2008 Annual Report

Bureau of Communicable Disease Control and Prevention

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Acknowledgements

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Communicable Disease Surveillance 2008 Annual Report

Note: This report does **not** include a summary of sexually transmitted diseases, hepatitis (except hepatitis A), HIV, or environmental conditions.

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Table of Contents

Missouri Profile ……4

Missouri Health Districts (map) ……5

Introduction ……6

Executive Summary……8

Communicable Disease Surveillance
Comparative Statistics, Reported Diseases, 2008 ……12
Cryptosporidiosis ……13
Ehrlichiosis ……16
Escherichia coli (*E. Coli*) and Hemolytic Uremic Syndrome (HUS) ……19
Haemophilus Influenzae……23
Hepatitis A ……26
Legionellosis ……28
Malaria ……31
Pertussis ……34
Rabies, Animal and Human, and Rabies post-exposure Prophylaxis (PEP) Initiated ……37
Rocky Mountain Spotted Fever (RMSF) ……42
Salmonellosis ……45
Streptococcus Pneumoniae ……48
Tuberculosis and LTBI ……50

Glossary ……54
Statistical Calculations ……57

Summary Tables

Acute Gastrointestinal Diseases—Comparative Statistics, by Socio-demographics, 2008
Acute Gastrointestinal Diseases—Rate Map, 2008
Selected Reportable Diseases by County, 2008
Selected Reportable Diseases by Sex, 2008
Selected Reportable Diseases by Age Group, 2008
Selected Reportable Diseases by Month, 2008
Selected Reportable Diseases by District, Case Count and Rate, 2008

Missouri Profile 2008

Population (2007)	5,878,415	Percent of Total Population
Urban	69.4%	(Based on 2000 census)
Rural	30.6%	(Based on 2000 census)

Live Births	80,944
Deaths	56,278

Sex	Population	
Male	2,871,022	48.8%
Female	3,007,393	51.2%

Race	Population	Percent of Total Population
White	5,045,485	85.9%
Black	701,395	11.9%
Other	131,535	2.2%

Age Group	Population	
<1	81,883	1.4%
1-4	311,294	5.3%
5-14	776,051	13.2%
15-24	813,974	13.8%
25-39	1,163,527	19.8%
40-64	1,943,315	33.1%
65+	788,371	13.4%

District	Population	
Central	646,851	11.0%
Eastern	2,230,178	37.9%
Northwest	1,532,133	26.1%
Southeast	460,897	7.8%
Southwest	1,008,356	17.2%

Leading Causes of Death*:	Number of Deaths Reported	Percent of Total Deaths Reported
Heart disease	14,550	25.9%
Malignant Neoplasms	12,497	22.2%
Chronic lower respiratory disease	3,743	6.7%
Cerebrovascular disease (stroke)	3,252	5.8%
Unintentional injuries	2,876	5.1%
Alzeheimer's disease	2,014	3.6%
Pneumonia and Influenza	1,428	2.5%
Diabetes Mellitus	1,332	2.4%

*Not all causes of death are listed.

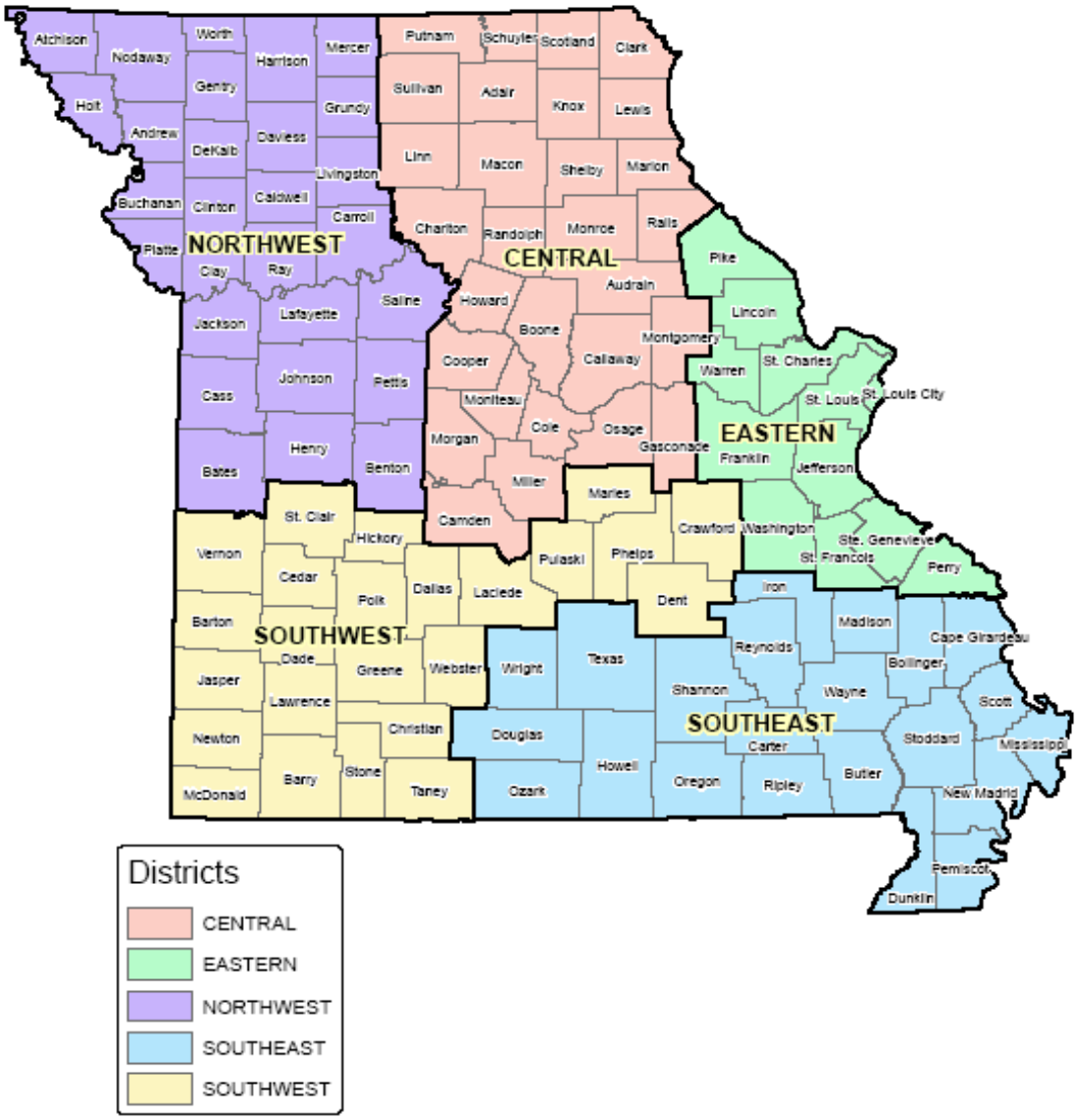
Data Provided by: Public Health Practice & Administrative Support Section, Bureau of Health Informatics, Department of Health and Senior Services.

Missouri is 69,697 square miles with slightly more than half of the population living in the two major cities, St. Louis and Kansas City, and their surrounding counties. Jefferson City is the capital. The state has 114 counties. The major flows of traffic within the state are from the east to west along the Missouri valley and southward along the Mississippi.

Although agriculture has remained important as an income-producing activity, services, manufacturing, and wholesale and retail trade have forged ahead since World War II. Manufacturing is led by the production of aerospace and transportation equipment, followed by the processing of food and the production of chemicals. Recreation and tourism have surpassed agriculture in economic importance, with more than seven million tourists a year visiting Branson's celebrity theaters and attractions.

"Missouri." Encyclopedia Britannica 2007.

Missouri Disease Investigation / Emergency Response Districts



Source:
Missouri Department of Health and Senior Services

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Introduction

The Bureau of Communicable Disease Control and Prevention (BCDCP) provides prevention, intervention, and surveillance programs related to ninety-one reportable communicable (or infectious) diseases and conditions of public health significance in Missouri. Many of these diseases are emerging infections (such as Multi-drug resistant tuberculosis and Cryptosporidiosis). The program also maintains a statewide surveillance system (WebSurv) and performs analysis of morbidity to identify trends and risk factors. In addition to WebSurv, Electronic Surveillance System for Early notification of Community-Based Epidemics (ESSENCE) is a statewide syndromic surveillance system that looks at chief complaints from hospitals, emergency rooms and over the counter drug sales, and receives data from the poison control centers. The BCDCP, working with the Local Public Health Agencies (LPHA's), strive to protect Missouri's citizens and visitors from the threats of infectious diseases of public health significance.

BCDCP services include:

- Conduct epidemiological studies to investigate the cause, origin, and method of transmission of communicable diseases in order to identify and implement appropriate disease control and preventive measures, such as contact identification, testing, treatment, and source identification.
- Identify communicable disease surveillance data needs, design data collection processes/systems, develop and maintain data systems and datasets, analyze and interpret data at regular intervals to track trends and provide regular reports on these analyses to support targeted interventions.
- Consult with LPHA's, government at all levels, community organizations, hospitals, health care providers, private businesses, media, and others regarding diagnosis and control measures for reportable communicable diseases and provide public health education, as requested.
- Provide training and technical assistance/consultation to local health officials on disease investigations, control activities, and analysis/interpretation of data to prevent communicable diseases in their communities and rapidly respond to outbreaks.
- Provide community planning and rapid epidemiologic response for emergencies such as bioterrorism, pandemic influenza, and natural disasters, such as flooding and earthquakes.
- Provide the treatment of tuberculosis (TB) disease or infection, as well as tuberculin skin testing materials for use in extended contact investigations and assist LPHA's with TB case management.
- Provide assistance to local health officials in the screening and treatment of public health conditions in newly arriving refugees.
- Collaborate with other programs within the Missouri Department of Health and Senior Services (DHSS), other state and federal agencies, and community-based organizations in emergency event planning and response.

The DHSS rule for the **Reporting of Communicable, Environmental and Occupational Diseases**, can be found at: 19 CSR 20-20.020. This annual report contains information only for those diseases and conditions that are addressed by the BCDCP. Information and statistics for HIV, STD, and Hepatitis can be found by clicking on Bureau of HIV, STD, and Hepatitis.

Data used in this report were gathered from disease and condition reports made by medical providers, laboratories, hospitals, LPHA's, and others.

Introduction

The information collected through 19 CSR 20-20.020 flows from the LPHA's to DHSS and on to the national Centers for Disease Control and Prevention (CDC). Data are linked to the national level through the CDC's National Electronic Telecommunications Surveillance System (NETSS). This information is critical for two reasons:

1. It enables public health agencies to act quickly to prevent the spread of disease, and
2. It provides an overall picture of disease trends at the local, state and national levels. Analyzing these trends allows us to target resources where they are most needed and to assess our effectiveness in preventing and controlling disease.

There are limitations to the data provided in this report for the following reasons:

1. sick people do not always seek healthcare; and
2. healthcare providers and others do not always recognize, confirm, or report notifiable conditions.

Therefore, reported cases may represent only a fraction of the actual burden of disease.

We are pleased to provide the following summary of the data reported in calendar year 2008. In addition to the contributors listed on the previous page, we would like to recognize the staff of our State Public Health Laboratories and the thousands of people in LPHA's, clinics, hospitals and clinical laboratories throughout Missouri whose disease reports and efforts constitute the basis for this document. Without vigilant reporting of disease, targeted and effective prevention and control measures cannot be implemented.

While this report was compiled by DHSS, please keep in mind that most of the public health workforce is in city or county health departments. Therefore, much of the work is at that level. The state, county, and city health departments and their private-sector partners work to promote health, protect against illness and injury, and render public health services to all people in Missouri.

A table of all reported notifiable diseases is located **here**. Where spatial analysis and use of Geographic Information Systems (GIS) was useful, maps have been provided to depict the data. Hyperlinks to additional information are included throughout the document.

We hope that you find this report informative and useful. We invite your questions and comments on this report, "Communicable Disease Surveillance 2008 Annual Report".

Harvey L. Marx, Jr.
Chief, Bureau of Communicable Disease Control and Prevention

"Without health there is no happiness. An attention to health, then, should take the place of every other object." — Thomas Jefferson, 1787

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Executive Summary

Ninety-one communicable diseases or conditions are reportable in the State of Missouri because of the potential for significant impact on the public's health. In 2008, Missouri continued to see the presence of TB, there were multiple outbreaks revolving around food safety issues, and Missouri had it's first fatal human case of rabies in almost 50 years. It is the responsibility of DHSS to protect the citizens of Missouri against these threats to the best of our abilities. The department does this through a strong network of LPHA's, local community partners (including private physicians, hospitals, child care centers, long term care facilities, schools and correctional centers to name a few), and other state departments. Given the mandate to protect the health of Missourians, the department collects surveillance data through those channels to determine what communicable diseases are impacting which populations, and uses that information to target intervention and prevention strategies. In 2008, public health investigations were numerous, with over 26,765* conditions reported through those surveillance activities. This significant decrease from 2007 (more than 42,000) is largely due to the drop in the number of reported influenza cases. There were 30,978 reported cases of influenza during the 2007-2008 season compared to 11,137 reported cases in the 2008-2009 season. The decrease is due in part because the circulating strains of influenza were not a perfect match for the vaccine during the 2007-2008 season, resulting in more cases of influenza.

An important partner in our efforts is the Missouri State Public Health Laboratory (SPHL). The SPHL continues to provide technical assistance through not only consultations but also through the specialized testing methods they employ. In 2008, the SPHL performed 3,564,236 analyses in support of many diverse public health programs and also conducted specialized procedures as a reference laboratory. Those analyses are not only done for Missouri residents but can include residents from other states as well. Their advanced network with other states allows us to more readily identify potential outbreaks through the Pulse Net surveillance system. Partnering with the SPHL through this national surveillance project allows us the ability to rapidly identify commonalities among cases and intervene more quickly to address the threat. Through Pulse Field Gel Electrophoresis (PFGE) testing at the SPHL we were able to determine very early on when we had cases in Missouri related to the nationwide outbreak of *Salmonella* Saintpaul linked to contaminated jalapeno/Serrano peppers. Further genetic testing by the SPHL also revealed cases in Missouri related to nationwide outbreaks of *Salmonella* Litchfield (MOLI001) infections caused by contaminated cantaloupe and *Salmonella* Typhimurium (MO636 & MO639) infections associated with peanut butter and peanut products.

Missouri continued to see an upward trend in the incidence of Shiga toxin-producing *E. coli* (STEC) and hemolytic uremic syndrome (HUS) cases. Case numbers were once again higher than the 5-year median. An outbreak of STEC associated illness was reported in 2008 and was associated with the drinking of unpasteurized goat's milk. Consuming unpasteurized dairy products is a known risk factor for developing gastrointestinal illnesses.

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* The figure "over 26,765" refers to all reportable communicable diseases that are monitored by the Bureau of Communicable Disease Control and Prevention. This does not include sexually transmitted diseases, HIV/AIDS, Hepatitis B (acute and chronic), Hepatitis C (acute and chronic) and conditions that are not infectious. Separate reports are available from DHSS for these diseases/conditions.

Executive Summary

Norovirus continues to occur more frequently than other causes of gastrointestinal outbreaks in Missouri, following second only to acute gastrointestinal illness (AGI) of unknown etiology. Cryptosporidiosis is another common enteric illness endemic to the state of Missouri. And although no outbreaks of Cryptosporidiosis were reported during 2008 in Missouri, the association found with recreational waters for the majority of cases still requires us to be vigilant in our efforts to prevent cases.

During 2008, TB incidence on university/college campuses necessitated collaboration with those facilities to work on screening protocols for incoming students to help detect active TB disease cases earlier. Likewise, an active case in a childcare setting required an extensive contact investigation, allowing public health to work closely with the childcare facility to put appropriate control measures in place.

Legionellosis continued an increasing trend in 2008. While there were no reported outbreaks of Legionellosis, the state saw an increase of 108.8% over the 5-year median. A review of cases performed by the Eastern district revealed no common source; however, smokers, diabetics and others with chronic respiratory issues were more likely to be affected by the disease.

Pertussis continues to be a disease of concern in the state of Missouri. Eleven outbreaks of Pertussis occurred in the state during 2008, compared to only two outbreaks for 2007. There were 561 cases reported in 2008. This is 82.1% above the 5-year median of 308. Approximately 75% of the cases reported were in persons 14 years of age and under. Interventions included enhanced surveillance, encouraging persons to be up-to-date on vaccinations, excluding children with Pertussis from the school or childcare setting as well as informing providers about the increased incidence through our health alert system. The increases in vaccine preventable diseases, such as Pertussis, illustrate our need in public health to continue aggressive vaccination programs among the populations most affected by these diseases.

Missouri once again saw an increase in tick-borne illness among its residents. Rocky Mountain Spotted Fever (RMSF) incidence soared past the five-year median to triple the number of reports. There were 409 reports of RMSF compared to the 5-year median of 128. Likewise, reported cases of Ehrlichiosis (227) also increased above the 5-year median (70). These increased rates emphasize the need to continue to promote awareness of tick-borne illness among the public and the health care community, and the appropriate use of repellants when persons are in areas likely to be infested with ticks.

Missouri had its first reported human case of rabies in almost 50 years in 2008, from a bat bite. The last reported case of human rabies in Missouri was in 1959. During the period of 2000-2008, a total of 19 domestically acquired human rabies cases were reported in the United States and Puerto Rico. Of those 19 cases, 90% were associated with bats. Missouri's case underscores the importance of seeking medical attention promptly after any potential bat exposure. Rabies is preventable if rabies immune globulin and vaccine are administered soon after the exposure occurs. Exposure to bats constitutes one of the highest risk factors for transmission of rabies to humans.

Executive Summary

Another disease of interest in Missouri during 2008 was streptococcus pneumoniae. Drug resistant streptococcus pneumonaie more than doubled the 5-year median, with 93 cases reported in 2008 compared to the 5-year median of 37. Likewise, invasive disease among children less than five also climbed past the 5-year median, with 41 cases in 2008 compared to 16 for the 5-year median. The incidence of this disease in Missouri highlights the importance of maintaining and increasing the vaccination levels for appropriate groups in Missouri.

State and local public health officials in Missouri continued work on partnering with other agencies to enhance and maintain emergency response preparedness in 2008. A devastating ice storm facilitated the efforts between agencies to assure Missouri residents in the southern part of the state had access to necessities during major power outages. Access to appropriately prepared foods became of paramount importance with no electricity to properly heat or cool food items. Likewise, access to clean water supplies were somewhat compromised with loss of power for extended periods of time.

Each year, state and local health departments spend countless hours investigating disease reports. Equally as much time is spent on implementing control measures to prevent cases. You will find in this report the compilation of the data acquired during those investigations. Readers who are interested in "just the facts" will find that he or she can quickly glean from the data tables a sense of what happened in the past year from a general perspective. For those who would like more detailed information, please check out the disease narratives to learn more about several conditions of public health significance that are highlighted in this report. Thanks to the 114 LPHA's in Missouri, and all others who worked hard to collect the information presented in this report. We hope that you find this report informative, interesting and, above all, useful.

Section A - Communicable Disease Surveillance

Disease Outbreaks

The BCDCP maintains a database and provides on-site and technical assistance to the LPHA's on reported outbreaks. The bureau reviews outbreaks for lessons learned and any new information on disease reservoirs, modes of transmission, control strategies and provide data to CDC for inclusion in national statistics.

Diseases and Conditions	Number of Outbreaks	Diseases and Conditions	Number of Outbreaks
Gastrointestinal		**Vaccine Preventable**	
Acute Gastrointestinal Illness - etiology unknown	17	Chickenpox	23
E. coli O157:H7 and Hemolytic Uremic Syndrome	1	Pertussis	12
Norovirus	16	**Total**	**35**
Norovirus-like	1		
Salmonellosis	8	**Other**	
Shigellosis	5	Hand-foot-and-mouth disease	1
Total	**48**	Methicillin-resistant Staphylococcus aureus	3
		Ringworm	1
Respiratory		Scabies	7
Acute Respiratory Illness	1	**Total**	**12**
Influenza and Influenza-like illness	7		
Tuberculosis	1		
Total	**9**		
Total Outbreaks: 104			

Diseases of Note

There are several notable decreasing and increasing disease trends as reflected in the 15 year report.

Decreasing Trends:

- Giardiasis, with 468 cases reported in 2008, decreased 9% from the 2007 total of 515 cases reported. There were no outbreaks reported in 2008; there was one reported in 2007.
- Shigellosis, with 227 cases reported in 2008, decreased 82% from the 2007 total of 1276 cases reported. Five outbreaks of Shigellosis were reported in 2008, compared to 11 outbreaks during 2007.

Increasing Trends and Significant Increases:

- *Haemophilus influenzae*, with 72 cases reported in 2008, increased 71% from the 42 cases reported in 2007. No outbreaks were reported in 2008; cases were distributed statewide. For additional information on *Haemophilus influenzae*, click here.
- Pertussis, with 561 cases reported in 2008, increased 375% from the 118 cases reported in 2007. The 2008 total is 82% above the 5-year median of 308 cases. There were 12 reported outbreaks of pertussis for 2008. For additional information on Pertussis, click here.

Section A - Communicable Disease Surveillance

Comparative Statistics, Reported Diseases, Missouri 2008

Reportable Diseases & Conditions entered into the Missouri Health Surveillance Information System (MOHSIS)	Case Count 2008	5-Year First Quartile	5-Year Median	5-Year Third Quartile	% Change from 5-Year Median	Rate per 100,000
Adult Respiratory Distress Syndrome (ARDS)	3	0	0	1	N/A	0.1
Animal Bites	6,288	4,472	4,743	5,150	32.60%	107
Botulism Infant	2	0	0	1	N/A	0
Campylobacteriosis	815	686	714	722	14.10%	13.9
Chlamydia	24,817	21,319	22,371	22,982	10.90%	422.2
Coccidioidomycosis	3	1	3	3	0.00%	0.1
Creutzfeldt-Jakob Disease (CJD)	5	2	3	3	66.70%	0.1
Cryptosporidiosis	195	78	214	246	-8.90%	3.3
Dengue Fever	3	0	0	3	N/A	0.1
E Coli Shiga Toxin Positive	77	23	26	72	196.20%	1.3
E. Coli (All)	153	105	124	152	23.40%	2.6
E. Coli O157 H7	76	80	84	90	-9.50%	1.3
Ehrlichiosis (All)	227	54	70	99	224.30%	3.9
Giardiasis	468	515	522	548	-10.30%	8
Gonorrhea	8,014	9,218	9,455	9,876	-15.20%	136.3
HIV Disease	588	467	516	520	14.00%	10
Haemophilus Influenzae, Invasive	72	39	42	42	71.40%	1.2
Hansen's Disease (Leprosy)	2	0	1	2	100.00%	0
Hemolytic Uremic Syndrome	13	8	8	9	62.50%	0.2
Hepatitis A Acute	45	32	34	45	32.40%	0.8
Hepatitis B (Pregnancy) Prenatal	144	90	124	129	16.10%	2.4
Hepatitis B Acute	38	62	159	186	-76.10%	0.6
Hepatitis B Chronic Infection	328	175	341	342	-3.80%	5.6
Hepatitis C Acute	2	5	18	38	-88.90%	0
Hepatitis C, Chronic Infection	4,921	3,146	3,811	4,463	29.10%	83.7
Influenza***	11,137	12,991	14,845	15,212	-25.00%	189.5
Legionellosis	71	31	34	36	108.80%	1.2
Leptospirosis	2	0	0	0	N/A	0
Listeriosis	11	6	6	8	83.30%	0.2
Lyme	13	10	17	26	-23.50%	0.2
Malaria	14	6	8	18	75.00%	0.2
Measles	1	0	0	2	N/A	0
Meningococcal Disease	26	18	20	28	30.00%	0.4
Mumps	8	4	5	12	60.00%	0.1
Non-Neuroinvasive St Louis	1	0	0	0	N/A	0
Pertussis	561	208	308	595	82.10%	9.5
Q Fever (All)	5	3	11	12	-54.50%	0.1
Rabies Animal	64	43	59	66	8.50%	N/A
Rabies Human	1	0	0	0	N/A	0
Rabies Post Exposure Prophylasis**	259		86		201.20%	4.4
Rocky Mountain Spotted Fever	407	106	128	163	218.00%	6.9
Salmonellosis	764	764	766	801	-0.30%	13
Shiga Toxin + (Non E. Coli - Unknown Organism)	9	5	9	13	0.00%	0.2
Shigellosis	227	355	658	1,017	-65.50%	3.9
Staph Aureus VISA**	1		2		-50.00%	0
Strep Disease, Group A Invasive	97	74	81	91	19.80%	1.7
Strep Pneumoniae, Drug-Resistant	93	20	37	44	151.40%	1.6
Strep Pneumoniae, lt 5 Years, Invasive	41	13	16	18	156.30%	0.7
Syphilis, Primary and Secondary	224	94	147	168	52.40%	3.8
Tick-borne Diseases	668	226	230	282	190.40%	11.4
Toxic Shock (Staph) Syndrome	2	3	3	4	-33.30%	0
Toxic Shock (Strep) Syndrome	2	1	1	2	100.00%	0
Tuberculosis	107	108	118	127	-100.00%	0
Tuberculosis Infection	3,573	3,837	3,886	3,963	-100.00%	0
Tularemia	21	27	28	32	-25.00%	0.4
Typhoid Fever	2	1	2	2	0.00%	0
Varicella (Chickenpox)**	774		1,188		-34.80%	13.2
Vibriosis	1	0	0	0	N/A	0
West Nile Fever and Viral Encephalitis-Meningitis	15	36	63	70	-76.20%	0.3
Yersiniosis	6	9	10	15	-40.00%	0.1

**Not a reportable disease in at least 3 of the last 5-years. The count mean of the years reported is used in this situation if available.
***Influenza is reported based on the Influenza Season Year. 2008 includes Weeks 40 to 53 of 2008 and Weeks 1 to 20 of 2009.

Section A - Communicable Disease Surveillance

Cryptosporidiosis

Click to view maps

Cryptosporidiosis is a diarrheal disease caused by a microscopic parasite *cryptosporidium*. Both the disease and the parasite are commonly referred to as "Crypto."

Crypto lives in the intestine of infected humans or animals. An infected person or animal sheds Crypto feces. Crypto may be found in soil, food, water, or surfaces that have been contaminated with the feces from infected humans or animals. People become infected after accidentally swallowing the parasite. The most common symptom of cryptosporidiosis is watery diarrhea. Other symptoms include stomach cramps or pain, dehydration, nausea, vomiting, fever, and weight loss. Some individuals with Crypto will have no symptoms at all. While the disease is typically mild, people with weakened immune systems may develop serious, chronic, and sometimes fatal illness.

Table 1. Cryptosporidiosis—Comparative Statistics, by Socio-demographic Category, Missouri[1]

		Case Count 2008	% of Total	Rate per 100,000	5-Year Median	% Change from 5-Year Median
State of Missouri		195	100.0%	3.3	214	-8.9%
Sex	Female	109	55.9%	3.6	110	-0.9%
	Male	85	43.6%	3	104	-18.3%
	Unknown	1	0.5%	N/A	0	N/A
Race	Black	6	3.1%	0.9	2	200.0%
	Other	1	0.5%	0.8	1	0.0%
	Unknown	48	24.6%	N/A	55	-12.7%
	White	140	71.8%	2.8	131	6.9%
Age Group	00 to <01	7	3.6%	8.5	3	133.3%
	01 to 04	39	20.0%	12.5	43	-9.3%
	05 to 14	39	20.0%	5	45	-13.3%
	15 to 24	24	12.3%	2.9	19	26.3%
	25 to 39	30	15.4%	2.6	31	-3.2%
	40 to 64	38	19.5%	2	33	15.2%
	65 plus	18	9.2%	2.3	9	100.0%
District	Central	13	6.7%	2	6	116.7%
	Eastern	28	14.4%	1.3	41	-31.7%
	Northwest	42	21.5%	2.7	37	13.5%
	Southeast	33	16.9%	7.2	8	312.5%
	Southwest	79	40.5%	7.8	41	92.7%

[1]Socio-demographics are missing for some cases.
*All rates are calculated per 100,000 using 2007 population estimates provided by MDHSS, Bureau of Health Informatics.
Data Source: Missouri Health Surveillance Information System.

Although this parasite can be transmitted in several different ways, water is a common method of transmission and *Cryptosporidium* is one of the most frequent causes of waterborne disease (drinking water and recreational water) among humans in the United States. Unlike bacterial pathogens, *Cryptosporidium* oocysts are resistant to chlorine disinfection and can survive for days in treated recreational water venues. The popularity of recreational water venues, the number and geographic distribution of recent cryptosporidiosis outbreaks, and the resistance of *Cryptosporidium* to chlorination prompted more stringent recommendations from the CDC on treatment strategies for recreational water facilities.

Statewide in 2008, there were 195 cases of cryptosporidiosis reported. This is an 8.9% decrease when compared to the 5-year median (2003-2007). The overall incidence rate was 3.3 per 100,000, for 2008.

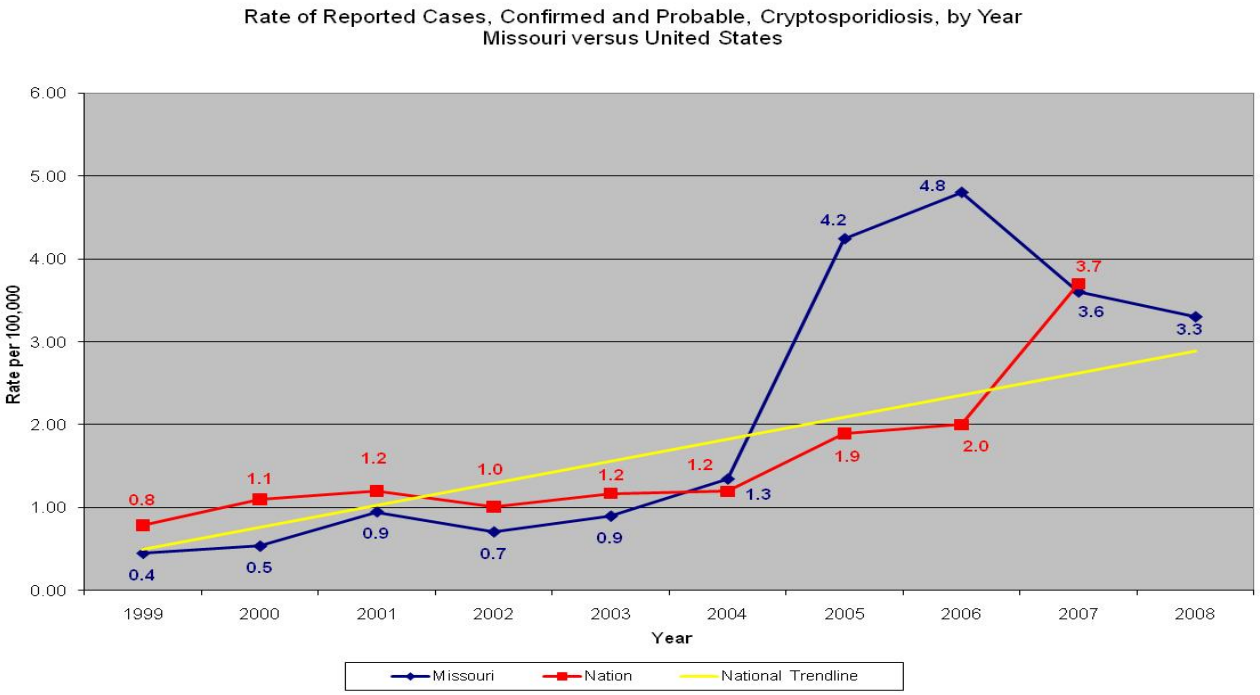
Section A - Communicable Disease Surveillance

Cryptosporidiosis - Continued

Since 2006, the incidence rates have dropped with 4.8 in 2006 and 3.6 in 2007. Missouri's rate is slightly below the national trend for 2007. Females account for 55.9% of the cases. The age group 1 to 14 years of age account for 40.0% of the cases, with the age group 40 to 64 years of age accounting for 19.5% of the cases.

During 2008, no outbreaks occurred in the state. However, many of the reported cases were attributed to recreational waters. Nationally, there appears to be a steady upward trend in the number of cases. Because of the growing concern, an alert system was implemented to make aquatic operators aware of outbreaks in their areas. CDC collaborated with the National Swimming Pool Foundation (NSPF) to set up a Crypto outbreak alert system for the aquatics sector. Making these facilities aware of possible outbreaks will allow them to implement enhanced control measures on Recreation Water Illnesses (RWIs).

Comparison to National Data: The annual rate of reported cryptosporidiosis in Missouri has shown a steady increase; however, for 2007 and 2008 the rates have declined. Since 2004, Missouri has surpassed the national rate, until 2007, when the state rate was slightly below the national rate.



Section A - Communicable Disease Surveillance

Cryptosporidiosis - Continued

Along with the national alert systems, public education should be emphasized in communities during months of peak recreational water use. Healthy swimming behaviors are needed to protect you and your kids from RWIs. CDC and DHSS would like all swimmers to abide by the six "**PLEAs**" that promote Healthy Swimming[1]:

Please don't swim when you have diarrhea. You can spread germs in the water and make other people sick. This is especially important for kids in diapers. People diagnosed with cryptosporidiosis should not use recreational waters for two weeks after symptoms resolve.

Please don't swallow the pool water. In fact, avoid getting water in your mouth.

Please practice good hygiene. Take a shower before swimming and wash your hands after using the toilet or changing diapers. Germs on your body end up in the water.

Please take your kids on bathroom breaks or check diapers often. Waiting to hear "I have to go" may mean that it's too late.

Please change diapers in a bathroom or a diaper-changing area and not at poolside. Germs can spread to surfaces and objects in and around the pool and cause illness.

Please wash your child thoroughly (especially the rear end) with soap and water before swimming. Everyone has invisible amounts of fecal matter on their bottoms that ends up in the pool.

[1]Centers for Disease Control and Prevention, Division of Parasitic Diseases, National Center for Zoonotic, Vector-borne, and Enteric Diseases; Six "PLEAs" For Healthy Swimming: Protection Against Recreational Water Illnesses (RWIs).

Additional Website Resources

CDC Health Topics
CDIRM
Health District Defined

Section A - Communicable Disease Surveillance

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Ehrlichiosis (All)

Human ehrlichiosis is a bacterial tick-borne illness that was first recognized in the mid-1980s. It is an acute, systemic, febrile illness often accompanied by one or more systemic manifestations, including headache, chills or rigors, malaise, myalgia, arthralgia, nausea, vomiting, anorexia, and acute weight loss. Symptoms typically begin with high fever, shaking chills, severe headache, and body aches. The severity of ehrlichiosis can range from a mild, subclinical infection to a life-threatening illness. The greatest risk of serious infection is found in people over the age of 40.

Table 1. —Compartative Statistics, by Socio-demographic Category,

		Case Count 2008	% of Total	Rate per 100,000	5-Year Median	% Change from 5-Year Median
State of Missouri		227	100.00%	3.9	70	224.30%
Sex	Female	93	41.00%	3.1	27	244.40%
	Male	134	59.00%	4.7	38	252.60%
Race	Black	3	1.30%	0.4	0	N/A
	Other	1	0.40%	0.8	0	N/A
	Unknown	19	8.40%	N/A	27	-29.60%
	White	204	89.90%	4	43	374.40%
Age Group	00 to <01	0	0.00%	0	0	N/A
	01 to 04	4	1.80%	1.3	1	300.00%
	05 to 14	14	6.20%	1.8	2	600.00%
	15 to 24	15	6.60%	1.8	3	400.00%
	25 to 39	22	9.70%	1.9	7	214.30%
	40 to 64	106	46.70%	5.5	34	211.80%
	65 plus	66	29.10%	8.4	20	230.00%
District	Central	64	28.20%	9.9	15	326.70%
	Eastern	51	22.50%	2.3	9	466.70%
	Northwest	36	15.90%	2.3	18	100.00%
	Southeast	23	10.10%	5	3	666.70%
	Southwest	53	23.30%	5.3	26	103.80%

[1]Socio-demographics are missing for some cases.
*All rates are calculated per 100,000 using 2007 population estimates provided by MDHSS, Bureau of Health Informatics.
Data Source: Missouri Health Surveillance Information System.

Ehrlichiosis is difficult to distinguish from viral infections. Characteristic laboratory findings include thrombocytopenia, leukopenia, and elevated liver enzymes. Severe manifestations of the disease can include prolonged fever, renal failure, disseminated intravascular coagulopathy, meningoencephalitis, adult respiratory distress syndrome, seizures, or coma. Approximately two-thirds of reported ehrlichiosis illnesses are hospitalized. It is estimated that 2-3% of patients may die from the infection.

In Missouri, there are two similar yet distinct species of bacteria known to cause ehrlichiosis, *Ehrlichia chaffeensis*, which targets monocyte white blood cells, and *E. ewingii*, which targets granulocyte white blood cells. A third related tick-borne bacteria that also infects granulocyte white blood cells, *Anaplasma phagocytophilum*, was initially identified as an *Ehrlichi*a species (*E. phagocytophila*). However, molecular phylogenetic studies have indicated that it belongs to a different genus of bacteria called *Anaplasma*. For simplicity in public reporting, DHSS counts reported cases of illnesses caused by *Ehrlichia* and *Anaplasma* species as ehrlichiosis.

Section A - Communicable Disease Surveillance

Ehrlichiosis (All) - Continued

Ehrlichiosis is caused by zoonotic bacteria that are maintained by animal hosts and require a vector such as a tick to be transmitted from the animal reservoir to the human host. Ticks become infected with *Ehrlichia* bacteria while feeding on the blood of an infected animal host. Ticks require up to three blood meals to complete their life cycle, so they sometimes later infect humans with bacteria acquired earlier in life. Animal studies suggest it takes several hours of attachment and feeding before *Ehrlichia* bacteria are transmitted from the tick to the host.

Statewide in 2008, Missouri reported 227 cases of ehrlichiosis, which is just a 2% increase from the number of cases reported in 2007 (222). However, it is a 69% increase from the five-year median of 70 cases. Year -to-year variation in reports of ehrlichiosis disease in Missouri is likely a result of numerous factors in the environment that affect tick survival as well as the number of infected ticks.

Comparison to National Data: Nationally, the annual incidence rate for ehrlichiosis has ranged between a high of 0.7 cases per 100,000 in 2007 and a low of 0.10 cases per 100,000 in 1999, the first year ehrlichiosis was designated a nationally reportable disease. In contrast, the annual incidence in Missouri has ranged from a low of 0.6 cases per 100,000 in 2001 to the current (2008) rate of 3.9 cases per 100,000. Some of Missouri's increase in ehrlichiosis cases is likely a result of increased recognition by physicians and automated disease reporting by laboratories. In addition, human changes to the landscape can increase tick and deer reproduction, while suburban and rural residential development bring ticks, animal hosts, and people into close contact.

Missouri and national epidemiologists also attribute increases in ehrlichiosis disease reports to members of the aging "baby-boomer" population, who appear to be more susceptible to severe infection, complications, and hospitalization. State and national epidemiologic investigations suggest that the natural decline in human immune system function that accompanies aging, as well as health conditions and drug therapies that suppress the immune system, may have resulted in people over age 40 contributing disproportionately to ehrlichiosis disease reports. This trend appears to influence ehrlichiosis morbidity in Missouri, with individuals age 40 to 64 years making up almost half (46.7%) of disease cases reported in 2008 and people age 65 and older contributing almost a third (29.1%) to the 2008 ehrlichiosis surveillance total (Table 1).

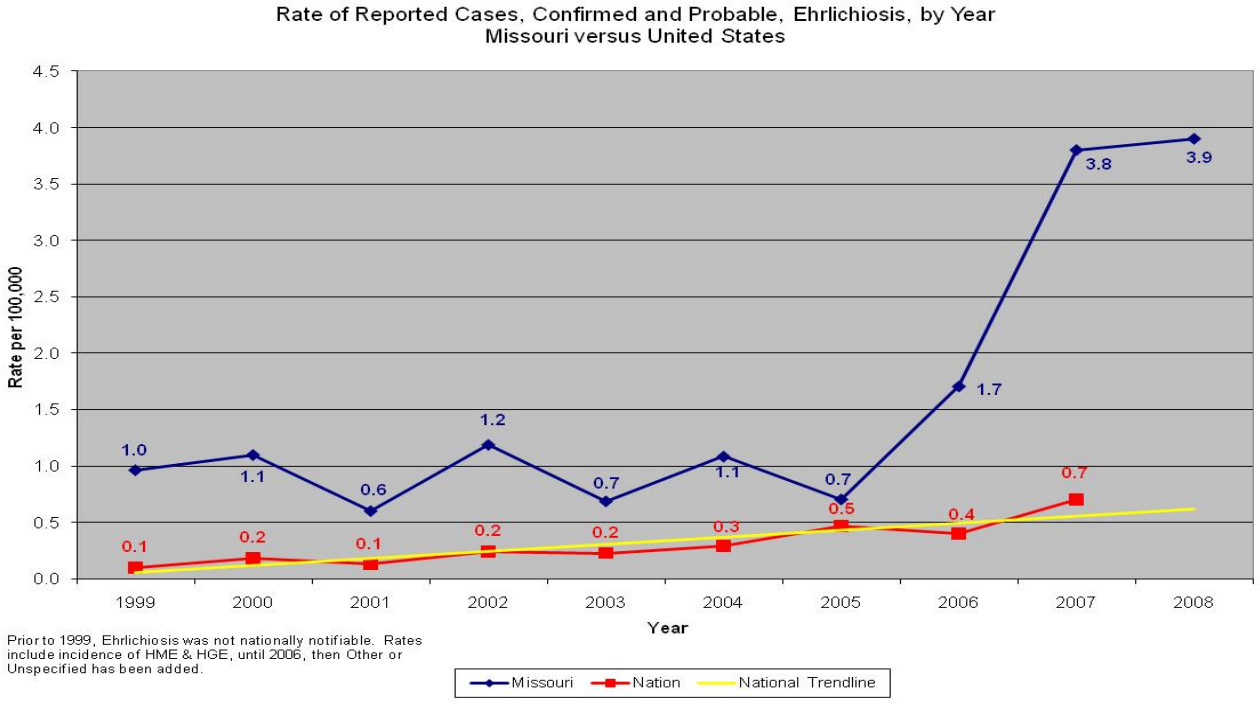
Further, in keeping with national trends in ehrlichiosis disease reporting, most Missouri ehrlichiosis cases are reported in males – almost 60% of Missouri's 2008 reported cases are men, while about only 40% of reports are in women (Table 1).

Section A - Communicable Disease Surveillance

Ehrlichiosis (All) - Continued

Reports of ehrlichiosis disease increased in all five of DHSS' Disease Investigation/Terrorism Response Districts compared to each District's respective five-year median case count for the period 2003-2007 (Table 1). The greatest increase in reports over the median was seen in the Southeast District, where disease reports increased six-fold. DHSS' Central and Eastern Districts also experienced substantial increases in reports compared to the median, increasing three-fold and four-fold, respectively.

Although reports of ehrlichiosis in 2008 did not increase substantially over the previous year's case count, Missouri residents should be aware of the recent yearly increases in disease reports. People over the age of 40 and those with impaired immune systems should be alert to lifestyle and/or environmental factors that may increase their exposure to ticks (such as recreation in the countryside, occupations focused on outdoor activities, and the displacement of wildlife resulting from residential development in rural areas). DHSS recommends the use of multiple self-protection bite prevention measures, including the use of a repellent with at least 20% DEET, tick checks, and protective clothing.



Section A - Communicable Disease Surveillance

E. coli
HUS

Escherichia coli (*E. coli*) and Hemolytic Uremic Syndrome (HUS)

Escherichia coli (*E. coli*) are a diverse group of bacteria. The majority of *E. coli* strains are harmless; however, several are known for their propensity to cause a potentially severe disease in humans. Many of the disease causing strains of the bacteria produce toxins called Shiga toxins, and are often collectively referred to as Shiga toxin-producing *E. coli* (STEC). The primary STEC strain in the United States is *E. coli* O157:H7, which was first identified as a human pathogen in 1982. Other non-O157 STEC strains have also been identified including O26, O111, O103, O45, O121, and O145. The primary source of STEC is the intestinal tract of cattle; however, it has also been isolated from other animals including sheep, goats, deer and others. Humans can also serve as a source of the bacteria with illnesses resulting from person-to-person transmission.

Table 1. **Shiga toxin–producing *E. coli* (STEC)**
Comparative Statistics, by Socio-demographic Category, Missouri[1]

		Case Count 2008	% of Total	Rate per 100,000	5-Year Median	% Change from 5-Year Median
State of Missouri		153	100.00%	2.6	124	23.40%
Sex	Female	77	50.30%	2.6	67	14.90%
	Male	76	49.70%	2.6	57	33.30%
Race	Black	5	3.30%	0.7	3	66.70%
	Unknown	50	32.70%	N/A	47	6.40%
	White	98	64.10%	1.9	76	28.90%
Age Group	00 to <01	5	3.30%	6.1	5	0.00%
	01 to 04	42	27.50%	13.5	29	44.80%
	05 to 14	36	23.50%	4.6	29	24.10%
	15 to 24	19	12.40%	2.3	17	11.80%
	25 to 39	9	5.90%	0.8	15	-40.00%
	40 to 64	27	17.60%	1.4	21	28.60%
	65 plus	12	7.80%	1.5	13	-7.70%
	Unknown	3	2.00%	N/A	0	N/A
District	Central	13	8.50%	2	16	-18.80%
	Eastern	46	30.10%	2.1	52	-11.50%
	Northwest	19	12.40%	1.2	30	-36.70%
	Southeast	12	7.80%	2.6	6	100.00%
	Southwest	63	41.20%	6.2	21	200.00%

[1]Socio-demographics are missing for some cases.
*All rates are calculated per 100,000 using 2007 population estimates provided by MDHSS, Bureau of Health Informatics.

The illness caused by STEC includes diarrhea ranging from mild and nonbloody to stools that are virtually all blood. Other symptoms may include severe stomach cramps and vomiting. Symptoms typically begin within 3-4 days following exposure, but can range from 1 to 10 days. Most persons with a STEC associated illness will get better within 5 to 7 days. However, approximately 5 to 10% of persons diagnosed with STEC infection and 20% of children with diarrhea due to *E. coli* O157:H7 will develop a potentially life-threatening complication called HUS. Rates may vary for other STEC strains. HUS typically develops within two weeks following onset of diarrhea. The condition is often severe as 50% of persons with diarrhea-associated HUS will require dialysis, and about 5% of persons that develop HUS will die. Although not all HUS cases are caused by infections due to STEC, *E. coli* O157:H7 is thought to cause over 90% of cases of diarrhea-associated HUS.

Statewide, a total of 153 cases of STEC infections were reported in 2008. This represents a 23% increase in the number of cases compared to the five-year median. However, the number of reported cases in 2008 remained relatively consistent with the previous two years, 152 and 167 cases respectively. For cases whose race was known, the rate of disease was 2.7 times greater among whites compared to blacks.

Section A - Communicable Disease Surveillance

Escherichia coli (*E. coli*) and Hemolytic Uremic Syndrome (HUS) - Continued

Cases were reported from all age groups; however, over 50% of cases occurred in children aged 14 years or younger. The highest attack rate (13.5 per 100,000 population) was reported among children aged 1 to 4 years.

A total of 13 cases of HUS were reported among residents of Missouri in 2008, which is an increase of 62.5% compared to the previous five-year median. Females accounted for 53.8% of cases. Ninety-two percent of HUS cases were reported among children 14 years of age or younger.

Table 2. Hemolytic Uremic Syndrome (HUS) - Comparative Statistics, by Socio-demographic Category, Missouri[1]

		Case Count 2008	% of Total	Rate per 100,000	5-Year Median	% Change from 5-Year Median
State of Missouri		13	13.90%	1	4	150.00%
Sex	Female	7	53.80%	0.2	6	16.70%
	Male	6	46.20%	0.2	3	100.00%
Race	Black	1	7.70%	0.1	0	N/A
	White	12	92.30%	0.2	7	71.40%
Age Group	00 to <01	1	7.70%	1.2	0	N/A
	01 to 04	6	46.20%	1.9	5	20.00%
	05 to 14	5	38.50%	0.6	3	66.70%
	15 to 24	0	0.00%	0	0	N/A
	25 to 39	0	0.00%	0	0	N/A
	40 to 64	1	7.70%	0.1	0	N/A
	65 plus	0	0.00%	0	0	N/A
District	Central	1	7.70%	0.2	2	-50.00%
	Eastern	4	30.80%	0.2	1	300.00%
	Northwest	1	7.70%	0.1	2	-50.00%
	Southeast	2	15.40%	0.4	2	0.00%
	Southwest	5	38.50%	0.5	3	66.70%

[1]Socio-demographics are missing for some cases.
*All rates are calculated per 100,000 using 2007 population estimates provided by MDHSS, Bureau of Health Informatics.
Data Source: Missouri Health Surveillance Information System.

Geographically, the greatest number of STEC cases (63 cases) was reported in residents of the Southwest District, resulting in a rate 2.4 times greater than the overall state rate representing a 200% increase over the previous 5-year median. An increase in the number of reported cases was also observed in the Southeast District (12 cases), which was double the previous 5-year median of 6 cases. The Southeast and Southwest Districts also had the highest rates of HUS (0.4 and 0.5 cases per 100,000 population) respectively, which is expected given the association between STEC and HUS. The cause of the increases of reported cases observed in 2008, in both the Southeast and Southwest Districts, is not known and cannot be attributed to a single outbreak.

In 2008, one outbreak of STEC associated illnesses was reported in Missouri. The outbreak occurred in the Southwest District and included a total of four illnesses, including three confirmed cases of genetically indistinguishable *E. coli* O157:H7. Each of the ill persons developed symptoms during a two week period in April and May. The median age of cases was 4.5 years with a range of 1-57 years. Two of the cases developed HUS, were hospitalized, and placed on dialysis. The average length of their hospital stay was 23 days.

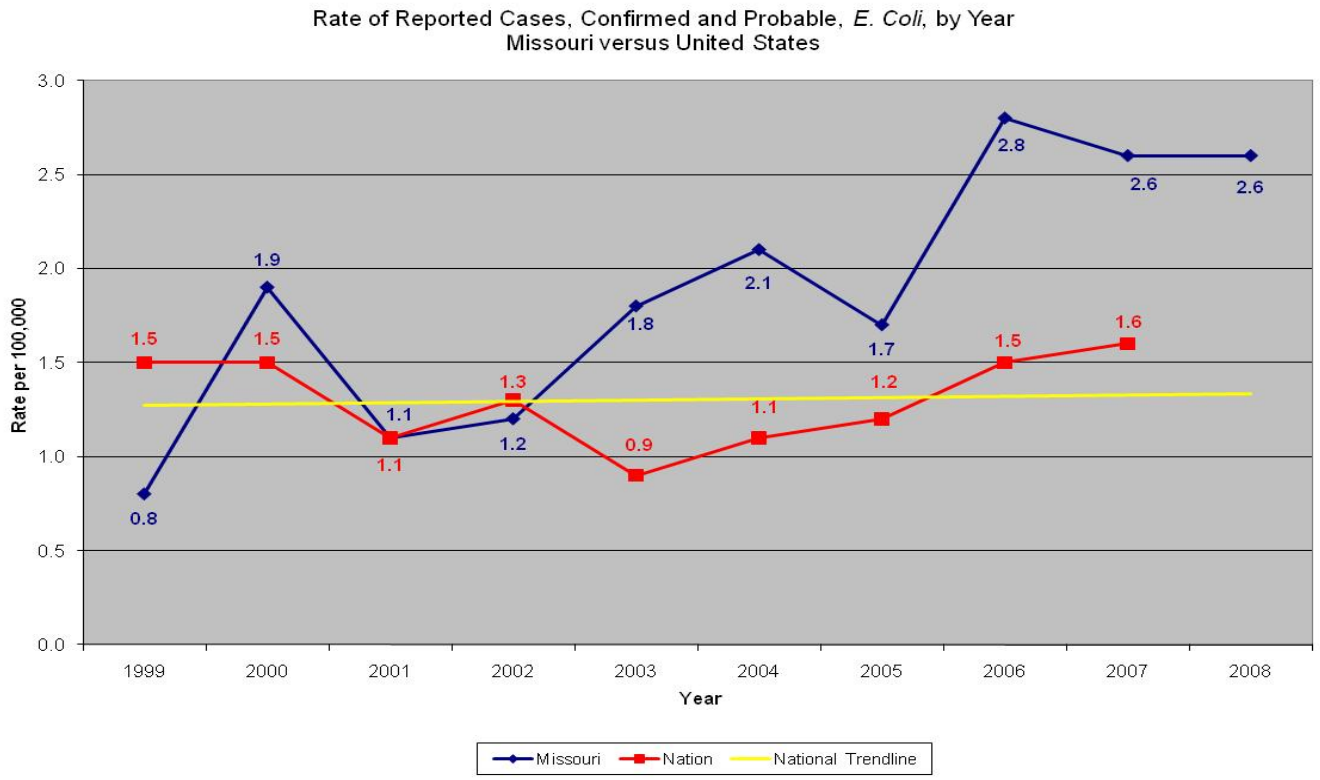
The only common risk factor identified for all of the cases was the consumption of unpasteurized goat's milk originating from a local farm. Each of the four ill persons had consumed the milk within 3-4 days prior to becoming ill. Although the source of the infections could not be confirmed, the epidemiological

Section A - Communicable Disease Surveillance

Escherichia coli (*E. coli*) and Hemolytic Uremic Syndrome (HUS) - Continued

findings strongly suggest the unpasteurized goat's milk from the local farm was the likely source of infection for each of the cases associated with this outbreak. Consuming unpasteurized dairy products is a known risk factor for developing gastrointestinal illnesses caused by a variety of pathogens including *E. coli* O157:H7, *Listeria*, *Campylobacter* and *Brucella*. Despite the numerous claims regarding the health benefits of unpasteurized dairy products, the product, no matter how carefully produced, may be unsafe.

Comparison to National Data: During the previous five year period from 2003 to 2007, the rate of STEC cases in Missouri has consistently been one to two times greater than the corresponding rate nationally. However, the rates of STEC cases in Missouri and nationally appear to have similar upward trends during the same five year period. Whether this represents an actual increase in the incidence of STEC infections or is a reflection of increased reporting and better diagnostics is unknown.

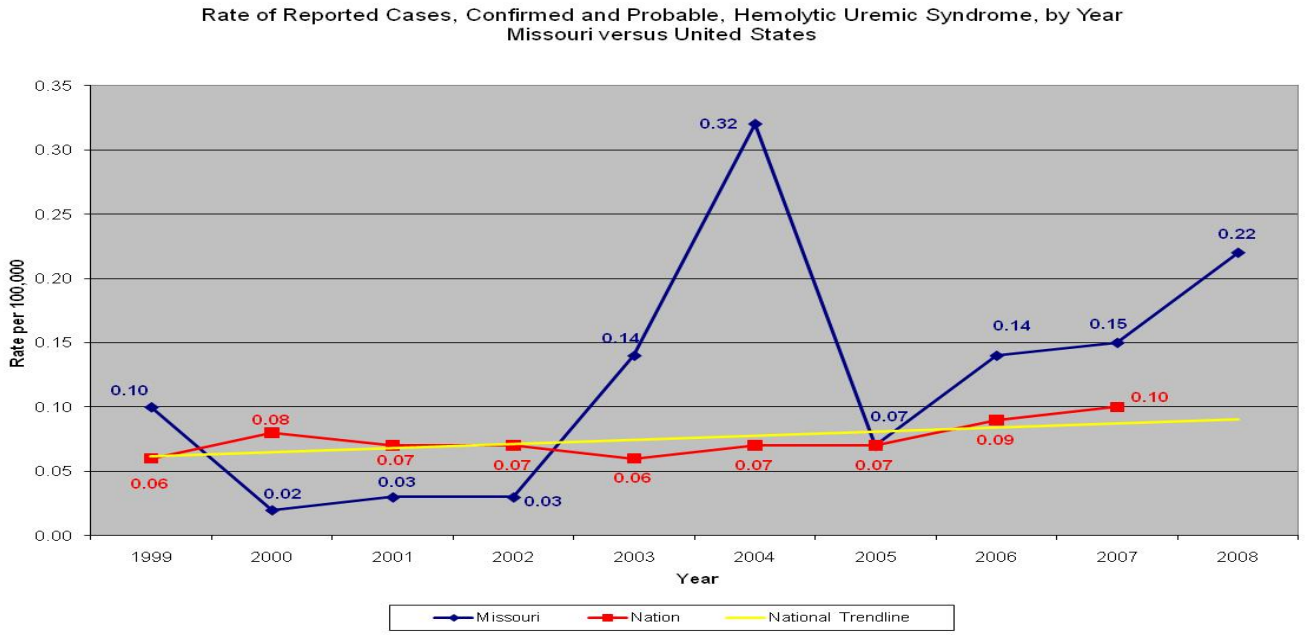


Section A - Communicable Disease Surveillance

Escherichia coli (*E. coli*) and Hemolytic Uremic Syndrome (HUS) - Continued

Given the ability of STEC to cause outbreaks of potentially life-threatening disease, reported cases must continue to be promptly reported and investigated. Identifying the specific source of infection is often difficult particularly in the absence of an outbreak. The collection of accurate exposure information from the ill persons or their surrogates remains an integral component of public health surveillance. The collection of exposure information is challenging and can be further complicated when the possible exposures include a potentially controversial topic such as the consumption of raw diary products. Many people believe the benefits of drinking raw milk far outweighs the known health risks, which includes developing a STEC infection and HUS.

Outbreaks of STEC have been linked to a variety of exposures in the United States including ground beef, petting zoos, raw fruits and vegetables, unpasteurized dairy, and both recreational and drinking waters. With over 50% of STEC cases and 92% of HUS cases reported in Missouri occurring among children aged 14 years or younger, it is critical for parents and guardians to implement preventive measures within your family. The education and implementation of a few simple prevention measures will reduce the potential for you and your child to develop a STEC associated illness. Preventive measures for all ages include, but are not limited to: washing hands with soap and water after contact with animals, safe handling and cooking of meats, avoid consuming unpasteurized milk and dairy products, and avoid swallowing or getting recreational water in your mouth.



Additional Website Resources

CDC Health Topics | CDIRM | Health District Defined

Section A - Communicable Disease Surveillance

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Haemophilus Influenza

Haemophilus Influenzae (*H. influenzae*) includes a group of bacteria whose natural habitat is the upper respiratory tract of humans. *H. influenzae* are broadly divided into two different groups (encapsulated and unencapsulated) based on their ability to produce an outer layer or capsule. The strains that produce a capsule (encapsulated) can then be further defined by the specific polysaccharides that make up the capsule. A total of six different types have been identified and are designated with the letters a through f. The unencapsulated strains that do not produce a capsule are also referred to as nontypable strains. The presence of the capsule and the capsule type are important indicators of severity of disease, potential risk to others, and determining the appropriate public health response.

Table 1. - Haemophilus Influenza, Invasive
Compartative Statistics, by Socio-demographic Category, Missouri[1]

		Case Count 2008	% of Total	Rate per 100,000	5-Year Median	% Change from 5-Year Median
State of Missouri		72	100.00%	1.2	42	71.40%
Sex	Female	45	62.50%	1.5	21	114.30%
	Male	27	37.50%	0.9	18	50.00%
Race	Black	9	12.50%	1.3	4	125.00%
	Unknown	27	37.50%	N/A	12	125.00%
	White	36	50.00%	0.7	24	50.00%
Age Group	00 to <01	11	15.30%	13.4	4	175.00%
	01 to 04	4	5.60%	1.3	3	33.30%
	05 to 14	2	2.80%	0.3	2	0.00%
	15 to 24	3	4.20%	0.4	1	200.00%
	25 to 39	4	5.60%	0.3	3	33.30%
	40 to 64	16	22.20%	0.8	10	60.00%
	65 plus	32	44.40%	4.1	18	77.80%
District	Central	5	6.90%	0.8	4	25.00%
	Eastern	31	43.10%	1.4	15	106.70%
	Northwest	21	29.20%	1.4	14	50.00%
	Southeast	5	6.90%	1.1	2	150.00%
	Southwest	10	13.90%	1	4	150.00%

[1]Socio-demographics are missing for some cases.
*All rates are calculated per 100,000 using 2007 population estimates provided by MDHSS, Bureau of Health Informatics.
Data Source: Missouri Health Surveillance Information System.

Although all *H. influenzae* can cause invasive disease, *H. influenzae* type b (Hib) is of greatest public health importance. Prior to the introduction of effective vaccines, *H. influenzae* type b (Hib) was the leading cause of bacterial meningitis and other invasive infections among children younger than five years of age. In addition to meningitis, infections with Hib include pneumonia, bacteremia, epiglottis, septic arthritis, cellulitis, otitis media and pericarditis. Infections are generally seen in infants and children less than five years of age. Invasive disease due to Hib is often severe as approximately 5% of Hib meningitis cases result in death and 25% of persons may experience permanent hearing loss or other long term side effects. With the availability of the Hib vaccine, the incidence of invasive Hib disease in the United States has decreased by 99%. Invasive Hib infections are now relatively uncommon in the United States and occur primarily in unimmunized children or children too young to receive, or have completed, their primary immunization series.

Nontypable *H. influenzae* strains may cause invasive disease but are generally less virulent than encapsulated strains. Nontypable strains are common causes of the respiratory tract including ear infections in children and bronchitis in adults. Other infections caused by nontypable strains include conjunctivitis, otitis media, sinusitis and pneumonia. *H. influenzae* may also aggravate underlying medical issues such as chronic bronchitis or cystic fibrosis.

Section A - Communicable Disease Surveillance

Haemophilus Influenza - Continued

H. influenzae are spread from person-to-person via inhalation of respiratory droplets or by direct contact with respiratory tract secretions. Infection may also be spread to neonates by aspiration of amniotic fluid or by contact with infected genital tract excretions. The incubation period is unknown, but likely 2-4 days. Persons remain communicable as long as the organism is present. Persons are no longer considered communicable 24-48 hours after starting appropriate antibiotic treatment.

A total of 72 cases of invasive *H. influenzae* (non Hib) were reported in Missouri in 2008 resulting in an incidence rate of 1.2 cases per 100,000 population. This represents a 71.4% increase of reported cases compared to the previous five year median. Females accounted for 62.5% of cases. Age is a significant risk factor for invasive *H. influenzae* disease. The highest rates were reported among persons less one year of age (13.4 per 100,000) and greater than 64 years of age (4.1 per 100,000). Each of the five districts statewide observed increases in reported cases of invasive *H. influenzae* disease. Although the greatest increases were observed in the Southeast and Southwest regions, the rates for each region were very similar. The cause of the increase in reported cases observed in 2008 is not known. No outbreaks of illness due to *H. influenzae* were reported. There were no Hib cases reported in 2008.

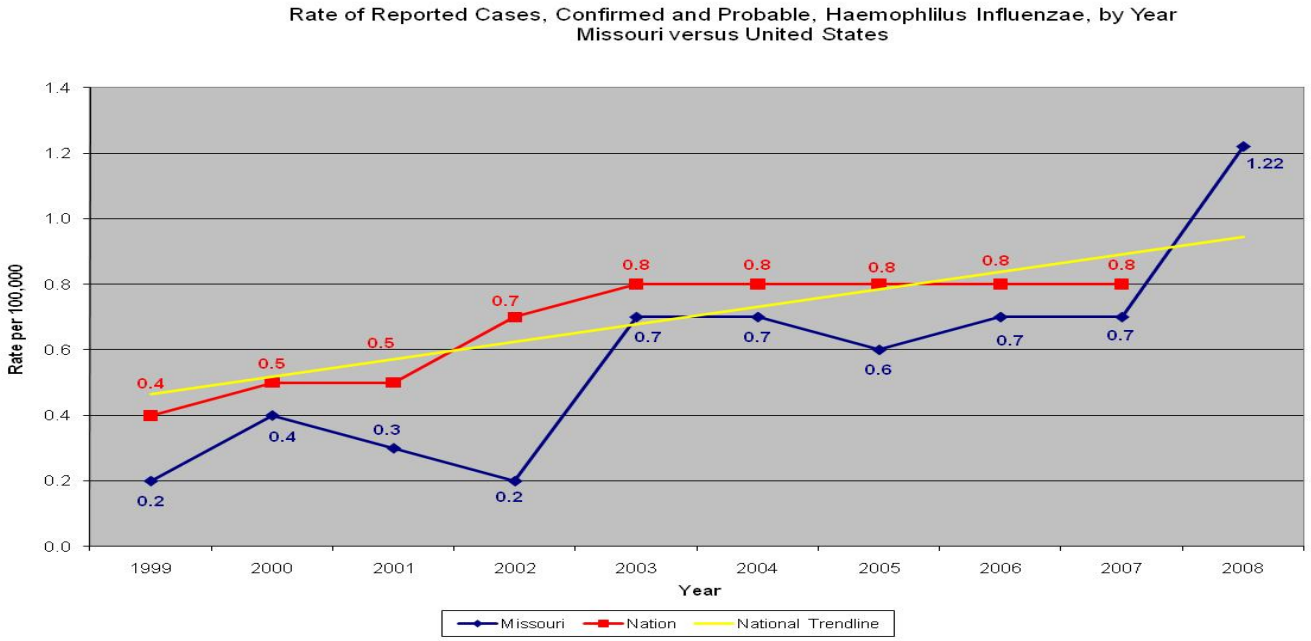
Comparison to National Data: Nationwide, in 2008, there were 2,886 invasive *H. influenzae* cases reported with a national incidence rate of 0.96 per 100,000 population. During the past decade, the rate of reported cases of invasive *H. influenzae* in Missouri was typically below the national rate. During the past five years the overall rates both nationally and in Missouri have remained relatively constant 0.8 and 0.7 per 100,000 respectively. In 2008, Missouri's case rate increased to 1.2 which was above the national rate of 0.96. Although the overall incidence rate of invasive *H. influenza*e in Missouri was slightly higher than the national rate, greater age specific differences were observed. The age group ($\geq$ 65 years of age) had the greatest number of cases reported both nationally, 1,336 cases (rate 1.46 per 100,000) and in Missouri with 32 cases reported (rate 4.1 per 100,000). The highest rates were observed among persons in the age group (< 1 year of age) both nationally, 261 cases (rate 6.13 / 100,000) and in Missouri, 11 cases (rate 13.4 per 100,000). The specific causes of the observed increase of invasive *H. influenza*e among the two age groups at greatest risk of invasive disease are not fully understood.

The Hib conjugate vaccine has drastically decreased the incidence of invasive Hib disease in Missouri. Although Hib cases are now uncommon in Missouri, it is important we continue the diligent surveillance of *H. influenzae* invasive disease to promptly identify Hib cases and implement the appropriate public health control measures. In addition, we must continue to monitor the changing epidemiology of Hib invasive disease. Serotype information for all *H. influenza*e invasive disease cases is essential and will

Section A - Communicable Disease Surveillance

Haemophilus Influenza - Continued

generate data needed to examine strategies for elimination of this disease. It is critically important to continue to promote the vaccination of children for the prevention of Hib, which is the most proven measure of prevention against Hib. Other prevention measures are also important at reducing the risk of *H. influenzae* associated diseases including the education and implementation of good hand washing and appropriate cough/sneeze etiquette.



Additional Website Resources

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Section A - Communicable Disease Surveillance

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Hepatitis A

Hepatitis A is a contagious viral infection of the liver. While infection with the virus can cause a significant illness, and the recovery may be prolonged, recovery is usually complete and does not include permanent sequale or a chronic infection as is sometimes seen with hepatitis B and C infections. Humans are the only natural reservoir. Symptoms, if present, can consist of yellow skin or eyes, tiredness, stomach ache, loss of appetite, or nausea. Hepatitis A is usually spread when the hepatitis A virus is taken in by mouth from contact with objects, food, or drinks contaminated by the feces (or stool) of an infected person. Infection with the virus provides lifelong immunity.

Table 1. - Compartative Statistics, by Socio-demographic Category, Missouri[1]

		Case Count 2008	% of Total	Rate per 100,000	5-Year Median	% Change from 5-Year Median
State of Missouri		45	100.00%	0.8	34	32.40%
Sex	Female	23	51.10%	0.8	17	35.30%
	Male	22	48.90%	0.8	18	22.20%
Race	Black	5	11.10%	0.7	3	66.70%
	Other	1	2.20%	0.8	1	0.00%
	Unknown	13	28.90%	N/A	15	-13.30%
	White	26	57.80%	0.5	16	62.50%
Age Group	00 to <01	0	0.00%	0	0	N/A
	01 to 04	0	0.00%	0	1	-100.00%
	05 to 14	2	4.40%	0.3	3	-33.30%
	15 to 24	7	15.60%	0.9	5	40.00%
	25 to 39	11	24.40%	0.9	6	83.30%
	40 to 64	16	35.60%	0.8	11	45.50%
	65 plus	9	20.00%	1.1	8	12.50%
District	Central	6	13.30%	0.9	5	20.00%
	Eastern	19	42.20%	0.9	13	46.20%
	Northwest	12	26.70%	0.8	7	71.40%
	Southeast	3	6.70%	0.7	1	200.00%
	Southwest	5	11.10%	0.5	6	-16.70%

[1]Socio-demographics are missing for some cases.
*All rates are calculated per 100,000 using 2007 population estimates provided by MDHSS, Bureau of Health Informatics.
Data Source: Missouri Health Surveillance Information System.

Descriptions of a disease with symptoms of hepatitis A date back to the second century. In the 1920's, it was postulated that the cause of "infectious hepatitis" was a virus, but the virus that actually causes hepatitis A was not identified until 1973. Identification of the specific virus allowed development of serologic tests and, eventually an effective vaccine. The vaccine was licensed in 1995 and has been included in the list of recommended childhood vaccines since 1999.

Some serologic studies have shown that up to 30% of the population carry antibodies indicating exposure to the virus sometime during their lifetime. In 2008, only 45 cases of confirmed or probable hepatitis A were reported in Missouri.

Historically, Human Immune Globulin (IG) has been used to prevent the disease in those exposed to hepatitis A. However, in October of 2007 CDC published guidelines for use of the vaccine for post-exposure prophylaxis of healthy people between the ages of 12 months and 40 years. For persons outside of that age range or with certain pre-existing conditions, IG is still the choice for prophylaxis. Regardless of whether IG or vaccine is used, prophylaxis must be given within 14 days of exposure to be effective.

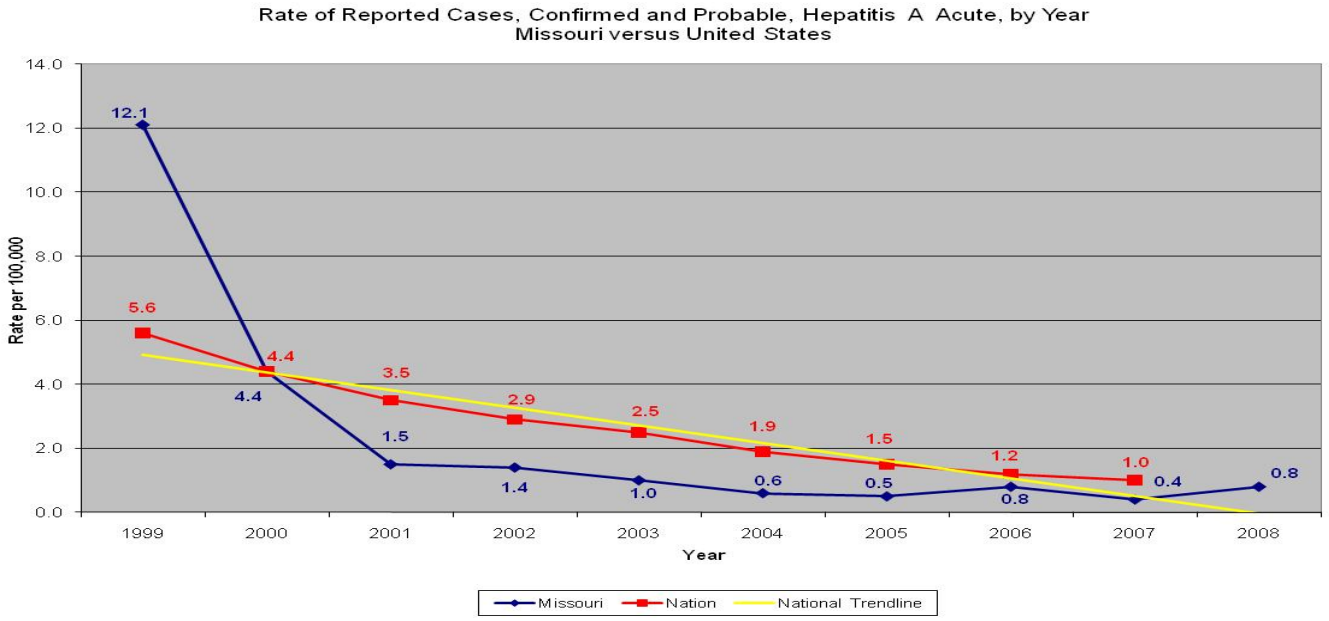
Section A - Communicable Disease Surveillance

Hepatitis A - Continued

In addition to pre-exposure vaccination and post-exposure prophylaxis, the main prevention efforts have relied heavily on educational efforts.

- Education of infected persons and their caregivers about the importance of good handwashing with soap and water after defecation or handling diapers or feces, and before handling food or caring for children or patients.
- Education of the private medical community regarding the importance of rapid reporting of possible hepatitis A cases to permit identification and prophylaxis of contacts within 14 days of exposure.
- Education of parents, travelers and those in high-risk groups about the benefits of pre-exposure vaccination to prevent infection with the virus.

Comparison to National Data: The advent and widespread use of the hepatitis A vaccine has resulted in a dramatic reduction in the number of cases of hepatitis A cases reported in Missouri and nationwide. The trend is steadily downward in both instances. The introduction of the vaccine, and especially its inclusion in the recommended childhood immunization schedule has proven very effective in reducing the number of cases of hepatitis A. Additionally, in response to local outbreaks, several local jurisdictions have mandated hepatitis A vaccine for those seeking a food handler's permit. While this is not a statewide or national requirement, where it has been implemented locally, there has been a dramatic decrease in the number of restaurant-associated outbreaks.



Section A - Communicable Disease Surveillance

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Legionellosis

Legionellosis refers to conditions associated with the bacteria called *Legionella*. Although a total of 35 species of *Legionella,* with at least 45 serogroups, are currently recognized, *Legionella pneumophila* serogroup 1 (*L. pneumophila*) accounts for almost 90% of human cases. The term legionellosis encompasses two very distinct clinical and epidemiological conditions called Legionnaires' disease and Pontiac fever.

Table 1. —Compartative Statistics, by Socio-demographic Category, Missouri[1]

		Case Count 2008	% of Total	Rate per 100,000	5-Year Median	% Change from 5-Year Median
State of Missouri		71	100.00%	1.2	34	108.80%
Sex	Female	33	46.50%	1.1	11	200.00%
	Male	38	53.50%	1.3	25	52.00%
Race	Black	10	14.10%	1.4	4	150.00%
	Unknown	21	29.60%	N/A	11	90.90%
	White	40	56.30%	0.8	15	166.70%
Age Group	00 to <01	0	0.00%	0	0	N/A
	01 to 04	0	0.00%	0	0	N/A
	05 to 14	0	0.00%	0	0	N/A
	15 to 24	1	1.40%	0.1	1	0.00%
	25 to 39	7	9.90%	0.6	5	40.00%
	40 to 64	37	52.10%	1.9	17	117.60%
	65 plus	26	36.60%	3.3	10	160.00%
District	Central	5	7.00%	0.8	2	150.00%
	Eastern	39	54.90%	1.7	17	129.40%
	Northwest	17	23.90%	1.1	8	112.50%
	Southeast	4	5.60%	0.9	0	N/A
	Southwest	6	8.50%	0.6	5	20.00%

[1]Socio-demographics are missing for some cases.
*All rates are calculated per 100,000 using 2007 population estimates provided by MDHSS, Bureau of Health Informatics.
Data Source: Missouri Health Surveillance Information System.

Legionellosis sources may include almost any warm water system or device including man-made or natural, that disseminates water, particularly as aerosols, sprays or mists and provides favorable conditions for *Legionella* bacteria growth and amplification. *Legionella* bacteria are widely present at low levels in lakes, streams, rivers, freshwater ponds, and mud. However, the levels of bacteria that are found in the natural environment are so low that it is unlikely that an individual will contract the disease from these sources.

The risk of exposure increases when high concentrations of the organism grow in water systems including showers, air conditioning cooling towers, humidifiers, whirlpool spas, respiratory therapy devices, and decorative fountains, which have all been associated with disease. The bacteria do not seem to grow in car or window air conditioners. Persons become infected when *Legionella* bacteria, that have been aerosolized in the air, are inhaled into the lungs. Symptoms of disease usually begin 2-10 days following exposure for Legionnaires' disease and 5-66 hours following exposure for Pontiac fever. The initial symptoms often include anorexia, malaise, myalgia, headache, diarrhea, cough, and a high fever. Persons with Legionnaires' disease will typically develop pneumonia while Pontiac fever is a milder illness and is generally not associated with pneumonia. Although most persons with Pontiac fever will recover fully, an estimated 10% to 15% of cases of Legionnaires' disease will be fatal. The bacteria that cause legionellosis are not spread from one person to another person.

Section A - Communicable Disease Surveillance

Legionellosis - Continued

Legionnaires' disease was first identified in 1976 following an outbreak of pneumonia in persons who had attended an American Legion convention in Philadelphia. *L. pneumophila* had undoubtedly caused previous pneumonia outbreaks, but the organism's slow growth and special growth requirements prevented earlier discovery.

The likelihood of contracting Legionnaires' disease depends on the level of contamination in the water source, the susceptibility of the person exposed, and the intensity of exposure. Legionnaires' disease occurs in approximately 5% or less of people who are exposed. In the United States, Legionnaires' disease is fairly common and serious. Legionnaires disease bacteria are one of the top three causes of non-epidemic, community-acquired pneumonia. It is estimated that over 25,000 cases of the illness occur each year and cause more than 4,000 deaths. It is difficult to distinguish this disease from other forms of pneumonia; so many cases go unreported.

Legionnaires' disease is characterized as an "opportunistic" disease that attacks individuals who have an underlying illness or weakened immune system. The most susceptible people include: the elderly, smokers, those on immunosuppressive therapy, individuals with chronic obstructive pulmonary disease (COPD), organ transplant patients, and people taking corticosteroid therapy. Approximately 20% of cases are associated with travel.

Statewide, in 2008, there were 71 cases of legionellosis reported, which is a 108.8% increase in the number of cases compared to the five-year median data from 2003-2007. The incidence rate for the year was 1.2 cases per 100,000 population and represents the highest rate of reported legionellosis cases observed over the past decade. Legionellosis was most prevalent in older adults with 88.7% of cases above age 39 years. Fifty-three percent of cases were male and the race specific incidence rates were similar among both blacks and whites.

The upward trend in Missouri legionellosis cases over the past two years was observed in all areas of Missouri with the most cases in the largest metropolitan areas surrounding Kansas City and St. Louis. Although legionellosis cases were reported during each month, more cases were reported in the months of June and July.

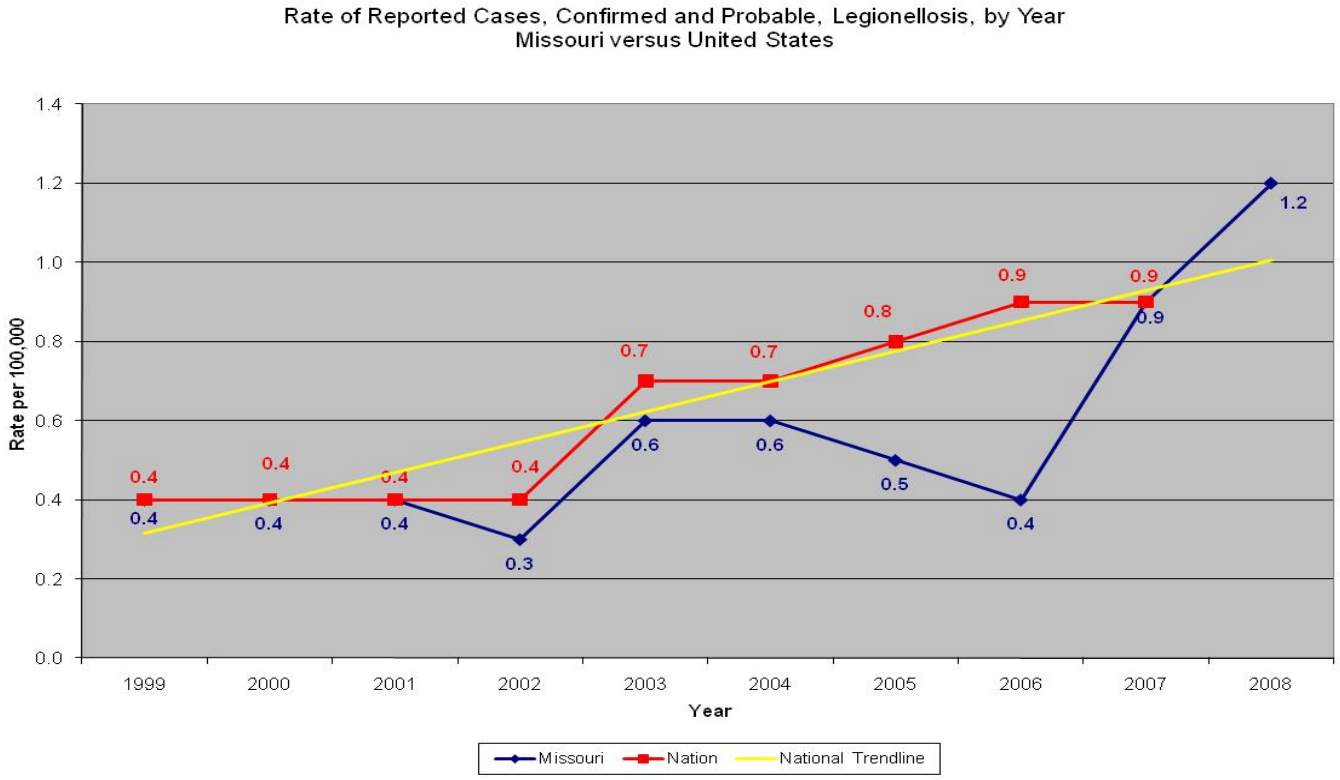
A study of 19 cases in Eastern District over the summer found no specific cause for the increase of reported cases. Cases were not linked by geographic clustering or common exposure types. However, it was determined that smokers and diabetics were most affected along with others experiencing chronic breathing difficulties.

Section A - Communicable Disease Surveillance

Legionellosis - Continued

Comparison to national data: The rates of reported legionellosis cases in Missouri and nationally have continued an upward trend over the past decade.

Outbreaks of legionellosis have been associated with hotels, hospitals, and other travel associated exposures and often resulting in severe disease. This highlights the importance of owners and operators to properly maintain water sources such as air conditioning cooling towers, spas, hot tubs, and the like, to prevent the growth and/or proliferation and spread of *Legionella* bacteria and therefore prevent legionellosis disease. The American Society of Heating, Refrigerating, and Air Conditioning Engineers has developed Guideline 12-2000 "Minimizing the Risk of Legionellosis Associated with Building Water Systems". Legionellosis case and outbreak investigations often require the expedient collaboration of local, state, federal, and international agencies to identify and eliminate sources of disease.



Additional Website Resources

CDC Health Topics | CDIRM | Health District Defined

Table of Contents | Next Page | Previous Page

Section A - Communicable Disease Surveillance

Malaria

Click to view maps

Malaria is a parasitic disease caused by infection of one (or more) of four species of plasmodium: *P. falciparum*, *P. vivax*, *P. ovale*, and *P. malariae*. *P. falciparum* and *P. vivax* infections are the most common worldwide, with *P. falciparum* representing the most serious public health threat because of its tendency toward severe or fatal infections.

Table 1. - Compartative Statistics, by Socio-demographic Category, Mis-

		Case Count 2008	% of Total	Rate per 100,000	5-Year Median	% Change from 5-Year Median
State of Missouri		14	100.00%	0.2	8	75.00%
Sex	Female	6	42.90%	0.2	3	100.00%
	Male	8	57.10%	0.3	5	60.00%
Race	Black	6	42.90%	0.9	3	100.00%
	Other	1	7.10%	0.8	0	N/A
	Unknown	4	28.60%	N/A	3	33.30%
	White	3	21.40%	0.1	2	50.00%
Age Group	00 to <01	0	0.00%	0	0	N/A
	01 to 04	0	0.00%	0	0	N/A
	05 to 14	1	7.10%	0.1	0	N/A
	15 to 24	5	35.70%	0.6	3	66.70%
	25 to 39	6	42.90%	0.5	4	50.00%
	40 to 64	2	14.30%	0.1	3	-33.30%
	65 plus	0	0.00%	0	0	N/A
District	Central	1	7.10%	0.2	2	-50.00%
	Eastern	6	42.90%	0.3	4	50.00%
	Northwest	6	42.90%	0.4	2	200.00%
	Southeast	0	0.00%	0	0	N/A
	Southwest	1	7.10%	0.1	1	0.00%

[1]Socio-demographics are missing for some cases.
*All rates are calculated per 100,000 using 2007 population estimates provided by MDHSS, Bureau of Health Informatics.

The classic early symptoms of malaria are high fever, chills, rigor, sweats and headache, which may be paroxysmal. If appropriate treatment is not administrated, fever and paroxysms may occur in a cyclic pattern every other or every third day depending on the infecting species. Other symptoms include nausea, vomiting, diarrhea, cough, tachypnea, arthralgia, myalgia, abdominal and back pain, anemia, thrombocytopenia, jaundice and hepatoslpenomegaly. If left untreated infection with *P. falciparum* is potentially fatal. *P. vivax* and *P. ovale* may develop into: anemia, hypersplenism with danger of late splenic rupture and may relapse for as long as three to five years after the primary infection. Congenital malaria secondary to perinatal transmission is rare but does sometimes occur. Incubation periods range from 9 to 40 days depending on the species. Some strains of the *P. vivax* can have an incubation period as long as 6 to 12 months.

Missouri experienced a significant increase in the number of reported Malaria cases in 2008 (14 cases), which was a 75% increase in the number of cases compared to the five-year median data from 2003-2007. The incident rate for the year was 0.2 cases per 100,000 population. The cases range from 5 years to 64 years of age with the highest percent being reported among persons aged 25 to 39 years. Fifty-seven percent of the cases were male and the race specific rates were 0.9 among blacks and 0.1 among whites.

The increase in cases was observed primarily in the Eastern and Northwestern regions of the state, with a 43% of the cases being reported in each of these regions. Both of these regions contain major metropolitan areas.

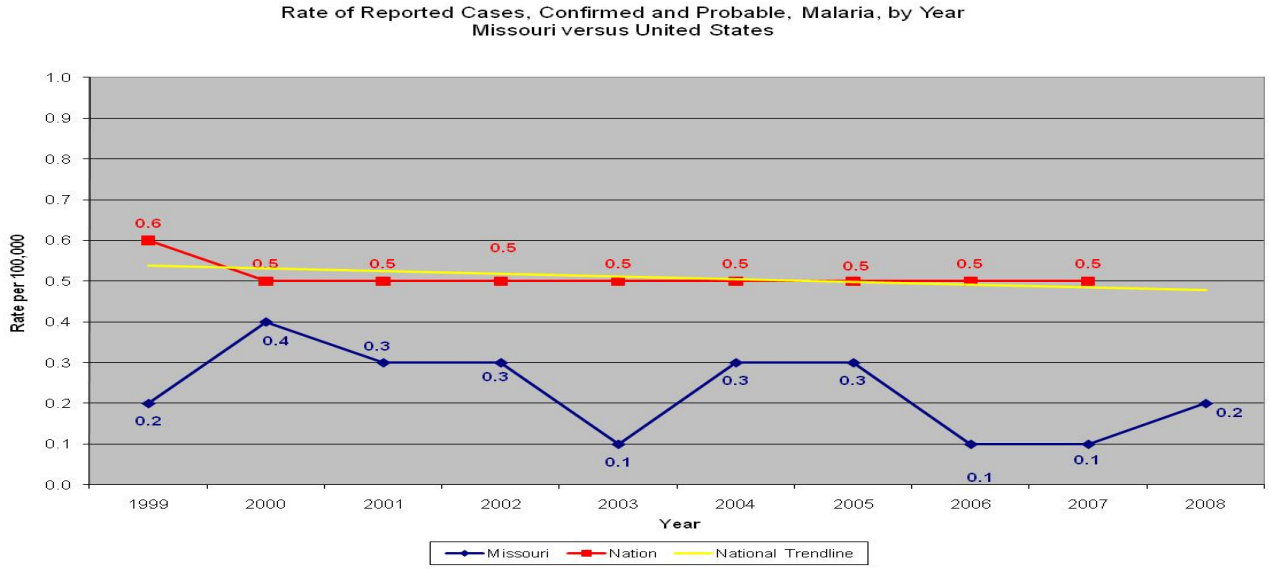
Section A - Communicable Disease Surveillance

Malaria - Continued

Malaria is endemic throughout the tropical areas of the world and is still a major cause of illness in some sub-tropical areas of the world. The disease is transmitted to humans through the bite of an infected female nocturnal-feeding *Anopheles* mosquito. Annually, there are approximately 1,500 cases of malaria reported in the United States. Nearly all of these cases result from infections acquired abroad. Of all of the malaria infected patients reported in the United States, more than 80% did not follow a CDC-recommended prophylaxis regimen. The World Health Organization estimates that in 2008 malaria caused 190—311 million clinical episodes, and 708,000—1,003,000 deaths. Most deaths occur in young children. There is also a substantial risk to pregnant women and their fetuses, often resulting in spontaneous abortions or stillbirths.

The malaria risk is high for travelers to sub-Saharan Africa, Papua New Guinea, the Solomon Islands and Vanuatu; the risk is intermediate on the Indian subcontinent and is low in most of Southeast Asia and Latin America. There have also been recent cases reported in travelers to Jamaica, the Dominican Republic, and the Bahamas. Preventative medication or chemoprophylaxis is available. Anyone planning a trip to tropical or sub-tropical regions should contact CDC to determine the appropriate chemoprophylactic regimen. The appropriate regimen is determined by the areas that the travelers will be visiting, the type of malaria that is prevalent in that area and the travelers risk of exposure to malaria that is resistant to particular medications. Travelers should begin their chemoprophylaxis early enough prior to their departure date that their physician can determine if they have an adverse reaction to that medication and can be started on an alternative regimen prior to departure.

Comparison to National data:
In 2007, the national rate per 100,000 population was 0.5 while the state had a rate of 0.2 per 100,000 population in 2008. The increase in the annual incidence rate of malaria cases in Missouri, from 2007



Section A - Communicable Disease Surveillance

Malaria - Continued

through 2008, was in contrast to the steady level observed nationally. Despite the increase in reported malaria cases in 2008, the incidence rate for reported malaria cases in Missouri remains below the national rate. While the Missouri rates have continued to fluctuate over the past eight years, they have consistently remained below the national rate.

Malaria is the 5th cause of death from infectious diseases worldwide (after respiratory infections, HIV/ AIDS, diarrheal diseases, and tuberculosis). The vast majority of cases in the United States are in travelers and immigrants returning from countries where malaria transmission occurs, many from sub-Saharan Africa and South Asia. Although malaria can be a deadly disease, illness and death from malaria can usually be prevented.

- Travelers should be aware of the ABCD of malaria Prevention. This includes first- and second-generation immigrants from malaria-endemic countries returning to their "home" countries to visit friends and relatives.
  - Be **A**ware of the risk, the incubation period and the possibility of delayed onset and the main symptoms;
  - Avoid being **B**itten by mosquitoes, especially between dusk and dawn;
  - Take anti-malarial drugs (**C**hemoprophylaxis) when appropriate, to prevent infection developing into clinical disease; and
  - Immediately seek **D**iagnosis and treatment if a fever develops one week or more after entering an area where there is a malaria risk and up to 3 months (or, rarely, later) after departure from a risk area.

- During 1963-2009, 96 cases of transfusion-transmitted malaria were reported in the United States; approximately two thirds of these cases could have been prevented if the implicated donors had been deferred according to established guidelines.

- Remember, of the species of *Anopheles* mosquitoes found in the United States, the three species that were responsible for malaria transmission prior to elimination (*Anopheles quadrimaculatus* in the east, *An. freeborni* in the west, and *An. albimanus* in the Caribbean) are still widely prevalent; thus there is a constant risk that malaria could be reintroduced in the United States -- local mosquitoes can become infected by biting persons carrying malaria parasites (acquired in endemic areas) and then transmit malaria to local residents.

Section A - Communicable Disease Surveillance

Click to view maps

Pertussis

Pertussis (whooping cough) is a highly contagious, vaccine-preventable disease caused by the bacteria *Bordetella pertussis*. Signs of illness often begin with a runny nose and severe cough that typically progresses to bouts of prolonged coughing fits (known as paroxysms), and may be followed by a whooping noise with inspiration, and posttussive vomiting. Pertussis is spread from person-to-person by respiratory secretions laden with *B. pertussis*. Symptoms typically appear within three weeks of initial infection and persons are capable of transmitting the disease to others for about the same length of time (unless they are treated with an effective antibiotic).

Table 1. Pertussis - Comparative Statistics, by Socio-demographic Category, Missouri[1]

		Case Count 2008	% of Total	Rate per 100,000	5-Year Median	% Change from 5-Year Median
State of Missouri		561	100.00%	9.5	308	82.10%
Sex	Female	311	55.40%	10.3	177	75.70%
	Male	250	44.60%	8.7	131	90.80%
Race	Black	15	2.70%	2.1	27	-44.40%
	Other	2	0.40%	1.5	1	100.00%
	Unknown	255	45.50%	N/A	85	200.00%
	White	289	51.50%	5.7	195	48.20%
Age Group	00 to <01	46	8.20%	56.2	74	-37.80%
	01 to 04	53	9.40%	17	29	82.80%
	05 to 14	333	59.40%	42.9	70	375.70%
	15 to 24	33	5.90%	4.1	35	-5.70%
	25 to 39	34	6.10%	2.9	28	21.40%
	40 to 64	56	10.00%	2.9	47	19.10%
	65 plus	5	0.90%	0.6	5	0.00%
	Unknown	1	0.20%	N/A	0	N/A
District	Central	43	7.70%	6.6	35	22.90%
	Eastern	455	81.10%	20.4	63	622.20%
	Northwest	24	4.30%	1.6	126	-81.00%
	Southeast	36	6.40%	7.8	25	44.00%
	Southwest	3	0.50%	0.3	23	-87.00%

[1]Socio-demographics are missing for some cases.
*All rates are calculated per 100,000 using 2007 population estimates provided by MDHSS, Bureau of Health Informatics.
Data Source: Missouri Health Surveillance Information System.

Persons under the age of one year with pertussis infection are at higher risk for severe complications, including pneumonia, seizures, encephalopathy and death. An effective vaccine has been widely used in children ages two months to six years since the 1940s, and a vaccine for adolescents and adults (ages 10-64) became available in 2005.

In 2008, there were 561 reported cases of pertussis in Missouri. Pertussis had been on the decline for the past two years (118 in 2007 and 308 in 2006). The number of reported cases in 2008 was an 82% increase over the five-year median of 308 cases. The number of reported pertussis outbreaks also increased in 2008, from two reported in 2007 and 11 reported in 2008.

Pertussis affected all areas of the state in 2008, with the highest rates reported in the Eastern, Southeast and Central Districts.

Section A - Communicable Disease Surveillance

Pertussis - Continued

Over 75% of the reported cases were among children age 14 years or less, with the five to fourteen year age group most highly represented. Females represented the majority of the reported cases, with two cases reporting a concurrent pregnancy. As in previous years, the most common venue for pertussis outbreaks reported in 2008 was the school or college setting.

The ages of the thirty-six hospitalized pertussis cases ranged from one month to 71 years, with a median of three months. Although persons under the age of one represented only 8.2% of the total number of pertussis cases, the age group accounted for 72% (26) of the hospitalized cases, and one pertussis-associated death was reported in a three-month-old, previously unvaccinated child from Southeastern Missouri. Five of the hospitalized cases under the age of one (who were age-eligible to begin the five-shot series) also had not received a single dose of pertussis-containing vaccine. Reported vaccination rates among all 2008 pertussis cases reflects considerable variability in coverage across different age groups.

State and local public health officials implemented several control measures in response to the high rate of pertussis infection in Missouri, including: 1) exclusion of infectious cases from school and other venues that would foster transmission; 2) recommending prophylaxis for close contacts of cases; and 3) using the public health information system to disseminate educational message about pertussis to at-risk populations. Public health officials alerted pregnant women, parents of school children, and others that pertussis was present in their community, and encouraged them to contact their physician if they contracted a cough illness. Information was also shared with health care providers about appropriate treatment and prophylaxis of cases and close contacts, with encouragement to vaccinate eligible persons via DHSS Health Advisories and Updates. The ultimate goal of these interventions is to protect the population most vulnerable to the severe effects of pertussis: infants.

Comparison to National Data: The pertussis incidence pattern reported in Missouri since 1999 mirrors the national trend for the same time period. The waxing and waning of pertussis incidence may be related to the cyclical nature of the disease (associated with the movement of susceptible persons in and out of geographically-defined populations).

Prior to the availability of vaccine, pertussis was a common disease among children and caused significant mortality. Before the availability of pertussis vaccine in the 1940s, more than 200,000 cases of pertussis were reported annually in the United States. Since the widespread use of vaccine began, incidence has decreased more than 80% compared with the prevaccine era. National pertussis case reports started to increase again around the end of this time period for reasons which are not clear. It is, however, worthy of mention that several countries have reported decreased pertussis incidence following the re-instatement of vaccination programs.

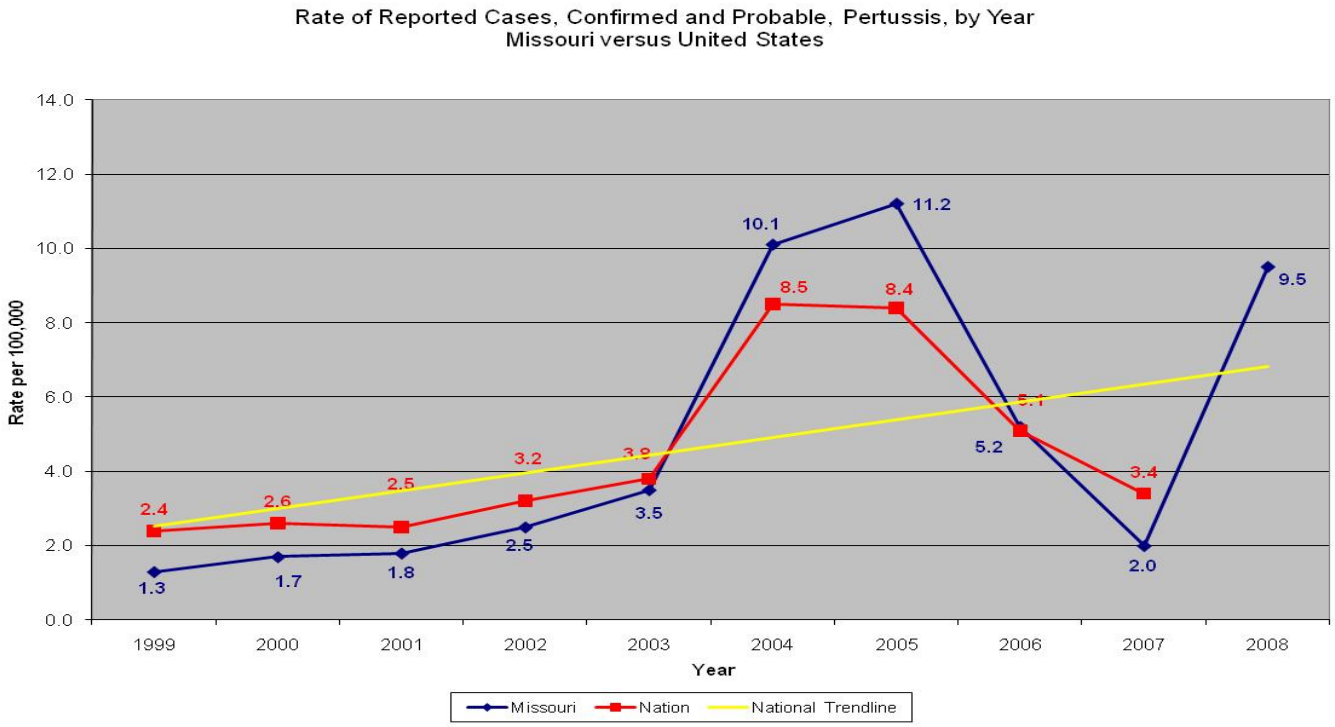
Section A - Communicable Disease Surveillance

Pertussis - Continued

Immunization is the single most effective tool in the public health arsenal for preventing this potentially life -threatening disease.

Health care providers should:

- Consider pertussis in the differential diagnosis of patients presenting with cough illness.
- Evaluate persons for eligibility for Tdap vaccination, and vaccinate as indicated.
- Educate people who have or may have close contact with infants about the importance of being up-to-date on pertussis immunization. Encourage parents to keep infants away from individuals with a cough illness.
- Immediately report known or suspected pertussis cases to the LPHA, or to DHSS at 800/392-0272.



Additional Website Resources

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Section A - Communicable Disease Surveillance

All Species Map
Wild Species Map
Domesticated Species Map
PEP Map

Rabies, Animal and Human
Rabies Post-Exposure Prophylaxis (PEP) Initiated

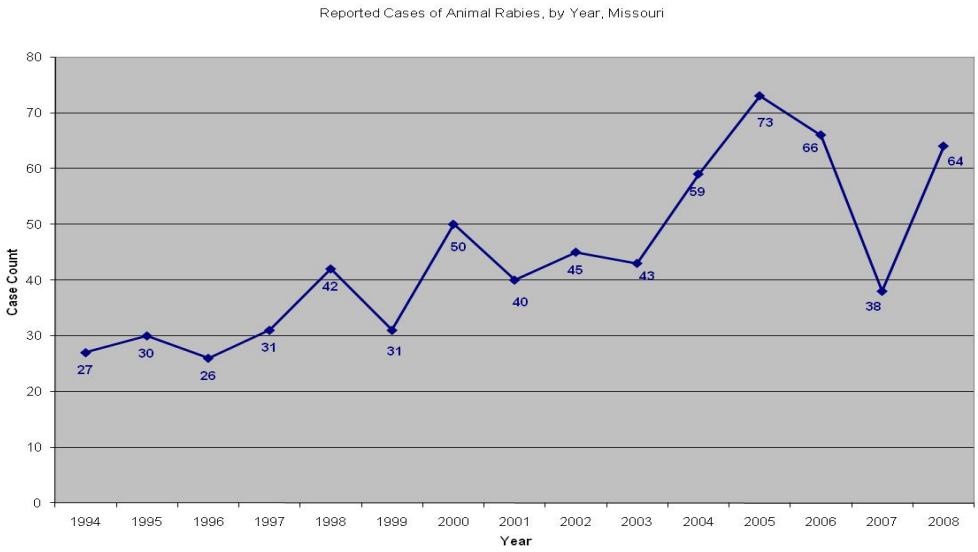
Rabies is a fatal viral illness that affects both animals and humans. Laboratory testing for rabies is useful for confirmation of the virus' presence in certain species and geographic locations, and for determination of the need to administer rabies prophylaxis in cases of human exposure to a potentially rabid animal. The only reliable method of testing animals for the presence of rabies virus is through laboratory analysis of brain tissue. Public health surveillance for this disease, in both the domestic and wild animal populations, is a valuable tool in the prevention of human rabies cases.

Table 1. - Animal Rabies, by Species, Missouri 2008

Species	Number Examined	Number Positive	Percent Positive
Bat	1,504	57	3.80%
Cat	646	0	0.00%
Cow	21	0	0.00%
Dog	673	0	0.00%
Fox	9	0	0.00%
Horse	21	1	4.80%
Other Domestic	13	0	0.00%
Other Wild	27	0	0.00%
Raccoon	134	0	0.00%
Rodent/Rabbit	80	0	0.00%
Skunk	32	6	18.80%
Total	**3,160**	**64**	**2.00%**

Rabies (Animal)

During 2008, 64 cases of animal rabies were detected in Missouri, compared to 38 cases the previous year, representing a 68% increase. Animals found to be rabid in Missouri during 2008 included: bats (57 cases); skunks (six cases); and horses (one case). The number of specimens tested in 2008 was 3,160, with 64 found positive, giving a positivity rate of 2.0%. In 2007, 38 of 3,036 submitted specimens tested positive, yielding a 1.3% positivity rate. The annual number of rabies cases during the preceding ten years (1998-2007) ranged from a low of 31 cases in 1999 to a high of 73 cases in 2005. The median number of cases per year during this time period was 44.



Although the number of cases detected in 2008 was substantially higher than the previous year, the 2008 incidence was still within the normal range of fluctuation for this disease. As with most diseases having wild animals as the reservoir, the number of rabies cases goes through a cycle of "troughs" and "peaks" over a period of several years. Peaks usually

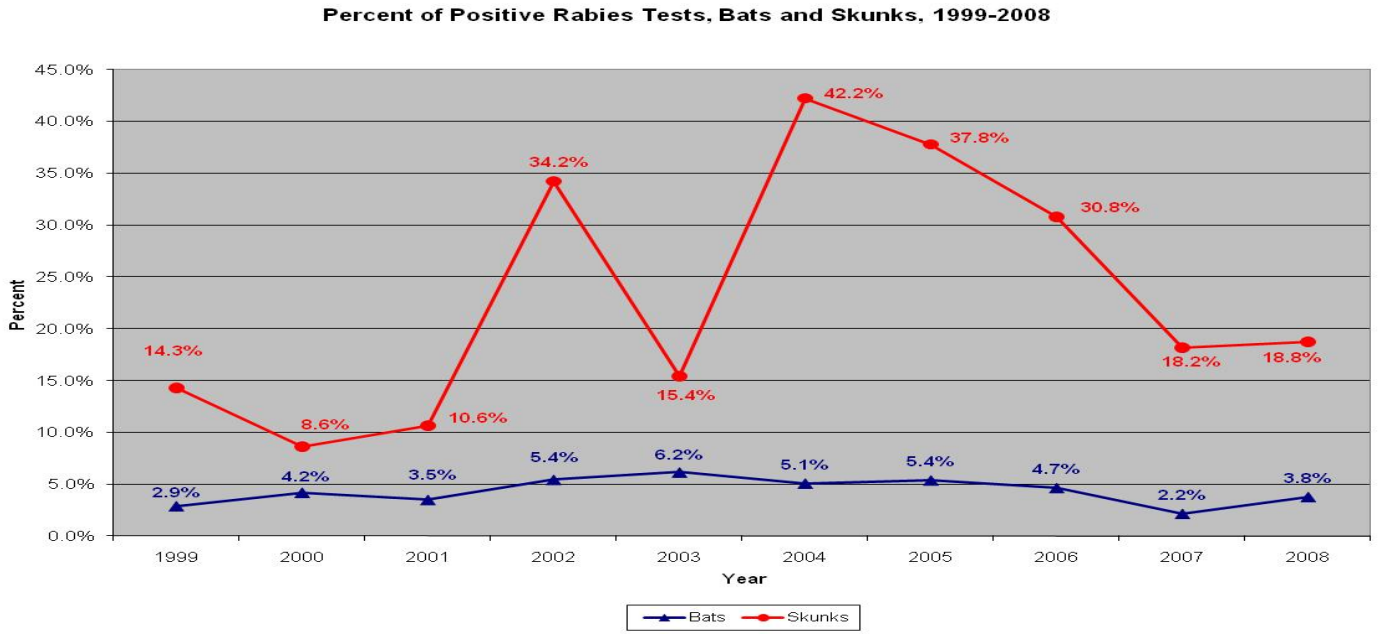
Section A - Communicable Disease Surveillance

Rabies, Animal and Human; Rabies Post-Exposure Prophylaxis (PEP) Initiated - Continued

correspond to the infection of large numbers of immunologically naïve animals that result when animal populations increase due to favorable environmental conditions, decreased human intervention (hunting, trapping, eradicating), and other factors. Troughs result as transmission rates decrease among rabies die-off survivors, which tend to have a wider degree of geographic dispersion and perhaps some level of immunity. Survivors eventually reproduce, providing a new population of vulnerable animals through which the rabies virus can spread and which results in the next peak of the cycle. As the number of rabid reservoir animals (bats and skunks) increases, so does the chance of "spill-over" into other species, both wild and domestic. Presumably, the percentage of animals that test positive for rabies increases as the natural incidence increases (and vice versa), but there is little predictive value to this relationship since the exact correlation cannot be determined with existing data.

The SPHL is the only facility in Missouri that tests animals for rabies. Wild and domestic animals are tested only when they have potentially exposed a person or pet, or in other situations with possible public health significance. In 2008, specimens were submitted in a representative fashion from all regions of the state (only six counties did not submit any specimens for testing). Rabies in bats occurs sporadically across Missouri. While rabid skunks can be found anywhere in the state, most cases are usually confined to roughly the southern one-half of Missouri. Both the north-central and south-central variants of the skunk rabies virus are found in rabid skunks in Missouri.

A county is placed under a "rabies alert" when a positive domestic animal is detected in that county, or when the threshold level for rabid wild animals is exceeded. Two counties were placed under alert in



Section A - Communicable Disease Surveillance

Rabies, Animal and Human; Rabies Post-Exposure Prophylaxis (PEP) Initiated - Continued

August of 2008 - Boone County due to an increase in the percentage of laboratory-positive bats and Cass County due to a rabid horse. Alerts routinely last for three months but can be extended if the threat of rabies continues at a heightened level. The rabies alert was not extended for either Boone or Cass County.

Rabies (Human)

A human death due to rabies was recorded in Missouri in 2008. This was the first human case reported in Missouri since 1959. The patient was a 55-year-old man who had been bitten by a bat 4- 6 weeks prior to the onset of symptoms. On November 19, the patient first developed itching on his left ear that spread to his left face and arm. On November 21, he began experiencing mild chest pain and was evaluated for acute myocardial infarction at a local emergency department (ED) with negative results. On November 22, the patient returned to the ED with panic attacks and anxiety associated with swallowing water. He reported that he had been bitten by a bat, on the left ear, 4 – 6 weeks earlier. He was treated with rabies PEP, consisting of rabies immune globulin and vaccine, administered a tetanus-diphtheria booster, and released. On November 23, the patient visited a second ED because of numbness of the left side of the face and difficulty in swallowing water. The patient informed the ED physician that he had been bitten by a bat and had begun rabies PEP the preceding day. The patient was released from this ED after being advised to seek medical attention if his symptoms progressed. Later that day, the patient returned to the first ED complaining of dehydration and exhibiting anxiety when offered fluids to drink. The following day, November 24, he was transferred to a tertiary care facility with rabies infection a high probability among several other differential diagnoses.

On November 24, serum, cerebrospinal fluid (CSF), nuchal skin biopsy, and saliva were collected and submitted to CDC for rabies testing. A diagnosis of rabies was confirmed on November 26 when positive results were obtained for serum, nuchal skin biopsy, and saliva specimens; CSF tests were negative. On November 25, treatment was initiated using the Milwaukee protocol, which included induction of coma and administration of the antiviral agent amantadine. [Note: The Milwaukee protocol is an experimental treatment for rabies that was first used in 2004 as therapy in a Wisconsin patient who recovered from the disease. Subsequent attempts to treat rabies patients have been unsuccessful in the United States; however, one patient in Equatorial Guinea who received this treatment reportedly recovered from rabies infection.] Despite attempts at treatment, the condition of the Missouri patient continued to deteriorate over the next five days. Given the patient's poor prognosis, the family elected to withdraw life support on November 30 and the patient died shortly thereafter.

The public health investigation showed that this death could have been prevented if the patient had immediately reported the bite to public health or medical authorities and received treatment. Around the middle to late October, the patient and his family had noticed a bat in the rafters of their front porch for several days before it flew into the home. The patient caught the bat and allowed it to crawl up his arm and neck, and it eventually bit him on the left earlobe. Knowing that bats can carry rabies, the man kept the bat

Section A - Communicable Disease Surveillance

Rabies, Animal and Human; Rabies Post-Exposure Prophylaxis (PEP) Initiated - Continued

in the house for two days, mistakenly believing this would serve as a "quarantine period." When the bat appeared to still be healthy at the end of that time, the patient released the bat to the outdoors instead of submitting for rabies testing. The patient did not seek medical evaluation until he was symptomatic, and he died 12 days later.

During the course of this investigation, five other individuals were identified who required rabies PEP. Four of these were family members and friends who might have been exposed to saliva from either the patient or the bat. The fifth was a physician who had examined the patient, including an oral examination, without the protection of gloves. The patient owned a dog and cat, which might have been bitten by the bat. The dog, which was current on its rabies vaccination, received a rabies booster and was placed under a 45-day home quarantine. The cat, which had never been vaccinated, was immunized and placed under a 6-month quarantine at a local veterinary facility. Neither the animals nor the human contacts who received rabies PEP developed any signs of rabies infection.

Human rabies is preventable if rabies PEP is instituted soon after an exposure. Once symptoms begin, rabies has no standard treatment and is nearly always fatal. One reason why the patient identified in this case might have underestimated the risk associated with the bat and did not seek medical care was that he was an avid outdoorsman and had kept many wild animals as pets throughout his life. Having apparently not contracted any disease from these animals, despite close association with them, could have resulted in a false sense of security following the bat bite. The two-day "quarantine" of the bat following the bite proved to be an unfortunate misjudgment regarding response to a bat bite. This case highlights the importance of raising public awareness of rabies, particularly the risk of rabies after bat and other wildlife exposures. Healthcare providers should maintain a high clinical suspicion for rabies in patients with a recent animal bite history and unexplained encephalitis, and should have an enhanced understanding of potential treatment modalities.

Rabies Post-Exposure Prophylaxis (Initiated)

"Rabies post-exposure prophylaxis (initiated)" (PEP), became a reportable condition on August 31, 2006. This condition was reported only nine times during the remainder of that year, while 159 and 259 reports were received in 2007 and 2008, respectively. CDC estimates that about 40,000 persons receive rabies PEP in the United States each year. Missourians no doubt account for a significant portion of these cases due to the endemnicity of rabies in wild animals in the state and the interaction of people and their pets with these animals. The expense of providing rabies PEP remains high, with an estimated average cost of $2,500 per patient.

Section A - Communicable Disease Surveillance

Rabies, Animal and Human; Rabies Post-Exposure Prophylaxis (PEP) Initiated - Continued

The following measures should be employed to help prevent rabies in the community:

- Ensure dogs, cats, and ferrets are vaccinated against rabies; vaccinations are also available for horses, cattle, and sheep.
- Keep pets under control; do not allow them to run loose.
- Avoid contact with stray pets and wild animals.
- Report stray pets to an animal control officer as well as wild animals that are acting strangely.
- If bitten by an animal, wash the wound with soap and water for 10 to 15 minutes and consult a physician to determine if rabies PEP, tetanus booster, and antibiotics are needed.
- Have pets spayed or neutered, since pets that are fixed are less likely to stray from home and produce unwanted litters.
- Pets should not be handled without gloves or other protection directly after they have been exposed to wildlife since they might have saliva on their fur from a rabies-infected animal.

Additional Website Resources

CDC Health Topics

CDIRM

Health District Defined

Section A - Communicable Disease Surveillance

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Rocky Mountain Spotted Fever

Rocky Mountain spotted fever (RMSF) is a zoonotic tick-borne disease caused by the bacteria *Rickettsia rickettsii*. It is characterized by an acute onset of fever, severe headache, muscle pain, nausea, vomiting, and lack of appetite. Later symptoms include rash, abdominal pain, joint pain, and diarrhea. Many patients will develop the characteristic red spotted (petechial) rash. The rash usually develops two to five days after the onset of fever and begins as small, non-itchy spots that are faint and pink in color. Most often this rash begins on the wrists, forearms and ankles and often spreads to the palms of the hand as well as the soles of the feet. However, up to one third of RMSF patients may never develop the rash. RMSF is one of the most severe and most frequently reported tick-borne rickettsial illnesses in both Missouri and the United States. The disease can be difficult to diagnose in the early stages and without prompt, appropriate treatment it can be fatal.

Table 1. RMSF—Comparative Statistics, by Socio-demographic Category, Missouri[1]

		Case Count 2008	% of Total	Rate per 100,000	5-Year Median	% Change from 5-Year Median
State of Missouri		407	100.00%	6.9	128	218.00%
Sex	Female	125	30.70%	4.2	57	119.30%
	Male	282	69.30%	9.8	63	347.60%
Race	Black	4	1.00%	0.6	1	300.00%
	Other	1	0.20%	0.8	0	N/A
	Unknown	45	11.10%	N/A	45	0.00%
	White	357	87.70%	7.1	78	357.70%
Age Group	00 to <01	0	0.00%	0	0	N/A
	01 to 04	4	1.00%	1.3	2	100.00%
	05 to 14	28	6.90%	3.6	8	250.00%
	15 to 24	23	5.70%	2.8	11	109.10%
	25 to 39	55	13.50%	4.7	23	139.10%
	40 to 64	185	45.50%	9.5	52	255.80%
	65 plus	112	27.50%	14.2	25	348.00%
District	Central	112	27.50%	17.3	15	646.70%
	Eastern	62	15.20%	2.8	8	675.00%
	Northwest	52	12.80%	3.4	19	173.70%
	Southeast	72	17.70%	15.6	10	620.00%
	Southwest	109	26.80%	10.8	63	73.00%
	State of Missouri	407	100.00%	6.9	128	218.00%

[1]Socio-demographics are missing for some cases.
*All rates are calculated per 100,000 using 2007 population estimates provided by MDHSS, Bureau of Health Informatics.
Data Source: Missouri Health Surveillance Information System.

Most zoonotic diseases require a biological vector, such as mosquitoes, ticks, fleas or mites to transmit the disease from an animal host to a human host. In RMSF, the tick serves as both the reservoir and the vector for the disease. Ticks transmit the pathogen primarily by their bite. Less commonly, infections may occur after exposure to crushed tick tissues, fluid, or tick feces.

In Missouri, the major ticks that harbor *Rickettsia rickettsii* are the American dog tick and the Rocky Mountain wood tick. Ticks become infected with *Rickettsia rickettsii* while feeding on blood from the host in either the larval, nymphal, or adult stage. Male ticks may also pass on the *Rickettsia rickettsii* to the female tick through body fluids or spermatozoa during mating. The female tick can then transmit the *Rickettsia rickettsii* to her eggs. Once a tick is infected it can carry the pathogen for life.

Section A - Communicable Disease Surveillance

Rocky Mountain Spotted Fever - Continued

The rickettsiae are transmitted to the host through the saliva while the tick is feeding. It usually takes several hours of attachment and feeding before the rickettsiae are transmitted to the host. The risk of exposure to a tick carrying *Rickettsia rickettsii* is relatively low since only 1% to 3% of the tick population carries the organism even in areas where cases of human RMSF are frequently reported.

In 2008, Missouri had 407 confirmed and probable cases of RMSF, which exceeded the combined number of reports for Missouri's other tick-borne diseases (ehrlichiosis, anaplasmosis, tularemia, and Lyme disease). This represents a statewide incidence rate of 6.9 per 100,000, which is nearly three times the median number of RMSF cases for the previous five-year period.

Comparison to National Data: Since 2003, Missouri's incidence rate of RMSF has risen sharply. Between 2003 and 2008, the rate per 100,000 increased from 0.9 to 6.9 which represents an increase of nearly 670% during that period. By comparison, the national rate per 100,000 for RMSF was 0.7 for 2007. This ongoing increase may be related to lifestyle changes or other environmental factors that increase individuals' exposure to ticks (such as increase in outdoor activities, travel to rural areas, and urbanization of tick habitats). In addition, there appears to be an increased awareness of tick-borne illness among physicians that may also contribute to the increased use of commercially available diagnostic tests, which have the ability to detect current or past infections.

Since there is no licensed vaccine available for the prevention of RMSF, limiting exposure to ticks is the most effective way to reduce the likelihood of RMSF infection. In persons exposed to tick-infested habitats, prompt careful inspection and removal of crawling or attached ticks is an important method of preventing disease.

RMSF is a seasonal disease and occurs throughout the United States during the months of April through September. Although the disease was first discovered and recognized in the Rocky Mountain area, relatively few cases are reported from that area today. The highest incidence rates for the disease have been found in Oklahoma, Arkansas, Missouri, North Carolina, and South Carolina.

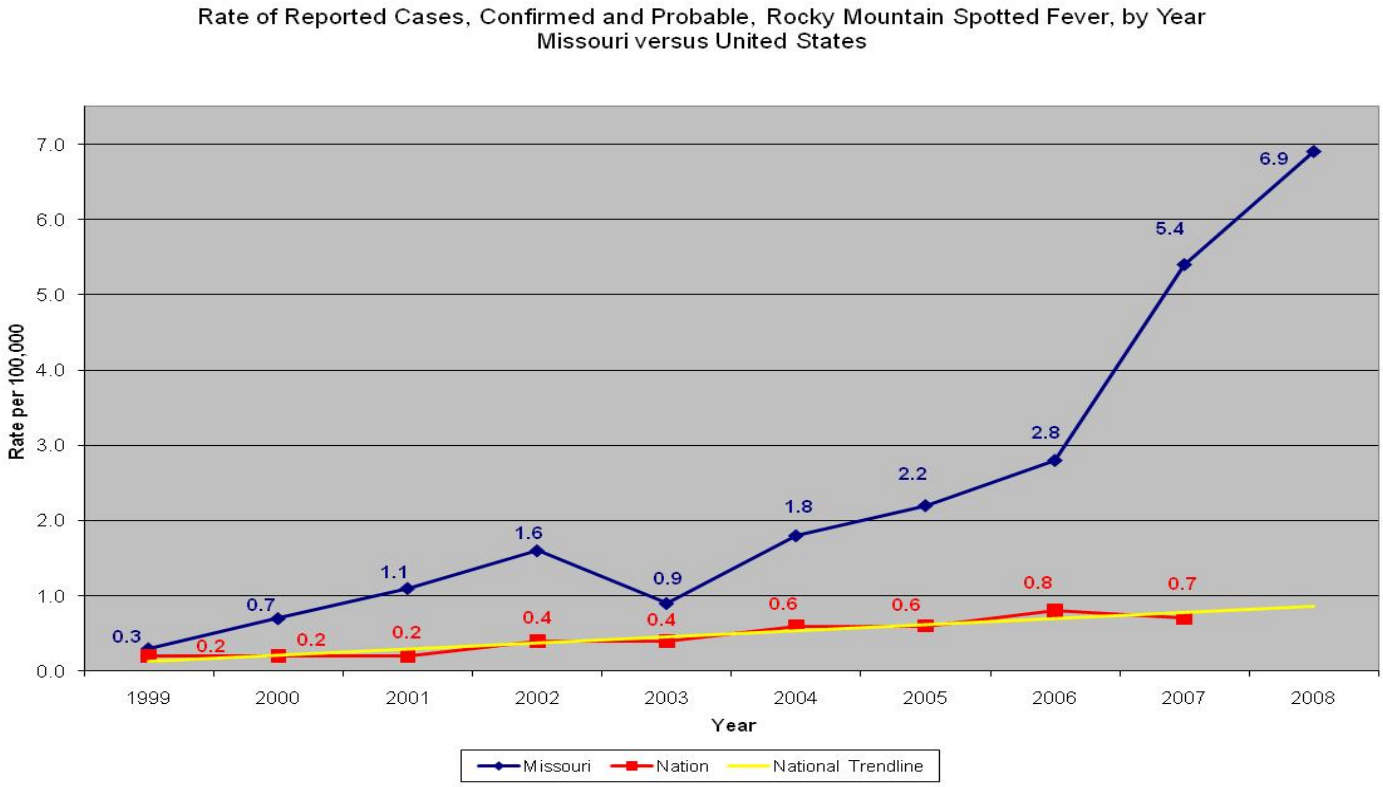
It is unreasonable to assume that a person can completely eliminate activities that may result in tick exposure. Therefore, prevention measures should emphasize personal protection when exposed to natural areas where ticks are present:

- Wear light-colored clothing which allows you to see ticks that are crawling on your clothing.
- Tuck your pants legs into your socks so that ticks cannot crawl up the inside of your pants legs.
- Apply repellents to discourage tick attachment. Repellents containing permethrin can be sprayed on boots and clothing, and will last for several days. Repellents containing DEET (n, n-diethyl-m-toluamide) can be applied to the skin, but will last only a few hours before reapplication is necessary. Use DEET with caution on children. Application of large amounts of DEET on children has been associated with adverse reactions.

Section A - Communicable Disease Surveillance

RMSF - Continued

- Conduct a body check upon return from potentially tick-infested areas by searching your entire body for ticks. Use a hand-held or full-length mirror to view all parts of your body. Remove any tick you find on your body.
- Parents should check their children for ticks, especially in the hair, when returning from potentially tick-infested areas. Ticks may also be carried into the household on clothing and pets, and attach later, so both should be examined carefully to exclude the ticks.



Section A - Communicable Disease Surveillance

Click to view maps

Salmonellosis

Salmonellosis is an infection with bacteria called *Salmonella*. The most common symptoms are sudden onset of headache, abdominal pain, diarrhea, nausea and sometimes vomiting. The illness usually lasts four to seven days. Fever is almost always present. Deaths are uncommon, except in infants, the elderly, and debilitated or immunosuppressed patients. Asymptomatic infection or mild illness is common.

Table 1. Salmonellosis - Comparative Statistics, by Socio-demographic Category, Missouri[1]

		Case Count 2008	% of Total	Rate per 100,000	5-Year Median	% Change from 5-Year Median
State of Missouri		764	100.00%	13	766	-0.30%
Sex	Female	401	52.50%	13.3	402	-0.20%
	Male	362	47.40%	12.6	362	0.00%
	Unknown	1	0.10%	N/A	3	-66.70%
Race	Black	43	5.60%	6.1	63	-31.70%
	Other	3	0.40%	2.3	5	-40.00%
	Unknown	277	36.30%	N/A	353	-21.50%
	White	441	57.70%	8.7	354	24.60%
Age Group	00 to <01	65	8.50%	79.4	67	-3.00%
	01 to 04	98	12.80%	31.5	108	-9.30%
	05 to 14	83	10.90%	10.7	114	-27.20%
	15 to 24	95	12.40%	11.7	89	6.70%
	25 to 39	140	18.30%	12	108	29.60%
	40 to 64	192	25.10%	9.9	195	-1.50%
	65 plus	90	11.80%	11.4	89	1.10%
	Unknown	1	0.10%	N/A	4	-75.00%
District	Central	100	13.10%	15.5	81	23.50%
	Eastern	281	36.80%	12.6	268	4.90%
	Northwest	164	21.50%	10.7	186	-11.80%
	Southeast	91	11.90%	19.7	99	-8.10%
	Southwest	128	16.80%	12.7	108	18.50%

[1]Socio-demographics are missing for some cases.
*All rates are calculated per 100,000 using 2007 population estimates provided by MDHSS, Bureau of Health Informatics.
Data Source: Missouri Health Surveillance Information System.

Missouri experienced a slight decrease in the number of Salmonellosis cases in 2008. Statewide there were 764 cases of Salmonellosis for the year, which was a 0.3% decrease in the number of cases as compared to the combined five-year median data from 2003-2007. The incidence rate for the year was 13.0 per 100,000 Missourians. Females account for 52.5% of the cases. The age group of less than one year of age report 79.4 cases per 100,000 population, followed by the age group of 1 – 4 with 31.5 cases per 100,000 population.

Missouri also reported two cases of *Salmonella* Typhi (Typhoid Fever) for 2008 for an incidence rate of 0.03 per 100,000 population. The two cases were 22 and 41 years of age. One of the cases was female and the other was male. Both cases reported foreign travel prior to onset of illness.

Salmonellosis is generally a food borne disease. Contaminated food, mainly of animal origin, is the most common vehicle of transmission. Food can be contaminated at its source, or by an infected food handler. The incubation period is generally six to 72 hours, commonly 12 to 36 hours, and has been as long as five to seven days. Person-to-person transmission can occur since the organism is shed in stool. Pets, especially chicks, ducklings and turtles, can also transmit *Salmonella*.

Section A - Communicable Disease Surveillance

Salmonellosis - Continued

Salmonella organisms can multiply in a variety of foods. Outbreaks have been traced to processed meat products, inadequately cooked poultry, raw (unpasteurized) milk, dairy products, water supplies and uncooked or lightly cooked products containing eggs. More recently, fresh produce has been implicated in outbreaks. Contaminated utensils and work surfaces can also spread Salmonellosis.

Since foods of animal origin may be contaminated with *Salmonella*, people should not eat raw or undercooked eggs, poultry or meat. Raw eggs may be unrecognized in some foods such as homemade hollandaise sauce, caesar and other homemade salad dressings, tiramisu, homemade ice cream, homemade mayonnaise, cookie dough and frostings. Poultry and meat, including hamburgers, should be well-cooked, not pink in the middle. Persons should not consume unpasteurized milk or other unpasteurized dairy products. Produce should be thoroughly washed prior to being consumed.

Cross-contamination of foods should be avoided. Uncooked meats should be kept separate from produce, cooked foods and ready-to-eat foods. Hands, cutting boards, counters, knives and other utensils should be washed thoroughly after handling uncooked foods. Hands should be washed before handling any food, between handling different food items and after all food preparation has been completed.

People should wash their hands after handling animals, pet toys, leashes, treats or feces. Since reptiles are particularly likely to have *Salmonella*, everyone should immediately wash their hands after handling reptiles. Baby chicks, ducklings and reptiles (including turtles) are not appropriate pets for small children and should not be in the same house as an infant.

Numerous serotypes of *Salmonella* cause illness in both animals and humans. The prevalence of these serotypes varies from place to place and at different times. The most common are *Salmonella* serotype Typhimurium and *Salmonella* serotype Enteritidis. Diagnosis is made through isolation of *Salmonella* organisms from cultures of stool or other specimens. Serotyping can be a very useful tool for recognition of an outbreak from a common source. The Department also utilizes pulsed-field gel electrophoresis (PFGE) to detect clusters and/or outbreaks, both in Missouri and nationwide.

Missouri reported one *Salmonella* outbreak for 2008. The outbreak occurred at a private gathering in August in which no source was identified.

The United States reported seven multi-state outbreaks of *Salmonella* infections during 2008. *S.* Litchfield (MOLI001) infections caused by contaminated cantaloupe; *S.* Saintpaul infections caused by contaminated tomatoes, jalapeños and serrano peppers; *S.* Typhimurium (0807PAJPX-2c) infections associated with exposure to turtles; *S.* Typhimurium (MO636 & MO639) infections associated with peanut butter and peanut products; and *S.* Poona (MOPO010), *S.* Agona (MOAG055) and *S.* Typhimurium (0810MLJPX-1c) infections, all with an unknown source.

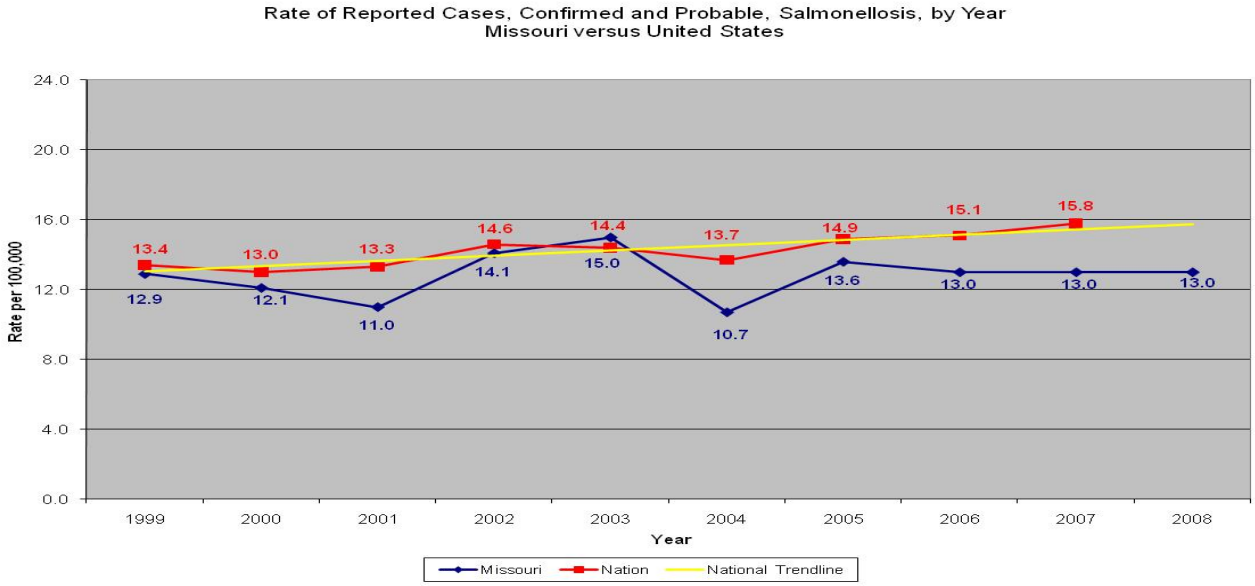
Section A - Communicable Disease Surveillance

Salmonellosis - Continued

Comparison to National Data: The annual rate of reported Salmonellosis in Missouri has shown a slight decrease for the past five years beginning in 2004. For each of these years, Missouri has been below the national rate. In 2007, the national rate per 100,000 population was 15.8 while the state had a rate of 13.0. While the national rate remains between 13.0 to 15.8 for the years 1999 to 2008. the Missouri rate varies from 10.7 to 15.0 for the same years.

Preventing *Salmonella*

- Cook poultry, ground beef, and eggs thoroughly. Do not eat or drink foods containing raw eggs, or raw (unpasteurized) milk.
- If you are served undercooked meat, poultry or eggs in a restaurant, do not hesitate to send it back to the kitchen for further cooking.
- Wash hands, kitchen work surfaces, and utensils with soap and water immediately after they have been in contact with raw meat or poultry.
- Be particularly careful with foods prepared for infants, the elderly, and the immunocompromised.
- Wash hands with soap after handling reptiles, birds, or baby chicks, and after contact with pet feces.
- Avoid direct or even indirect contact between reptiles (turtles, iguanas, other lizards, snakes) and infants or immunocompromised persons.
- Do not work with raw poultry or meat, and an infant (e.g., feed, change diaper) at the same time.
- Mother's milk is the safest food for young infants. Breastfeeding prevents salmonellosis and many other health problems.



Additional Website Resources

CDC Health Topics | CDIRM | Health District Defined

Section A - Communicable Disease Surveillance

Drug-resistant

<5 years

Streptococcus pneumoniae, drug resistant invasive disease and invasive in children less than five (5) years

Table 1. Strep Pneumoniae, Drug-Resistant Comparative Statistics, by Socio-demographic Category, Missouri[1]

		Case Count 2008	% of Total	Rate per 100,000	5-Year Median	% Change from 5-Year Median
State of Missouri		93	100.00%	1.6	37	151.40%
Sex	Female	53	57.00%	1.8	23	130.40%
	Male	40	43.00%	1.4	11	263.60%
Race	Black	20	21.50%	2.9	3	566.70%
	Unknown	27	29.00%	N/A	8	237.50%
	White	46	49.50%	0.9	23	100.00%
Age Group	00 to <01	1	1.10%	1.2	1	0.00%
	01 to 04	2	2.20%	0.6	1	100.00%
	05 to 14	2	2.20%	0.3	2	0.00%
	15 to 24	3	3.20%	0.4	0	N/A
	25 to 39	4	4.30%	0.3	4	0.00%
	40 to 64	34	36.60%	1.7	15	126.70%
	65 plus	47	50.50%	6	13	261.50%
District	Central	9	9.70%	1.4	7	28.60%
	Eastern	41	44.10%	1.8	10	310.00%
	Northwest	9	9.70%	0.6	7	28.60%
	Southeast	29	31.20%	6.3	4	625.00%
	Southwest	5	5.40%	0.5	3	66.70%

[1]Socio-demographics are missing for some cases.
*All rates are calculated per 100,000 using 2007 population estimates provided by MDHSS, Bureau of Health Informatics.
Data Source: Missouri Health Surveillance Information System.

Streptococcus pneumoniae or "pneumococci" are ubiquitous bacteria that are often carried transiently in the upper respiratory tract. Transmission of these organisms is from person to person by respiratory droplet contact. Viral upper respiratory infections, including influenza, can predispose to pneumococcal infections. These infections are most prevalent during winter months. Rates of infection are highest in infants, young children, elderly people, and black, Alaska Native, and some American Indian populations. When pneumococci get into sterile body sites and cause disease the infections are known as invasive. Invasive Streptococcal pneumoniae can cause many conditions, such as bacteremia, endocarditis, pneumonia, osteomyelitis, and meningitis. The incubation period varies by the type of infection and can be as short as 1 to 3 days. Traditionally, these organisms have been fairly susceptible to antibiotics such as penicillin however, due to the overuse and misuse of these drugs antibiotic resistance has become a real problem. Before the use of heptavalent pneumococcal vaccine (PCV7) Streptococcus pneumonia was the most common cause of invasive bacterial infections in children and more than 40% of isolates from sterile body sites were non-susceptible to penicillin G. The use of this vaccine however, has reduced the overall incidence of invasive disease caused by these resistant strains. Never the less, invasive disease caused by nonvaccine serotypes has increased since 2002.

In 2004 invasive Streptococcus pneumonia in children less than five years of age became a reportable disease in Missouri. Statewide in 2008 there were 41 cases reported. The overall incidence rate was 0.7 per 100,000. In looking specifically at invasive drug-resistant S. pneumonia there were a total of 93 cases reported in Missouri for a rate of 1.6 per 100,000.

Section A - Communicable Disease Surveillance

Strep Pneumoniae - Continued

Comparison to National Data: Due to differences in methods of reporting in various states, data reported to the national level do not enable accurate assessment of pneumococcal disease burden or evaluation of immunization program impact. However, with a new 13-valent pneumococcal conjugate vaccine being licensed and with recent changes made in national disease reporting systems this data will be able to assist in determining the effectiveness of this new vaccine on lowering the overall burden of invasive pneumococcal disease and invasive drug-resistant pneumococcal disease in children under five years of age in future years. Also, a new method of PCR-based serotyping is now available for use by state public health laboratories. Adopting these methods will provide an opportunity for state health departments to specifically track changes in serotypes targeted by the conjugate vaccine and will enhance surveillance systems for vaccine preventable invasive pneumococcal disease.

Table 2. Strep Pneumoniae, Invasive in children less than five (5) years, Comparative Statistics, by Socio-demographic Category, Missouri[1]

		Case Count 2008	% of Ttotal	Rate per 100,000	5-Year Median	% Change from 5-Year Median
State of Missouri		41	100.00%	0.7	16	156.30%
Sex	Female	13	31.70%	0.4	6	116.70%
	Male	28	68.30%	1	8	250.00%
Race	Black	9	22.00%	1.3	3	200.00%
	Other	1	2.40%	0.8	0	N/A
	Unknown	8	19.50%	N/A	2	300.00%
	White	23	56.10%	0.5	10	130.00%
Age Group	00 to <01	15	36.60%	18.3	5	200.00%
	01 to 04	25	61.00%	8	9	177.80%
	05 to 14	1	2.40%	0.1	0	N/A
	15 to 24	0	0.00%	0	0	N/A
	25 to 39	0	0.00%	0	0	N/A
	40 to 64	0	0.00%	0	0	N/A
	65 plus	0	0.00%	0	1	-100.00%
District	Central	5	12.20%	0.8	3	66.70%
	Eastern	19	46.30%	0.9	4	375.00%
	Northwest	9	22.00%	0.6	8	12.50%
	Southeast	5	12.20%	1.1	0	N/A
	Southwest	3	7.30%	0.3	0	N/A

[1]Socio-demographics are missing for some cases.
*All rates are calculated per 100,000 using 2007 population estimates provided by MDHSS, Bureau of Health Informatics.
Data Source: Missouri Health Surveillance Information System.

Section A - Communicable Disease Surveillance

TB Map
LTBI Map

Tuberculosis and LTBI

Tuberculosis (TB) is a disease caused by a bacterium called *Mycobacterium tuberculosis* that is spread from person to person through the air. TB usually affects the lungs, but it can also affect other parts of the body, such as the brain, the kidneys, or the spine. When a person with infectious TB disease coughs, sneezes, speaks or sings droplets nuclei containing *M. tuberculosis* are expelled into the air. If another person inhales air containing these droplet nuclei, that person may become infected. However, not everyone infected with TB bacteria becomes sick. As a result, two TB-related conditions exist: latent TB infection (LTBI) and TB disease.

Table 1. Tuberculosis
Comparative Statistics by Socio-demographic Category, Missouri 2008[1]

		Case Count 2008	% of Total	Rate per 100,000	5-Year Median	% Change from 5-Year Median
State of Missouri		107	100.00%	1.8	118	-9.30%
Sex	Female	46	43.00%	1.5	42	9.50%
	Male	61	57.00%	2.1	70	-12.90%
Race	Black	36	33.60%	5.1	39	-7.70%
	Other	22	20.60%	16.7	17	29.40%
	White	49	45.80%	1	60	-18.30%
Age Group	00 to <01	1	0.90%	1.2	0	N/A
	01 to 04	2	1.90%	0.6	2	0.00%
	05 to 14	0	0.00%	0	2	-100.00%
	15 to 24	14	13.10%	1.7	12	16.70%
	25 to 39	34	31.80%	2.9	24	41.70%
	40 to 64	29	27.10%	1.5	40	-27.50%
	65 plus	27	25.20%	3.4	30	-10.00%
District	Central	12	11.20%	1.9	6	100.00%
	Eastern	49	45.80%	2.2	46	6.50%
	Northwest	30	28.00%	2	35	-14.30%
	Southeast	8	7.50%	1.7	9	-11.10%
	Southwest	8	7.50%	0.8	18	-55.60%

[1]Socio-demographics are missing for some cases.
*All rates are calculated per 100,000 using 2007 population estimates provided by MDHSS, Bureau of Health Informatics.
Data Source: Missouri Health Surveillance Information System.

People who become infected with TB usually have had very close, day-to-day contact with someone who has TB disease (e.g. a family member, friend, or close co-worker). You are not likely to get infected from someone coughing in line at a supermarket or restaurant. Dishes do not spread TB, nor drinking glasses, sheets, or clothing. Persons with LTBI do not feel sick and do not have any symptoms. They are infected with *M. tuberculosis*, but do not have TB disease. The only sign of LTBI is a positive reaction to the tuberculin skin test or special TB blood test. Persons with latent TB infection are not infectious and cannot spread TB infection to others.

Overall, about 5 to 10% of infected persons will develop TB disease at some time in their lives. About half of the people who develop TB disease will do so within the first two years of infection. For persons whose immune systems are weak, especially those with HIV infection, the risk of developing TB disease is considerably higher than for persons with normal immune systems. Missouri is one of several states that also require reporting of LTBI. Missouri had 3,573 reported cases of LTBI in 2008.

Section A - Communicable Disease Surveillance

Tuberculosis and LTBI - Continued

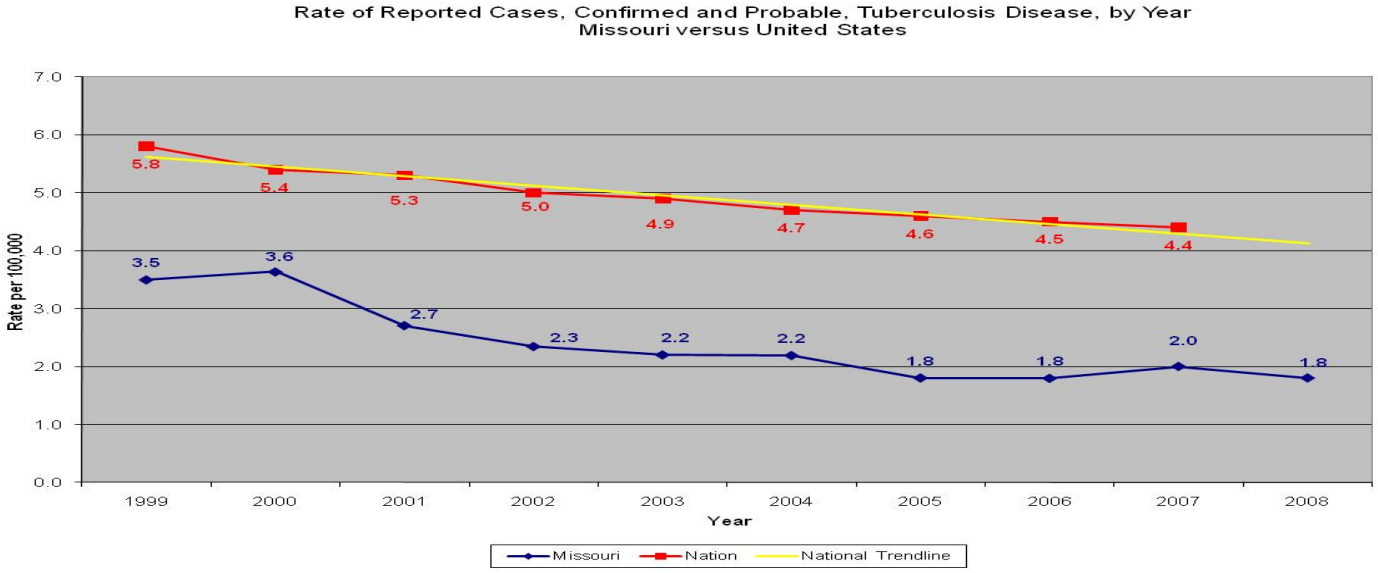
In some people, TB bacteria overcome the defenses of the immune system and begin to multiply, resulting in the progression from LTBI to TB disease. Some people develop TB disease soon after infection, while others develop TB disease later when their immune system becomes weak.

The general symptoms of untreated pulmonary TB disease include; unexplained weight loss, loss of appetite, night sweats, fever, fatigue, and chills. The symptoms of TB of the lungs include; coughing for three weeks or longer, hemoptysis (coughing up blood), and chest pain. Other symptoms depend on the part of the body that is affected.

Persons with TB disease are considered infectious and may spread TB bacteria to others. If TB disease is suspected, persons should be referred for a complete medical evaluation. If it is determined that a person has TB disease, therapy is given to treat it. TB disease is a serious condition and can lead to death if not treated.

Missouri had 107 cases of TB disease reported in 2008. This represents a statewide incidence rate of 1.8 per 100,000 population. In 2008, 12,906 TB disease cases were reported in the United States representing a national incidence rate of 4.2 cases per 100,000 population. Missouri is a low-incidence TB disease state ranked 39th in the nation (or 38 states had a greater incidence of TB disease reported than Missouri in 2008).

The three metro areas of the state reported 61% of the cases of TB disease in Missouri in 2008. St Louis County reported a total of 29% of the cases with St Louis City reporting 15% and Kansas City Reporting 17% of the cases. Seventy-six cases or 72% of the TB disease cases in 2008 were pulmonary cases with



Section A - Communicable Disease Surveillance

Tuberculosis and LTBI - Continued

be both pulmonary and extra pulmonary cases of tuberculosis. Individuals 40 years of age, and older, represented 52% of the TB cases in Missouri during 2008. The rate of individuals born outside of the United States who were diagnosed with TB while residing in Missouri continues to comprise a significant portion of the TB cases in Missouri. In 2008, 57% of all TB cases were individuals who were born outside of the United States. This is an increase of 21% from 2007.

Table 1. LTBI Comparative Statistics by Health Districts, Missouri[1]

	Case Count 2008	% of Total	Rate per 100,000	5-Year Median	% Change from 5-Year Median
Central	387	10.80%	59.8	502	-22.90%
Eastern	1,061	29.70%	47.6	1,438	-26.20%
Institutionalized	136	3.80%	447.1	355	-61.70%
Northwest	1,118	31.30%	73	1,036	7.90%
Southeast	146	4.10%	31.7	160	-8.80%
Southwest	725	20.30%	71.9	423	71.40%
State of Missouri	3,573	100.00%	60.8	3,886	-8.10%

[1]Socio-demographics are missing for some cases.
*All rates are calculated per 100,000 using 2007 population estimates provided by MDHSS, Bureau of Health Informatics.
Data Source: Missouri Health Surveillance Information System.

Ninety-nine percent of the TB disease cases in Missouri (excluding those who were diagnosed at death and those who died during treatment) completed the full treatment regimen for the disease while one case was lost to follow-up because of returning to their country of residence. This represents a three percent increase from 2007. Missouri experienced a slight decrease in preventable TB disease cases from 37.3% reported in 2007 to 34% reported in 2008. In Missouri four people died with tuberculosis in 2008, one at diagnosis and three before the completion of therapy.

Persons at greatest risk for exposure to TB would be: close contacts of a person with known/suspected TB, foreign born from areas where TB is common, resident or employee of high-risk congregate settings such as jails, prisons, homeless shelters and nursing homes, and health care workers. Persons at higher risk for developing disease once infected include: HIV-positive persons, medically underserved and persons with certain medical conditions.

Even though the State TB Program, in partnership with Missouri's LPHA's, has been successful in decreasing the occurrence of TB disease in Missouri, we have several challenges ahead: multi-resistant TB, dealing with non-compliant TB cases, successful treatment of LTBI cases, etc.

Tuberculosis is one of the world's deadliest diseases:

- One third of the world's population is infected with tuberculosis.
- Each year, over nine million people around the world become sick with TB.
- Each year, there are almost two million TB-related deaths worldwide.
- TB is a leading killer of people who are HIV infected.

Section A - Communicable Disease Surveillance

Tuberculosis and LTBI - Continued

Effective treatment is available for both TB disease and LTBI. It is important to remember that persons with LTBI may develop TB disease in the future. Persons with LTBI are often prescribed treatment to prevent them from developing TB disease. Usually, only one drug is needed to treat latent TB infection. Many health care providers have concerns about treating patients for LTBI. These concerns are generally related to the length of treatment, generally nine months, and the potential side effects of isoniazid (INH). As with any treatment, the physician must weigh the risks and benefits for each individual.

TB disease can be treated by taking several drugs for 6 to 12 months. It is very important that people who have TB disease finish their treatment regimen, and take the medication exactly as prescribed. If they stop taking the drugs too soon, they can become sick again; also, if they do not take the drugs correctly, the bacterium that are still alive may become resistant to those medications. TB that is drug-resistant is harder and more expensive to treat. Persons with pulmonary TB disease, not appropriately treated, can still be infectious to others.

Additional Website Resources

CDC Health Topics

CDIRM

Health District Defined

Glossary

Agent (of Disease) - A factor (e.g. virus, bacterium , parasite, chemical, or radiation) whose presence, excessive presence, or absence of, is essential for the occurrence of disease.

Bioterrorism - The intentional use of chemical, biological, or radiological agents as weapons during acts of violence or intimidation.

Case - A person or animal identified as having a particular disease.

Confirmed Case - Surveillance definition, a case usually with positive laboratory results for the disease, generally associated with signs and symptoms of the disease.

Probable Case - Surveillance definition, a case usually with a clinically compatible illness that is epidemiologically linked to a confirmed case.

CD - Communicable Disease (or Infectious Disease) - diseases caused by biological agents such as a virus, bacterium or parasite.

Communicable - Able to spread disease from one person or species to another, either directly or indirectly; contagious.

Disseminated intravascular coagulopathy - Bleeding into the skin.

ELC - Epidemiology and Laboratory Capacity for Infectious Diseases Grant.

Endemnicity - Amount or severity of a disease in a particular geographic area.

Epidemiology - The study of how and why diseases and other conditions are distributed within the population the way they are.

Epidemiologist - An investigator who studies the occurrence of disease or other health-related conditions or events in defined populations.

Fecal-oral - The transmission of an infectious agent by ingestion of feces.

Five-year Median - A data set which includes five consecutive year data totals where half of the elements have a larger value and half of the elements have a lesser value. The median can be thought of as the “middle” of the data.

Glossary

Incidence - The number of new cases of a disease occurring in a population during a defined time period.

Incidence Rate - The rate at which new events occur in a population. For examples of the calculations, see page 59.

Incubation period - The time between exposure to an infectious agent and appearance of the first sign or symptom of the disease.

Leukopenia - Abnormal decrease of white blood cells usually below $5000/mm^3$.

Malaise - A subjective sense of discomfort, weakness, fatigue, or feeling rundown that may occur alone or accompany other symptoms and illnesses.

Mean - Commonly called average, is defined as the sum of the observations divided by the number of observations. For examples of the calculations, see page 59.

Median - The point in a data set where half of the elements have a larger value and half of the elements have a lesser value. The median can be thought of as the "middle" of the data. For examples of the calculations, see page 59.

Morbidity - Having disease, or the proportion of persons in a community with the disease.

Mortality - Refers to death.

Myalgia - Tenderness or pain in the muscles; muscular rheumatism.

Neonate - A newborn infant up to one month of age.

Outbreak - The occurrence of illness(es) similar in nature and clearly in excess of normal expectancy.

Pandemic - An outbreak occurring over a wide geographic area; widespread.

Pathogen - An organism capable of causing disease.

Pathogenic - Capable of causing disease.

PCR - Polymerase Chain Reaction. A laboratory procedure used to identify pathogens through amplification of genetic material.

PFGE - Pulse Field Gel Electrophoresis. A laboratory procedure of bacterial strain typing.

Glossary

Prevalence - The total number of cases of a disease existing in a given area at any given time.

Preventable TB case:
- A person with a previous positive TB skin test who is a candidate for treatment and not offered treatment;
- A person with a risk factor for TB who is never offered a TB skin test; and/or
- A secondary case to a preventable case.

Quartile - Any of three values which divide the sorted data set into four equal parts, so that each part represents 1/4 of the sample or population.

Recreational Water - Swimming pools, hot tubs, water parks, water play areas, interactive fountains, lakes, rivers, creeks or oceans.

Risk Factors - The presence of any particular factor known to be associated with health related conditions considered important to prevent.

Sequela: A condition following and resulting from a disease.

Serotype - To distinguish organisms on the basis of their constituent antigen(s).

Surveillance (of disease) - An ongoing mechanism to collect, analyze, interpret and distribute information.

Tdap - Tetanus, diphtheria and pertussis vaccine.

Trend - Shows movement consistently in the same direction over a long time.

Thrombocytopenia - An abnormal decrease in the number of platelets.

Vaccine - A suspension of attenuated live or killed microorganisms or fractions thereof, administered to induce immunity and thereby prevent infectious disease.

Vector - A carrier, usually an insect or other arthropod.

Statistical Calculations

Examples of Central Tendency Calculation

Mean

Calculate the **mean** by adding all of the values and dividing the sum by the number of observed values (in this case 11).

55 + 12 + 60 + 46 + 85 + 27 + 39 + 94 + 73 + 5 + 60 = **556**

556 / 11 = **50.54545455**

The **mean** for this data set is **50.5** (result is rounded).

Median

The **median** is the element that falls in the middle of the ordered set. Rank the values from least to most:

39, 60, 73, 85, 55, 27, 12, 94, 60, 46, 5

In this example the **median** is the sixth element in the set, which is **55**.

5, 12, 27, 39, 46, **55**, 60, 60, 73, 85, 94

Example of a Measure of Frequency Calculation

Incidence rates are calculated with the following equation:

(X divided by Y) multiplied by K

Where:
X is the number of cases for a specified time period
Y is the population (possibly exposed) for the same time period
K is a constant (often 1000 or 100,000) that transforms the result into a uniform quantity allowing comparison with other similar quantities.

Example: The Southwest Region has 86 cases of Hepatitis A in 1993, compared to 63 cases in the Central Region for that year. The 1993 population for the Southwest Region is 694,712, while the population for the Central Region is 621,740.

Southwest Region: **(86 / 694,712) * 100,000 = 12.4**
Central Region: **(63 / 621,740) * 100,000 = 10.1**

A comparison of the two incidence rates shows that in 1993 Southwest Region has a slightly higher incidence of Hepatitis A (12.4 reported cases per 100,000 population) than the Central Region (10.1 reported cases per 100,000 population).