MINNESOTA DEPARTMENT OF HEALTH

DISEASE CONTROL NEWSLETTER

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Annual Summary of Communicable Diseases Reported to the Minnesota Department of Health, 2015

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 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 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 13.3805).

Since April 1995, MDH has participated as an Emerging Infections Program (EIP) site funded by the U.S. 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, tickborne 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) and whole genome sequencing, 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. 28-29).

Table 2 summarizes cases of selected communicable diseases reported during 2015 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 transmitted to humans by bites from *Ixodes scapularis* (the blacklegged tick or deer tick). Although 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 *E. muris*-like), and a strain of Powassan virus. *A. phagocytophilum* can also be transmitted by blood transfusion.

In 2015, 613 confirmed or probable cases of anaplasmosis (10.8 cases per 100,000) were reported, up from the 448 cases reported in 2014 (Figure 1). Despite small annual fluctuations in

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Inside:

Table 1. Diseases Reportable to the Minnesota Department of Health

Report Immediately by Telephone

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

Report Within One Working Day

Amebiasis (*Entamoeba histolytica/dispar*)
Anaplasmosis (*Anaplasma phagocytophilum*)
Arboviral disease (including but not limited to, La Crosse 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 disease
Vibrio spp. a
Yellow fever
Yersiniosis, enteric (*Yersinia* spp.) a
Zoster (all cases <18 years old; other unusual case incidence or complications regardless of age)

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

Staphylococcus aureus (invasive only) a, b
Clostridium difficile a
Carbapenem-resistant *Enterobacteriaceae* spp., *Acinetobacter* spp. (CRA), and *Pseudomonas aeruginosa* (CR-PA; as of July 2016) a
Severe acute respiratory illness 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, 2015

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 2014 estimates)									
Anaplasmosis	145	104	96	186	49	5	23	5	0	613
Arboviral disease										
La Crosse	0	0	0	0	0	1	0	0	0	1
West Nile	5	0	0	2	1	0	0	1	0	9
Babesiosis	9	14	3	12	5	1	1	0	0	45
Blastomycosis	16	3	5	7	1	0	2	0	0	34
Botulism (Infant)	0	0	0	0	0	0	1	0	0	1
Brucellosis	3	0	0	0	0	0	1	0	0	4
Campylobacteriosis	469	15	29	152	42	47	91	79	0	924
Cryptosporidiosis	72	7	8	58	44	30	60	37	0	316
Escherichia coli O157 infection	49	2	1	22	4	6	11	20	0	115
Hemolytic uremic syndrome	2	0	0	4	1	1	2	1	0	11
Giardiasis	316	15	42	105	23	25	49	45	0	620
Haemophilus influenzae disease	37	6	8	17	3	9	10	14	0	104
HIV (non-AIDS)	200	1	3	7	3	2	6	2	4	228
AIDS (diagnosed in 2015)	93	3	3	6	4	3	7	2	20	141
Legionellosis	31	0	5	6	1	2	6	0	0	51
Listeriosis	1	0	0	1	0	0	1	0	0	3
Lyme disease	555	44	120	288	49	18	92	10	0	1,176
Measles (rubeola)	2	0	0	0	0	0	0	0	0	2
Meningococcal disease	2	0	1	2	0	0	2	0	0	7
Mumps	6	0	0	0	0	0	0	0	0	6
Pertussis	343	23	30	88	13	6	75	14	2	594
Q Fever (acute)	0	0	1	1	0	0	0	0	0	2
Salmonellosis	578	18	36	135	31	48	70	59	0	975
Sexually transmitted diseases										
Chlamydia trachomatis - genital infections	13,534	461	992	1,901	576	823	1,470	370	1,111	21,238
Gonorrhea	3,166	50	130	263	87	54	185	23	139	4,097
Syphilis, total	569	3	13	29	1	10	19	10	0	654
Primary/secondary	220	0	2	10	0	4	6	4	0	246
Early latent*	162	3	1	10	0	3	4	2	0	185
Late latent**	184	0	10	9	1	3	9	4	0	220
Congenital	3	0	0	0	0	0	0	0	0	3
Other***	0	0	0	0	0	0	0	0	0	0
Shigellosis	244	1	6	12	8	8	8	5	0	292
Streptococcal invasive disease - Group A	124	10	27	32	8	8	20	7	0	236
Streptococcal invasive disease - Group B	275	13	39	76	15	30	62	17	0	527
Streptococcus pneumoniae disease	238	16	50	81	32	44	51	22	0	534
Toxic shock syndrome (Staphylococcal)	10	0	0	1	0	0	0	0	0	11
Tuberculosis	111	1	0	9	3	4	18	4	0	150
Varicella	167	4	10	75	9	35	33	28	0	361
Viral hepatitis, type A	15	0	2	0	1	2	1	0	0	21
Viral hepatitis, type B (acute infections only, not perinatal)	15	0	0	2	0	0	2	0	0	19
Viral hepatitis, type C (acute infections only)	13	2	10	4	4	1	2	1	0	37

* 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

reported cases, the overall trend is an increase in yearly case totals over time. Three hundred eighty-five (63%) cases were male. The median age of cases was 58 years (range, 10 to 94 years), 14 years older than the median age of Lyme disease cases. As is typical, most cases had illness onsets during the summer months, with 56% of cases reporting illness onsets in June and July. One hundred sixty-eight (27%) cases were hospitalized at some point due to their infection, for a median duration of 4 days (range, 1 to 38 days).

Arboviral Diseases

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.

Nine WNV disease cases were reported in 2015. There were no deaths attributed to WNV infections, but 3 had neuroinvasive presentations including encephalitis or meningitis. The other 6 cases had West Nile fever. Four of the cases were male, and the median age was 43 years (range, 30 to 81 years). Five cases were hospitalized. Eight cases reported symptom onset in August or September, although 1 case reported a symptom onset in June. Six asymptomatic WNV-positive blood donors were also identified in 2015.

In 2015, 1 case of La Crosse encephalitis was reported. The single case was a 44 year-old male, much older than the median case age from 1985-2015. 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, 139 cases have been reported from 22 Minnesota counties, primarily in the southeastern part of the state. Most persons infected with La Crosse encephalitis virus have no apparent symptoms, but severe disease can occur in children. The median case age 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.

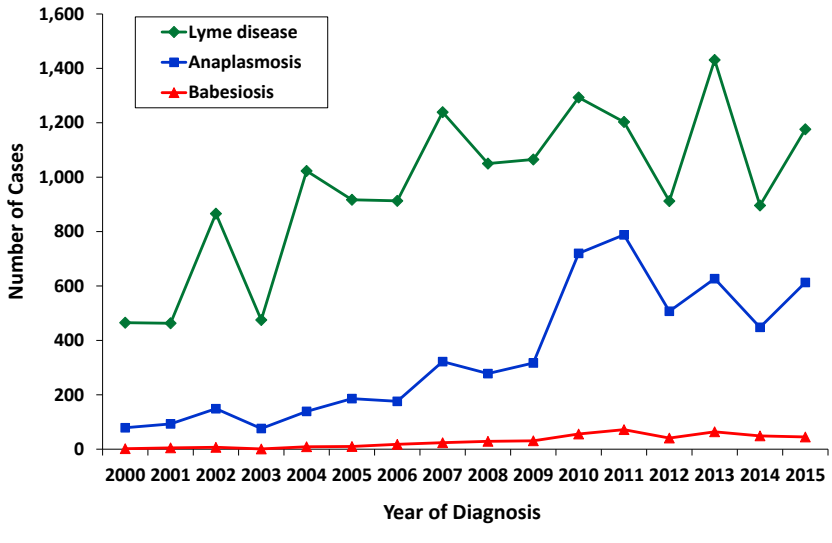
Two cases of Jamestown Canyon virus were reported. This virus is transmitted by *Aedes* genus mosquitoes, and the maintenance cycle in nature is thought to include deer and other large mammals. Much remains unknown about the clinical spectrum of Jamestown Canyon virus, but the typical presentation includes fever, and in more severe cases, meningitis or encephalitis. The virus is likely widespread in Minnesota. Patients were aged 56 and 77 years, and disease presentations ranged from fever to more severe illness, including meningoencephalitis.

Babesiosis

Babesiosis is a malaria-like illness caused by a protozoan, typically *Babesia microti*, which 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 2015, 45 confirmed and probable cases (0.8 per 100,000 population) were reported, down from the 49 reported cases in 2014 (Figure 1). Despite this decrease, yearly case totals since 2005 (range, 10 to 72) have been consistently higher than reported totals from 1996 to 2004 (range, 0 to 9). In 2015, 26 (58%) of the babesiosis cases reported occurred in males. The median case age was 64 years (range, 8 to 85 years), older than the median ages for both anaplasmosis (58 years) and Lyme disease (44 years). Onsets of illness peaked in the summer months; 36 (80%) reported first experiencing symptoms in June, July, or August. Nineteen (42%) cases were hospitalized due to their infection

Figure 1. *I. scapularis*-borne Disease Cases, Minnesota, 2000-2015



for a median duration of 5.5 days (range, 3 to 14 days). Although severe complications such as organ failure were reported in 9 cases, there was only 1 death attributable to babesiosis in 2015.

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 *B. dermatitidis* is moist soil enriched with decomposing organic debris. The fungus is endemic in Ontario, Manitoba, and the south-central, south-eastern, and mid-western United States. Transmission occurs by inhalation of spores after disturbance of contaminated soil.

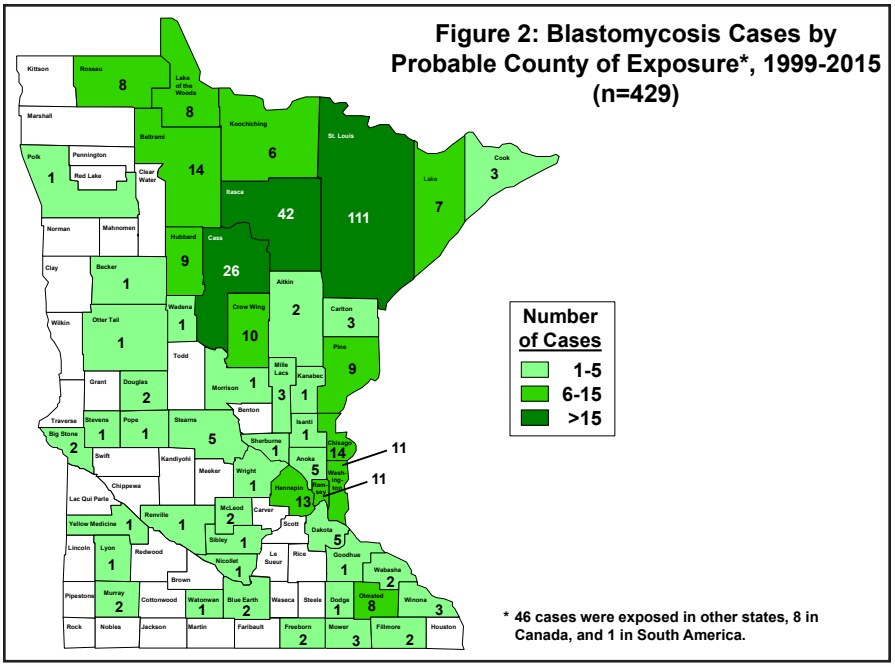
In 2015, there were 34 reported blastomycosis cases. This is similar to the 32 cases reported in 2014, and 34 in 2013. The median age of the cases was 45 years (range, 5 to 75 years); 27 cases (79%) were male. Twenty-seven cases were white, 1 (3%) was black, 2 (6%) were American Indian, 3 (9%) were Asian/Pacific Islander, and 1 was of unknown race. Twenty-four (71%) cases were hospitalized for a median of 6.5 days (range, 2 to 53 days). In 1 case, blastomycosis was a contributing factor to death. Twenty-five (73%) cases had pulmonary infections, 4 (12%) cases had extra-pulmonary infections, and 5 (15%) had disseminated infections.

From 1999 to 2015, 544 blastomycosis cases were reported; the median number of cases annually is 33 (range, 22 to 49). Exposure information is available for 429 cases. The largest number of cases, 111 (26%), were likely exposed in St. Louis County, 42 (10%) cases were likely exposed in Itasca County, 26 (6%) in Cass County, 14 (3%) in Beltrami County, and 14 (3%) in Chisago County. (see Figure 2 for endemic counties).

Botulism

Botulinum toxin, a neurotoxin, is produced by the spore forming bacteria *Clostridium botulinum* and other related Clostridial species; there are eight distinct toxin types: A, B, C, D, E, F, G, and newly recognized type H. Toxin types A, B, E, F, and H can cause human intoxication. Botulism

Figure 2: Blastomycosis Cases by Probable County of Exposure*, 1999-2015 (n=429)



is characterized by a descending, bilateral paralysis that can be fatal without treatment. Botulism spores are ubiquitous in the environment and cause three main forms of human botulism intoxication: foodborne, wound, and intestinal-toxemia, which includes infant botulism and adult intestinal toxemia. Infant botulism, which is the most common form of botulism in the United States, results from the ingestion of *C. botulinum* spores that germinate and colonize the intestinal tract, producing toxin that is absorbed into the circulation.

In 2015, no foodborne or wound botulism cases were reported. One case of infant botulism was reported in a 10 month-old male who presented to the hospital with symptoms including weakened cry, inability to feed, progressive weakness, constipation, and ptosis. The infant tested positive for *C. botulinum* toxin type B; he received human botulism immune globulin and made a full recovery after an 8 day hospitalization.

From 2001-2015, 11 cases of infant botulism and 2 of foodborne botulism were reported. The median age of infants was 18 weeks (range 5 to 41 weeks), and 7 (64%) were male. Eight (73%) infants' illnesses were caused by botulinum toxin type B and 3 (27%) by toxin type A; since 2006 all infant botulism cases in Minnesota have been caused by toxin type B. Nine infants were known to be hospitalized, for a median of 15 days (range 8 to 30 days). The 2 foodborne cases were of toxin type A, and occurred in 2009 in 2 men consuming home-canned asparagus. The men were aged 50 and 54 years, both hospitalized, for 6 and 16 days. No deaths occurred among the infant or foodborne botulism cases.

Brucellosis

Brucellosis is an acute or chronic illness caused by bacteria of the *Brucella* genus. There are 5 important species of *Brucella*: *B. abortus*, *B. melitensis*, *B. suis*, *B. canis*, and *B. ovis*, of which cattle, goats, pigs, dogs, and sheep are the respective reservoir animals. Transmission can occur though ingestion of unpasteurized dairy products, contact with infected animal tissue, or inhalation of aerosolized bacteria in a laboratory setting. Minnesota's livestock have been brucellosis free since 1985; most infections are acquired in *Brucella* endemic countries.

In 2015, 4 cases were reported; 3 cases were infected with *B. suis* and 1 was infected with *B. melitensis*. Ages were 63, 66, 68, and 86 years; 3 were male. All were hospitalized and survived. One case likely acquired brucellosis by ingesting unpasteurized camel milk in Africa, 2 likely acquired it while hunting feral swine in Texas or handling meat of feral swine, and 1 case likely acquired infection while working in a pig slaughter facility 60 years ago. Two of the cases' clinical isolates resulted in

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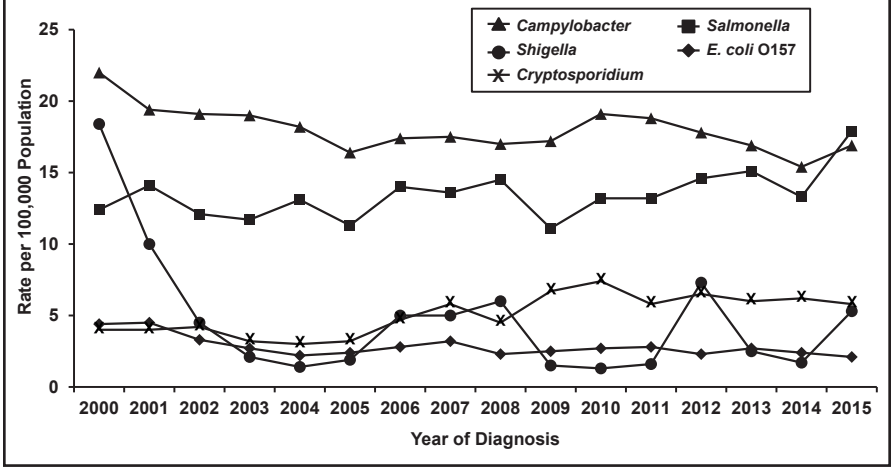
Figure 3. Trends of Major Enteric Pathogens, Minnesota, 2000-2015



exposure to 27 clinical laboratory staff; none resulted in infection.

From 2011 to 2015, 10 cases were reported. Six likely acquired their infection outside the United States and 4 were domestically acquired.

The median number of cases reported annually was 3 (range 0 to 4). Six were infected with *B. melitensis* and 4 with *B. suis.* The median age of cases was 60 years (range, 30 to 86 years). Four of 8 cases for which race was known were black, 3 were Asian, and 1 was white.

Campylobacteriosis

Campylobacter historically has been the most commonly reported bacterial enteric pathogen in Minnesota but was surpassed by *Salmonella* in 2015 (Figure 3). There were 924 culture-confirmed *Campylobacter* cases reported in 2015 (16.9 per 100,000 population). This is an 11% increase from the 834 cases reported in 2014, but similar to the annual median of 904 cases reported from 2005 to 2014 (range, 843 to 1,009). In 2015, 51% of cases occurred in people who resided in the metropolitan area. Of the 880 *Campylobacter* isolates confirmed and identified to species by MDH, 88% were *C. jejuni* and 8% were *C. coli*.

The median age of cases was 36 years (range, 2 months to 91 years). Forty-three percent were between 20 and 49 years of age, and 10% were ≤5 years of age. Fifty-nine percent were male. Fourteen percent were hospitalized; the median length of hospitalization was 3 days. Fifty percent of infections occurred during June through September. Of the 828 cases for whom data were available, 139 (18%) reported travel outside the United States during the week prior to illness onset. The most common travel destinations were Europe (n=38), Mexico (n=34), Asia (n=34), and Central or South America or the Caribbean (n=19).

Three foodborne outbreaks were identified in 2015. In April, an outbreak of *C. jejuni* and *C. coli* infections was associated with chicken liver pate served at a restaurant; 5 culture-confirmed cases were identified. In May, 3 culture-confirmed *C. jejuni* infections were associated with a wedding. In July, 3 culture-confirmed cases were associated with a family picnic. The vehicle of transmission was not confirmed for the latter two outbreaks.

A primary feature of public health importance among *Campylobacter* cases was the continued presence of *Campylobacter* isolates resistant to fluoroquinolone antibiotics (e.g., ciprofloxacin), which are commonly used to treat campylobacteriosis. In 2015, the overall proportion of quinolone resistance among *Campylobacter* isolates tested was 25%. However, 73% 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 (CIDT) became commercially available for the qualitative detection of antigens in stool. In 2015, 675 patients were positive for *Campylobacter* by a CIDT conducted in a clinical laboratory. However, only 183 (27%) of the specimens were subsequently culture-confirmed and therefore met the surveillance case definition for inclusion in MDH case count totals.

Carbapenem-resistant *Enterobacteriaceae* (CRE)

Enterobacteriaceae are a large family of Gram-negative bacilli that cause community- and healthcare-associated infections (HAIs). Carbapenem-resistant *Enterobacteriaceae* (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 those caused by carbapenem-susceptible *Enterobacteriaceae*.

Carbapenem resistance can be acquired through a variety of mechanisms. Some CRE carry 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 in the United States. Other carbapenemases have been identified in the United States (e.g., New Delhi metallo-β-lactamase [NDM], Verona integron-encoded metallo-β-lactamase [VIM], active on imipenem [IMP], and oxacillinase [OXA-48]), though they are more frequently identified in other countries. Carbapenem resistance can also be acquired through the production of a β-lactamase effective against third-generation cephalosporins (e.g., AmpC β-lactamases or extended-spectrum β-lactamases [ESBLs]) when combined with porin mutations that prevent carbapenem antibiotics from entering the cell. In recent years, CRE have been increasingly recognized as an important cause of HAIs. CRE are often resistant to most available antibiotics, leaving clinicians with few treatment options. In 2013, CDC identified CRE

as one of three "urgent" antibiotic resistance threats requiring immediate and aggressive action.

MDH first identified a KPC-producing CRE in February 2009, and voluntary reporting of CRE began, including isolate submission. In 2012, we adopted a standardized CRE definition developed by the 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 was expanded to include isolates of any *Enterobacteriaceae* species from all body sites collected in Minnesota residents. The PHL tests all submitted isolates by PCR for KPC and NDM carbapenemase genes, and utilizes other molecular and phenotypic assays (e.g., CarbaNP) to detect additional carbapenemases when applicable.

During 2015, 271 isolates from 233 patients (including non-residents) were submitted to the PHL for further testing. Of these, 155 incident CRE cases representing 150 patients were identified in Minnesota residents. Of these 155 isolates, 33 (21%) (representing 27 patients) were KPC positive (*E. cloacae* [16], *K. pneumoniae* [12], *E. coli* [2], *K. oxytoca* [1], *E. asburiae* [1], and *L. adecarboxylata* [1]). Of note, 2 (6%) patients were positive for the same organism in the calendar year prior to the date of initial culture. No tested isolates were NDM-positive.

Of the 27 residents with KPC-positive isolates, the median age was 60 years (range, 21 to 83); 16 (59%) were male and 10 (37%) were residents of Hennepin or Ramsey County. Fourteen (52%) patients were white, 2 (7%) were black, 2 (7%) were American Indian, 2 (7%) were Asian, and 6 (22%) were of unknown race. Hispanic ethnicity was reported for 2 (7%) patients. Urine (15) was the most common source followed by sputum (3), bronchial lavage (3), wounds (2), and other sites (4). Twenty-one (78%) were hospitalized (7 hospitalized ≥3 days prior to culture); median length of stay was 11 days (range, 2 to 113). Nine patients (33%) required ICU care; in-hospital mortality was 11% with 1 patient having CRE isolated from a sterile site within 7 days of death. Other KPC-positive CRE isolates were collected in patients from outpatient settings (3), long-term acute care hospitals (1), or long-term care facilities (2) without subsequent hospitalization within 30 days.

A total of 53 incident CRE cases (representing 49 patients) were reported during 2015. Of these cases, 33 were *Enterobacter* spp., 11 were *Klebsiella* spp., and 9 were *E. coli*. KPC was identified in 11% of MuGSI CRE (*K. pneumoniae* [3/11], *E. cloacae* [2/10], and *E. coli* [1/9]). Again, CRE was most frequently isolated from urine (47) followed by blood (4), peritoneal fluid (1), and pleural fluid (1).

During 2015, 1 NDM-producing CRE (*E. coli*) was detected in a non-resident. To date, a total of 11 NDM-producing CRE (*E. coli* [5] and *K. pneumoniae* [6]) from 9 patients have been detected. This includes 1 resident and 8 non-residents, all of whom had received medical care outside the United States (8 patients) or in a non-Minnesota U.S. facility (1 patient) prior to their initial NDM-positive culture. In 2015, the PHL identified, and CDC confirmed, 2 OXA-48-producing CRE (*K. pneumoniae* [2]) detected from non-Minnesota residents with significant healthcare exposure outside the United States prior to receiving healthcare in Minnesota.

In summary, 14% of CRE isolates tested by the PHL during 2015 were KPC-positive; 4 cases with KPC-positive isolates had a history of KPC positive CRE from previous years, all 4 of them from multiple body sites. Detection of NDM and OXA-48 serves as a reminder to clinicians that a travel history, including receipt of medical care 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 CRE colonization in newly admitted patients with known hospitalization outside the United States within the last 6 months. CRE can spread in healthcare facilities (e.g., on the hands of healthcare workers or contaminated equipment) 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 in-house patients with epidemiologic links to a patient colonized or infected with CRE, including any roommates. Screening might also be expanded to patients cared for by the same healthcare workers, those on the same unit, and/or patients who have had similar procedures (e.g., endoscopic procedures).

Chikungunya Disease

Chikungunya virus is a mosquito-borne alphavirus found in Africa, Asia, and more recently, Europe. In late 2013, locally acquired cases appeared for the first time in the Americas, on the Caribbean island of St. Martin. The virus is transmitted by the same *Aedes* spp. mosquitoes (*Ae. aegypti* and *Ae. albopictus*) that also transmit the dengue and Zika viruses.

Unlike many other mosquito-borne viruses, most people who are infected with Chikungunya develop symptoms. The most common symptoms are fever and joint pain, but patients may also experience headache, muscle aches, or rash. Symptoms usually begin 3-7 days after a person is bitten by an infected mosquito, and most recover within a week. Joint pain may persist for weeks to years after the initial illness.

In 2015, 15 chikungunya cases were reported in Minnesota residents. The median case age was 44 years (range, 13 to 69 years). Symptom onsets occurred from early January through mid-September. All of the cases represented imported infections acquired abroad, and all had traveled to either Central America (8), Mexico (4), or the Caribbean (3). Nationwide, human cases of chikungunya were reported from 44 states. All cases in

continued...

U.S. residents were acquired while traveling abroad.

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.

In the early 2000s, a marked increase in the number of CDI cases and mortality due to CDI was 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 pulsed-field gel electrophoresis type 1 (NAP1), toxinotype III.

In 2009, in an effort to better understand the burden of CDI in Minnesota, as part of EIP, MDH initiated population-based, sentinel surveillance for CDI at clinical laboratories serving Stearns, Benton, Morrison, and Todd Counties; in 2012 Olmsted County was added.

CDIs that occur outside the traditional healthcare settings (community-associated) have also been receiving increased attention. Community-associated (CA) CDI data from 2009 - 2011 across 10 EIP sites showed that 36% of CA CDI patients did not receive prior antibiotics and 82% had some outpatient healthcare exposure. Patients with CA CDI commonly have outpatient healthcare exposures and reduction of antibiotic use alone may not prevent over one third of CDI in the community.

A CDI case is defined as a positive *C. difficile* toxin assay from 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 2015, 799 incident CDI cases were reported in the five counties (202 per 100,000 population), an increase from 183 per 100,000 population in 2014. Fifty-six percent of these cases were classified as CA, 21% as CO-HCFA, and 20% as HCFO. The median ages for CA, CO-HCFA, and HCFO cases were 54 years, 62 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 86% of HCFO cases and 85% of CO-HCFA cases. Of the 471 putative CA cases eligible for interview, 353 were interviewed and confirmed as CA cases. Fifty-nine 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 (27%); dental procedures (23%); urinary tract infections (13%); and skin infections (12%).

Cryptosporidiosis

During 2015, 316 cryptosporidiosis cases (5.8 per 100,000 population) were reported (Figure 3). This is similar to the median number of cases reported annually from 2005 to 2014 (median, 316 cases; range, 166 to 389). The median age of cases was 25 years (range, 9 months to 88 years). Children ≤10 years of age accounted for 25% of cases. Fifty-four percent of cases occurred during July through October. The incidence in the West Central, Southwestern, Southeastern, South Central, and Central districts (18.5, 16.9, 12.0, 10.4, and 7.8 cases per 100,000, respectively) was significantly higher than the statewide incidence. Only 72 (23%) cases occurred among residents of the metropolitan area (2.4 per 100,000). Twenty-nine (9%) cases required hospitalization, for a median of 4 days (range, 2 to 22 days).

Ten outbreaks were identified in 2015, accounting for 16 laboratory-confirmed cases. Three outbreaks were associated with contact with calves, accounting for 26 cases (5 laboratory-confirmed). These outbreaks were associated with a private farm (Swift County), an animal research facility (Anoka County), and a veterinary technician class farm visit (Hennepin County). Seven outbreaks due to person-to-person transmission at daycares or preschools accounted for 37 cases (11 laboratory-confirmed); the outbreaks occurred in Blue Earth, Clay, Dakota, Mower, Nicollet, Nobles, and Pope Counties.

In a 2010 paper published in *Clinical Infectious Diseases*, we evaluated rapid assays used by Minnesota clinical laboratories for the diagnosis of cryptosporidiosis. The positive predictive value of the rapid assays was 56%, compared to 97% for non-rapid assays, suggesting the widespread use of rapid assays could be artificially contributing to the increased number of reported cases of cryptosporidiosis. In 2015, 239 (76%) patients were positive for *Cryptosporidium* by a rapid assay conducted in a clinical laboratory. However, 50 (24%) of the 205 specimens received at the PHL could not subsequently be confirmed by polymerase chain reaction or direct fluorescent antibody test. 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 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 *Ae. 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 2015, 21 dengue cases were reported in Minnesota residents. The median case age was 45 years (range, 12 to 72 years), and onset of symptoms occurred from January through December. All infections were acquired abroad. The majority of cases had traveled to Southeast Asia (6), the Caribbean (5), or Mexico (4).

***Escherichia coli* O157:H7 and Other Shiga Toxin-producing *E.coli* Infections, and Hemolytic Uremic Syndrome (HUS)**

During 2015, 115 culture-confirmed cases of *Escherichia coli* O157:H7 infection (2.09 per 100,000 population) were reported (Figure 3). The number of reported cases represents a 15% decrease from the median number of cases reported annually from 2005 to 2014 (median, 136 cases; range, 120 to 163). Forty-nine (43%) cases occurred in the metropolitan area. Ninety-three (81%) cases occurred during May through October. The median age of the cases was 21 years (range, 4 months to 101 years). Twenty percent of the cases were 4 years of age or younger. Thirty-seven (32%) cases were hospitalized; the median hospital stay was 3 days (range, 1 to 33 days). No cases died.

In addition to the 115 culture-confirmed *E. coli* O157 cases, 125 cases of Shiga toxin-producing *E. coli* (STEC) infection were identified in 2015. Of those, culture-confirmation was not possible in 17, and therefore it is unknown if those were O157 or another serogroup. Among the remaining 108 cases with STEC other than O157, *E. coli* O103 accounted for 38 (35%) cases, *E. coli* O26 for 33 (31%), and *E. coli* O111 for 22 (20%). The median age of the non-O157 STEC cases was 23 years (range, 2 months to 88 years). Twenty-eight (26%) cases were hospitalized; the median hospital stay was 3 days (range, 1 to 22 days). No cases died.

Nine *E. coli* O157 outbreaks were identified during 2015. Five outbreaks involved foodborne transmission, two outbreaks were due to person-to-person transmission in daycares, and two outbreaks were due to animal contact. The nine outbreaks resulted in 43 illnesses (34 laboratory-confirmed) with a median of 3 cases per outbreak (range, 2 to 15 cases).

In June, an outbreak of *E. coli* O157 infections was associated with a restaurant. Two cases, both laboratory-confirmed, were identified. A vehicle was not identified. Also, an outbreak of *E. coli* O157 infections associated with person-to-person transmission occurred at a daycare in Murray County. Fifteen cases, 9 laboratory-confirmed, were identified.

In July, an outbreak of *E. coli* O157 infections associated with person-to-person transmission occurred at another daycare in Murray County. Five cases, all laboratory-confirmed, were identified. Also, an outbreak of *E. coli* O157 infections was associated with animal contact at a county fair. Four cases, all laboratory-confirmed, were identified, and 1 case developed HUS. The source of this outbreak was likely calves or goats but animal testing to determine a specific source could not be conducted.

In August, an outbreak of *E. coli* O157 infections was associated with animal contact at a county fair. Two cases, both laboratory-confirmed, were identified.

In September, an outbreak of *E. coli* O157 infections was associated with a restaurant. Seven cases, 5 laboratory-confirmed, were identified. A vehicle was not identified.

In October, an outbreak of *E. coli* O157 infections was associated with consumption of unpasteurized apple cider purchased at an orchard. Two cases, both laboratory-confirmed, were identified. Also, an outbreak of *E. coli* O157 infections was associated with beef and goat meat purchased from a live animal market. Three cases, two laboratory-confirmed, were identified.

In December, a multistate outbreak of *E. coli* O157 infections associated with consumption of dessert pizza at a restaurant chain was identified. Five cases, all laboratory-confirmed, were identified in Minnesota. Two cases had illness onsets in December and 3 had illness onsets in January 2016.

One non-O157 STEC outbreak was identified during 2015. In October, a multistate outbreak of *E. coli* O26 infections was associated with eating at a restaurant chain. Two cases, both laboratory-confirmed, were identified in Minnesota. A vehicle was not identified.

Hemolytic Uremic Syndrome (HUS)

In 2015, 11 HUS cases were reported. The number of reported cases represents a 33% decrease from the median number of cases reported annually from 2005 to 2014 (median, 16.5 cases; range, 10 to 22). In 2015, the median age of HUS cases was 3.6 years (range, 1 to 87 years); 6 of the 11 cases occurred in children less than 7 years of age. All 11 cases were hospitalized, with a median hospital stay of 14 days (range, 6 to 34 days). No cases died. From 1997 through 2015, the overall case fatality rate among HUS cases was 5.1%. All 11 HUS cases reported in 2014 were post-diarrheal. *E. coli* O157:H7 was cultured from the stool of 9 (82%) cases. In 2015, there was 1 outbreak-associated HUS case.

Giardiasis

During 2015, 626 cases of *Giardia* infection (11.5 per 100,000) were reported. This represents a 16% decrease from the median number of cases reported annually from 2005 through 2014 (median, 729 cases; range, 620 to 1,241). Recent immigrants and refugees continue to represent a substantial proportion of cases, accounting for 42% of all cases. An additional 9% of cases reported international travel in the 3 weeks prior to illness onset. The median age for all cases reported in 2015 was 20 years (range, 10 months to 83 years). Thirty-five percent of cases were <10 years of age, and 20% were >50 years of age. Excluding cases identified through immigrant and refugee health screenings, 66% were male. *Giardia* infections showed a summer/fall seasonality; 51% of non-immigrant and refugee cases occurred during July through October. Thirty-three (5%) cases required hospitalization, for a median of 3 days (range, 1 to 15 days). One outbreak of giardiasis

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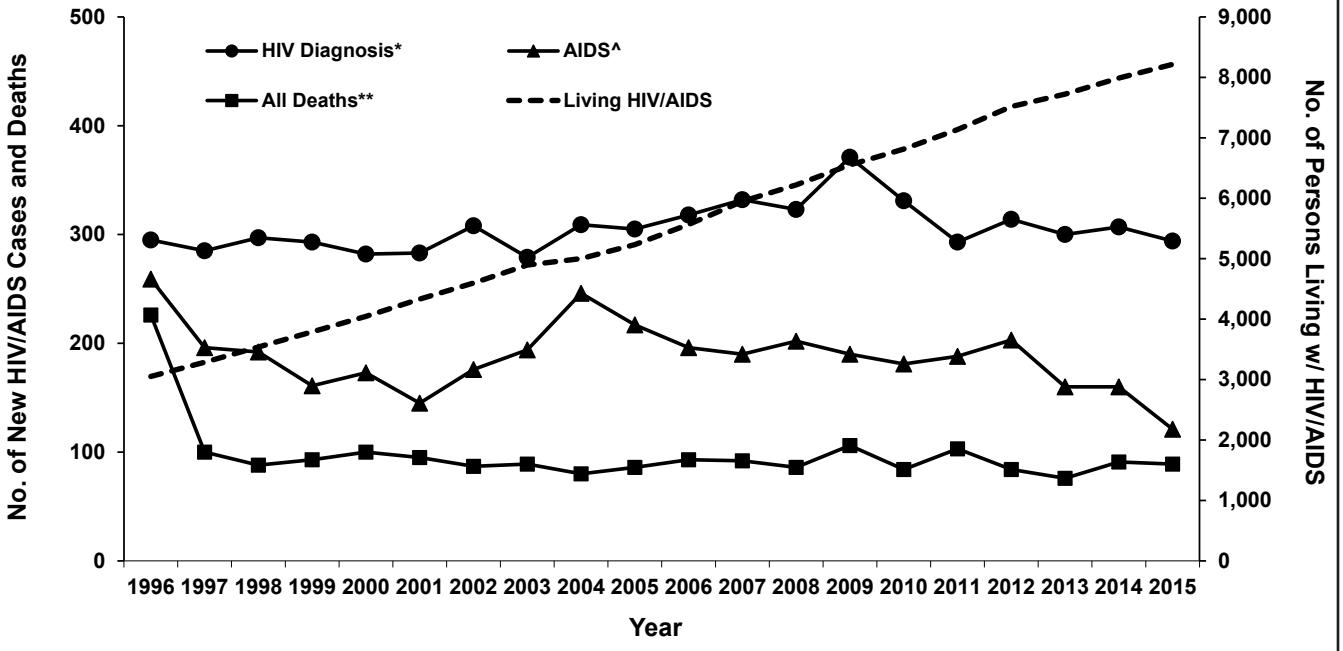
Figure 4. HIV/AIDS in Minnesota: Number of New Cases, Prevalent Cases, and Deaths by Year, 1996-2015



* Includes all new cases of HIV infection (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.

was identified in Minnesota in 2015; it occurred in a daycare and accounted for 4 laboratory-confirmed cases.

Haemophilus influenzae

One hundred four cases of invasive *Haemophilus influenzae* disease (1.9 per 100,000 population) were reported in 2015. Cases ranged in age from newborn to 100 years (median 67 years*)*. Allowing for more than one syndrome per case, 47 (39%) cases had pneumonia, 37 (31%) had bacteremia without another focus of infection, 12 (19%) had septic shock, 8 (7%) had meningitis, 2 (2%) had epiglottitis, 2 (2%) had septic arthritis, and 1 (1%) each had abscess, cellulitis, cerebritis, endocarditis, endophthalmitis, lymphadenopathy, otitis media, pericarditis, peritonitis, pleural effusion, and pneumonitis. Eighteen (17%) cases died.

Of 100 *H. influenzae* isolates for which typing was performed at PHL, 12 were type a, 14 were type f, 2 type b, 3 type e, and 69 were untypeable. Two cases of type b (Hib) disease occurred in 2015, compared to 1 case in 2014, 4 cases in 2013, and 3 cases in 2012. Both cases were in adults and survived. One case had pneumonia and the other had cellulitis.

The 18 deaths occurred in patients ranging in age from newborn to 94 years. Nine cases had pneumonia (of these 1 also had septic shock and 1 had meningitis), 8 had bacteremia without focus (of these 4 also had septic shock), and 2 had meningitis. Seventeen cases had *H. influenzae* isolated from blood and 1 from CSF. Underlying medical conditions were reported in 17 cases. Of the 18 cases that died, 14 case-isolates were untypeable, and 4 were serotype f.

HIV Infection and AIDS

The incidence of HIV/AIDS in Minnesota remains moderately low. In 2014, state-specific HIV infection diagnosis rates ranged from 1.9 per 100,000 population in Montana to 36.6 per 100,000 in Louisiana. Minnesota had the 16th lowest HIV infection rate at 7.0 cases per 100,000 population. In 2014, state-specific AIDS diagnosis rates ranged from 0.7 per 100,000 persons in Montana and Wyoming to 13.7 per 100,000 population in Louisiana. Minnesota had the12th lowest AIDS rate at 3.0 AIDS cases reported per 100,000 population.

As of December 31, 2015, a cumulative total of 11,007 cases of HIV infection (6,499 AIDS cases and 4,508 HIV [non-AIDS] cases) had been reported among Minnesota residents. Of the 11,007 cases, 3,737 (34%) are known to have died. By the end of 2015, an estimated 8,215 persons with HIV/AIDS were assumed to be living in Minnesota.

The annual number of AIDS cases reported in Minnesota increased steadily from 1982 through the early 1990s, reaching a peak of 361 cases in 1992. Beginning in 1996, the annual number of new AIDS diagnoses and deaths declined sharply, primarily due to better antiretroviral therapies. In 2015, 141 new AIDS cases (Figure 4), and 89 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 2005 through 2015, at approximately 247 cases per year. With a peak of 282 newly

diagnosed HIV (non-AIDS) cases in 2009, 228 new HIV (non-AIDS) cases were reported in 2015 (a decrease of 4% from 2014).

Historically, and in 2015, over 80% (255/294) of new HIV diagnoses (both HIV [non-AIDS] and AIDS at first diagnosis) occurred in the metropolitan area. However, HIV or AIDS cases have been diagnosed in residents of 86 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 2015, there were 109 new infections among white males. During the past decade, the number of cases among black males has fluctuated from year to year, with 57 new HIV diagnoses in 2015. This represents a 27% increase among black males from 2014 to 2015. The number of HIV infections diagnosed among Hispanic males decreased from 28 in 2014 to 21 in 2015. The number of new infections among black African-born males has fluctuated greatly from year to year and in 2015 the number of cases increased to 23 compared to 20 in 2014, representing a 15% increase.

Females account for an increasing percentage of new HIV infections, from 11% of new infections in 1990 to 23% in 2015. 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. Since 1991, the number of new infections among women of color has exceeded that of white women. Since 2005, the annual number of new infections diagnosed among black females has decreased slightly overall, although without a clear pattern from year to year. In 2015, there were 15 cases diagnosed among black women, compared to 16 in 2014. In 2015, the number of new cases among black African-born women was 36, accounting for 52% of all new diagnoses among women; this accounted for an increase of 13% among black African-born women compared to 2014.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 2015, men of color comprised approximately 17% of the male population in Minnesota and 49% of new HIV diagnoses among men. Similarly, women of color comprised approximately 13% of the female population and 81% of new HIV infections among women. It bears noting that race is not considered a biological cause of disparities in the occurrence of HIV, but instead race can be used as a proxy for other risk factors, including lower socioeconomic status and education.

A population of concern for HIV infection is adolescents and young adults (13 to 24 years of age). The number of new HIV infections among males in this age group has remained higher than new diagnoses among females since 1999. Since 2001, a steady increase in new cases among males in this age group has occurred, with 53 cases reported in 2015. Since 2005, the number of cases among young males has increased by about 77%. The number of new HIV infections among females in this age group has remained relatively consistent over time. In 2015 there were 12 cases diagnosed among young women. From 2013 to 2015, the majority (58%) of new infections among male adolescents and young adults were among youth of color (84/144), with young black males accounting for 61% of cases among young males of color. During the same time period, young women of color accounted for 72% (16/22) of the cases diagnosed, with young black African-born women accounting for 75% of cases among young women of color. Between 2013 and 2015 after re-distributing those with unspecified risk, 97% (140/144) of new cases among young males were attributed to male-to-male sex. Among young females, 91% (29/32) of new cases were attributed to heterosexual sex.

Since the beginning of the 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 2015, this group accounted for 53% of new diagnoses (156/294).

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 9% (26/294) in 2015. Though, in 2015 there was an 86% increase of HIV infections attributed to injection drug use as compared to 2014 (14/307). 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. Seventy-five percent of 68 new HIV diagnoses among women in 2015 is attributed to heterosexual exposure.

Historically, race/ethnicity data for HIV/ AIDS in Minnesota have grouped non-African born blacks and black 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 black African-born persons was observed. In 2015, there were 59 new HIV infections reported among black Africans. While black African-born persons comprise less than 1% of the state’s population, they accounted for 20% of all HIV infections diagnosed in Minnesota in 2015.

HIV perinatal transmission in the United States decreased 90% since the early 1990s with increased testing and antiretroviral therapy. 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 3% in 1995. The overall rate of perinatal transmission for 2013-15 was 1.6% with 2 HIV-positive births from HIV-infected mothers in Minnesota in 2015.

Influenza
Several influenza surveillance methods are employed. 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 began during the 2003-2004 influenza season, and was expanded statewide 2008-2009. Since the 2013-2014 season, clinicians are 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 testing. In the 2014-2015 season, influenza B subtyping was added.

During the 2015-2016 season, there were 1,501 laboratory-confirmed hospitalized cases (27.5 cases per 100,000 persons compared to 77.2 cases per 100,000 in 2014-2015) reported. Cases included 1,327 influenza A (590 A[H1N1]pdm09, 41 H3, and 695 unknown A type), 156 influenza B (55 of Yamagata lineage, 3 of Victoria lineage), 6 positive for both influenza A and B, and 12 of unknown influenza types. Among the cases, 16% were 0-18 years of age, 21% were 19-49 years of age, 28% were 50-64 years of age, and 35% were ≥65 years of age. Residents of the metropolitan area made up 65% of cases.

Case report forms have been completed on 70% of 976 metropolitan area cases. Of these, 32% were diagnosed with pneumonia, 20% required admission into an intensive care unit, and 10% were placed on mechanical ventilation. An invasive bacterial co-infection was present in 9% of hospitalized cases. Antiviral treatment, recommended for all hospitalized influenza cases, was prescribed for 85% of cases. Overall, 93% of adult cases and 45% of pediatric cases had at least one chronic medical condition that would have put them at increased risk for influenza disease.

Deaths
There were 3 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 October 4, 2015 - May 21, 2016, laboratories reported data on 21,273 influenza PCR tests, 1,617 (8%) of which were positive for influenza. Of these, 687 (43%) were positive for influenza A(H1N1)pdm09, 21 (1%) were positive for influenza A/(H3), 649 (40%) were positive for influenza A-not subtyped, and 260 (16%) were positive for influenza B.

Sentinel Surveillance
We conduct sentinel surveillance for 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 22 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 March 6-12, 2016 at 2.4%.

Influenza Incidence Surveillance
MDH was one of eight nationwide sites to participate in an Influenza Incidence Surveillance Project for the 2015-2016 influenza season. Four clinic sites reported the number of ILI patients and acute respiratory illness (ARI; recent onset of at least two of the following: rhinorrhea, sore throat, cough, or fever) patients seen within five age groups, 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 13 other respiratory pathogens. Minimal demographic information and clinical data were provided with each specimen.

From July 26, 2015 – May 21, 2016, these clinics saw 1,208 ILI and 6,807 ARI patients.They submitted 724 specimens for influenza and respiratory pathogen testing, 54 (7%) of which were positive for influenza. Of those, 6 were positive for influenza A/(H3), 1 was positive for influenza A-type unspecified, 9 were positive for influenza B/Yamagata lineage, 1 was positive for influenza B-lineage unspecified, and 2 were positive for influenza C. In addition to influenza, the following pathogens were detected by PCR: 23 (3%) adenovirus, 21 (3%) human metapneumovirus, 23 (3%) RSV, 128 (18%) rhinovirus, 6 (0.8%) enterovirus, 14 (2%) parainfluenza virus 1, 2 (0.3%) parainfluenza virus 2, 6 (0.8%) parainfluenza virus 3, 7 (1%) parainfluenza virus 4, 2 (0.3%) coronavirus 229E, 7 (1%) coronavirus OC43, and 14 (2%) coronavirus NL63, and 9 (1%) coronavirus HKU1 (note: these coronaviruses are not SARS-CoV or MERS-CoV).

ILI Outbreaks (Schools and Long Term Care Facilities)
Between 1988 and 2009, a probable ILI outbreak in a school was defined as a doubled absence rate with primary influenza symptoms reported among students. The definition of ILI outbreaks changed 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 the 2013-2014 school year. This is the lowest number of schools reporting ILI outbreaks since the 2009-2010 school year when the highest was 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. Forty-eight facilities in 23 counties reported confirmed outbreaks during the 2015-2016 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 2015, 51 legionellosis cases (0.9 per 100,000 population) were reported. The criteria for confirmation of a legionellosis case are 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 of any level is not considered diagnostic for legionellosis. Patients positive by PCR only are classified as suspected cases; in 2015, there were 5 suspected cases.

Of the 51 confirmed cases, 50 (98%) had pneumonia. All 51 cases were hospitalized, with a median duration of acute hospitalization of 6 days (range, 1 to 46 days). Twenty-nine (57%) were admitted to an intensive care unit, 17 (33%) required mechanical ventilation, and 9 (18%) died. Thirty-three (65%) cases were male. Older adults were more often affected, with 42 (82%) cases occurring among individuals ≥50 years of age (overall median age, 62 years; range, 24 to 82 years). Twenty-seven (53%) cases had onset dates in June through September. Thirty-one (61%) were residents of the metropolitan area and 20 (39%) were residents of Greater Minnesota.

Of the 48 cases for which information was available, 14 (29%) were classified as travel-associated, defined as spending 1 or more night away from their residence (excluding healthcare facilities) in the 10 days prior to onset of illness. Of 34 cases with exposure information available and no travel, 12 (35%) had exposure to a healthcare facility in the 10 days prior to onset of illness. There was one legionellosis outbreak identified in Minnesota, with 2 cases associated with poor plumbing at a restaurant. There were also 2 cases in Minnesota residents associated with outbreaks in different states, one in Missouri and one in New York City. The remaining 47 cases (92%) were sporadic.

Listeriosis

Three listeriosis cases were reported during 2015. All three were hospitalized and survived. The median age of cases was 76 years (range, 76 to 84 years). All three had *Listeria monocytogenes* isolated from blood. Three cases represent a marked decrease from the 17 cases reported in 2014, a decrease in the median number of cases reported from 1996 through 2014 (median, 7 cases; range, 3 to 19 cases), and the lowest number of cases reported since 2009. No listeriosis outbreaks were identified in 2015.

Lyme Disease

Lyme disease is caused by *Borrelia burgdorferi*, a spirochete transmitted to humans by bites from *Ixodes scapularis* (the blacklegged tick or deer tick) in Minnesota. Recently, a new species of bacteria, *Borrelia mayonii*, has also been identified as a cause of human disease. 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 2015, 1,176 confirmed Lyme disease cases (20.7 cases per 100,000 population) were reported (Figure 1). In addition, 630 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. Despite some yearly fluctuations, the number of reported cases of Lyme disease has been increasing, as evidenced by the median number of cases from 2006 through 2015 (median, 1,121; range, 896 to 1,431) compared to the median from 1996 to 2005 (median, 464; range, 252 to1,023).

Seven hundred forty (63%) confirmed cases in 2015 were male. The median age was 44 years (range, 1 to 91 years). Physician-diagnosed erythema migrans (EM) was present in 882 (75%) cases. Three hundred thirty-four (28%) cases had one or more late manifestations of Lyme disease (including 218 with a history of objective joint swelling, 95 with cranial neuritis, including Bell's palsy, 9 with lymphocytic meningitis, 14 with acute onset of 2nd or 3rd degree atrioventricular conduction defects, and 8 with radiculoneuropathy) and confirmation by Western immunoblot (positive IgM ≤30 days post-onset or positive IgG). In 2015, 1 death due to Lyme disease was reported. The patient, a 59 year-old male, was diagnosed with Lyme carditis post-mortem. Of the 1,105 cases with known onset dates, onset of symptoms peaked from June through August, with 43% 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 2015 either resided in or traveled to endemic counties in north-central, east-central, or southeast Minnesota, or Wisconsin.

Malaria

Malaria is 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 subsequently have been imported infections acquired abroad.

In 2015, 43 malaria cases (0.8 per 100,000 population) were reported. Thirty-three (77%) cases were identified with *P. falciparum*, 5 (12%) with *P. vivax*, 2 (5%) with *P. ovale*, and 1 (2%) with mixed *Plasmodium* species infections; infections with unidentified *Plasmodium* species were detected in 3 cases. The median age of cases was 33 years (range, 18 to 62 years). Of the 34 cases with known race, 29 (85%) were black, 3 (9%) were white, 1 (3%) was Asian, and 1 (3%) was American Indian. Forty cases were Minnesota residents at the time of their illness, 35 (88%) of whom resided in the metropolitan area. Three patients were residents of a country other than the United States. Of the 34 cases with known country of birth, 8 (24%) were born in the United States. Thirty-nine (91%) cases in 2015 likely acquired malaria in Africa, 2 (4%) cases were likely acquired in Asia, and 1 (2%)

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case was likely acquired in Central America. Exposure information was not available for 1 case. Sixteen countries were considered possible exposure locations for malaria infections, including Liberia (7), Nigeria (6), Kenya (5), and Ghana (5), as well as several other countries in sub-Saharan Africa.

Measles
Two measles cases were reported in 2015. Both were residents of Hennepin County. The first case, identified in late January, was a 20 year-old Asian, non-Hispanic male. The case was a University of Minnesota student who had recently returned from Indonesia. Though he had symptoms clinically compatible with measles, his illness was mild and he was not hospitalized. The case reported having 2 doses of measles-containing vaccine. Over 3,200 individuals were exposed to this case on campus, but no secondary cases were identified. Vaccinated individuals who develop measles disease typically have milder symptoms and are less contagious than those who are unvaccinated.

The second case was a 9 month-old Asian, non-Hispanic female too young to have been vaccinated. The child was febrile and developed a rash while on an international flight from India to the United States. The child was hospitalized and recovered without complications.

Both cases were confirmed by PCR at the PHL. The first case was genotype D9 and the second B3. The cases were considered international importations (exposed to measles outside of the United States) and were not epidemiologically linked to each other or to any other known case or outbreak.

Meningococcal Disease
Seven *Neisseria meningitidis* (NM) invasive disease cases (0.15 per 100,000 population) were reported in 2015; 6 cases were reported in 2014. Six were serogroup B and 1 case could not be serogrouped because the isolate was non-viable. All cases were sporadic.

Cases ranged in age from 4 months to 58 years. Five occurred in Greater Minnesota, while in 2014, 4 of the 6 cases occurred in the metropolitan area. Three cases had meningitis, 3 had bacteremia without another focus of infection (of these 1 also had septic shock), and 1 had pneumonia. There were no deaths.

One case-isolate demonstrated intermediate resistance to both ampicillin and penicillin, and 1 case-isolate was intermediate resistant only to ampicillin. None demonstrated ciprofloxacin resistance.

One Minnesota 2015 suspect case (suspect because specimen collected >12 hours after death) was linked by molecular laboratory tests to an ongoing outbreak of 7 cases in Chicago. All cases were in men who have sex with men.

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. Later vaccines were licensed for use in the United States in January 2005 for persons aged 11 to 55 years, and include protection against serogroups A, C, Y, and W-135. In 2011, the license was approved to include 9 through 23 months. The U.S. Advisory Committee on Immunization Practices (ACIP) 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. Meningitis serogroup B outbreaks have occurred on college campuses in the United States. As a result of these outbreaks, two meningitis B vaccines were licensed (Bexsero®, Trumenba®). Current recommendations are that teens and young adults (16-23 years) may be vaccinated against meningitis B, preferably at 16 through 18 years old.

Mumps
Six mumps cases were reported in 2015. All six were residents of the metropolitan area. One was classified as confirmed (tested positive by PCR) and 5 as probable (tested positive by IgM serology or were epidemiologically linked to another case or outbreak).

The confirmed case had recently returned from the Caribbean. Lab testing revealed that her genotype matched a common wild-type mumps genotype circulating in that region. One of the 5 probable cases was IgM negative but was epidemiologically linked to an ongoing outbreak at an Iowa university. The remaining 4 probable cases were positive by IgM serology and were not epidemiologically linked to each other or to a source case. Mumps surveillance is complicated by nonspecific clinical presentation in nearly half of cases, asymptomatic infections in an estimated 20% of cases, and suboptimal sensitivity and specificity of serologic testing.

Cases ranged in age from 15 to 73 years. One case occurred in a person <18 years of age; 2 cases occurred in persons 19 through 33 years of age; 1 case was 42 years old; and 2 cases occurred in persons ≥50 years. Two cases reported a history of receiving at least 1 dose of mumps-containing vaccine but had no documentation of those doses; one case reported never having received any doses of mumps-containing vaccine, and 3 cases (including 2 born prior to 1957) had unknown vaccination status.

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 2015, 58 cases (0.84 cases per 1,000 live births) were reported compared to 60 cases in 2014. Among these cases, all were identified via blood or cerebrospinal fluid (CSF). Most cases (84%) were culture-positive within the first 2 days of life. In 2015, *Escherichia coli* was the most common bacteria (25) followed by group B Streptococcus (16), *Streptococcus viridians* (6), *Haemophilus influenzae* (2; both non-typeable), *Klebsiella* spp. (2), and 1 each of *Arthrobacter* spp, *Enterococcus* spp., *Gordonia* spp., group A Streptococcus, group C Streptococcus, group D Streptococcus, *Staphylococcus aureus,* and *Streptococcus pneumoniae*.

Pertussis
In 2015, 594 pertussis cases (11 per 100,000 population) were reported. Laboratory confirmation was available for 476 (80%) cases, 15 (3%) of which

were confirmed by culture and 461 (96%) of which were confirmed by PCR. In addition, 57 (10%) cases met the clinical case definition and were epidemiologically linked to laboratory-confirmed cases, and 61 (10%) met the clinical case definition only. Three hundred forty-three (58%) of the reported cases occurred in residents of the metropolitan area.

Paroxysmal coughing was the most commonly reported symptom, which 557 (93%) cases experienced. Approximately one fourth (172, 29%) reported whooping. Although commonly referred to as "whooping cough," very young children, older individuals, and persons previously immunized may not have the typical "whoop". Post-tussive vomiting was reported in 246 (41%) cases. Infants and young children are at the highest risk for severe disease and complications. Pneumonia was diagnosed in 17 (3%) cases, only 1 of which was in an infant; 9 (53%) were between the ages of 2 and 16 years, 6 (35%) were between the ages of 20 and 81 years. Ten (2%) cases were hospitalized; 2 (20%) of the hospitalized patients were <6 months of age. No deaths occurred.

Pertussis can affect persons of any age. The disease is increasingly recognized in older children and adults. During 2015, cases ranged in age from <1 month to 89 years. Two hundred eight (35%) cases occurred in adolescents 13-17 years of age, 129 (22%) in adults ≥18 years of age, 182 (31%) in children 5-12 years of age, 66 (11%) in children 6 months through 4 years of age, and 9 (2%) in infants <6 months of age. The median age of cases was 14 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 2015, 20 cases were in infants <1 year of age. A likely source of exposure was identified for 6 of those cases; 1 was infected by adults 18 years of age and older, 1 by an adolescent 13-17 years of age, 3 by a child <13 years of age, and 1 exposure's age was unknown. Fourteen infant cases had no identified source of infection. 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 disease, particularly as the number of years since vaccination increase. Disease in those previously immunized is usually mild. Efficacy for currently licensed DTaP vaccines is estimated to be 71-84% in preventing typical disease within the first 3 years of completing the series. Waning immunity sharply increases at 7 years of age, and most are susceptible by 11-12 years of age when Tdap booster is recommended. Recent studies suggest that immunity wanes sharply 2 years from receipt of Tdap. Of the 85 (14%) cases who were 7 months to 6 years of age, 45 (53%) were known to have received at least a primary series of 3 doses of DTP/ DTaP vaccine prior to onset of illness; 38 (45%) received fewer than 3 doses and were considered preventable cases.

Reporting rules require clinical isolates of *Bordetella pertussis* be submitted to the PHL in order to track changes in circulating strains. Isolates for all 26 culture-confirmed cases were received and sub-typed, with five distinct PFGE patterns identified. Nationally, isolates have had low minimum inhibitory concentrations, falling within the reference range for susceptibility to erythromycin and azithromycin. Only 11 erythromycin-resistant *B. pertussis* cases have been identified in the United States to date.

Laboratory tests should be performed on all suspected cases. Culture of *B. pertussis* requires inoculation of a specimen of nasopharyngeal mucus 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. Whenever possible, culture should be done in conjunction with PCR testing. Serological tests may be useful for coughs >2 weeks.

Pertussis remains endemic 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 middle school-aged children, adolescents, and adults.

Q Fever

Q fever is an acute or chronic illness caused by the bacterium *Coxiella burnetti*. Cattle, sheep, and goats are the primary sources of human infection. Transmission can occur through contact with infected animal tissue, inhalation of aerosolized bacteria, ingestion of unpasteurized dairy products, and tick bites.

In 2015, 2 confirmed cases of acute Q fever were reported. There were no chronic cases reported. The cases were 58 and 60 years old, both male. Both were hospitalized for 12 and 3 days respectively and survived. Both cases lived on or near a beef cattle farm.

From 1997 to 2015, 19 confirmed acute cases and 4 confirmed chronic cases of Q fever were reported. The median age of acute cases was 58 years (range, 11 to 76 years); the median age of chronic cases was 32 years (range, 23 to 75 years). Six (75%) cases for which both race and ethnicity were known were white, non-Hispanic, 1 (13%) was black, non-Hispanic, and 1 (13%) was mixed race, non-Hispanic. During this time, 13 (76%) of the 17 cases for whom exposure information was available were likely exposed through direct or indirect contact with infected animals, 2 (12%) were likely exposed through ingestion of unpasteurized dairy products, and 2 (12%) through a tick bite. Five (42%) of the 12 cases with known occupations were employed in an agriculture-related occupation.

Rabies

In Minnesota, the animal reservoir for rabies are skunks and multiple bat species. Dogs, cats, and livestock are generally exposed to rabies through encounters with skunks. Vaccinating them for rabies provides a buffer between wildlife and people.

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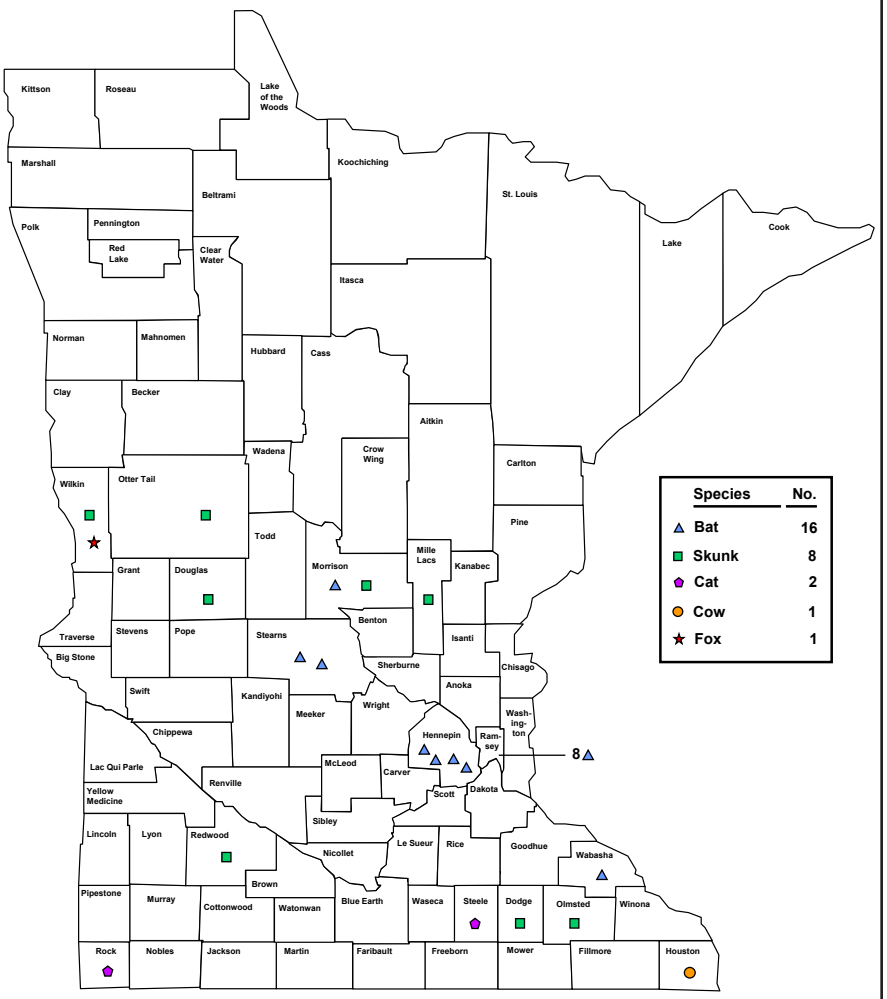
In 2015, 28 (1.4%) of 1,999 animals tested were positive for rabies. This is similar to 2014, when 33 (1.4%) of 2,291 animals tested were positive. The majority of positive animals in 2015 were bats (16/28 [57%]), followed by skunks (8/28 [29%]), cats (2/28 [7%]), cattle (1/28 [4%]), and foxes (1/28 [4%], [Figure 5]). There were no human cases of rabies.

From 2003 to 2015, 743 (2.4%) of 31,193 animals tested were positive for rabies. The median number of rabies positive animals identified annually was 59 (range, 28 to 94). From 2003 to 2015, 299/644 (46%) skunks, 51/739 (7%) cattle, 307/8,772 (3%) bats, 7/294 (2%) horses, 43/9,581(0.4%) cats, 28/8,644 (0.3%) dogs, 0/982 (0%) raccoons, and 8/1,537 (0.5%) other animals (fox [3], goat [2], woodchuck, bison, deer) tested positive for rabies. Rabies in raccoons is rare in Minnesota: from 1988 to 2015, 3 raccoons have tested positive for rabies; these occurred in 1989, 1990, and 1993.

Figure 5. Rabid Animals by County, 2015 (n=28)



Salmonellosis

In 2015, 975 culture-confirmed *Salmonella* cases (17.9 per 100,000 population) were reported (Figure 3). This is a 36% increase from the median annual number of cases reported from 2005 to 2014 (median, 717; range, 578 to 810), and the highest annual case count reported in Minnesota since 1989. The increase was largely due to 200 outbreak-associated cases.

Of the 91 serotypes identified in 2015, 6 serotypes, *S.* Enteritidis (229), *S.* Newport (132), *S.* I 4,[5],12:i:- (88), *S.* Typhimurium (81), *S.* Poona (46), and *S.* Heidelberg (37) accounted for 63% of cases. All but 3 of the *S.* Poona cases were associated with one large outbreak. *Salmonella* was isolated from stool in 859 (88%), urine in 62 (6%), and blood in 40 (4%) cases. Other specimen sources included cerebrospinal fluid, paracentesis fluid, bile fluid, abdominal aortic aneurysm, pancreas pseudocyst, eye swab, breast, shoulder tissue, and wound.

Two hundred sixty-four (27%) cases were hospitalized for their infection; the median length of hospital stay was 4 days (range, 1 to 78 days). One culture-confirmed *Salmonella* case died; a 53 year-old who died of metastatic malignancy 5 days after *S.* Enteritidis was isolated from a paracentesis fluid specimen.

Of the 887 cases asked about travel, 132 (15%) had traveled internationally during the week prior to their illness onset. There were 3 *S.* Typhi cases; 2 had traveled or emigrated from India, and 1 did not report any travel. There were 2 *S.* Paratyphi A cases; 1 had traveled to India, and 1 did not report any travel.

In 2015, culture-independent tests became commercially available for the detection of *Salmonella* nucleic acid in stool. Two patient specimens that were positive by a culture-independent test conducted at a clinical laboratory were not subsequently culture-confirmed, and therefore did not meet the surveillance case definition for inclusion in MDH case count totals.

Two hundred cases were part of 18 *Salmonella* outbreaks identified in 2015, including 2 cases that were part of a multi-state outbreak but who were not exposed in Minnesota (no cases were exposed in Minnesota in this outbreak). Twelve of the outbreaks involved foodborne transmission, three person-to-person transmission, one animal contact, and two outbreaks were due to other modes of transmission (laboratory-acquired, and exposure to raw suet). Nine of the outbreaks, including the non-Minnesota outbreak, involved cases in multiple states. The 18 outbreaks resulted in a median of 5 culture-confirmed cases per outbreak (range, 1 to 81 cases).

In January, 2 *S.* Dublin cases were associated with exposure to beef products sourced from the same Minnesota distributor. The outbreak strain was found in a sample of beef suet (purchased for bird feed) collected from one case's household.

In January, 1 laboratory-confirmed and 4 probable *S.* I 4,5,12:b:- var. L(+) Tartrate+ cases were part of a person-to-person outbreak at an in-home daycare.

In March, 4 laboratory-confirmed and 3 probable *S.* I 4,[5],12:i:- cases were linked to an outbreak at two locations of a Mexican-style chain restaurant. Guacamole was identified as the probable vehicle, but the contaminated ingredient and source were not identified. Also in March, 3 *S.* Poona cases were acquired via person-to-person transmission among three extended family members in two households. The original source of the index case's infection was likely reptile contact at another family member's house. Also in March, 9 *S.* I 4,[5],12:i:- cases were associated with an outbreak at one location of a fried chicken chain restaurant. Cross-contamination of coleslaw with *Salmonella* from raw chicken by a food worker during preparation was the most probable cause of the outbreak. Lastly, 2 *S.* Newport cases were part of a multi-state outbreak of 25 cases from 10 states likely associated with Mexican-style cheese. The Minnesota cases both traveled to Mexico and were likely exposed there.

During April through July, 8 *S.* Enteritidis cases were part of a multi-state outbreak of 15 cases in 7 states associated with raw frozen stuffed chicken products. A local and national press release was issued and a recall initiated.

In April, 8 *S.* Paratyphi B L(+) tartrate+ cases were part of an outbreak at a steak restaurant. Several outbreak cases were also identified in West Virginia. Consumption of the house salad was associated with illness. Due to the number and collinearity of ingredients in the house salad, the implicated ingredient could not be identified epidemiologically. A lack of traceback efforts by external federal partners further prevented identification of the vehicle and source of contamination.

In May, 10 *S.* Enteritidis cases were part of a multi-state outbreak of 252 cases in 43 states with several *Salmonella* serotypes (Enteritidis, Hadar, Indiana, Muenchen, and Muenster) associated with live chicken contact. While a common hatchery was not identified, contact with poultry, particularly with young poultry, is a well-known risk factor for *Salmonella* infections in humans.

During May through July, 5 laboratory-confirmed *S.* Enteritidis cases were associated with consumption of raw frozen stuffed chicken products. A local and national press release was issued and a recall initiated. This outbreak was caused by a different brand/ manufacturer and was not associated with the April – July outbreak.

During June through October, 3 laboratory-confirmed and 7 probable *S.* Agona cases were part of a graduation party outbreak associated with pork prepared from a whole roasted pig. Undercooking and temperature abuse likely contributed to the outbreak.

In June, 4 laboratory-confirmed *S.* Paratyphi B L(+) tartrate(+) cases were part of a multi-state outbreak of 65 cases in 11 states associated with consumption of sushi products made with raw frozen tuna imported from Indonesia. A local and national press release was issued and a recall initiated.

In August, 7 laboratory-confirmed and 2 probable *S.* Virchow cases were part of an outbreak at a restaurant. Consumption of lobster guacamole was significantly associated with illness. Cross-contamination and hand hygiene issues were a likely mechanism for cross-contamination of the guacamole from a raw food of animal origin.

During August 2015 through January 2016, 45 laboratory-confirmed and 3 probable *S.* Poona cases were part of a multi-state outbreak of 907 cases in 40 states linked to garden cucumbers imported from Mexico. Many of the Minnesota cases were exposed at multiple locations of a sandwich chain restaurant and a seafood chain restaurant that received the implicated cucumbers. A local and national press release was issued and a recall initiated.

During August and September, 81 laboratory-confirmed and 34 probable *S.* Newport cases in Minnesota residents were associated with tomatoes served at multiple Mexican-style chain restaurant locations in Minnesota and Wisconsin. Four *S.* Newport cases in Wisconsin residents were identified who were also part of the outbreak. Tomatoes were implicated as the outbreak vehicle by an ingredient-specific analytic study, supported by internal product distribution information provided by the corporate restaurant owner. The ultimate source of contamination (i.e., the tomato farm or packing house) was not identified.

During August through November, 5 *S.* Typhimurium cases were part of a multi-state outbreak of 109 cases in 38 states associated with exposure to the ATCC strain of *S.* Typhimurium in clinic and teaching microbiology laboratories.

In October, 2 laboratory-confirmed and 3 probable *S.* Typhimurium cases were associated with a person-to-person outbreak at a child care center.

During December 2015 through March 2016, 3 *S.* Virchow cases were part of a multi-state outbreak of 33 cases in 23 states associated with an organic packaged meal replacement powder. The manufacturer recalled all lots of product with "best by" dates from August 2017 to December 2017. Organic moringa leaf powder was the contaminated ingredient in the product.

Severe Acute Respiratory Illness (SARI)

In the United States, disease surveillance is largely based on pathogen identification, and severe acute respiratory disease surveillance is most often focused on influenza. There is a gap in surveillance for non-influenza severe acute respiratory illnesses (SARI). In 2013, MDH established year-round SARI surveillance in hospitalized patients at three metropolitan area hospitals. Residual respiratory specimens from admitted patients submitted to the PHL for testing for 20 respiratory pathogens (16 viral, 4 bacterial), and medical

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records for patients with submitted specimens are reviewed.

In 2015, 3,845 patient specimens were received. Children <2 years of age accounted for 50% of submitted specimens (1,924), and 75% of all specimens came from children <18 years old (2,901). Adults 18-44, 45-64, and ≥ 65 years of age accounted for 6% (215), 9% (335), and 10% (385) of submitted specimens, respectively. Median patient age was 2 years (range 0-99 years). Of tested specimens, 2,387 (62%) were positive for at least one pathogen; 571 (15%) had two or more pathogens detected. Rhinovirus/enterovirus (1,136, 30%), respiratory syncytial virus (753, 20%), adenovirus (303, 8%), parainfluenzaviruses 1-4 (296, 8%), human metapneumovirus (196, 5%), and influenza viruses A, B, and C (185, 5%) were the most commonly detected pathogens.

Table 3. Number of Cases and Rates (per 100,000 persons) of Chlamydia, Gonorrhea, and Syphilis, 2011-2015

Disease	2011		2012		2013		2014		2015	
	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
Chlamydia	16,898	319	18,048	340	18,724	353	19,897	375	21,238	400
Gonorrhea	2,283	43	3,082	58	3,872	73	4,073	77	4,097	77
Syphilis, Total	366	6.9	335	6.3	537	10.1	629	11.9	654	12.3
Primary/Secondary	139	2.6	118	2.2	193	3.6	257	4.8	246	4.6
Early latent	121	2.3	96	1.8	139	2.6	159	3.0	185	3.5
Late latent	106	2.0	120	2.3	205	3.9	213	4.0	220	4.1
Other*	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Congenital**	0	0.0	1	1.5	0	0.0	0	0.0	3	4.3

* 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, 2015

Demographic Group	Chlamydia		Gonorrhea		P&S Syphilis	
	No.	Rate	No.	Rate	No.	Rate
Total	21,238	400	4,097	77	246	4.6
Residence*						
Minneapolis	4,302	1,124	1,438	376	129	33.7
St. Paul	2,473	868	657	230	23	8.1
Suburban**	6,763	310	1,071	49	68	3.1
Greater Minnesota	6,593	269	792	32	19	0.8
Age						
<15 years	149	14	24	2	1	0.1
15-19 years	5,160	1,403	640	174	10	2.7
20-24 years	8,309	2,336	1,251	352	21	5.9
25-29 years	3,953	1,061	886	238	50	13.4
30-34 years	1,859	542	509	148	33	9.6
35-44 years	1,295	190	483	71	63	9.2
≥45 years	513	24	304	14	68	3.2
Gender						
Male	7,122	271	2,420	92	207	7.9
Female	14,107	528	1,675	63	39	1.5
Transgender^^	9	-	2	-	2	-
Race^/Ethnicity						
White	8,701	192	1,529	34	139	3.1
Black	4,667	1,701	1,456	531	80	29.2
American Indian	559	918	147	241	8	13.1
Asian/PI	738	341	97	45	7	3.2
Other^^	585	-	96	-	4	-
Unknown^^	5,988	-	541	-	8	-
Hispanic^^^	1,270	507	202	81	30	12.0

* Residence information missing for 988 cases of chlamydia and 149 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.

Sexually Transmitted Diseases (STDs)

Surveillance for gonorrhea and chlamydia in Minnesota are monitored through a mostly passive surveillance system involving collecting both case reports and laboratory reports. Syphilis is monitored through active surveillance, which involves immediate follow-up with the clinician upon receipt of a positive laboratory report. 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 2015, 21,238 chlamydia cases (400 per 100,000 population) were reported, representing a 7% increase from 2014 (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 (2,336 per 100,000), followed by the 15 to 19-year-old age group (1,403 per 100,000). The incidence of chlamydia among adults 25 to 29 years of age (1,061 per 100,000) is considerably lower but has continued to increase in recent years. The chlamydia rate among females (528 per 100,000) is more than twice the rate among males (271 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 (1,701 per 100,000) is nine times higher than the rate among whites (192 per 100,000). Although blacks comprise approximately 5% of Minnesota's population, they account for 22% of reported chlamydia cases. Rates among Asian/Pacific Islanders (341 per 100,000), Hispanics (507 per 100,000), and American Indians (918 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 (1,124 per 100,000) and St. Paul (868 per 100,000). While there was an overall increase of 7% across the state in 2015, the greatest increase for chlamydia was seen in Minneapolis. This area displayed an increase of 13%, as shown in Table 4. Every county in Minnesota had at least 2 cases in 2014.

Gonorrhea

Gonorrhea, caused by *Neisseria gonorrhoeae*, is the second most commonly reported STD in Minnesota. In 2015, 4,097 cases (77 per 100,000 population) were reported. 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 rates of 174 per 100,000 among 15 to 19-year-olds, 352 per 100,000 among 20 to 24-year olds, and 238 per 100,000 among 25 to 29-year-olds. Gonorrhea rates for males (92 per 100,000) were higher than females (63 per 100,000). Communities of color are disproportionately affected by gonorrhea. The incidence of gonorrhea among blacks (531 per 100,000) is 15 times higher than the rate among whites (34 per 100,000). Rates among Asian/Pacific Islanders (45 per 100,000), Hispanics (81 per 100,000), and American Indians (241 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 (376 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 12 times higher than the rate in greater Minnesota (32 per 100,000). In 2015, Greater Minnesota saw the largest increase in cases at 15%.

The emergence of quinolone-resistant *N. gonorrhoeae* (QRNG) in recent years has become a 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, 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. New CDC STD Treatment Guidelines were released in 2015. (http://www.cdc.gov/std/tg2015/default.htm)

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 2015, there were 246 cases of primary/secondary syphilis in Minnesota (4.6 cases per 100,000 persons). This represents a small decrease compared to the 257 cases (4.8 per 100,000) reported in 2014

Early Syphilis

In 2015, the number of early syphilis cases increased by 4%, with 431 cases, compared to 416 cases in 2014. The incidence remains highly concentrated among MSM. Of the early syphilis cases in 2015, 341 (80%) occurred among men; 222 (65%) of these were MSM; 56% of the MSM diagnosed with early syphilis were co-infected with HIV. However, the number of women reported has continued to increase from 2012.

Congenital Syphilis

Three congenital syphilis cases were reported in 2015. Congenital syphilis can be prevented by screening and treatment during pregnancy. Because of an increase in syphilis in Minnesota among women of childbearing age, MDH issued a health advisory in January 2016 that all pregnant women be tested at their first prenatal visit, at 28 weeks gestation, and at delivery.

Chancroid

Chancroid continues to be very rare in Minnesota. The last case was reported in 1999.

Shigellosis

In 2015, 292 culture-confirmed cases of shigellosis (5.3 per 100,000 population) were reported (Figure 3). This represents a 314% increase from the 93 cases reported in 2014, and is 254% greater than the median annual number of cases reported during 2005-2014 (median, 115 per year; range, 66 to 391). This is consistent with cyclical increases in shigellosis incidence that are observed every 4-7 years. *S. sonnei* accounted for 254 (87%) cases, and *S. flexneri* for 37 (13%) cases. The species was not identified in 1 case. There were no *S. dysenteriae* infections reported in 2015. Cases ranged in age from 3 months to 85 years (median, 17 years). Thirty percent of cases were ≤5 years of age; 49% of cases were 18 years of age or older. Fifty-two percent of cases were female. Sixty-three (22%) cases were hospitalized. No cases died. Fifty-two percent of cases reported either non-White race (119 of 263 cases) or Hispanic ethnicity (37 of 271 cases). Of the 268 cases for which travel information was available, 10 (4%) traveled internationally (7 of 236 [3%] *S. sonnei*, and 3 of 31 [10%] *S. flexneri*). Eighty-four percent of cases resided in the metropolitan area, including 54% in Hennepin County and 11% in Ramsey County.

Forty-one (14%) cases were part of 19 *Shigella* outbreaks identified in 2015 (median, 1 case per outbreak; range 1 to 10). Eighteen person-to-person outbreaks were caused by *S. sonnei*: 13 outbreaks were in daycares, 3 in schools, 1 in a homeless shelter, and 1 in an adult foster care facility. One

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confirmed foodborne outbreak of *S. sonnei* infections was associated with a private gathering; the vehicle of transmission was not determined.

In 2015, 43 of the 289 *Shigella* isolates received at MDH were tested for antimicrobial resistance. Of the 43 isolates, 44% (19 isolates) were resistant to trimethoprim-sulfamethoxazole, 14% (6 isolates) were resistant to ampicillin, and 2% (1 isolate) had decreased susceptibility to azithromycin.

Staphylococcus aureus

Invasive *Staphylococcus aureus* (SA) infections are classified into one of three categories: hospital-onset (HO-SA), healthcare-associated, community-onset (HACO-SA), and community-associated (CA-SA). SA must be isolated from a normally sterile body site >3 days after hospital admission for a case to be considered HO-SA. HACO-SA cases have at least one HA risk factor identified in the year prior to infection; examples of risk factors include residence in a long term care facility, recent hospitalization(s), dialysis, presence of an indwelling central venous catheter, and surgery. CA-SA cases do not have any identifiable HA risk factors present in the year prior to infection.

In 2005, as part of EIP, population-based surveillance of invasive methicillin-resistant SA (MRSA) was initiated in Ramsey County; surveillance was expanded to include Hennepin County in 2008. The incidence rate decreased to 11.2 per 100,000 in 2015 (Ramsey: 10.3/100,000, Hennepin: 11.6/100,000) compared to 15.2/100,000 population in 2014. In 2015, MRSA was most frequently isolated from blood (77%), and 13% (25/196) of the cases died in the hospital. HACO-MRSA cases comprised the majority (72%, 141/196) of invasive MRSA infections in 2015; CA-MRSA cases accounted for 18% (35/196) and 10% (20/196) cases were HO-MRSA. The median age for all cases was 62 years (range, <1 to 96 years); the median age was 58 (range, 41 to 79), 63 (range, 5 to 96 years), and 53 years (range, <1 to 91) for HO-, HACO-, and CA-MRSA cases, respectively. Please refer to the MDH Antibiogram (pp. 28-29) for details regarding antibiotic susceptibility testing results.

In August 2014, population-based surveillance of invasive methicillin-sensitive (MSSA) was initiated in Hennepin and Ramsey Counties. The incidence rate was 28.7 per 100,000 in 2015 (Ramsey: 28.5/100,000, Hennepin: 28.8/100,000). In 2015, MSSA was most frequently isolated from blood (72%), and 10% (51/501) of the cases died in the hospital. HACO-MSSA cases comprised the majority (58%, 289/501) of invasive MSSA infections in 2015; CA-MSSA cases accounted for 32% (159/501) and 11% (53/501) cases were HO- MSSA. The median age for all cases was 60 years (range, <1 to 102 years); the median age was 60 (range, <1 to 94), 62 (range, <1 to 102), and 57 years (range, <1 to 90) for HO-, HACO-, and CA-MSSA cases, respectively.

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 µg/ml for VISA and MIC≥16 µg/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. Prior to 2008, the PHL had confirmed 1 VISA case. Between 2008 and 2013, we confirmed 16 VISA cases; 2008 (3), 2009 (3), 2010 (2), 2011 (5), and 2013 (3). No VISA cases were confirmed in 2014 or 2015. Among all cases, 8 (47%) were male and the median age was 62 years (range, 27 to 86). Of those cases with known history (15), 80% reported recent exposure to vancomycin.

Streptococcal Invasive Disease – Group A

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 usually sterile site such as blood, cerebrospinal fluid, or from a wound when accompanied with necrotizing fasciitis or streptococcal toxic shock syndrome (STSS).

Two hundred thirty-six cases (4.2 cases per 100,000 population), including 14 deaths, were reported in 2015, compared to 259 cases and 27 deaths in 2014. Ages of cases ranged from 0 to 101 years (median, 52 years). Fifty-three percent of cases were residents of the metropolitan area. Seventy (30%) cases had cellulitis, 49 (21%) had bacteremia without another focus of infection, 42 (18%) had septic arthritis and/or osteomyelitis, 20 (8%) had an abscess, 43 (18%) had septic shock, and 14 (6%) had necrotizing fasciitis. Fourteen (6%) cases were residents of long-term care facilities. Twelve facilities had a single case, and one facility had 2 cases. The 14 deaths included 3 cases of bacteremia without another focus of infection, 5 cases septic shock, and 5 cases of pneumonia. Two fatal cases had both septic shock and pneumonia. The deaths occurred in persons ranging in age from 11 to 94 years. Two fatal cases had no underlying medical conditions reported. Of the 12 deaths where underlying medical condition was known, the most frequently reported were current smoking (7), chronic obstructive pulmonary disease (4), solid organ malignancy (4), and diabetes (4).

Streptococcal Invasive Disease – Group B

Five hundred twenty-seven cases of invasive group B streptococcal (GBS) disease (9.7 per 100,000 population), including 25 deaths, were reported in 2015. In 2013, 595 cases were reported, the largest number of GBS cases reported since surveillance was initiated in 1995.

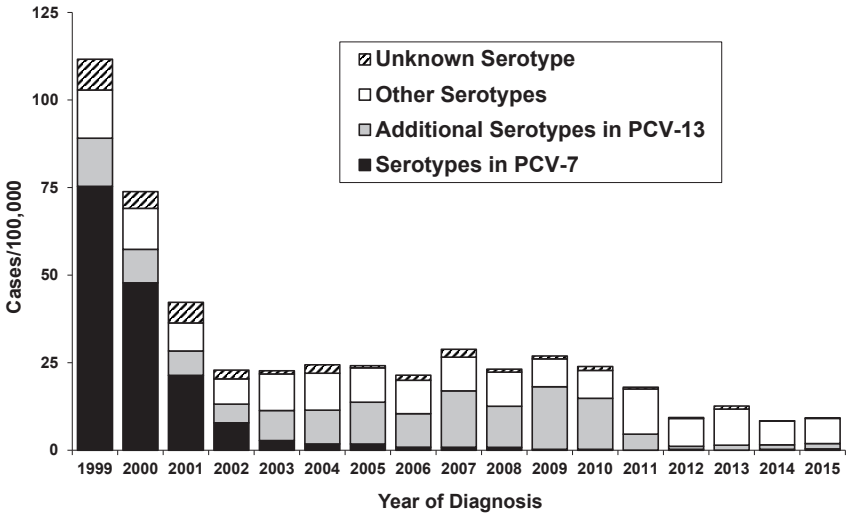
By age group, annual incidence was highest among infants <1 year of age (56.2 per 100,000 population) and cases aged 70 years or older (36.8 per 100,000). Twelve (48%) of the 25 deaths were among cases age 65 years and older. Fifty-two percent of cases were residents of the metropolitan area. Bacteremia without a focus of infection occurred most frequently (33% of infections), followed by cellulitis (18%), septic arthritis (11%), abscess (7%), osteomyelitis (4%), and meningitis (2%). The majority (73%) of cases had GBS isolated from blood; other isolate

sites included joint fluid (15%) and bone (2%).

Forty-two cases were infants or pregnant women (maternal cases), compared to 48 cases in 2014. Sixteen infants developed early-onset disease (occurred within 6 days of birth [0.2 cases per 1,000 live births]), and 21 infants developed late-onset disease (occurred at 7 to 89 days of age [0.3 cases per 1,000 live births]). Two stillbirth/spontaneous abortions were associated with the 5 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 2015. Overall, 10 of 16 women who delivered GBS-positive infants underwent prenatal screening for GBS. Of these, 2 were positive and 8 negative. Two of the 6 women who did not receive prenatal screening were screened upon admission to the hospital and prior to delivery. Among the 16 women who delivered GBS-positive infants, 5 received intrapartum antimicrobial prophylaxis (IAP). One of the 2 women with a positive GBS screen after hospital admission received IAP.

Figure 6. Invasive Pneumococcal Disease Incidence Among Children <5 Years of Age, by Year and Serotype Group, Metropolitan Area, 1999-2001; Minnesota, 2002-2015



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).

***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 2015, 534 (9.8 per 100,000) cases of invasive pneumococcal disease were reported. By age group, annual incidence rates per 100,000 were 10.3 cases among children aged 0-4 years, 2.5 cases among children and adults aged 5-39 years, 11.0 cases among adults 40-64 years, and 30.3 cases among adults aged 65 years and older.

In 2015, pneumonia occurred most frequently (50% of infections), followed by bacteremia without another focus of infection (29%), septic shock (8%), and meningitis (6%). Fifty-six (10%) cases died. Health histories were available for 51 of these 56 cases; of these, 48 had an underlying health condition reported. The conditions most frequently reported were emphysema/chronic obstructive pulmonary disease (16), diabetes (13), heart failure/congestive heart failure (12), alcohol abuse (9), current smoker (7), solid organ malignancy (7) dementia (7), and atherosclerotic cardiovascular disease (4).

In 1999, the year before the pediatric pneumococcal conjugate vaccine (Prevnar [PCV-7]) was licensed, the rate of invasive disease among children <5 years of age in the metropolitan area was 111.7 cases/100,000. Over 2000 to 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 since 2012 (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 2015, 17% 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 (11%), 19A (3%), and 7F (3%). In August 2014, the Advisory Committee on Immunization Practices recommended that all adults ≥65 years of age receive 1 dose of PCV-13 followed by 1 dose of 23-valent pneumococcal polysaccharide vaccine (PPSV-23) 6 to 12 months later. Among adults 65 years and older 15% of cases were caused by PCV-13 serotypes in 2015.

Of the 499 isolates submitted for 2015 cases, 98 (20%) isolates were resistant to penicillin using meningitis breakpoints. Using non-meningitis breakpoints, 5 (1%) isolates were resistant to penicillin and 8 (2%) exhibited intermediate level resistance (Note: CLSI penicillin breakpoints changed in 2008; refer to the MDH Antibiogram on pp. 28-29). Multi-drug resistance (i.e., high-level resistance to two or more antibiotic classes) was exhibited in 82 (16%) isolates.

Surveillance for non-invasive *S.*

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pneumoniae disease become established January 1, 2016. Cases are detectable through positive urine antigen screening from select sentinel hospital laboratories. Surveillance is limited to Minnesotans aged ≥18 years who reside within the metropolitan area. Retrospective cases through January 1, 2013 were also made reportable. In 2015, 90 non-invasive pneumococcal disease cases were reported. Fifty-five cases (61%) were female. Cases had a median age of 69.5 years, with 25% aged 57 years or younger and 25% aged 81 years or older. Five percent of cases were aged 35 years or younger, with the youngest case aged 24 years. All 90 cases had underlying conditions, with 36 (14%) reporting emphysema/ chronic obstructive pulmonary disease. Other common underlying conditions included 29 (11%) with current smoking, 21 (8%) with history of solid organ malignancy, 18 (7%) with asthma, 15 (6%) with obesity, and 12 (5%) with chronic kidney disease. Two cases died during hospitalization, and 33 cases (37%) required admission to intensive care.

Toxic Shock Syndrome

In 2015, 11 cases of suspect, probable, or confirmed staphylococcal toxic shock syndrome (TSS) were reported. The 2011 CDC case definition is used to classify cases, and it encompasses a variety of clinical and laboratory findings. Nine were female and the median age was 28 years (range, 12 to 86 years). Three cases were associated with tampon use. One case was associated with a wound. One case was fatal.

Staphylococcal toxic shock syndrome is reportable within 1 working day and includes submission of clinical isolates. The 2011 CDC case definition is used to classify cases and encompasses multiple clinical and laboratory findings.

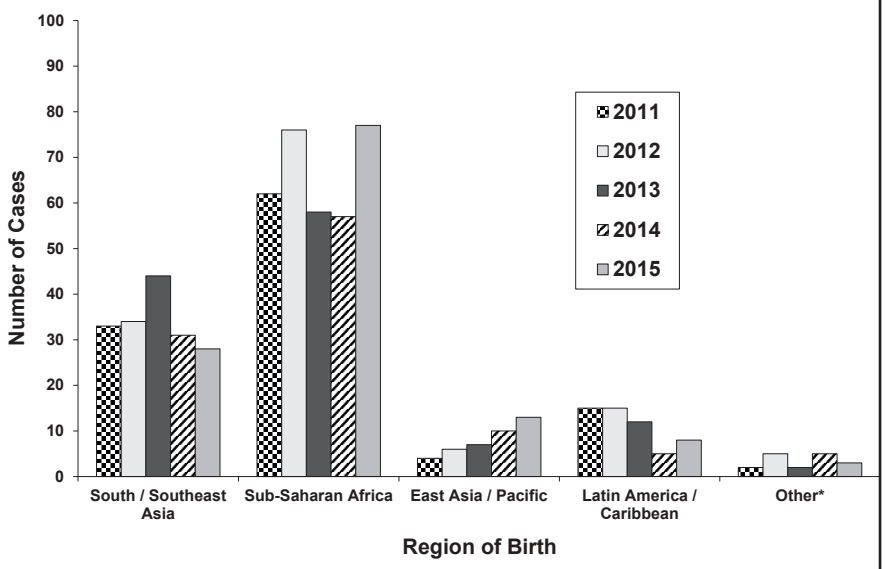
In 2015, 11 confirmed and probable cases of streptococcal toxic shock syndrome (STSS) were reported (using 2010 CDC case definition). Six were female and the median age was 38 years. All were hospitalized and 1 case was fatal.

Toxoplasmosis

Toxoplasmosis is an illness caused by the coccidian protozoan *Toxoplasma gondii*. Cats are the primary reservoir for *T. gondii*. *T. gondii* transmission in the United States is primarily foodborne, through the consumption of food or water that has been contaminated with cat feces or through ingestion of cysts in undercooked meat; people also can be infected through direct contact with cat feces that contain the parasites.

MDH conducts passive physician and laboratory-based surveillance for toxoplasmosis. In 2015, 9 cases were reported, similar to the 7 cases reported in 2014, and 8 reported in 2013. Five of the 9 cases had immunosuppressing conditions. One case was diagnosed with cerebral toxoplasmosis, 4 cases were diagnosed with ocular toxoplasmosis, and 4 cases were diagnosed with generalized toxoplasmosis. There were no pregnant or congenital cases. The median age of cases was 49 (range, 15 to 61 years). Five cases were male. Six cases were white, 2 were black, and 1 was Asian; 5 were non-Hispanic, and 4 were Hispanic.

Figure 7. Foreign-Born Tuberculosis Cases by Region of Birth and Year of Report, Minnesota, 2011 – 2015



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

Tuberculosis

In 2015, 150 tuberculosis (TB) cases (2.7 per 100,000 population) were reported. This represents a 2% increase in the number of cases compared to 2014 (147), but a 37% decrease in the number of cases since 2007, when the highest number (238) in the past decade was reported. As seen in most years, Minnesota's TB incidence rate in 2015 was lower than the national rate of 3.0 cases per 100,000 population. Two (1%) of the cases died due to TB-related causes.

Twenty-three (26%) of the state's 87 counties reported at least 1 new case of TB disease in 2015. The majority (74%) of cases occurred in the metropolitan area, primarily in Hennepin (38%) and Ramsey (19%) Counties. Seventeen percent (25) were from the other five metropolitan counties. The remaining 26% of cases were reported from Greater Minnesota. Among metropolitan area counties, the highest TB incidence rate in 2015 was reported in Ramsey County (5.4 per 100,000 population), followed by Hennepin County (4.7 per 100,000), and Dakota County (2.7 per 100,000 population). The TB incidence rate for all Greater Minnesota counties combined was 1.6 per 100,000 population.

The vast majority (87%) of TB cases reported in Minnesota in 2015 were identified as a result of individuals seeking medical care for symptoms of disease. Various targeted public health interventions identified a portion of the remaining 13% of cases. Such methods of case identification are considered high priority, core TB prevention and control activities; they included TB contact investigations (3%), follow-up evaluations resulting from abnormal findings on pre-immigration exams performed overseas (3%), and domestic refugee health assessments (2%). An

additional 3% were identified through other means (e.g., other immigration medical exams, occupational screening or other targeted testing for TB). Five (3%) cases were diagnosed with active TB disease incidentally while being evaluated for another medical condition.

TB incidence is disproportionately high in racial minorities in Minnesota as well as in the United States. In 2015, only 12 cases occurred among non-Hispanic whites in Minnesota (0.3 cases per 100,000 population). In contrast, among non-Hispanic persons of other races, 84 cases occurred among blacks (24.5 cases per 100,000), 41 among Asian/Pacific Islanders (15.3 cases per 100,000), and 4 among American Indian/Alaskan Natives (6.0 cases per 100,000). Nine cases were Hispanic persons of any race (3.2 cases per 100,000). The vast majority of black TB cases (92%) and Asian TB cases (98%) were foreign-born.

The most distinguishing characteristic of the epidemiology of TB disease in Minnesota continues to be the large proportion of cases occurring among persons born outside the United States. In 2015, the percentage of TB cases in Minnesota occurring in foreign-born persons was 86%, compared to 66% of TB cases reported nationally. The 129 foreign-born TB cases reported in Minnesota represented 26 different countries of birth; the most common region of birth among these patients was Sub-Saharan Africa (60% of foreign-born cases), followed by South/Southeast Asia (22%), East Asia/Pacific (10%), and Latin America (including the Caribbean) (6%) (Figure 7). All 6 U.S.-born pediatric TB cases (<15 years of age at diagnosis) had at least one foreign-born parent or guardian. These second-generation children appear to experience an increased risk of TB disease that more closely resembles that of foreign-born persons.

Among the foreign-born TB cases, 19% were diagnosed with TB within the first 12 months after arriving in the United States, and an additional 12% were diagnosed 1 - 2 years after arrival. These cases most likely acquired TB infection prior to immigrating and started progressing to active TB disease shortly after arrival. Of the 16 cases ≥15 years of age who arrived as immigrants or refugees and diagnosed in Minnesota within 12 months of arriving in the U.S., only 4 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.

Table 5. UNEX/MED-X Pathogens Identified as Confirmed, Probable, or Possible Cause of Illness, 2015*

Pathogen Identified	UNEX (n=47)	MED-X (n=36)**
Adenovirus	1	0
Adenovirus type 2	1	0
Anabaena toxin	1	0
Borrelia burgdorferi	1	0
Clostridium difficile	1	0
Clostridium perfringens	0	1
Coxsackievirus B5	1	0
Cytomegalovirus	0	1
Epstein-Barr Virus	2	1
Escherichia coli	0	4
Group A Streptococcus/ *Streptococcus pyogenes*	2	5
Group B Streptococcus	2	2
Group C Streptococcus	0	1
Group F Streptococcus	0	1
Haemophilus influenzae	2	3
Hantavirus	1	0
Herpes simplex virus 2	1	0
Human herpes virus 6	1	0
Influenza A virus (no hemagglutinin typing information available)	0	2
Influenza A - H3	9	0
Influenza B	1	1
Lymphocytic choriomeningitis virus	1	0
Mycrocystis toxin	1	0
Neisseria meningitidis seroroup C	1	0
Parainfluenza virus type 1	1	0
Parechovirus	1	0
Peptoniphilus spp.	0	1
Pseudomonas spp.	0	1
Respiratory syncytial virus	3	0
Rhinovirus	2	1
Rotavirus	1	0
Sapovirus	1	0
Staphylococcus aureus	3	5
Staphylococcus aureus - MRSA	2	2
Streptococcus spp.	4	1
Streptococcus anginosus	0	2
Streptococcus intermedius	1	1
Streptococcus pneumoniae	8	5
Streptococcus viridans	0	2
Vancomycin resistant *Enterococcus*	0	1

* Some cases had multiple pathogens identified as possible coinfections contributing to illness/death.
** MED-X includes pathogens identified by the Medical Examiner. If the cause was found through testing at MDH/CDC it is included in the UNEX column.

Fifty-three percent of cases had pulmonary disease exclusively. Another 11% had both pulmonary and extrapulmonary sites of disease. An equal percentage of foreign-born and U.S.-born TB cases (47%) had at least 1 extrapulmonary site of disease, although extrapulmonary disease is usually more common among foreign-born cases. Among cases with an extrapulmonary site of disease, the most common sites were lymphatic (55%) followed by musculoskeletal (21%).

Aside from foreign-born persons, individuals in other high risk groups comprise a smaller proportion of the TB cases in Minnesota. Twenty-five percent 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, and 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 7% having a history of substance abuse during the

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12 months prior to their TB diagnosis. Nine (6%) were co-infected with HIV. Three percent reported being homeless during the 12 months prior to diagnosis. Another high risk group accounting for 2% of cases included correctional facility residents at time of diagnosis.

In 2015, of 115 culture-confirmed TB cases with drug susceptibility results available, 16 (14%) were resistant to at least 1 first-line anti-TB drug [i.e., isoniazid (INH), rifampin, pyrazinamide, or ethambutol], including 9 (8%) cases resistant to INH. There were no cases of multidrug-resistant TB (MDR-TB, or resistance to at least INH and rifampin) reported in 2015. In comparison, 24% of culture-confirmed cases in 2014 with susceptibility results available were resistant to at least one first-line anti-TB drug, 18% were resistant to INH, and 1 case had MDR-TB.

Unexplained Critical Illnesses and Deaths of Possible Infectious Etiology, and Medical Examiner Deaths Surveillance

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, in which an autopsy was performed by an ME, with a potential infectious cause of death listed. 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.

In 2015, 87 cases met UNEX criteria (71 deaths, 16 critical illnesses) in 2015, compared to 89 cases in 2014. Of the 87, 74 (85%) were reported by providers and 13 (15%) were found by death certificate review. Thirty-two (37%) cases presented with respiratory symptoms; 23 (26%) with sudden unexpected death; 17 (20%) with neurologic symptoms; 2 (2%) with shock/sepsis; 9 (10%) with gastrointestinal illness, 3 (4%) with cardiac symptoms and 1 (1%) with multiple symptoms. The age of cases ranged from newborn to 75 years. The median age was 15 years among 74 reported cases, and 50 years among 13 non-reported cases found through active surveillance. Fifty-two percent resided in the metropolitan area and 52% were male.

There were 272 MED-X cases in 2015; 71 of these also met UNEX criteria. The median age of the cases was 45 years, and 64% were male. There were 170 (63%) cases found through death certificate review; MEs reported 98 (36%) cases. The most common syndrome was respiratory disease (n=102 [37%]). Of the 272 cases, 67 (25%) were confirmed to have had an infectious cause, 160 (52%) had possible infectious causes, and 45 (17%) were non-infectious or unknown cause.

There were 146 cases that had specimens tested at the PHL and/or the IDPB. Forty-seven cases had pathogens identified as confirmed, probable, or possible cause of illness, including 45 UNEX cases (Table 5). Among 43 unexplained deaths occurring in those <50 years of age without any immunocompromising conditions, UNEX helped to identify the pathogen(s) involved in 24 (56%) cases. ME surveillance detected an additional 36 cases with pathogens identified by MEs as the cause of death (Table 5). Cases with pathogens of public health importance detected included a 59 year-old male with a 3-week history of fever, nausea, and vomiting who collapsed at home and was not able to be resuscitated. Pancarditis was noted on autopsy and a positive Western blot for *Borrelia burgdorferi* was reported 3 days after death. *B. burgdorferi* spirochetes were visualized in autopsied heart tissues at CDC documenting the first Lyme carditis death in Minnesota. UNEX laboratory testing detected lymphocytic choriomeningitis virus (LCMV) infection in a 15 year-old female. A home investigation was initiated and was found to have a rodent infestation with droppings that were positive for LCMV. Finally, UNEX surveillance was able to diagnose a case of *Neisseria meningitidis* Group C in a 47 year-old male linked to a multistate outbreak associated with men who have sex with men, the majority of whom were HIV-infected.

Varicella

During 2015, 361 varicella cases (7 per 100,000 population) were reported. One hundred sixty-seven cases (46%) were reported from the metropolitan area. Cases ranged from 6 weeks to 97 years of age. Fifty (14%) cases were <1 year of age, 107 (30%) were 1-5 years of age, 126 (35%) were 6-12 years of age, 27 (7%) were 13-17 years of age, and 51 (14%) were ≥18 years of age.

Outbreaks in Minnesota K-12 schools have been declining markedly in number and size since vaccination requirements were phased in, beginning in 2004. In 2015, only one school reported an outbreak with 6 cases in a grades K-4 school; 5 were unvaccinated due to parental refusal. Four additional cases were unvaccinated siblings of the cases. Overall, 90% of students at the outbreak school were fully vaccinated. By comparison, 10 elementary schools with similar enrollments had cases that did not result in outbreaks; the average immunization rate at those schools was 96%. Two outbreaks were reported in childcare centers, one with 10 cases and one with 6 cases. All cases were too young to be vaccinated.

Seven cases were hospitalized, but there were no deaths. One was <1 year of age, 2 were 1-12 years of age, and 4 were ≥13 years of age. Five had

severe disease and/or complications including pneumonia, bacterial cellulitis and group A streptococcal septicemia. Three had predisposing conditions for severe disease. Four had never received varicella-containing vaccine; 2 were underage for the vaccine, and 2 were adults who were never offered the vaccine. One case had been vaccinated with 1 dose of varicella vaccine and was hospitalized for observation rather than for severe disease, and vaccination history was unknown for 2 cases.

Varicella is sometimes identified by parents/guardians reporting to schools and child care facilities, rather than diagnosed by a provider. Of the 348 cases for which diagnosis information was available, 229 (66%) had visited a health care provider, 32 (9%) had consulted a provider or clinic by telephone, 5 (1%) had been identified by school health personnel, and 82 (24%) had not consulted a healthcare provider. Of the 332 cases for which information regarding laboratory testing was available, 86 (26%) had testing performed.

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 2015, 79 zoster cases were reported. Ages ranged from 1 to 17 years (median, 9 years). Laboratory testing by PCR or DFA confirms the diagnosis of zoster. Of the 73 cases for which information about testing was available, 39 (53%) had testing done; 37 (95%) of these were positive for VZV by PCR.

Zoster with dissemination or complications (other than post-herpetic neuralgia) in persons of any age is also reportable. During 2015, 69 zoster cases with dissemination or complications were reported; 62 were hospitalized. Twenty-eight (41%) cases were ≥60 years of age, 30 (43%) were 30 to 59 years of age, and 11 (16%) were <30 years of age. Twenty-seven (39%) had underlying conditions or were being treated with immunosuppressive drugs. Twenty-three cases had meningitis, 20 had disseminated rash or disease, 17 had cellulitis or other bacterial superinfection, 8 had Ramsay-Hunt Syndrome, 6 had encephalitis or meningoencephalitis, 4 had Bell-like palsy, and 1 had myelitis. Immunocompromising conditions and immunosuppressive drug treatment were more common among cases with disseminated rash or disease (70%) than among those with meningitis without dissemination (17%). No deaths attributable to zoster were reported.

Viral Hepatitis A

In 2015, 21 cases of hepatitis A (HAV) (0.4 per 100,000 population) were reported. Fifteen cases were residents of the metropolitan area, including 10 residents of Hennepin or Ramsey Counties. Twelve of the cases were female. Cases ranged in age from 2 to 62 years (median, 28 years). Race was known for 17 cases; of those 13 (76%) were white, 2 (12%) were Asian, 1 (6%) was black, and 1 (6%) was Native Hawaiian/Pacific Islander. Hispanic ethnicity was reported for 1 case.

Nine cases were associated with travel. No risk factor was identified for the other 12 cases. No outbreaks occurred in 2015.

Viral Hepatitis B

In 2015, 19 cases of acute hepatitis B virus (HBV) infection (0.3 per 100,000 population) were reported. In 2012, the case definition for acute hepatitis B was revised to include laboratory confirmed asymptomatic acute cases. Three of the 19 cases of acute hepatitis B were asymptomatic, laboratory-confirmed infections.

Acute cases ranged in age from 22 to 65 years (median, 42 years). Fifteen (79%) cases were residents of the metropolitan area, including 9 (47%) in Hennepin County and 3 (16%) in Ramsey County. Fifteen (79%) cases were male and 8 (42%) were adolescents or young adults between 13 - 39 years of age. Race was known for 14 cases; of those, 9 were white, 2 were black, 2 were multi-racial, and 1 was Asian. Hispanic ethnicity was reported for 1 case. Incidence rates were higher among Asians (0.4 per 100,000) and blacks (0.6 per 100,000), than among non-Hispanic whites (0.2 per 100,000).

One hundred sixty-five reports of newly identified cases of confirmed chronic HBV infection were received in 2015. A total of 23,855 persons are estimated to be alive and living in Minnesota with chronic HBV. The median age of chronic HBV cases in Minnesota is 45 years.

In addition to the 19 hepatitis B cases, 3 perinatal infections were identified in infants who tested positive for HBsAg during post-vaccination screening performed between 9 and 15 months of age. The perinatal cases were born in 2013 and 2014. The infected infants were 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 were therefore considered treatment failures. Infants born to HBV-infected women are followed and receive hepatitis B immune globulin, 3 doses of the hepatitis B vaccine, and post-vaccination serologic testing. Three hundred forty-six infants born to HBV-infected women in 2014 had post-serologic testing demonstrating no infection.

Viral Hepatitis C

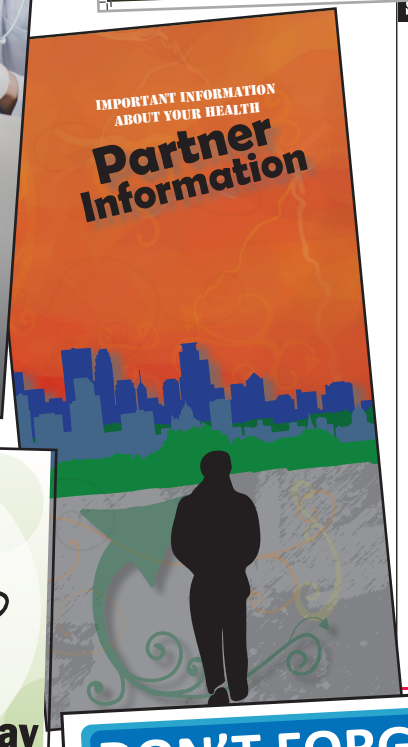
In 2015, 37 cases of acute hepatitis C virus (HCV) infection (0.7 per 100,000) were reported. In 2012, the case definition for acute hepatitis C changed to include documented asymptomatic seroconversion. Of the 40 acute cases, 5 (14%) were asymptomatic, laboratory-confirmed acute HCV infection.

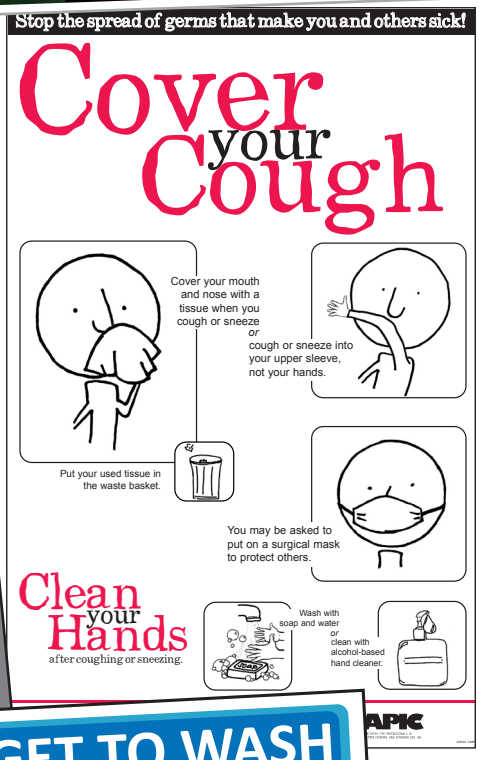
Twenty-four (65%) cases resided in Greater Minnesota. The median age of all cases was 29 years (range, 20 to 53 years). Twenty-two (59%) cases were female. Race was known for 33 cases; of those, 22 (67%) were white and 11 (33%) were American Indian. No cases were known to be of Hispanic ethnicity.

We received 2,396 reports of newly identified anti-HCV antibody-positive or HCV PCR-positive persons in 2015, the vast majority of whom are chronically infected. A total of 45,791 persons are estimated to be alive and living in Minnesota with past or present HCV infection. The median age of these cases is 57 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.

Posters and Other Materials

The Minnesota Department of Health has a variety of posters and other print materials for your facilities and clinics, visit www.health.state.mn.us/divs/idepc to find all of these and many more.

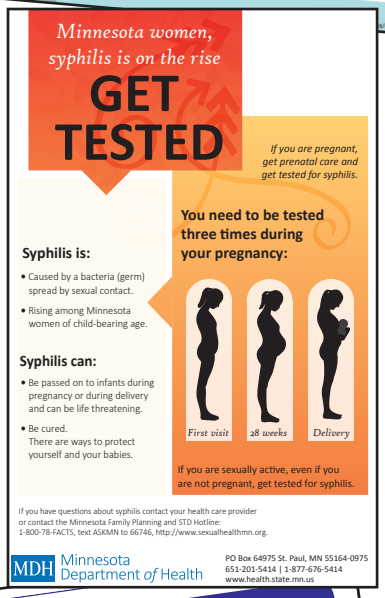





VISITING ANOTHER COUNTRY? PROTECT YOUR FAMILY.
THINK MEASLES.
Measles is widespread in places like Europe, Africa, Asia, India, and the Philippines.
BEFORE YOU TRAVEL
Tell your doctor where you are traveling. Babies and children may need measles vaccination at a younger age than usual.
AFTER YOU TRAVEL
Call your doctor if anyone gets a fever and rash within 3 weeks of returning from your trip. Describe where you traveled.
Talk with your doctor if you are planning an international trip.
For more information go to www.cdc.gov/travel.
MDH


DON'T WAIT 'TIL IT HURTS.
Urine Sample
Patient Number: 15493
CHLAMYDIA
GONORRHEA
TESTING AND TREATMENT ARE QUICK AND PAIN
PEE IN A CUP. GET IT CLEARED UP.
800.78FACTS VOICE/TTY WrapTestTreat.
wrap it / test it / treat it

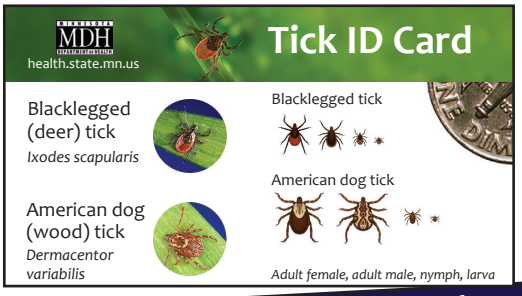

IMPORTANT NOTICE TO ALL SWIMMERS
STOP
• Shower before you get in the water.
• Stay out of the water if you have diarrhea.
• Don't swallow the water.
MDH

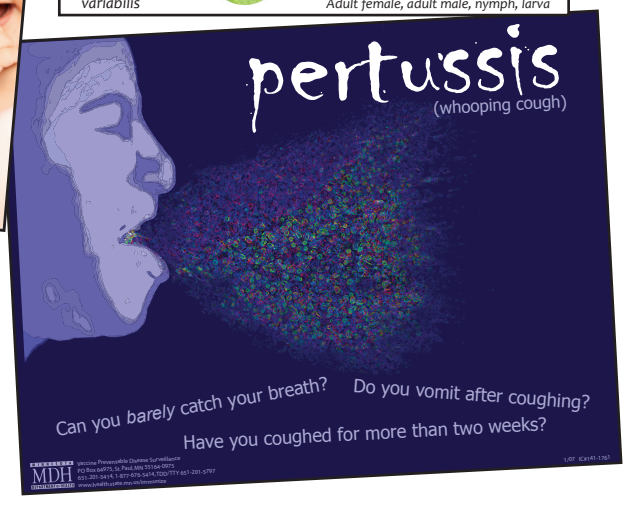

Minnesota women, syphilis is on the rise
GET TESTED
If you are pregnant, get prenatal care and get tested for syphilis.
You need to be tested three times during your pregnancy:
First visit
28 weeks
Delivery
Syphilis is:
• Caused by a bacteria (germ) spread by sexual contact.
• Rising among Minnesota women of child-bearing age.
Syphilis can:
• Be passed on to infants during pregnancy or during delivery and can be life threatening.
• Be cured. There are ways to protect yourself and your babies.
If you are sexually active, even if you are not pregnant, get tested for syphilis.
If you have questions about syphilis contact your health care provider or contact the Minnesota Family Planning and STD Hotline: 1-800-78-FACTS, text ASKMN to 66746, http://www.sexualhealthmn.org.
MDH Minnesota Department of Health
PO Box 64975 St. Paul, MN 55164-0975
651-201-5414 | 1-877-676-5414
www.health.state.mn.us


MAKE YOUR WATER SAFE
No matter how remote or clean-looking a backcountry water source seems, it may still contain viruses, bacteria, and parasites that make people sick with diarrhea and vomiting.
Boil
Boiling water for 1 minute is most effective at removing harmful pathogens from untreated water sources.
Filter & Disinfect
If boiling is not possible, a combination of filtration followed by chemical disinfection is also effective. Water conditions, filter pore size, disinfection concentration, treatment time, and other factors impact the product's effectiveness. Manufacturer's instructions must always be followed.
BOIL
FILTER
DISINFECT
MDH Minnesota Department of Health
Waterborne Diseases Unit • 625 Robert St. N., St. Paul, MN 55155-2538 • 651-201-5414 • 1-877-676-5414


Pregnancy and Vaccination
Pregnant women may be at risk for infectious diseases and their complications. Consider vaccination - even during pregnancy - to protect the woman and the fetus.
Recommended
Contraindicated
If indicated
Vaccine
Before pregnancy
During pregnancy
After pregnancy
Hepatitis A (HepA)
If indicated
Hepatitis B (HepB)
If indicated
Human Papillomavirus (HPV)
Age 9 through 26 years
Not recommended
Age 9 through 26 years
Influenza (IIV)
1 dose annually
Influenza (LAIV)
Avoid conception for 4 weeks
Contraindicated
Avoid conception for 4 weeks
Measles, Mumps, Rubella (MMR)
Avoid conception for 4 weeks
Contraindicated
Give immediately postpartum if susceptible to rubella
Meningococcal (MCV4)
If indicated
Pneumococcal (PPSV / PCV)
If indicated
Tetanus, Diphtheria, Pertussis (Tdap)
If never given previously
During each pregnancy between 27 and 36 weeks
Give immediately postpartum if not given during pregnancy
Tetanus, Diphtheria (Td)
If indicated
Varicella (VAR)
Avoid conception for 4 weeks
Contraindicated
Give immediately postpartum if susceptible
1-800-657-3970
MDH Immunization Program


KEEP THEM SAFE!
Vaccinate
Resources you can trust
GOT YOUR baby SHOT?
MDH


MDH
health.state.mn.us
Tick ID Card
Blacklegged (deer) tick
Ixodes scapularis
American dog (wood) tick
Dermacentor variabilis
Blacklegged tick
American dog tick
Adult female, adult male, nymph, larva


pertussis
(whooping cough)
Can you barely catch your breath?
Do you vomit after coughing?
Have you coughed for more than two weeks?
MDH

Antimicrobial Susceptibilities of Selected Pathogens, 2015

On the following pages is the *Antimicrobial Susceptibilities of Selected Pathogens, 2015*, a compilation of antimicrobial susceptibilities of selected pathogens submitted to MDH during 2015 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."

MDH
Antimicrobial Susceptibilities of Selected Pathogens, 2015

Sampling Methodology
* all isolates tested
‖ ~20% sample of statewide isolates received at MDH
§ ~15% sample of statewide isolates received at MDH
† ~10% 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* complex[10*]	Healthcare-associated MRSA[11*‡]	Community-associated MRSA[11*‡]
Number of Isolates Tested		170	94	43	105	6	221	493	499	115	120	24
		% Susceptible										
ß-lactam antibiotics	amoxicillin								95			
	ampicillin (AMP)		82	86		67	100	100				
	penicillin				0	83	100	100	80#/97¶			
	cefixime				100							
	cefuroxime sodium								90			
	cefotaxime						100	100	92#/98¶			
	ceftriaxone		95	100	100	100			92#/98¶			
	ceftaroline										100	100
	meropenem					100			92			
Other antibiotics	ciprofloxacin	73[1]	91	100	59	100						
	levofloxacin					100	100	99	100		25	58
	azithromycin (AZ)	96		98[3]	90	100						
	erythromycin	96					90	49	65		17	17
	clindamycin						99/90[6]	71/59[7]	92		57/41[11]	71/58[11]
	chloramphenicol		93	91					99			
	gentamicin	97			33							
	doxycycline										96	100
	tetracycline	37			23		92		90		93	92
	trimethoprim/sulfamethoxazole (TMP/SMX)		94	56					82		98	100
	linezolid										100	100
	daptomycin										100	100
	telavancin										100	100
	vancomycin						100	100	100		100	100
TB antibiotics	ethambutol									99		
	isoniazid									92		
	pyrazinamide									94		
	rifampin					100				99	99	96

Trends, Comments, and Other Pathogens

[1] *Campylobacter* spp.	Quinolone susceptibility was determined for all isolates (n=878); isolates that were screened as nalidixic acid-susceptible were assumed to be ciprofloxacin susceptible. Only 25% of isolates from patients returning from foreign travel (n=134) were susceptible to quinolones. *Campylobacter* susceptiblity interpretations are listed in the 2013 *NARMS Human Isolates Report* (www.cdc.gov/narms/reports).
[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 AMP and TMP/SMX-resistant strain is isolated, AZ for 3 days, ceftriaxone for 2 to 5 days, or a fluoroquinolone (such as ciprofloxacin) for 3 days is recommended. For susceptible strains, AMP or TMP/SMX is effective; amoxicillin is less effective because of its rapid absorption from the gastrointestinal tract. (*Red Book*, 2015). Isolates with no zone of inhibition of bacterial growth using 15 µg of AZ were considered to have decreased susceptibility to AZ (DSA). The only DSA isolate in the 2015 sample was identified in an adult male; an increase in DSA *Shigella* infections has been noted in adult males nationally; recent outbreaks were published in the June 5, 2015 *MMWR* (http://bit.ly/29zq9nI).
[4] *Neisseria gonorrhoeae*	Routine resistance testing for *N. gonorrhoeae* by MDH was discontinued in 2008. Susceptibility results were obtained from the CDC-contracted lab at Johns Hopkins University, and are for isolates obtained through the Gonococcal Isolate Surveillance Program (GISP). Isolates (n = 105) were received from the Red Door Clinic in Minneapolis. Resistance criteria for the following antibiotics have not been established; therefore, data reflect reduced susceptibility using provisional MIC breakpoints for cefixime ≥0.5 µg/ml, ceftriaxone ≥0.5 µg/ml, and AZ ≥2.0 µg/ml. 2015 STD Treatment Guidelines are available at www.cdc.gov/std/tg2015/default.htm and include changes for gonorrhea treatment and test of cure. GISP stopped susceptibility testing for spectinomycin in 2015 and added testing for gentamicin.
[5] *Neisseria meningitidis*	The 6 isolates represent 86% of 7 total cases. In 2015, 1 case-isolate was intermediate to both penicillin and AMP, 1 case-isolate was intermediate to AMP only. There were no case-isolates with ciprofloxacin resistance. The MIC interpretive criteria for AZ, 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 221 isolates tested represent 94% of the 236 total cases. Among the 20 erythromycin resistant-clindamycin susceptible or intermediate isolates all 20 had inducible clindamycin resistance for a total of 90% of isolates that were susceptible to clindamycin and did not exhibit inducible clindamycin resistance.
[7] Group B *Streptococcus*	100% (16/16) of early-onset infant, 100% (21/21) late-onset infants, 80% (4/5) of maternal, and 93% (452/485) of other invasive GBS cases were tested. Among 108 erythromycin resistant - clindamycin susceptible or intermediate isolates, 59 (55%) had inducible resistance to clindamycin for a total of 59% (291/493) that were susceptible to clindamycin and did not exhibit inducible clindamycin resistance. 57% (24/42) of infant and maternal cases were susceptable to clindamycin and did not exhibit inducible clindamycin resistance.
[8] *Streptococcus pneumoniae*	The 499 isolates tested represent 93% of 534 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; 100% (499/499) were ≤ 2 µg/ml. Using meningitis breakpoints, 16% (82/499) of isolates were resistant to two or more antibiotic classes and 10% (51/499) 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) complex	National guidelines recommend initial four-drug therapy for TB disease, at least until first-line drug susceptibility results are known. Of the 16 TB cases reported in 2015 resistant to at least one first-line drug, 15 (94%) were foreign-born. There were no new cases of multidrug-resistant TB (MDR-TB) (i.e., resistant to at least isoniazid and rifampin).
[11]Methicillin-resistant *Staphylococcus aureus* (MRSA)	196 cases of invasive MRSA infection were reported in 2015 in Ramsey and Hennepin Counties, 144/196 had an isolate submitted and antimicrobial susceptibility testing conducted. Of cases with an isolate tested, 83% (120/144) were epidemiologically classified as healthcare-associated (hospital and community onset). Healthcare-associated isolates were screened for mupirocin resistance with 4% (5/120) exhibiting high-level resistance (MIC >256 µg/ml), 57% (68/120) of isolates were susceptible to clindamycin by broth microdilution; however among 47 erythromycin resistant-clindamycin susceptible or intermediate isolates, 19 had inducible clindamycin resistance for a total of 41% (49/120) that were susceptible to clindamycin and did not exhibit inducible clindamycin resistance. For community-associated cases (24/144 isolates), 4% (1/24) exhibited high-level mupirocin resistance. 71% (17/24) were susceptible to clindamycin by broth microdilution; however among 13 erythromycin resistant-clindamycin susceptible or intermediate isolates 13% (3/13) had inducible clindamycin resistance for a total of 58% (14/24) that were susceptible to clindamycin and did not exhibit inducible clindamycin resistance. There were no isolates confirmed as vancomycin resistant or intermediate in 2015.
Bordetella pertussis	In 2015, 15 case-isolates of pertussis were screened for erythromycin susceptibility in Minnesota and none were resistant.
Carbapenem-resistant Enterobacteriaceae (CRE)	Of the 271 isolates submitted from 233 patients, 37 (14%) isolates (representing 32 patients) were bla_{KPC} positive by PCR including 17 (46%) *Enterobacter cloacae*, 15 (41%) *Klebsiella pneumoniae*, 2 (5%) *E. coli*, 1 (3%) *Enterobacter asburiae*, 1 (3%) *Klebsiella oxytoca*, and 1 (3%) *Leclercia adecarboxylata*. 41% (13/32) patients with bla_{KPC} positive isolates were residents of the 7-county metro area, and 5 (16%) were non-Minnesota residents. Additionally, 1 isolate (*E. coli*) from a non-MN resident was positive for bla_{NDM}. Although not routinely tested for, 2 isolates (*K. pneumoniae*) were positive for bla_{OXA-48} from non-MN residents. More systematic testing for bla_{OXA-48} is needed to determine true prevalence. The 2015 CRE definition is based on current 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.

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.

Emerging Infections in Clinical Practice & Public Health
At Home and Abroad

November 18, 2016

Radisson Blu-Mall of America
Bloomington, MN

7:00 *am*	*Registration and Continental Breakfast*
7:30	**Welcome and Introductions**
7:40	**Keynote: Zika Virus**
8:25	**Questions and Discussion**
	Sonja Rasmussen, MD, Centers for Disease Control and Prevention
8:40	**Update in Syphilis**
9:10	**Questions and Discussion**
	TBD
9:25	**Update in HIV**
9:55	**Questions and Discussion**
	Keith Henry
10:10	*Refreshment Break*
10:25	**Infections in the Global Village**
10:55	**Questions and Discussion**
	Brett R. Hendel-Paterson, MD, Regions Hospital and University of Minnesota
11:10	**Control of Mosquitoes and their Diseases; What Minnesotans Need to Know**
11:40	**Questions and Discussion**
	David Neitzel, MS, Minnesota Department of Health
11:55	Lunch
12:55 pm	**A One-Health Approach to Antibiotic Stewardship - Can This Enable Progress?**
1:25	**Questions and Discussion**
	Amanda Beaudoin, DVM, PhD,
1:35	**Hot Topics**
2:05	**Questions and Discussion**
	Richard Danila, PhD, MPH, Minnesota Department of Health
2:15	**Whole Genome Sequencing**
2:45	**Questions and Discussion**
	Robin Patel, MD
2:55	*Refreshment Break*
3:10	**Dermatological Mysteries and Infectious Enigmas**
3:40	**Questions and Discussion**
	TBD
3:50	**Panel: Interesting and Unusual Case Presentations of Public Health Importance**
	Moderator: *Phillip K. Peterson, MD - University of Minnesota*
	Presenter: *Stacy Holzbauer, DVM, MPH - Minnesota Department of Health*
	Panelists: *Dimitri Drekonja, MD• Jamie Green • Mark Schleiss, MD - University of Minnesota • TBD*
5:00	*Evaluations & Adjourn*

Faculty and Curriculum Subject to Change

UNIVERSITY OF MINNESOTA

Emerging Infections in Clinical Practice & Public Health
At Home and Abroad
Registration Form

November 18, 2016

Radisson Blu – Mall of America
Bloomington, MN

Please type or print clearly. A name badge and Statement of Participation are generated from this document. SM/MM - 3681

Name _____

Affiliation _____ **Department** _____

Address _____ ☐ HOME ☐ OFFICE

City _____ **State** _____ **Zip** _____

Telephone _____ **E-mail** _____

Receipts, confirmations and driving directions are e-mailed from our office. Please provide your e-mail address and print clearly.

DEGREE
☐ **MD** ☐ **DO** ☐ **PhD** ☐ **PharmD** ☐ **RPh** ☐ **MPH**
☐ **APRN (NP, CNS, CRNA, CNM)** ☐ **RN** ☐ **PA** ☐ **Other** _____

SPECIALTY
☐ **Family Medicine/Subspecialty** _____ ☐ **Internal Medicine/Subspecialty** _____
☐ **Pediatrics/Subspecialty** _____ ☐ **Infection Prevention** _____
☐ **Public Health** _____ ☐ **Other** _____
☐ **Laboratorian** _____

REGISTRATION FEES	**Early Rate On or Before October 21**	**Regular Rate After October 21**
☐ Physician	$225	$275
☐ Other Healthcare Professionals	$195	$245
☐ Retired Physicians	$180	$225
UMN/ M Health, Mayo, MDH (must have UMN ID to qualify for these rates)		
☐ Full-time Faculty	$195	$245
☐ Other Healthcare Professionals	$145	$195
☐ Adjunct Faculty	$145	$195
☐ Resident / Fellow / Student	$80	$100

SPECIAL REQUESTS *Special needs, such as dietary restrictions, lactation room, etc., should be **requested in advance**. These requests cannot always be honored on site.*

Dietary: _____ Other: _____

TO REGISTER
Mail this registration form and your check, payable to **Regents of the University of Minnesota**, to:

Office of Continuing Professional Development, University of Minnesota Medical School
MMC 293, Mayo Memorial Bldg.
Room G-254, 420 Delaware Street SE
Minneapolis, MN 55455
For credit card payment, register online at www.cme.umn.edu/emerginginfections

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 4, 2016**. 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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