

## Epidemiologic Summary of Salmonellosis (Non-typhoidal) in California, 2013 - 2019

### Key Findings

Salmonellosis is an infection caused by *Salmonella*, a type of bacteria that naturally live in the intestines and feces (poop) of many animals, including reptiles, poultry, and livestock such as cows and pigs. Salmonellosis can make people sick with diarrhea, fever, and stomach cramps. People can get infected with *Salmonella* bacteria in many ways, including eating or drinking something that has been contaminated with animal poop and having contact with infected animals, animal areas, or other people infected with *Salmonella*. Salmonellosis is one of the most commonly reported gastrointestinal infections reported in the U.S., causing thousands of hospitalizations and hundreds of deaths per year.

### Salmonellosis in California from 2013 through 2019

**Total Cases:** There were a total of 38,119 new salmonellosis cases from 2013 through 2019. This is an average of 5,446 cases each year.

**Rate:** The average annual rate of new salmonellosis cases during 2013-2019 was about 14 cases per 100,000 people in California.

- **By County:** The average rate was highest in Imperial County (about 28 cases per 100,000 people), followed by Sierra County (about 23 cases per 100,000 people), and Placer and Marin Counties (both with about 19 cases per 100,000 people).
- **By Sex:** The average rate was slightly higher in females (about 14 cases per 100,000 people) than in males (about 13 cases per 100,000 people).
- **By Age Group:** The average rates were highest in children aged less than 1 year (65 cases per 100,000 people in this age group) and aged 1 to 4 years (about 32 cases per 100,000 people in this age group).
- **By Race/Ethnicity:** For cases where race and ethnicity information was available, the highest percentages of cases were in people who reported non-Hispanic White race/ethnicity (about 41%) and Hispanic/Latino race/ethnicity (about 41%).
- **By Month:** There were more cases of salmonellosis in August (4,810 cases, about 13%) than in any other month.

To help prevent salmonellosis, people should wash their hands with soap and water before preparing or eating food, after using the toilet, and after touching animals (including farm animals, pet reptiles, live poultry, and amphibians) or being in areas where animals live. It is also important to [follow food safety guidelines](#) when preparing food, especially by cooking food to the right temperature and refrigerating food right away to prevent bacteria from growing.

For more information about salmonellosis in California, please visit the [CDPH Salmonellosis webpage](#). For details about key infectious diseases in California, please visit the [CDPH Surveillance and Statistics Section webpage](#).

## Background

Non-typhoidal *Salmonella* are among the most commonly reported enteric bacterial pathogens in the United States, causing an estimated 1.35 million infections, 26,500 hospitalizations, and 420 deaths each year.<sup>1</sup> Of the approximately 2,000 *Salmonella* serotypes that cause human illness, the most common in the United States are Typhimurium, Enteritidis, and Newport.<sup>2</sup> In 2018, the overall incidence rate of salmonellosis in the U.S. was 18.6 cases per 100,000 population.<sup>3</sup> The national *Healthy People 2020* target objective for salmonellosis was to have an incidence rate lower than 11.4 cases per 100,000 population.<sup>4</sup>

Consuming foods directly or indirectly contaminated with the feces of infected animals is the leading cause of salmonellosis. However, direct contact with infected people, consumption of foods handled by ill persons, or exposure to infected animals (notably poultry, petting zoo and farm animals, and reptiles such as pet turtles) and their environments may also result in infection. *Salmonella* is a commonly identified etiology in foodborne disease outbreaks, though most individual salmonellosis cases are not associated with recognized outbreaks.

Most people with salmonellosis have diarrhea, fever, and abdominal pain. Some may also have vomiting, nausea, or a headache. Symptoms usually begin within 6 hours to 6 days after infection and last 4-7 days. Treatment with antibiotics is not usually necessary.<sup>1</sup> However, for some patients, illness may be severe and require hospitalization; those at higher risk include children aged 5 years and younger, adults aged 65 years and older, and immunocompromised persons.<sup>1, 5</sup> Although rare, *Salmonella* can cause invasive disease, including meningitis, pneumonia, and sepsis; death can result. Reactive arthritis is a rare, long-term complication.<sup>6</sup> Asymptomatic infections may also occur.

This report describes the epidemiology of confirmed and probable non-typhoidal salmonellosis cases in California from 2013 through 2019. Due to multiple factors that can contribute to underreporting, data in this report are likely underestimates of actual disease incidence. For a complete discussion of the definitions, methods, and limitations associated with this report, please refer to the *Technical Notes*.<sup>7</sup> The epidemiologic description of non-typhoidal salmonellosis for earlier surveillance periods can be found in the *Epidemiologic Summary of Salmonellosis (Non-typhoidal) in California, 2001-2008 and 2009-2012*.<sup>8, 9</sup>

## California Reporting Requirements and Surveillance Case Definition

California Code of Regulations (CCR), Title 17, Section 2500 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.<sup>10</sup> Per CCR, Title 17, Section 2505, laboratories are 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.<sup>11</sup> Per CCR, Title 17, Section 2612, The organism isolated from the suspected salmonellosis patient must be submitted to a local public health laboratory or California Department of Public Health (CDPH) Microbial Diseases Laboratory for definitive identification and serotyping.<sup>12</sup>

California regulations require cases of salmonellosis to be reported to CDPH. CDPH counted cases that satisfied the U.S. Centers for Disease Control and Prevention/Council of State and

Territorial Epidemiologists surveillance case definition of a confirmed or probable case. During the surveillance period (2013-2019), a confirmed case of salmonellosis was defined as one in which non-typhoidal *Salmonella* (excluding *S. Typhi*, Paratyphi A, Paratyphi B [tartrate negative], and Paratyphi C) was isolated from a clinical specimen, including laboratory-confirmed asymptomatic and extraintestinal infections. From 2013 through 2016, a probable case of salmonellosis was defined as one with clinically compatible illness and an established epidemiologic link to a laboratory-confirmed case. Beginning in 2017, a probable case was defined as one in which *Salmonella* was detected in a clinical specimen using a culture-independent diagnostic test (CIDT), or one who had clinically compatible illness and an established epidemiologic link to either a laboratory-confirmed or CIDT-positive case.<sup>13</sup>

## Epidemiology of Salmonellosis in California, 2013-2019

CDPH received reports of 38,119 total cases of non-typhoidal salmonellosis with estimated symptom onset dates from 2013 through 2019. This corresponds to an average of 5,446 cases each year and an average annual incidence rate of 13.9 cases per 100,000 population. Incidence rates increased slightly from 2013 (13.1 per 100,000; 5,014 cases) to 2019 (14.2 per 100,000; 5,672 cases), with moderate fluctuations over time [Figure 1]. The highest incidence rate occurred in 2018 (15.8 per 100,000; 6,303 cases), and the lowest incidence rate occurred in 2016 (12.1 per 100,000; 4,760 cases). Deaths were reported among 183 (0.5%) case-patients at the time of case report. Case fatality rates were greatest among case-patients aged 65 years and older (1.8%).

County-specific average annual incidence rates per 100,000 population from 2013 through 2019 ranged from 0 (Alpine County) to 27.6 (Imperial County, 359 cases) [Figure 2]. In addition to Imperial County, average annual incidence rates of salmonellosis were highest in Sierra County (22.7 per 100,000; 5 cases), Placer County (19.4 per 100,000; 514 cases), and Marin County (19.1 per 100,000; 349 cases). Of the 58 total California counties, 44 (75.9%) had an average annual incidence rate that was above the national *Healthy People 2020* target rate for salmonellosis of 11.4 cases per 100,000 population.<sup>4</sup> Of note, Los Angeles County had the highest number of salmonellosis cases during the surveillance period with 8,588 total cases and an average annual incidence rate of 12.0 per 100,000 population.

From 2013 through 2019, the average annual incidence rate was slightly higher among females (14.4 per 100,000; 19,909 cases) than among males (13.1 per 100,000; 17,980 cases); 52.6% of salmonellosis case-patients were female and 47.5% were male.

Average annual salmonellosis incidence rates during the surveillance period were highest among children aged less than 1 year (65.0 per 100,000; 2,200 cases) and children aged 1 to 4 years (32.4 per 100,000; 4,481 cases), followed by adults aged 75 years and older (16.2 per 100,000; 2,623 cases, not shown) [Figure 3]. Incidence rates were most variable over time among children aged less than 1 year; during 2013-2019 in this age group, rates ranged from 58.5 per 100,000 (282 cases) in 2017 to 81.0 per 100,000 (374 cases) in 2018.

For salmonellosis cases with complete race/ethnicity information (see *Technical Notes*), the highest percentages of cases were among those who reported non-Hispanic White race/ethnicity (41.2%) and Hispanic/Latino race/ethnicity (40.6%). The distribution of cases by reported race/ethnicity was similar to the demographic profile of California during the same time period [Figure 4].

Salmonellosis occurs seasonally, with the highest number of cases occurring during warmer-weather months. From 2013 through 2019, more case-patients had estimated symptom onsets during August (4,810 cases; 12.6%) than any other month [Figure 5].

From 2013 through 2019, there were 133 foodborne outbreaks of salmonellosis involving more than 2,500 California case-patients; 2018 had the most outbreaks with 25 (18.8%). The most common serotypes associated with outbreaks were *S. Enteritidis* (27 outbreaks) and *S. Newport* (16 outbreaks). Sixty-seven (50.4%) outbreaks involved patients exposed in multiple states<sup>14</sup> and were primarily due to widely distributed food products. Some notable multi-state salmonellosis outbreaks involving California residents that led to food recalls included: a 2013-2014 *S. Heidelberg* outbreak associated with chicken (634 cases in U.S., 490 from California); a 2015 *S. Poona* outbreak associated with imported cucumbers (907 cases in U.S., 245 from California); and a 2018-2019 *S. Newport* outbreak associated with ground beef (403 cases in U.S., 143 from California).<sup>15, 16, 17</sup> There were also multi-state salmonellosis outbreaks linked to other foods or ingestibles such as kratom, dried coconut, tahini, raw nut butters/spreads, and a breakfast cereal.<sup>18</sup> Additionally, California case-patients have been involved in several multi-state outbreaks associated with contact with animals such as backyard poultry, small turtles, bearded dragons, geckos, hedgehogs; and pet food and treats such as pig ear dog treats and frozen feeder rodents.<sup>19</sup>

**Figure 1. Salmonellosis Cases and Incidence Rates by Year of Estimated Illness Onset, California, 2013-2019**

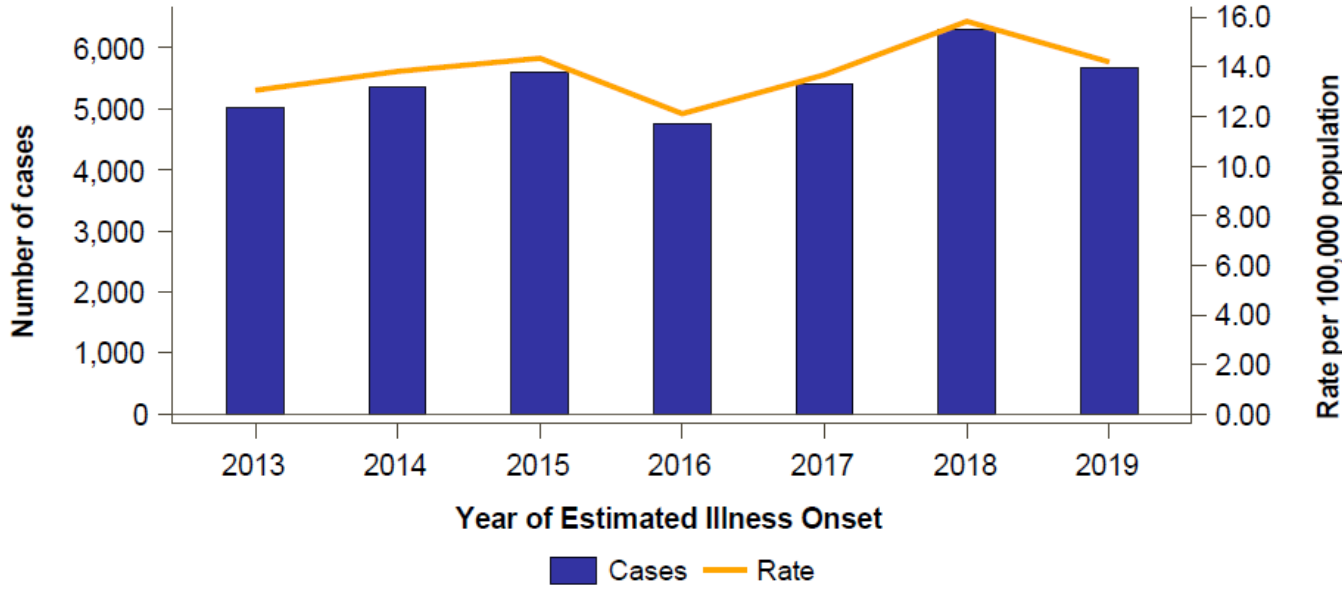
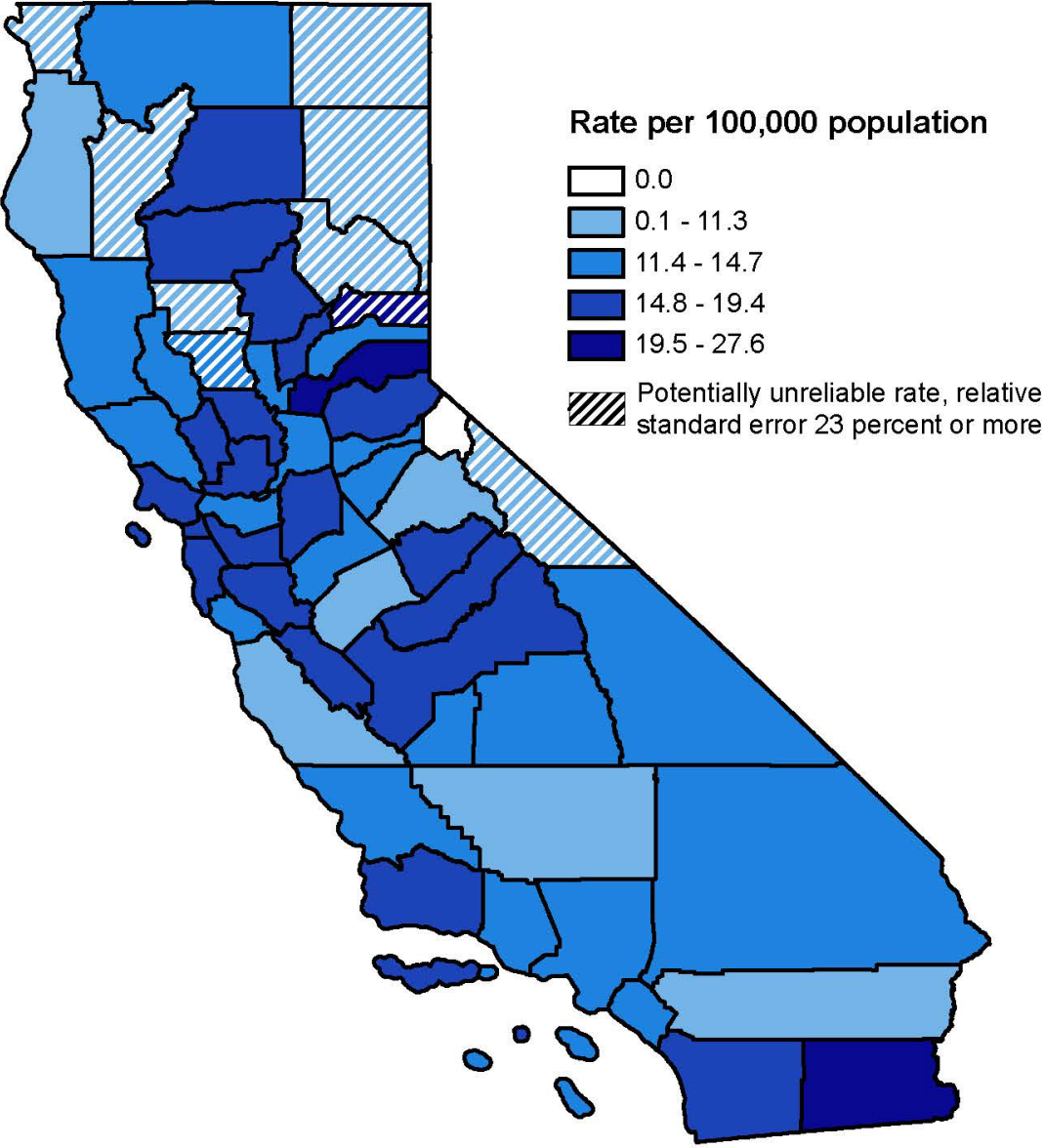
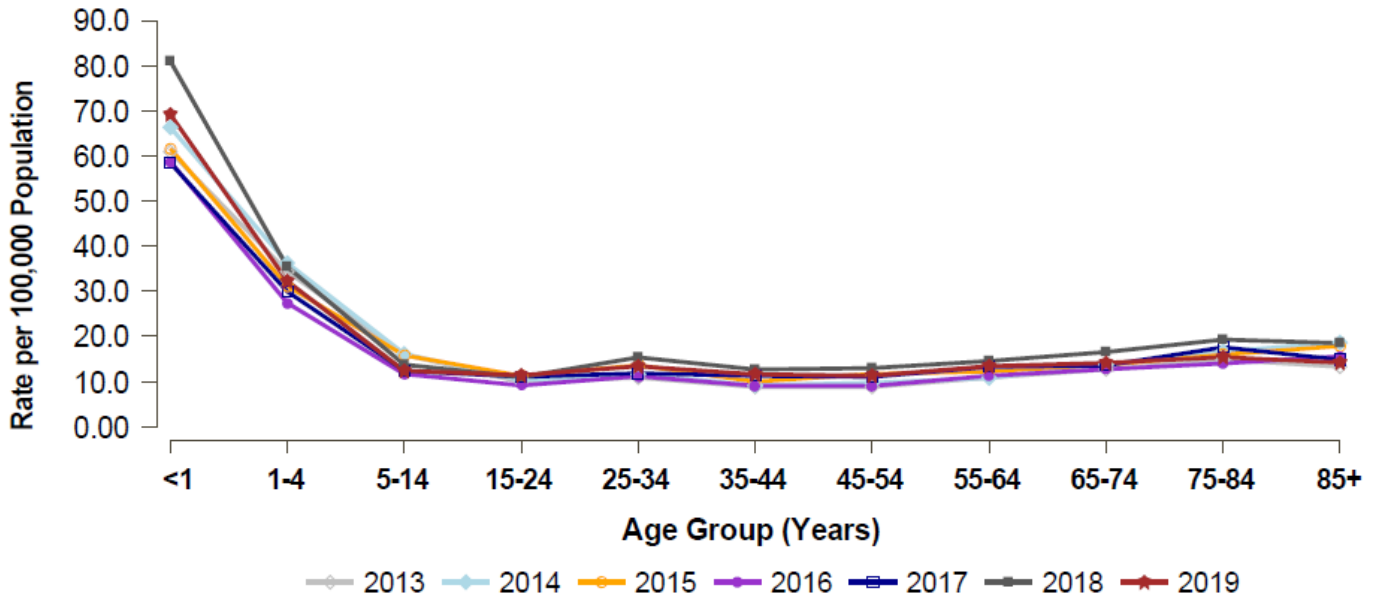


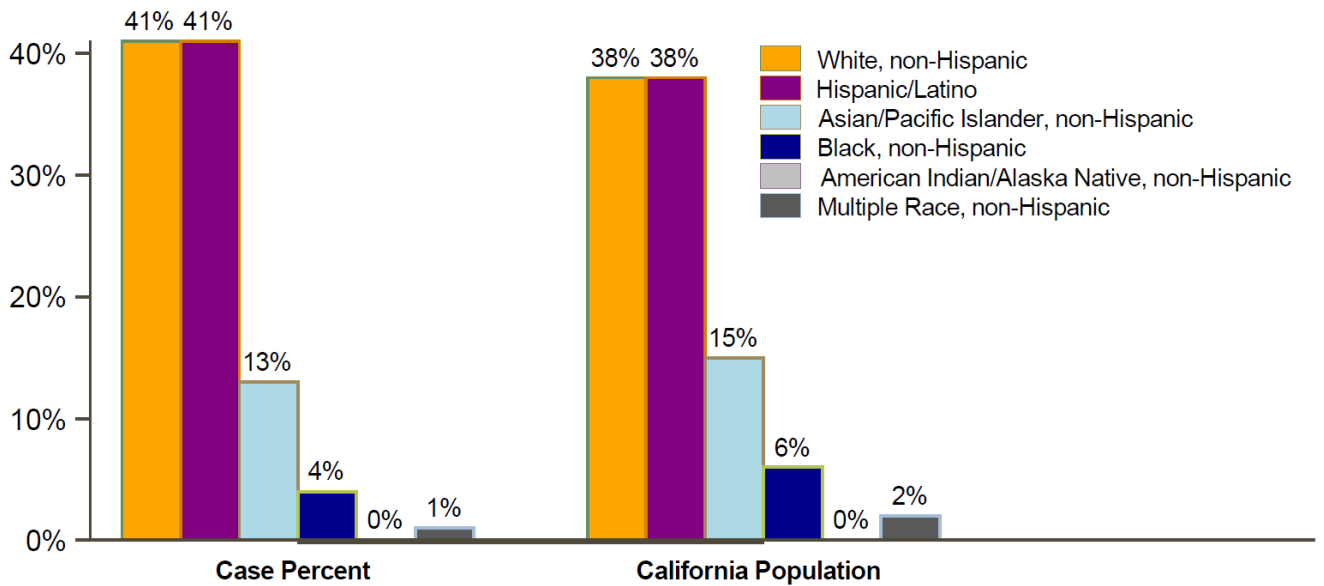
Figure 2. Salmonellosis Average Annual Incidence Rates by County, California, 2013-2019



**Figure 3. Salmonellosis Incidence Rates by Age Group and Year of Estimated Illness Onset, California, 2013-2019**

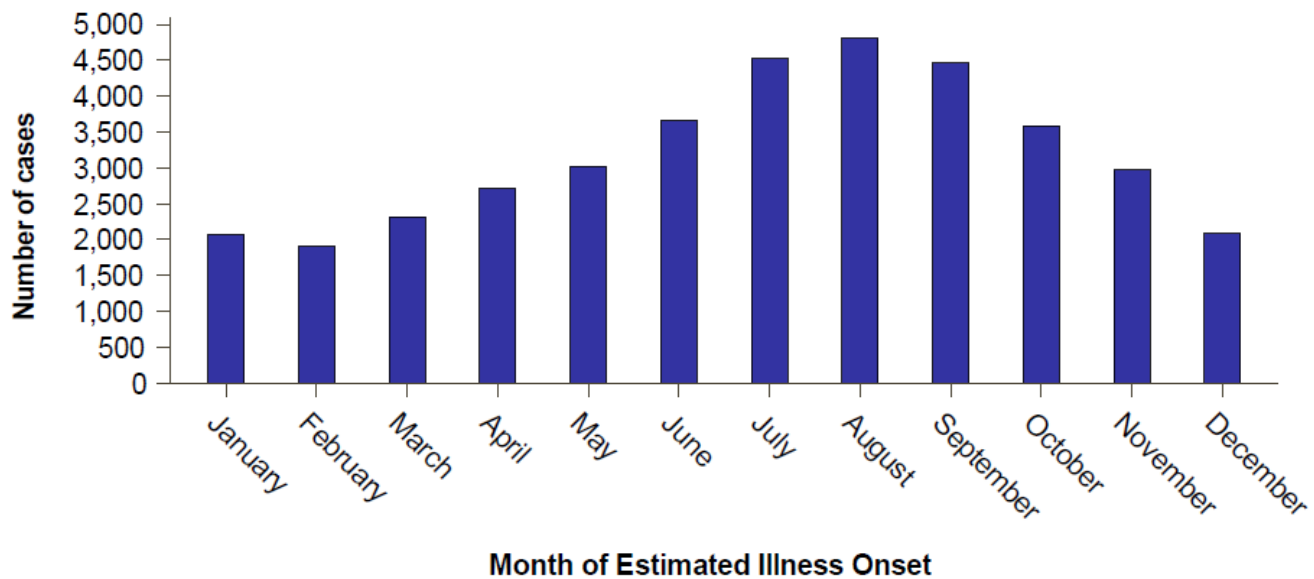


**Figure 4. Salmonellosis Cases and Population by Race/Ethnicity, California, 2013-2019**



13.6% (n=5191) of reported incidents of Salmonellosis did not identify race/ethnicity and 2.9% (n=1090) of incidents identified as 'Other' race/ethnicity and are not included in the Case Percent calculation. Information presented with a large percentage of missing data should be interpreted with caution.

**Figure 5. Salmonellosis Cases by Month of Estimated Illness Onset, California, 2013-2019**



## Comments

Incidence rates per 100,000 population of salmonellosis infection among Californians increased slightly from 2013 through 2019, with minor fluctuations during the 7-year period. The peak rate of this surveillance period was in 2018 (15.8 per 100,000 population). Of note, it is estimated that only 1 of every 29 people who are infected with *Salmonella* bacteria seek medical care and are diagnosed with salmonellosis; therefore, the true rates are likely to be much higher.<sup>20</sup>

Overall, incidence rates increased moderately during the 2013-2019 surveillance period (average annual rate of 13.9 per 100,000 population) compared to the 2009-2012 surveillance period (average annual rate of 12.5 per 100,000 population) as described in previous epidemiologic summaries.<sup>9</sup> This increase may be due to the increased use of CIDT and a more inclusive probable case definition. The increase in incidence was most pronounced in children aged less than 1 year. The age group, racial/ethnic, sex, and regional epidemiologic profiles of incident cases, however, were similar to those reported in epidemiologic summaries from earlier years.<sup>8, 9</sup>

Compared to national salmonellosis incidence rates, California's 2013-2019 rates were lower. However, the age distribution of incident cases in California and in the U.S. were similar; children aged less than five years experienced the highest rates of salmonellosis.<sup>21, 22, 23</sup> Also, the two serotypes most commonly involved in California salmonellosis outbreaks—*S. Enteritidis* and *S. Newport*—were among the serotypes most frequently isolated from laboratory-confirmed *Salmonella* infections nationally.<sup>2</sup>

Preventing contamination and cross-contamination during the processing and production of foods, including both foods of animal origin and produce, is crucial to the mitigation of foodborne disease infections and outbreaks. Long-term prevention of outbreaks necessitates

the coordination and implementation of food safety practices among partners throughout the food production chain. Additionally, education of Californians about food safety practices and safe contact with potentially infected animals (especially backyard poultry and pet reptiles) is key to controlling and limiting the impact of salmonellosis in California.

To prevent salmonellosis, persons should wash their hands with soap and water before preparing or eating food, after using the toilet, and after touching animals (including farm animals, pet reptiles, live poultry, and amphibians) or being in animal environments. It is also important to [follow food safety guidelines](#) when preparing food, especially by cooking food to the proper temperature and promptly refrigerating food to prevent bacterial growth.

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