Acquired Immunodeficiency Syndrome (AIDS)

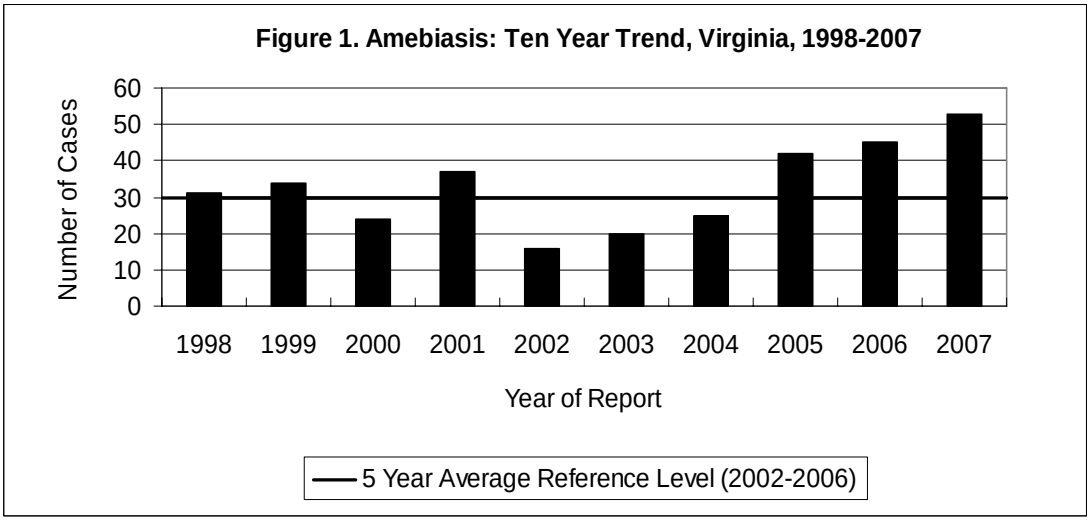
See Human Immunodeficiency Virus (HIV)

Amebiasis

Agent: *Entameoba histolytica* (parasite)
Mode of Transmission: Ingestion of food contaminated with amebic cysts or by direct contact with fecal material from infected animals or people.
Signs/Symptoms: Most infections are asymptomatic. Symptomatic infections include diarrhea, which may become severe, bloody or contain mucus; lower abdominal pain; straining to pass stool or urine; weight loss; fever; chills; and constipation. Symptoms may become chronic.
Prevention: Careful hand hygiene after each toilet visit and before preparing and eating food.
Other Important Information: Invasive amebiasis is mostly a disease of young adults and children under two years of age.

There were 53 cases of amebiasis reported in Virginia during 2007. This is an 18% increase over the 45 cases reported in 2006 and a 79% increase from the five year average of 29.6 cases per year. This is the fifth consecutive annual increase in reported cases since 2002 (Figure 1).

Figure 1. Amebiasis: Ten Year Trend, Virginia, 1998-2007



The 20-29 year age group had the highest incidence rate (1.1 per 100,000), followed closely by the 40-49 year age group (1.0 per 100,000 population). No cases occurred in infants. Information on race was missing for 41% of the reported cases. Among cases with a reported race, the "other" race population had the highest incidence (1.4 per 100,000), while the black population had a higher incidence rate than the white population (0.9 and 0.2 per 100,000, respectively). The incidence rate for males (1.0 per

100,000) was more than twice the rate for females (0.4 per 100,000). The highest number of cases occurred in the northern region (18 cases, 0.9 per 100,000), while the northwest region had the highest incidence rate (16 cases, 1.4 per 100,000). The other regions had incidence rates of 0.2 to 0.8 per 100,000.

Anthrax

Agent: *Bacillus anthracis* (spore forming bacteria)
Mode of Transmission: Through direct contact with contaminated animal products; ingestion of contaminated, undercooked meat; and inhalation of spores during risky industrial practices (e.g., processing wool or hides) or through an intentional bioterrorism release.
Signs/Symptoms: Exposure through direct contact presents as a lesion that often develops a black scab. Symptoms of abdominal distress (nausea, vomiting, diarrhea, fever) are present in intestinal anthrax. Symptoms of inhalation anthrax are initially nonspecific (fever, cough, chest pain) but will lead to respiratory distress and death if untreated.
Prevention: Minimize contact with infected animals and animal products. A vaccine is available to immunize high-risk individuals.
Other Important Information: Person-to-person transmission is very rare. The period of time from exposure to onset of symptoms ranges from 1 to 60 days. Anthrax is classified as a potential bio-weapon because it can cause serious public health problems, be spread across a large area, and require a great deal of planning to protect the public's health.

No cases of anthrax were reported in Virginia during 2007. In 2001, two Virginia residents were reported with inhalation anthrax due to an intentional release of *Bacillus anthracis* spores through the U.S. Postal Service. Both individuals were exposed at their workplace and both survived. These were the first reported cases of anthrax in Virginia since 1970.

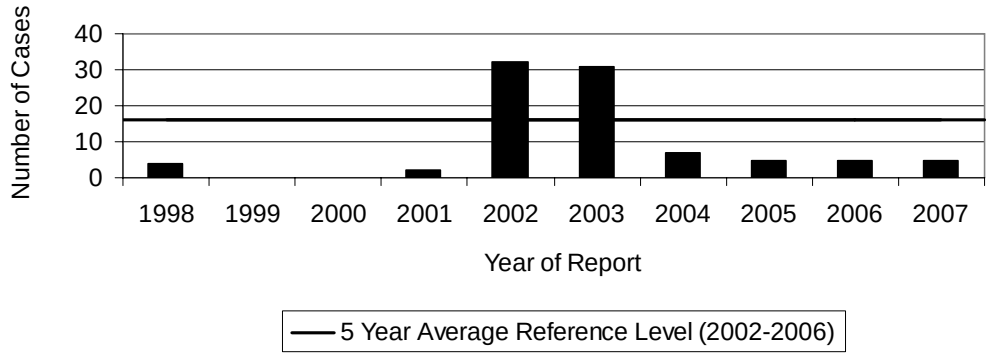
Arboviral Infection

Agent(s): In Virginia, the most common endemic mosquito-borne agents of arboviral infection are West Nile virus (WNV), LaCrosse encephalitis (LAC) virus, Eastern equine encephalitis (EEE) virus, and St. Louis encephalitis (SLE) virus.
Mode of Transmission**:** Most commonly transmitted by the bite of an infected mosquito. West Nile virus may also be transmitted by blood transfusion or transplanted organs from infected donors, by cuts or punctures with contaminated scalpels or needles and, more rarely, by inhalation or ingestion of dust or particles from infected bird feces.
Signs/Symptoms: Range from no symptoms to death, depending on the particular virus and characteristics of the infected person. More severe disease can cause encephalitis (inflammation of the brain) or meningitis (inflammation of the lining of the brain and spinal cord) and may lead to death.
Prevention: Avoid being bitten by mosquitoes. Avoid areas infested by mosquitoes and when in those areas, use mosquito repellents and wear long-sleeved, loose fitting, light-

colored clothing (mosquitoes are not attracted to light colors). Maintain screens on all open windows and doors. Around your home, eliminate or dump all containers that could hold water and breed mosquitoes.

Other Important Information: WNV infections are more likely to cause severe disease in older persons, but the majority of infections result in no symptoms. LAC is seen primarily in individuals less than 16 years of age. EEE is more likely to affect children and older people and has a high death rate. All age groups are equally at risk for developing SLE.

Figure 2. Human Arboviral Infection: Ten Year Trend, Virginia, 1998-2007

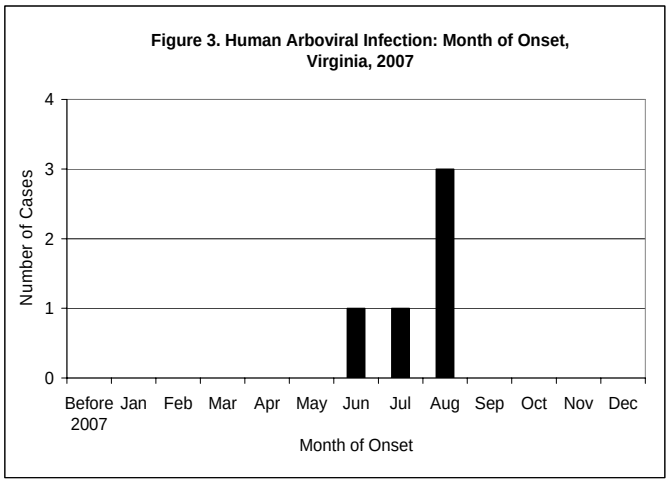


Human

Five cases of human arboviral infection were reported in 2007. This is similar to the five cases reported in 2006 and 2005, and the seven cases reported in 2004, but 84% less than the 31 cases reported in 2003 (Figure 2). The elevated levels in 2002 and 2003 were largely attributable to the emergence of WNV in Virginia. Since that time WNV has been the most common cause of arboviral infections in Virginia. All five of the recorded arboviral infections in 2007 were due to WNV infection, but two of the 2007 infections were imported to Virginia from states in the western U.S. where human infections with WNV are relatively common. Virginia's 2007 human WNV cases all occurred in residents of northern Virginia. Levels of WNV activity were much higher in the tested mosquito pools monitored by mosquito surveillance programs in northern Virginia localities. Of the 781 WNV positive mosquito pools identified during 2007, 81% of the pools were located in northern Virginia. Bridge-vector species may have contributed to the human WNV cases. An unusually large number of the bridge-vector mosquito species (Asian tiger mosquitoes, and *Aedes vexans*) tested positive for WNV. For unknown reasons, these bridge-vector species may have had larger populations in northern Virginia than in other parts of the state. Their infection with WNV coincided with, and may have been enabled by, periods of hot weather in northern areas of the state.

Three of the five WNV infections in 2007 occurred in persons age 50 and older, as is typical for WNV infections. All the WNV infections were seen in the white population,

and all of the patients were male. Four of the five WNV infections had onset dates in the third quarter, and one infection had an onset in the second quarter (Figure 3). WNV infections typically increase during mid to late summer months and early fall when the mosquito population may reach its highest levels of infection.



Although LAC is the second most common cause of arboviral infections in Virginia, no cases were detected in 2007. The last reported cases occurred in 2005 when there were four human LAC infections. There is no known reason for the apparent decline of LAC activity in 2006 and 2007. Cases of SLE and EEE are relatively rare in Virginia.

Animal

Zoonotic surveillance for WNV and EEE is conducted each year using mosquitoes, sentinel chickens, and horses. During 2007, over 344,336 mosquitoes were tested for WNV. Mosquitoes were tested as "pools" (batches of up to 50 mosquitoes), and of the 10,588 pools tested for WNV, 781 pools (7.3%) were positive (i.e., contained at least one WNV positive mosquito). Of the 101,388 mosquitoes (2,417 pools) tested for EEE, only 20 pools (0.8%) were positive. In 2007, one horse was found to have WNV infection and three were found to have died from EEE. Sentinel chickens in a total of 35 flocks were tested by serology every other week from May to October. Of the approximately 120 sentinel chickens tested through the season, one was positive for WNV and 19 chickens (in 11 flocks) were positive for EEE.

Botulism

Agent: Neurotoxin produced by the spore forming organism *Clostridium botulinum* (bacteria)
Mode of Transmission: Foodborne botulism occurs when *Clostridium botulinum* is allowed to grow and produce toxin in food which is then eaten without sufficient heating to inactivate the toxin. In intestinal (infant) botulism, ingested spores germinate, multiply and produce toxin in the intestine.
Signs/Symptoms: Foodborne symptoms include fatigue, weakness, vertigo, and sometimes diarrhea and vomiting. Descending, flaccid paralysis can also occur, which may lead to cessation of breathing and death unless respiration is aided. Intestinal botulism cases show weakness, loss of appetite, an altered cry and loss of head control.
Prevention: All canned and preserved food should be properly processed and prepared. Boiling food for 10 minutes will destroy the toxin, but much higher temperatures are

required to kill the spores. Honey and corn syrup should not be given to children younger than 12 months of age.
Other Important Information: The case-fatality rate is 5%-10%. Botulism is listed by the CDC as a potential bio-weapon because an aerosolized or foodborne botulinum-toxin weapon could cause severe disease and would require swift public health action to control.

Foodborne

One case of foodborne botulism was reported in Virginia during 2007. The reported case occurred in an adult Asian female from the southwest region. The individual died as a result of this condition. The last reported case in Virginia was in 2002. It occurred in an infant but was determined to be foodborne botulism, not intestinal (infant) botulism, because *Clostridium botulinum* toxin type A was found in home-canned baby food and not found in a stool specimen.

Intestinal (Infant)

No cases of intestinal botulism were reported in Virginia during 2007. The annual average for the preceding five years is 1.6 cases.

Brucellosis

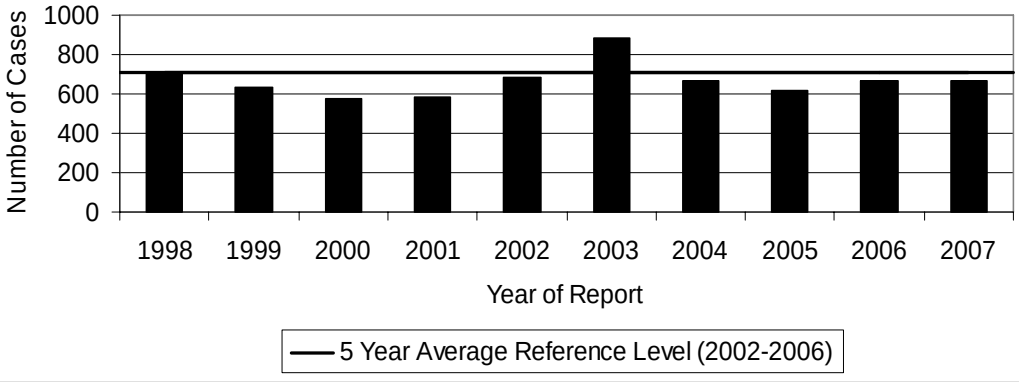
Agent: *Brucella* species (bacteria)
Mode of Transmission: Contamination of skin wounds with infected animal tissue or body fluids, ingestion of unpasteurized milk or milk products, and inhalation of the organism.
Signs/Symptoms: Intermittent and irregular fever, headache, chills, sweating, and muscle pain.
Prevention: Use rubber gloves when handling animal tissue. Do not consume unpasteurized dairy products, especially milk, cheese, or ice cream.
Other Important Information: Listed by the CDC as a potential bioterrorism agent because the organism may be relatively easily disseminated, may cause moderate injury and/or death, and may need enhanced surveillance for detection.

No cases of brucellosis were reported in 2007. The last case of brucellosis in Virginia was reported in 2005. The illness occurred in a male in the 50-59 year age group from the northern region. He had recently traveled to Mexico where he reported drinking raw goat's milk.

Campylobacteriosis

Agent: *Campylobacter* species (bacteria)
Mode of Transmission: Ingestion of contaminated food or direct contact with fecal material from infected animals or people.
Signs/Symptoms: Includes diarrhea (frequently with bloody stools), abdominal pain, malaise, fever, nausea and/or vomiting. In neonates and young infants, bloody diarrhea without fever may be the only manifestation of illness. Rarely, post-infectious complications include reactive arthritis, febrile convulsions or Guillain-Barré Syndrome.
Prevention: Careful hand hygiene after each toilet visit, before preparing and eating food and after contact with feces of dogs and cats is critical. Pasteurization of milk and chlorination of water supplies are important. Thoroughly cook all foods containing eggs and meats, particularly poultry.

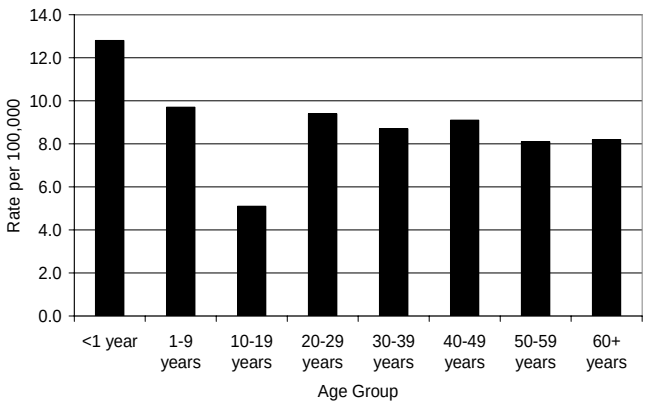
Figure 4. Campylobacteriosis: Ten Year Trend, Virginia, 1998-2007



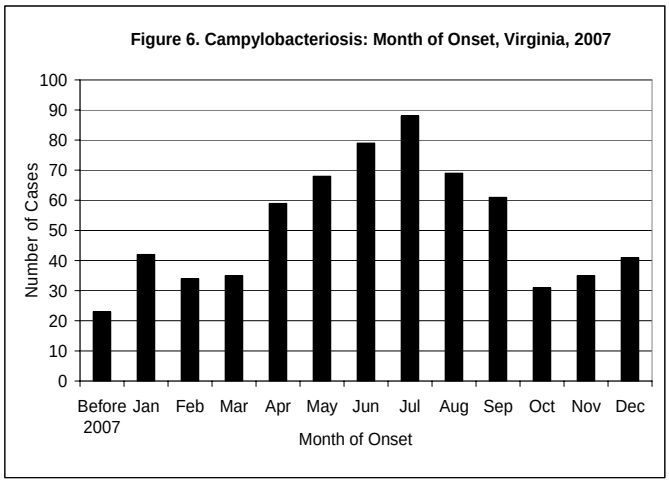
During 2007, 665 cases of campylobacteriosis were reported in Virginia. This is a 5% decrease from the five year average of 704.6 cases per year, and an incremental (<1%) decrease from the 669 cases reported in 2006 (Figure 4).

The highest rate of infection occurred in the less than one year age group (12.8 per 100,000). Rates in the other age groups ranged between 5.1 and 9.7 per 100,000 (Figure 5). Race was missing for 45% of reported campylobacteriosis cases. Among cases for which race was reported, the incidence rate in the white population (5.9 per 100,000) was more than three times that of the black population (1.6 per 100,000),

Figure 5. Campylobacteriosis: Rate by Age Group, Virginia, 2007



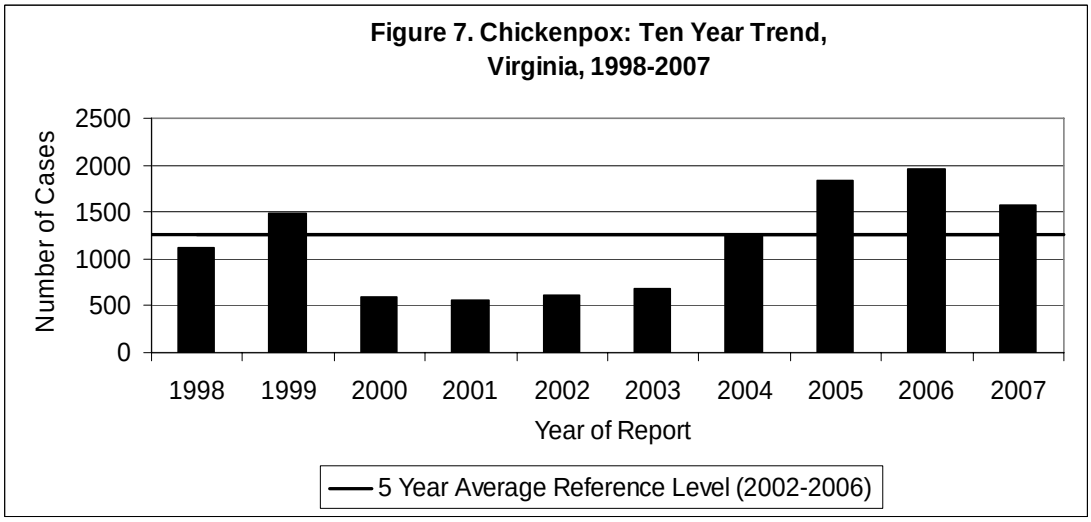
and more than twice that of the "other" population (2.3 per 100,000).



The rate among females (7.5 per 100,000) was slightly lower than the rate among males (10.0 per 100,000). By region, the highest rates of disease occurred in the northwest and southwest (11.6 and 10.4 per 100,000 respectively). Rates among the other regions were between 6.7 and 8.7 per 100,000. Cases occurred throughout the year, but the majority of cases had onsets from April through September (Figure 6).

Chickenpox (Varicella)

Agent: Varicella-zoster virus
Mode of Transmission: Person-to-person by direct contact or through droplet or airborne spread of vesicle fluid or respiratory secretions from an infected person.
Signs/Symptoms: Acute onset of mild fever and skin eruptions. Successive crops of lesions appear first on the head and progress to the trunk and extremities. The skin lesions can appear on the scalp, armpit, and mucous membranes of the mouth and respiratory tract.
Prevention: Vaccination of children starting at age 12 months followed by a second dose at age 4-6 years.
Other Important Information: The disease is highly transmissible; susceptible household contacts have an 80%-90% risk of becoming infected. Acute varicella is generally mild and self-limited, but severe complications may occur.



There were 1,582 cases of chickenpox reported in Virginia during 2007. This is a 19% decrease from the 1,959 cases in 2006, and a 25% increase over the five year average of 1,264 cases per year (Figure 7). The elevated number of cases seen between 2002 and 2007 may be attributed to more complete reporting by physicians and school personnel.

Varicella vaccine was licensed in 1995, and in 1999 vaccination became a requirement for entry into school and daycare in Virginia for all children born on or after January 1, 1997. However, outbreaks of chickenpox occur despite high vaccination coverage, as the vaccine is 80%-85% effective in preventing infection.

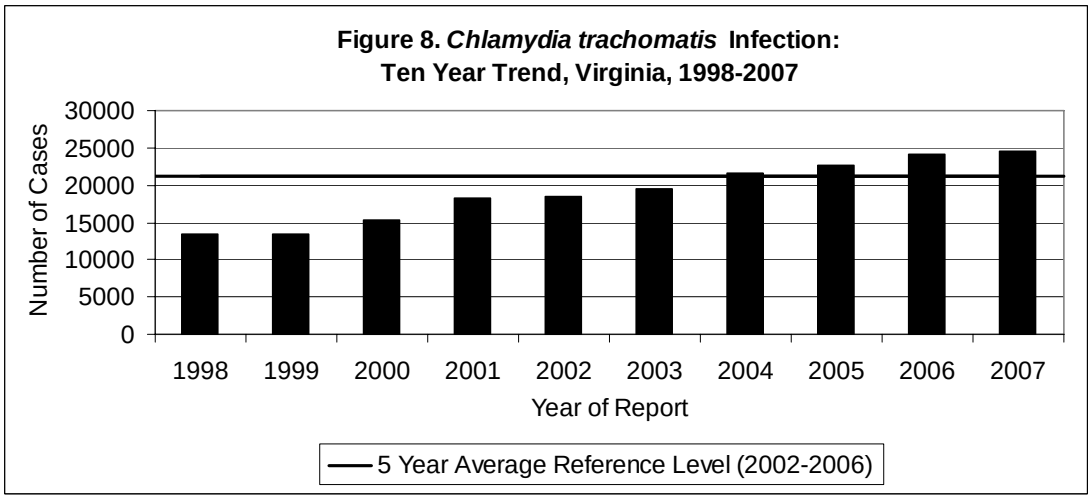
The majority of cases (94%) were reported in those less than 20 years of age. The 1-9 year age group had the highest incidence rate (97.1 per 100,000). This was followed by the 10-19 year age group (56.9 per 100,000) and the less than 1 year age group (32.4 per 100,000). The other age groups had between 0.4 cases per 100,000 (60 year and older age group) and 3.9 cases per 100,000 (20-29 year age group). The white population had a higher rate than the black population (18.4 and 14.7 per 100,000, respectively). Rates were similar among females and males (19.7 and 21.0, respectively).

The highest incidence rate (27.4 per 100,000) occurred in the eastern region. Rates were between 20.4 and 15.4 cases per 100,000 among the other regions. Cases occurred throughout the year, with the smallest proportion of cases (24%) occurring during the second half of the year. This is consistent with the traditional seasonal fluctuation seen in chickenpox with the highest incidence occurring in winter and early spring.

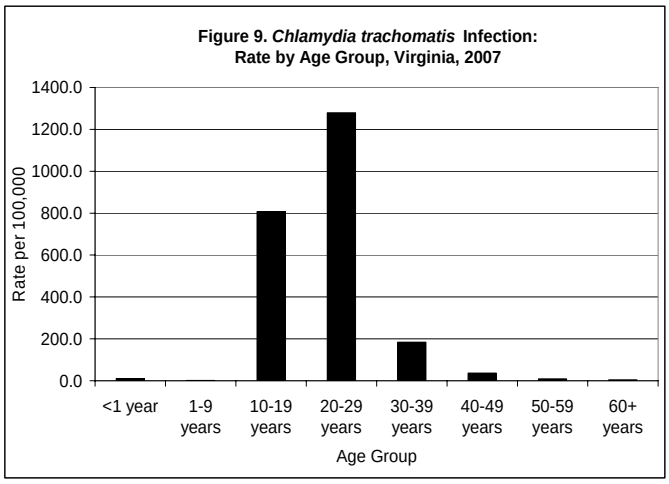
Thirty outbreaks were reported in 2007, with an average of twelve cases per outbreak. All of the outbreaks involved school-aged children. Despite high one-dose vaccination coverage, outbreaks of varicella have continued to occur, especially in elementary schools, where a large percentage of the students are vaccinated. This mirrors a nationwide trend and has led to new recommendations for a two-dose varicella vaccination schedule. While breakthrough infections have continued to occur in vaccinated individuals, on average, the illness in vaccinated individuals is much milder (less than 50 skin lesions, low or no fever, and a shorter duration of illness).

***Chlamydia trachomatis* Infection**

Agent: *Chlamydia trachomatis* (bacteria)
Mode of Transmission: Person-to-person via sexual transmission, or from the genital tract of an infected mother to her infant during birth.
Signs/Symptoms:
Men: Urethritis, with discharge, itching, and burning upon urination.
Women: Cervical inflammation with discharge, fluid buildup, and easily induced vaginal bleeding.
Infants: Infections of the eyes and respiratory tract.
Prevention: Safer sexual practices; screening of young women under 25 years of age; and presumptive treatment for *Chlamydia* infection among people who are exposed.
Other Important Information: Approximately 70% of infected women are asymptomatic.



During 2007, a total of 24,528 cases of *C. trachomatis* infection were reported in Virginia (Figure 8). The overall incidence for 2007 (320.9 per 100,000 population) is a 15% increase over the average for the preceding 5 years and almost double the 1998 rate. The steady increase in reported *C. trachomatis* infections may be due to additional screening and to more sensitive tests, as well as to increased infections. Despite the high rates, these diagnosed infections are believed to underestimate the true burden of disease due to asymptomatic infection, presumptive treatment of those diagnosed with other sexually transmitted infections (e.g., gonorrhea) and screening programs that have historically been limited to high-risk females and male partners of infected women. While screening criteria make it more likely that females will be tested, the number of males who are screened has increased. This increase in detection of disease among males is reflected in the incidence rates.



In 2007, the highest rates were seen in the 20-29 year age group (1,287.5 per 100,000) followed by the 10-19 year age group (806.9 per 100,000) (Figure 9). Among *C. trachomatis* infections in the less than 1 year age group, ten of the 11 infections were ophthalmic (eye) infections due to perinatal exposure (see Ophthalmia Neonatorum section). Incidence in the black population (928.6 per 100,000) was just over nine times the rate in the white population (99.7 per 100,000) and almost three times the rate in the "other" population (374.3 per 100,000).

Since 2001, the eastern region has experienced the highest *C. trachomatis* infection rates (555.3 per 100,000 in 2007). The lowest rate in 2007 occurred in the northern region (158.2 per 100,000). No seasonal trend was observed.

Creutzfeldt-Jakob Disease

Agent: Believed to be caused by a prion protein.
Mode of Transmission: The majority of classic cases are sporadic, with no known source. A small percentage of cases (5%-15%) may be due to heredity or exposure to organ tissue contaminated with the prion. A form of the disease, variant CJD (vCJD), is thought to be transmitted through ingestion of beef from cattle infected with bovine spongiform encephalopathy (BSE, or mad cow disease).
Signs/Symptoms: Symptoms may begin with confusion, and they rapidly progress to a wide range of neurological signs and symptoms, including loss of coordination and dementia.
Prevention: Avoid organ and tissue transplants from infected individuals. For protection against vCJD, the federal government has regulations in place to prevent the spread of BSE in the United States.
Other Important Information: vCJD occurs in younger individuals, while sporadic CJD occurs more often in older individuals and has a slower progression. In Virginia, CJD is reportable when it occurs in persons under 55 years of age.

One case of Creutzfeldt-Jakob disease in persons less than 55 years of age was reported in Virginia during 2007. The infection was determined to be sporadic CJD and occurred in a white male in the 30-39 year age group from the central region of the state. The individual died as a result of this condition. This one case of CJD is consistent with the five year average of 0.4 cases per year. Past diagnoses of CJD in Virginia residents less than 55 years of age were classic CJD infections (five were reported between 1998 and 2002).

The only case of vCJD ever diagnosed in a Virginia resident occurred in 2006. Based on the patient's history, it was determined that the infection most likely occurred from contaminated cattle products consumed as a child when living in Saudi Arabia. It was the third case of vCJD reported in a U.S. resident. The two previously reported cases were born and raised in the United Kingdom, where they were believed to have been infected.

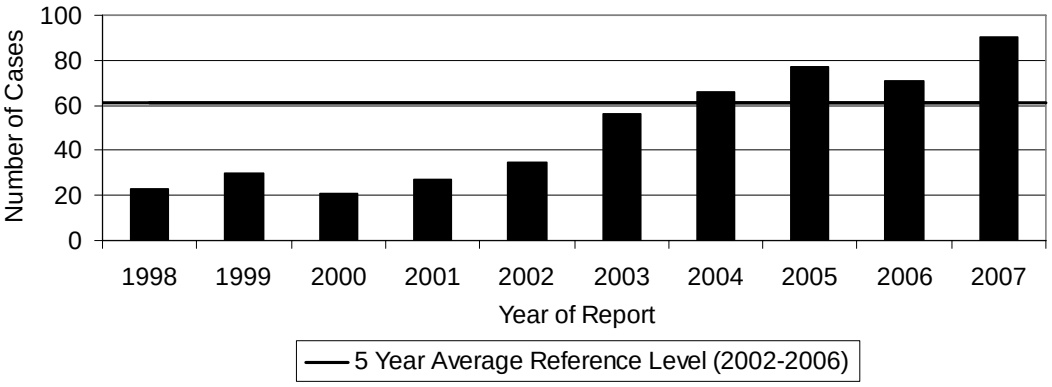
Cryptosporidiosis

Agent: *Cryptosporidium parvum* (parasite)
Mode of Transmission: Occurs via the fecal-oral route and can include person-to-person, animal-to-person, foodborne and waterborne transmission. *Cryptosporidium* oocytes can remain infectious for 2-6 months after being excreted from infected individuals. The oocytes are very resistant to chemicals used to purify drinking water.
Signs/Symptoms: Profuse watery diarrhea with cramping and abdominal pain. The diarrhea may be preceded by anorexia and vomiting in children. Cryptosporidiosis can also be asymptomatic.
Prevention: Careful hand hygiene after each toilet visit and before preparing and eating food. People with diarrhea should not enter public recreational water. Do not drink water from streams, lakes, springs or any unknown source. Water purification methods,

including boiling water or filtration, should be considered when drinking water from natural or unknown sources.

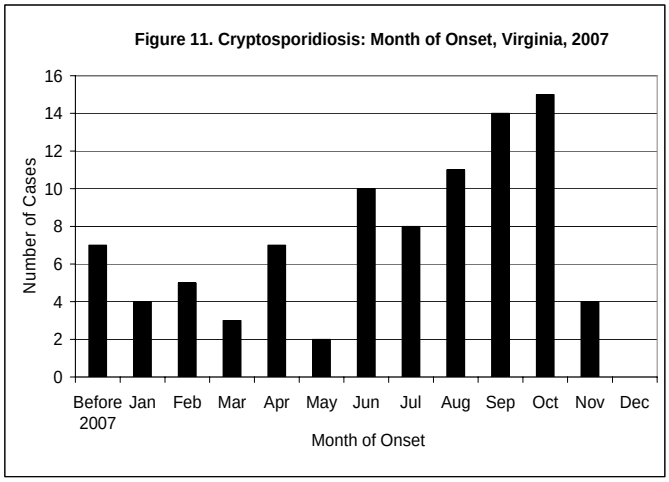
Ninety cases of cryptosporidiosis were reported in Virginia during 2007. This is a 27% increase in cases from the 71 cases reported in 2006, and a 48% increase from the five year average of 61 cases per year (Figure 10). Cases of cryptosporidiosis increased between 2000 and 2007, with the exception of 2006.

Figure 10. Cryptosporidiosis: Ten Year Trend, Virginia, 1998-2007



In 2007, the highest incidence rate (1.5 per 100,000) occurred among the 40-49 year and 60 year and older age groups. The other age groups had rates between 0.8 and 1.2 per 100,000. Race was not reported for 22% of cases, but among those with information on race, the white population had a higher rate of infection than the black population (1.1 and 0.7 per 100,000 respectively). The rate of infection among males was higher than that among females (1.3 compared to 1.0 per 100,000). By region, the highest rate was reported from the southwest region (2.9 per 100,000). The other regions had rates between 0.6 and 1.4 per 100,000. A seasonal trend was observed, with 64% of the cases occurring from June through October (Figure 11).

Figure 11. Cryptosporidiosis: Month of Onset, Virginia, 2007



Cyclosporiasis

Agent: *Cyclospora cayetanensis* (parasite)
Mode of Transmission: Can be foodborne or waterborne. *Cyclospora* are resistant to chlorination. Direct person-to-person transmission has not been documented.
Signs/Symptoms: Profuse watery diarrhea commonly occurs, along with nausea, vomiting, anorexia, substantial weight loss, abdominal bloating or cramping and prolonged fatigue. Fever occurs in approximately half the patients.
Prevention: Fresh produce should be washed thoroughly before it is consumed.

Two cases of cyclosporiasis were reported during 2007. While no cases were reported in 2006, the two reported cases during 2007 are consistent with the five year average of 1.6 cases per year. Both cases of cyclosporiasis were reported in females in the northwest region of the state.

Diphtheria

Agent: Toxin secreted by strains of the bacterium *Corynebacterium diphtheriae*
Mode of Transmission: Person-to-person via droplet spread. Rarely, transmission may occur from contact with skin lesions or articles soiled with discharges from the lesions of infected persons.
Signs/Symptoms: Sore throat, anorexia, nasal discharge, and formation of a bluish-white, grayish-green, or black adherent membrane in the throat. More severe cases can include swelling of the neck and airway passages.
Prevention: Diphtheria vaccination beginning at two months of age. Antibody levels wane over time making booster doses necessary every 10 years, beginning at age 11-12 years.
Other Important Information: The overall case-fatality rate for diphtheria is 5%-10%, with higher death rates in young children and those over 40 years of age.

In Virginia, no cases of diphtheria were reported during 2007. The last reported case occurred in 1989. Nationally, zero to five cases of diphtheria are reported each year.

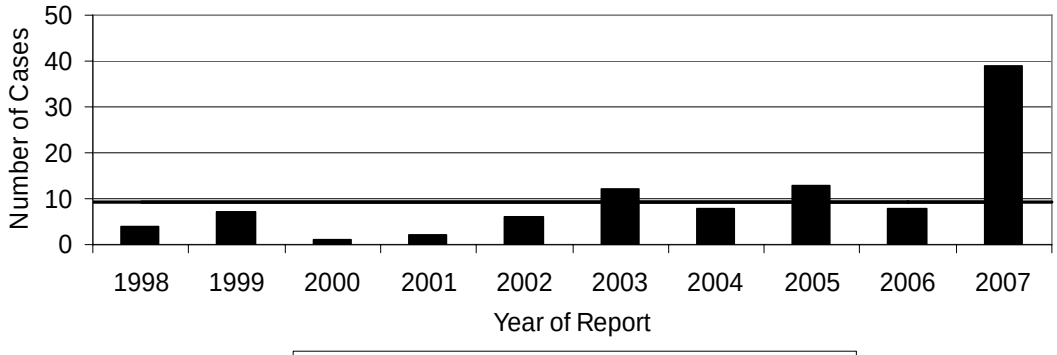
Ehrlichiosis

Agent(s): *Ehrlichia chaffeensis* and *E. ewingii* cause human monocytic ehrlichiosis (HME) and *Anaplasma phagocytophilum* causes human granulocytic anaplasmosis (HGA), formerly known as human granulocytic ehrlichiosis (HGE). All are bacteria.
Mode of Transmission: Through the bite of an infected tick. *Ehrlichia chaffeensis* and *E. ewingii* may infect adult or nymphal lone star ticks and *Anaplasma phagocytophilum* may infect adult or nymphal blacklegged ticks (formerly known as deer ticks). All of these pathogens may be transmitted to humans when an infected tick bites a human and stays attached (feeding) for a period of more than 24 hours.
Signs/Symptoms: Usually non-specific but commonly include fever, headache, nausea, anorexia, vomiting, and muscle pain. Untreated cases may result in prolonged fever,

renal failure, respiratory distress, seizures, coma and death. Inflammation of the brain and the lining around the brain and spinal cord develops in 20% of patients with HME, but is very rare with HGA.

Prevention: Avoid being bitten by ticks. Avoid tick-prone habitats such as humid forest environments with dense undergrowth and/or heavy leaf litter, tall weeds along forest margins, tree lines, forest trails and forest clearings. When in tick-prone habitats, wear light-colored clothing with pants legs tucked into socks. Apply permethrin-based repellants to clothing and shoes and DEET, Picaridin, or Oil of Lemon Eucalyptus-based repellents to exposed areas of skin. Thoroughly check your body for ticks after visiting tick-prone habitats and remove attached ticks as soon as possible.

Figure 12. Ehrlichiosis: Ten Year Trend, Virginia, 1998-2007



Thirty-nine cases of ehrlichiosis were reported in Virginia during 2007. This is a 315% increase from the five year average of 9.4 cases per year (Figure 12). The reason for this considerable increase is not known. Among cases reported in 2007, 23 were specified as HME, 6 were specified as HGA, and 10 were unspecified.

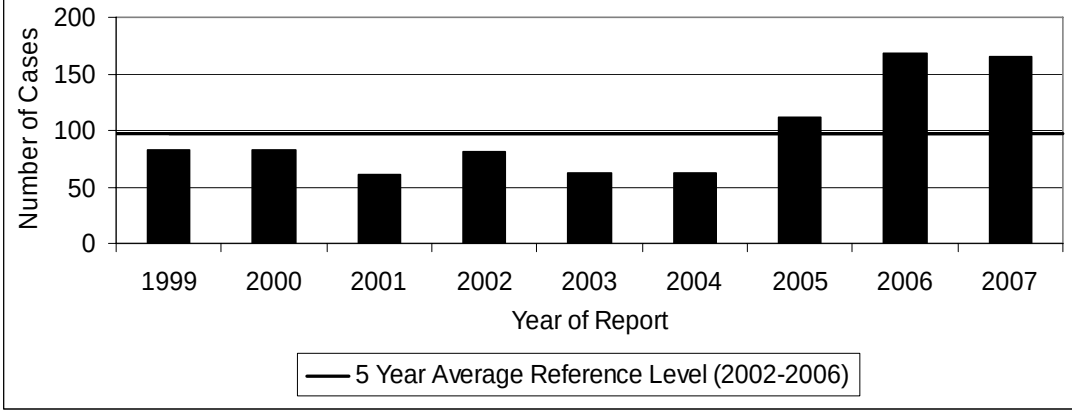
Ehrlichiosis incidence was highest in the 60 year and older age group (1.2 cases per 100,000) and decreased with age. This is similar to the expected age pattern seen for ehrlichiosis. In the United States, most cases are in persons over the age of 50 years. The white population had higher incidence (0.4 cases per 100,000) than the black population (0.1 cases per 100,000). Females had slightly lower incidence than males (0.4 and 0.6 cases per 100,000, respectively).

Cases occurred in all regions of the state. The northwest region had the highest incidence rate (1.3 cases per 100,000). Other regions in the state had similar incidence rates, ranging from 0.5 to 0.3 per 100,000. A majority of cases (53.8%) had onset in the third quarter, while the next largest portion (33.3%) had onset in the second quarter.

Escherichia coli Infection, Shiga Toxin-Producing

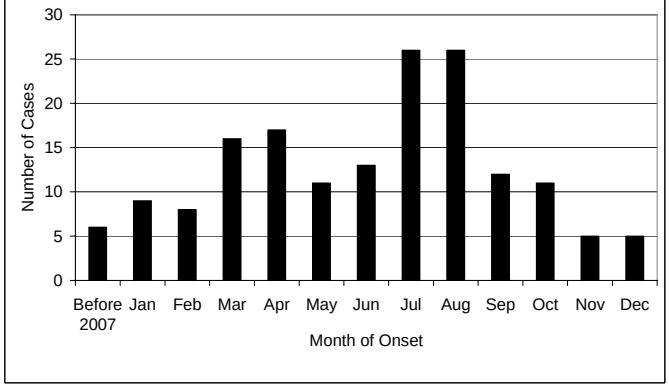
Agent: Shiga toxin-producing *Escherichia coli* (bacteria)
Mode of Transmission: From food or water contaminated with human or animal feces, or person-to-person from infected symptomatic people or from carriers. Fomites and contaminated environment may also play a role in transmission.
Signs/Symptoms: Non-bloody to completely-bloody diarrhea and severe abdominal cramps with little or no fever. In some people, including children under five years of age and the elderly, the infection can cause a complication called hemolytic uremic syndrome (HUS), in which the red blood cells are destroyed and the kidneys fail.
Prevention: Careful hand hygiene after each toilet visit and before preparing and eating food. All ground beef should be cooked thoroughly until no pink meat remains and the juices are clear. Raw milk and unpasteurized juice products should not be consumed.

Figure 13. *Escherichia coli* Infection, Shiga Toxin-Producing: Nine Year Trend, Virginia, 1999-2007



Shiga toxin-producing *E. coli* infection has been a reportable condition in Virginia since 1999. During 2007, 165 cases were reported in Virginia. This is a slight decrease from 2006, but a 70% increase from the five year average of 97 cases per year (Figure 13). The highest incidence rates were in children less than 10 years old: 18.7 per 100,000 in infants and 6.6 per 100,000 in the 1-9 year age group. The other age groups had incidence rates between 0.5 and 3.2 per 100,000. Fifty percent of cases did not have a reported race. Among those with race information, rates for whites and blacks were similar (1.2 and 1.0 per 100,000, respectively). Females had a higher incidence rate than males (2.5 and 1.8 per 100,000 respectively). The northwest and northern regions

Figure 14. *Escherichia coli* Infection, Shiga Toxin-Producing: Month of Onset, Virginia, 2007

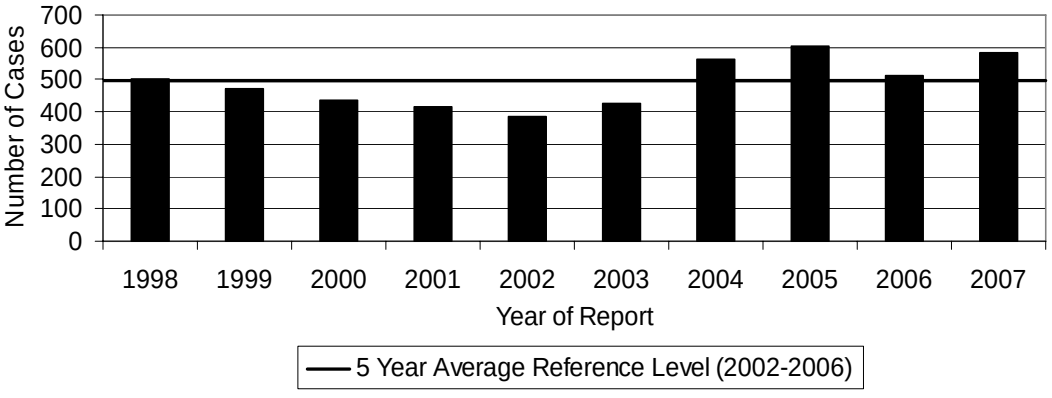


reported the highest incidence rates (3.0 and 2.9 per 100,000), while rates in the other regions ranged from 1.2 to 2.4 per 100,000, with the lowest rate observed in the eastern region. Cases occurred throughout the year, but peaked in the warmer months of July and August (Figure 14).

Giardiasis

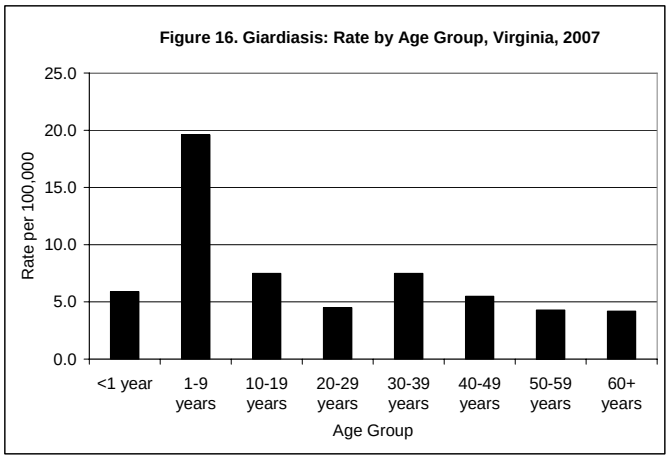
Agent: *Giardia lamblia* (parasite)
Mode of Transmission: Person-to-person transmission by hand-to-mouth transfer of cysts from the feces of an infected person. Localized outbreaks are more often due to ingestion of cysts in fecally-contaminated drinking and recreational water than from fecally-contaminated food. Another source is unfiltered stream and lake waters open to contamination by human and animal feces.
Signs/Symptoms: Symptoms may include diarrhea, abdominal pain, bloating, nausea and vomiting. A person may be asymptomatic or develop chronic illness.
Prevention: Careful hand hygiene after each toilet visit and before preparing and eating food. Do not drink recreational water or untreated water from shallow wells, lakes, rivers, springs, ponds or streams.

Figure 15. Giardiasis: Ten Year Trend, Virginia, 1998-2007

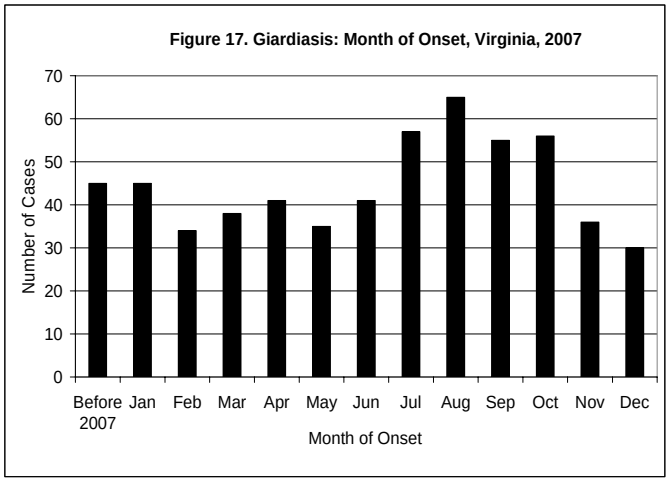


During 2007, 582 cases of giardiasis were reported in Virginia. This is a 13% increase from the 514 cases reported in 2006, and a 17% increase from the five year average of 498.2 cases per year (Figure 15). While this disease follows a cyclic trend, the increase in cases since 2004 is at least partly attributed to infections identified through screening of refugees newly arrived in the U.S.

Figure 16. Giardiasis: Rate by Age Group, Virginia, 2007



In 2007, the 1-9 year age group had the highest proportion of reported cases and the highest incidence rate (30%, 19.6 per 100,000). The 10-19 and the 30-39 year age groups followed with an incidence rate of 7.5 per 100,000 (Figure 16). Rates in the other age groups ranged between 5.9 and 4.2 per 100,000. Race was not reported for 47% of the cases, but among those with a reported race, rates were higher in the "other" and black populations (9.3 and 7.9 per 100,000) than among the white population (2.5 per 100,000). A slightly higher rate was reported in the male population (8.8 per 100,000) than the female population (6.4 per 100,000).

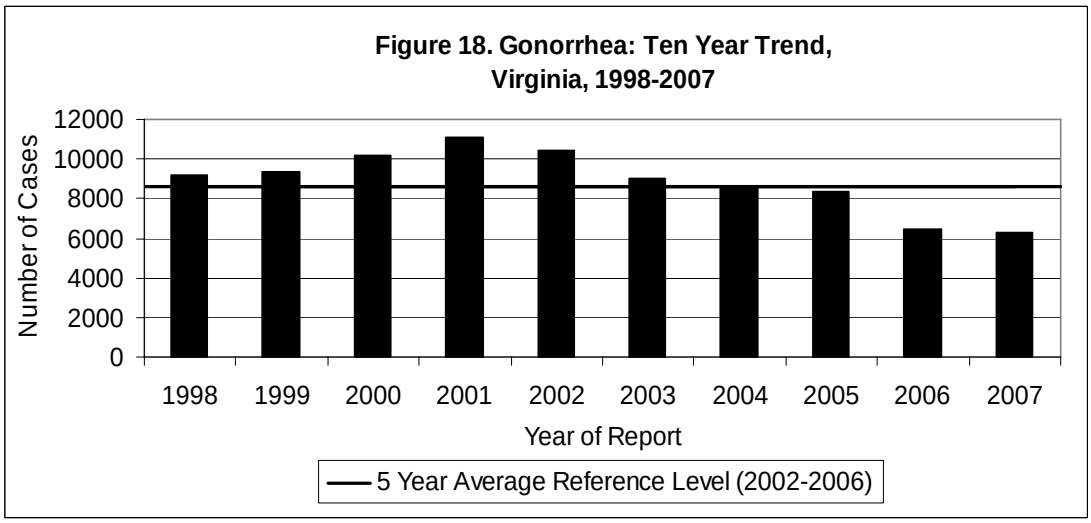


By region, the highest rate was seen in the northwest (11.4 per 100,000), followed by the northern region (8.7 per 100,000). Rates in the other regions ranged from 6.9 to 5.1 per 100,000. Onset peaked during the July to October period (40% of cases) (Figure 17).

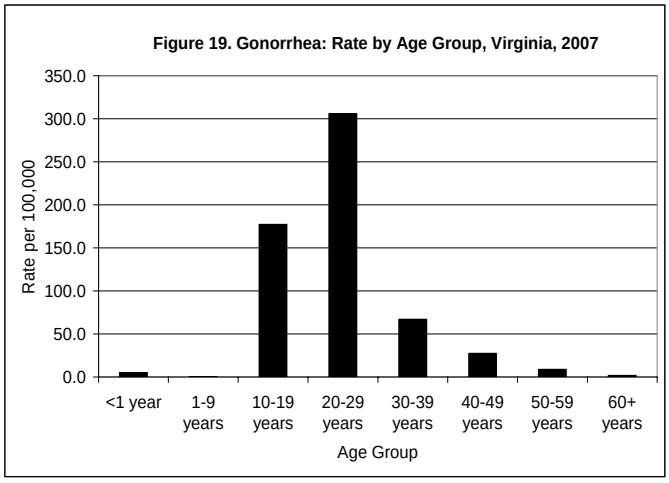
Gonorrhea

Agent: *Neisseria gonorrhoeae* (bacteria)
Mode of Transmission: Sexually transmitted through direct contact with infected areas.
Signs/Symptoms:
Men: Discharge from the urethra.
Women: Usually asymptomatic, although it may cause vaginal discharge or bleeding after intercourse.
Prevention: Safer sexual practices and ensuring that infected sexual contacts are treated.
Other Important Information: In 2004, the CDC stopped recommending fluoroquinolones as a first-line treatment of gonorrhea in men who have sex with men (MSM) because of an increase in fluoroquinolone resistance. Since April 2007, CDC has advised providers not to use fluoroquinolones (ciprofloxacin, ofloxacin, and levofloxacin) for the treatment of gonorrhea.

According to the CDC, gonorrhea is substantially under-diagnosed and under-reported, and approximately twice as many new infections are estimated to occur as are reported each year. Gonorrhea rates have been declining in Virginia since 2001, when the rate was 154.2 per 100,000. During 2007, 6,267 cases of gonorrhea were reported in Virginia (82.0 cases per 100,000) (Figure 18).



A comparison of age groups indicates that gonorrhea incidence is highest in the 20-29 year age group (306.0 per 100,000 population), followed by the 10-19 year age group (177.4 per 100,000 population) (Figure 19). Gonorrhea incidence rates among females and males were similar (86.7 and 77.0 per 100,000, respectively). The rate in the black population (323.5 per 100,000) was 22 times the rate in the white population (14.4 per 100,000), and ten times the rate in the "other" population. While the difference in incidence between the black and white populations is high, it has decreased from 33 times the rate in the white population in 1998. Regardless, gonorrhea remains the STD with the largest racial disparity in Virginia.



The central region had the highest incidence rate (176.4 per 100,000 population), followed by the eastern region (146.0 per 100,000). No seasonal trend was observed.

Granuloma Inguinale

Agent: *Calymmatobacterium granulomatis* (bacteria)
Mode of Transmission: Direct contact with lesions, presumably during sexual activity. Young children can be infected by contact with infectious secretions.
Signs/Symptoms: Skin lesions that eventually form fibrous tissue. This is a chronic condition that can lead to destruction of genital organs and spread to other parts of the body through autoinoculation.

Prevention: Sexual partners should be examined, counseled to practice safe sex, and offered antimicrobial therapy, when needed.

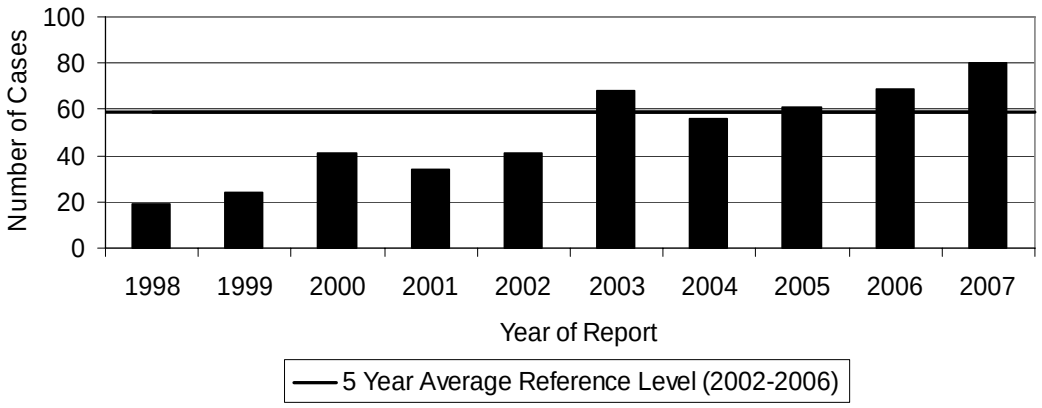
No cases of granuloma inguinale were reported in Virginia during 2007. The last reported case occurred in 2001.

Haemophilus influenzae Infection, Invasive

Agent: *Haemophilus influenzae* (bacteria)
Mode of Transmission: Person-to-person by inhalation of respiratory droplets or direct contact with nose and throat discharge during the infectious period.
Signs/Symptoms: Inflammation of the lining of the brain and spinal cord (meningitis), inflammation of the epiglottis (which may lead to blockage of upper airway and death), pneumonia, skin infection (cellulitis), arthritis, or bloodstream infection (bacteremia).
Prevention: Vaccination with conjugate *Haemophilus influenzae* type b (Hib) vaccine beginning at 2 months of age.
Other Important Information: Since the licensure of conjugate Hib vaccine in the late 1980s, the incidence of invasive Hib disease has declined by more than 99% compared with the pre-vaccine era.

Eighty cases of invasive *H. influenzae* infection were reported in Virginia during 2007. This is a 16% increase from the 69 cases reported in 2006, and a 36% increase from the five year average of 59 cases per year (Figure 20).

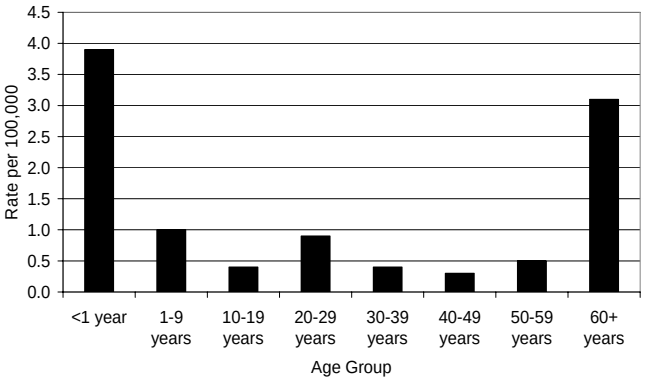
Figure 20. *Haemophilus influenzae* Infection, Invasive: Ten Year Trend, Virginia, 1998-2007



Incidence was highest in infants and the elderly. Children less than 1 year of age had a rate of 3.9 per 100,000, while the 60 year and older age group had a rate of 3.1 per 100,000 (Figure 21). The other age groups had rates between 0.3 and 1.0 per 100,000. Twelve percent of cases had no race reported, but among those with a reported race, the black and white populations had the same rate of infection (1.0 per 100,000). Incidence in females was twice the rate in males (1.4 and 0.7 per 100,000, respectively). The southwest region had the highest number of cases and the highest incidence rate (26

cases, 2.0 per 100,000), followed by the central region (22 cases, 1.7 per 100,000). The other regions had rates between 0.2 and 1.2 per 100,000. Cases occurred throughout the year with the highest proportion (36%) occurring in the first quarter. Among the cases reported in 2007, seven deaths were attributed to invasive *H. influenzae* infection: six in the 60 year and older age group and one in the less than 1 year age group.

Figure 21. *Haemophilus influenzae* Infection, Invasive: Rate by Age Group, Virginia, 2007



Hansen Disease (Leprosy)

Agent: *Mycobacterium leprae* (bacteria)
Mode of Transmission: Person-to-person, probably through nasal secretions from persons with untreated lepromatous disease (those with discolored spots on the skin).
Signs/Symptoms: A chronic disease with varying symptoms, including skin lesions (tuberculoid leprosy); discolored, flat spots on the skin (lepromatous leprosy); nasal congestion; nosebleeds; and nerve damage.
Prevention: Early diagnosis and treatment is important. Hand washing when in contact with patients with lepromatous leprosy and disinfection of surfaces contaminated with infectious nasal secretions should be performed until treatment is established.

One case of Hansen disease was reported in Virginia during 2007. The case occurred in an adult male immigrant from South America where the disease was more than likely acquired. The last reported case occurred in 2006, and previous to that one case was reported in 2001.

Hantavirus Pulmonary Syndrome

Agent: Hantavirus family
Mode of Transmission: Several different types of hantaviruses have been identified and each is associated with a different rodent species. Rodents infected with hantavirus do not become ill but they can transmit the virus to humans when their urine or feces are aerosolized and inhaled.
Signs/Symptoms: Fever, muscle pain, and gastrointestinal complaints followed by an abrupt onset of respiratory distress and decreased blood pressure. Respiratory failure and shock follow quickly.
Prevention: Exclude rodents from houses and other buildings. Disinfect rodent-contaminated areas with a spray disinfectant solution prior to cleaning. Contaminated

areas should be cleaned with a wet mop and not be vacuumed or swept. Use approved respirators to avoid inhalation of dust when cleaning previously unoccupied areas.
Other Important Information: Although most common in the southwestern part of the country, hantavirus infections can occur anywhere.

No cases of hantavirus pulmonary syndrome (HPS) were reported in Virginia during 2007. The only hantavirus case reported in Virginia occurred in 1993. In 2004, a resident of southwest Virginia died due to HPS following an exposure that occurred in West Virginia. For surveillance purposes, that case is attributed to West Virginia.

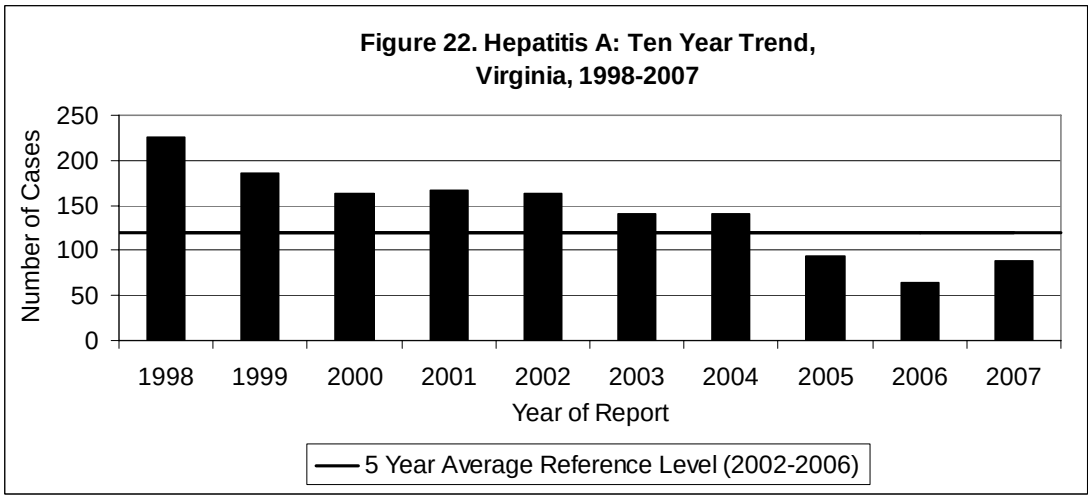
Hemolytic Uremic Syndrome

Agent: Serious sequelae associated with infection with Shiga toxin-producing bacteria, such as *Escherichia coli* or *Shigella*.
Mode of Transmission: See section on *E. coli* Infection, Shiga Toxin-Producing or Shigellosis.
Signs/Symptoms: Kidney failure (often requiring dialysis) as well as neurological impairment (e.g., stroke or seizures). Eight percent of persons with diarrhea due to *E. coli* O157:H7 develop this syndrome, which occurs during the first two weeks after onset of diarrhea.
Prevention: See section on *E. coli* Infection, Shiga Toxin-Producing or Shigellosis.

One case of hemolytic uremic syndrome (HUS) was reported in 2007. This is slightly less than the five year average of 2.6 cases per year. The reported case occurred in a white male under the age of ten from the northwest region of the state with onset during the third quarter of the year.

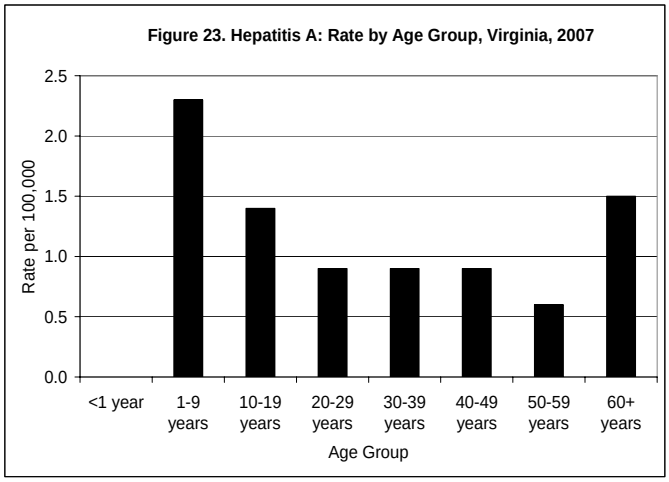
Hepatitis A

Agent: Hepatitis A virus (Picornaviridae family)
Mode of Transmission: Person-to-person by direct contact with fecal material from infected animals or people. Important vehicles for transmission include food or water contaminated by infected animals or people.
Signs/Symptoms: Fever, malaise, nausea, abdominal discomfort, and jaundice. In older children and adults, symptoms usually occur for several weeks, though prolonged or relapsing disease can last up to six months. Younger children often exhibit no symptoms.
Prevention: Safe food preparation, good personal hygiene (e.g., washing hands with soap after diaper changes in child care settings), and immunization. Administering immune globulin (IG) after exposure to hepatitis A can protect against symptomatic infection.
Other Important Information: This is an acute illness only; chronic infection does not occur. A vaccine was first introduced in 1995 and is currently recommended for all children at the age of one year, persons who are at increased risk of infection, and persons who are at increased risk for complications from hepatitis A.



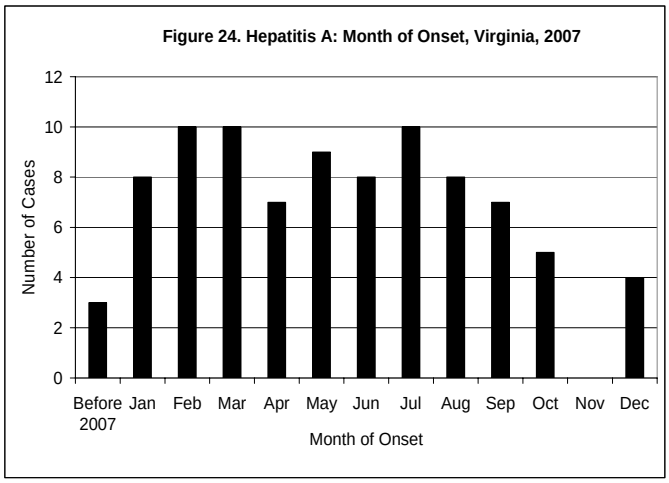
During 2007, 89 cases of hepatitis A infection were reported in Virginia, representing an increase in the number of reported cases for the first time since 2001. This is a 39% increase from the 64 cases reported in 2006, but a 26% decrease from the five year average of 120.2 cases per year (Figure 22). Overall, there has been a national downward trend in reported hepatitis A infections which began in the late 1990s. There were 31,032 hepatitis A cases reported in the U.S. in 1996 and only 3,579 reported in 2006 (the most recent year for which national data are available). The hepatitis A vaccine that was introduced in 1995 is probably responsible for a substantial proportion of this decrease in disease.

In Virginia in 2007, the highest number of cases and incidence rate occurred in the 1-9 year age group (20 cases, 2.3 per 100,000) (Figure 23). Rates in the other age groups ranged from 0.0 (in infants) to 1.5 per 100,000 (60 and over age group). Thirty-four percent of cases were missing race data. Among cases with race reported, the rate in the white population (0.9 per 100,000) was higher than the rates in the black and "other" race groups (0.5 and 0.6 per 100,000 respectively). Males had a higher rate of infection (1.5 per 100,000) than females (0.9 per 100,000).



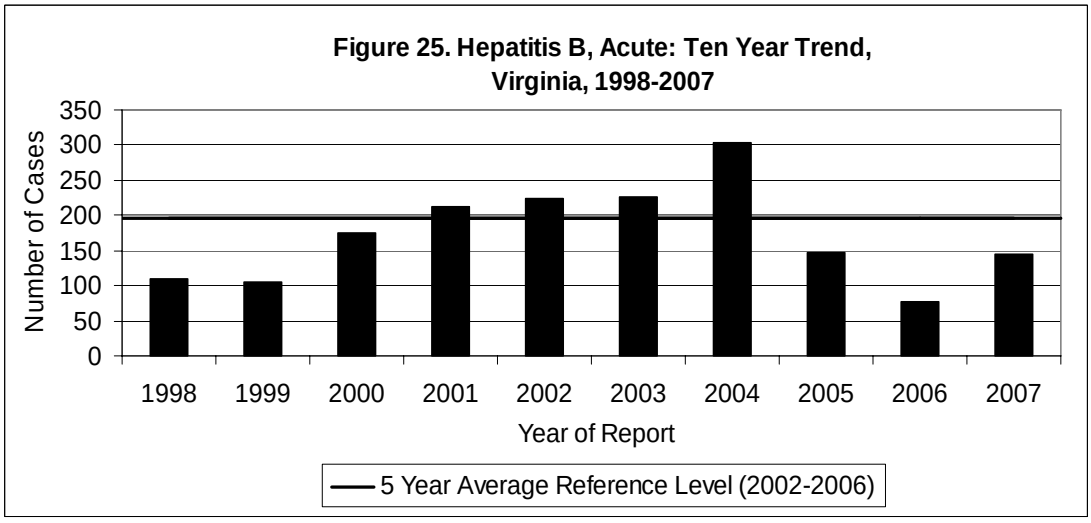
By region, the highest incidence rates were observed in the northern (2.4 per 100,000) and central (1.4 per 100,000) regions. Increases in the number of cases from these two regions (12 in each) contributed to the increased number of cases reported in 2007 compared to 2006. The rates in the other regions were between 0.2 and 0.8 per 100,000. Onset of cases was fairly evenly distributed throughout the year except for the fourth

quarter when only 10% of cases occurred (Figure 24). Among the hepatitis A cases reported in 2007, there was one death in an adult male.

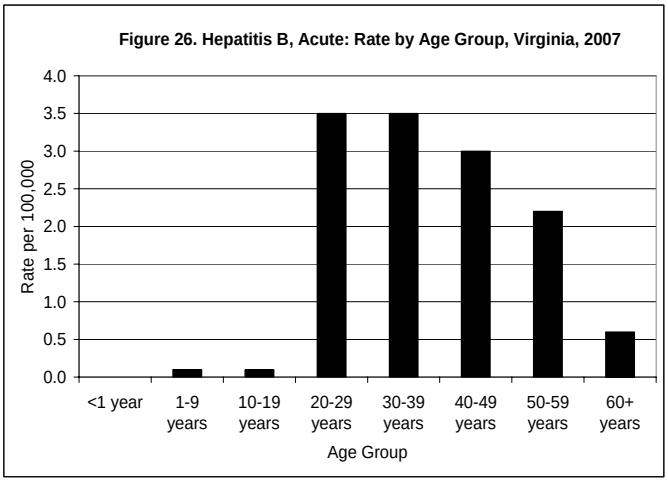


Hepatitis B, Acute

Agent: Hepatitis B virus (Hepadnavirus)
Mode of Transmission: Person-to-person by blood or body fluid exposure (e.g., sexual, perinatal, or through the skin, such as during injection drug use).
Signs/Symptoms: Fever, general feeling of illness, nausea, abdominal pain, and jaundice. Infection can be asymptomatic, and the likelihood of developing symptoms is age dependent.
Prevention: Strategies include: 1) immunization of people at increased risk of infection; 2) screening of all pregnant women and treatment of children born to positive women; 3) routine immunization of infants; 4) routine immunization of adolescents who have not previously been immunized; and 5) screening of donated blood and organs.
Other Important Information: Infection with hepatitis B virus may lead to chronic (long-term) infection. Death from liver disease occurs in 15%-25% of those with chronic infection.



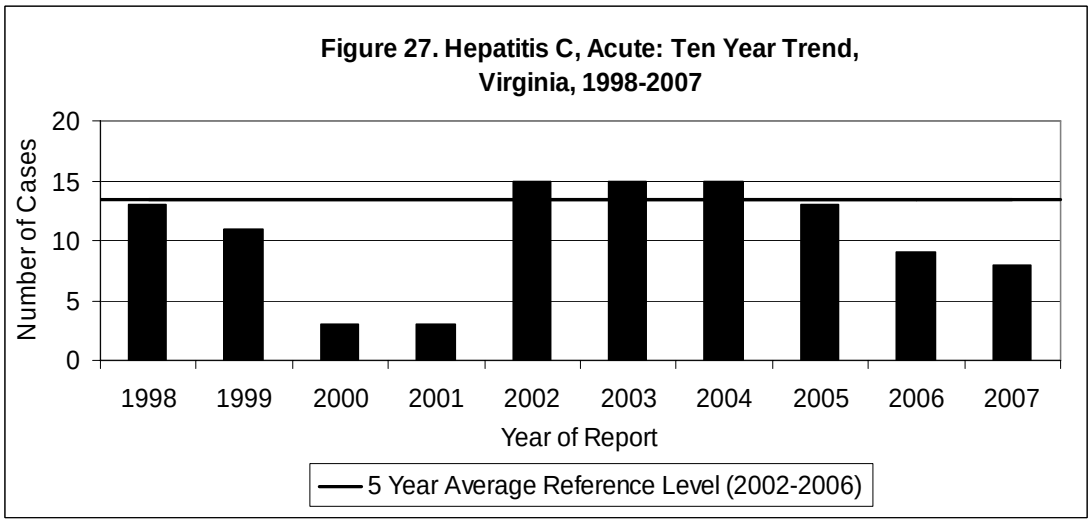
The 144 cases of acute hepatitis B infection reported in Virginia during 2007 reverses a recent downward trend in the annual number of cases. The 2007 incidence represents an 85% increase from the 78 cases reported in 2006, but is comparable to the 146 cases reported in 2005 (Figure 25).



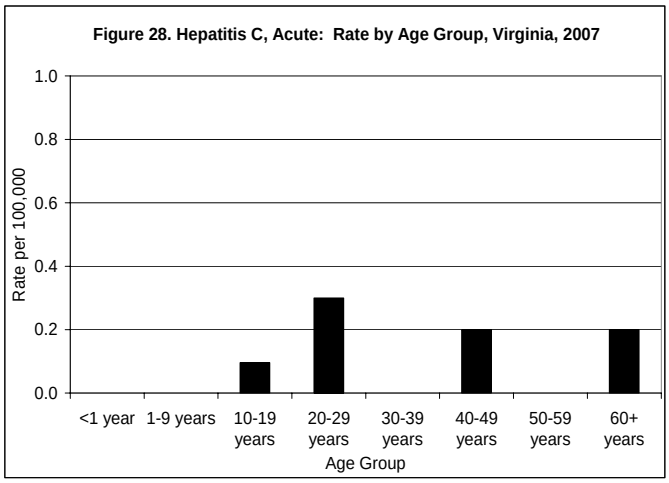
By age, the highest incidence rates were seen in the 20-29 and 30-39 year age groups (3.5 per 100,000 in each), followed closely by the 40-49 year age group (3.0 per 100,000) (Figure 26). Only two cases were reported in someone under the age of 20; however, age was not reported for two cases. Twenty-five percent of reports were missing race information. Among cases with race reported, the rate in the black population was three times the rate in the white population (3.3 and 1.0 per 100,000, respectively). The male population had a higher rate than females (2.1 and 1.6 per 100,000, respectively). The central region had the highest rate of acute hepatitis B cases (3.8 per 100,000), followed by the southwest region (2.6 per 100,000). The other regions had rates between 0.8 and 1.7 per 100,000. The highest number of cases occurred during the first quarter but were fairly evenly distributed the remainder of the year. Among the cases reported in 2007, three deaths were attributed to acute hepatitis B infection, and occurred in one adult female and two adult males.

Hepatitis C, Acute

Agent: Hepatitis C virus (HCV) (Flaviviridae family)
Mode of Transmission: Person-to-person through perinatal transmission; through the skin, such as during injection drug use; or (rarely) through sexual exposure to blood or body fluids.
Signs/Symptoms: Loss of appetite, nausea, abdominal discomfort, or jaundice.
Prevention: Screening of donated blood and organs and avoidance of injection drug use.
Other Important Information: Only 10% of new infections cause symptoms, but 80% of new infections become chronic, resulting in carriers capable of spreading infection. As people with chronic HCV infection age, they are at higher risk for developing chronic liver disease, cirrhosis, and liver cancer.



Eight cases of acute hepatitis C infection were reported in Virginia during 2007 (Figure 27). This is 40% less than the five year average of 13.4 cases per year. The incidence rate was highest in the 20-29 year age group (0.3 per 100,000), followed by the 40-49 and 60 and over year age groups (0.2 per 100,000 in both age groups). No cases were reported among children less than ten years of age, and only one case was reported in the 10-19 year age group (Figure 28). Rates of disease reported among the black and white populations were similar (0.2 and 0.1 per 100,000, respectively), and females and males had the same rate (0.1 per 100,000). The southwest and central regions had the highest number of cases and incidence rate among all regions of the state (3 cases, 0.2 per 100,000). Although 38% of reported cases had onset during the second quarter, no seasonality is expected with this condition.



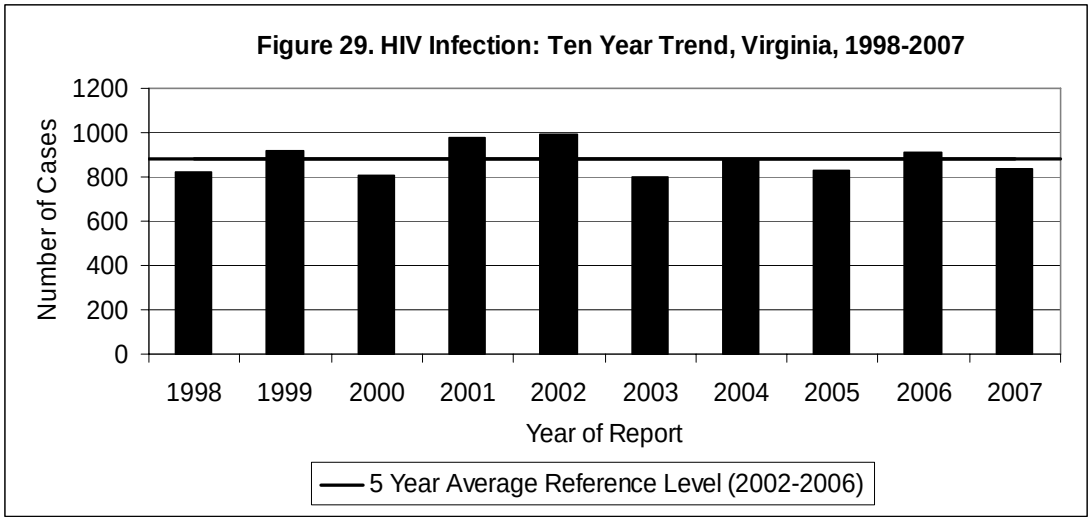
Human Immunodeficiency Virus (HIV) Infection and Acquired Immunodeficiency Syndrome (AIDS)

Agent: Human Immunodeficiency Virus (retrovirus)
Mode of Transmission: Person-to-person via unprotected intercourse, contact of cut or abraded skin with body secretions carrying the virus, use of contaminated needles, blood transfusions and transplants with organs from infected donors, or from mother to child before or during birth or through breastfeeding.

Signs/Symptoms: Initial infection with HIV can cause an acute illness of fever, muscle pain, and sore throat, after which the person can be asymptomatic for several years. Eventually the immune system is affected, causing AIDS.
Prevention: Safer sexual practices; screening of blood and plasma; and among infected mothers, antiretroviral prophylaxis, cesarean delivery before labor, and avoidance of breastfeeding.
Other Important Information: Rapid tests (which provide results within 30 minutes) are becoming more widely available and are used at various testing sites in Virginia. For more information, see: http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5524a2.htm, call your local health department or contact the Virginia Department of Health HIV/STD/Viral Hepatitis Hotline at 1-800-533-4148.

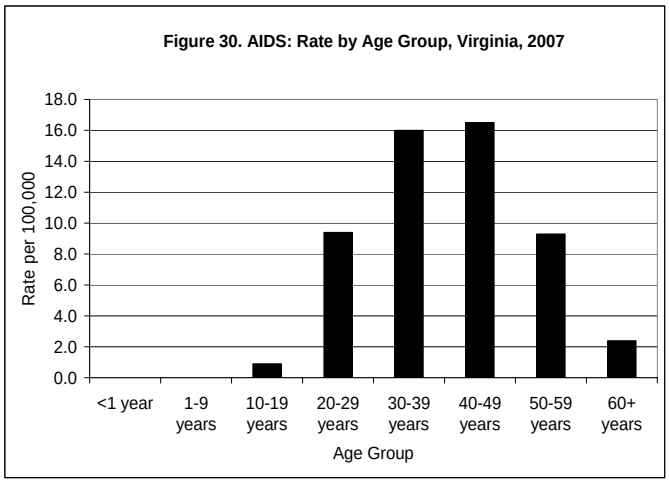
HIV

During 2007, 836 cases of HIV infection were reported in Virginia. This represents a 9% decrease from the 914 cases reported in 2006 (Figure 29).

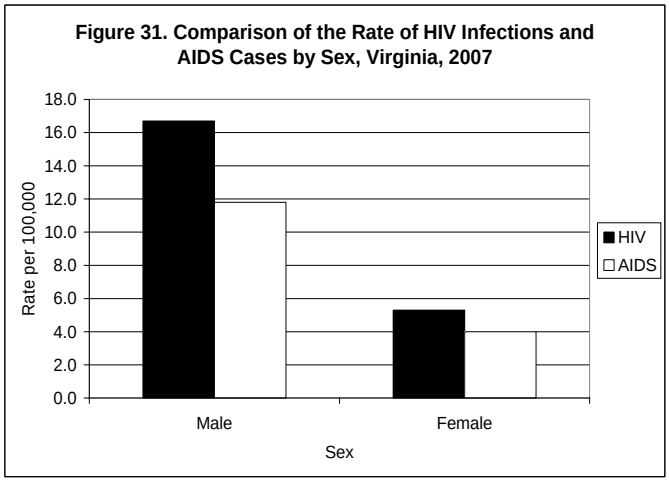


The highest HIV infection rates were in the 20-29 and 30-39 year age groups (25.6 and 19.0 per 100,000, respectively), followed by the 40-49 year old population (15.5 per 100,000). Incidence rates among males have been consistently higher than rates among females. In 2007, males were three times as likely to be reported with HIV infection as females (16.7 and 5.3 per 100,000, respectively). The incidence rate in the black population (35.7 per 100,000) was nine times the rate in the white population (3.9 per 100,000), and more than twice the rate in the "other" population (14.5 per 100,000). Despite this disparity, HIV/AIDS rates among black males in Virginia and the U.S. have declined substantially since the early 1990s. In 2007, the eastern, central and northern regions reported the highest incidence rates (18.7, 17.7 and 9.2 per 100,000, respectively).

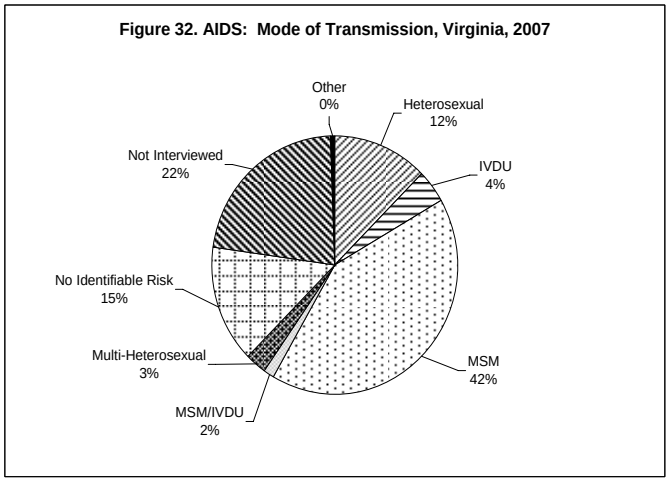
AIDS



Prior to 1996, approximately 50% of those infected with HIV developed AIDS within 10 years; however, this interval increased with the introduction of anti-retroviral medications. In Virginia, the annual number of reported AIDS cases and the incidence rate decreased steadily from 970 cases (13.5 per 100,000) in 2001 to 589 cases (7.8 per 100,000) in 2006. In 2007, there was a slight increase to 599 cases reported; however, the incidence rate remained the same as 2006. The highest incidence rates in 2007 were observed in the 40-49 year age group and the 30-39 year age group (16.5 and 16.0 per 100,000, respectively) (Figure 30).



Similar to observed data for HIV, the AIDS incidence rate in the black population was nine times the rate in the white population (24.9 and 2.7 per 100,000, respectively), and almost twice the rate in the "other" population (13.9 per 100,000). The rate in males was three times the rate in females (11.8 and 4.0 per 100,000, respectively) (Figure 31). In 2007, the eastern region had the highest incidence rate followed by the northern region (12.3 and 9.0 per 100,000, respectively).



Men having sex with men (MSM) was the most common mode of transmission for HIV/AIDS and accounted for 42% of Virginia's 2007 cases, and 56% of cases in males (Figure 32). Men aged 25-39 years accounted for about 63% of cases among MSM, while black men accounted for 50% of cases among MSM. Heterosexual contact was the mode of transmission for 12% of cases, and 4% were attributed to injection drug use.

Influenza

Agent: The influenza virus; Types A, B and (rarely) C cause human disease.
Mode of Transmission: Person-to-person primarily through inhalation of droplets released through coughing or sneezing.
Signs/Symptoms: Fever, headache, muscle pain, exhaustion, sore throat and cough; influenza can also lead to pneumonia, especially in those with existing health conditions (e.g., lung or heart disease).
Prevention: Annual vaccination is the primary prevention strategy; antiviral medications are sometimes used with high-risk populations (e.g., nursing home residents) to prevent illness. Transmission may be reduced by frequent hand washing; avoidance of touching the eyes, nose, and mouth with contaminated hands; and covering the nose and mouth with a tissue when coughing or sneezing.
Other Important Information: The influenza virus changes slightly from year to year (antigenic drift), making it necessary to prepare a new vaccine each year. Periodically, the virus will change to form a completely new subtype (antigenic shift) which can lead to pandemics.

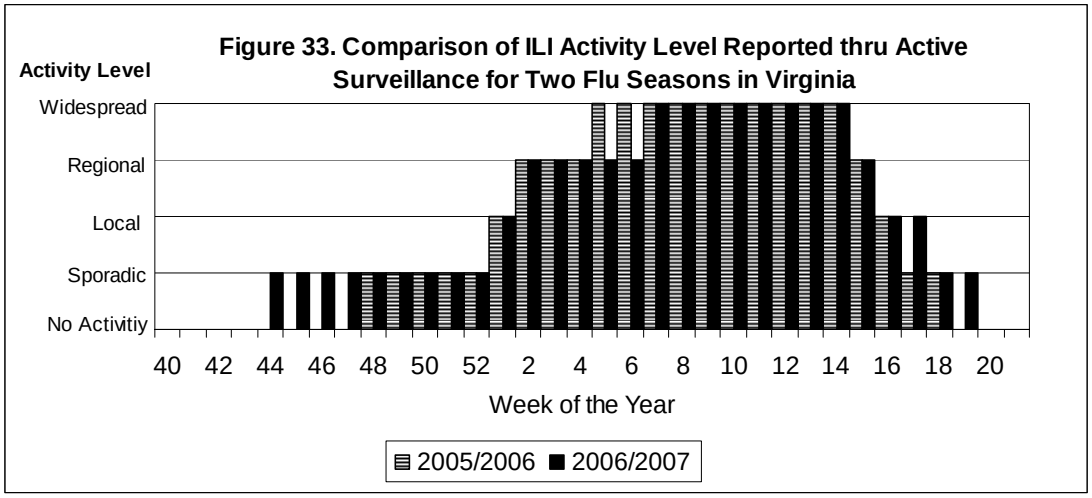
Influenza Surveillance

In Virginia, influenza generally begins to increase in November and starts to decrease in March or April. The Virginia Department of Health uses multiple sources of information to perform influenza surveillance activities during the influenza season. These sources include active surveillance with sentinel physicians around the state who report the weekly number of cases of influenza-like illness (ILI) seen at their office; passive surveillance with physicians, hospitals and laboratories submitting summary data on ILI and flu type; and information on patients presenting to hospital emergency departments or urgent care centers with ILI. In addition, laboratory reports of influenza positive specimens, information from outbreak investigations, and reports of influenza-associated deaths in the pediatric population are also assessed. A combination of these data were used to determine weekly influenza activity levels, summarize the length and severity of the influenza season, and characterize the prevalence of influenza types and strains throughout the 2006-2007 season.

Active Surveillance and Activity Levels

During the influenza season, the Virginia Department of Health conducts active surveillance with sentinel physicians around the state who report the weekly number of cases of influenza-like illness (ILI) seen at their office. An ILI case is defined as any person with a fever greater than or equal to 100° F and a cough and/or sore throat in the absence of another known cause. Six weeks of baseline data are collected and a threshold level is determined. Virginia began collecting baseline data for the 2005-2006 and 2006-2007 influenza seasons in October of each year and active data collection continued through May of each year. During the rest of the season, regions with ILI levels over the threshold were considered elevated and contributed to the determination of the overall activity level within the state, in combination with reports of laboratory-confirmed

influenza and influenza-associated outbreaks. Levels, in order of progressing severity, are: no activity, sporadic, local, regional, and widespread. These data indicate that peak influenza activity occurred from early February to early April (Weeks 5 to 14) during the 2005-2006 season and from mid-February to early April (Weeks 7 to 14) during the 2006-2007 season (Figure 33).



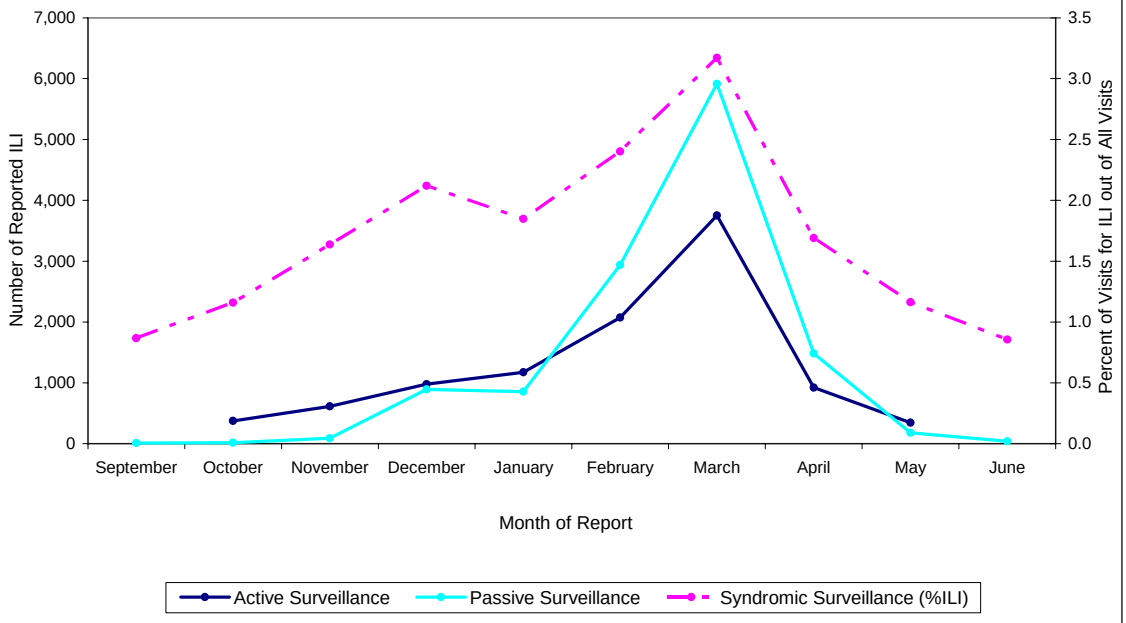
Passive Surveillance

Influenza-like illness was also reported through passive surveillance throughout the calendar year. Passive data are based on unsolicited information provided by private practitioners, hospitals, and laboratories submitted to the local health department. The data are summary numbers and include results from rapid flu tests and the resulting flu type. Overall, fewer cases of influenza-like illness and laboratory confirmed influenza were reported in the 2006-2007 season than the 2005-2006 season. Similar to the active surveillance data, these reports suggest that influenza activity peaked in March during the 2006-2007 season (Figure 34).

Syndromic Surveillance

In addition to the two previously mentioned influenza surveillance methods, the chief complaints of patients visiting emergency departments and urgent care centers were used to unofficially track ILI. These data were sent to VDH daily in automated transmissions from 73 facilities around the state. Patients presenting with complaints of fever and cough or fever and sore throat were classified as having influenza-like illness. These data also suggest that ILI activity peaked in March during the 2006-2007 season (Figure 34).

Figure 34. Influenza-like Illness Reported Through Three Surveillance Methods in Virginia, 2006-2007 Influenza Season



Influenza Types and Subtypes in Virginia

During the 2006-2007 influenza season, the Virginia Division of Consolidated Laboratory Services identified a total of 95 specimens with detectable influenza virus. Of the 95 positives, 67 (70.5%) were type A and 28 (29.5 %) were type B isolates. Of the 67 influenza A viruses, 42 (62.7%) were subtype A/H3, and 25 (37.3%) were subtype A/H1.

Outbreaks

Six outbreaks of influenza were reported to VDH during the 2006-2007 season. In comparison, 30 outbreaks of influenza had been reported to VDH during the 2005-2006 influenza season. The 2006-2007 outbreaks were reported from nursing homes or other senior residential facilities (5) and correctional facilities (1). Of these 6 outbreaks, three (50%) occurred in the northern region, two (33%) were in the eastern, and one was in the southwest region of Virginia. The first outbreak was reported during the week ending February 10, 2007, and the last was reported during the week ending April 14, 2007.

Pediatric Deaths

Three influenza-associated pediatric deaths were reported to VDH during the 2006-2007 influenza season. Two deaths occurred in residents of the central region and one occurred in a resident of the eastern region. All three deaths were in young children under five years of age. Nationwide, 60 influenza-associated deaths in children were reported to CDC.

Kawasaki Syndrome

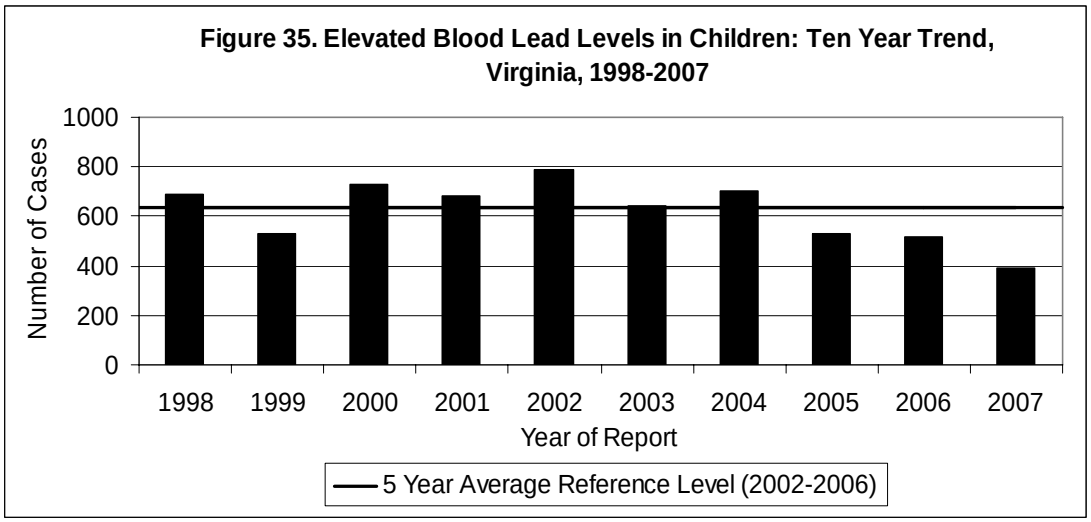
Agent: Unknown – toxin or infectious agent suspected
Mode of Transmission: Unknown
Signs/Symptoms: High fever, rash, swelling of the hands and feet, irritability, conjunctivitis, swollen lymph nodes and inflammation of mouth/lips/throat.
Prevention: Unknown
Other Important Information: Children less than five years of age make up approximately 80% of cases worldwide.

Two cases of Kawasaki syndrome were reported in Virginia during 2007. This is a 67% decrease from the six cases reported in 2006, and an 84% decrease from the five year average of 12.6 cases per year. Both cases were reported in female children less than ten years of age. There was one case each reported from the black population and the white population. One case each was reported from the eastern and central regions. Onset occurred in the third and fourth quarters of the year.

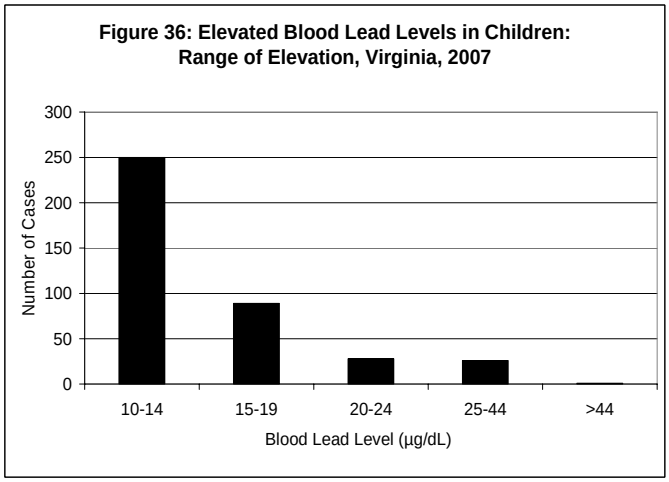
Lead - Elevated Blood Levels in Children

Agent: Lead (metal)
Mode of Transmission: Chewing objects painted with lead paint; ingesting contaminated dust, soil or water; or using glassware, healthcare products or folk remedies containing lead.
Signs/Symptoms: Even at low levels, lead in children can cause nervous system damage, learning disabilities, behavior problems, muscle weakness, decreased growth, hearing damage, or anemia.
Prevention: Avoid ingestion of lead-contaminated materials or use of lead-containing objects. Education of healthcare professionals and parents is important in reducing and detecting lead exposure.
Other Important Information: The primary source of lead for children is exposure to deteriorated paint in housing built before 1978. There is an increased awareness of new sources of lead exposures, including improper renovation of older homes; imported toys; candies popular among some ethnic groups; traditional Hispanic, Indian, and Middle Eastern folk remedies; and ceramics from foreign countries.

Virginia law requires reporting of elevated childhood blood lead levels (>9 μg/dL). There were 394 cases of elevated blood levels in children less than 16 years of age reported during 2007. This is a significant decrease (38%) from the five year average of 635.8 cases per year (Figure 35). This decrease in cases can partially be attributed to improved reporting of test type by physicians and laboratories. Previously, an elevated level from a specimen of unknown type and with no follow-up result was counted as a suspect case. There were 196 suspect cases reported in 2003. In recent years, more initial elevated levels were reported as capillary blood tests, and follow-up tests with venous blood showed levels of less than 10 μg/dL. These results are not included in the total case counts. In 2007, only 39 cases were reported without a specimen type and classified as suspect.



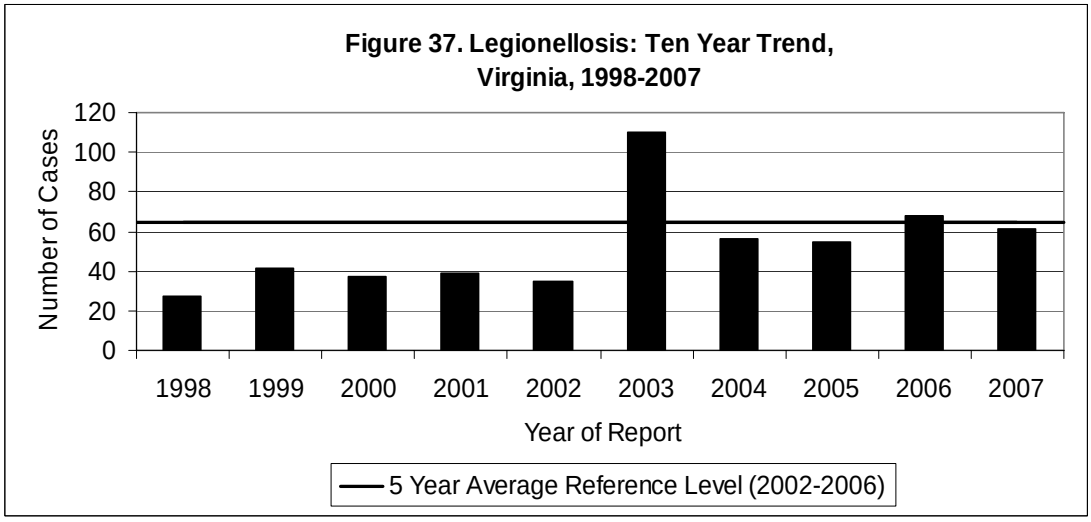
Blood lead levels in the 10-14 μg/dL range are above normal, but only require lead awareness education and follow-up monitoring. Blood lead levels in the 15-19 μg/dL range require nutritional and environmental education and more frequent screening, while a finding in the range of 20-24 μg/dL requires medical and environmental evaluation and environmental remediation. Blood lead levels greater than 24 μg/dL require medical and environmental interventions. Among children reported with elevated blood lead levels, 250 cases (63%) fell in the 10-14 μg/dL range, 89 cases (23%) fell in the 15-19 μg/dL range, 28 cases (7%) fell in the 20-24 μg/dL range, and 26 cases (7%) fell in the 25-44 μg/dL range. One child (<1%) had a lead level greater than 44 μg/dL (Figure 36).



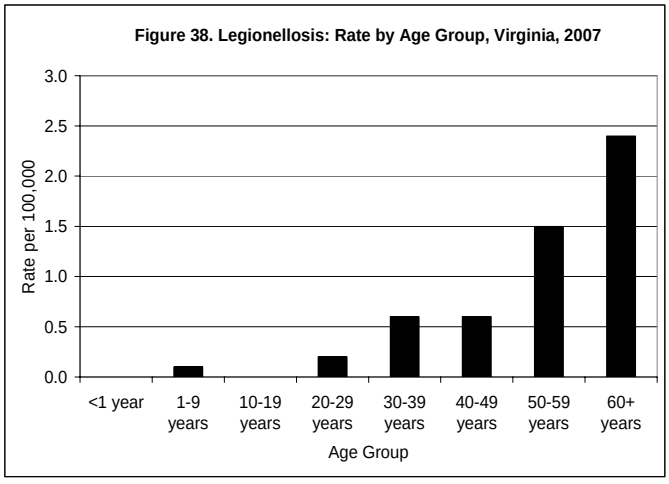
The majority of elevated blood lead levels (92%) and the highest rate occurred in 1-9 year olds (357 cases, 40.2 per 100,000). This was followed by infants (25.5 per 100,000 population) and 10-15 year olds (1.8 per 100,000). Forty-one percent of reports were missing race data, including thirteen (3%) that reported Hispanic ethnicity and no race. Among reports with a race, the black population had an incidence rate more than five times that of the white population (39.6 versus 6.8 per 100,000, respectively), while the "other" population had an incidence rate of 8.9 per 100,000. The male population had a higher incidence rate than the female population (28.6 and 20.6 per 100,000, respectively). The central region had the highest incidence rate of elevated blood lead levels in children, with 49.3 per 100,000. This was followed by the southwest, eastern and northwest regions with incidence rates ranging from 31.9 to 20.7 per 100,000. The northern region had the lowest rate at 7.4 per 100,000.

Legionellosis

Agent: *Legionella* species (bacteria); most infections in the United States are caused by *Legionella pneumophila*
Mode of Transmission: Inhalation of contaminated aerosols (e.g., water sprays, mists).
Signs/Symptoms: Infection with *L. pneumophila* causes two distinct illnesses: Legionnaires' disease, characterized by fever, muscle aches, headaches, malaise, cough, and pneumonia; and Pontiac fever, a mild influenza-like illness without pneumonia. Pontiac fever and Legionnaires' disease are referred to as "legionellosis", separately or together.
Prevention: For outbreaks, disinfection of contaminated water sources by chlorination or superheating of water to 160° - 170°F, and appropriate mechanical cleaning.
Other Important Information: Legionellosis is more common among people who smoke or have chronic medical conditions.



Sixty-one cases of legionellosis were reported in Virginia during 2007. This is a 10% decrease from the 68 cases reported in 2006, and a 6% decrease from the five year average of 64.8 cases per year (Figure 37). The highest incidence rate occurred among adults age 60 and over (2.4 per 100,000) (Figure 38). While one case was reported among the 1-9 year age group, incidence generally increased with age beginning with the 20-29 year age group. By race, the highest rate was reported for the black population (1.1 per 100,000). Males had a higher incidence rate than females (1.0 and 0.6 per 100,000, respectively). Regionally, the northwest region had the highest incidence rate (1.4 per 100,000), while the remaining regions had similar rates (0.5 to 0.8

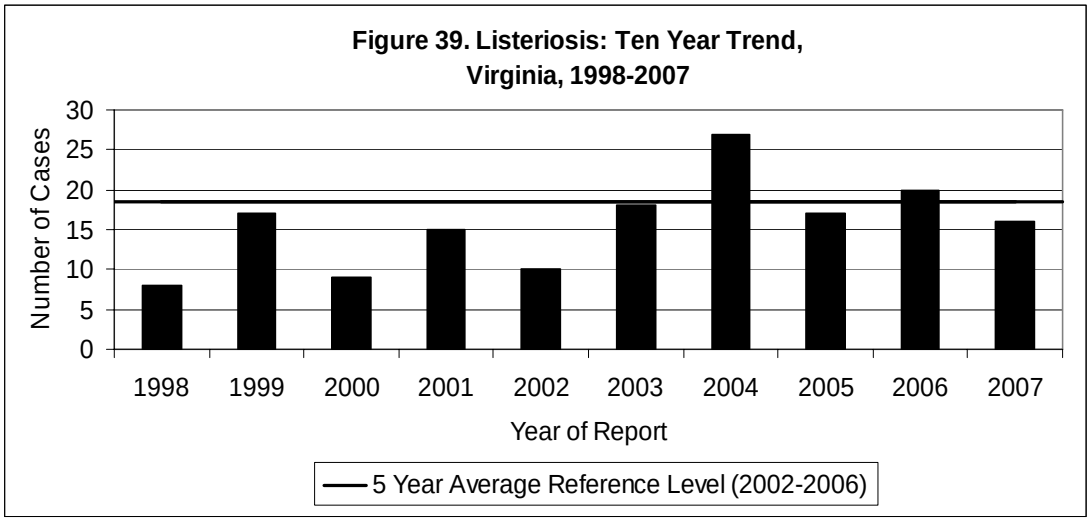


per 100,000). In 2007, the largest proportion of cases (34.4%) had onset during the fourth quarter of the year. However, this disease is not known to have a seasonal pattern. Among cases reported in 2007, one death was attributed to legionellosis and occurred in a person in the 60 year and older age group.

Listeriosis

Agent: *Listeria monocytogenes* (bacteria)
Mode of Transmission: Ingestion of contaminated foods or beverages.
Signs/Symptoms: Typically, fever, headache, nausea, and vomiting. Infection can lead to serious disease, including shock and inflammation of the brain and the fluid surrounding the brain and spinal cord. Miscarriage may occur.
Prevention: Safe food preparation (e.g., thoroughly cooking raw food from animals and wash vegetables) and avoidance of high risk foods (e.g., unpasteurized dairy products).
Other Important Information: Persons at higher risk include pregnant women and persons with weakened immune systems.

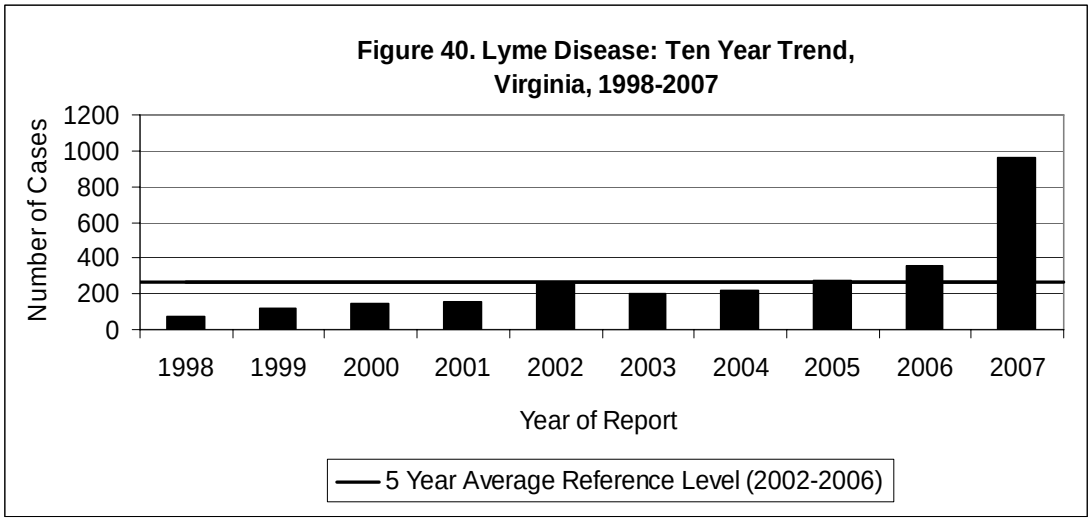
Figure 39. Listeriosis: Ten Year Trend, Virginia, 1998-2007



The 16 cases of listeriosis reported in Virginia during 2007 represent a 13% decrease from the five year average of 18.4 cases per year (Figure 39). The 60 year and older age group had the highest number of cases (8 cases, 0.6 per 100,000), but the highest rate occurred among infants (2 cases, 2.0 per 100,000). The other age groups had incidence rates between 0.0 and 0.2 per 100,000. Incidence rates were similar in the black and white populations (0.3 and 0.2 per 100,000, respectively) and were the same for females and males (0.2 per 100,000). Incidence rates in the regions ranged from 0.1 to 0.4 per 100,000, with the highest rate in the northwest region. Cases occurred in all but the second quarter, with peak activity occurring in the third quarter. Among cases reported in 2007, three deaths were attributed to listeriosis and occurred in one male and two females aged 50 years and older.

Lyme Disease

Agent**:** *Borrelia burgdorferi* (spirochete bacteria)
Mode of Transmission**:** Transmitted to humans from the bite of infected nymphal or adult blacklegged ticks (formerly known as deer ticks). No other tick species plays a role in Lyme disease transmission. Infected ticks must bite a human and remain attached (feeding) for a minimum of 36 hours to be able to transmit the Lyme disease pathogen.
Signs/Symptoms**:** Initial symptoms include fever, headache, fatigue, and a characteristic skin rash called erythema migrans, or EM rash. If untreated, infection can affect the joints, heart, and nervous system.
Prevention**:** Avoid being bitten by ticks. Avoid tick-prone habitats such as humid forest environments with dense undergrowth and/or heavy leaf litter, tall weeds along forest margins, tree lines, forest trails and forest clearings. When in tick-prone habitats, wear light-colored clothing with pants legs tucked into socks. Apply permethrin-based repellents to clothing (shoes, pants, and socks). Apply DEET, Picaridin, or Oil of Lemon Eucalyptus-based repellents to exposed areas of skin (legs and arms). Thoroughly check your body for ticks after visiting tick-prone habitats and remove attached ticks as soon as possible.
Other Important Information: Lyme disease is diagnosed based on symptoms, physical findings (e.g., rash), and the possibility of prolonged exposure to an infected deer tick. The EM rash is the only physical manifestation that is distinctive enough to allow a definitive diagnosis without laboratory testing. The EM rash may be overlooked or absent in up to 30% of persons with Lyme disease.



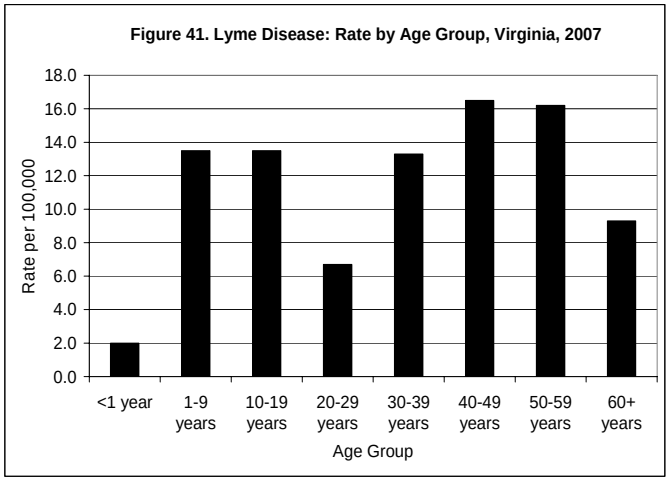
The 959 cases reported in 2007 represent a 169% increase from the 357 cases reported in 2006 and a 266% increase from the five year average (Figure 40). The dramatic increase in the numbers of reported cases of Lyme disease is likely due to a large increase in Lyme disease occurrence, but may also have resulted from increased case follow-up by local health departments and better use of web-based disease reporting. The increased disease incidence occurred primarily in suburbanized areas of Virginia. Suburbanization may enhance the environment for white-tailed deer (which are crucial for tick reproduction) and white-footed mice (which play an important role in transmission of the

Lyme disease agent to ticks). Suburbanized forest areas also bring the human population into greater contact with the tick vector's natural habitat.

Although Lyme disease cases were reported in every quarter during 2007, there was a seasonal pattern, with the majority of cases (74%) reported from April-September and a peak occurrence in June. The seasonality of Lyme disease is strongly correlated to the period when nymphal black-legged ticks are active. Nymphal-stage blacklegged ticks are the primary vectors of Lyme disease and are mostly active during a period from April through mid-July.

There was a bimodal peak in infections by age group, with increased incidence in children and teenagers aged 1 to 19 years, and in adults aged 30 to 59 years. Children and teenagers had an incidence rate of 13.5 cases per 100,000, and the adult group had incidence rates ranging from 13.3 to 16.5 cases per 100,000 (Figure 41). This bimodal age risk for Lyme disease is very typical of what is observed in Lyme-endemic regions of the United States.

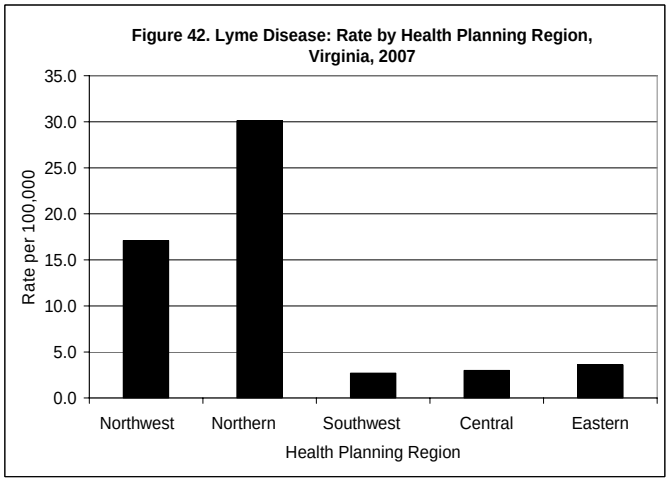
Figure 41. Lyme Disease: Rate by Age Group, Virginia, 2007



Among cases for which race was recorded, the white population had the highest incidence at 9.4 cases per 100,000, followed by the "other" race population at 3.9 per 100,000, and the black population at 1.4 per 100,000. Racial differences may in part be related to differences in healthcare access and exposure to suburban and rural tick habitats, and possibly to easier detection of the EM rash in individuals with lighter skin pigmentation. Females had a slightly higher incidence than males (12.9 and 12.1 per 100,000, respectively).

Cases were reported from all regions of the state; however, the incidence of Lyme disease was highest in the northern region (30.1 per 100,000) and northwest region (17.1 per 100,000). Rates in other regions ranged from 2.8 to 3.6 per 100,000 (Figure 42).

Figure 42. Lyme Disease: Rate by Health Planning Region, Virginia, 2007



Lymphogranuloma Venereum

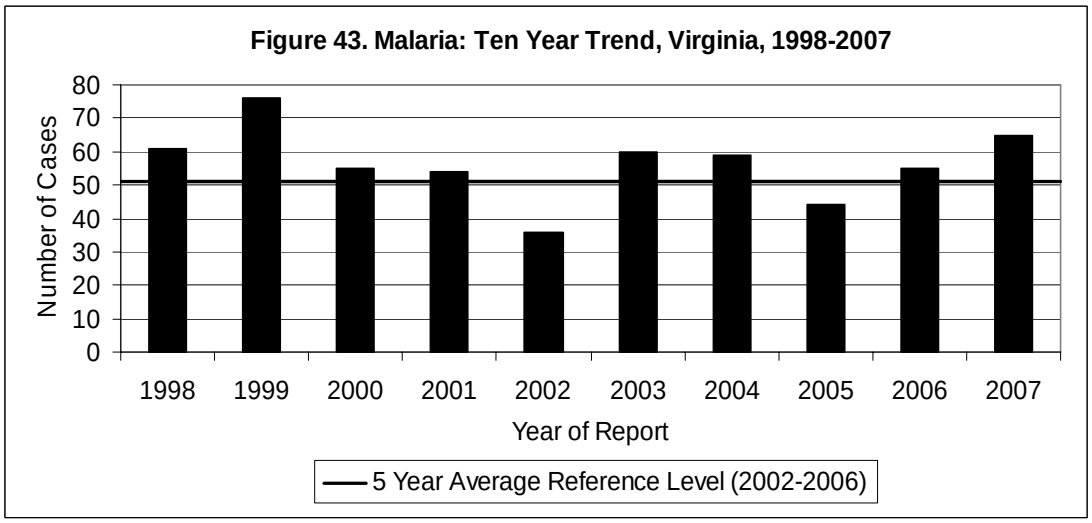
Agent: Specific immunotypes of the bacteria, *Chlamydia trachomatis*
Mode of Transmission: Sexually transmitted through contact with the lesions of an infected person.
Signs/Symptoms: Small, painless lesions on the penis or vulva, which usually go unnoticed. Fever, chills, headache, anorexia, and joint pain may also be present.
Prevention: Safer sexual practices.
Other Important Information: This disease rarely occurs in most developed countries, but in September 2004, the Netherlands reported as many as 92 cases among men who have sex with men.

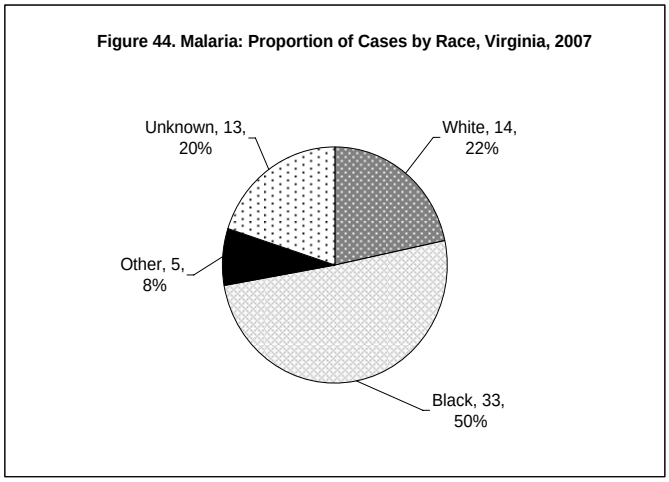
No cases of lymphogranuloma venereum were reported in Virginia in 2007. Three cases were reported in 2005.

Malaria

Agent(s): Four different species of protozoan parasites: *Plasmodium falciparum, P. vivax, P. ovale,* and *P. malariae*.
Mode of Transmission: In Virginia, malaria could be transmitted to humans by infected Anopheline mosquitoes of the species *Anopheles quadrimaculatus* or by *An. punctipennis*. Malaria may also be transmitted by blood transfusion or transplanted organs from infected donors.
Signs/Symptoms: Typically, high fevers, shaking, chills, sweats, severe headache, muscle and joint pain, anorexia, nausea, flu-like illness, anemia and an enlarged spleen. *P. falciparum* infections may progress to severe malaria if not treated promptly; symptoms include acute alteration of brain structure and function, severe anemia, jaundice, renal failure and coma.
Prevention: Appropriate medication for malaria prophylaxis should be taken by travelers to malaria endemic countries. Anopheline mosquitoes bite only at dusk, dawn or during night-time hours and tend to enter buildings. Avoid mosquito bites at these times by staying in structures with adequate screening and/or equipped with bed nets, and when outdoors, by wearing longsleeved, loose fitting, light-colored clothing and mosquito repellents.
Other Important Information: Humans and certain *Anopheles* mosquito species are the only natural reservoirs for malaria. Although no form of malaria is currently endemic to Virginia, it may be brought to this region by travelers or immigrants with dormant or unapparent infections. Various forms of malaria might also arrive in Virginia carried by infected mosquitoes transported in aircraft arriving from foreign destinations. Almost all infections reported in Virginia occur in individuals who were infected in other countries.

In 2007, 65 cases of malaria were reported in Virginia. This is an 18% increase from the 55 cases reported in 2006, and a 28% increase from the five year average of 50.8 cases per year (Figure 43).





Incidence rates were highest for the 1-9 year age group (1.7 per 100,000), followed by the 30-39 year age group (1.3 per 100,000). Half of the reported cases occurred among the black population (Figure 44), which had a much higher incidence rate than the white population (2.2 and 0.2 per 100,000, respectively). The male population had a higher incidence rate than the female population (1.0 and 0.7 per 100,000, respectively). Among regions, the northern region had the highest incidence rate (1.7 per 100,000). Rates in other regions ranged between 0.3 and 0.7 per 100,000. No deaths due to malaria were reported in 2007. Sixty two cases (95%) reported a history of travel outside of the United States within the four years prior to disease onset. Travel histories for the remaining three cases were not available. Information on malaria prophylaxis usage was obtained for 56 cases (86%). Of these, 15 (27%) reported receiving prophylaxis for malaria, although two of these cases reported missing at least one dose.

Measles

Agent: Measles virus
Mode of Transmission: Primarily person-to-person by inhalation of respiratory droplets or direct contact with nasal or throat secretions of infected people; however, airborne transmission via aerosolized droplet nuclei has been documented.
Signs/Symptoms: Fever, cough, conjunctivitis, coryza, and a typical rash on the third to seventh day after onset of symptoms.

Prevention: Measles vaccine should be given as part of the measles, mumps, and rubella (MMR) series beginning at 12-15 months of age followed by a second dose at age 4-6 years.
Other Important Information: Measles is highly communicable, with >90% secondary attack rates among susceptible people. Although measles is no longer endemic in the United States, imported cases continue to cause occasional limited transmission of measles.

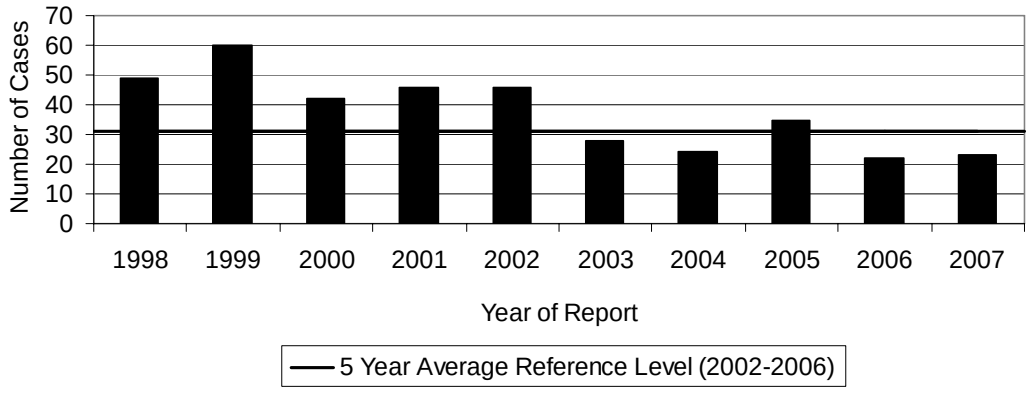
No cases of measles were reported in Virginia during 2007. Virginia's last reported case occurred in 2001.

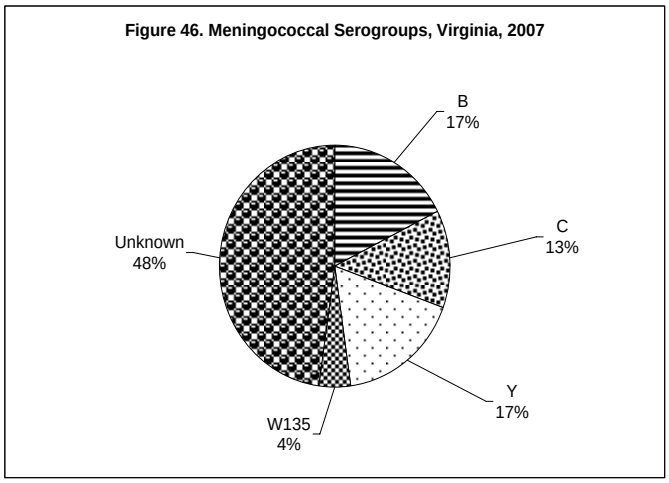
Meningococcal Disease

Agent: *Neisseria meningitidis* (bacteria)
Mode of Transmission: Transmission occurs through contact with respiratory droplets from the nose or throat of infected people (e.g., through coughing or kissing).
Signs/Symptoms: Sudden onset of fever, headache, stiff neck, vomiting, and photophobia (fear of light). A rash may also be present.
Prevention: Vaccination protects against two of the three types of infection that are common in the United States.
Other Important Information: Crowding, exposure to tobacco smoke, and coexisting respiratory tract infections increase the risk of disease. Five to ten percent of people carry *N. meningitidis* in their nose without having any symptoms of disease; those who develop disease are usually infected by a carrier who does not have symptoms.

During 2007, 23 cases of meningococcal disease were reported in Virginia. This is a slight 5% increase from the 22 cases reported in 2006, but a 26% decrease from the five year average of 31 cases per year (Figure 45).

Figure 45. Meningococcal Disease: Ten Year Trend, Virginia, 1998-2007





The highest rate of infection occurred in the infant population (2.0 per 100,000). Rates in the other age groups ranged from 0.2 to 0.5 per 100,000. Among cases where race was reported, the rate in the black population was slightly higher than that in the "other" population (0.5 and 0.4 per 100,000 respectively), while the rate in the white population was 0.2 per 100,000. The incidence rate was the same for males and females (0.3 per 100,000). Of the twelve cases for which a serogroup was identified, four were group B, three were group C, four were group Y and one was group W135 (Figure 46).

The highest incidence rate was observed in the northwest region (0.6 per 100,000), with rates in the other regions ranging from 0.2 to 0.3 per 100,000. By onset, the largest proportion of cases occurred in the first and fourth quarters of the year (30.4% per quarter), and the smallest proportion (13%) occurred during the third quarter. Among 2007 cases, three deaths were reported in individuals whose infections developed into meningitis. Two occurred in adult females, and one occurred in a female infant.

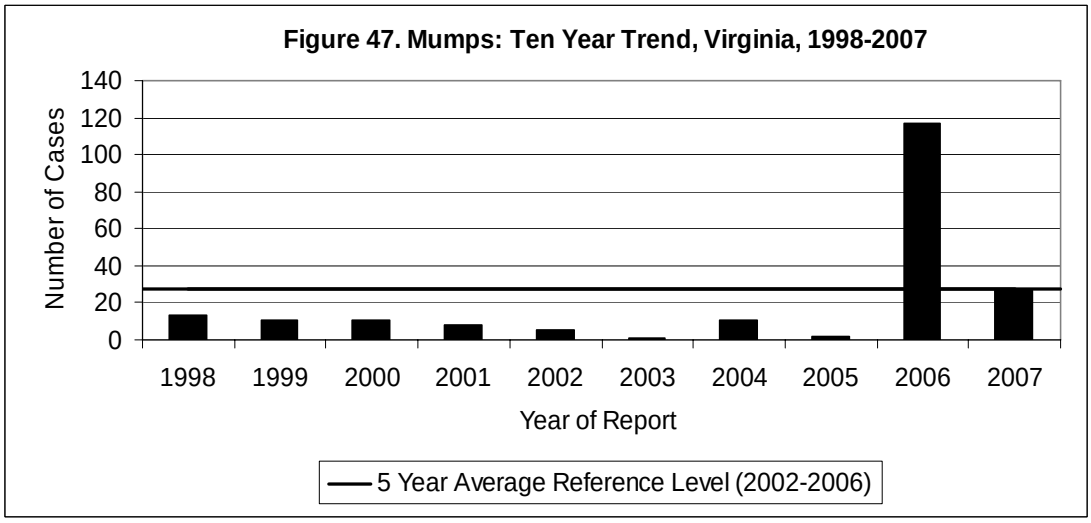
Monkeypox

Agent: Monkeypox virus (genus *Orthopoxvirus*)
Mode of Transmission: From the bite of or direct contact with lesions or body fluids of an infected animal. Though less common, infection can be transmitted from person to person by respiratory droplets or by direct contact with body fluids of an infected person, or with virus-contaminated objects such as bedding.
Signs/Symptoms: Similar to smallpox, though more mild. Initial symptoms include fever, headache, backache, sore throat, cough and swollen lymph nodes. Three days after fever onset, a rash develops.
Prevention: Avoid contact with exotic or wild mammals that originate from areas where monkeypox has occurred.
Other Important Information: In 2003, a monkeypox outbreak was reported in the United States among persons exposed to native prairie dogs that had contact with imported African rodents.

Monkeypox became a reportable disease in Virginia in 2004. No cases of monkeypox have ever been reported in Virginia.

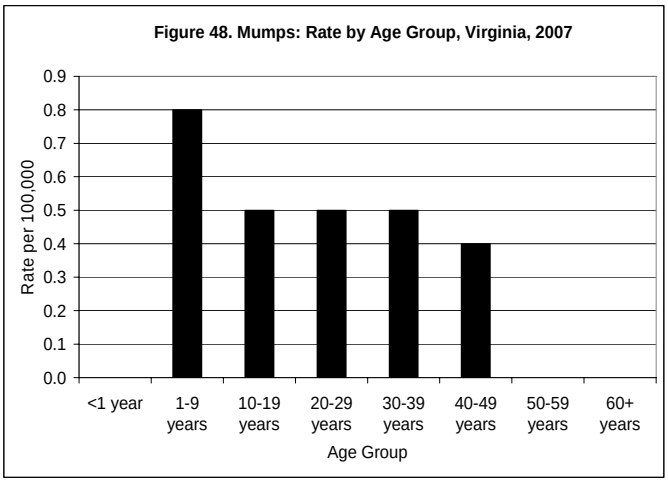
Mumps

Agent: Mumps (virus)
Mode of Transmission: Person-to-person through respiratory droplets, as well as through direct contact with saliva of an infected person.
Signs/Symptoms: Fever, swelling and tenderness of one or more salivary glands. In children under age five, 40%-50% of cases are associated with respiratory symptoms. As many as 20% of mumps infections are asymptomatic.
Prevention: Vaccination, preferably administered as MMR, beginning at age 12 months. Two doses of mumps-containing vaccine are recommended for school-aged children, healthcare workers, international travelers, and college students.



The 27 cases of mumps reported in 2007 were a dramatic decrease from the 117 cases of mumps reported in 2006 and is in-line with the five-year average of 27.2 cases per year (Figure 47). The unusually high number of cases reported in 2006 was due primarily to elevated awareness of mumps following a large multi-state outbreak in the mid-western part of the country, coupled with a university-based outbreak in Virginia.

Of the 27 cases reported in 2007, the highest incidence rate was seen in the 1-9 year age group (0.8 per 100,000). Incidence rates for adolescents and adults to age 49 years were very similar (Figure 48). No cases were reported in infants or adults fifty years and older. Rates were higher among those of "other" races (1.5 per 100,000) than among blacks and whites (0.2 and 0.3 per 100,000, respectively). The incidence among



females was twice the rate among males (0.5 and 0.2 per 100,000). Although cases were reported in all regions of the state, 70% of cases occurred in the northwest and northern regions (0.7 and 0.5 per 100,000). The occurrence of mumps peaks predominantly in late winter and early spring and this coincides with 52% of the cases being reported in the first quarter of 2007.

Ophthalmia Neonatorum

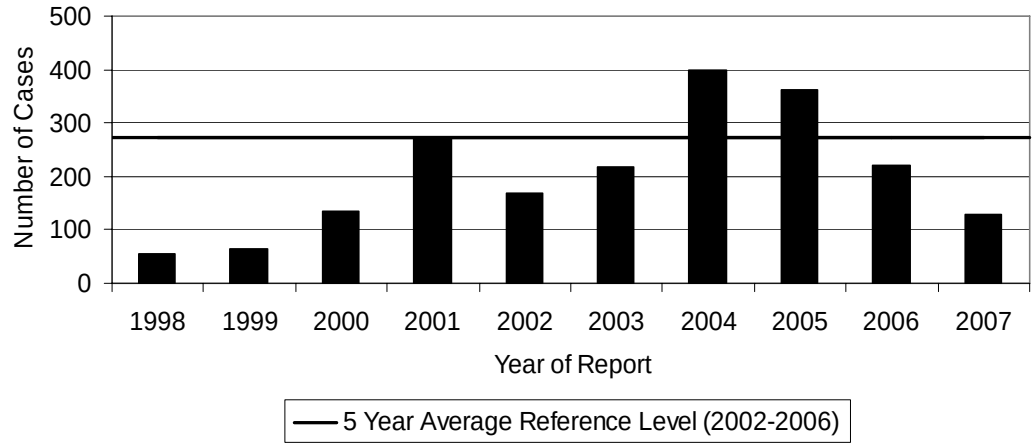
Agent: *Chlamydia trachomatis* (bacteria) or *Neisseria gonorrhoeae* (bacteria), though *C. trachomatis* is most common.
Mode of Transmission: Infants are exposed to the organism in the birth canal during childbirth.
Signs/Symptoms: Redness or swelling of one or both eyes beginning five to fourteen days after birth.
Prevention: Screening of all pregnant women for chlamydia and gonorrhea infection, followed with appropriate treatment for infected women and their partner(s).

Five infants were reported with ophthalmia neonatorum in 2007, all of which were caused by *C. trachomatis*.

Pertussis

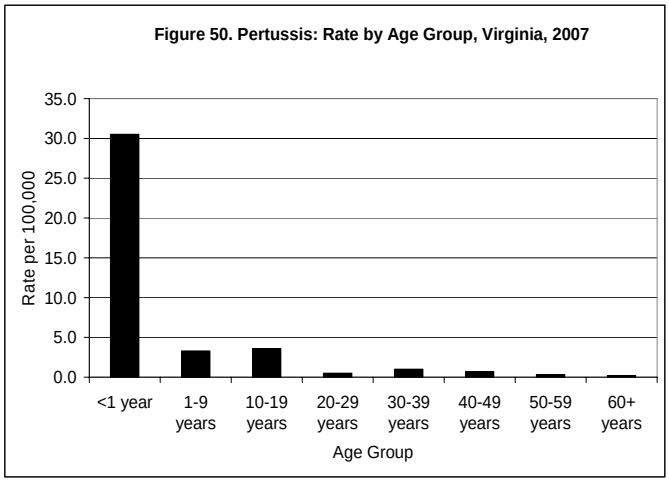
Agent: *Bordetella pertussis* (bacteria)
Mode of Transmission: Contact with droplet respiratory secretions from infected patients.
Signs/Symptoms: Insidious cough that progresses to paroxysmal coughing (severe, sequential coughs with difficulty inhaling) and may be accompanied by post-cough vomiting.
Prevention: Vaccination beginning at 2 months of age.
Other Important Information: In vaccinated populations, the case-fatality rate is low. When deaths occur, they are generally in children less than six months old who are too young to have received the vaccine.

Figure 49. Pertussis: Ten Year Trend, Virginia, 1998-2007



In 2007, 128 cases of pertussis were reported in Virginia. This is a 42% decrease from the 221 cases reported in 2006 and a 53% decrease from the five year average of 274.2 per year (Figure 49). Cases of pertussis typically occur in waves, with peak numbers appearing every 3-4 years. A high of 400 cases was reported in 2004. This general downward trend in pertussis cases since 2004 has also been noted nationally.

In Virginia, pertussis cases were reported from every age group, but those under one year of age had the highest incidence rate, with 30.5 per 100,000 population. This was followed by the 10-19 and 1-9 year age groups, with 3.6 and 3.3 cases per 100,000, respectively (Figure 50). The incidence rate in the white population was more than twice the rate in the black population (1.7 and 0.8 per 100,000, respectively). Females had a slightly higher incidence rate than males (1.8 and 1.6 per 100,000, respectively).



Among regions, the northwest region had the highest incidence rate (3.1 per 100,000). This was followed by the eastern region with 2.4 per 100,000. The largest proportion of cases (33%) occurred in the third quarter of the year. Six outbreaks were reported in 2007. The largest outbreak occurred in the northern region and involved 10 cases.

Plague

Agent: *Yersinia pestis* (bacteria)
Mode of Transmission: Transmitted to humans through the bite of infected fleas or through bites or scratches from infected animals (e.g., cats). If the disease attacks the lungs, it may be spread from person to person by droplets released when coughing.
Signs/Symptoms: Fever, chills, nausea, headache and body aches. Specific types of plague also lead to other symptoms, such as swollen lymph nodes ("buboes"), bloodstream infections, and pneumonia.
Prevention: In areas where plague occurs, travelers should avoid contact with rodents and fleas and avoid handling stray animals. Persons with plague that results in pneumonia should be isolated until 48 hours after antibiotics have been started.
Other Important Information: Fewer than 20 people in the United States are diagnosed with plague every year. Plague is considered to be one of the agents that could be used for bioterrorism because the disease can be spread from person to person and would cause increased illness and death in the population if used as a weapon.

No cases of plague have been reported in Virginia since the nineteenth century.

Poliomyelitis

Agent: Poliovirus
Mode of Transmission: Person-to-person through ingestion of contaminated food or direct contact with fecal material from infected people.
Signs/Symptoms: Ten percent of infections will develop into a non-specific syndrome with fever, malaise, headache, nausea, and vomiting. Flaccid paralysis occurs in 1% of poliovirus infections.
Prevention: Vaccination beginning at 2 months of age.
Other Important Information: Polio eradication programs have led to the elimination of the disease in the Western Hemisphere; however, at the beginning of 2006, four countries still had endemic polio: Afghanistan, India, Nigeria, and Pakistan.

The last reported case of poliomyelitis in Virginia occurred in 1978.

Psittacosis

Agent: *Chlamydophila psittaci* (formerly known as *Chlamydia psittaci*) (bacteria)
Mode of Transmission: Transmission occurs when the bacteria are inhaled from aerosolized dried feces, from respiratory tract secretions, or from dust from feathers of infected birds.
Signs/Symptoms: Most commonly fever, headache, weakness, loss of appetite, muscle aches, chills, sore throat, and cough. They can present as a mild flu-like illness or can be very severe, especially in older persons.
Prevention: Proper design and management of facilities that raise and sell birds and use of protective clothing (e.g., wearing of masks or respirators and gloves) by those working with birds. Bird cages should be cleaned regularly with disinfectants and the contents of the cage should be disposed of properly.
Other Important Information: Birds may or may not show signs of illness when infected. Birds in the parrot family (e.g., cockatiels, parakeets, parrots, macaws) are most commonly responsible for human infection, but any bird species can be infected and, thus, be a source for human disease.

No cases of psittacosis were reported in Virginia during 2007. One case was reported in 2003 and previous to that, one case was reported in 1998.

Q Fever

Agent: *Coxiella burnetii* (bacteria)
Mode of Transmission: Inhalation of air contaminated with dried placental material, birth fluids, or excreta of infected animals; direct exposure to infected animals or tissues; exposure to contaminated material, such as wool, straw, fertilizer, or laundry.
Signs/Symptoms: High fever, severe headache, malaise, muscle aches, confusion, non-productive cough, nausea, diarrhea, abdominal pain, and/or chest pain.

Prevention: Appropriate disposal of potentially infectious tissues and proper hygiene when handling animal birth material.
Other Important Information: Q fever is classified by the CDC as a potential bioterrorist agent in light of its possible use as an agent that could be easily disseminated and result in a moderate amount of illness.

Four probable cases of Q fever were reported in Virginia in 2007. The four cases were dispersed among the 30-39, 40-49, 50-59, and 60 year and over age groups. Three of the cases were female and one was male. Two of the cases were reported as white and the other two were listed as unknown race. Two cases were from the eastern region. The other cases were from the southwest and central regions. One case had contact with lamb intestines two months prior to the onset of signs and symptoms. The other three had no obvious exposures. Among reported cases in 2007, one death was attributed to Q fever. Four probable cases were reported in 2006. Two probable cases of Q fever were reported in Virginia in 2005, and were the first cases of Q fever reported in Virginia since 1999.

Rabies

Agent: Rabies virus, a rhabdovirus of the genus *Lyssavirus*.
Mode of Transmission: Most commonly transmitted through the bite of an infected animal, but may be transmitted through any method by which virus-infected saliva or central nervous system tissue enters the body.
Signs/Symptoms: Vary widely, but often include an initial headache, fever and apprehension which progresses to paralysis, spasms of the muscles used for swallowing, delirium and convulsions. Once symptoms appear, rabies is almost invariably fatal.
Prevention: Important prevention methods include vaccinating cats and dogs, eliminating stray animals, and avoiding handling wildlife. A pre-exposure vaccine should be given to people at high risk of infection (e.g., veterinarians and laboratorians working with rabies virus). Post-exposure vaccine should be administered to anyone possibly exposed to a rabid animal.
Other Important Information: The main reservoir of rabies in the United States is wildlife. In most other countries, the main reservoir is dogs.

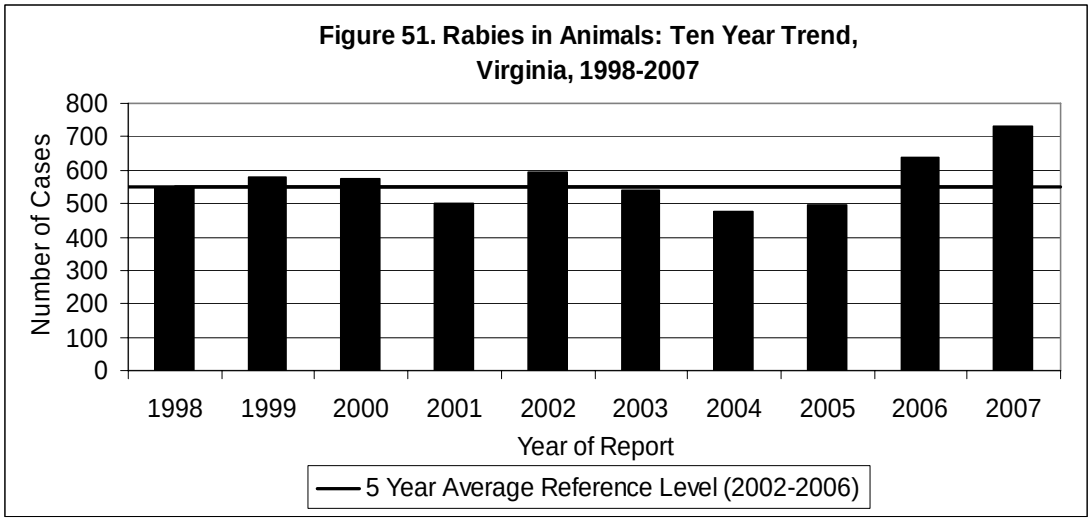
Human

No human cases of rabies were reported in Virginia during 2007. The last human case occurred in 2003 in an adult male from the northern region that was infected with a raccoon rabies variant. Though no specific exposure event could be determined, the case had lived and worked in an area with endemic raccoon rabies. This was the first instance of a raccoon-variant human rabies infection reported in the United States.

Animal

A 15% increase occurred in the number of animals testing positive for rabies from 637 in 2006 to 730 in 2007 (Figure 51). This increase also represented a 33% rise from the 5

year average. The proportion of tested animals that were positive increased from 15% in the previous year to 19% in 2007. The Fairfax Health District reported the most positive animals (68 positives, 9% of Virginia's positives), followed by Central Shenandoah (56 positives, 8%) and Lord Fairfax (52 positives, 7%).



Among the 4,566 specimens sent for analysis, the most commonly tested animals were cats (1,116), bats (880), raccoons (757), dogs (627), skunks (261), opossums (193) and groundhogs (150). Animals with the highest percentage of positive rabies tests included skunks (71%), bobcats (60%), foxes (48%) and raccoons (47%). During 2007, there were 160 reports of human exposures to animals that tested positive for rabies. These human exposures included 10 animal species (Table 8).

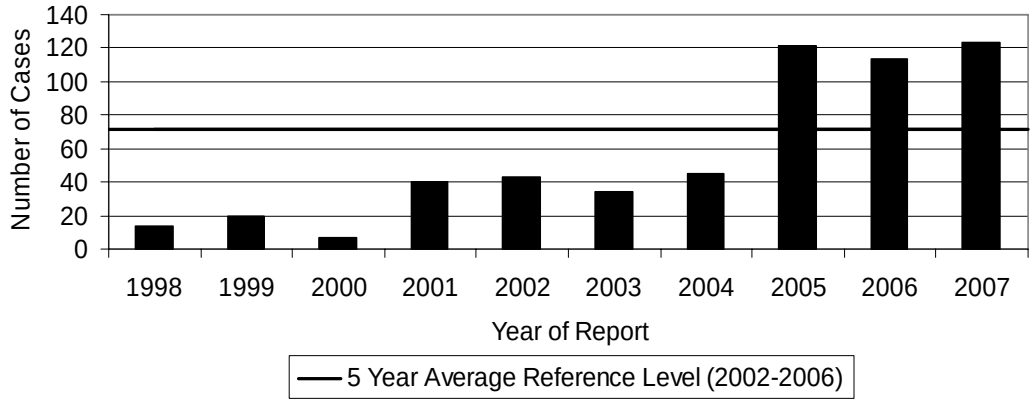
Table 8. Animals Testing Positive for Rabies and Resulting Number of Human Exposures, by Species, in Virginia for 2007

Animal Species	Animals Tested	Animals Positive		Positives with Human Exposures
		Number	Percent	
Bat	880	30	3%	17
Bobcat	5	3	60%	0
Cat	1,116	36	3%	31
Cow	85	8	9%	7
Dog	627	5	1%	4
Horse	61	1	2%	1
Fox	189	90	48%	31
Goat	22	0	0%	0
Groundhog	150	9	6%	3
Opossum	193	0	0%	0
Raccoon	757	359	47%	49
Sheep	9	0	0%	0
Skunk	261	185	71%	15
Other	211	4	2%	2
TOTAL	4,566	730	15%	160

Rocky Mountain Spotted Fever

Agent**:** *Rickettsia rickettsi* (bacteria)
Mode of Transmission: Rocky Mountain spotted fever (RMSF) is transmitted to humans by the bite of an infected American dog tick. Ticks must be attached (feeding) for at least 4 to 6 hours to transmit infection.
Signs/Symptoms**:** Persons infected with RMSF may have a sudden onset of fever, severe headache, muscle pain, nausea and vomiting. This may be followed after four days by development of a rash that starts on the hands and feet and spreads to the rest of the body. The rash is seen in only 40% to 60% of cases and does not occur until late in the progression of the disease, a point at which fatalities may begin to occur.
Prevention**:** Avoid being bitten by ticks. Avoid American dog tick-prone habitats such as open fields with tall brush and weeds, old fields with early succession forest growth, or brushy vegetation along forest margins and trails. Wear light-colored clothing with pants legs tucked into socks, apply a permethrin-based repellant to clothing (e.g., a clothing treatment to shoes, socks and pants) and an approved repellent to exposed skin. Thoroughly check your body for ticks after visiting tick-prone habitats and remove attached ticks as soon as possible. American dog ticks are frequently found feeding on the neck or head, or in hair at the base of the scalp.
Other Important Information: The disease can be difficult to diagnose in the early stages, but without early intervention, may be fatal in up to 30% of untreated patients. Although the national case fatality rates ranged from 3% to 8% of all reported cases in the period from 1970 to 1982, case fatality rates have declined in recent years to <1% of cases reported from 2001 to 2007.

Figure 52. Rocky Mountain Spotted Fever: Ten Year Trend, Virginia, 1998-2007

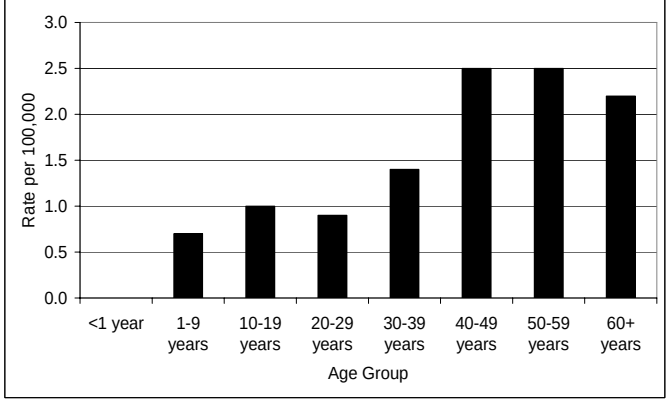


In 2007, 123 cases of RMSF were reported in Virginia. This is slightly more than the previous high of 121 cases reported in 2005, and is a 72% increase from the five year average of 71.4 cases (Figure 52). This recent large increase in cases may be attributed to the fact that more local health department resources are being devoted to following up on laboratory reports of RMSF, but it may also represent an actual increase in RMSF activity. The increased number of RMSF cases since 2004 has not been accompanied by

an increase in human fatalities. Among cases reported from 2005 to 2007, no deaths were attributed to RMSF.

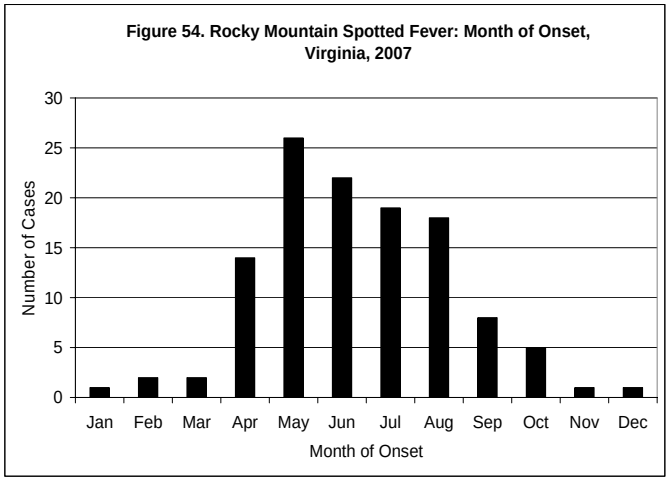
In 2007, incidence rates by age group were dissimilar to what is expected for RMSF. Rates were uncharacteristically low in persons aged 1-9 years old (0.7 cases per 100,000), while rates were uncharacteristically high in persons aged 40 years and older (2.5 to 2.2 cases per 100,000) (Figure 53). This age pattern is similar to what was observed in Virginia in 2005 and 2006, but differs from the national pattern in which the majority of RMSF cases occur in the 1-9 year age group.

Figure 53. Rocky Mountain Spotted Fever: Rate by Age Group, Virginia, 2007



The white population had an incidence rate of 1.5 per 100,000, while the black population had a rate of 1.1 per 100,000. The male population had a higher incidence rate than the female population (1.8 and 1.4 per 100,000, respectively). The southwest and central regions of Virginia had the highest incidence (3.0 and 2.8 per 100,000, respectively), followed by the northwest region (1.7 per 100,000). The majority of cases (87%) had onsets from April through September (Figure 54).

Figure 54. Rocky Mountain Spotted Fever: Month of Onset, Virginia, 2007



Rubella

Agent: Rubella virus
Mode of Transmission: Person-to-person through contact with nose and throat secretions from infected people. It may also be transmitted from mother to child during pregnancy, causing congenital rubella syndrome in the infant.
Signs/Symptoms: Fever and rash, with frequent occurrences of arthralgia, arthritis, and lymphadenopathy.
Prevention: Vaccination, preferably administered as MMR, beginning at 12 months of age.

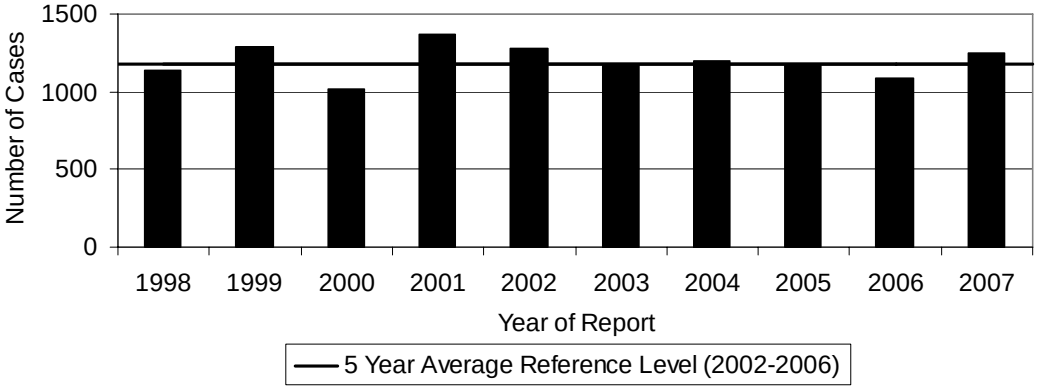
Other Important Information: Approximately half of the reported cases of rubella in the U.S. since 2001 have occurred among persons born outside of the country, most of whom were born outside of the Western Hemisphere. In 2004, a panel convened by the Centers for Disease Control and Prevention concluded that sustained transmission of rubella has been interrupted and rubella is no longer endemic in the U.S.

No cases of rubella were reported in Virginia during 2007. The last Virginia case was reported in 1998.

Salmonellosis

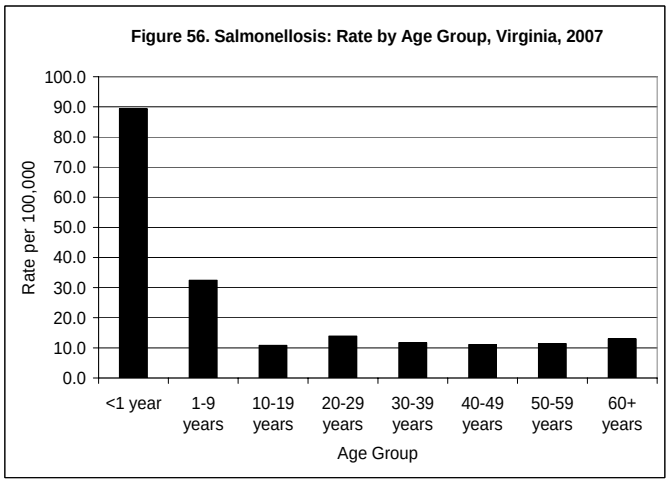
Agent: *Salmonella* (bacteria)
Mode of Transmission: Eating contaminated food or drinking contaminated water. Infected persons can spread the bacteria by not washing their hands after going to the bathroom and then handling food that other people will eat. Another way to get this disease is by having direct contact with feces from an infected person or animal and then transferring the bacteria to the mouth from the hands.
Signs/Symptoms: Sudden onset of headache, fever, abdominal pain, diarrhea and sometimes vomiting. Dehydration, especially in the elderly and young children, can be a severe complication.
Prevention: Proper sanitation methods for food preparation (including preventing cross-contamination of food preparation surfaces), sanitation of water supplies, proper hand hygiene, sanitary sewage disposal, exclusion of infected people from handling food or providing healthcare, prohibiting the sale of pet turtles and restricting the sale of other reptiles for pets. Eggs and other foods of animal origin should be cooked thoroughly.
Other Important Information: The incidence rate is highest among infants and young children. Mortality rates are higher in infants, the elderly and people with immunosuppressive conditions.

Figure 55. Salmonellosis: Ten Year Trend, Virginia, 1998-2007



The 1,249 cases of salmonellosis reported in 2007 were a 15% increase from the 1,089 cases reported in 2006, and a 6% increase from the five year average of 1,182 cases per year (Figure 55).

By far, the highest incidence rate was observed in the <1 year age group (89.4 per 100,000), followed by the 1-9 year age group (32.4 per 100,000) (Figure 56). Other age groups all showed similar rates of infection (between 10.8 and 13.9 per 100,000). Although information on race was missing for 44% of the cases, incidence rates where race was known were slightly higher in the white population (9.5 per 100,000) than the black population (8.6 per 100,000). Rates were also similar among females and males (16.3 and 16.0 per 100,000, respectively).



The northern region had the highest incidence rate with 17.5 cases per 100,000. However, the rates in all other regions were not substantially lower, ranging from 14.3 to 16.8 per 100,000. While salmonellosis occurred throughout the year, there was a notable increase in the second and third quarters (62% of the cases), with a peak in July and August (Figure 57). Among reported cases from 2007, four deaths were attributed to salmonellosis, all of which occurred in adults over 40 years of age. Among Virginia salmonellosis cases reported in 2007, the most commonly identified serotype was *Salmonella* ser. Enteritidis (Table 9).

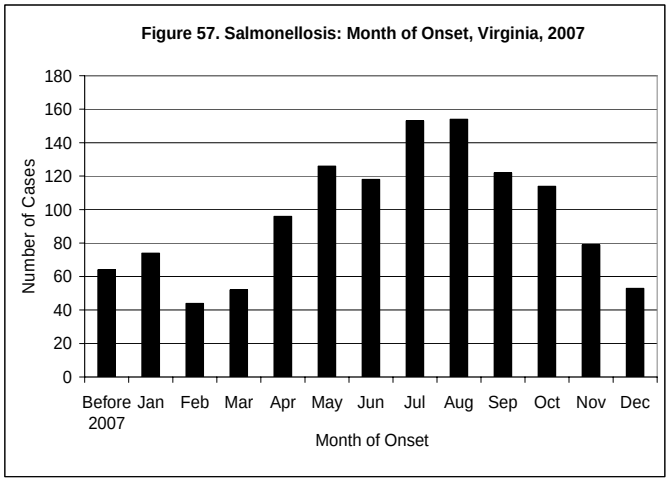


Table 9. Number and Percent of *Salmonella* Infections by Serotype, Virginia, 2007

Serotype Causing Infection	Number	Percent		Serotype Causing Infection	Number	Percent
S. ser. Enteritidis	282	22.4		*S.* ser. Infantis	25	2.0
S. ser. Typhimurium	275	21.8		*S.* ser. Heidelberg	19	1.5
S. ser. Newport	88	7.0		*S.* ser. Braenderup	18	1.4
S. ser. Javiana	43	3.4		*S.* ser. Saintpaul	18	1.4
S. ser. Tennessee	39	3.1		All Others	222	17.6
S. ser. Bareilly	30	2.4		Unspecified	201	16.0
				TOTAL*	1,260	100

*The total number of serotypes (1,260) is larger than the total number of *Salmonella* infections (1,249) because a person may be infected with more than one serotype.

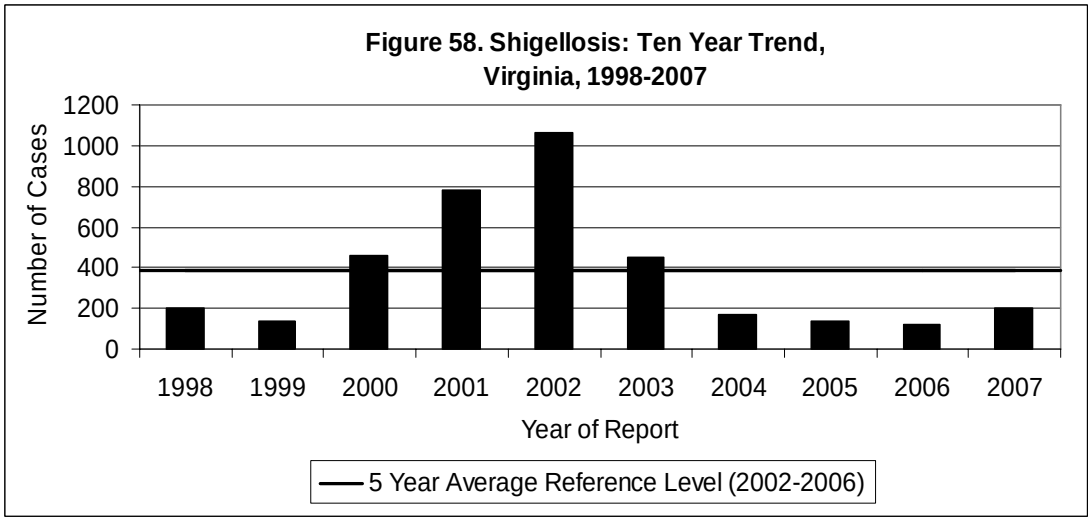
Severe Acute Respiratory Syndrome

Agent: Severe acute respiratory syndrome-associated coronavirus (SARS-CoV)
Mode of Transmission: Most likely transmitted from person to person through coughing and sneezing; spread can also occur by touching a contaminated surface or object and then touching the mouth, nose, or eyes. It is possible that SARS-CoV might be spread more broadly through the air or by other routes that are not yet known.
Signs/Symptoms: Weakness, muscle pain, and fever followed by respiratory symptoms, such as cough and shortness of breath. Diarrhea may occur.
Prevention: Factors that may reduce transmission include frequent hand washing; avoidance of touching the eyes, nose, and mouth with contaminated hands; and covering the nose and mouth with a tissue when coughing or sneezing.
Other Important Information: Major outbreaks of SARS occurred between November 2002 and July 2003 in Canada, China, Singapore and Vietnam. In the United States, eight people had laboratory evidence of SARS-CoV infection. SARS is thought to have originated in China.

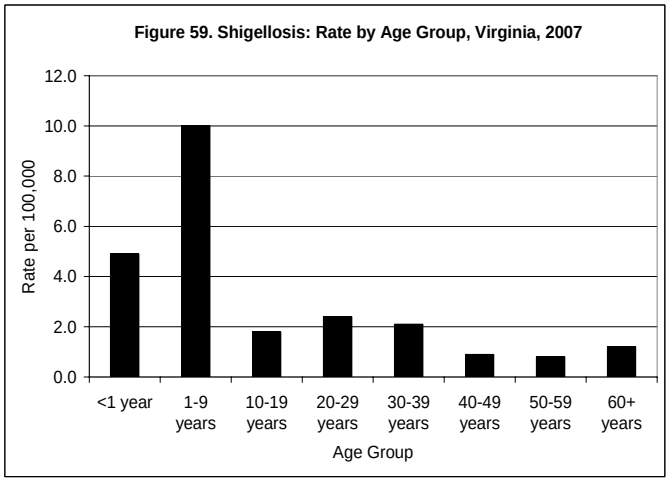
No cases of SARS were reported in Virginia during 2007. Previously, one case of SARS was confirmed in Virginia during the international outbreaks in 2003. The case occurred in a female over age 50 who had traveled to Taiwan, Malaysia and Singapore in the four weeks before onset of symptoms. Her exposure most likely occurred in a Singapore hospital, where she had direct contact with patients being treated for SARS. Active global surveillance for SARS has detected no person-to-person transmission of SARS since July 2003.

Shigellosis

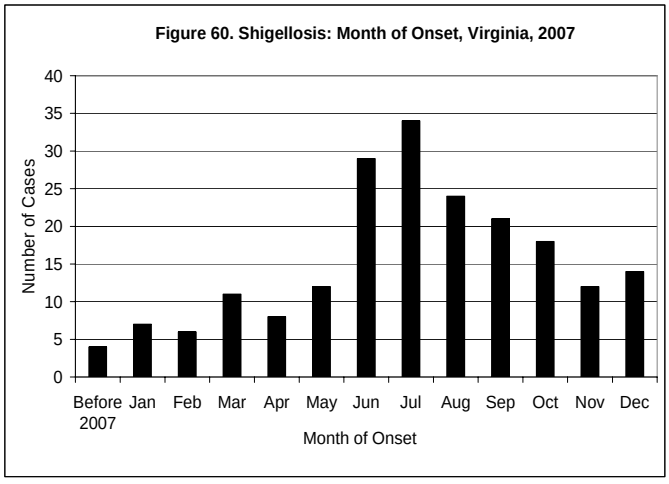
Agent: *Shigella* (bacteria)
Mode of Transmission: The primary mode is fecal-oral via person-to-person contact. Additionally, contact with a contaminated inanimate object, ingestion of contaminated food or water and sexual contact may spread the disease.
Signs/Symptoms: Characterized by diarrhea (ranging from watery and loose to mucoid with or without blood), fever and sometimes nausea, vomiting, abdominal cramps and painful straining at stool or urination. Mild and asymptomatic infections can occur.
Prevention: Strict attention to hand hygiene is essential to limit transmission. Additional control measures include improved sanitation, chlorination of drinking water, proper cooking and storage of food, the exclusion of infected persons as food handlers and measures to decrease contamination of food by houseflies.



During 2007, 200 cases of shigellosis were reported in Virginia. This is a 67% increase from the 120 cases reported in 2006, but a 48% decrease from the five year average of 386.6 cases per year (Figure 58). The 1-9 year age group had the highest number of reported cases and incidence rate (89 cases, 10.0 per 100,000), followed by the <1 year age group with a rate of 4.9 per 100,000. The other age groups had rates between 0.8 and 1.8 per 100,000 (Figure 59). The black and white populations had similar incidence rates (0.3 and 0.2 per 100,000, respectively). Females and males had the same incidence rate (0.2 per 100,000).



The northern region showed the highest incidence rate at 0.4 per 100,000. The other regions followed closely with rates between 0.3 and 0.1 per 100,000. A seasonal trend was observed, with 63% of cases occurring from June through October (Figure 60). Among cases reported in 2007, one death was attributed to shigellosis and occurred in an adult female.



Smallpox

Agent: Variola virus
Mode of Transmission: Spread from person to person through contact with respiratory droplets, airborne particles (rare), and skin lesions of an infected person. Smallpox can also be transmitted through contact with contaminated clothing or bedding.
Signs/Symptoms: Sudden onset of fever, headache, weakness and exhaustion followed by development of a rash that first appears on the face and extremities.
Prevention: Routine vaccinations among the American public stopped in 1972.
Other Important Information: The last case of smallpox in the United States was in 1949; the last naturally occurring case in the world was in Somalia in 1977. Smallpox is considered to be one of the agents that could be used for bioterrorism because the disease can be spread from person to person and would cause increased illness and death in the population if used as a weapon.

The last case of smallpox in Virginia occurred in 1944.

Staphylococcus aureus Infection, Invasive, Methicillin-Resistant (MRSA)

Agent: *Staphylococcus aureus* (bacteria)
Mode of Transmission: Person-to-person via direct contact with colonized skin or skin lesions of an infected person, or by indirect contact with contaminated personal items or surfaces. Invasive infections occur when the bacteria penetrates to normally-sterile sites.
Signs/Symptoms: Invasive infections may affect the blood, bone, lung, and lining of the brain and spinal cord and may cause fever, difficulty breathing, chills, pain and other syndrome-specific signs and symptoms. Non-invasive skin and soft tissue infections most commonly cause swelling, tenderness, and redness and can manifest as abscesses, boils and other pus-filled lesions.
Prevention: Appropriate wound care; infection control techniques and practices such as the use of central line device 'bundles'.
Other Important Information: Only invasive MRSA infections are required to be reported in Virginia and only laboratories are required to report. Asymptomatic colonization and infections from non-sterile sites (e.g., skin and soft tissue) are not reportable. Reporting of this condition was implemented through Emergency Regulation on October 26, 2007.

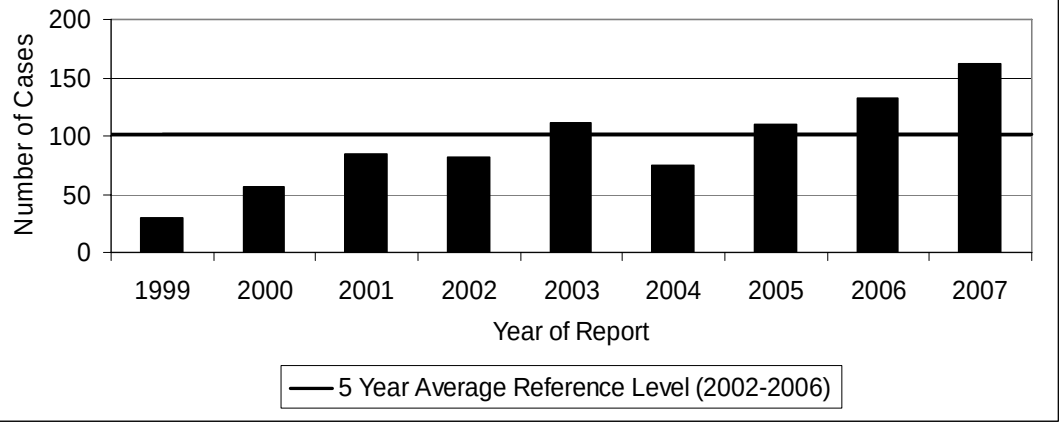
Invasive MRSA infection became a reportable condition in Virginia on October 26, 2007. During the approximately nine-week reporting time frame in 2007, 253 cases were reported. The highest incidence rate occurred in the 60 year and older age group (11.8 per 100,000), followed by infants (6.9 per 100,000). Among cases with information on race, the incidence rate was 4.5 per 100,000 among blacks and 2.3 per 100,000 among whites. The rate was slightly higher in males than in females (3.7 and 2.9 per 100,000, respectively). Incidence rates were similar among the southwest, central, and eastern regions (5.2 to 3.9 per 100,000). Lower rates were seen in the northwest and northern regions (1.9 and 1.6 per 100,000). Among cases reported in 2007, six deaths were attributed to invasive MRSA infection, all of which occurred in adults over the age of 60 years.

Streptococcal Disease, Group A, Invasive

Agent: *Streptococcus pyogenes* (bacteria)
Mode of Transmission: Person-to-person by respiratory droplets or through direct contact.
Signs/Symptoms: Depending on the site of infection (e.g., skin, blood, throat, etc.), infection can result in no illness; mild illness (sore throat, fever, or skin infections); or severe illness (infection of the soft tissue or toxic shock syndrome).
Prevention: Prompt identification and treatment of cases and temporary exclusion of infected healthcare employees from work for the first 24 hours of antibiotic therapy.

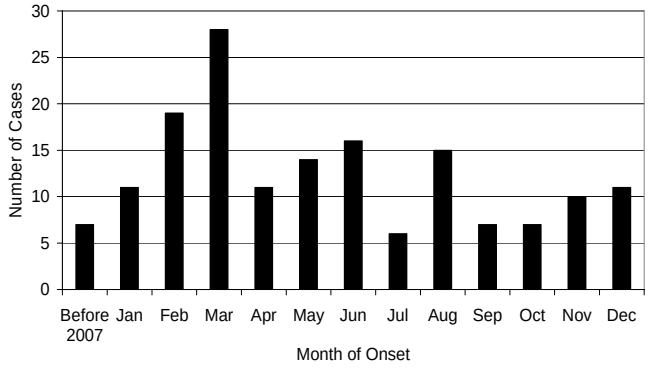
During 2007, 162 cases of invasive group A streptococcal disease (GAS) were reported in Virginia. This is a 23% increase from the 132 cases reported in 2006, and a 59% increase over the five year average of 101.8 cases per year (Figure 61).

Figure 61. Streptococcal Disease, Group A, Invasive: Nine Year Trend, Virginia, 1999-2007



The highest number of cases and the highest incidence rate were seen in the 60 year and older age group (71 cases, 5.7 per 100,000). This was followed by the less than 1 year age group, with an incidence of 2.9 per 100,000. The black population had a higher incidence rate (2.5 per 100,000) than the white population (1.7 per 100,000). Males had a slightly higher incidence rate than females (2.3 and 1.9 per 100,000, respectively). By region, the northwest region had the highest incidence rate (3.1 per 100,000), while the other regions in the state had rates ranging from 2.6 to 1.1 per 100,000. The largest proportion of cases (36%) occurred

Figure 62. Streptococcal Disease, Group A, Invasive: Month of Onset, Virginia, 2007



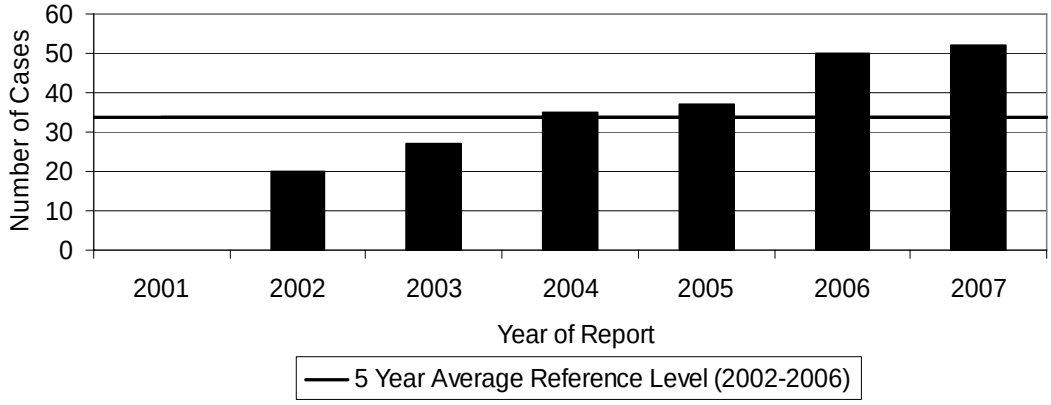
during the first quarter of the year, with a peak in March (Figure 62). Among cases reported in 2007, fifteen deaths were attributed to group A streptococcal infection. Eleven of the deaths occurred in those aged 40 years and older, and seven were female and eight were male. No cases of toxic shock due to group A streptococcal infection were reported.

***Streptococcus pneumoniae*, Invasive, in Children Less than 5 Years of Age**

Agent: *Streptococcus pneumoniae* (bacteria)
Mode of Transmission: Person-to-person via droplet or direct contact with oral secretions from persons carrying the bacteria in their upper respiratory tract.
Signs/Symptoms: Invasive infections may affect the blood, lung, and lining of the brain and spinal cord and may cause fever, chills, and irritability. Headache, stiff neck, confusion, sleepiness, vomiting, and poor feeding can occur with meningitis.
Prevention: Routine immunization with pneumococcal conjugate vaccine as a 4-dose series for infants at 2, 4, 6, and 12 to 15 months of age. Pneumococcal infections can be hard to treat because of antibiotic resistance thus making prevention through vaccination even more important.
Other Important Information: With the decline of invasive *Haemophilus influenzae* infections, *S. pneumoniae* has become the leading cause of bacterial meningitis among children less than 5 years of age in the United States.

Fifty-two cases of invasive *S. pneumoniae* infection in children less than 5 years of age were reported in Virginia during 2007. This represents a 4% increase over the 50 cases reported in 2006, a 54% increase over the five year average of 33.8 cases per year, and the sixth consecutive increase in reported cases since 2001, when the condition became reportable (Figure 63).

Figure 63. *Streptococcus pneumoniae* , Invasive, in Children Less than 5 Years of Age: Seven Year Trend, Virginia, 2001-2007

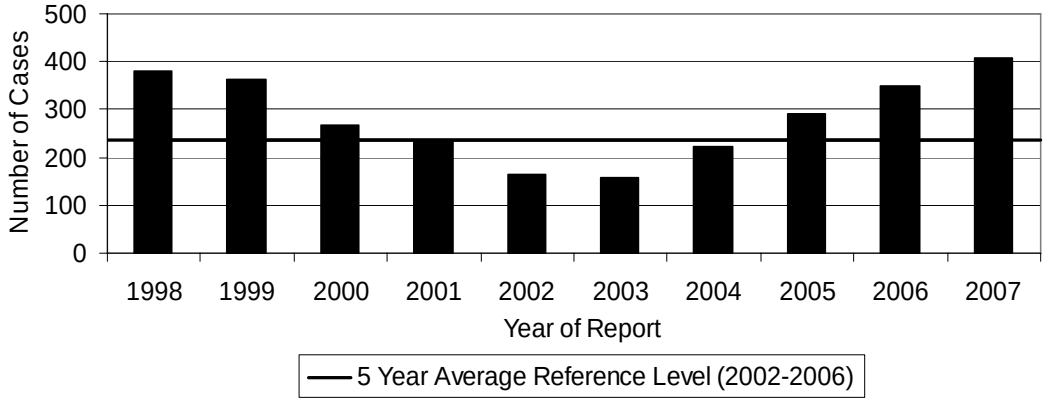


Thirty percent of the reported cases were infants less than one year of age, with an incidence rate of 15.7 per 100,000. Information on race was missing from 10% of the reported cases. Among cases where race was reported, incidence in the black population was more than twice the incidence in the white population (16.6 and 7.8 per 100,000, respectively). The rate of *S. pneumoniae* infection among males (11.5 per 100,000) was higher than the rate of infection in females (8.0 per 100,000). Incidence rates were highest in the northwest and eastern regions (19.2 and 15.2 per 100,000) and lowest in the northern and southwest regions (2.5 and 5.7 per 100,000). Cases occurred throughout the year and indicated a seasonal trend with 35% of cases occurring during the first quarter and 29% in the fourth quarter. This is consistent with the pattern of pneumococcal infections occurring primarily in the winter and early spring when respiratory diseases are more common. Among cases reported in 2007, four deaths were attributed to *S. pneumoniae* infection. All were in children less than three years of age.

Syphilis

Agent: *Treponema pallidum* (bacteria)
Mode of Transmission: Through sexual intercourse, from mother to child through the placenta, and via blood transfusion from an infected donor in the early stage of disease.
Signs/Symptoms: The primary stage is characterized by a chancre. The secondary stage includes a skin rash and lesions of the mucous membranes. A latent period follows with no clinical symptoms. In late syphilis, the central nervous system may become sufficiently damaged, causing death.
Prevention: Safer sexual practices, screening of all women during early pregnancy to prevent infection of infants, and treatment of infected partners.
Other Important Information: Nationwide, the rate of primary and secondary syphilis is on the rise for two important populations: men who have sex with men (MSM) and blacks.

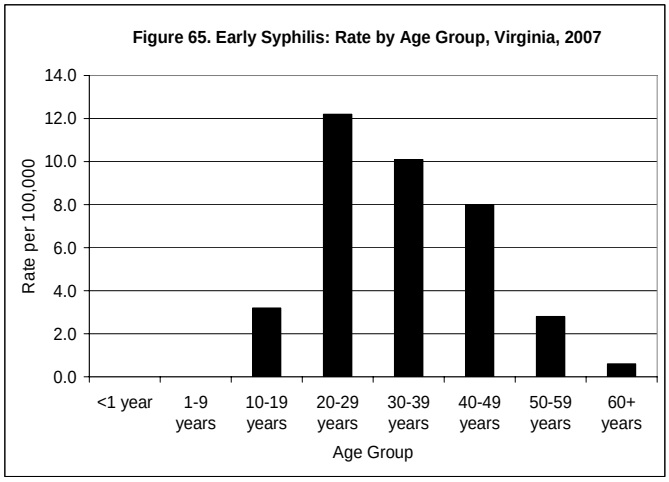
Figure 64. Early Syphilis: Ten Year Trend, Virginia, 1998-2007



Early Syphilis

Early syphilis includes the primary and secondary stages and early latent syphilis (cases diagnosed within one year from the time of infection). There were 407 cases of early syphilis reported in Virginia during 2007 (Figure 64). Since 2002, incidence has more than doubled from 2.3 to 5.3 per 100,000 in 2007.

The highest incidence occurred in the 20-29 year age group (12.2 per 100,000), followed by the 30-39 year age group (10.1 per 100,000 population) (Figure 65). The rate in the black population (14.8 per 100,000) was more than five times the rate in the white population (2.7 per 100,000), and more than twice the rate in the "other" population. The rate in males was six times the rate in females (9.3 and 1.5 per 100,000). The male to female ratio has risen from approximately 1:1 to 6:2 over the past ten years, which is indicative of a rising syphilis incidence among MSM. Since 2002, the rate of early syphilis has tripled in the southwest and central regions.



Congenital Syphilis

Only one case of congenital syphilis was reported in Virginia in 2007, compared to five cases in 2006.

Late Syphilis

In 2007, 328 cases of late syphilis were reported in Virginia, slightly less than the 343 cases reported in 2006. Incidence in the black population was 16 times the incidence in the white population (11.3 and 0.7 per 100,000, respectively), and the rate in males was higher than in females (5.3 and 3.2 per 100,000, respectively). The highest incidence rate was reported in the 30-39 year age group (7.7 per 100,000). Incidence rates were highest in the northern and eastern regions, at 6.3 and 5.2 per 100,000, respectively.

Tetanus

Agent: Toxin secreted by the bacteria *Clostridium tetani*
Mode of Transmission: Usually transmitted when a wound is infected by contaminated soil, dust, or animal or human feces.
Signs/Symptoms: A descending pattern of painful muscle contractions, particularly of the neck muscles; difficulty swallowing; and abdominal rigidity.

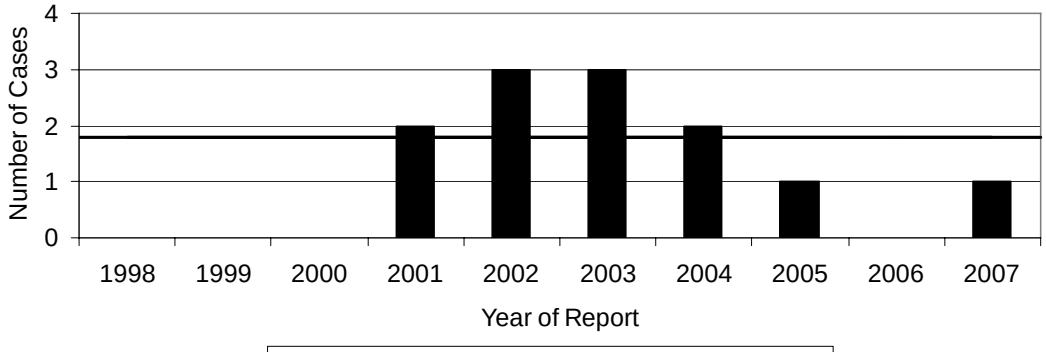
Prevention: Tetanus vaccine is available as part of the diphtheria/tetanus/pertussis (DTaP) vaccine for children and as a new combination tetanus/diphtheria/pertussis (Tdap) vaccine for adolescents and adults. One dose of Tdap should be given at 11 to 12 years of age with booster doses of Td following every ten years after that.
Other Important Information: The case-fatality rate of tetanus ranges from 10% to 80% and depends on the length of incubation and the recognition of symptoms as indicative of tetanus.

No cases of tetanus were reported in Virginia in 2007. Single cases were reported in 2005 and in 2004. Prior to 2004, the last reported case of tetanus in Virginia occurred in 1998.

Toxic Shock Syndrome

Agent: *Staphylococcus aureus* or beta-hemolytic streptococci (bacteria)
Mode of Transmission: Person-to-person spread through direct contact or through contact with contaminated materials or surfaces.
Signs/Symptoms: Sudden onset of high fever, rash, vomiting, watery diarrhea, and muscle pain, followed by a drop in blood pressure, and shock (severe cases).
Prevention: Practice good hand hygiene, clean skin abrasions, and eradicate *S. aureus* and *Streptococcus pyogenes* from draining wounds.
Other Important Information: The majority of early cases were reported in women during menses; however, in recent years, only 55% of cases have been reported among women of child-bearing age.

Figure 66. Toxic Shock Syndrome: Ten Year Trend, Virginia, 1998-2007



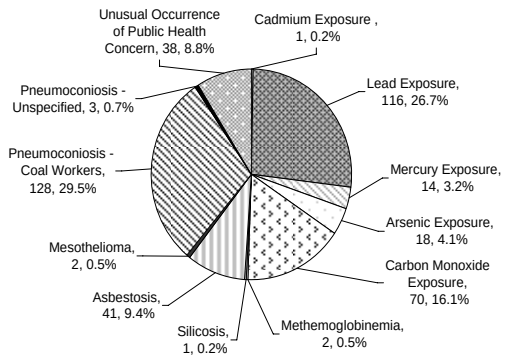
One case of toxic shock syndrome due to *Staphylococcus aureus* was reported in Virginia during 2007. The reported case occurred in a white female adolescent from the northwest region. This is consistent with the average of 1.8 cases per year seen over the last five years, but substantially lower than the average of 7.7 cases per year observed from 1994-1996 (Figure 66).

For information on toxic shock syndrome cases due to infection with group A *Streptococcus*, see the "Streptococcal Disease, Group A, Invasive" section in this report.

Toxic Substance-Related Illness

Agent: Multiple, including pesticides, heavy metals (lead, cadmium, mercury, arsenic), occupational dusts or fibers (coal, silica, asbestos), gases (carbon monoxide, methane) or radioactive materials.
Mode of Transmission: Varies depending on agent; can include absorption through skin, ingestion, or inhalation.
Signs/Symptoms: Varies depending on agent. Chronic occupational dust or fiber exposure may increase the risk of lung cancer, mesothelioma and nonmalignant lung disorders. Heavy metals, gases and pesticides may damage nervous, digestive, or reproductive systems.
Prevention: Do not eat, drink, or smoke in contaminated work areas. Wash hands and face after contacting toxic materials; after working with potential toxic substances, shower and change clothes at work, if possible. Always follow safety guidelines and requirements.
Other Important Information: Improving public and healthcare professional awareness and recognition of various toxic substance exposures can help reduce subsequent illness.

Figure 67: Reported Adult Toxic Substance-Related Illness, by Illness Type, Virginia, 2007



During 2007, 434 cases of toxic substance-related illness were reported in Virginia. An incidence of exposure is based on a physician's diagnosis or on a laboratory finding above expected normal values. The three most frequently reported toxic substance-related illnesses were pneumoconiosis, lead exposure, and carbon monoxide exposure (Figure 67). Additional toxic substance-related illness reported during 2007 included exposures to asbestos, arsenic, mercury, cadmium, silica, and oxidizing agents causing methemoglobinemia. Beginning in 2007, occurrence of illness from exposure to rarely reported substances were captured. These included exposures to combustion products, ethanol, methane, ethylene glycol, difluoroethane, gasoline, helium, sodium hypochlorite, salicylate, herbicide, rubbing alcohol, and mold spores resulting in farmer's lung. Many of these exposures were reported from death certificates.

Among those reported with pneumoconioses (including coal workers pneumoconiosis), 92% worked in the coal mining industry, while among those with lead exposures, 39% worked in battery manufacturing. Those reported with carbon monoxide exposures worked in various industries. However, 70% of the exposures were reported from death certificates, and most resulted from accidental fires or deliberate exposure to vehicle exhaust.

Age and race were unknown in 15% of the toxic exposures. Where age was known, 33% percent of the cases occurred in the 60 year and over age group and the incidence was highest in this age group (9.8 per 100,000). Where race information was reported, the white population had the highest incidence (3.8 per 100,000), followed by the black population (1.8 per 100,000). Eighty-three percent of all cases occurred in males and the incidence was more than five times that of females (9.6 and 1.9 per 100,000, respectively). The southwest region, where coal and battery manufacturing industries are focused, accounted for 53% of reported exposures and had an incidence of 17.5 per 100,000. Other regions of the state had incidence rates ranging from 4.0 to 2.2 per 100,000.

Children with exposure to lead are not discussed in this section. For this information, see the "Lead - Elevated Blood Levels in Children" section.

Trichinosis

Agent: Roundworms of genus *Trichinella* (*T. spiralis* is the most common cause of human infection).
Mode of Transmission: Eating undercooked contaminated meat (including bear, pork, wild feline [such as cougar], fox, dog, wolf, horse, seal, or walrus).
Signs/Symptoms: Nausea, diarrhea, vomiting, fatigue, fever, and abdominal discomfort. Headaches, fevers, chills, cough, eye swelling, aching joints and muscle pains, itchy skin, diarrhea, or constipation may follow. Individuals may be asymptomatic, but severe infections can cause death.
Prevention: Cook all pork products and meat from wild animals to an internal temperature of 160 degrees Fahrenheit.
Other Important Information: Trichinosis is not transmitted from person to person. Infected meat will remain infective until it has been properly cooked, cured, frozen or irradiated.

No cases of trichinosis were reported in Virginia in 2007. One case of trichinosis was reported in Virginia during 2005.

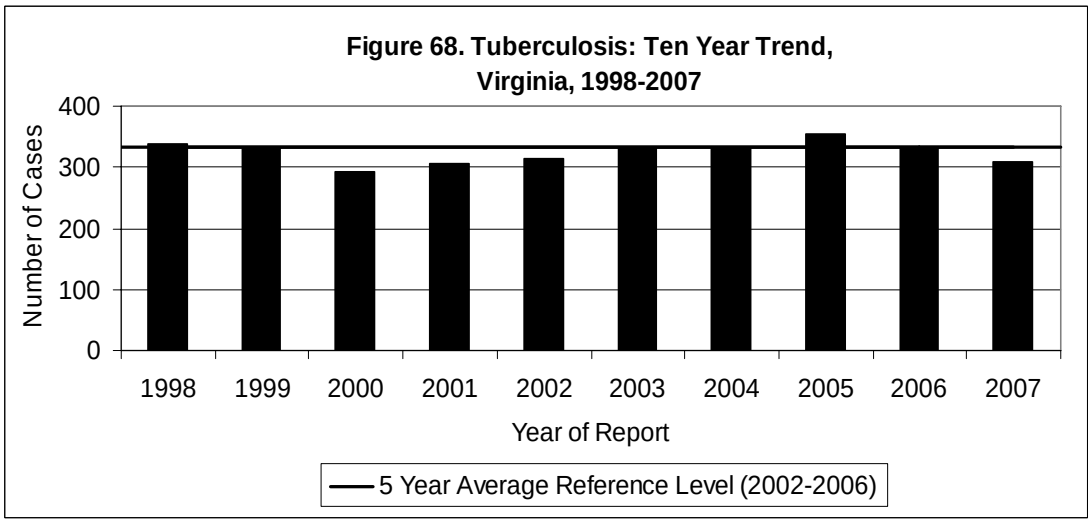
Tuberculosis

Agent: *Mycobacterium tuberculosis* (bacteria)
Mode of Transmission: Inhalation of tubercle bacilli via airborne droplet nuclei produced when patients with pulmonary or respiratory tract tuberculosis exhale the bacilli through coughing, singing, or sneezing.
Signs/Symptoms: Dependent on the organ(s) affected. General systemic signs and symptoms include fever, chills, night sweats, weight loss and fatigue. Symptoms of pulmonary tuberculosis may also include a prolonged productive cough (greater than 3 weeks) and coughing up blood.
Prevention: Prompt identification, diagnosis and treatment of persons with infectious tuberculosis. Timely contact investigations to identify and treat additional persons with

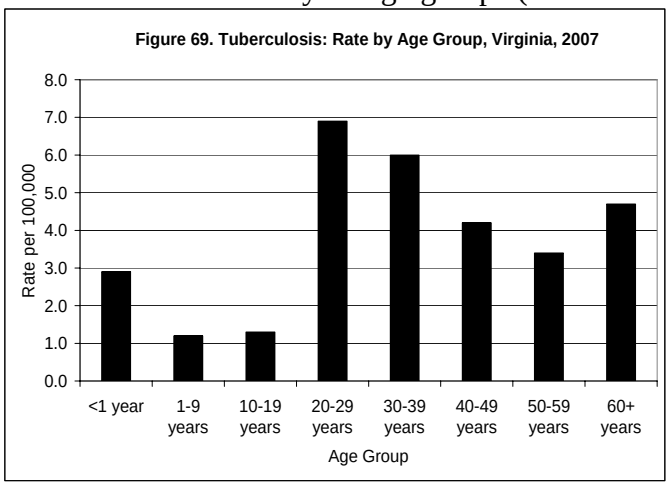
active tuberculosis disease and persons with latent tuberculosis infection. Infection control measures in high-risk settings.

Other Important Information: About 10% of those infected with tuberculosis will develop active disease during their lifetime, with the greatest risk for disease progression during the two years following infection. Co-infection with HIV and other immune suppressing conditions represent the greatest risks for progression to active disease.

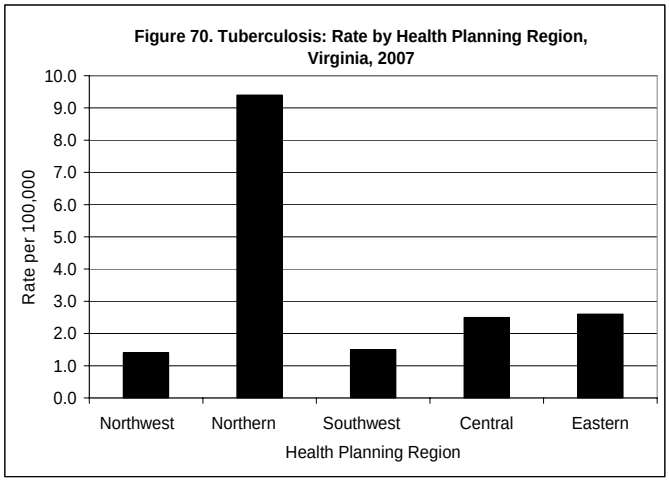
The 309 tuberculosis cases reported in 2007 was a 7% decrease from the 332 cases reported in 2006 and lower than the five year average of 332.6 cases per year (Figure 68). Drug resistance was found in 28 cases, five of which were multi-drug resistant. No cases of extensively drug resistant (XDR) tuberculosis were reported. The majority of cases (74%) were reported among foreign-born persons. The top five countries of origin were the Philippines, El Salvador, India, Bolivia and Mexico.



Rates in adults were higher than rates in children and adolescents. Among age groups, the highest incidence rates occurred in the 20-29 and the 30-39 year age groups (6.9 and 6.0 per 100,000, respectively). The lowest rate (1.2 per 100,000) was reported among those aged 1-9 years (Figure 69). By race, the highest incidence was observed in the "other" race population (20.3 per 100,000) followed by the black population (5.0 per 100,000) and the white population (2.3 per 100,000). In 2007, all persons of "other" race with tuberculosis were Asian and Pacific Islanders.



Males had a higher rate (4.8 per 100,000) than females (3.3 per 100,000). The northern region reported the highest number of cases and highest incidence rate (194 cases, 9.4 per 100,000) and the lowest number and rate were seen in the northwest region (17 cases, 1.4 per 100,000) (Figure 70). The high rate in the northern region is attributed to 77% of the 230 foreign-born cases being reported from that area.



Tularemia

Agent: *Francisella tularensis* (bacteria)
Mode of Transmission: In the United States, by the bite of an infected tick such as the American dog tick or the lone star tick, or occasionally by the bite of an infected deer fly. Hunters can contract the disease while cleaning infected game or when eating poorly cooked, infected meat. Humans may also become infected by drinking contaminated water, or by breathing *F. tularensis* spores from the dried carcasses or pelts of animals that died from tularemia.
Signs/Symptoms: Vary depending on the mode of transmission, but usually include sudden onset of high fever, chills, fatigue, general body aches, headache and nausea. Pneumonia may complicate the disease and requires prompt identification and specific treatment to prevent development of serious, life-threatening illness.
Prevention: Avoid the bites of ticks or deer flies and avoid untreated water in areas where tularemia is prevalent among wild animals. Use impervious protective gloves when skinning rabbits and other wild game. Avoid contaminating other food items with utensils used for preparing meat from game and do not eat undercooked meat.
Other Important Information: Tularemia is classified as a potential bio-weapon because its spores are relatively easy to disseminate as a breathable aerosol or as a food and water contaminant.

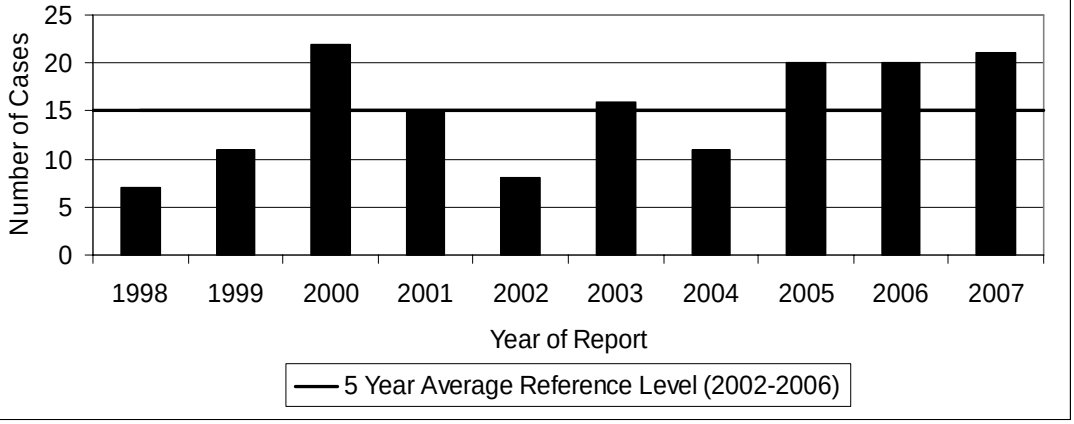
Three probable cases of tularemia were reported in Virginia in 2007. All cases were male; two were white and the other was in the unknown race category. Two of the cases were in the 1-9 year age group and the other was in the 30-39 year age group. Each case resided in a different area of the state, and the diagnoses were made at different times throughout the year. Two of the three cases were associated with tick bites. The last occurrence of tularemia reported in Virginia was in 2003 (four cases).

Typhoid Fever

Agent: *Salmonella* ser.Typhi (bacteria)
Mode of Transmission: Ingestion of food or water contaminated by feces or urine of patients and carriers. The bacteria live only in humans.
Signs/Symptoms: Include sustained fever, headache, malaise, a change in mental status, lethargy, anorexia, fast heart rate, enlarged spleen, a non-productive cough and constipation.
Prevention: Access to safe water and proper sanitation as well as following safe food handling practices are essential. Typhoid fever vaccine should be considered for travelers to a country where the disease is common.

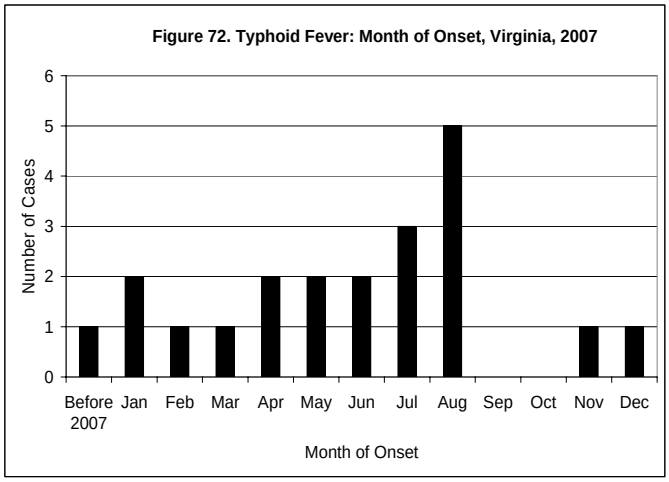
During 2007, 21 cases of typhoid fever were reported in Virginia. This was similar to the number of cases reported in 2006 (20 cases) but a 40% increase from the five year average of 15 cases per year (Figure 71). Travel histories were obtained for 18 (86%) of these cases, and all but four cases had traveled outside of the United States in the 30 days prior to onset of illness.

Figure 71. Typhoid Fever: Ten Year Trend, Virginia, 1998-2007



The 1-9 year age group had the highest incidence rate (0.8 per 100,000), followed by the 10-19 year age group (0.6 per 100,000). The other age groups had rates between 0.0 and 0.2 cases per 100,000. Race information was not available for 57% of the cases, but among cases with a race reported, the "other" race category had the highest number of cases and the highest incidence rate (6 cases, 1.2 per 100,000). Females had rates twice as high as males (0.4 and 0.2

Figure 72. Typhoid Fever: Month of Onset, Virginia, 2007



per 100,000, respectively). Fourteen cases (67%) were reported from the northern region and the incidence rate was 0.7 per 100,000. The other regions in the state had incidence rates ranging from 0.0 to 0.3 per 100,000. In 2007, the largest proportion of cases (38%) had onset during July and August (Figure 72).

Vaccinia, Disease or Adverse Event

Agent: Vaccinia virus, which is used in smallpox vaccine.
Mode of Transmission: Transmitted through injection with the smallpox vaccine or through direct contact with the vaccination site or contaminated materials.
Signs/Symptoms: Include rash, fever and head and body aches. Some individuals, especially those with certain skin conditions or weakened immune systems, may experience more serious effects such as a toxic or allergic reaction at the site of the vaccination or spread of the virus to other parts of the body.
Prevention: When smallpox is not circulating, in order to prevent serious reactions to the vaccine, only laboratory workers who handle smallpox and certain healthcare workers are recommended to receive the smallpox vaccine.
Other Important Information: The U.S. government has enough smallpox vaccine to vaccinate every person in the United States in the event of a smallpox emergency.

Vaccinia became a reportable condition in Virginia in 2003. Since then, no cases of vaccinia have been reported in Virginia.

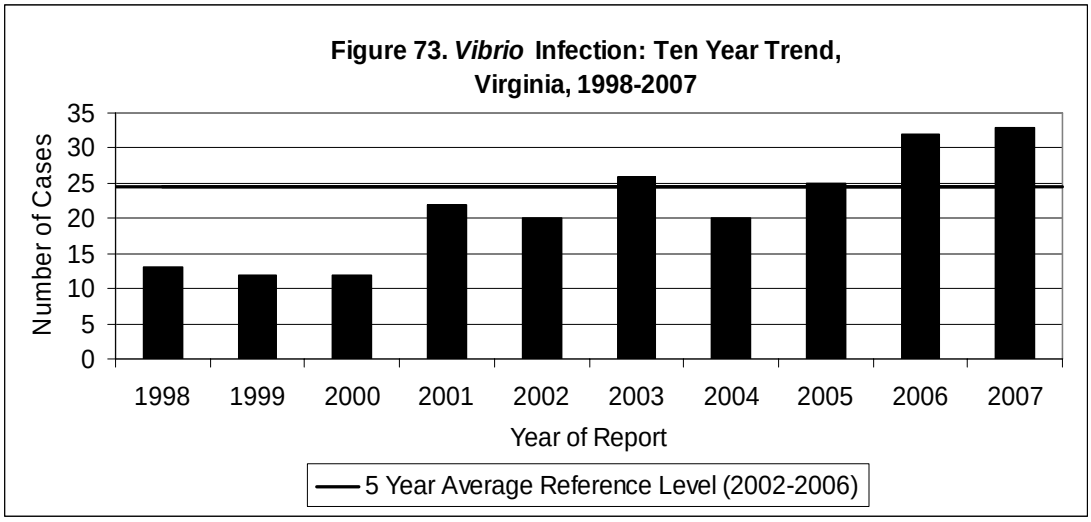
Vancomycin-Intermediate or Vancomycin-Resistant *Staphylococcus aureus* Infection

Agent: *Staphylococcus aureus* (bacteria) that has developed resistance to the antibiotic vancomycin.
Mode of Transmission: Person-to-person spread through direct contact or through contact with contaminated materials or surfaces.
Signs/Symptoms: Depends on site of infection (e.g., skin, bone, urinary and respiratory tract) and may cause toxic shock syndrome (see Toxic Shock Syndrome section); asymptomatic colonization can occur.
Prevention: Appropriate use of antibiotics to treat infections, good hand hygiene, and proper cleaning of contaminated surfaces.

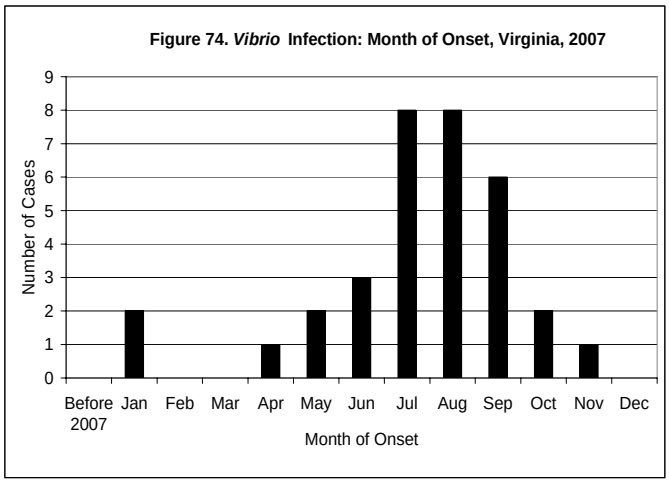
The first case of VISA infection reported in Virginia occurred in 2007. The individual was a black female over 60 years of age from the eastern region of the state. The condition resulted in death.

***Vibrio* Infection**

Agent: *Vibrio* (bacteria)
Mode of Transmission: Gastroenteritis is usually related to the consumption of raw or undercooked seafood, particularly shellfish. Wound infections arise from environmental exposures, usually from brackish waters or from occupational injuries (e.g., among fishermen).
Signs/Symptoms: Syndromes associated with *Vibrio* infection include diarrhea, wound infection, and septicemia. Diarrheal illness is most common and includes watery stools, cramping, and abdominal pain. Low-grade fever, headache and chills are seen in half of those ill with diarrheal illness, and vomiting is present in 30%. Wound infection is usually severe in those who have liver disease or are immunosuppressed.
Prevention: Seafood should be cooked adequately and should be refrigerated. Abrasions suffered by ocean bathers should be rinsed with clean, fresh water. Children, immunosuppressed persons and those with chronic liver disease should not eat raw oysters or clams.
Other Important Information: Most *Vibrio* infections occur during summer and fall months, when levels of bacteria in brackish waters and estuaries are highest.



During 2007, 33 cases of *Vibrio* infection were reported in Virginia. This is similar to the 32 cases reported in 2006 and a 34% increase over the five year average of 24.6 cases per year (Figure 73). The species breakdown among the 33 *Vibrio* infections included 10 infections caused by *V. parahaemolyticus*, nine caused by *V. alginolyticus*, seven caused by *V. vulnificus*, five caused by other various species of *Vibrio (cholera* non 01, non 0139, *damsela and fluvialis)* and two cases with no species identified. Illnesses included 16 wound infections, seven gastrointestinal infections, seven ear infections and three septicemic infections. *V. parahaemolyticus* was equally associated with causing gastrointestinal and wound infections (4/10 cases each), but in addition caused ear infections (2/10 cases). *V. alginolyticus* was associated with wound (5/10 cases) or ear infections (4/10 cases). *V. vulnificus* was associated with wound (4/7 cases) or septicemic infections (3/7 cases).



Thirty-six percent of reported cases occurred in the 60 year and older age group and the incidence rate was highest in this age group (1.0 per 100,000). The second highest incidence rate was in the 10-19 year age group (0.6 per 100,000), which represented 18 percent of all cases. No cases were reported in infants. Incidence rates were the highest among whites (0.4 per 100,000) with 20 cases reported. Among the 33 cases reported in Virginia in 2007, *Vibrio* infection predominantly affected males. Seventy percent of infections occurred among males and the incidence rate was three times the rate for females (0.6 and 0.2 per 100,000). Geographically, the eastern region had the largest proportion of cases and the highest incidence rate (42%, 0.8 per 100,000), followed by the northern region (33%, 0.5 per 100,000) and central region (18%, 0.5 per 100,000). Sixty-seven percent of cases occurred during the third quarter and peaked during the summer months of July and August (Figure 74). Among cases reported in 2007, three deaths were attributed to *Vibrio vulnificus* infection.

Cholera

No cases of cholera were reported in Virginia in 2007. The last case of cholera in Virginia occurred in 1994.

Viral Hemorrhagic Fever

Agent(s): Multiple, including *Arenaviruses* (Argentinian, Bolivian, Venezuelan, and Brazilian hemorrhagic fevers, and Lassa fever), *Filoviruses* (Ebola and Marburg hemorrhagic fevers), *Bunyaviruses* (Crimean-Congo hemorrhagic fever [CCHF] and Rift Valley fever [RVF]), and *Flaviviruses* (Omsk hemorrhagic fever [OHF] and dengue hemorrhagic fever [DHF]).

Mode of Transmission**:** Vary by agent. *Arenaviruses* are carried by rodents and are contracted by breathing dust contaminated with saliva, feces or urine of infected rodents, but may also be transmitted person-to-person by infected patients. *Filovirus* hemorrhagic fevers are contracted through direct contact with blood or fluids from infected animals or persons. *Bunyaviruses* are typically transmitted by the bites of arthropods but may also be contracted through contact with the blood and body fluids of infected livestock or people. Hemorrhagic fevers caused by *Flaviviruses* are typically transmitted by the bites of arthropods. Among these, only DHF has been found to occur naturally in North America.

Signs/Symptoms**:** Vary by type; including, but not limited to, malaise, headache, fever, bleeding from nose and gums, rash, appearance of blood in the eyes, or vomiting. Case-fatality rates can range from 1% (Dengue) to 90% (Ebola).

Prevention**:** Depending on agent, exposure to hemorrhagic diseases can be reduced by rodent control around the home in endemic areas, by isolation of infected persons during their febrile period, by preventing contact with blood or body fluids of sick or dead animals, and by avoiding the bites of mosquito or tick vectors.
Other Important Information: Viral hemorrhagic fevers are classified as potential bio-weapons because they can cause high mortality and public panic and social disruption, and they require a great deal of planning to protect the public's health.

Since becoming a reportable condition in 2003, no cases of viral hemorrhagic fever have been reported in Virginia.

Yellow Fever

Agent: Yellow fever virus
Mode of Transmission: Through the bite of several species of *Aedes* mosquitoes, most notably the yellow fever mosquito (*Aedes aegypti*), which breeds in containers of water occurring around human habitations. Yellow fever mosquitoes occur in Virginia but have become uncommon after being displaced from their container breeding habitats by the arrival of the Asian tiger mosquito (*Aedes albopictus*) in Virginia in 1992. The Asian tiger mosquito is very common and is similar in behavior and appearance to the yellow fever mosquito, but is not currently known to be a competent vector of yellow fever.
Signs/Symptoms: Varying levels of severity; include a sudden onset of fever, chills, headache, backache, generalized muscle pain, prostration, nausea, and vomiting. Jaundice is usually mild in early disease but intensifies later. Among cases with jaundice, fatality is 20% to 50%.
Prevention: Vaccination against the yellow fever virus prior to visiting yellow fever endemic regions of the world.

No cases of yellow fever have been reported in Virginia since the nineteenth century.

Yersiniosis

Agent: *Yersinia* species (bacteria)
Mode of Transmission: Ingestion of contaminated foods (raw or incompletely cooked pork products and unpasteurized milk), or contaminated surface or well water, or by direct or indirect contact with infected people or animals.
Signs/Symptoms: Vary depending on age, but may include fever, abdominal pain, and bloody diarrhea.
Prevention: Safe food preparation and pasteurization of dairy products. People handling pork intestines should wash their hands and environmental surfaces thoroughly after contact and should not care for a young infant at the same time.
Other Important Information: Most infections occur during the winter.

Ten cases of yersiniosis were reported in Virginia during 2007. This is a decrease from the 18 cases reported in 2005, but comparable to the five year average of 9.8 cases per

year. The highest incidence of cases was reported in the 1-9 year age group (5 cases, 0.6 per 100,000). Data on race were missing for all but four cases. Six of the ten cases were male and the incidence rate for males was twice that for females (0.2 and 0.1 per 100,000, respectively). Fifty percent of the cases occurred in the northern region with a resulting incidence rate of 0.2 per 100,000. Five of the ten cases occurred in the third and fourth quarters of the year.