connecticut, Delaware, Florida, Georgia, Hawaii, Iowa, Illinois, Kansas, Kentucky, Maine, Michigan, Minnesota, Mississippi, Missouri, Montana, New Hampshire, New Jersey, New York City, New York (state), Ohio, Pennsylvania, Rhode Island, South Carolina, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, and Wyoming.

^d Based on year of symptom onset in SLDSS. If onset date was not stated in SLDSS, case year for confirmed cases was determined by the following dates (in order of reporting): positive laboratory date (by either urinary antigen testing, culture, or fourfold rise of antibody titer against *Legionella pneumophila* serogroup 1); date patient was hospitalized during treatment for Legionnaires’ disease; or date case was first reported to public health at any level.

^e CFR: Case fatality rate calculated as the number of reported confirmed Legionnaires’ disease case deaths divided by the number of patients with Legionnaires’ disease and the same exposure history.

Accessible version at: <https://www.cdc.gov/legionella/health-depts/surv-reporting/2016-17-report-tables/index.html#figure6a>

Figure 6b. Number of reported confirmed cases and deaths of Legionnaires' disease by exposure category^a—SLDSS,^b complete reporting jurisdictions,^c 2017.^d



Exposure category	Cases (Total = 5,898)		Deaths (Total= 438)	
	N	%	N	CFR ^e
Any healthcare	1,255	21.3	142	11.3
Definite healthcare	232	3.9	47	20.3
Possible healthcare	1,023	17.3	95	9.3
Any travel	931	15.8	30	3.2
Any assisted or senior living	211	3.6	22	10.4
None of these	3,733	63.3	260	7.0

^a Exposure categories are not mutually exclusive. A patient may report multiple exposures in the 10 days before date of symptom onset. Exposure categories:

Healthcare: A patient who visited, worked, or stayed in a healthcare setting in the 10 days before date of symptom onset.

Travel: A patient with a history of spending at least one night away from home (in the state of residence, another state, or another country) in the 10 days before date of symptom onset, not including nights spent in a healthcare facility.

Assisted or senior living: A patient who visited, worked, or stayed in a senior or assisted living facility in the 10 days before date of symptom onset.

None of these: A patient without reported healthcare setting, travel, or senior or assisted living facility exposure in the 10 days before date of symptom onset.

^b Supplemental Legionnaires' Disease Surveillance System (SLDSS).

^c Complete reporting jurisdictions for 2017: 39 complete reporting jurisdictions reported at least 90% of confirmed NNDSS cases to SLDSS in 2017: Alabama, Alaska, Arkansas, Colorado, Connecticut, Florida, Georgia, Iowa, Illinois, Kansas, Kentucky, Maryland, Maine, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York City, New York (state), North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Utah, Vermont, Washington, West Virginia, Wisconsin, and Wyoming.

^d Based on year of symptom onset in SLDSS. If onset date was not stated in SLDSS, case year for confirmed cases was determined by the following dates (by either urinary antigen testing, culture, or fourfold rise of antibody titer against *Legionella pneumophila* serogroup 1); date patient was hospitalized during treatment for Legionnaires' disease; or date case was first reported to public health at any level.

^e CFR: Case fatality rate calculated as the number of reported confirmed Legionnaires' disease case deaths divided by the number of patients with Legionnaires' disease and the same exposure history.

Accessible version at: <https://www.cdc.gov/legionella/health-depts/surv-reporting/2016-17-report-tables/index.html#figure6b>

Table 3. Number of reported confirmed cases of Legionnaires' disease by exposure category^a and year^b—SLDSS,^c complete reporting jurisdictions,^d 2016 and 2017.

Exposure Category	2016 (Total = 4,150)		2017 (Total=5,898)	
	N	%	N	%
Healthcare	835	20.1	1,255	21.3
Healthcare facility type				
Hospital	325	38.9	443	35.3
Long-term care facility	197	23.6	282	22.5
Clinic	196	23.5	335	26.7
Multiple	89	10.7	125	10.0
Other	1	0.1	0	0.0
Not stated	27	3.2	70	5.6
Healthcare exposure type				
Inpatient	317	38.0	430	34.3
Outpatient	292	35.0	460	36.7
Visitor	74	8.9	143	11.4
Employee	70	8.4	89	7.1
Multiple	50	6.0	61	4.9
Not stated	32	3.8	72	5.7
Travel	616	14.8	931	15.8
Any public accommodation	417	67.7	585	62.8
Hotel/motel/resort	412	N/A	576	N/A
Cruise ship	11	N/A	18	N/A
All private accommodations	181	29.4	239	25.7
Unknown travel accommodation type	18	2.9	107	11.5
Assisted or Senior Living	152	3.7	211	3.6
Assisted or Senior Living Facility Type				
Assisted living facility	90	59.2	121	57.3
Senior living facility	48	31.6	64	30.3
Both	1	0.7	1	0.5
Not stated	13	8.6	25	11.8
Assisted or Senior Living Exposure Type				
Resident	99	65.1	137	64.9
Visitor	25	16.4	41	19.4
Employee	11	7.2	9	4.3
Not stated	17	11.2	24	11.4
None of these	2,693	64.9	3,733	63.3

^a Exposure categories (categories are not mutually exclusive):

Healthcare: A patient who visited, worked, or stayed in a healthcare setting in the 10 days before date of symptom onset.

Travel: A patient with a history of spending at least one night away from home (in the state of residence, another state, or another country) in the 10 days before date of symptom onset, not including nights spent in a healthcare facility. Cases may occur in patients with multiple travel locations during the exposure period. If any exposure to a

public accommodation occurs, the case is categorized as public travel. Private travel represents exposure to private accommodations only. If a patient has exposure to both private and unknown accommodations, the case is categorized as unknown travel.

Assisted or senior living: A patient who visited, worked, or stayed in a senior or assisted living facility in the 10 days before date of symptom onset.

None of these: A patient without reported healthcare setting, travel, or senior or assisted living facility exposure in the 10 days before date of symptom onset.

^b Based on year of symptom onset in SLDSS. If onset date was not stated in SLDSS, case year for confirmed cases was determined by the following dates (in order of reporting): positive laboratory date (by either urinary antigen testing, culture, or fourfold rise of antibody titer against *Legionella pneumophila* serogroup 1); date patient was hospitalized during treatment for Legionnaires' disease; or date case was first reported to public health at any level.

^c Supplemental Legionnaires' Disease Surveillance System (SLDSS).

^d Complete reporting jurisdictions in 2016: 35 complete reporting jurisdictions reported at least 90% of confirmed NNDSS cases to SLDSS: Alabama, Alaska, Arkansas, Arizona, Colorado, Connecticut, Delaware, Florida, Georgia, Hawaii, Iowa, Illinois, Kansas, Kentucky, Maine, Michigan, Minnesota, Mississippi, Missouri, Montana, New Hampshire, New Jersey, New York City, New York (state), Ohio, Pennsylvania, Rhode Island, South Carolina, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, and Wyoming.

Complete reporting jurisdictions for 2017: 39 complete reporting jurisdictions reported at least 90% of confirmed NNDSS cases to SLDSS in 2017: Alabama, Alaska, Arkansas, Colorado, Connecticut, Florida, Georgia, Iowa, Illinois, Kansas, Kentucky, Maryland, Maine, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York City, New York (state), North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Utah, Vermont, Washington, West Virginia, Wisconsin, and Wyoming.

Accessible version at: <https://www.cdc.gov/legionella/health-depts/surv-reporting/2016-17-report-tables/index.html#table3>

Table 4a. Number of reported confirmed cases of Legionnaires' disease by demographic characteristics and exposure category^a—SLDSS,^b complete reporting jurisdictions,^c 2016.^d

Characteristic	<u>Healthcare</u> (Total = 835)		<u>Travel</u> (Total = 616)		<u>Assisted or senior living</u> (Total =152)		<u>None of these</u> (Total =2,693)	
	N	%	N	%	N	%	N	%
Median Age (years)	65	N/A	61	N/A	78	N/A	61	N/A
Age								
0–9	3	0.4	1	0.2	0	0.0	3	0.1
10–19	3	0.4	2	0.3	0	0.0	5	0.2
20–29	12	1.4	13	2.1	0	0.0	59	2.2
30–39	40	4.8	35	5.7	6	3.9	164	6.1
40–49	60	7.2	80	13.0	7	4.6	303	11.3
50–59	167	20.0	144	23.4	15	9.9	673	25.0
60–69	212	25.4	203	33.0	28	18.4	715	26.6
70–79	160	19.2	87	14.1	25	16.4	441	16.4
80–84	63	7.5	28	4.5	24	15.8	153	5.7
85+	114	13.7	21	3.4	47	30.9	175	6.5
Not stated	1	0.1	2	0.3	0	0.0	2	0.1
Sex								
Female	413	49.5	242	39.3	88	57.9	964	35.8
Male	418	50.1	370	60.1	64	42.1	1,712	63.6
Not stated	4	0.5	4	0.6	0	0.0	17	0.6
Race								
American Indian/ Alaska Native	4	0.5	5	0.8	0	0.0	7	0.3
Asian	14	1.7	8	1.3	3	2.0	27	1.0
African American/Black	142	17.0	86	14.0	23	15.1	558	20.7
Native Hawaiian/ Other Pacific Islander	0	0.0	0	0.0	0	0.0	6	0.2
White	519	62.2	397	64.4	87	57.2	1,590	59.0
Multiple	1	0.1	0	0.0	0	0.0	6	0.2
Not stated	155	18.6	120	19.5	39	25.7	499	18.5
Ethnicity								
Hispanic	31	3.7	22	3.6	5	3.3	132	4.9
Non-Hispanic	651	78.0	460	74.7	115	75.7	2,039	75.7
Not stated	153	18.3	134	21.8	32	21.1	522	19.4

^a Exposure categories (categories are not mutually exclusive):

Healthcare: A patient who visited, worked, or stayed in a healthcare setting in the 10 days before date of symptom onset.

Travel: A patient with a history of spending at least one night away from home (in the state of residence, another state, or another country) in the 10 days before date of symptom onset, not including nights spent in a healthcare facility.

Assisted or senior living: A patient who visited, worked, or stayed in a senior or assisted living facility in the 10 days before date of symptom onset.

None of these: A patient without reported healthcare setting, travel, or senior or assisted living facility exposure in the 10 days before date of symptom onset.

^b Supplemental Legionnaires' Disease Surveillance System (SLDSS).

^c Complete reporting jurisdictions in 2016: 35 complete reporting jurisdictions reported at least 90% of confirmed NNDSS cases to SLDSS in 2016: Alabama, Alaska, Arkansas, Arizona, Colorado, Connecticut, Delaware, Florida, Georgia, Hawaii, Iowa, Illinois, Kansas, Kentucky, Maine, Michigan, Minnesota, Mississippi, Missouri, Montana, New Hampshire, New Jersey, New York City, New York (state), Ohio, Pennsylvania, Rhode Island, South Carolina, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, and Wyoming.

^d Based on year of symptom onset in SLDSS. If onset date was not stated in SLDSS, case year for confirmed cases was determined by the following dates (in order of reporting): positive laboratory date (by either urinary antigen testing, culture, or fourfold rise of antibody titer against *Legionella pneumophila* serogroup 1); date patient was hospitalized during treatment for Legionnaires' disease; or date case was first reported to public health at any level.
Accessible version at: <https://www.cdc.gov/legionella/health-depts/surv-reporting/2016-17-report-tables/index.html#table4a>

Table 4b. Number of reported confirmed cases of Legionnaires' disease by demographic characteristics and exposure category^a—SLDSS,^b complete reporting jurisdictions,^c 2017.^d

	Healthcare (Total = 1,255)		Travel (Total = 931)		Assisted or senior living (Total = 211)		None of these (Total = 3,733)	
Characteristic	N	%	N	%	N	%	N	%
Median Age (years)	66	N/A	61	N/A	74	N/A	61	N/A
Age								
0–9	1	0.1	0	0.0	0	0.0	1	0.0
10–19	3	0.2	0	0.0	0	0.0	5	0.1
20–29	21	1.7	21	2.3	6	2.8	85	2.3
30–39	48	3.8	71	7.6	7	3.3	228	6.1
40–49	110	8.8	110	11.8	8	3.8	442	11.8
50–59	250	19.9	211	22.7	29	13.7	922	24.7
60–69	295	23.5	285	30.6	39	18.5	941	25.2
70–79	279	22.2	152	16.3	40	19.0	665	17.8
80–84	96	7.6	49	5.3	24	11.4	206	5.5
85+	151	12.0	29	3.1	58	27.5	234	6.3
Not stated	1	0.1	3	0.3	0	0.0	4	0.1
Sex								
Female	563	44.9	360	38.7	98	46.4	1,301	34.9
Male	682	54.3	564	60.6	111	52.6	2,409	64.5
Not stated	10	0.8	7	0.8	2	0.9	23	0.6
Race								
American Indian/ Alaska Native	5	0.4	4	0.4	1	0.5	8	0.2
Asian	12	1.0	6	0.6	1	0.5	33	0.9
African American/Black	251	20.0	157	16.9	41	19.4	860	23.0
Native Hawaiian/ Other Pacific Islander	0	0.0	0	0.0	0	0.0	2	0.1
White	846	67.4	636	68.3	149	70.6	2,296	61.5
Multiple	3	0.2	1	0.1	0	0.0	10	0.3
Not stated	138	11.0	127	13.6	19	9.0	524	14.0
Ethnicity								
Hispanic	54	4.3	41	4.4	4	1.9	207	5.5
Non-Hispanic	968	77.1	692	74.3	166	78.7	2,821	75.6
Not stated	233	18.6	198	21.3	41	19.4	705	18.9

^a Exposure categories (categories are not mutually exclusive):

Healthcare: A patient who visited, worked, or stayed in a healthcare setting in the 10 days before date of symptom onset.

Travel: A patient with a history of spending at least one night away from home (in the state of residence, another state, or another country) in the 10 days before date of symptom onset, not including nights spent in a healthcare facility.

Assisted or senior living: A patient who visited, worked, or stayed in a senior or assisted living facility in the 10 days before date of symptom onset.

None of these: A patient without reported healthcare setting, travel, or senior or assisted living facility exposure in the 10 days before date of symptom onset.

^b Supplemental Legionnaires' Disease Surveillance System (SLDSS).

^c Complete reporting jurisdictions for 2017: 39 complete reporting jurisdictions reported at least 90% of confirmed NNDSS cases to SLDSS in 2017: Alabama, Alaska, Arkansas, Colorado, Connecticut, Florida, Georgia, Iowa, Illinois, Kansas, Kentucky, Maryland, Maine, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York City, New York (state), North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Utah, Vermont, Washington, West Virginia, Wisconsin, and Wyoming.

^d Based on year of symptom onset in SLDSS. If onset date was not stated in SLDSS, case year for confirmed cases was determined by the following dates (in order of

reporting): positive laboratory date (by either urinary antigen testing, culture, or fourfold rise of antibody titer against *Legionella pneumophila* serogroup 1); date patient was hospitalized during treatment for Legionnaires' disease; or date case was first reported to public health at any level.
Accessible version at: <https://www.cdc.gov/legionella/health-depts/surv-reporting/2016-17-report-tables/index.html#table4b>

Table 5a. Number of reported confirmed cases of healthcare-associated^a Legionnaires' disease by healthcare facility type and healthcare exposure certainty^b—SLDSS,^c complete reporting jurisdictions^d, 2016.^e

Facility type	Healthcare exposure certainty					
	Definite		Possible		Total	
	N	%	N	%	N	%
Hospital	31	17.4	294	44.7	325	38.9
Long-term care facility	110	61.8	87	13.2	197	23.6
Clinic	0	0.0	196	29.8	196	23.5
Multiple ^f	31	17.4	58	8.8	89	10.7
Other ^g	0	0.0	1	0.2	1	0.1
Not stated	6	3.4	21	3.2	27	3.2
Total	178	100	657	100	656	100

^a Healthcare-associated Legionnaires' disease includes both definite and possible cases in patients who worked, visited, or stayed in a healthcare setting for any amount of time in the 10 days preceding symptom onset.

^b Healthcare exposure certainty defined as:

Definite case of healthcare-associated Legionnaires' disease was defined as laboratory-confirmed legionellosis in a patient with exposure to a hospital or long-term-care facility for the entire 10 days preceding symptom onset.

Possible case of healthcare-associated Legionnaires' disease was defined as laboratory-confirmed legionellosis in a patient with exposure to a healthcare facility for a portion of the 10 days preceding symptom onset.

^c Supplemental Legionnaires' Disease Surveillance System (SLDSS).

^d Complete reporting jurisdictions in 2016: 35 complete reporting jurisdictions reported at least 90% of confirmed NNDSS cases to SLDSS in 2016: Alabama, Alaska, Arkansas, Arizona, Colorado, Connecticut, Delaware, Florida, Georgia, Hawaii, Iowa, Illinois, Kansas, Kentucky, Maine, Michigan, Minnesota, Mississippi, Missouri, Montana, New Hampshire, New Jersey, New York City, New York (state), Ohio, Pennsylvania, Rhode Island, South Carolina, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, and Wyoming.

^e Based on year of symptom onset in SLDSS. If onset date was not stated in SLDSS, case year for confirmed cases was determined by the following dates (in order of reporting): positive laboratory date (by either urinary antigen testing, culture, or fourfold rise of antibody titer against *Legionella pneumophila* serogroup 1); date patient was hospitalized during treatment for Legionnaires' disease; or date case was first reported to public health at any level.

^f Multiple indicates more than one type of healthcare facility.

^g Other facility includes locations such as outpatient laboratories and pharmacies.

Accessible version at: <https://www.cdc.gov/legionella/health-depts/surv-reporting/2016-17-report-tables/index.html#table5a>

Table 5b. Number of reported confirmed cases of healthcare-associated^a Legionnaires' disease by healthcare facility type and healthcare exposure certainty^b—SLDSS,^c complete reporting jurisdictions,^d 2017.^e

Facility type	Healthcare exposure certainty					
	Definite		Possible		Total	
	N	%	N	%	N	%
Hospital	43	18.5	400	39.1	443	35.3
Long-term care facility	137	59.1	145	14.2	282	22.5
Clinic	0	0.0	335	32.7	335	26.7
Multiple ^f	43	18.5	82	8.0	125	10.0
Other ^g	0	0.0	0	0.0	0	0.0
Not stated	9	3.9	61	6.0	70	5.6
Total	232	100	1,023	100	1,255	100

^a Healthcare-associated Legionnaires' disease includes both definite and possible cases in patients who worked, visited, or stayed in a healthcare setting for any amount of time in the 10 days preceding symptom onset.

^b Healthcare exposure certainty defined as:

Definite case of healthcare-associated Legionnaires' disease was defined as laboratory-confirmed legionellosis in a patient with exposure to a hospital or long-term-care facility for the entire 10 days preceding symptom onset.

Possible case of healthcare-associated Legionnaires' disease was defined as laboratory-confirmed legionellosis in a patient with exposure to a healthcare facility for a portion of the 10 days preceding symptom onset.

^c Supplemental Legionnaires' Disease Surveillance System (SLDSS).

^d Complete reporting jurisdictions for 2017: 39 complete reporting jurisdictions reported at least 90% of confirmed NNDSS cases to SLDSS in 2017: Alabama, Alaska, Arkansas, Colorado, Connecticut, Florida, Georgia, Iowa, Illinois, Kansas, Kentucky, Maryland, Maine, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York City, New York (state), North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Utah, Vermont, Washington, West Virginia, Wisconsin, and Wyoming.

^e Based on year of symptom onset in SLDSS. If onset date was not stated in SLDSS, case year for confirmed cases was determined by the following dates (in order of reporting): positive laboratory date (by either urinary antigen testing, culture, or fourfold rise of antibody titer against *Legionella pneumophila* serogroup 1); date patient was hospitalized during treatment for Legionnaires' disease; or date case was first reported to public health at any level.

^f Multiple indicates more than one type of healthcare facility.

^g Other facility includes locations such as outpatient laboratories and pharmacies.

Accessible version at: <https://www.cdc.gov/legionella/health-depts/surv-reporting/2016-17-report-tables/index.html#table5b>

Table 6a. Number of reported confirmed cases of Legionnaires' disease by hospitalization,^a outcome,^b and exposure category^c—SLDSS,^d complete reporting jurisdictions,^e 2016.^f

	Healthcare (Total = 835)		Travel (Total = 616)		Assisted or senior living (Total = 152)		None of these (Total = 2,693)	
	N	%	N	%	N	%	N	%
Hospitalized								
Yes	777	93.1	579	94.0	139	91.4	2,588	96.1
No	52	6.2	27	4.4	10	6.6	76	2.8
Not stated	6	0.7	10	1.6	3	2.0	29	1.1
Outcome								
Death	87	10.4	30	4.9	14	9.2	160	5.9
Still ill	105	12.6	56	9.1	17	11.2	228	8.5
Survived	608	72.8	476	77.3	99	65.1	1,868	69.4
Not stated	35	4.2	54	8.8	22	14.5	437	16.2

^a Hospitalization for treatment of Legionnaires' disease.

^b Outcome at time of case reporting.

^c Exposure categories (categories are not mutually exclusive):

Healthcare: Legionnaires' disease in a patient who visited, worked, or stayed in a healthcare setting in the 10 days before date of symptom onset.

Travel: Legionnaires' disease in a patient with a history of spending at least one night away from home (in the state of residence, another state, or another country) in the 10 days before date of symptom onset, not including nights spent in a healthcare facility.

Assisted or senior living: Legionnaires' disease in a patient who visited, worked, or stayed in a senior or assisted living facility in the 10 days before date of symptom onset.

None of these: A patient without reported healthcare setting, travel, or senior or assisted living facility exposure in the 10 days before date of symptom onset.

^d Supplemental Legionnaires' Disease Surveillance System (SLDSS).

^e Complete reporting jurisdictions in 2016: 35 complete reporting jurisdictions reported at least 90% of confirmed NNDSS cases to SLDSS in 2016: Alabama, Alaska, Arkansas, Arizona, Colorado, Connecticut, Delaware, Florida, Georgia, Hawaii, Iowa, Illinois, Kansas, Kentucky, Maine, Michigan, Minnesota, Mississippi, Missouri, Montana, New Hampshire, New Jersey, New York City, New York (state), Ohio, Pennsylvania, Rhode Island, South Carolina, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, and Wyoming.

^f Based on year of symptom onset in SLDSS. If onset date was not stated in SLDSS, case year for confirmed cases was determined by the following dates (in order of reporting): positive laboratory date (by either urinary antigen testing, culture, or fourfold rise of antibody titer against *Legionella pneumophila* serogroup 1); date patient was hospitalized during treatment for Legionnaires' disease; or date case was first reported to public health at any level.

Accessible version at: <https://www.cdc.gov/legionella/health-depts/surv-reporting/2016-17-report-tables/index.html#table6a>

Table 6b. Number of reported confirmed cases of Legionnaires' disease by hospitalization,^a outcome,^b and exposure category^c—SLDSS,^d complete reporting jurisdictions,^e 2017.^f

	<u>Healthcare</u> (Total = 1,255)		<u>Travel</u> (Total = 931)		<u>Assisted or senior living</u> (Total = 211)		<u>None of these</u> (Total = 3,733)	
	N	%	N	%	N	%	N	%
Hospitalized								
Yes	1,193	95.1	886	95.2	201	95.3	3,613	96.8
No	55	4.4	18	1.9	9	4.3	79	2.1
Not stated	7	0.6	27	2.9	1	0.5	41	1.1
Outcome								
Death	142	11.3	30	3.2	22	10.4	260	7.0
Still ill	133	10.6	95	10.2	15	7.1	310	8.3
Survived	860	68.5	701	75.3	152	72.0	2,653	71.1
Not stated	120	9.6	105	11.3	22	10.4	510	13.7

^a Hospitalization for treatment of Legionnaires' disease.

^b Outcome at time of case reporting.

^c Exposure categories (categories are not mutually exclusive):

Healthcare: Legionnaires' disease in a patient who visited, worked, or stayed in a healthcare setting in the 10 days before date of symptom onset.

Travel: Legionnaires' disease in a patient with a history of spending at least one night away from home (in the state of residence, another state, or another country) in the 10 days before date of symptom onset, not including nights spent in a healthcare facility.

Assisted or senior living: Legionnaires' disease in a patient who visited, worked, or stayed in a senior or assisted living facility in the 10 days before date of symptom onset.

None of these: A patient without reported healthcare setting, travel, or senior or assisted living facility exposure in the 10 days before date of symptom onset.

^d Supplemental Legionnaires' Disease Surveillance System (SLDSS).

^e Complete reporting jurisdictions for 2017: 39 complete reporting jurisdictions reported at least 90% of confirmed NNDSS cases to SLDSS in 2017: Alabama, Alaska, Arkansas, Colorado, Connecticut, Florida, Georgia, Iowa, Illinois, Kansas, Kentucky, Maryland, Maine, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York City, New York (state), North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Utah, Vermont, Washington, West Virginia, Wisconsin, and Wyoming.

^f Based on year of symptom onset in SLDSS. If onset date was not stated in SLDSS, case year for confirmed cases was determined by the following dates (in order of reporting): positive laboratory date (by either urine antigen testing, culture, or fourfold rise of antibody titer against *Legionella pneumophila* serogroup 1); date patient was hospitalized during treatment for Legionnaires' disease; or date case was first reported to public health at any level.

Accessible version at: <https://www.cdc.gov/legionella/health-depts/surv-reporting/2016-17-report-tables/index.html#table6b>

Figure 7. Percent of reported confirmed cases of Legionnaires' disease that were treated in hospital^a by age group and year^b—SLDSS,^c complete reporting jurisdictions,^d 2016 and 2017.



^a Hospitalization for treatment of Legionnaires' disease.

^b Based on year of symptom onset in SLDSS. If onset date was not stated in SLDSS, case year for confirmed cases was determined by the following dates (in order of reporting): positive laboratory date (by either urinary antigen testing, culture, or fourfold rise of antibody titer against *Legionella pneumophila* serogroup 1); date patient was hospitalized during treatment for Legionnaires' disease; or date case was first reported to public health at any level.

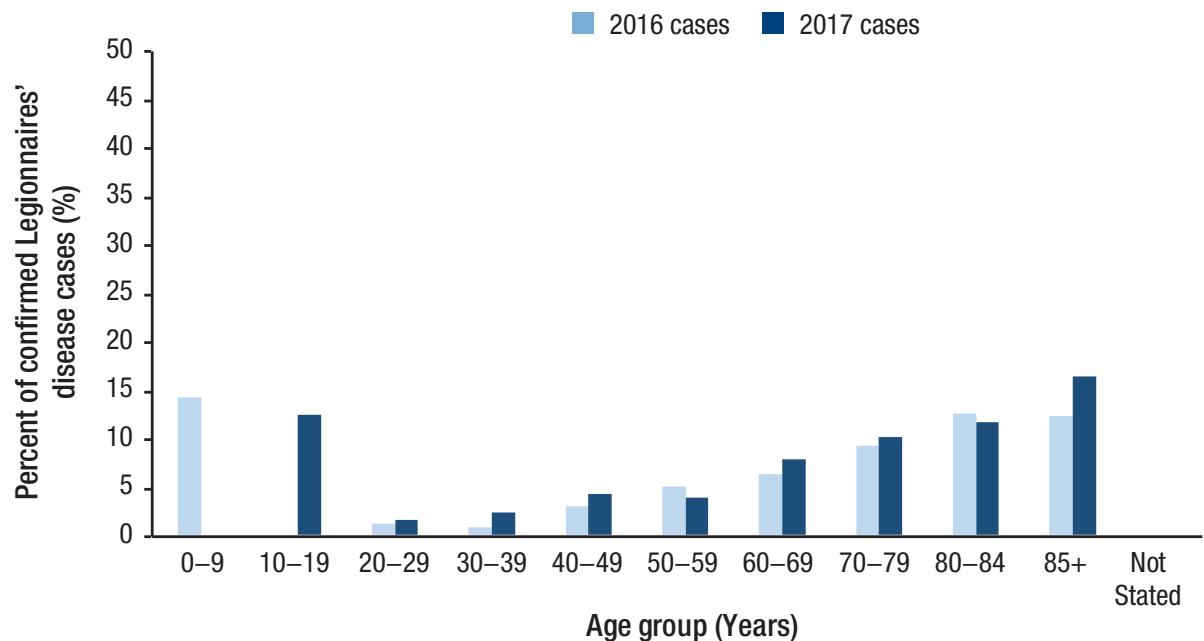
^c Supplemental Legionnaires' Disease Surveillance System (SLDSS).

^d Complete reporting jurisdictions for 2016: 35 complete reporting jurisdictions reported at least 90% of confirmed NNDSS cases to SLDSS in 2016: Alabama, Alaska, Arkansas, Arizona, Colorado, Connecticut, Delaware, Florida, Georgia, Hawaii, Iowa, Illinois, Kansas, Kentucky, Maine, Michigan, Minnesota, Mississippi, Missouri, Montana, New Hampshire, New Jersey, New York City, New York (state), Ohio, Pennsylvania, Rhode Island, South Carolina, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, and Wyoming.

Complete reporting jurisdictions for 2017: 39 complete reporting jurisdictions reported at least 90% of confirmed NNDSS cases to SLDSS in 2017: Alabama, Alaska, Arkansas, Colorado, Connecticut, Florida, Georgia, Iowa, Illinois, Kansas, Kentucky, Maryland, Maine, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York City, New York (state), North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Utah, Vermont, Washington, West Virginia, Wisconsin, and Wyoming.

Accessible version at: <https://www.cdc.gov/legionella/health-depts/surv-reporting/2016-17-report-tables/index.html#figure7>

Figure 8. Percent of reported confirmed cases of Legionnaires' disease resulting in death^a by age groups and year^b—SLDSS,^c complete reporting jurisdictions,^d 2016 and 2017.



^a Based on outcome at time of case reporting.

^b Based on year of symptom onset in SLDSS. If onset date was not stated in SLDSS, case year for confirmed cases was determined by the following dates (in order of reporting): positive laboratory date (by either urinary antigen testing, culture, or fourfold rise of antibody titer against *Legionella pneumophila* serogroup 1); date patient was hospitalized during treatment for Legionnaires' disease; or date case was first reported to public health at any level.

^c Supplemental Legionnaires' Disease Surveillance System (SLDSS).

^d Complete reporting jurisdictions for 2016: 35 complete reporting jurisdictions reported at least 90% of confirmed NNDSS cases to SLDSS in 2016: Alabama, Alaska, Arkansas, Arizona, Colorado, Connecticut, Delaware, Florida, Georgia, Hawaii, Iowa, Illinois, Kansas, Kentucky, Maine, Michigan, Minnesota, Mississippi, Missouri, Montana, New Hampshire, New Jersey, New York City, New York (state), Ohio, Pennsylvania, Rhode Island, South Carolina, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, and Wyoming.

Complete reporting jurisdictions for 2017: 39 complete reporting jurisdictions reported at least 90% of confirmed NNDSS cases to SLDSS in 2017: Alabama, Alaska, Arkansas, Colorado, Connecticut, Florida, Georgia, Iowa, Illinois, Kansas, Kentucky, Maryland, Maine, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York City, New York (state), North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Utah, Vermont, Washington, West Virginia, Wisconsin, and Wyoming.

Accessible version at: <https://www.cdc.gov/legionella/health-depts/surv-reporting/2016-17-report-tables/index.html#figure8>

Table 7. Number of reported confirmed cases of Legionnaires' disease by diagnostic testing method^a and year^b—SLDSS,^c United States, 2016 and 2017.

	2016		2017		Total	
	N	%	N	%	N	%
Diagnostic testing method						
Urinary antigen test	4,674	97.8	6,103	98.1	10,777	98.0
Serology	6	0.1	3	0.0	9	0.1
Culture	173	3.6	209	3.4	382	3.5
Culture Site						
Respiratory secretion ^d	149	86.1	180	86.1	329	86.1
Blood	5	2.9	6	2.9	11	2.9
Lung biopsy	5	2.9	5	2.4	10	2.6
Pleural fluid	3	1.7	1	0.5	4	1.0
Other	1	0.6	1	0.5	2	0.5
Not stated	10	5.8	16	7.7	26	6.8
Culture Species						
<i>L. pneumophila</i>	115	66.5	115	55.0	230	60.2
Serogroup 1	51	N/A	60	N/A	111	N/A
Serogroup 2	0	N/A	1	N/A	1	N/A
Serogroup 4	2	N/A	0	N/A	2	N/A
Serogroup 5	1	N/A	3	N/A	4	N/A
Serogroup 6	1	N/A	1	N/A	2	N/A
Serogroup 9	6	N/A	0	N/A	6	N/A
Serogroup 10	0	N/A	1	N/A	1	N/A
Serogroup 12	0	N/A	2	N/A	2	N/A
<i>L. micdadei</i>	4	2.3	3	1.4	7	1.8
<i>L. bozemanii</i>	2	1.2	0	0.0	2	0.5
<i>L. gormanii</i>	2	1.2	0	0.0	2	0.5
<i>L. donaldsonii</i>	0	0.0	1	0.5	1	0.3
<i>L. feeleyi</i>	0	0.0	1	0.5	1	0.3
<i>L. longbeachae</i>	1	0.6	0	0.0	1	0.3
<i>L. parisiensis</i>	0	0.0	1	0.5	1	0.3
Other or not stated	49	28.3	88	42.1	137	35.9

^a More than one type of test might apply. Laboratory criteria for diagnosis include the following for confirmed cases:

Urinary antigen test: detection of *Legionella pneumophila* serogroup 1 antigen in urine using validated reagents.

Culture: isolation of any *Legionella* organism from respiratory secretions, lung tissue, pleural fluid, or other normally sterile site.

Serology: fourfold or greater rise in specific serum antibody titer to *L. pneumophila* serogroup 1 using validated reagents detected 3–6 weeks apart.

^b Based on year of symptom onset in SLDSS. If onset date was not stated in SLDSS, case year for confirmed cases was determined by the following dates (in order of reporting): positive laboratory date (by either urinary antigen testing, culture, or fourfold rise of antibody titer against *Legionella pneumophila* serogroup 1); date patient was hospitalized during treatment for Legionnaires' disease; or date case was first reported to public health at any level.

^c Supplemental Legionnaires' Disease Surveillance System (SLDSS).

^d Respiratory secretions include sputum, bronchial wash, bronchoalveolar lavage.

Accessible version at: <https://www.cdc.gov/legionella/health-depts/surv-reporting/2016-17-report-tables/index.html#table7>

