

GIARDIASIS

SUMMARY REPORT



2016

NATIONAL NOTIFIABLE DISEASES
SURVEILLANCE SYSTEM, UNITED STATES



Centers for Disease
Control and Prevention
National Center for Emerging and
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Data are presented for cases of giardiasis for the year 2016 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.

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Background

Surveillance Overview: National Giardiasis Case Surveillance

Giardiasis is an illness caused by the protozoan parasite *Giardia duodenalis* (formerly called *G. lamblia* or *G. intestinalis*), which causes gastrointestinal symptoms such as diarrhea, abdominal cramps, bloating, weight loss, or malabsorption (1, 2). Each year in the United States, it is estimated that *Giardia* causes more than 1.2 million illnesses (3).

Giardiasis is a [nationally notifiable disease](#); the first full year of reporting was 1993. National data are collected through passive surveillance. Healthcare providers and laboratories that diagnose confirmed giardiasis cases report to the local or state health departments. State and territorial health departments, the District of Columbia (DC), and the New York City health departments, in turn, voluntarily notify CDC of cases via the [National Notifiable Disease Surveillance System \(NNSS\)](#). The number of health departments submitting can vary from year to year depending on which states have designated giardiasis as reportable in their jurisdictions.

State, DC, US territory, and Freely Associated State public health agencies voluntarily notify CDC of giardiasis outbreaks via the [National Outbreak Reporting System \(NORS\)](#). NORS data are not presented here; however, [summaries of data on waterborne disease outbreaks](#) are published elsewhere.

Methods

Case Definition

The [definition](#) of a confirmed case of giardiasis has changed over time; the [first national case definition](#) was published in 1997 (4), and [a revised case definition](#) was published in 2011 (5). The current (2011) case definition differs from the 1997 definition in clarifying that clinical symptoms are necessary for categorizing giardiasis cases as confirmed.

A confirmed case of giardiasis is defined as a case that meets the clinical description and the criteria for laboratory confirmation. Laboratory-confirmed giardiasis is defined as the detection of *Giardia* organisms, antigen, or DNA in stool, intestinal fluid, tissue samples, biopsy specimens, or other biological samples (5). Nonconfirmed cases of giardiasis include probable, suspected, and unknown cases. A probable case of giardiasis meets the clinical description and is epidemiologically linked to a confirmed case. A national case definition for suspected cases of giardiasis does not exist; the definition varies by state. Cases not classified as confirmed, probable, or suspect are classified as unknown.

Analysis

National giardiasis surveillance data for 2016 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 giardiasis were calculated in aggregate for the United States and separately for each reporting jurisdiction. Rates were calculated by dividing the number of giardiasis cases by each year's mid-year census estimates (6, 7) and multiplying by 100,000. Region and total population estimates included only jurisdictions that reported (Supplemental Table 1). 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, giardiasis rates were calculated by year (1995 to 2016) and case status (confirmed or nonconfirmed). Average annual giardiasis rates were calculated by demographic variables (e.g., age and sex) and jurisdiction. Rates were not calculated for race, ethnicity, or month of onset due to large proportion of missing data for these variables (i.e., 39.1%, 44.9%, and 52.9%, respectively). Cases reported by territories were excluded from the analysis, because detailed demographic census data are not available to calculate rates by age and sex.

Acknowledgements

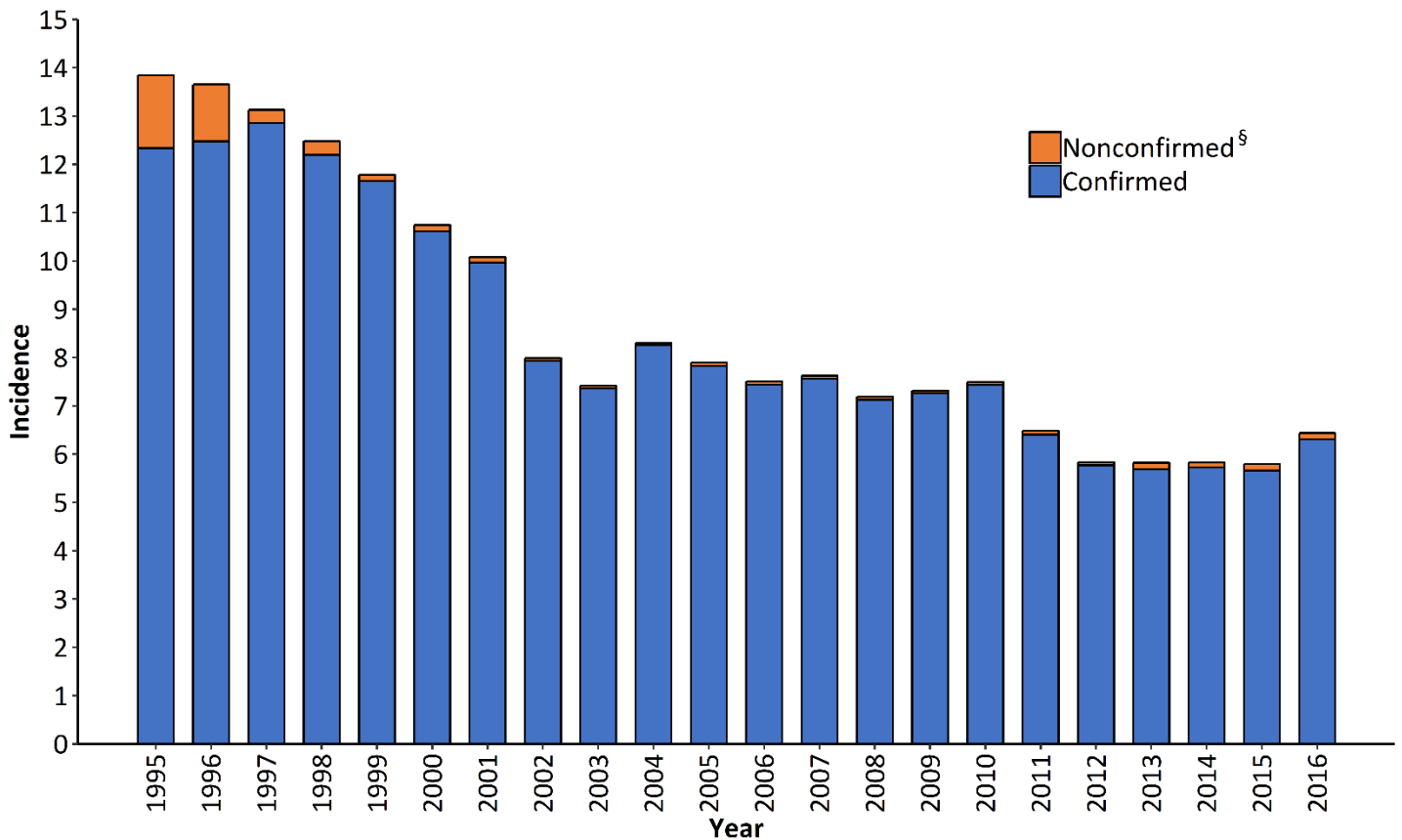
The authors gratefully acknowledge Julia Painter and Jonathan Yoder for their assistance in summarizing the annual reporting of giardiasis by state through previous work on the Domestic Epidemiology Team, Waterborne Disease Prevention Branch, CDC. This report is based on contributions by state and local epidemiologists and microbiologists.

References

1. Huang DB, White AC. An updated review on *Cryptosporidium* and *Giardia*. *Gastroenterol Clin North Am*. 2006;35(2):291-314, viii. DOI: <https://www.sciencedirect.com/science/article/pii/S0889855306000252?via%3Dihub>.
2. Eberhard M, Gabrielli A, Montresor A, et al. Giardiasis (*Giardia enteritis*). In: Control of communicable diseases manual, 20th Edition. Heymann DL, Ed. Washington, DC; 2014:234-36.
3. 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](https://doi.org/10.3201/eid1701.P11101).
4. CDC. Giardiasis: 1997 case definition. Atlanta, GA: US Department of Health and Human Services, CDC; 1997. Available at <http://wwwn.cdc.gov/nndss/script/casedef.aspx?CondYrID=683&DatePub=1997-01-01>.
5. CDC. Giardiasis: 2011 case definition. Atlanta, GA: US Department of Health and Human Services, CDC; 2011. Available at <http://wwwn.cdc.gov/nndss/script/casedef.aspx?CondYrID=685&DatePub=1/1/2011>.
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 Apr 18, 2019.
7. US Census Bureau. Annual Estimates of the Resident Population for Incorporated Places of 50,000 or More, Ranked by July 1, 2017 Population: April 1, 2010 to July 1, 2017. Washington, DC: US Census Bureau; Release Date: May 2018. Available at <https://www.census.gov/content/census/en/data/tables/time-series/demo/pep/2010s-total-cities-and-towns.html>.
8. US Census Bureau. Census regions and divisions of the United States. Washington, DC: 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 giardiasis cases, by year and case classification — National Notifiable Diseases Surveillance System, United States, 1995–2016 (n = 435,302) - Download raw data.



* Cases per 100,000 population per year

[§] Probable, suspect, and unknown cases

Since 2011, the incidence of reported, confirmed giardiasis cases has remained < 7.0 cases per 100,000 population. In 2016, there were 16,342 reported giardiasis cases in the United States (98.0% confirmed and 2.0% nonconfirmed).

Table 1. Number, percentage*, and incidence[§] of giardiasis cases, by region and jurisdiction — National Notifiable Diseases Surveillance System, United States, 2016 (n = 16,342)

Region/Jurisdiction	No.	%	Incidence	No. of outbreak associated cases
Northeast	4,171	25.5	7.5	41
Connecticut	277	1.7	7.7	
Maine	137	0.8	10.3	
Massachusetts	589	3.6	8.6	2
New Hampshire	104	0.6	7.8	
New Jersey	466	2.9	5.2	
New York City [¶]	911	5.6	10.6	
New York State [¶]	995	6.1	8.9	21
Pennsylvania	606	3.7	4.7	18
Rhode Island	86	0.5	8.1	
Vermont	NR			
Midwest	3,631	22.2	6.6	14
Illinois	NR			
Indiana	199	1.2	3.0	2
Iowa	260	1.6	8.3	
Kansas	103	0.6	3.5	
Michigan	580	3.5	5.8	10
Minnesota	652	4.0	11.8	2
Missouri	337	2.1	5.5	
Nebraska	124	0.8	6.5	
North Dakota	46	0.3	6.1	
Ohio	401	2.5	3.5	
South Dakota	116	0.7	13.5	
Wisconsin	813	5.0	14.1	
South	3,394	20.8	5.1	99
Alabama	234	1.4	4.8	
Arkansas	178	1.1	6.0	
Delaware	20	0.1	2.1	
District of Columbia	59	0.4	8.6	
Florida	1,128	6.9	5.5	99
Georgia	760	4.7	7.4	
Kentucky	NR			
Louisiana	217	1.3	4.6	
Maryland	233	1.4	3.9	
Mississippi	NR			
North Carolina	NR			
Oklahoma	NR			
South Carolina	151	0.9	3.0	
Tennessee	NR			
Texas	NR			
Virginia	317	1.9	3.8	
West Virginia	97	0.6	5.3	
Northwest	1,455	8.9	9.4	12
Alaska	86	0.5	11.6	
Idaho	187	1.1	11.1	12
Montana	120	0.7	11.6	

Oregon	338	2.1	8.3	
Washington	672	4.1	9.2	
Wyoming	52	0.3	8.9	
Southwest	3,691	22.6	6.0	14
Arizona	125	0.8	1.8	
California	2,718	16.6	6.9	12
Colorado	464	2.8	8.4	1
Hawaii	41	0.3	2.9	
Nevada	75	0.5	2.6	
New Mexico	110	0.7	5.3	1
Utah	158	1.0	5.2	
Total	16,342	100	6.4	180

Abbreviation NR = Not Reportable

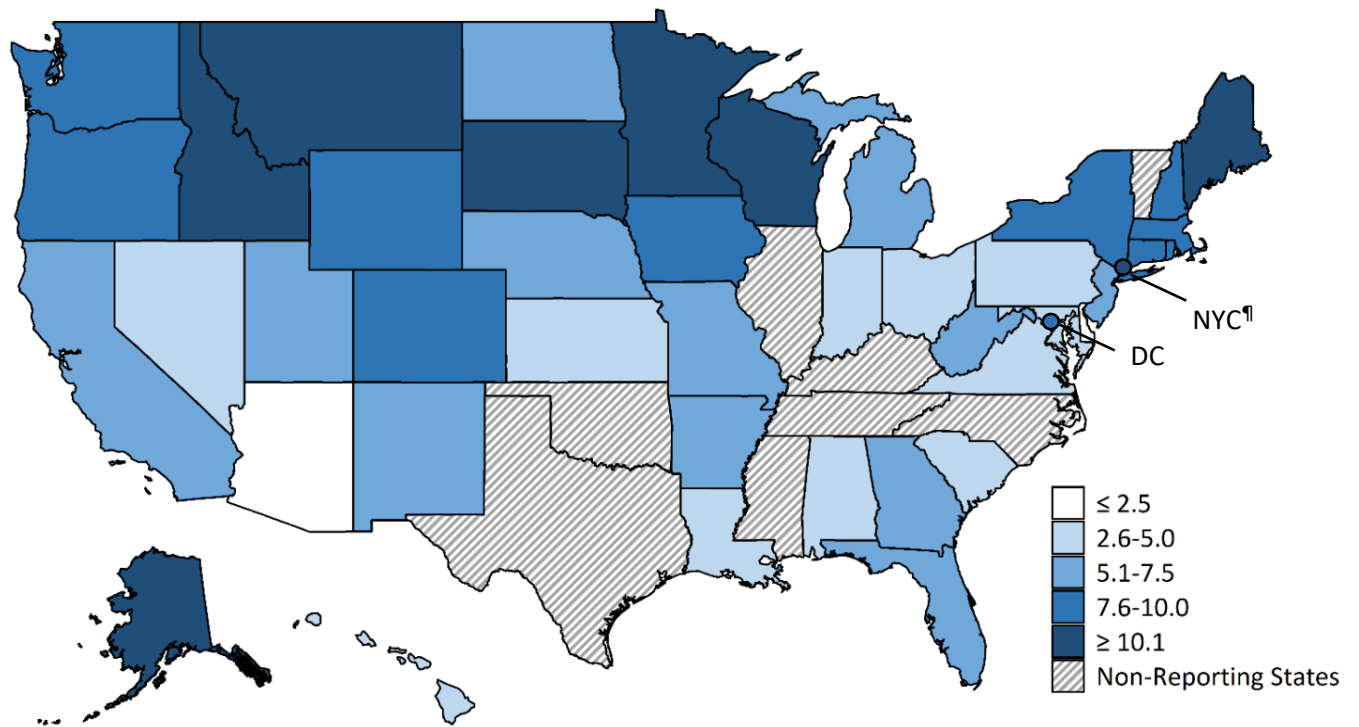
* Percentages might not total 100% because of rounding

§ Cases per 100,000 population

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

By jurisdiction, giardiasis incidence ranged from 1.8 per 100,000 population in Arizona to 14.1 per 100,000 population in Wisconsin. By region, incidence of reported giardiasis cases ranged from 5.1 cases per 100,000 population in the South to 9.4 in the Northwest. Differences in incidence might reflect differences in risk factors or mode of transmission of *Giardia*; the magnitude of outbreaks; or the capacity or requirements to detect, investigate, and report cases.

Figure 2. Incidence* of giardiasis cases, by reporting jurisdiction — National Notifiable Diseases Surveillance System, United States, 2016 (n=16,342[§]) - Download raw data.



* Cases per 100,000 population

[§] Non-reporting states included Illinois, Kentucky, Mississippi, North Carolina, Oklahoma, Tennessee, Texas, and Vermont

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

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

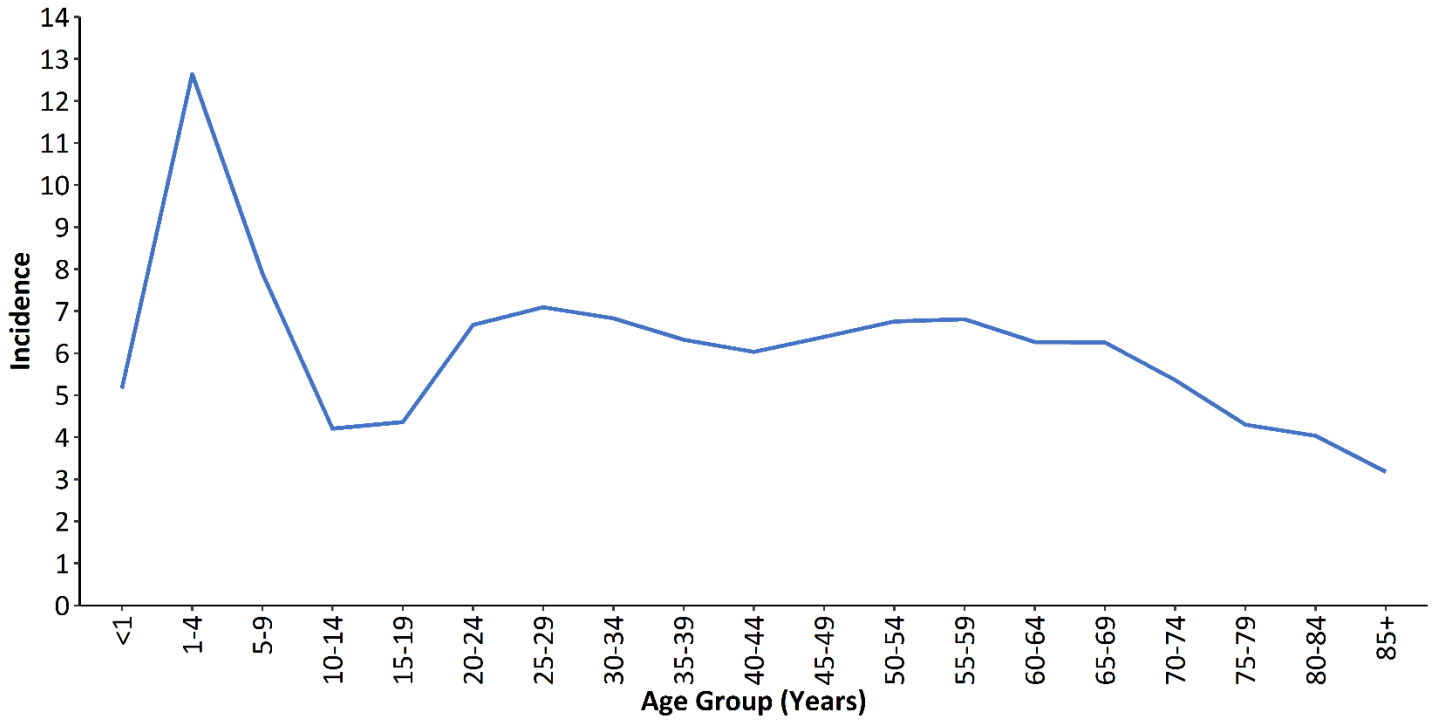
Table 2. Number and percentage* of giardiasis cases, by selected patient demographic characteristics — National Notifiable Diseases Surveillance System, United States, 2016 (n = 16,342)

Characteristic	No.	%
Sex		
Male	9,792	59.9
Female	6,500	39.8
Missing	50	0.3
Race		
American Indian/Alaska Native	94	0.6
Asian/Pacific Islander	430	2.6
Black	1,331	8.1
White	8,069	49.4
Other	728	4.5
Missing	5,690	34.8
Ethnicity		
Hispanic	1,073	6.6
Non-Hispanic	8,839	54.1
Missing	6,430	39.3
Total	16,342	100.0

* Percentages might not total 100% because of rounding

During 2016, a total of 9,792 patients were male (59.9%) and 6,500 (39.8%) were female; 50 (0.3%) were missing data on sex. The majority of cases for whom data on race were available occurred among the classifications white (75.8%), black (12.5%), and Asian/Pacific Islander (4.0%). Data on race were not included for 34.8% of total annual case reports, and data on ethnicity were missing for 39.3% of case reports. The majority of patients for whom data on ethnicity were available were non-Hispanic (89.2%).

Figure 3. Incidence* of giardiasis cases, by age group — National Notifiable Diseases Surveillance System, United States, 2016 (n = 16,283[§]) - Download raw data.

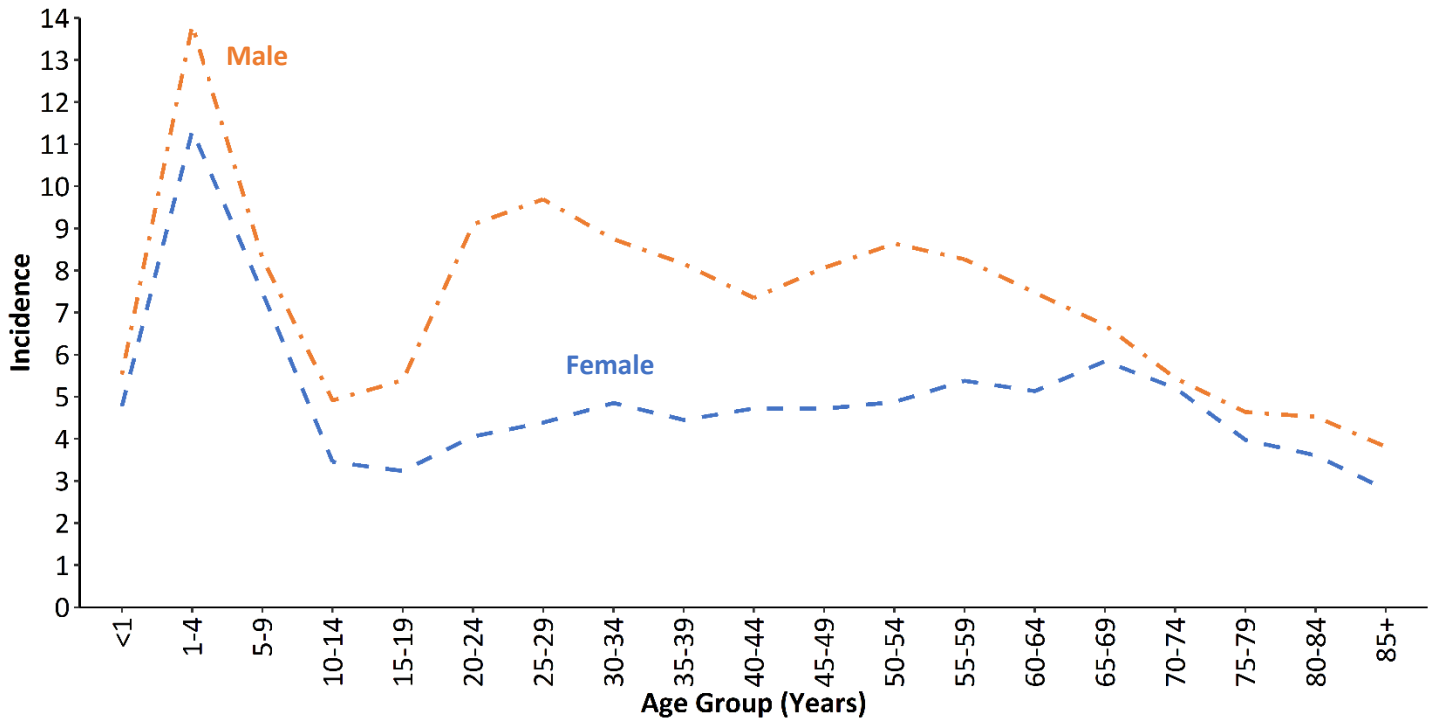


* Cases per 100,000 population

[§] Age data missing for 59 patients

In 2016, the incidence of reported giardiasis cases was highest among patients aged 1-4 years, 5-9 years, and 25-29 years (Incidence = 12.6, 7.9, and 7.1 cases per 100,000 population, respectively).

Figure 4. Incidence* of giardiasis cases, by sex and age group — National Notifiable Diseases Surveillance System, United States, 2016 (n = 16,236[§]) - Download raw data.

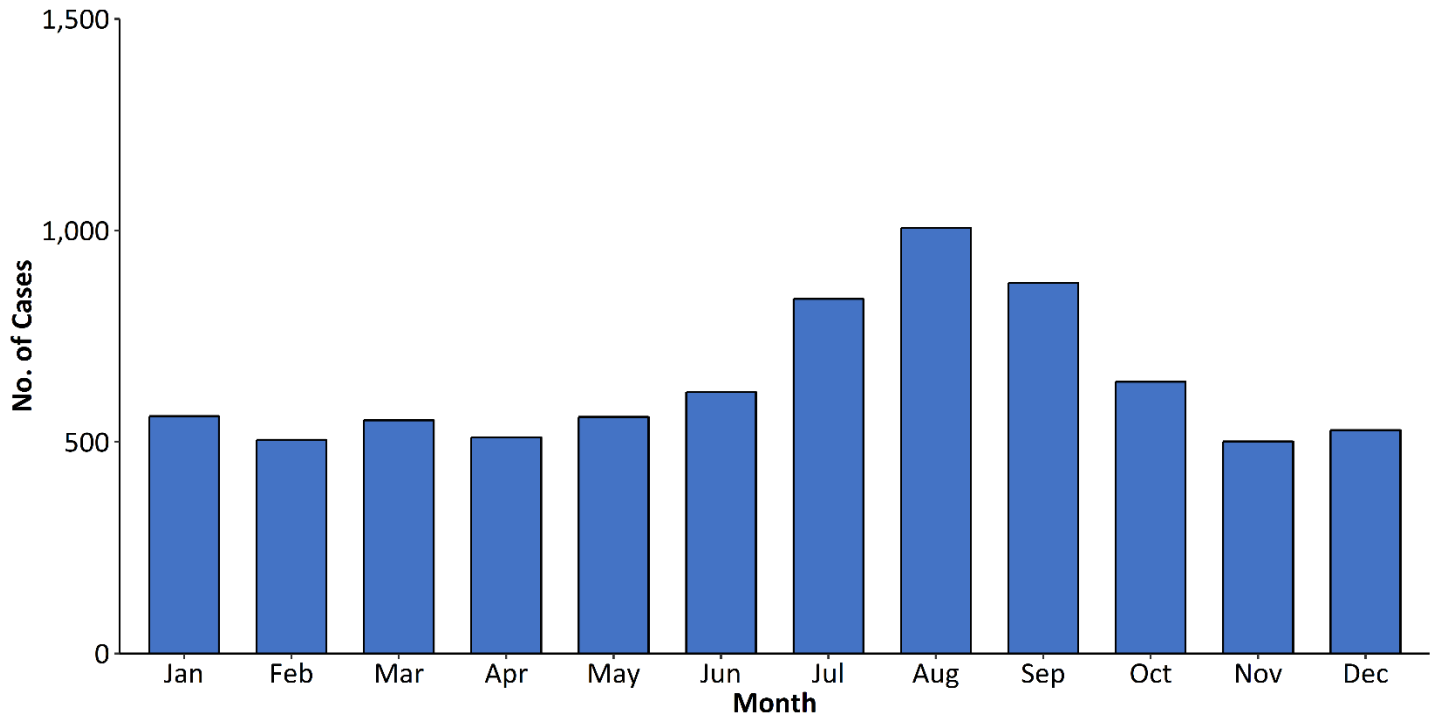


* Cases per 100,000 population

[§] Age or sex data missing for 106 patients

Rates were highest among males in every age group. The difference was most pronounced between sexes aged 25-29 years.

Figure 5. Number of giardiasis cases, by date of symptom onset — National Notifiable Diseases Surveillance System, United States, 2016 (n = 7,696*) - Download raw data.



* Date of symptom onset data missing for 8,646 patients

In 2016, the majority of cases by symptom onset occurred between June and October, with a peak in August (n=1,006).

Supplemental Table

Table S1. Giardiasis reporting and non-reporting states (gray shading) — National Notifiable Diseases Surveillance System, United States, 1995–2016

State	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016		
AK																								
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AR																								
AZ																								
CA																								
CO																								
CT																								
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FL																								
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