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Giardiasis Surveillance United States, 1992–1997

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***Abbreviations**

ATSDR	Agency for Toxic Substances and Disease Registry
CIO	Centers/Institute/Offices
EPO	Epidemiology Program Office
IHPO	International Health Program Office
NCCDPHP	National Center for Chronic Disease Prevention and Health Promotion
NCEH	National Center for Environmental Health
NCEHIC	National Center for Environmental Health and Injury Control
NCHSTP	National Center for HIV, STD, and TB Prevention
NCID	National Center for Infectious Diseases
NCIPC	National Center for Injury Prevention and Control
NCPS	National Center for Prevention Services
NIOSH	National Institute for Occupational Safety and Health
NIP	National Immunization Program

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College Students	NCCDPHP	1997; Vol. 46, No. SS-6
National Alternative High Schools	NCCDPHP	1999; Vol. 48, No. SS-7

Giardiasis Surveillance — United States, 1992–1997

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Abstract

Problem/Condition: *Giardia intestinalis*, the organism that causes the gastrointestinal illness giardiasis, is the most commonly diagnosed intestinal parasite in public health laboratories in the United States. In 1992, the Council of State and Territorial Epidemiologists assigned giardiasis an event code that enabled states to begin voluntarily reporting surveillance data on giardiasis to CDC.

Reporting Period: This report includes data that were reported from January 1992 through December 1997.

Description of the System: The National Giardiasis Surveillance System includes data about reported cases of giardiasis from participating states. Because most states were already collecting data on occurrence of giardiasis, the assignment of an event code to giardiasis has allowed voluntary reporting of these data to CDC via the National Electronic Telecommunications System for Surveillance.

Results: Since 1992, the number of states reporting cases of giardiasis to CDC has risen from 23 to 43. The annual number of giardiasis cases reported has ranged from 12,793 in 1992 to 27,778 in 1996. In 1997, cases per 100,000 state population ranged from 0.9 to 42.3, with 10 states reporting >20.0 cases per 100,000 population and a national average of 9.5 cases per 100,000 population. In 1997, New York State, including New York City, reported the highest number of cases (3,673, or 20.3 cases per 100,000 population), accounting for 14.5% of cases nationally; however, Vermont reported the highest incidence rate in 1997 (42.3 cases per 100,000 population). Both states have active surveillance systems in place for giardiasis. Cases have an approximately equal sex distribution. Nationally, rates were the highest among children aged 0–5 years, followed closely by persons aged 31–40 years. In these two age groups, most cases were reported during late summer and early fall — an indication that transmission occurred during the summer.

Interpretation: This report documents the first nationwide look at epidemiologic parameters and disease burden estimates for giardiasis in the United States. Transmission occurs in all major geographic areas of the country. The seasonal peak in age-specific case reports coincides with the summer recreational water season and might reflect the heavy use by young children of communal swimming venues (e.g., lakes, rivers, swimming pools, and water parks) — a finding consistent with *Giardia's* low infectious dose, the high prevalence of diaper-aged children in swimming venues, the extended periods of cyst shedding that can occur, and *Giardia*'s environmental resistance. Estimates based on state surveillance data indicate that as many as 2.5 million cases of giardiasis occur annually in the United States.

Public Health Action: Giardiasis surveillance provides data to educate public health practitioners and health-care providers about the scope and magnitude of giardiasis in the United States. These data can be used to establish research priorities and to plan future prevention efforts.

INTRODUCTION

Giardiasis is the gastrointestinal illness caused by the flagellated protozoan *Giardia intestinalis*, also known as *G. lamblia* or *G. duodenalis*. *Giardia* is the most commonly diagnosed intestinal parasite in public health laboratories in the United States (*1–4*). *Giardia* was the most frequently identified etiologic agent of outbreaks associated with drinking water in the United States for the years 1976–1994 (*5*).

Giardia is spread from person to person and from animals to humans through fecal-oral transmission, has an incubation period of 3–25 days (median, 7–10 days), and has a two-stage life cycle — trophozoite and cyst. The life cycle begins with ingested cysts, which release trophozoites (10–20 µm x 5–15 µm) in the duodenum. These trophozoites attach to the surface of the intestinal epithelium by using a ventral sucking disk and then reproduce by binary fission. The trigger for encystment is unclear, but the process results in the inactive, environmentally resistant form of *Giardia* — a cyst (11–14 µm x 7–10 µm) that is excreted in feces (*6*).

Giardiasis occurs when cysts are ingested through person-to-person transmission or ingestion of fecally contaminated food or water. The infectious dose is low: humans can be infected with as few as 10 cysts (*6,7*). Persons at greatest risk of exposure to infection are children in day care, their close contacts, men who have sex with men, backpackers and campers (via ingestion of unfiltered, untreated drinking water), travelers to disease-endemic areas, and persons drinking water from shallow wells (*8–11*).

Giardia is found worldwide and infects domestic and wild animals (e.g., cats, dogs, cattle, deer, and beavers) (*6,7*). Giardiasis usually occurs sporadically, although outbreaks do occur. Waterborne outbreaks, associated with ingestion of both drinking and recreational water (e.g., lakes, rivers, or swimming pools) (*5*), and foodborne outbreaks (*12,13*) are well documented as are person-to-person outbreaks among men who have sex with men (*8*) and among children and staff in day care centers (*14*). The relative contribution of waterborne, foodborne, and person-to-person transmission to sporadic giardiasis is unknown.

Clinically, *Giardia* produces a broad spectrum of gastrointestinal symptoms, including one or more of the following symptoms: diarrhea, flatulence, bloating, weight loss, abdominal cramping, nausea, malabsorption, foul-smelling stools, steatorrhea, fatigue, anorexia, and chills. Although the hallmark of giardiasis is diarrhea, asymptomatic infections can occur (*15,16*), especially in children and in persons with prior infections (*6*). *Giardia* cysts can be excreted in the stool intermittently for weeks or months, resulting in a protracted period of communicability (*14,17,18*).

Because infections can be asymptomatic or characterized by mild signs and symptoms, giardiasis is often regarded as a benign gastrointestinal illness, although chronic or debilitating giardiasis has been reported (*15*). From 1979 through 1988, an estimated 4,600 hospitalizations per year in the United States resulted from severe giardiasis and its complications, resulting in an average of 23,238 days per year in the hospital

and a mean annual incidence of 2.0 hospitalizations per 100,000 persons (*15*). Volume depletion was reported for 33% of case-patients, and 19% of hospitalized children aged <5 years had a codiagnosis of failure to thrive (*15*).

Many effective treatment alternatives are available for patients with symptomatic giardiasis (Table 1). Metronidazole is the treatment most often prescribed in the United States. Furazolidone is a less effective treatment option, but it is the only drug approved by the U.S. Food and Drug Administration (FDA) for treatment of giardiasis in the United States. Because furazolidone is available in liquid form, it is often used to treat children (*6*). Quinacrine, an effective and inexpensive treatment option, is not available from any U.S. manufacturer, although several compounding pharmacies have made it available. Tinidazole is widely used throughout the world; however, it is not approved for use in this country. Albendazole has been reported to be as effective as metronidazole with fewer side effects among children aged 2–12 years (*19*). Paromomycin, a nonabsorbed aminoglycoside, is less effective than other agents but is used for treatment among pregnant women because of potential teratogenic effects of the other agents (*20*). A combination of metronidazole and quinacrine has been used to treat refractory cases (*21*).

TABLE 1. Drugs for treatment of giardiasis*

Drugs (listed alphabetically)	Dosage
Adults (nonpregnant)	
Albendazole	400 mg by mouth once a day for 5 days
Furazolidone	100 mg by mouth 4 times a day for 7–10 days
Metronidazole	250 mg by mouth 3 times a day for 5–7 days
Paromomycin	500 mg (30mg/kg/day) by mouth 3 times a day for 7 days
Quinacrine†	100 mg by mouth 3 times a day for 5 days
Tinidazole†	2 g by mouth once
Pregnant Women	
Paromomycin	500 mg (30 mg/kg/day) by mouth 3–4 times a day for 7 days
Children	
Albendazole	400 mg by mouth once a day for 5 days
Furazolidone	6–8 mg/kg/day by mouth divided 3–4 times a day for 7–10 days
Metronidazole	15 mg/kg/day by mouth divided 3 times a day for 5 days (maximum = 300 mg/day)
Paromomycin	30 mg/kg/day by mouth divided 3 times a day for 7 days
Quinacrine†	6 mg/kg/day divided 3 times a day for 5 days (maximum = 300 mg/day)
Tinidazole†	50 mg/kg by mouth once (maximum = 2 g)
Refractory Cases	
Metronidazole AND Quinacrine†	750 mg by mouth 3 times a day for 14 days AND 100 mg by mouth 3 times a day for 14 days

* Sources: Ortega YR, Adam RD. *Giardia*: overview and update. Clin Infect Dis 1997;25:545–50; Taylor GD, Wenman WM, Tyrrell DLJ. Combined metronidazole and quinacrine hydrochloride therapy for chronic giardiasis. CMAJ 1987;136:1179–80; Sanford JP, Gilbert DN, Moellering RC, Sande MA. The Sanford guide to antimicrobial therapy, 27th edition. Vienna, VA: Antimicrobial Therapy, Inc., 1997; and Anonymous. Drugs for parasitic infections. Med Lett Drugs Ther 1998;40:1–12.

† Not commercially available in the United States.

Despite the public health importance of giardiasis, reliable data on national incidence and prevalence in the United States are not available. Estimates have been extrapolated from published data collected by states with active giardiasis surveillance, laboratory surveys, and waterborne-disease outbreak reports. Giardiasis is the most frequently reported diarrheal disease in northern New England (*10*), and from 1983 through 1986, it was the most common reportable disease in Vermont (*22*). *Giardia* also was the most prevalent protozoan parasite in Arkansas during 1997 (*23*) as well as the most commonly reported enteric pathogen in Wisconsin during the years 1983–1986 (*24*).

The prevalence of *Giardia* in stool specimens submitted for examination ranges from 2% to 5% in industrialized countries and from 20% to 30% in developing countries, and it can be as high as 35% among children attending day care centers in the United States in a nonoutbreak setting (*4,6*). Before the tightening of water treatment standards, an estimated 25% of endemic cases of giardiasis in the United States were waterborne (*7,9*). Furthermore, giardiasis was one of the two leading recognized etiologies in the 129 water-associated disease outbreaks that occurred during the years 1991–1994 in the United States (*7*).

Although giardiasis reporting is required by 43 states, it is not a nationally notifiable disease (*25,26*). In 1992, the public health importance of the disease prompted the Council of State and Territorial Epidemiologists to assign an event code (code 11570) to giardiasis to allow states to voluntarily transmit their reported giardiasis data to CDC via the National Electronic Telecommunications System for Surveillance (NETSS) (*27*). State health departments collect data on giardiasis case-patients from both health-care providers and laboratories, and the data are subsequently transmitted with notifiable disease information to CDC via NETSS.

The purpose of the National Giardiasis Surveillance System is to estimate the disease burden in the United States and to monitor the demographic parameters (sex, age, race, ethnicity), seasonality, and geographic variation of giardiasis. This report summarizes national surveillance data on giardiasis for the years 1992–1997.

METHODS

The diagnosis of giardiasis is made through examination of stool specimens that are typically collected and preserved in 10% formalin, although fresh stool may also be examined. Light microscopy can be used to visualize the parasite via wet mount, staining (trichrome or iron hematoxylin), or the direct fluorescent antibody detection method (monoclonal antibodies). In addition, enzyme linked immunosorbent assay (ELISA)-based kits have been used to detect *Giardia*-specific antigen in stool (*4,6*).

Approximately 85% of infections can be diagnosed with a single stool specimen. Sensitivity increases with the number of stool specimens examined, so that three specimens collected every other day during a 5-day period will detect approximately 90% of infections (*28*). In the rare occasions when infections are suspected but multiple stool tests are negative, duodenal fluid can be sampled for *Giardia* trophozoites. Three procedures have commonly been used: the string test (Entero-test), endoscopy with upper intestinal aspiration, and endoscopy with upper intestinal biopsy (*6*). No serologic test is commercially available (*4,6*).

The National Giardiasis Surveillance System collects data on persons who have either symptomatic or asymptomatic giardiasis, seek health care, have a positive diag-

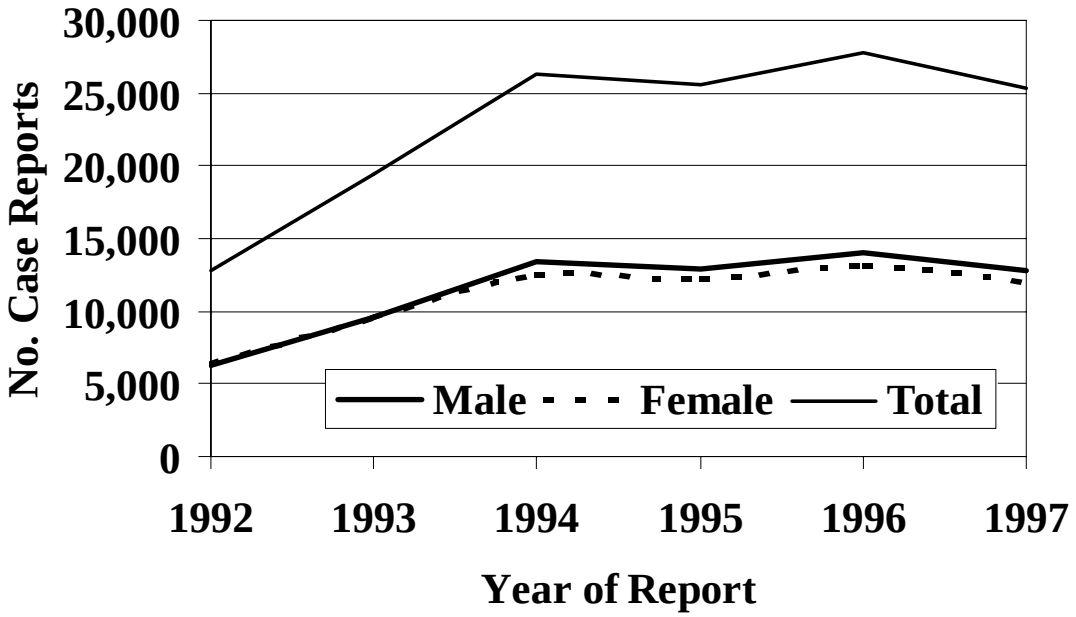
nostic test result, and are reported to both the state and CDC (*29*). This report represents the first time that national surveillance information on giardiasis has been published and includes reports from the 43 participating states.

RESULTS

Since the inception of the National Giardiasis Surveillance System in 1992, the number of states voluntarily reporting cases and the number of states reporting >100 cases per year increased through 1994 and subsequently plateaued. In 1992, only 23 states reported giardiasis cases to CDC, with only 17 states reporting >100 cases. By 1997, 43 states reported giardiasis cases, with 40 of those states reporting >100 cases each.

In 1992, a total of 12,793 cases of giardiasis were reported. The number of reported cases eventually doubled by 1994. Between 1994 and 1997, case reporting plateaued at 25,389–27,778 cases reported per year, with sex distribution being approximately equal (Figure 1). In 1997, New York State, including New York City, reported the highest number of cases (3,673), accounting for 14.5% of cases nationally.

FIGURE 1. Giardiasis case reports, by sex* — United States, 1992–1997



*1.0%–2.3% of case reports have no sex identification.

In 1997, cases per 100,000 population ranged from 0.9 to 42.3 in reporting states. Vermont reported the highest incidence rate (42.3 cases per 100,000 population) (Table 2). Ten states reported >20.0 cases per 100,000 population (Alaska, Colorado, Minnesota, Nebraska, New Hampshire, New York, North Dakota, Oregon, Vermont, and Wisconsin). Seven states reported no cases to CDC in 1997 (California, Connecticut, Kentucky, New Jersey, North Carolina, South Carolina, and Texas) (Table 2).

A bimodal age distribution in giardiasis rates was observed. The highest rates of giardiasis occurred among children aged 0–5 years, followed closely by persons aged 31–40 years (Figure 2).

TABLE 2. Giardiasis case reports — United States, 1992–1997*

State	No. case reports						% of total case reports in 1997†	Case reports per 100,000 population in 1997†
	1992	1993	1994	1995	1996	1997		
Alabama	0	0	0	0	299	378	1.5	8.8
Alaska	20	106	0	78	120	160	0.6	26.3
Arizona	0	366	330	316	311	309	1.2	6.8
Arkansas	0	0	126	131	182	220	0.9	8.7
California	0	0	0	0	0	0	0.0	0.0
Colorado	3	857	908	963	1,025	788	3.1	20.2
Connecticut	0	0	0	0	0	0	0.0	0.0
Delaware	184	154	151	76	114	127	0.5	17.4
District of Columbia	0	10	25	27	27	24	0.1	4.5
Florida	1,792	1,990	2,345	2,105	2,318	2,003	7.9	13.7
Georgia	0	391	463	572	820	916	3.6	12.2
Hawaii	195	190	217	184	229	162	0.6	13.7
Idaho	0	0	201	145	184	223	0.9	18.4
Illinois	0	1,234	1,242	1,848	1,644	1,562	6.2	13.1
Indiana	1,049	1,020	933	908	875	721	2.8	12.3
Iowa	0	339	341	391	410	358	1.4	12.6
Kansas	0	385	415	395	237	230	0.9	8.9
Kentucky§	0	0	208	187	267	0	0.0	0.0
Louisiana§	6	14	58	29	60	41	0.2	0.9
Maine	0	331	335	294	301	249	1.0	20.0
Maryland§	76	85	108	147	146	140	0.6	2.7
Massachusetts	0	0	1,044	1,040	974	901	3.5	14.7
Michigan	1,333	1,199	1,370	1,435	1,290	1,212	4.8	12.4
Minnesota	1,355	1,163	827	984	988	1,098	4.3	23.4
Mississippi§	0	0	22	162	164	184	0.7	6.7
Missouri	739	770	774	761	777	800	3.2	14.8
Montana	152	127	139	122	129	153	0.6	17.4
Nebraska	418	342	345	315	277	345	1.4	20.8
Nevada	264	293	257	257	264	247	1.0	14.7
New Hampshire	0	404	398	330	334	327	1.3	27.9
New Jersey	0	0	634	711	908	0	0.0	0.0
New Mexico	305	285	240	245	216	277	1.1	16.0
New York¶	1,985	1,866	4,430	4,299	4,227	3,673	14.5	20.3
(New York City)	(0)	(0)	(2,452)	(2,486)	(2,287)	(1,784)		
North Carolina§	0	0	0	0	0	0	0.0	0.0
North Dakota	0	0	0	112	148	135	0.5	21.1
Ohio	0	1,215	1,147	1,292	1,333	1,247	4.9	11.1
Oklahoma	0	256	254	205	168	154	0.6	4.6
Oregon	0	1,012	929	902	926	909	3.6	28.0
Pennsylvania	1,670	1,552	1,552	0	1,708	1,664	6.6	13.8
Rhode Island	238	173	138	177	173	149	0.6	15.1
South Carolina§	0	0	0	0	0	0	0.0	0.0
South Dakota	0	155	140	171	89	127	0.5	17.2
Tennessee	212	215	166	148	149	176	0.7	3.3
Texas§	0	0	0	0	0	0	0.0	0.0
Utah	296	244	338	247	332	299	1.2	14.5
Vermont	373	312	348	315	335	249	1.0	42.3
Virginia	0	373	337	318	405	465	1.8	6.9
Washington	0	23	723	855	668	738	2.9	13.2

TABLE 2. (Continued) Giardiasis case reports — United States, 1992–1997*

State	No. case reports						% of total case reports in 1997†	Case reports per 100,000 population in 1997†
	1992	1993	1994	1995	1996	1997		
West Virginia	67	82	60	83	70	94	0.4	5.2
Wisconsin	0	0	1,287	1,247	1,121	1,099	4.3	21.3
Wyoming	61	32	41	42	36	56	0.2	11.7
Total	**12,793**	**19,565**	**26,346**	**25,571**	**27,778**	**25,389**	**100.0**	**9.5**

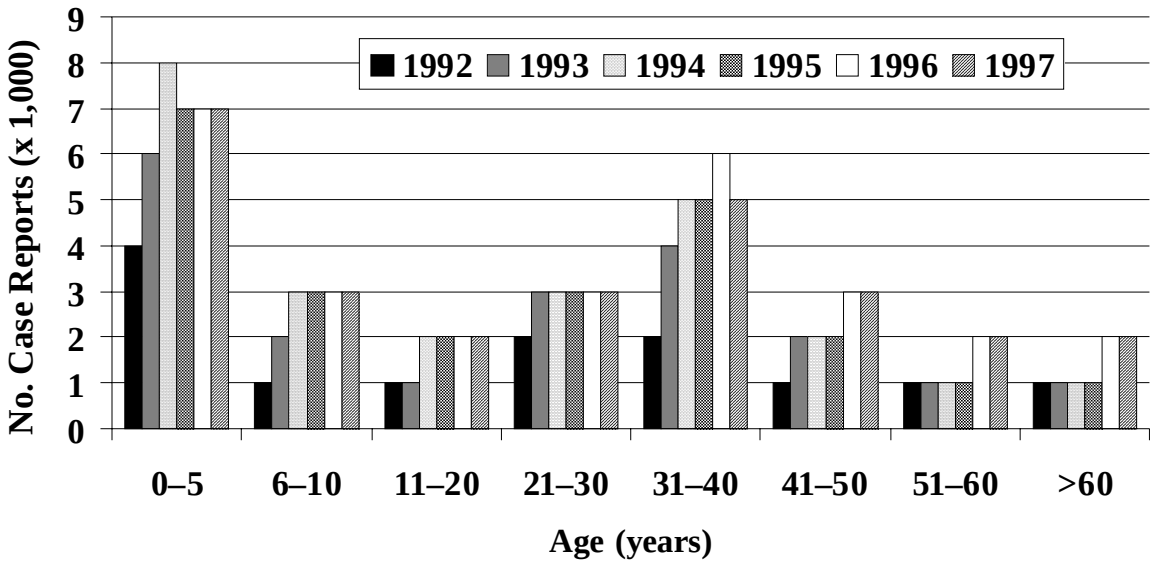
* Includes District of Columbia. Population estimates are from Population Estimates Program, Population Division, US Bureau of the Census. Estimates of the population of states: annual time series, July 1, 1990 to July 1, 1997. Data in this table were accessed on October 21, 1998 at <http://www.census.gov/population/estimates/state/ST9097T1.txt>. Last accessed on May 3, 2000.

† The two right columns use 1997 data to report state-specific percentages of total cases reported and infection rates per 100,000 population.

§ States without laws requiring giardiasis reporting.

¶ New York State includes data for New York City (in parentheses).

FIGURE 2. Giardiasis case reports, by age group and year — United States, 1992–1997



In 1997, 34.4% (8737/25,389) of cases were reported with unknown race/ethnicity. Of those cases for whom information on race and ethnicity was reported, 78.8% (13,129/16,652) were reported as white, 10.9% (1809/16,652) as Hispanic, 6.0% (991/16,652) as black, 3.5% (575/16,652) as Asian, 0.7% (113/16,652) as Native American, and 0.2% (35/16,652) as of other race or ethnicity.

A marked seasonality in reported giardiasis cases occurred, peaking during weeks 37–46, or late summer and early fall (Figure 3). Thus, most case reports arrived at CDC during September and October. Age-specific analysis of the data illustrates that this seasonality is primarily exhibited by persons in two age groups — 0–5 and 31–40 years (Figure 4).

FIGURE 3. Giardiasis case reports, by week — United States, 1995

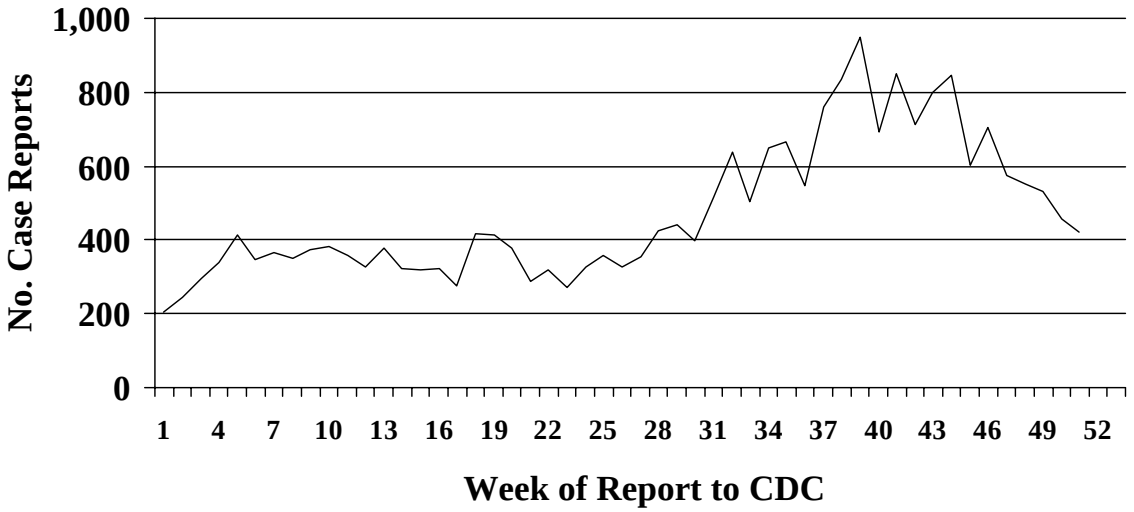
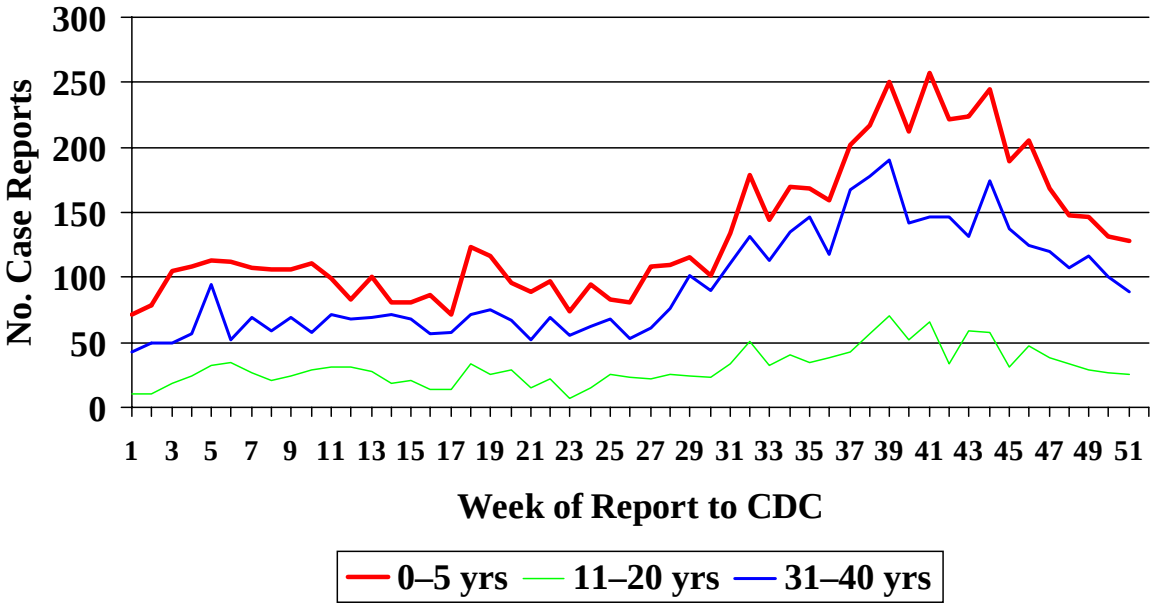


FIGURE 4. Giardiasis case reports, by selected age groups* and week — United States, 1995



* The 0–5-year and 31–40-year age groups are presented because they have the highest numbers of giardiasis case reports and have the greatest seasonality. The 11–20-year age group was chosen as being representative of all other age groups.

DISCUSSION

Since NETSS giardiasis reporting began in 1992, both the number of states participating in voluntary reporting to CDC and the annual number of cases reported have increased. This national surveillance system provides data to assess epidemiologic characteristics and to estimate the disease burden of giardiasis.

In the surveillance data, no sex-specific differences were observed. This finding is in contrast to what was expected on the basis of both the estimated national incidences of salmonellosis and shigellosis, which are higher for women than for men (*30*), and the estimated incidence of hospitalization for giardiasis, which was 22%–70% higher for women than for men; researchers have hypothesized that these estimates are higher for women because they have increased care-giving responsibility and exposure to infected children (*15*). Why these surveillance data do not show sex-specific differences remains unclear.

Although giardiasis affects all age groups, a bimodal age distribution was observed. The incidence of giardiasis was highest for children aged 0–5 years, followed by adults aged 31–40 years. These data correlate with reports of giardiasis prevalence being higher than average among children who attend day care centers as well as the family members and day care workers who care for these children (*11*). This same age distribution has also been documented for state-based surveillance of giardiasis (*10,22*), hospitalizations for severe giardiasis (*15*), and cryptosporidiosis (*31*).

Although all racial and ethnic groups were represented — with rates per 100,000 population ranging from 3.1 (African American) to 6.9 (white) — underdiagnosis and underreporting limit interpretation of these data. Only half of the case reports received through NETSS from 1994 through 1997 included information about both the race and ethnicity of patients. In comparison, 95%–99% of case reports during the same period included sex and age data (*32*).

The seasonality of giardiasis has been documented (*2,3,10,23,24*). The greatest number of reports of giardiasis are received during the late summer and early autumn (Figure 3). Because case reports can take 1–2 months to reach CDC after onset of illness (*2*), this peak reflects increased transmission during the summer months. The seasonal peak in cases coincides with the summer recreational water season and might reflect the increased use by young children of community swimming (essentially communal bathing) venues — a finding consistent with *Giardia*'s low infectious dose, the high prevalence of diaper-aged children in swimming venues, and *Giardia*'s role as one of the most common causes of recreational water-associated disease outbreaks in the United States (*5*). This seasonal variation has also been shown for cryptosporidiosis (*31*).

Giardiasis is geographically widespread in the United States. States with >20.0 case reports per 100,000 population represent almost every major region of the country. Data collected and reported via NETSS, though, are not sufficient for interpreting geographic variation in the incidence of giardiasis. Data from state laboratories suggest that the incidence of giardiasis might be higher in the midwest and northwest regions (*2,3*). In contrast, the highest mean annual incidence of hospitalization for giardiasis occurs in southern states (*15*).

In 1997, 25,389 cases of giardiasis were reported, or 9.5 case-patients per 100,000 population. This is an underestimation of the 1997 giardiasis disease burden in the United States because a) the system is not representative of all persons infected with *Giardia*, b) seven states did not submit any giardiasis reports to CDC in 1997, and c) diarrheal diseases are often underreported (*15*).

Calculating the sensitivity of the National Giardiasis Surveillance System in estimating the disease burden in the United States is difficult. One way to estimate the burden is to look at the estimated proportion of persons with diarrheal illness who seek medical care and the proportion of cases reported. Only 8% of persons with a diarrheal illness seek medical care, and subsequently, only 1%–5% of foodborne disease cases are reported to CDC through passive surveillance systems, according to estimates from FoodNet, an active surveillance system for estimating the burden of foodborne disease transmission in the United States (*33*). Assuming this pattern is also true for *Giardia*, and using the National Giardiasis Surveillance System, the calculated incidence of giardiasis in the United States during 1997 could be as low as 500,000 or as high as 2.5 million case-patients (185–926 cases per 100,000 population).

Another way to approximate the giardiasis disease burden is to extrapolate from incidence data reported from states with active giardiasis surveillance systems. For example, Vermont reported 45.9 cases per 100,000 population per year from 1983 through 1986 (*22*), and Wisconsin reported 49.1 cases per 100,000 population in 1988 (*24*). These data are close to Vermont's 42.3 case-patients per 100,000 population reported for 1997 through the National Giardiasis Surveillance System. If this state surveillance information is extrapolated to the national level (i.e., 46–49 case-patients per 100,000 population) by using 1997 population estimates, approximately 124,000–132,000 case reports could be expected nationally.

The true burden of giardiasis in the United States most likely ranges between these two estimates: from 46–49 cases to 185–926 cases per 100,000 population. *Giardia* is the most commonly detected intestinal protozoan parasite in the world (*1–4*), and it likely causes a range of 100,000 to 2.5 million infections each year in the United States, with an expected incidence equivalent to that reported for *Salmonella* and *Shigella* (*34,35*). *Giardia*'s protracted communicability, low infectious dose, and environmental resistance make it easily transmitted by drinking and recreational water, by food, and from person to person. Because *Giardia* can be a cause of severe gastrointestinal illness and effective treatment options are available, health-care providers should include testing for giardiasis in the workup for diarrheal illness.

The following recommendations would lead to an improved National Giardiasis Surveillance System:

- Encourage health-care providers to consider and test for *Giardia* in the workup for gastrointestinal illness.
- Continue educating health-care providers as well as public and private laboratories to improve reporting of cases to state health departments.
- Continue encouraging states to transmit giardiasis data to CDC via the NETSS.
- Regularly publish and distribute giardiasis surveillance data for public health education purposes.
- Conduct case-control studies of risk factors for sporadic giardiasis — similar to studies being conducted by FoodNet sites for sporadic cryptosporidiosis — to help focus prevention efforts by assessing the relative contribution of waterborne, person-to-person, and foodborne routes to transmission of giardiasis in the United States (see Recommendations for Prevention and Control of Giardiasis).

Recommendations for Prevention and Control of Giardiasis

Practice good hygiene.

- Wash hands thoroughly with soap and water.
  - Wash hands after using the toilet and before handling food (especially for persons with diarrhea).
  - Wash hands after every diaper change and when working with children, even if you are wearing gloves.
- Avoid swimming if experiencing diarrhea (essential for children in diapers).

Avoid water that might be contaminated.

- Avoid swallowing recreational water (e.g., water in lakes, rivers, swimming pools, water parks).
- Avoid drinking untreated water from shallow wells, lakes, rivers, springs, ponds, and streams.
- Avoid drinking untreated water during communitywide outbreaks caused by contaminated drinking water.
- Avoid drinking untreated water when traveling in countries where the water supply might be unsafe.
- If you are unable to avoid water that might be contaminated, then treat the water.
  - Heat water to a rolling boil for 1 minute.

    OR

    Use a filter that has an absolute pore size of at least 1µm or that has been NSF-rated for cyst removal.
  - Do not rely on cyst inactivation by chlorination or iodination, which are less effective than other methods because they are highly dependent on the temperature, pH, and cloudiness of the water.

Avoid food that might be contaminated.

- Use uncontaminated water to wash all food that is to be eaten raw.
- Avoid eating uncooked foods when traveling in disease-endemic areas.

Avoid fecal exposure during sex.

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