MINNESOTA DEPARTMENT OF HEALTH
DISEASE CONTROL NEWSLETTER

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Annual Summary of Communicable Diseases Reported to the Minnesota Department of Health, 2011

Introduction
Assessment of the population's health is a core public health function. Surveillance for communicable diseases is one type of assessment. Epidemiologic surveillance is the systematic collection, analysis, and dissemination of health data for the planning, implementation, and evaluation of health programs. The Minnesota Department of Health (MDH) collects information on certain infectious diseases for the purposes of determining disease impact, assessing trends in disease occurrence, characterizing affected populations, prioritizing control efforts, and evaluating prevention strategies. Prompt reporting allows outbreaks to be recognized in a timely fashion when control measures are most likely to be effective in preventing additional cases.

In Minnesota, communicable disease reporting is centralized, whereby reporting sources submit standardized report forms to MDH. Cases of disease are reported pursuant to Minnesota Rules Governing Communicable Diseases (Minnesota Rules 4605.7000 - 4605.7800). The diseases listed in Table 1 (page 2) must be reported to MDH. As stated in the rules, physicians, health care facilities, laboratories, veterinarians, and others are required to report these diseases. Reporting sources may designate an individual within an institution to perform routine reporting duties (e.g., an infection preventionist for a hospital). Data maintained by MDH are private and protected under the Minnesota Government Data Practices Act (Section 13.38). Provisions of the Health Insurance Portability and Accountability Act (HIPAA) allow for routine disease reporting without patient authorization.

Since April 1995, MDH has participated as an Emerging Infections Program (EIP) site funded by the Centers for Disease Control and Prevention (CDC) and, through this program, has implemented active hospital- and laboratory-based surveillance for several conditions, including selected invasive bacterial diseases, foodborne diseases, and hospitalized influenza cases.

Isolates for pathogens with certain diseases are required to be submitted to MDH (Table 1). The MDH Public Health Laboratory (PHL) performs microbiologic evaluation of isolates, such as pulsed-field gel electrophoresis (PFGE), to determine whether isolates (e.g., enteric pathogens such as *Salmonella* and *Escherichia coli* O157:H7, and invasive pathogens such as *Neisseria meningitidis*) are related, and potentially associated with a common source. Testing of submitted isolates also allows detection and monitoring of antimicrobial resistance, which continues to be an important problem (see pp. 26-27).

Table 2 summarizes cases of selected communicable diseases reported during 2011 by district of the patient's residence. Pertinent observations for some of these diseases are presented below.

Incidence rates in this report were calculated using disease-specific numerator data collected by MDH and a standardized set of denominator data derived from U.S. Census data. Disease incidence is categorized as occurring within the seven-county Twin Cities metropolitan area (metropolitan area) or outside of it in Greater Minnesota.

Anaplasmosis
Human anaplasmosis (formerly known as human granulocytic ehrlichiosis) is caused by *Anaplasma phagocytophilum*, a rickettsial organism transmitted to humans by bites from *Ixodes scapularis* (the blacklegged tick or deer tick). In Minnesota, the same tick vector also transmits the etiologic agents of Lyme disease, babesiosis, one form of human ehrlichiosis, and a strain of Powassan virus. *A. phagocytophilum* can also be transmitted by blood transfusion.

In 2011, a record number of 782 confirmed or probable anaplasmosis cases (14.7 cases per 100,000 population) were reported (Figure 1). The median number of 298 cases (range, 139 to 782 cases) reported from 2004 through 2011 is also

continued on page 4

Inside:

Table 1. Diseases Reportable to the Minnesota Department of Health

Report Immediately by Telephone

Anthrax (*Bacillus anthracis*) a
Botulism (*Clostridium botulinum*)
Brucellosis (*Brucella* spp.) a
Cholera (*Vibrio cholerae*) a
Diphtheria (*Corynebacterium diphtheriae*) a
Hemolytic uremic syndrome a
Measles (rubeola) a
Meningococcal disease (*Neisseria meningitidis*) (all invasive disease) a, b
Orthopox virus a
Plague (*Yersinia pestis*) a
Poliomyelitis a
Q fever (*Coxiella burnetii*) a
Rabies (animal and human cases and suspected cases)
Rubella and congenital rubella syndrome a
Severe Acute Respiratory Syndrome (SARS) (1. Suspect and probable cases of SARS. 2. Cases of health care workers hospitalized for pneumonia or acute respiratory distress syndrome.) a
Smallpox (variola) a
Tularemia (*Francisella tularensis*) a
Unusual or increased case incidence of any suspect infectious illness a

Report Within One Working Day

Amebiasis (*Entamoeba histolytica/dispar*)
Anaplasmosis (*Anaplasma phagocytophilum*)
Arboviral disease (including but not limited to, LaCrosse encephalitis, eastern equine encephalitis, western equine encephalitis, St. Louis encephalitis, and West Nile virus)
Babesiosis (*Babesia* spp.)
Blastomycosis (*Blastomyces dermatitidis*)
Campylobacteriosis (*Campylobacter* spp.) a
Cat scratch disease (infection caused by *Bartonella* spp.)
Chancroid (*Haemophilus ducreyi*) c
Chlamydia trachomatis infection c
Coccidioidomycosis
Cryptosporidiosis (*Cryptosporidium* spp.) a
Cyclosporiasis (*Cyclospora* spp.) a
Dengue virus infection
Diphyllobothrium latum infection
Ehrlichiosis (*Ehrlichia* spp.)
Encephalitis (caused by viral agents)
Enteric *E. coli* infection (*E. coli* O157:H7, other enterohemorrhagic [Shiga toxin-producing] *E. coli*, enteropathogenic *E. coli*, enteroinvasive *E. coli*, enterotoxigenic *E. coli*) a
Enterobacter sakazakii (infants under 1 year of age) a
Giardiasis (*Giardia lamblia*)
Gonorrhea (*Neisseria gonorrhoeae*) c
Haemophilus influenzae disease (all invasive disease) a,b
Hantavirus infection
Hepatitis (all primary viral types including A, B, C, D, and E)
Histoplasmosis (*Histoplasma capsulatum*)
Human immunodeficiency virus (HIV) infection, including Acquired Immunodeficiency Syndrome (AIDS) a, d
Influenza (unusual case incidence, critical illness, or laboratory confirmed cases) a
Kawasaki disease
Kingella spp. (invasive only) a, b
Legionellosis (*Legionella* spp.) a
Leprosy (Hansen's disease) (*Mycobacterium leprae*)
Leptospirosis (*Leptospira interrogans*)
Listeriosis (*Listeria monocytogenes*) a
Lyme disease (*Borrelia burgdorferi*)
Malaria (*Plasmodium* spp.)
Meningitis (caused by viral agents)
Mumps
Neonatal sepsis, less than 7 days after birth (bacteria isolated from a sterile site, excluding coagulase-negative *Staphylococcus*) a, b
Pertussis (*Bordetella pertussis*) a
Psittacosis (*Chlamydophila psittaci*)
Retrovirus infection
Reye syndrome
Rheumatic fever (cases meeting the Jones Criteria only)
Rocky Mountain spotted fever (*Rickettsia rickettsii*, *R. canada*)
Salmonellosis, including typhoid (*Salmonella* spp.) a
Shigellosis (*Shigella* spp.) a
Staphylococcus aureus (vancomycin-intermediate *S. aureus* [VISA], vancomycin-resistant *S. aureus* [VRSA], and death or critical illness due to community-associated *S. aureus* in a previously healthy individual) a
Streptococcal disease (all invasive disease caused by Groups A and B streptococci and *S. pneumoniae*) a, b
Syphilis (*Treponema pallidum*) c
Tetanus (*Clostridium tetani*)
Toxic shock syndrome a
Toxoplasmosis (*Toxoplasma gondii*)
Transmissible spongiform encephalopathy
Trichinosis (*Trichinella spiralis*)
Tuberculosis (*Mycobacterium tuberculosis* complex) (Pulmonary or extrapulmonary sites of disease, including laboratory confirmed or clinically diagnosed disease, are reportable. Latent tuberculosis infection is not reportable.) a
Typhus (*Rickettsia* spp.)
Unexplained deaths and unexplained critical illness (possibly due to infectious cause) a
Varicella-zoster disease (1. Primary [chickenpox]: unusual case incidence, critical illness, or laboratory-confirmed cases. 2. Recurrent [shingles]: unusual case incidence, or critical illness.) a
Vibrio spp. a
Yellow fever
Yersiniosis, enteric (*Yersinia* spp.) a

Sentinel Surveillance (at sites designated by the Commissioner of Health)

Methicillin-resistant *Staphylococcus aureus* a, b
Clostridium difficile a
Carbapenem-resistant Enterobacteriaceae spp. and carbapenem-resistant *Acinetobacter* spp. a

a Submission of clinical materials required. If a rapid, non-culture assay is used for diagnosis, we request that positives be cultured, and isolates submitted. If this is not possible, send specimens, nucleic acid, enrichment broth, or other appropriate material. Call the MDH Public Health Laboratory at 651-201-4953 for instructions.

b Isolates are considered to be from invasive disease if they are isolated from a normally sterile site, e.g., blood, CSF, joint fluid, etc.

c Report on separate Sexually Transmitted Disease Report Card.

d Report on separate HIV Report Card.

Table 2. Cases of Selected Communicable Diseases Reported to the Minnesota Department of Health by District of Residence, 2011

Disease	Metropolitan (2,810,414)	Northwestern (153,218)	Northeastern (320,342)	Central (715,467)	West Central (229,186)	South Central (286,956)	Southeastern (486,517)	Southwestern (218,293)	Unknown Residence	Total (5,220,393)
	District (population per U.S. Census 2009 estimates)									
Anaplasmosis	201	121	106	280	32	7	30	5	0	782
Arboviral disease										
LaCrosse	0	0	0	0	0	0	1	0	0	1
West Nile	2	0	0	0	0	0	0	0	0	2
Babesiosis	12	14	6	25	8	0	6	1	0	72
Campylobacteriosis	464	15	45	159	57	49	142	64	0	995
Cryptosporidiosis	47	6	37	31	39	16	87	44	0	307
Escherichia coli O157 infection	68	1	4	28	11	7	19	8	0	146
Hemolytic uremic syndrome	5	0	0	4	0	1	1	1	0	12
Giardiasis	386	17	53	59	18	9	55	24	65	686
Haemophilus influenzae disease	34	2	3	11	2	2	12	5	0	71
HIV infection other than AIDS	217	1	5	9	1	7	4	4	0	248
AIDS (cases diagnosed in 2010)	137	0	6	12	3	3	9	2	1	173
Legionellosis	20	0	1	0	1	2	7	0	0	31
Listeriosis	2	1	0	0	1	0	2	0	0	6
Lyme disease	510	81	119	314	43	17	108	9	0	1,201
Meningococcal disease	7	0	0	1	1	0	0	0	0	9
Mumps	2	0	0	0	0	0	0	0	0	2
Pertussis	595	16	33	305	17	50	88	39	0	1,143
Salmonellosis	418	19	25	88	24	30	76	21	0	701
Sexually transmitted diseases	12,207	295	716	1,311	311	564	1,253	338	765	17,760
Chlamydia trachomatis - genital infections	11,320	273	845	1,358	343	552	1,133	346	728	16,898
Gonorrhea	1,840	26	60	114	25	28	76	23	91	2,283
Syphilis, total	321	2	6	14	1	3	10	2	7	366
Primary/secondary	124	1	0	6	0	3	3	0	2	139
Early latent*	111	0	3	3	0	0	1	2	1	121
Late latent**	86	1	3	5	1	0	6	0	4	106
Congenital	0	0	0	0	0	0	0	0	0	0
Other***	0	0	0	0	0	0	0	0	0	0
Shigellosis	76	1	0	5	0	0	3	2	0	87
Streptococcus pneumoniae disease	244	35	49	100	24	40	47	43	0	582
Streptococcal invasive disease - Group A	115	8	23	21	16	11	26	11	0	231
Streptococcal invasive disease - Group B	293	22	41	60	22	30	49	18	0	535
Toxic shock syndrome (Staphylococcal)	3	0	0	0	0	1	0	0	0	4
Tuberculosis	102	4	2	6	4	0	13	6	0	137
Viral hepatitis, type A	14	0	4	1	1	1	2	4	0	0
Viral hepatitis, type B (acute infections only, not perinatal)	14	0	0	3	1	0	1	1	0	20
Viral hepatitis, type C (acute infections only)	8	0	5	3	1	0	0	1	0	18

* Duration ≤1 year

** Duration >1 year

*** Includes unstaged neurosyphilis, latent syphilis of unknown duration, and latent syphilis with clinical manifestations

County Distribution within Districts

Metropolitan - Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, Washington

Northwestern - Beltrami, Clearwater, Hubbard, Kittson, Lake of the Woods, Marshall, Pennington, Polk, Red Lake, Roseau

Northeastern - Aitkin, Carlton, Cook, Itasca, Koochiching, Lake, St. Louis

Central - Benton, Cass, Chisago, Crow Wing, Isanti, Kanabec, Mille Lacs, Morrison, Pine, Sherburne, Stearns, Todd, Wadena, Wright

West Central - Becker, Clay, Douglas, Grant, Mahnomen, Norman, Otter Tail, Pope, Stevens, Traverse, Wilkin

South Central - Blue Earth, Brown, Faribault, LeSueur, McLeod, Martin, Meeker, Nicollet, Sibley, Waseca, Watonwan

Southeastern - Dodge, Fillmore, Freeborn, Goodhue, Houston, Mower, Olmsted, Rice, Steele, Wabasha, Winona

Southwestern - Big Stone, Chippewa, Cottonwood, Jackson, Kandiyohi, Lac Qui Parle, Lincoln, Lyon, Murray, Nobles, Pipestone, Redwood, Renville, Rock, Swift, Yellow Medicine

considerably higher than the median number of cases reported annually from 1996 to 2003 (median, 56 cases; range, 14 to 149). Five hundred three (64%) cases reported in 2011 were male. The median age of cases was 58 years (range, 2 to 92 years),18 years older than the median age of Lyme disease cases. Onsets of illness were elevated from May through July and peaked in June (32% of cases). In 2011, 27% of anaplasmosis cases (210 of 778 cases with known information) were hospitalized for their infection, for a median duration of 4 days (range, 1 to 17 days).

Arboviral Diseases

Mosquito-borne Arboviruses

LaCrosse encephalitis and Western equine encephalitis historically have been the primary arboviral encephalitides found in Minnesota. During July 2002, West Nile virus (WNV) was identified in Minnesota for the first time; subsequently, 465 human cases (including 15 fatalities) were reported from 2002 to 2011. In 2011, WNV cases were reported from 43 states and the District of Columbia; nationwide, 712 human cases of WNV disease were reported, including 43 fatalities. The largest WNV case counts during 2011 occurred in California (158 cases), Arizona (69), and Mississippi (52).

In Minnesota, 2 cases of WNV disease were reported in 2011 (the lowest annual case total to date). One was a fatal encephalitis case, and the other case had West Nile (WN) fever. Both cases were elderly (≥ 65 years). While most past WNV disease cases occurred among residents of western and central Minnesota, both 2011 cases were Hennepin County residents. Similar to previous years, onset of symptoms for both cases occurred within the typical high risk period of mid to late summer (August for both cases).

WNV is maintained in a mosquito-to-bird transmission cycle. Several mosquito and bird species are involved in this cycle, and regional variation in vector and reservoir species exists. Interpreting the effect of weather on WNV transmission is extremely complex, leading to great difficulty in predicting how many people will become infected in a given year. WNV appears to be established throughout Minnesota; it will probably be present in the state to some extent every year. The disease risk to humans, however, will likely continue to be higher in central and western Minnesota where the primary mosquito vector, *Culex tarsalis*, is most abundant.

All of the WNV test kits currently available are labeled for use on serum to aid in a presumptive diagnosis of WNV infection in patients with clinical symptoms of neuroinvasive disease. Positive results from these tests should be confirmed at the MDH PHL or CDC.

During 2011, 1 case of LaCrosse encephalitis was reported. The disease, which primarily affects children, is transmitted through the bite of infected *Aedes triseriatus* (Eastern Tree Hole) mosquitoes. Persons are exposed to infected mosquitoes in wooded or shaded areas inhabited by this mosquito species, especially in areas where water-holding containers (e.g., waste tires, buckets, or cans) that provide mosquito breeding habitats are abundant. From 1985 through 2011, 126 cases were reported from 21 southeastern Minnesota counties, with a median of 4 cases (range, 0 to 13 cases) reported annually. The median case age was 6 years. Disease onsets have been reported from June through September, but most onsets have occurred from mid-July through mid-September.

Tick-borne Arbovirus

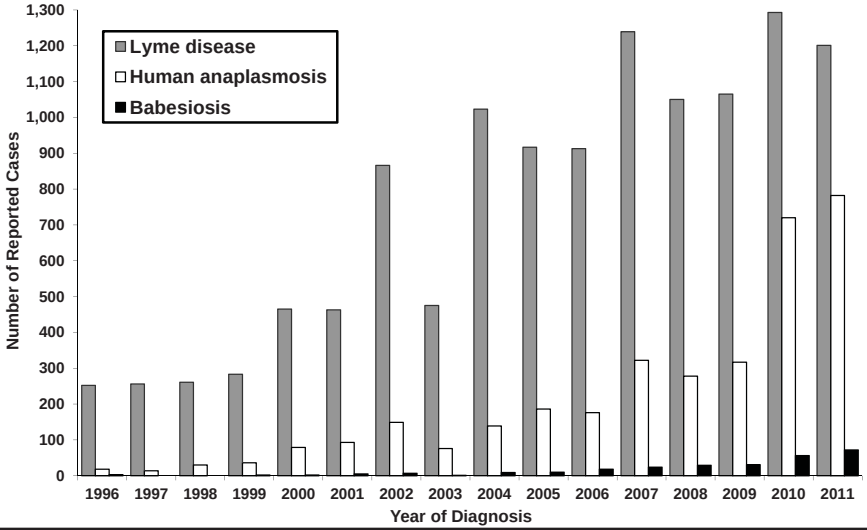
Powassan virus (POW) is a tick-borne flavivirus that includes a strain (lineage II or "deer tick virus") that is transmitted by *I. scapularis*. The virus can cause encephalitis or meningitis, and long-term sequelae occur in approximately half of patients. Approximately 10-15% of cases are fatal. Since 2008, 17 cases (1 fatal) of POW disease have been reported in Minnesota residents. Most had neuroinvasive disease (10 encephalitis and 5 meningitis) but 2 were non-neuroinvasive POW fever cases. Fourteen (82%) cases were male. Median age was 49 years (range, 3 mos. to 70 years) and 6 (35%) were immunocompromised. Fourteen (82%) had onset of illness between May through August and 3 (18%) had October or November onsets. Eleven of the 17 cases were reported in 2011. Cases were exposed to ticks in several north-central Minnesota counties. MDH has also identified POW virus-positive ticks at sites in all four counties that have been investigated to date (Clearwater, Cass, Pine, and Houston). Thus, the virus appears to be widely distributed in the same wooded parts of the state that are endemic to other tick-borne diseases transmitted by *I. scapularis.*

POW virus testing is not widely available; however, the MDH PHL is available to test cerebrospinal fluid and serum specimens from suspect cases (i.e., patients with viral encephalitis or meningitis of unknown etiology).

Babesiosis

Babesiosis is a malaria-like illness caused by the protozoan *Babesia microti* or other *Babesia* organisms. *B.*

Figure 1. Reported Cases of Anaplasmosis, Babesiosis, and Lyme Disease, Minnesota, 1996-2011



microti is transmitted to humans by bites from *I. scapularis* (the blacklegged tick or deer tick), the same vector that transmits the agents of Lyme disease, human anaplasmosis, one form of human ehrlichiosis, and a strain of Powassan virus. *Babesia* parasites can also be transmitted by blood transfusion.

In 2011, a record number of 72 confirmed and probable babesiosis cases (1.4 per 100,000 population) were reported, a 29% increase over the previous record of 56 cases in 2010. The median number of 27 cases (range, 9 to 73) reported from 2004 through 2011 is considerably higher than the median number of 2 cases (range, 0 to 7) from 1996 to 2003. Fifty-two (72%) babesiosis cases reported in 2011 were male. The median age of cases was 59 years (range, 3 to 90 years). Onsets of illness peaked in the summer months, with 49 (69%) of 71 cases with known onset occurring from June through August. In 2011, 27 (38%) cases were hospitalized for their infection, for a median duration of 4 days (range, 2 to 17 days). At least 1 reported case died from complications of babesiosis in 2011.

Campylobacteriosis

Campylobacter continues to be the most commonly reported bacterial enteric pathogen in Minnesota (Figure 2). There were 995 cases of culture-confirmed *Campylobacter* infection reported in 2011 (18.8 per 100,000 population). This is similar to the 1,007 cases reported in 2010 but a 10% increase from the median annual number of cases reported from 2001 to 2010 (median, 903 cases; range, 843 to 1,007). In 2011, 47% of cases occurred in people who resided in the metropolitan area. Of the 915 *Campylobacter* isolates confirmed and identified to species by MDH, 87% were *C. jejuni* and 11% were *C. coli*.

The median age of cases was 35 years (range, 3 weeks to 98 years). Forty-two percent of cases were between 20 and 49 years of age, and 13% were 5 years of age or younger. Fifty-four percent of cases were male. Seventeen percent of cases were hospitalized; the median length of hospitalization was 4 days. Fifty-two percent of infections occurred during June through September. Of the 931 (94%) cases for whom data were available, 158 (17%) reported travel outside of the United States during the week prior to illness onset. The most common travel destinations were Europe (n=42), Central or South America or the Caribbean (n=41), Asia (n=31), and Mexico (n=21).

There were three outbreaks of campylobacteriosis identified in Minnesota in 2011. In late June-early July, an outbreak of *C. jejuni* infections was associated with raw milk consumption from a farm in Benton County; 2 culture-confirmed cases were identified. In July, an outbreak of quinolone-resistant *C. coli* infections was associated with raw milk consumption from a farm in Todd County; 3 culture-confirmed cases were identified. In July, an outbreak of *C. jejuni* infections was associated with masonry workers at a dairy farm; 2 culture-confirmed cases were identified.

A primary feature of public health importance among *Campylobacter* cases was the continued presence of *Campylobacter* isolates resistant to fluoroquinolone antibiotics (e.g., ciprofloxacin), which are commonly used to treat campylobacteriosis. In 2011, the overall proportion of quinolone resistance among *Campylobacter* isolates tested was 27%. However, 80% of *Campylobacter* isolates from patients with a history of foreign travel during the week prior to illness onset, regardless of destination, were resistant to fluoroquinolones. Sixteen percent of *Campylobacter* isolates from patients who acquired the infection domestically were resistant to fluoroquinolones.

In June 2009, a non-culture based test became commercially available for the qualitative detection of *Campylobacter* antigens in stool. Three hundred seventy-seven patients were positive for *Campylobacter* by a non-culture based test conducted in a clinical laboratory in 2011. However, only 137 (36%) of the specimens were subsequently culture-confirmed and therefore met the surveillance case definition for inclusion in MDH case count totals.

Clostridium difficile

Clostridium difficile is an anaerobic, spore-forming, Gram-positive bacillus that produces two pathogenic toxins: A and B. *C. difficile* infections (CDI) range in severity from mild diarrhea to fulminant colitis and death. Transmission of *C. difficile* occurs primarily in healthcare facilities, where environmental contamination by *C. difficile* spores and exposure to antimicrobial drugs are common. The primary risk factor for development of CDI in healthcare settings is recent use of antimicrobials, particularly clindamycin, cephalosporins, and fluoroquinolones. Other risk factors for CDI acquisition in these settings are age greater than 65 years, severe underlying illness, intensive care unit admission, nasogastric intubation, and longer duration of hospital stay.

A marked increase in the number of cases of CDI and mortality due to CDI has been noted across the United

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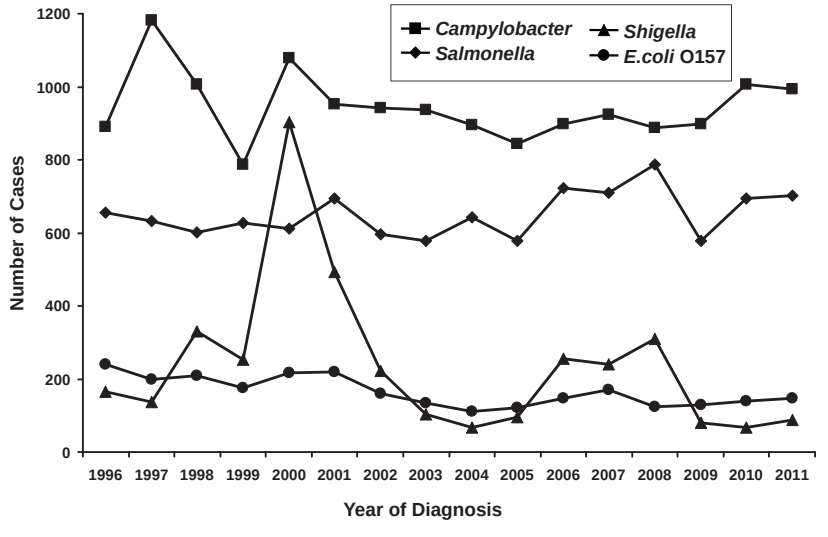
Figure 2. Reported Cases of *Campylobacter*, *Salmonella*, *Shigella*, and *Escherichia coli* O157:H7 Infection, Minnesota, 1996-2011



States, Canada, and England. Most notable was a series of large-scale protracted outbreaks in Quebec first reported in March 2003. During this period, Quebec hospitals reported a 5-fold increase in healthcare-acquired CDI. These and other healthcare facility (e.g., long-term care facilities) outbreaks have been associated with the emergence of a new more virulent strain of *C. difficile*, designated North American pulsed-field gel electrophoresis type 1 (NAP1), toxinotype III.

Community-associated CDI is also receiving increased attention. Several cases of serious CDI have been reported in what have historically been considered low-risk populations, including healthy persons living in the community and peripartum women. At least 25% of these cases had no history of recent healthcare or antimicrobial exposure.

In 2009, as part of the EIP, we initiated population-based, sentinel surveillance for CDI at 10 hospital laboratories serving Stearns, Benton, Morrison, and Todd Counties. A CDI case is defined as a positive *C. difficile* toxin assay on an incident stool specimen from a resident of one of the four counties. A CDI case is classified as healthcare facility-onset (HCFO) if the initial specimen was collected greater than 3 days after admission to a healthcare facility. Community-onset (CO) cases who had an overnight stay at a healthcare facility in the 12 weeks prior the initial specimen are classified as CO-HCFA, whereas CO cases without documented overnight stay in a healthcare facility in the 12 weeks prior the initial specimen result are classified as CA. A more detailed set of case definitions is available upon request.

In 2011, 472 incident cases of CDI were reported in the four sentinel counties (190.9 per 100,000 population). Sixty-three percent of these cases were classified as CA, 19% as HCFO, and 18% as CO-HCFA. The median ages for CA, HCFO, and CO-HCFA cases were 48 years, 79 years, and 57 years, respectively. Thirty-nine percent of CA cases reported antibiotic usage in the 2 weeks prior to stool specimen collection compared to 67% of HCFO cases and 56% of CO-HCFA cases. Of the 304 putative CA cases eligible for interview, 258 were interviewed and confirmed as CA cases. Sixty percent of CA cases reported antibiotic use in the 12 weeks prior to illness onset date. Most common uses of antibiotics included treatment of ear, sinus or upper respiratory infections (34%), dental procedures (15%), and prior CDI (12%).

Carbapenem-resistant Enterobacteriaceae (CRE)

Enterobacteriaceae are a large family of Gram-negative bacilli (GNB) that can cause community- and healthcare-associated infections. Carbapenem-resistant Enterobacteriaceae (CRE) are resistant to most available antibiotics. Some CRE bacteria harbor resistance genes that produce chromosomally- or plasmid-mediated enzymes known as carbapenemases. Plasmid-mediated carbapenemases, such as the *Klebsiella pneumoniae* carbapenemase (KPC), can easily spread between bacteria of similar species.

KPC is the most common plasmid-mediated carbapenemase found in the United States. Since 2009, several types of metallo-β-lactamase (MBL)-producing Enterobacteriaceae have been reported in the United States, including New Delhi MBL (NDM) and Verona Integron-encoded MBL (VIM). MBL-producing bacteria are more common outside the United States.

CRE infections most commonly occur among patients with co-morbid conditions, invasive devices, and who have received extended courses of certain antibiotics.

MDH first detected a KPC-producing Enterobacteriaceae isolate in February 2009, and began statewide passive CRE surveillance. As part of this surveillance, laboratories submit isolates from CRE cases to the PHL for further characterization.

In 2011, we adopted a standardized CRE case definition developed by CDC and states participating in the EIP Gram-negative Surveillance Initiative. This CRE definition includes Enterobacteriaceae that are non-susceptible to a carbapenem (excluding ertapenem) and resistant to all tested third generation cephalosporins (2011 CSLI breakpoints).

During 2011, 44 cases of CRE were reported. The median age of cases was 58 years (range, 1 month to 91 years); 20 (45%) were male and 23 (52%) were residents of the metropolitan area. Urine (25) was the most common source followed by respiratory tract (7), peritoneal fluid (5), blood (4), wound (2), and other body fluid (1). Two isolates of different species were detected in 1 case; CRE species varied: 33/44 (75%) were represented by *E. cloacae* (23) and *K. pneumoniae* (10). Twenty-one (48%) cases were hospitalized at the time of culture (12 hospitalized >3 days prior to culture); median length of stay (LOS) was 27 days (range, 2 to 238). Twenty-three (52%) cases were identified in other healthcare settings including ER/outpatient clinics (15), long-term acute care hospitals (6), and long-term care facilities (2).

Forty-one isolates from 40 cases were tested by PCR for the bla_{KPC} gene; 21 (51%) were KPC positive. Of these, 12 (57%) were cultured from urine, 5 (24%) respiratory tract, 2 (9%) blood, 1 (5%) peritoneal fluid, and 1 (5%) other body fluid. KPC-positive isolates were *E. cloacae* (11), *K. pneumoniae* (9), and *C. freundii* (1). The median age of KPC positive cases was 64 years (range, 6 months to 91 years); 9 (43%) were male; 11 (52%) were residents of the metropolitan area; and 9 (43%) were hospitalized at the time of culture (6 hospitalized >3 days prior to culture). Median LOS was 27 days (range, 5 to 238). Other cases were detected in ER/outpatient clinics (5), long-term acute care hospitals (6), and long-term care facilities (1).

Two KPC-negative isolates (1 *E. coli* and 1 *K. pneumoniae*) were confirmed NDM positive by CDC. Both isolates came from a single outpatient urine culture. This case had recently returned to the United States after being hospitalized during a trip to India where NDM is known to be present in hospitals.

In summary, approximately half of the CRE cases reported were KPC positive. Active surveillance testing should be considered when a patient with previously unrecognized CRE or hospital-onset CRE infections is identified. No outbreaks or transmission

of CRE were reported among facilities that conducted active surveillance testing during 2011.

Cryptosporidiosis

During 2011, 307 cases of cryptosporidiosis (5.8 per 100,000 population) were reported. This is 55% higher than the median number of cases reported annually from 1998 to 2010 (median, 198 cases; range, 91 to 389). The median age of cases in 2011 was 27 years (range, 3 months to 92 years). Children 10 years of age or younger accounted for 21% of cases. Fifty percent of cases occurred during July through October. The incidence of cryptosporidiosis in the Southwestern, Southeastern, West Central, and Northeastern districts (20.2, 17.8, 17.0, 11.5 cases per 100,000, respectively) was significantly higher than the statewide incidence. Only 47 (15%) reported cases occurred among residents of the metropolitan area (1.7 per 100,000). Fifty-two (17%) cases required hospitalization, for a median of 4 days (range, 2 to 66 days).

Three outbreaks of cryptosporidiosis were identified in 2011, accounting for 7 laboratory-confirmed cases. One recreational waterborne outbreak occurred among swimmers on a high school swim team, including 11 cases (2 laboratory-confirmed). One outbreak of cryptosporidiosis associated with drinking unpasteurized apple cider at an apple orchard where a petting zoo was present accounted for 4 cases (3 laboratory-confirmed). One outbreak at a daycare accounted for 2 cases (both laboratory confirmed).

In a paper published in *Clinical Infectious Diseases* in April 2010, we reported an evaluation of rapid assays used by Minnesota clinical laboratories for the diagnosis of cryptosporidiosis. The overall positive predictive value of the rapid assays was 56%, compared to 97% for non-rapid assays. The widespread use of rapid assays could be artificially contributing to the increased number of reported cases of cryptosporidiosis. Rapid assay-positive specimens should be confirmed with other methods. It is important that health care providers are aware of the limitations and proper use of rapid assays in the diagnosis of cryptosporidiosis and that they limit testing to patients who have symptoms characteristic of the disease cryptosporidiosis.

Dengue

Dengue fever and the more clinically severe dengue hemorrhagic fever (DHF) is one of the most frequently occurring mosquito-borne diseases worldwide, with an estimated 50-100 million cases (including approximately 500,000 DHF cases and over 20,000 fatalities) each year. Four serotypes of dengue virus are transmitted to humans through the bite of certain *Aedes* genus mosquitoes (e.g., *Aedes aegypti*). The risk is widespread in tropical or subtropical regions around the world, especially where water-holding containers (e.g., waste tires, buckets, or cans) provide abundant mosquito breeding habitat.

In 2011, 6 cases (0.11 per 100,000 population) of dengue fever were reported in Minnesota residents. This was lower than the median of 10 cases per year (range, 6 to 20) in the 90 cases reported from 2004-2011. In 2011, the median case age was 32 years (range, 17 to 61 years). Four cases (67%) resided within the metropolitan area, including 3 cases in Dakota County. Onset of symptoms occurred from February through November. All of the cases represented imported infections acquired out of state or abroad. Most cases had traveled to Latin America (3) or Asia (2) but 1 had potential exposure to the virus in Florida.

***Escherichia coli* O157 and Other Shiga-toxin Producing *E. coli* Infection, and Hemolytic Uremic Syndrome**

During 2011, 146 culture-confirmed cases of *Escherichia coli* O157 infection (2.8 per 100,000 population) were reported. The number of reported cases is similar to the median number of cases reported annually from 1997 to 2010 (median, 151 cases; range, 110 to 219). During 2011, 68 (47%) cases occurred in the metropolitan area. One hundred nineteen (82%) cases occurred during May through October. The median age of the cases was 19 years (range, 1 to 90 years). Twenty-one percent of the cases were 4 years of age or younger. Sixty (41%) cases were hospitalized; the median duration of hospitalization was 4 days (range, 1 to 61 days). One case died.

In addition to the 146 culture-confirmed *E. coli* O157 cases, 115 cases of Shiga-toxin producing *E. coli* (STEC) infection were identified in 2011. Of those, culture-confirmation was not possible in 13, and therefore it is unknown if those were O157 or another serogroup. Among the remaining 102 cases of STEC other than O157, *E. coli* O26 accounted for 24 cases, *E. coli* O111 for 22, and *E. coli* O103 for 21. These three serogroups represented 66% of all non-O157 STEC.

In 2011, an outbreak caused in party by non-O157 STEC was identified among individuals who visited an apple orchard in October. In total, 14 cases were identified, including 5 laboratory-confirmed *E. coli* O111:NM cases and 3 laboratory-confirmed *Cryptosporidium parvum* cases. Consuming samples of unpasteurized apple cider from a pressing demonstration was associated with illness. *E. coli* O111:NM was isolated from a calf at the orchard's petting zoo.

Six *E. coli* O157:H7 outbreaks were identified during 2011. Four outbreaks involved foodborne transmission (including two outbreaks with cases in multiple states) one involved animal contact, and one involved person-to-person transmission. The six outbreaks resulted in a median of 3 culture-confirmed cases per outbreak (range, 2 to 8 cases).

An outbreak of *E. coli* O157:H7 infections associated with animal contact at a county fair occurred in August; both cases reported contact with goats. Two culture-confirmed cases with the same PFGE subtype were identified.

In July, 3 cases of *E. coli* O157:H7 infection were associated with a private event. Fresh fruit was associated with illness. The fruit was prepared in a household in which household members had recently visited a goat farm from which *E. coli* O157:H7 was isolated.

In July, 3 cases of *E. coli* O157:H7 infection were associated with person-to-person transmission in a day care. The index case had contact with goats at a farm from which *E. coli* O157:H7 with the same PFGE subtype was

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isolated.

During September - October, 4 cases of *E. coli* O157:H7 infection in Minnesota residents were part of a multi-state outbreak that resulted in 26 cases in 14 states. Pre-packaged romaine lettuce was implicated as the vehicle.

In October, 2 cases of *E. coli* O157:H7 infection in Minnesota residents were part of a multi-state outbreak that resulted in 58 cases in 9 states. Romaine lettuce was implicated as the vehicle. This investigation resulted in a recall of the implicated product.

Hemolytic Uremic Syndrome (HUS)
In 2011, 12 HUS cases were reported. The number of reported cases represents a 29% decrease from the median number of cases reported annually from 1997 to 2010 (median 17 cases; range, 10 to 25). In 2011, the median age of HUS cases was 4 years (range, 1 to 88 years); 10 of the 12 cases occurred in children. All 12 cases were hospitalized, with a median hospital stay of 14 days (range, 9 to 61 days). There was 1 fatal case. From 1997 through 2011, the overall case fatality rate was 5.3%. All 12 HUS cases reported in 2011 were post-diarrheal. *E. coli* O157:H7 was cultured from the stool of 9 (75%) cases; the remaining 3 (25%) HUS cases were positive for *E. coli* O157:H7 by serology. In 2011, there were no outbreak-associated HUS cases.

Giardiasis
During 2011, 692 cases of *Giardia* infection (13.1 per 100,000) were reported. This represents a 35% decrease from the median number of cases reported annually from 1998 through 2010 (median, 1,059 cases; range, 678 to 1,556). Historically, a substantial proportion of *Giardia* cases has represented positive tests during routine screenings of recent immigrants and refugees.

The median age for all cases reported in 2011 was 23 years (range, 2 weeks to 89 years). Seventeen percent of cases were less than 5 years of age, and 20% of cases were over 50 years of age.

Haemophilus influenzae
Seventy-one cases of invasive *Haemophilus influenzae* disease (1.3 per 100,000 population) were reported in 2011. Cases ranged in age from newborn to 97 years (median, 68 years). Allowing for more than one syndrome per case, 39 (55%) cases had pneumonia, 15 (21%) had bacteremia without another focus of infection, 7 (10%) had meningitis, 5 (7%) had septic shock, 3 (4%) had otitis, 2 (3%) had epiglottitis, and 1 (1%) each had septic arthritis, endometritis, and empyema. Six (8%) cases died.

Of 62 *H. influenzae* isolates for which typing was performed at MDH, 7 (11%) were type f, 3 (5%) type b, 3 (5%) type e, 2 (3%) type a, and 47 (76%) were untypeable.

Three cases of type b (Hib) disease occurred in 2011, compared to 1 case in 2010, 2 cases in 2009, and 5 cases in 2008. One of the Hib cases was identified in a child <1 year of age who presented with meningitis. The other Hib cases were in adults >50 years of age. One patient presented with pnuemonia and the other with epiglottitis and an abscess. All 3 cases survived.

The 6 deaths occurred in patients ranging in age from 68 to 97 years. Five cases presented with pneumonia (of these, 1 also had septic shock) and 1 case presented with bacteremia without another focus of infection. All 6 cases had *H. influenzae* isolated from blood and all had underlying medical conditions. Of the 6 cases who died, 4 case-isolates were untypeable, 1 was serotype f, and 1 was serotype e.

HIV Infection and AIDS
The incidence of HIV/AIDS in Minnesota remains moderately low. In 2010, state-specific AIDS rates ranged from 0.5 per 100,000 population in Vermont to 22.1 per 100,000 in Maryland. Minnesota had the 14th lowest AIDS rate (4.0 cases per 100,000). Similar comparisons for HIV (non-AIDS) incidence rates are not possible because some states only began named HIV (non-AIDS) reporting recently.

As of December 31, 2011, a cumulative total of 9,785 cases of HIV infection (5,997 AIDS cases and 3,788 HIV [non-AIDS] cases) had been reported among Minnesota residents. Of the 9,785 HIV/AIDS cases, 3,347 (34%) are known to have died.

The annual number of AIDS cases reported in Minnesota increased steadily from the beginning of the epidemic through the early 1990s, reaching a peak of 361 cases in 1992. Beginning in 1996, the annual number of new AIDS diagnoses and deaths among AIDS cases declined sharply, primarily due to better antiretroviral therapies. In 2011, 182 new AIDS cases (Figure 3) and 61 deaths among persons living with HIV infection were reported.

The number of HIV (non-AIDS) diagnoses has remained fairly constant over the past decade from 2002 through 2011, at approximately 230 cases per year. With a peak of 280 newly diagnosed HIV (non-AIDS) cases in 2009, the past 2 years have seen promising decreases with 248 in 2010 (a 13% decrease) and 219 in 2011 (a 12% decrease). By the end of 2011, an estimated 7,136 persons with HIV/AIDS were assumed to be living in Minnesota.

Historically, and in 2011, over 80% (251/292) of new HIV infections (both HIV [non-AIDS] and AIDS at first diagnosis) reported in Minnesota occurred in the metropolitan area. However, HIV or AIDS cases have been diagnosed in residents of more than 90% of counties statewide. HIV infection is most common in areas with higher population densities and greater poverty.

The majority of new HIV infections in Minnesota occur among males. Trends in the annual number of new HIV infections diagnosed among males differ by race/ethnicity. New infections occurred primarily among white males in the 1980s and early 1990s. Whites still comprise the largest proportion of new HIV infections among males, but new infections among white males decreased between 1991 and 2000, from 297 to 101. However, since then the trend has reversed, and in 2011 there were 129 new infections among white males (28% increase). The decline among U.S.-born black males has been more gradual, falling from a peak of 79 new infections in 1992 to a low of 33 new infections in 2003. Since 2004 the number of cases among African American males has

been stable at around 40 cases per year. While during the past several years the number of cases in this group has trended upwards, with 58 cases diagnosed in 2010 and a peak of 64 in 2009, the number is back down in 2011 with 43 new HIV diagnoses. The number of HIV infections diagnosed among Hispanic males decreased in 2011 to 19 from 29 in 2010. The number of new infections among African-born males increased in 2011 to 17 from 13 in 2010. This represents a decrease of 34% among Hispanic males and an increase of 31% among African-born males from 2010 to 2011.

Females account for an increasing percentage of new HIV infections, from 11% of new infections in 1990 to 25% in 2011. Trends in HIV infections diagnosed annually among females also differ by race/ethnicity. Early in the epidemic, whites accounted for the majority of newly diagnosed infections in women. Since 1991, the number of new infections among women of color has exceeded that of white women. The annual number of new HIV infections diagnosed among U.S.-born black females had remained stable at 22 or fewer cases during 2001 to 2004, but increased to 28 new cases in both 2005 and 2006. In 2011 there were 21 new infections diagnosed among U.S.-born black females. In contrast, the number of new infections among African-born females increased greatly from 4 cases in 1996 to 39 in 2002. However, since 2002 the number of new HIV infections in African-born females has decreased, with 17 new cases diagnosed in 2006. In 2011 the number of new cases among African-born women was 27, making up 36% of all new diagnoses among women. The annual number of new infections diagnosed among Hispanic, American Indian, and Asian females is small, with 10 or fewer cases annually in each group.

Despite relatively small numbers of cases, persons of color are disproportionately affected by HIV/AIDS in Minnesota. In 2011, non-white men comprised approximately 17% of the male population in Minnesota and 41% of new HIV infections among men. Similarly, persons of color comprised approximately 13% of the female population and 81% of new HIV infections among women. It bears noting that race is not considered a biological cause of disparities in the occurrence of HIV, but instead race can be used as a proxy for other risk factors, including lower socioeconomic status and education.

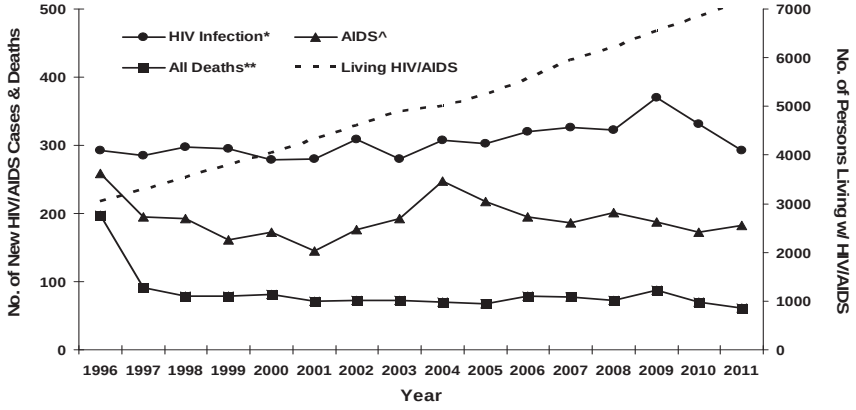
A population of concern for HIV infection is adolescents and young adults (13 to 24 years of age). The number of new HIV infections among males in this age group has remained higher than new infections among females since 1999. Since 2001, Minnesota has seen a steady increase in new cases among males in this age group, with 47 cases reported in 2011. Since 2001, the number of cases among young males has increased by over 250%. The number of new HIV infections among females in this age group increased slightly between 2007 and 2009, (from 13 cases to 18 cases), but decreased to 11 cases in 2010 and that trend continued 2011 with 8 cases. From 2009 to 2011, the majority (55%) of new infections among male adolescents and young adults were among youth of color (108/195), with young African American males accounting for 65% of the cases among young males of color. During the same time period, young women of color accounted for 63% (22/35) of the cases diagnosed, with young African American women accounting for 32% of cases among young women of color. Between 2009 and 2011 after re-distributing those with unspecified risk, 96% (188/195) of new cases among young males were attributed to male-to-male sex. Among young females, all 35 new cases were attributed to heterosexual sex.

Since the beginning of the HIV epidemic, male-to-male sex has been the predominant mode of exposure to HIV reported in Minnesota, although the number and proportion of new HIV infections attributed to men who have sex with men (MSM) has declined since 1991. In 1991, 70% (318/455) of new HIV infections were attributed to MSM (or MSM who also inject drugs); in 2011, this group accounted for 53% of new infections (156/292).

The number and percentage of HIV infections in Minnesota that are attributed to injection drug use has declined over the past decade for men and women, falling from 12% (54/455) of cases in 1991 to 1% (2/292) in 2011. Heterosexual contact with a partner who has or is at increased risk of HIV infection is the predominant mode of exposure to HIV for women. Ninety-five percent of 205 new HIV diagnoses among women between 2009 and 2011 can be attributed to heterosexual exposure after re-distributing cases with unspecified risk.

Historically, race/ethnicity data for HIV/AIDS in Minnesota have grouped U.S.-born blacks and African-born persons together as “black.” In 2001, we began analyzing these groups separately, and a marked trend of increasing numbers

Figure 3. HIV/AIDS in Minnesota: Number of New Cases, Prevalent Cases, and Deaths by Year, 1996-2011



* Includes all new cases of HIV infection (both HIV (non-AIDS) and AIDS at first diagnosis) diagnosed within a given calendar year

** Deaths among AIDS cases, regardless of cause

^ Includes all new cases of AIDS diagnosed within a given calendar year, including AIDS at first diagnosis. This includes refugees in the HIV+ Resettlement Program, as well as other refugee/immigrants diagnosed with AIDS subsequent to their arrival in the United States

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of new HIV infections among African-born persons was observed. In 2011, there were 44 new HIV infections reported among Africans. While African-born persons comprise less than 1% of the state's population, they accounted for 15% of all HIV infections diagnosed in Minnesota in 2011.

HIV perinatal transmission in the United States decreased 81% between 1995 and 1999. The trend in Minnesota has been similar but on a much smaller scale. While the number of births to HIV-infected women increased nearly 7-fold between 1990 and 2011, the rate of perinatal transmission decreased 6-fold, from 18% in 1990 to 1995 to 3% in 1996–2006. The overall rate of transmission for 2009 to 2011 was 1.0% with no HIV-positive births from HIV-infected mothers in Minnesota in 2011.

Influenza

Several surveillance methods are employed for influenza. Surveillance data are summarized by influenza season (generally October-April) rather than calendar year.

Hospitalized Cases

Surveillance for pediatric (<18 years of age), laboratory-confirmed hospitalized cases of influenza in the metropolitan area was established during the 2003-2004 influenza season. During the 2006-2007 season, surveillance was expanded to include adults. For the 2008-2009 season, surveillance was expanded statewide, although the collection of clinical information on hospitalized cases was limited to metropolitan area residents only. During the 2011-2012 season (October 2, 2011 – April 30, 2012), we requested clinicians collect a throat or nasopharyngeal swab, or other specimen from all patients admitted to a hospital with suspect influenza, and submit the specimen to the PHL for influenza testing.

During the 2011-2012 influenza season, 552 laboratory-confirmed hospitalizations for influenza (10.4 hospitalizations per 100,000 persons compared to 18.3 per 100,000 during the 2010-2011 influenza season) were reported. Since October 2, 2011, hospitalized cases of influenza have included 522 that were influenza A (295 H3, 18 2009 H1N1, and 209 unknown A type), 29 that were influenza B, and 1 was influenza type unknown. The unknown type was tested locally with no material available to the PHL for testing for further subtyping.

Among hospitalized cases, 22% were 0-18 years of age, 22% were 19-49 years of age, and 56% were 50 years of age and older. Median age was 54.4 years. Forty-five percent of cases were residents of the metropolitan area. Of the 248 metropolitan area cases, 98 (39%) cases were also diagnosed with pneumonia. One (<1%) had an invasive bacterial co-infection. Twenty-three (9%) required admission into an intensive care unit. Of these, 6 (26%) were placed on mechanical ventilation. Ninety-four percent of adult and 47% of pediatric cases had at least one chronic medical condition that would put them at increased risk for influenza disease.

Deaths

Since the H1N1 pandemic, we have increased our efforts to identify deaths related to influenza. Influenza-associated deaths are reported through several systems including hospital surveillance, Unexplained Critical Illnesses and Deaths of Possible Infectious Etiology (UNEX) reporting, Medical Examiner Infectious Deaths (MED-X) surveillance, death certificate review, nursing home outbreak investigations, as well as other sources. All reported cases are investigated to determine if there was a positive influenza laboratory result and symptoms of an infectious process consistent with influenza without recovery to baseline prior to death. In a small number of cases there may not be a positive influenza laboratory result due to the lack of specimens taken, in which case the person must have influenza noted as a cause of death on the death certificate, or the person must have had direct contact with a laboratory-confirmed influenza case to be included as an influenza-related death.

For the 2011-2012 influenza season, there were 33 influenza-associated deaths (16 influenza A-type unspecified, 13 influenza A-H3, and 4 influenza B). The median age was 86 years; 1 (3%) 25-49 years, 2 (6%) 50-64 years, 5 (15%) 64-79 years, and 25 (76%) age 80 and up. Thirty percent of cases were from the metropolitan area. Thirty-one (94%) had underlying medical conditions, and 23 (70%) were hospitalized for their illness. Twenty-one (64%) were residents of a long-term care facility. Two (6%) cases were identified through the UNEX/MED-X programs, 15 (45%) from hospital surveillance, 8 (24%) through death certificate review, 7 (21%) from nursing home outbreaks, and 1 (3%) through other methods.

Laboratory Data

The Minnesota Laboratory System (MLS) Laboratory Influenza Surveillance Program is made up of more than 310 clinic- and hospital-based laboratories, voluntarily submitting testing data on a weekly basis. These laboratories perform rapid testing for influenza and respiratory syncytial virus (RSV). Significantly fewer labs perform viral culture testing (6 labs) for influenza, RSV, and other respiratory viruses. Five laboratories perform PCR testing for influenza and three also perform PCR testing for other respiratory viruses. The PHL also provides further characterization of submitted influenza isolates to determine the hemagglutinin serotype to indicate vaccine coverage. Tracking laboratory results assists healthcare providers with patient diagnosis of influenza-like illness and provides an indicator of the progression of the influenza season as well as prevalence of disease in the community.

Between October 2, 2011 and May 19, 2012, virology laboratories reported 86 viral cultures positive for influenza. Of these, 71 (83%) were positive for influenza A and 15 (17%) were positive for influenza B. The number of positive influenza cultures peaked during the week of March 11 - March 17, 2012 at 14. Between October 2, 2011 and May 19, 2012, laboratories reported data on 11,459 influenza PCR tests, 1,437 (13%) of which were positive for influenza. Of these, 60 (4%) were positive for influenza A 2009 H1N1, 949 (66%) were positive for influenza A/(H3), 295 (21%) were positive for influenza A-not subtyped, 60 (4%) were positive for influenza A non-typeable, 71 (5%) were positive for influenza B, and 2 (0.1%) were positive for both influenza A and B. Between October 2, 2012 and May 19, 2012, 348 influenza isolates were further characterized in the PHL; 20 (6%) were characterized as influenza A 2009 H1N1, 267 (77%) were characterized as influenza A/(H3), 9 (3%) were characterized as influenza A-type unspecified, 8 (2%) were characterized as influenza B/Brisbane-like, and 44 (13%) were influenza B/Wisconsin-like.

Influenza Sentinel Surveillance

We conduct sentinel surveillance for influenza-like illness (ILI; fever ≥100° F and cough and/or sore throat in the absence of known cause other than influenza) through outpatient medical providers including those in private practice, public health clinics, urgent care centers, emergency rooms, and university student health centers. For these data there are 22 sites in 18 counties. Participating providers report the total number of patient visits each week and number of patient visits for ILI by age group (0-4 years, 5-24 years, 25-64 years, >65 years). Percentage of ILI peaked during the week of December 25-31, 2011 at 3.3%.

Influenza Incidence Surveillance Project

MDH was one of 12 nationwide sites to participate in an Influenza Incidence Surveillance Project for the 2011-2012 influenza season. Four clinic sites reported the number of ILI patients and acute respiratory illness (ARI; recent onset of at least two of the following: rhinorrhea, sore throat, cough, or fever) patients divided by the total patients seen by the following age groups: <1 year, 1-4 years, 5-17 years, 18-24 years, 25-64 years, and ≥65 years, each week. These clinics also performed rapid influenza testing on all ILI patients and reported results to us. Clinical specimens were collected on the first 10 patients with ILI and the first 10 patients with ARI for PCR testing at the PHL for influenza and 12 other respiratory pathogens. Minimal demographic information and clinical data were provided with each specimen.

From July 31, 2011 – May 19, 2012, these clinics saw 1,865 ILI and 8,390 ARI patients. They submitted 913 specimens for influenza and respiratory pathogen testing, 61 (7%) of which were positive for influenza. Of those, 10 (16%) were positive for influenza A 2009 H1N1, 43 (70%) were positive for influenza A/(H3), 3 (5%) were positive for influenza A-type unspecified, and 5 (8%) were positive for influenza B. In addition to influenza, the following pathogens were detected by PCR: 43 (5%) adenovirus, 18 (2%) human metapneumovirus, 75 (8%) respiratory syncytial virus (RSV), 170 (19%) rhinovirus, 36 (4%) parainfluenza virus 1, 14 (2%) parainfluenza virus 2, 2 (0.2%) parainfluenza virus 3, 7 (0.8%) parainfluenza virus 4, 22 (2%) coronavirus C229E, 11 (1%) coronavirus OC43, 9 (1%) coronavirus HKU1, and 4 (0.4%) coronavirus NL63.

ILI Outbreaks (Schools and Long Term Care Facilities)

Between 1988 and 2009, a probable ILI outbreak in a school was defined as a doubled absence rate with all of the following primary influenza symptoms reported among students: rapid onset, fever, illness lasting 3 or more days, and at least one secondary influenza symptom (e.g., myalgia, headache, cough, coryza, sore throat, or chills). A possible ILI outbreak in a school was defined as a doubled absence rate with reported symptoms among students, including two of the primary influenza symptoms and at least one secondary influenza symptom. Prior to the 2009-2010 influenza season, the number of schools reporting probable influenza outbreaks has ranged from a low of 38 schools in 20 counties in 1996-1997 to 441 schools in 71 counties in 1991-1992.

The definition of ILI outbreaks changed beginning with the 2009-2010 school year. Schools reported when the number of students absent with ILI reached 5% of total enrollment, or when three or more students with ILI are absent from the same elementary classroom. Ninety-one schools in 36 counties reported ILI outbreaks during the 2011-2012 school year. During the previous school year 218 schools in 50 counties reported ILI outbreaks. During the 2009-2010 school year, 1,302 schools in 85 counties reported ILI outbreaks.

An influenza outbreak is suspected in a long-term care facility (LTCF) when three or more residents in a single unit present with a cough and fever or chills during a 48- to 72-hour period. An influenza outbreak is confirmed when at least one resident has a positive culture, PCR, or rapid antigen test for influenza. Forty-one facilities in 26 counties reported outbreaks during the 2011-2012 influenza season. Surveillance for outbreaks in LTCFs began in the 1988-1989 season. The number of LTCFs reporting ILI outbreaks has ranged from a low of 3 in 2008-2009 to a high of 140 in 2004-2005.

Legionellosis

During 2011, 31 confirmed cases of legionellosis (Legionnaires' disease [LD]) were reported including 20 cases (65%) among residents of the metropolitan area and 11 cases among greater Minnesota residents. Four (13%) cases died. Older adults were more often affected, with 28 (90%) cases occurring among individuals 50 years of age and older (median, 62.5 years; range, 37 to 88 years). Sixteen (52%) cases had onset dates in June through September. Travel-associated legionellosis accounted for 7 (23%) cases, defined as spending at least 1 night away from the case's residence in the 10 days before onset of illness.

The criteria for confirmation of a case requires a clinically compatible case and at least one of the following: 1) isolation of any *Legionella* organism from respiratory secretions, lung tissue, pleural fluid, or other normally sterile fluid by culture, or 2) detection of *L. pneumophila* serogroup 1 antigen in urine using validated reagents, or 3) seroconversion of fourfold or greater rise in specific serum antibody titer to *L. pneumophila* serogroup 1 using validated reagents. A single antibody titer at any level is not of diagnostic value for LD. The American Thoracic Society, in collaboration with the Infectious Diseases Society of America, recommends urinary antigen assay and culture of respiratory secretions on selective media for detection of LD. Culture is particularly useful because environmental and clinical isolates can be compared by molecular typing in outbreaks and in investigations of healthcare-associated LD.

Listeriosis

Six cases of listeriosis were reported during 2011. Five cases were hospitalized, and 4 (66%) died. The median age of the cases was 76 years (range, 56 to 87 years). Five (83%) cases had *Listeria monocytogenes* isolated from blood. One case had *L. monocytogenes* isolated from a wound. None of the cases were part of a recognized outbreak. The 6 cases reported in 2011 is similar to the median annual number of cases reported from 1996 through 2010 (median, 7 cases; range, 3 to 19).

Elderly persons, immunocompromised individuals, pregnant women, and neonates are at highest risk for acquiring listeriosis. Listeriosis generally

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manifests as meningoencephalitis and/or septicemia in neonates and adults. Pregnant women may experience a mild febrile illness, abortion, premature delivery, or stillbirth. In healthy adults and children, symptoms usually are mild or absent. *L. monocytogenes* can multiply in refrigerated foods. Persons at highest risk should: 1) avoid soft cheeses (e.g., feta, Brie, Camembert, blue-veined, and Mexican-style cheeses) and unpasteurized milk; 2) thoroughly heat/reheat deli meats, hot dogs, other meats, and leftovers; and 3) wash raw vegetables.

Lyme Disease

Lyme disease is caused by *Borrelia burgdorferi*, a spirochete transmitted to humans by bites from *I. scapularis* (the blacklegged tick or deer tick) in Minnesota. In Minnesota, the same tick vector also transmits the agents of babesiosis, human anaplasmosis, one form of human ehrlichiosis, and a strain of Powassan virus.

In 2011, 1,201 confirmed Lyme disease cases (22.6 cases per 100,000 population) were reported (Figure 1). In addition, 953 probable cases (physician-diagnosed cases that did not meet clinical evidence criteria for a confirmed case but that had laboratory evidence of infection) were reported. The 1,201 confirmed cases represent a 7% decrease from the 1,293 confirmed cases reported in 2010 but higher than the 1,065 confirmed cases reported in 2009. The median number of 1,058 cases (range, 913 to 1,293 cases) reported from 2004 through 2011 is considerably higher than the median number of cases reported annually from 1996 through 2003 (median, 373 cases; range, 252 to 866). Seven hundred fifty (62%) confirmed cases in 2011 were male. The median age of cases was 40 years (range, <1 to 91 years). Physician-diagnosed erythema migrans (EM) was present in 863 (72%) cases. Three hundred seventy-two (31%) cases had one or more late manifestations of Lyme disease (including 262 with a history of objective joint swelling, 89 with cranial neuritis, 9 with acute onset of 2nd or 3rd degree atrioventricular conduction defects, 8 with radiculoneuropathy, 7 with lymphocytic meningitis, and 1 with encephalomyelitis) and confirmation by Western immunoblot (positive IgM ≤30 days post-onset or positive IgG). Onsets of illness were elevated in the summer months and peaked in June and July (26% and 44% of EM cases, respectively), corresponding to the peak activity of nymphal *I. scapularis* ticks in mid-May through mid-July. Most cases in 2011 either resided in or traveled to endemic counties in north-central, east-central, or southeast Minnesota, or in western Wisconsin.

Malaria

Malaria is a febrile illness caused by several protozoan species in the genus *Plasmodium*. The parasite is transmitted to humans by bites from infected *Anopheles* genus mosquitoes. The risk of malarial infection is highest in the tropical and sub-tropical regions of the world. Although local transmission of malaria frequently occurred in Minnesota over 100 years ago, all of the cases reported in Minnesota residents since that time likely have been imported infections acquired abroad.

In 2011, 47 malaria cases (0.9 per 100,000 population) were reported in Minnesota residents, slightly above the 2000 to 2011 annual median of 40 cases (range, 29 to 50). Thirty-two (68%) cases were identified with *P. falciparum*, 7 (15%) with *P. vivax*, 3 (6%) with *P. ovale,* 2 (4%) with *P. malariae,* and 3 (6%) with mixed *Plasmodium* species infections. The median age of cases was 33 years (range, 1 to 75 years). Of 35 cases of known race, 24 (69%) were black, 8 (23%) were white, and 3 (9%) were Asian. Eighty-three percent of cases resided in the metropolitan area, including 27 (57%) in Hennepin or Ramsey Counties. Of the 31 cases with known country of birth, 11 (35%) were born in the United States. Thirty-eight (81%) cases in 2011 likely acquired malaria in Africa. Six cases were likely acquired in Asia, 1 in Oceana, 1 in Central America, and 1 in the Caribbean. Twenty-three countries were considered possible exposure locations for malarial infections, including Liberia (10), Nigeria (7), and Ghana (5).

Measles

Twenty-six cases of measles were reported in 2011. This is the highest number of cases in Minnesota since 1991. A total of 6 cases were reported during the previous 5 years, including 3 unrelated cases in 2010. The most recent known transmission of measles within Minnesota occurred in 1991. Twenty-one of the 26 cases were associated with an outbreak in Hennepin County occurring in February through April, 3 cases were associated with an outbreak in Dakota County in August, and 2 unrelated cases occurred in Hennepin and LeSueur Counties during the time of the spring outbreak.

Of the 21 Hennepin County outbreak cases, 19 (90%) were laboratory-confirmed; 11 (52%) were confirmed both by serology and PCR, 8 (42%) by PCR only. Genotyping was performed for 9 cases, including the index case, and was B3, a genotype circulating in Sub-Saharan Africa. All 3 Dakota County outbreak cases were laboratory-confirmed; 1 by PCR only; the other 2 were confirmed by both PCR and IgM serology, and 1 of these was also culture-confirmed. The source case was genotype B3. The 2 unrelated cases were laboratory-confirmed by both PCR and IgM serology.

The source case of the Hennepin County outbreak was a 30 month-old U.S.-born child of Somali descent who had traveled to Kenya. Measles was transmitted to 3 contacts at a drop-in childcare center (including the first identified case) and 1 household contact. Subsequent cases resulted in exposures in two homeless shelters (8), two healthcare facilities (3), two households (3), and another childcare center (1). One case's specific exposure was unknown but was considered a community exposure. Fourteen (67%) cases were hospitalized (mean 4 days; range 2-7 days).

The median age of the Hennepin County outbreak cases was 12 months (range, 4 months to 51 years). Nine (43%) cases were black and of non-Somali descent, 8 (38%) were of Somali descent, 3 (14%) were American Indian, and 1(5%) was white.

None of these outbreak cases were known to have been age-appropriately vaccinated. Sixteen (76%) cases were known to be unvaccinated; of those, 7 (44%) were too young to have received measles vaccine in accordance with the routine schedule, and 9 (56%) were of age but unvaccinated. Of these 9 unvaccinated cases, 2 (22%) were behind on immunizations, and 7 (78%) were unvaccinated because of incorrectly

perceived safety concerns, 6 (86%) of whom were children of Somali descent. Three (14%) of the outbreak cases had unknown vaccination history. One additional case, a healthcare worker with unknown vaccination status, had documented history of a positive measles IgG serologic test result. The remaining case was a child vaccinated at 11 months of age, younger than the recommended 12 months of age.

The source case of the Dakota County outbreak was a 12 month-old U.S.- born child of Ethiopian descent who had traveled to Kenya. Measles was transmitted to 2 other individuals; 1 was exposed in a private home and the other in a clinic setting. Two cases were hospitalized; 1 for 4 days and the other for 27 days. The critically ill case developed pneumonitis and required ventilator support for 15 days. The age range of the cases was 12 months to 43 years. Two cases were black and of Ethiopian descent and 1 case was white. The source case was too young to have received measles vaccine in accordance with the routine schedule, and missed the opportunity for early vaccination prior to international travel at 9 months of age. One case was not vaccinated because of incorrectly perceived safety concerns, and 1 case had unknown vaccination history.

The 2 additional unrelated cases occurred in white adults ages 27 and 34 years. These cases resulted from exposure in India and Florida, respectively. Genotypes were D8 (endemic to West Africa and India) and D4 (a genotype with many endemic locations), respectively. One had a documented history of 2 doses of measles vaccine; the other had unknown vaccination history. The cases were unrelated to the outbreak cases and to each other; no secondary cases were identified in Minnesota, although the Florida exposure resulted in 5 additional cases in two states.

Meningococcal Disease

Fifteen cases of *Neisseria meningitidis* invasive disease (0.28 per 100,000 population) were reported in 2011, compared to 9 cases in 2010. There were 8 serogroup B cases, 5 serogroup Y, and 1 serogroup W135, and 1 not groupable.

Cases ranged in age from 5 months to 98 years, with a median of 48 years. Sixty percent of the cases occurred in the metropolitan area. Eight cases had meningitis, 4 had bacteremia without another focus of infection, 2 had septic arthritis, and 1 had pneumonia. There were no fatalities. All cases were sporadic with no epidemiologic links.

In 2011, 1 case-isolate demonstrated intermediate resistance to penicillin and ampicillin, as well as resistance to trimethoprim/sulfamethoxazole. One additional case-isolate demonstrated intermediate resistance to penicillin. Seven additional case-isolates demonstrated resistance to trimethoprim/sulfamethoxazole. There were no 2011 case-isolates with ciprofloxacin resistance. In 2008, 2 isolates from cases occurring in northwestern Minnesota had nalidixic acid MICs >8 µg/ml and ciprofloxacin MICs of 0.25 µg/ml indicative of resistance.

In 2011, meningococcal conjugate vaccine (Menveo), previously licensed for 11-15 year-olds in 2010, was extended for licensed use in the United States to 9 months of age. Menactra was licensed for use in the United States in January 2005 for persons aged 11 to 55 years, and was the first meningococcal polysaccharide-protein conjugate vaccine for serogroups A,C,Y, and W-135 (MCV4). In 2007, the license was approved to include 2 to 10 year-olds. The U.S. Advisory Committee on Immunization Practices and American Academy of Pediatrics recommend immunization with either vaccine routinely at age 11-12 years or at high school entry and a booster dose at age 16, as well as for college freshmen living in dormitories, and other groups in the licensed age range previously determined to be at high risk. In 2006, MDH in collaboration with the CDC and other sites nationwide, began a case-control study to examine the efficacy of MCV4 and the study continues.

Methicillin-Resistant *Staphylococcus aureus* (MRSA)

Strains of *Staphylococcus aureus* that are resistant to methicillin and all available beta-lactam antibiotics are referred to as methicillin-resistant *S. aureus* (MRSA). Traditional risk factors for healthcare-associated (HA) MRSA include recent hospitalization or surgery, residence in a long-term care facility, and renal dialysis.

In 2005, as part of the EIP Active Bacterial Core surveillance (ABCs) system, we initiated population-based invasive MRSA surveillance in Ramsey County. In 2005, the incidence of invasive MRSA infection in Ramsey County was 19.8 per 100,000 and was 19.4, 18.5 and 19.9 per 100,000 in 2006, 2007, and 2008, respectively. In 2008, surveillance was expanded to include Hennepin County. The incidence rate for MRSA infection in Ramsey and Hennepin Counties was 17.0, 14.0, and 18.2 per 100,000 in 2009, 2010, and 2011, respectively (2011: Ramsey 19.9/100,000 and Hennepin 17.4/100,000). MRSA was most frequently isolated from blood (66%), and 14% (42/302) of the cases died. The rate of invasive MRSA infection acquired in hospitals (hospital-onset or nosocomial) decreased from 5.4 per 100,000 in 2005 to 1.8 in 2011. Twelve percent (37/302) of 2011 reported cases had no reported healthcare-associated risk factors in the year prior to infection. Please refer to the MDH Antibiogram for details regarding antibiotic susceptibility testing results (pp. 26-27).

Vancomycin-intermediate (VISA) and vancomycin-resistant *S. aureus* (VRSA) are reportable in Minnesota, as detected and defined according to Clinical and Laboratory Standards Institute approved standards and recommendations: a Minimum Inhibitory Concentration (MIC)=4-8 ug/ml for VISA and MIC≥16 ug/ml for VRSA. Patients at risk for VISA and VRSA generally have underlying health conditions such as diabetes and end stage renal disease requiring dialysis, previous MRSA infections, recent hospitalizations, and recent exposure to vancomycin. There have been no VRSA cases in Minnesota. We confirmed 1 VISA case in 2000, 3 cases in 2008, 3 cases in 2009, and 2 cases in 2010. In 2011, 5 VISA cases were reported; 2 were methicillin-susceptible SA (MSSA) and 3 were MRSA. The MSSA cases had a history of immunosuppression; interestingly, there was no prior history of MRSA or recent exposure to vancomycin. The MRSA cases had a history of diabetes or chronic renal insufficiency. One MRSA isolate was daptomycin-nonsusceptible.

Critical illnesses or deaths due to

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community-associated (CA) *S. aureus* infection (both methicillin-susceptible and-resistant) are reportable in Minnesota. From 2005-2011, 106 cases of critical illness or death due to community-associated *S. aureus* infection were reported: 8 (2005), 14 (2006), 16 (2007), 19 (2008), 20 in 2009, 17 (2010), and 12 (2011); 56 (53%) were MRSA and 50 (47%) MSSA. Twenty-six (46%) MRSA cases were male and the median age was 35 years (12 days-88 years); 28 (56%) MSSA cases were male and the median age was 16 years (1 day-78 years). Multifocal infections occurred in 25 cases; 17 MRSA, 8 MSSA. Pneumonia was most frequent with 31 MRSA and 20 MSSA cases, and accounted for 21 (68%) deaths. One MRSA and 8 MSSA had TSS; 3 MRSA and 8 MSSA had endocarditis (5/11 fatal); 20 MRSA and 7 MSSA had skin structure infections. Death occurred in 15 (28%) MRSA and 16 (32%) MSSA cases.

PFGE typing and toxin PCR were performed on 45 MRSA and 42 MSSA isolates. Most MRSA isolates belonged to clonal groups associated with CA USA types (80% USA300). There was no change in the number of USA300 MRSA cases over time. MSSA isolates were in clonal groups associated with CA and healthcare-associated USA types.

Mumps

During 2011, 2 cases of mumps were reported. Both cases were laboratory-confirmed; 1 was confirmed by PCR and the other by IgM serology. Neither case was epidemiologically linked, demonstrating that asymptomatic infections are occurring, and suggesting that mumps is underdiagnosed.

Both cases were adults between 30 and 50 years of age (born after 1957). Neither case had documentation of mumps vaccine; however, 1 case reported being immunized, and the other case reported having mumps in childhood.

Mumps surveillance is complicated by nonspecific clinical presentation in nearly half of cases, asymptomatic infections in an estimated 20% of cases, and suboptimal sensitivity and specificity of serologic testing. Mumps should not be ruled out solely on the basis of negative laboratory results. Providers are advised to test for other causes of sporadic parotitis including parainfluenza virus types 1 and 3, Epstein-Barr virus, influenza A virus, group A coxsackievirus, echovirus, lymphocytic choriomeningitis virus, human immunodeficiency virus, and other noninfectious causes such as drugs, tumors, and immunologic diseases.

Neonatal Sepsis

Statewide surveillance for neonatal sepsis includes reporting of any bacteria (other than coagulase-negative *Staphylococcus*) isolated from a sterile site in an infant <7 days of age, and mandatory submission of isolates.

In 2011, 56 cases of neonatal sepsis (0.82 cases per 1,000 live births) were reported compared to 58 cases (0.82 cases per 1,000 live births) in 2010. Among these cases, all were identified via blood or cerebral spinal fluid (CSF). Most cases (86%) were culture-positive within the first 2 days of life. In 2011, group B *Streptococcus* was the most common bacteria isolated (21) followed by *Escherichia coli* (17), *Streptococcus viridians* (3), other *Streptococcus* spp. (3), *Staphylococcus aureus* (3), *Enterococcus* spp. (3), *Actinomyces* spp. (2), and 1 each *Haemophilus influenzae*, *Klebsiella pneumoniae*, group D *Streptococcus*, and *Streptococcus pneumoniae*.

Pertussis

During 2011, 662 cases of pertussis (12 per 100,000 population) were reported. Pertussis annual incidence in Minnesota exceeded this number every year since 2007, when 393 cases (7.6 per 100,000 population) were reported. Laboratory confirmation was available for 428 (65%) cases, 8 (2%) of which were confirmed by culture and 420 (98%) of which were confirmed by PCR. In addition to the laboratory-confirmed cases, 135 (20%) cases were epidemiologically linked to laboratory-confirmed cases, and 97 (15%) met the clinical case definition only. Three hundred forty-nine (53%) of the reported cases occurred in residents of the metropolitan area.

Paroxysmal coughing was the most commonly reported symptom. Six hundred thirty-three (96%) cases experienced paroxysmal coughing. Almost one third (200, 30%) reported whooping. Although commonly referred to as “whooping cough,” very young children, older individuals, and persons previously immunized may not have the typical “whoop” associated with pertussis. Post-tussive vomiting was reported in 283 (43%) of the cases. Infants and young children are at the highest risk for severe disease and complications. Pneumonia was diagnosed in 21 (3%) cases, 49 (7%) of whom were <1 year of age. Nineteen (3%) cases were hospitalized; 10 (52%) of the hospitalized patients were <6 months of age.

Due to waning immunity from either natural infection or vaccine, pertussis can affect persons of any age. The disease is increasingly recognized in older children and adults. During 2011, cases ranged in age from <1 week to 77 years. Ninety-four (14%) cases occurred in adolescents 13 to 17 years of age, 148 (22%) in adults 18 years of age and older, 278 (42%) in children 5-12 years of age, 117 (18%) in children 6 months through 4 years of age, and 25 (4%) in infants <6 months of age. The median age of cases was 11 years.

Infection in older children and adults may result in exposure of unprotected infants who are at risk for the most severe consequences of infection. During 2011, 49 pertussis cases were reported in infants <1 year of age. A likely source of exposure was identified for 16 (33%) cases; 6 (31%) were infected by adults 18 years of age and older, 1 (6%) was infected by an adolescent 13 to 17 years of age, and 9 (50%) were infected by a child <13 years of age. For the 33 (67%) cases with no identified source of infection, the source was likely from outside the household. Vaccinating adolescents and adults with Tdap will decrease the incidence of pertussis in the community and thereby minimize infant exposures.

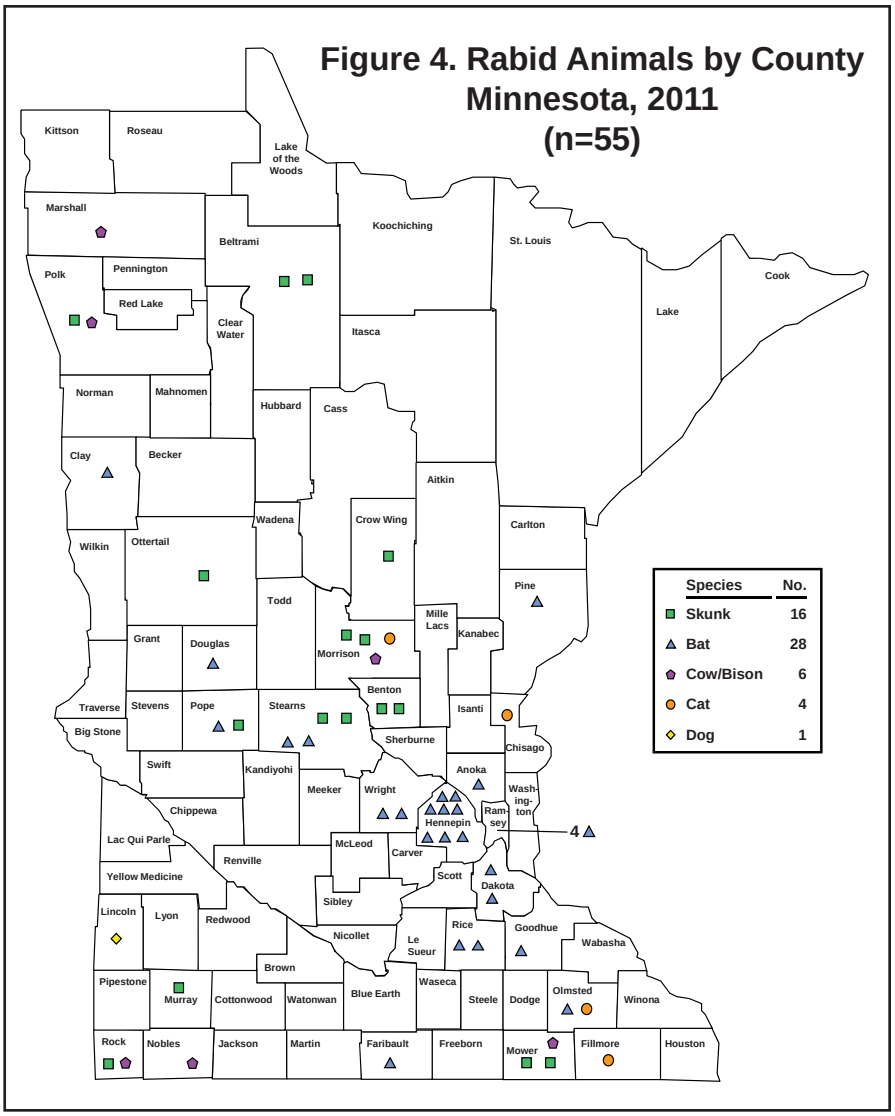
Although unvaccinated children are at highest risk for pertussis, fully immunized children may also develop the disease. Disease in those previously immunized is usually mild. Efficacy for currently licensed vaccines is estimated to be 71 - 84% in preventing serious disease. Of the 154 cases who were 7 months to 6 years of age, 107 (69%) were known to have received at least a primary series of 3 doses of DTP/DTaP vaccine prior to onset of illness; 43 (28%) received fewer than 3 doses and were considered preventable cases.

Vaccine history was unavailable for the remaining 4 (3%) cases.

MDH reporting rules require that clinical isolates of *Bordetella pertussis* be submitted to the PHL. Of the 8 culture-confirmed cases, 6 of the isolates were received and sub-typed by PFGE with 6 distinct PFGE patterns identified. In 2011 no case-isolates of pertussis were tested in Minnesota for susceptibility to erythromycin, ampicillin, or trimethoprim-sulfamethoxazole. However, nationally isolates have had low minimum inhibitory concentrations, falling within the reference range for susceptibility to the antibiotics evaluated. Only 11 erythromycin-resistant *B. pertussis* cases have been identified in the United States to date.

Laboratory tests should be performed on all suspected cases of pertussis. Culture of *B. pertussis* requires inoculation of nasopharyngeal mucous on special media and incubation for 7 to 10 days. However, *B. pertussis* is rarely identified late in the illness; therefore, a negative culture does not rule out disease. A positive PCR result is considered confirmatory in patients with a 2-week history of cough illness. PCR can detect non-viable organisms. Consequently, a positive PCR result does not necessarily indicate current infectiousness. Patients with a 3-week or longer history of cough illness, regardless of PCR result, may not benefit from antibiotic therapy. Cultures are necessary for molecular and epidemiologic studies and for drug susceptibility testing. Whenever possible, culture should be done in conjunction with PCR testing. Serological tests are not standardized and are not acceptable for laboratory confirmation at this time.

Pertussis remains endemic in Minnesota despite an effective vaccine and high coverage rates with the primary series. Reported incidence of pertussis has consistently increased over the past 10 years, particularly in adolescents and adults. One of the main reasons for the ongoing circulation of pertussis is that vaccine-induced immunity to pertussis wanes approximately 5-10 years after completion of the primary series, leaving adolescents and adults susceptible.



Rabies

Rabies is caused by the rabies virus, which is highly antigenic, only infects mammals, and has been identified worldwide. In Minnesota, the reservoir species are the skunk and multiple bat species.

In 2011, 55 (2%) of 2,385 animals submitted for testing were positive for rabies (Figure 4). This is similar to 2010, when 59 (2%) of 2,508 animals tested positive. The majority of positive animals in 2011 were bats (28/55 [50%]), followed by skunks (16/55 [30%]), cattle (5/55 [10%]), cats (4/55 [7%]) and dogs (1/55 [2%]). No raccoons or horses tested positive for rabies in 2011 and there were no human cases. The years 2008, 2009, and 2011 are the only ones in which bats have comprised the greatest number of positive animals; all other years the majority of positive animals were skunks.

From 2003 to 2011, 22,069 animals were submitted for rabies testing. The median number of positive animals reported annually was 59 (range, 39 to 94). From 2003 to 2011, 247/512 (48%) skunks, 43/547 (8%) cattle, 189/5,667 (3%) bats, 27/6,209 (0.4%) dogs, 35/7,071 (0.5%) cats, and 0/732 (0%) raccoons that were submitted tested positive for rabies. From 1988 to 2011, 3 raccoons tested positive for rabies; these occurred in 1989, 1990, and 1993.

Salmonellosis

During 2011, 701 culture-confirmed cases of *Salmonella* infection (13.2 per 100,000 population) were reported. This represents a 5% increase from the median annual number of cases reported from 2001 to 2010 (median, 668 cases; range, 578 to 755). Of the 91 serotypes

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identified in 2011, 5 serotypes, *S.* Enteritidis (173), *S.* Typhimurium (105), *S.* I 4,[5],12:i:- (60), *S.* Newport (55), and *S.* Infantis (20) accounted for 59% of cases. *Salmonella* was isolated from stool in 615 (88%), urine in 44 (6%), and blood in 32 (5%) cases. Other specimen sources included abscesses, bone, endometrium, placenta, tissue, leg laceration, and a toe swab. There were 3 cases of *S.* Typhi infection; 2 had travelled to India and 1 to Pakistan. There were 3 cases of *S.* Paratyphi A infection; 1 had travelled internationally (India).

Of the 648 cases interviewed about travel history, 91 (14%) had traveled internationally during the week prior to their illness onset. Cases who reported Asian race had a higher incidence (25.4 per 100,000 population) than any other reported race (Black, 15.7; Native American, 12.8; White, 10.7). One 81-year-old case died of congestive heart failure secondary to type 2 diabetes mellitus 8 days after *S.* Javiana was isolated from a urine sample.

Seventy-three cases were part of 13 *Salmonella* outbreaks identified in 2011. Eight outbreaks involved cases in multiple states. Ten of the outbreaks involved foodborne transmission and three outbreaks were due to animal contact. The 13 outbreaks resulted in a median of 3 culture-confirmed cases per outbreak (range, 1 to 16 cases).

In February, 3 cases of *S.* Enteritidis infection were part of an outbreak at a wedding reception. An undercooked chicken dish was the suspected vehicle.

In February, 3 cases of *S.* Agona infection were part of a multi-state outbreak of 106 cases in 25 states. Papayas imported from Mexico by a single distributor in Texas were implicated as the vehicle and a national recall was initiated. Sampling of papayas from Mexico during the outbreak showed a 15.6% *Salmonella* contamination rate.

In April, 2 cases of *S.* Heidelberg infection were part of a multi-state outbreak involving two strains of *S.* Heidelberg and 136 cases in 34 states. Commercially distributed ground turkey products were implicated as the vehicle. The outbreak led to a national consumer alert and a ground turkey recall.

In May, 1 case of *S.* Altona infection was associated with a multi-state outbreak that involved 45 cases in 15 states. Contact with baby chicks originating from a single mail order hatchery in Ohio was identified as the cause of the outbreak.

In June, 11 cases of *S.* Muenchen infection were associated with a multi-state outbreak involving 24 cases in 7 states. Commercially distributed iceberg lettuce was the suspected vehicle.

In June, 1 case of *S.* Uganda infection was part of a multi-state outbreak of 13 cases in 7 states. Cantaloupe was the likely vehicle, but the source of the cantaloupe was not identified.

In July, 4 cases of *S.* Newport infection were part of a multi-state outbreak of 6 cases in Minnesota and North Dakota that was associated with sandwich chain restaurants. Epidemiological and traceback investigations suggested that cucumbers or tomatoes were the likely vehicle.

In July, 8 cases of *S.* Typhimurium infection were associated with an outbreak at a Mexican-style restaurant. The outbreak occurred during the State of Minnesota government shutdown and therefore we were unable to perform an ingredient-specific investigation and analysis. The ultimate source of the outbreak was not identified.

In August, 14 cases of *S.* Typhimurium infection were likely associated with consumption of seedless watermelon that traced back to companies in the same area in Indiana. Five of the cases attended a family gathering where the watermelon was served.

In August, 1 case of *S.* I 4,[5],12:i:- infection was associated with an ongoing multi-state outbreak associated with rodents used to feed reptiles. Frozen mice from a pet store in another state where a case purchased mice tested positive for the outbreak strain. The same strain was the cause of a 2010 outbreak associated with feeder rodents; this strain may now be endemic in feeder rodent populations in the United States.

In August, 1 case of *S.* Sandiego infection was part of a multi-state outbreak involving 5 strains of 3 *Salmonella* serotypes and a total of 124 cases in 27 states. Small turtles were implicated as the vehicles in the outbreak.

In September, 8 cases of *S.* Enteritidis infection were associated with consumption of shell eggs from an organic egg supplier in Minnesota. Environmental samples from the egg belt at the supplier's packing plant tested positive for the outbreak strain of *Salmonella*, and a recall and press release were issued.

From May through December, 16 cases of *Salmonella* infection (including 14 *S.* I 4,[5],12:i:- cases, 2 *S.* Rissen cases, and 1 *S.* Infantis case) were part of an outbreak associated with exposure to live animal slaughter markets. Environmental samples from one market yielded these 3 *Salmonella* serotypes as well as 7 additional serotypes. Disease prevention measures at the markets are being implemented.

Sexually Transmitted Diseases (STDs)

Active surveillance for gonorrhea and chlamydia involves cross-checking laboratory-reported cases against cases reported by clinicians. Although both laboratories and clinicians are required to report STDs independently of each other, a laboratory-reported case is not considered a case for surveillance purposes until a corresponding case report is submitted by the clinical facility. Case reports contain demographic and clinical information that is not available from laboratory reports. When a laboratory report is received but no corresponding case report is received within 45 days, we mail a reminder letter and case report form to the clinical facility. Active surveillance for syphilis involves immediate follow-up with the clinician upon receipt of a positive laboratory report. Cases of chancroid are monitored through a mostly passive surveillance system. Herpes simplex virus and human papillomavirus infections are not reportable.

Although overall incidence rates for STDs in Minnesota are lower than those in many other areas of the United States, certain population subgroups in Minnesota have very high STD rates. Specifically, STDs disproportionately affect adolescents, young adults, and persons of color.

Chlamydia

Chlamydia trachomatis infection is the most commonly reported infectious disease in Minnesota. In 2011, 16,898 chlamydia cases (319 per 100,000 population) were reported, representing a 9% increase from 2010 (Table 3).

Adolescents and young adults are at highest risk for acquiring chlamydial infection (Table 4). The chlamydia rate is highest among 20 to 24-year-olds (1,907 per 100,000), with the next highest rate among 15 to 19-year-olds (1,385 per 100,000). The incidence of chlamydia among adults 25 to 29 years of age (719 per 100,000) is considerably lower but has increased in recent years. The chlamydia rate among females (443 per 100,000) is more than twice the rate among males (193 per 100,000), a difference most likely due to more frequent screening among women.

The incidence of chlamydia infection is highest in communities of color (Table 4). The rate among blacks (1,768 per 100,000) is 11 times higher than the rate among whites (166 per 100,000). Although blacks comprise approximately 5% of Minnesota's population, they account for 29% of reported chlamydia cases. Rates among Asian/Pacific Islanders (320 per 100,000), Hispanics (434 per 100,000), and American Indians (780 per 100,000) are over two to four times higher than the rate among whites.

Chlamydia infections occur throughout the state, with the highest reported rates in Minneapolis (848 per 100,000) and St. Paul (759 per 100,000). While there was an overall increase of 9% across the state in 2011 the greatest increase for chlamydia was seen in the suburban area (metropolitan area excluding Minneapolis and St. Paul) with an increase of 15%, shown in Table 4.

Gonorrhea

Gonorrhea, caused by *Neisseria gonorrhoeae*, is the second most commonly reported STD in Minnesota. In 2011, 2,283 cases (43 per 100,000 population) were reported, representing a 5% increase from 2010. This is the first increase in reported gonorrhea cases since 2007 (Table 3).

Adolescents and young adults are at

Table 3. Number of Cases and Rates (per 100,000 persons) of Chlamydia, Gonorrhea, Syphilis and Chancroid - Minnesota, 2007-2011

	2007		2008		2009		2010		2011	
Disease	**No.**	**Rate**	**No.**	**Rate**	**No.**	**Rate**	**No.**	**Rate**	**No.**	**Rate**
Chlamydia	13,480	259	14,414	275	14,369	272	15,509	292	16,898	319
Gonorrhea	3,479	67	3,054	58	2,328	44	2,149	41	2,283	43
Syphilis, Total	186	3.6	263	5.0	215	4.1	351	6.6	366	6.9
Primary/Secondary	59	1.1	116	2.2	71	1.3	150	2.8	139	2.6
Early Latent	55	1.1	47	0.9	46	0.9	74	1.4	121	2.3
Late Latent	72	1.4	100	1.9	97	1.8	126	2.4	106	2.0
Other*	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Congenital**	0	0.0	0	0.0	1	1.4	1	1.5	0	0.0
Chancroid	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0

* Includes unstaged neurosyphilis, latent syphilis of unknown duration, and late syphilis with clinical manifestations.
** Congenital syphilis rate per 100,000 live births.
Note: Data exclude cases diagnosed in federal or private correctional facilities.

Table 4. Number of Cases and Incidence Rates (per 100,000 persons) of Chlamydia, Gonorrhea, and Primary/Secondary Syphilis by Residence, Age, Race/Ethnicity, and Gender - Minnesota, 2011

	Chlamydia		Gonorrhea		Syphilis	
Demographic Group	**No.**	**Rate**	**No.**	**Rate**	**No.**	**Rate**
Total	16,898	319	2,283	43	139	2.6
*Residence**						
Minneapolis	3,246	848	809	211	58	15.2
St. Paul	2,165	759	376	132	14	4.9
Suburban**	5,909	271	655	30	52	2.4
Greater Minnesota	4,850	198	352	14	13	0.5
Age						
<15 years	162	15	21	2	0	0.0
15-19 years	5,094	1,385	585	159	3	0.8
20-24 years	6,784	1,907	807	227	26	7.3
25-29 years	2,681	719	392	105	26	7.0
30-34 years	1,097	320	188	55	16	4.7
35-44 years	800	117	187	27	32	4.7
≥45 years	280	13	103	5	36	1.7
Gender						
Male	5,067	193	988	38	134	5.1
Female	11,824	443	1,293	48	5	0
Transgender^^	7	-	2	-	-	-
Race^/Ethnicity						
White	7,494	166	726	16	98	2.2
Black	4,851	1,768	1,152	420	24	8.7
American Indian	475	780	63	103	1	1.6
Asian/PI	692	320	33	15	6	2.8
Other ^^	847	-	97	-	9	-
Unknown^^	2,539	-	212	-	1	-
Hispanic^^^	1,087	434	92	37	10	4

* Residence information missing for 728 cases of chlamydia and 91 cases of gonorrhea.
** Suburban is defined as the seven-county metropolitan area (Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, and Washington Counties), excluding the cities of Minneapolis and St. Paul.
^ Case counts include persons by race alone. Population counts used to calculate results include race alone or in combination.
^^ No comparable population data available to calculate rates.
^^^ Persons of Hispanic ethnicity may be of any race.
Note: Data exclude cases diagnosed in federal or private correctional facilities.

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greatest risk for gonorrhea (Table 4), with incidence rates of 159 per 100,000 among 15 to 19-year-olds, 227 per 100,000 among 20 to 24-year olds, and 105 per 100,000 among 25 to 29-year-olds. Gonorrhea rates for males (38 per 100,000) and females (48 per 100,000) are comparable. Communities of color are disproportionately affected by gonorrhea, with nearly one half of cases reported among blacks. The incidence of gonorrhea among blacks (420 per 100,000) is 26 times higher than the rate among whites (16 per 100,000). Rates among Asian/Pacific Islanders (15 per 100,000), Hispanics (37 per 100,000), and American Indians (103 per 100,000) are up to six times higher than among whites.

Gonorrhea rates are highest in the cities of Minneapolis and St. Paul (Table 4). The incidence in Minneapolis (211 per 100,000) is nearly two times higher than the rate in St. Paul (132 per 100,000), seven times higher than the rate in the suburban metropolitan area (30 per 100,000), and 15 times higher than the rate in Greater Minnesota (14 per 100,000). Geographically in 2011, St. Paul saw the largest increase in cases at 35% and Minneapolis saw an 8% increase in cases.

The emergence of *quinolone-resistant N. gonorrhoeae* (QRNG) in recent years has become a particular concern. Due to the high prevalence of QRNG in Minnesota as well as nationwide, quinolones are no longer recommended for the treatment of gonococcal infections.

Syphilis

Surveillance data for primary and secondary syphilis are used to monitor morbidity trends because they represent recently acquired infections. Data for early syphilis (which includes primary, secondary, and early latent stages of disease) are used in outbreak investigations because they represent infections acquired within the past 12 months and signify opportunities for disease prevention.

Primary and Secondary Syphilis

The incidence of primary/secondary syphilis in Minnesota is lower than that of chlamydia or gonorrhea (Table 3), but has remained elevated since an outbreak began in 2002 among men who have sex with men (MSM). In 2011, there were 139 cases of primary/secondary syphilis in Minnesota (2.6 cases per 100,000 persons). This represents a decrease of 8% compared to the 149 cases (2.8 per 100,000 population) reported in 2010.

Early Syphilis

In 2011, the number of early syphilis cases increased by 16%, with 260 cases occurring compared to 224 cases in 2010. The incidence remains highly concentrated among MSM. Of the early syphilis cases in 2011, 246 (95%) occurred among men; 218 (88%) of these men reported having sex with other men; 57% of the MSM diagnosed with early syphilis were co-infected with HIV.

Congenital Syphilis

No cases of congenital syphilis were reported in Minnesota in 2011 (Table 3).

Chancroid

Chancroid continues to be very rare in Minnesota. No cases were reported in 2010. The last case was reported in 1999.

Shigellosis

During 2011, 87 culture-confirmed cases of *Shigella* infection (1.6 per 100,000 population) were reported. This represents a 32% increase from the 66 cases reported in 2010, but a 46% decrease from the median number of cases reported annually from 2001 to 2010 (median, 162.5; range, 66 to 493). *S. sonnei* accounted for 73 (84%) cases, *S. flexneri* for 11 (13%), and *S. boydii* for 3 (3%). Cases ranged in age from 1 to 72 years (median, 36 years). Forty-three percent of cases were males 18 to 55 years of age. Ten percent of cases were ≤5 years of age. Nineteen (22%) cases were hospitalized. Of the 75 cases for which travel information was available, 17 (23%) travelled internationally (12 of 65 [19%] *S. sonnei*, 4 of 9 [44%] *S. flexneri,* and 1 of 1 *S. boydii*). Eighty-seven percent of cases resided in the metropolitan area, including 48% in Hennepin County and 22% in Ramsey County. No outbreaks of shigellosis were identified in 2011.

Every tenth Shigella isolate received at MDH is tested for antimicrobial resistance. Nine isolates were tested in 2011; 89% (8 isolates) were resistant to trimethoprim-sulfamethoxazole (Sxt) and 11% (1 isolate) were resistant to ampicillin. The ampicillin-resistant isolate (*S. Sonnei*) was also resistant to Sxt, tetracycline (T), streptomycin (S), sulfasoxizole (Su), and cephalothin. Five other isolates with Sxt resistance had resistance phenotype SSuTSxt. All isolates tested were *S. Sonnei* except 1 SSuTSxt isolate that was *S. Boydii*.

***Streptococcus pneumoniae* Invasive Disease**

Statewide active surveillance for invasive *Streptococcus pneumoniae* (pneumococcal) disease began in 2002, expanded from the metropolitan area, where active surveillance was ongoing since 1995. In 2011, 582 (11.0 per 100,000) cases of invasive pneumococcal disease were reported. By age group, annual incidence rates per 100,000 were 14.1 cases among children aged 0-4 years, 2.5 cases among children and adults aged 5-39 years, 11.1 cases among adults 40-64 years, and 39.8 cases among adults aged 65 years and older.

In 2011, pneumonia occurred most frequently (63% of infections), followed by bacteremia without another focus of infection (19%), and pneumococcal meningitis (6%). Seventy-one (12%) cases died. Health histories were available for 67 (94%) of the 71 cases who died. Of these, 62 had an underlying health condition reported. The conditions most frequently reported were chronic obstructive pulmonary disease (19), atherosclerotic cardiovascular disease (19), smoking (14), solid organ malignancy (14), and diabetes (10). In 1999, the year before the pediatric pneumococcal conjugate vaccine (Prevnar [PCV-7]) was licensed, the rate of invasive pneumococcal disease among children < 5 years in the metropolitan area was 111.7 cases/100,000. Over the years 2000-02 there was a major downward trend in incidence in this age group (Figure 5). Rates in each of the subsequent 9 years were level or somewhat higher, although there has not been a continuing upward trend (Figure 5). Based on the distribution of serotypes among isolates from these cases, this increase was limited to disease caused by non-vaccine serotypes (i.e. serotypes other than the 7 included in PCV-7) (Figure 5). This small degree of replacement disease due to non-PCV-7 serotypes, similar to that seen in other parts of the

country, has been far outweighed by the declines in disease caused by PCV-7 serotypes. This trend supports the need for ongoing monitoring, however, because further increases due to non-vaccine serotypes are possible.

In March 2010, the U.S. Food and Drug Administration approved a new 13-valent pediatric pneumococcal conjugate vaccine (PCV-13 [Prevnar 13]) which replaced PCV-7. The new vaccine provides protection against the same serotypes in PCV-7, plus 6 additional serotypes (serotypes 1, 3, 5, 6A, 7F, and 19A). Since 2007, the majority of invasive pneumococcal disease cases among children <5 years of age have been caused by the 6 new serotypes included in PCV-13 (Figure 5). In 2011, 30% of cases occurring among Minnesotans of all ages were caused by 3 of the new PCV-13-included serotypes: 19A (11%), 3 (10%), and 7F (9%).

Of the 560 isolates submitted for 2011 cases, 133 (24%) isolates were resistant to penicillin using meningitis breakpoints. Using non-meningitis breakpoints, 8 (1%) of 560 isolates were resistant to penicillin and 32 (6%) exhibited intermediate level resistance (Note: CLSI penicillin breakpoints changed in 2008; refer to the MDH Antibiogram on pages 26-27) Multi-drug resistance (i.e., high-level resistance to two or more antibiotic classes) was exhibited in 144 (26%) isolates.

Streptococcal Invasive Disease – Group A

We have been conducting active surveillance for invasive disease caused by group A Streptococcus (GAS, [also known as *Streptococcus pyogenes*]) since 1995. Invasive GAS is defined as GAS isolated from a usually sterile site such as blood, cerebral spinal fluid, or from a wound when accompanied with necrotizing fasciitis or streptococcal toxic shock syndrome (STSS).

Two hundred thirty-one cases of invasive GAS disease (4.3 per 100,000), including 17 deaths, were reported in 2011, compared to 158 cases and 13 deaths in 2010. Ages of cases ranged from 1 to 98 years (median, 55 years). Fifty percent of cases were residents of the metropolitan area. Forty-one (18%) cases had bacteremia without another focus of infection, 73 (32%) cases had cellulitis, and 25 (11%) cases had an abscess. Of the 73 cellulitis cases (10 cases had both cellulitis and an abscess), 74% had a positive blood culture and 15% had a positive joint culture for GAS. There were 32 (14%) cases of pneumonia and 21 (9%) cases of necrotizing fasciitis (2 cases had both pneumonia and necrotizing fasciitis). Twenty-four (10%) cases had septic arthritis and/or osteomyelitis. Twelve (5%) cases were residents of 12 different long-term care facilities.

The 17 deaths included 3 cases of bacteremia without another focus of infection, 3 cases of septic shock, 2 cases with cellulitis, 2 cases of pneumonia, 2 cases of urinary tract infection/urosepsis, and 1 case of septic arthritis. The remaining 4 cases had multiple syndromes including 2 cases of pneumonia and septic shock; 1 case of necrotizing fasciitis and cellulitis; and 1 case of necrotizing fasciitis, septic shock, and pneumonia. The deaths occurred in persons ranging in age from 33 years to 94 years (median, 70 years). Five fatal cases had no underlying medical conditions reported. Of the 12 cases with underlying medical conditions the most frequently reported were diabetes (6) and congestive heart failure (4).

Streptococcal Invasive Disease – Group B

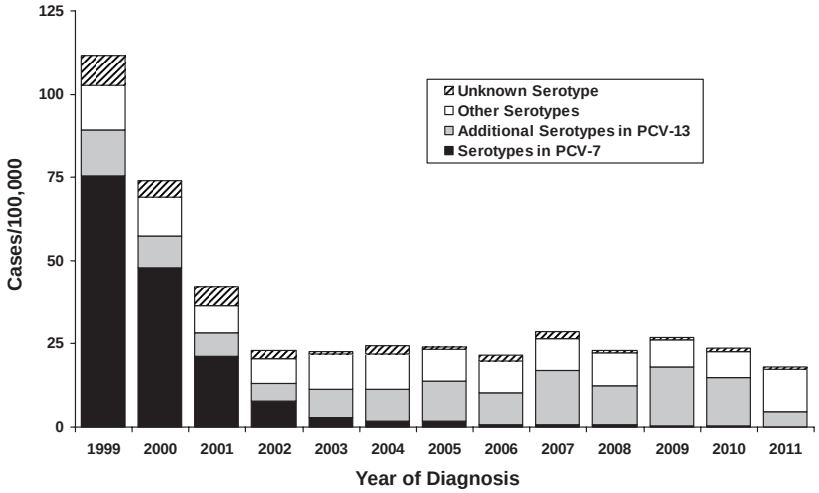
Five hundred thirty-five cases of invasive group B streptococcal disease (10.1 per 100,000 population), including 25 deaths, were reported in 2011. These cases were those in which group B *Streptococcus* (GBS) was isolated from a normally sterile site. The largest number of GBS cases reported since surveillance was initiated in 1995 was 454, reported in 2009.

By age group, annual incidence was highest among infants <1 year of age (52.2 per 100,000 population) and those aged 70 years or older (39.1 per 100,000). Sixteen (64%) of the 25 deaths were among those age 65 years and older. Fifty-four percent of cases were residents of the metropolitan area. Bacteremia without a focus of infection occurred most frequently (25% of infections), followed by cellulitis (23%), osteomyelitis (13%), septic arthritis (7%), pneumonia (7%), and meningitis (2%). The majority (70%) of cases had GBS isolated from blood; other isolate sites included bone (14%) and joint fluid (11%).

Thirty-five cases were infants or pregnant women (maternal cases), compared to 52 cases in 2010. Twenty-one infants developed early-onset disease (occurred within 6 days of birth [0.31 cases per 1,000 live births]), and 11 infants developed late-onset disease (occurred at 7 to 89 days of age [0.16 cases per 1,000 live births]). One stillbirth/spontaneous abortion was associated with 1 of 3 maternal GBS infections.

Since 2002, there has been a

Figure 5. Invasive Pneumococcal Disease Incidence Among Children <5 Years of Age, by Year and Serotype Group, Metropolitan Area, 1999-2001; Minnesota, 2002-2011



PCV-13 contains the 7 serotypes in PCV-7 (4,6B,9V,14,18C,19F and 23F) plus 6 additional serotypes (1,3,5,6A,7F and 19A)

continued...

recommendation for universal prenatal screening of all pregnant women at 35 to 37 weeks gestation. In light of this, we reviewed the maternal charts for all early-onset cases reported in 2011. Overall, 12 (57%) of 21 women who delivered GBS-positive infants underwent prenatal screening for GBS. Of these, 5 (42%) were positive, 6 (50%) negative, and 1 (8%) had an unknown result. Two of the seven women who did not receive prenatal screening were screened upon admission to the hospital and prior to delivery. Of the two women for whom it was unknown if they received prenatal screening, one was screened upon admission to the hospital and prior to delivery. Among the 21 women who delivered GBS-positive infants, 11 (52%) received intrapartum antimicrobial prophylaxis (IAP). Of the five women with a positive GBS screen, four (80%) received IAP.

Tetanus

One case of tetanus was reported during 2011. The case occurred in a 24-year-old white male with a history of receiving the primary series of DTaP (diphtheria and tetanus toxoids and acellular pertussis vaccine) on a delayed schedule; the patient had not received a booster for 12 years. There was no known injury or wound; however, the patient had significant dental caries and fractured teeth. A possible tooth infection or abscess was documented. He received tetanus immune globulin (TIG) between 7-23 hours after illness onset as well as a booster dose of Tdap (tetanus, diphtheria and acellular pertussis vaccine). The case left the medical facility against medical advice and further follow-up was unsuccessful.

Toxic Shock Syndrome

In 2011, 4 cases of suspect or probable staphylococcal toxic shock syndrome (TSS) were reported. Of the reported cases, all were female, the median age was 14 years (range, 12 to 19 years), and all were menstrual-associated with tampon use reported.

Staphylococcal toxic shock syndrome with isolate submission (if isolated) is reportable to MDH within 1 working day. We follow the 2011 CDC case definition which includes fever (temperature ≥102.0°F or 38.9°C), rash (diffuse macular erythroderma), desquamation (within 1-2 weeks after onset of illness), hypotension (SBP ≤ 90 mm Hg for adults or less than fifth percentile by age for children aged <16 years), multisystem involvement (>3 of the following: vomiting or diarrhea at onset of illness; severe myalgia or creatine phosphokinase level at least twice the upper limit of normal; vaginal, oropharyngeal, or conjunctival hyperemia; blood urea nitrogen or creatinine at least twice the upper limit of normal for laboratory or urinary sediment with pyuria (>5 leukocytes per high-power field) in the absence of urinary tract infection; total bilirubin, alanine aminotransferase enzyme, or aspartate aminotransferase enzyme levels at least twice the upper limit of normal for laboratory; platelets less than 100,000/mm3; disorientation or alterations in consciousness without focal neurologic signs when fever and hypotension are absent); negative results for blood or cerebrospinal fluid cultures (blood culture may be positive for *Staphylococcus aureus*) or negative serologies for Rocky Mountain spotted fever, leptospirosis, or measles (if done).

Tuberculosis

During 2011, 137 cases of tuberculosis (TB) disease (2.6 cases per 100,000 population) were reported, compared to 135 cases in 2010. Although this represents an increase of 1% in the number of cases and a 4% increase in the incidence rate compared to 2010, the number of cases reported annually has decreased 42% since 2007, when 238 cases (the highest number in the past decade) were reported. From 2010 to 2011, the number of TB cases reported among U.S.-born persons in Minnesota decreased 16%, while cases among foreign-born persons increased 5%. In 2011, Minnesota's TB incidence rate was below the national rate (3.4 cases per 100,000 population) but slightly higher than the median rate among 51 U.S. states and reporting areas (2.4 cases per 100,000 population) and well above the U.S. Healthy People 2020 objective of 1.0 case per 100,000 population (Figure 6). Seven (5%) of the TB cases reported in Minnesota in 2011 died due to TB or TB-related causes.

The incidence of TB disease is disproportionately high in racial minorities in the United States and in Minnesota. In 2011, 13 TB cases occurred among whites (0.3/100,000 population). In contrast, 66 TB cases occurred among blacks (22.1/100,000), 40 among Asians (17.5/100,000), and 3 among American Indians (4.7/100,000). The majority (62/66, or 94%) of black TB cases reported in Minnesota in 2011 were foreign-born. There were no TB cases reported among individuals who self-reported being multi-racial.

The most distinguishing characteristic of the epidemiology of TB disease in this state continues to be the large proportion of cases that occur among persons born outside the United States. Eighty-five percent of cases reported in 2011 occurred among foreign-born persons. In contrast, 63% of TB cases reported nationwide in 2011 were foreign-born. The 116 foreign-born TB cases reported in Minnesota during 2011 represented 25 different countries of birth; the most common region of birth among these patients was sub-Saharan Africa (53%), followed by South/Southeast Asia (28%), and Latin America (including the Caribbean) (13%) (Figure 7). Among U.S.-born pediatric TB cases, 80% (8 of 10) have at least one foreign-born parent. The ethnic diversity among foreign-born TB cases in Minnesota reflects the unique and constantly changing demographics of immigrant and other foreign-born populations arriving statewide.

Among foreign-born TB cases reported in Minnesota during 2011, 16% were diagnosed with TB disease less than 12 months after arriving in the United States, and an additional 13% were diagnosed 1 to 2 years after their arrival in this country. Many of these cases, particularly those diagnosed during their first year in the United States, likely represent persons who acquired TB infection prior to immigrating and began progressing to active TB disease shortly after arriving in the United States. Of 17 TB cases 15 years of age or older who were diagnosed in Minnesota within 12 months of arriving in the United States and who arrived as immigrants or refugees, only 1 had any TB-related condition noted in their pre-immigration medical examination reports. These findings highlight the need for clinicians to have a high index of suspicion for TB among newly arrived foreign-born persons, regardless of the results of medical exams performed overseas.

Figure 6. Tuberculosis Incidence Rates per 100,000 Population, United States and Minnesota, 1997-2011

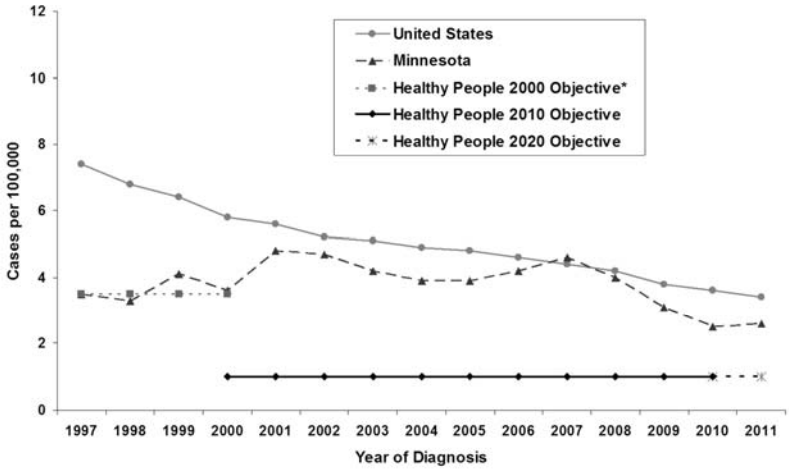
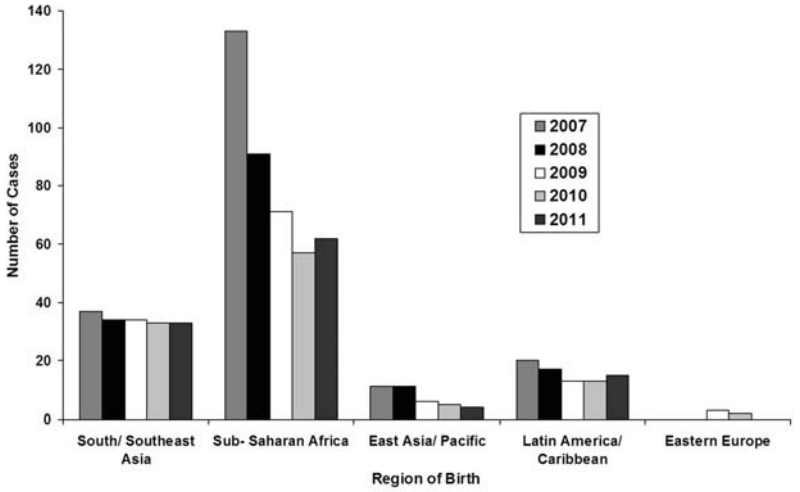


Figure 7. Foreign-Born Tuberculosis Cases by Region of Birth and Year of Diagnosis, Minnesota, 2007-2011



The majority (80%) of TB cases reported in Minnesota during 2011 were identified as a result of presenting with symptoms for medical care. Various targeted public health interventions identified the remaining 20% of cases. Such methods of case identification traditionally are considered high priority, core TB prevention and control activities; they include TB contact investigations (4%), follow-up evaluations subsequent to abnormal findings on pre-immigration exams performed overseas (1%), and domestic refugee health assessments (1%). Notably, however, an additional 13% of TB cases were identified through a variety of other means (e.g., occupational screening) that typically are considered lower priority activities.

Aside from foreign-born persons, individuals with other risk factors comprise much smaller proportions of the TB cases in Minnesota. Among cases reported in 2011, 20% (27) of TB cases occurred among persons with certain medical conditions (excluding HIV infection) that increase the risk for progression from latent TB infection (LTBI) to active TB disease (e.g., diabetes, prolonged corticosteroid or other immunosuppressive therapy, end stage renal disease, etc.). Notably, these patients represent the largest annual proportion of TB cases reported with such medical conditions since at least 1993, when we initiated an electronic surveillance database that included data on TB-related risk factors among reported cases. This observation of a trend toward a growing risk category among TB cases reported in Minnesota in recent years illustrates the importance of TB screening and, if indicated, treatment for LTBI among patients with underlying medical conditions that increase the risk for progression from LTBI to active TB disease. Following these underlying medical conditions, the next most common risk factor among TB cases was substance abuse (including alcohol abuse and/or illicit drug use), with 5% of TB cases reported in 2011 having a history of substance abuse during the 12 months prior to their TB diagnoses. Three (2%) of the 137 TB cases reported in Minnesota during 2011 were infected with HIV. The percentage of new TB cases with HIV co-infection in Minnesota remains less than that among TB cases reported nationwide (7.9% of those with an HIV test result). Other risk groups, such as correctional facility inmates, homeless persons, and residents of nursing homes, each represented 1% of TB cases reported during 2011.

Twenty-five (29%) of the state's 87 counties had at least 1 case of TB disease in 2011. The large majority (74%) of cases occurred in the metropolitan area, particularly in Hennepin (43%) and Ramsey (23%) counties, both of which have public TB clinics. Nine percent of TB cases reported statewide during 2011 occurred in the five suburban metropolitan counties (i.e., Anoka, Dakota, Carver, Scott, and Washington). Olmsted County, which also maintains a public TB clinic, represented 7% of cases reported in 2011. The remaining 19% of cases occurred in primarily rural areas of Greater Minnesota. We calculate county-specific annual TB incidence rates for Hennepin, Ramsey, and Olmsted counties, as well as for the five-county suburban metropolitan area and collectively for the remaining 79 counties in Greater Minnesota. In 2011, the highest TB incidence rate statewide was reported in Olmsted County (6.2 cases per 100,000 population), followed by Ramsey County (6.1 cases per 100,000 population) and Hennepin County (5.1 cases per 100,000 population). In 2011, the incidence rates in the five-county suburban metropolitan area (1.0 cases per 100,000 population) and Greater Minnesota (1.1 cases per 100,000

continued...

population) were considerably lower than that in the state overall (2.6 cases per 100,000 population).

The prevalence of drug-resistant TB in Minnesota, particularly resistance to isoniazid (INH) and multi-drug resistance (i.e., resistance to at least INH and rifampin), historically has exceeded comparable national figures. In 2011, of 109 culture-confirmed TB cases with drug susceptibility results available, 22 (22%) were resistant to at least one first-line anti-TB drug (i.e., INH, rifampin, pyrazinamide, or ethambutol), including 12 (12%) cases that were resistant to INH. Three (3%) cases of multidrug-resistant (MDR) TB were reported in 2011. One case of extensively drug resistant (XDR) TB occurred in Minnesota in 2006.

Another clinical characteristic of particular significance is the high proportion of extrapulmonary TB disease in Minnesota. Over half (53%) of foreign-born TB cases and 43% of U.S.-born TB cases reported in 2011 had an extrapulmonary site of disease. Among extrapulmonary TB cases, by far the most common sites of TB disease were lymphatic (51%), followed by bone/joint (15%), pleural (13%), and various other sites that each represented less than 10% of such cases.

The national goal of TB elimination by 2010, which was established in 1989 by the Advisory Council for the Elimination of Tuberculosis in partnership with the CDC, remains unmet, both nationally and in Minnesota. The incidence of TB disease reported annually in the United States has decreased each year since 1993, albeit at a decelerating rate of decline in recent years. In Minnesota, the incidence of TB disease increased throughout much of the 1990s and fluctuated during the past decade, with peaks in 2001 (239 cases) and 2007 (238 cases). From 2008 through 2010, the statewide TB incidence rate decreased an average of 17% per year. The significant and largely sustained annual decreases in Minnesota's TB incidence rate since 2007 appear to be optimistic indicators of a real and substantial reduction in the occurrence of TB in Minnesota. This decline likely is attributable to several factors, including dramatic decreases in the number of primary refugees resettling in Minnesota in recent years (particularly a marked decline since 2006 in the number of those arriving in Minnesota from sub-Saharan Africa) and changes initiated in 2007 in the technical instructions for the overseas medical examinations required for refugees and some new immigrants.

Unexplained Critical Illnesses and Deaths of Possible Infectious Etiology (UNEX) and Medical Examiner Infectious Deaths Surveillance (MED-X)

Surveillance for unexplained critical illnesses and deaths of possible infectious etiology (UNEX) began September 1995. Focus is given to cases < 50 years of age with no significant underlying conditions; however, any case should be reported regardless of the patient's age or underlying medical conditions to determine if further testing conducted or facilitated by MDH may be indicated. In addition to provider reporting, death certificates are reviewed for any deaths in persons <50 years of age with no apparent significant underlying conditions for possible unexplained infectious syndromes.

In 2006, we began Medical Examiner Infectious Deaths Surveillance (MED-X) to evaluate all medical examiner (ME) cases for infectious-related deaths. MEs report explained and unexplained cases to us. Unexplained deaths in previously healthy individuals < 50 years of age are included regardless of infectious hallmarks; this primarily includes Sudden Unexplained Infant Deaths (SUIDs). In addition, we review death certificates for any case in which an autopsy was performed by an ME with a potential infectious cause of death. Cases found through death certificate review are also considered for UNEX surveillance if they are <50 years of age and have no immunocompromising conditions.

Testing of pre-mortem and post-mortem specimens is conducted at the PHL and the CDC Infectious Diseases Pathology Branch (IDPB). Cases are excluded from UNEX if they are determined to be explained by providers, are not critically ill, or have no infectious disease hallmarks.

There were 137 cases that met criteria for UNEX surveillance (115 deaths and 22 critical illnesses) in 2011, compared to 172 cases in 2010. Of the 137, 81 (59%) were reported by providers, 55 (40%) were found by death certificate review, and 1 (1%) was found through other reporting methods. Sixty-two (45%) cases presented with respiratory symptoms; 27 (20%) with sudden unexpected death; 14 (10%) with cardiac symptoms; 12 (9%) with neurologic symptoms; 12 (9%) with shock/sepsis; 7 (5%) with an illness that did not fit a defined syndrome; 2 (1%) with gastrointestinal illness; and 1 with a genitourinary illness. The age of cases ranged from newborn to 87 years. The median age was 9 years among 81 reported cases, and 45.5 years among 56 non-reported cases found through active surveillance. Forty-eight percent resided in the metropolitan area and 60% were male.

There were 335 MED-X cases in 2011; 108 of these also met UNEX criteria. The median age of the cases was 38 years, and 61% were male. There were 211 (63%) cases found through death certificate review. MEs reported 122 (36%) cases. The most common syndrome was pneumonia/upper respiratory infection (n=137 [41%]). Of the 335 cases, 117 (35%) were confirmed to have had an infectious cause, 130 (39%) had possible infectious causes, and 88 (26%) were non-infectious or unknown cause. Pathogens determined to be related to the cause of death are described below (Table 5).

There were 148 cases that had specimens tested at the PHL and/or the IDPB. Thirty cases had pathogens identified as confirmed or probable cause of illness, including 22 UNEX cases (Table 5). Among 43 unexplained deaths occurring in those <50 years of age without any immunocompromising conditions, 17 (40%) were explained by UNEX testing. ME surveillance detected an additional 24 cases with pathogens identified by MEs as the cause of death (Table 5). Cases with pathogens of public health importance detected included a 33 year-old previously healthy male who died suddenly after a 1-week history of an upper respiratory infection. At autopsy he was found to have bilateral acute bronchopneumonia.

We identified Group A *Streptococcus* from bilateral lung cultures. A 5-month old was found unresponsive and died with a history of illness and with sick contacts. PCR testing detected human metapneumovirus as the likely cause of infection. A 14 year-old previously healthy female died after history of an influenza-like illness. We detected influenza B virus and methicillin-resistant *Staphylococcus aureus*.

Varicella and Zoster

Unusual case incidence, individual critical cases, and deaths due to varicella and zoster are reportable. The reporting rules allow for the use of a sentinel school surveillance system to monitor varicella and zoster incidence until the system no longer provides adequate data for epidemiological purposes, at which time case-based surveillance will be implemented. This summary represents the sixth full year of surveillance.

Six cases of critical illness, but no deaths, due to varicella were reported. All 6 were hospitalized for 4 to 8 days. Complications included meningitis and bacterial super-infection. Two cases had an underlying medical condition and recent history of treatment with immunosuppressive drugs. Both were children with juvenile rheumatoid arthritis and both were being treated with methotrexate. The other cases had no or unknown underlying conditions and were not known to be immunosuppressed. Five cases had not received varicella-containing vaccine; 2 were adults, 2 were not vaccinated due to parental refusal, and 1 was a very recent immigrant to the United States. Vaccination history for the other case, age 20, was unknown.

An outbreak of varicella in a school is defined as 5 or more cases within a 2-month period in persons <13 years of age, or 3 or more cases within a 2-month period in persons 13 years of age and older. An outbreak is considered over when no new cases occur within 2 months after the last case is no longer contagious. During the 2011-2012 school year, we received reports of outbreaks from eight schools in eight counties involving 69 students and no staff. By comparison, we received reports of outbreaks from five schools in five counties involving 31 students and no staff during the 2010-2011 school year. The number of cases per outbreak ranged from 5 to 15 (median, 8.5) during the 2011-2012 school year compared with 5 to 11 (median, 5) during the 2010-2011 school year.

Table 5. UNEX/MED-X Cases with Pathogens Identified as Confirmed, Probable, or Possible Cause of Illness, 2011*

Pathogen Identified	UNEX (n=22)	MED-X (n=24)**
Aspergillus fumigatus		1
Bocavirus	2	
Campylobacter jejuni	1	
Clostridium septicum		1
Cytomegalovirus	1	
Enterobacter aerogenes		1
Enterovirus	1	1
Escherichia coli	2	
Group A *Streptococcus*	2	3
Group B *Streptococcus*		3
Haemophilus influenzae	2	
Hepatitis C virus		1
Herpes simplex virus 2	1	
Human immunodeficiency virus		2
Influenza A virus		1
Influenza A-H1N1	1	
Influenza B virus	1	
Klebsiella pneumoniae	1	1
Listeria monocytogenes		1
Metapneumovirus	3	
Neisseria meningitidis		1
Parainfluenza virus 3	1	
Picornavirus	1	
Pneumocystis spp.		1
Pseudomonas aeruginosa		3
Respiratory syncytial virus	1	
Rhinovirus	1	
Staphylococcus aureus	3	1
Staphylococcus aureus-MRSA	2	
Staphylococcus spp.		1
Streptococcus agalactiae	1	
Streptococcus pneumoniae	4	2
Streptococcus viridians		1

* Some cases had multiple pathogens identified as possible coinfections contributing to illness/death.

** MED-X includes pathogens identified by the Medical Examiner. If the cause was found through testing at MDH/CDC it is included in UNEX column.

Surveillance data also include individual cases from sentinel schools throughout Minnesota; these data are used to extrapolate to the statewide burden of sporadic disease. Eighty schools were selected and participated throughout the 2011-2012 school year. A case of varicella is defined as an illness with acute onset of diffuse (generalized) maculopapulovesicular rash without other apparent cause; however, sentinel sites have been requested to also report possible breakthrough infection that may present atypically. During the 2011-2012 school year, 35 cases were reported from 19 schools. None of the schools reported a cluster of cases that met the outbreak definition. Based on these data, an estimated 632 sporadic cases of varicella would have been expected to occur during a school year among the 898,717 total school-aged children representing 0.07% of this population, for an incidence rate of 70.5 per 100,000 population. Most cases occurred among elementary school students, with an estimated incidence rate of 130.2 per 100,000 (536 of 411,536).

Case-based reporting of varicella in all child care settings was initiated in February 2010. In 2011, we received reports of 56 cases from 40 facilities. Fifty-four (96%) were <6 years of age. By comparison, 111 cases were reported from February to December 2010.

All suspected or confirmed cases of zoster with disseminated disease or complications other than post-herpetic neuralgia, irrespective of age, are reportable. During 2011, 50 cases were reported; 44 were hospitalized. Twenty-four cases were 60 years of age

continued...

or older; 17 were 30 to 59 years of age; and 9 were <30 years of age. Twenty-three (46%) had underlying conditions or were being treated with immunosuppressive drugs. Fifteen cases had disseminated disease, 14 had meningitis, 9 had encephalitis or meningoencephalitis, 7 had bacterial super-infection, and 7 had severe ocular involvement. Two cases with encephalitis subsequently died.

We currently conduct zoster surveillance in all schools. During the 2011-2012 school year, 62 cases were reported from schools in 27 counties, representing 0.01% of the total school population of 898,717 for an incidence rate of 6.2 per 100,000 population. Ages ranged from 6 to 18 years. As compared to varicella, which is often diagnosed by school heath personnel and parents, most (91%) of the 58 zoster cases for whom an interview could be obtained were provider-diagnosed. All cases of zoster in individuals <18 years of age are reportable. Additional cases in children <18 years old were reported by child care sites (4 cases) and by providers (44 cases). In addition, death certificate data were reviewed to identify zoster-related deaths in 2011. Three deaths were identified; all were >60 years of age.

Since 2006, the U.S. Advisory Committee on Immunization Practices has recommended 2 doses of varicella vaccine for children. The Minnesota school immunization law has required 2 doses of vaccine for students entering kindergarten and grade 7 since 2010. Students who will be in grades 3-6 and grades 10-12 during the 2012-2013 school year were beyond kindergarten or beyond grade 7 when the law was implemented and therefore were not included in the requirement. Children in these grades should be evaluated to determine whether they need a second dose of varicella vaccine, particularly given the increased severity of varicella in older children and adults. Older adolescents and adults should also be evaluated for varicella immunity (history of varicella disease or 2 doses of varicella vaccine at least 4 weeks apart) and offered varicella vaccine if indicated.

Viral Hepatitis A

In 2011, 27 cases of hepatitis A (HAV) (0.5 per 100,000 population) were reported. Thirteen (48%) cases were residents of the metropolitan area, including 12 residents of Hennepin or Ramsey Counties. Fifteen (56%) of the cases were female. Cases ranged in age from 3 to 86 years (median, 27 years). Nine (33%) were white, 4 (15%) were Asian, 2 (7%) were black, 1 (4%) was American Indian, and 1 (4%) was multi-racial; race was unknown for 10 (37%) cases. Hispanic ethnicity was reported for 2 cases (0.8 per 100,000).

A risk factor was identified for 20 (74%) of the cases, 2 of whom had known exposure to a confirmed hepatitis A case. These persons became infected following exposure to a close contact, representing missed opportunities to administer immune globulin or HAV vaccine. Of the remaining 18 cases with a risk factor identified, 12 were associated with travel. Of these 12 cases, 2 traveled to Mexico, Central, or South America.

In 2011, there were no newly identified outbreaks of hepatitis A. Two cases were associated with an outbreak in Cottonwood County that began in 2010 and resulted in 13 total cases.

Viral Hepatitis B

In 2011, 20 cases of symptomatic acute hepatitis B virus (HBV) infection (0.4 per 100,000 population) were reported, with no deaths. In addition to these cases, 1 individual with documented asymptomatic seroconversion was reported.

We also received 689 reports of newly identified cases of confirmed chronic HBV infection in 2011. Prior to 2009, confirmed and probable chronic cases were reported in the year in which they were first reported. Beginning in 2009, only confirmed cases are reported, and cases are reported in the year in which case-confirming data are available. A total of 20,216 persons are assumed to be alive and living in Minnesota with chronic HBV. The median age of chronic HBV cases in Minnesota is 42 years.

Acute cases ranged in age from 18 to 59 years (median, 45 years). Fourteen (70%) cases were residents of the metropolitan area, including 5 (25%) in Hennepin County and 5 (25%) in Ramsey County. Fifteen (75%) cases were male and 6 (30%) were adolescents or young adults between 13 and 39 years of age. Six (30%) were black, 4 (20%) were white, 1 (5%) was Asian, and 1 (5%) was multi-racial; race was unknown for 8 (40%) cases. No case was known to be of Hispanic ethnicity. Incidence rates were higher among blacks (2.0 per 100,000) and Asians (0.4 per 100,000) than among non-Hispanic whites (0.1 per 100,000).

In addition to the 20 hepatitis B cases, 1 perinatal infection was identified in an infant who tested positive for HBsAg during post-vaccination screening performed between 9 and 15 months of age. The perinatal case was born in 2010. The perinatal infection occurred in an infant identified through a public health program that works to ensure appropriate prophylactic treatment of infants born to HBV-infected mothers. The infected infant was born in the United States and had received hepatitis B immune globulin and 3 doses of hepatitis B vaccine in accordance with the recommended schedule and was therefore considered a treatment failure. Despite this failure, the success of the public health prevention program is demonstrated by the fact that an additional 357 infants born to HBV-infected women during 2010 had post-serologic testing demonstrating no infection.

Viral Hepatitis C

In 2011, 18 cases of symptomatic acute hepatitis C virus (HCV) infection (0.3 per 100,000) were reported. In addition to the 18 cases, 4 individuals with asymptomatic, laboratory-confirmed acute HCV infection were reported.

Eleven (61%) cases resided in Greater Minnesota. The median age of all cases was 28 years (range, 20 to 53 years). Nine (50%) cases were male. Eleven (61%) were white, 3 (17%) were American Indian, 2 (11%) were of other race, and 1 (1%) was black; race was unknown for 1 (1%) case.

We received 1,793 reports of newly identified anti-HCV positive persons in 2011, the vast majority of whom are chronically infected. A total of 37,303 persons are assumed to be alive and living in Minnesota with past or present HCV infection. The median age of these cases is 55. Because most cases are asymptomatic, medical providers are encouraged to consider each patient's risk for HCV infection to determine the

need for testing. Patients for whom testing is indicated include: persons with past or present injection drug use; recipients of transfusions or organ transplants before July 1992; recipients of clotting factor concentrates produced before 1987; persons on chronic hemodialysis; persons with persistently abnormal alanine aminotransferase levels; healthcare, emergency medical, and public safety workers after needle sticks, sharps, or mucosal exposures to HCV-positive blood; and children born to HCV-positive women. Infants born to HCV-infected mothers should be tested at 12 to 18 months of age, as earlier testing tends to reflect maternal antibody status. Persons who test positive for HCV should be screened for susceptibility to hepatitis A and B virus infections and immunized appropriately.

Antimicrobial Susceptibilities of Selected Pathogens, 2011

On the following pages is the *Antimicrobial Susceptibilities of Selected Pathogens, 2010*, a compilation of antimicrobial susceptibilities of selected pathogens submitted to MDH during 2010 in accordance with Minnesota Rule 4605.7040. Because a select group of isolates is submitted to MDH, it is important to read the notes entitled "Sampling Methodology" and "Trends, Comments, and Other Pathogens." Please note the data on inducible clindamycin resistance for Group A and B *Streptococcus*

Trends, Comments, and Other Pathogens	
[1] *Campylobacter* spp.	Ciprofloxacin susceptibility was determined for all isolates (n=910). Only 19% of isolates from patients returning from foreign travel (n=150) were susceptible to quinolones. Susceptiblities were determined using CLSI 2012 standards for *Campylobacter,* or *Enterobacteriaceae* where *Campylobacter* standards were unavailable.
[2] *Salmonella enterica* (non-typhoidal)	Antimicrobial treatment for uncomplicated gastroenteritis due to *Salmonella* is not generally recommended.
[3] *Shigella* spp.	The number of isolates tested in 2011 was very low. In 2010, 83% of 6 isolates were susceptible to SXT. For cases in which treatment is required and susceptibility is unknown or an ampicillin and SXT-resistant strain is isolated, parenteral ceftriaxone, a fluoroquinolone (such as ciprofloxacin), or azithromycin should be given. (2012 *Red Book*)
[4] *Neisseria gonorrhoeae*	Routine resistance testing for *Neisseria gonorrhoeae* by MDH PHL was discontinued in 2008. Susceptibility results were obtained from the CDC Regional Laboratory in Cleveland, Ohio, and are for isolates obtained through the Gonococcal Isolate Surveillance Program. The 47 isolates tested were received from the Red Door Clinic in Minneapolis. Resistance criteria for cefixime, ceftriaxone, cefpodoxime, and azithromycin have not been established; data reflect reduced susceptibility using CLSI and CDC provisional breakpoints (minimum inhibitory concentration $\geq$ 0.5 µg/ml, $\geq$ 0.5 µg/ml, $\geq$ 1.0 µg/ml, and $\geq$ 2.0 µg/ml, respectively). Also, the number of *N. gonorrhoeae* isolates submitted for testing decreased from 72 in 2010 to 47 in 2011.
[5] *Neisseria meningitidis*	In 2011, 1 case-isolate was intermediate to penicillin and ampicillin, as well as resistant to SXT. One additional case-isolate was intermediate to penicillin. Seven case-isolates were resistant to SXT. There were no case-isolates with ciprofloxacin resistance. In 2008, 2 isolates from cases occurring in northwestern MN had nalidixic acid MICs >8 µg/ml and ciprofloxacin MICs of 0.25 µg/ml indicative of resistance.
[6] Group A *Streptococcus*	The 206 isolates tested represent 89% of 231 total cases. Among 18 erythromycin-resistant, clindamycin-susceptible or intermediate isolates 13 (72%) had inducible resistance to clindamycin for a total of 94% that were susceptible to clindamycin and did not exhibit inducible clindamycin resistance.
[7] Group B *Streptococcus*	100% (21/21) of early-onset infant, 91% (10/11) of late-onset infant, 67% (2/3) of maternal, and 88% (440/500) of other invasive GBS cases were tested. Among 109 erythromycin-resistant, clindamycin susceptible or intermediate isolates 66 (61%) had inducible resistance to clindamycin for a total of 59% (277/473) that were susceptible to clindamycin and did not exhibit inducible clindamycin resistance. 52% (17/33) of infant and maternal cases were susceptible to clindamycin and did not exhibit inducible clindamycin resistance.
[8] *Streptococcus pneumoniae*	The 560 isolates tested represent 96% of 582 total cases. Reported above are the proportions of case-isolates susceptible by meningitis breakpoints for cefotaxime, ceftriaxone (intermediate = 1.0 µg/ml, resistant $\geq$ 2.0 µg/ml), and penicillin (resistant $\geq$ 0.12 µg/ml). By nonmeningitis breakpoints (intermediate = 2.0 µg/ml, resistant $\geq$ 4.0 µg/ml), 93% (519/560) of isolates were susceptible to cefotaxime and ceftriaxone. By nonmeningitis breakpoints (intermediate = 4.0 µg/ml, resistant $\geq$ 8.0 µg/ml), 93% (519/560) of isolates were susceptible to penicillin. Isolates were screened for high-level resistance to rifampin at a single MIC; all were $\leq$ 2 µg/ml. Using meningitis breakpoints, 26% (144/560) of isolates were resistant to two or more antibiotic classes and 16% (90/560) were resistant to three or more antibiotic classes. (CLSI also has breakpoints for oral penicillin V; refer to the most recent CLSI recommendations for information).
[9] *Haemophilus influenzae*	In 2011, 22 (36%) of the case-isolates were resistant to ampicillin and produced ß-lactamase, but (all) were susceptible to amoxicillin-clavulanate, which contains a ß-lactamase inhibitor.
[10] *Mycobacterium tuberculosis* (TB)	National guidelines recommend initial four-drug therapy for TB disease, at least until first-line drug susceptibility results are known. Of the 22 drug-resistant TB cases reported in 2011, 21 (95%) were in foreign-born persons, including the three multidrug-resistant (MDR-TB) cases (i.e., resistant to at least isoniazid and rifampin) reported in 2011. There were no cases of extensively drug-resistant TB (XDR-TB) (i.e., resistance to at least INH, rifampin, any fluoroquinolone, and at least one second-line injectable drug).
Invasive methicillin-resistant *Staphylococcus aureus* (MRSA)	301 cases of invasive MRSA infection were reported in 2011 in Ramsey and Hennepin Counties, of which 202 (67%) were from blood. 80% (241/301) had an isolate submitted and antimicrobial susceptibility testing conducted. Of cases with an isolate, 79% (207/241) were epidemiologically classified as healthcare-associated. Additional susceptibilities were as follows: 100% to linezolid and telavancin; 99% to daptomycin, doxycycline, gentamicin, minocycline, vancomycin; 98% rifampin, SXT; 97% to tetracycline; 21% to levofloxacin; 10% to erythromycin. Isolates were screened for mupirocin resistance with 2% exhibiting high-level resistance (MIC >256 ug/ml). 52% (107/207) were susceptible to clindamycin by broth microdilution; however, 40 of 86 isolates that were clindamycin susceptible or intermediate and erythromycin resistant were found to have inducible resistance to clindamycin (32% susceptible and negative for inducible clindamycin resistance). For community-associated (CA) cases (34/38 with isolates), susceptibilities were as follows: 100% to daptomycin, doxycycline, gentamicin, linezolid, minocycline, mupirocin, rifampin, tetracycline, telavancin, vancomycin; 97% to SXT; 38% to levofloxacin; 18% to erythromycin. 88% (30/34) were susceptible to clindamycin by broth microdilution; however, 1 of 24 isolates that were clindamycin susceptible or intermediate and erythromycin resistant were found to have inducible clindamycin resistance (85% susceptible and negative for inducible clindamycin resistance). In addition to invasive MRSA surveillance, MDH received 5 reports of isolates (3 MRSA and 2 MSSA) with intermediate resistance to vancomycin (MIC 4-8 µg/ml).
Bordetella pertussis	In 2011 no cases of pertussis were tested for susceptibility in Minnesota. Nationally, only 11 erythromycin-resistant *B. pertussis* cases have been identified to date.
Carbapenem-resistant *Enterobacteriaceae* (CRE)	Of 41 CRE isolates submitted from 40 cases, 21 (51%) were bla_{KPC} positive by PCR including 11 (52%) *E. cloacae*, 9 (43%) *K. pneumoniae*, and 1 (5%) *C. freundii.* 11 (52%) were residents of the 7-county metro area. Two submitted isolates were positive for bla_{NDM-1} by PCR: 1 *E. coli* and 1 *K. pneumoniae* from the same case. The definition of CRE is based on 2011 CLSI breakpoints and includes *Enterobacteriaceae* that are nonsusceptible to a carbapenem (excluding ertapenem) and resistant to all tested third generation cephalosporins. Due to their intrinsic resistance to imipenem, additional criteria apply for all species of *Proteus*, *Providencia*, and *Morganella*.
Escherichia coli O157:H7	Antimicrobial treatment for *E. coli* O157:H7 infection is not recommended.

Antimicrobial Susceptibilities of Selected Pathogens, 2011

MINNESOTA MDH DEPARTMENT OF HEALTH

Sampling Methodology
† all isolates tested
‡ ~10% sample of statewide isolates received at MDH
§ isolates from a normally sterile site

		Campylobacter spp. [1‡]	*Salmonella* Typhimurium [2†]	Other *Salmonella enterica* serotypes (non-typhoidal) [2‡]	*Shigella* spp. [3‡]	*Neisseria gonorrhoeae* [4]	*Neisseria meningitidis* [5†§]	Group A *Streptococcus* [6†§]	Group B *Streptococcus* [7†§]	*Streptococcus pneumoniae* [8†§]	*Haemophilus influenzae* [9†§]	*Mycobacterium tuberculosis* [10†]
Number of Isolates Tested		91	105	50	9	47	15	206	473	560	62	101
		% Susceptible										
ß-lactam antibiotics	amoxicillin									91		
	ampicillin		79	94	89		93	100	100		65	
	penicillin					0	87	100	100	76		
	cefixime					98	100					
	cefpodoxime					94						
	cefuroxime sodium									87	100	
	cefotaxime							100	100	90	100	
	ceftriaxone		100	100	100	100	100			90		
	meropenem						100			90	100	
Other antibiotics	ciprofloxacin	73[1]	100	100	100	72	100				100	
	levofloxacin						100	99	99	99		
	azithromycin	99				100	100				97	
	erythromycin	99						91	50	66		
	clindamycin							99/94[6]	72/59[7]	89		
	chloramphenicol		83	98	100					99	98	
	gentamicin	99										
	spectinomycin					100						
	tetracycline	58				21		96		86	97	
	trimethoprim/sulfamethoxazole (SXT)		99	98	0		47			77	84	
	vancomycin							100	100	100		
TB antibiotics	ethambutol											98
	isoniazid											88
	pyrazinamide											87
	rifampin						100				100	97

and community associated methicillin-resistant *Staphylococcus aureus.*
The MDH Antibiogram is available on the MDH Web site at:
www.health.state.mn.us/divs/idepc/dtopics/antibioticresistance/antibiogram.html.

Laminated copies can be ordered from: Antibiogram, Minnesota Department of Health, Acute Disease Investigation and Control Section, PO Box 64975, St. Paul, MN 55164 or by calling 651-201-5414.

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The *Disease Control Newsletter* is available on the MDH Acute Disease Investigation and Control (ADIC) Section web site: http://www.health.state.mn.us/divs/idepc/newsletters/dcn/index.html