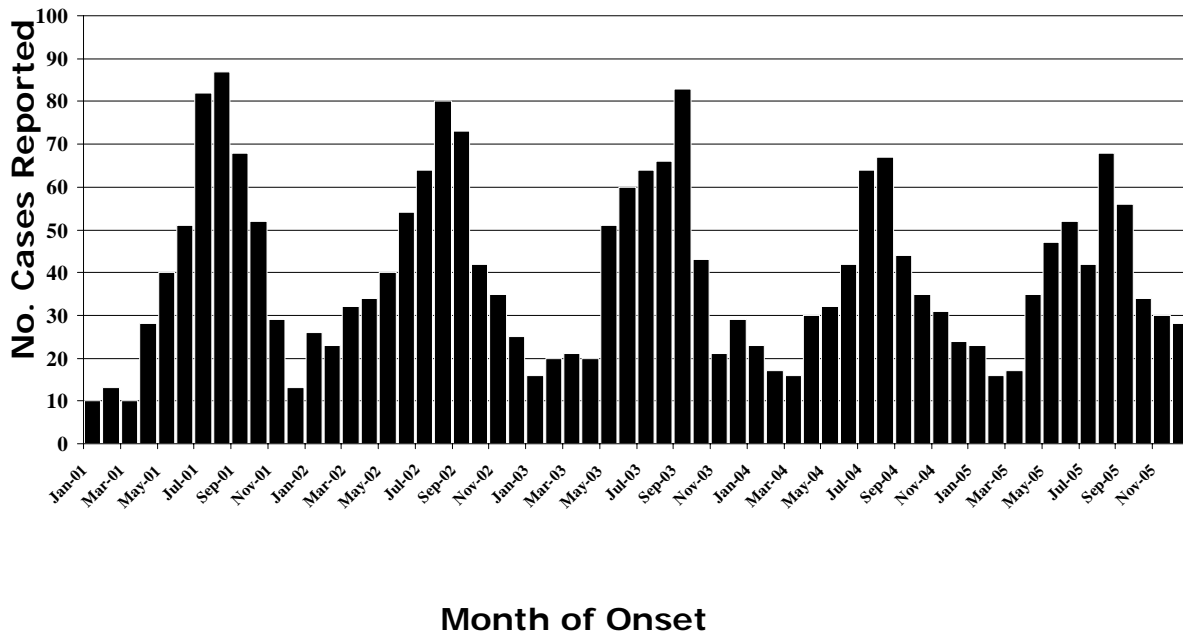


Enteric / Diarrheal Diseases

Distribution of Reported *Salmonella* Cases in Oklahoma by Month of Onset, 2001 Through 2005



Campylobacteriosis

2005 Case Total 547
2004 Case Total 594

2005 Rate 15.9 per 100,000
2004 Rate 17.2 per 100,000

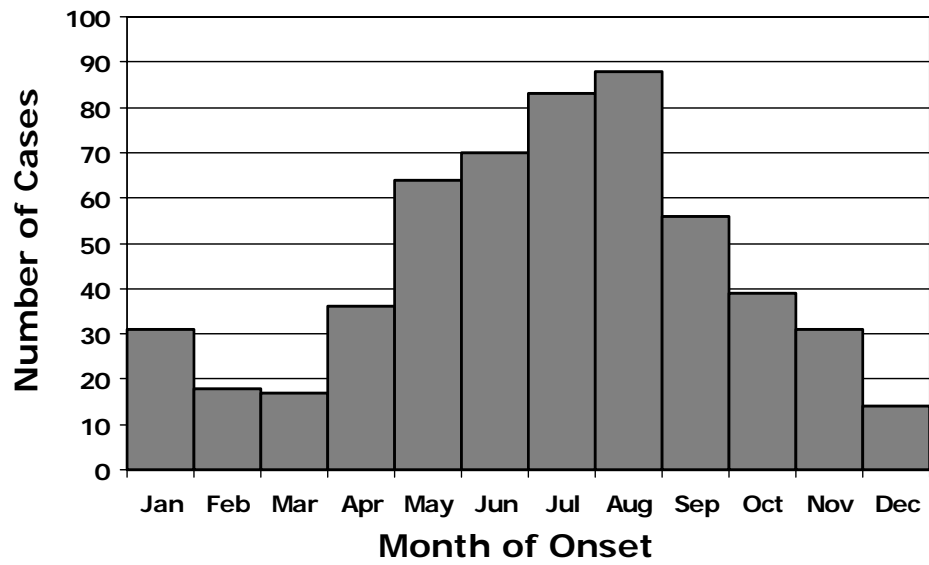
The rate of campylobacteriosis in Oklahoma reached a peak in 2004 after rising for several years, then declining 8% between 2004 and 2005. Sixty-two of 77 counties had cases of campylobacteriosis in 2005. Counties with rates over two times the state rate include Blaine (4 cases, 33.4 per 100,000), Beaver (2 cases, 34.2 per 100,000), Carter (18 cases, 39.5 per 100,000), Murray (5 cases, 39.6 per 100,000), Jefferson (3 cases, 44.0 per 100,000), Love (4 cases, 45.3 per 100,000), Adair (10 cases, 47.3 per 100,000), Pawnee (8 cases, 48.2 per 100,000), Alfalfa (3 cases, 49.1 per 100,000), Harper (2 cases, 56.2 per 100,000), and Tillman (9 cases, 96.9 per 100,000). None of these counties were associated with a known common source of exposure.

Campylobacteriosis has been observed more often in males than in females over the last several years in Oklahoma. In 2005, 245 females (14.0 per 100,000) and 296 males (17.5 per 100,000) with campylobacteriosis were reported. Children less than five years of age were much more likely to become infected with *Campylobacter* (see accompanying graph). However, the rate of disease drops off among older children. The differences in incidence among boys and girls is marked; why this sex difference lessens after age 19 is not presently known. In 2004 a similar pattern was noted, although 2005 differs from the previous year in that incidence in women age 35-54 was slightly higher than in men. As in previous years, rates of campylobacteriosis incidence are much higher in the warmer months (see graph), although the reasons for this are not well understood. Increased outdoor activities including contact with infected animals, as well as consumption of improperly prepared or stored food (e.g., at a picnic) are possible reasons for the perennial increase during the summer months.

Racial information was available for 70.0% of cases. Among those for whom information is available, Native Americans had the highest rate of disease at 12.8 per 100,000, closely followed by whites at 12.7 per 100,000. Asians had the lowest rate (2.1 per 100,000) and blacks were second lowest at 5.4 per 100,000. Hispanics of any race had higher rates of campylobacteriosis, at 18.4 per 100,000. However, as ethnicity information was only obtainable from 46.4% of reported cases, it is possible the actual rate is higher. Because of incomplete ascertainment of these data, rates by race and ethnicity are useful for comparison to each other only.

While most cases of campylobacteriosis are sporadic, one outbreak associated with consumption of raw milk was investigated in Comanche county in 2005. Four confirmed cases and seven symptomatic but unconfirmed (epi-links) shared a common exposure to raw goat and cow milk at two different farms. Both kinds of milk are known to cause campylobacteriosis infections in humans. Because of the overlap in human exposures, an epidemiologic investigation was not able to determine if one or both kinds of milk were implicated.

Reported Number of Campylobacteriosis Cases by Month, Oklahoma, 2005



Parasitic Gastrointestinal Diseases

Three parasitic gastrointestinal diseases are reportable in Oklahoma: cryptosporidiosis, giardiasis, and cyclosporiasis. Parasitic gastrointestinal diseases are associated with diarrhea that may be intermittent and scant, or voluminous, watery stools. The severity of diarrhea varies from individual to individual and may wax and wane or be persistent. Additional symptoms may include weight loss, fever, nausea and vomiting, and abdominal cramps.

Confirmation requires the identification of cysts or trophozoites in a stool specimen. The collection of fecal specimens for ova & parasites (O&P) identification may not be a laboratory test that is routinely performed. Therefore, when a parasitic etiology is suspected, clinicians should request testing for these specific organisms. Clinicians should also request several stool specimens from their patient since oocysts may be passed intermittently and may not be identified from just one stool specimen. A single negative stool specimen does not rule out the diagnosis; three or more at 2 or 3-day intervals may be required. Cases of cryptosporidiosis and giardiasis were reported to the OSDH-CDD in 2004.

Cryptosporidiosis

2005 Case Total 46
2004 Case Total 22

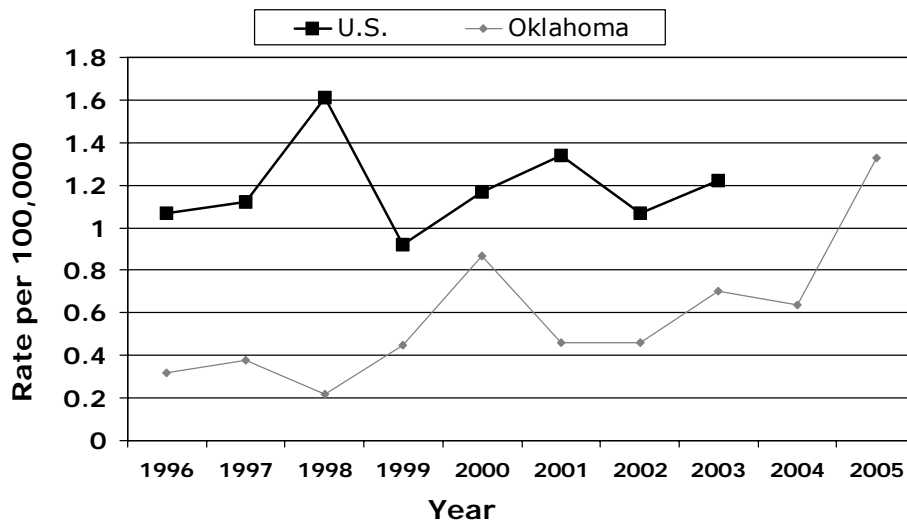
2005 Rate 1.33 per 100,000
2004 Rate 0.64 per 100,000

Twenty-two cases of Cryptosporidiosis were reported to the OSDH-CDD in 2004, which represents an 8% decrease compared to the number of cases reported in 2003. The incidence rate in Oklahoma was 0.64 per 100,000 population, which was slightly higher than the previous five-year (1999-2003) rate of 0.58 per 100,000. Cases occurred among residents of 13 counties (17%). The highest number of cases was reported from Muskogee (3), Oklahoma (3), and Payne County (3). One to two cases were reported from the following counties: Cleveland (2), Delaware (1), Garvin (1), Grady (1), Haskell (1), McClain (1), McIntosh (2), Pittsburg (2), Pottawatomie (1), and Tulsa County (1).

The age range of cryptosporidiosis cases was 1 to 80 years with a median age of 34 years. The majority of cases occurred among males compared to females; 16 cases (73%) were reported among males and 6 cases (27%) among females resulting in gender-specific incidence rates of 0.94 per 100,000 and 0.34 per 100,000, respectively. Thirteen cases (59%) reported their racial background as white, 4 cases (18%) reported their race as Native American, and 3 cases (14%) reported their race as black. Racial background was unknown for 2 cases.

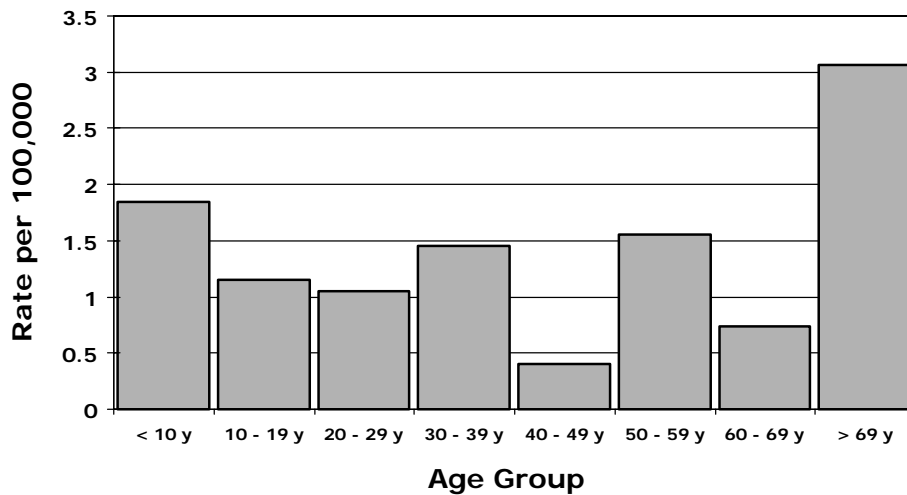
No cases died due to cryptosporidiosis, however, 7 cases (32%) required hospitalization. Persons who were hospitalized ranged in age from 8 to 76 years with a median age of 55 years. Case investigations conducted by local county health department public health nurses did not reveal any outbreaks caused by cryptosporidiosis. No cases were identified in high-risk settings such as attendees or employees of childcare settings, direct patient care providers, or food handlers.

Cryptosporidiosis Incidence Rate by Year, Oklahoma and U.S., 1996 - 2005



* Finalized national cryptosporidiosis data for 2004 and 2005 was not available during the publication of this summary.

Rate of Reported Cryptosporidiosis Cases by Age Group, Oklahoma, 2005



Giardia

2005 Case Total 197
2004 Case Total 166

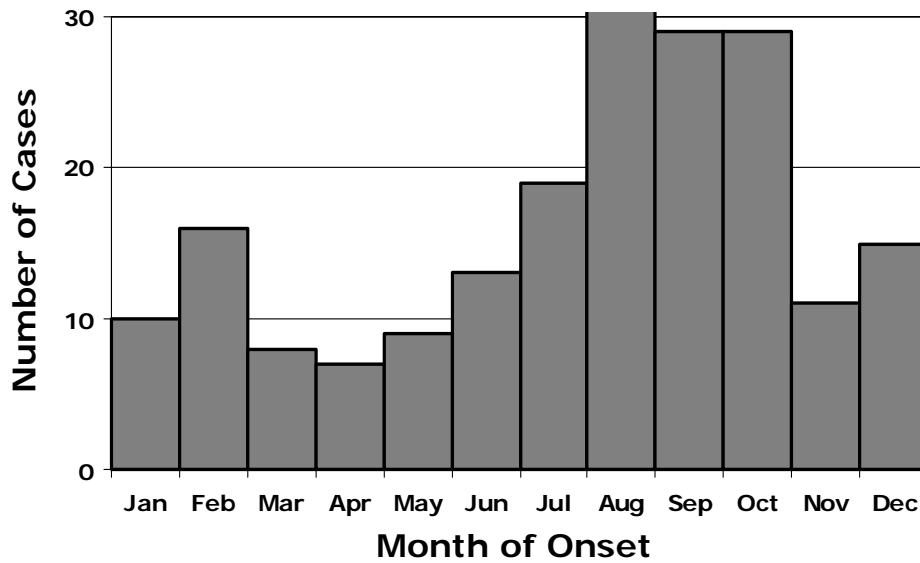
2005 Rate 5.71 per 100,000
2004 Rate 4.81 per 100,000

A total of 197 cases of *Giardia* were reported in 2005 to the OSDH representing an 18.7% increase from 2004. *Giardia* was removed from the state list of reportable diseases in 2000 and added to the list again in 2002. From 1994 to 2000, the number of reported cases decreased and tapered off to a steady yearly rate of cases that has continued. The most common species of *Giardia* reported in Oklahoma is *Giardia lamblia*. The incidence of *Giardia* in 2005 was 5.71 cases per 100,000 population. Cases occurred among residents of 42 counties (54.5%). Counties with the highest rates of *Giardia* cases were Harmon County (30.5 per 100,000) Major County (26.5 per 100,000) and Garfield County (24.2 per 100,000). The majority of cases were reported in Tulsa County (17.2%), Oklahoma County (15.7%), and Cleveland County (10.6%). Fifty-five percent of cases were reported in the months of July through October. In 2005, *Giardia* peaked in August with 31 (15.7%) cases. Fourteen cases were hospitalized (7.5%), with an equal number of males and females. No cases were known to have died as a result of *Giardia* in 2005.

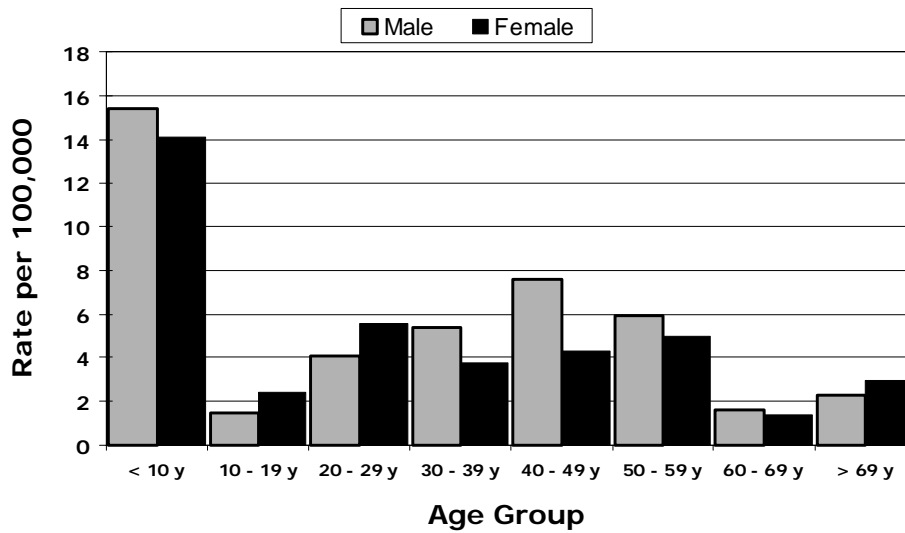
Risk factors for acquiring *Giardia* include drinking or swallowing water or food that is contaminated with sewage or feces from humans or animals. Children who attend daycare centers, child care workers, international travelers, and persons who drink or swallow unfiltered or untreated water are at highest risk for being infected with *Giardia*.

In 2005, cases ranged in age from 10 months to 94 years with a median age of 26 years. Those under the age of 10 years had the highest rate of cases at 15.2 per 100,000. The incidence of disease among men and women were similar (5.96 per 100,000 and 5.13 per 100,000, respectively). Similar incidence rates of giardiasis existed when looking at men and women according to stratified age groups, with higher rates observed among children less than 10 years and adults aged 20 to 57 years old. With reference to racial background, the highest rate of disease occurred in those persons reporting their racial background as Asian (4.28 per 100,000; N=2) followed by blacks at 4.22 per 100,000 (N=11), whites at 3.61 per 100,000 (N=95), and Native American at 3.29 per 100,000 population (N=9). Two cases were reported in food handlers (1%), and twelve cases were associated, attend or work, with a child care setting (6%). No outbreaks of giardiasis were identified in 2005.

Reported Number of *Giardia* Cases by Month, Oklahoma, 2005



Rate of Reported *Giardia* Cases by Age Group and Gender, Oklahoma, 2005



Enterohemorrhagic *Escherichia Coli* Infection and Hemolytic Uremic Syndrome

2005 Case Total 40
2004 Case Total 29

2005 Rate 1.16 per 100,000
2004 Rate 0.84 per 100,000

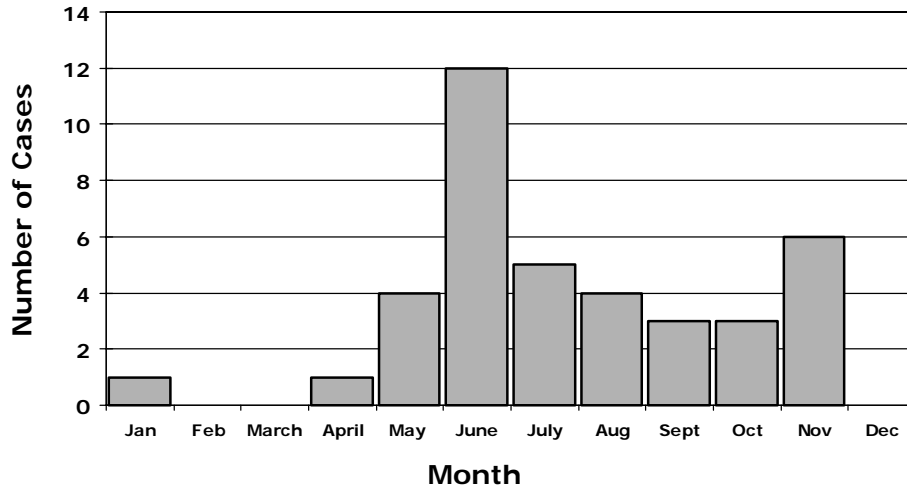
The disease category of enterohemorrhagic *Escherichia Coli* (EHEC) includes infection with species of this bacteria which produce shiga toxin, notably *E. coli* O157:H7, along with several other less common types. Ninety percent (36/40) of Oklahoma's EHEC cases were caused by *E. coli* O157:H7 in 2005. The number of cases of EHEC rose 38% between 2004-2005. Twenty-one of 77 counties had cases of EHEC in 2005. Counties with both a high rate of disease and a high number of cases (that is, more than one or two cases) include Rogers (4 cases, 5.7 per 100,000) and Pittsburg (6 cases, 13.7 per 100,000). Upon investigation, no common exposures were found in either county.

EHEC infection occurred in equal proportions among males and females in 2005 (20 cases each). As in previous years, children continue to be at much higher risk of infection with EHEC. Children less than five years of age had a rate of disease of 5.1 per 100,000, which is over four times the rate for all ages. Rates of EHEC infection incidence are much higher than in the warmer months (see graph), although the reasons for this are not well understood. Increased outdoor activities including contact with infected animals, as well as consumption of contaminated foods are possible causes for this yearly increase. Failure to wash hands after contact with animals, for example, after visiting a petting zoo, is a well known risk factor for EHEC infection.

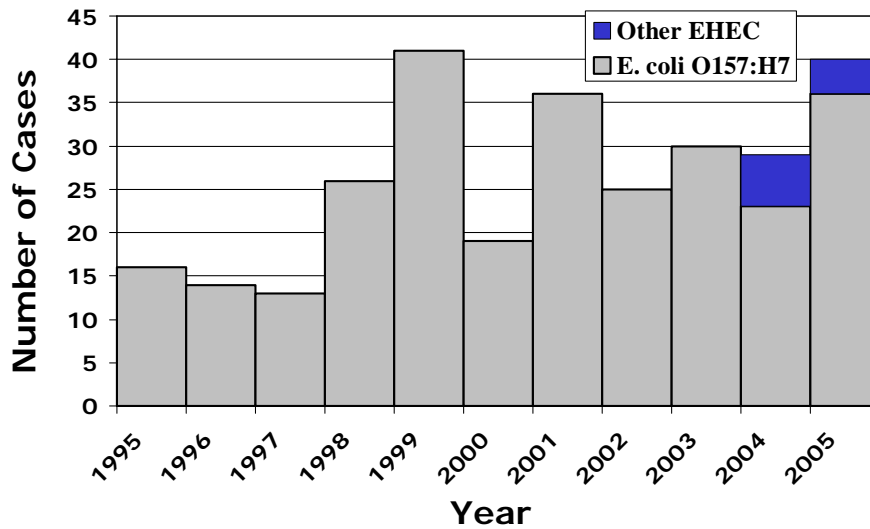
Racial information was available for 29 of 40 (72.5%) of cases. Twenty-eight cases reported their race as white, while the remaining case was Native American. Information regarding Hispanic ethnicity was available for 21 of 40 (52.5%) cases. Of these, all were non-Hispanic. Because of incomplete ascertainment of these data, rates by race and ethnicity are useful for comparison to each other only.

Hemolytic Uremic Syndrome (HUS) follows *E coli* O157:H7 infection in approximately 8% of infections; the rate of HUS may be different following infection with other strains of EHEC. Other infections, such as *Shigella dysenteriae*, as well as non-infectious causes, may lead to HUS. In 2005, five cases of HUS were reported to OSDH. All cases were female, and their ages ranged from 1 to 69 years. All were white, and one was Hispanic; Hispanic ethnicity status was unknown for one case. *E. coli* O157:H7 preceded HUS in two cases, and another species of EHEC preceded HUS in one case. In the other two cases, the preceding infection, if any, was unknown. One case each of HUS had onsets in the months of January, March, May, September, and October.

Incidence of Reported EHEC Cases by Month of Onset, Oklahoma, 2005



Reported Number of *E. coli* O157:H7 and other Enterohemorrhagic *E. coli* (EHEC) Cases by Year, Oklahoma, 1995-2005



Salmonellosis

2005 Case Total 448
2004 Case Total 422

2005 Rate 13.0 per 100,000
2004 Rate 12.4 per 100,000

Although the rate of *Salmonella* infections in Oklahoma increased by six percent from 2004 to 2005, the rates of salmonellosis have been equal to or slightly lower than the U.S. average for the last six years (see graph, next page). In 2005, fifty-nine of 77 (76.6%) Oklahoma counties had at least one case of salmonellosis. Counties with at least two cases and a disease rate two or more times higher than the state average included Adair (42.8 per 100,000; 9 cases), Alfalfa (32.7 per 100,000; 2 cases), Beckham (30.3 per 100,000; 6 cases), Jefferson (29.3 per 100,000; 2 cases), Le Flore (31.2 per 100,000; 15 cases), McIntosh (30.8 per 100,000; 6 cases), and Okfuskee (33.9 per 100,000; 4 cases).

Salmonella infections typically exhibit a seasonal distribution with higher incidence in the warmer months. The largest number of cases occurred in August (n=68, 15.2% of cases) and September (n=55, 12.3% of cases). May and June had 47 and 52 cases each (10.5 and 11.6% respectively), and July had 42 cases (9.4% of cases). The fewest number of cases occurred in February (16 cases, 3.6% of cases).

The median age of salmonellosis was 23 in 2005. Following a trend seen in earlier years, rates of disease were slightly higher in females than males, but not among all age groups. Overall, the rate of salmonellosis in females in 2005 was 13.6, and 12.2 in males. As can be seen in the accompanying graph, rates were more than twice as high in males age 5-14 than in females of that age. In women 25-39, this trend is reversed, with females having rates over twice that of males.

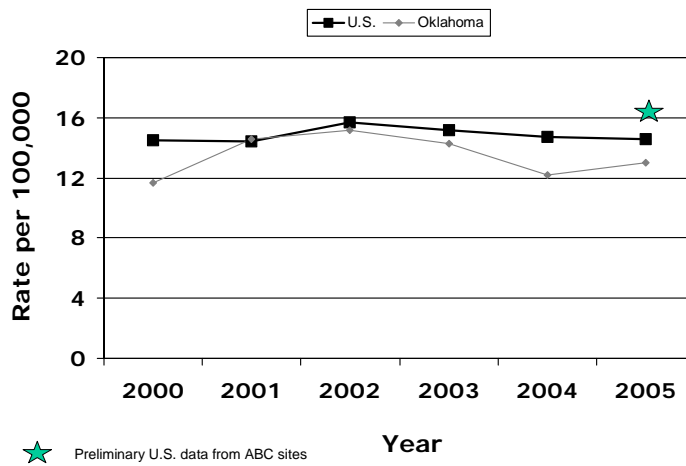
Racial information was obtained on 67.2%, and ethnic information for 58.7%, of reported cases. Asians, and Hispanics of any race, had higher rates of salmonellosis than other groups; at 17.1 and 17.3 per 100,000, respectively, compared to 9.2 for whites, 9.2 for blacks, and 10.3 for Native Americans. Because of incomplete ascertainment of these data, rates by race and ethnicity are useful for comparison to each other only.

Clinical isolates of *Salmonella* are required to be submitted to the OSDH PHL for serotyping. Fifty-four different serotypes were identified in 2005, compared with 45 in 2004 and 60 in 2003. In 2003 *Salmonella* newport and *Salmonella* typhimurium were the most common serotypes, with 79 isolates of each. Overall, these two serotypes accounted for 40.8% of all isolates serotyped at the OSDH PHL. The second most common serotype was *S. enteritidis*, of which there were 41 (10.6% of all isolates in 2005 as compared to 5.3% of the total in 2004).

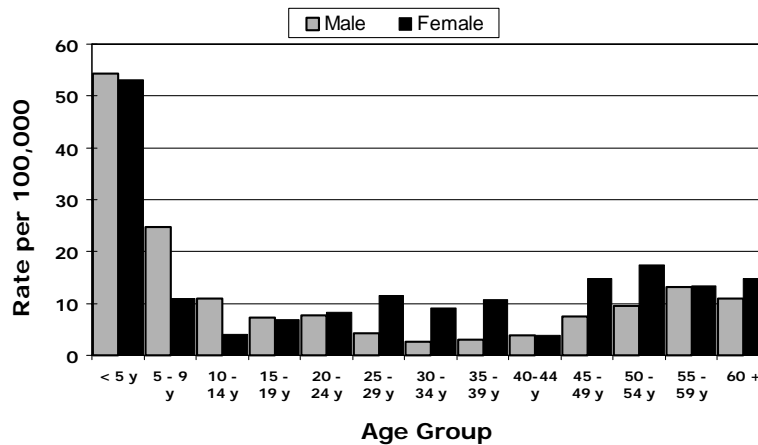
A public health investigation is conducted on each reported case by the county health department CDN. The CDN gathers information in risk factors for disease, attempts to find related cases, and educates the client on disease prevention measures. The majority of cases were sporadic, with no major outbreaks detected.

High-risk settings for the transmission of salmonellosis include food preparation, child daycare settings, and nursing homes. In 2005, food handler status was gathered from 149 of the 448 reported cases. Four of these cases were food handlers. Daycare setting affiliation, including attendance, employment, and family members of an attendee, were collected from 117 of 448 cases. Twenty cases were known to attend daycare, while two cases worked in a daycare setting, and two were family members of children who attended daycare.

Salmonellosis Incidence Rate by Year, Oklahoma and U.S., 2005



Rate of Reported Salmonellosis Cases by Age Group and Gender, Oklahoma, 2005



Shigellosis

2005 Case Total 937
2004 Case Total 724

2005 Rate 27.15 per 100,000
2004 Rate 20.98 per 100,000

In 2005, a total of 937 cases of shigellosis were reported, an increase of 22.7% from 2004. Of the cases reported in 2005, 578 (61.7%) were laboratory confirmed cases and 359 (38.3%) were probable cases or epidemiologically linked cases. *Shigella* infections are reportable in Oklahoma, and isolates of *Shigella* species are required to be forwarded to the OSDH-PHL for confirmation and speciation. *Shigella sonnei* is the most commonly identified *Shigella* species in the U.S. and totaled 98.6% (N=569) of the isolates speciated at the PHL in 2005. *S. flexneri* comprised the other species identified (n=8, 1.4%).

Persons of every age, sex, and race are susceptible to disease caused by *Shigella* species. However, children under 10 have historically had the highest rate of cases reported. In 2005, 343 cases (36.6%) occurred in children less than five years of age (103.87 per 100,000 population), and another 254 (27.1%) occurred in children between five and nine years of age. The ages of cases reported ranged from 16 days to 98 years. Fifty-seven percent of the cases were female and 42% were male (gender was unknown for 1.3% of cases reported). For cases with a reported race, the highest incidence rate occurred in blacks (44.45 cases per 100,000 population), followed by those persons reporting their race as Native American (26.72 per 100,000 population), white (22.83 per 100,000 population), and Asian (10.69 per 100,000).

In 2005, shigellosis cases were reported in 46 counties in Oklahoma. Three counties accounted for 62.7% of the total number of reported cases: Oklahoma (49.5 cases per 100,000 population), Pottawatomie (215.2 cases per 100,000 population), and Cleveland (57.7 cases per 100,000 population). The large numbers of cases reported in 2005 are primarily the result of transmission within child care settings (CCS) and among members of the same household. Data regarding CCS associated cases was available for 71.8% (n=673) of reported cases. For cases with a known exposure history, 64.3% (n=433) of cases reported an association to a CCS. Of those cases, 276 (63.7%) were attendees, 20 (4.6%) were employees, and 137 (31.6%) had a family member that attended a CCS. Cases of shigellosis were also reported in persons associated with other high-risk settings including food handlers (2%, N=14). Two cases (0.02%) occurred in connection with long term care facilities in two separate counties.

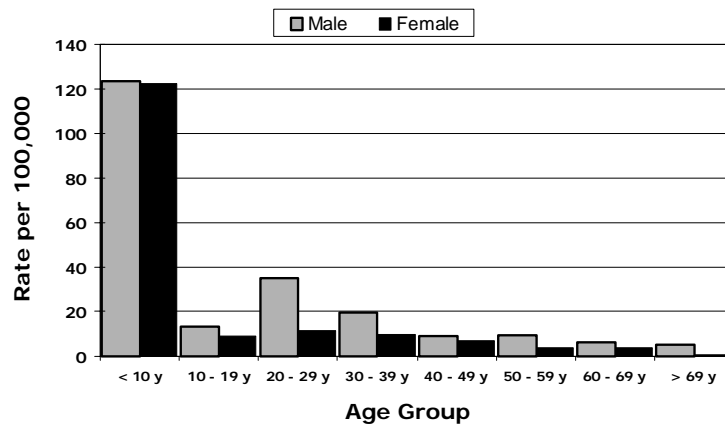
Shigellosis is typically a mild, self-limiting enteric disease with symptoms ranging from asymptomatic infections to severe disease. In 2005, 83 cases (8.9%) required hospitalization[#], and no deaths were reported. Because of the low infectious dose of 10-100 organisms required to cause disease, a high secondary attack rate is normally seen in high-risk settings such as foodservice establishments, child care centers, long-term care facilities, and health care settings. Appropriate antibiotic therapy is recommended for persons in these settings to hopefully lessen the severity of illness and reduce the length of bacterial

shedding. Public health interventions include inspections of these facilities by county health department sanitarians when outbreaks occur.

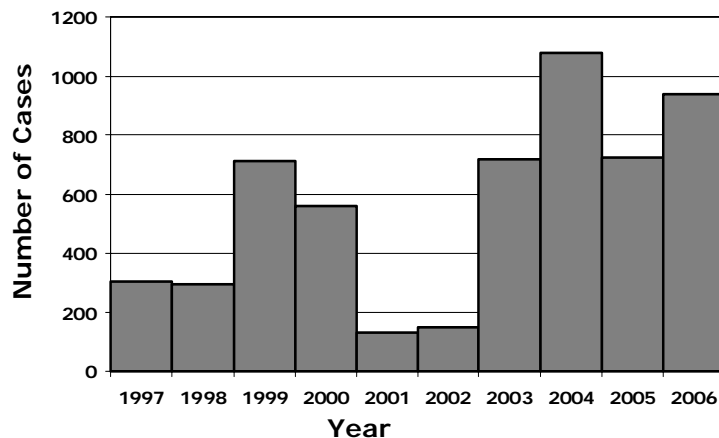
Measures to control transmission begin with increased efforts in rapid identification of suspects and removing them from high-risk settings while diarrhea is present. Other measures include promotion of frequent hand hygiene and environmental cleaning because the organism can persist on inanimate objects for extended periods of time. A vaccine is not available, and immunity after infection is thought to be temporary, possibly contributing to the wide fluctuation in the number of cases per year.

Hospitalization status unknown for 126 cases

Rate of Reported *Shigella* Cases by Age Group and Gender, Oklahoma, 2005

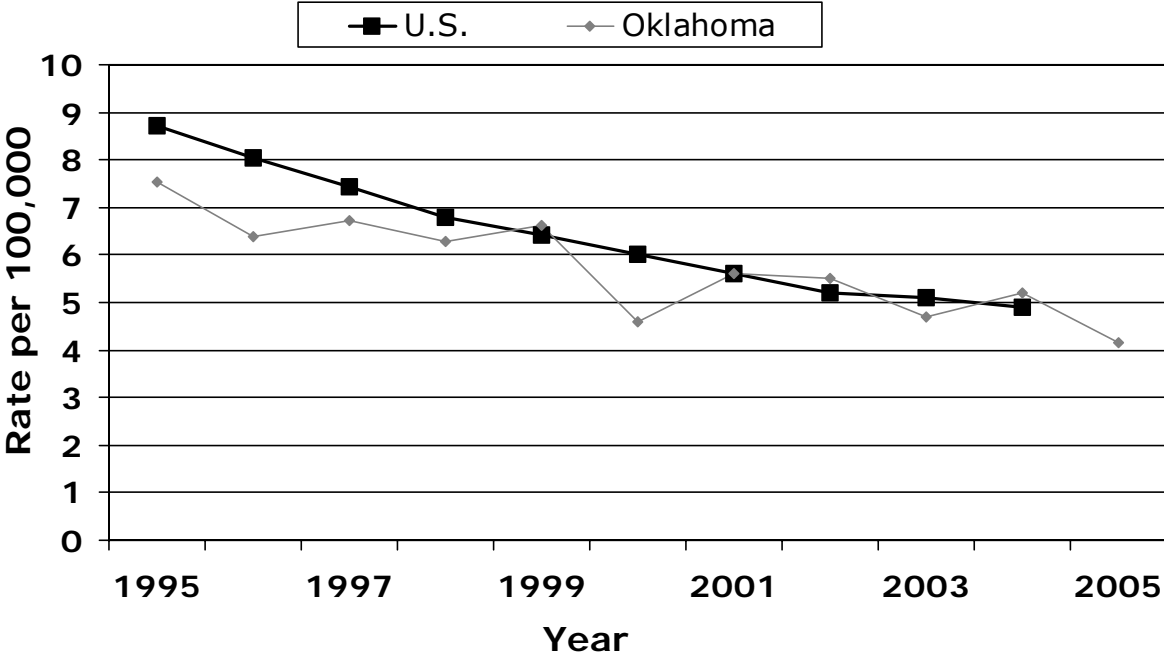


Reported Number of *Shigella* Cases by Year, Oklahoma, 1997-2005



General Communicable Diseases

Tuberculosis Incidence Rates by Year, Oklahoma and U.S., 1995-2005



Finalized U.S. Tuberculosis numbers for 2005 not available at the time of this publication

Legionellosis

2005 Case Total 10
2004 Case Total 24

2005 Rate 0.3 per 100,000
2004 Rate 0.7 per 100,000

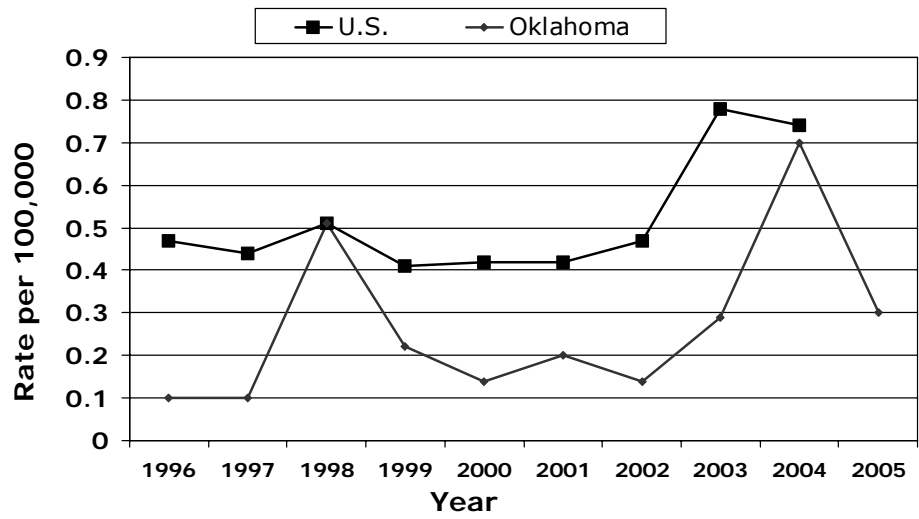
Ten cases of legionellosis were reported in 2005, a 58.3% decrease from 24 cases in 2004. An outbreak of legionellosis associated with a hotel hot tub and pool caused 2004 to be the year with the highest number of cases reported in the past 10 years.

Cases occurred among residents of 10 Oklahoma counties. The highest number of cases was reported from Tulsa County (3), with an incidence of 0.5 per 100,000. One to two cases were reported from Creek (1), Jackson (1), Muskogee (1), Oklahoma (2), Pottawatomie (1), and Washington (1) counties. The highest rate of legionellosis was from Jackson County with 3.5 per 100,000. The cases ranged from 40 years of age to 75 years of age with a mean age of 54.6 years. The highest age-specific incidence rate occurred in the 50 to 59 year old group with 1.29 per 100,000 representing 50% of the cases.

Seventy percent of cases were males (0.41 per 100,000); the incidence for males was 2.4 times higher than the rate among females (0.17 per 100,000). All of the cases reported their racial background as white. Eighty percent of cases reported having no Hispanic ethnicity, while Hispanic ethnicity was unknown for two cases. Forty percent (4/10) of cases were hospitalized; hospitalized status was unknown for two cases. There were no deaths due to legionellosis reported in 2005. Sixty percent (6/10) of cases were confirmed to be *L. pneumophila* serogroup 1 by urinary antigen testing. Two cases were confirmed by demonstration of a four-fold rise in antibody titer levels between acute and convalescent serology specimens, one case was confirmed by culture from bronchial fluid, and one case was confirmed by culture and isolation of *L. pneumophila* from a bronchoalveolar fluid specimen. The urinary antigen test continues to predominate the other diagnostic tests available because it provides rapid results for infections with *L. pneumophila* serogroup 1.

Laboratory reports positive for *L. pneumophila* are investigated by the CDD to determine if the case is sporadic or part of an outbreak. No outbreaks of legionellosis were identified in Oklahoma during 2005.

Legionellosis Incidence Rate by Year, Oklahoma and U.S., 2005



* Finalized national legionellosis data for 2005 was not available during the publication of this summary.

Malaria

2005 Case Total 12
2004 Case Total 10

2005 Rate 0.29 per 100,000
2004 Rate 0.29 per 100,000

Twelve cases of malaria were reported in 2005 representing a 20% increase from the number of cases reported in 2004. All of the cases reported travel to endemic areas during their exposure period including Central America and Africa. Cases were reported among residents of four counties: Oklahoma (7), Tulsa (3), Payne (1) and Cleveland (1). The mean age of cases was 33 years with cases ranging in age from 23 to 44 years. The majority (66.7%) of cases were men with a rate of 0.47 per 100,000, which is two times higher than the rate among females (0.23 per 100,000). The age-specific rates for malaria are as follows: 0.84 per 100,000 among those 20-29 years (N=4), 1.04 per 100,000 (N=5) among those 30-39 years, and 0.59 per 100,000 (N=3) among those 40-49 years. Cases reporting their racial background as black had the highest incidence of malaria with 3.07 per 100,000 population. Twenty-five percent of cases (0.11 per 100,000, N=3) reported their racial background as white; racial background was unknown for 1 case

Fifty-eight percent of the cases were hospitalized and no deaths were reported for 2005. Seventy-five percent of the cases had *Plasmodium falciparum* with 25% having *P. vivax*. International travel was associated with all of the twelve cases. Eighty-percent of cases reported travel to the West African region, Sierra Leone, Nigeria, or Ghana, during their exposure period. One case traveled to Ethiopia and one case traveled to Guatemala. Travel history was unknown for two cases. Only one case reported taking the recommended malaria prophylaxis medications during their international travel to malaria-endemic areas.

Malaria is a reportable disease in Oklahoma. Confirmation of malaria is accomplished through microscopic identification of the parasites in the patient's blood. Thick and thin slides prestained with Giemsa or Giemsa-Wright stain are required for examination. Slides from suspected malaria cases must be sent to the OSDH-PHL for confirmation (*310 O.A.C. § 315 Subchapter 1 et. seq.*).

Prevention of malaria includes appropriate prophylaxis, use of insect repellent containing DEET (N, N-diethyl-m-toluamide), and use of mosquito nets treated with permethrin, which may also be used on clothing and other items. Use of flying mosquito repellent is also advised. See the CDC Travelers' Health website at <http://www.cdc.gov/travel/index.htm> for more details and recommendations on prophylaxis and immunizations to prevent a variety of travel-related diseases.

Additional Resources

1. CDC's Malaria website <http://www.cdc.gov/malaria/facts.htm>
2. OSDH Malaria Fact Sheet <http://www.health.ok.gov/program/cdd/malaria.htm>