Key Findings and Public Health Messages

- The California Department of Public Health (CDPH) received reports of 18,664 cases of non-typhoidal salmonellosis infections with estimated symptom onset dates from 2009 through 2012, corresponding to an average annual incidence rate of 12.47 cases per 100,000 population.
- During 2009-2012, salmonellosis incidence rates were relatively stable. The minimum rate occurred in 2011 (10.74 per 100,000) and the maximum rate occurred in 2010 (13.56 per 100,000).
- Average annual incidence rates were highest among children under 1 year of age (54.90 per 100,000) and 1 to 4 years of age (36.47 per 100,000), followed by children 5 to 14 years of age (14.20 per 100,000) and adults 65 years of age or older (13.27 per 100,000).
- From 2009 through 2012, CDPH received reports of 69 outbreaks of foodborne salmonellosis involving more than 900 California case-patients.
- Preventing contamination and cross-contamination during the processing and production of foods, combined with education of consumers and foodhandlers about food safety may provide the best opportunities for preventing and controlling salmonellosis.

Background

Salmonella is among the most commonly reported enteric bacterial pathogens in the United States, causing an estimated 1.2 million infections, 23,000 hospitalizations, and 450 deaths each year.[1,2] Non-typhoidal *Salmonella* is a commonly identified etiology in foodborne disease outbreaks, though most salmonellosis cases are not associated with outbreaks. From 2009 through 2012, the *Salmonella* serotypes most frequently isolated from human cases nationally were *S. enteritidis, S. typhimurium, S. newport,* and *S. javiana.*[3] The national Healthy People 2020 target objective for salmonellosis is for an incidence rate lower than 11.4 new cases per 100,000 population.

Consuming foods directly or indirectly contaminated with the feces of infected animals is the leading source of *Salmonella* infections. However, direct contact with infected people, consumption of foods handled by ill persons or exposure to infected animals and their environments (notably birds, petting zoo or farm animals, and reptiles such as pet turtles) may also result in infection.

Acute illness, usually gastroenteritis, occurs after an incubation period of 12 to 72 hours, and lasts 4 to 7 days; treatment with antibiotics is not usually necessary.[4] Some patients, especially young children, the elderly, and immunocompromised persons, may develop severe illness and require hospitalization. Rarely, *Salmonella* can cause invasive disease, including meningitis, pneumonia, and sepsis; death can result. Reactive arthritis is a rare long-term complication[5].

This report describes the epidemiology of non-typhoidal salmonellosis infections in California from January 1, 2009 through December 31, 2012 reported by December 2014. Data for 2012 are provisional and may differ from data in future publications. For a complete discussion of the definitions, methods, and limitations associated with

this report, please refer to the Technical Notes.[6] The epidemiologic description of non-typhoidal salmonellosis for the 2001-2008 surveillance period can be found in the *Epidemiologic Summary of Salmonellosis in California, 2001-2008*[7].

California reporting requirements and surveillance case definition

California Code of Regulations, Title 17, requires health care providers to report suspected cases of salmonellosis to their local health department within one working day of identification or immediately by telephone if an outbreak is suspected. Laboratories are also required to report laboratory testing results suggestive of *Salmonella* infection to either the California Reportable Disease Information Exchange (CalREDIE) (via electronic laboratory reporting) or the local health department; reporting must occur within one working day after the health care provider has been notified. A culture of the organism upon which the diagnosis of salmonellosis was established must be submitted to the local public health laboratory and then onto the State Microbial Diseases Laboratory for definitive identification and serotyping.

Local health officers are required by regulation to report to CDPH cases of salmonellosis. CDPH counted cases that satisfied the Centers for Disease Control and Prevention (CDC)/Council of State and Territorial Epidemiologists' surveillance case definition of a confirmed or probable case. During the surveillance period, a confirmed case was defined as one from whom *Salmonella* (excluding *S. typhi*) was isolated from a clinical specimen, including laboratory-confirmed asymptomatic and extraintestinal infections. A probable case had clinically compatible illness and an established epidemiologic link to a laboratory-confirmed case.[8]

Epidemiology of salmonellosis in California

CDPH received reports of 18,664 cases of non-typhoidal salmonellosis with estimated symptom onset dates from 2009 through 2012. This corresponds to an average annual incidence rate of 12.47 cases per 100,000 population. Incidence rates during the 2009-2012 surveillance period were relatively stable, showing moderate fluctuations similar to those observed since 2001 [Figure1]. Rates declined from the surveillance period's maximum in 2010 of 13.56 per 100,000 to the minimum in 2011 of 10.74 per 100,000. In 2012, incidence rates increased to 12.36 per 100,000. During the surveillance period, 76 (0.4 percent) case-patients were reported to have died by the time of case report. Case fatality rates were greatest among case-patients 65 years of age or older (1.6 percent).

Average annual salmonellosis incidence rates for the surveillance period were highest among children under 1 year of age (54.90 per 100,000) and 1 to 4 years of age (36.47 per 100,000), followed by children 5 to 14 years of age (14.20 per 100,000) and adults 65 years of age or older (13.27 per 100,000, not shown) [Figure 2]. Incidence rates were most variable over time among children under 1 year: during 2009-2012, rates ranged from 66.73 per 100,000 in 2009 to 43.83 per 100,000 in 2011.

The ratio of male to female case-patients was 1.0:0.9. Incidence rates by race/ethnicity were not calculated due to the substantial portion of missing data (23.0 percent). However, salmonellosis cases with complete data reported Hispanic ethnicity slightly more frequently than would be expected based on the demographic profile of California [Figure 3].

County-specific incidence rates during the

surveillance period ranged from 0 to 33.96 per 100,000 [Figure 4]. Average annual incidence rates for the surveillance period were higher in Northern California (13.63 per 100,000) than Southern California (11.57 per 100,000). The Bay Area (15.35 per 100,000), San Joaquin Valley (13.64 per 100,000) and Central Coast (12.83 per 100,000) regions reported the highest average annual incidence rates during the surveillance period.

From 2009 through 2012, there were 69 foodborne outbreaks of salmonellosis involving more than 900 California case-patients.[9] There was no discernable trend in the number of outbreaks. The most common serotypes reported among outbreaks were *S. typhimurium* (12 outbreaks, 168 California case-patients), *S. enteritidis* (9 outbreaks, more than 140 California case-patients), *S. heidelberg* (9 outbreaks, 111 California case-patients), and *S. newport* (6 outbreaks, 42 California case-patients). Exposure was confined to California for 40 (58.0 percent) of the outbreaks (638 California case-patients were involved), while for 29 (42.0 percent) outbreaks, California was one of multiple states where exposure occurred (at least 262 California case-patients were involved in these multi-state outbreaks). Among 49 (71.0 percent) outbreaks with a confirmed food vehicle, the most common types of foods implicated were multiple-ingredient foods (8, 16.3 percent), fruits (6, 12.2 percent), turkey (5, 10.2 percent), chicken (4, 8.2 percent), pork (4, 8.2 percent), and sprouts (4, 8.2 percent).[10] A notable outbreak involving California residents was a large multi-state *S. enteritidis* outbreak in 2010 that included nearly 2000 reported cases nationwide and was associated with consumption of shell eggs from a company in Iowa.[11]

Figure 1. California salmonellosis case counts and incidence rates by estimated year of illness onset

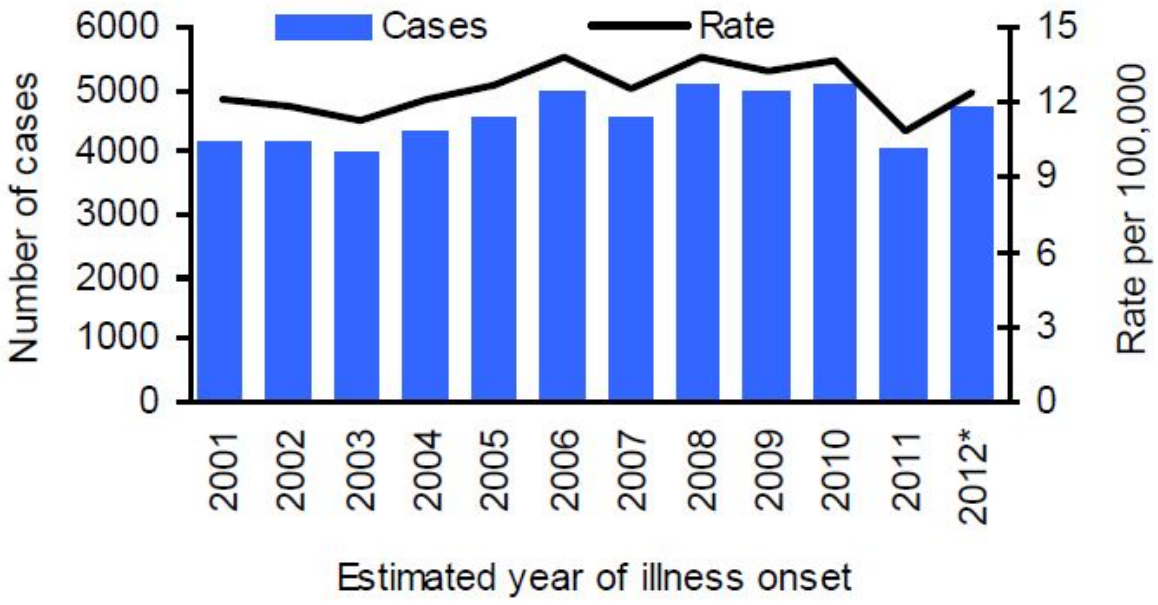


Figure 2. California salmonellosis incidence rates by age group and estimated year of illness onset

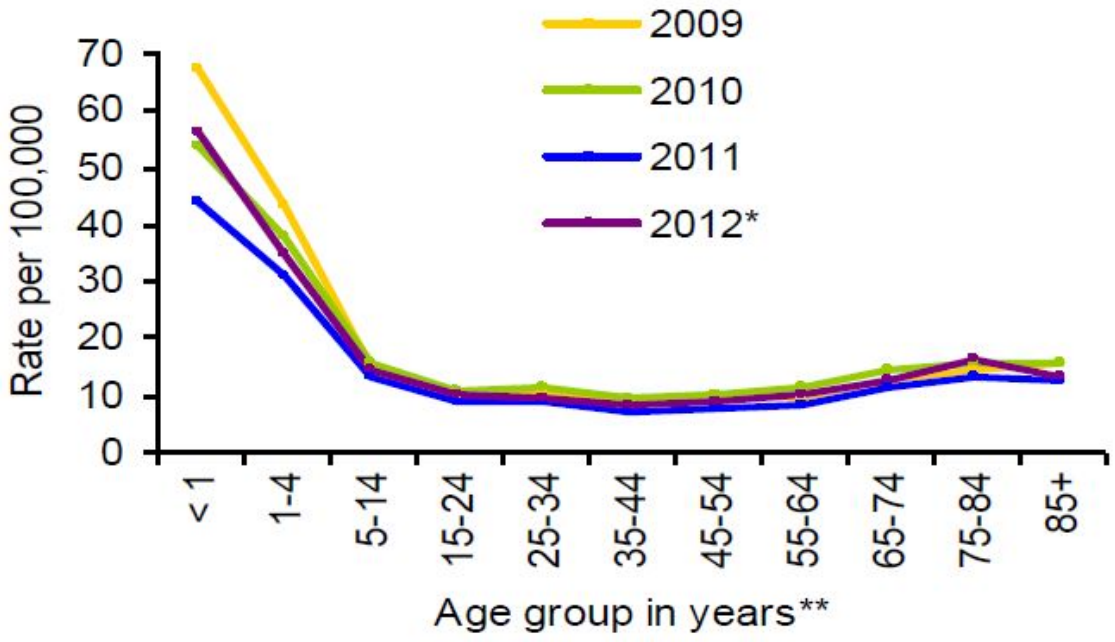
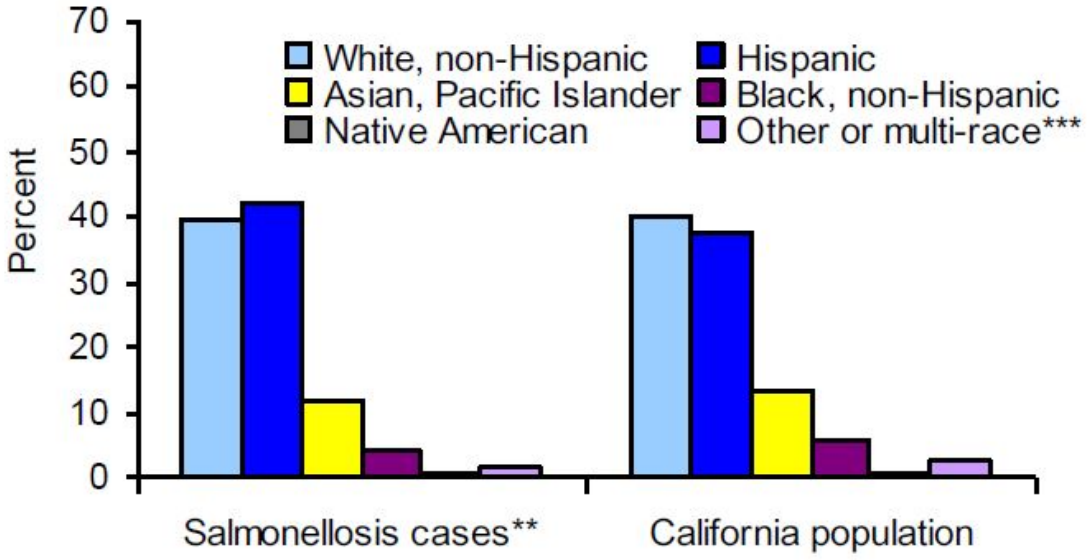


Figure 3. California salmonellosis cases and population by race/ethnicity, 2009 - 2012*



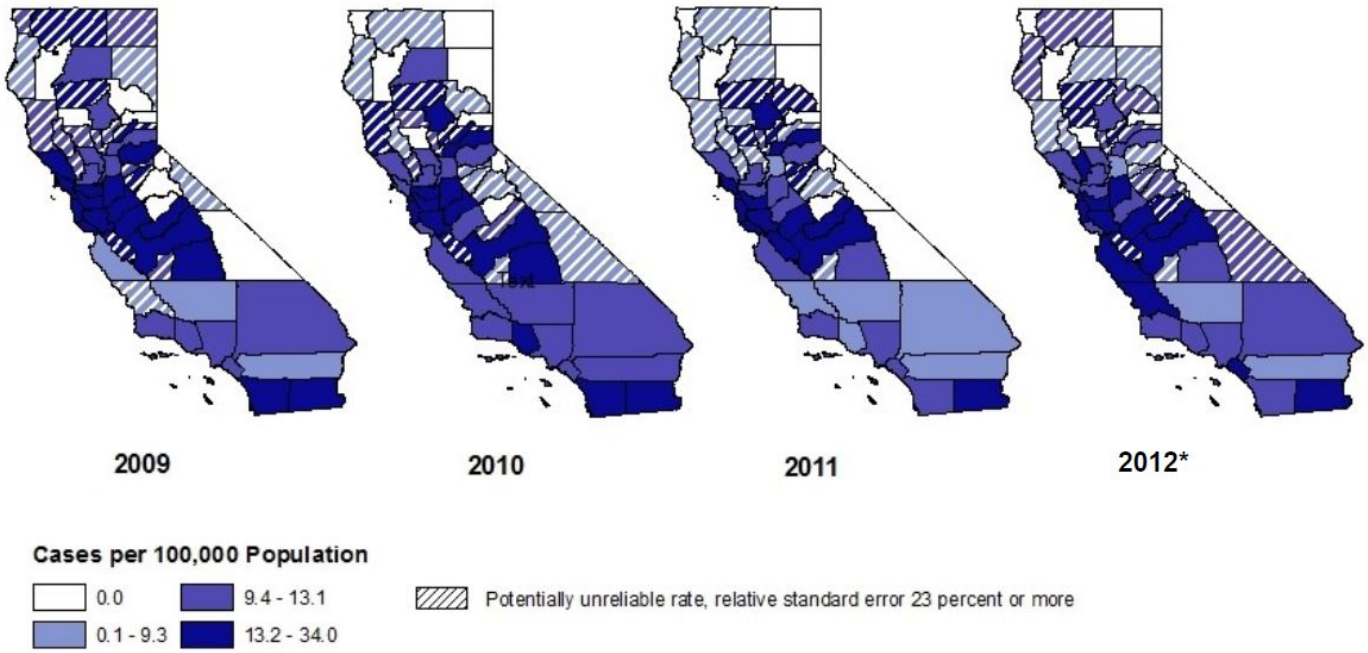
Notes for Figures 1-4

*2012 data are provisional

**Unknowns were excluded

***Includes cases who identified 'other' as their race and

Figure 4. California county-specific salmonellosis incidence rates by estimated year of illness onset



Comment

Incidence rates of reported salmonellosis infection among Californians were relatively stable from 2009 through 2012, with minor fluctuations in rates similar to the previous surveillance period. The rate in 2011 was the lowest in more than a decade. However, rates increased at the end of the surveillance period to essentially equal the average annual rate during the 2001-2008 surveillance period. The statewide 2009-2012 average annual incidence rate of salmonellosis was greater than the national Healthy People 2020 target objective, though California met the target in 2011. Salmonellosis infections are often not diagnosed and not reported, so rates may be underestimated.[2,12]

The age, race/ethnicity and gender distribution of cases incident in California from 2009 through 2012 remained fairly consistent with that of 2001 through 2008.[7] Incidence rates by age group, though, particularly in children under 1 year old, varied more during the 2009-2012 surveillance period than during the previous surveillance period.

Compared to salmonellosis incidence rates reported nationally during 2009 through 2012, rates reported among Californians were lower each year. However, the distribution by age group of incident cases in California and those reported nationally was similar: children under 5 years of age experienced the highest rates of salmonellosis.[13-16] Also during the surveillance period, three of the four serotypes most commonly involved in California salmonellosis outbreaks *S. typhimurium*, *S. enteritidis* and *S. newport* were the three serotypes most frequently isolated from lab-confirmed *Salmonella* infections nationally.[3]

Preventing contamination and cross-contamination during the processing and production of foods, including both foods of animal origin and produce, combined with education of consumers and foodhandlers on food safety may provide the best opportunities for preventing and controlling salmonellosis.

References and resources

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2 An Atlas of *Salmonella* in the United States, 1968-2011: Laboratory-based Enteric Disease Surveillance. Centers for Disease Control and Prevention, 2013. http://www.cdc.gov/salmonella/pdf/salmonella-atlas-508c.pdf

3 National *Salmonella* Surveillance, Annual Summaries, 2009-2012. Centers for Disease Control and Prevention, 2014. http://www.cdc.gov/nationalsurveillance/salmonella- surveillance.html

4 Salmonellosis. California Department of Public Health. http://www.cdph.ca.gov/HealthInfo/discond/Pages/ Salmonellosis.aspx

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6 Epidemiologic Summaries of Selected General Communicable Diseases in California, 2009-2012: Technical Notes. http://www.cdph.ca.gov/programs/sss/Documents/ TechnicalNotes01-08and09-12.pdf

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[11]Multistate Outbreak of Human *Salmonella* Enteritidis Infections Associated with Shell Eggs (Final Update). Centers for Disease Control and Prevention, 2010. http://www.cdc.gov/salmonella/enteritidis/index.html

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Last updated 9/17/2015

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