

Key Findings and Public Health Messages

- The California Department of Public Health (CDPH) received reports of 537 cases of non-cholera vibriosis with estimated symptom onset dates from 2009 through 2012. This corresponds to an average annual incidence rate of 0.36 cases per 100,000 Californians.
- Non-cholera vibriosis incidence rates decreased from 2009 (0.37 per 100,000) to 2011 (0.28 per 100,000), followed by a 75-percent increase in 2012 (0.49 per 100,000).
- During the surveillance period, the highest incidence rate of non-cholera vibriosis was among adults 25 to 34 and 45 to 54 years of age (0.51 per 100,000). Average incidence rates were 1.8 times higher in men (0.46 per 100,000) compared to women (0.26 per 100,000).
- The highest reported incidence rates for the surveillance period were reported by the San Diego (0.73 per 100,000), San Francisco Bay Area (0.63 per 100,000), and Central Coast (0.56 per 100,000) regions.
- From 2009 through 2012, CDPH received reports of 4 foodborne outbreaks of non-cholera vibriosis involving a total of 26 California cases. Additionally, a 2012 multi-state outbreak accounted for two more cases in California. Consumption of raw or undercooked oysters was the implicated exposure in all five outbreaks.
- Ensuring that shellfish beds are routinely monitored for the presence of *Vibrio spp.*, that shellfish are handled safely during and after harvest, and educating consumers about the risks of consuming raw or undercooked shellfish provide the best opportunities for reducing non-cholera vibriosis.

Background

Several non-cholera *Vibrio* species are important enteric bacterial pathogens, accounting for an estimated 80,000 illnesses, 500 hospitalizations, and 100 deaths each year in the United States (US)^{1,2}. *Vibrio* species are natural inhabitants of marine coastal and estuarine environments, and their populations increase during the warm summer months. In the US, the non-cholera *Vibrio* species of greatest concern are *V. parahaemolyticus* and *V. vulnificus*. *V. parahaemolyticus* is the most commonly reported *Vibrio* infection, but *V. vulnificus* is associated with the greatest mortality. Consuming raw or undercooked shellfish is the most common cause of non-cholera vibriosis³⁻⁵.

Exposing wounds to contaminated warm seawater or raw shellfish harvested from such waters can also cause skin or soft tissue *Vibrio* infection⁶.

V. parahaemolyticus infection causes acute gastroenteritis with fever that usually occurs after an incubation period of 24 hours. Symptoms usually last 1 to 7 days and are often self-limited. *V. vulnificus* can cause systemic disease that is frequently fatal, especially in persons with immunocompromising conditions, particularly those with chronic liver disease⁷.

We describe here the epidemiology of confirmed and probable non-cholera vibriosis cases in California with estimated illness onset from 2009 through 2012 that were reported to CDPH by April 21, 2015. For a complete discussion of the definitions, methods, and limitations associated with this report, please refer to Technical Notes⁸. The epidemiologic description of non-cholera vibriosis for the 2001–2008 surveillance period can be found in the *Epidemiologic Summary of Non-Cholera Vibriosis in California, 2001–2008*⁹.

California reporting requirements and surveillance case definition

California Code of Regulations, Title 17, requires health care providers to report suspected cases of *Vibrio* infection to their local health department within one working day of identification or immediately by telephone if an outbreak is suspected. Clinical and reference laboratories are also required to report laboratory testing results suggestive of *Vibrio* species to either the California Reportable Diseases Information Exchange (CaREDIE) (via electronic laboratory reporting) or the local health department; notification should occur within one working day after the health care provider has been notified of the laboratory testing result.

Local health officers are required by regulation to report to CDPH cases of non-cholera vibriosis. CDPH counted cases that satisfied the US 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, CDC defined a confirmed case of non-cholera vibriosis as one with isolation of *Vibrio spp.* other than toxigenic *Vibrio cholerae* O1 or O139 from a clinical specimen. A probable case had clinically-compatible illness and an epidemiologic link to a confirmed case, but no laboratory confirmation.

Epidemiology of non-cholera vibriosis in California

CDPH received reports of 535 confirmed and 2 probable cases of non-cholera vibriosis with estimated symptom onset dates from 2009 through 2012. This corresponds to an average annual incidence rate of 0.36 cases per 100,000 Californians. Non-cholera vibriosis incidence rates decreased from 2009 (0.37 per 100,000) to 2011 (0.28 per 100,000), followed by a 75-percent increase in 2012 (0.49 per 100,000) [Figure 1]. During the surveillance period, a

majority of reported cases were *V. parahaemolyticus*. Four cases of *V. vulnificus* were reported between 2009-2012.

The non-cholera vibriosis incidence rate during the surveillance period was highest among adults, 25 to 34 and 45 to 54 years of age (0.51 per 100,000) [Figure 2]. The incidence rates were 1.8 times higher in men (0.46 per 100,000) compared to women (0.26 per 100,000). Incidence rates by race/ethnicity were not calculated due to the substantial portion (20.5% percent) of missing data. However, non-cholera vibriosis cases with complete information reported White non-Hispanic race/ethnicity more frequently than would be expected based on the overall demographic profile of California [Figure 3].

Incidence rates for the surveillance period were 1.3 times higher in Northern California (0.42 per 100,000) than in Southern California (0.32 per 100,000). However, from 2009 to 2012, rates for Southern California increased by 37.5% percent (from 0.32 to 0.44 per 100,000) whereas rates for Northern California increased by 31.0% percent (from 0.42 to 0.55 per 100,000). In Northern California, the highest incidence rate (0.55 per 100,000) occurred in year 2012. The 3 geographic regions of California with the highest rates for the surveillance period were San Diego (0.73 per 100,000), the San Francisco Bay Area (0.63 per 100,000), and the Central Coast (0.56 per 100,000) [Figure 4].

From 2009 through 2012, CDPH received reports of 4 foodborne outbreaks of non-cholera vibriosis, involving 24 confirmed and 2 probable cases. Additionally, a 2012 multistate outbreak accounted for two more cases in California. Consumption of raw or undercooked oysters was the implicated exposure in all five outbreaks. The largest California outbreak occurred in 2009, involved 15 persons with *V. parahaemolyticus* infections, and was associated with consumption of imported raw oysters from oyster beds in Canada.

Comment

During the surveillance period, the highest incidence rate of reported non-cholera vibriosis among Californians was in 2012; most infections were due to *V. parahaemolyticus*. The geographic regions of California with the highest rates were San Diego, the San Francisco Bay Area, and the Central Coast, where *Vibrio* infections occurred in people who consume raw or undercooked shellfish.

Vibrio infections are often underdiagnosed, partly due to laboratories not routinely using media that are selective for vibriosis¹⁰. The recent increase in availability and use of culture-independent diagnostic tests (CIDT) is moving the clinical detection of bacterial

Figure 1. California non-cholera vibriosis case counts and incidence rates, 2001-2012*

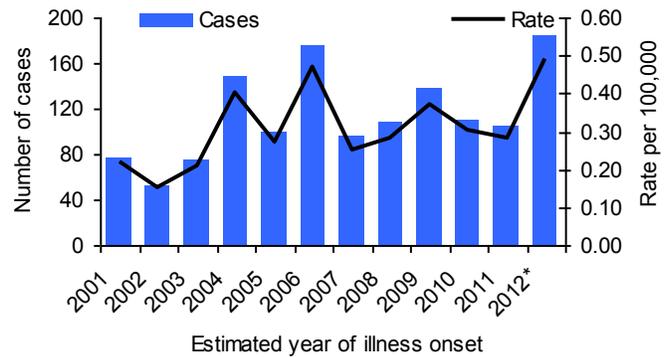


Figure 2. California non-cholera vibriosis by incidence rates by age-group and time period, 2009-2012*

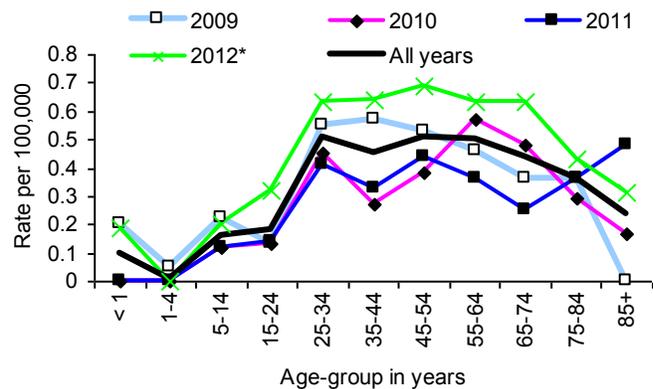
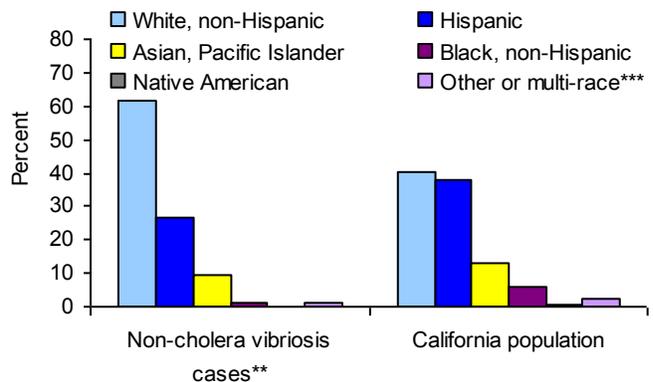


Figure 3. California non-cholera vibriosis cases and population by race/ethnicity, 2009 - 2012*



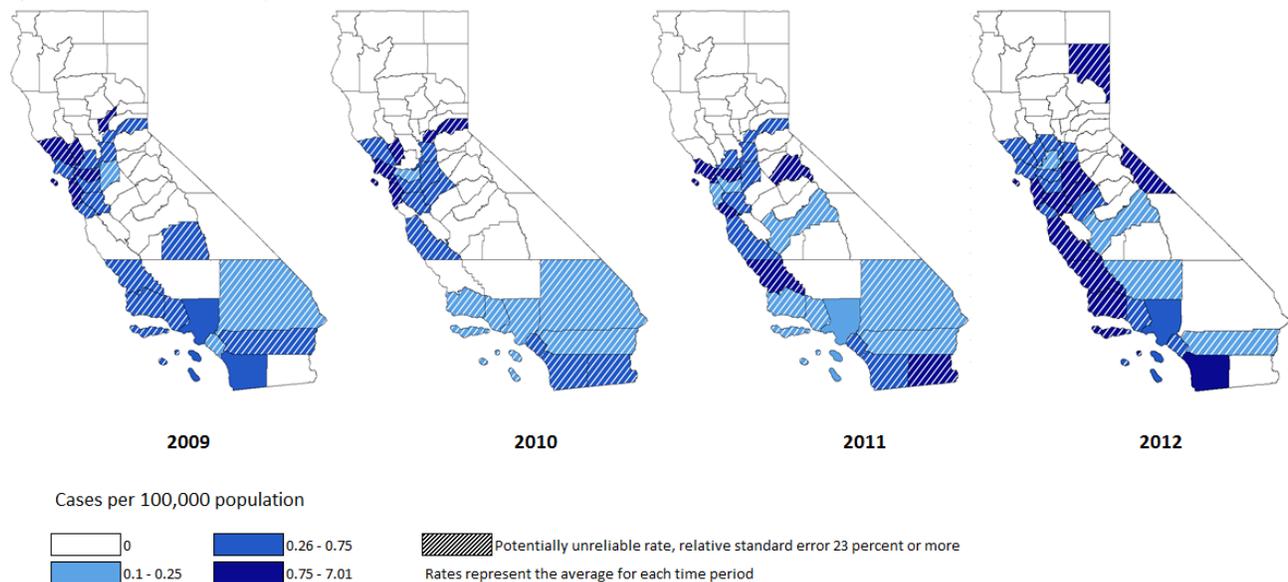
Notes for Figures 1-3

* 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 non-cholera vibriosis incidence rates, 2009-2012*



infections, including vibriosis, away from culture-based methods¹¹. While CIDT allows for more rapid diagnosis, the lack of isolates that are currently needed to distinguish among strains and subtypes makes monitoring of trends and rapid detection of outbreaks difficult. Ensuring that a positive CIDT result is followed by culture confirmation is critical in the detection, investigation, and prevention of foodborne disease outbreaks.

Ensuring that shellfish beds are routinely monitored for the presence of enteric pathogens, that shellfish are handled safely during and after harvest, and educating consumers about the risks of consuming raw or undercooked shellfish and about potential exposure from open-wound contact with warm seawater provide the best opportunities for reducing non-cholera vibriosis. Immunocompromised individuals, especially those with chronic liver disease, are at highest risk for severe *Vibrio* infection and should be targeted for education. Physicians should maintain a high index of suspicion in persons with gastroenteritis or sepsis and a history of raw shellfish consumption. Physicians suspecting vibriosis should also notify the laboratory of their suspicions so that the appropriate selective culture medium can be used to isolate the organism.

References and resources

¹Scallan E, Hoekstra RM, Angulo FJ, et al. Foodborne Illness Acquired in the United States—Major Pathogens. *Emerg Infect Dis* 2011 Jan;17 (1):7-15.

²CDC. *Vibrio* Illness (Vibriosis) - <http://www.cdc.gov/vibrio/> (Accessed on 5/19/2016)

³Altekruse SF, Bishop RD, Baldy LM, et al. *Vibrio* gastroenteritis in the US Gulf of Mexico region: the role of raw oysters. *Epidemiol Infect* 2000;124:489-95.

⁴CDC. *Vibrio parahaemolyticus* infectious associated with consumption of raw shellfish - three states, 2006. *MMWR* 2006;55:854-6. (Accessed on 5/19/2016)

⁵Newton AE, Garrett N, Stroika SG, et al. Increase in *Vibrio parahaemolyticus* infections associated with consumption of Atlantic Coast shellfish—2013. *MMWR Morb Mortal Wkly Rep*. 2014 Apr 18;63 (15):335-6.

⁶Dechet AM1, Yu PA, Koram N, Painter J. Nonfoodborne *Vibrio* infections: an important cause of morbidity and mortality in the United States, 1997-2006. *Clin Infect Dis*. 2008 Apr 1;46(7):970-6. doi: 10.1086/529148.

⁷Horseman MA, Surani S. A comprehensive review of *Vibrio vulnificus*: an important cause of severe sepsis and skin and soft-tissue infection. *Int J Infect Dis*. 2011 Mar;15(3):e157-66.

⁸CDPH. 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> (Accessed on 5/19/2016)

⁹CDPH. Epidemiologic Summary of Non-Cholera Vibriosis in California, 2001 - 2008 <http://www.cdph.ca.gov/programs/sss/Documents/Epi-Summaries-CA-2001-2008-083111.pdf#page=73> (Accessed on 5/19/2016)

¹⁰Voetsch AC, Angulo FJ, Rabatsky-Ehr T, et al. Laboratory practices for stool-specimen culture for bacterial pathogens, including *Escherichia coli* O157:H7, in the FoodNet sites, 1995-2000. *Clin Infect Dis*. 2004 Apr 15;38 Suppl 3:S190-7.

¹¹Iwamoto M, Huang JY, Cronquist AB, et al. Bacterial enteric infections detected by culture-independent diagnostic tests—FoodNet, United States, 2012-2014.

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