# CRYPTOSPORIDIOSIS

## SUMMARY REPORT

# 2017

NATIONAL NOTIFIABLE DISEASES SURVEILLANCE SYSTEM, UNITED STATES

Centers for Disease Control and Prevention
National Center for Emerging and Zoonotic Infectious Diseases

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**Report Compiled By**

Michelle E. Gleason, MPH; Ariana Perez, MPH; Sarah A. Collier, MPH; Kathy Benedict, DVM, PhD; Jennifer R. Cope, MD, MPH; Kathleen E. Fullerton, MPH; Michele C. Hlavsa, RN, MPH

**Centers for Disease Control and Prevention**
National Center for Emerging and Zoonotic Infections
Division of Foodborne, Waterborne, and Environmental Diseases
Waterborne Disease Prevention Branch
1600 Clifton Road, Atlanta, GA 30329
E-mail: healthywater@cdc.gov

Data are presented for cases of cryptosporidiosis reported to CDC through October 9, 2018.

*Findings and conclusions from this report do not necessarily represent the official position of the Centers for Disease Control and Prevention.*

# Contents

# Background

## Surveillance Overview: National Cryptosporidiosis Case Surveillance

Cryptosporidiosis is a gastrointestinal illness caused by protozoa of the genus *Cryptosporidium*, the leading cause of U.S. waterborne disease outbreaks (*1*). One study estimated the proportion of cryptosporidiosis attributable to animal contact to be 16%; this percentage was second only to that of campylobacteriosis among zoonotic enteric pathogens *(2).* *Cryptosporidium* infection can be symptomatic or asymptomatic. Immunocompetent patients can experience frequent, non-bloody, watery diarrhea typically lasting up to 2–3 weeks *(3).* Additional symptoms can include vomiting, nausea, abdominal pain, fever, anorexia, fatigue, and weight loss. Immunocompromised patients can experience profuse watery diarrhea lasting weeks to months or even life-threatening malnutrition and wasting.

Cryptosporidiosis is a nationally notifiable disease; the first full year of reporting was 1995. National data are collected through passive surveillance. Healthcare providers and laboratories that diagnose cryptosporidiosis are mandated to report cases to the local or state health department. The 50 states, District of Columbia (DC), and New York City health departments, in turn, voluntarily notify CDC of cases via the National Notifiable Diseases Surveillance System (NNDSS). Some states conduct enhanced molecular surveillance of cryptosporidiosis through participation in CryptoNet; CryptoNet data are not presented here.

An estimated 748,000 cryptosporidiosis cases occur annually; this means <2% of cases are nationally notified (*4*).

State, DC, US territories, and Freely Associated States public health agencies voluntarily notify CDC of cryptosporidiosis outbreaks via the National Outbreak Reporting System (NORS). NORS data are not presented here; however, summaries of data on waterborne disease outbreaks are reported elsewhere.

# Methods

## Case Definition

The definition of a confirmed case of cryptosporidiosis has changed over time; the first national case definition was published in 1995, and the current case definition was published in 2012. The pre-2011 case definitions classified a case with any laboratory evidence of *Cryptosporidium* infection as a confirmed case.

The 2012 confirmed case definition requires evidence of *Cryptosporidium* organisms or DNA in stool, intestinal fluid, tissue samples, biopsy specimens, or other biological sample by certain laboratory methods with a high positive predictive value (e.g., direct fluorescent antibody [DFA] test, polymerase chain reaction [PCR], enzyme immunoassay [EIA], or light microscopy of stained specimen).

A probable case of cryptosporidiosis is defined as 1) having supportive laboratory test results for *Cryptosporidium* spp. infection using a screening test method, such as immunochromatographic card or rapid card test, or a laboratory test of unknown method or 2) meeting clinical criteria (i.e., diarrhea and one of more of the following: diarrhea duration of ≥72 hours, abdominal cramping, vomiting, or anorexia) and being epidemiologically linked to a confirmed case.

A suspect case is defined as having a diarrheal illness and being epidemiologically linked to a probable case. Cases not classified as confirmed, probable, or suspect are classified as unknown.

## Analysis

National cryptosporidiosis surveillance data for 2017 were analyzed using R version 3.5.1 and SAS 9.4. Data cleaning processes included case deduplication and the verification of case status (e.g., confirmed, nonconfirmed). Numbers, percentages, and incidence (cases per 100,000 population) of cryptosporidiosis were calculated in aggregate for the United States and separately for each reporting jurisdiction. Rates were calculated by dividing the number of

cryptosporidiosis cases by mid-year census estimates (*5*–*7*) and multiplying by 100,000. In addition to analyzing data nationally and by reporting jurisdiction, data were analyzed by region (Northeast, Midwest, South, and West regions), as defined by the U.S. Census Bureau (*8*). To account for differences in the seasonal use of recreational water, the West region was further subdivided into Northwest and Southwest.

To examine reporting over time, cryptosporidiosis rates were calculated by year (1995–2017) and case status (confirmed or nonconfirmed). Average annual cryptosporidiosis rates were calculated by demographic variables (e.g., age and sex) and by month of symptom onset. Rates were not calculated for race and ethnicity because 15.4% of race data and 24.0% of ethnicity data were missing. One case reported by Puerto Rico in 2016 was excluded from analysis, because detailed demographic census data are not available to calculate rates by age and sex.

## Acknowledgements

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# References


1. Hlavsa MC, Cikesh BL, Roberts VA, et al. Outbreaks associated with treated recreational water — United States, 2000–2014. MMWR Morb Mortal Wkly Rep 2018;67:547–551. DOI: http://dx.doi.org/10.15585/mmwr.mm6719a3.

2. Hale RH, Scallan E, Cronquist AB, et al., Estimates of enteric illness attributable to contact with animals and their environments in the United States, Clinical Infect Dis 2012:54:472–9. DOI: https://doi.org/10.1093/cid/cis051.

3. Hunter PR, Hughes S, Woodhouse S, et al. Sporadic cryptosporidiosis case-control study with genotyping. Emerg Infect Dis 2004;10:1241–9. DOI: 10.3201/eid1007.030582.

4. Scallan E, Hoekstra RM, Angulo FJ, et al. Foodborne illness acquired in the United States—major pathogens. Emerg Infect Dis 2011;17:7–15. DOI: 10.3201/eid1701.P11101.

5. US Census Bureau. Annual estimates of the population for the United States cities and towns: April 1, 2010 to July 1, 2017. Washington, DC: US Census Bureau; 2017. Available at https://www.census.gov/data/tables/2017/demo/popest/total-cities-and-towns.html.

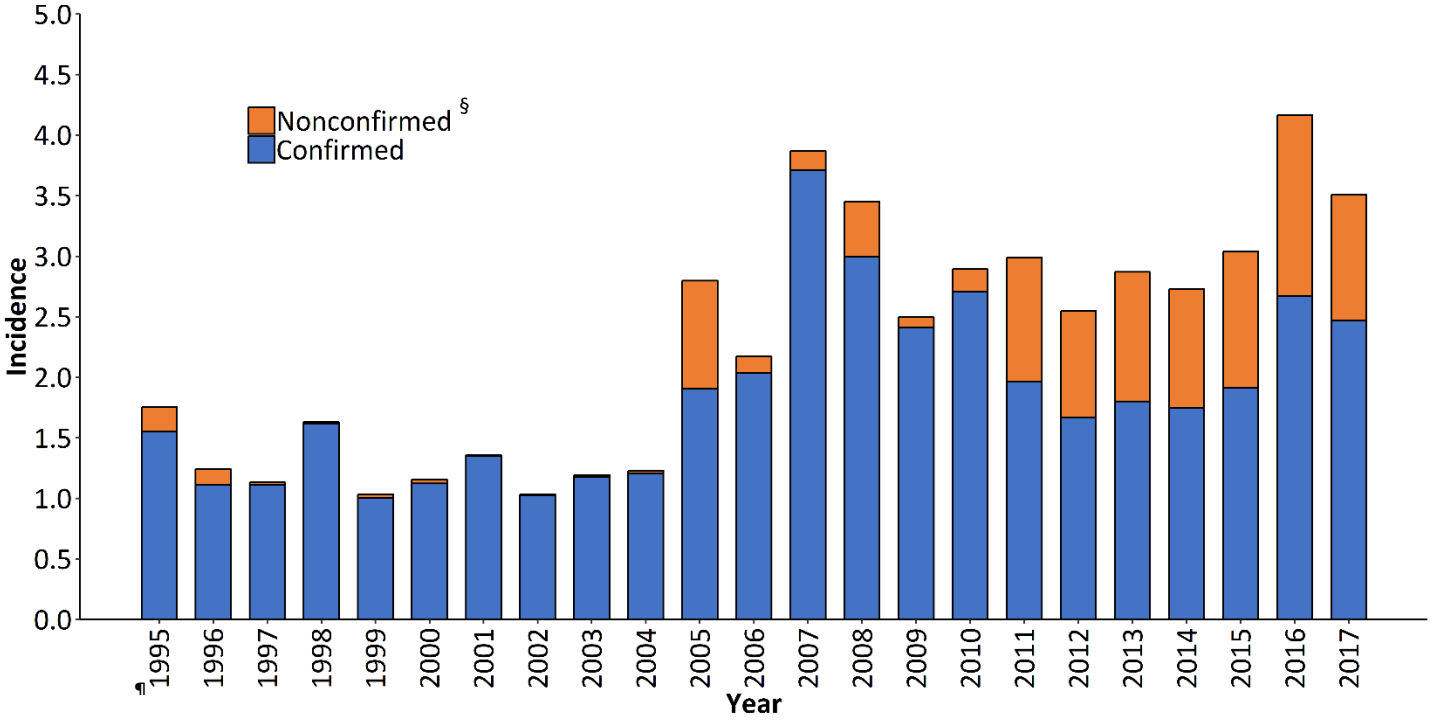
6. United States Department of Health and Human Services (US DHHS), Centers for Disease Control and Prevention (CDC), National Center for Health Statistics (NCHS), Bridged-Race Population Estimates, United States July 1st resident population by state, county, age, sex, bridged-race, and Hispanic origin. Compiled from 1990-1999 bridged-race intercensal population estimates (released by NCHS on 7/26/2004); revised bridged-race 2000-2009 intercensal population estimates (released by NCHS on 10/26/2012); and bridged-race Vintage 2017 (2010-2017) postcensal population estimates (released by NCHS on 6/27/2018). Available on CDC WONDER Online Database. Accessed at http://wonder.cdc.gov/bridged-race-v2017.html on Oct 9, 2018.

7. United States Department of Health and Human Services (US DHHS), Centers for Disease Control and Prevention (CDC), National Center for Health Statistics (NCHS), Bridged-Race Population Estimates, United States July 1st resident population by state, county, age, sex, bridged-race, and Hispanic origin. Compiled from 1990-1999 bridged-race intercensal population estimates (released by NCHS on 7/26/2004); revised bridged-race 2000-2009 intercensal population estimates (released by NCHS on 10/26/2012); and bridged-race Vintage 2017 (2010-2017) postcensal population estimates (released by NCHS on 6/27/2018). Available on CDC WONDER Online Database. Accessed at http://wonder.cdc.gov/bridged-race-v2017.html on Feb 5, 2019.

8. US Census Bureau. Census regions and divisions of the United States. Washington, DC: US Department of Commerce Economics and Statistics Administration, US Census Bureau. Available at https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf.

## Tables and Figures

**Figure 1. Incidence* of cryptosporidiosis cases, by year and case classification — National Notifiable Diseases Surveillance System, United States, 1995–2017 (n=155,105)**




* Cases per 100,000 population per year

§ Probable, suspect, or unknown cases

¶ First full year of national reporting

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After 2004, the overall annual incidence rate of cryptosporidiosis has remained greater than 2.0 per 100,000 population. It is unclear if this reflects a true increase or one or more of the following: U.S. Food and Drug Administration's 2005 approval of nitazoxanide to treat cryptosporidiosis in immunocompetent patients ages ≥12 years; substantial outbreaks (each affecting ≥2,000 persons) that occurred in 2005 (NYS), 2007 (UT), 2008 (TX), and 2016 (OH). After 2015, testing for *Cryptosporidium* increased due to increasing use of multiplex PCR for gastrointestinal illness. The consistently increased rate of nonconfirmed cases after 2010 likely reflects changes in the national case definition.

**Table 1. Number, percentage*, and incidence§ of cryptosporidiosis cases, by region and jurisdiction — National Notifiable Diseases Surveillance System, United States, 2017 (n=11,423)**

| Region/Jurisdiction | No. | % | Rate | No. of outbreak-associated cases |
|---|---|---|---|---|
| **Northeast** | **1,409** | **12.3** | **2.5** | **66** |
| Connecticut | 72 | 0.6 | 2.0 | 4 |
| Maine | 45 | 0.4 | 3.4 | 3 |
| Massachusetts | 154 | 1.3 | 2.2 | 3 |
| New Hampshire | 76 | 0.7 | 5.7 | 14 |
| New Jersey | 135 | 1.2 | 1.5 | |
| New York City¶ | 163 | 1.4 | 1.9 | 1 |
| New York State¶ | 276 | 2.4 | 2.5 | 19 |
| Pennsylvania | 405 | 3.5 | 3.2 | 22 |
| Rhode Island | 33 | 0.3 | 3.1 | |
| Vermont | 50 | 0.4 | 8.0 | |
| **Midwest** | **4,243** | **37.1** | **6.2** | **114** |
| Illinois | 335 | 2.9 | 2.6 | 22 |
| Indiana | 223 | 2.0 | 3.3 | 4 |
| Iowa | 538 | 4.7 | 17.1 | 8 |
| Kansas | 128 | 1.1 | 4.4 | 3 |
| Michigan | 422 | 3.7 | 4.2 | 10 |
| Minnesota | 481 | 4.2 | 8.6 | 28 |
| Missouri | 332 | 2.9 | 5.4 | |
| Nebraska | 203 | 1.8 | 10.6 | 2 |
| North Dakota | 42 | 0.4 | 5.6 | 3 |
| Ohio | 649 | 5.7 | 5.6 | 34 |
| South Dakota | 163 | 1.4 | 18.7 | |
| Wisconsin | 727 | 6.4 | 12.5 | |
| **South** | **3,873** | **33.9** | **3.1** | **151** |
| Alabama | 190 | 1.7 | 3.9 | 1 |
| Arkansas | 131 | 1.1 | 4.4 | |
| Delaware | 36 | 0.3 | 3.7 | |
| District of Columbia | 43 | 0.4 | 6.2 | |
| Florida | 556 | 4.9 | 2.6 | 67 |
| Georgia | 349 | 3.1 | 3.3 | |
| Kentucky | 91 | 0.8 | 2.0 | |
| Louisiana | 145 | 1.3 | 3.1 | |
| Maryland | 100 | 0.9 | 1.7 | |
| Mississippi | 62 | 0.5 | 2.1 | |
| North Carolina | 211 | 1.8 | 2.1 | 14 |
| Oklahoma | 197 | 1.7 | 5.0 | |
| South Carolina | 112 | 1.0 | 2.2 | 1 |
| Tennessee | 206 | 1.8 | 3.1 | 4 |
| Texas | 1,152 | 10.1 | 4.1 | 64 |
| Virginia | 239 | 2.1 | 2.8 | |
| West Virginia | 53 | 0.5 | 2.9 | |
| **Northwest** | **651** | **5.7** | **4.2** | **3** |
| Alaska | 20 | 0.2 | 2.7 | |
| Idaho | 94 | 0.8 | 5.5 | 3 |
| Montana | 70 | 0.6 | 6.7 | |

| | | | | |
|---|---|---|---|---|
| Oregon | 294 | 2.6 | 7.1 | |
| Washington | 150 | 1.3 | 2.0 | |
| Wyoming | 23 | 0.2 | 4.0 | |
| **Southwest** | **1,247** | **10.9** | **2.0** | **51** |
| Arizona | 112 | 1.0 | 1.6 | |
| California | 640 | 5.6 | 1.6 | 47 |
| Colorado | 200 | 1.8 | 3.6 | |
| Hawaii | 4 | 0.0 | 0.3 | |
| Nevada | 43 | 0.4 | 1.4 | |
| New Mexico | 123 | 1.1 | 5.9 | |
| Utah | 125 | 1.1 | 4.0 | 4 |
| **Total** | **11,423** | **100.0** | **3.5** | **385** |

* Percentages might not total 100% because of rounding

§ Cases per 100,000 population

¶ New York State and New York City data are mutually exclusive

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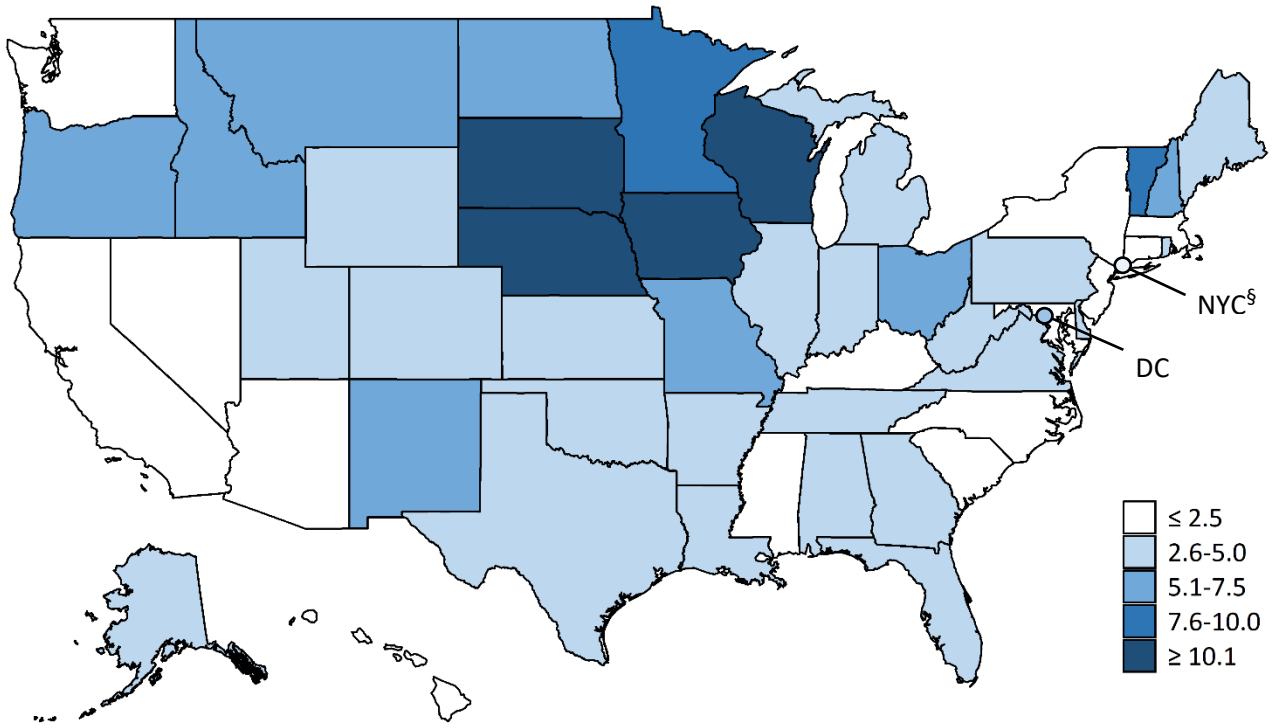
By jurisdiction, incidence ranged from 18.7 per 100,000 population in South Dakota to 0.3 per 100,000 population in Hawaii. As a region, the Midwest has the greatest overall incidence of 6.2 per 100,000 population. This coincides with this region having some of the highest incidence by jurisdiction. Differences in incidence might reflect differences in risk factors or mode of transmission of *Cryptosporidium*; the magnitude of outbreaks; or the capacity or requirements to detect, investigate, and report cases.

**Figure 2. Incidence[*] of cryptosporidiosis cases, by jurisdiction — National Notifiable Diseases Surveillance System, United States, 2017 (n=11,423)**




[*] Cases per 100,000 population
[§] New York State and New York City data are mutually exclusive

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Cryptosporidiosis is geographically widespread across the United States. Although incidence appears to be consistently higher in the northern Midwest states, differences in incidence might reflect differences in risk factors or modes of transmission of *Cryptosporidium*; the magnitude of outbreaks; or the capacity or requirements to detect, investigate, and report cases.

**Table 2. Number and percentage* of cryptosporidiosis cases, by selected patient demographic characteristics — National Notifiable Diseases Surveillance System, United States, 2017 (n=11,423)**

| Characteristic | No. | % |
|---|---|---|
| **Sex** | | |
| Male | 5,370 | 47.0 |
| Female | 6,036 | 52.8 |
| Missing | 17 | 0.1 |
| **Race** | | |
| American Indian/Alaska Native | 79 | 0.7 |
| Asian/Pacific Islander | 164 | 1.4 |
| Black | 987 | 8.6 |
| White | 7,941 | 69.5 |
| Other | 488 | 4.3 |
| Missing | 1,764 | 15.4 |
| **Ethnicity** | | |
| Hispanic | 1,206 | 10.6 |
| Non-Hispanic | 7,481 | 65.5 |
| Missing | 2,736 | 24.0 |
| **Total** | **11,423** | **100.0** |

* Percentages might not total 100% because of rounding

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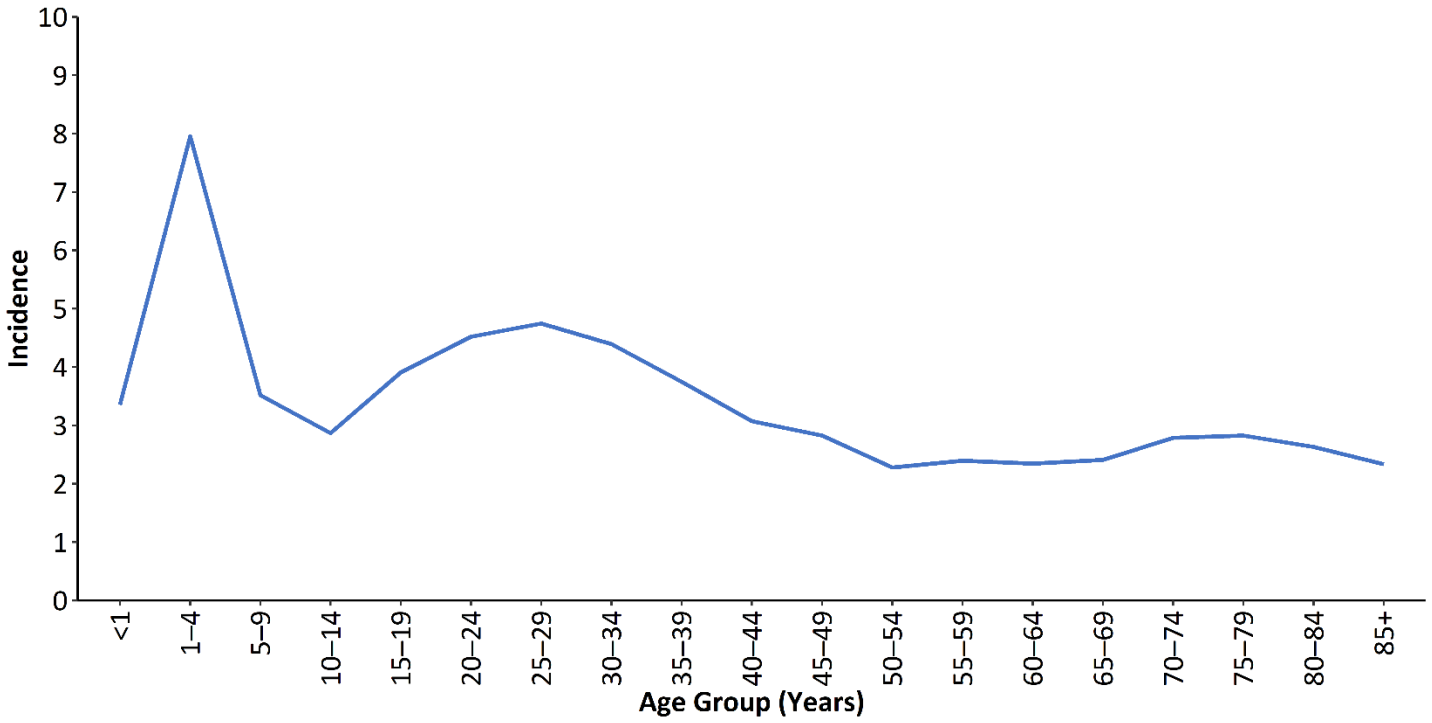
More than half of patients (6,036 [52.8%]) were female. Of the 9,659 patients for whom race was reported, 82.2% were white. Of the 8,687 patients for whom ethnicity was reported, 13.9% were Hispanic.

**Figure 3. Incidence[*] of cryptosporidiosis cases, by age group — National Notifiable Diseases Surveillance System, United States, 2017 (n=11,411[§])**




[*] Cases per 100,000 population

[§] Age data missing for 12 patients

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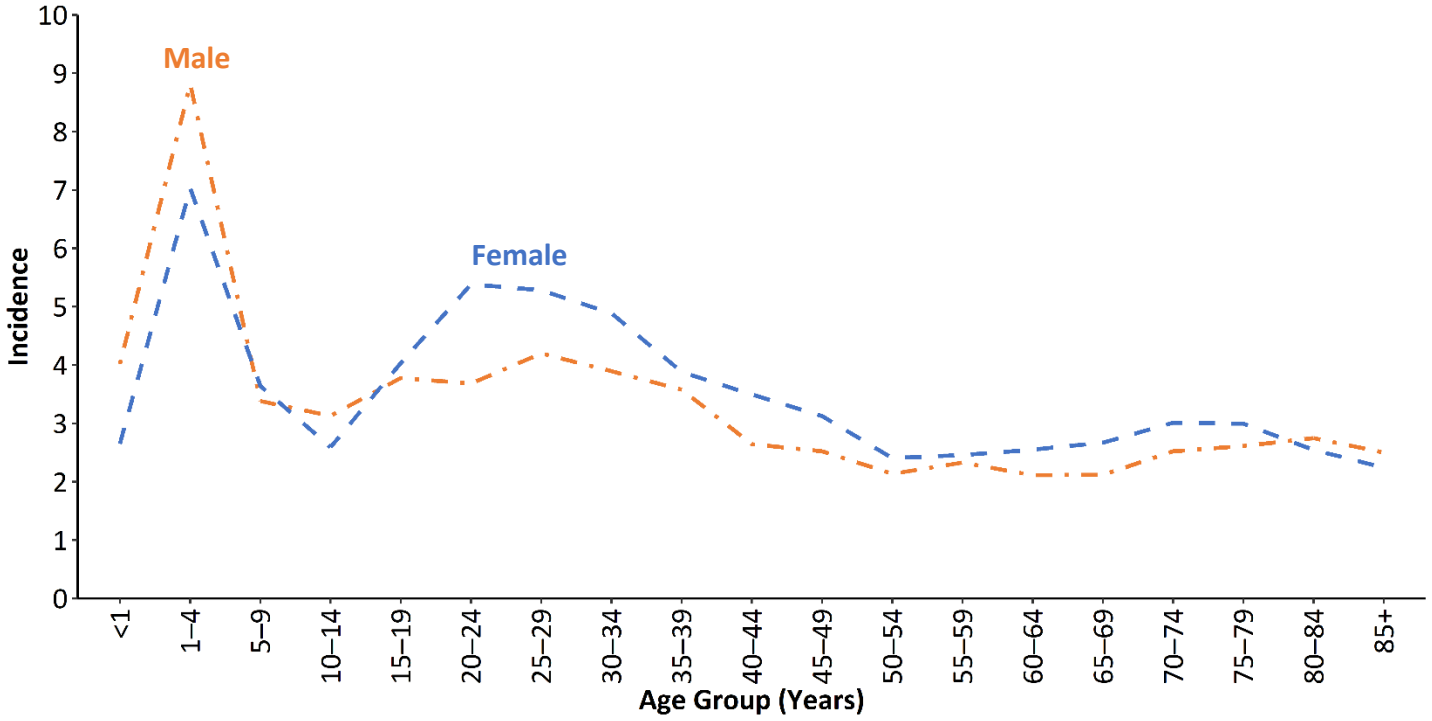
The incidence of cryptosporidiosis cases was highest among patients ages 1–4 years (8.0 cases per 100,000 population), 25–29 years (4.8), and 30–34 years (4.4). This might reflect young children becoming infected and ill and their caregivers subsequently becoming infected after changing diapers of young children or helping them with toileting.

**Figure 4. Incidence[*] of cryptosporidiosis cases, by sex and age group — National Notifiable Diseases Surveillance System, United States, 2017 (n=11,395[§])**




[*] Cases per 100,000 population per year

[§] Age or sex data missing for 28 patients

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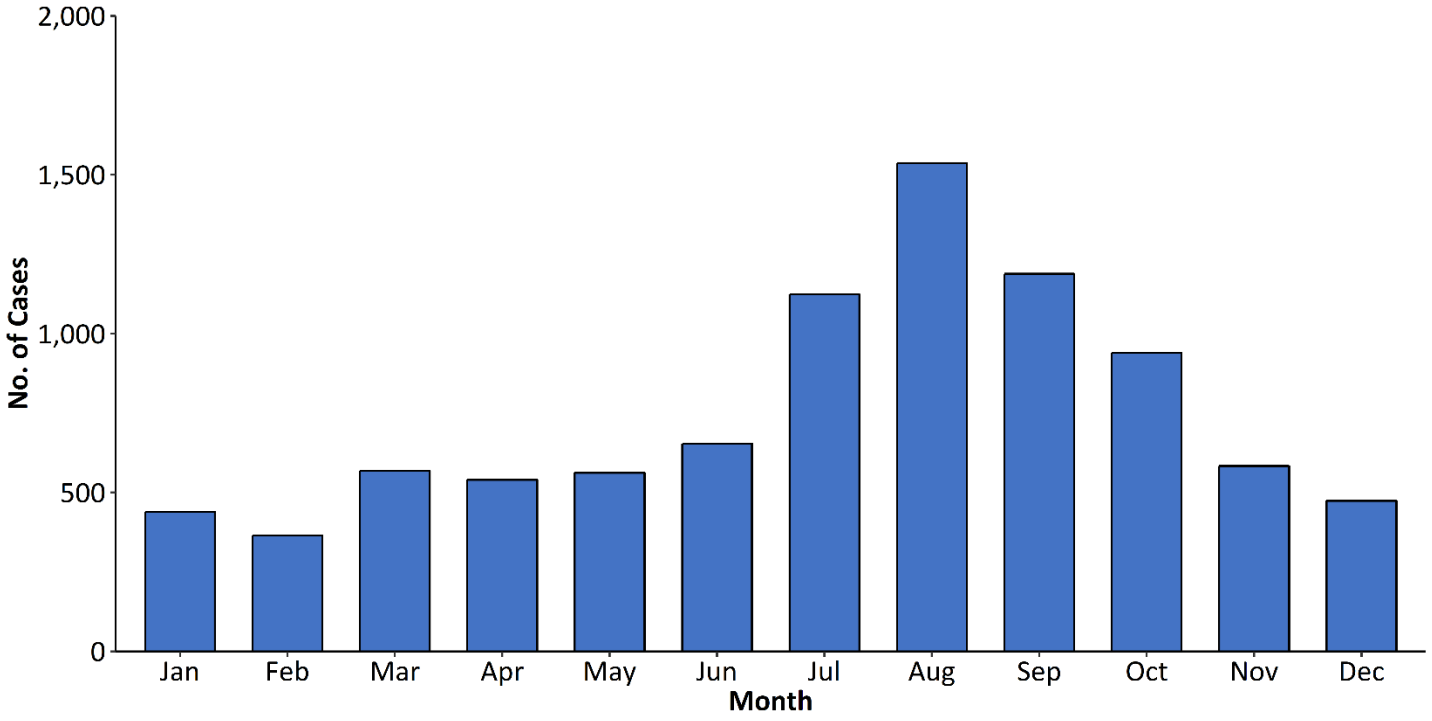
Among both males and females, the highest incidence of cryptosporidiosis were among those ages 1–4 years. Among those ages 15–79 years, rates for females were higher than for males. Differences in age-specific incidence might be due to age-specific differences in risk factors or modes of transmission of *Cryptosporidium*. For example, compared with males, females might be more likely to change diapers of young children or help them with toileting, and thus, more likely to be exposed to *Cryptosporidium*. Additionally, compared with males, females ages 15–79 years, might be more likely to seek healthcare, and thus, more likely to have illness diagnosed and reported as cryptosporidiosis.

**Figure 5. Number of cryptosporidiosis cases, by date of symptom onset — National Notifiable Diseases Surveillance System, United States, 2017 (n=8,972*)**




* Date of symptom onset data missing for 2,451 patients

The incidence of cryptosporidiosis in August (n=1,537) was more than four times greater than the incidence in February (n=365). The number of cases by date of symptom onset reflect seasonal differences in exposure, such as summertime swimming.