

Shiga toxin-producing *Escherichia coli* (STEC)

Shiga toxin-producing E. coli (STEC) is a Class B Disease and must be reported to the state within one business day.

Epidemiology

Most *Escherichia coli* are harmless and part of a healthy intestinal tract. However, some *E. coli* can cause diarrhea and have the ability to produce shiga toxins and are collectively known as shiga toxin producing *E. coli* (STEC). The most commonly identified STEC strain is *E. coli* O157:H7. Many other kinds of *E. coli* in the STEC group are known to cause illness and are often referred to as *E. coli* non-O157. People become infected with STEC through eating or drinking contaminated food or water or through contact with animals, animal environments, or other people. STEC has a bovine reservoir and can be transmitted by undercooked meat and unpasteurized milk. Infection can also occur through the consumption of food that has been contaminated with STEC, including: leafy greens, other fresh produce, and unpasteurized juice or cider.

Symptoms of *E. coli* infection include diarrhea that ranges from mild and non-bloody to stools that are virtually all blood but contain no fecal leukocytes. Fever is not usually present. In some people, particularly children under the age of 5, infection can lead to the development of hemolytic uremic syndrome (HUS). HUS is a serious life threatening disease that affects the kidneys and blood clotting system.

Incidence

Shiga toxin-producing *E. coli* became reportable in Louisiana in 1996. An upward trend in reported cases began around 2015 and 2016 (Figure 1), coinciding with the introduction of culture-independent diagnostic tests (CIDTs). In 2018, a case definition change occurred, changing CIDT test from suspect to probable cases. This definition change, along with the increased availability of CIDT tests, likely led to an increase of reported cases (Figure 2).

Figure 1: Shiga toxin-producing *E. coli* incidence rates - Louisiana, 2010 - 2023

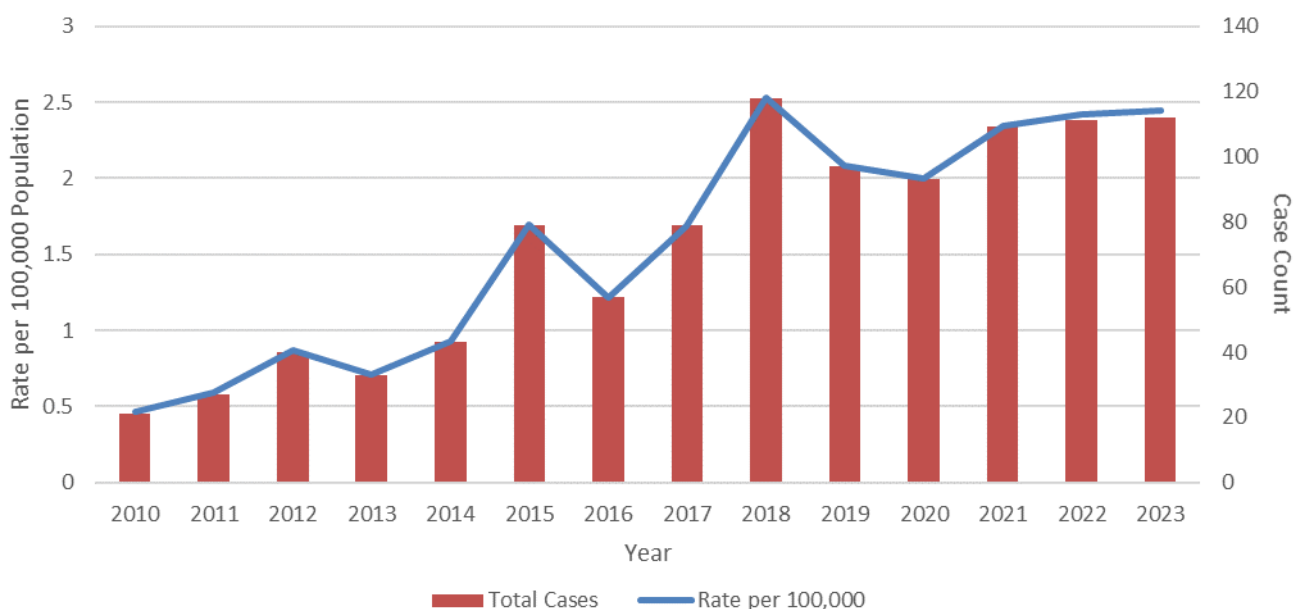
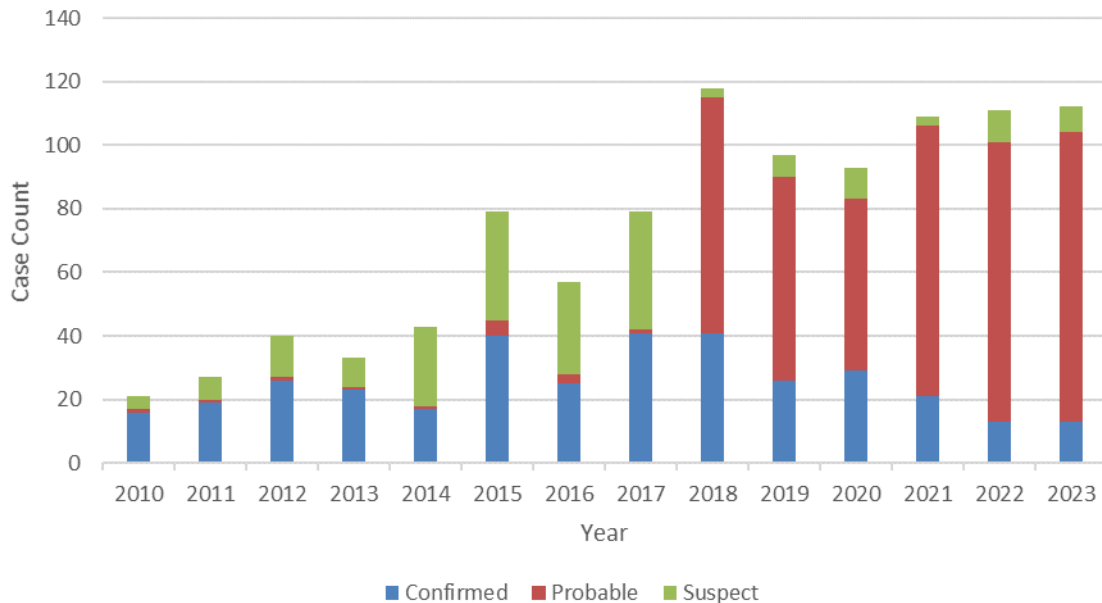


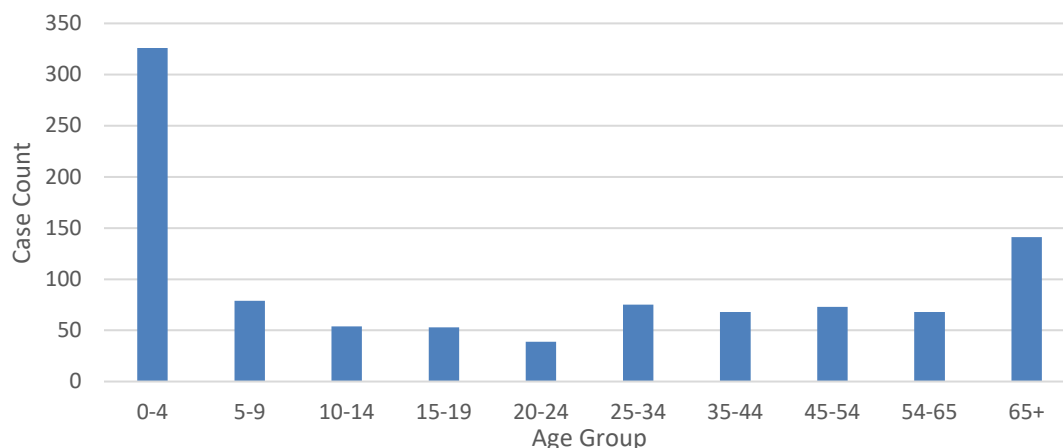
Figure 2: Shiga toxin-producing *E. coli* incidence rates by Case Status - Louisiana, 2010 - 2023

The most recent data (2023) from FoodNet* states shows a national incidence rate of all STEC infections to be 5.3 per 100,000. The incidence rate of STEC infections for Louisiana in 2023 was 2.27 per 100,000 population.

* *FoodNet* is a collaborative project of the CDC, 10 EIP sites, the U.S. Department of Agriculture (USDA), and the Food and Drug Administration (FDA).

Age Group Distribution

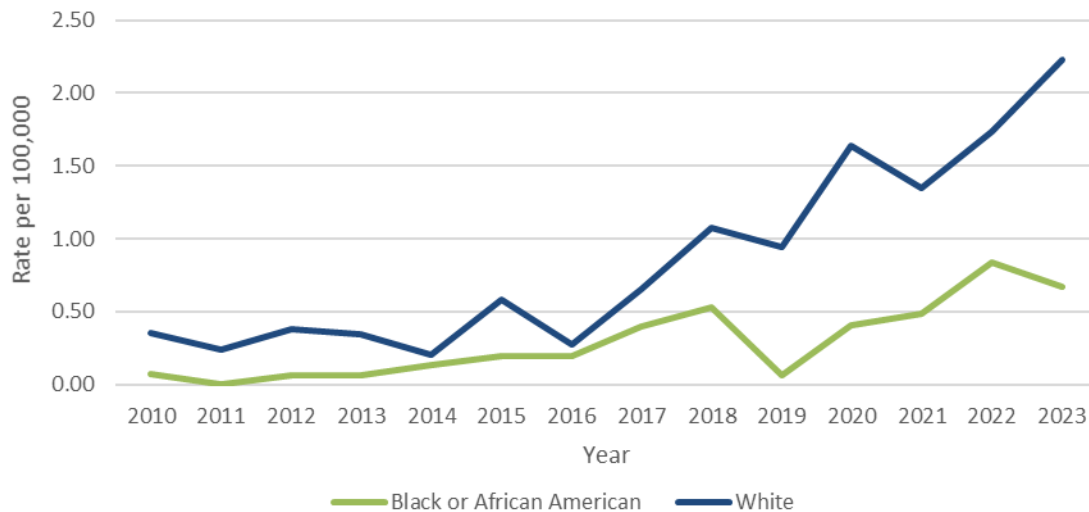
The age group distribution shows highest rates among infants and young children (Figure 3). Detection is higher among infants than among older children and adults because infants with diarrhea are more likely to be brought to medical care and have stool cultured. Those 65 years old and older, while not defined as a high risk group for STEC infections, are at a higher risk for complications as a result of an STEC infection.

Figure 3: Shiga toxin-producing *E. coli* 10-year incidence rates by age– Louisiana, 1990-2023

Race Distribution

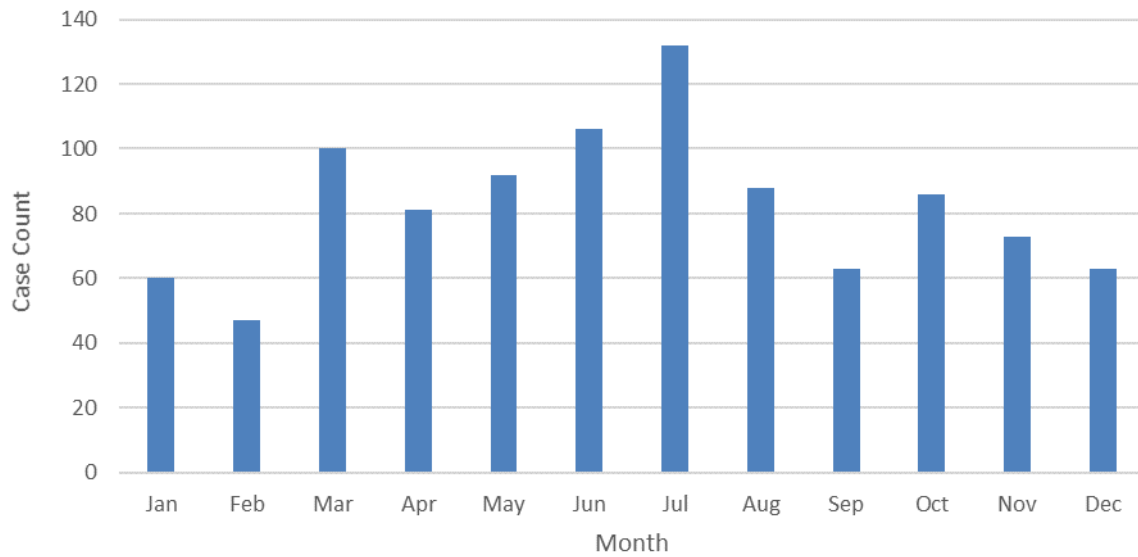
The race distribution shows a large discrepancy by race, with White individuals having higher rates compared to Black or African-American individuals. These rates of STEC are more reflective of diagnosis of diarrhea and access to medical care rather than true incidence (Figure 3).

Figure 3: Shiga toxin-producing *E. coli* average incidence rates by race - Louisiana, 2010-2023



Seasonal Distribution

Typically the seasonal distribution of STEC infections shows a higher number of cases during the summer months. Data from 1990 to 2023 shows an increase in cases between March and July in Louisiana (Figure 4). The large number of cases in March is mostly due to an outbreak in March of 2015.

Figure 4: Shiga toxin-producing *E. coli* total cases by month - Louisiana, 1990-2023

Geographical Distribution

The geographic distribution of STEC cases is a reflection of reporting patterns from medical providers (Table).

Table: 10-Year incidence rate of STEC infections per 100,000 population by parish Louisiana, 2014-2023

Parish	Inc. Rate 2014-2023	Parish	Inc. Rate 2014-2023
Acadia	3.32	Madison	0.00
Allen	0.41	Morehouse	2.36
Ascension	2.40	Natchitoches	1.84
Assumption	0.00	Orleans	1.10
Avoyelles	1.25	Ouachita	2.10
Beauregard	2.17	Plaquemines	0.86
Bienville	0.00	Pointe Coupee	4.68
Bossier	2.04	Rapides	1.54
Caddo	1.12	Red River	2.45
Calcasieu	2.85	Richland	2.97
Caldwell	4.08	Sabine	1.72
Cameron	4.86	Saint Bernard	1.55
Catahoula	3.20	Saint Charles	1.15
Claiborne	1.32	Saint Helena	2.85
Concordia	1.04	Saint James	0.97
De Soto	1.47	Saint John the Baptist	2.18
East Baton Rouge	2.19	Saint Landry	1.71
East Carroll	1.40	Saint Martin	2.20

East Feliciana	6.19	Saint Mary	2.00
Evangeline	3.64	Saint Tammany	0.24
Franklin	2.00	Tangipahoa	1.43
Grant	2.25	Tensas	2.30
Iberia	0.85	Terrebonne	1.09
Iberville	1.90	Union	3.21
Jackson	2.58	Vermilion	2.72
Jefferson	1.64	Vernon	2.04
Jefferson Davis	4.42	Washington	3.27
La Salle	0.29	Webster	1.05
Lafayette	7.39	West Baton Rouge	0.75
Lafourche	7.40	West Carroll	3.81
Lincoln	2.31	West Feliciana	4.54
Livingston	2.05	Winn	2.86

2015 Outbreak

In March of 2015, the Louisiana Department of Health's (LDH) Office of Public Health's (OPH) Infectious Disease Epidemiology Section (IDEpi) was notified about a possible gastrointestinal illness outbreak amongst students at a school in Louisiana. Fifteen students sought medical care and reported diarrhea and abdominal pain, 12 of whom were hospitalized. Based on onset times, 10 were identified as primary cases and 5 were possible secondary cases. Eleven stool samples tested positive for *E. coli* O157 at the State Public Health Laboratory. Cases were interviewed and a case control study was conducted. Case histories were compared and multiple environmental samples were taken, including school food, water, and sporting event exposures; but no common and unique exposure could be identified. It is likely that this outbreak was caused by a one-time exposure to a limited group of individuals over a short period of time.

Other *E. coli*

Most strains of *E. coli* are normal, harmless inhabitants of the intestinal tract.

There are a few Enterohemorrhagic *E. coli* (EHEC) strains beyond O157:H7, e.g., *E. coli* O26:H11. All of these strains produce cytotoxins resembling those found in *Shigella dysenteriae*, type 1. These toxins are referred to as shigalike toxins or verotoxins.

Enteroinvasive *E. coli* (EIEC) strains include these specific serotypes of *E. coli*: O28, O112, O115, O124, O136, O143, O144, O147, O152, O164 and O167. The EIEC strains resemble *Shigella* biochemically, and can invade intestinal epithelial cells.

Enteropathogenic *E. coli* (EPEC) strains traditionally have been defined as members of specific *E. coli* serotypes that have been epidemiologically incriminated as causes of infantile diarrhea. They include the following somatic serogroups: O44, O55, O86, O111, O114, O119, O125, O126, O127, O128, O142 and O158.

More recently, EPEC has been defined according to specific virulence properties. EPEC strains adhere to intestinal mucosa and produce a characteristic lesion in the gastrointestinal tract, termed an attaching and effacing lesion. EPEC do not produce enterotoxins and are not invasive.

Enterotoxigenic *E. coli* (ETEC) strains colonize the small intestine without invading it and produce either, or both, heat-labile and/or heat-stable enterotoxins. Examples of these strains include O6:H16 and O8:H9.

In 2001, national surveillance began for shiga-toxin producing *E. coli* under the name of EHEC. The case definition changed from EHEC to STEC (shiga-toxin producing *E. coli*) in 2006 and serotype specific reporting was implemented. From 2009 to 2023, STEC cases in Louisiana have been grouped into *E. coli* O157:H7 (22.37%) and *E. coli* non-O157:H7 (24.04%). The remaining cases were not grouped (53.58%) (Figure 5).

Figure 5: Reported STEC cases by serotype - Louisiana, 2009-2023

