

Campylobacteriosis

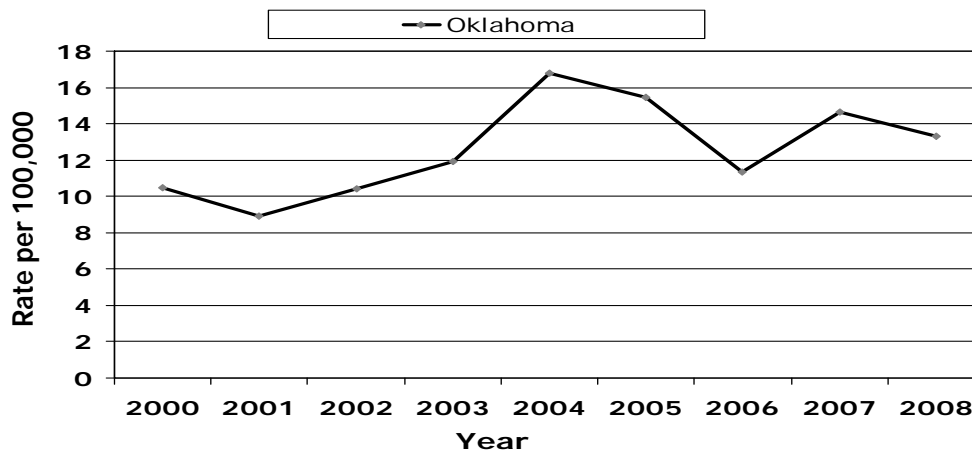
2008 Case Total	486	2008 Rate	13.3 per 100,000
2007 Case Total	530	2007 Rate	15.4 per 100,000

Campylobacteriosis is a diarrheal illness caused by *Campylobacter* species and is characterized by an acute onset of diarrhea, sometimes bloody, abdominal cramps, fever, malaise, nausea, and sometimes vomiting. In 2008, 486 cases of campylobacteriosis were reported in Oklahoma, an 8% decrease from the 530 cases reported in 2007. Of the 486 cases reported, 57 (12%) were identified during investigations conducted by county health department public health nurses as an ill contact to a confirmed case. Since 2000, the annual incidence rate (IR) of campylobacteriosis has steadily increased, ranging from 8.9 to 16.8 cases per 100,000 peaking in 2004 with 591 cases (refer to graph). A seasonal trend for campylobacteriosis was seen with the highest number of cases occurring during the months of June through September (N=259, 53%).

The highest rate of cases occurred in Beaver County (IR=133.4 per 100,000, N=7) with 5 of the cases occurring within one family. Other counties with high rates included Adair County (IR=45.9, N=10) and Jackson County (IR=43.6, N=11). Of the cases reported in 2008, 17 (3.5%) reported travel outside of the United States during the incubation period of their illness, 40 (8.2%) reported drinking water from a private well, 39 (8%) reported visiting, working, or living on a farm, 23 (4.7%) reported contact with cattle, and 18 (3.7%) reported consuming unpasteurized (raw) milk. Ninety-five (19.5%) cases were associated with a high-risk setting (childcare setting, school, long term care facilities, food service, etc.). No outbreaks due to *Campylobacter* were identified in Oklahoma in 2008.

The age range of cases was from 10 days to 87 years with a median of 28 years of age. When the cases are grouped by age, the highest IR is in children less than ten years of age (29.3 per 100,000). The incidence rate per 100,000 population for males was higher (15.7) than females (10.9) in 2008. Cases who report Hispanic or Latino ethnicity have a higher IR (16.2 per 100,000) than those cases who were not Hispanic or Latino (10.5 per 100,000). In cases that reported one race, the highest IR was for Native Hawaiian or other Pacific Islander (25.9 per 100,000) although only one case was reported in 2008. Individuals who reported their race as White had the second highest IR (13.2) followed by American Indians or Alaskan Natives (12.4), African Americans (4.1) and Asians (IR = 1.6). Eighty-one (17%) cases were hospitalized for campylobacteriosis, with no deaths due to this disease in 2008. The OSDH PHL received 303 isolates to confirm *Campylobacter* and serotype serogroup identification in 2008 representing 62% of the reported cases. Of these isolates, 64% were identified as *Campylobacter jejuni*, 18% as *C. jejuni* var. *doylei*, 6.3% as *C. coli*, and 12% were non-viable.

Campylobacteriosis Incidence Rate by Year, Oklahoma, 2005 -2008



Cryptosporidiosis

2008 Case Total	238	2008 Rate	6.5 per 100,000
2007 Case Total	216	2007 Rate	6.3 per 100,000

Two hundred thirty-eight cases of cryptosporidiosis were reported to the OSDH resulting in an incidence rate of 6.5 per 100,000. The number of cases reported in 2008 was a 9% increase compared to the 216 cases reported during 2007. Among cases in 2008, predominant symptoms included diarrhea (99.5%, N=237), abdominal cramps (89.1%, N=189), watery diarrhea (85.8%, N=176) and weight loss (64.8%, N=151). The duration of diarrhea ranged from one day to 180 days with a median of 10 days; the median number of loose stools within a 24 period was 6 with a range from one to 60. The incidence rate of cryptosporidiosis in those under the age of 10 (16.3 per 100,000 population) was between 1.6 and 13.6 times greater than across all other age groups (refer to table). Twenty-five (11%) cases reported working in or attending a childcare setting.

A seasonal trend was observed in 2008 with the majority of cases (69%) reporting a symptom onset during the months of August and September. The highest incidence rates of cryptosporidiosis were in McClain (77.2 per 100,000 population) and Cleveland Counties (29.2 per 100,000 population) accounting for 39.9% of cases statewide. Investigations conducted by the OSDH and county health departments determined cases in these counties reported swimming in several public and private swimming pools or splash pads located in Cleveland County. Public bathing place inspections were conducted and educational materials regarding prevention of diarrheal illnesses were provided to public pool operators. For more information about preventing cryptosporidiosis and other waterborne diseases, visit <http://ads.health.ok.gov>.

Summary Statistics Cryptosporidiosis in Oklahoma, 2008

	Number (%)	Rate/100,000
<u>Gender</u> (N=238)		
Female	134 (56.3%)	5.6
Male	104 (43.7%)	5.6
<u>Age</u> (median and range)	Median = 18.5 years Ranged: 5 months – 83 years	--
<u>Age Groups</u>		
Less than 10 years	84 (35.3%)	16.3
10-19	48 (20.1%)	9.8
20-29	39 (16.3%)	7.2
30-39	30 (12.6%)	6.6
40-49	17 (7.1%)	3.5
50-59	6 (2.5%)	1.3
60 years or older	13 (6.7%)	1.2
<u>Race</u> (N=226)		
White	203 (89.8%)	7.1
Black or African American	8 (3.5%)	2.8
American Indian or Alaskan Native	11 (4.8%)	3.8
Asian	1 (0.4%)	1.6
Two or more Races	3 (1.3%)	2.0
<u>Ethnicity</u> (N=219)		
Hispanic	16 (7.3%)	5.7
Hospitalized (N=238)	20 (8.4%)	--

Dengue Fever

2008 Case Total	2	2008 Rate	0.05 per 100,000
2007 Case Total	3	2007 Rate	0.09 per 100,000

Dengue fever is a reportable condition in Oklahoma. Dengue fever is endemic in most of the countries in the tropics including those in Southeast Asia, Central America, and Western Africa. Cases of dengue fever are generally acquired outside of the US (imported or travel-associated), but autochthonous cases have been identified in Texas near the Mexico border as recently as the summer of 2005.

Dengue fever is transmitted through the bite of an infected mosquito. Differential diagnosis includes chikungunya, other arboviral infections, influenza, measles, rubella, malaria and other systemic febrile illness. Symptoms include fever, intense headache, myalgia, arthralgia, eye pain, vomiting and a generalized maculo-papular rash.

In 2008, 4,681 cases of dengue hemorrhagic fever and 24 cases of dengue fever were reported from the countries in the English-, French- and Dutch- speaking Caribbean. In Oklahoma, two cases of dengue fever were reported in persons who had visited the Caribbean in 2008. This article summarizes the epidemiologic, clinical and laboratory information from the investigation of Oklahoma's two cases.

Case One: The first reported case of dengue fever in an Oklahoma resident was a 50 year-old female from Woodward County. The individual visited St. Barthelemy Island in the Caribbean during February 2008. One day after returning to Oklahoma, the individual developed a fever, a macular rash, anorexia, diarrhea, myalgia, nausea and vomiting. The rash covered her extremities as well the palms of her hands and the soles of her feet. Additional symptoms were dehydration and bilateral neuropathy in all extremities. The patient presented to an area emergency department for evaluation where dengue fever was suspected based on clinical history and recent travel to the Caribbean. Dengue fever was confirmed by the detection of IgM antibodies.

Case Two: The second reported case of dengue fever in an Oklahoma resident was a 54 year-old female from Tulsa County. The individual visited St. Maarten during November 2008 for seven days. Two days after returning to Oklahoma, the individual developed a fever (max measured temperature = 102°F), retro-orbital pain, anorexia, backaches, chills, headaches, myalgia and severe fatigue. Approximately five days after symptom onset, the patient developed a macular rash on all areas of her body that lasted approximately three days; a petechial rash then developed on her ankles that lasted five days. The patient was evaluated by a physician five days after symptom onset where dengue fever was suspected based on clinical and travel history. IV fluids were administered and the patient was sent home with instructions for management of symptoms. Dengue fever was confirmed by serologic testing where IgM antibodies were detected. During the case investigation conducted by the Acute Disease Service, the patient recalled receiving several mosquito bites on at least one occasion during her trip to St. Maarten.

Prevention of dengue fever may be achieved by routine use of an insect repellent containing 20-30% DEET (N, N-diethyl-m-toluamide) when visiting or residing in an endemic area along with sleeping indoors with screened windows or mosquito netting protection. Neither case reported wearing insect repellent or taking precautions to prevent mosquito bites. The CDC Division of Vectorborne Infectious Diseases website has recommendations, news and updates for travelers and clinicians regarding dengue fever at <http://www.cdc.gov/NCIDOD/DVBID/dengue>.

Ehrlichiosis

2008 Case Total	121	2008 Rate	3.3 per 100,000
2007 Case Total	106	2007 Rate	3.1 per 100,000

One hundred twenty-one cases of ehrlichiosis were reported to the OSDH during 2008 resulting in an incidence rate of 3.3 per 100,000 population. The number of cases reported in 2008 is a 14% increase compared to the number of cases reported in 2007. There are two forms of human ehrlichiosis that primarily occur in the U.S., human monocytic ehrlichiosis (HME) and human granulocytic anaplasmosis (HGA). HME is the most common form of ehrlichiosis reported in Oklahoma. Eastern Oklahoma had higher incidence rates of ehrlichiosis due to its higher tick population. The counties with the highest rates of disease were Latimer county (28.41 per 100,000), followed by Craig county (26.43 per 100,000), then Pittsburg county (24.38 per 100,000 population). The majority of the cases reported occurred during the warmer months of the year. Eighty-eight percent of reported cases in Oklahoma occurred during the months of May through September. Thirty-eight percent of cases required hospitalization; no deaths due to ehrlichiosis were reported in 2008.

Serologic testing is the most widely available and frequently used laboratory method for diagnosis. It is important to collect both IgM and IgG antibody titer levels. Collections of acute (within a week of onset) and convalescent (2 to 4 weeks later) specimens are important to evaluate titer changes and confirm diagnosis. A single specimen is generally not diagnostic of an acute infection and may indicate past exposure. Diagnosis is confirmed by a four-fold change in antibody titers. Treatment for ehrlichiosis should be initiated before lab confirmation, when there is high suspicion of tickborne illness, to reduce the severity of disease. Doxycycline is the primary drug of choice for the treatment of ehrlichiosis.¹

Demographic and Clinical Summary of Reported Ehrlichiosis Cases, Oklahoma, 2008, (N=121)

	Frequency (%)	Rate/100,000
Gender		
Male	74 (61%)	4.11
Female	47 (39%)	2.55
Age	Median 38 Years (Range 11 months-79 Years)	--
Hospitalization	46 (38%)	--
Race		
White	89 (75%)	3.13
Native Hawaiian/Pacific Islander	1 (1%)	25.89
Native American/Alaska Native	20 (17%)	6.86
Asian	1 (1%)	1.59
2 or more Races	7 (6%)	4.72
Symptoms		
Fever	119 (98%)	--
Headache	99 (85%)	--
Myalgia	95 (83%)	--
Anorexia	83 (75%)	--
Rash	48 (42%)	--
Reported Exposures		
Exposed to a Wooded Area	98 (88%)	--
Tickbite	76 (78%)	--

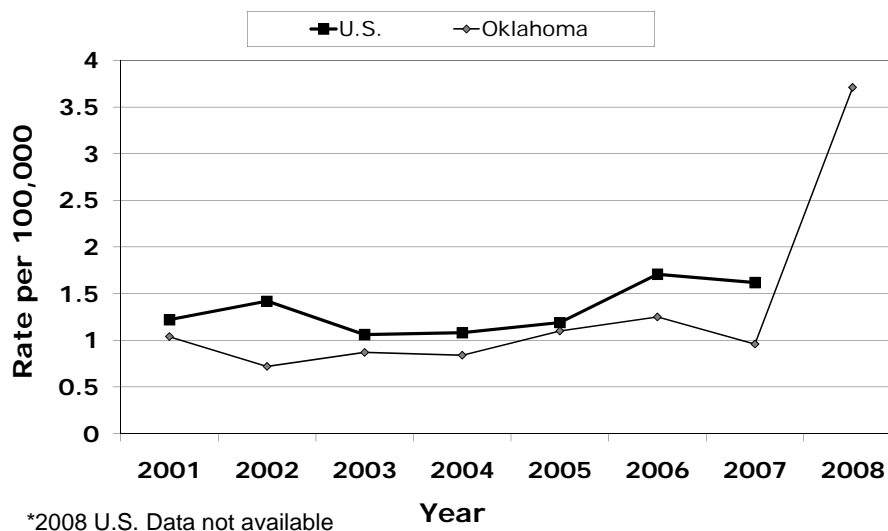
1. Heymann, M.D., Control of Communicable Diseases Manual 19th Edition, APHA, 2008. Ehrlichiosis, pp 212-215.

Shiga toxin producing *Escherichia coli* (STEC)

2008 Case Total 135	2008 Rate	3.71 per 100,000
2007 Case Total 33	2007 Rate	0.96 per 100,000

The most common serotype of Shiga toxin producing *E. coli* (STEC) reported nationally continues to be *E. coli* O157:H7. Other less common serotypes are also reportable and the number reported yearly is rising. This increase may be partially due to more widely used laboratory tests that identify other serotypes of STEC beyond O157:H7. One hundred and thirty-five STEC cases were reported in Oklahoma for 2008. This is a 409% increase from the 33 cases reported in 2007. This notable increase can be partially attributed to a large *E. coli* O111 outbreak that occurred in northeastern Oklahoma in August and September of 2008. Eighty-seven of the 135 cases (64.4%) were associated with the *E. coli* O111 outbreak. Without the outbreak-related cases, there was still a 45% increase in STEC cases from 2007. The large outbreak began in late August of 2008 and health alert networks were sent to healthcare providers and laboratories across northeastern Oklahoma to notify them of the outbreak and request that testing for a STEC be considered in a patient presenting with symptoms consistent with a STEC infection. Additionally, multiple labs across the state added the testing capacity for STEC beyond O157:H7. The supplementary laboratory capacity may explain the higher number of reported STEC cases in 2008. The 2008 incidence rate for Oklahoma was 3.71 cases per 100,000 persons.

Shiga toxin producing *E. coli* (STEC) Incidence Rate by Year, Oklahoma and U.S., 2001 – 2008*

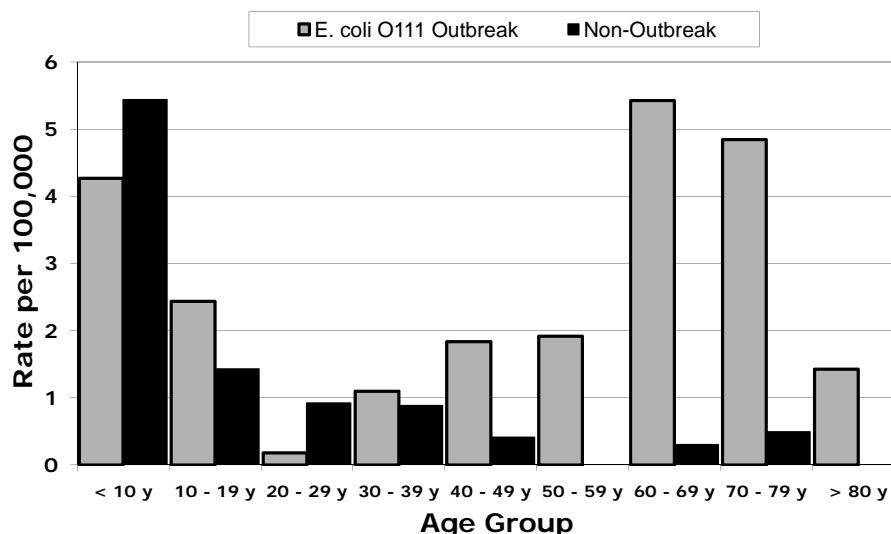


Non-outbreak related STEC cases in 2008 were residents of 26 counties across Oklahoma. Outbreak cases were residents of eleven counties all located in northeast Oklahoma, with the majority (75.9%) from Rogers, Mayes and Tulsa counties. Beyond the outbreak, no other geographic clustering was noted.

Cases ranged from less than one year old to 88 years with a median of 18 years. Fifty-four percent of cases were female. The highest incidence rates occurred in males less than ten years of age with an incidence of 10.23 per 100,000 persons. Females less than ten followed closely behind the males with an incidence of 9.17 per 100,000. When cases were stratified by outbreak association, the incidence rate for cases not associated with the *E. coli* O111 outbreak was highest in children less than ten years and was 3.8 times higher than the incidence for any other age group. For outbreak related cases, incidence rate in children less than ten was still high with a rate of 4.27 cases per

100,000 persons; however, the 60 – 69 and 70 – 79 year age groups had higher rates with 5.43 and 4.85 cases per 100,000, respectively.

Rate of Reported Shiga toxin producing *E. coli* (STEC) Cases by Age Group and Outbreak Association, Oklahoma, 2008



The highest incidence by racial background occurred in the American Indian and Alaska Native population with an incidence of 5.49 cases per 100,000 persons. Incidence for the white population is 3.83 cases per 100,000. Only one case reported race as black or African American corresponding to an incidence rate of 0.34 per 100,000. One case reported race as American Indian or Alaska Native and white. Hispanic ethnicity was reported by three cases corresponding to an incidence of 1.08 per 100,000 as compared to non-Hispanic cases with an incidence of 2.91 per 100,000.

Symptoms included abdominal cramps (87.7%), bloody diarrhea (68.7%), nausea (65.6%), fever (48.4%), and vomiting (44.3%). Fifty-six cases (41.5%) were hospitalized for their illness with the majority of hospitalizations in cases less than 20 years of age (54%) or female (57%). Twenty (14.8%) cases developed hemolytic uremic syndrome (HUS) as a consequence of their illness; of which *E. coli* O157:H7 was isolated in four cases and *E. coli* O111:NM in the other 16.

Of the 135 STEC cases in 2008, 102 were confirmed and the other 33 were epidemiologically linked to a confirmed case. All suspect STEC isolates are required to be forwarded to the OSDH PHL for confirmation. In 2008, 61 (59.8%) of the STEC cases were due to infection with *E. coli* O111:NM. *E. coli* O157:H7 was isolated in 26 cases (25.5%) and eight additional less common serotypes were identified in the remaining confirmed STEC isolates. Nationally, O157:H7 continues to be the most commonly reported serotype.¹

In August of 2008, OSDH was notified of an increase in children being admitted to a northeast Oklahoma hospital with severe hemorrhagic diarrhea. Upon investigation, exposure to a popular buffet style restaurant was noted. Outbreak case definitions were established to identify persons associated with the outbreak. The case definition included categories for confirmed, probable and suspect cases. In all, 341 outbreak cases were identified, of which 70 were hospitalized, and one case died. Only confirmed and probable cases are reported to CDC yearly and referenced in this summary.

¹ Centers for Disease Control and Prevention. [Summary of notifiable diseases—United States, 2007]. Published July 9, 2009 for MMWR 2007;56(No. 53):68.

Giardiasis

2008 Case Total	172	2008 Rate	4.72 per 100,000
2007 Case Total	172	2007 Rate	4.98 per 100,000

One hundred seventy-two cases of giardiasis were reported to the OSDH resulting in an incidence rate of 4.72 per 100,000. Of the 172 cases reported, 12 (7%) were epidemiologically linked cases identified during the investigation conducted by the county communicable disease nurse. No geographical differences in disease incidence were notable for giardiasis in Oklahoma. Unlike most other enteric diseases, which have seasonal peaks during the summer months, giardiasis infections occurred throughout the year with no seasonal trend observed. No outbreaks due to *Giardia* were identified in Oklahoma during 2008. Cases ranged in age from less than one year to 108 years with a media age of 25 years. Children under the age of 5 had the highest incidence rate at 14.26 per 100,000 population of disease in 2008 (refer to table).

Giardiasis should be suspected when a patient displays with an infection of the small intestine especially associated with chronic diarrhea, pale and greasy stools, and weight loss. The most common symptoms reported by cases were diarrhea (91%), abdominal cramps (73%), and malaise (62%). Direct examination and identification of cysts or trophozoites in stool (ova and parasite test) is the most widely available and frequently used laboratory method for diagnosis. Because of intermittent shedding of the parasite, three negative specimens are needed to rule out the diagnosis.

Demographic and Clinical Summary of Reported Giardiasis Cases, Oklahoma, 2008 (N=172)

	Frequency (%)	Rate/100,000
Gender		
Male	91 (53%)	5.05
Female	81 (47%)	4.39
Age	Median= 25 Years (Range <1-108 Years)	--
Age groups		
Less than 5 years	38 (24%)	14.26
5-9	18 (11%)	7.25
10-19	11 (7%)	2.24
20-29	17 (11%)	3.12
30-39	18 (11%)	3.97
40-49	16 (10%)	3.27
50-59	20 (13%)	4.24
60 -69	9 (6%)	2.71
70+	10 (6%)	2.89
Hospitalized	20 (12%)	--
Race		
White	128 (74%)	4.50
Native American/Alaska Native	16 (9%)	5.49
Black/African American	8 (5%)	2.76
Asian	1 (1%)	1.59
Multi-Race	4 (2%)	2.70
Reported Symptoms		
Diarrhea	149 (91%)	--
Cramps	104 (73%)	--
Malaise	86 (62%)	--
Bloating	75 (57%)	--
Fever	51 (34%)	--

Haemophilus influenzae Invasive Disease

2008 Case Total	90	2008 Rate	2.47 per 100,000
2007 Case Total	93	2007 Rate	2.70 per 100,000

Invasive *Haemophilus influenzae* (*H. flu*) disease is reportable condition in Oklahoma, and all *H. flu* sterile-site isolates are required to be submitted to the OSDH Public Health Laboratory (PHL) for confirmation and serotype identification. Ninety cases of invasive *H. flu* were reported to the OSDH during 2008 resulting in an incidence rate of 2.47 per 100,000 population. *H. flu* isolates are serotyped based on the presence of a capsule (serotype a-f) or absence of a capsule (non-typeable). Both capsulated and nonencapsulated isolates have the ability to cause severe disease. Of the 90 isolates, 49 (54%) were non-typeable, 11 (12%) were serotype e, 10 (11%) were serotype f, 6 (7%) were serotype a, 1 (1%) was serotype c, and 4 (4%) were serotype b. Isolates for nine (10%) cases were not available for serotype identification by the PHL.

Cases of invasive *H. flu* in 2008 ranged in age from 1 day to 90 years with a median age of 71 years. The highest age-specific incidence rates per 100,000 population was seen among persons 70 years and older (refer to graph). Seven (7.8%) cases occurred among children less than five years of age, none were serotype b.

When a case of *Haemophilus influenzae* type b (Hib) is identified, an active contact investigation commences to locate all close contacts less than 5 years of age to confirm age-appropriate Hib vaccination history. Recommendations for chemoprophylaxis are made for all the case's exposed contacts if a child is less than 5 years of age who is unvaccinated or incompletely vaccinated with Hib vaccine is identified. All four Hib cases reported in 2008 were over the age of 40 years. Investigations conducted by county health department public health nurses determined none of the close contacts were less than 4 years of age; therefore, post-exposure chemoprophylaxis was not recommended.

Descriptive Summary of Reported *Haemophilus influenzae* Invasive Disease Cases, Oklahoma, 2008 (N=90)

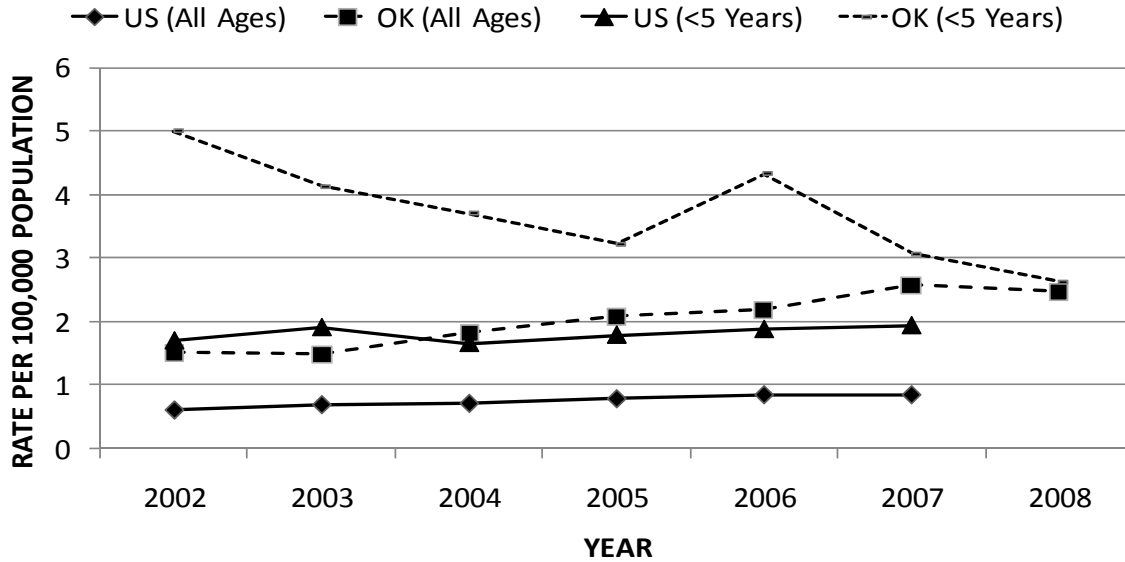
	Frequency (%)	Rate/100,000
Gender		
Male	36 (40%)	2.00
Female	54 (60%)	2.93
Age	Median Age: 71 years (Range: 1 day – 90 years)	
Hospitalized for <i>H. flu</i> *	61 (73%)	--
Deaths to <i>H. flu</i> **	14 (56%)	--
Race		
White	69 (77%)	2.42
Black	9 (10%)	3.10
American Indian	5 (6%)	1.72
Other	0	--
Two or more races	1 (1%)	0.67
Unknown race	6 (7%)	--
Hispanic Ethnicity	1 (1%)	0.36
Infection Types***		
Bacteremia/sepsis	86 (96%)	
Meningitis	2 (2%)	
Pneumonia	51 (58%)	
Other Infection	4 (4%)	
Cases <5 years of age	7 (7.8%)	2.63
Serotype B	0	--

*Number hospitalized for *H. flu* out of those hospitalized (N=83)

**Number died from *H. flu* of those who died (N=25)

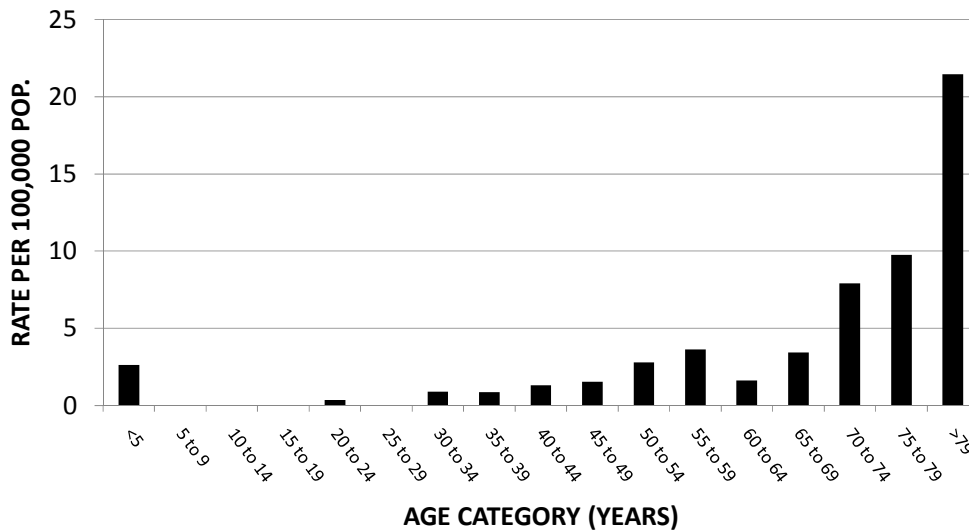
***Infection types not mutually exclusive

Invasive *Haemophilus influenzae* Incidence Rate by Year and Age, Oklahoma and U.S., 2002-2008*



*2008 data not available for US

Incidence Rate of Reported Invasive *Haemophilus influenzae* Cases by Age Group, Oklahoma, 2008 (N=90)



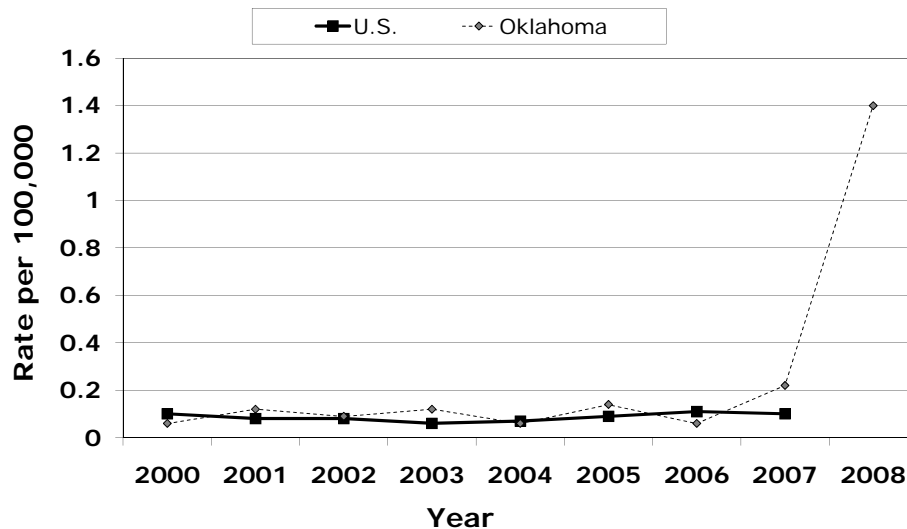
Hemolytic Uremic Syndrome, post diarrheal

2008 Case Total 51
2007 Case Total 8

2008 Rate 1.40 per 100,000
2007 Rate 0.23 per 100,000

Oklahoma experienced a sharp increase in the number of post diarrheal Hemolytic Uremic Syndrome (HUS), cases reported in 2008 compared with previous years. Fifty-one cases were reported correlating to an increase of over 600 percent from 2007. HUS became a reportable condition in Oklahoma in 2001 and since that time two to eight cases have been reported yearly. The increase in the number of 2008 cases can largely be attributed to an *E. coli* O111 outbreak that occurred in northeastern Oklahoma in August and September of 2008. Eleven cases were not attributable to the *E. coli* O111 outbreak thus, if outbreak-related cases were set aside, there was still a 38% increase in the number of 2008 cases as compared to 2007.

Hemolytic Uremic Syndrome, post diarrheal Incidence Rate by Year, Oklahoma and U.S., 2000 – 2008*



*2008 US data not available

In August of 2008, OSDH was notified of an increase in children being admitted to a northeast Oklahoma hospital with severe hemorrhagic diarrhea. Upon investigation, exposure to a popular buffet style restaurant was noted. In all, 341 cases of *E. coli* O111 were identified, of which 70 were hospitalized, and one case died. A HUS case definition was established for outbreak cases. While 40 cases met the CDC case definition for HUS and were thus reported to the CDC and are reflected in this summary, 25 of the cases met a more stringent case definition established for this outbreak, which required thrombocytopenia. A HUS case was identified in one child who had no exposure to the restaurant, but was a sibling to a child who had eaten at the restaurant.

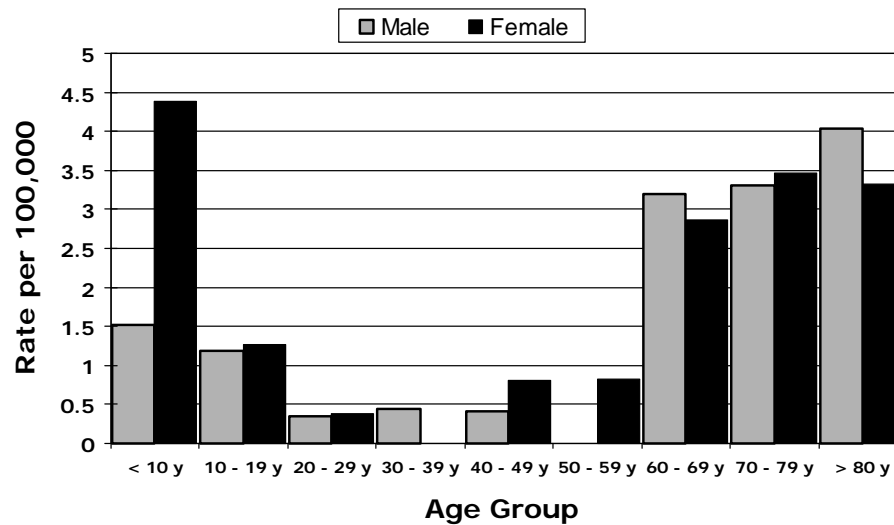
Non-outbreak related cases occurred sporadically across the state with one to two cases in nine counties. One case reported travel during the incubation period to another county; otherwise the ten other cases had no travel history documented during the investigation. Outbreak related cases were residents of ten northeastern Oklahoma counties with Tulsa and Mayes counties having the highest number of cases.

Case-patient ages ranged from one year to 88 years with a median of 45 years. Sixty-one percent of cases were female. The highest incidence occurred in the females under the age of ten with a rate of 4.4 per 100,000 persons. Higher incidence rates were also noted in males and females over the age of 60 years. The higher incidence rates in these groups may be attributed to outbreak-related cases. The analysis of the outbreak showed an increased risk of

developing disease for females as compared to males. Additionally, the rates by age group did not follow the national pattern in that the highest rates were not always in children less than 5 years of age.¹

The highest incidence rate for race occurred in the Native American population. Seven cases (13.7%) reported Native American for race corresponding to an incidence rate of 2.40 per 100,000. White race was reported by the other 44 cases with an incidence rate of 1.55 per 100,000. Hispanic ethnicity was reported by two cases with a rate 0.72 compared to an incidence rate of 1.25 for Non-Hispanics.

Rate of Reported Hemolytic Uremic Syndrome, post diarrheal Cases by Age Group and Gender, Oklahoma, 2008



All HUS cases in 2008 were hospitalized. The length of hospitalization ranged from one to 45 days with a median of eleven days. One death was reported in a previously healthy 26-year-old male who was also associated with the outbreak. Identification of HUS is made through evaluation of a combination of laboratory test results. Anemia with microangiopathic changes shown on a peripheral blood smear was documented for 26 (51%) of the cases. Of those with microangiopathic changes, schistocytes were most commonly seen (96.2%) followed by burr cells (42.3%) and then helmet cells (23.1%). Hematuria was reported in 76.5% of cases; likewise, proteinuria was also seen in 76.5% of cases. Additionally, elevated creatinine was documented for 68.6% of cases and thrombocytopenia in 62.8% of cases.

Of the cases not associated with the outbreak, an etiologic agent was identified in four (36%) of the eleven cases, which was *E. coli* O157:H7 with results confirmed by the OSDH PHL. A case control study of ten medical centers in the United States looked at persons with sporadic *E. coli* O157:H7 infections to assess for risk factors associated with development of HUS. The investigators reported that approximately eight percent of *E. coli* O157:H7 cases will progress to HUS.² In Oklahoma in 2008, four of 32 (12.5%) *E. coli* O157:H7 cases also developed HUS.

¹ Centers for Disease Control and Prevention. [Summary of notifiable diseases—United States, 2007]. Published July 9, 2009 for MMWR 2007;56(No. 53):10-11,35.

² Slutsker L, Ries AA, Maloney K, et al. A nationwide case-control study of *Escherichia coli* O157:H7 infection in the United States. J Infect Dis 1998;177:962-6.

Hepatitis A

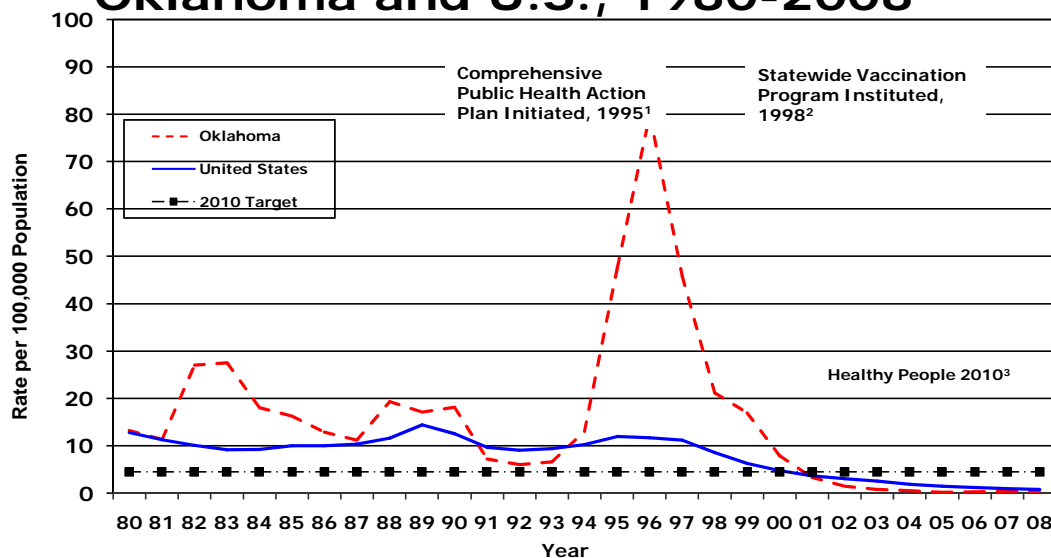
2008 Case Total	13	2008 Rate	0.36 per 100,000
2007 Case Total	13	2007 Rate	0.38 per 100,000

Since the Oklahoma Hepatitis A epidemic that took place from 1995 through 1997, with the peak in 1996 of 2516 cases (rate = 79.99 per 100,000), the incidence of hepatitis A in the state has dramatically declined. The number of cases has been less than 20 per year since 2004, and no outbreaks were identified in 2008 (refer to graph).

Cases that are associated with high-risk settings such as child care settings, food establishments and patient care settings are excluded from working during their infectious period. Three cases were associated with high-risk settings in 2008: two (unrelated) patient care providers and one resident of a homeless shelter, but no secondary cases occurred. None of the 13 cases had a history of hepatitis A vaccination, and none expired.

A total of 19 close contacts were identified (median 1, range 1 – 5 per case) that required post exposure prophylaxis (PEP) because they did not have evidence of immunity through previous testing or history of vaccination. The county health departments provide PEP to those identified as close contacts to confirmed hepatitis A cases. New PEP guidelines were released in 2007 by the Advisory Committee on Immunization Practices, which limited the use of immunoglobulin (IG) and expanded the use of the hepatitis A vaccine. For persons between 12 months and 40 years of age, the hepatitis A vaccine is the preferred method of PEP. It is still recommended to use IG for PEP for persons less than 12 months of age, greater than 40 years of age, and for those who are immunocompromised or who have chronic liver disease.¹

Hepatitis A Incidence Rate by Year, in Oklahoma and U.S., 1980-2008*



¹ Comprehensive Public Health Action Plan consisted of aggressive surveillance, enhanced Hepatitis A testing, aggressive confirmed and epi-link case investigation and contact prophylaxis, and public awareness and prevention media campaigns.

² Due to the statewide outbreak of Hepatitis A 1995-1997, Oklahoma became the first state in the nation to mandate Hepatitis A vaccinations for daycare and school (K and 7th grade) admission in 1998.

³ The Healthy People 2010 Target Rate for Hepatitis A in the United States is 4.5 cases per 100,000 population.

*2008 U.S. data provisional based on CDC, MMWR 2008;57:1420-1431

Hepatitis A should be considered in unvaccinated persons with hallmark symptoms of jaundice, very dark urine and/or clay-colored stools (refer to table for symptoms reported by cases), particularly those with recent exposure to high-risk regions through travel or residence. Three (23%) cases reported international travel during their exposure period. A positive hepatitis A IgM titer indicates current infection, although false positive tests are common.² Healthcare providers should limit testing for hepatitis A to those clients with evidence of acute hepatitis A infection. Liver function tests are usually markedly elevated in confirmed cases. All of the 2008 cases had elevated liver function tests with a median ALT of 1867 (range 400 – 6082), and a median AST of 1866 (range 132 – 4841). The median total bilirubin was 8 (range 0.4 – 17).

The hepatitis A vaccine is recommended for individuals 2 years of age or older, and the two-dose regimen is required for entry into childcare or grade school in Oklahoma. The CDC Travelers' Health website has recommendations regarding hepatitis A prevention for those traveling out of the US, and can be accessed at <http://www.cdc.gov/travel/index.htm>.

Demographic and Clinical Summary of Reported Hepatitis A Cases, Oklahoma, 2007 (N=13)

	Number (%)	Rate per 100,000
Gender		
Female	8 (61.5%)	0.43
Male	5 (38.5%)	0.28
Age	Median = 45 years (range: 24-61 years)	
Race		
White	10 (76.9%)	0.35
African American	1 (7.7%)	0.34
American Indian or Alaska Native	1 (7.7%)	0.34
Asian	1 (7.7%)	1.59
Ethnicity		
Hispanic or Latino	0	-
Not Hispanic or Latino	12 (92.3%)	0.36
Unknown	1 (7.7%)	-
Hallmark symptoms (not exclusive)		
Dark Urine	12 (92.3%)	-
Jaundice	10 (76.9%)	-
Clay-colored stool	6 (46.2%)	-
Hospitalized for this disease:	5 (35.7%)	-
Recent travel out of country	3*	-

* Eastern Europe (1), Caribbean/Central America (1), South Central Asia (1)

References:

- Centers for Disease Control and Prevention Update: Prevention of Hepatitis A After Exposure to Hepatitis A Virus and in International Travelers. Updated Recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 2007;56:[1080-1084], available at <http://www.cdc.gov/mmwr/PDF/wk/mm5641.pdf>
- Centers for Disease Control and Prevention. Positive Test Results for Acute Hepatitis A Virus Infection Among Persons with No Recent History of Acute Hepatitis – United States, 2002-2004. MMWR 2005;54; (453-456).

Malaria

2008 Case Total	5	2008 Rate	0.14 per 100,000
2007 Case Total	10	2007 Rate	0.29 per 100,000

Five cases of malaria were reported to the Oklahoma State Department of Health in 2008. Diagnosed malaria cases in Oklahoma each were a result of travel to endemic countries: four (80%) cases reported traveling to Africa (Uganda [2], Nigeria [1], and Sudan [1]) and one (20%) to South America during their exposure periods. Since 2001, the majority of reported cases in Oklahoma had a history of traveling to Africa (70%) or Asia (15%) during their exposure period (refer to table). Among the five cases reported in 2008, three (60%) reported taking malaria prophylaxis; however two of these took an unknown medication that was purchased abroad. One case described taking doxycycline as recommended. The CDC Travelers' Health website has recommendations regarding malaria prophylaxis and other travel-related diseases at <http://www.cdc.gov/travel>.

Malaria can be a severe, potentially fatal disease (particularly when caused by *Plasmodium falciparum*) and treatment should be initiated as soon as possible. It should be considered in persons experiencing fever of unknown origin, chills, and/or flu-like illness, with recent travel to a high-risk area, especially international travelers, immigrants, adoptees, military personnel, and international visitors. Most clinical labs are capable of performing preliminary identification. Specimens are required to be sent to the OSDH Public Health Laboratory (PHL) for confirmatory testing and speciation. Thick and thin slides prestained with Giemsa or Giemsa-Wright stain are required for examination. Specimens for the five reported cases in 2008 were submitted to the OSDH PHL for confirmation: four (80%) were identified as *Plasmodium falciparum* while one (20%) was identified as *Plasmodium vivax*.

Demographic and Clinical Summary of Reported Malaria Cases, Oklahoma, 2008 (N = 5)

	Number (%)	Incidence Rate per 100,000
Gender		
Male	4 (80%)	0.22
Female	1 (20%)	0.05
Age	Median = 43 years (range: 32 – 51 years)	
Race (N=4)		
White	2 (50%)	0.07
Black	2 (50%)	0.69
Hispanic Ethnicity	0	--
Hospitalized	4 (80%)	--
Died due to malaria	0	--
Travel history		
Africa	4 (80%)	--
South America	1 (20%)	--

World Region of Malaria Acquisition Reported by Oklahoma Cases, 2001-2008 (N=69)

Region	Number (%)
Africa	48 (69.6%)
Asia	10 (14.5%)
Central America	1 (1.5%)
Oceania	1 (1.5%)
South America	1 (1.5%)
Unknown	8 (11.6%)

Meningococcal Invasive Disease

2008 Case Total	17	2008 Rate	0.47 per 100,000
2007 Case Total	23	2007 Rate	0.67 per 100,000

Meningococcal disease incidence continues on a downward trend in the state and in the nation. Reported cases of meningococcal disease in the state decreased 35% from 2007. Age-specific incidence rates indicate the highest rates occurred among persons over 80, followed by those less than 20 years old (refer to graph). In 2008, 16 (94%) cases were hospitalized, and five deaths occurred due to meningococcal disease, resulting in a case fatality rate of 29%.

Laboratory specimens are required to be forwarded to the OSDH Public Health Lab for confirmation of the causative organism, *Neisseria meningitidis*, and for serogroup identification. Serogroups B (23.5%) and Y (23.5%) accounted for the greatest proportion of isolates for which a serogroup was confirmed.

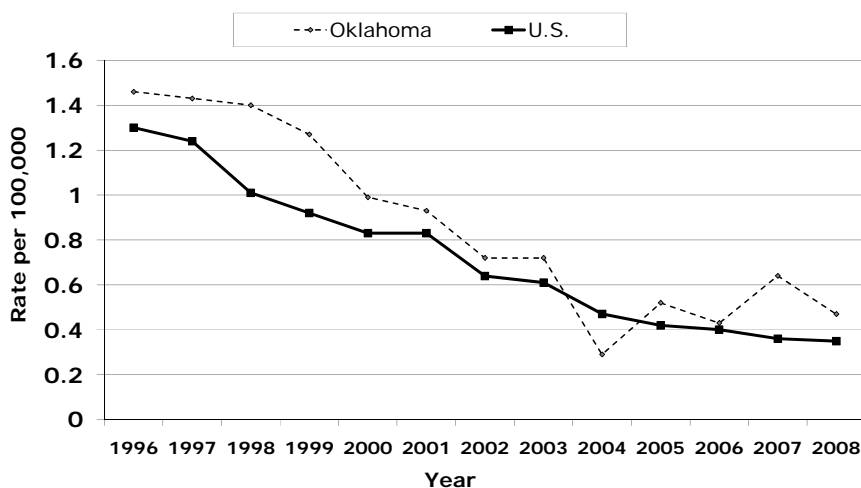
Demographic and Clinical Summary of Reported Meningococcal Invasive Disease Cases, Oklahoma, 2008

	Number (%)	Incidence Rate per 100,000
Gender (N = 17)		
Male	9 (52.94%)	0.50
Female	8 (47.06%)	0.43
Ages (N=17)	Median = 23.5 years (range: 7 months - 86 years)	
<10 years	4	0.78
10-19 years	4	0.81
20-29 years	1	0.18
30-39 years	1	0.22
40-49 years	1	0.20
50-59 years	2	0.42
60-69 years	1	0.30
70-79 years	2	0.97
80+ years	1	0.72
Race (N=15)		
White	12 (80%)	0.42
African American or Black	2 (13.33%)	0.69
American Indian or Alaska Native	1 (1.67%)	0.34
Hispanic Ethnicity (N=13)	1 (7.69%)	0.36
Specimen source		
Blood	8 (47.08%)	-
Cerebrospinal Fluid	8 (47.08%)	-
Tissue	1 (5.88%)	-
Serogroup		
Group B	4 (23.53%)	-
Group Y	4 (23.53%)	-
Group C	3 (17.65%)	-
Group W-135	1 (5.88%)	-
Nongroupable	5 (29.41%)	-

Neisseria meningitidis is an immediately notifiable disease. Suspicion or diagnosis of meningococcal invasive disease must be immediately reported to the OSDH per the Oklahoma Disease Reporting Rules (Oklahoma Administrative Code 310:515). The state health department immediately investigates reported meningococcal disease cases to identify contacts, and to facilitate prophylaxis for persons having high risk exposures, although secondary cases are extremely rare. Two hundred and nine contacts (median 5.5, range 0 – 135 per case) were identified and recommended to receive prophylaxis in 2008. One case had 135 contacts, and involved an unvaccinated college student who lived in a group setting. This case was due to serotype Y, which is included in the meningococcal vaccine.

A tetravalent (serotypes A,C,Y,W-135) meningococcal conjugate vaccine (MCV4) is licensed for persons aged 2–55 years. In 2007, the Advisory Committee on Immunization Practices (ACIP) revised recommendations for routine use of MCV4 to include children ages 11–12 years at the preadolescent vaccination visit and adolescents aged 13–18 years at the earliest opportunity. MCV4 also is recommended for college freshmen living in dormitories and other populations aged 2–55 years at increased risk for meningococcal disease.^{1,2} Beginning with the 2004-2005 academic year, Oklahoma became one of the few states with a mandated vaccination law requiring public or private post-secondary educational institutions to provide information on the risks associated with meningococcal disease and the risks and benefits of vaccination to students who plan to reside in on-campus housing.

Meningococcal Disease Incidence Rate by Year, Oklahoma and U.S., 1996 – 2008*



*2008 U.S. data provisional based on CDC, MMWR 2008;57:1420-1431

References:

1. CDC. Prevention and control of meningococcal disease: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 2005;54(No. RR-7), available at <http://www.cdc.gov/mmwr/pdf/rr/rr5407.pdf>
2. CDC. Notice to readers: revised recommendations of the Advisory Committee on Immunization Practices to vaccinate all persons aged 11–18 years with meningococcal conjugate vaccine. MMWR 2007;56:794–5, available at <http://www.cdc.gov/mmwr/PDF/wk/mm5614.pdf>