MINNESOTA DEPARTMENT OF HEALTH

DISEASE CONTROL NEWSLETTER

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Annual Summary of Communicable Diseases Reported to the Minnesota Department of Health, 2013

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 reports 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 of pathogens from 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. 24-25).

Table 2 summarizes cases of selected communicable diseases reported during 2013 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, caused by *Anaplasma phagocytophilum*, is a rickettsial disease transmitted by bites from *Ixodes scapularis* (the blacklegged tick or deer tick). Although human anaplasmosis was initially referred to as human granulocytic ehrlichiosis, anaplasmosis and ehrlichiosis (due to *Ehrlichia chaffeensis*) are distinct diseases caused by different rickettsial species, and only human anaplasmosis is endemic in Minnesota. In Minnesota, the same tick vector also transmits the etiologic agents of Lyme disease, babesiosis, ehrlichiosis (due to *Ehrlichia muris*-like), and a strain of Powassan virus. *A. phagocytophilum* can also be transmitted by blood transfusion.

In 2013, 627 confirmed or probable anaplasmosis cases (11.7 cases per 100,000 population) were reported (Figure 1). This represents a 24% increase from the 507 cases in 2012, although it is considerably lower than the record 788 cases in 2011. Despite these fluctuations, the trend is an increase in yearly case totals over time. Three hundred ninety-two (63%) cases reported in 2013 were male. The median age of cases was 56 years (range, 2 to 93 years), 14 years older than the median age of Lyme disease cases. As is typical, most cases had

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Inside:

Antimicrobial Susceptibilities of Selected Pathogens, 2013 24-25
Emerging Infections in Clinical Practice and Public Health Announcement and Registration 26-27

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
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, 2013

Disease	Metropolitan (2,919,177)	Northwestern (157,393)	Northeastern (326,026)	Central (732,492)	West Central (235,563)	South Central (290,521)	Southeastern (498,011)	Southwestern (212,847)	Unknown Residence	Total (5,372,030)
	District (population per U.S. Census 2012 estimates)									
Anaplasmosis	175	95	84	164	52	18	33	6	0	627
Arboviral disease										
La Crosse	3	0	0	0	0	2	0	0	0	5
West Nile	16	9	0	5	18	12	3	17	0	80
Babesiosis	17	12	3	17	6	1	6	2	0	64
Blastomycosis	12	0	13	3	1	0	5	0	0	34
Campylobacteriosis	433	18	24	143	45	46	120	80	0	909
Cryptosporidiosis	60	5	25	54	48	16	85	31	0	324
Escherichia coli O157 infection	65	3	4	18	7	9	19	18	0	143
Hemolytic uremic syndrome	8	0	0	3	2	2	1	1	0	17
Giardiasis	354	3	41	85	16	34	59	28	0	620
Haemophilus influenzae disease	41	7	9	14	3	5	11	1	0	91
HIV (non-AIDS)	185	1	9	10	9	4	6	0	0	224
AIDS (diagnosed in 2013)	124	2	14	6	0	2	3	3	0	154
Legionellosis	23	0	6	4	2	5	9	1	0	50
Listeriosis	6	0	1	0	1	0	2	2	0	12
Lyme disease	748	54	159	239	62	44	117	8	0	1,431
Meningococcal disease	7	0	1	3	1	0	0	0	0	12
Pertussis	496	4	30	100	14	61	137	23	0	865
Salmonellosis	499	12	37	94	19	43	61	45	0	810
Sexually transmitted diseases										
Chlamydia trachomatis - genital infections	11,595	424	992	1,125	443	874	1,455	399	1,417	18,724
Gonorrhea	3,136	56	110	104	57	70	117	25	197	3,872
Syphilis, total										
Primary/secondary	179	1	3	5	0	0	1	4	0	193
Early latent*	129	2	0	3	2	1	2	0	0	139
Late latent**	171	1	4	10	0	5	11	2	1	205
Congenital	0	0	0	0	0	0	0	0	0	0
Other***										
Shigellosis	95	1	3	9	8	10	5	3	0	134
Streptococcal invasive disease - Group A	110	6	22	35	5	8	17	6	0	209
Streptococcal invasive disease - Group B	351	12	44	76	17	39	46	10	0	595
Streptococcus pneumoniae disease	236	23	54	83	32	27	56	30	0	542
Toxic shock syndrome (Staphylococcal)	12	0	1	0	0	0	1	0	0	14
Tuberculosis	110	2	4	10	2	3	14	6	0	151
Viral hepatitis, type A	17	0	3	5	1	4	1	1	0	32
Viral hepatitis, type B (acute infections only, not perinatal)	14	0	2	1	0	0	1	1	0	19
Viral hepatitis, type C (acute infections only)	19	3	18	3	1	0	2	1	0	47

* 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

illness onsets during the summer months, although the peak occurred in July (34% of cases) rather than in June as in recent years. In 2013, 160 (26%) anaplasmosis cases were hospitalized at some point for their infection, with a median duration of 4 days (range, 1 to 90 days).

Arboviral Diseases

Mosquito-borne Arboviruses

Historically, the primary arboviral encephalitides found in Minnesota have been La Crosse encephalitis, Western equine encephalitis (WEE), and more recently, West Nile virus (WNV). Both WNV and WEE are maintained in mosquito-to-bird transmission cycles involving several different species of each, and regional variation in vectors and reservoirs is likely. WNV is established throughout Minnesota, and will probably be present in the state to some extent every year, whereas human infections of WEE occur more sporadically. Human disease risk will likely continue to be higher in central and western Minnesota where the primary mosquito vector, *Culex tarsalis*, is most abundant. Interpreting the effect of weather on arboviral transmission is complex, making it extremely difficult to predict the number of people who will become infected in any given year.

In Minnesota, 80 cases of WNV disease were reported in 2013 (the third highest annual case total to date [range, 2 to 148]). Three (4%) patients died from complications of their WNV infection. Thirty-one (38%) cases, including the 3 fatalities, had encephalitis or meningitis. The other 49 (61%) cases had West Nile (WN) fever. Sixty-nine percent (55) of the cases were male, and the median age was 57 years (range, 7 to 92 years). In 2013, 41 (51%) of WNV cases were hospitalized. All but 1 case reported symptom onset in July, August, or September (median onset August 15, range June 16 to September 22), and as in past years, most cases occurred among residents of western and central Minnesota (Table 2). Twenty-seven WNV-positive blood donors were identified during 2013; 25 remained asymptomatic, and 2 developed WN fever.

Nationwide, 2,469 human cases of WNV disease were reported from 47 states and the District of Columbia. There were 119 fatalities. A total of 431 viremic donors were reported from 36 states, 60 (14%) of whom developed clinical disease. The largest WNV case counts during 2013 occurred in California (379 cases), Colorado (322 cases), and Nebraska (226).

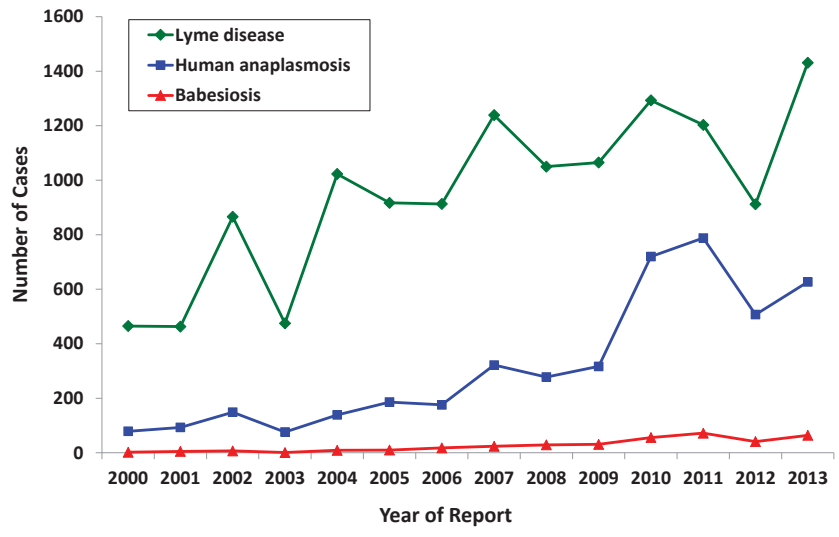
In 2013, 5 cases of La Crosse encephalitis were reported to MDH. The disease, which primarily affects children, is transmitted through the bite of infected *Aedes triseriatus* (Eastern Tree Hole) mosquitoes, and is maintained in a cycle that includes mosquitoes and small mammals. Exposure to infected mosquitoes typically occurs 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. Since 1985, 135 cases have been reported from 22 Minnesota counties, primarily in the southeastern part of the state. Many people who are infected with La Crosse encephalitis have no apparent symptoms, but severe disease can occur in children. The median case age for La Crosse encephalitis patient is 6 years (range, <1 to 49). Disease onsets have been reported from June through September, but most onsets have occurred from mid-July through mid-September. A 2012 Stearns County case represented the farthest north and west that La Crosse encephalitis has been reported to date in the United States.

Minnesota reported its first case of Jamestown Canyon virus in 2013, a California group virus related to La Crosse. The virus is transmitted by *Aedes* genus mosquitoes, and the maintenance cycle in nature is thought to include deer and other large mammals. Much remains unknown about the clinical spectrum of Jamestown Canyon virus, but the typical presentation includes fever, and in more severe cases, meningitis or encephalitis. The virus is likely widespread in Minnesota.

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 *Ixodes scapularis*. The virus can cause encephalitis or meningitis, and long-term sequelae occur in approximately half of those patients. Approximately 10-15% of cases are fatal. Since 2008, 22 cases (1 fatal) of POW disease have been reported in Minnesota residents. Most of these patients had neuroinvasive disease (12 encephalitis and 8 meningitis) but 2 were non-neuroinvasive POW fever cases. Seventeen (77%) cases have been male, and the median age is 52 years (range, 3 mos. to 75 years). Seven patients (32%) were immunocompromised. Similar to other tick-borne diseases, the majority of patients (18, or 82%) reported illness onsets between May and August. Four patients (18%) had onset dates in October or November. Cases have been reported every year since 2008, with a peak of 11 in 2011 (range, 1 to 11). Cases were exposed to ticks in several north-central Minnesota counties. MDH has also identified POW virus-positive ticks at sites in the five counties that have been investigated to date (Clearwater, Cass, Pine, Anoka and Houston). Thus, the virus appears to be widely distributed in the same wooded parts of the state that are

Figure 1. Reported *I. scapularis*-borne Disease Cases in Minnesota, 2000-2013



endemic to other pathogens transmitted by *I. scapularis.*

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

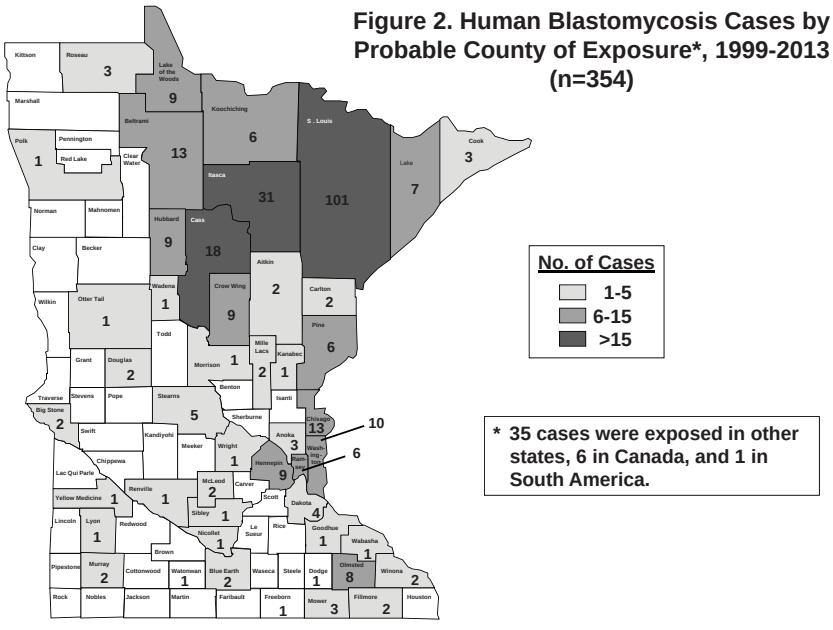
Babesiosis
Babesiosis is a malaria-like illness caused by the protozoan, *Babesia microti* or other *Babesia* organisms, that infects red blood cells. *B. microti* is transmitted to humans by bites from *I. scapularis* (the blacklegged tick or deer tick), the same vector that transmits the agents of Lyme disease, human anaplasmosis, one form of human ehrlichiosis, and a strain of Powassan virus. *Babesia* parasites can also be transmitted by blood transfusion. *Babesia* infections can range in severity, and while most people have asymptomatic infections, people with weak immune systems, underlying health conditions, and the elderly may become seriously ill.

In 2013, 64 confirmed and probable babesiosis cases (1.2 per 100,000 population) were reported, the second highest total since 2011's record of 72 cases. Yearly case totals since 2005 (range, 10 to 72) have been consistently higher than reported totals from 1996 to 2004 (range, 0 to 9, [Figure 1]). In 2013, 37 (58%) of the babesiosis cases reported occurred in males. The median case age was 66 years (range, 4 to 89 years), up from 57 in 2012. Onsets of illness peaked in the summer months, with 43 (69%) of 62 cases with known onset occurring from June through August. Twenty-three (36%) cases were hospitalized for their infection in 2013 for a median duration of 7 days (range, 3 to 26 days). At least 3 reported cases died from complications of babesiosis in 2013.

Blastomycosis
Blastomycosis is caused by the dimorphic fungus *Blastomyces dermatitidis* which exists as a mold in the environment and as a pathogenic yeast form in the body. The reservoir for spores is moist soil enriched with decomposing organic debris. The fungus is endemic in Ontario, Manitoba, and the southcentral, southeastern, and midwestern United States. Transmission occurs by inhalation of airborne spores after disturbance of contaminated soil.

In 2013, 34 blastomycosis cases were reported. This was a 35% increase from the 22 cases that were reported in 2012. The median age of cases was 43 years (range, 8 to 90 years), and 26 cases (76%) were male. Twenty-three (68%) cases were white, 2 (6%) were black, 4 (12%) were American Indian, 1 (3%) was of another race, and 4 (12%) were of unknown race. Twenty-five (74%) cases were hospitalized, for a median of 11 days (range, 1 to 31 days); 2 (6%) cases died as a result of their infection. Seventeen (50%) cases had pulmonary infections, 4 (12%) had extrapulmonary infections, and 9 (26%) had disseminated infections (information missing from 4 cases).

Figure 2. Human Blastomycosis Cases by Probable County of Exposure*, 1999-2013 (n=354)



From 1999 to 2013, 479 cases were reported. The median number of cases annually was 33 (range, 22 to 49). During this time, 101 (29%) of the 354 cases for whom exposure information was available were likely exposed in St. Louis County, 31 (9%) in Itasca County, 18 (5%) in Cass County, 13 (4%) in Beltrami County, 13 (4%) in Chisago County, and 10 (3%) cases in Washington County; these counties are known to be endemic for blastomycosis in Minnesota (Figure 2).

Campylobacteriosis
Campylobacter continues to be the most commonly reported bacterial enteric pathogen in Minnesota (Figure 3). There were 909 culture-confirmed *Campylobacter* cases reported in 2013 (16.9 per 100,000 population). This is a 5% decrease from the 950 cases in 2012, but similar to the median annual number of cases reported from 2003 to 2012 (median, 903 cases; range, 843 to 1,007). In 2013, 48% of cases occurred in people who resided in the metropolitan area. Of the 862 *Campylobacter* isolates confirmed and identified to species by MDH, 89% were *C. jejuni* and 9% were *C. coli*.

The median age of cases was 34 years (range, 4 days to 97 years). Thirty-nine percent of cases were between 20 and 49 years of age, and 12% were 5 years of age or younger. Fifty-six percent of cases were male. Fourteen percent of cases were hospitalized; the median length of hospitalization was 3 days. Forty-nine percent of infections occurred during June through September. Of the 823 cases for whom data were available, 125 (15%) reported travel outside the United States during the week prior to illness onset. The most common travel destinations were Asia (n=35), Europe (n=35), Central or South America or the Caribbean (n=30), and Mexico (n=23).

There were two confirmed outbreaks of campylobacteriosis identified in 2013. In June, an outbreak of *C. jejuni* infections was associated with raw milk from a dairy in Isanti County; 3 culture-confirmed cases were identified. Also in June, an outbreak of *C. jejuni* infections was associated with raccoon contact at a wildlife rehabilitation center in Ramsey County; 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

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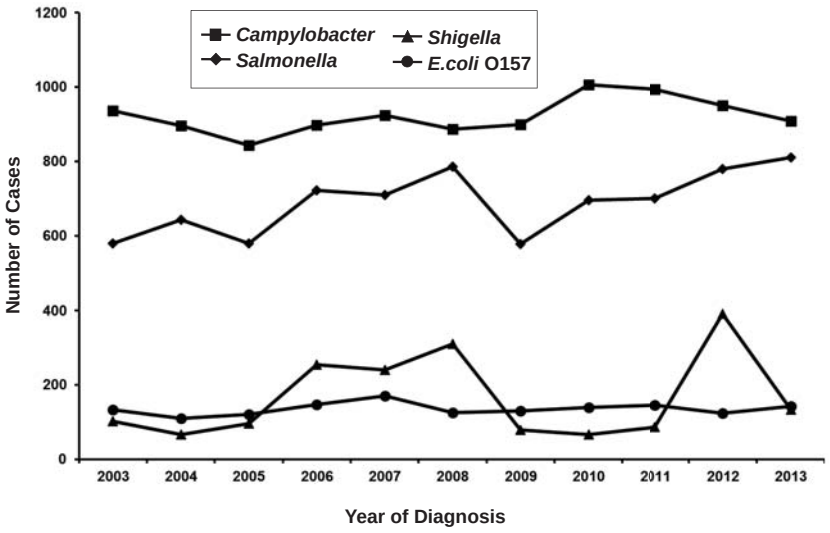
Figure 3. Reported Cases of *Campylobacter*, *Salmonella*, *Shigella*, and *Escherichia coli* O157:H7 Infection, 2003-2013



to treat campylobacteriosis. In 2013, the overall proportion of quinolone resistance among *Campylobacter* isolates tested was 26%. However, 81% 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. Fifteen percent of *Campylobacter* isolates from patients who acquired the infection domestically were resistant to fluoroquinolones.

In June 2009, a culture-independent test became commercially available for the qualitative detection of *Campylobacter* antigens in stool. In 2013, 439 patients were positive for *Campylobacter* by a culture-independent test conducted in a clinical laboratory. However, only 157 (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 >65 years, severe underlying illness, intensive care unit admission, nasogastric intubation, and longer duration of hospital stay.

A marked increase in the number of CDI cases and mortality due to CDI has been noted across the United 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 PFGE type 1 (NAP1), toxinotype III.

Community-associated (CA) 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 clinical laboratories serving Stearns, Benton, Morrison, and Todd Counties; in 2012 Olmsted County was added. A CDI case is defined as a positive *C. difficile* toxin assay on an incident stool specimen from a resident (≥ 1 year of age) of one of the five 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 2013, 691 incident cases of CDI were reported in the five sentinel counties (175 per 100,000 population). Fifty-seven percent of these cases were classified as CA, 25% as CO-HCFA, and 18% as HCFO. The median ages for CA, CO-HCFA, and HCFO cases were 48 years, 63 years, and 73 years, respectively. Fifty-eight percent of CA cases were prescribed antibiotics in the 12 weeks prior to stool specimen collection compared to 79% of HCFO cases and 85% of CO-HCFA cases. Of the 391 putative CA cases eligible for interview, 267 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 (32%); dental procedures (18%); skin infections (13%); and urinary tract infections (9%).

Carbapenem-resistant *Enterobacteriaceae* (CRE)

Enterobacteriaceae are a large family of Gram-negative bacilli that are common causes of community- and healthcare-associated infections (HAI). Carbapenem-resistant Enterobacteriaceae (CRE) are resistant to most available antibiotics, including carbapenems. In recent years, CRE have been increasingly recognized as an important cause of HAI. CRE infections most commonly occur among patients with significant healthcare exposures, co-morbid conditions, invasive devices, and those who have received extended courses of antibiotics. Invasive infections caused by CRE are associated with higher morbidity and mortality than carbapenem-susceptible Enterobacteriaceae.

Carbapenem resistance can be acquired through different mechanisms. Some CRE harbor resistance genes that produce enzymes known as carbapenemases. Certain carbapenemases (e.g., *Klebsiella*

pneumoniae carbapenemase [KPC]), are encoded by transmissible genetic elements that can easily spread between bacteria of similar species. KPC is the predominant carbapenemase among CRE in the United States. Other types of carbapenemases have been identified in the United States (i.e. New Delhi metallo-β-lactamase [NDM], Verona integron-encoded metallo-β-lactamase [VIM], active on imipenem [IMP], and oxacillinase [OXA-48]) though these carbapenemases are more common in other countries. Resistance to carbapenems can also be acquired through the production of a β-lactamase effective against third-generation cephalosporins (i.e. AmpC β-lactamases or extended-spectrum β-lactamases [ESBLs]) when combined with porin mutations that prevent carbapenem antibiotics from entering the cell.

MDH first identified a KPC-producing CRE in February 2009, and began voluntary reporting of CRE to track the emergence of these highly resistant organisms in Minnesota. In 2012, MDH adopted a standardized CRE definition developed by the CDC EIP Multi-site Gram-negative Surveillance Initiative (MuGSI), and initiated active laboratory- and population-based surveillance in Hennepin and Ramsey Counties. This surveillance includes all isolates of *Escherichia coli*, *Enterobacter* spp., or *Klebsiella* spp. from normally sterile sites or urine that are non-susceptible to imipenem, meropenem, or doripenem and resistant to all tested third-generation cephalosporins using current Clinical and Laboratory Standards Institute breakpoints; an incident case is defined as the first eligible isolate of each species collected from a Hennepin or Ramsey County resident in 30 days. For statewide surveillance, the MuGSI definition is expanded to include isolates of any Enterobacteriaceae species from all body sites collected in Minnesota residents, including all isolates that are positive for carbapenemase production. The PHL tests all submitted CRE isolates by PCR for KPC and NDM genes.

In 2013, 103 CRE were reported. Of 92 isolates submitted (representing 90 patients), 26 ([28%] representing 24 patients) were KPC positive (*K. pneumoniae* [11], *E. cloacae* [11], *K. oxytoca* [2], *C. freundii* [1], and *C. koseri* [1]); 2 cases had isolates of different species detected from the same body site. Of note, 2 KPC-positive isolates were susceptible to carbapenems tested by the submitting laboratory. None of the tested isolates were NDM positive. Of the 24 patients with KPC-positive isolates, the median age was 60 years (range,17 to 89); 13 (54%) were male and 13 (54%) were residents of Hennepin or Ramsey County. Urine (11) was the most common source followed by blood (4) and sputum (4). Seventeen (71%) were hospitalized (8 hospitalized >3 days prior to culture); median length of stay was 17 days (range, 1 to 68). Six (35%) required ICU care; in-hospital mortality was 6%. Other KPC-positive CRE isolates were collected in patients from outpatient settings (3), long-term acute care hospitals (2), or long-term care facilities (2).

A total of 41 incident CRE cases (representing 36 patients) were reported for MuGSI during 2013. Species identified were *Enterobacter* spp. (23), *Klebsiella* spp. (13), and *E. coli* (5). KPC was identified in 31% of MuGSI CRE (*K. pneumoniae* [7/11] and *E. cloacae* [4/7]). Again, CRE was most frequently isolated from urine (36) followed by blood (3) and other sterile body sites (2).

To date, 2 NDM-producing CRE (*E. coli* and *K. pneumoniae* from a single patient) have been detected in Minnesota residents and 3 (*E. coli* [1] and *K. pneumoniae* [2]) in 2 non-Minnesota residents. All 3 patients had received prior medical care in countries where NDM is more common. In 2013, the PHL identified, and CDC confirmed, the first OXA-48-producing CRE (*K. pneumoniae*) in Minnesota, also from a non-resident. The OXA-48-positive urine culture was collected during an outpatient dialysis visit. The patient had significant healthcare exposure outside the United States prior to receiving healthcare in Minnesota.

In summary, approximately one third of reported CRE isolates were KPC-positive; 2 cases had KPC-positive isolates of different species cultured from the same body site. Detection of NDM and OXA-48 serves as a reminder to clinicians that a travel history, including hospitalization outside the United States, is a critical component of early detection of CRE isolates with carbapenemases that are less common in the United States. CDC recommends performing rectal screening cultures to detect colonization in newly admitted patients with known hospitalization outside the United States within the last 6 months. CRE bacteria can spread in healthcare facilities (e.g., on the hands of healthcare workers) and have been associated with outbreaks in these settings in other states and countries. The spread of CRE can be halted with early detection and implementation of appropriate infection prevention measures, and proper communication of CRE status upon patient transfer. Healthcare facilities should consider screening epidemiologically linked patients including roommate(s) of a patient colonized or infected with CRE who are still in-house. Screening might also be expanded to patients who have shared the same healthcare workers and/or those on the same unit. No outbreaks or transmission of CRE were reported among Minnesota facilities that conducted active surveillance testing during 2013.

Cryptosporidiosis

During 2013, 324 cases of cryptosporidiosis (6.0 per 100,000 population) were reported. This is 19% higher than the median number of cases reported annually from 2003 to 2012 (median, 273 cases; range, 147 to 389). The median age of cases in 2013 was 26 years (range, 7 months to 89 years). Children 10 years of age or younger accounted for 23% of cases. Fifty-five percent of cases occurred during July through October. The incidence of cryptosporidiosis in the West Central, Southeastern, and Southwestern Districts (20.4, 17.0, and 14.6 cases per 100,000, respectively) was significantly higher than the statewide incidence. Only 60 (19%) reported cases occurred among residents of the metropolitan area (2.0 per 100,000). Forty-two (13%) cases required hospitalization, for a median of 4 days (range, 1 to 43 days).

Four outbreaks of cryptosporidiosis were identified in 2013, accounting for 17 laboratory-confirmed cases. One recreational water outbreak occurred at a municipal pool in Olmsted County, accounting for 10 cases (2 laboratory-confirmed). One outbreak associated with "Breakfast on a Farm" occurred, accounting for 2 primary cases and 1 secondary case, all laboratory-confirmed. One outbreak at a daycare in Douglas County accounted for 10 cases (6 laboratory-confirmed). An outbreak among HIV-infected men who had sex with men accounted for 6 laboratory-confirmed cases in 2013; 2 additional cases were identified in 2014.

In a paper published in *Clinical Infectious Diseases* in April 2010, we reported an evaluation of rapid assays used by Minnesota clinical

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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.

Dengue

Dengue fever is one of the most frequently occurring mosquito-borne diseases worldwide, with an estimated 50-100 million cases (including approximately 500,000 cases of severe dengue) each year. About 2.5% of those with severe dengue (also known as dengue hemorrhagic fever) die. Four serotypes of dengue virus are transmitted to humans through the bite of *Aedes aegypti* and *Aedes albopictus* mosquitoes. 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 2013, 22 cases (0.4 per 100,000 population) of dengue were reported in Minnesota residents, including 2 cases of severe dengue. This represents the highest yearly case total to date, surpassing the previous record of 20 cases in 2008. In 2013, the median case age was 42 years (range, 10 to 66 years). Seventeen cases resided within the metropolitan area. Onset of symptoms occurred from January through November. All of the cases represented imported infections acquired abroad. Cases had travelled to Latin America (9), Asia (8), the Caribbean (3), South America (1), or Africa (1).

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

During 2013, 143 culture-confirmed cases of *Escherichia coli* O157 infection (2.7 per 100,000 population) were reported. This represents an 8% increase from the median number of cases reported annually from 2003 to 2012 (median, 132 cases; range, 110 to 163 [Figure 3]). During 2013, 64 (45%) cases occurred in the metropolitan area. One hundred seven (75%) cases occurred during May through October. The median age of the cases was 16 years (range, 9 months to 82 years). Twenty-seven percent of the cases were 4 years of age or younger. Fifty (35%) cases were hospitalized; the median hospital stay was 4 days (range, 1 to 31 days). No cases died.

In addition to the 143 culture-confirmed *E. coli* O157 cases, 139 cases of Shiga toxin-producing *E. coli* (STEC) infection were identified. Of those, culture-confirmation was not possible in 27, and therefore it is unknown if those were O157 or another serogroup. Among the remaining 112 cases of STEC other than O157, *E. coli* O26 accounted for 37 (33%) cases, *E. coli* O103 for 33 (29%), and *E. coli* O111 for 20 (18%). The median age of the cases was 18 years (range, 11 months to 94 years). Sixteen (14%) cases were hospitalized; the median hospital stay was 2 days (range, 1 to 12 days). One case (serogroup O111) developed HUS and died.

Ten *E. coli* O157 outbreaks were identified during 2013. Five outbreaks were due to person-to-person transmission in daycares, two outbreaks were due to animal contact, 1 outbreak involved foodborne transmission, 1 outbreak involved waterborne transmission, and 1 outbreak was suspected of being due to foodborne transmission, but other transmission routes could not be ruled out. The 10 outbreaks resulted in 46 illnesses (33 culture-confirmed), with a median of 5 cases per outbreak (range, 2 to 9 cases).

In June, an outbreak of *E. coli* O157 infections associated with person-to-person transmission occurred at a daycare in Ramsey County. Two culture-confirmed cases were identified.

In July, 3 cases of *E. coli* O157 infections were associated with swimming at a lake in Hennepin County. A press release was issued at the time.

In July, an outbreak of *E. coli* O157 infections associated with person-to-person transmission occurred at a daycare in Ramsey County. Seven cases were identified, including 3 culture-confirmed.

In August, an outbreak of *E. coli* O157 infections was associated with a restaurant in Olmsted County. Seven cases were identified, including 6 culture-confirmed. While a specific vehicle was not identified, the environmental health investigation suggested that cross-contamination from raw beef to ready-to-eat foods was the likely cause of the outbreak.

In August, an outbreak of *E. coli* O157 infections was associated with a wedding and private reception held in Nicollet County. Nine cases were identified, including 8 culture-confirmed. One case developed HUS. The lack of cooperation from the wedding organizers limited the investigation, and while foodborne transmission was suspected, other transmission routes could not be ruled out.

In September, an outbreak of *E. coli* O157 infections associated with person-to-person transmission occurred at a daycare in Becker County. Two culture-confirmed cases were identified.

In October, 7 cases of *E. coli* O157 infections were associated with animal contact at a "Pumpkin Patch" business. Three cases were culture-confirmed, and 2 cases developed HUS. Goats and cattle were present at the "Pumpkin Patch," and multiple animal fecal and environmental samples taken from the pumpkin patch tested positive for Shiga toxin 2, indicating the presence of Shiga toxin-producing *E. coli*.

In October, an outbreak of *E. coli* O157 infections due to animal contact at a Fall Festival petting zoo occurred. Two culture-confirmed cases were identified, and 1 developed HUS. *E. coli* O157 with the same PFGE subtype as the human isolates was isolated from calf and goat feces, and environmental samples.

In October, an outbreak of *E. coli* O157 infections associated with person-to-person transmission occurred at a daycare in Murray County. Two cases were identified, including 1 culture-confirmed.

In November, an outbreak of *E. coli* O157 infections associated with person-to-person transmission occurred at a daycare in Anoka County. Five cases were identified, including 3 culture-confirmed. Two cases developed HUS. The index case in the outbreak reported recent contact with an ill cousin who was identified as a case in the October Murray County daycare outbreak.

Two non-O157 Shiga toxin-producing *E. coli* outbreaks were identified during 2013. In April, an outbreak of *E. coli* O26 infections associated with

consumption of iceberg lettuce resulted in 5 cases, all laboratory confirmed. In May, an outbreak of *E. coli* O103 infections due to person-to-person transmission in a daycare resulted in 3 cases, 2 culture-confirmed.

Hemolytic Uremic Syndrome (HUS)
In 2013, 17 HUS cases were reported. This number is a 31% increase from the median number of cases reported annually from 2002 to 2012 (median, 13 cases; range, 10 to 22). In 2013, the median age of HUS cases was 3 years (range, 1 to 87 years); 16 of the 17 cases occurred in children <7 years of age. All 17 cases were hospitalized, with a median hospital stay of 11 days (range, 3 to 32 days). One adult case died. From 1997 through 2013, the overall case fatality rate among HUS cases was 5.1%. All 17 2013 HUS cases were post-diarrheal. *E. coli* O157:H7 was cultured from the stool of 16 (85%) cases, and *E. coli* O111 was cultured from the stool of the remaining case (the fatal case). In 2013, there were 6 outbreak-associated HUS cases.

Giardiasis
During 2013, 620 cases of *Giardia* infection (11.5 per 100,000) were reported. This represents a 27% decrease from the median number of cases reported annually from 2003 through 2012 (median, 849 cases; range, 633 to 1,398). Recent immigrants and refugees continue to represent a substantial proportion of reported *Giardia* cases, accounting for 32% of all cases. An additional 10% of cases reported international travel in the 3 weeks prior to illness onset.

The median age for all cases reported in 2013 was 21 years (range, 5 weeks to 90 years). Thirty-five percent of cases were <10 years of age, and 21% of cases were >50 years of age. Thirty-eight (6%) cases required hospitalization, for a median of 4 days (range, 1 to 35 days). Excluding cases identified through immigrant and refugee health screenings, *Giardia* infections showed a summer/fall seasonality; 50% of cases occurred during July through October. Two outbreaks of giardiasis were identified in Minnesota in 2013, accounting for 4 laboratory-confirmed cases; both outbreaks occurred in a daycare.

Haemophilus influenzae
Ninety-one cases of invasive *Haemophilus influenzae* disease (1.7 per 100,000 population) were reported in 2013. Cases ranged in age from newborn to 100 years (median, 66 years). Allowing for more than one syndrome per case, 42 (46%) cases had pneumonia, 32 (35%) had bacteremia without another focus of infection, 7 (8%) had septic shock, 5 (6%) had meningitis, 2 (2%) each had cellulitis, epiglottitis and septic arthritis, 1 (10%) each had peritonitis, endometritis, empyema, osteomyelitis, and otitis media. Nine (10%) cases died.

Of 88 *H. influenzae* isolates for which typing was performed at the PHL, 16 (18%) were type f, 4 (5%) type b, 8 (9%) type a, 7 (8%) type e, and 53 (60%) were untypeable. Serotype f represented on average 14.5% of case-isolates from 2006-2012.

The 4 cases of type b (Hib) disease, compared to 3 cases reported in 2012, 3 cases in 2011, and 1 case in 2010. All 2013 cases were in adults >60 years of age. One case died.

The 9 deaths occurred in patients ranging in age from 50 to 100 years. Four cases had pneumonia (of these, 1 also had septic shock), 5 had bacteremia without focus (of these 2 also had septic shock). All 9 cases had *H. influenzae* isolated from blood and 7 reported underlying medical conditions. Of the 9 cases that died, 6 case-isolates were untypeable, 2 were serotype f, and 1 was serotype b.

HIV Infection and AIDS
The incidence of HIV/AIDS in Minnesota remains moderately low. In 2011, state-specific HIV infection diagnosis rates ranged from 2.3 per 100,000 population in Vermont to 36.6 per 100,000 in Louisiana. Minnesota had the 17th lowest HIV infection rate (7.2 cases per 100,000 population). State-specific AIDS diagnosis rates ranged from 0.5 per 100,000 persons in Vermont to 22.8 per 100,000 population in Georgia. Minnesota had the 15th lowest AIDS rate (4.0 AIDS cases reported per 100,000 population).

As of December 31, 2013, a cumulative total of 10,409 cases of HIV infection (6,316 AIDS cases and 4,093 HIV [non-AIDS] cases) had been reported among Minnesota residents. Of the 10,409 HIV/AIDS cases, 3,558 (3%) 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 2013, 154 new AIDS cases (Figure 4) and 71 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 2004 through 2013, at approximately 230 cases per year. With a peak of 281 newly diagnosed HIV (non-AIDS) cases in 2009, 224 new HIV (non-AIDS) cases were reported in 2013 (decrease of 5% from 235 in 2012). By the end of 2013, an estimated 7,723 persons with HIV/AIDS were assumed to be living in Minnesota.

Historically, and in 2013, over 80% (247/301) of new HIV diagnoses (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 number of new HIV infections among males, but the proportion of cases that white males account for is decreasing. In 2013 there were 126 new infections among white males. The annual number of cases among African American males peaked in 1992 at 78 and gradually decreased to 33 new infections in 2003. During the past several years the number of cases in this group has trended upwards, with a peak of 64 cases diagnosed in 2009, and 56 new HIV diagnoses in 2013. The number of HIV infections diagnosed among Hispanic males decreased in 2013 to 24 from 35 in 2012. The number of new infections among African-born males decreased in 2013 to 9 from 19 in 2012.

Females account for an increasing proportion of new HIV infections, from 11% of new infections in 1990 to 24% in 2013. 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

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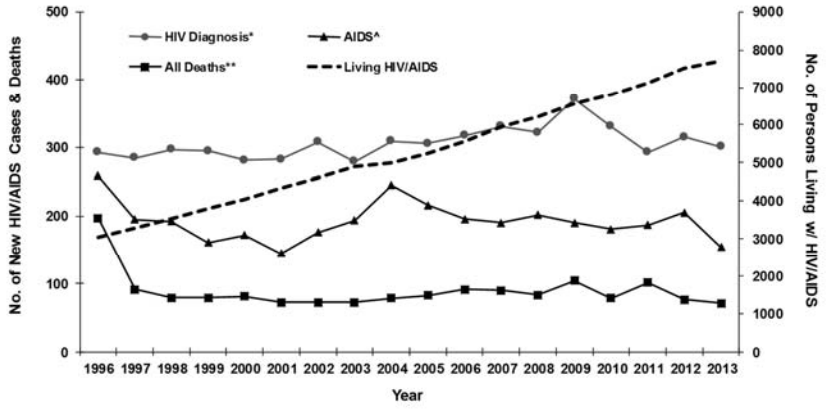
in women. Since 1991, the number of new infections among women of color has exceeded that of white women. Since 2004, the annual number of new infections diagnosed among African American females has decreased slightly overall, although without a clear pattern from year to year. In 2013, 15 cases were reported among African American women, compared to 17 in 2012. In 2013, the number of new cases among African-born women was 33, accounting for 45% of all new diagnoses among women; this accounted for a 50% increase among African-born women from 2012. 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 2013, non-white men comprised approximately 17% of the male population in Minnesota and 42% of new HIV diagnoses among men. Similarly, persons of color comprised approximately 13% of the female population and 73% of new HIV infections among women. Race is viewed 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 (13-24 years of age). The number of new HIV infections among males in this age group has remained higher than new diagnoses among females since 1999. Since 2001, Minnesota has seen a steady increase in new cases among males in this age group, with 41 cases reported in 2013. Since 2004, the number of cases among young males has increased by about 78%. The number of new HIV infections among females in this age group has remained relatively consistent over time. In 2013 there were 11 cases diagnosed among young women. From 2011 to 2013, the majority (57%) of new infections among male adolescents and young adults were among youth of color (81/141), with young African American males accounting for 69% of the cases among young males of color. During the same time period, young women of color accounted for 60% (14/23) of the cases diagnosed, with young African American women accounting for 42% of cases among young women of color. Between 2011 and 2013 after re-distributing those with unspecified risk, 94% (133/141) of new cases among young males were attributed to male-to-male sex. Among young females, 94% (22/23) of new cases were attributed to heterosexual sex.

Figure 4. HIV/AIDS in Minnesota: Number of New Cases, Prevalent Cases, and Deaths by Year, 1996-2013



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

** Deaths among HIV 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

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 diagnoses were attributed to MSM (or MSM who also inject drugs); in 2013, this group accounted for 50% of new diagnoses (151/301).

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 2% (5/301) in 2013. 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-three percent of 212 new HIV diagnoses among women between 2011 and 2013 is attributed to heterosexual exposure after re-distributing cases with unspecified risk.

Historically, race/ethnicity data for HIV/ AIDS in Minnesota have grouped non-African born blacks and African-born persons together as “black.” In 2001, we began analyzing these groups separately, and a marked trend of increasing numbers of new HIV infections among African-born persons was observed. In 2013, there were 42 new HIV infections reported among Africans. While African-born persons comprise less than 1% of the state’s population, they accounted for 14% of all HIV infections diagnosed in Minnesota in 2013.

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 2012, 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 2011 to 2013 was 0.5% with no HIV-positive births from an HIV-infected mother in Minnesota in 2013.

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 2013-2014 season (September 29, 2013 – May 3, 2014), clinicians

were encouraged to 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 2013-2014 influenza season, 1,540 laboratory-confirmed hospitalizations (28.6 hospitalizations per 100,000 persons compared to 57.7 per 100,000 during the 2012-2013 influenza season) were reported. Since September 29, 2013, hospitalized cases included 1,346 that were influenza A (26 H3, 650 A[H1N1]pdm09, and 670 unknown A type), 179 that were influenza B, 12 that were positive for both influenza A and B, and 3 were unknown influenza types. Among hospitalized cases, 18% were 0-18 years of age, 23% were 19-49 years of age, 29% were 50-64 years of age and 30% were 65 years of age and older. Median age was 54.6 years. Fifty-four percent of cases were residents of the metropolitan area.

Case report forms have been completed on 784 (96.9%) of 809 metropolitan area cases to date. Of these, 29% were diagnosed with pneumonia, 20% required admission into an intensive care unit, and 9% were placed on mechanical ventilation. Three percent of hospitalized influenza cases had an invasive bacterial co-infection. Eighty-five percent of cases received antiviral treatment. Overall, 90% of adult cases and 59% of pediatric cases had at least one chronic medical condition that would have put them at increased risk for influenza disease.

Deaths

For the 2013-2014 influenza season, there were no pediatric influenza-associated deaths.

Laboratory Data

The Minnesota Laboratory System (MLS) Laboratory Influenza Surveillance Program is made up of more than 110 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 (six labs) for influenza, RSV, and other respiratory viruses. Nine 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 (ILI) and provides an indicator of the progression of the influenza season as well as prevalence of disease in the community.

Between September 29, 2013 - May 10, 2014, virology laboratories reported 71 viral cultures positive for influenza. Of these, 66 (93%) were positive for influenza A, and 5 (7%) were positive for influenza B. The number of positive influenza cultures peaked during the week of December 29, 2013 - January 4, 2014 at 14. Between September 29, 2013 - May 10, 2014, laboratories reported data on 19,806 influenza PCR tests, 2,353 (12%) of which were positive for influenza. Of these, 1,395 (59%) were positive for influenza A(H1N1)pdm09, 34 (1%) were positive for influenza A/(H3), 783 (33%) were positive for influenza A-not subtyped, and 141 (6%) were positive for influenza B. One hundred sixty-one influenza isolates were further characterized in the PHL; 115 (71%) were characterized as influenza A(H1N1)pdm09, 4 (2%) were characterized as influenza A/(H3), 4 (2%) were characterized as influenza A-type unspecified, and 38 (24%) were characterized as influenza B/Yamagata lineage.

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. There are 26 sites in 21 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 22-28, 2013 at 3.5%.

Influenza Incidence Surveillance Project

MDH was one of six nationwide sites to participate in an Influenza Incidence Surveillance Project for the 2013-2014 influenza season. Five 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. 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 28, 2013 – May 10, 2014, these clinics saw 1,852 ILI and 8,813 ARI patients. They submitted 625 specimens for influenza and respiratory pathogen testing, 62 (10%) of which were positive for influenza. Of those, 52 (84%) were positive for influenza A(H1N1)pdm09, 7 (11%) were positive for influenza A/(H3), 2 (1%) were positive for influenza A-type unspecified, and 1 (1%) was positive for influenza B. In addition to influenza, the following pathogens were detected by PCR: 20 (3%) adenovirus, 8 (1%) human metapneumovirus, 23 (4%) RSV, 83 (13%) rhinovirus, 11 (2%) parainfluenza virus 1, 12 (2%) parainfluenza virus 2, 3 (1%) parainfluenza virus 3, 7 (1%) parainfluenza virus 4, 9 (1%) coronavirus 229E, 4 (1%) coronavirus OC43, 11 (2%) coronavirus HKU1, and 6 (1%) coronavirus NL63 (note: these coronaviruses are not SARS-virus or MERS-CoV).

ILI Outbreaks in 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 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-two schools in 35 counties reported ILI outbreaks during

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the 2013-2014 school year. This is the lowest number of schools reporting ILI outbreaks since the 2009-2010 school year with the highest being 1,302 schools in 85 counties in 2009-2010.

An influenza outbreak is suspected in a long-term care facility (LTCF) when two or more residents in a facility develop symptoms consistent with influenza 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 and there are other cases of respiratory illness in the same unit. Twenty-seven facilities in 17 counties reported confirmed outbreaks during the 2012-2013 influenza season. The number of LTCFs reporting outbreaks ranged from a low of three in 2008-2009 to a high of 209 in 2012-2013.

Legionellosis
During 2013, 50 confirmed cases of legionellosis (Legionnaires' disease [LD]) were reported (0.9 per 100,000 population), including 24 cases (48%) among residents of the metropolitan area and 26 (52%) cases among Greater Minnesota residents. Four (8%) cases died. Thirty-five (70%) of the cases were male. Older adults were more often affected, with 39 (78%) cases occurring among individuals ≥50 years of age (overall median, 63 years; range, 18 to 90 years). Twenty-eight (57%) cases had onset dates in June through September. Travel-associated LD accounted for 9 (18%) cases, defined as spending 1 or more overnight stays away from the case's residence in the 10 days before onset of illness.

The criteria for confirmation of a confirmed LD case requires a clinically compatible illness 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
Twelve cases of listeriosis were reported during 2013. Eleven cases were hospitalized, and 2 (17%) died. The median age of cases was 63 years (range, 0 days to 87 years). Six (50%) cases had *Listeria monocytogenes* isolated from blood, 5 (42%) from cerebrospinal fluid (CSF), and 1 (8%) from a boil. Two of the cases were pregnancy-associated: 1 neonate had *L. monocytogenes* cultured from blood at birth, and 1 neonate developed fever and diarrhea 8 days after birth and had *L. monocytogenes* isolated from CSF; both cases survived.

Two cases were part of a multi-state outbreak of 6 cases from five states due soft ripened cheese made from pasteurized milk at a Wisconsin plant. The 12 cases reported in 2013 represent an increase from the median number of cases reported from 1996 through 2012 (median, 7 cases; range, 3 to 19), and the highest number of cases reported since 2005.

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

Lyme Disease
Lyme disease is a bacterial infection 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 2013, 1,431 confirmed Lyme disease cases (26.6 cases per 100,000 population) were reported (Figure 1). In addition, 909 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 1,431 confirmed cases represent a 9.6% increase from the previous record of 1,293 confirmed cases reported in 2010. Despite some small yearly fluctuations, the number of reported cases of Lyme disease has been increasing, as evidenced by the median number of cases from 2005 through 2012 (median, 1,065; range, 912 to 1,431) compared to the median from 1996 to 2004 (median, 463; range, 252 to1,023).

Nine hundred seventeen (64%) confirmed cases in 2013 were male. The median age of cases was 42 years (range, 1 to 88 years). Physician-diagnosed erythema migrans (EM) was present in 1,083 (76%) cases. Three hundred eighty-one (27%) cases had one or more late manifestations of Lyme disease (including 238 with a history of objective joint swelling, 117 with cranial neuritis, 15 with lymphocytic meningitis, 13 with acute onset of 2nd or 3rd degree atrioventricular conduction defects, 9 with radiculoneuropathy, and 1 with encephalomyelitis) and confirmation by Western immunoblot (positive IgM ≤30 days post-onset or positive IgG). Of the 1,338 cases with known onset dates, onset of illnesses peaked from June through August, with 40% of EM cases experiencing symptom onset in July. This timing corresponds with peak activity of nymphal *I. scapularis* ticks in mid-May through mid-July. The majority of cases in 2013 either resided in or traveled to endemic counties in north-central, east-central, or southeast Minnesota, or 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 malaria 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 in recent years have been imported infections acquired abroad.

In 2013, 66 malaria cases (1.2 per 100,000 population) were reported in Minnesota residents, the highest number of cases reported since 2000 (range, 29 to 66). Forty-eight (73%) cases were identified with *P. falciparum*,

5 (8%) with *P. vivax*, 4 (6%) with *P. ovale,* 2 (3%) with *P. malariae,* and 4 (6%) with mixed *Plasmodium* species infections; infections with unidentified *Plasmodium* species were detected in 3 (5%) cases. The median age of cases was 34 years (range, 2 to 73 years). Of the 59 cases with known race, 52 (88%) were black, 5 (8%) were white, and 2 (3%) were Asian. Fifty-nine cases were Minnesota residents at the time of their illness, 42 (71%) of which resided in the metropolitan area. Five (7%) cases were residents of other states that were diagnosed in Minnesota, and 2 (3%) were residents of countries other than the United States. Of the 44 cases with known country of birth, 7 (16%) were born in the United States. Sixty-one (92%) cases in 2013 likely acquired malaria in Africa, 2 (3%) cases were likely acquired in Asia, and 1 (2%) case was exposed in South America. Exposure information was not available for 2 of the cases. Eighteen countries were considered possible exposure locations for malaria infections, including Liberia (15), Nigeria (14), Kenya (5), and India (2), as well as several other countries in sub-Saharan Africa.

Measles

Two cases of measles were reported in 2013. Both were Hennepin County residents. The first case was a 50-year-old white, non-Hispanic male with unknown vaccination status. He had returned from Germany, where he presumably was exposed. The second case was a 2-year-old Asian, non-Hispanic male who had recently been adopted from China and was unvaccinated due to a medical condition. This child was linked to a small cluster of adoptees (2 confirmed cases from other states) whose families had also recently returned to the United States from China.

One of the cases was confirmed by both PCR and IgM serology, and the other by PCR only. The first case was genotype D8 and the second H1. The 2 cases were considered international importations (exposed to measles outside of the United States) and were unrelated to each other. No secondary cases were identified.

Meningococcal Disease

Twelve cases of *Neisseria meningitidis* invasive disease (0.2 per 100,000 population) were reported in 2013; 12 cases were also reported in 2012. There were 8 serogroup B, 3 serogroup C, and 1 serogroup Y case. All cases were sporadic except 2 serogroup B cases in central Minnesota linked through epidemiology and molecular subtyping. One meningococcemia case died.

Cases ranged in age from 15 days to 83 years, with a mean of 27 years. Fifty-eight percent of the cases occurred in the metropolitan area. Including multiple presentations in an individual case, 7 cases had meningitis, 4 had bacteremia without another focus of infection, 1 had pneumonia, and 1 had septic shock.

In 2013, 1 case isolate demonstrated intermediate resistance to penicillin. There were no 2013 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 2012, meningococcal conjugate vaccine MenHibrix®, covering serogroups Y and C and *Haemophilus influenzae* b, was extended for licensed use in the United States to 6 weeks 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 2011, the license was approved to include 9 through 23 months. 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; 1 case qualified for enrollment in 2013.

Methicillin-Resistant *Staphylococcus aureus* (MRSA)

Strains of *Staphylococcus aureus* that are resistant to methicillin and 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), population-based invasive MRSA surveillance was initiated 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. Surveillance was expanded to include Hennepin County in 2008. The incidence rate for MRSA infection in Ramsey and Hennepin Counties was 17.0, 14.0, 18.2, 14.0, and 12.5 per 100,000 in 2009, 2010, 2011, 2012, and 2013, respectively (2013: Ramsey, 14.6/100,000; and Hennepin, 11.5/100,000). In 2013, MRSA was most frequently isolated from blood (68%); 9% (18/213) 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 1.5 in 2013. Sixteen percent (33/213) of cases reported in 2013 had no reported healthcare-associated risk factors in the year prior to infection. The overall median age was 60 years (range, <1 to 103); the median age was 52 (range, <1 to 86), 47 (<1 to 92), and 63 (range, 2 to 103) for hospital-onset, community-associated, and healthcare-associated community-onset, respectively. 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, 2 cases in 2010, 5 cases in 2011, and no cases in 2012. In 2013, 3 VISA cases were confirmed; 2 were MRSA and 1 was methicillin-susceptible SA (MSSA). Among all cases, 7 (41%) were male and the median age was 62 years (range, 27 to 62). The 3 2013 cases all reported a history of diabetes, end stage renal disease on hemodialysis, history of MRSA (MSSA for the MSSA case), and recent exposure to vancomycin. The MSSA isolate belonged to a clonal group associated

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with CA-MRSA (USA300) and the 2 MRSA isolates belonged to a clonal group associated with healthcare-associated MRSA types (USA100). All isolates were non-susceptible to daptomycin.

Mumps

During 2013, no cases of confirmed mumps were reported, but there were 3 cases of probable mumps. Beginning in 2012, national case reporting criteria for mumps were revised. Confirmed cases must be laboratory-confirmed by PCR, and present with clinically compatible illness defined as acute parotitis or other salivary gland swelling lasting at least 2 days; aseptic meningitis, encephalitis, hearing loss, orchitis, oophoritis, mastitis, or pancreatitis. Probable cases are also reportable and require a positive mumps IgM antibody test result and/or epidemiologic linkage to another probable or confirmed case. Additionally, probable cases must present with clinically compatible illness defined as acute parotitis or other salivary gland swelling lasting at least 2 days; orchitis, or oophoritis.

All 3 of the probable cases of mumps were confirmed by IgM serology, and none were epidemiologically linked, demonstrating that asymptomatic infections are occurring, and suggesting that mumps is underdiagnosed. Cases ranged from 5 to 53 years of age. Two cases were fully vaccinated (with documentation of vaccination), and 1 had an unknown vaccination history but self-reported a history of disease.

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 2013, 36 cases of neonatal sepsis (0.53 cases per 1,000 live births) were reported compared to 40 cases (0.58 cases per 1,000 live births) in 2012. Among these cases, all were identified via blood or cerebrospinal fluid (CSF). Most cases (86%) were culture-positive within the first 2 days of life. In 2013, group B Streptococcus was the most common bacteria (17), followed by *Escherichia coli* (9), *Streptococcus viridians* (5), and 1 each *Enterococcus* spp., *Haemophilus influenzae*, *Haemophilus parainfluenzae*, *Staphylococcus aureus*, and group A Streptococcus.

Pertussis

During 2013, 865 cases of pertussis (16 per 100,000 population) were reported. Laboratory confirmation was available for 647 (75%) cases, 22 (3%) of which were confirmed by culture and 644 (>99%) of which were confirmed by PCR. In addition to the laboratory-confirmed cases, 154 (18%) cases were epidemiologically linked to laboratory-confirmed cases, and 64 (7%) met the clinical case definition only. Four hundred ninety-six (57%) cases occurred in residents of the metropolitan area.

Paroxysmal coughing was the most commonly reported symptom. Eight hundred seventeen (94%) cases experienced paroxysmal coughing. One fourth (221, 26%) 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 325 (38%) of the cases. Infants and young children are at the highest risk for severe disease and complications. Pneumonia was diagnosed in 20 (2%) cases, 4 (20%) of whom were <1 year of age. Twenty-five (3%) cases were hospitalized; 12 (48%) of the hospitalized patients were <6 months of age.

Pertussis is increasingly recognized in older children and adults. During 2013, cases ranged in age from <1 month to 91 years. One hundred ninety-two (22%) cases occurred in adolescents 13-17 years of age, 192 (22%) in adults 18 years of age and older, 324 (37%) in children 5-12 years of age, 113 (13%) in children 6 months through 4 years of age, and 41 (5%) in infants <6 months of age. Age was missing for 3 (<1%) cases. 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 2013, 55 (6%) cases were reported in infants <1 year of age. A likely source of exposure was identified for 30 (55%) of those cases; 12 (40%) were infected by adults 18 years of age and older, 1 (3%) was infected by an adolescent 13-17 years of age, 15 (50%) were infected by a child <13 years of age, and 2 (7%) were of unknown age. For the 25 (45%) infant cases with no identified source of infection, the source was likely from outside the household. One death occurred in a 1-month old child who had no underlying conditions. The likely source was another child in the household. ACIP recommends vaccination of women at ≥20 weeks gestation during each pregnancy in an effort to protect young infants. Ensuring up-to-date vaccination of children, adolescents, and adults, especially those in contact with young children is also important. 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, particularly as the years since vaccination increase. 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 157 (18%) cases who were 7 months to 6 years of age, 119 (76%) were known to have received at least a primary series of 3 doses of DTP/DTaP vaccine prior to onset of illness; 38 (24%) received fewer than 3 doses and were considered preventable cases.

MDH reporting rules require clinical isolates of *Bordetella pertussis* be submitted to the PHL. Isolates for 18 of the 20 culture-confirmed cases were received and sub-typed by PFGE, with 9 distinct PFGE patterns identified. In 2013, no case-isolates of pertussis were tested in Minnesota for susceptibility to erythromycin, ampicillin, or trimethoprim-sulfamethoxazole. 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* isolates 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 may be useful for diagnosis in later phases of the disease; however, serological tests are not yet standardized and should be interpreted with caution.

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 begins to wane 3 years after completion of the primary series.

Rabies

Rabies is caused by the rabies virus, an enveloped RNA virus from the *Rhabdoviridae* family and *Lyssavirus* genus. In Minnesota, the reservoir species are skunks and bats. Dogs, cats, and horses are generally exposed through encounters with skunks. Vaccinating them for rabies provides a buffer between wildlife and people.

In 2013, 63 (2.6%) of 2,398 animals submitted for testing were positive (Figure 5). This is decreased from 2012, when 72 (2.9%) of 2,518 animals submitted tested positive, but within the expected range. The majority of positive animals in 2013 were bats (36/63 [57%]), followed by skunks (20 [32%]), cows (3 [5%]), horses (2 [3%]), cats (1 [2%]), and goats (1 [2%]). There were no human cases of rabies.

From 2003 to 2013, 682 (2.5%) of 26,890 animals tested positive for rabies. The median number of rabies positive animals identified annually was 63 (range, 39 to 94). From 2003 to 2013, 288/595 (48%) skunks, 49/663 (7%) cows, 264/7,360 (4%) bats, 40/8,456 (0.5%) cats, 28/7,406 (0.4%) dogs, and 0/875 raccoons that were submitted tested positive for rabies. Rabies in raccoons is rare in Minnesota: from 1988 to 2013, 3 raccoons tested positive for rabies; these occurred in 1989, 1990, and 1993.

Salmonellosis

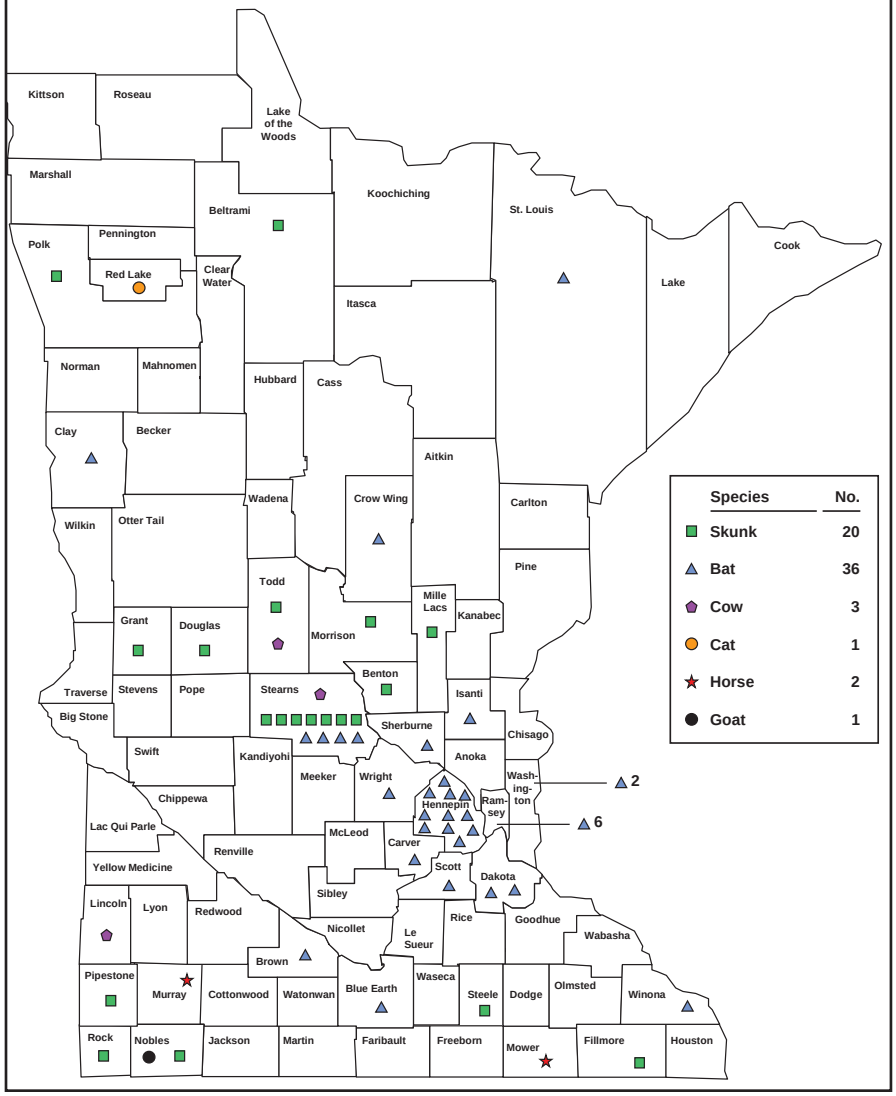
During 2013, 810 culture-confirmed cases of *Salmonella* infection (15.1 per 100,000 population) were reported. This represents a 16% increase from the median annual number of cases reported from 2003 to 2012 (median, 698 cases; range, 578 to 781 [Figure 3]), and the highest incidence since 1996. Of the 86 serotypes identified in 2013, 6 serotypes, *S*. Enteritidis (154), *S*. Typhimurium (143), *S*. I 4,[5],12:i:- (93), *S*. Newport (41), *S*. Saintpaul (31), and *S*. Infantis (29) accounted for 60% of cases. *Salmonella* was isolated from stool in 710 (88%) cases, blood in 50 (6%) cases, and urine in 45 (6%) cases. Other specimen sources included gallbladder, aortic stent graft, and various non-sterile sites.

Two hundred twenty-four (28%) cases were hospitalized due to their infection. One culture-confirmed *Salmonella* infection case died in 2013, a 57 year-old who died due to gastrointestinal bleeding 8 days after *Salmonella* was isolated from a stool specimen.

Of the 710 cases interviewed, 80 (11%) had traveled internationally during the week prior to their illness onset. There were 7 cases of *S*. Typhi infection; 3 had traveled to India, 1 to Mexico, and 1 to Denmark and the United Kingdom.

One hundred seven cases were part of 13 *Salmonella* outbreaks identified in 2013, including 5 cases that were part of two outbreaks in other states. Ten outbreaks involved foodborne transmission, one outbreak was due to animal contact, and the mode of transmission was not conclusive for two outbreaks. Four of the outbreaks involved cases in multiple states. The 13 outbreaks resulted in a median of 3 culture-confirmed cases per outbreak (range, 1 to 40 cases).

Figure 5. Rabid Animals by County, 2013 (n=63)



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From February through May, 10 cases with *S*. Saintpaul were part of a multi-state outbreak associated with cucumbers imported from Mexico. A total of 84 persons infected with the outbreak strain of *S*. Saintpaul were reported from 18 states.

From March through April, 3 cases with *S*. Infantis were associated with ducklings purchased from the same tractor supply store. The cases were part of a multi-state outbreak that resulted in 158 persons infected with *S*. Infantis, *S*. Lille, *S*. Newport, or *S*. Mbandaka in 30 states associated with live poultry from two national suppliers.

Also from March through April, 19 *S*. Typhimurium infections were associated with eating queso fresco (a fresh Mexican-style white cheese) made from unpasteurized milk by a person that sold it door-to-door and on a street corner in Minneapolis. Seven additional ill persons were identified but not tested. All were Hispanic.

In March and May, two children <1 year of age became ill with salmonellosis, one with S. Montevideo and one with S. Mbandaka, as part of an outbreak associated with eating tahini sesame paste. The product was recalled April 28 after S. Montevideo was found in the product during routine sampling. S. Mbandaka was found in further sampling of the same brand of tahini. A total of 16 persons infected with S. Montevideo or S. Mbandaka in nine states were part of the outbreak.

In May, 4 *S*. I 4,5,12:i:- infections were identified in Minnesota that were part of an outbreak at a restaurant in Las Vegas. Also in May, 1 *S*. Uganda infection in a Minnesota resident was part of an outbreak associated with a family gathering in Wisconsin.

In June, 6 illnesses, including 1 *S*. I 4,12:i:- infection, occurred among attendees of a family gathering. The likely vehicle was seedless watermelon; however, it was not determined if the watermelon was contaminated prior to purchase or during preparation or serving.

In June and July, 12 *S*. Newport cases in Minnesota were part of a multi-state outbreak that resulted in 37 cases in six states. Human isolates were resistant to ampicillin, amoxicillin/clavulanate, cefoxitin, ceftriaxone, cephalothin, chloramphenicol, streptomycin, sulfisoxazole, and tetracycline. The Minnesota cases were associated with consuming private kill beef, likely from a single farm. Leftover beef and liver from a case-household that purchased a whole cow from the implicated farm tested positive for the outbreak strain of *S*. Newport. In Wisconsin, cases were primarily associated with direct contact with cattle. A common source of cattle for the multi-state cases was not identified, but it is likely that this strain of *S*. Newport occurs widely in cattle herds in Wisconsin and elsewhere. A high proportion of the cases in Minnesota were Hmong.

In July, 7 *S*. Javiana cases associated with a sandwich restaurant in Northfield were identified. No specific menu item could be implicated, and the source of the contamination was not identified. The most plausible vehicle was a contaminated produce item.

In July, an outbreak associated with a gathering at Ham Lake resulted in 3 confirmed *S*. Livingstone cases and one additional ill person who was not tested. A goat from a live animal market was slaughtered and prepared on the day of the gathering, and the goat meat was most likely the vehicle.

In August, 2 cases of *S*. Enteritidis were identified among residents of an assisted living facility. Both cases had *Salmonella* isolated from blood, and 1 was hospitalized. The most plausible source of the outbreak was undercooked eggs sourced from a local farm. However, other routes of transmission or vehicles could not be ruled out.

One hundred nineteen illnesses were identified among persons who attended an Ecuadorian Festival in Minneapolis in August; *Salmonella* was isolated from 40 case stool specimens as well as from several leftover foods. Multiple *Salmonella* serotypes were identified among the cases: Typhimurium, Uganda, I 4,[5],12:i:-, Chailey, and Infantis. One case also was co-infected with *Campylobacter jejuni*. Most cases reported eating food from one booth that served roasted pork, guinea pig, pork tripe stuffed with vegetables, rice, potatoes, ceviche, and boiled corn (mote). While no food item was implicated as the original source of the *Salmonella*, several PFGE subtypes isolated from cases and leftover foods previously have been associated with pork/pigs, suggesting that the whole pigs or pork tripe were most likely the original source of the *Salmonella*. The environmental health investigation identified evidence of cross-contamination between foods and potential time-temperature abuse of foods by the vendor, likely resulting in the high number of foods that were culture-positive for *Salmonella* and the high number of illnesses.

In September, an outbreak of *S*. Saintpaul infections associated with a prison resulted in 3 confirmed cases and 10 additional illnesses. Neither the source of the contamination nor the vehicle of transmission were identified. Several structural and cleanliness issues, as well as a significant rodent infestation in the prison's kitchen, were identified and may have contributed to foodborne transmission. However, other routes of transmission could not be ruled out.

Sexually Transmitted Diseases (STDs)

Surveillance for gonorrhea and chlamydia are monitored through a passive surveillance system by receiving patient case and laboratory reports. 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 2013, 18,724 chlamydia cases (353 per 100,000 population) were reported, representing a 4% increase from 2012 (Table 3).

Adolescents and young adults are at highest risk for acquiring chlamydia infection (Table 4). The chlamydia rate is highest among 20 to 24-year-olds (2,142 per 100,000), with the next highest rate among 15 to 19-year-olds (1,394 per 100,000). The incidence of chlamydia among adults 25 to 29 years of age (843 per 100,000) is considerably lower but has continued to increase in recent years. The chlamydia rate among females (484 per 100,000) is more than twice the rate among males (220 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 (1,517 per 100,000) is 10 times higher than the rate among whites (158 per 100,000). Although blacks comprise approximately 5% of Minnesota's population, they account for 23% of reported chlamydia cases. Rates among Asian/Pacific Islanders (289 per 100,000), Hispanics (379 per 100,000), and American Indians (703 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 (933 per 100,000) and St. Paul (834 per 100,000). While there was an overall increase of 4% across the state in 2013, the greatest increase for chlamydia was seen in the Greater Minnesota area with an increase of 7%. For the first time ever, Minnesota had at least 3 chlamydia cases in every county in the state in 2013.

Gonorrhea

Gonorrhea, caused by *Neisseria gonorrhoeae*, is the second most commonly reported STD in Minnesota. In 2013, 3,872 cases (73 per 100,000 population) were reported, representing a 26% increase from 2012. This is the highest reported rate of gonorrhea in the last decade (Table 3).

Adolescents and young adults are at greatest risk for gonorrhea (Table 4), with incidence rates of 267 per 100,000 among 15 to 19-year-olds, 360 per 100,000 among 20 to 24-year olds, and 177 per 100,000 among 25 to 29-year-olds. Gonorrhea rates for males (70 per 100,000) and females (76 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 (611 per 100,000) is 26.5 times higher than the rate among whites (23 per 100,000). Rates among Asian/Pacific Islanders (32 per 100,000), Hispanics (53 per 100,000), and American Indians (165 per 100,000) are up to seven times higher than among whites.

Gonorrhea rates are highest in the cities of Minneapolis and St. Paul (Table 4). The incidence in Minneapolis (359 per 100,000) is over 1.5 times higher than the rate in St. Paul (230 per 100,000), seven times higher than the rate in the suburban metropolitan area (49 per 100,000), and 15 times higher than the rate in Greater Minnesota (23 per 100,000). Geographically in 2013, Minneapolis had the largest increase in cases at 28% and Greater Minnesota had a 27% increase in cases.

The emergence of quinolone-resistant *N. gonorrhoeae* (QRNG) in recent

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Table 3. Number of Cases and Rates (per 100,000 persons) of Chlamydia, Gonorrhea, Syphilis and Chancroid, 2009-2013

Disease	2009		2010		2011		2012		2013	
	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
Chlamydia	14,369	272	15,509	292	16,898	319	18,048	340	18,724	353
Gonorrhea	2,328	44	2,149	41	2,283	43	3,082	58	3,872	73
Syphilis, Total	215	4.1	351	6.6	366	6.9	335	6.3	537	10.1
Primary/Secondary	71	1.3	150	2.8	139	2.6	118	2.2	193	3.6
Early latent	46	0.9	74	1.4	121	2.3	96	1.8	139	2.6
Late latent	97	1.8	126	2.4	106	2.0	120	2.3	205	3.9
Other*	0		0	0.0	0	0.0	0	0.0	0	0.0
Congenital**	1	1.5	1	1.5	0	0.0	1	1.5	0	0
Chancroid	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, 2013

Demographic Group	Chlamydia		Gonorrhea		Syphilis	
	No.	Rate	No.	Rate	No.	Rate
Total	18,724	353	3,872	73	193	3.6
Residence*						
Minneapolis	3,570	933	1,374	359	100	26.1
St. Paul	2,377	834	657	230	20	7.0
Suburban**	5,355	245	1,080	49	55	2.5
Greater Minnesota	6,000	244	567	23	18	0.7
Age						
<15 years	141	40	40	4	0	0.0
15-19 years	5,126	1,394	983	267	2	0.5
20-24 years	7,617	2,142	1,279	360	33	9.3
25-29 years	3,141	843	659	177	42	11.3
30-34 years	1,313	383	382	111	27	7.9
35-44 years	999	147	329	48	41	6.0
≥45 years	887	42	200	9	48	2.3
Gender						
Male	5,791	220	1,835	70	178	6.8
Female	12,932	484	2,036	76	12	0.4
Transgender^^	1	-	1	-	3	-
Race^/Ethnicity						
White	7,317	158	1,065	23	111	2.5
Black	4,263	1,517	1,718	611	48	17.5
American Indian	473	703	111	182	2	3.3
Asian/PI	638	289	70	32	8	3.7
Other^^	385	-	22	-	4	-
Unknown^^	5,666	-	886	-	20	-
Hispanic^^^	949	379	132	53	9	3.6

* Residence information missing for 1422 cases of chlamydia and 194 cases of gonorrhea.

** Suburban is defined as the 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.

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. Additionally, the CDC changed the treatment guidelines for gonococcal infections in August 2012. CDC no longer recommends cefixime at any dose as a first-line regimen for treatment of gonococcal infections. If cefixime is used as an alternative agent, then the patient should return in 1 week for a test-of-cure at the site of infection.

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 2013, there were 193 cases of primary/secondary syphilis in Minnesota (3.6 cases per 100,000 persons). This represents an increase of 64% compared to the 118 cases (2.2 per 100,000 population) reported in 2012.

Early Syphilis

In 2013, the number of early syphilis cases increased by 55%, with 332 cases occurring compared to 214 cases in 2012. The incidence remains highly concentrated among MSM. Of the early syphilis cases in 2013, 298 (90%) occurred among men; 261 (88%) of these men reported having sex with other men; 46% of the MSM diagnosed with early syphilis were co-infected with HIV.

Congenital Syphilis

There were no cases of congenital syphilis reported in Minnesota in 2013.

Chancroid

Chancroid continues to be very rare in Minnesota. No cases were reported in 2013. The last case was reported in 1999.

Shigellosis

During 2013, 134 culture-confirmed cases of *Shigella* infection (2.5 per 100,000 population) were reported. This represents a 66% decrease from the 391 cases reported in 2012, but is 35% higher than the annual number of cases reported during 2003-2012 (median, 99.5 per year; range, 66 to 391 [Figure 3]). *S. sonnei* accounted for 86 (64%) cases, *S. flexneri* for 42 (31%) cases, and *S. boydii* for 3 (2%) cases. The species was not identified in 3 (2%) cases. There were no *S. dysenteriae* infections reported in 2013. Cases ranged in age from 1 month to 94 years (median, 24.5 years). Twenty-six percent of cases were ≤5 years of age. Thirty-four (25%) cases were hospitalized. No cases died. Sixty percent of cases reported either non-White race (65 of 122 cases) or Hispanic ethnicity (24 of 116 cases). Of the 110 cases for which travel information was available, 17 (16%) travelled internationally (7 of 72 [10%] *S. sonnei*, 8 of 33 [24%] *S. flexneri*, and 2 of 3 [67%] *S. boydii*). Seventy-one percent of cases resided in the metropolitan area, including 51% in Hennepin County and 12% in Ramsey County.

Seventeen (13%) cases were part of four *Shigella* outbreaks identified in 2013 (median, 4.5 cases per outbreak; range 2 to 6). Three person-to-person outbreaks were caused by *S. sonnei*: one in a childcare setting, one at a woman's shelter, and one associated with a private party. One community outbreak in Minneapolis of *S. flexneri* infections was detected among men who have sex with men.

Approximately 25% of *Shigella* isolates received at MDH are tested for antimicrobial resistance. Thirty-seven isolates were tested in 2013; 70% (26 isolates) were resistant to trimethoprim-sulfamethoxazole and 22% (8 isolates) were resistant to ampicillin.

Streptococcal Invasive Disease - Group A

As part of EIP, MDH has 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 usual sterile site such as blood, cerebrospinal fluid, or from a wound when accompanied with necrotizing fasciitis or streptococcal toxic shock syndrome (STSS).

Two hundred nine cases of invasive GAS disease (3.9 cases per 100,000 population), including 14 deaths, were reported in 2013, compared to 169 cases and 18 deaths in 2012. Ages of cases ranged from 0 to 98 years (median, 53 years). Fifty-three percent of cases were residents of the metropolitan area. Eighty-three (40%) cases had cellulitis, 43 (21%) had bacteremia without another focus of infection 30 (14%) had septic arthritis and/or osteomyelitis, 25 (12%) cases had an abscess, 23 (11%) cases had septic shock, and 22 (11%) had necrotizing fasciitis. Twelve (6%) cases were residents of long-term care facilities. Eight facilities had only 1 case, 2 facilities had 2 GAS cases each.

The 14 deaths included 4 cases of bacteremia without another focus of infection, 3 cases septic shock, 2 cases of necrotizing fasciitis, 2 cases of cellulitis, and 1 case each of pneumonia and pleural effusion/pulmonary edema. One case had multiple syndromes including necrotizing fasciitis and septic shock. The deaths occurred in persons ranging in age from 37 to 88 years. One fatal case had no underlying medical conditions reported. Of the 13 cases where underlying medical condition was known the most frequently reported were diabetes (11), atherosclerotic cardiovascular disease (4), chronic renal insufficiency (3), COPD (3), and solid organ malignancy (3).

Streptococcal Invasive Disease - Group B (GBS)

Five hundred ninety-five cases of invasive group B streptococcal (GBS) disease (11.1 per 100,000 population), including 22 deaths, were reported in 2013. This was the largest number of GBS cases reported since surveillance was initiated in 1995 as part of EIP; the second largest was 564 cases, reported in 2012.

By age group, annual incidence was highest among infants <1 year of age (44.4 per 100,000 population), and persons ≥70 years of age (37.9 per 100,000). Thirteen (59%) of the 22 deaths were among persons ≥65 years of age. Fifty-nine percent of cases were residents of the metropolitan area. Bacteremia without a focus of infection occurred most frequently (30% of infections), followed by cellulitis (23%), osteomyelitis (18%), septic arthritis (9%), pneumonia (5%), and meningitis (1%). The majority (61%) of cases had GBS isolated from blood; other isolate sites included bone (20%), and joint fluid (12%).

Twenty-nine cases were infants or pregnant women (maternal cases), compared to 32 cases in 2012. Seventeen infants developed early-onset disease (occurring within 6 days of birth [0.2 cases per 1,000 live births]), and 12 infants developed late-onset disease (occurring at 7 to 89 days of age [0.2 cases per 1,000 live births]). Ten stillbirth/spontaneous abortions were associated with the 12 maternal GBS infections.

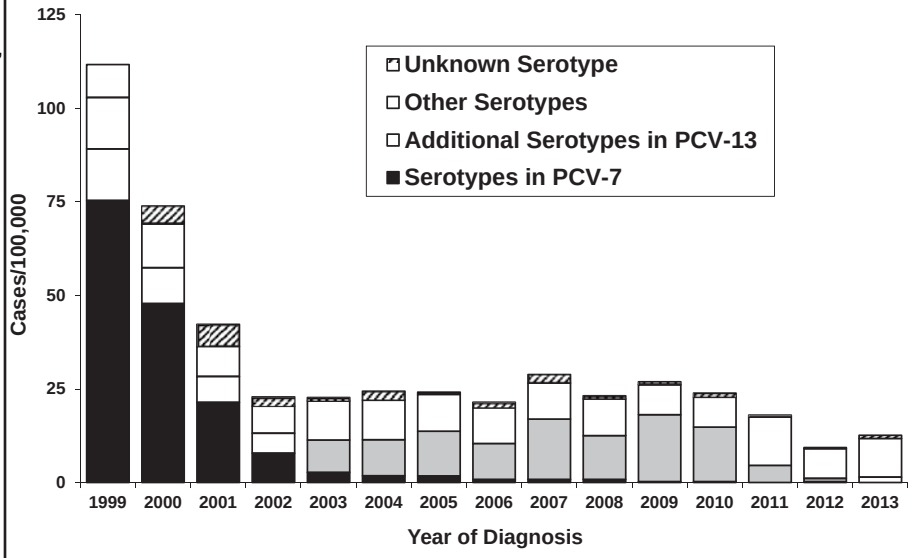
Since 2002, there has been a recommendation for universal prenatal screening of all pregnant women at 35 to 37 weeks gestation. In light of this, we reviewed the maternal charts for all early-onset cases reported in 2013. Overall, 11 of the 17 women who delivered GBS-positive infants underwent prenatal screening for GBS. Of these, 2 tested positive, and 9 negative. One of the six women who did not receive prenatal screening was screened upon admission to the hospital and prior to delivery. Among the 17 women who delivered GBS-infected infants, six received intrapartum antimicrobial prophylaxis (IAP). One of the two women with a positive GBS screen received IAP.

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 2013, 542 (10.1 per 100,000) cases of invasive pneumococcal disease were reported. By age group, annual incidence rates per 100,000 were 12.6 cases among children aged 0-4 years, 2.2 cases among children and adults aged 5-39 years, 10.4 cases among adults 40-64 years, and 34.9 cases among adults aged 65 years and older.

In 2013, pneumonia occurred most frequently (66% of infections), followed by bacteremia without another focus of infection (23%), and pneumococcal meningitis (4%). Fifty-eight (11%) cases died. Health histories were available for 51 of the 58 cases who died. Of these, 45 had an underlying health condition reported. The conditions most frequently reported were atherosclerotic cardiovascular disease (16), chronic obstructive pulmonary disease (9), diabetes (14), heart failure/congestive heart failure (11), and renal failure/ dialysis (5).

Figure 6. Invasive Pneumococcal Disease Incidence Among Children <5 Years of Age, by Year and Serotype Group, Metropolitan Area, 1999-2001; Minnesota, 2002-2013



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)

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 of age in the metropolitan area was 111.7 cases/100,000. Over the years 2000-2002 there was a major downward trend in incidence in this age group (Figure 6). Rates in each of the subsequent 8 years were level or somewhat higher, although there has not been a continuing upward trend (Figure 6). 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 6).

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). From 2007 to 2010, 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 6). Since 2011, the majority of invasive pneumococcal disease cases among children <5 years of age have been caused by serotypes not included in PCV-13 (Figure 6). In 2013, 20% of cases occurring among Minnesotans of all ages, with isolates available for testing, were caused by 3 of the new PCV-13-included serotypes: 3 (10%), and 7F (6%), 19A (4%).

Of the 518 isolates submitted for 2013 cases, 90 (17%) isolates were resistant to penicillin using meningitis breakpoints. Using non-meningitis breakpoints, 3 (<1%) of 518 isolates were resistant to penicillin and 13 (3%) 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 75 (14%) isolates.

Tetanus

One case of tetanus was reported during 2013. The case occurred in a fully vaccinated 62-year-old white female. She presented to an ED with cellulitis about 3 weeks after sustaining an abrasion-type wound on the hand while moving a bike in her garage. The wound was debrided and the patient received antibiotic therapy. She was then admitted to a hospital facility for pain, neck stiffness and muscle spasms. She received tetanus immune globulin (TIG) and Tdap 10-14 days after symptom onset. She was hospitalized a total of 23 days at two different facilities and spent time in an ICU, though no mechanical ventilation was required.

Toxic Shock Syndrome

In 2013, 14 cases of suspect, probable, or confirmed staphylococcal toxic shock

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syndrome (TSS) were reported. Of the reported cases, 64% (9/14) were female, and the median age was 14 years (range, 1 to 57 years). Five cases were menstrual-associated with tampon use, 3 were associated with wound infection, 1 was post-partum, 1 was associated with pneumonia, and 4 were unknown.

Staphylococcal toxic shock syndrome with isolate submission (if isolated) is reportable to MDH within 1 working day. We use 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/mm^3; 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).

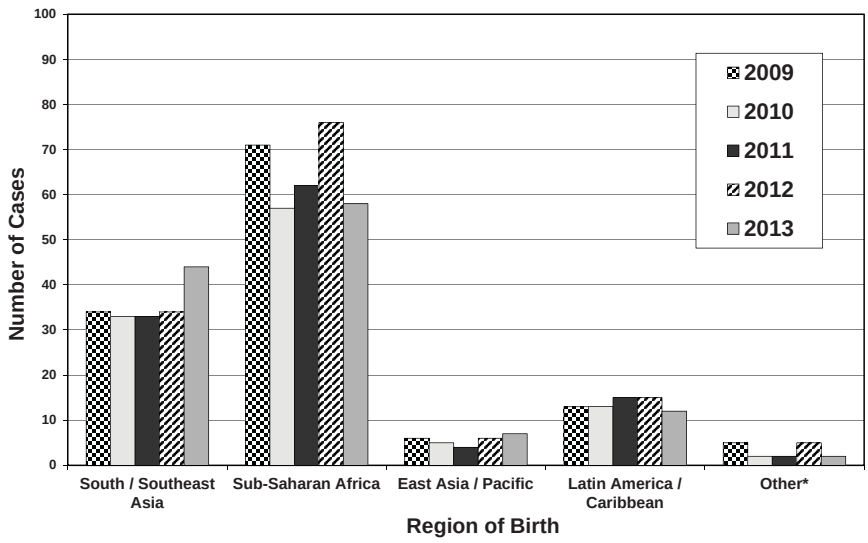
Tuberculosis

In 2013, 151 cases of active tuberculosis (TB) disease (2.8 cases per 100,000 population) were reported. This represents a 7% decrease in both the number of cases (162) and the incidence rate (3.0) compared to 2012, as well as a 37% decrease in the number of cases since 2007, when the highest number (238 cases) in the past decade was reported. As seen in most years, Minnesota's TB incidence rate in 2013 was below the national rate of 3.0 cases per 100,000 population. Two (1%) of the cases died due to TB or TB-related causes.

Twenty-one (24%) of the state's 87 counties reported at least 1 new TB case in 2013. The majority (73%) of cases occurred in the metropolitan area, primarily in Hennepin (34%) and Ramsey (26%) Counties. Thirteen percent of cases in 2013 were reported in the other five metropolitan counties (i.e., Anoka, Carver, Dakota, Scott, and Washington). The remaining 27% of cases were reported from outside the metropolitan area, which is higher than in previous years. Among metropolitan area counties, the highest TB incidence rate in 2013 was reported in Ramsey County (7.5 cases per 100,000 population), followed by Hennepin County (4.3 cases per 100,000), and Anoka County (2.4 cases per 100,000 population). The TB incidence rate for all Greater Minnesota counties combined was 1.7 per 100,000 population.

The majority (82%) of cases in 2013 were identified as a result of individuals seeking medical care due to symptoms of TB disease. Various targeted public health interventions identified a portion of the remaining cases. Such methods of case identification are considered high priority, core TB prevention and control activities; they include TB contact investigations (3%), domestic refugee health assessments (1%), and follow-up evaluations resulting from abnormal findings on pre-immigration exams performed overseas (1%). An additional 10% were identified through a variety of other means (e.g., occupational screening). Four (3%) cases were diagnosed with active TB disease while being evaluated for another medical condition.

Figure 7. Foreign-Born Tuberculosis Cases by Region of Birth and Year of Report, 2009 – 2013



**"Other" includes: Eastern Europe, North Africa/Middle East, and Western Europe*

The incidence of TB disease is disproportionately high in racial minorities in the United States and in Minnesota. In 2013, 16 TB cases occurred among non-Hispanic whites (incidence rate: 0.4/100,000 population). In contrast, 60 cases occurred among blacks (incidence rate: 18.1/100,000), 55 among Asians (incidence rate: 21.9/100,000), and 4 among American Indians (incidence rate: 5.0/100,000). The vast majority of black cases (95%) and Asian cases (95%) reported in Minnesota in 2013 were foreign-born.

The most distinguishing characteristic of TB disease in Minnesota continues to be the large proportion of cases occurring among persons born outside the United States. Eighty-one percent of cases reported in 2013 occurred among foreign-born persons. In contrast, 65% of TB cases reported nationally in 2013 were foreign-born. The 123 foreign-born TB cases reported in Minnesota represented 23 different countries of birth; the most common region of birth among these patients was sub-Saharan Africa (47% of foreign-born cases), followed by South/Southeast Asia (36%), and Latin America (including the Caribbean) (10%) (Figure 7). All 6 U.S.-born pediatric (<15 years of age) cases had at least one foreign-born parent. The ethnic diversity among foreign-born TB cases in Minnesota reflects the unique and constantly changing demographics of immigrants and other foreign-born populations arriving in the state.

Among the foreign-born TB cases reported during 2013, 14% were diagnosed within the first 12 months after arriving in the United States, and an additional 14% were diagnosed 1 to 2 years after their arrival. These cases most likely acquired TB infection prior to immigrating and started progressing to active TB disease shortly after arrival. Of the 11 TB cases ≥15 years of age who arrived as immigrants or refugees and diagnosed in Minnesota within 12 months of arriving in the United States, only 2 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.

Fifty-eight percent of Minnesota cases reported had TB disease exclusively in the lungs, or pulmonary TB. Another 7% had both pulmonary and extrapulmonary sites of disease. Almost half (46%) of foreign-born and 29% of U.S.-born TB cases had at least one extrapulmonary site of disease (including those who also had pulmonary disease). Among cases with an extrapulmonary site of disease, the most common sites were lymphatic (45%), followed by bone/joint (23%), and pleural (9%).

Aside from foreign-born persons, individuals in other high risk groups comprise a smaller proportion of the cases in Minnesota. Among cases reported in 2013, 23% 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). Following the presence of these underlying medical conditions, the next most common risk factor was substance abuse (including alcohol abuse and/or injection and non-injection drug use), with 6% of TB cases reported in 2013 having a history of substance abuse during the 12 months prior to their TB diagnosis. Four (3%) were co-infected with HIV. The percentage of new TB cases with HIV co-infection in Minnesota remains lower than that reported nationally (7%). Other high risk groups accounting for the remainder of cases reported in Minnesota included homeless persons (3%) and residents of long-term care facilities (1%).

In 2013, of 113 culture-confirmed TB cases with drug susceptibility results available, 24 (21%) were resistant to at least one first-line anti-TB drug (i.e., isoniazid (INH), rifampin, pyrazinamide, or ethambutol), including 13 (12%) cases resistant to INH. There were no cases of multidrug-resistant TB (MDR-TB, or resistance to at least INH and rifampin) reported in 2013. In comparison, 19% of culture-confirmed cases in 2012 with susceptibility results available were resistant to at least one first-line anti-TB drug, 10% were resistant to INH, and 1 (0.8%) had MDR-TB.

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, MDH began Medical Examiner (ME) Infectious Deaths Surveillance (known as MED-X) to evaluate all ME cases for infectious-related deaths. MEs report explained and unexplained cases. Unexplained deaths in previously healthy individuals <50 years of age are included regardless of infectious hallmarks; this is predominantly represented by Sudden Unexplained Infant Deaths. 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 70 cases that met criteria for UNEX surveillance (58 deaths and 12 critical illnesses) in 2013, compared to 82 cases in 2011. Of the 70, 61 (88%) were reported by providers, 8 (12%) were found by death certificate review, and 1 (2%) were found through other reporting methods. Twenty-nine (41%) cases presented with respiratory symptoms; 11 (16%) with neurologic symptoms; 6 (9%) with cardiac symptoms; 19 (28%) with sudden unexpected death; 2 (3%) with shock/sepsis; 2 (3%) with an illness that did not fit a defined syndrome; 1 (1%) with gastrointestinal illness. The age of cases ranged from newborn to 93 years. The median age was 16 years among 61 reported cases, and 39 years among 9 non-reported cases found through active surveillance. Forty percent resided in the metropolitan area and 54% were male.

There were 247 MED-X cases in 2013; 55 of these also met UNEX criteria. The median age of the cases was 45 years, and 57% were male. There were 147 (60%) cases found through death certificate review. MEs reported 100 (40%) cases. The most common syndrome was pneumonia/upper respiratory infection (n=86 [35%]). Of the 247 cases, 69 (28%) were confirmed to have had an infectious cause, 122 (49%) had possible infectious causes, and 55 (22%) were non-infectious or unknown cause.

There were 129 cases that had specimens tested at the PHL and/or the IDPB. Forty-five cases had pathogens identified as confirmed, probable, or possible cause of illness, including 35 UNEX cases (Table 5). Among 40 unexplained deaths occurring in those <50 years of age without any immunocompromising conditions, UNEX helped to identify the pathogen(s) involved in 17 (43%) cases. ME surveillance detected an additional 23 cases with pathogens identified by MEs as the cause of death (Table 5). Cases with pathogens of public health importance detected included a 91 year-old female who presented with slurred speech, head and neck pain and had a history of an epidural injection known to be contaminated. CSF PCR testing done at the PHL identified *Streptococcus salivarius* which indicated improper use of PPE during the procedure rather than infection from a contaminated product. The first documented case of

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Table 5. UNEX/MED-X Pathogens Identified as Confirmed, Probable, or Possible Cause of Illness, 2013*

Pathogen Identified	UNEX(n=35)	MED-X (n=23)**
Adenovirus	5	0
Candida albicans	0	1
Citrobacter freundii	0	1
Clostridium perfringens	1	0
Coxsackievirus	1	0
Cytomegalovirus	2	0
Ebstein-Barr Virus	0	1
Echovirus 11	1	0
Enterovirus	1	0
Escherichia coli	0	2
Fusobacterium nucleatum	1	0
Group B Streptococcus	2	3
Haemophilus influenzae	0	1
Haemophilus parainfluenzae	0	1
Histoplasma capsulatum	1	0
Influenza A virus (no hemagglutinin typing information available)	4	0
Influenza A-H3	2	0
Influenza A-H1	2	0
Influenza B virus	2	0
Jamestown Canyon virus	1	0
Klebsiella pneumoniae	0	1
Lactobacillus	0	1
Legionella pneumophila	1	0
Mycoplasma pneumoniae	1	0
Neisseria meningitidis	0	0
Paraechovirus	1	0
Parainfluenza 3 virus	1	0
Picornavirus	1	0
Pseudomonas spp.	1	1
Respiratory syncytial virus	5	0
Staphylococcus aureus	1	3
Staphylococcus aureus-MRSA	0	1
Staphylococcus spp.	0	0
Streptococcus spp.	0	3
Streptococcus anginosus	0	1
Streptococcus pneumoniae	5	6
Streptococcus salivarius	1	0
Streptococcus viridans	2	0

* 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.

Jamestown Canyon virus in Minnesota was detected in a 49 year-old male who presented with back and shoulder pain that progressed to seizures. PCR serum testing at CDC detected Jamestown canyon virus. Finally, UNEX surveillance was able to determine the etiologic agent in the death of a 48 year-old female who died at home from pneumonia. Testing at PHL and CDC detected *Legionella pneumophila* and a public health investigation was initiated.

Varicella - Zoster Virus

Case-based surveillance for varicella was implemented January 1, 2013. Due to declining disease incidence in the post-vaccination era, the sentinel school program in place from 2006 through 2012 was no longer effective and was discontinued. During 2013, 478 cases (9 per 100,000 population) were reported. Two hundred seventy-four cases (57%) were reported from the metropolitan area. Cases ranged from 13 days to 63 years of age. Fifty-three (11%) cases were <1 year of age, 167 (35%) were 1-5 years of age, 167 (35%) were 6-12 years of age, 32 (7%) were 13-17 years of age, and 59 (12%) were >18 years of age.

Varicella cases continue to be associated with outbreaks, and in 2013, 72 cases (15%) were outbreak-associated. Six schools reported outbreaks in 2013. The largest outbreak occurred in a school with grades pre-K to 12 and included 22 students. Prior to the outbreak, 6.4% of the students in the school were unvaccinated for varicella and had no reported varicella disease history. Among students with no previous history of disease, the attack rate was 56% for unvaccinated students, 1% for students with 1 dose of varicella vaccine, and <1% for students with 2 doses of varicella vaccine. Of the 15 unvaccinated cases for which rash severity information was available, 2 were classified as mild (<50 lesions), 8 as moderate (50-249 lesions), 3 as moderately severe (250-499 lesions), and 2 as severe (>500 lesions). Both vaccinated cases had mild disease (<50 lesions).

Varicella tends to be more severe in individuals <1 year of age and in individuals ≥13 years of age. During 2013, 4 cases were hospitalized; no deaths were reported. Of the hospitalized cases, 1 was <1 year of age, 1 was 5 years of age, and 2 were ≥13 years of age with a total age range from 13 days to 51 years. One case was admitted for observation and 3 had complications including mild hepatitis, metabolic encephalitis, high fever, dehydration, and severe pain requiring management with morphine. Only 2 of the hospitalized cases had underlying conditions; 1 was immunosuppressed due to chemotherapy for cancer, and 1 had underlying medical conditions of pancreatitis and liver disease. None of the hospitalized cases had received varicella-containing vaccine: 1 was born outside of the United States, 1 was underage for the vaccine, and 2 were adults who were never offered the vaccine.

Varicella is often identified by parents/guardians, as opposed to provider-diagnosed. Of the 457 cases for which an interview could be completed: 268 (59%) had visited a health care provider, 48 (10%) had consulted a provider by telephone, 8 (2%) had been identified by school health personnel, and for 133 (29%) no consult was obtained. Laboratory confirmation is recommended when the rash presents atypically. Testing is by PCR. Of the 424 cases for which test information was

known, 82 (19%) had laboratory testing performed. Testing was more frequently performed in cases ≥18 years of age, of which 46 (85%) were tested.

Although vaccine coverage continues to increase, students who will be in grades 5-6 and grade 12 during the 2014-2015 school year may need a second dose of varicella vaccine. These students were beyond kindergarten and 7th grade at the time when the vaccine school requirement was implemented in 2010. Children in these grades should be evaluated to determine whether they have had a second dose of varicella vaccine, particularly given the increased severity of varicella in older children and adults. Since 2006, the U.S. Advisory Committee on Immunization Practices has recommended 2 doses of varicella vaccine for children. Older adolescents and adults should also be evaluated for immunity (history of varicella disease or 2 doses of vaccine at least 4 weeks apart) and offered vaccine if indicated.

All zoster cases in children <18 years of age are reportable. Cases may be reported by school health personnel, childcare facilities, or healthcare providers. During 2013, cases were reported from 69 schools in 32 counties. Ages ranged from 6 to17 years (median, 13 years). Sixty-two (89%) of 76 cases reported by schools were provider-diagnosed. Additional cases in children <18 years of age were reported during 2013 by childcare sites (5 cases) and by providers (26 cases). Overall, of 86 cases for whom both disease history and vaccination history were available, 44 (51%) had a history of disease but had not received vaccine, 14 (16%) had no history of disease but had received 1-2 doses of vaccine, 20 (23%) had a history of disease and had received 1-2 doses of vaccine, and 8 (9.3%) had no known history of disease or vaccination.

Zoster with dissemination or complications (other than post-herpetic neuralgia) in persons of any age is also reportable. During 2013, 55 zoster cases with dissemination or complications were reported; 50 were hospitalized. Thirty-two cases were 60 years of age or older, 16 were 30 to 59 years of age, and 7 were <30 years of age. Thirty (55%) had underlying conditions or were being treated with immunosuppressive drugs. Twenty-seven cases had disseminated disease, 13 had cellulitis or other bacterial superinfection,11 had meningitis, 8 had encephalitis or meningoencephalitis, 2 had pneumonia, and 1 had myelitis. One case with pneumonia and suspected bacterial superinfection and 1 case with meningoencephalitis subsequently died.

Viral Hepatitis A

In 2013, 32 cases of hepatitis A (HAV) (0.6 per 100,000 population) were reported. Seventeen (53%) cases were residents of the metropolitan area, including 12 residents of Hennepin or Ramsey Counties. Seventeen cases were male. Cases ranged in age from 11 to 80 years (median, 43 years). Race was known for 27 cases; of those 25 were white, 1 was Asian, and 1 was black. Hispanic ethnicity was reported for 5 cases (1.9 per 100,000).

A risk factor was identified for 11 (34%) of the cases, 2 of whom had known exposure to a confirmed hepatitis A case, representing missed opportunities to administer immune globulin or HAV vaccine. Of the remaining 9 cases with a risk factor identified, all were associated with travel. Of these, 8 traveled to Mexico, Central, or South America. No outbreaks of hepatitis A occurred in 2013.

Viral Hepatitis B

In 2013, 19 cases of acute hepatitis B virus (HBV) infection (0.4 per 100,000 population) were reported. In 2012, the case definition for acute hepatitis B was revised to include laboratory confirmed asymptomatic acute cases. None of the 19 cases of acute hepatitis B were asymptomatic infections.

One hundred sixty-six reports of newly identified cases of confirmed chronic HBV infection were also reported. 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. A total of 21,585 persons are estimated to be alive and living in Minnesota with chronic HBV. The median age of chronic HBV cases in Minnesota is 43 years.

Acute cases ranged in age from 19 to 69 years (median, 42 years). Fourteen (74%) cases were residents of the metropolitan area, including 8 (42%) in Hennepin County and 4 (21%) in Ramsey County. Fifteen (79%) cases were male, and 9 (47%) were adolescents or young adults between 13 - 39 years of age. Thirteen (68%) were white, 3 (16%) were Asian, 2 (11%) were black, and 1 (5%) was American Indian. No cases were known to be of Hispanic ethnicity. Incidence rates were higher among American Indians (1.3 per 100,000), Asians (1.2 per 100,000), and blacks (0.6 per 100,000) than among non-Hispanic whites (0.3 per 100,000).

In addition to the 19 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 2012. 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 a public health perinatal hepatitis B prevention program is demonstrated by an additional 332 infants born to HBV-infected women during 2012 who had post-serologic testing demonstrating no infection.

Viral Hepatitis C

In 2013, 47 cases of acute hepatitis C virus (HCV) infection (0.9 per 100,000) were reported. In 2012, the case definition for acute hepatitis C changed to include documented asymptomatic seroconversion. Of the 47 acute cases, 19 (40%) were asymptomatic, laboratory-confirmed acute HCV infections.

Twenty-eight (60%) cases resided in Greater Minnesota. The median age of cases was 32 years (range, 17 to 64 years). Twenty-nine (62%) were male. Race was known for 38 cases; of those, 33 (87%) were white, 3 (8%) were American Indian, 1 (3%) was black, and 1 (3%) was multi-racial. Hispanic ethnicity was reported for 1 (3%) case.

In addition, 1,906 newly identified anti-HCV antibody-positive or HCV PCR-positive persons were reported, the vast majority of whom are chronically infected. A total of 40,943 persons were estimated to be alive and living in Minnesota with past or present HCV infection by the end of 2013. The median age of these cases is 56 years. Because most cases are asymptomatic, medical providers are encouraged to consider each patient's risk for HCV infection to determine the need for testing.

Antimicrobial Susceptibilities of Selected Pathogens, 2013

On the following pages is the *Antimicrobial Susceptibilities of Selected Pathogens, 2013*, a compilation of antimicrobial susceptibilities of selected pathogens submitted to MDH during 2012 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."

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, IDEPC, PO Box 64975, St. Paul, MN 55164 or by calling 651-201-5414.

Antimicrobial Susceptibilities of Selected Pathogens, 2013

MINNESOTA MDH DEPARTMENT OF HEALTH

Sampling Methodology
* all isolates tested
† ~10% sample of statewide isolates received at MDH
‡ ~20% sample of statewide isolates received at MDH
§ ~25% sample of statewide isolates received at MDH
‖ isolates from a normally sterile site

		Campylobacter spp.[1‡]	*Salmonella enterica* (non-typhoidal)[2†]	*Shigella* spp.[3§]	*Neisseria gonorrhoeae*[4]	*Neisseria meningitidis*[5*‖]	Group A *Streptococcus*[6*‖]	Group B *Streptococcus*[7*‖]	*Streptococcus pneumoniae*[8*‖]	*Mycobacterium tuberculosis*[10*]
Number of Isolates Tested		159	80	37	98	12	197	530	518	113
		% Susceptible								
ß-lactam antibiotics	amoxicillin								95	
	ampicillin		85	78		100	100	100		
	penicillin				0	92	100	100	83#/97¶	
	cefixime				100					
	cefpodoxime									
	cefuroxime sodium								92	
	cefotaxime						100	100	93#/97¶	
	ceftriaxone		95	100	100	100			93#/97¶	
	meropenem					100			93	
Other antibiotics	ciprofloxacin	74[1]	100	97	82	100				
	levofloxacin					100	100	99	99	
	azithromycin	96			99	100				
	erythromycin	96					87	47	65	
	clindamycin						96/87[6]	67/57[7]	94	
	chloramphenicol		96	84					99	
	gentamicin	99								
	spectinomycin				100					
	tetracycline	30			26		89		91	
	trimethoprim/sulfamethoxazole (TMP/SMX)		99	30					82	
	vancomycin						100	100	100	
TB antibiotics	ethambutol									96
	isoniazid									88
	pyrazinamide									87
	rifampin					100				100

Trends, Comments, and Other Pathogens	
[1] *Campylobacter* spp.	Quinolone susceptibility was determined for all isolates (n=909); isolates that were nalidixic acid-susceptible were assumed to be ciprofloxacin susceptible. Only 19% of isolates from patients returning from foreign travel (n=125) were susceptible to quinolones. Campylobacter susceptiblities were determined using new CDC NARMS 2012 interpretive criteria (http://www.cdc.gov/narms/pdf/2012-annual-report-narms-508c.pdf).
[2] *Salmonella enterica* (non-typhoidal)	Antimicrobial treatment for uncomplicated gastroenteritis due to *Salmonella* is not generally recommended.
[3] *Shigella* spp.	For cases in which treatment is required and susceptibility is unknown or an ampicillin and TMP/SMX-resistant strain is isolated, azithromycin for 3 days, ceftriaxone for 5 days, or a fluoroquinolone (such as ciprofloxacin) for 3 days should be administered. For susceptible strains, ampicillin or TMP/SMX is effective; amoxicillin is less effective because of rapid absorption from the gastrointestinal tract. (2012 *Red Book*)
[4] *Neisseria gonorrhoeae*	Routine resistance testing for *Neisseria gonorrhoeae* by the 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. Isolates (n = 98) were received from the Red Door Clinic in Minneapolis. One isolate did not have results reported. Resistance criteria for the following antibiotics have not been established; therefore, the data reflect reduced susceptibility using provisional MIC breakpoints for cefixime ≥0.5 µg/ml, ceftriaxone ≥0.5 µg/ml, and azithromycin ≥2.0 µg/ml. Also, the number of gonorrhea isolates submitted for testing increased from 79 in 2012 to 98 in 2013.
[5] *Neisseria meningitidis*	In 2013, 1 case-isolate was intermediate to penicillin. 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. The MIC interpretive criteria for azithromycin, ciprofloxacin, levofloxacin, and rifampin apply to prophylactic therapy and do not apply to therapy of patients with invasive meningococcal disease.
[6] Group A *Streptococcus*	The 197 isolates tested represent 94% of 209 total cases. Among 19 erythromycin resistant-clindamycin susceptible or intermediate isolates 19 (100%) had inducible clindamycin resistance for a total of 87% that were susceptible to clindamycin and did not exhibit inducible clindamycin resistance.
[7] Group B *Streptococcus*	100% (17/17) of early-onset infant, 100% (12/12) of late-onset infant, 92% (11/12) of maternal, and 88% (490/556) of other invasive GBS cases were tested. Among 106 erythromycin-resistant, clindamycin susceptible or intermediate isolates, 54 (51%) had inducible resistance to clindamycin for a total of 57% (301/530) that were susceptible to clindamycin and did not exhibit inducible clindamycin resistance. 63% (26/41) of infant and maternal cases were susceptible to clindamycin and did not exhibit inducible clindamycin resistance.
[8] *Streptococcus pneumoniae*	The 518 isolates tested represent 96% of 542 total cases. #Case-isolates susceptible by meningitis breakpoints for cefotaxime, ceftriaxone (intermediate = 1.0 µg/ml, resistant > 2.0 µg/ml) and penicillin (resistant > 0.12 µg/ml). ¶Case isolates susceptible by nonmeningitis breakpoints for cefotaxime, ceftriaxone (intermediate = 2.0 µg/ml, resistant > 4.0 µg/ml), and penicillin (intermediate = 4.0 µg/ml, resistant > 8.0 µg/ml). Isolates were screened for high-level resistance to rifampin at a single MIC; >99% (517/518) were ≤2 µg/ml. Using meningitis breakpoints, 14% (75/518) of isolates were resistant to two or more antibiotic classes and 8% (41/518) 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).
[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 24 TB cases reported in 2013 resistant to at least one first-line drug, 21 (88%) were foreign-born. There were no cases of multidrug-resistant TB (MDR-TB) (i.e., resistant to at least isoniazid and rifampin) or extensively drug-resistant TB (XDR-TB) (i.e., resistance to isoniazid and rifampin, plus one fluoroquinolone, and at least one injectable second-line drug).
Invasive methicillin-resistant *Staphylococcus aureus* (MRSA)	213 cases of invasive MRSA infection were reported in 2013 in Ramsey and Hennepin Counties, of which 144 (68%) were from blood. 87% (185/213) had an isolate submitted and antimicrobial susceptibility testing conducted. Of cases with an isolate, 84% (153/185) were epidemiologically classified as healthcare-associated. Susceptibilities were as follows: 100% to linezolid; 99% to daptomycin, doxycycline, telavancin, and vancomycin; 98% to gentamicin, tetracycline, and TMP/SMX; 95% to rifampin; 20% to levofloxacin; 12% to erythromycin. Isolates were screened for mupirocin resistance with 6% exhibiting high-level resistance (MIC >256 ug/ml). 49% (75/153) were susceptible or intermediate to clindamycin by broth microdilution; however, 26/56 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 (32/33 with isolates), susceptibilities were as follows: 100% to daptomycin, doxycycline, gentamicin, linezolid, rifampin, telavancin, tetracycline, TMP/SMX, vancomycin; 56% to levofloxacin; 16% to erythromycin. No CA isolates screened for mupirocin resistance exhibited high-level resistance. 84% (27/32) were susceptible to clindamycin by broth microdilution; however, 4/22 isolates that were clindamycin susceptible or intermediate and erythromycin resistant were found to have inducible clindamycin resistance (72% susceptible and negative for inducible clindamycin resistance). In addition to invasive MRSA surveillance, MDH confirmed 3 isolates (2 MRSA; 1 MSSA) with intermediate resistance to vancomycin (MIC 4-8 µg/ml).
Bordetella pertussis	In 2013, 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 92 CRE isolates submitted from 90 patients, 26 (28%) were bla_{KPC} positive by PCR including 11 (42%) *Klebsiella pneumoniae*, 11 (42%) *Enterobacter cloacae*, 2 (8%) *K. oxytoca*, 1 (4%) *Citrobacter freundii*, and 1 (4%) *C. koseri*; none were bla_{NDM} positive. 69% (18/26) were residents of the 7-county metro area. Additionally, one isolate (*K. pneumoniae*) from a non-MN resident was positive for bla_{OXA-48} by PCR. The CRE definition is based on 2013 CLSI breakpoints and includes Enterobacteriaceae that are nonsusceptible to a carbapenem (excluding ertapenem) and resistant to all tested third generation cephalosporins, or are positive for carbapenemase production. 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.

20th Annual Conference

EMERGING INFECTIONS IN CLINICAL PRACTICE AND PUBLIC HEALTH

From the Practical to the Cutting Edge

Friday, November 21, 2014 • Radisson Blu Mall of America

PRELIMINARY AGENDA

7:00 am	*Registration and Continental Breakfast*
7:45	**Welcome and Introductions**
8:00	**Surges in Syphilis: The Great Pox**
8:35	**Questions and Discussion**
	Juan Salazar, MD, MPH, Connecticut Children's Medical Center
8:45	**The Emergence of MERS-CoV**
9:20	**Questions and Discussion**
	Pritish Tosh, MD, Mayo Clinic
9:30	**How to Recognize and Treat UTI (Pediatrics and Adult)**
10:05	**Questions and Discussion**
	Jim Johnson, MD, University of Minnesota, Minneapolis VA Health Care System
10:15	*Refreshment Break*
10:35	**Interpretation & Limitations of New Diagnostics**
11:10	**Questions and Discussion**
	Robin Patel, MD, Mayo Clinic
11:20	**Agricultural Use of Antimicrobials: Does it Impact Human Health?**
11:55	**Questions and Discussion**
	Dimitri Drekonja, MD, MS, University of Minnesota, Minneapolis VA Health Care System
12:05 pm	*Lunch*
1:00	**Hot Topics from Minnesota Department of Health**
1:35	**Questions and Discussion**
	Richard Danila, PhD, MPH, Minnesota Department of Health
1:45	**Can Antimicrobial Stewardship be Done in Long Term Care?**
2:20	**Questions and Discussion**
	Gary Kravitz, MD, St. Paul Infectious Disease
2:30	**Antibiotics: Back to the Future**
3:05	**Questions and Discussion**
	Mark Schleiss, MD, University of Minnesota
3:15	*Refreshment Break*
3:30	**Healthcare Associated Infection Outbreaks across the Continuum of Care**
4:05	**Questions and Discussion**
	Jane Harper, RN, MS, Minnesota Department of Health
4:15	**Panel: Interesting and Unusual Case Presentations of Public Health Importance**
	Moderator: *Phillip K. Peterson, MD – University of Minnesota*
	Panelists: *Aaron DeVries, MD, MPH – Minnesota Department of Health • Dimitri Drekonja, MD, MS, – Minneapolis VA Health Care System • Robin Patel, MD, –Mayo Clinic • Juan Salazar, MD, MPH, – Connecticut Children's Medical Center*
5:00	*Evaluations & Adjourn*

Faculty and Curriculum Subject to Change

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☐ Physician	$195	$245
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SPECIAL REQUESTS - *Special needs, such as dietary restrictions, lactation room, etc., must be **indicated in advance**; requests cannot always be honored on site.*

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CANCELLATION POLICY

In the event you need to cancel your registration, the registration fee, less a $50 administrative fee, will be refunded if you notify us by 4:30 p.m. CST on **November 7, 2014**. No refunds will be made after this date. If you have any questions, please contact our office at (612) 626-7600 or (800) 776-8636, or e-mail us at cme@umn.edu.

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