

Key Findings and Public Health Messages

- The California Department of Public Health (CDPH) received reports of 885 cases of legionellosis with estimated symptom onset dates from 2009 through 2012. This corresponds to an average annual incidence rate of 0.59 cases per 100,000 Californians.
- From 2009 (167 cases, 0.45 per 100,000) through 2012 (247 cases, 0.65 per 100,000), legionellosis incidence rates increased by 44.4 percent. From 2001 (57 cases; 0.17 per 100,000) through 2012, the annual rates increased by 282.4 percent. The highest annual incidence rate occurred in 2011 (251 cases; 0.67 per 100,000).
- From 2009 through 2012, 82 (9.3 percent) reported case-patients died with legionellosis.
- Average legionellosis incidence rates increased with increasing age and were highest among adults 85 years of age and older (3.6 per 100,000).
- Average incidence rates for the surveillance period were 2.6 times higher in southern California (0.81 per 100,000) compared to northern California (0.31 per 100,000).
- In 2009, there were two outbreaks involving two cases each in southern California from recreational water exposure.
- Further study may help determine if an increasing population of older persons and other at risk individuals, improved detection such as increased use of urine legionella antigen testing and reporting (endorsement of more timely and sensitive surveillance),

or some combination thereof contributed to the steady increase in legionellosis incidence rates in California.

Background

Legionella is an important respiratory bacterial pathogen in the United States (US). The national incidence rate has increased 192% from 0.39 per 100,000 population in 2000 to 1.15 per 100,000 in 2009¹. It was estimated that *Legionella* caused between 8,000 and 18,000 cases of community-acquired pneumonias requiring hospitalization each year². People get legionellosis from inhaling or aspirating contaminated water aerosols. Legionellae are ubiquitous in manmade and fresh water-environments where they replicate within free-living amoebae. Warm temperatures and biofilms support bacterial growth, and hot-water and aircirculation systems, hot tubs, and decorative fountains have been implicated exposure sources in community-based outbreaks. *L. pneumophila* serogroup 1 is the most frequently identified serogroup among reported cases (the causative agent in 60% to 80% of patients)³. Most cases are now diagnosed by urine antigen, which is highly specific but only for *L. pneumophila* serogroup 1, so that disease caused by other serogroups or species is less likely to be diagnosed.

Legionellosis is associated with two clinically and epidemiologically distinct syndromes. Pontiac fever is a self-limited, nonpneumonic, influenza-like illness whereas Legionnaires' disease is a common cause of serious bacterial pneumonia. The vast majority of reported legionellosis cases are Legionnaires' disease. Although most cases occur sporadically, outbreaks have been identified in nosocomial and community based settings. Since its addition to national outbreak surveillance in 2001, *Legionella* has been the

most commonly reported pathogen associated with drinking water outbreaks. Persons at increased risk for legionellosis include those of advanced age and deficient immune status^{4,5}.

We describe here the epidemiology of legionellosis in California from 2009 through 2012. Data for 2012 are provisional and may differ from data in future publications. The epidemiological description of legionellosis for the 2001–2008 periods can be found in the Epidemiologic Summary of Legionellosis in California, 2001–2008⁶. For a complete discussion of the definitions, methods, and limitations associated with this report, please refer to Technical Notes⁷.

California reporting requirements and surveillance case definitions

California Code of Regulations (CCR), Title 17, Section 2500 requires health care providers to report suspected cases of legionellosis to their local health department within seven working days of identification or immediately by telephone if an outbreak is suspected. In late 2006, revised regulations required clinical and reference laboratories to notify the local health department when laboratory testing yielded evidence suggestive of *Legionella* within one working day after the health care provider has been notified. Since 2010, CCR, Title 17, Section 2505 has also mandated all laboratories to report *Legionella* spp. (antigen or culture) to the local health jurisdictions within one working day after the health care provider or other person authorized to receive the report has been notified.

Local health officers are required by regulation to report to CDPH cases of legionellosis. CDPH officially counts cases that meet the 2005 U.S. Centers for Disease Control and Prevention (CDC)/Council of State and Territorial Epidemiologists' surveillance case definition. During the surveillance period, CDC defined a

confirmed case as one with clinically compatible illness and either culture isolation of any *Legionella* organism from respiratory secretions, lung tissue, pleural fluid, or other normally sterile fluid; detection of *L. pneumophila* serogroup 1 antigen in urine; or at least a four-fold increase in serum antibody titer for *L. pneumophila* serogroup¹.

Epidemiology of legionellosis in California

CDPH received reports of 885 cases of legionellosis with estimated symptom onset dates from 2009 through 2012. This corresponds to an average annual incidence rate of 0.59 cases per 100,000 Californians. Legionellosis incidence rates increased by 44.4 percent from 0.45 per 100,000 (167 cases) in 2009 to 0.65 per 100,000 (247 cases) in 2012. From 2001 through 2012, the annual rates increased by 282.4 percent (from 57 cases, 0.17 per 100,000 in 2001). The highest annual incidence rate occurred in 2011 (251 cases; 0.67 per 100,000) [Figure 1]. During the surveillance period, 82 (9.3 percent) case-patients were reported to have died with legionellosis.

Average legionellosis incidence rates increased with increasing age and were highest among adults 85 years of age and older (3.6 per 100,000) [Figure 2]. The ratio of male to female cases was 2:1. Incidence rates by race/ethnicity were not calculated due to missing data (7.2 percent). However, legionellosis cases with complete data reported White and Black/African American non-Hispanic race/ethnicities more frequently than would be expected based on the demographic profile of California [Figure 3].

Average incidence rates for the surveillance period were 2.6 times higher in southern California (0.81 per 100,000) compared to northern California (0.31 per 100,000). From 2009 through 2012, incidence rates increased by 43.3 percent in southern California (from 0.60 to 0.86 per 100,000) and by 52 percent in

northern California (from 0.25 to 0.38 per 100,000).

In 2009, there were two outbreaks involving two cases each; these outbreaks were attributed to the colonization of recreational water facilities at an apartment community and a fitness center in southern California.

Figure 1. California legionellosis case counts and incidence rates

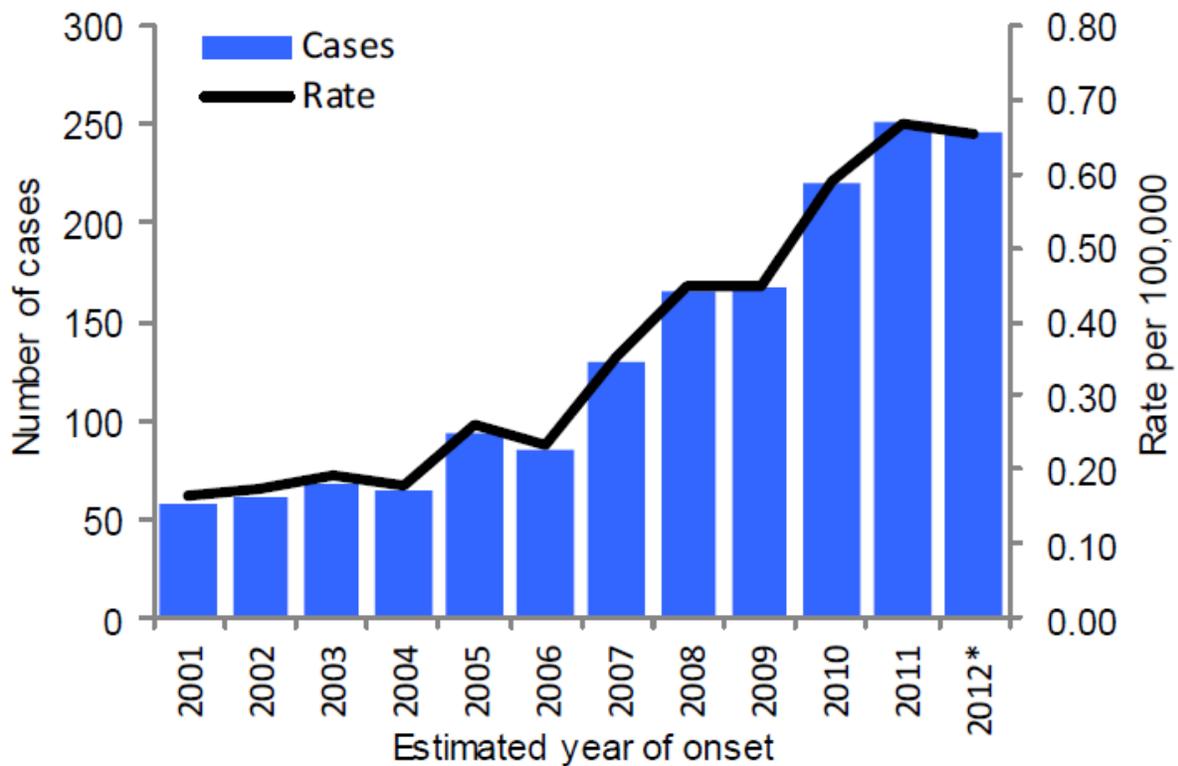


Figure 2. California legionellosis incidence rates by age and time period

Figure 2. California legionellosis incidence rates by age and time period

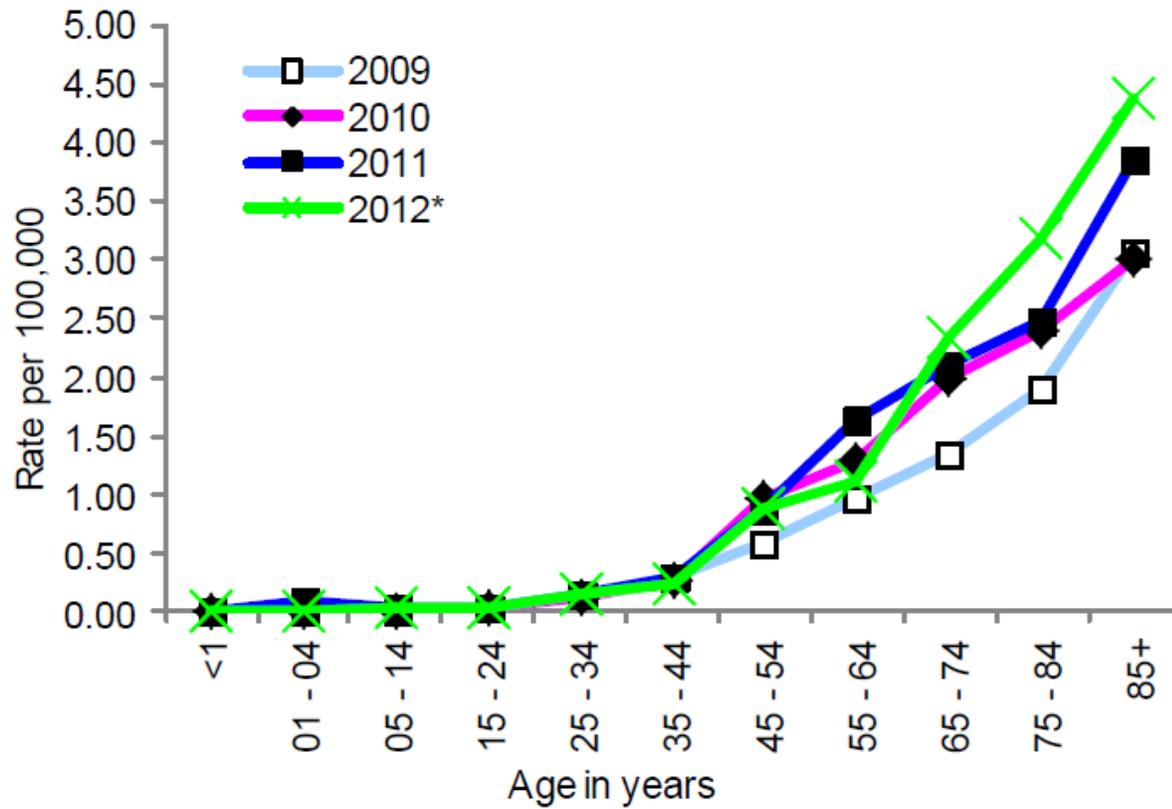
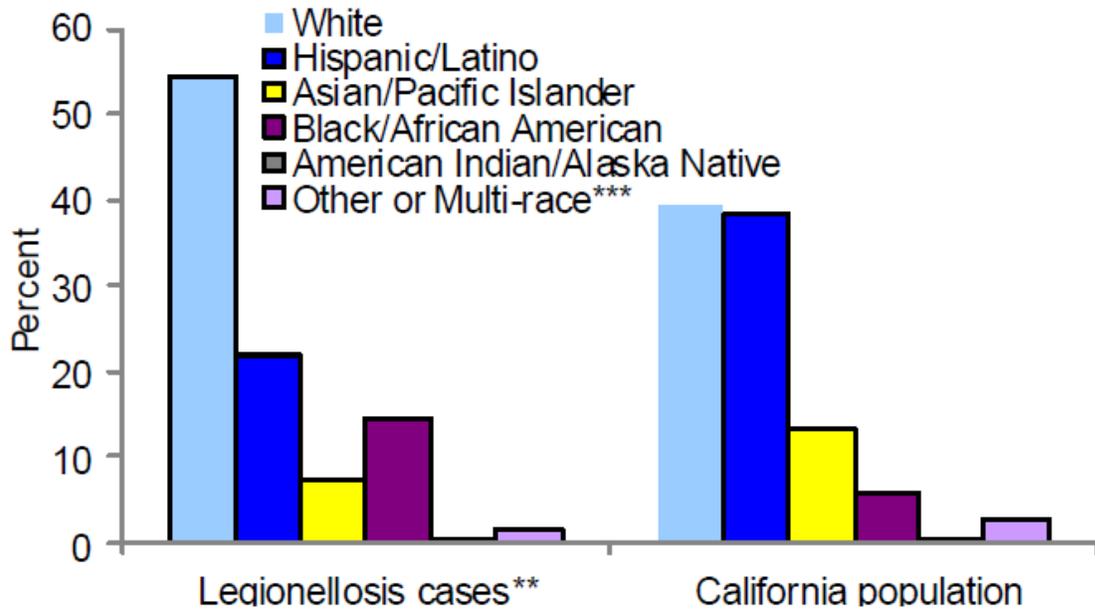


Figure 3. California legionellosis cases and population by race/ethnicity 2009 - 2012*



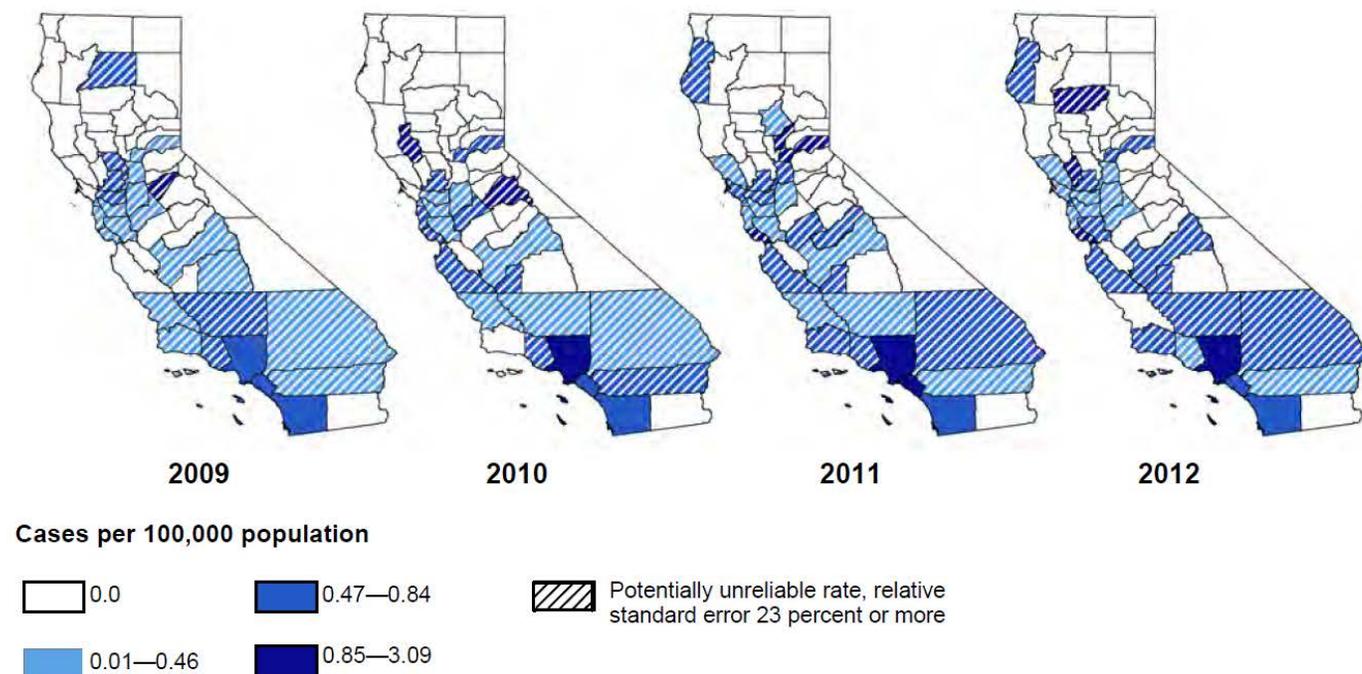
Notes for Figures 1-3

*2012 data are provisional

**Unknowns were excluded

***Includes cases who identified 'other' as their race and Californians ('population') who identified more than one race

Figure 4. California county-specific legionellosis incidence rates



Comments

During the surveillance period, the highest annual number of legionellosis cases was reported in 2011. California experienced a significant increase in reported legionellosis incidence rates from 2001 through 2012. The increase in incidence rates was also noticeable from 2009 to 2012. Similar increases have also been noted nationally^{1,8,9}. Age group, race/ethnicity, gender, and county epidemiologic profiles of incident cases with estimated onset dates from 2009 through 2012 remained fairly consistent with those with estimated onset dates from 2001 through 2008 as described previously. California reported two legionellosis outbreaks in 2009. In the U.S. during 2007-2008, legionellosis was the most frequently reported etiology among drinking water-associated outbreaks that were mostly attributed to untreated or inadequately treated ground water and majority were occurred in public water systems¹⁰.

Prevention efforts targeting against pathogens, infrastructure problems, and water sources associated with waterborne disease outbreaks are key to reduce legionellosis-associated waterborne outbreaks. Further study may help determine if an increasing population of older persons and other at risk individuals, improved detection such as increased use of urine legionella antigen testing and reporting, or some combination thereof contributed to the steady increase in legionellosis incidence rates in California.

References and resources

¹ Lauri A. Hicks, DO, Laurel E. Garrison, et al. Legionellosis – United States, 2000-2009. MMWR Surveill Summ, 2011;60 (32):1083-1086.

² Marston BJ, Plouffe JF, File TM JR et al.; Community-Based Pneumonia Incidence Study Group. Incidence of community-acquired pneumonia requiring hospitalization: results of a population-based active surveillance study in Ohio. Arch Intern Med 1997;157:1709-18.

³ Fields BS, Benson RF, Besser RE. *Legionella* and Legionnaires' disease: 25 years of investigation/ Clin Micro Rev. 2002;15:506-526

⁴ [California Department of Public Health](http://www.cdph.ca.gov/HealthInfo/discond/Pages/Legionellosis.aspx)
<http://www.cdph.ca.gov/HealthInfo/discond/Pages/Legionellosis.aspx>

⁵ [Centers for Disease Control and Prevention](https://www.cdc.gov/legionella/index.html)
<https://www.cdc.gov/legionella/index.html>

⁶ [Epidemiological Summaries of Selected General Communicable Diseases in California, 2001-2008: Legionellosis](http://www.cdph.ca.gov/programs/sss/Documents/Epi-Summaries-CA-2001-2008-083111.pdf#page=39)
<http://www.cdph.ca.gov/programs/sss/Documents/Epi-Summaries-CA-2001-2008-083111.pdf#page=39>

⁷ [Epidemiologic Summaries of Selected General Communicable Diseases in California, 2001-2008: Technical Notes](http://www.cdph.ca.gov/data/statistics/Documents/technicalnotes-episummary-aug2409.pdf)
<http://www.cdph.ca.gov/data/statistics/Documents/technicalnotes-episummary-aug2409.pdf>

⁸ Neil K, Berkelman R. Increasing incidence of legionellosis in the United States, 1990-2005: changing epidemiologic trends. Clin Infect Dis 2008;47:591-9.

⁹ Ng V, Tang P, Fishman DN. Our evolving

understanding of legionellosis epidemiology: learning to count. Clin Infect Dis 2008;47:600-2.

¹⁰ Brunkard JM, Ailes E, Roberts VA, et al. Surveillance for waterborne disease outbreaks associated with drinking water---United States, 2007-2008. MMWR Surveill Summ. 2011 Sep 23;60(12):38-68.

Last updated: 03/13/2014

Prepared by Farzaneh Tabnak, Alyssa Nguyen, Lauren Lee, and Duc Vugia, Infectious Diseases Branch