TUBERCULOSIS

SYPHILIS

INFLUENZA

GONORRHEA

ROCKY MOUNTAIN SPOTTED FEVER

CHLAMYDIA

HIV/AIDS

SHIGELLOSIS

SALMONELLOSIS

EHRLICHIOSIS/ANAPLASMOSIS

HEPATITIS B

CRYPTOSPORIDIOSIS

2011 ANNUAL SUMMARY OF INFECTIOUS DISEASES · OKLAHOMA STATE DEPARTMENT OF HEALTH

Executive Summary
2011 Annual Summary of Infectious Diseases

The Oklahoma State Department of Health (OSDH) is pleased to send you a copy of the 2011 Annual Summary of Infectious Diseases. The information contained in this report consolidates summaries of communicable disease surveillance and investigations conducted by the OSDH during 2011. Communicable disease summaries were written by personnel in the OSDH Acute Disease Service, HIV/STD Service, and the Public Health Laboratory. Specifically, the annual summary contains information on the numbers and incidence rates of reportable infectious diseases at the state and county level, disease specific data collected during public health investigations, and summaries of program activities.

Title 63 Oklahoma Statute §1-503 as well as Oklahoma Administrative Code (OAC) Title 310, Chapter 515 require that healthcare providers and laboratories report cases of certain communicable diseases to the OSDH. This allows the surveillance, investigation, and control of the spread of disease in the population by public health personnel. A list of the Oklahoma notifiable disease rules is included in this annual summary for your reference. The diseases listed in the Oklahoma disease reporting rules must be reported, along with patient identifiers, demographics, and contact information, to the OSDH upon discovery as dictated in sections OAC 310:515-1-3 and OAC 310:515-1-4. The current "Oklahoma Disease Reporting Manual" is the standard reference for disease-specific diagnostic test results to be reported. The current edition of the "Oklahoma Disease Reporting Manual" and additional disease reporting resources may be accessed from the Acute Disease Service disease reporting web page of the OSDH web site at http://IDReportingAndAlerts.health.ok.gov.

Several service areas of the OSDH as well as the county health departments are charged with surveillance, investigation, and control of spread of communicable diseases. Summarized below are a few notable observations regarding the epidemiology of communicable diseases in Oklahoma reported during 2011.

Oklahoma's incidence of vectorborne diseases such as Rocky Mountain spotted fever (RMSF), ehrlichioses (ehrlichiosis & anaplasmosis), and tularemia continue to occur at rates higher than national levels. In 2011, Oklahoma experienced the second highest incidence of Rocky Mountain spotted fever (RMSF) and ehrlichiosis during the past 10 years. A total of 472 cases of RMSF (n = 334; 8.9 per 100,000), ehrlichiosis & anaplasmosis (n = 123; 3.3 per 100,000), and tularemia (n = 15; 0.4 per 100,000) were reported, resulting in a combined incidence rate of 12.6 per 100,000 population. Among RMSF, ehrlichiosis, and anaplasmosis cases, the incidence rate among persons who reported their race as Native American/Alaska Native was approximately three times higher than the overall rate.

Public health efforts of timely case diagnosis, contact investigation, administration of therapy, prevention, and education, have resulted in a steady decline of tuberculosis (TB) in Oklahoma. The incidence rate of TB has declined 47% from 178 (5.2 per 100,000) cases in 2004 to 94 (2.5 per 100,000) cases in 2011. Racial disparities continued to occur among reported TB cases. In particular, the highest rates of reported TB cases occurred among persons who reported their race as Asian (23.1 per 100,000), American Indian/Alaska Natives (5 per 100,000), and Black (4 per 100,000) compared to persons who reported their race as White (1.6 per 100,000). Foreign-born individuals accounted for 27% of reported TB cases in Oklahoma. Prevention, early diagnosis, and treatment are paramount to successful tuberculosis control. TB should be considered in the differential diagnosis of persons presenting with a productive cough, bloody sputum, fevers, and/or unexplained weight loss. Early suspicion and testing are of utmost importance.

The OSDH Acute Disease Service (ADS) collaborated with other state and federal public health officials to investigate a national outbreak of *Listeria monocytogenes* associated with consumption of cantaloupe produced from the Rocky Ford growing region of Colorado. A total of 146 persons from 28 states were identified; with 30 deaths. Ages ranged from less than one year to 96 years (median: 77 years), with the majority of cases over the age of 60 years. Seven illnesses occurred among women who were pregnant at the time of their symptom onset, one

miscarriage was reported. Of the cases associated with this national listeriosis outbreak, 12 were identified as Oklahoma residents. Ten of the twelve (83%) Oklahoma cases were hospitalized and one died.

The OSDH ADS collaborated with other state health officials to conduct interviews of outbreak-associated *Listeria* cases. ADS epidemiologists conducted in-person interviews of these cases using a standard outbreak questionnaire to collect demographics, clinical history, and exposure, including consumption of specific foods. The source of the outbreak was consumption of whole cantaloupe grown at Jensen Farms in the Rocky Ford Region of Colorado. Of the 140 ill persons with available food consumption history, 131 (94%) reported consuming cantaloupe in the month prior to illness onset. During the early stages of the outbreak investigation, Jensen Farms issued a voluntary recall of the implicated cantaloupes.

The HIV/STD Service investigated two syphilis outbreaks, one involving residents from Pontotoc County and the other Comanche county. The Pontotoc County investigation identified 91 people associated with the outbreak, 13 of which tested positive for syphilis. This outbreak was among heterosexual males and females of all races. The Comanche County investigation identified 40 people associated with the outbreak as either positive for syphilis, sex partner of a person positive for syphilis, or identified as benefiting from a test. There were eight confirmed positive patients identified: one primary syphilis, four secondary syphilis, and three early latent syphilis diagnoses.

Significant racial and age disparities continue among reported sexually transmitted diseases. In particular, the highest rates of reported chlamydia and gonorrhea cases occurred among African Americans. In 2011, the incidence rate of reported gonorrhea cases was 16.9 times higher among African Americans compared to the incidence rate among Whites. Similarly, the incidence rate of reported chlamydia cases among African Americans was six times higher than among Whites. The highest age-specific incidence rates of reported chlamydia and gonorrhea cases occurred among young adults 15 to 19 years of age and 20 to 24 years of age.

The OSDH Public Health Laboratory continues to perform serogroup identification and pulsed-field gel electrophoresis (PFGE), a molecular method of DNA fingerprinting, on all submitted *Salmonella* isolates. PFGE subtyping complements disease surveillance by detecting clusters of indistinguishable PFGE patterns among isolates of Oklahoma cases as well as patterns identified by other state public health laboratories. Once clusters are detected, public health officials rapidly investigate to identify a common source and coordinate with food regulatory agencies to initiate product recalls when indicated, which prevents the continued occurrence of illness among persons who may consume the implicated products.

During 2011, the OSDH ADS collaborated with other state and federal public health officials to investigate 14 multi-state clusters and outbreaks involving Oklahoma residents. One was a multistate outbreak of *Salmonella* Heidelberg associated with consumption of ground turkey; 136 cases from 34 states were identified in this outbreak, including two Oklahoma cases. As an outcome of this investigation, Cargill Meat Solutions Corporation recalled approximately 36 million pounds of ground turkey products that may have been contaminated with *Salmonella* Heidelberg.

Another multistate outbreak identified during 2011 involved 106 cases of *Salmonella* Agona, including one Oklahoma resident. State public health officials conducted interviews and determined the proportion of cases consuming fresh, whole papaya was significantly higher compared to a survey of healthy persons. A traceback investigation determined Agromod Produce, Inc. was the supplier of the papayas, which were imported from Mexico. Furthermore, *Salmonella* Agona with the outbreak PFGE pattern was isolated from samples of papaya. As a result of this investigation, Agromod Produce, Inc. voluntarily recalled affected lots of fresh, whole papayas.

It is part of our continuing efforts to return useful information to you from the data you have reported to us. Use of this summary should give you a better idea of the incidence of reportable infectious diseases in your community and epidemiologic trends of infectious diseases in the state of Oklahoma. Additional summaries of reportable diseases in Oklahoma as well as resources on disease reporting are available on the OSDH website at http://www.ok.gov/health.

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Oklahoma State Department of Health
Contact Information

Acute Disease Service

Communicable Disease Division
1000 NE 10th St.
Oklahoma City, OK 73117-1299
Phone Number: (405) 271-4060 — Epidemiologist-on-Call 24 hours per day
Fax Number: (405) 271-6680
Fax Number: (800) 898-6734

Division of Surveillance and Informatics
1000 NE 10th St
Oklahoma City, OK 73117-1299
Phone Number: (405) 271-4060
Fax Number: (405) 271-6680

Tuberculosis Division
1000 NE 10th St.
Oklahoma City, OK 73117-1299
Phone Number: (405) 271-4060
Fax Number: (405) 271-6680

HIV / STD Service
1000 NE 10th St.
Mail Drop 0308
Oklahoma City, OK 73117-1299
Phone Number: (405) 271-4636
Fax Number: (405) 271-5149

Public Health Laboratory
1000 NE 10th St.
Oklahoma City, OK 73117-1299
Phone Number: (405) 271-5070
Fax Number: (405) 271-4850

Mailing Isolates and Samples for Testing
Public Health Laboratory
P.O. Box 24106
OKC, OK 73124-0106

For instructions on sending isolates or clinical specimens to the Public Health Laboratory (PHL), contact the PHL personnel between 8:00 a.m. - 4:30 p.m., Monday through Friday.

All FAX machines are located in locked offices and are monitored to ensure the confidentiality of disease reports.

2011 Annual Summary
List of Contributors

Acute Disease Service

Lauri Smithee, Ph.D., Chief

Communicable Disease Division

Laurence Burnsed, M.P.H., Director
Becky Coffman, M.P.H., R.N., C.I.C., Epidemiologist
Jolianne Stone, M.P.H., Epidemiologist
Kendra Dougherty, M.S., Epidemiologist
Lacey Kovar, M.P.H., Epidemiologist
Matthew Johnson, M.D., Epidemic Intelligence Service Officer
Rachel Clinton, M.S., Epidemiologist

Division of Surveillance and Informatics

Anthony Lee, M.P.H., Director
Christie McDonald-Hamm, M.P.H., Epidemiologist
Kim Mitchell, B.S., Health Alert Network (HAN) Coordinator
Tony McCord, A.A.S., Information Systems Services Coordinator

Tuberculosis Program

Amy Hill, RN, TB Nurse Consultant

HIV / STD Service

Jan Fox, M.P.H., R.N., Chief
Kristen Eberly, M.P.H., Director, Division of Prevention and Intervention
Debbie Purton, M.P.H., R.N., Director, Division of Care Delivery
Terrainia Harris, M.P.H., Manager, HIV/STD Surveillance and Analysis
Janet Wilson, RN, Manager, Viral Hepatitis and Adult Viral Hepatitis Prevention Coordinator
Mark Turner, M.P.H., Manager, Field Operations

Public Health Laboratory

S. Terence Dunn, Ph.D., Laboratory Chief
Steve Johnson, B.S., A.S.C.P., Clinical Laboratory Administrator
John Murray, B.A., M.B.A., M.P.H., State Training Coordinator

TITLE 310. OKLAHOMA STATE DEPARTMENT OF HEALTH
CHAPTER 515. COMMUNICABLE DISEASE AND INJURY REPORTING
EFFECTIVE 7/12/2012

310:515-1-1. Purpose
The rules in this Chapter implement the Communicable Diseases Reporting Regulations, 63 O.S. 1981, § 1-503.

310:515-1-1.1. Definitions
When used in this Chapter, the following words or terms shall have the following meaning unless the context of the sentence requires another meaning:
"AIDS" means Acquired Immunodeficiency Syndrome.
"Anti-HAV-IgM+" means a positive test result for the hepatitis A virus immunglobulin M antibody.
"Anti-HBc-IgM+" means a positive test result for the hepatitis B core immunglobulin M antibody.
"CD4" means cluster of differentiation 4 glycoprotein that serves as a receptor for HIV on T helper cells.
"Department" or "OSDH" means the Oklahoma State Department of Health.
"*E. coli*" means *Escherichia coli*.
"EIA" means enzyme immunoassay.
"HBeAg+" means a positive test result for the hepatitis B "e" antigen.
"HBsAg+" means a positive test result for the hepatitis B surface antigen.
"HBV DNA+" means a positive test result for deoxyribonucleic acid of the hepatitis B virus.
"HIV" means Human Immunodeficiency Virus.
"PHIDDO" or "PHIDDO system" means Public Health Investigation and Disease Detection of Oklahoma system.
"NAT for HCV RNA+" means a nucleic acid amplification test with a positive test result for hepatitis C virus ribonucleic acid.
"Outbreak of disease" means two or more cases residing in different households that have a similar clinical syndrome of a potentially infectious disease, toxin, or agent of known or unknown etiology.
"RIBA" means recombinant immunoblot assay.
"S/co" means the signal-to-cut-off-ratio.
"Spp." is an abbreviation referring to the term "species," and is used to broaden the anteceding term in order to include all organisms that may be found or described within a given genus.
"Unusual disease or syndrome" means a case of an uncommon, possibly infectious disease of known or unknown etiology, even if laboratory testing may be pending or inconclusive, or if testing for common etiologies is negative. Such cases of disease may not normally be endemic to Oklahoma, may be an emerging or re-emerging disease, and/or represent diseases for which a public health intervention may be needed. Examples of such unusual diseases or syndromes include but are not limited to, unexplained adult respiratory distress syndrome, rash illness with atypical presentation, or an illness occurring along with an unusual pattern of illness or death among animals.
"VISA" means vancomycin intermediate *Staphylococcus aureus*.
"VRSA" means vancomycin resistant *Staphylococcus aureus*.

310:515-1-2. Diseases to be reported
The diseases listed in this Chapter must be reported, along with patient identifiers, demographics, and contact information, to the Department upon discovery as dictated in sections OAC 310:515-1-3 and OAC 310:515-1-4. The current “Oklahoma Disease Reporting Manual” shall serve as the standard for disease-specific diagnostic test results to be reported. Ancillary laboratory test results, signs, and symptoms must be reported upon request. The current edition of the "Oklahoma Disease Reporting Manual" may be accessed from the Acute Disease Service disease reporting and alerts web page of the OSDH web site at http://IDReportingAndAlerts.health.ok.gov. Laboratories

having greater than 400 positive tests performed onsite per year for reportable diseases described in 310:515-1-3, 310:515-1-4(1) and 310:515-1-4(2), or as may be otherwise required to be reported by OSDH, shall begin reporting no later than August 30, 2010 using secure electronic data transmission.

310:515-1-3. Diseases to be reported immediately

The following diseases must be reported by any health practitioner or laboratory personnel to the OSDH electronically via the secure web-based Public Health Investigation and Disease Detection of Oklahoma system or by telephone (405-271-4060 or 800-234-5963) immediately upon suspicion, diagnosis, or testing as specified in the "Oklahoma Disease Reporting Manual".

(1) Anthrax (*Bacillus anthracis*).
(2) Bioterrorism – suspected disease.
(3) Botulism (*Clostridium botulinum*).
(4) Diphtheria (*Corynebacterium diphtheriae*).
(5) *Haemophilus influenzae* invasive disease.
(6) Hepatitis A (Anti-HAV-IgM+).
(7) Hepatitis B during pregnancy (HBsAg+).
(8) Measles (Rubeola).
(9) Meningococcal invasive disease (*Neisseria meningitidis*).
(10) Outbreaks of apparent infectious disease.
(11) Plague (*Yersinia pestis*).
(12) Poliomyelitis.
(13) Rabies.
(14) Smallpox.
(15) Tularemia (*Francisella tularensis*).
(16) Typhoid fever (*Salmonella* Typhi).
(17) Viral hemorrhagic fever.

310:515-1-4. Additional diseases, conditions, and injuries to be reported

The following diseases, conditions and injuries must be reported by physicians, laboratories, and hospitals (by infection control practitioners, medical records personnel, and other designees) to the OSDH as dictated in the following subsections:

(1) Infectious diseases. Reports of infectious diseases and conditions listed in this subsection must be submitted electronically via the PHIDDO system, telephoned or submitted via secure electronic data transmission to the OSDH within one (1) working day (Monday through Friday, state holidays excepted) of diagnosis or positive test as specified in the "Oklahoma Disease Reporting Manual".

(A) Acid Fast Bacillus (AFB) positive smear. Report only if no additional testing is performed or subsequent testing is indicative of *Mycobacterium tuberculosis* Complex.
(B) AIDS (Acquired Immunodeficiency Syndrome).
(C) Arboviral infections (West Nile virus, St. Louis encephalitis virus, Eastern equine encephalitis virus, Western equine encephalitis virus, Powassan virus, California serogroup virus).
(D) Brucellosis (*Brucella* spp.).
(E) Campylobacteriosis *(Campylobacter* spp.).
(F) Congenital rubella syndrome.
(G) Cryptosporidiosis (*Cryptosporidium* spp.).
(H) Dengue Fever.
(I) *E. coli O157, O157:H7,* or a Shiga toxin producing *E. coli*.
(J) Ehrlichiosis (*Ehrlichia* or *Anaplasma* spp.).
(K) Hantavirus pulmonary syndrome.
(L) Hemolytic uremic syndrome, postdiarrheal.
(M) Hepatitis B. If HBsAg+, anti-HBc-IgM+, HBeAg+, or HBV DNA+ then report results of the entire hepatitis panel.

(N) Hepatitis C in persons < or = 40 years or in persons having jaundice or ALT > or = 400 regardless of age with laboratory confirmation. If hepatitis C EIA is confirmed by RIBA or NAT for HCV RNA, or signal-to-cut-off (s/co) ratio or index is predictive of a true positive then report results of the entire hepatitis panel.
(O) Human Immunodeficiency Virus (HIV) infection.
(P) Influenza associated pediatric mortality.
(Q) Legionellosis (*Legionella* spp.).
(R) Leptospirosis (*Leptospira interrogans)*.
(S) Listeriosis (*Listeria monocytogenes*).
(T) Lyme disease (*Borrelia burgdorferi*).
(U) Malaria (*Plasmodium* spp.).
(V) Mumps.
(W) Pertussis (*Bordetella pertussis*).
(X) Psittacosis (*Chlamydophila psittaci*).
(Y) Q Fever (*Coxiella burnetii*).
(Z) Rocky Mountain Spotted Fever (*Rickettsia rickettsii*).
(AA) Rubella.
(BB) Salmonellosis (*Salmonella* spp.).
(CC) Shigellosis (*Shigella* spp.).
(DD) *Staphylococcus aureus* with reduced susceptibility to vancomycin (VISA or VRSA).
(EE) *Streptococcus pneumoniae* invasive disease, in persons less than 5 years of age.
(FF) Syphilis (*Treponema pallidum*).
(GG) Tetanus (*Clostridium tetani*).
(HH) Trichinellosis (*Trichinella spiralis*).
(II) Tuberculosis (*Mycobacterium tuberculosis*).
(JJ) Unusual disease or syndrome.
(KK) Vibriosis (*Vibrionaceae* family: *Vibrio* spp. (including cholera), *Grimontia* spp., *Photobacterium* spp., and other genera in the family).
(LL) Yellow Fever.

(2) Infectious diseases. Reports of infectious diseases and conditions listed in this subsection must be reported to the OSDH within one (1) month of diagnosis or test result as specified in the OSDH Disease Reporting Manual.
(A) CD4 cell count < 500 with corresponding CD4 cell count percentage of total (by laboratories only).
(B) Chlamydia infections (*Chlamydia trachomatis*).
(C) Creutzfeldt-Jakob disease.
(D) Gonorrhea (*Neisseria gonorrhoeae*).
(E) HIV viral load (by laboratories only).

(3) Occupational or Environmental diseases. Laboratories must report blood lead level results greater than 10 ug/dL within one (1) week and results less than 10 ug/dL within one (1) month. Health care providers must report blood lead level results 20 ug/dL or greater within twenty-four (24) hours and results 10-19 ug/dL within one (1) week.

(4) Injuries (hospitalized and fatal cases only).
(A) Burns.
(B) Drownings and Near Drownings.
(C) Traumatic Brain Injuries.
(D) Traumatic Spinal Cord Injuries.

310:515-1-6. Additional diseases may be designated

The Commissioner of Health may designate any disease or condition as reportable for a designated period of time for the purpose of special investigation.

310:515-1-7. Control of Communicable Diseases Manual

The OSDH adopts the most recently published edition of the publication, "Control of Communicable Diseases Manual," published by the American Public Health Association, as a guideline for the prevention and control of communicable diseases. In order to determine the most recently published edition of the "Control of Communicable Diseases Manual," access the American Public Health Association web site at https://secure.apha.org/source/orders/index.cfm.

310:515-1-8. Organisms/specimens to be sent to the Public Health Laboratory

(a) Isolates or appropriate specimens of the following organisms shall be sent to the OSDH Public Health Laboratory for typing.

(1) *Bacillus anthracis.*
(2) *Brucella* spp.
(3) *E. coli O157, O157:H7*, or a Shiga toxin producing *E. coli*.
(4) *Francisella tularensis.*
(5) *Haemophilus influenzae* (sterile site).
(6) *Listeria monocytogenes* (sterile site).
(7) *Mycobacterium tuberculosis*.
(8) *Neisseria meningitidis* (sterile site).
(9) *Plasmodium* spp.
(10) *Salmonella* spp.
(11) *Staphylococcus aureus* that are VISA or VRSA
(12) *Vibrionaceae* family (*Vibrio* spp., *Grimontia* spp., *Photobacterium* spp. and other genera in the family).
(13) *Yersinia* spp.

(b) Following consultation with an OSDH epidemiologist, clinical specimens from suspected cases of Botulism must be sent to the OSDH Public Health Laboratory for testing.

SUBCHAPTER 3. DISCLOSURES AND USES OF DISEASE PREVENTION AND CONTROL INFORMATION

310:515-3-1. General provisions

Information received, created and/or maintained by the Department pursuant to the provisions of the Public Health Code relating to Disease Prevention and Control is confidential and shall be protected from disclosure unless release or disclosure is sought in accordance with this subchapter or is otherwise authorized by law.

310:515-3-2. Disclosures upon written consent

Information received, created and/or maintained by the Department pursuant to the provisions of the Public Health Code relating to Disease Prevention and Control may be disclosed to a requesting person upon the presentation of a valid written consent executed by the person whose information is being kept confidential or the legal guardian or legal custodian of such person, under the following conditions:

(1) If the written consent is delivered to the Department by a person other than the person whose information is being kept confidential or the legal guardian or legal custodian of such person, the written consent must either be verified under oath or contain some form of attestation certifying or confirming the authenticity of the signature of the person whose information is being kept confidential or the legal guardian or legal custodian of such person.

(2) The written consent must advise the person whose information is being kept confidential or the legal guardian or legal custodian of such person the identity of all persons and/or entities who are likely or intended to receive or view the information sought to be released or disclosed. The identity must include the full name, address and title or office of such person or entity identified in the written consent. The written consent must state that the information will not be released or disclosed to any person or entity not so identified.

(3) The written consent must include a notice thereon, in bold typeface, that the information authorized for release may include records that may indicate the presence of a communicable or venereal disease, which may include, but are not limited to, diseases such as hepatitis, syphilis, gonorrhea and the human immunodeficiency virus, also known as Acquired Immune Deficiency Syndrome (AIDS).

(4) The written consent must advise the person whose information is being kept confidential or the legal guardian or legal custodian of such person of the provisions of 63 O.S.Supp.2005, § 1- 502.2.

310:515-3-3. Grounds for denial

A person whose information is being kept confidential or the legal guardian or legal custodian of such person may be denied access to information if the information was obtained from someone other than a health care provider under a promise of confidentiality, the access requested would be reasonably likely to reveal the confidential source of the information and the requested information cannot be presented in a manner that preserves the confidentiality of the source. The Department incorporates HIPAA, 42 C.F.R. § 164.524(a)(2)(v)(2006) only as guidance in applying this section.

310:515-3-4. Disclosures permitted without a written consent

Information received, created and/or maintained by the Department pursuant to the provisions of the Public Health Code relating to Disease Prevention and Control may, without first obtaining a written consent in accordance with this subchapter, be disclosed, shared and/or disseminated with health professionals engaged in activities described or identified in the provisions of the Public Health Code relating to Disease Prevention and Control.

Table One. Number of Reported Cases of Communicable Diseases, Oklahoma, 1982 - 2011

Disease	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Anthrax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Botulism (Foodborne)	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	0
Botulism (Infant)	0	0	1	0	1	0	0	0	0	1	1	0	0	0	0	0
Brucellosis	8	6	7	5	0	5	3	4	1	2	1	0	0	1	1	0
Campylobacteriosis	116	*212	216	305	288	252	212	223	247	205	267	199	187	289	281	247
Chlamydia	0	0	0	0	0	0	0	0	0	*5714	5220	4886	3784	5050	7371	7566
Cholera	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0
Congential Rubella Syndrome	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Creutzfeldt-Jakob disease	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cryptosporidiosis	0	0	81	27	11	14	11	12	6	8	0	1	1	12	10	12
Dengue Fever	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diphtheria	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Escherichia coli O157:H7 and other Shiga toxin producing *E. coli*	0	0	0	0	0	0	0	6	4	0	5	8	*13	16	14	13
Ehrlichiosis/Anaplasmosis	0	0	0	0	0	23	14	1	1	3	8	0	0	0	0	0
Gonorrhea	16021	15230	13088	13005	12572	9657	7411	6846	6464	6546	6432	4855	4935	5652	4897	4840
Haemophilus influenzae , Invasive Disease (Total)	120	*179	240	303	290	244	236	154	134	76	33	45	44	33	31	33
Haemophilus influenzae , Invasive Disease, type b, <5 yrs	2	*13	39	6	3	0	0	0	78	33	3	1	4	3	0	1
Hantavirus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Hemolytic Uremic Syndrome, post diarrheal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hepatitis A	821	833	548	491	390	338	580	501	588	273	217	206	395	1497	2516	1441
Hepatitis B	358	354	208	256	240	250	209	221	183	198	174	193	129	176	60	63
Hepatitis C	0	0	0	0	0	0	0	0	0	0	0	0	0	1	8	10
Influenza Associated Pediatric	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Legionellosis	13	*12	19	24	24	32	20	26	15	24	12	14	7	8	16	4
Leptospirosis	0	4	0	1	0	0	0	0	1	0	0	0	0	0	0	0
Listeriosis	3	0	1	10	20	17	14	17	16	6	8	12	11	11	5	9
Lyme Disease	0	0	0	0	0	3	9	16	20	23	25	20	111	57	34	45
Malaria	8	9	14	8	12	5	11	8	10	9	5	5	9	1	3	9
Measles	30	1	9	1	41	4	8	73	88	0	12	0	0	0	0	1
Meningococcal Invasive Disease	33	39	30	41	38	40	27	29	21	16	18	36	52	49	46	45
Mumps	0	0	0	0	0	102	295	184	74	15	20	11	*13	1	4	3
Pertussis	10	348	248	209	149	173	72	54	48	48	53	60	19	47	21	60

*First year disease was reportable by law

^*H. influenzae* isolates required to be sent to OSDH PHL for serotyping.

Table One. Number of Reported Cases of Communicable Diseases, Oklahoma, 1982 - 2011

Disease	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Plague	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Poliomyelitis	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Psittacosis	1	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0
Q Fever	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Rabies (Animal)	191	108	104	111	62	35	38	102	132	173	219	65	40	32	38	113
Rabies (Human)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rocky Mountain spotted fever	89	221	137	103	110	86	103	60	68	95	111	46	36	48	45	30
Rubella	3	1	0	2	0	6	1	1	1	2	0	1	4	0	0	0
Staphylococcus aureus , Vancomycin intermediate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Staphylococcus aureus , Vancomycin resistant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Streptococcus pneumoniae , Invasive disease, <5 years	38	20	18	29	199	16	11	20	37	28	13	87	73	48	19	22
Salmonellosis	516	613	445	474	512	474	500	446	441	481	368	320	444	471	520	392
Shigellosis	440	241	220	301	256	166	233	236	510	192	252	472	200	266	305	293
St. Louis Encephalitis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Syphilis	593	571	532	538	489	552	479	375	589	596	709	636	399	489	398	275
Tetanus	1	0	2	1	1	1	1	2	0	0	1	1	1	0	1	2
Trichinellosis	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0
Tuberculosis	335	331	262	264	267	250	277	218	243	206	216	209	261	237	201	211
Tularemia	36	35	24	22	19	27	17	8	10	12	10	16	4	7	4	5
Typhoid Fever	4	3	5	2	3	6	0	1	3	3	0	1	3	1	0	3
Vibrio spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0
Vibrio parahaemolyticus	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Vibrio vulnificus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
West Nile Virus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

*First year disease was reportable by law

^*H. influenzae* isolates required to be sent to OSDH PHL for serotyping.

Table One. Number of Reported Cases of Communicable Diseases, Oklahoma, 1982 - 2011

Disease	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Anthrax	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Botulism (Foodborne)	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Botulism (Infant)	0	1	0	1	0	0	0	1	0	0	0	0	2	0
Brucellosis	0	0	1	0	1	0	0	1	2	1	0	2	0	1
Campylobacteriosis	241	320	361	308	362	417	591	544	405	530	486	384	448	315
Chlamydia	9378	8737	9346	10622	10732	10983	10371	12957	13206	12529	14173	14991	14302	14596
Cholera	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Congential Rubella Syndrome	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Creutzfeldt-Jakob disease	0	0	0	0	0	*0	0	0	1	1	1	1	1	2
Cryptosporidiosis	7	14	*30	16	16	24	22	46	56	216	238	141	122	91
Dengue Fever	1	0	0	0	*0	1	0	2	0	3	2	0	4	0
Diphtheria	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Escherichia coli O157:H7 and other Shiga toxin producing *E. coli*	26	41	19	36	25	30	29	38	43	33	135	64	104	88
Ehrlichiosis/Anaplasmosis	2	12	*12	24	13	36	49	96	47	106	121	147	107	123
Gonorrhea	4225	4291	5236	4818	4624	4543	4543	5031	5170	4827	4945	4661	4369	4216
Haemophilus influenzae , Invasive Disease (Total)	35	47	^46	48	53	52	67	74	78	93	90	92	105	73
Haemophilus influenzae , Invasive Disease, type b, <5 yrs	1	0	^0	0	0	0	0	0	0	0	0	2	0	0
Hantavirus	0	0	*0	1	0	0	0	0	0	0	0	0	0	0
Hemolytic Uremic Syndrome, post diarrheal	0	1	*2	4	3	4	2	5	3	8	51	17	11	7
Hepatitis A	667	534	271	116	52	29	19	6	11	13	13	6	6	11
Hepatitis B	169	185	179	115	111	73	80	59	96	152	129	122	115	100
Hepatitis C	23	13	*13	6	21	6	7	14	19	49	21	27	41	52
Influenza Associated Pediatric	0	0	0	0	0	0	0	0	0	0	2	*9	2	0
Legionellosis	18	6	5	7	5	10	24	10	10	9	11	10	15	15
Leptospirosis	0	1	0	0	1	0	0	0	0	1	0	0	1	0
Listeriosis	19	12	*8	2	9	3	4	4	5	2	7	8	9	15
Lyme Disease	12	8	1	0	0	0	3	0	0	1	2	2	0	2
Malaria	4	2	10	5	12	4	10	12	11	10	5	2	6	10
Measles	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Meningococcal Invasive Disease	44	40	34	32	25	24	10	18	15	23	17	17	18	12
Mumps	4	5	3	0	3	2	1	2	11	7	1	3	1	4
Pertussis	36	40	60	43	135	106	122	125	64	58	100	117	199	69

*First year disease was reportable by law

^*H. influenzae* isolates required to be sent to OSDH PHL for serotyping.

Table One. Number of Reported Cases of Communicable Diseases, Oklahoma, 1982 - 2011

Disease	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Plague	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poliomyelitis	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Psittacosis	4	0	*0	0	0	0	0	0	0	0	0	0	0	0
Q Fever	0	0	0	0	0	0	1	3	0	2	3	*2	0	3
Rabies (Animal)	107	94	58	60	126	204	113	79	69	78	42	49	62	60
Rabies (Human)	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Rocky Mountain spotted fever	39	29	37	69	99	138	190	206	135	187	267	342	235	335
Rubella	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Staphylococcus aureus , Vancomycin intermediate	0	0	0	0	0	0	0	0	0	*1	0	0	0	0
Staphylococcus aureus , Vancomycin resistant	0	0	0	0	0	0	0	0	0	*0	0	0	0	0
Streptococcus pneumoniae , Invasive disease, <5 years	26	45	38	58	67	81	52	48	73	77	76	63	55	37
Salmonellosis	501	468	404	503	524	494	425	448	604	709	901	657	752	831
Shigellosis	712	560	131	148	717	1078	724	936	196	162	234	399	416	276
St. Louis Encephalitis	0	0	0	1	*0	0	0	0	0	0	0	0	0	0
Syphilis	264	347	245	185	183	141	88	73	193	150	212	256	92	84
Tetanus	0	0	0	1	0	0	0	0	1	0	0	0	0	0
Trichinellosis	0	0	*0	0	0	0	0	0	0	0	0	0	0	0
Tuberculosis	198	208	154	194	190	163	178	144	144	149	100	102	86	94
Tularemia	5	7	11	7	10	9	19	20	3	18	7	7	8	15
Typhoid Fever	1	0	1	1	2	1	1	1	0	3	3	2	1	2
Vibrio spp.	9	1	0	0	1	*1	0	3	1	2	5	2	0	2
Vibrio parahaemolyticus	0	0	0	0	0	*0	0	1	0	0	1	0	0	0
Vibrio vulnificus	0	0	1	0	1	*0	1	1	0	0	0	0	1	0
West Nile Virus	0	0	0	0	*17	79	22	33	48	107	9	10	1	1

*First year disease was reportable by law

^*H. influenzae* isolates required to be sent to OSDH PHL for serotyping.

Table Two. Incidence Rate per 100,000 Oklahoma Population of Reported Communicable Diseases, Oklahoma 1982 - 2011*

Disease	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Anthrax	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Botulism (Foodborne)	0.00	0.00	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00
Botulism (Infant)	0.00	0.00	0.03	0.00	0.03	0.00	0.00	0.00	0.00	0.03	0.03	0.00	0.00	0.00	0.00
Brucellosis	0.26	0.20	0.23	0.17	0.00	0.17	0.10	0.13	0.03	0.06	0.03	0.00	0.00	0.03	0.03
Campylobacteriosis	3.83	7.01	7.14	10.08	9.52	8.33	7.01	7.37	7.85	6.52	8.49	6.33	5.94	9.19	8.93
Chlamydia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	181.7	165.9	155.3	120.3	160.5	234.3
Cholera	0.00	0.00	0.03	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Congential Rubella Syndrome	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Creutzfeldt-Jakob disease	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cryptosporidiosis	0.00	0.00	2.68	0.89	0.36	0.46	0.36	0.40	0.19	0.25	0.00	0.03	0.03	0.38	0.32
Dengue Fever	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Diphtheria	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Escherichia coli O157:H7 and other Shiga toxin producing *E. coli*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.13	0.00	0.16	0.25	0.41	0.51	0.45
Ehrlichiosis	0.00	0.00	0.00	0.00	0.00	0.76	0.46	0.03	0.03	0.10	0.25	0.00	0.00	0.00	0.00
Gonorrhea	529.6	503.4	432.6	429.9	415.6	319.2	245.0	226.3	205.5	208.1	204.5	154.3	156.9	179.7	155.7
Haemophilus influenzae , Invasive Disease (Total)	3.97	5.92	7.93	10.02	9.59	8.07	7.80	5.09	4.26	2.42	1.05	1.43	1.40	1.05	0.99
Haemophilus influenzae , Invasive Disease, type b, <5 yrs	0.86	5.60	16.79	2.58	1.29	0.00	0.00	0.00	34.43	14.57	1.32	0.44	1.77	1.32	0.00
Hantavirus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Hemolytic Uremic Syndrome, post diarrheal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hepatitis A	27.14	27.53	18.11	16.23	12.89	11.17	19.17	16.56	18.69	8.68	6.90	6.55	12.56	47.59	79.99
Hepatitis B	11.83	11.70	6.88	8.46	7.93	8.26	6.91	7.31	5.82	6.29	5.53	6.14	4.10	5.60	1.91
Hepatitis C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.25
Influenza Associated Pediatric Mortalit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Legionellosis	0.43	0.40	0.63	0.79	0.79	1.06	0.66	0.86	0.48	0.76	0.38	0.45	0.22	0.25	0.51
Leptospirosis	0.00	0.13	0.00	0.03	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00
Listeriosis	0.10	0.00	0.03	0.33	0.66	0.56	0.46	0.56	0.51	0.19	0.25	0.38	0.35	0.35	0.16
Lyme Disease	0.00	0.00	0.00	0.00	0.00	0.10	0.30	0.53	0.64	0.73	0.79	0.64	3.53	1.81	1.08
Malaria	0.26	0.30	0.46	0.26	0.40	0.17	0.36	0.26	0.32	0.29	0.16	0.16	0.29	0.03	0.10
Measles	0.99	0.03	0.30	0.03	1.36	0.13	0.26	2.41	2.80	0.00	0.38	0.00	0.00	0.00	0.00
Meningococcal Invasive Disease	1.09	1.29	0.99	1.36	1.26	1.32	0.89	0.96	0.67	0.51	0.57	1.14	1.65	1.56	1.46
Mumps	0.00	0.00	0.00	0.00	0.00	3.37	9.75	6.08	2.35	0.48	0.64	0.35	0.41	0.03	0.13
Pertussis	0.33	11.50	8.20	6.91	4.93	5.72	2.38	1.78	1.53	1.53	1.68	1.91	0.60	1.49	0.67

*Oklahoma population numbers are obtained from the U.S. Census Bureau Decennial Census numbers.

Table Two. Incidence Rate per 100,000 Oklahoma Population of Reported Communicable Diseases, Oklahoma 1982 - 2011*

Disease	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Plague	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00
Poliomyelitis	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Psittacosis	0.03	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00
Q Fever	0.03	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rabies (Human)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rocky Mountain spotted fever	2.94	7.31	4.53	3.40	3.64	2.84	3.40	1.98	2.16	3.02	3.53	1.46	1.14	1.53	1.43
Rubella	0.10	0.03	0.00	0.07	0.00	0.20	0.03	0.03	0.03	0.06	0.00	0.03	0.13	0.00	0.00
Staphylococcus aureus , Vancomycin intermediate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Staphylococcus aureus , Vancomycin resistant	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Streptococcus pneumoniae , Invasive disease, <5 years	16.36	8.61	7.75	12.48	85.66	6.89	4.74	8.61	16.33	12.36	5.74	38.41	32.23	21.19	8.39
Salmonellosis	17.06	20.26	14.71	15.67	16.92	15.67	16.53	14.74	14.02	15.29	11.70	10.17	14.12	14.97	16.53
Shigellosis	14.54	7.97	7.27	9.95	8.46	5.49	7.70	7.80	16.21	6.10	8.01	15.01	6.36	8.46	9.70
St. Louis Encephalitis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Syphilis	19.60	18.87	17.59	17.78	16.16	18.25	15.83	12.40	18.72	18.95	22.54	20.22	12.68	15.55	12.65
Tetanus	0.03	0.00	0.07	0.03	0.03	0.03	0.03	0.07	0.00	0.00	0.03	0.03	0.03	0.00	0.03
Trichinellosis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Tuberculosis	11.07	10.94	8.66	8.73	8.83	8.26	9.16	7.21	7.73	6.55	6.87	6.64	8.30	7.53	6.39
Tularemia	1.19	1.16	0.79	0.73	0.63	0.89	0.56	0.26	0.32	0.38	0.32	0.51	0.13	0.22	0.13
Typhoid Fever	0.13	0.10	0.17	0.07	0.10	0.20	0.00	0.03	0.10	0.10	0.00	0.03	0.10	0.03	0.00
Vibrio spp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.03
Vibrio parahaemolyticus	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vibrio vulnificus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
West Nile Virus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

*Oklahoma population numbers are obtained from the U.S. Census Bureau Decennial Census numbers.

Table Two. Incidence Rate per 100,000 Oklahoma Population of Reported Communicable Diseases, Oklahoma 1982 - 2011*

Disease	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Anthrax	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Botulism (Foodborne)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.03
Botulism (Infant)	0.00	0.00	0.03	0.00	0.03	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.05	0.00
Brucellosis	0.00	0.00	0.00	0.03	0.00	0.03	0.00	0.00	0.03	0.06	0.03	0.00	0.05	0.00	0.03
Campylobacteriosis	7.85	7.66	10.17	10.46	8.93	10.49	12.08	17.13	15.77	11.74	15.36	13.34	10.54	12.15	8.40
Chlamydia	240.5	298.1	277.8	270.8	307.8	311.0	318.3	300.6	375.5	382.7	363.1	389.1	411.6	387.9	389.09
Cholera	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Congential Rubella Syndrome	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Creutzfeldt-Jakob disease	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.03	0.03	0.03	0.05
Cryptosporidiosis	0.38	0.22	0.45	0.87	0.46	0.46	0.70	0.64	1.33	1.62	6.26	6.53	3.87	3.31	2.43
Dengue Fever	0.00	0.03	0.00	0.00	0.00	0.00	0.03	0.00	0.06	0.00	0.09	0.05	0.00	0.11	0.00
Diphtheria	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Escherichia coli O157:H7 and other Shiga toxin producing *E. coli*	0.41	0.83	1.30	0.55	1.04	0.72	0.87	0.84	1.10	1.25	0.96	3.71	1.76	2.82	2.35
Ehrlichiosis	0.00	0.06	0.38	0.35	0.70	0.38	1.04	1.42	2.78	1.36	3.07	3.32	4.04	2.85	3.28
Gonorrhea	153.9	134.3	136.4	151.7	139.6	134.0	131.7	131.7	145.8	149.8	139.9	135.8	128.0	116.46	112.39
Haemophilus influenzae , Invasive Disease (Total)	1.05	1.11	1.49	1.33	1.39	1.54	1.51	1.94	2.14	2.26	2.70	2.47	2.53	0.00	1.95
Haemophilus influenzae , Invasive Disease, type b, <5 yrs	0.44	0.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00
Hantavirus	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hemolytic Uremic Syndrome, post diarrheal	0.00	0.00	0.03	0.06	0.12	0.09	0.12	0.06	0.14	0.09	0.23	1.40	0.47	0.29	0.19
Hepatitis A	45.81	21.20	16.98	7.85	3.36	1.51	0.84	0.55	0.17	0.32	0.38	0.36	0.16	0.16	0.29
Hepatitis B	2.00	5.37	5.88	5.19	3.33	3.22	2.12	2.32	1.71	2.78	4.40	3.54	3.35	3.12	2.67
Hepatitis C	0.32	0.73	0.41	0.38	0.17	0.61	0.17	0.20	0.41	0.55	1.42	0.58	0.74	1.09	1.39
Influenza Associated Pediatric Mortalit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.98	0.22	0.00
Legionellosis	0.13	0.57	0.19	0.14	0.20	0.14	0.29	0.70	0.29	0.29	0.26	0.30	0.27	0.40	0.40
Leptospirosis	0.00	0.00	0.03	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.03	0.00
Listeriosis	0.29	0.60	0.38	0.23	0.06	0.26	0.09	0.12	0.12	0.14	0.06	0.19	0.22	0.24	0.40
Lyme Disease	1.43	0.38	0.25	0.03	0.00	0.00	0.00	0.09	0.00	0.00	0.03	0.05	0.05	0.00	0.05
Malaria	0.29	0.13	0.06	0.29	0.14	0.35	0.12	0.29	0.35	0.32	0.29	0.14	0.05	0.16	0.27
Measles	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Meningococcal Invasive Disease	1.43	1.40	1.27	0.99	0.93	0.72	0.70	0.29	0.52	0.43	0.67	0.47	0.47	0.48	0.32
Mumps	0.10	0.13	0.16	0.09	0.00	0.09	0.06	0.03	0.06	0.32	0.20	0.03	0.08	0.03	0.11
Pertussis	1.91	1.14	1.27	1.74	1.25	3.91	3.07	3.54	3.62	1.85	1.68	2.75	3.21	5.40	1.84

*Oklahoma population numbers are obtained from the U.S. Census Bureau Decennial Census numbers.

Table Two. Incidence Rate per 100,000 Oklahoma Population of Reported Communicable Diseases, Oklahoma 1982 - 2011*

Disease	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Plague	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Poliomyelitis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Psittacosis	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Q Fever	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.09	0.00	0.06	0.08	0.05	0.00	0.08
Rabies (Human)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rocky Mountain spotted fever	0.95	1.24	0.92	1.07	2.00	2.87	4.00	5.51	5.97	3.91	5.42	7.33	9.39	6.37	8.93
Rubella	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Staphylococcus aureus , Vancomycin intermediate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.03	0.00
Staphylococcus aureus , Vancomycin resistant	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Streptococcus pneumoniae , Invasive disease, <5 years	9.71	11.48	19.87	16.08	24.54	28.35	34.27	22.00	20.31	30.89	32.58	28.60	23.17	20.23	0.99
Salmonellosis	12.46	15.93	14.88	11.71	14.58	15.19	14.32	12.32	12.98	17.50	20.55	24.74	18.04	20.05	22.15
Shigellosis	9.31	22.63	17.80	3.80	4.29	20.78	31.24	20.98	27.13	5.68	4.69	6.42	10.95	11.09	7.36
St. Louis Encephalitis	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Syphilis	8.74	8.39	11.03	7.10	5.36	5.30	4.09	2.55	2.12	5.59	4.35	5.82	7.03	2.45	2.24
Tetanus	0.06	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00
Trichinellosis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tuberculosis	6.71	6.29	6.61	4.46	5.62	5.51	4.72	5.16	4.17	4.17	4.32	2.75	2.80	2.29	2.51
Tularemia	0.16	0.16	0.22	0.32	0.20	0.29	0.26	0.55	0.58	0.09	0.52	0.19	0.19	0.21	0.40
Typhoid Fever	0.10	0.03	0.00	0.03	0.03	0.06	0.03	0.03	0.03	0.00	0.09	0.08	0.05	0.03	0.05
Vibrio spp.	0.00	0.29	0.03	0.00	0.00	0.03	0.03	0.00	0.09	0.03	0.06	0.14	0.05	0.00	0.05
Vibrio parahaemolyticus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.03	0.00	0.00	0.00
Vibrio vulnificus	0.00	0.00	0.00	0.03	0.00	0.03	0.00	0.03	0.03	0.00	0.00	0.00	0.00	0.03	0.00
West Nile Virus	0.00	0.00	0.00	0.00	0.00	0.49	2.29	0.64	0.96	1.39	3.10	0.25	0.27	0.03	0.03

*Oklahoma population numbers are obtained from the U.S. Census Bureau Decennial Census numbers.

Table Three. Reportable Diseases by County, Oklahoma, 2011^

	Campylobacteriosis		Cryptosporidiosis		*E. coli* O157:H7 and other STEC		Ehrlichiosis / Anaplasmosis	
County	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Adair County	8	35.27	0	*	1	4.41	7	30.86
Alfalfa County	1	17.72	0	*	0	*	0	*
Atoka County	0	*	0	*	0	*	1	7.05
Beaver County	0	*	0	*	0	*	0	*
Beckham County	2	9.04	0	*	2	9.04	0	*
Blaine County	0	*	0	*	0	*	1	8.37
Bryan County	0	*	1	2.36	1	2.36	0	*
Caddo County	9	30.41	0	*	0	*	0	*
Canadian County	6	5.19	2	1.73	7	6.06	0	*
Carter County	5	10.51	1	2.10	1	2.10	0	*
Cherokee County	7	14.90	0	*	0	*	3	6.38
Choctaw County	0	*	0	*	0	*	2	13.15
Cimarron County	0	*	0	*	0	*	0	*
Cleveland County	20	7.82	15	5.86	1	0.39	0	*
Coal County	0	*	0	*	0	*	2	33.76
Comanche County	15	12.09	4	3.22	4	3.22	0	*
Cotton County	1	16.15	0	*	0	*	0	*
Craig County	1	6.65	0	*	1	6.65	3	19.96
Creek County	7	10.00	0	*	2	2.86	3	4.29
Custer County	2	7.28	0	*	0	*	0	*
Delaware County	9	21.69	0	*	0	*	2	4.82
Dewey County	0	*	0	*	0	*	0	*
Ellis County	1	24.09	0	*	0	*	0	*
Garfield County	11	18.16	2	3.30	0	*	0	*
Garvin County	3	10.88	0	*	0	*	0	*
Grady County	17	32.42	2	3.81	2	3.81	0	*
Grant County	1	22.09	0	*	0	*	0	*
Greer County	0	*	0	*	0	*	0	*
Harmon County	1	34.22	0	*	1	34.22	0	*
Harper County	3	81.41	0	*	0	*	0	*
Haskell County	0	*	0	*	0	*	0	*
Hughes County	0	*	0	*	0	*	1	7.14
Jackson County	2	7.56	5	18.91	0	*	0	*
Jefferson County	0	*	2	30.90	1	15.45	0	*
Johnston County	1	9.13	2	18.25	0	*	0	*
Kay County	5	10.74	0	*	2	4.30	2	4.30
Kingfisher County	5	33.26	0	*	0	*	0	*
Kiowa County	2	21.17	0	*	0	*	0	*

^2011 rates illustrate county specific incidence rates per 100,000 population. Rates calculated by dividing the number of reported cases by the 2009 Census Bureau county population estimate and multiplying by 100,000

Table Three. Reportable Diseases by County, Oklahoma, 2011^

	Campylobacteriosis		Cryptosporidiosis		*E. coli* O157:H7 and other STEC		Ehrlichiosis / Anaplasmosis	
County	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Latimer County	0	*	0	*	0	*	3	26.90
Le Flore County	3	5.95	0	*	0	*	8	15.88
Lincoln County	5	14.59	0	*	1	2.92	1	2.92
Logan County	6	14.34	3	7.17	1	2.39	1	2.39
Love County	1	10.61	0	*	0	*	0	*
McClain County	3	8.69	1	2.90	0	*	0	*
McCurtain County	0	*	0	*	0	*	4	12.07
McIntosh County	1	4.94	1	4.94	0	*	0	*
Major County	1	13.29	0	*	5	66.43	0	*
Marshall County	0	*	1	6.31	1	6.31	0	*
Mayes County	3	7.27	0	*	7	16.97	2	4.85
Murray County	1	7.41	0	*	0	*	0	*
Muskogee County	6	8.45	5	7.04	0	*	5	7.04
Noble County	0	*	0	*	0	*	0	*
Nowata County	0	*	0	*	0	*	2	18.98
Okfuskee County	0	*	0	*	0	*	0	*
Oklahoma County	55	7.65	22	3.06	8	1.11	8	1.11
Okmulgee County	4	9.98	0	*	2	4.99	2	4.99
Osage County	0	*	1	2.11	0	*	1	2.11
Ottawa County	4	12.56	0	*	2	6.28	2	6.28
Pawnee County	1	6.03	0	*	1	6.03	0	*
Payne County	3	3.88	0	*	7	9.05	4	5.17
Pittsburg County	9	19.63	2	4.36	0	*	14	30.54
Pontotoc County	4	10.67	1	2.67	1	2.67	0	*
Pottawatomie County	2	2.88	0	*	0	*	1	1.44
Pushmataha County	0	*	0	*	0	*	1	8.64
Roger Mills County	0	*	0	*	0	*	0	*
Rogers County	3	3.45	2	2.30	2	2.30	4	4.60
Seminole County	1	3.92	2	7.85	0	*	0	*
Sequoyah County	5	11.79	0	*	2	4.72	0	*
Stephens County	2	4.44	6	13.32	0	*	1	2.22
Texas County	1	4.84	2	9.69	0	*	0	*
Tillman County	1	12.51	0	*	0	*	0	*
Tulsa County	37	6.13	6	0.99	17	2.82	23	3.81
Wagoner County	5	6.84	0	*	2	2.74	5	6.84
Washington County	1	1.96	0	*	3	5.89	4	7.85
Washita County	0	*	0	*	0	*	0	*
Woods County	0	*	0	*	0	*	0	*
Woodward County	2	9.96	0	*	0	*	0	*
State of Oklahoma	315	8.40	91	2.43	88	2.35	123	3.28

^2011 rates illustrate county specific incidence rates per 100,000 population. Rates calculated by dividing the number of reported cases by the 2009 Census Bureau county population estimate and multiplying by 100,000

Table Three. Reportable Diseases by County, Oklahoma, 2011^

	Haemophilus influenzae , invasive		Hepatitis A		Hepatitis B		Hepatitis C	
County	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Adair County	1	4.41	0	*	0	*	1	4.41
Alfalfa County	0	*	0	*	0	*	0	*
Atoka County	0	*	0	*	2	14.10	0	*
Beaver County	0	*	1	17.74	0	*	0	*
Beckham County	0	*	0	*	0	*	0	*
Blaine County	1	8.37	0	*	0	*	0	*
Bryan County	0	*	0	*	0	*	0	*
Caddo County	2	6.76	0	*	1	3.38	0	*
Canadian County	3	2.60	0	*	0	*	1	0.87
Carter County	1	2.10	0	*	1	2.10	0	*
Cherokee County	0	*	0	*	0	*	1	2.13
Choctaw County	0	*	0	*	1	6.58	0	*
Cimarron County	0	*	0	*	0	*	0	*
Cleveland County	8	3.13	0	*	2	0.78	4	1.56
Coal County	0	*	0	*	1	16.88	0	*
Comanche County	3	2.42	1	0.81	3	2.42	0	*
Cotton County	0	*	0	*	0	*	0	*
Craig County	1	6.65	0	*	2	13.31	0	*
Creek County	0	*	1	1.43	2	2.86	5	7.15
Custer County	0	*	0	*	0	*	0	*
Delaware County	0	*	0	*	0	*	0	*
Dewey County	0	*	0	*	0	*	0	*
Ellis County	0	*	0	*	0	*	0	*
Garfield County	2	3.30	0	*	0	*	1	1.65
Garvin County	0	*	0	*	0	*	0	*
Grady County	3	5.72	0	*	2	3.81	2	3.81
Grant County	0	*	0	*	0	*	0	*
Greer County	0	*	1	16.03	1	16.03	0	*
Harmon County	0	*	0	*	0	*	0	*
Harper County	0	*	0	*	1	27.14	0	*
Haskell County	0	*	0	*	0	*	0	*
Hughes County	0	*	0	*	0	*	0	*
Jackson County	0	*	0	*	0	*	1	3.78
Jefferson County	0	*	0	*	0	*	0	*
Johnston County	0	*	0	*	1	9.13	1	9.13
Kay County	2	4.30	0	*	1	2.15	0	*
Kingfisher County	0	*	0	*	0	*	0	*
Kiowa County	0	*	0	*	0	*	0	*

^2011 rates illustrate county specific incidence rates per 100,000 population. Rates calculated by dividing the number of reported cases by the 2009 Census Bureau county population estimate and multiplying by 100,000

Table Three. Reportable Diseases by County, Oklahoma, 2011^

	Haemophilus influenzae , invasive		Hepatitis A		Hepatitis B		Hepatitis C	
County	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Latimer County	0	*	0	*	0	*	1	8.97
Le Flore County	0	*	1	1.98	4	7.94	1	1.98
Lincoln County	0	*	0	*	3	8.75	1	2.92
Logan County	0	*	0	*	1	2.39	0	*
Love County	0	*	0	*	3	31.84	0	*
McClain County	1	2.90	0	*	0	*	1	2.90
McCurtain County	0	*	0	*	2	6.03	0	*
McIntosh County	2	9.88	0	*	1	4.94	0	*
Major County	1	13.29	0	*	0	*	0	*
Marshall County	1	6.31	0	*	0	*	0	*
Mayes County	2	4.85	2	4.85	1	2.42	1	2.42
Murray County	0	*	0	*	0	*	0	*
Muskogee County	1	1.41	0	*	2	2.82	3	4.23
Noble County	0	*	0	*	1	8.65	0	*
Nowata County	0	*	0	*	0	*	0	*
Okfuskee County	1	8.20	0	*	1	8.20	0	*
Oklahoma County	9	1.25	2	0.28	17	2.37	6	0.83
Okmulgee County	0	*	0	*	3	7.49	3	7.49
Osage County	0	*	0	*	7	14.75	0	*
Ottawa County	0	*	1	3.14	0	*	3	9.42
Pawnee County	1	6.03	0	*	0	*	0	*
Payne County	3	3.88	0	*	0	*	1	1.29
Pittsburg County	3	6.54	0	*	1	2.18	0	*
Pontotoc County	0	*	0	*	1	2.67	0	*
Pottawatomie County	1	1.44	0	*	2	2.88	1	1.44
Pushmataha County	0	*	0	*	0	*	0	*
Roger Mills County	0	*	0	*	0	*	0	*
Rogers County	0	*	0	*	1	1.15	3	3.45
Seminole County	1	3.92	0	*	0	*	0	*
Sequoyah County	1	2.36	0	*	1	2.36	2	4.72
Stephens County	0	*	0	*	1	2.22	0	*
Texas County	0	*	0	*	0	*	0	*
Tillman County	0	*	0	*	0	*	0	*
Tulsa County	13	2.15	1	0.17	24	3.98	7	1.16
Wagoner County	1	1.37	0	*	0	*	1	1.37
Washington County	3	5.89	0	*	1	1.96	0	*
Washita County	0	*	0	*	1	8.60	0	*
Woods County	1	11.26	0	*	0	*	0	*
Woodward County	0	*	0	*	0	*	0	*
State of Oklahoma	73	1.95	11	0.29	100	2.67	52	1.39

^2011 rates illustrate county specific incidence rates per 100,000 population. Rates calculated by dividing the number of reported cases by the 2009 Census Bureau county population estimate and multiplying by 100,000

Table Three. Reportable Diseases by County, Oklahoma, 2011^

	Meningococcal invasive disease		Pertussis		Rocky Mountain Spotted Fever		Salmonellosis	
County	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Adair County	0	*	0	*	5	22.04	10	44.09
Alfalfa County	0	*	0	*	0	*	0	*
Atoka County	0	*	0	*	2	14.10	5	35.26
Beaver County	0	*	0	*	0	*	0	*
Beckham County	0	*	0	*	0	*	7	31.65
Blaine County	0	*	0	*	2	16.75	2	16.75
Bryan County	0	*	1	2.36	0	*	8	18.86
Caddo County	0	*	0	*	1	3.38	11	37.16
Canadian County	0	*	1	0.87	6	5.19	18	15.58
Carter County	0	*	3	6.31	1	2.10	20	42.05
Cherokee County	0	*	0	*	4	8.51	9	19.15
Choctaw County	0	*	0	*	5	32.88	5	32.88
Cimarron County	0	*	0	*	0	*	0	*
Cleveland County	1	0.39	6	2.35	15	5.86	54	21.11
Coal County	0	*	0	*	3	50.63	1	16.88
Comanche County	0	*	1	0.81	2	1.61	16	12.89
Cotton County	0	*	0	*	0	*	2	32.29
Craig County	0	*	0	*	3	19.96	6	39.92
Creek County	1	1.43	1	1.43	6	8.58	16	22.87
Custer County	0	*	0	*	1	3.64	6	21.84
Delaware County	0	*	0	*	4	9.64	9	21.69
Dewey County	2	41.58	0	*	0	*	0	*
Ellis County	0	*	0	*	0	*	0	*
Garfield County	2	3.30	0	*	2	3.30	4	6.60
Garvin County	1	3.63	0	*	2	7.25	10	36.26
Grady County	0	*	0	*	5	9.54	22	41.96
Grant County	0	*	0	*	0	*	3	66.27
Greer County	0	*	0	*	0	*	4	64.11
Harmon County	0	*	0	*	0	*	1	34.22
Harper County	0	*	0	*	0	*	1	27.14
Haskell County	0	*	0	*	7	54.82	3	23.49
Hughes County	0	*	0	*	7	49.99	4	28.57
Jackson County	0	*	0	*	0	*	14	52.94
Jefferson County	0	*	0	*	0	*	3	46.35
Johnston County	0	*	0	*	0	*	4	36.51
Kay County	0	*	0	*	3	6.44	5	10.74
Kingfisher County	0	*	0	*	5	33.26	2	13.30
Kiowa County	0	*	0	*	0	*	2	21.17

^2011 rates illustrate county specific incidence rates per 100,000 population. Rates calculated by dividing the number of reported cases by the 2009 Census Bureau county population estimate and multiplying by 100,000

Table Three. Reportable Diseases by County, Oklahoma, 2011^

	Meningococcal invasive disease		Pertussis		Rocky Mountain Spotted Fever		Salmonellosis	
County	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Latimer County	0	*	0	*	21	188.27	7	62.76
Le Flore County	0	*	0	*	16	31.76	18	35.73
Lincoln County	0	*	0	*	7	20.42	24	70.03
Logan County	0	*	0	*	4	9.56	13	31.06
Love County	0	*	1	10.61	0	*	7	74.29
McClain County	0	*	0	*	1	2.90	8	23.18
McCurtain County	0	*	0	*	14	42.23	8	24.13
McIntosh County	1	4.94	0	*	6	29.63	4	19.75
Major County	0	*	0	*	1	13.29	3	39.86
Marshall County	0	*	0	*	0	*	2	12.63
Mayes County	0	*	0	*	13	31.51	3	7.27
Murray County	0	*	0	*	0	*	2	14.83
Muskogee County	0	*	3	4.23	6	8.45	18	25.36
Noble County	0	*	0	*	4	34.60	2	17.30
Nowata County	1	9.49	0	*	1	9.49	1	9.49
Okfuskee County	0	*	0	*	3	24.61	1	8.20
Oklahoma County	2	0.28	22	3.06	32	4.45	128	17.81
Okmulgee County	0	*	3	7.49	4	9.98	3	7.49
Osage County	0	*	0	*	3	6.32	10	21.07
Ottawa County	0	*	0	*	5	15.70	7	21.98
Pawnee County	0	*	2	12.06	3	18.10	5	30.16
Payne County	0	*	4	5.17	6	7.76	15	19.39
Pittsburg County	0	*	0	*	17	37.09	7	15.27
Pontotoc County	0	*	0	*	5	13.34	15	40.01
Pottawatomie County	0	*	1	1.44	6	8.64	30	43.20
Pushmataha County	0	*	0	*	19	164.19	3	25.92
Roger Mills County	0	*	0	*	1	27.42	1	27.42
Rogers County	0	*	0	*	3	3.45	19	21.86
Seminole County	0	*	0	*	4	15.70	5	19.62
Sequoyah County	0	*	1	2.36	3	7.08	9	21.23
Stephens County	0	*	0	*	2	4.44	13	28.86
Texas County	0	*	1	4.84	0	*	2	9.69
Tillman County	0	*	0	*	0	*	2	25.03
Tulsa County	1	0.17	18	2.98	26	4.31	119	19.72
Wagoner County	0	*	0	*	5	6.84	20	27.37
Washington County	0	*	1	1.96	1	1.96	2	3.92
Washita County	0	*	0	*	0	*	2	17.20
Woods County	0	*	0	*	1	11.26	0	*
Woodward County	0	*	0	*	0	*	6	29.88
State of Oklahoma	12	0.32	70	*	334	8.90	831	22.15

^2011 rates illustrate county specific incidence rates per 100,000 population. Rates calculated by dividing the number of reported cases by the 2009 Census Bureau county population estimate and multiplying by 100,000

Table Three. Reportable Diseases by County, Oklahoma, 2011^

	Shigellosis		*S. pneumoniae* , invasive, < 5 yrs.		Tuberculosis		Tularemia	
County	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Adair County	0	*	0	*	0	*	2	8.82
Alfalfa County	1	17.72	0	*	0	*	0	*
Atoka County	0	*	0	*	1	7.05	0	*
Beaver County	0	*	0	*	0	*	0	*
Beckham County	5	22.61	0	*	1	4.52	0	*
Blaine County	1	8.37	0	*	0	*	0	*
Bryan County	0	*	0	*	1	2.36	0	*
Caddo County	0	*	0	*	1	3.38	0	*
Canadian County	5	4.33	1	0.87	3	2.60	0	*
Carter County	4	8.41	0	*	3	6.31	0	*
Cherokee County	1	2.13	0	*	0	*	1	2.13
Choctaw County	0	*	0	*	0	*	0	*
Cimarron County	0	*	0	*	0	*	0	*
Cleveland County	21	8.21	3	1.17	4	1.56	0	*
Coal County	0	*	0	*	0	*	0	*
Comanche County	4	3.22	2	1.61	1	0.81	0	*
Cotton County	0	*	0	*	0	*	0	*
Craig County	1	6.65	0	*	0	*	0	*
Creek County	0	*	0	*	6	8.58	0	*
Custer County	0	*	0	*	2	7.28	0	*
Delaware County	1	2.41	0	*	1	2.41	0	*
Dewey County	0	*	0	*	0	*	0	*
Ellis County	0	*	0	*	0	*	0	*
Garfield County	26	42.92	1	1.65	3	4.95	0	*
Garvin County	0	*	1	3.63	0	*	0	*
Grady County	0	*	1	1.91	0	*	0	*
Grant County	0	*	0	*	0	*	0	*
Greer County	0	*	0	*	0	*	0	*
Harmon County	0	*	0	*	0	*	0	*
Harper County	0	*	0	*	0	*	0	*
Haskell County	0	*	0	*	0	*	3	23.49
Hughes County	0	*	0	*	0	*	0	*
Jackson County	2	7.56	0	*	0	*	0	*
Jefferson County	0	*	0	*	0	*	0	*
Johnston County	0	*	0	*	0	*	0	*
Kay County	1	2.15	0	*	0	*	0	*
Kingfisher County	0	*	1	6.65	0	*	0	*
Kiowa County	1	10.59	0	*	1	10.59	0	*

^2011 rates illustrate county specific incidence rates per 100,000 population. Rates calculated by dividing the number of reported cases by the 2009 Census Bureau county population estimate and multiplying by 100,000

Table Three. Reportable Diseases by County, Oklahoma, 2011^

	Shigellosis		*S. pneumoniae* , invasive, < 5 yrs.		Tuberculosis		Tularemia	
County	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Latimer County	0	*	1	8.97	0	*	0	*
Le Flore County	0	*	1	1.98	1	1.98	0	*
Lincoln County	1	2.92	0	*	0	*	0	*
Logan County	0	*	0	*	0	*	0	*
Love County	1	10.61	0	*	0	*	0	*
McClain County	4	11.59	0	*	1	2.90	0	*
McCurtain County	6	18.10	1	3.02	3	9.05	0	*
McIntosh County	0	*	0	*	0	*	0	*
Major County	0	*	0	*	0	*	0	*
Marshall County	0	*	0	*	0	*	0	*
Mayes County	1	2.24	0	*	2	4.85	0	*
Murray County	0	*	0	*	0	*	0	*
Muskogee County	8	11.27	0	*	3	4.23	0	*
Noble County	0	*	0	*	0	*	0	*
Nowata County	0	*	1	9.49	1	9.49	0	*
Okfuskee County	0	*	1	8.20	1	8.20	0	*
Oklahoma County	134	18.65	6	0.83	28	3.90	2	0.28
Okmulgee County	0	*	0	*	2	4.99	0	*
Osage County	0	*	0	*	0	*	0	*
Ottawa County	18	56.52	1	3.14	1	3.14	0	*
Pawnee County	0	*	0	*	0	*	0	*
Payne County	1	1.29	1	1.29	1	1.29	0	*
Pittsburg County	3	6.54	2	4.36	1	2.18	2	4.36
Pontotoc County	1	2.67	0	*	1	2.67	0	*
Pottawatomie County	1	1.44	0	*	1	1.44	0	*
Pushmataha County	0	*	0	*	1	8.64	0	*
Roger Mills County	0	*	0	*	0	*	0	*
Rogers County	0	*	2	2.30	0	*	1	1.15
Seminole County	2	7.85	0	*	1	3.92	0	*
Sequoyah County	0	*	0	*	0	*	1	2.36
Stephens County	1	2.22	0	*	0	*	0	*
Texas County	0	*	0	*	2	9.69	0	*
Tillman County	0	*	0	*	0	*	0	*
Tulsa County	12	1.99	8	1.33	15	2.49	3	0.50
Wagoner County	0	*	1	1.37	0	*	0	*
Washington County	0	*	0	*	0	*	0	*
Washita County	4	34.40	0	*	0	*	0	*
Woods County	0	*	0	*	0	*	0	*
Woodward County	4	19.92	1	4.98	0	*	0	*
State of Oklahoma	276	7.36	37	0.99	94	2.51	15	0.40

^2011 rates illustrate county specific incidence rates per 100,000 population. Rates calculated by dividing the number of reported cases by the 2009 Census Bureau county population estimate and multiplying by 100,000

Table Three. Reportable Diseases by County, Oklahoma, 2011^

	Chlamydia		Gonorrhea		Syphilis (Total Early)	
County	Number	Rate	Number	Rate	Number	Rate
Adair County	66	291.0	6	112.4	*	*
Alfalfa County	*	*	*	*	*	*
Atoka County	43	303.2	3	21.2	*	*
Beaver County	*	*	*	*	*	*
Beckham County	44	198.9	*	*	*	*
Blaine County	16	134.0	*	*	*	*
Bryan County	135	318.3	10	23.6	*	*
Caddo County	97	327.7	12	40.5	*	*
Canadian County	233	201.7	36	31.2	*	*
Carter County	207	435.3	44	92.5	3	6.3
Cherokee County	175	372.4	17	36.2	*	*
Choctaw County	67	440.6	10	65.8	*	*
Cimarron County	*	*	*	*	*	*
Cleveland County	652	254.9	173	67.6	*	*
Coal County	29	489.5	*	*	*	*
Comanche County	1159	933.9	348	280.4	8	6.4
Cotton County	11	177.6	*	*	*	*
Craig County	50	332.7	10	66.5	*	*
Creek County	223	318.7	26	37.2	*	*
Custer County	50	182.0	13	47.3	*	*
Delaware County	77	185.6	6	14.5	*	*
Dewey County	8	166.3	*	*	*	*
Ellis County	3	72.3	*	*	*	*
Garfield County	189	312.0	29	47.9	*	*
Garvin County	81	293.7	8	29.0	*	*
Grady County	101	192.6	13	24.8	*	*
Grant County	11	243.0	*	*	*	*
Greer County	8	128.2	4	64.1	*	*
Harmon County	4	136.9	*	*	*	*
Harper County	9	244.2	4	108.5	*	*
Haskell County	17	133.1	*	*	*	*
Hughes County	49	349.9	7	50.0	*	*
Jackson County	124	468.9	24	90.8	*	*
Jefferson County	26	401.7	*	*	*	*
Johnston County	34	310.3	5	45.6	*	*
Kay County	153	328.6	13	27.9	*	*
Kingfisher County	29	192.9	6	39.9	*	*
Kiowa County	25	264.7	4	42.3	*	*

^2011 rates illustrate county specific incidence rates per 100,000 population. Rates calculated by dividing the number of reported cases by the 2009 Census Bureau county population estimate and multiplying by 100,000

Table Three. Reportable Diseases by County, Oklahoma, 2011^

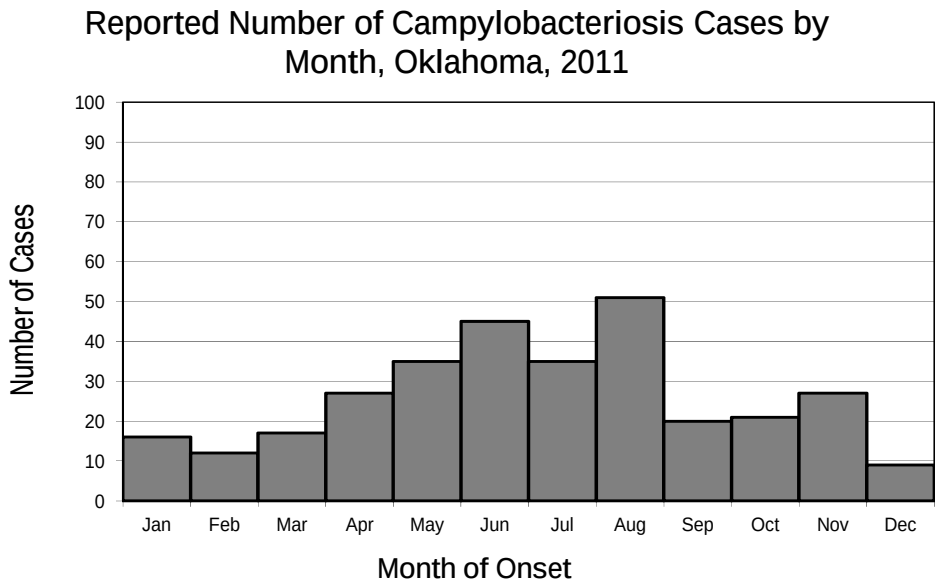
	Chlamydia		Gonorrhea		Syphilis (Total Early)	
County	Number	Rate	Number	Rate	Number	Rate
Latimer County	35	313.8	*	*	*	*
Le Flore County	124	246.1	12	23.8	*	*
Lincoln County	95	277.2	19	55.4	*	*
Logan County	243	580.7	82	195.9	*	*
Love County	21	222.9	3	31.8	*	*
McClain County	71	205.8	13	37.7	*	*
McCurtain County	111	334.8	36	108.6	*	*
McIntosh County	86	424.6	15	74.1	*	*
Major County	8	106.3	*	*	*	*
Marshall County	48	303.0	*	*	*	*
Mayes County	100	242.4	4	9.7	*	*
Murray County	25	185.3	4	29.7	*	*
Muskogee County	401	564.9	124	174.7	*	*
Noble County	28	242.2	5	43.2	*	*
Nowata County	22	208.8	4	38.0	*	*
Okfuskee County	33	270.7	8	65.6	*	*
Oklahoma County	3692	513.8	1509	210.0	35	4.9
Okmulgee County	162	404.3	53	132.3	*	*
Osage County	83	174.8	24	50.6	*	*
Ottawa County	117	367.4	10	31.4	*	*
Pawnee County	42	253.4	3	18.1	*	*
Payne County	340	439.6	79	102.1	*	*
Pittsburg County	119	259.6	23	50.2	*	*
Pontotoc County	153	408.1	24	64.0	*	*
Pottawatomie County	315	453.6	83	119.5	*	*
Pushmataha County	18	155.5	4	34.6	*	*
Roger Mills County	3	82.3	*	*	*	*
Rogers County	170	195.6	31	35.7	*	*
Seminole County	114	447.4	39	153.0	*	*
Sequoyah County	127	299.6	14	33.0	*	*
Stephens County	142	315.2	22	48.8	*	*
Texas County	49	237.4	4	19.4	*	*
Tillman County	26	325.3	5	62.6	*	*
Tulsa County	3012	499.2	1080	179.0	19	3.1
Wagoner County	96	131.4	17	23.3	*	*
Washington County	66	129.5	15	29.4	*	*
Washita County	10	86.0	*	*	*	*
Woods County	22	247.8	4	45.1	*	*
Woodward County	58	288.8	*	*	*	*
State of Oklahoma	14596	389.1	4216	112.4	84	2.2

^2011 rates illustrate county specific incidence rates per 100,000 population. Rates calculated by dividing the number of reported cases by the 2009 Census Bureau county population estimate and multiplying by 100,000

Campylobacteriosis

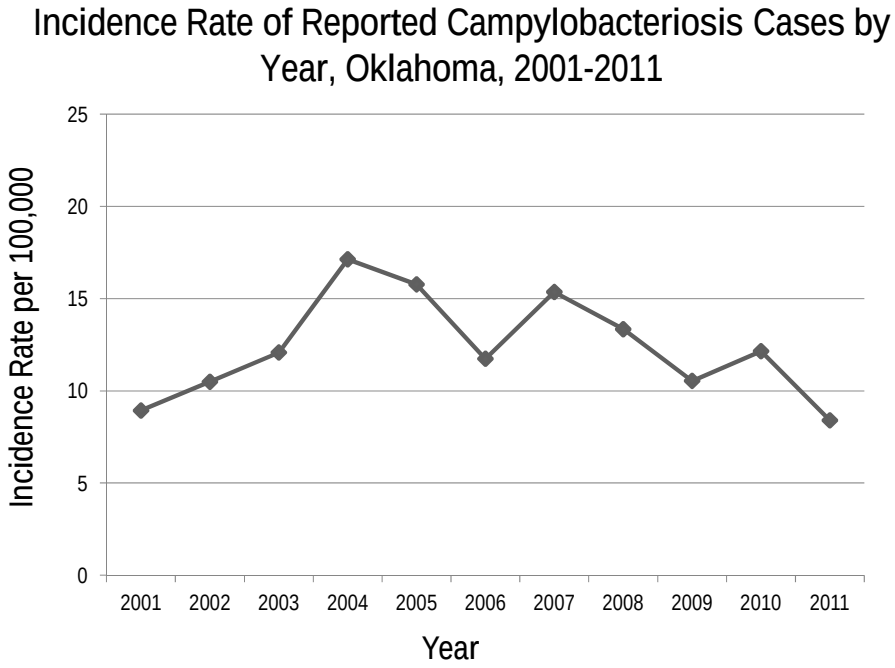
2011 Case Total	315	2011 Incidence Rate	8.4 per 100,000
2010 Case Total	448	2010 Incidence Rate	12.2 per 100,000

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. The number of cases reported in 2011 is a 31% decrease from the 448 cases reported in 2010. As shown in the graph below, a seasonal trend for campylobacteriosis was seen with more cases occurring during the months of May through August (n = 166, 53%).



The highest incidence rate (IR) by age group occurred among cases less than five years of age (20.82 per 100,000, n = 55), followed by cases 40 to 49 years of age (9.60 per 100,000, n = 47), and cases 30 to 39 years of age (8.02 per 100,000, n = 38). The IR of campylobacteriosis was greater among men (8.83 per 100,000, n = 164) than women (7.44 per 100,000, n = 141). No outbreaks of campylobacteriosis were reported in 2011.

Cases of campylobacteriosis were reported from 54 counties in Oklahoma. The highest IR of cases occurred among residents of Harper County (81.41 per 100,000; n = 3). Other counties with high rates included Adair County (35.27 per 100,000; n = 8), Harmon County (34.22 per 100,000; n = 1), and Kingfisher County (33.26 per 100,000; n = 5). Population size can affect incidence rates; consequently the higher rates occurred in counties with smaller populations. The highest numbers of cases occurred in Oklahoma county with 55 cases (7.65 per 100,000) followed by Tulsa county with 37 cases (6.13 per 100,000). Nineteen cases (6%) were hospitalized for campylobacteriosis; there were no deaths due to this disease in 2011. The OSDH PHL received 21 isolates to confirm *Campylobacter* and serogroup identification, representing 7% of the reported cases. Of these isolates, 76% were identified as *C. jejuni*, 10% as *C. jejuni* var. *doylei*, and 14% as *C. coli*.



Demographic and Clinical Summary of Reported Campylobacteriosis Cases, Oklahoma, 2011 (N = 315)

	Number (%)	Incidence rate per 100,000
Gender		
Male	164 (52%)	8.83
Female	141 (45%)	7.44
Unknown	10 (3%)	--
Age	Median Age: 30 years (Range: 15 days – 91 years)	
Age Groups		
Less than 5 years	55 (18%)	20.82
5 - 9	16 (5%)	6.17
10 - 19	29 (9%)	5.60
20 - 29	42 (13%)	7.85
30 - 39	38 (12%)	8.02
40 - 49	47 (15%)	9.60
50 - 59	39 (12%)	7.79
60 - 69	28 (9%)	7.69
70 - 79	12 (4%)	5.55
80+	9 (3%)	6.86
Race		
White	173 (55%)	6.39
American Indian or Alaska Native	26 (8%)	8.08
Black or African American	7 (2%)	2.52
Multiracial, unspecified	1 (0.3%)	0.45
Unknown	108 (34%)	--
Hispanic or Latino Ethnicity	29 (9%)	8.73
Hospitalized	19 (6%)	--

Chlamydia

2011 Case Total	14,596	2011 Rate	389 per 100,000
2010 Case Total	14,302	2010 Rate	381 per 100,000

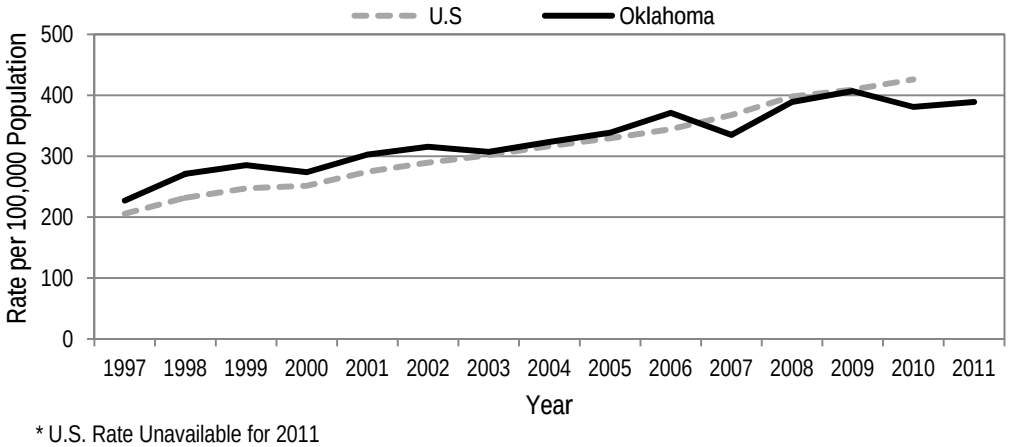
Chlamydia is the most commonly reported notifiable sexually transmitted disease (STD) in the United States and Oklahoma. Caused by the bacterium *Chlamydia trachomatis*, it is the most prevalent STD in Oklahoma accounting for 77% of reported STDs in the state for 2011. Although symptoms of Chlamydia are usually mild or absent, serious complications that cause irreversible damage can develop "silently" before a patient ever recognizes a problem. In women, chlamydia can cause pelvic inflammatory disease, ectopic pregnancy, chronic pain, and/or infertility. Unfortunately, up to 70% of women with chlamydia are asymptomatic. In addition, a pregnant woman infected with chlamydia can transmit the infection to her baby's eyes during a vaginal birth. The resulting ophthalmic infection can ultimately result in the infant's blindness. Men infected with chlamydia may have penile discharge or burning and itching around the urethra, while about 1%-25% of men infected are asymptomatic. Possible complications of male infections include epididymitis, infertility, and Reiter's Syndrome (reactive arthritis). In men, receptive anal intercourse may result in chlamydial proctitis.

When Oklahoma mandated chlamydia reporting in 1988, 2,714 cases were reported. In 2011, a total of 14,596 cases were reported. The rate of chlamydia in Oklahoma increased 2.0% between 2010 and 2011. Oklahoma had an incidence rate of 389.1 per 100,000 in 2011, with 71% of the reported cases being female. Women go to the doctor more frequently than men due to yearly exams and pregnancy; this could partially explain the gender gap in reported chlamydia cases.

Oklahoma, Tulsa, and Comanche counties accounted for 53.9% of the total chlamydia cases reported in Oklahoma in 2011. The rate in Oklahoma County increased by 6.2% between 2010 and 2011, while rates decreased in Comanche and Tulsa counties by 3.1% and 4.3% respectively. While Oklahoma County had the highest number of reported cases at 3,692, Comanche County had the highest rate at 933.9 per 100,000, followed by Logan County (580.7 per 100,000) and Muskogee County (564.9 per 100,000). Chlamydia occurs in all ages, but age groups 15 to 19 years (1809.2 per 100,000) and 20 to 24 years (2235.2 per 100,000) had the highest rates among all the age groups. Age group 40 to 44 years had the highest rate increase at 56.5 per 100,000, 13.2% higher than 2010 (114 to 129 cases).

Blacks had the highest rate among all racial groups with a rate of 1,603.5 per 100,000, 6.0 times higher than Whites (268.6 per 100,000). American Indians/Alaska Natives had the second highest rate (531.3 per 100,000) which was 2.0 times higher than Whites and a 6.3% increase from the 2010 rate. Asians/Pacific Islanders had a rate of 247.7 per 100,000. Hispanics had a rate of 350.9 per 100,000 in 2011, which represents a 15.5% decrease from 2010.

Incidence Rate of Reported Chlamydia by Year, Oklahoma and U.S., 1997-2011*



* U.S. Rate Unavailable for 2011

Demographic and Clinical Summary of Reported Chlamydia Cases, Oklahoma, 2011 (N = 14,596)

	Number (%)	Incidence Rate per 100,000
Gender		
Male	3,851 (26%)	207.4
Female	10,349 (71%)	546.3
Unknown	396 (3%)	-
Age Groups		
< 10 Years	22 (<1%)	4.2
10 to 14	124 (<1%)	48.9
15 to 19	4,785 (33%)	1,809.2
20 to 24	6,018 (41%)	2,235.2
25 to 29	2,216 (15%)	833.9
30 to 34	873 (6%)	362.2
35 to 39	308 (2%)	132.3
40 to 44	129 (<1%)	56.5
45 to 49	56 (<1%)	21.1
> 50 Years	51 (<1%)	4.2
Unknown	14 (<1%)	-
Race		
White	7,270 (50%)	268.6
Black/African American	4,452 (31%)	1,603.5
American Indian/Alaska Native	1,709 (12%)	531.3
Multiple Race	283 (2%)	127.9
Asian/Pacific Islander	172 (1%)	247.7
Other/Unknown	710 (5%)	-
Ethnicity		
Hispanic or Latino	1,165 (8%)	350.9

Cryptosporidiosis

2011 Case Total	90	2011 Incidence Rate	2.4 per 100,000
2010 Case Total	122	2010 Incidence Rate	3.3 per 100,000

The number of cryptosporidiosis cases reported in Oklahoma during 2011 was a 26.2% decrease compared to the 122 cases reported during 2010. *Cryptosporidium* was identified by antigen identification using immunodiagnostic methods in 88 (98%) of the 90 reported cases, and the *Cryptosporidium* organism or DNA was detected by PCR in two (2%).

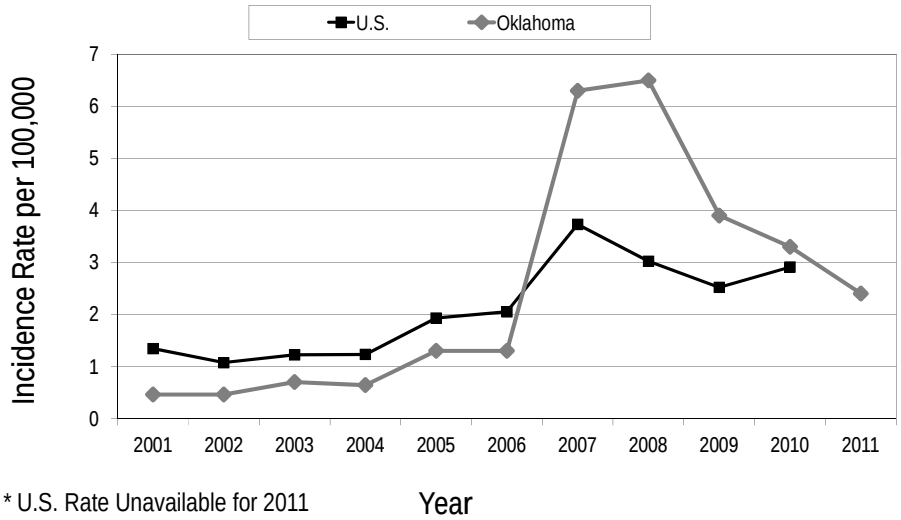
The highest incidence rate of cryptosporidiosis occurred in persons 60 to 69 years of age (5.0 per 100,000 population). Six (7%) cases reported working in or attending a child care setting. In 2011, the majority of cases occurred in June (17%). The highest incidence rates of cryptosporidiosis occurred among residents of Jackson (18.9 per 100,000 population), Johnston (18.3 per 100,000 population), and Stephens counties (13.3 per 100,000 population). Ten individuals (13%) reported exposure to a pond or river, and 15 (19%) reported exposure to a swimming pool.

Cryptosporidium is one of the most common causes of waterborne disease among humans in the United States. For information about healthy swimming behaviors to prevent recreational water-related diseases, visit the Oklahoma State Department of Health, Acute Disease Service website at http://ads.health.ok.gov.

Demographic Summary of Reported Cryptosporidiosis Cases, Oklahoma, 2011 (N = 90)

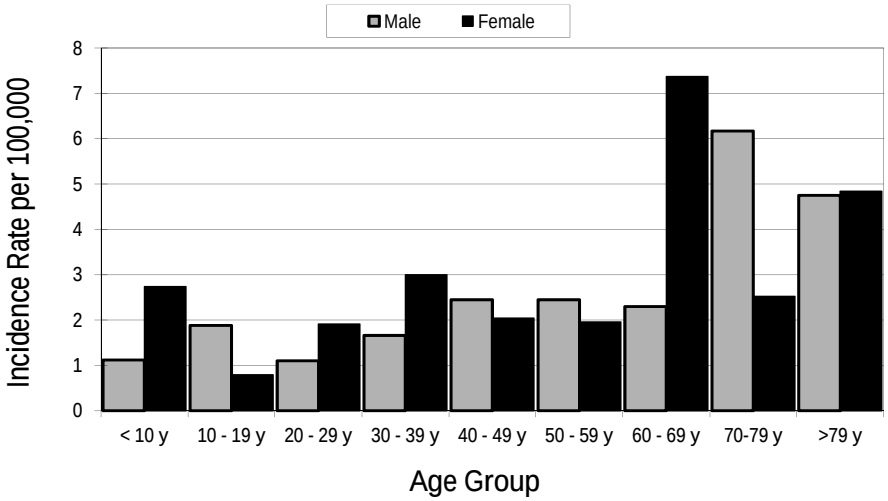
	Number (%)	Incidence Rate per 100,000
Gender		
Female	52 (58%)	2.75
Male	38 (42%)	2.05
Age	Median = 47.5 years (range: 1 – 86 years)	
Race		
White	76 (84%)	2.81
Black or African American	2 (2%)	0.72
American Indian or Alaskan Native	2 (2%)	0.62
Asian	2 (2%)	1.54
Two or more races	2 (2%)	0.9
Unknown	6 (7%)	-
Hispanic or Latino Ethnicity	6 (7%)	1.81
Hospitalization	31 (34%)	-
Symptoms		
Diarrhea	79 (88%)	-
Watery diarrhea	68 (76%)	-
Abdominal cramps	64 (71%)	-
Anorexia	45 (50%)	-
Duration of diarrhea	Median = 7 days (range: 2 – 200 days)	
Number of loose stools in a 24-hour period	Median = 10 stools (range: 0 – 50 stools)	

Incidence Rate of Reported Cryptosporidiosis by Year, Oklahoma and U.S., 2001 – 2011*



* U.S. Rate Unavailable for 2011

Incidence Rate of Reported Cryptosporidiosis Cases by Age Group and Gender, Oklahoma, 2011



E. coli O157, O157:H7, or Shiga toxin-producing *Escherichia coli* (STEC)

2011 Case Total	88	2011 Incidence Rate	2.35 per 100,000
2010 Case Total	104	2010 Incidence Rate	2.82 per 100,000

Nationally, *E. coli* O157:H7 is the most commonly reported serotype of Shiga toxin-producing *E. coli* (STEC); however, the number of reported non-O157 STEC cases each year is increasing[i]. This increase may be partially due to more widely used laboratory tests that identify other serotypes of STEC beyond O157:H7. The number of reported STEC cases reported in 2011 is a 13% decrease from the 104 cases reported in 2010.

STEC cases in 2011 occurred among residents of 29 Oklahoma counties. The five counties with the highest incidence rates were Major (66.43 per 100,000, n = 5), Harmon (34.22 per 100,000, n = 1), Mayes (16.97 per 100,000, n = 7), Jefferson (15.45 per 100,000, n = 1), and Payne (9.05 per 100,000, n = 7) counties. The highest incidence rate occurred among females less than ten years of age with an incidence of 10.55 per 100,000 (n = 27). The second highest incidence rate occurred among males less than ten years of age with an incidence of 9.34 per 100,000 (n = 25).

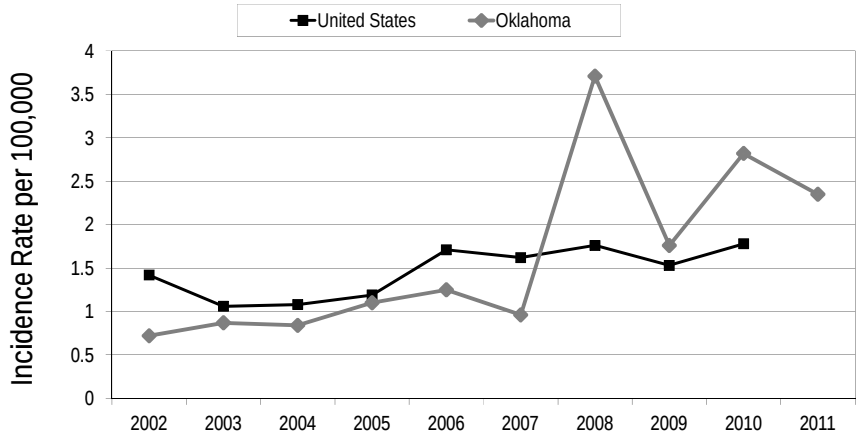
Demographic and Clinical Summary of Reported STEC Cases, Oklahoma, 2011 (N = 88)

	Number (%)	Incidence Rate per 100,000
Gender		
Male	40 (45%)	2.15
Female	48 (55%)	2.53
Age	Median Age: 5 years (Range: 8 months – 78 years)	
Race		
White	67 (76%)	2.48
African American or Black	4 (5%)	1.44
Two or more races	2 (2%)	0.90
American Indian or Alaska Native	6 (7%)	1.87
Asian	1 (1%)	1.54
Unknown	8 (9%)	--
Hispanic or Latino Ethnicity	7 (8%)	2.11
Hospitalized	22 (25%)	--
Hemolytic Uremic Syndrome	6 (7%)	--
Symptoms		
Diarrhea	85 (97%)	--
Abdominal Cramps	71 (81%)	--
Bloody Diarrhea	52 (59%)	--
Nausea	42 (48%)	--
Vomiting	30 (34%)	--
Fever	30 (34%)	--

Thirty (34%) cases reported involvement with high-risk settings. Of those, 22 (73%) were associated with child care settings, two (7%) resided in a correctional facility, and six (20%) were affiliated with a school. Secondary cases were reported in two child care settings. Eleven (13%) of the reported STEC cases were epidemiologically-linked symptomatic contacts identified by county health department public health nurses during case investigations.

All suspected STEC isolates are required to be forwarded to the Oklahoma State Department of Health (OSDH) Public Health Laboratory (PHL) for confirmation and serogroup identification. In 2011, STEC isolates were forwarded to the OSDH PHL for 81 (100%) confirmed cases. Of the 81 isolates, 33 (41%) were confirmed *E. coli* O157:H7 and 48 (59%) were STEC non-O157.

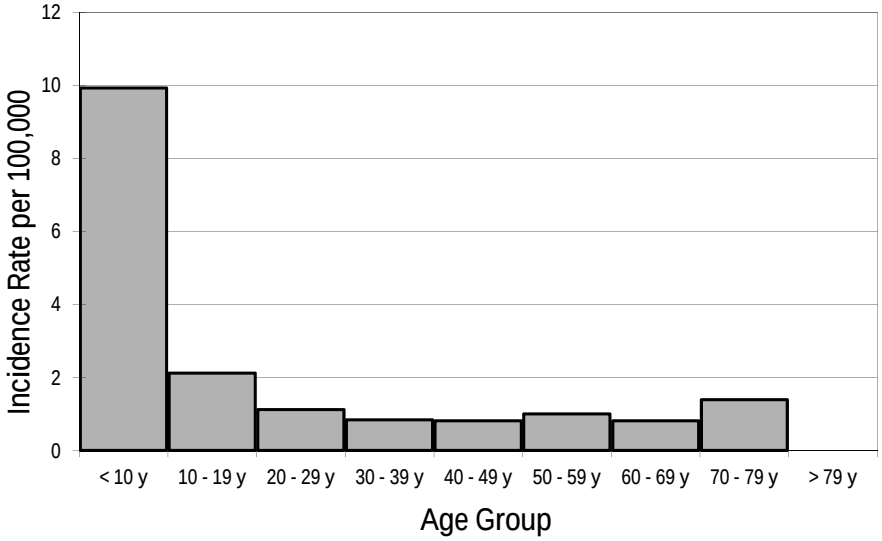
Incidence Rate of Reported *Escherichia coli* O157:H7 and other Shiga toxin producing *E. coli* by Year, Oklahoma and U.S., 2002 – 2011*



* U.S. Rate Unavailable for 2011

Year

Incidence Rate of Reported *Escherichia coli* O157:H7 and other Shiga toxin producing *E. coli* Cases by Age Group, Oklahoma, 2011



[i] Centers for Disease Control and Prevention. [Summary of notifiable diseases—United States, 2009]. Published May 12, 2011 for MMWR 2011;58(No. 53):74.

Ehrlichioses: Ehrlichiosis & Anaplasmosis

Human monocytic ehrlichiosis (HME) and human granulocytic anaplasmosis (HGA, formerly called human granulocytic ehrlichiosis, or HGE) are distinct but closely related tickborne diseases with similar clinical presentations. Previously, these two diseases have been considered as one, and epidemiologic descriptions combined both cases of ehrlichiosis and anaplasmosis together. These diseases are now considered separate bacterial, tickborne diseases; therefore, this summary will present separate data for each.

Ehrlichiosis

2011 Case Total	113	2011 Incidence Rate	3.01 per 100,000
2010 Case Total	101	2010 Incidence Rate	2.69 per 100,000

Ehrlichiosis is a general name used to describe several bacterial diseases that can affect both animals and humans. There are three different ehrlichial species in the United States: *Ehrlichia chaffeensis, Ehrlichia ewingii, and Ehrlichia muris*-like (EML). These infections are spread to humans by the bite of an infected tick, namely the lone star tick (*Amblyomma americanum*). Common symptoms for ehrlichiosis include: fever, headache, fatigue, and muscle aches. Ehrlichiosis is diagnosed based on symptoms, clinical presentation, and laboratory testing (serology).

Serologic testing is the most widely available and frequently used laboratory method for diagnosis. Both IgM and IgG antibody levels are used to confirm illness. Collection of acute (within a week of onset) and convalescent (2 to 4 weeks later) specimens are recommended for confirming the diagnosis. Treatment 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.[i]

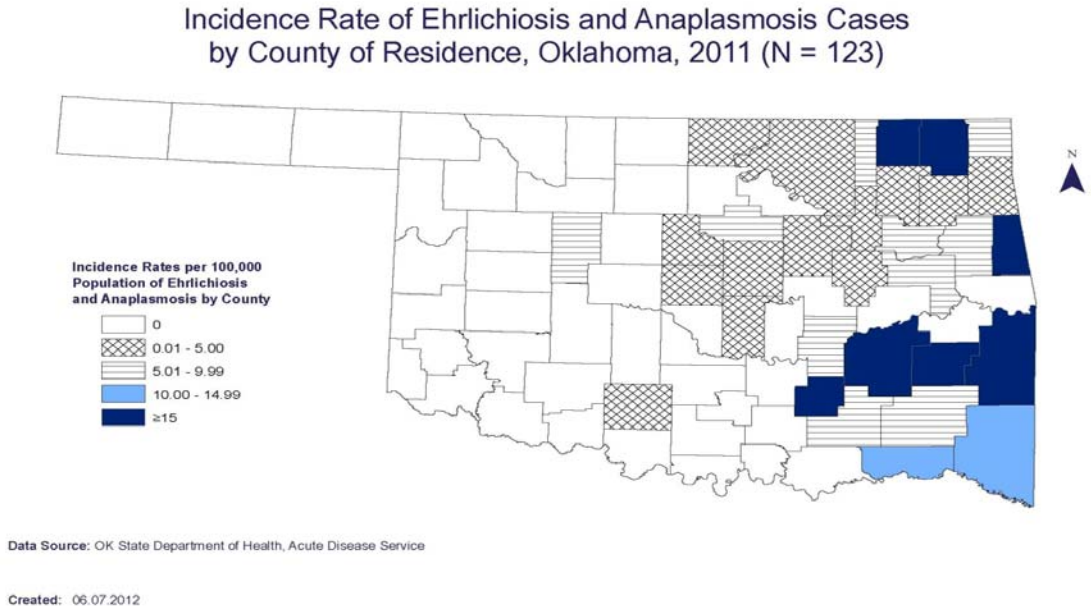
In 2011, the incidence rate (IR) of ehrlichiosis in Oklahoma represented a 12% increase from 2010. Eastern Oklahoma had higher incidence rates corresponding with its larger tick population. The counties with the highest rates of disease in 2011 were Adair (30.86 per 100,000, n=7), followed by Latimer (26.90 per 100,000, n = 3), and Pittsburg counties (26.18 per 100,000, n = 12). Onsets of illness peaked during the month of July.

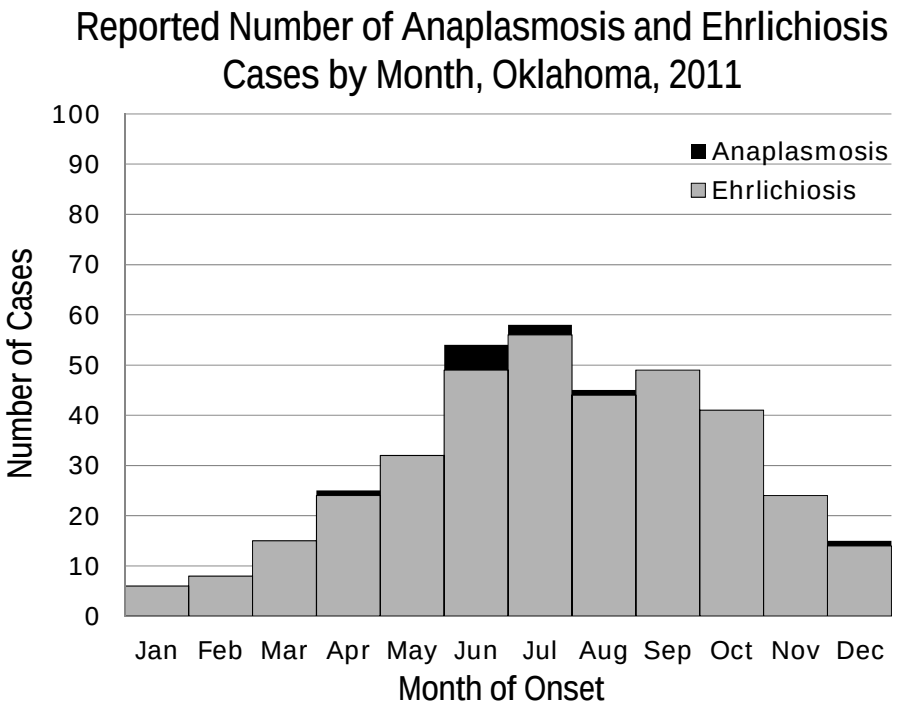
Anaplasmosis

2011 Case Total	10	2011 Incidence Rate	0.27 per 100,000
2010 Case Total	9	2010 Incidence Rate	0.24 per 100,000

Anaplasmosis is a tickborne disease that is caused by the bacterium *Anaplasma phagocytophilum*. It was previously called human granulocytic ehrlichiosis (HGE) and is now commonly referred to as human granulocytic anaplasmosis (HGA). Humans contract anaplasmosis through tick bites, especially the black-legged tick and the western black-legged tick. Symptoms of anaplasmosis are very similar to those of ehrlichiosis and include: fever, headache, chills, and muscle aches. Symptoms will typically develop 1-2 weeks after a tick bite. Anaplasmosis is also diagnosed based on symptoms, clinical presentation, and laboratory testing. Doxycycline is the first line of treatment for anaplasmosis[i].

In 2011, the incidence rate of anaplasmosis in Oklahoma represented an 11% increase from 2010. Similar to ehrlichiosis, higher incidence rates occurred in eastern Oklahoma counties corresponding with its larger tick population. The counties with the highest rates of disease in 2011 were Coal (33.76 per 100,000, n=2), followed by Hughes (n = 7.14 per 100,000, n = 1) and Pittsburg counties (n = 4.36 per 100,000, n = 2).


Incidence Rate of Ehrlichiosis and Anaplasmosis Cases
by County of Residence, Oklahoma, 2011 (N = 123)
Incidence Rates per 100,000
Population of Ehrlichiosis
and Anaplasmosis by County
0
0.01 - 5.00
5.01 - 9.99
10.00 - 14.99
≥15
N
Data Source: OK State Department of Health, Acute Disease Service
Created: 06.07.2012


Reported Number of Anaplasmosis and Ehrlichiosis
Cases by Month, Oklahoma, 2011
Anaplasmosis
Ehrlichiosis
Number of Cases
0
10
20
30
40
50
60
70
80
90
100
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month of Onset

Descriptive and Clinical Summary of Reported Ehrlichiosis (N = 113) and Anaplasmosis (N = 10) Cases, Oklahoma, 2011

	Ehrlichiosis		Anaplasmosis	
	Number (%)	Incidence rate per 100,000	Number (%)	Incidence rate per 100,000
Gender				
Male	50 (44%)	2.69	5 (50%)	0.27
Female	63 (56%)	3.33	5 (50%)	0.27
Age	Median Age: 45 years (Range: 3 – 84 years)		Median Age: 42 Years (Range: 8 -74 years)	
Race				
White	59 (52%)	2.18	5 (50%)	0.18
American Indian or Alaska Native	31 (28%)	9.64	1 (10%)	0.31
Native Hawaiian or Pacific Islander	0 (0%)	--	1 (10%)	22.89
African American	1 (0.8%)	0.36	0 (0%)	--
Unknown	19 (17%)	--	3 (30%)	--
Hispanic or Latino Ethnicity	3 (3%)	0.90	0	--
Symptoms				
Fever	113 (100%)	--	10 (100%)	--
Headache	67 (59%)	--	7 (70%)	--
Myalgia	60 (53%)	--	4 (40%)	--
Rash	19 (17%)	--	1 (10%)	--
History of a tick bite	45 (40%)	--	5 (50%)	--
Hospitalized due to the disease	22 (19%)	--	2 (20%)	--

[i] Heymann, David L., Editor. Control of Communicable Diseases Manual. 19th Edition. American Public Health Association, 2008

Gonorrhea

2011 Case Total	4,216	2011 Incidence Rate	112.4 per 100,000
2010 Case Total	4,369	2010 Incidence Rate	116.5 per 100,000

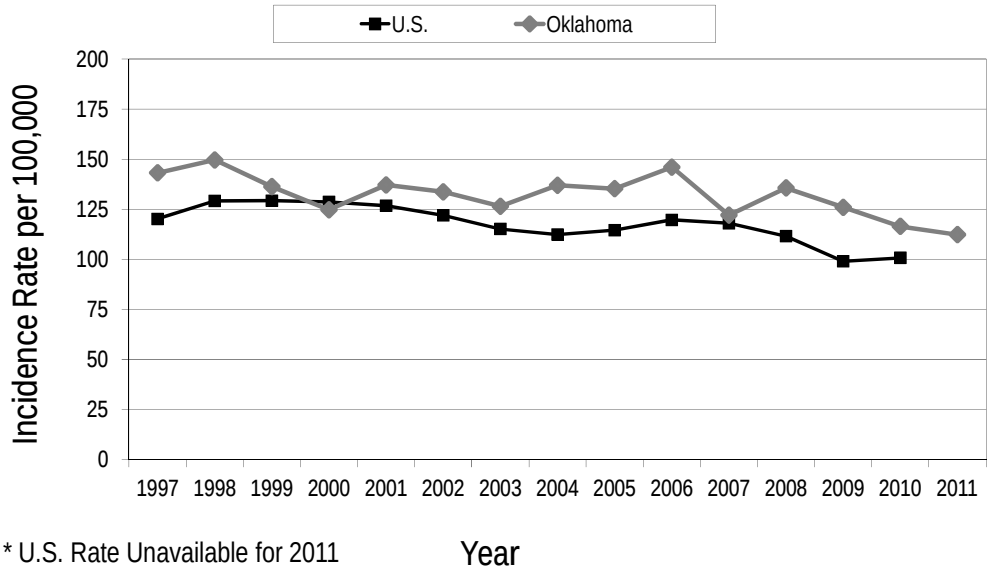
After chlamydia, gonorrhea is the second most prevalent sexually transmitted disease reported in Oklahoma. Gonorrhea is caused by *Neisseria gonorrhea*, a bacterium that can grow and multiply in warm, moist areas of the reproductive tract, mouth, throat, eyes, and anus. In women, gonorrhea can result in pelvic inflammatory disease, ectopic pregnancy, cervicitis, and eventually infertility. Pregnant women infected with gonorrhea can transmit the infection to their unborn babies during pregnancy or birth. In men, this infection most often manifests as purulent urethral discharge and dysuria, and can cause infertility.

When Oklahoma mandated gonorrhea reporting in 1943, 4,715 cases were reported. Reported gonorrhea cases increased until 1982 when Oklahoma's numbers started following a national decline due to the implementation of a national gonorrhea control program in the mid-1970s. In 2011, a total of 4,216 cases were reported in Oklahoma, approximately a 3.5% decrease from 2010. Oklahoma had an incidence rate of 112.4 per 100,000 in 2011 with 57% of the reported cases being female. On a national level, men made up the majority of gonorrhea cases in 1989, but since 2002 women have made up the majority of cases. Oklahoma has followed a similar trend.

While Oklahoma County had the highest number of reported cases with 1,509, Comanche County had the highest rate (280.4 per 100,000), followed by Oklahoma County (210.0 per 100,000) and Logan County (195.9 per 100,000). All three counties had a rate increase between 2010 and 2011. Logan County had the highest increase at 43.8%, followed by Comanche at 12.2% and Oklahoma at 3.3%.

Gonorrhea occurs in all ages, but age groups 20 to 24 years (623.6 per 100,000) and 15 to 19 years (391.3 per 100,000) had the highest rates among all other age groups. Although most age groups had a rate decrease from 2010 to 2011, three age groups experienced an increase: greater than 50 years at 34.4% increase, 35 to 39 years at 15.8% increase, and 20 to 24 years at 11% increase.

Incidence Rate of Reported Gonorrhea Cases by Year, Oklahoma and U.S., 1997 – 2011*



* U.S. Rate Unavailable for 2011

Blacks had the highest rate among all racial groups with a rate of 826.2 per 100,000, 16.9 times higher when compared to Whites (48.8 per 100,000). American Indians and Alaska Natives had the second highest rate (97 per 100,000) which was 2 times higher than Whites. Asian and Pacific Islanders had a rate of 47.5 per 100,000, but represented only 33 cases in 2011. Hispanics had a rate of 63.9 per 100,000 in 2011, which represents a 7.8% increase from 2010. Asian and Pacific Islanders had the highest increase in gonorrhea rate (a 65% increase from 2010), while Blacks had the largest decrease (a 6.4% decrease from 2010).

Demographic and Clinical Summary of Reported Gonorrhea Cases, Oklahoma, 2011 (N = 4,216)

	Number (%)	Incidence Rate per 100,000
Gender		
Female	2,396 (57%)	126.5
Male	1,708 (41%)	92.0
Unknown	112 (3%)	-
Age		
< 10 Years	6 (<1%)	1.1
10 to 14	25 (<1%)	9.9
15 to 19	1,035 (25%)	391.3
20 to 24	1,679 (40%)	623.6
25 to 29	751 (18%)	282.6
30 to 34	374 (9%)	155.2
35 to 39	159 (4%)	68.3
40 to 44	74 (2%)	32.4
45 to 49	46 (1%)	17.6
> 50 Years	57 (1%)	4.7
Unknown	10 (<1%)	-
Race		
Black/African American	2,294 (54%)	826.2
White	1,320 (31%)	48.8
American Indian/Alaska Native	312 (7%)	97.0
Multiple Race	85 (2%)	38.4
Asian/Pacific Islander	33 (<1%)	47.5
Other/Unknown	172 (4%)	-
Hispanic or Latino Ethnicity	212 (5%)	826.2

Haemophilus influenzae Invasive Disease

2011 Case Total	73	2011 Incidence Rate	1.94 per 100,000
2010 Case Total	105	2010 Incidence Rate	2.85 per 100,000

Invasive *Haemophilus influenzae* (*H. flu*) disease is a 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. In 2011, 73 cases of invasive *H. flu* were reported to the OSDH, a 30.5% decrease from 2010. All *H. flu* isolates forwarded to the OSDH PHL are serotyped based on the presence of a capsule (serotypes a through f) or absence of a capsule (non-typeable). Both capsulated and nonencapsulated isolates have the ability to cause severe disease. Of the 69 isolates (94% of reported cases) available for serotype identification by the PHL, 44 (63.8%) were non-typeable, 14 (20.3%) were serotype f, 8 (11.6%) were serotype e, and 3 (4.3%) were serotype a.

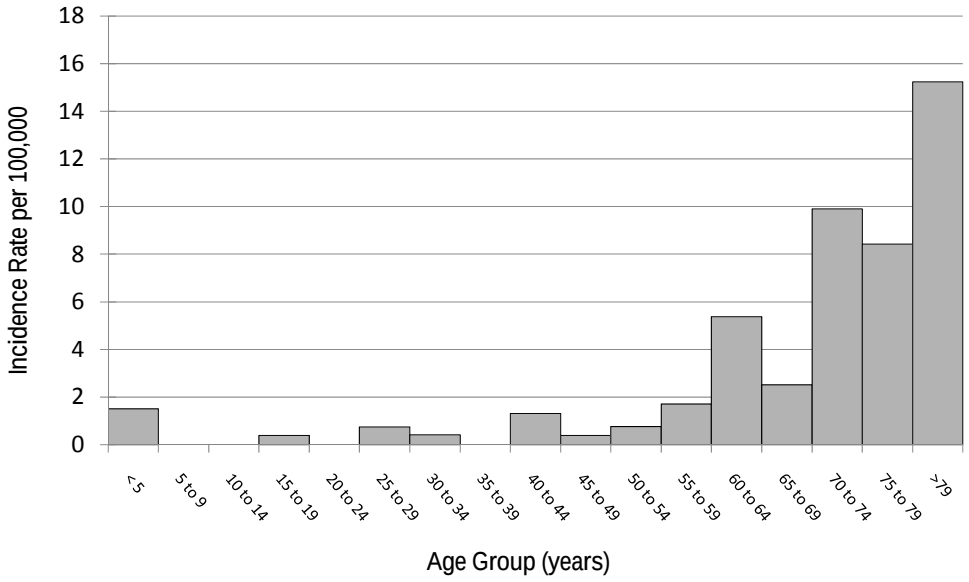
During 2011, cases of invasive *H. flu* ranged in age from 1 month to 97 years, with a median age of 71 years. The highest age-specific incidence rates per 100,000 population occurred among persons 80 years and older (refer to graph). Four (5.5%) cases occurred among children less than 5 years of age, an age-specific incidence rate of 1.51 per 100,000 population. The highest proportion of cases occurred during the winter months, with almost half of reported cases (47%, n = 34) occurring during the months from November through February.

When a case of invasive *Haemophilus influenzae* type b (Hib) is identified, an active contact investigation commences to locate all close contacts less than 4 years of age, review vaccination history, and recommend antibiotic prophylaxis if needed. If any exposed children less than 4 years of age who are either unvaccinated or have not yet received the full primary series of the Hib vaccine are identified, then chemoprophylaxis is recommended for household members to eradicate carriage of the organism. No cases of serotype b were identified in 2011.

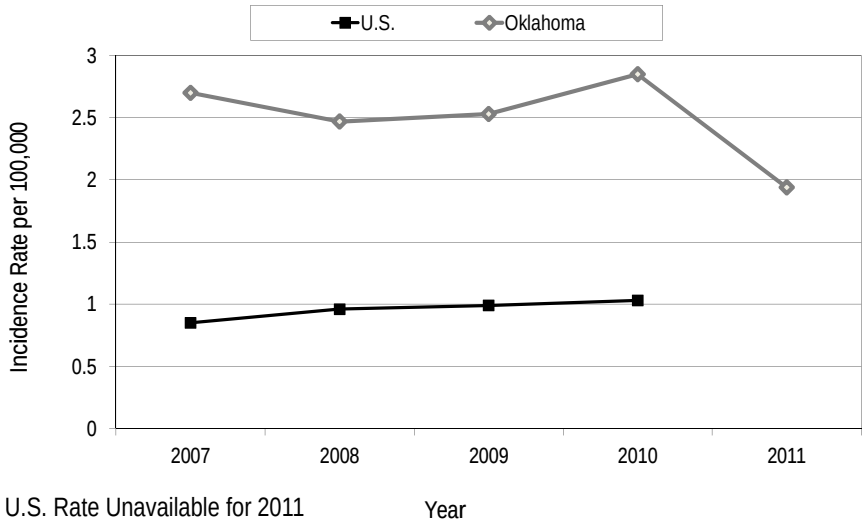
Demographic Summary of Reported *Haemophilus influenzae* Invasive Disease Cases, Oklahoma, 2011 (N = 73)

	Number (%)	Incidence Rate per 100,000
Gender		
Male	33 (45%)	1.78
Female	40 (55%)	2.11
Age	Median = 71 years (Range: 1 month – 97 years)	
Hospitalized for *H. flu*	51 (70%)	-
Deaths due to *H. flu*	9 (11%)	-
Race		
White	60 (82%)	2.22
Black	4 (6%)	1.44
Asian	1 (1%)	1.54
Multiracial	1 (1%)	0.45
Unknown	7 (10%)	-
Hispanic or Latino Ethnicity	2 (3%)	0.60
Infection Types (not mutually exclusive)		
Bacteremia/sepsis	71 (97%)	-
Meningitis	1 (1%)	-
Pneumonia	48 (66%)	-

Incidence Rate of Reported Invasive *Haemophilus influenzae* Cases by Age Group, Oklahoma, 2011



Haemophilus influenzae Incidence Rate by Year, Oklahoma and U.S., 2007-2011*



* U.S. Rate Unavailable for 2011

Hemolytic Uremic Syndrome, Post-diarrheal

2011 Case Total	7	2011 Incidence Rate	0.19 per 100,000
2010 Case Total	11	2010 Incidence Rate	0.30 per 100,000

Hemolytic Uremic Syndrome (HUS) is a condition characterized by an acute onset of microangiopathic hemolytic anemia, renal injury and thrombocytopenia, with the majority of cases preceded by a diarrheal illness. In 2011, the incident rate of HUS in Oklahoma represented a 36% decrease from 2010. Post-diarrheal HUS became a nationally notifiable disease in 2000, and since that time, Oklahoma's incidence rate has been similar to the national incidence. From 2002 to 2011, the median annual number of reported HUS cases in Oklahoma was 5 (range: 2 to 51), and the overall case fatality rate was 3%.

In 2011, ages of post-diarrheal HUS cases ranged from 8 months to 68 years of age with a median of 3 years. The highest incidence rate occurred among persons less than 5 years of age (1.89 per 100,000, n = 5), followed by cases 5 – 9 years of age (0.39 per 100,000, n = 1), and 60 – 69 years of age (0.27 per 100,000, n = 1). Cases occurred among residents of seven Oklahoma counties.

The diagnosis 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 6 (86%) of the cases. Of those with microangiopathic changes (non-exclusive), schistocytes were most commonly seen (83%) compared to helmet cells (33%) and burr cells (17%). Both hematuria and proteinuria were reported in 71% of cases. Additionally, elevated creatinine was documented for 71% of cases and thrombocytopenia in 100% of cases. An etiologic agent was identified in six (86%) of the cases, which were *E. coli* O157:H7 (n = 5) and *E. coli* O121 (n =1) with results confirmed by the Oklahoma State Department of Health, Public Health Labortaory.

Descriptive and Clinical Summary of Reported Hemolytic Uremic Syndrome Cases, Oklahoma, 2011 (N = 7)

	Frequency (%)	Rate/100,000
Gender		
Male	2 (29%)	0.11
Female	5 (71%)	0.26
Age	Median Age: 3 years (Range: 8 months – 68 years)	
Race		
White	6 (86%)	0.22
Two or More Races	1 (14%)	0.45
Non-Hispanic or Latino Ethnicity	7 (100%)	0.20
Symptoms		
Diarrhea	7 (100%)	--
Abdominal Cramps	6 (86%)	--
Bloody Diarrhea	5 (71%)	--
Vomiting	4 (57%)	--
Fever	1 (14%)	--
Hospitalized for this disease	7 (100%)	--
Hospitalization duration	Median Hospitalization: 16 days (Range: 11 days – 31 days)	
Died due to this disease	0 (0%)	--

Hepatitis A

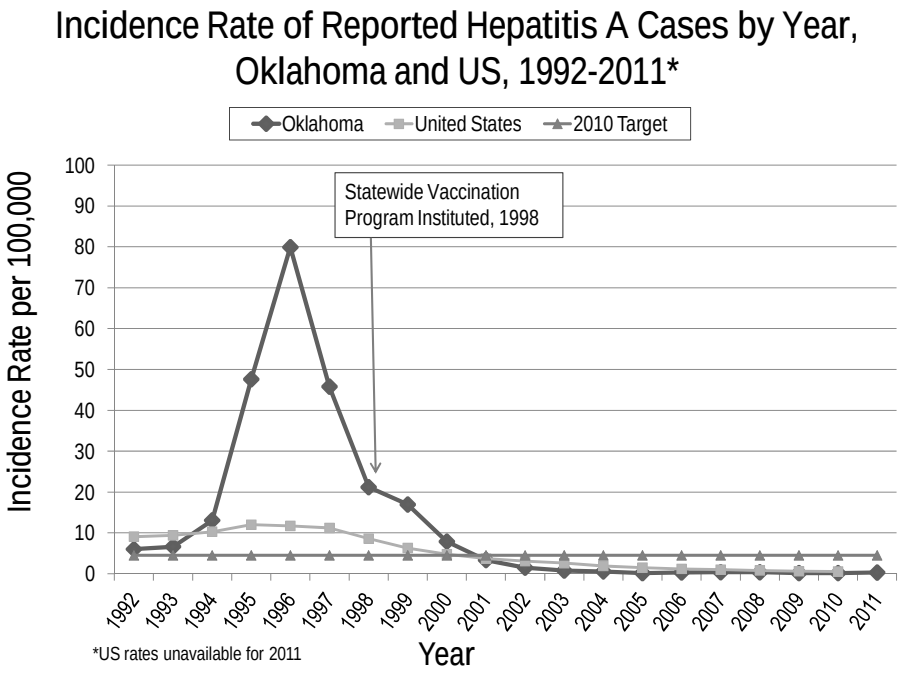
2011 Case Total	11	2011 Incidence Rate	0.29 per 100,000
2010 Case Total	6	2010 Incidence Rate	0.16 per 100,000

Oklahoma continues to successfully recover from the state's hepatitis A epidemic that peaked in 1996 with 2,516 cases (incidence rate = 79.99 per 100,000). Despite an 83% increase in reported cases compared to 2010, hepatitis A incidence continued to remain below the Healthy People 2010 target. The last peak in acute, symptomatic hepatitis A cases in the United States was observed around 1995, when hepatitis A vaccine became available. Since then, the decline in disease incidence has been constant.[i]

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. A positive hepatitis A IgM titer indicates current infection, although false positive tests are common.[ii] All positive hepatitis A IgM reports are investigated; in 2011 there were 138 reports investigated. Of the 138 hepatitis A IgM positive reports, 11 (8%) met the clinical criteria for classification as an acute case of hepatitis A.

Liver function tests are usually markedly elevated in confirmed cases, but not every time. Of the eight cases with liver function test results, the median alanine transaminase (ALT) was 249 (range: 26 – 1472), median aspartate aminotransferase (AST) of 191 (range: 20 – 380), and median total bilirubin was 1.7 (range: 0.3 –11.7).

High risk exposures noted in the 2011 confirmed cases included street drug use (9%, n = 1) and travel out of state (9%, n = 1). High risk settings included correctional facilities (18%, n = 2). No outbreaks were identified. Four cases (36%) were hospitalized, and none of the cases expired.



A total of 70 close contacts were investigated (median: 2, range: 0 – 26 per case). Of those, 53 did not have evidence of immunity through previous testing or history of vaccination, and therefore required post exposure prophylaxis (PEP). The county health departments provide PEP to those identified as close contacts to confirmed hepatitis A cases. In 2007, PEP guidelines were revised by the Advisory Committee on Immunization Practices (ACIP), limiting the use of immunoglobulin (IG) and expanding the use of the hepatitis A vaccine. For persons from 12 months to 40 years of age, the hepatitis A vaccine is now the preferred method of PEP. IG remains the recommended 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 diseases such as liver disease or other chronic medical conditions.[iii]

The hepatitis A vaccine is very effective, with nearly 100% seroconversion after receiving the two dose series[iv]. The vaccine is a recommended childhood immunization to be administered at two 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 persons traveling out of the US, and can be accessed at the website www.cdc.gov/travel.

Demographic and Clinical Summary of Reported Hepatitis A Cases, Oklahoma, 2011 (N = 11)

	Number (%)	Incidence Rate per 100,000
Gender		
Male	7 (64%)	0.22
Female	4 (36%)	0.37
Age	Median = 48 years (range: 18 - 78 years)	
Race		
White	8 (73%)	0.30
American Indian	2 (18%)	0.62
Unknown	1 (9%)	-
Hispanic or Latino Ethnicity	1 (9%)	0.30
Hospitalized for this disease	4 (36%)	-
Died due to this disease	0	-
Hallmark symptoms (not exclusive)		
Dark Urine	10 (91%)	-
Jaundice	7 (64%)	-
Clay-colored stool	5 (45%)	-

[i] Centers for Disease Control and Prevention. [Summary of Notifiable Diseases, 2010]. Published June 1, 2012 for MMWR 2010;59(No. 53):[inclusive page numbers].

[ii] 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), available at http://www.cdc.gov/mmwr/PDF/wk/mm5418.pdf

[iii] 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

[iv] Centers for Disease Control and Prevention. Epidemiology and Prevention of Vaccine-Preventable Diseases. Atkinson, W, Wolfe s, Hamborsky J, eds. 12th ed. Washington DC: Public Health Foundation, 2011, page 106. Available at http://www.cdc.gov/vaccines/pubs/pinkbook/index.html

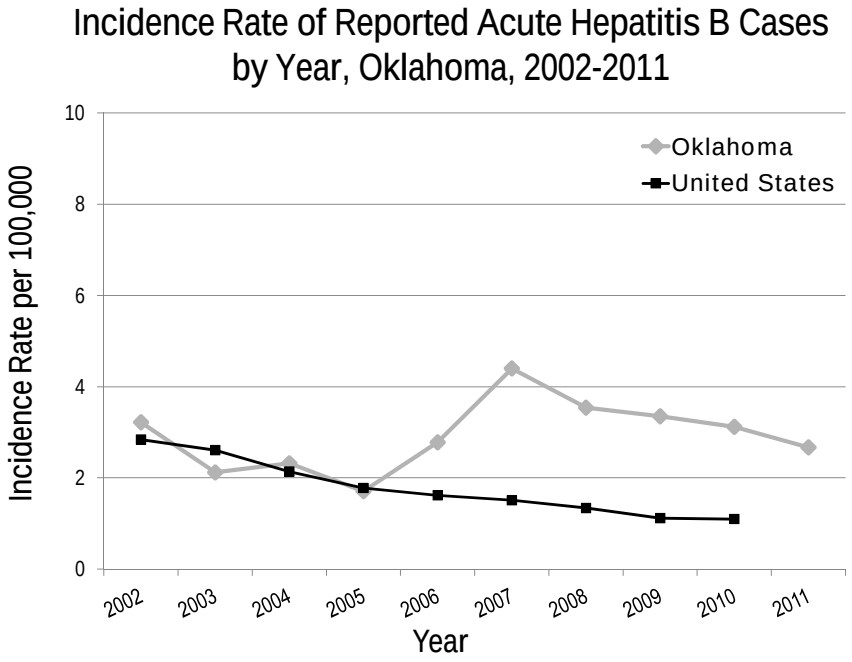
Hepatitis B

2011 Case Total	100	2011 Incidence Rate	2.67 per 100,000
2010 Case Total	115	2010 Incidence Rate	3.12 per 100,000

Oklahoma has witnessed a steady decline in the incidence of acute hepatitis B cases over the course of the last four years. Confirmed cases of acute hepatitis B have decreased from 129 cases in 2008 to 100 cases in 2011. This reduction in the incidence of acute hepatitis cases for Oklahoma mirrors the national trend. Despite the continued success of the Oklahoma State Department of Health's (OSDH's) expanded adult hepatitis B vaccine program, the number of Oklahomans infected with acute hepatitis B remains higher than the most recent national rate (1.1 per 100,000) and certainly higher than the goal for complete elimination of hepatitis B virus transmission.

Reported acute hepatitis B cases for 2011 totaled 100 cases with a rate of 2.67 per 100,000. The highest rates (6.0 per 100,000) are noted in the 25 to39 year age group, with the second highest rates (4.1 per 100,000) in the 40 to64 year age group. Fifty-nine (59%) reported acute hepatitis B cases were males; forty-one (41%) were females. African Americans had the highest incidence rate (3.60 per 100,000, n = 10), followed by American Indian and Alaska Native (3.12 per 100,000, n = 10), white (2.59 per 100,000, n = 70), and Asian (1.5 per 100,000, n = 1). Race information for nine of the cases was unknown. Forty-six individuals reported having more than two sexual partners as risk factor, 20 (20%) patients were hospitalized due to hepatitis B, and 22 (22%) persons reported injection drug use as a risk factor.

Hepatitis B vaccination is the most effective measure to prevent hepatitis B virus (HBV) infection and its consequences, including cirrhosis of the liver, liver cancer, liver failure, and death. Through the OSDH Adult Viral Hepatitis Program hepatitis B vaccines are provided to individuals at highest risk for infection. Unvaccinated or inadequately vaccinated offenders in the Oklahoma Department of Corrections, clients seen in county health department STD clinics, and persons seeking medical treatment at two major metropolitan area (Oklahoma City) medical clinics for the homeless can receive hepatitis B vaccine free of charge.



Perinatal Hepatitis B

2011 Case Total	82
2010 Case Total	83

The Perinatal Hepatitis B Program identified 82 babies born to hepatitis B surface antigen positive women in Oklahoma in 2011. Six of the infants were identified retrospectively, known only to the Perinatal Hepatitis B Program after the infant was delivered and at risk for not receiving any preventative treatment for exposure to hepatitis B virus.

The CDC recommends that infants born to hepatitis B surface antigen positive women be given Hepatitis B Immune Globulin (HBIg) and hepatitis B vaccine within 12 hours of birth. Sixty-eight (82.9%) of the babies born in Oklahoma hospitals received both injections within 12 hours, seventy-three (89.0%) received both injections within 24 hours and seventy-six (92.7%) received both injections within 48 hours of birth. Two infants received neither Hepatitis B Immune Globulin (HBIg) nor hepatitis B vaccine within 7 days of life.

The ages of the women who were hepatitis B surface antigen positive and who delivered infants ranged from 20 years to 42 years. Sixty-two percent (n = 51) of delivering women were between 20 and 30 years of age. Thirty-eight percent (n = 31) were between 30 and 40 years of age.

Hepatitis C

2011 Case Total	52	2011 Incidence Rate	1.4 per 100,000
2010 Case Total	41	2010 Incidence Rate	1.1 per 100,000

Hepatitis C can be either acute or chronic, but the Oklahoma reportable disease rules specify reporting hepatitis C in persons aged 40 years or younger, or in persons having jaundice, or alanine transaminase (ALT) of 400 or higher, regardless of age, with laboratory confirmation, which represents only acute cases of hepatitis C infection. The acute form is a short-term illness that occurs within the first six months after a person is exposed to the hepatitis C virus (HCV), which causes hepatitis C infection. However, the disease can become chronic, and people who received a blood transfusion before 1992 or are past or current injection-drug users are at risk for chronic hepatitis C, and should be screened for the disease. Chronic HCV infection progresses slowly over the course of 15 to 30 years and can lead to cirrhosis of the liver or liver cancer. Eight to ten thousand deaths occur annually in the United States as a result of chronic HCV infection.

In 2011, confirmed cases of acute hepatitis C in Oklahoma reflected a 22% increase from 2010. Based on the most current national data, Oklahoma's case rate (1.4 per 100,000) continues to be above the national rate (0.3 per 100,000) for confirmed cases of acute hepatitis C. Tulsa and Oklahoma County had the highest number of cases of acute hepatitis C in 2011 with 6 cases each (23%). The highest incidence rate occurred in Ottawa county with 9.4 cases per 100,000 (n = 3), followed by Johnston county with 9.13 per 100,000 (n = 1) and Latimer county with 8.96 per 100,000 (n = 1).

Cases of acute hepatitis C ranged in age from 17 years to 67 years. The highest number of cases, 21 (40%), occurred in the 20 to 29 year age group. Age groups of the remaining cases were as follows: two (4%) 13 to 19 years, 17 (32%) 30 to 39 years, six (11%) 40 to 49 years, five (10%) 50 to 59 years, and one (2%) $\geq$ 60 years. There were 25 females (48%) and 27 males (51%) with confirmed acute hepatitis C. The confirmed acute hepatitis C cases broken down by race occurred in whites (1.6 per 100,000, n = 33), Native Americans (4.7 per 100,000, n = 15), Asian American (1.5 per 100,000, n = 1) and unknown race (n =3).

The Centers for Disease Control and Prevention states that of the cases reported in 2007 for which information concerning exposures during the incubation period was available, the most common risk factor identified was injection drug use (IDU, 48%). During 1998–2007, IDU was reported for an average of 44% of persons (range: 38%–54%).[i] In 2011, the risk factors most frequently reported by Oklahoma cases were: IDU 51%), other drug use besides IDU (55%), tattoos (51%), and 2 or more sexual partners (17%). Nineteen (36%) cases reported both IDU and other drug use. Three (6%) cases reported all four of the listed risk factors.

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[i] Centers for Disease Control and Prevention. Surveillance for Acute Viral Hepatitis – United States, 2007. Surveillance Summaries, May 29, MMWR 2009;58(No. SS-3)

HIV/AIDS

2011 Case Total	382	2011 Rate	10.2 per 100,000
2010 Case Total	300	2010 Rate	8.0 per 100,000

HIV (Human Immunodeficiency Virus), the virus that causes AIDS (Acquired Immune Deficiency Syndrome), is transmitted through direct contact of a mucous membrane with a bodily fluid containing HIV, such as blood, semen (including pre-seminal fluid), vaginal fluid, and breast milk. The most common activities which place a person at risk are sexual intercourse (oral, anal, or vaginal), sharing of needles or syringes, or exposure from mother to baby before or during birth or through breast feeding.

People living with HIV may appear and feel healthy for years; however, HIV is still affecting their bodies. HIV progressively reduces the immune system by destroying specific blood cells called CD4 positive T-lymphocytes (CD4+ T-cells) and leaves individuals susceptible to opportunistic infections. When the quantity of CD4+ T-cells per cubic milliliter of blood is below 200 (or less than 14%), and/or at least one clinical opportunistic infection is present, an HIV diagnosis becomes an AIDS diagnosis. Antiretroviral treatment reduces both the mortality and the morbidity of HIV infection. Currently, people can live much longer, even decades, with HIV before they develop AIDS. Although treatments for AIDS and HIV can slow the course of the disease, there is no known cure or vaccine.

AIDS was first recognized by the United States Centers for Disease Control and Prevention in 1981; AIDS became reportable in Oklahoma in 1983, and HIV infection in 1988. By the end of 2011, an estimated 8,770 cumulative HIV/AIDS cases have been diagnosed among residents of Oklahoma.

Cumulative HIV/AIDS Cases

A breakdown of HIV/AIDS cases show 5,625 (64.1%) AIDS and 3,145 (35.9%) HIV. Of these cases, 5,582 (63.6%) were diagnosed among whites, 1,883 (21.5%) among Blacks, 529 (6.0%) among Hispanics, 51 (0.5%) among Asian and Pacific Islanders, and 559 (6.4%) among American Indian and Alaskan Natives. Persons who reportedly belong to two or more races accounted for 166 (1.9%) of the cases diagnosed. By 2011, 3,826 (43.6%) of these HIV/AIDS cases were known to have died.

The ratio of males to females diagnosed was 17:3 (7,466, 85.1% to 1,304, 14.9%). Men who have sex with men (MSM) accounted for 53.6% n = (4,700) and those MSM who also reported using injection drugs (MSM/IDU) accounted for 10.5% (n = 919) of the diagnosed cases. Approximately 11% (n = 1,002) reported their risk as injection drug use (IDU). Exposure through heterosexual sex with an HIV infected partner contributed 10.2% (n = 897). For 12.1% (n = 1,064) of the cases, no risk was reported.

Among age groups, ages 30-39 years accounted for the largest proportion of cases (37.5%; n = 3,293), followed by 20-29 years (31.4%; n = 2,757). Teenagers 13-19 years of age accounted for a total of 2.7% (n = 241) cases, while children under the age of 13 years accounted for less than 1% (n = 75) of the 8,770 cases.

Living HIV/AIDS Cases

At the end of 2011, an estimated 4,944 cases were living with HIV/AIDS (HIV: n = 2,581, 52.2%; AIDS: n = 2,363, 47.8%). The majority of the living HIV/AIDS cases in Oklahoma were diagnosed in three counties: Oklahoma (1,825, 36.9%), Tulsa (1,298, 26.3%), and Cleveland (307, 6.2%). A much greater number of those living with HIV/AIDS are male (4,073, 82.4%) than female (871, 17.6%).

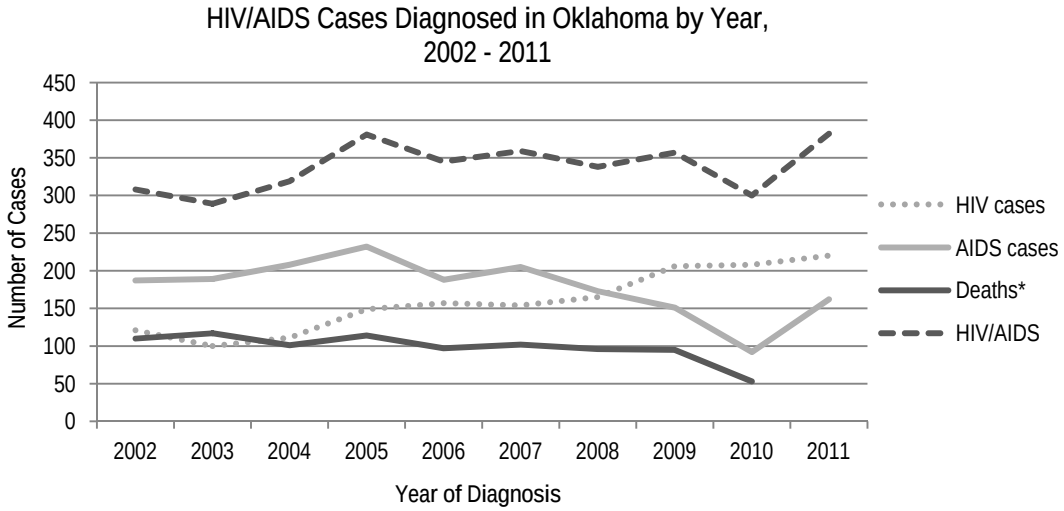
Among those living with HIV/AIDS, the most common reported risk was MSM (n = 2,605, 52.7%), followed by heterosexual relationship (n = 612, 12.4%). Almost 10% (n = 489) reported their risk as IDU. Another 9.0% (n = 443) of cases reported both MSM and IDU as risks. Whites made up the majority of living HIV/AIDS cases (n = 2,885, 58.4%), followed by Blacks (n = 1,201, 24.3%), Hispanics (n = 395, 8.0%), and American Indians and Alaska Natives (n = 290,

5.9%). Age groups 30-39 years (n = 1,803, 36.5%) and 20-29 years (n = 1,672, 33.8%) accounted for over two-thirds of the living HIV/AIDS cases.

Newly Diagnosed HIV/AIDS Cases

In the year 2011, 382 cases of HIV/AIDS (HIV, n = 220; AIDS, n = 162) were diagnosed, a 27.3% increase from 2010. Over the five year period from 2007 to 2011, HIV/AIDS was diagnosed at an average of 347 cases per year. There has been a downward trend of AIDS diagnoses from 188 in 2006 to 92 in 2010, most likely due to advancements in treatment and earlier HIV detection, however 162 AIDS cases were diagnosed in 2011. In contrast, the upward trend of newly diagnosed HIV (not AIDS) cases has continued, from a total of 157 newly diagnosed HIV (not AIDS) cases in 2006 to 220 cases in 2011. Three counties in Oklahoma accounted for the majority (72.2%) of the newly diagnosed HIV/AIDS cases: Oklahoma (n = 144, 37.7%), Tulsa (n = 97, 25.4%), and Cleveland (n = 27, 7.1%).

Of the 382 cases diagnosed in 2011, males represented 313 (81.9%) cases with a rate of 16.9 per 100,000 population, while females reported 69 (18.1%) cases with a rate of 3.6 per 100,000 population. Of these newly diagnosed HIV/AIDS cases, MSM accounted for 50.8% (n = 194), MSM/IDU accounted for 6.5% (n = 25), heterosexual sex accounted for 9.7% (n = 37), and IDU accounted for almost 8% (n = 30). Approximately a quarter (n = 94) of those diagnosed in 2011, did not report their risk.



Deaths are irrespective of date of diagnosis

Prevalence (Persons Living) Estimates for HIV/AIDS Cases, Rates by County, Oklahoma 1982-2011						
County of Diagnosis	HIV Cases		AIDS Cases		HIV & AIDS	
	Number of Cases	Prevalence Rate/100,000 Population	Number of Cases	Prevalence Rate/100,000 Population	Number of Cases	Prevalence Rate/100,000 Population
State of Oklahoma	2,581	68.8	2,363	63.0	4,944	131.8
Adair County	4	17.6	6	26.5	10	44.1
Alfalfa County	*	*	*	*	4	70.9
Atoka County	*	*	8	56.4	10	70.5
Beaver County	*	-	*	*	*	17.7
Beckham County	7	31.6	3	13.6	10	45.2
Blaine County	9	75.4	7	58.6	16	134.0
Bryan County	17	40.1	16	37.7	33	77.8
Caddo County	24	81.1	15	50.7	39	131.8
Canadian County	55	47.6	48	41.5	103	89.1
Carter County	14	29.4	15	31.5	29	61.0
Cherokee County	8	17.0	11	23.4	19	40.4
Choctaw County	10	65.8	7	46.0	17	111.8
Cimarron County	*	-	*	*	*	40.4
Cleveland County	188	73.5	119	46.5	307	120.0
Coal County	*	-	*	*	*	33.8
Comanche County	142	114.4	44	35.5	186	149.9
Cotton County	*	*	3	48.4	5	80.7
Craig County	7	46.6	13	86.5	20	133.1
Creek County	30	42.9	21	30.0	51	72.9
Custer County	11	40.0	7	25.5	18	65.5
Delaware County	6	14.5	5	12.1	11	26.5
Dewey County	*	*	*	*	4	83.2
Ellis County		-		-	*	0.0
Garfield County	21	34.7	16	26.4	37	61.1
Garvin County	4	14.5	10	36.3	14	50.8
Grady County	17	32.4	21	40.1	38	72.5
Grant County		-		-	*	0.0
Greer County	5	80.1	5	80.1	10	160.3
Harmon County	*	-	*	*	*	34.2
Harper County	*	*	*	-	*	27.1
Haskell County	*	-	7	54.8	7	54.8
Hughes County	4	28.6	4	28.6	8	57.1
Jackson County	6	22.7	7	26.5	13	49.2
Jefferson County	4	61.8	3	46.4	7	108.2
Johnston County	8	73.0	4	36.5	12	109.5
Kay County	15	32.2	16	34.4	31	66.6
Kingfisher County	3	20.0	*	*	4	26.6
Kiowa County	*	*	*	*	3	31.8

Prevalence (Persons Living) Estimates for HIV/AIDS Cases, Rates by County, Oklahoma 1982-2011 (cont.)						
County of Diagnosis	HIV Cases		AIDS Cases		HIV & AIDS	
	Number of Cases	Prevalence Rate/100,000 Population	Number of Cases	Prevalence Rate/100,000 Population	Number of Cases	Prevalence Rate/100,000 Population
Latimer County	*	*	5	44.8	7	62.8
Le Flore County	20	39.7	23	45.6	43	85.3
Lincoln County	10	29.2	9	26.3	19	55.4
Logan County	39	93.2	20	47.8	59	141.0
Love County	*	*	*	*	3	31.8
McClain County	9	26.1	16	46.4	25	72.5
McCurtain County	9	27.1	8	24.1	17	51.3
McIntosh County	5	24.7	4	19.8	9	44.4
Major County	*	*	*	-	*	26.6
Marshall County	5	31.6	*	*	7	44.2
Mayes County	4	9.7	11	26.7	15	36.4
Murray County	*	*	*	*	*	14.8
Muskogee County	25	35.2	29	40.9	54	76.1
Noble County	8	69.2	*	*	10	86.5
Nowata County	4	38.0	4	38.0	8	75.9
Okfuskee County	5	41.0	7	57.4	12	98.4
Oklahoma County	947	131.8	878	122.2	1,825	254.0
Okmulgee County	8	20.0	14	34.9	22	54.9
Osage County	36	75.8	43	90.6	79	166.4
Ottawa County	8	25.1	8	25.1	16	50.2
Pawnee County	5	30.2	5	30.2	10	60.3
Payne County	24	31.0	21	27.1	45	58.2
Pittsburg County	13	28.4	16	34.9	29	63.3
Pontotoc County	7	18.7	6	16.0	13	34.7
Pottawatomie County	26	37.4	27	38.9	53	76.3
Pushmataha County	*	-	*	*	*	8.6
Roger Mills County	*	-	*	*	*	27.4
Rogers County	26	29.9	22	25.3	48	55.2
Seminole County	8	31.4	4	15.7	12	47.1
Sequoyah County	13	30.7	12	28.3	25	59.0
Stephens County	8	17.8	10	22.2	18	40.0
Texas County	7	33.9	5	24.2	12	58.1
Tillman County	*	*	*	*	3	37.5
Tulsa County	639	105.9	659	109.2	1,298	215.1
Wagoner County	10	13.7	10	13.7	20	27.4
Washington County	3	5.9	18	35.3	21	41.2
Washita County		-		-	*	0.0
Woods County	*	*	*	-	*	11.3
Woodward County	7	34.9	5	24.9	12	59.8
Unknown	4	**	*	**	6	**

** Due to confidentiality concerns cell these cell sizes have been suppressed.*

*** Population data was not available.*

Legionellosis

2011 Case Total	15	2011 Incidence Rate	0.40 per 100,000
2010 Case Total	15	2010 Incidence Rate	0.41 per 100,000

The number of legionellosis cases reported in 2011 is the same as the number of cases reported in 2010. Since 2000, the annual incidence rate of legionellosis has ranged from 0.14 to 0.41 per 100,000 population, with the exception of 2004 when the incidence rate was 0.70 per 100,000 population due to an outbreak associated with exposure to a hotel indoor whirlpool spa and pool. In 2011, lab tests were performed via bronchial culture (7%) and urine antigen testing (93%). No outbreaks of legionellosis were identified in Oklahoma during 2011.

During 2011, cases of legionellosis occurred among residents of nine Oklahoma counties and were spread geographically across all regions of the state. The highest incidence rate (IR) occurred among cases 50 to 59 years of age (IR = 1.2, n = 6) followed by cases 60 to 69 years of age (IR = 1.1, n = 4) and 70 to 79 years of age (IR = 0.93, n = 2). Of the cases reported in 2011, 4 (27%) reported travel outside of the state during the incubation period of their illness, and one (7%) reported exposure to a respiratory device filled with tap water such as a nebulizer or humidifier.

Demographic and Clinical Summary of Reported Legionellosis Cases, Oklahoma, 2011 (N = 15)

	Number (%)	Incidence Rate per 100,000
Gender		
Male	7 (47%)	0.38
Female	8 (53%)	0.42
Age	Median = 58 years (range: 36 – 80 years)	
Race		
American Indian or Alaska Native	2 (13%)	0.62
Black or African American	2 (13%)	0.72
White	10 (67%)	0.37
Unknown	1 (7%)	-
Ethnicity		
Hispanic or Latino	0 (0%)	0.00
Not Hispanic or Latino	5 (33%)	0.15
Unknown	10 (67%)	-
Symptoms		
Fever	15 (100%)	-
Cough	11 (73%)	-
Malaise	11 (73%)	-
Chills	11 (73%)	-
Headache	6 (40%)	-
Myalgia	6 (40%)	-
Chest pain	5 (33%)	-
Hospitalization	11 (73%)	-
Possible nosocomial infection	2 (13%)	-
Complication/Comorbidity		
Death	1 (7%)	-
Pneumonia	14 (93%)	-
Corticosteroid treatment	2 (13%)	-

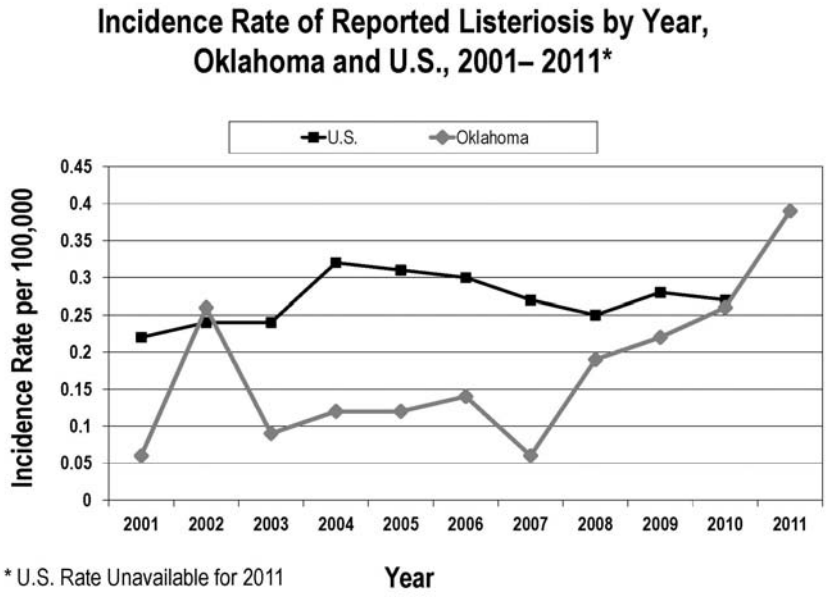
Listeriosis

2011 Case Total	15	2011 Incidence Rate	0.39 per 100,000
2010 Case Total	9	2010 Incidence Rate	0.26 per 100,000

In Oklahoma, 15 cases of listeriosis were reported to OSDH resulting in an incidence rate of 0.15 per 100,000 population, a 67% increase from 2010. This increase occurred due to a 2011 multi-state outbreak of listeriosis due to consumption of whole, contaminated cantaloupe, in which 80% of the 2011 cases were associated with the outbreak. Listeriosis became a reportable condition in Oklahoma in the year 2000; with an average of 6 cases per year (range: 2 to 9 cases per year) reported to the OSDH.

Thirteen (87%) cases were hospitalized and two (13%) cases died due to *Listeria*. Ages of cases ranged from 61 to 96 years with a median of 73 years. Nine (60%) cases were male. Fourteen (93%) of the cases reported their race as White, and one reported their race as Black or African American (7%). One case reported Hispanic ethnicity (7%). All cases reported during 2011 were over the age of 60 and had a history of underlying medical conditions that compromised their immune system. The Communicable Disease Reporting Rules (OAC 310: Chapter 515) require that *Listeria* isolates grown from sterile sites (e.g. blood, cerebrospinal fluid, etc.) be sent to the OSDH Public Health Laboratory (PHL) for confirmation and identification. *Listeria* was isolated from blood for 14 (93%) cases, and from cerebrospinal fluid for one case (7%).

Listeriosis infection ranges from mild to severe illness, with most infections not requiring medical care. Persons at risk of severe disease include persons with weakened immune systems such as those with cancer, diabetes, kidney disease, AIDS, and individuals older than 60 years. Pregnant women are also at increased risk of developing disease. In pregnancy, the infection can be passed to the fetus, and in some cases cause premature delivery, infection of the newborn, or stillbirth. Newborns, rather than the mothers, experience the serious effects of infection during pregnancy; the case-fatality rate is 20 to 30% in infants born alive and the occurrence of abortion and stillbirth increases the overall mortality rate to more than 50%.[i]



[i] Mandell, Douglas, and Bennett's principles and practice of infectious diseases / [edited by] Gerald L. Mandell, John E. Bennett, Raphael Dolin.-6th ed. p. 2478-2483.

Malaria

2011 Case Total	10	2011 Incidence Rate	0.27 per 100,000
2010 Case Total	6	2010 Incidence Rate	0.16 per 100,000

All ten cases of malaria reported to the Oklahoma State Department of Health in 2011 also reported recent travel or residence in countries with endemic malaria. Since 2001, the majority of reported malaria cases in Oklahoma had a history of traveling or living in Africa during their exposure period (refer to tables).

Of the eight cases interviewed, only one reported taking malaria prophylaxis as prescribed, although details about schedule and dosage were not known. Recommendations regarding malaria prophylaxis can be accessed on the CDC Travelers' Health website at www.cdc.gov/travel. These medications should be purchased in the US prior to traveling, because sale of counterfeit malaria prophylaxis medications has occurred in other countries. Although humans are the reservoir, the malaria vector is the mosquito, so protection from mosquito bites while traveling is also important.

Malaria can be a severe, potentially fatal disease (particularly when caused by *Plasmodium falciparum*) and treatment should be initiated as soon as possible. Malaria should be considered as a possible diagnosis in persons experiencing fever of unknown origin, chills, and/or flu-like illness, and who have a history of recent travel or residence in an endemic area. This includes international travelers, immigrants, adoptees, military personnel, and international visitors.

Most clinical laboratories are capable of performing preliminary identification of the malaria parasite. Specimens are required to be sent to the OSDH Public Health Laboratory (PHL) for confirmation and speciation. Thick and thin slides pre-stained with Giemsa or Giemsa-Wright stain are needed for these tests.

Demographic and Clinical Summary of Reported Malaria Cases, Oklahoma, 2011 (N = 10)

	Number (%)	Incidence Rate per 100,000
Gender		
Male	7 (70%)	0.38
Female	3 (30%)	0.16
Age	Median: 36 years (range 19 – 53 years)	
Race		
Black	7 (70%)	2.52
White	3 (30%)	0.11
Hispanic Ethnicity	0	--
Hospitalized	7 (70%)	--
Died due to malaria	0	--
Travel history		
Africa	10 (100%)	--
Species		
P. malariae	5 (50%)	--
P. falciparum	5 (50%)	--

World Region of Malaria Acquisition Reported by Oklahoma Cases, 2001-2011 (N = 81)

Region	Number (%)
Africa	60 (74%)
Asia	10 (12%)
Central America	1 (1%)
Oceania	1 (1%)
South America	1 (1%)
Unknown	8 (10%)

Meningococcal Invasive Disease

2011 Case Total	12	2011 Incidence Rate	0.32 per 100,000
2010 Case Total	18	2010 Incidence Rate	0.49 per 100,000

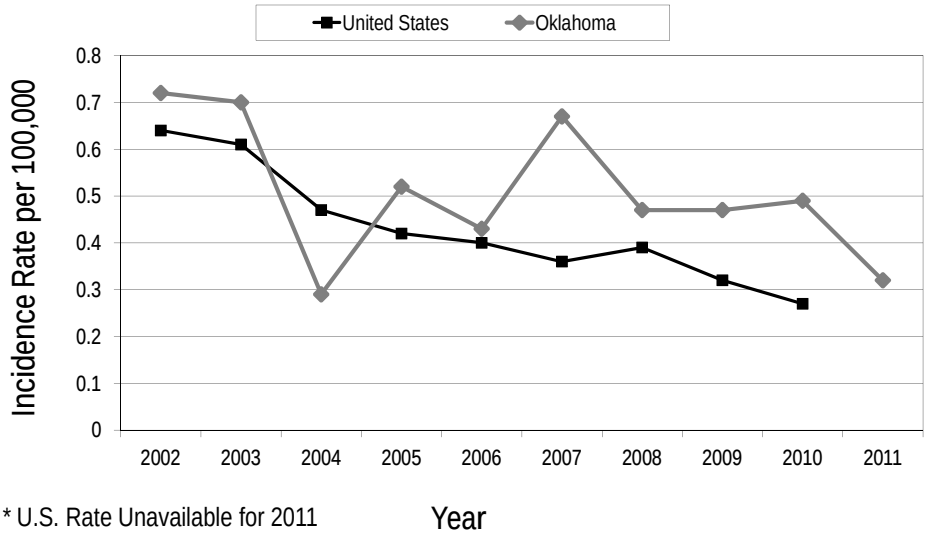
During 2011, 12 cases of invasive meningococcal disease were reported to the Acute Disease Service (ADS), which is a 33% decrease from the 18 cases reported in 2010. Age-specific incidence rates indicate the highest rates occurred among persons 70 – 79 years (0.93 per 100,000), followed by those 60 – 69 years (0.82 per 100,000) (see figure). In 2011, 10 (83%) cases were hospitalized and one death occurred, resulting in a case fatality rate of 8%.

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. In 2011, serogroup Y and serogroup B accounted for 75% of the isolates for which serogroup testing was performed (see table).

Neisseria meningitidis is an immediately notifiable condition. Suspicion or diagnosis of meningococcal invasive disease must be immediately reported to the ADS per the Oklahoma Disease Reporting Rules (Oklahoma Administrative Code 310:515). The state health department immediately investigates reported cases of invasive meningococcal disease to identify close contacts and recommend prophylaxis. Case investigations conducted by county health department nurses identified 107 close contacts (Median = 10; Range: 1 – 24) who were recommended to receive prophylaxis. Three cases were associated with a high-risk setting such as a childcare center, long term care center, or a healthcare setting.

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 is also recommended for college freshmen living in dormitories and other populations aged 2 – 55 years at increased risk for meningococcal disease[i,ii].

Incidence Rate of Reported Meningococcal Invasive Disease by Year, Oklahoma and U.S., 2002 – 2011*

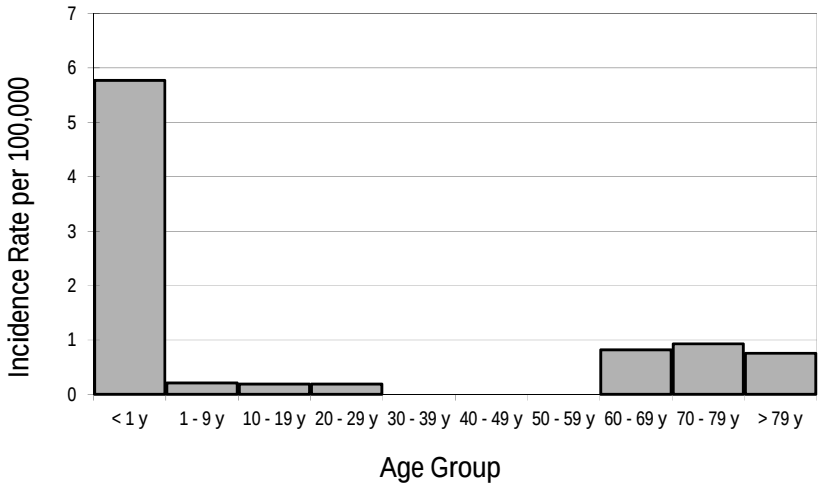


* U.S. Rate Unavailable for 2011

Demographic and Clinical Summary of Reported Meningococcal Invasive Disease Cases, Oklahoma, 2011 (N = 12)

	Number (%)	Incidence Rate per 100,000
Gender		
Male	7 (58%)	0.38
Female	5 (42%)	0.26
Ages	Median = 42 years (Range: 2 months – 85 years)	
Race		
White	8 (67%)	0.30
Black or African American	1 (8%)	0.36
American Indian or Alaska Native	1 (8%)	0.31
Native Hawaiian or Pacific Islander	2 (17%)	45.78
Ethnicity		
Not Hispanic or Latino	11 (92%)	0.32
Unknown	1 (8%)	-
Hospitalized	10 (83%)	-
Deaths	1 (8%)	-
Infection Types (not mutually exclusive)		
Bacteremia/Sepsis	6 (50%)	-
Meningitis	7 (58%)	-
Meningoencephalitis	1 (8%)	-
Pneumonia	3 (25%)	-
Serogroup		
Group B	4 (33%)	-
Group W-135	2 (17%)	-
Group Y	5 (42%)	-
Not groupable	1 (8%)	-

Incidence Rate of Reported Meningococcal Invasive Disease Cases by Age Group, Oklahoma, 2011



[i] CDC. Prevention and Control of Meningococcal Disease Recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 2005;54(No. RR-7).

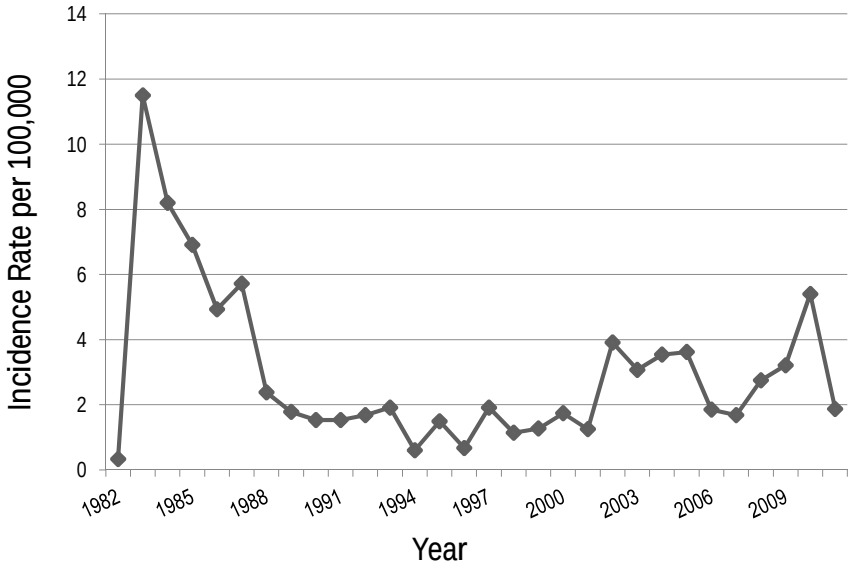
[ii] CDC. Notice to Readers: Revised recommendations of the Advisory Committee on Immunization Practices to vaccinate all persons aged 11-18 years with meningococcal conjugate vaccine. MMWR 2007;56:794-5.

Pertussis

2011 Case Total	70	2011 Rate	1.87 per 100,000
2010 Case Total	199	2010 Rate	5.40 per 100,000

The number of pertussis cases in 2011 was a 65% decrease from the 199 cases reported in 2010. During 2010, Oklahoma saw the highest incidence rate of pertussis since 1987 (see Figure 1). During 2010, several local community clusters were observed in different parts of the state contributing to the large number of overall cases seen in the state; this was fortunately not the case during 2011. During 2011, pertussis cases were identified throughout the state with the highest rates occurring in Pawnee County (12.06 per 100,000, n = 2), Love County (10.61 per 100,000, n = 1), and Okmulgee County (7.49 per 100,000, n = 3). Pertussis is known to often have a more severe clinical presentation in children. Nearly half of all cases in 2011 were in children less than five years of age, with 26% in infants less than one year of age, followed by 19% in children one to four years of age. Twenty-eight percent of infants less than one year of age were hospitalized compared to 6% of cases that occurred among all other age groups.

Figure 1: Incidence Rate of Reported Pertussis Cases by Year, Oklahoma, 1982-2011



Polymerase chain reaction (PCR) testing has become the most prevalent type of testing conducted for pertussis. Of the 70 cases in 2011, 27 (39%) had a positive PCR test. Culture for *Bordetella pertussis* accounted for 1% of cases (n = 1). Fifteen (21%) of the pertussis cases had a positive serology or direct fluorescent antibody (DFA) test, although these testing methodologies are not considered confirmatory because they have not been standardized. Twenty-seven (39%) cases did not have any laboratory testing; however, they met the clinical case definition. The clinical case definition consists of a cough lasting for at least two weeks and at least one of the following hallmark symptoms: paroxysmal cough, inspiratory whoop, or post-tussive vomiting.

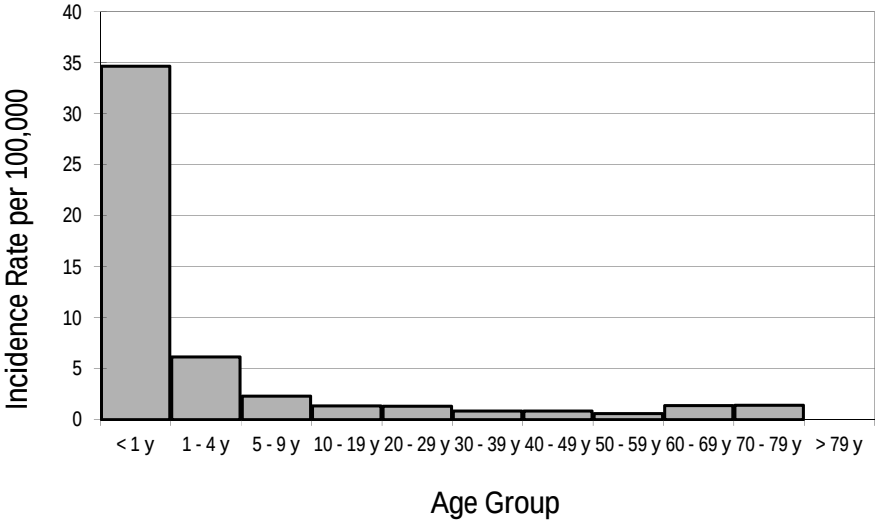
County health department (CHD) nurses conduct investigations of all reported cases of pertussis. Contacts to a case are assessed to determine whether they should be recommended to receive post-exposure prophylaxis (PEP) to prevent development of illness and to control continued transmission. PEP is typically recommended only for household members or those having close contact. The case's association with a high-risk setting is also assessed to identify any outbreaks and recommend implementation of control measures to limit the continued spread of pertussis. In 2011, CHD nurses assessed a total of 365 case contacts for PEP recommendation (Median = 3; Range: 1 – 52). Twenty-five cases were associated with a high-risk setting such as a child care center, school, or healthcare setting.

Demographic and Clinical Summary of Reported Pertussis Cases, Oklahoma, 2011 (N = 70)

	Frequency (%)	Rate/100,000
Gender		
Male	24 (34%)	1.29
Female	46 (66%)	2.43
Age	Median Age: 8 years (Range: 1 Day – 75 years)	
Race		
White	51 (73%)	1.88
Black	4 (6%)	1.44
Asian	1 (1%)	1.54
American Indian or Alaska Native	3 (4%)	0.93
Two or More Races	4 (6%)	1.81
Unknown	7 (10%)	--
Ethnicity		
Hispanic or Latino	14 (20%)	4.22
Not Hispanic or Latino	51 (73%)	1.49
Unknown	5 (7%)	--
Cough Duration	Median: 25 days (Range: 14 days to 347 days)	
Hallmark Symptoms (not exclusive)		
Paroxysmal Cough	65 (93%)	--
Inspiratory Whoop	37 (53%)	--
Post-Tussive Vomiting	45 (64%)	--
Hospitalized for Disease	8 (11%)	--
Deaths Due to Pertussis	0	--

Pertussis vaccine is recommended for all children beginning with the primary 3-dose series at 2, 4, and 6 months of age followed by a booster vaccination at 12 – 15 months of age. Additionally, a single dose of Tdap is recommended for persons 10 through 64 years of age. Tdap is recommended for children 7 – 10 years of age who are not fully vaccinated against pertussis. Adults 65 years of age and older who have not previously received Tdap and will be in close contact with an infant are also recommended to receive a single dose of Tdap.

Figure 2: Incidence Rate of Reported Pertussis Cases by Age Group, Oklahoma, 2011



Animal Rabies

2011 Case Total 60
2010 Case Total 62

The Oklahoma State Department of Health (OSDH) Public Health Laboratory (PHL) is the only Oklahoma laboratory with validated methods for the performance of rabies diagnostic testing. In 2011, a total of 1,044 animals were submitted to the OSDH PHL for rabies testing, and 59 (5.6%) were positive for rabies[i]. There were 960 (92%) animals that were negative for rabies and 25 (2.4%) animals that had inconclusive (unsatisfactory) results due to decomposed brain tissue or crushed skull. The skunk is the most common rabies reservoir in Oklahoma. A total of 84 skunks were tested during 2011, and 41 (49%) were positive. Bats are another wildlife vector of rabies virus in Oklahoma. Of the 33 bats tested during 2011, 2 (6.1%) were positive. Due to the interactions between pets and people, dogs and cats are the most frequently tested animals for rabies; however, they have a lower positivity rate. Of 487 dogs tested, 9 (1.9%) were positive; and of 275 cats tested, 4 (1.5%) were positive. Other rabid animals in Oklahoma during 2011 were a bobcat (1), cow (1), and horse (1).

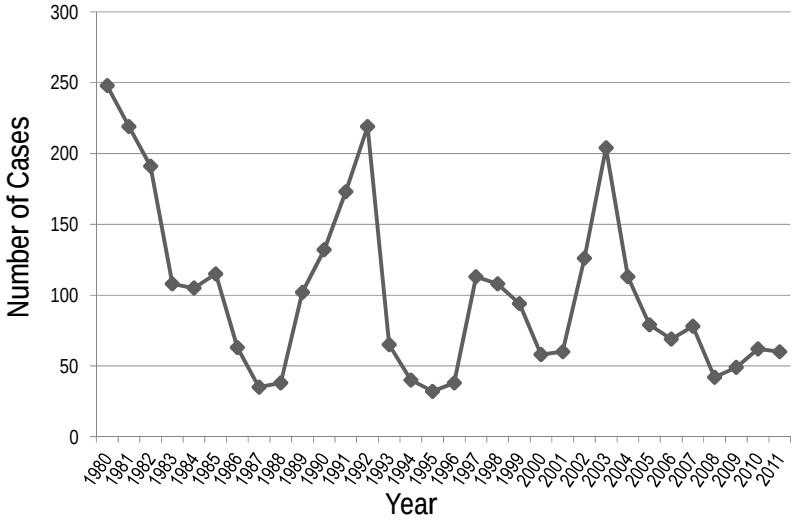
Animal rabies activity in Oklahoma is cyclical with epizootics occurring approximately every six to eight years, and tends to correlate with changes in regional skunk population numbers (Figure 1). During the most recent epizootic in 2003, 204 animals were found to be positive for rabies by laboratory testing. There is a seasonality to animal rabies incidence, with bimodal activity in the spring and fall. In 2011, the highest number of rabies cases was reported in October (10), April (9) and March (8). All counties in Oklahoma have the potential for animal rabies transmission; however, the geographic distribution of animal rabies tends to vary regionally from year to year. During 2011, at least one rabid animal was identified in 27 counties with a concentration of activity in the southeastern and south central regions of the state (Figure 2). Five rabid animals originated from Pontotoc and Le Flore counties, while Beckham, Bryan and McCurtain counties each had four rabid animals. A large percentage of rabid animals were found in eastern Oklahoma along the Arkansas border, accounting for 23% of all animal rabies cases in 2011.

When an animal tests positive for rabies or the result is inconclusive, an epidemiologist in the OSDH Acute Disease Service (ADS) initiates a thorough investigation of potentially exposed animals and humans. Recommendations for human post-exposure prophylaxis (PEP) and/or requirements for animal quarantine or euthanasia are made based upon the findings of the investigation. Exposure to rabies virus usually results from the bite of a rabid animal, when the animal's saliva is introduced into the wound. However, transmission may also occur if saliva or neural tissue of a rabid animal comes into direct contact with mucous membranes or broken skin. As a result of the 2011 case contact investigations, a total of 98 domestic animals were identified as exposed to a laboratory-confirmed rabid animal. Of the exposed animals, only 22 (22%) were deemed currently vaccinated by a licensed veterinarian, and therefore only required to receive a booster dose of the rabies vaccine along with a 45-day observation period on the owner's property. Of the 76 (78%) exposed pets that were not currently vaccinated, owners of 8 (11%) elected placement in a six-month quarantine under the supervision of a licensed veterinarian, and owners of 69 (91%) chose to have the animal euthanized. A total of 201 humans were assessed for exposure to a confirmed rabid animal; 47 (23%) were determined to have potential exposure to rabies virus and recommended to receive PEP.

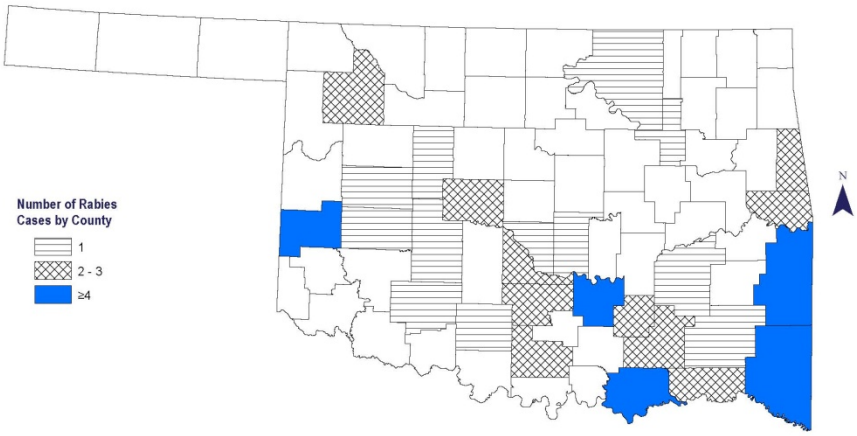
Human rabies PEP should be sought through an individual's health care provider, as it is not provided through the OSDH or county health departments. Due to access to life-saving rabies biologics, human rabies is rare in the United States (US). Most indigenous human rabies cases are associated with rabid bats, whereas in developing countries, dogs are the most common reservoir and vector species[ii]. Canine rabies acquired from dog bites in Africa and Asia account for >95% of all human rabies cases worldwide[iii]. Human rabies prophylaxis is nearly 100% effective, and human fatalities in the US due to rabies occur in people who fail to seek medical assistance or were unaware of their exposure. The last case of human rabies in Oklahoma occurred in 2004 and was associated with an organ transplant. Prior to this incident, the most recent human rabies case in Oklahoma was in 1981.

Consultation regarding animal bites and the PEP series is available by contacting the epidemiologist-on-call at (405) 271-4060. Questions regarding rabies testing can be directed to the OSDH PHL at (405) 271-5070. For additional Oklahoma rabies statistics, click on "Disease Information" and select the rabies webpage at http://ads.health.ok.gov.

Figure 1. Number of Confirmed Animal Rabies Cases by Year, Oklahoma, 1980 - 2011 (N = 3,238)



County Location of Animal Rabies in Oklahoma
January 1 through December 31, 2011 (N=60)



[i] Of the 60 rabid animals identified in Oklahoma during 2011, two were tested at out-of-state laboratories; one animal that tested positive at the OSDH PHL originated from another state.
[ii] CDC. Imported Human Rabies—California, 2008. MMWR 2009; 58(26): 713-716.
[iii] CDC. Imported Human Rabies in a US Army Soldier—New York, 2011. MMWR 2011; 61(17): 302-305.

Rocky Mountain Spotted Fever

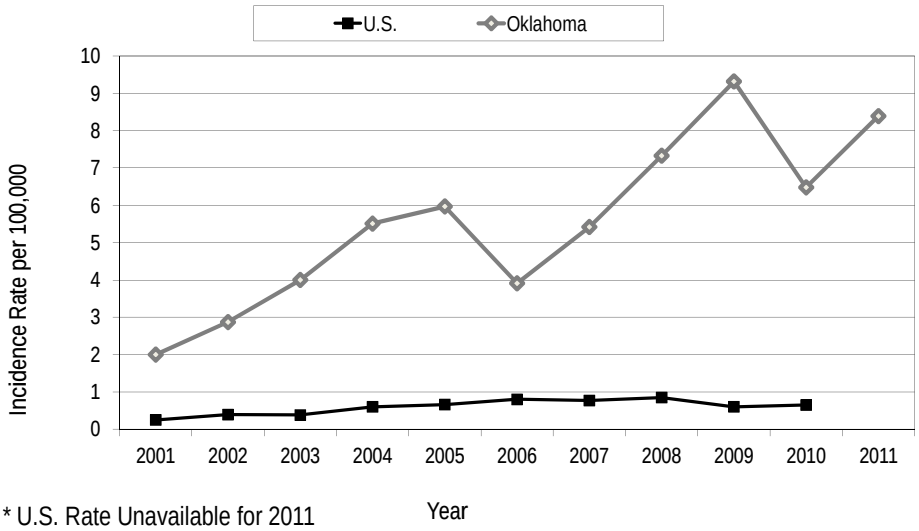
2011 Case Total	334	2011 Incidence Rate	8.90 per 100,000
2010 Case Total	243	2010 Incidence Rate	6.48 per 100,000

Rocky Mountain spotted fever (RMSF) is caused by the bacterium *Rickettsia rickettsii*, which is most often transmitted to humans via the American dog tick (*Dermacentor variabilis)*. Oklahoma consistently reports one of the highest annual incidence rates (IR) in the United States, along with North Carolina, Arkansas, Tennessee and Missouri. In 2011, there was a 27% increase in the IR of RMSF in Oklahoma as compared to 2010. Eastern Oklahoma has higher rates of disease due to its more favorable tick habitat. Counties with the highest IR in 2011 were Latimer (188.27 per 100,000, n=21) and Pushmataha (164.19 per 100,000, n=19). RMSF is largely a seasonal disease, with 66% of cases reported during the warmer months of May to August when ticks are most active.

The highest incidence of RMSF occurred among persons who reported their race as American Indian (25.80 per 100,000, n = 83), which is 3 times higher than the overall rate in Oklahoma in 2011. The IR among males was 1.8 times higher than that of females. Fever was present in all cases of RMSF; other prominent symptoms include headache and myalgias. Although the classic clinical triad for RMSF is considered to be fever, rash and a tick bite, a rash was present in only 24% of this year's cases. When present, the rash was most frequently found on the patient's trunk or legs. Known tick bites or exposure to wooded or tick infested areas were reported by 40% and 7% of all cases, respectively, suggesting that many exposures to infected ticks go unrecognized.

Serologic testing is the most widely available and frequently used laboratory method for diagnosis. A four-fold change in titer between acute (within a week of onset) and convalescent (2 to 4 weeks later) specimens confirms the diagnosis. Treatment should NOT be delayed while awaiting laboratory confirmation. The mortality rate is 3–5%, but death is rare with prompt diagnosis and treatment. There was one death in Oklahoma in 2011 – a 45 year old white female who presented with altered mental status, fever and a petechial rash, but was diagnosed with acute cholecystitis and severe sepsis and was never treated for RMSF. Doxycycline is the treatment drug of choice among all age groups.

Incidence Rate of Reported Rocky Mountain Spotted Fever
By Year
Oklahoma and U.S., 2001 – 2011*

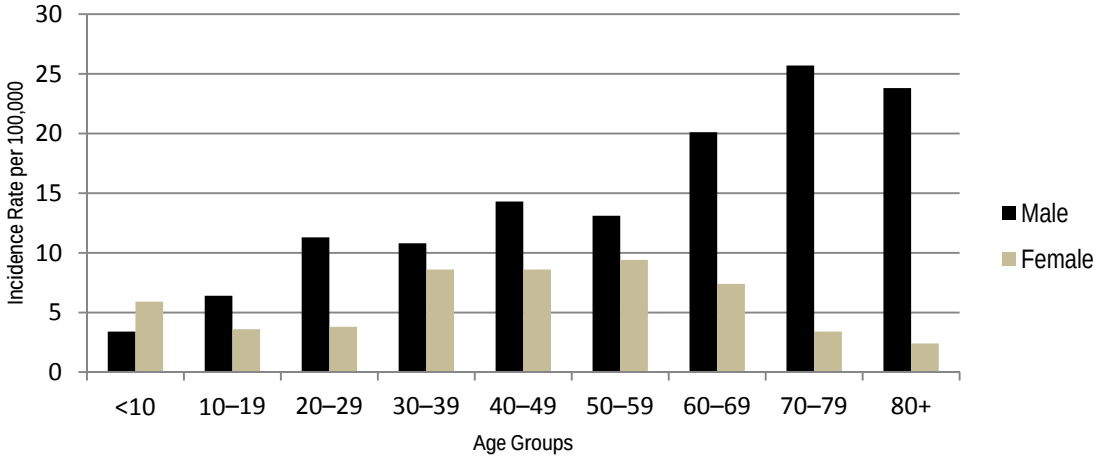


* U.S. Rate Unavailable for 2011

Descriptive and Clinical Summary of Reported Rocky Mountain Spotted Fever Cases, Oklahoma, 2011 (N = 334)

	Number (%)	Incidence Rate per 100,000
Gender		
Male	215 (64%)	11.58
Female	119 (36%)	6.28
Age	Median Age: 46 years (Range: 21 months – 84 years)	
Age Groups		
0-4	8 (2%)	3.03
5-18	41 (12%)	5.69
19-50	149 (45%)	9.25
>50	136 (41%)	11.76
Race		
White	169 (50%)	6.24
American Indian	83 (25%)	25.80
Black or African American	5 (1%)	1.80
Native Hawaiian or Pacific Islander	1 (<1%)	22.89
Unknown	76 (23%)	-
Hispanic or Latino Ethnicity	6 (2%)	1.81
Symptoms		
Fever	334 (100%)	-
Headache	199 (60%)	-
Myalgias	184 (55%)	-
Rash	81 (24%)	-
Rash location (N=81)		
Trunk	30 (37%)	-
Legs	30 (37%)	-
Arms	17 (21%)	-
Face	9 (11%)	-
Palms/Soles	5 (6%)	-
Hospitalization	28 (8%)	-
Death	1 (<1%)	-
Exposures		
Recognized tick bite	135 (40%)	-
Exposure to wooded or tick infested area	24 (7%)	-

Incidence Rate of Reported Rocky Mountain Spotted Fever
By Gender and Age Group, Oklahoma, 2011



Salmonellosis

2011 Case Total	831	2011 Incidence Rate	22.2 per 100,000
2010 Case Total	752	2010 Incidence Rate	20.4 per 100,000

In 2011, salmonellosis increased by 10.5% from the previous year. Of the 831 cases, 82 (9.9%) were epidemiologically linked symptomatic contacts to confirmed cases identified during routine case investigations performed by the county health department public health nurses. Each year, a seasonal trend for salmonellosis is noted, with over 50% of cases occurring between July and October, which was again demonstrated in 2011 with 55% of cases reported during that period (n = 455).

Persons with salmonellosis ranged in age from 9 days to 95 years, with a median age of 27 years. The highest age-specific incidence rates (IR) per 100,000 population occurred among children less than five years of age (IR = 73.83 per 100,000) followed by children five to nine years of age (IR = 31.23 per 100,000).

The highest proportion of cases occurred in Oklahoma County (15.4%, n = 128), resulting in an IR of 17.81 per 100,000. The highest county-specific rate occurred in Love County with an IR of 74.29 per 100,000 (n = 7). Other counties with high rates for salmonellosis included Lincoln County (IR = 70.0 per 100,000, n = 24), Grant County (IR = 66.3 per 100,000, n = 3), Greer County (IR = 64.1 per 100,000, n = 3), and Latimer County (IR = 62.8 per 100,000, n = 7).

Clinical isolates of *Salmonella* species identified by laboratories are required to be submitted to the OSDH Public Health Laboratory (PHL) for confirmation, serogroup identification, and analysis by pulsed-field gel electrophoresis (PFGE). The OSDH PHL confirmed and serogrouped 701 (84%) *Salmonella* isolates of the 831 reported cases in 2011. Forty-two different serogroups were identified, with the top four being Newport (n = 151, 18.2% of typed isolates), Typhimurium (n = 97, 11.7%), Enteriditis (n = 80, 9.6%), and Paratyphi B variant L Tartrate + (n = 61, 7.3%).

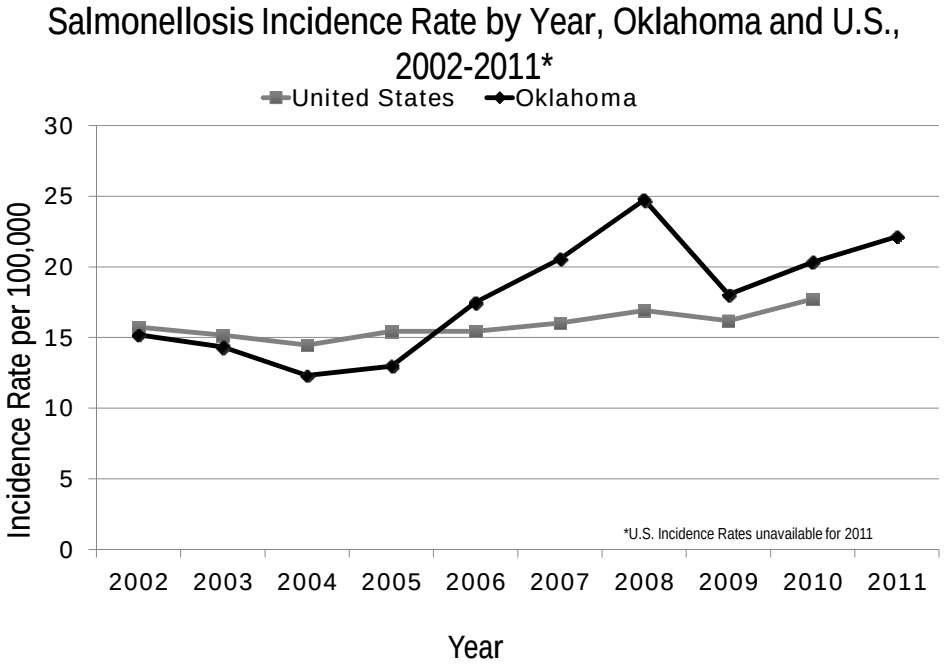
The Acute Disease Service (ADS) regularly evaluates *Salmonella* surveillance data to identify reports of multiple cases with characteristics that suggest a potential common source, such as similar serogroup, PFGE pattern, geographic location, and higher than expected number of cases. Additional interviews are conducted by ADS epidemiologists to determine if cases are related to a common source and to implement control measures. During 2011, the ADS investigated15 *Salmonella* clusters; one of these was a local cluster involving only cases in Oklahoma, and the remaining 14 were multistate investigations.

During October 2011, the ADS and Oklahoma City-County Health Department investigated an outbreak of *Salmonella* Oranienburg that occurred among residents of Central Oklahoma. Interviews of the13 culture-confirmed cases determined that all of the cases consumed meals from the same restaurant; however, the investigation did not identify the source, such as a specific food item, or contributing factors associated with development of illness.

Isolates of salmonellosis are uploaded to a national database for cluster and outbreak identification based upon serogroup and PFGE. In 2011, a multistate outbreak of *Salmonella* Typhimurium involving an Oklahoma resident was investigated to determine a potential source of infection; 83 individuals from 31 states were identified in this outbreak. A case-control study was performed and implicated contact with frogs, primarily African dwarf frogs as the source of infection. The frogs were traced back to a California frog breeder and measures were subsequently implemented to prevent further sale of infected frogs to consumers.

Demographic and Clinical Summary of Reported Salmonellosis Cases, Oklahoma, 2011 (N = 831)

	Number (%)	Incidence Rate per 100,000
Gender		
Female	446 (54%)	23.54
Male	384 (46%)	20.68
Unknown	1 (0.1%)	--
Age	Median = 27.0 years (range: 9 days – 95 years)	
Race		
White	619 (75%)	22.67
American Indian or Alaska Native	68 (8%)	21.14
African American or Black	39 (5%)	14.05
Asian	5 (0.6%)	7.68
Native Hawaiian or Other Pacific Islander	1 (0.1%)	22.89
Two or more races	28 (3%)	12.65
Unknown	71 (9%)	--
Hispanic or Latino Ethnicity	44 (5%)	13.25
Hospitalized for Salmonellosis	197 (24%)	--
Deaths	0 (0%)	--
Exposures (not mutually exclusive)		
Travel outside U.S.	16 (2%)	--
Consumed raw or undercooked eggs	116 (14%)	--
Consumed raw/unpasteurized milk	6 (0.7%)	--
Consumed raw/unpasteurized cheese	1 (0.1%)	--
Consumed raw/unpasteurized juice	4 (0.5%)	--



Shigellosis

2011 Case Total	276	2011 Incidence Rate	7.36 per 100,000
2010 Case Total	416	2010 Incidence Rate	11.3 per 100,000

In 2011, a total of 276 cases of shigellosis were reported to the OSHD, a decrease of 33.7% from 2010. Of the 276 cases, 167 (60.5%) were laboratory-confirmed cases and 109 (39.5%) were epidemiologically linked cases identified during investigations conducted by county health department communicable disease nurses.

Shigellosis is typically a mild, self-limiting enteric disease with symptoms ranging from asymptomatic infection to severe disease. In 2011, 27 cases (9.8%) required hospitalization for shigellosis, and no deaths were reported. Specimen sources of confirmed cases included stool (56.6%, n = 156), urine (3%, n = 8), and blood (0.4%, n = 1).

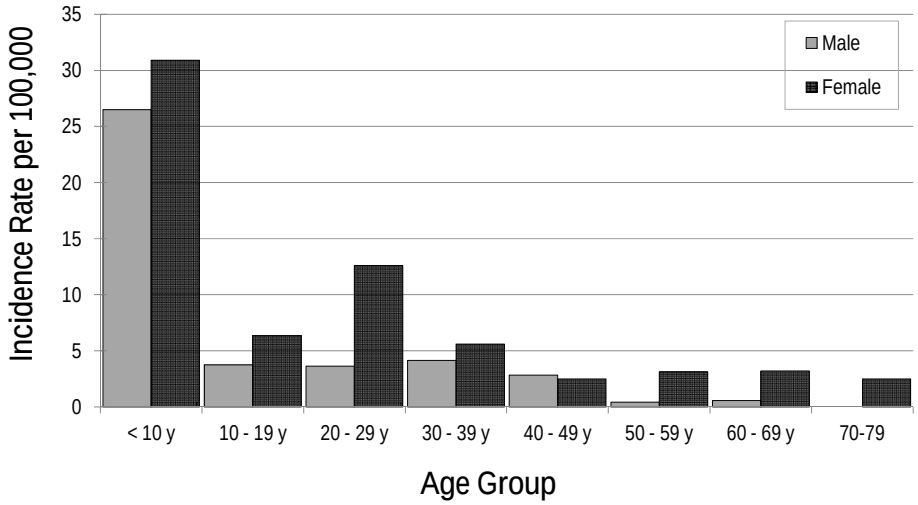
In 2011, shigellosis cases were reported in 31 counties in Oklahoma. The counties with the highest rates of shigellosis were Ottawa (56.5 cases per 100,000), Garfield (42.9 cases per 100,000), and Washita (34.4 per 100,000). The highest rate of illness occurred in children less than 10 years of age. Namely, females less than 10 years of age had higher rates of illness (30.9 per 100,000) compared to males under 10 years of age (26.5 per 100,000). In 2011, females had higher rates of shigellosis in all age categories except for persons 40 to 49 years of age.

Because of the low infectious dose of 10 to100 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 healthcare settings. Thirty-three percent (n = 88) of cases in 2011with known exposure history reported association with a child care setting (CCS). Of those cases associated with a CCS, 46 (52%) were attendees, 7 (8%) were employees, 4 (4.5%) were food handlers that worked at CCS, and 31 (35%) had other affiliations with a CCS, such as a household member that attended or worked at a CCS. Cases of shigellosis were also reported in persons associated with other high-risk settings including food handlers (1.4%, n = 4) and healthcare (1.1%, n =3).

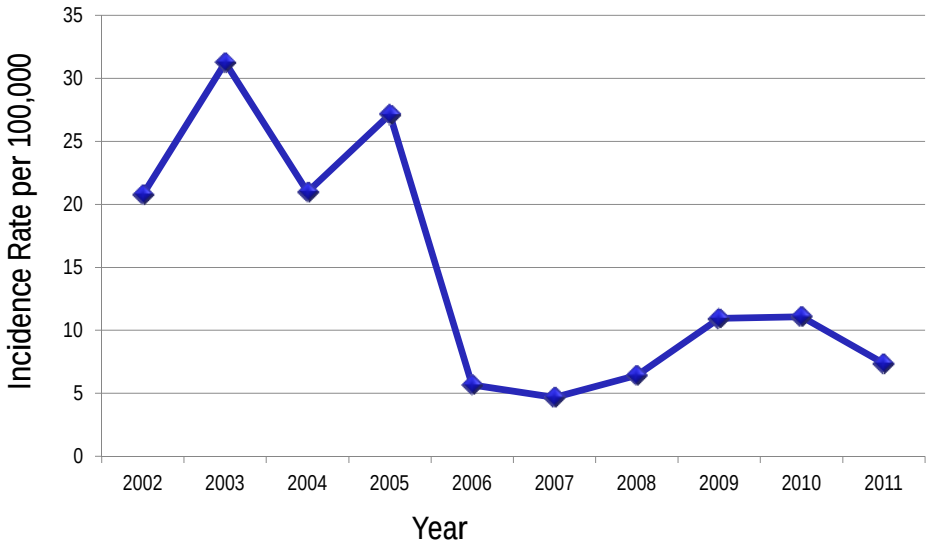
Demographic and Clinical Summary of Reported Shigellosis Cases, Oklahoma, 2011 (N = 276)

	Number (%)	Incidence rate per 100,000
Gender		
Female	165 (60%)	8.7
Male	111 (40%)	6.0
Age	Median = 8 years (range: 5 months – 80 years)	
Race		
White	195 (71%)	7.2
American Indian or Alaska Native	19 (7%)	5.9
Black or African American	26 (9%)	9.4
Native Hawaiin or other Pacific Islander	0 (0%)	-
Two or more races	20 (7%)	9.0
Unknown	16 (6%)	-
Symptoms (not mutually exclusive)		
Diarrhea	271 (99%)	-
Duration of diarrhea (days)	Median = 5 days (range: 1 day – 23 days)	
Diarrhea, bloody	70 (26%)	-
Abdominal cramps	215 (78%)	-
Vomiting	105 (38%)	-
Mucous in stool	89 (32%)	-

Incidence Rate of Reported Shigellosis Cases by Age Group and Gender, Oklahoma, 2011 (N = 276)



Incidence Rate of Reported Shigellosis Cases by Year, Oklahoma, 2002-2011



Invasive *Streptococcus pneumoniae,* Among Children Less Than 5 Years

2011 Case Total	37	2011 Incidence Rate	14.0 per 100,000
2010 Case Total	55	2010 Incidence Rate	20.2 per 100,000

Invasive *Streptococcus pneumoniae* (IPD) causes a wide spectrum of disease including otitis media, pneumonia, bacteremia/sepsis, and meningitis. A 13-valent pneumococcal conjugate vaccine (PCV13) is currently recommended for all children to be administered at 2, 4, 6 and 12-15 months of age. This 13-valent vaccine contains all PCV7 serotypes plus six additional, covering approximately 64% of all serotypes of IPD in children <5 years. For those children aged 14 to 59 months who have completed the full series of PCV7 or those with underlying medical conditions, ACIP also recommends a single supplemental PCV13 dose.

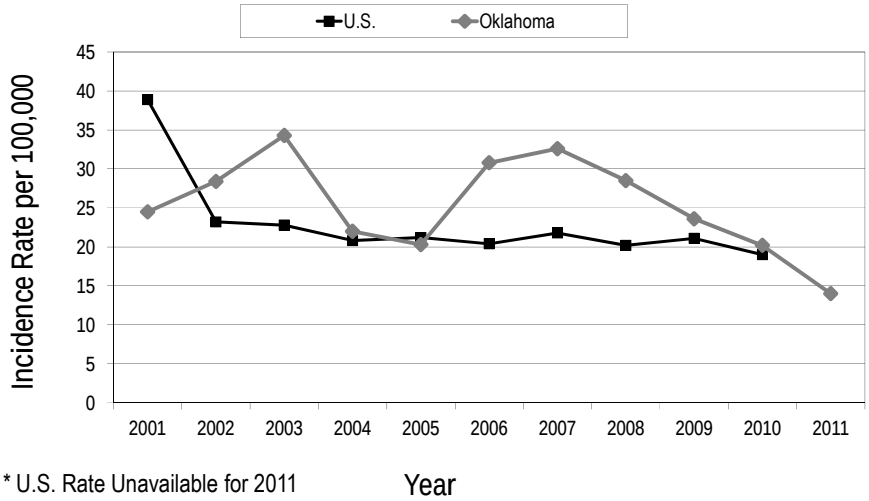
Demographic and Clinical Summary of Reported Invasive *Streptococcus pneumoniae* Cases Among Children Less Than 5 Years, Oklahoma, 2011 (N = 37)

	Number (%)	Incidence Rate per 100,000*
Gender		
Female	13 (35%)	10.04
Male	24 (65%)	17.82
Age	Median = 12 months (range: 1 month – 4 years)	
< 1 year	18 (49%)	34.65
1 year	6 (16%)	11.39
2 years	7 (19%)	13.13
3 years	3 (8%)	5.57
≥4 years	3 (8%)	5.73
Hospitalized for IPD	25 (68%)	-
Died due to IPD	1 (3%)	-
Race		
White	26 (70%)	16.61
Black	3 (8%)	13.83
American Indian	2 (6%)	13.90
Native Hawaiian or other Pacific Islander	1 (3%)	210.97
Multiracial	3 (8%)	8.91
Unknown	2 (4%)	-
Hispanic or Latino Ethnicity	6 (16%)	1.8
Infection Types (not mutually exclusive)		
Bacteremia/sepsis	32 (86%)	--
Meningitis	9 (24%)	--
Pneumonia	10 (27%)	--
Other§	11 (30%)	
Vaccinated with ≥1 dose pneumococcal conjugate vaccination at time of illness (n = 33)¶	31 (94%)	-
Age-appropriately vaccinated at time of Illness (n = 33)	25 (76%)	-

* Incidence rate per 100,000 population based on the number of children less than 5 years of age in Oklahoma.
§ Other infection types include otitis media, sterile-site abscess, septic arthritis, peritonitis
¶ Number includes only those children who were eligible for vaccination (i.e., children ≥2 months of age)

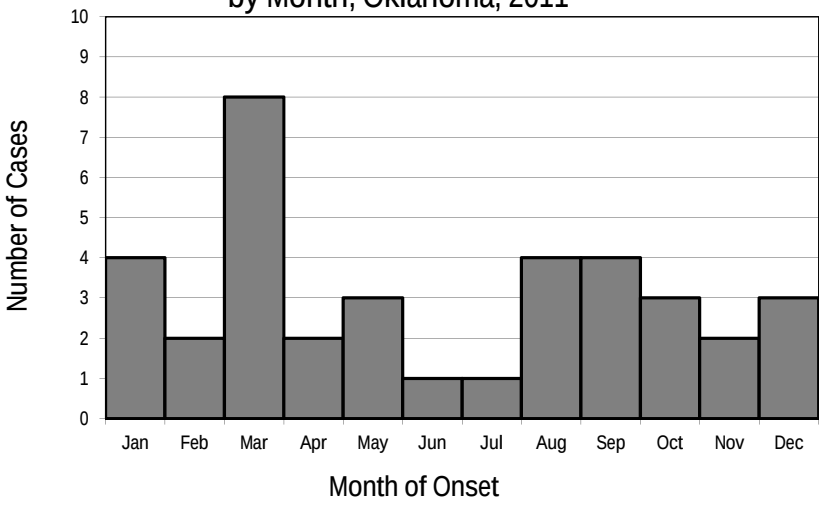
In 2011, the incidence of reported IPD in children less than 5 years of age decreased 33% compared to 2010, making 2011 the fourth consecutive year in which cases have decreased. The median age of cases was 12 months, with the highest number of cases occurring in those less than one year of age (n = 18, 49%). Overall, males had higher rates of disease than females, but were not consistent when looking at individual age groups. In 2011, 43% (n = 24) of cases occurred during the influenza season (October through April); which some studies suggest influenza may be associated with an increased risk of developing IPD[i]. One child died due to IPD in 2011; resulting in a case-fatality rate of 2.7%.

Incidence Rate of Reported Invasive *Streptococcus pneumoniae* Cases Among Children Less Than 5 Years, by Year, Oklahoma and U.S., 2001 – 2011*



* U.S. Rate Unavailable for 2011

Reported Number of Invasive *Streptococcus pneumoniae* Cases Among Children Less Than 5 Years, by Month, Oklahoma, 2011



[i] Walter ND, Taylor TH, Shay DK, Thompson WW, Brammer L, Dowell SF, Moore MR for the Active Bacterial Core Surveillance Team. Influenza Circulation and the Burden of Invasive Pneumococcal Pneumonia during a Non-pandemic Period in the United States. Clin Infect Dis 2010; 50:175-183.

Tuberculosis

2011 Case Total	94	2011 Incidence Rate	2.5 per 100,000
2010 Case Total	86	2010 Incidence Rate	2.3 per 100,000

Tuberculosis (TB) is often considered a disease of the past. However, nearly one-third of the world's total population, or approximately two billion people, are currently infected with the bacteria that causes TB. Each year, approximately nine million people around the world develop TB, and almost two million deaths are related to TB. TB is the leading killer of people who are HIV infected. Although Oklahoma and the US have seen a steady decline of TB through the years through public health efforts, including timely case diagnosis, contact investigation, administration of therapy, and education, Oklahoma did see an increase in number of cases of tuberculosis in 2011 (see graph).

In Oklahoma, the highest number of cases (n = 43) occurred among persons that reported their race as White. Conversely, the highest incidence rate occurred among persons that reported their race as Native Hawaiian/Pacific Islander (68.7 per 100,000). Some races may be under-represented as race is self-reported and more than one race can be declared. Foreign-born persons represented 27% of the total cases in Oklahoma. Persons ages 65 and older represented the highest rate of illness (3.8 per 100,000 population) followed by two age groups: adults 45 to 64 and children less than five years of age (see Table 2).

People at high risk for TB infection include those who are close contacts to active TB cases, foreign born, low-income and/or homeless individuals, people who work with high risk groups in special settings such as correctional facilities or drug treatment centers, racial and ethnic minorities and people who inject illicit drugs. People at high risk for progressing from latent TB infection (LTBI, non-contagious) to active TB disease (contagious) include those who are immunocompromised, malnourished, substance abusers, people with medical conditions (such as diabetes, severe kidney disease, or silicosis), people who were infected with TB within the previous two years, children under 4 years of age, and people who inject illicit drugs.

Prevention, early diagnosis and treatment are paramount to successful tuberculosis control. TB should be considered in the differential diagnosis of persons presenting with a productive cough, bloody sputum, fevers, and/or unexplained weight loss. Early suspicion and testing are of utmost importance. Delayed diagnosis of TB can result in serious disease as well as community spread of TB. Persons with active TB are treated using directly observed therapy (DOT) in Oklahoma, meaning that each dose of TB medication is supervised to confirm adherence.

Incidence Rate of Reported Tuberculosis Cases by Year,
Oklahoma and U.S., 2001 – 2011

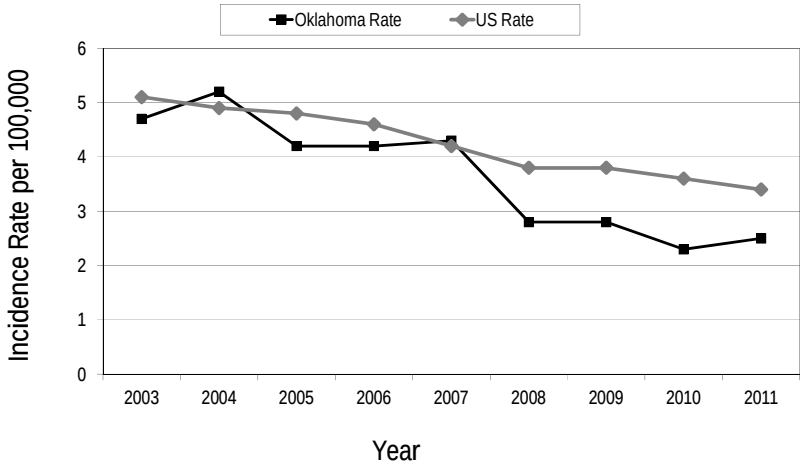


Table One: Demographic and Bacteriologic Summary of Reported Tuberculosis Cases, Oklahoma, 2003 – 2011

Year	2003	2004	2005	2006	2007	2008	2009	2010	2011
Tuberculosis Cases	163	178	144	144	149	100	102	86	94
Age									
0-4	11 (7%)	14 (8%)	12 (8%)	8 (6%)	12 (8%)	12 (12%)	10 (10%)	8 (9%)	8 (9%)
5-14	1 (1%)	10 (6%)	7 (5%)	3 (2%)	9 (6%)	1 (1%)	7 (7%)	1 (1%)	4 (4%)
15-24	16 (10%)	24 (13%)	7 (5%)	9 (6%)	11 (7%)	8 (8%)	7 (7%)	9 (11%)	5 (5%)
25-44	51 (31%)	50 (28%)	40 (28%)	36 (25%)	36 (24%)	29 (29%)	23 (22%)	23 (27%)	27 (29%)
45-64	52 (32%)	54 (30%)	53 (37%)	56 (39%)	60 (40%)	32 (32%)	38 (37%)	27 (31%)	31 (33%)
65-Over	32 (20%)	27 (15%)	25 (17%)	32 (22%)	21 (14%)	18 (18%)	17 (17%)	18 (21%)	19 (20%)
Race									
American Indian/Alaska Native	33 (20%)	36 (20%)	32 (22%)	22 (15%)	30 (20%)	19 (19%)	13 (13%)	14 (16%)	16 (17%)
Asian	16 (10%)	20 (11%)	14 (10%)	20 (10%)	8 (5%)	7 (7%)	12 (12%)	14 (16%)	15 (16%)
Black	27 (17%)	32 (18%)	21 (15%)	22 (15%)	22 (15%)	23 (23%)	13 (13%)	10 (12%)	11 (12%)
Native Hawaiian/Pacific Islander	0	0	0	0	5 (3%)	6 (6%)	5 (5%)	6 (7%)	3 (3%)
White	87 (53%)	88 (50%)	70 (49%)	79 (55%)	84 (56%)	45 (45%)	51 (50%)	32 (37%)	43 (46%)
Race Unknown	--	--	--	--	--	--	--	8 (9%)	5 (5%)
Multiple Races	0	2 (1%)	7 (4%)	1 (.7%)	--	--	7 (7%)	2 (3%)	1 (1%)
Hispanic***	18 (11%)	29 (32%)	21 (15%)	25 (17%)	25 (17%)	13 (13%)	16 (16%)	18 (21%)	16 (17%)
Special Populations									
Foreign Born	37 (23%)	37 (21%)	35 (24%)	39 (27%)	38 (26%)	30 (30%)	20(20%)	23 (27%)	26 (27%)
Univ. Students	8 (5%)	5 (3%)	2 (1%)	5 (3%)	2 (1%)	1 (1%)	0	0	1 (1%)
Homeless	7 (4%)	9 (5%)	13 (9%)	8 (6%)	7 (5%)	8 (8%)	6 (6%)	2 (2%)	6 (6%)
Nursing Homes	5 (3%)	5 (3%)	5 (3%)	8 (6%)	4 (3%)	5 (5%)	4 (4%)	0	2 (2%)
HIV/TB	10 (6%)	4 (2%)	10 (7%)	6 (4%)	5 (3%)	3 (3%)	1 (1%)	3 (4%)	1 (1%)
Prisoners	6 (4%)	11 (6%)	8 (6%)	7 (5%)	2 (1%)	2 (2%)	2 (2%)	0	4 (4%)
Bacteriology									
Resistance To INH	9 (5.6%)	1 (1%)	5 (5%)	3 (2%)	0	3 (3%)	4 (4%)	2 (2%)	1 (1%)
MDR-TB	1 (0.8%)	0	1 (1%)	0	0	0	0	1 (1%)	1 (1%)
Culture Positive for MTB	126 (77%)	109 (61%)	93 (65%)	73 (51%)	91 (61%)	80 (80%)	62 (61%)	59 (69%)	68 (72%)

Table Two: Incidence Rate of Reported Tuberculosis Cases by Age and Race, Oklahoma and United States, 2003 – 2011

Year	2003	2004	2005	2006	2007	2008	2009	2010	2011
Oklahoma Case Rate*	4.7	5.2	4.2	4.2	4.3	2.8	2.8	2.3	2.5
U.S. Case Rate*	5.1	4.9	4.8	4.6	4.2	3.8	3.8	3.6	3.4
Age**									
0-4	5	6	5	3	5	4.6	3.8	2.9	3
5-14	1	2	1	0.6	2	0.2	1.4	0.2	0.8
15-24	3	5	1	2	2	1.5	1.3	1.7	0.9
25-44	5	5	4	4	4	3	2.4	2.4	2.8
45-64	7	7	7	7	8	3.5	4.1	2.9	3.2
65+	7	6	5	7	5	3.7	3.5	3.6	3.8
Race***									
American Indian/Alaska Native	12	13	12	8	11	6.7	4.5	4.7	5
Asian	34	43	30	43	17	11.2	19.1	22.3	23.1
Black	9	12	8	8	8	8	4.5	3.4	4
Native Hawaiian/ Pacific Islander	0	0	0	0	210	164.3	129.4	152	68.7
White	3	3	3	3	3	1.6	1.8	1.1	1.6
Multiple Races	0	1	4	0.6	--	--	4.7	1.3	0.5
***Hispanic	10	16	7	13	14	5	5.7	6	4.8

*Rate is 100,000 per population
**Race and Age calculations using census data
***Persons of Hispanic ethnicity may be represented in other races.

Tularemia

2011 Case Total	15	2011 Rate	0.40 per 100,000
2010 Case Total	8	2010 Rate	0.22 per 100,000

Tularemia is an endemic zoonotic disease caused by the bacterium *Francisella tularensis*. In Oklahoma, it is most commonly spread to humans via the bite of an infected *Amblyomma americanum* (lone star) tick, but can also be contracted by handling infected wild animals, being bitten by sick pets, eating or drinking contaminated food or water, or inhaling airborne bacteria. Due to its numerous transmission routes and low infectious dose, *F. tularensis* is classified as a bioterrorism agent and is therefore an immediately notifiable disease in Oklahoma. Epidemiologists from the Acute Disease Service investigate all cases to identify the source of exposure and evaluate for case clustering or outbreaks.

There are several different clinical presentations of tularemia related to the route of exposure. Of the 15 reported cases in 2011, five (33%) were classified as ulceroglandular, five (33%) were typhoidal, four (27%) were glandular and one (7%) was oropharyngeal. The most commonly reported symptoms were: fever, headache, localized adenopathy, chills, myalgias, fatigue, nausea, vomiting and weakness.

Tularemia tends to be more common in the warmer months when ticks are most active. Tularemia prevention centers on avoiding tick bites, using gloves when handling or skinning wild animals, and avoiding mowing over dead animals. For more information regarding tularemia or tick bite prevention, visit http://ads.health.ok.gov.

Demographic and Clinical Summary of Reported Tularemia Cases, Oklahoma, 2011 (N = 15)

	Number (%)	Incidence Rate per 100,000
Gender		
Male	11 (73%)	0.59
Female	4 (27%)	0.21
Age	Median = 42 years (range: 13–75)	
Race		
White	8 (53%)	0.30
American Indian/Alaska Native	3 (20%)	0.93
Native Hawaiian or other Pacific Islander	1 (7%)	22.89
Unknown	3 (20%)	-
Hispanic or Latino Ethnicity	1 (7%)	0.30
Hospitalization	3 (20%)	-
Death	0 (0%)	-
Geographical Distribution		
Tulsa	3 (20%)	0.50
Haskell	3 (20%)	23.49
Oklahoma	2 (13%)	0.28
Pittsburg	2 (13%)	4.36
Adair	2 (13%)	8.82
Rogers	1 (7%)	1.15
Cherokee	1 (7%)	2.13
Sequoyah	1 (7%)	2.36
Common Exposures		
Exposure to wooded or tick infested area	12 (80%)	-
Recognized tick bite	10 (67%)	-
Cat bite	1 (7%)	-

Human Illness Associated with Harmful Blue-Green Algal Blooms in Oklahoma, 2011

During late June 2011, the Oklahoma Department of Environmental Quality and the Grand River Dam Authority announced the presence of blue-green algae (also called cyanobacteria) in multiple lakes in the state of Oklahoma. The blue-green algae (BGA) can form blooms that may look like foam, scum, or mats on the surface of the water, and as the algae in the blooms die, the water may smell bad. These blue-green algae blooms can produce a multitude of toxins that can cause illness in humans and animals. Potential health outcomes can vary and depends on the route of exposure or the amount of toxin or bacteria present in the water at the time of exposure. Getting toxins on the skin from swimming or wading may cause people to get rash, hives, or skin blisters; inhaling water droplets from skiing or boating may cause runny eyes or nose, sore throat, asthma-like symptoms, or allergic reactions. When persons swallow the affected water, it can cause more severe symptoms such as gastroenteritis, liver toxicity, kidney toxicity, and neurotoxicity. There are currently no laboratory tests to detect cyanobacteria toxins or antibodies in human specimens, and medical care is supportive.

In response to detection of BGA in Oklahoma lakes, the Oklahoma State Department of Health, Acute Disease Service (ADS) conducted surveillance for suspected cases of BGA-related illness. The ADS distributed an Oklahoma Health Alert Network advisory to Oklahoma hospitals advising clinicians to report suspected BGA-related illnesses, based on symptoms and history of recent exposure to a lake where BGA was observed, to the ADS for investigation. ADS epidemiologists attempted to interview all suspected cases to gather demographics, symptoms, and exposure information. Individuals were asked about type of activities they participated in (i.e., boating, swimming), amount of time spent participating in the activity, and location on the body of water the activity occurred. To help identify areas with algal blooms, cases were also asked if they noticed any mats, scum, or foam, or if the water smelled bad. Cases were then asked about symptoms they experienced after exposure to the water, pre-existing health conditions which may place them more at risk of illness, and whether they sought any type of medical care. Information about water exposures were shared with other partners so BGA toxin testing could be performed on the implicated water source.

A total of 76 suspected cases were reported to the ADS, of which 57 were available for interview. Symptoms were grouped into syndromes, with many cases experiencing multiple syndromes. The syndromes reported by cases included (not mutually exclusive): upper respiratory (cough, shortness of breath, wheezing, and chest tightness, 60%); gastrointestinal (nausea, vomiting, diarrhea, and abdominal cramps, 51%); rash of various presentations (macular, papular, and blistering, 30%); neurologic (numbness, vertigo, confusion, and vision disturbance, 25%); and other symptoms such as fever, conjunctivitis, and sore throat (12%). Twenty-eight (49%) received some type of medical care. One person was hospitalized. Ages of cases ranged from 8 months to 77 years, with a median age of 26 years; 32 (56%) were female and 25 (44%) were male. Dates of exposure ranged from June 5, 2011 – September 24, 2011. Suspected cases reported exposure to nine Oklahoma lakes prior to illness onset, with the majority of exposures reported to be Grand Lake (38%) and Lake Eufaula (20%).

National Outbreak of *Listeria monocytogenes* Associated with Consumption of Whole Cantaloupes, 2011

Listeriosis is a disease caused by the bacterium *Listeria monocytogenes*, and is usually acquired by eating food contaminated with the bacteria. The disease mostly affects older adults, persons with weakened immune systems, and pregnant women and their newborns. Symptoms of listeriosis include fever, muscle aches, diarrhea or other gastrointestinal symptoms; and can lead to more severe conditions such as septicemia (bloodstream infection) or meningitis. The incubation period for listeriosis is quite long, ranging from 3 to 70 days, with most illness occurring approximately 3 weeks after exposure. Most cases of listeriosis are sporadic; however, outbreaks due to consumption of contaminated food products have been identified. Prompt reporting of cases can help in the early detection of an outbreak, identification of the source, and prevention of additional cases. When a food item is implicated during listeriosis outbreak investigations, actions are taken to remove the implicated food from further consumption. Between July and October 2011, a national outbreak of listeriosis occurred due to consumption of cantaloupe produced by a local farm in Colorado.

The Oklahoma Disease Reporting Rules (Oklahoma Administrative Code 310: Chapter 515) require that isolates of *Listeria* cultured from a sterile site (e.g. blood, cerebrospinal fluid, etc.) be sent to the Oklahoma State Department of Health (OSDH) Public Health Laboratory (PHL) for confirmation and pulsed-field gel electrophoresis (PFGE). PFGE data is shared through PulseNet, a national electronic database coordinated through the Centers for Disease Control and Prevention (CDC). PFGE data is routinely evaluated by public health officials to identify clusters of cases with indistinguishable patterns. In this outbreak, a total of four *Listeria monocytogenes* PFGE patterns were identified as associated with this national outbreak associated with consumption of cantaloupe.

National Outbreak Summary

A total of 146 persons from 28 states were identified with one or more of the four outbreak PFGE patterns; with 30 deaths. Ages ranged from less than one year to 96 years (median: 77 years), with the majority of cases over the age of 60 years. Fifty-eight percent of cases were female. Of 144 cases in which clinical information was available, 142 (99%) were hospitalized and 30 deaths occurred. Illness onsets of cases ranged from July 31 through October 27, 2011. Seven illnesses occurred among women who were pregnant at the time of their symptom onset, one miscarriage was reported.

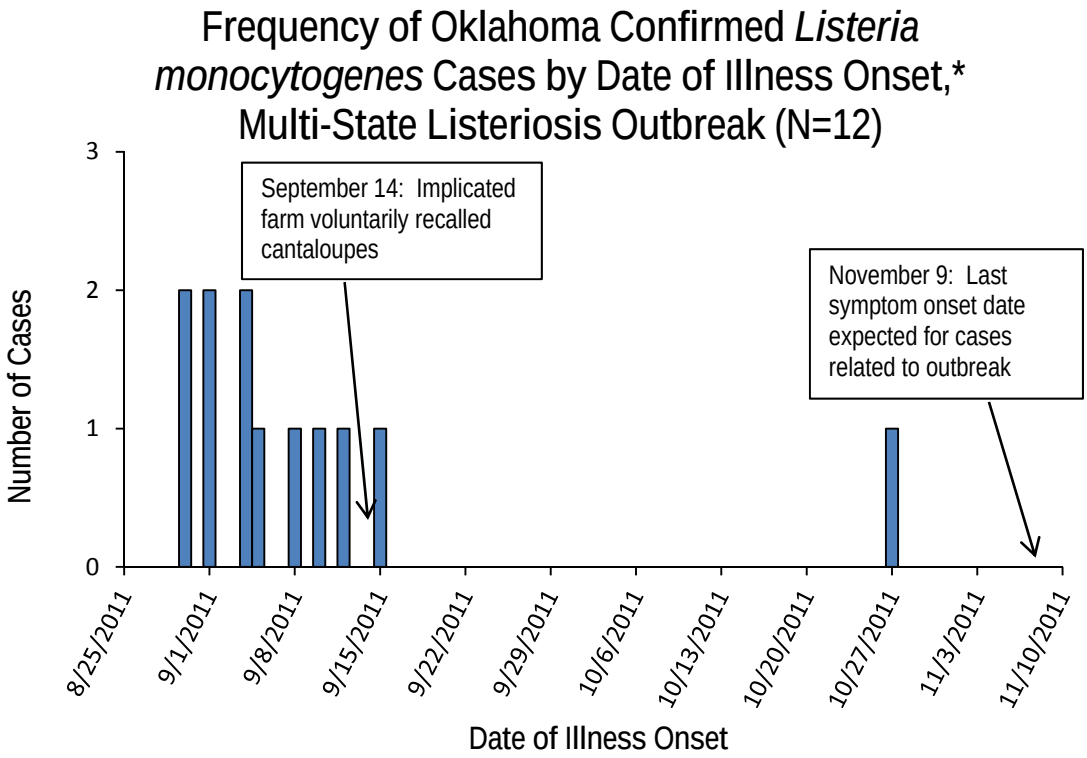
The source of the outbreak was consumption of whole cantaloupe grown at Jensen Farms in the Rocky Ford Region of Colorado. Of the 140 ill persons with available food consumption history, 131 (94%) reported consuming cantaloupe in the month prior to illness onset. Laboratory testing by the Colorado Department of Public Health and Environment identified *Listeria monocytogenes* outbreak strains in samples from equipment and cantaloupes at the farm. All four of the outbreak associated PFGE patterns were found in cantaloupes distributed by this farm either through retail or farm sampling. On September 14, 2011, during the early stages of the outbreak investigation, Jensen Farms issued a voluntary recall of the implicated cantaloupes. State and federal public health officials conducted recall checks to ensure the implicated product was removed from circulation.

Oklahoma Case Summary

The OSDH ADS collaborated with other state health officials to conduct interviews of outbreak-associated *Listeria* cases. ADS epidemiologists conducted in-person interviews of these cases using a standard outbreak questionnaire to collect demographics, clinical history, and exposure, including consumption of specific foods. If the case was not able to participate in the interview due to severe disease, ADS epidemiologists interviewed the case's caretaker and/or the person who purchased the groceries for the case in order to collect a comprehensive food history. Due to the long incubation period of listeriosis, patients were asked about their food consumption during the month prior to their illness onset, including whether they consumed cantaloupe. If patients reported consuming cantaloupe, a supplemental questionnaire was administered regarding preparation and storage of the cantaloupe prior to consumption.

A total of 12 listeriosis cases were identified in Oklahoma with PFGE patterns associated with the outbreak strains. Symptom onset dates ranged from August 1 to October 27, 2011 (refer to graph). Ten of the twelve (83%) cases were hospitalized and one case died. Ages ranged from 61 to 96 years (median: 81.5 years); eight (67%) cases were male and four (33%) were female. All twelve cases were interviewed, 11 (92%) reported consuming cantaloupe during their exposure period purchased from stores that received Rocky Ford cantaloupes.

A cut cantaloupe sample was obtained from one of the Oklahoma case's refrigerator for testing. The sample was tested by the Oklahoma Department of Agriculture and was positive for *Listeria monocytogenes*. Further testing of the isolate by the PHL revealed the PFGE pattern of the isolate was associated with the outbreak.



*Date of specimen collection was used for one confirmed case whose symptom onset date was unavailable.

Measles Exposures Associated with Airline Travel, 2011

Measles (rubeola) is an immediately notifiable condition in Oklahoma; clinicians must report suspected or laboratory-confirmed cases to the Acute Disease Service (ADS) by contacting the Epidemiologist-on-Call at (405) 271-4060 (24/7/365 availability), or by submitting the report via the Public Health Investigation and Disease Detection of Oklahoma (PHIDDO) system, Oklahoma's secure, web-based disease reporting and investigation system. When suspected or confirmed cases are reported, the ADS immediately conducts an investigation to coordinate laboratory-confirmation, if the testing was not already performed; identify the source of exposure; identify exposed contacts and determine their susceptibility to measles; recommend measles vaccination to susceptible contacts; and implement isolation and quarantine measures to limit continued transmission and additional cases.

Measles is one of the most highly communicable diseases: It has a low infectious dose, and is spread through airborne droplets that remain infective while travelling on air currents for up to two hours.[i] Measles cases have declined greatly in the US since the first measles vaccine was licensed in 1963. The last confirmed case of measles occurring in Oklahoma was in 1997 and was an imported case. No secondary cases were identified.

Because measles is so rare in the United States, the proportion of physicians with experience diagnosing and managing patients with measles is shrinking. Measles begins with a high (≥101° F) fever and characteristic prodrome of cough, coryza and/or conjunctivitis. These symptoms are followed in two to four days by a maculopapular rash with distinct characteristics. The rash begins on the face, and gradually moves downward to the extremities, taking two to three days. The rash fades in the same order of occurrence.

Measles immunity is defined as having documentation of receiving two doses of measles-containing vaccine, serologic confirmation of measles immunity, or having been born prior to 1957 (important note: birth before 1957 is not an acceptable proof of measles immunity for healthcare personnel). For exposed persons who are susceptible to measles, administration of a measles-containing vaccine within 72 hours of first exposure can prevent development of measles.[ii]

In recent years, measles cases occurring in the US are typically linked to travel to countries where the disease remains endemic or among susceptible contacts to a case, often themselves a traveler from an endemic country[iii]. Non-immune or unvaccinated persons are at risk of developing measles in these situations. Although there were no reported cases of measles among Oklahoma residents during 2011, the ADS collaborated with state and federal public health officials to investigate Oklahoma residents who were contacts to measles cases. This article summarizes the four multistate contact investigations that occurred during 2011.

India

In April 2011, the Florida Department of Health reported diagnosis of a case of measles to the Miami Quarantine Station, occurring in an unvaccinated Floridian pre-adolescent who returned from an extended stay in India (where measles remains endemic). This case had a prodromal fever on the day of travel, and additional prodromal symptoms (cough, coryza, conjunctivitis and possible Koplik's spots) noted at the time of rash onset five days later. This case had a history of measles exposure while abroad, in a household member whose rash onset was eight days prior to the case's onset of symptoms. Four Oklahoma residents were exposed on the flights, all born prior to 1957. The local health department interviewed the exposed persons and obtained histories of measles disease during childhoods of three individuals. Exposed persons were followed for development of measles symptoms, and none developed symptoms upon follow-up.

France

In April 2011, the New Jersey Department of Health and Senior Services notified the Newark Airport Quarantine Station of a suspected case of measles based on symptoms and exposure history. The suspect, a US citizen, had a history of extensive exposure to a confirmed measles case eight days earlier that had traveled to France. The case travelled to and from Newark two days prior to onset of fever, and the rash developed two days later. The case's

vaccination status was unconfirmed, and had received post-exposure measles-containing vaccine (MMR) on the day after exposure. One Oklahoman was on the flight, and had a documented history of receiving two measles-containing vaccines. This person was followed for development of symptoms, and none occurred.

France

In May 2011, the New Mexico Department of Health notified the El Paso Quarantine Station of an unvaccinated child who travelled from France to Texas, and was then diagnosed with measles. Prodromal symptoms occurred the day prior to the flight, and included cough, coryza and fever. Rash onset occurred on the day of the flight, and the next day the patient was seen in an ER and diagnosed clinically. Laboratory confirmation was finalized five days later. One Oklahoman was on the flight, and had records of receiving one dose of measles-containing vaccine. This person was born after 1962, so it was recommended to receive a second dose of vaccine. This person was followed for development of symptoms, and did not develop any symptoms of measles.

Malaysia

In August 2011, ADS was notified by the California Department of Public Health of a foreign-borne teenager who travelled from Malaysia (where measles remains endemic) to California and was subsequently diagnosed with measles. Prodromal symptoms occurred two days prior to the flight, and included rash, fever, and conjunctivitis. The patient was exposed to a family member with measles while traveling. Six persons on that flight travelled on to Oklahoma to establish residency. Oklahoma public health officials confirmed that all six had received an MMR (measles-mumps-rubella) vaccine upon arrival in Oklahoma, which was the sixth day after exposure. They were followed for development of symptoms, and none occurred.

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[i] Centers for Disease Control and Prevention. Epidemiology and Prevention of Vaccine-Preventable Diseases. Atkinson W, Wolfe S, Hamborsky J, eds. 12th ed., second printing. Washington DC: Public Health Foundation, 2012. http://www.cdc.gov/vaccines/pubs/pinkbook/index.html

[ii] Centers for Disease Control and Prevention. Manual for the surveillance of vaccine-preventable diseases. Centers for Disease Control and Prevention, Atlanta, GA, 2008. http://www.cdc.gov/vaccines/pubs/surv-manual/index.html

[iii] Centers for Disease Control and Prevention. Measles — United States, 2011. MMWR 2012;61:253-257. http://www.cdc.gov/mmwr/PDF/wk/mm6115.pdf

Multi-State *Salmonella* Investigations Due to Consumption of Contaminated Foods

Public health officials monitor isolates of *Salmonella* uploaded to a national database to detect clusters and suspected outbreaks. Clusters and outbreaks are identified based upon the serogroup and PFGE pattern of *Salmonella*. During 2011, the Oklahoma State Department of Health (OSDH) Acute Disease Service (ADS) collaborated with other state and public health officials to investigate 14 multi-state clusters and outbreaks involving Oklahoma residents. This article summarizes three notable multistate outbreaks investigations.

Salmonella Heidelberg associated with consumption of ground turkey

The OSDH ADS collaborated with public health officials in 33 states, the Centers for Disease Control and Prevention (CDC) and the U.S. Department of Agriculture's Food Safety and Inspection Service (USDA-FSIS) to investigate a multistate outbreak of *Salmonella* Heidelberg. A total of 136 persons from 34 states were identified with the outbreak pattern of *Salmonella* Heidelberg. The number of persons identified in each state were: Alabama (1), Arkansas (1), Arizona (3), California (7), Colorado (4), Connecticut (1), Georgia (2), Illinois (16), Indiana (2), Iowa (2), Kansas (3), Kentucky (2), Louisiana (1), Massachusetts (4), Maryland (1), Michigan (12), Minnesota (2), Mississippi (2), Missouri (7), Nebraska (2), Nevada (1), New Jersey (1), New York (3), North Carolina (4), Ohio (12), Oklahoma (2), Oregon (1), Pennsylvania (8), South Dakota (3), Tennessee (2), Texas (18), Utah (1), Vermont (1), and Wisconsin (4). Illness onset dates ranged from February 27 to September 13, 2011. Ill persons ranged in age from less than one year to 90 years old (median 23 years). Of the 94 cases where information was available, 37 (39%) were hospitalized and one death was reported for this outbreak.

Routine PFGE subtyping of *Salmonella* isolates performed by the OSDH Public Health Laboratory (PHL) identified two Oklahoma cases with the outbreak-associated pattern. Both cases were infants; one from Oklahoma County and one from Tulsa County. Illness onsets occurred during the same timeframe as other cases affiliated with the multistate investigation. The OSDH ADS conducted interviews of guardians for each case to gather information regarding symptoms and specific exposure, including foods consumed.

State public health officials were able to interview 94 cases; 51 (54%) reported consuming ground turkey prior to illness onset. The proportion of cases consuming ground turkey was significantly higher compared to a survey of healthy persons in which only 11% of persons interviewed reported consuming ground turkey. Among persons that reported consumption of ground turkey, product information, including brand name, approximate date purchased, and purchase location was collected to determine if common brands were consumed by cases.

During the same timeframe as the outbreak investigation, *Salmonella* Heidelberg was isolated from five samples of ground turkey that were collected as part of the National Antimicrobial Resistance Monitoring System; PFGE patterns of all five isolates were indistinguishable to the outbreak strain. Product sample information indicated all of the products originated from Cargill Meat Solutions Corporation in Springdale, Arkansas, which were also reported as products consumed by cases.

As an outcome of this investigation and NARMS results, the USDA-FSIS released a health alert for frozen or fresh ground turkey products. The alert advised consumers to following safety storage and cooking instructions for fresh or frozen ground turkey products. Cargill Meat Solutions Corporation initially recalled approximately 36 million pounds of ground turkey products that may have been contaminated with the outbreak strain of *Salmonella* Heidelberg. Another 185,000 pounds of ground turkey were recalled once the outbreak strain of *Salmonella* Heidelberg was isolated from several samples collected at the production plant.

Salmonella Agona associated with consumption of papayas imported from Mexico

During 2011, the OSDH ADS collaborated with public health officials in 24 states, the CDC and the Food & Drug Administration (FDA) to investigate a multistate outbreak of *Salmonella* Agona. A total of 106 individuals from 25 states were identified with the PFGE outbreak pattern of *Salmonella* Agona. The number of persons identified in each state were: Arkansas (1), Arizona (4), California (8), Colorado (1), Georgia (8), Illinois (18), Indiana (1), Kentucky (1), Louisiana (2), Massachusetts (1), Minnesota (3), Missouri (3), Nebraska (2), Nevada (1), New Jersey (1), New Mexico (3), New York (9), Ohio (1), Oklahoma (1), Pennsylvania (2), Tennessee (1), Texas (25), Virginia (2), Washington (5), and Wisconsin (4). Symptom onset dates ranged from January 1 to August 25, 2011; cases ranged in age from less than one to 91 years (median 21 years). Of the 56 cases interviewed for this outbreak, 10 (18%) were hospitalized; no deaths occurred among outbreak cases.

The one Oklahoma case was an adolescent that resided in Oklahoma County. The case reported an onset during June 2011, which was within the timeframe of other outbreak-associated cases. The OSDH ADS interviewed the parents of the case to collect information regarding symptoms and specific exposures, including foods consumed, using the multistate outbreak questionnaire.

Of the 56 cases interviewed by state public health officials, 57% reported consuming papaya during the seven days prior to symptom onset. The proportion of ill individuals consuming fresh, whole papaya was significantly higher compared to a survey of healthy persons.

Among persons that reported papaya consumption, approximate purchase date and location purchased was collected by federal and state public health official to identify a common supplier. The traceback investigation determined Agromod Produce, Inc. was the common supplier of the papayas consumed by ill persons. Furthermore, *Salmonella* Agona with the outbreak PFGE pattern was isolated from samples of papaya collected during the outbreak investigation. A review of source records indicated the papayas were imported from Mexico. As a result of this investigation, Agromod Produce, Inc. volunatarily recalled affected lots of fresh, whole papayas.

Salmonella Enteritidis associated with consumption of foods from a Mexican-style fast food restaurant chain

From November 2011 through January 2012, the OSDH ADS worked with the Texas Department of State Health Services and CDC to investigate on an outbreak of *Salmonella* Enteritidis. A total of 67 cases with an indistinguishable PFGE pattern were identified among residents of 10 states: Iowa (1), Kansas (2), Michigan (1), Missouri (1), Nebraska (1), New Mexico (1), Ohio (1), Oklahoma (16), Tennessee (1) and Texas (43). Cases ranged in age from less than one to 79 years (median 25 years). Symptom onset dates ranged from October 13 to November 29, 2011. Thirty-one percent of ill persons were hospitalized; no deaths were reported among outbreak-associated cases. The 16 Oklahoma cases were located in the following counties: Cleveland (62%), Bryan (13%), Lincoln (13%), Pottawatomie (6%), and Greer (6%). The symptom onset dates ranged from October 21 to November 18, 2011. Four individuals were hospitalized. The ages of Oklahoma cases ranged from 5 to 78 years (median 23 years). Twelve of the sixteen ill persons were interviewed about their exposures. The remaining four did not respond to multiple phone call attempts and letters requesting an interview, and were considered lost-to-follow-up.

State public health officials conducted hypothesis-generating interviews with 52 cases; of those, 60% reported foods from Mexican-style fast food Restaurant Chain A prior to illness onset. All twelve (100%) Oklahoma cases interviewed reported eating food prepared by Restaurant Chain A. A case-control study was conducted by re-interviewing 48 cases and 103 controls (non-ill comparison group). Analysis indicated eating at Mexican-style fast food Restaurant Chain A was significantly associated with illness. Sixty-two percent of cases that participated in the case-control study reported consuming foods from Restaurant Chain A compared to 17% of controls

Cases reported eating at 18 different locations of Restaurant Chain A during the seven days prior to illness onset; three chain locations were identified where more than one case reported eating. These results suggest contamination likely occurred before the product reached Restaurant Chain A locations; however, a statistically significant association was not identified for a specific food item.

Syphilis Outbreaks in Two Counties, Oklahoma, 2011

Syphilis is a genital ulcerative sexually transmitted disease (STD) caused by the bacteria *Treponema pallidum*. Nicknamed "the great imitator", syphilis is known to have signs and symptoms that are indistinguishable from many other diseases.

Syphilis is transmitted from person to person through direct contact with a syphilis lesion or sore. Lesions primarily occur on or around the external genital area such as the penis, vagina, or rectum; but may also occur in the mouth or on the lips. Syphilis transmission usually occurs during vaginal, anal, or oral sex. In addition, syphilis in a pregnant woman can result in miscarriage, premature birth, stillbirth, and infant death. Many people have no symptoms for years, yet remain at risk for complications if not treated. There are several stages of syphilis infection: primary, secondary, early latent, latent, late latent, and neurosyphilis. This article summarizes two syphilis outbreaks that occurred in Oklahoma during 2011.

Pontotoc County Outbreak Summary

During June 2011, three syphilis cases were identified in a small town in Oklahoma. Only two cases had been identified in this county over the past fourteen years, so these cases caused major concern. These three original cases and their partners became a priority for Oklahoma Disease Intervention Specialists (DIS) and an Outbreak Response Plan was initiated.

By October 2011, 91 people were associated with the outbreak, 13 of which tested positive. The outbreak was among heterosexual males and females of all races. No cases were identified as co-infected with HIV, however there were several with either chlamydia and/or gonorrhea. Two females were identified as pregnant, however neither of them tested positive for syphilis.

Other prevention activities provided by the Oklahoma State Department of Health (OSDH) involved issuing a press release to raise awareness, developing campaign materials designed to reach the designated target audience, and distributing specific print campaign materials at commonly named hangouts and residential apartments. Also, several outreach activities were conducted at a local park, including a health educator being available to answer STD questions and hand out referral cards to the local county health department.

Comanche County Outbreak Summary

During September 2011, the OSDH noticed an increase of syphilis occurring among young adult males who have sex with males (MSM) and injection drug users (IDU) in Comanche County. Comanche County is the third largest metropolitan statistical area (MSA) in Oklahoma, and contains Fort Sill Army Base. Through the Outbreak Response Plan, it was determined print and television would not be the best sources of media outreach to raise awareness. Instead, the OSDH issued an Oklahoma's Health Alert Network (OKHAN) alert to local providers recommending screening patients who reported having unprotected sex, multiple sex partners, injection drug use, sex with an injection drug user, or reported a history of symptoms. The Field Surveillance Specialists (FSS) also made in-person site visits to urgent care facilities, emergency rooms, and detention centers in the area to make sure facilities were aware of the increase and proper protocols for testing, treatment, and recognition of symptoms.

Overall, there were 40 people investigated in the outbreak as either positive for syphilis, sex partner of a person positive for syphilis, or identified as benefiting from a test. There were eight confirmed positive patients identified: one primary syphilis, four secondary syphilis, and three early latent syphilis diagnoses. Four of the eight positive syphilis clients were also infected with HIV. All positive clients were male, as well as 85% of those investigated by DIS. The average age was 24 years.

Viral Gastroenteritis in Institutional Settings

Noroviruses are the most common cause of acute gastroenteritis in the United States with an estimated 20 million cases per year.[i] The average incubation period for norovirus is 24 to 48 hours, and clinical disease is characterized by acute onset of vomiting, diarrhea, or both, lasting 24 to 48 hours. The low infectious dose of norovirus (<100 viral particles), person-to-person transmission, and environmental contamination facilitates spread during outbreaks, especially among persons in institutional settings.

The Oklahoma State Department of Health (OSDH) Acute Disease Service (ADS), Oklahoma City-County Health Department, and Tulsa-City County Health Department (TCCHD) epidemiologists investigate outbreaks of acute gastroenteritis to (1) determine the magnitude of the outbreak; (2) identify the source; and (3) institute control measures. The OSDH Public Health Laboratory (PHL) has the capacity to perform norovirus testing by polymerase chain reaction (PCR) for outbreak investigations. OSDH and City-County Health Department epidemiologists collaborate with clinicians during investigations to collect specimens from symptomatic individuals for PCR testing.

In 2011, 25 acute gastroenteritis outbreaks with symptoms consistent with norovirus or other viral causes of gastroenteritis were reported to the OSDH and investigated by public health officials. Of the 25 outbreaks, 24 occurred within long-term care facilities and one occurred within a school setting.

Long-Term Care Facilities

Healthcare facilities, including long-term care facilities and hospitals, are the most commonly reported settings for norovirus and other viral gastrointestinal outbreaks in the United States. In 2011, 24 acute gastroenteritis outbreaks at long-term care facilities were reported to the OSDH ADS. Each facility contacted either the county health department or OSDH ADS to report an increase in the number of illnesses at the facility. Once the report was received, an outbreak investigation was initiated to determine attack rates among residents and staff, attempt to confirm the etiologic agent, perform active surveillance, and work with staff to implement infection control and prevention measures. Facilities were requested to compile a line list of all ill staff and residents to determine onset date and symptoms information. When an outbreak is reported, the ADS works with the facility to obtain stool specimens for laboratory testing. Of the 24 long-term care facility associated outbreaks, norovirus was confirmed as the etiologic agent by the Public Health Laboratory testing in 6 (26%) of the investigations conducted in this setting. Investigations by public health officials indicated 20 of the long-term care facility gastroenteritis outbreaks were due to person-to-person transmission, while the other four were due to unknown vehicles.

Schools

In 2011, an acute gastroenteritis outbreak was reported among a group of 100 students at a school banquet. Forty-five out of 100 individuals developed vomiting and/or diarrhea in the days following the banquet. Norovirus was confirmed as the etiologic agent. Results from this investigation indicated a point-source foodborne outbreak of norovirus occurred among participants of the banquet; illness was associated with persons who consumed pizza prepared by a local Italian eatery. Although epidemiologic results indicated an association between consumption of pizza and development of illness, we were not able to identify the specific contributing factors that led to contamination of the implicated product.

Conclusion

Norovirus is not a reportable disease in Oklahoma; however, the OSDH ADS investigates outbreaks of viral gastroenteritis, including suspected norovirus outbreaks, immediately upon report to identify the source and institute control measures to prevent additional cases. Clinicians are advised to immediately report suspected outbreaks of apparent infectious diseases to the OSDH Acute Disease Service Epidemiologist-on-Call at (405) 271-4060 (24/7/365 availability) for investigation and implementation of control measures.

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[i] Mead PS, Slutsker L, Dietz V, et al. Food-related illness and death in the United States. Emerg Infect Emerg Infect Dis 1999;5:607-25.

Influenza Surveillance Summary, 2011-2012

The Oklahoma Viral Respiratory Illness Sentinel Surveillance System works to detect disease transmission as early as possible, to monitor and describe the intensity and geographic distribution of disease, to measure the impact of influenza on different age groups, and to identify and disseminate information on the circulating types and subtypes of influenza in Oklahoma. The Oklahoma State Department of Health (OSDH) Acute Disease Service (ADS) has conducted sentinel surveillance activities year-round since 2007.

Twenty-one sentinel clinicians from 18 geographically distributed counties reported weekly the number and age distribution of patients with influenza-like illness (ILI) either via telephone, or a secure, web-based ILI reporting system. ILI was defined as a fever (100°F [37.8°C], oral or equivalent) AND cough or sore throat in the absence of a known cause other than influenza. Providers also reported the number of patients hospitalized due to ILI as well as the number of positive rapid antigen tests performed. Eleven geographically distributed laboratories reported results of respiratory virus testing (polymerase chain reaction [PCR], viral culture, direct fluorescent antibody [DFA], and/or rapid influenza diagnostic tests) on a weekly basis.

During the 2009-2010 influenza pandemic, OSDH monitored the occurrence of severe influenza disease, and that surveillance was continued during the 2011-2012 influenza season. To better describe the epidemiology of severe manifestations of influenza throughout the season, the OSDH Commissioner of Health designated laboratory-confirmed influenza-associated hospitalizations and deaths among persons of all ages statewide as reportable conditions for the calendar year 2012, beginning January 1, 2012. The epidemiology of outpatient visits due to ILI and influenza-associated hospitalizations and deaths were used to guide public health prevention and control measures. This influenza surveillance article describes both ILI sentinel surveillance and the influenza-associated hospitalization and death surveillance data collected during the 2011-2012 influenza season.

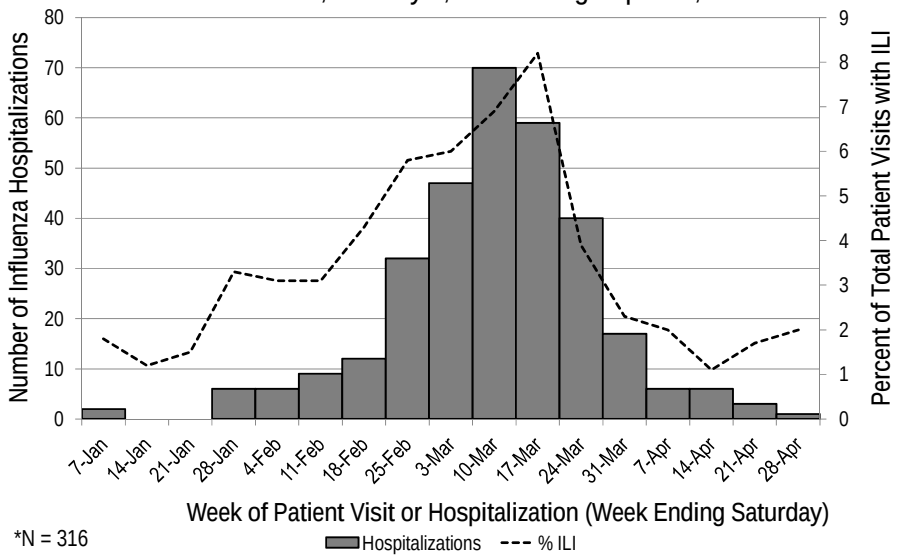
Influenza activity in Oklahoma typically occurs during the winter months and peaks in February each year. Throughout the summer months of 2011, outpatient ILI activity was very low (range: 0.0% to 0.9%) which is typical for influenza. Outpatient ILI activity began to increase the week ending January 28, 2012 (3.3%) and peaked (refer to figure 1) during the week ending March 17, 2012 (8.2%). The proportion of positive influenza tests performed at sentinel laboratories also began to increase during the week ending January 28, 2012 (2.4%) and peaked (refer to figure 2) during the week ending March 10, 2012 (26.3%).

From September 1, 2011 through April 28, 2012, 183 specimens were tested by the OSDH Pubic Health Laboratory (PHL) by real-time polymerase chain reaction (RT-PCR), and 69 (37.7%) of those specimens were positive for influenza. Of the 69 influenza positive specimens, 15 (21.7%) were positive for influenza A (H3), 49 (71.0%) were positive for 2009 influenza A (H1N1), and 5 (7.3%) were positive for influenza B. The first positive influenza test performed at the PHL was during week ending September 24, 2011. The proportion of positive influenza tests performed at the PHL peaked during week ending March 17, 2012 (84.6%, 22/26). The increasing proportion of positive PCR tests performed by the PHL during the influenza season was similar to the proportion of positive rapid tests performed by sentinel laboratories (refer to figure 2).

From January 1 through April 28, 2012, 316 influenza-associated hospitalizations and/or deaths were reported among Oklahomans resulting in an incidence rate of 8.4 per 100,000. The number of influenza-associated hospitalizations and/or deaths began to increase during week ending January 28, 2012 and peaked with 70 hospitalizations and/or deaths during week ending March 10, 2012 (refer to figure 1). A steady decline was observed following the peak in activity during mid-March. The frequency of influenza-associated hospitalizations by week was similar to the percent of total outpatient visits with ILI; both peaks occurred during mid-March. The age-specific incidence rate (IR) per 100,000 population for influenza-associated hospitalizations and/or deaths was highest for children less than 5 years of age (IR = 25.0) and 65 years of age and older (IR = 11.8) compared to individuals 19 to 64 (IR = 6.5) and children 5 to 18 years of age (IR = 5.8).

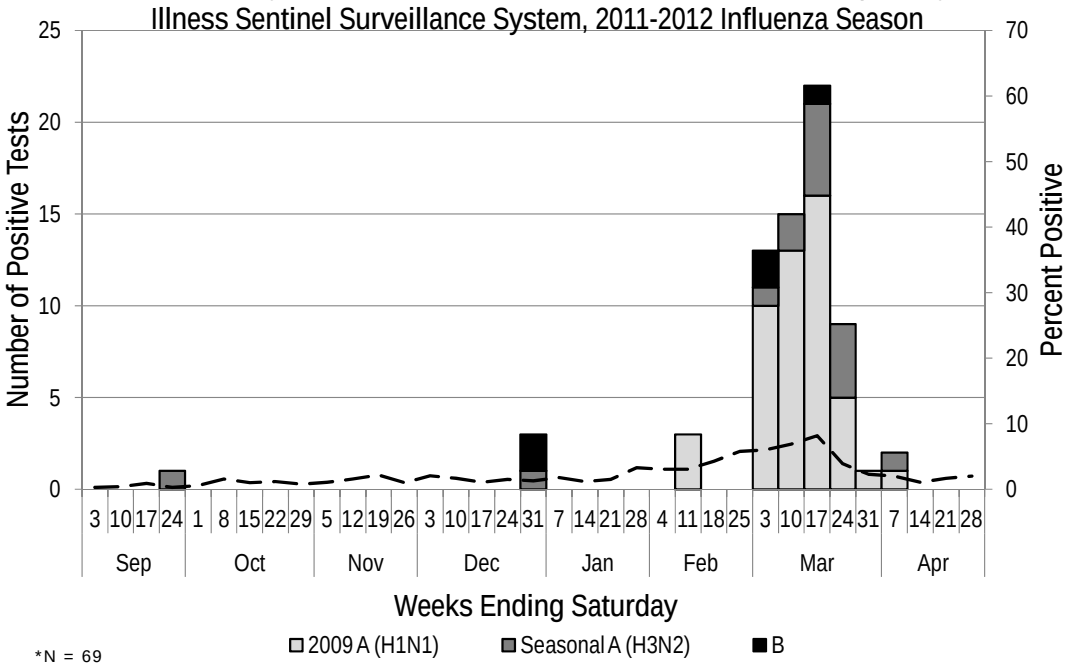
Nine influenza-associated deaths were reported between January 1 through April 28, 2012. The first reported influenza-associated death occurred during the week ending February 18, and the number of influenza-associated deaths peaked during the week ending March 17 with four deaths. The age range among mortalities was 5 years to 81 years with a median of 53 years. Lab testing for influenza-associated deaths included rapid influenza antigen test (56%, n = 5), RT-PCR (33%, n = 3), and viral culture (11%, n = 1). Among the influenza-associated deaths, lab testing revealed infection with influenza A (89%) and influenza B (11%). PCR testing revealed infection with influenza A 2009 H1N1 among all three individuals.

Figure 1: Number of Lab-Confirmed Influenza Hospitalizations and/or Deaths* by Week of Report and Weekly Percent of ILI Based on Total Patient Visits to Sentinel Clinicians, 2011 - 2012 Influenza Season, January 1, 2012 through April 28, 2012



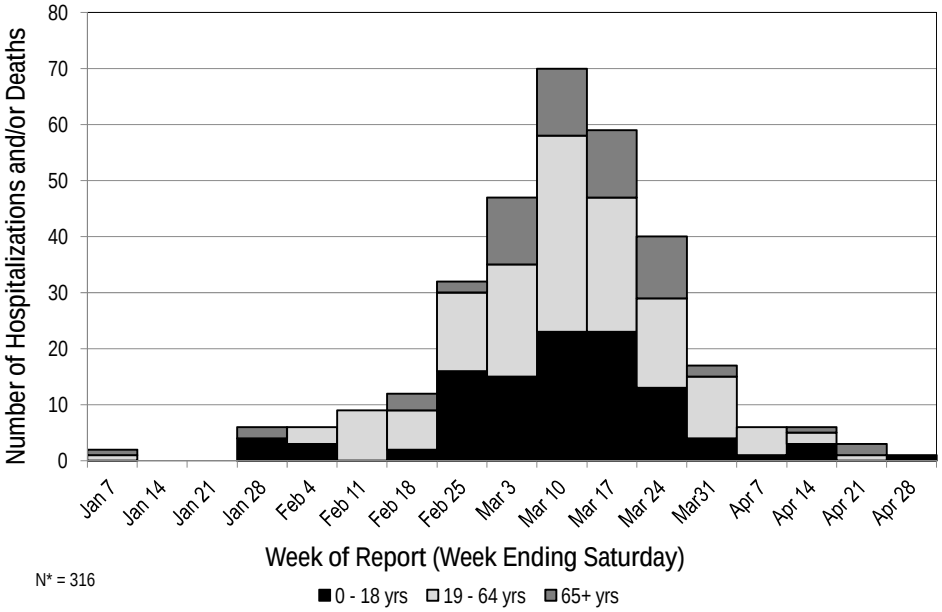
*N = 316

Figure 2: Number of Influenza Positive PCR Tests* Performed by the OSDH Public Health Laboratory and Percent of Positive Influenza Tests Performed by Sentinel Laboratories in the Oklahoma Viral Respiratory Illness Sentinel Surveillance System, 2011-2012 Influenza Season



*N = 69

Figure 3: Influenza-Associated Hospitalizations and/or Deaths* by Age Group and Week of Report, Oklahoma, January 1, 2012 through April 28, 2012



N* = 316

Oklahoma Health Alert Network (OK-HAN)

Oklahoma State Department of Health

A Source of Public Health Information In Oklahoma

- **What Is OK-HAN?**
  The Oklahoma Health Alert Network (OK-HAN) is an emergency communications system used to securely provide emergent health information to healthcare professionals. The OK-HAN system serves as part of a nationwide network of Health Alert Networks (HAN) and must follow guidelines and policies set by the Centers for Disease Control and Prevention (CDC). HANs improve public health preparedness among state and local public health partners.

- **What Can OK-HAN Do For Me?**
  Becoming a registered OK-HAN user will:

  - Ensure that you can be notified in the event of a public health emergency
  - Provide you with detailed information on health threats and diseases in Oklahoma as well as nationally. Below are examples of recent notifications:
    - Public Health Surveillance Identifying Increased West Nile Virus Activity in Oklahoma (7/19/2012)
    - Cefixime Resistant Infection of *Neisseria gonorrhoeae* Identified in Central Oklahoma (6/21/2012)
    - Surveillance for Human Illness Associated with Blue-green Algae Blooms in Oklahoma Lakes (5/18/2012)
    - Syphilis Increase in Oklahoma City and Surrounding Areas Confirmed (5/3/2012)

- **Can I Participate?**
  All Physicians, Physician Assistants, Nurses, Infection Preventionists, and Laboratorians working in a healthcare setting can have access to the secure OK-HAN Web site by requesting an invitation.

- **How Can I Gain Access?**
  Notify Kim Mitchell, HAN Coordinator, at (405) 271-4060, email KimberM@health.ok.gov or okhan@health.ok.gov. You will be sent an invitation by email with registration instructions.

Public Health Investigation and Disease Detection Of Oklahoma (PHIDDO) System

What is PHIDDO?

The Oklahoma State Department of Health presents the Public Health Investigation and Disease Detection of Oklahoma (PHIDDO) system to electronically submit cases of reportable diseases and conditions.

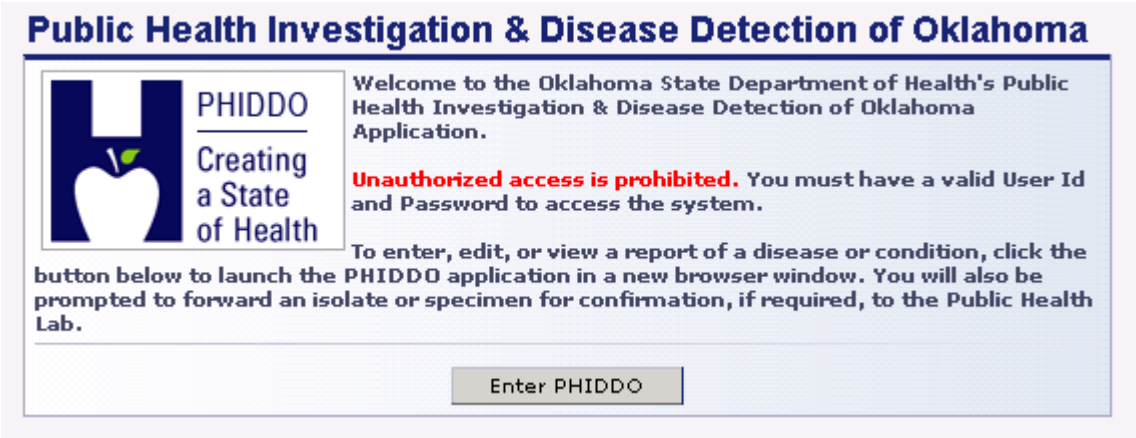
- User-friendly system.
- Secure Internet-based application.
- Real-time disease reporting.
- Centralized place for reporting.
- Online case reporting, eliminating paperwork completion, faxing, and mailing to the Oklahoma State Department of Health.
- All data is secured and accessible only to those with specific authorization, e.g., a user from Hospital A can only see cases submitted from Hospital A.
- Ability to update previously submitted reports.

Who should be a PHIDDO user?

- Physicians
- Physician Assistants
- Nurse Practitioners
- Infection Preventionists
- Laboratorians
- Other personnel in a clinic or health care setting who would be submitting cases of reportable diseases and conditions

How can I be a PHIDDO user?

To register for PHIDDO or if you have any questions or problems with PHIDDO, please contact Tony McCord (TonyWM@health.ok.gov) or Anthony Lee (AnthonyL@health.ok.gov) at (405) 271-4060.



Public Health Laboratory Annual Report: 2011

Mission

The Oklahoma State Department of Health (OSDH) Public Health Laboratory (PHL) implements and provides essential laboratory services to the citizens of Oklahoma through a system of County Health Departments, Agency Programs, and Private Health Providers. The PHL participates and supports strategies designed to prevent disease and protect and improve the health status of the citizens of Oklahoma.

Background

The OSDH PHL employs approximately 50 full-time employees and has been in continuous operation since 1907. The PHL plays a vital role in early detection of infectious and foodborne disease outbreaks, in patient diagnostic testing, and in the tracking of disease trends in the State of Oklahoma.

The PHL provides:

- Analytical services for the OSDH, local government and Tribal units, health care practitioners, and private citizens;
- Specialized PHL procedures and reference testing;
- Training, technical assistance, and consultation for private clinical laboratories of Oklahoma;
- Guidance and training for detection and identification of a bioterrorist event;
- Applied research and university instruction related to the public health mission of the PHL;
- Pharmacy services to County Health Departments in the State of Oklahoma.

Section Reports

The PHL is structured with the following 6 laboratory testing sections:

- Newborn Screening (NBS)
- Virology
- Immunology
- Molecular
- Microbiology / Parasitology
- Mycobacteria / Mycology

In 2011, the OSDH PHL service performed 597,513 analytical tests. The table below shows the test volumes for the respective laboratory sections for 2011. A narrative summary of the services performed in each section and specific accomplishments/innovations for 2011 follows.

Laboratory	Test Number	Percent Tests
Newborn Screening	441,290	74%
Immunology	70,438	12%
Virology	58,581	10%
Molecular	16,442	3%
Microbiology / Parasitology	5,682	1%
Mycobacteria / Mycology	5,080	1%
Total	597,513	

Newborn Screening

Newborn screening (NBS) is recognized internationally as an essential preventative public health program for early detection of disorders of newborns that can affect their long term health. Early detection, diagnosis, and treatment of various inherited disorders in the NBS panel can avert significant chronic health problems, mental retardation, or death. The OSDH PHL works closely with NBS Follow-up services, which conducts rapid follow-up on abnormal results to ensure families of affected babies are notified to seek immediate care.

The NBS laboratory has the highest testing volume of all laboratory sections within the PHL with 441,290 tests performed on dried blood spots during 2011. All babies born in the State of Oklahoma undergo NBS at the PHL. The PHL NBS test panel screens for over 50 disorders, including 29 of 30 core conditions and 22 of secondary target

conditions listed in the recommended uniform screening panel of the Secretary's Advisory Committee on Inheritable Disorders in Newborns and Children. Establishment of testing for Severe Combined Immunodeficiency (SCID) as part of the NBS panel is planned for implementation in 2012, which will complete the recommended 30 core conditions for NBS.

Accomplishments during 2011:

- Ground work laid for development of SCID testing
- Change in methodology for screening GALT test from BioRad Quantase assay to PerkinElmer Neonatal; better methodology and technical support
- Revisions to reports; better text and more detailed explanation of results on NBS mailers

Immunology / Serology

This laboratory section supports the OSDH HIV/STD Service, as well as many other Oklahoma healthcare providers by performing human immunodeficiency virus (HIV) testing. In July 2011, the laboratory began using a new and improved enzyme linked immunosorbent assay (ELISA) for HIV screening while using a Western Blot method for confirmation. This section also supports the OSDH Acute Disease Service by performing serological tests for tick-borne diseases (Rocky Mountain spotted fever and *Ehrlichia chaffeensis*) using an indirect fluorescent assay. Testing for West Nile virus and St. Louis encephalitis, hepatitis B, hepatitis C, and syphilis are also performed in this section.

The Immunology/Serology section received 70,438 specimens and performed 72,579 tests, including reflex testing, on those specimens during 2011. The two large-volume tests performed by the laboratory, human immunodeficiency virus (HIV) and syphilis screening and confirmation, are vital to the OSDH HIV/STD Service in initiating early treatment and reducing the risk of infection for others. Currently, the Immunology Section tests serum and dried blood spot specimens using an HIV-1 Microelisa system for antibody detection and Western Blot for confirmation. However, the Immunology Section has been investigating adoption of a 4th generation HIV antigen/antibody combination test for HIV screening along with new supplemental confirmatory testing, in response to a new testing algorithm recommended by the Association of Public Health Laboratories (APHL) and the Centers for Disease Control and Prevention (CDC). Adoption of these new testing methodologies will likely occur in 2012.

Accomplishments in 2011:

- Participated in the APHL's Supplemental HIV Testing Evaluation, which helped with the development of the new HIV algorithm by the APHL & CDC
- One employee retired in August. A new employee was hired in January of 2012. In the interim, 22,638 tests were performed September through December with reduced staff
- Implemented a new Pipette Calibration System (PCS) software for tracking pipette calibrations; the Immunology/Serology section calibrates all PHL's pipettes to assure pipetting accuracy
- Syphilis tests increased by 3222 in 2011 compared to 2010
- Hepatitis C tests increased by 224 in 2011 compared to 2010
- Successfully completed 96 proficiency challenges, which include proficiencies provided by CDC, College of American Pathologist (CAP) and American Association of Blood Banks, plus in-house proficiency challenges

Virology

This laboratory participates in the CDC national Infertility Prevention Program (IPP) that assists in funding *Chlamydia trachomatis* (CT) and *Neisseria gonorrhoeae* (GC) screening and treatment services for low-income, sexually active women and men attending family planning, STD, and women's healthcare clinics. This program has shown that routine screening and early diagnosis of CT/GC leads to timely treatment, thereby reducing the possibility of complications and the risk of further transmission. Results on submitted specimens are generally rendered within an average of 2 business days. In 2011, the laboratory switched from testing swab specimens to testing urine specimens, thus, providing ease of specimen collection, extended specimen stability and improved hands-on

laboratory processing. In 2011, 10.4% of submitted samples tested positive for CT, 2.2% were positive for GC, and 1.3% were positive for both CT and GC.

The Virology Section also performs virus isolation and identification, by cell culture, on all common viral agents. This section, together with the Molecular Section, participates yearly as a World Health Organization (WHO) collaborating laboratory by providing influenza strain typing and isolates to assist in the determination of yearly vaccine strain selection and the efficacy of the vaccine.

Rabies testing, performed in this laboratory section, plays a key role in the prevention and control of rabies in Oklahoma. The PHL is the only laboratory in Oklahoma that provides rabies testing. In 2011, 5.6% of the specimens submitted were positive for the rabies virus, with skunks being the leading species.

Accomplishments during 2011:

- Replacement of swab collection system by urine sample collection system for CT/GC screening
- Successfully completed 15 CT/GC and 15 Virus Isolation and Identification proficiencies from CAP, and 16 Rabies proficiencies from Wisconsin State Laboratory of Hygiene (WSLH)

Molecular

This section performs a variety of rapid, accurate and sensitive tests that augment testing performed in other sections within the PHL, such as NBS and Microbiology. Over recent years, molecular methods have successfully replaced some traditional microbiological procedures performed by serologic-based methods. Methods include polymerase chain reaction (PCR) amplification for the detection of *stx1, stx2, eae,* and *hly* virulence markers associated with toxigenic *Escherichia coli, Bordetella pertussis*, *B. parapertussis* and *B. holmesii* detection, seasonal influenza, and 2009 influenza A H1N1. The Molecular Section also offers second tier cystic fibrosis transmembrane conductance regulator (*CFTR*) genetic testing as part of the NBS program. Also, the use of DNA sequencing helps in the identification of rare and unusual bacterial isolates. The Molecular Section offers rapid rule-out detection of select microorganisms in clinical samples for clinicians, in potential bioterrorism isolates for law enforcement, as well as in environmental samples for epidemiological purposes.

The Molecular Section also collaborates with the CDC on various programs of national public health importance such as Laboratory Response Network (LRN), PulseNet and influenza surveillance.

The CDC's LRN provides a nation-wide network of laboratories that can respond quickly to the needs for rapid testing, timely notification and secure messaging of results associated with acts of biological or chemical terrorism and other high priority public health emergencies. The OSDH PHL operates a Biosafety Level 3 (BSL-3) facility that meets the strict safety and security guidelines for the rapid identification of a variety of bioterrorism agents, such as *Bacillus anthracis, Yersinia pestis, Brucella* species*, Francisella tularensis*, and *Burkholderia mallei/pseudomallei*, and chemical toxins such as ricin.

The Molecular Section is an active participant in CDC's PulseNet organization. PulseNet is the standardized international molecular subtyping network, which uses pulsed field gel electrophoresis (PFGE) to generate bacterial DNA patterns for identification of foodborne pathogens. PulseNet allows all 50 states, several large municipalities as well as the Food and Drug Administration (FDA), US Department of Agriculture, and Canadian provinces to interact and share test results. This allows for quick recognition of outbreaks at the outset, when prevention measures can be effectively undertaken. PulseNet has recently expanded to include PulseNet Europe, Asia Pacific, Middle East, and Latin America. The PHL is the only PulseNet certified laboratory in Oklahoma. The Molecular Section currently has three technologists certified to analyze and submit data to CDC's database. In 2011, the Molecular Section performed PFGE on over 1,500 *Salmonella, Shigella,* toxigenic *Escherichia coli* and *Listeria monocytogenes* isolates, rendering results within a 4-day turn-around time, as recommended by CDC. Molecular personnel alerted epidemiologists about approximately 30 localized clusters of indistinguishable PFGE patterns within Oklahoma in 2011. The Molecular Section also posted indistinguishable pattern matches to CDC for 44 national clusters.

DNA sequencing was used to aid in the identification of 227 rare and unusual bacterial isolates during 2011. The Molecular Section also performed second tier *CFTR* genetic testing as part of the NBS program on 1000 specimens.

The laboratory also performs West Nile Virus (WNV) and St. Louis Encephalitis (SLE) mosquito pool testing program in conjunction with Oklahoma State University. The laboratory screened over 250 mosquito pools for WNV and SLE. The laboratory also maintains weekly reporting of influenza test results to US World Health Organization (WHO).

Accomplishments during 2011:

- Added *eae* and *hly* virulence factor screening to toxigenic *E. coli* multiplex real-time PCR
- Expanded *Bordetella* testing to differentiate between *B. pertussis, B. parapertussis* and *B. holmesii*
- Established a proficiency exchange program for toxigenic *E. coli* and *Bordetella* real-time PCR with Missouri Department of Health
- Selected by CDC to participate in Molecular Salmonella Subtyping Evaluation/Validation RFP using Luminex instrumentation
- Purchased BioNumerics 6.0 software to stay up to date with PulseNet activities
- Performed validation studies for real-time PCR testing to differentiate *Neisseria meningitidis* serogroups from bacterial isolates
- One molecular laboratorian served on organizing committee for annual PulseNet Update Meeting
- Successfully completed over 40 internal and external proficiency challenges provided by CDC, Laboratory Response Network (LRN) and CAP

Microbiology / Parasitology

This laboratory section provides reference and clinical bacteriology services (such as identification and serotyping of bacterial pathogens that cause human disease) to many Oklahoman hospitals and physician's offices. The laboratory provides identification of causative agents important for epidemiological investigation of foodborne outbreaks. The Microbiology Section works particularly closely with the Molecular Section to provide rapid results on bacterial identification, such as pertussis testing and DNA sequencing of hard-to-characterize microbes. The laboratory receives blood and stool specimens for identification of parasites from hospitals and physician's offices around Oklahoma. While the number of parasitic specimens tested is low by comparison to other testing in this laboratory section, this service is essential considering the growing ethnic diversity of Oklahoma, the increase in foreign travel and the lack of necessary resources and expertise to identify these organisms at other medical facilities.

In 2011, the Microbiology Section received 313 specimens for *Bordetella pertussis*, *Bordetella parapertussis* and *Bordetella holmesii* testing, of which 10 were positive for *Bordetella pertussis* resulting in a 3.2% positivity rate.

In 2011, the PHL received a total of 101 Shiga Toxin Producing *Escherichia coli* (STEC)-positive clinical specimens and 76 referred suspect STEC isolates from clinical laboratories statewide. Out of these, 40 were identified as *E. coli* O157:H7 and 74 were identified as non-O157 STEC. As a result of our in-house seroptyping (established in September of 2010), which identifies the six most common serotypes of toxigenic *E. coli*, only 6 (8%) out of the 74 non-O157 STEC were sent to CDC for serotyping. This has also had the added benefit of reducing or average turn-around-time for suspect STECs from 68 days to 6 days.

In 2011, the Microbiology Section received 41 isolates that could not be ruled-out as possible bioterrorism agents by Oklahoma sentinel clinical laboratories. Of these 41 referred isolates, 3 were identified as *Francisella tularensis*, a select agent endemic in Oklahoma, and 1 *Brucella suis*. The Microbiology Section tested 3 suspicious powders, none of which were positive for biological agents.

Accomplishments during 2011:

- Purchased Omnilog Identification System and began validation studies in last quarter of 2011
- Arranged Wet Prep Direct Observation workshop for local ARNP meeting
- Successfully completed 20 external and internal proficiency challenges provided by CAP, LRN, and Food Emergency Response Network (FERN)

Mycobacteriology / Mycology

This laboratory section analyzes various types of clinical samples for the isolation and identification of *Mycobacterium tuberculosis* complex and yeasts and molds. In 2011, the laboratory processed over 4,500 patient specimens.

Slightly over 20% of the specimens processed had *Mycobacterium* spp. isolated and 29% of the culture-positive specimens tested positive for *Mycobacterium tuberculosis*. High-pressure liquid chromatography (HPLC) is used to identify organisms through the analysis of mycolic acid patterns; this has decreased the time from growth detection in culture to final identification to one day. The laboratory is currently using the Cepheid GeneXpert system for rapid detection of *Mycobacterium tuberculosis complex* from direct respiratory specimens. This method replaces the previous GenProbe MTD method, and allows for a 24-hour turn-around time for these results.

This laboratory also performs reference mycology testing, identifying yeasts and molds for clinical laboratories and physician's offices across the state. Presently, only fungal isolates, not patient specimens, are accepted for identification. The PHL readily accepts any dimorphic or suspected dimorphic submission. The laboratory also provides confirmatory testing for the select agent, *Coccidiodes immitis,* and all other systemic fungi.

Accomplishments during 2011:

- Replaced GenProbe MTD with Cepheid GeneXpert MTB/RIF allowing for same-day results compared to 2 batched-specimen runs per week
- Helped identify a M.tb.C. cross-contamination issue in one of the State's reference laboratories
- Identified a multiple-drug resistant-TB case and worked with physicians and Heartland TB Center to refer samples for further testing
- Successfully completed over 28 internal and external proficiency challenges provided by CDC, CAP, and WSLH

In addition to the 6 laboratory testing sections within the OSDH PHL, the following sections of the laboratory are essential to the overall regular operations of the PHL:

- Accessioning
- QC/Media Preparation
- Laboratory Shipping and Receiving
- Field Laboratory Operations
- Laboratory Outreach
- Pharmacy

Accessioning

Almost 600,000 specimens were received by the PHL in 2011 from County Health Departments and private providers. This laboratory section is responsible for determining the acceptability of specimens (according to criteria documented in the PHL Resource Manual), assigning appropriate accession numbers and labeling specimens, entering demographic information into the Laboratory Information System, initial processing as appropriate, and delivery of specimens to the individual laboratory testing sections.

Quality Control/Media Preparation

Quality Control is a critical feature of all testing laboratories to ensure quality processing of specimens and accurate generation of results. This area performs quality control on all incoming commercial and prepared media used by each testing laboratory section. Stocks of control materials used in the various assays run by PHL are maintained and organisms cultured as needed by this section. Media and reagents are made and checked for quality by this laboratory section prior to use in the various testing sections of the PHL.

Laboratory Shipping and Receiving

PHL Shipping and Receiving is responsible for coordinating the delivery, receipt, and storage of reagents, laboratory supplies, and equipment used by the PHL. This section prepares and coordinates shipments of collection kits for enterics, parasites, TB, pertussis, GC/CT, group B strep and viruses to all County Health Departments and private providers. Requisition forms for submission of dried blood spots on newborn babies are shipped to hospitals statewide from this facility. This section is also responsible for packaging and shipping of specimens for referral testing. Employees of this section are certified in shipping and packaging of infectious substances as mandated by the Department of Transportation. This allows PHL to ship infectious substances to the CDC and other locations in a controlled and safe manner protecting the public from accidental releases of potentially infectious agents.

This section is responsible for processing, packaging and forwarding specimens from hospitals to CDC for chemical testing in response to a chemical bioterrorism event. Chemical activities include participating with CDC in a yearly Sample Collection Packing & Shipping exercise and shipping of samples to hospital labs and ERs for practice exercises after chemical terrorism training for specimen collection and packaging.

Accomplishments during 2011:

- 100% on the exercise with CDC for the third year in a row

Field Laboratory Operations

The PHL is responsible for the oversight of 95 laboratory testing facilities performing CLIA waived testing for vaginal wet preparation microscopy, hemoglobin, and urine analyses throughout the State of Oklahoma. The PHL provides essential technical consultation for testing procedures, assessment of quality control systems, equipment evaluation, proficiency testing evaluations and competency assessment of personnel at these sites. Annual or semi-annual site visits (Quality Assurance Reviews) are conducted by PHL personnel to evaluate and document County Health Department laboratory performance, and to make recommendations to assure and improve the quality of testing. One-on-one training of personnel at these testing facilities is provided on-site, as needed. A Good Laboratory Practice Manual provides a quick reference to written testing procedures and guidelines for quality control and assurance at these waived testing facilities.

Accomplishments during 2011:

- Hemocue training went from region-based to site-based
- Hemocue data suggests an 8% points increase in the accuracy of QC tests from 71 percentile to 79 percentile

Laboratory Outreach

Laboratory Outreach comprises various programs designed to train medical personnel, laboratorians, and sanitarians in the collection, processing, and shipping of samples for referral to the OSDH PHL. Special training programs and exercises are also provided for medical professionals and others that may be involved in foodborne outbreaks, pandemic infectious disease events, and bio- or chemical terrorism threats.

Shipping/Packaging Training: Processes for packaging, handling and transportation of laboratory specimens are regulated by various federal agencies and professional associations. Proper packaging and transportation of laboratory specimens are essential to ensuring safe delivery and specimen integrity for quality testing. Therefore, the PHL provides training in packaging, handling and transportation of laboratory specimens to personnel at facilities that refer specimens to the OSDH PHL for testing. In 2011, 136 laboratorians from 58 hospitals, City/County Health Departments, and physician offices underwent training in aspects of packaging and shipping of laboratory specimens.

Preparedness Response Plan:
The PHL works closely with federal, state and local agencies, including hospital laboratories and emergency departments, reference laboratories, PHLs in other states, law enforcement, Homeland Security Chemical, Biological, Radiological and Nuclear (CBRN) response teams, National Guard Civil Support Team, CDC, communicable disease nurses and others, to develop efficient and timely responses to foodborne outbreaks, pandemic infectious disease events, and bioterrorism and chemical terrorism threats. Currently, 10 OSDH PHL employees are trained in the handling and testing of select agents. In the event of a local, statewide, or regional disaster, a Continuity of Operations Plan (COOP) assures that essential testing services are maintained in the short-term and recoverable in the long-term. Memoranda of Understanding (MOUs) have been established with other state agencies and PHLs for testing support during significant events. Additional MOUs are being pursued.

Chemical Terrorism Training:
During 2011, 60 laboratorians, safety personnel, and emergency department personnel from two hospitals received on-site chemical terrorism training, including specimen collection guidelines, PHL notification, chain-of-custody requirements and post-training exercises in chemical terrorism response. The OSDH PHL is a Level 3 Laboratory

Response Network-Chemical (LRN-C) laboratory and successfully participated in the annually required LRN-C Specimen, Collection, Packaging and Shipping exercise by scoring a 100%.

Sentinel Laboratory Training:
In coordination with the CDC and the APHL, various medical facilities in the State of Oklahoma have been designated Sentinel Level Clinical Laboratories. These frontline laboratories are able to process specimens using standard techniques that may help rule-out microorganisms that might be suspected as agents of bioterrorism or associated with an emerging infectious disease, or to refer these specimens to the OSDH PHL for confirmation.

In 2011, PHL training specialists visited 11 CDC-designated sentinel laboratories in the State of Oklahoma to provide information/training to 52 laboratorians in the bioterrorism response protocols, providing information on STEC screening and promoting collaboration and communication between the private and public laboratory sectors. Fifty-one laboratorians from 11 hospital and reference laboratories participated in 3 case studies/trainings delivered through the sentinel bioterrorism Secure Telecommunication and Terminal Package (STATPack) system. Oklahoma sentinel laboratories referred 30 possible select agent isolates to the PHL for confirmatory testing in 2011. The PHL also partnered with the CAP and participating Oklahoma sentinel laboratories to test referral and shipping protocols during the CAP bioterrorism surveys.

The PHL also presented biosafety/biosecurity workshops to 27 laboratorians from 18 laboratories in the Oklahoma City and Tulsa areas. Workshops addressed case studies and best practices associated with Biosafety Levels II and III practices and facilities.

Other accomplishments during 2011:

- Secured grant monies for providing proficiency tests (for some of the field screening equipment) for Hazmat teams
- Participated in the Sooner Response, a National Guard Civil Support Team exercise focusing on responding to suspect biological, chemical, and radiological events
- Collaborated with Acute Disease and Emergency Prepared Response Service in developing a protocol for responding to chemical events
- Participated in a state-wide exercise, " Operation Raindrops", to test our communication plan with sentinel laboratories
- Participated in the US Postal Inspection Service's statewide exercise for responding to an anthrax incident at a sorting facility

Pharmacy

The OSDH Pharmacy receives, stores and ships medications and medical supplies for 78 County Health Departments and other state agencies. The pharmacy prepares orders for the County Health Departments, keeps track of quantities on-hand, expiration dates, and lot numbers in a central State-wide Inventory System and ships orders daily. The Pharmacy is also responsible for receiving expired medications back from County Health Departments and coordinating their destruction. The Pharmacy also receives and stores vaccines ordered by the OSDH Immunization Service and serves as a repository for influenza vaccination supplies as part of the CDC's Strategic National Stockpile program. The Pharmacy works closely with Family Planning, Maternal Child Health, Acute Disease, Adolescents/Pediatrics, STD/HIV, and Immunization departments within the agency. The Pharmacy also provides consultation on many pharmaceutical questions from doctors and nurses.

Accomplishments during 2011:

- Implementation of the State-wide Inventory System
- Implementation of a double-check system for County Health Department orders
- Participated in state-wide "Operation Raindrops"

Laboratory Information System

The OSDH PHL is currently operating the Laboratory Information Management System (LIMS) that was provided free-of-charge from the CDC. This software has a number of technical problems and is not easily adapted to suit the

needs of the PHL. CDC no longer supports this software and modifications to the software are exceptionally challenging. It has become costly to maintain, modify and repair this vital system. Therefore, the PHL investigated alternative commercial LIMS that would more closely align with its current and future needs and is currently in the process of finalizing a purchase. NBS operates on an independent LIMS platform (Neometrics), which is suitable for NBS testing but does not offer the flexibility to fulfill the needs of other laboratory sections.

Publications/Presentations

Journal Publications:

Bradley KK, Williams JM, Burnsed LJ, Lytle MB, McDermott MD, Mody RK, Bhattarai A, Mallonee S, Piercefield EW, McDonald-Hamm CK, Smithee LK
Epidemiology of a Large Restaurant-Associated Outbreak of Shiga Toxin-Producing Escherichia coli O111:NM
Epidemiology and Infection 25 Nov, 2011:1-11 DOI: 10.1017/S0950268811002329

Lecture Presentations:

McDermott, M
Plex-ID Technology Overview/Assay Descriptions
2011 Annual APHL Omaha, NE May 2011

Poster Presentations:

Caton L, Vaz S, Haddad S
Utilization of Two-tier Testing for CAH in Oklahoma
Newborn Screening & Genetic Testing Symposium (NBS - Quality Improvement throughout NBS); San Diego, California, November 2011

McDermott M, Murray J, Zitterkopf N
Collaborative Efforts Between the Oklahoma Public Health Laboratory and Emergency Responders
American Society of Microbiologist BioDefense Meeting; Washington DC February 7, 2011

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