DISEASE CONTROL NEWSLETTER

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Annual Summary of Communicable Diseases Reported to the Minnesota Department of Health, 2010

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

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

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

Isolates for pathogens associated with certain diseases are required to be submitted to MDH (Table 1). The MDH Public Health Laboratory (PHL) performs microbiologic evaluation of isolates, such as pulsed-field gel electrophoresis (PFGE), to determine whether isolates (e.g., enteric pathogens such as *Salmonella* and *Escherichia coli* O157:H7, and invasive pathogens such as *Neisseria meningitidis*) are related, and potentially associated with a common source. Testing of submitted isolates also allows detection and monitoring of antimicrobial resistance, which continues to be an important problem (see pp. 28-29).

Table 2 summarizes cases of selected communicable diseases reported during 2010 by district of the patient's residence. Pertinent observations for some of these diseases are presented below.

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

Anaplasmosis
Human anaplasmosis (formerly known as human granulocytic ehrlichiosis) is caused by *Anaplasma phagocytophilum*, a rickettsial organism transmitted to humans by bites from *Ixodes scapularis* (the blacklegged tick or deer tick). In Minnesota, the same tick also transmits the etiologic agents of Lyme disease (*Borrelia burgdorferi*), babesiosis (*Babesia microti*), and a strain of Powassan virus. *A. phagocytophilum* can also be transmitted by blood transfusion. In 2010, a record number of 720 confirmed or probable anaplasmosis

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

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

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

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

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

c Report on separate Sexually Transmitted Disease Report Card.

d Report on separate HIV Report Card.

e Reportable as of October 1, 2009-September 30, 2011

Table 2. Cases of Selected Communicable Diseases Reported to the Minnesota Department of Health by District of Residence, 2010

District
(population per U.S. Census 2009 estimates)

Disease	Metropolitan (2,810,414)	Northwestern (153,218)	Northeastern (320,342)	Central (715,467)	West Central (229,186)	South Central (286,956)	Southeastern (486,517)	Southwestern (218,293)	Unknown Residence	Total (5,220,393)
Anaplasmosis	184	112	130	226	34	5	25	4	0	720
Arboviral disease										
LaCrosse	0	0	0	0	0	1	0	0	0	1
West Nile	4	0	0	1	0	0	1	2	0	8
Babesiosis	21	9	8	13	2	0	3	0	0	56
Campylobacteriosis	439	13	35	182	59	63	131	85	0	1007
Cryptosporidiosis	52	14	43	52	47	41	96	44	0	389
Escherichia coli O157 infection	67	5	2	23	9	11	12	11	0	140
Hemolytic uremic syndrome	3	2	0	6	2	1	2	1	0	17
Giardiasis	432	19	48	102	21	17	46	26	135	846
Haemophilus influenzae disease	35	2	8	10	4	4	13	5	0	81
HIV infection other than AIDS	217	1	5	9	1	7	4	4	0	248
AIDS (cases diagnosed in 2010)	137	0	6	12	3	3	9	2	1	173
Legionellosis	18	0	3	4	2	1	7	1	0	36
Listeriosis	4	0	1	1	2	0	1	0	0	9
Lyme disease	517	100	197	315	46	16	97	5	0	1,293
Meningococcal disease	7	0	0	1	1	0	0	0	0	9
Mumps	5	0	0	1	0	0	0	2	0	8
Pertussis	595	16	33	305	17	50	88	39	0	1,143
Salmonellosis	385	24	26	81	41	40	50	48	0	695
Sexually transmitted diseases	12,207	295	716	1,311	311	564	1,253	338	765	17,760
Chlamydia trachomatis - genital infections	10,264	260	653	1,198	293	526	1,131	305	664	15,294
Gonorrhea	1,638	34	50	107	18	33	111	31	97	2,119
Syphilis, total	305	1	13	6	0	5	11	2	4	347
Primary/secondary	138	0	6	2	0	1	2	0	0	149
Early latent*	67	0	3	0	0	0	0	0	2	72
Late latent**	100	1	4	4	0	4	8	2	2	125
Congenital	0	0	0	0	0	0	0	1	0	1
Other***	0	0	0	0	0	0	0	0	0	0
Shigellosis	43	2	0	5	2	1	10	3	0	66
Streptococcus pneumoniae disease	299	40	72	84	30	36	60	28	0	649
Streptococcal invasive disease - Group A	96	2	11	21	8	2	14	4	0	158
Streptococcal invasive disease - Group B	231	11	48	54	21	25	43	15	0	448
Toxic shock syndrome (Staphylococcal)	4	0	0	0	0	1	1	0	0	6
Tuberculosis	117	0	1	4	2	0	8	3	0	135
Viral hepatitis, type A	13	0	0	4	1	16	2	1	0	37
Viral hepatitis, type B (acute infections only, not perinatal)	12	0	4	4	0	2	1	1	0	24
Viral hepatitis, type C (acute infections only)	6	2	3	3	0	1	0	0	0	15

* 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

cases (16.9 cases per 100,000 population) were reported (Figure 1), more than twice the 317 cases reported in 2009. The median number of 322 cases (range, 139 to 322 cases) reported from 2004 through 2010 is also considerably higher than the median number of cases reported annually from 1996 to 2003 (median, 56 cases; range, 14 to 149). Four hundred twenty-seven (59%) cases reported in 2010 were male. The median age of cases was 57 years (range, 2 to 92 years), 18 years older than the median age of Lyme disease cases. Onsets of illness were elevated from May through July and peaked in June (36% of cases). In 2010, 27% of anaplasmosis cases (194 of 719 cases with known information) were hospitalized for their infection, for a median duration of 4 days (range, 1 to 42 days). One reported case died from complications of anaplasmosis in 2010.

A. phagocytophilum co-infections with the agents of Lyme disease and/or babesiosis can occur from the same tick bite. During 2010, 33 (5%) anaplasmosis cases were also confirmed cases of Lyme disease, and 8 (1%) were confirmed or probable cases of babesiosis. Because of under-detection, these numbers may underestimate the true frequency of co-infections.

Arboviral Diseases

Mosquito-borne Arboviruses

LaCrosse encephalitis and Western equine encephalitis historically have been the primary arboviral encephalitides found in Minnesota. During July 2002, West Nile virus (WNV) was identified in Minnesota for the first time; subsequently, 463 human cases (including 14 fatalities) were reported from 2002 to 2010. In 2010, WNV cases were reported from 40 states and the District of Columbia; nationwide, 1,021 human cases of WNV disease were reported, including 57 fatalities. The largest WNV case counts during 2010 occurred in Arizona (167 cases), New York (128), and California (111).

In Minnesota, 8 cases of WNV disease were reported in 2010 (the second lowest annual case total to date). Three cases had West Nile fever, and 5 had neuroinvasive disease (encephalitis or meningitis). The median age of all WNV cases was 40 years (range, 12 to 63 years). All cases occurred among residents of western and central Minnesota. Similar to previous years, onset of symptoms for the cases occurred in mid to late summer (median August 25; range, July 21 to September 25).

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

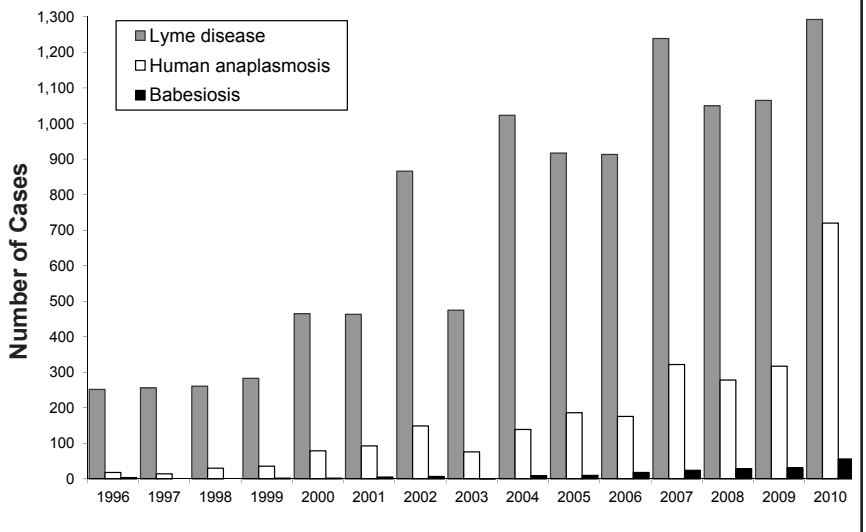
During 2008, there was a nationwide recall of a commercial WNV IgM test kit after many false-positive test results were identified in several states. All of the WNV test kits currently available are labeled for use on serum to aid in a presumptive diagnosis of WNV infection in patients with clinical symptoms of neuroinvasive disease. Positive results from these tests should be confirmed at the PHL or CDC.

During 2010, 1 case of LaCrosse encephalitis was reported to MDH. The disease, which primarily affects children, is transmitted through the bite of infected *Aedes triseriatus* (Eastern Tree Hole) mosquitoes. Persons are exposed to infected mosquitoes in wooded or shaded areas inhabited by this mosquito species, especially in areas where water-holding containers (e.g., waste tires, buckets, or cans) that provide mosquito breeding habitats are abundant. From 1985 through 2010, 125 cases were reported from 21 southeastern Minnesota counties, with a median of 4 cases (range, 0 to 13 cases) reported annually. The median case age was 6 years. Disease onsets have been reported from June through September, but most onsets have occurred from mid-July through mid-September.

Tick-borne Arbovirus

Powassan virus (POW) is a tick-borne flavivirus that includes a strain (lineage II or "deer tick virus") that is transmitted by *Ixodes scapularis*. The virus can cause encephalitis or meningitis, and long-term sequelae occur in approximately 50% of patients. Approximately 10-15% of cases are fatal. From 2008-2010, 6 cases of POW disease were reported in Minnesota residents. Three of those cases (Itasca, Kanabec, and Carlton County residents) were reported in 2010. MDH has identified POW virus-positive ticks at

Figure 1. Reported Cases of Anaplasmosis, Babesiosis, and Lyme Disease, Minnesota, 1996-2010



Includes 10,820 Lyme disease cases, 2,633 anaplasmosis cases, and 209 babesiosis cases

sites in all four counties that have been investigated to date (Clearwater, Cass, Pine, and Houston). Thus, the virus appears to be widely distributed in the same wooded parts of the state that are endemic to other tick-borne diseases transmitted by *I. scapularis* such as Lyme disease.

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

Babesiosis

Babesiosis is a malaria-like illness caused by the protozoan *Babesia microti* or other *Babesia* organisms. *B. microti* is transmitted to humans by bites from *Ixodes scapularis* (the blacklegged tick or deer tick), the same vector that transmits the agents of Lyme disease (*Borrelia burgdorferi*), human anaplasmosis (*Anaplasma phagocytophilum*), and a strain of Powassan virus. *Babesia* parasites can also be transmitted by blood transfusion.

In 2010, a record number of 56 confirmed and probable babesiosis cases (1.1 per 100,000 population) were reported (Figure 1). The previous record was 31 cases in 2009. The median annual number of babesiosis cases from 2004 through 2010 (median, 24 cases, range, 9 to 56) is notably higher than the median number of annual cases from 1996 to 2003 (median, 2 cases; range, 0 to 7). Thirty-three (59%) babesiosis cases reported in 2010 were male. The median age of cases was 61 years (range, 5 to 84 years). Onsets of illness were elevated from June through August and peaked in July (40% of cases). In 2010, 26 (46%) cases were hospitalized for their infection, for a median duration of 4 days (range, 2 days to >1 month). One reported case died from complications of babesiosis in 2010.

Babesia co-infections with the etiologic agents of Lyme disease or anaplasmosis can occur from the same tick bite, although many *Babesia* infections are asymptomatic. During 2010, 8 (14%) babesiosis case-patients were also confirmed cases of Lyme disease, and a different 8 (14%) were confirmed or probable cases of anaplasmosis.

Campylobacteriosis

Campylobacter continues to be the most commonly reported bacterial enteric pathogen in Minnesota (Figure 2). There were 1,007 cases of culture-confirmed *Campylobacter* infection reported in 2010 (19.1 per 100,000 population). This represents a 12% increase from the 899 cases reported in 2009 and the median annual number of cases reported from 2001 to 2009 (median, 899 cases; range, 843 to 953). In 2010, 44% of cases occurred in people who resided in the metropolitan area. Of the 911 *Campylobacter* isolates sent, confirmed, and identified to species by MDH, 90% were *C. jejuni* and 9% were *C. coli*.

The median age of cases was 33 years (range, 3 months to 92 years). Thirty-nine percent of cases were between 20 and 49 years of age, and 12% were 5 years of age or younger. Fifty-nine percent of cases were male. Fifteen percent of cases were hospitalized; the median length of hospitalization was 3 days. Fifty percent of infections occurred during June through September. Of the 902 (90%) cases for whom data were available, 163 (18%) reported travel outside of the United States during the week prior to illness onset. The most common travel destinations were Mexico (n=36), Central or South America or the Caribbean (n=36), Europe (n=29), and Asia (n=16).

There were three outbreaks of campylobacteriosis identified in Minnesota in 2010, all during August. One outbreak of *C. jejuni* infection was associated with an office party in Dakota County. Two culture-confirmed and one probable case were identified. An item containing undercooked chicken or ready-to-eat foods cross-contaminated from undercooked chicken was identified as the most plausible source of the outbreak. A second outbreak of quinolone-resistant *C. jejuni* infections was associated with employees at a chicken processing plant in Pope County. Two culture-confirmed cases were identified. The third outbreak of *C. jejuni* infections was associated with raw milk consumption from a farm in Sibley County. Three culture-confirmed cases were identified.

A primary feature of public health importance among *Campylobacter* cases was the continued presence of *Campylobacter* isolates resistant to fluoroquinolone antibiotics (e.g., ciprofloxacin), which are commonly used to treat campylobacteriosis. In 2010, the overall proportion of quinolone resistance among *Campylobacter* isolates tested was 21%. However, 68% 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. Ten percent of

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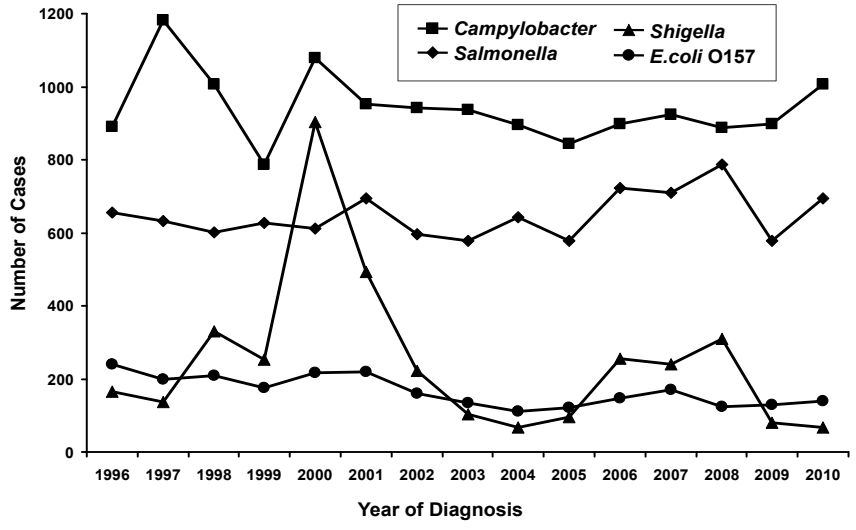
Figure 2. Reported Cases of *Campylobacter*, *Salmonella*, *Shigella*, and *Escherichia coli* O157:H7 Infection, Minnesota, 1996-2010



Campylobacter isolates from patients who acquired the infection domestically were resistant to fluoroquinolones.

In June 2009, a non-culture based test became commercially available for the qualitative detection of *Campylobacter* antigens in stool. Two hundred eighty patients were positive for *Campylobacter* by a non-culture based test conducted in a clinical laboratory in 2010. However, only 114 (41%) of the specimens were subsequently culture-confirmed, thus meeting the surveillance case definition for inclusion in case totals.

Carbapenem-resistant Enterobacteriaceae

Enterobacteriaceae are a large family of Gram-negative bacilli (GNB) that cause community- and healthcare-associated infections. Commonly encountered species include *Klebsiella pneumoniae*, *Escherichia coli*, and *Enterobacter cloacae*. Carbapenem-resistant Enterobacteriaceae (CRE) are resistant to almost all available antibiotics including penicillins, cephalosporins and carbapenems. Genes encoding for carbapenemases, which confer resistance, may be either chromosomally- or plasmid-mediated, and can easily spread among bacteria of similar species. The most common plasmid-mediated carbapenemase found in the United States is the *K. pneumoniae* carbapenemase (KPC). In 2010, CDC reported the occurrence of two additional plasmid-mediated carbapenemases in the U.S.: 1) New Delhi Metallo-β-lactamase (NDM-1), and 2) Verona Integron-Encoded Metallo-β-lactamase (VIM). With few treatment options available, CRE represent an emerging public health threat in the United States and worldwide.

KPC-producing Enterobacteriaceae were first detected in North Carolina in 1999. MDH first detected a KPC-producing Enterobacteriaceae isolate in February 2009, and began statewide passive CRE surveillance in March 2009. MDH sent an alert to laboratory and healthcare personnel requesting submission of possible carbapenemase-producing isolates to the PHL for further characterization (e.g., PCR for the bla_{KPC} gene). During 2010, MDH tested 57 CRE isolates for presence of the bla_{KPC} gene. Eighteen (32%) were bla_{KPC} positive. Of these, 6 (33%) were cultured from the respiratory tract, 3 (17%) urine, 4 (22%) wound, 3 (17%) blood, and 2 (11%) drainage from an indwelling GI tract device. These isolates were K. pneumoniae (9), E. cloacae (7) and K. oxytoca (2).

The median age for cases with bla_{KPC} positive isolates was 58 years (range, 1 year to 90 years); 10 (56%) were male. Of the 18 cases, 2 were known to be previously positive for bla_{KPC}. Fifteen (83%) cases were hospitalized in an acute care or long-term acute care hospital at the time of culture, 1 (6.5%) was a long-term care facility (LTCF) resident, and 1 (6.5%) an outpatient. The LTCF resident and outpatient had histories of frequent exposure to multiple healthcare facilities. Three (17%) cases died though it was unclear whether the presence of a KPC-producing organism contributed to their deaths.

While the bla_{KPC} gene was first detected in a K. pneumoniae isolate and is most frequently found in *K. pneumoniae* bacteria, we identified a cluster of 7 KPC-producing E. cloacae isolates in northwestern Minnesota. All 7 of these isolates were cultured from patients who had been hospitalized in one of two related healthcare facilities. Sites of culture included blood (1), sputum (2), urine (2) and GI tract device drainage (2). The PHL performed PFGE subtyping on available (6 of 7) isolates. PFGE results demonstrated that 4 of 6 isolates were genetically indistinguishable from one another and 2 were highly similar with 2 and 3 band differences, respectively; 5 control isolates had unrelated PFGE band patterns. Five cases were discharged to another healthcare facility, demonstrating the need for strict infection prevention measures and inter-facility communication of a patient's CRE status to the receiving healthcare facility.

MDH is developing recommendations for the prevention and control of CRE in healthcare facilities across the continuum of care based on the CDC *Guidance for Control of Infections with Carbapenem-Resistant or Carbapenemase-Producing Enterobacteriaceae in Acute Care Facilities* and advice from local infection prevention experts. MDH has also recently established laboratory-based surveillance for CRE in Hennepin and Ramsey counties using the 2011 Clinical and Laboratory Standards Institute carbapenem breakpoints for Enterobacteriaceae. With sporadic reports of metallo-β-lactamases (e.g. NDM-1) in other parts of the United States and Canada, MDH will soon begin performing PCR for additional plasmid-mediated carbapenemase-producing genes (e.g., blaNDM-1).

***Clostridium difficile* Infections**

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 antimicrobial use, particularly clindamycin, cephalosporins, and fluoroquinolones. Other risk factors for CDI acquisition in these settings are age greater than 65 years, severe underlying illness, intensive care unit admission, nasogastric intubation, and longer duration of hospital stay.

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

Community-associated (CA) CDI is also receiving increased attention. Several cases of serious CDI have been reported in what have historically been considered low-risk populations,

including healthy persons living in the community and peripartum women. At least 25% of these cases had no history of recent healthcare or antimicrobial exposure.

In 2009, as part of EIP, MDH initiated population-based, sentinel surveillance for CDI at 10 hospital laboratories serving Stearns, Benton, Morrison, and Todd Counties. A CDI case is defined as a positive *C. difficile* toxin assay on an incident stool specimen from a resident of one of the four counties. A CDI case is classified as healthcare facility-onset (HCFO) if the initial specimen was collected greater than 3 calendar 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 2010, 376 incident cases of CDI were reported in Stearns, Benton, Morrison, and Todd Counties (152.9 per 100,000 population). Fifty-two percent of these cases were classified as CA, 26% as HCFO, 21% as CO-HCFA, and 0.7% as CO but could not be further classified. The median age for CA, HCFO, and CO-HCFA were 42.5 years, 79.5 years, and 56.5 years, respectively. Forty-eight percent of CA cases reported antibiotic usage in the 2 weeks prior to stool specimen collection compared to 71% of HCFO cases and 56% of CO-HCFA cases.

Cryptosporidiosis

During 2010, 389 confirmed cases of cryptosporidiosis (7.4 per 100,000 population) were reported. This is 97% higher than the median number of cases reported annually from 1998 to 2009 (median, 197.5 cases; range, 91 to 349). The median age of cases was 25 years (range, 6 months to 94 years). Children 10 years of age or younger accounted for 28% of cases. Fifty-eight percent of cases occurred during July through October. The incidence of cryptosporidiosis in the West Central, Southwestern, Southeastern, South Central, and Northeastern districts (20.5, 20.2, 19.6, 14.3, and 13.4 cases per 100,000, respectively) was significantly higher than the statewide incidence. Only 52 (13%) reported cases occurred among residents of the metropolitan area (1.8 per 100,000). Forty-five (12%) cases required hospitalization, for a median of 4 days (range, 2 to 12 days).

Four outbreaks of cryptosporidiosis were identified in 2010, accounting for 14 laboratory-confirmed cases. Two recreational waterborne outbreaks occurred, including 3 primary and 1 secondary case (all laboratory-confirmed) associated with a swimming beach, and 2 cases (both laboratory-confirmed) associated with a community aquatic center. One outbreak of cryptosporidiosis associated with a veterinary school obstetrics laboratory class accounted for 9 cases (4 laboratory confirmed), and one outbreak associated with raw milk consumption accounted for 4 cases (all laboratory-confirmed).

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

Dengue

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

In 2010, 14 cases (0.27 per 100,000 population) of dengue fever were reported in Minnesota residents. This represents a 56% increase from the 9 cases in 2009 and a 47% increase from the median number of cases reported annually from 2004 to 2009 (median, 9.5 cases; range, 6 to 20). The median case age was 48 years (range, 12 to 80 years). The majority of cases (93%) resided within the metropolitan area, including 6 (43%) cases in Hennepin County. Onset of symptoms occurred from February through November. All of the cases represented imported infections acquired abroad. Cases had travelled to Asia (7), Latin America (6), or Africa (1).

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

During 2010, 140 culture-confirmed cases of *Escherichia coli* O157 infection (2.7 per 100,000 population) were reported. The number of reported cases represents a 13% decrease from the median number of cases reported annually from 1997 to 2009 (median, 160 cases; range, 110 to 219) (Figure 2). During 2010, 67 (48%) cases occurred in the metropolitan area. One hundred twenty (86%) cases occurred during May through October. The median age of the cases was 15 years (range, 4 months to 80 years). Twenty-five percent of the cases were 4 years of age or younger. Fifty-three (38%) cases were hospitalized; the median duration of hospitalization was 3 days (range, 1 to 81 days). One case died.

In addition to the 140 culture-confirmed *E. coli* O157 cases, 117 cases of Shiga-toxin producing *E. coli* (STEC) infection were identified in 2010. Of those, culture-confirmation was not possible in 12, and therefore it is unknown if those were O157 or another serogroup. Among the remaining 105 cases of STEC other than O157, *E. coli* O26 accounted for 23 cases, *E. coli* O111 for 23, and *E. coli* O103 for 18. These three serogroups represented 61% of all non-O157 STEC.

In 2010, one outbreak of non-O157

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STEC was identified among students in a high school class. In total, 29 cases were identified, including 6 laboratory-confirmed cases. Venison provided by students, and butchered and cooked on school grounds, was identified as the vehicle. *E. coli* O103:H2 and *E. coli* O145:NM were both isolated from ill students and leftover venison. This is the first documented non-O157 STEC outbreak associated with venison.

Six *E. coli* O157:H7 outbreaks were identified during 2010. Four outbreaks involved foodborne transmission, including two outbreaks with cases in multiple states, one involved waterborne transmission, and one involved person-to-person transmission. The six outbreaks resulted in a median of 4 culture-confirmed cases per outbreak (range, 2 to 9 cases).

An outbreak of *E. coli* O157:H7 infection associated with the consumption of raw milk from one farm occurred from May to June. Eight culture-confirmed cases with the same PFGE subtype were identified. One case developed HUS.

In July, 9 cases of *E. coli* O157:H7 infection with the same PFGE subtype occurred in Minnesota residents. The outbreak was most likely caused by an imported snack; however, the vehicle was not confirmed. One case developed HUS.

In July, 5 cases of *E. coli* O157:H7 infection were associated with swimming at a specific beach. The investigation resulted in the closure of the beach until water testing results became available. One case developed HUS.

In August, an outbreak of *E. coli* O157:H7 infection associated with person-to-person transmission occurred at a daycare in Stearns County. Two culture-confirmed cases were identified, and both cases developed HUS.

In October, 2 cases of *E. coli* O157:H7 infection in Minnesota residents were part of a multi-state outbreak that resulted in 8 cases in four states. Unpasteurized artisanal cheese was implicated as the vehicle. This investigation resulted in a recall of the implicated product.

From December 2010 through January 2011, 3 cases of *E. coli* O157:H7 infection with the same PFGE subtype occurred in Minnesota residents. One of these three cases occurred in December. These cases were part of a multi-state outbreak that resulted in 8 cases in three states. In-shell hazelnuts were confirmed as the vehicle, and the implicated product was recalled. This was the first documented *E. coli* O157:H7 associated with hazelnuts. Contamination likely occurred in the orchard as hazelnuts were collected from the ground.

Hemolytic Uremic Syndrome (HUS)
In 2010, 17 HUS cases were reported. There were no fatal cases. The number of reported cases represents a 6% increase from the median number of cases reported annually from 1997 to 2009 (median 16; range, 10 to 25). From 1997 through 2010, the overall case fatality rate was 5.2%. In 2010, the median age of HUS cases was 3 years (range, 1 to 62 years); 13 of the 17 cases occurred in children. All 17 cases were hospitalized, with a median hospital stay of 12 days (range, 4 to 57 days). All 17 HUS cases reported in 2010 were post-diarrheal. *E. coli* O157:H7 was cultured from the stool of 14 (82%) cases; 1 (6%) additional HUS case was positive for *E. coli* O157:H7 by serology. Enterotoxigenic *E. coli* (ETEC) was identified in the stool of 1 (6%) case. However, ETEC is not a known cause of HUS. In 2010, there were 5 outbreak-associated HUS cases.

Giardiasis
During 2010, 846 cases of *Giardia* infection (16.1 per 100,000) were reported. This represents a 25% increase from the 678 cases reported in 2009 but a 22% decrease from the median number of cases reported annually from 1998 through 2008 (median, 1,082 cases; range, 678 to 1,556). Historically, a substantial proportion of *Giardia* cases has represented positive tests during routine screenings of recent immigrants and refugees.

The median age for all cases reported in 2010 was 17 years (range, 1 month to 96 years). Twenty-four percent of cases were less than 5 years of age, and 19% of cases were over 50 years of age. There was one outbreak of giardiasis identified in Minnesota in 2010; this was an outbreak associated with drinking water from a campground well.

Guillain-Barré Syndrome
In 2009, Guillain-Barré syndrome (GBS) was added to the Minnesota Rules Governing Communicable Diseases for a duration of 2 years. While not an infectious disease, it was added to aid post-licensure safety monitoring of the 2009 novel influenza A H1N1 vaccine. Enhanced surveillance was conducted October 1, 2009 through May 31, 2010.

As part of EIP, Minnesota was one of 10 states which monitored the safety of the 2009 influenza A H1N1 vaccine. MDH established a network with all neurology clinics statewide that reported suspected GBS cases weekly. In addition, all hospital medical records departments screened discharge records biweekly to assure no GBS cases were missed. MDH reviewed medical records using a standardized case report form for each suspect GBS case. Information on antecedent infections and vaccination history, including influenza A H1N1 vaccine, in the 42 days prior to onset of GBS symptoms was collected. Case status was assigned according to Brighton clinical criteria.

Between January 1, 2010 and May 31, 2010, MDH investigated 90 reports of possible GBS. Of these, 27 (30%) cases had confirmed GBS, 1 (1%) case had probable GBS, 61 (68%) were non-cases, and 1 (1%) was an out of state resident. Nationally, CDC is evaluating whether there is an excess risk of GBS related to influenza A H1N1 vaccination; preliminary data showed a slightly increased risk of 0.8 excess cases per million vaccinees, no different than the excess risk associated with some seasonal influenza vaccines.

***Haemophilus influenzae* Invasive Disease**
Eighty-one cases of invasive *Haemophilus influenzae* disease (1.5 per 100,000 population) were reported in 2010. Cases ranged in age from newborn to 97 years (median, 72 years). Forty-one (51%) cases had pneumonia, 32 (40%) had bacteremia without another focus of infection, 5 (6%) had meningitis, 1 (1%) had epiglottitis, 1 (1%) had cellulitis, and 1

(1%) had pyelonephritis. Eleven (14%) deaths were reported among these cases.

Of 78 *H. influenzae* isolates for which typing was performed at MDH, 8 (10%) were type f, 6 (8%) type a, 6 (8%) type e, 1 (1%) type b, and 57 (73%) were untypeable.

One case of type b (Hib) disease occurred in 2010, compared to 2 cases in 2009, 5 cases in 2008, and 1 case in 2007. The Hib case was identified in an adult >60 years of age. The case presented with pneumonia and survived.

The 11 deaths occurred in patients ranging in age from 21 year to 94 years. Five cases presented with bacteremia without another focus of infection, 5 cases presented with pneumonia, and 1 case presented with pyelonephritis. Ten cases had *H. influenzae* isolated from blood and 1 case had *H. influenzae* isolated from the kidney. Of the 10 cases with data available, all 10 had significant underlying medical conditions. Of the 11 cases who died, 7 case-isolates were untypeable, 1 was serotype a, and 3 were not available for serotyping.

HIV Infection and AIDS

AIDS surveillance has been conducted in Minnesota since 1982. In 1985, Minnesota became the first state to make HIV infection a name-based reportable condition; all states now require name-based HIV infection reporting.

The incidence of HIV/AIDS in Minnesota is moderately low. In 2009, state-specific AIDS rates ranged from 1.1 per 100,000 population in Vermont to 24.6 per 100,000 in New York. Minnesota had the 15th lowest AIDS rate (4.2 cases per 100,000). Similar comparisons for HIV (non-AIDS) incidence rates are not possible because some states only began named HIV (non-AIDS) reporting recently.

As of December 31, 2010, a cumulative total of 9,493 cases of HIV infection (5,824 AIDS cases and 3,669 HIV [non-AIDS] cases) had been reported among Minnesota residents. Of the 9,493 HIV/AIDS cases, 3,228 (34%) are known to have died.

The annual number of AIDS cases reported in Minnesota increased steadily from the beginning of the epidemic through the early 1990s, reaching a peak of 370 cases in 1992. Beginning in 1996, the annual number of new AIDS diagnoses and deaths among AIDS cases declined sharply, primarily due to better antiretroviral therapies. In 2010, 173 new AIDS cases (Figure 3) and 70 deaths among persons living with HIV infection were reported.

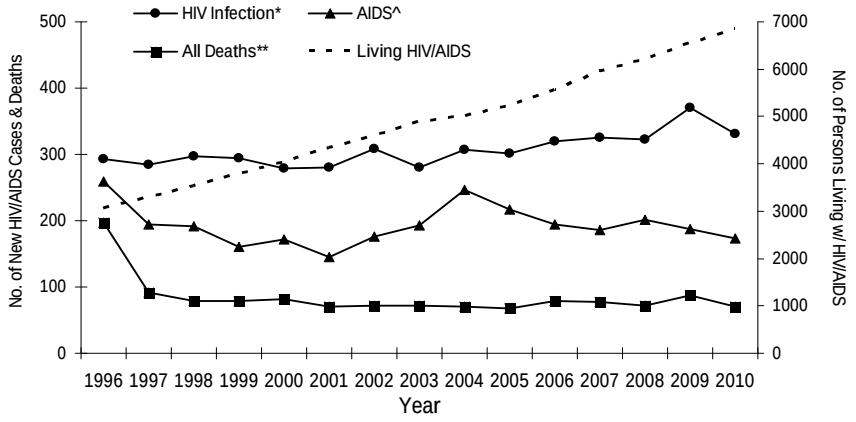
The annual number of newly diagnosed HIV (non-AIDS) cases reported has increased from 198 in 2004 to 248 in 2010 (a 25% increase). This trend, coupled with improved survival, has led to an increasing number of persons in Minnesota living with HIV or AIDS. By the end of 2010, an estimated 6,814 persons with HIV/AIDS were assumed to be living in Minnesota.

Historically, and in 2010, over 80% (282/331) of new HIV infections (both HIV [non-AIDS] and AIDS at first diagnosis) reported in Minnesota occurred in the metropolitan area. However, HIV or AIDS cases have been diagnosed in residents of more than 90% of counties statewide. HIV infection is most common in areas with higher population densities and greater poverty.

The majority of new HIV infections in Minnesota occur among males. Trends in the annual number of new HIV infections diagnosed among males differ by race/ethnicity. New infections occurred primarily among white males in the 1980s and early 1990s. Whites still comprise the largest proportion of new HIV infections among males. New infections among white males decreased between 1991 and 2000, from 297 to 101. However since then the trend has reversed, and in 2010 there were 142 new infections among white males (41% increase). The decline among U.S.-born black males has been more gradual, falling from a peak of 79 new infections in 1992 to a low of 33 new infections in 2003. However, since 2003 the number of new infections among U.S.-born black males has increased, with 58 new infections diagnosed in 2010. The number of HIV infections diagnosed among Hispanic males decreased slightly in 2007 from the previous year (33 versus 37) and that trend continued in 2010, with 29 new infections reported among Hispanic males. The number of new infections among African-born males decreased in 2010 to 13 from 19 in 2009.

Females account for an increasing percentage of new HIV infections, from 11% of new infections in 1990 to 21% in 2010. 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

Figure 3. HIV/AIDS in Minnesota: Number of New Cases, Prevalent Cases, and Deaths by Year, 1996-2010



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

** Deaths among AIDS cases, regardless of cause.

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

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in women. Since 1991, the number of new infections among women of color has exceeded that of white women. The annual number of new HIV infections diagnosed among U.S.-born black females had remained stable at 22 or fewer cases during 2001 to 2004, but increased to 28 new cases in both 2005 and 2006. In 2010, there were 16 new infections diagnosed among U.S.-born black females. In contrast, the number of new infections among African-born females increased greatly from 4 cases in 1996 to 39 in 2002. However, since 2002 the number of new HIV infections in African-born females has decreased steadily, with 18 new cases diagnosed in 2006. Since 2007, the number of new cases among African-born females has stayed stable at about 22 new infections per year (20 in 2010). 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 2010, non-white men comprised approximately 12% of the male population in Minnesota and 46% of new HIV infections among men. Similarly, persons of color comprised approximately 11% of the female population and 68% 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 (15 to 24 years of age). The number of new HIV infections among males in this age group has remained higher than new infections among females since 1999. Since 2001, Minnesota has seen a steady increase in new cases among males in this age group, with 67 cases reported in 2010, the second highest seen since 1987. The number of new HIV infections among females increased slightly between 2007 and 2009, (from 13 cases to 18 cases), but decreased to 11 cases in 2010. From 2008 to 2010, the majority (57%) of new infections among male adolescents and young adults were among youth of color (108/189), with young African American males accounting for 65% of the cases among young males of color. During the same time period, young women of color accounted for 65% of the cases diagnosed, with young African American women accounting for 42% of cases among young women of color. Between 2008 and 2010, 96% (181/189) of new cases among males were attributed to male-to-male sex. Among females, 95% (41/43) of new cases were attributed to heterosexual sex.

Since the beginning of the HIV epidemic, male-to-male sex has been the predominant mode of exposure to HIV reported in Minnesota, although the number and proportion of new HIV infections attributed to men who have sex with men (MSM) has declined since 1991. In 1991, 70% (318/455) of new HIV infections were attributed to MSM (or MSM who also inject drugs); in 2010, this group accounted for 57% of new infections (188/331). However, current attitudes, beliefs, and unsafe sexual practices documented in surveys among MSM nationwide, and a current epidemic of syphilis among MSM documented in Minnesota and elsewhere, warrant concern. Similar to syphilis increases in other U.S. cities and abroad, 57% of the recent syphilis cases in Minnesota among MSM were co-infected with HIV, some for many years.

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 3% (9/331) in 2010. 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; 92% of 218 new HIV diagnoses among women between 2008 and 2010 can be attributed to heterosexual exposure after re-distributing those with unspecified risk.

Historically, race/ethnicity data for HIV/ AIDS in Minnesota have grouped U.S.-born blacks and African-born persons together as “black.” In 2001, MDH began analyzing these groups separately, and a marked trend of increasing numbers of new HIV infections among African-born persons was observed. In 2010, there were 33 new HIV infections reported among Africans. While African-born persons comprise less than 1% of the state’s population, they accounted for 10% of all HIV infections diagnosed in Minnesota in 2010.

HIV perinatal transmission in the United States decreased 81% between 1995 and 1999. The trend in Minnesota has been similar but on a much smaller scale. While the number of births to HIV-infected women increased nearly 7-fold between 1990 and 2010, the rate of perinatal transmission decreased 6-fold, from 18% in 1990 to 1995 to 3% in 1996–2006. The overall rate of transmission for 2008 to 2010 was 1.0%; however, it was four times greater among foreign-born mothers.

Influenza

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

Hospitalized Cases

Surveillance for pediatric (<18 years of age), laboratory-confirmed hospitalized cases of influenza in the metropolitan area was established during the 2003-2004 influenza season. During the 2006-2007 season, surveillance was expanded to include adults. For the 2008-2009 season, surveillance was expanded statewide, although the collection of clinical information on hospitalized cases was limited to metropolitan area residents only. During the 2010-2011 season (October 3, 2010 – April 30, 2011), MDH requested that clinicians collect a throat or nasopharyngeal swab, or other specimen from all patients admitted to a hospital with suspect influenza, and submit a specimen to the PHL for influenza testing.

During the 2010-2011 influenza season, 965 laboratory-confirmed hospitalizations for influenza (18.3 hospitalizations per 100,000 persons, compared to 34.9 hospitalizations during the 2009-2010 influenza season [H1N1 pandemic period]) were reported. Since October 3, 2010, hospitalized cases of influenza have included 794 that were influenza A (353 H3, 129 2009 H1N1, and 312 unknown A type), 168 that were influenza B, and 3 that were influenza type unknown. Unknown types were tested locally with no material

available at the PHL for testing for further subtyping.

Among hospitalized cases, 23% were 0-18 years of age, 20% were 19-49 years of age, and 57% were 50 years of age and older. Median age was 56.9 years. Forty-six percent of cases were residents of the metropolitan area. Of the 446 metropolitan area cases, 137 (31%) cases were also diagnosed with pneumonia. Seven (2%) had an invasive bacterial co-infection. Sixty-five (15%) required admission into an intensive care unit. Of these, 28 (43%) were placed on mechanical ventilation. Eighty-two percent of adult and 51% of pediatric cases had at least one chronic medical condition that would put them at increased risk for influenza disease.

Deaths

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

From October 2010-April 2011, there were 70 influenza-associated deaths, 34 influenza A-type unspecified, 21 influenza A-H3, 9 influenza A-2009 H1N1, 5 influenza B, and 1 influenza A/B-type unspecified. The median age was 84 years; 3 (4%) age 0-17 years, 6 (9%) age 18-49 years, 7 (10%) age 50-64 years, 10 (14%) age 64-79 years, and 44 (63%) age 80 and up. Forty-four percent of cases were from the metropolitan area. Sixty-one (87%) had underlying medical conditions, and 44 (63%) were hospitalized for their illness. Forty (57%) were a resident of a long-term care facility.

Three (4%) cases were identified through the UNEX and MED-X programs, 25 (36%) through hospital surveillance, 24 (34%) through death certificate review, and 18 (26%) through other methods.

Laboratory Data

Between October 3, 2010 and May 21, 2011, virology laboratories reported data on 7,333 viral cultures, 344 (5%) of which were positive for influenza. Of these, 219 (64%) were positive for influenza A and 125 (36%) were positive for influenza B. Percent positive of influenza cultures peaked during the week of February 27-March 5, 2011 at 16%. Between October 3, 2010 and May 21, 2011, virology laboratories reported data on 9,424 PCR influenza tests, 1,842 (20%) of which were positive for influenza. Of these, 253 (14%) were positive for influenza A 2009 H1N1, 690 (37%) were positive for influenza A/(H3), 420 (23%) were positive for influenza A-type unspecified, and 479 (26%) were positive for influenza B. Between October 3, 2010 and May 21, 2011, 497 influenza isolates were further characterized in the PHL; 126 (25%) were characterized as influenza A 2009 H1N1, 158 (32%) were characterized as influenza A/(H3), 6 (1%) were characterized as influenza A-type unspecified, 206 (41%) were characterized as influenza B/Brisbane-like, and 1 (0.2%) was influenza B/Florida-like.

Influenza Sentinel Surveillance

MDH conducts sentinel surveillance for influenza-like illnesses (ILI; fever ≥100° F and cough and/or sore throat in the absence of known cause other than influenza) through outpatient medical providers including those in private practice, public health clinics, urgent care centers, emergency rooms, and university student health centers. For this report, there are 22 sites in 20 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 February 27-March 5, 2011 at 3.2%.

Influenza Incidence Surveillance

MDH was one of 12 sites nationally to participate in an Influenza Incidence Surveillance Project for the 2010-2011 influenza season. Four clinic sites reported the number of ILI patients and acute respiratory illness (ARI; recent onset of at least two of the following: rhinorrhea, sore throat, cough, or fever) patients divided by the total patients seen by the following age groups: <1 year, 1-4 years, 5-17 years, 18-24 years, 25-64 years, and ≥65 years, each week. These clinics also performed rapid influenza testing on all ILI patients and reported results to MDH. Clinical specimens were collected on the first 10 patients with ILI and the first 10 patients with ARI for PCR testing at the PHL for influenza and 12 other respiratory pathogens. Minimal demographic information and clinical data were provided with each specimen.

From August 1, 2010 – May 31, 2011, these clinics saw 1,321 ILI and 8,885 ARI patients. They submitted 1,277 specimens for influenza and respiratory pathogen testing, 242 (19%) of which were positive for influenza. Of those, 49 (20%) were positive for influenza A 2009 H1N1, 100 (41%) were positive for influenza A/(H3), 3 (1%) were positive for influenza A-type unspecified, and 90 (37%) were positive for influenza B. In addition to influenza, the following pathogens were detected by PCR: 39 (3%) adenovirus, 54 (4%) human metapneumovirus, 41 (3%) respiratory syncytial virus (RSV), 210 (16%) rhinovirus, 1 (0.1%) parainfluenza virus 1, 8 (0.6%) parainfluenza virus 2, 19 (1%) parainfluenza virus 3, 4 (0.3%) parainfluenza virus 4, 4 (0.3%) coronavirus C339E, 6 (0.5%) coronavirus HKU1, 24 (2%) coronavirus NL63, and 63 (5%) coronavirus OC43.

ILI Outbreaks (School and Long Term Care Facility)

Between 1988 and 2009, a probable ILI outbreak in a school was defined by MDH as a doubled absence rate with all of the following primary influenza symptoms reported among students: rapid onset, fever, illness lasting 3 or more days, and at least one

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

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

An influenza outbreak is suspected in a long-term care facility (LTCF) when three or more residents in a single unit present with a cough and fever or chills during a 48- to 72-hour period. An influenza outbreak is confirmed when at least one resident has a positive culture, PCR, or rapid antigen test for influenza. Fifty-four facilities in 36 counties reported outbreaks from October 3, 2010 – May 21, 2011. Surveillance for outbreaks in LTCFs began in the 1988-1989 season. The number of LTCFs reporting ILI outbreaks has ranged from a low of three in 2008-09 to a high of 140 in 2004-2005.

Legionellosis

During 2010, 36 confirmed cases of legionellosis (Legionnaires' disease [LD]) were reported including 18 cases (50%) among residents of the metropolitan area. Three (8%) cases died. Older adults and elderly persons were more often affected, with 28 (78%) cases occurring among individuals 50 years of age and older (median, 62 years; range, 28 to 87 years). Twenty (56%) cases had onset dates in June through September. Travel-associated legionellosis accounted for 6 (17%) cases, defined as spending at least 1 night away from the case's residence in the 10 days before onset of illness.

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

Listeriosis

Nine cases of listeriosis were reported during 2010. Seven (78%) cases were hospitalized, but none died. The median age of the cases was 65 years (range, 13 to 89 years). Eight (89%) cases had *Listeria monocytogenes* isolated from blood. One case had *L. monocytogenes* isolated from a wound. None of the cases were part of a recognized outbreak. The 9 cases reported in 2010 is higher than the median annual number of cases reported from 1996 through 2009 (median, 7 cases; range, 3 to 19).

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

Lyme Disease

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

In 2010, 1,293 confirmed Lyme disease cases (24.6 cases per 100,000 population) were reported (Figure 1). In addition, 667 probable cases (physician-diagnosed cases that did not meet clinical evidence criteria for a confirmed case but that had laboratory evidence of infection) were reported. The 1,293 confirmed cases was a 21% increase from the 1,065 confirmed cases reported in 2009 and slightly higher than the previous record number of 1,239 cases reported in 2007. The median number of 1,050 cases (range, 913 to 1,293 cases) reported from 2004 through 2010 is considerably higher than the median number of cases reported annually from 1996 through 2003 (median, 373 cases; range, 252 to 866). Seven hundred eighty (60%) confirmed cases in 2010 were male. The median age of cases was 39 years (range, <1 to 89 years). Physician-diagnosed erythema migrans (EM) was present in 987 (76%) cases. Three hundred fifty-two (27%) cases had one or more late manifestations of Lyme disease (including 226 with a history of objective joint swelling, 105 with cranial neuritis, 9 with lymphocytic meningitis, 5 with radiculoneuropathy, and 12 with acute onset of 2nd or 3rd degree atrioventricular conduction defects) and confirmation by Western immunoblot (positive IgM ≤30 days post-onset or positive IgG). Onsets of illness were elevated in the summer months and peaked in June and July (39% and 35% of EM cases, respectively), corresponding to the peak activity of nymphal *I. scapularis* ticks in mid-May through mid-July. Most cases in 2010 either resided in or traveled to endemic counties in north-central, east-central, or southeast Minnesota, or in western Wisconsin.

B. burgdorferi co-infections with the etiologic agents of anaplasmosis and babesiosis can occur from the same

tick bite. During 2010, 33 (3%) Lyme disease cases also were confirmed or probable cases of anaplasmosis, and 8 (1%) were confirmed or probable cases of babesiosis. Because of under-detection, these numbers likely underestimate the true frequency of co-infections.

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

In 2010, 48 malaria cases (0.9 per 100,000 population) were reported in Minnesota residents. This represents a 12% increase from the 43 cases reported in 2009 and a 33% increase from the median number of cases reported annually from 2000 to 2009 (median, 36 cases; range, 29 to 47). Of 46 cases in which the *Plasmodium* species was specified, 33 (72%) were identified with *P. falciparum*, 10 (22%) with *P. vivax*, 2 (4%) with *P. malariae*, and 1 (2%) with *P. ovale*. The median age of cases was 35 years (range, 2 to 66 years). Of 36 cases of known race, 31 (86%) were black, 4 (11%) were white, and 1 (3%) was Asian. Seventy-nine percent of cases resided in the metropolitan area, including 27 (56%) in Hennepin County. Of the 31 cases with known country of birth, 5 (16%) were born in the United States. Forty-one (85%) cases in 2010 likely acquired malaria in Africa. Four cases were likely acquired in Asia, 1 in South America, 1 in Central America, and 1 in Oceana. Sixteen countries were considered possible exposure locations for malarial infections, including Liberia (13 cases), Ghana (6 cases), Nigeria (5 cases), and Ethiopia (5 cases).

Measles
Three cases of measles were reported during 2010. All 3 cases were confirmed by positive measles IgM serology. Two cases were white, non-Hispanic male residents of Hennepin County, 20-29 and 30-39 years of age, respectively, with unknown vaccination history. One had traveled to Chicago and the other had traveled to Italy during the exposure period. The third case was a 30-39 year-old female resident of Kuwait visiting Minnesota on business. The individual had traveled to Portugal during her exposure period and her vaccination status was unknown. The 3 cases were unrelated, and no secondary cases were identified.

Meningococcal Disease
Nine cases of *Neisseria meningitidis* invasive disease (0.2 per 100,000 population) were reported in 2010, compared to 16 cases in 2009. There were 6 serogroup Y cases, 2 serogroup C, and 1 serogroup B. Cases ranged in age from 2 months to 85 years, with a median of 40 years. Seventy-eight percent of the cases occurred in the metropolitan area. Four cases had meningitis, 3 had bacteremia without another focus of infection, 1 had pneumonia, and 1 had tracheobronchitis. One death occurred in a case less than 1 year of age with bacteremia attributed to serogroup C.

In 2010, a new meningococcal conjugate vaccine (Menveo) was licensed for use in the United States for 11-55 year-olds and has demonstrated non-inferiority to MCV4 (Menactra). Menactra was licensed for use in the United States in January 2005 for persons aged 11 to 55 years, and was the first meningococcal polysaccharide-protein conjugate vaccine for serogroups A,C,Y, and W-135 (MCV4). In 2007, the license was approved to include 2-10 year olds. The Advisory Committee on Immunization Practices and American Academy of Pediatrics recommend immunization with either vaccine routinely at age 11-12 years or at high school entry and a booster dose at age 16, as well as for college freshmen living in dormitories, and other groups in the licensed age range previously determined to be at high risk. In 2006, MDH in collaboration with the CDC and other sites nationwide, began a case-control study to examine the efficacy of MCV4. In 2010, 1 case occurred among 11-22 year olds. The case had serogroup Y disease, was not vaccinated, and was not in school. The case was eligible for the MCV4 study.

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

In 2005, as part of the EIP Active Bacterial Core surveillance (ABCs) system, MDH initiated population-based invasive MRSA surveillance in Ramsey County. In 2005, the incidence of invasive MRSA infection in Ramsey County was 19.8 per 100,000 and was 19.4, 18.5 and 19.9 per 100,000 in 2006, 2007, and 2008, respectively. In 2008, surveillance was expanded to include Hennepin County. The incidence rate for MRSA infection in Ramsey County was 17.0 per 100,000 in 2009 and 20.0 per 100,000 in 2010; for Hennepin County it was 14.0 per 100,000 in 2009 and 11.3 per 100,000 in 2010. MRSA was most frequently isolated from blood (68%), and 13% (29/232) of cases died. Eleven percent (25/232) of cases had no reported healthcare-associated risk factors in the year prior to infection. Please refer to the MDH antibiogram for details regarding antibiotic susceptibility testing results (pp. 28-29).

Critical illnesses or deaths due to community-associated (without traditional risk factors) *S. aureus* infection (both methicillin-susceptible and-resistant) are reportable in Minnesota. Vancomycin-intermediate and vancomycin-resistant *S. aureus* are also reportable. *S. aureus* that have developed resistance mechanisms to vancomycin are called vancomycin-intermediate (VISA) or vancomycin-resistant *S. aureus* (VRSA), as detected and defined according to Clinical and Laboratory Standards Institute (CLSI) approved standards and recommendations (Minimum Inhibitory Concentration [MIC]=4-8 ug/ml for VISA and MIC≥16 ug/ml for VRSA). Patients at risk for VISA and VRSA generally have underlying health conditions such as diabetes and end stage renal disease requiring dialysis, previous MRSA infections, recent hospitalizations, and recent exposure to vancomycin.

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VISA infections are rare, but in the past 2 years there has been an increase in the reported number of cases. MDH confirmed 1 case in 2000, 3 cases in 2008, and 3 cases in 2009. Most of these cases had traditional risk factors for VISA infection including histories of diabetes, non-healing MRSA-positive leg ulcers, end-stage renal disease requiring renal dialysis, and vancomycin use. In 2010, 2 VISA cases were reported. One case was methicillin-susceptible SA (MSSA) and 1 was MRSA. The MRSA case had a history of dialysis, diabetes, and MRSA non-healing ulcers. The MSSA case did not have traditional VISA risk factors including no reported recent history of vancomycin use although this patient did have prolonged exposure to other antibiotics. Both isolates were susceptible to daptomycin.

Mumps

During 2010, 8 cases of mumps (0.2 per 100,000) were reported. All 8 cases were laboratory-confirmed, including 2 cases confirmed by both positive PCR and IgM serology, 1 confirmed by PCR only, and 5 confirmed by IgM serology only. Two cases were epidemiologically linked to a source case. Six of the 8 cases were not epidemiologically linked, demonstrating that asymptomatic infections are occurring, and suggesting that mumps is underdiagnosed.

Cases ranged in age from 3 to 53 years. Two cases occurred in persons 0 through 18 years of age; 4 cases occurred in persons 19 through 33 years of age; 1 case occurred in persons 34 through 49 years of age; and 1 case occurred in persons 50 years and older. One case had a documented history of 2 doses of mumps-containing vaccine; 3 cases had a documented history of 1 dose. Three cases reported a history of receiving at least 1 dose of mumps-containing vaccine but these reports were not verified. No cases reported a previous history of mumps disease; and 1 case, born in 1957, had unknown history of disease as well as unknown vaccination status.

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

Neonatal Sepsis

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

In 2010, 58 cases of neonatal sepsis (0.82 cases per 1,000 live births) were reported compared to 47 cases (0.62 cases per 1,000 live births) in 2009. Among these cases, all were identified via blood or cerebral spinal fluid (CSF). Most cases (91%) were culture-positive within the first 2 days of life. In 2010, group B Streptococcus was the most common bacteria isolated (31) followed by *Streptococcus viridians* (7), other *Streptococcus* spp. (6), *Escherichia coli* (6), *Haemophilus influenzae* (4), and 1 each *Enterococcus*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, and *Acinetobacter* spp.

Pertussis

During 2010, 1,143 cases of pertussis (22 per 100,000 population) were reported. This was the third consecutive peak incidence year, following 1,134 cases in 2009 and 1,034 cases in 2008. Laboratory confirmation was available for 729 (64%) cases, 33 (5%) of which were confirmed by culture and 696 (95%) of which were confirmed by PCR. In addition to the laboratory-confirmed cases, 276 (24%) cases were epidemiologically linked to laboratory-confirmed cases, and 134 (12%) met the clinical case definition only. Five hundred ninety-five (52%) of the reported cases occurred in residents of the metropolitan area.

Paroxysmal coughing was the most commonly reported symptom; 1,065 (93%) cases experienced paroxysmal coughing. Approximately one fourth (314, 27%) reported whooping. Although commonly referred to as “whooping cough,” very young children, older individuals, and persons previously immunized may not have the typical “whoop” associated with pertussis. Post-tussive vomiting was reported in 493 (43%) of the cases. Infants and young children are at the highest risk for severe disease and complications. Pneumonia was diagnosed in 23 (2%) cases, 5 (22%) of whom were between 18 months and 4 years of age. Twenty-nine (3%) cases were hospitalized; 21 (72%) of the hospitalized patients were younger than 6 months of age.

Due to waning immunity from either natural infection or vaccine, pertussis can affect persons of any age. The disease is increasingly recognized in older children and adults. During 2010, cases ranged in age from 14 days to 87 years. One hundred sixteen (10%) cases occurred in adolescents 13 to 17 years of age, 299 (26%) cases occurred in adults 18 years of age and older, 480 (42%) occurred in children 5-12 years of age, 190 (17%) occurred in children 6 months through 4 years of age, 54 (5%) occurred in infants less than 6 months of age, and 2 (<1%) occurred in persons of unknown age. The median age of cases during 2010 was 11 years, compared to a median age of 13 years in 2005, the most recent previous peak incidence year.

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 2010, 75 pertussis cases were reported in infants < 1 year of age. A likely source of exposure was identified for 36 (48%) cases; 12 (33%) were infected by adults 18 years of age and older, 2 (6%) were infected by an adolescent 13 to 17 years of age, and 20 (56%) were infected by a child less than 13 years of age. For the 39 (52%) cases with no identified source of infection, the source was likely from outside the household. Vaccinating adolescents and adults with Tdap will decrease the incidence of pertussis in the community and thereby minimize infant exposures.

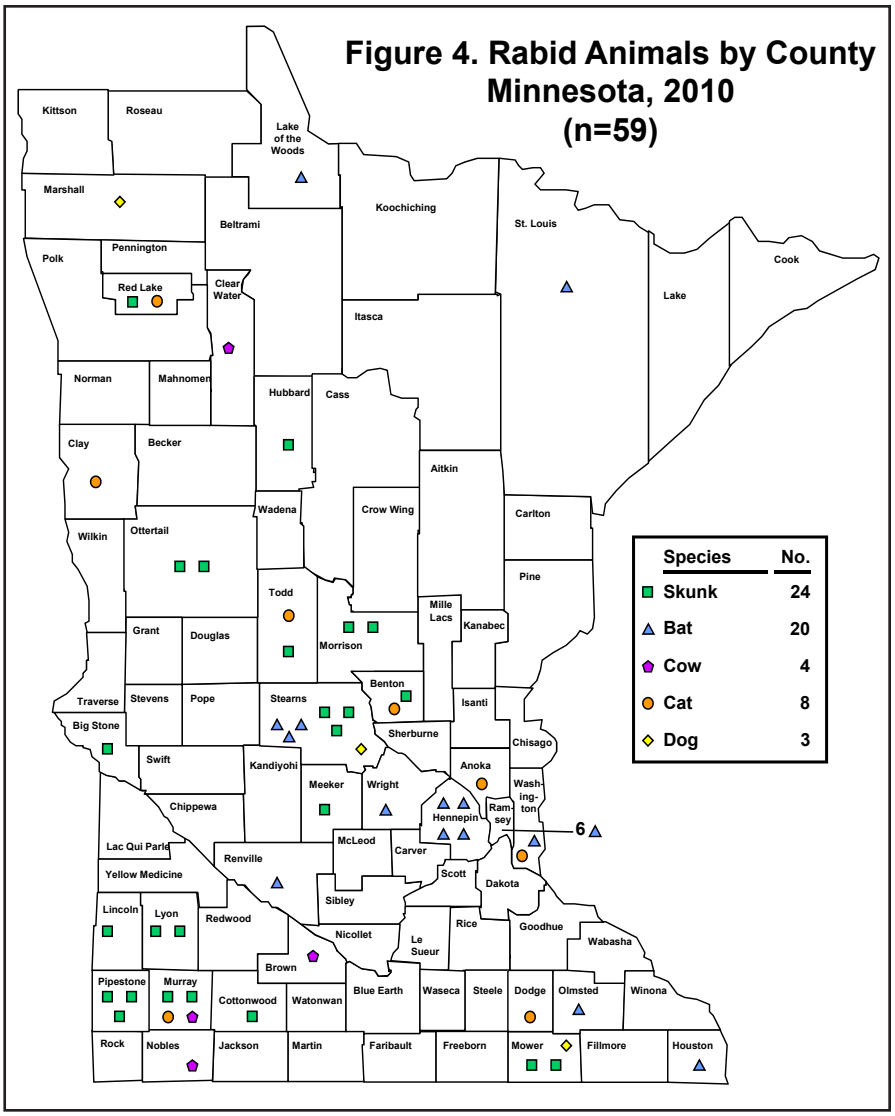
Although unvaccinated children are at highest risk for pertussis, fully immunized children may also develop the disease. Disease in those previously immunized is usually

mild. Efficacy for currently licensed vaccines is estimated to be 71 - 84% in preventing serious disease. Of the 252 cases who were 7 months to 6 years of age, 178 (71%) were known to have received at least a primary series of 3 doses of DTP/DTaP vaccine prior to onset of illness; 73 (29%) received fewer than 3 doses and were considered preventable cases. Vaccine history was unavailable for 1 case.

MDH reporting rules require that clinical isolates of *Bordetella pertussis* be submitted to the PHL. Of the 33 culture-confirmed cases, 19 (58%) of the isolates were received and sub-typed by PFGE. Nine distinct PFGE patterns were identified. Five of these patterns occurred in only a single case isolate. The most common pattern identified accounted for 7 (37%) of the total isolates.

In 2010 no case-isolates of pertussis were tested in Minnesota for susceptibility to erythromycin, ampicillin, and trimethoprim-sulfamethoxazole. However, nationally isolates have had low minimum inhibitory concentrations, falling within the reference range for susceptibility to the antibiotics evaluated. Only 11 erythromycin-resistant *B. pertussis* cases have been identified in the United States to date. Laboratory tests should be performed on all suspected cases of pertussis. Culture of *B. pertussis* requires inoculation of nasopharyngeal mucous on special media and incubation for 7 to 10 days. However, *B. pertussis* is rarely identified late in the illness; therefore, a negative culture does not rule out disease. A positive PCR result is considered confirmatory in patients with a 2-week history of cough illness. PCR can detect non-viable organisms. Consequently, a positive PCR result does not necessarily indicate current infectiousness. Patients with a 3-week or longer history of cough illness, regardless of PCR result, may not benefit from antibiotic therapy. Cultures are necessary for molecular and epidemiologic studies and for drug susceptibility testing. Whenever possible, culture should be done in conjunction with PCR testing. Serological tests are not standardized and are not acceptable for laboratory confirmation at this time.

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



Rabies

Rabies is caused by the rabies virus, an enveloped RNA virus from the Rhabdoviridae family and Lyssavirus genus. The virus is highly antigenic, only infects mammals, and has been identified worldwide. In Minnesota, the reservoir species are the skunk and multiple bat species.

In 2010, 59 (2%) of 2,506 animals submitted for testing were positive for rabies (Figure 4). This is similar to 2009, when 69 (3%) of 2,435 animals submitted tested positive for rabies. The majority of positive animals in 2010 were skunks, 24/53 (45%); followed by cattle, 4/58 (7%); bats, 20/771 (3%); cats, 8/758 (1%); and dogs, 3/667 (0.5%). No horses (0/17) or raccoons (0/69) tested positive for rabies. There were no human cases of rabies.

From 2003 to 2010, 19,682 animals were submitted for rabies testing. The median number of positive animals reported annually was 64 (range, 39 to 94). From 2003 to 2010, 231/460 (50%) skunks, 38/474 (8%) cattle,161/4,960 (3%) bats, 26/5,545 (0.5%) dogs, 31/6,341 (0.5%) cats, and 0/657 (0%) raccoons submitted and tested were positive for rabies. From 1988 to 2010, 3 raccoons tested positive for rabies;

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these occurred in 1989, 1990, and 1993. Presumably they were infected with one of the two skunk strains of rabies endemic in Minnesota.

Rubella
No cases of rubella were reported in 2010.

Salmonellosis
During 2010, 695 culture-confirmed cases of *Salmonella* infection (13.2 per 100,000 population) were reported. This represents an 11% increase from the median annual number of cases reported from 2000 to 2009 (median, 628 cases; range, 576 to 755) (Figure 2). Of the 84 serotypes identified in 2010, 5 serotypes, *S*. Enteritidis (188), *S.* Typhimurium (102), *S.* Newport (50), *S.* I 4,5,12:I:- (31), and *S.* Heidelberg (19) accounted for 56% of cases. *Salmonella* was isolated from stool in 615 (88%), urine in 41 (6%), and blood in 30 (4%) cases. Other specimen sources included wounds, an abscess, gall bladder, and bone. There were 8 cases of *S.* Typhi infection. Among the 7 *S.* Typhi cases reached for interview, 4 had travelled internationally (India, Lebanon, Pakistan, and Bangladesh) and 1 was an international student from Bangladesh. There was 1 case of *S.* Paratyphi B infection with unknown travel history.

Of the 629 cases interviewed about travel history, 82 (13%) traveled internationally during the week prior to their illness onset. Four cases died: a 58-year-old case died of acute renal failure associated with hepatocarcinoma 17 days after *Salmonella* was isolated from a peritoneal fluid sample; a 1-year-old case died of anoxic brain injuries and cardio-pulmonary arrest secondary to acute methadone toxicity 11 days after *Salmonella* was isolated from a stool sample; a 12-year-old case died of a stroke associated with an underlying blood condition 19 days after *Salmonella* was isolated from a blood specimen; and *Salmonella* was isolated at autopsy from the spleen of an 18-year-old case with sudden death.

Fifty-five cases were part of 14 *Salmonella* outbreaks identified in 2010. Five outbreaks involved cases in multiple states. Thirteen of the outbreaks involved foodborne transmission. One outbreak involved laboratory-acquired infections. The 14 outbreaks resulted in a median of 4 culture-confirmed cases per outbreak (range, 2 to 6 cases).

In April, 2 cases of *S.* Typhimurium infection were associated with food consumed at a Hmong funeral, including raw cow's stomach and pudding with raw egg. A specific vehicle was not implicated.

In May, 4 cases of *S.* Typhimurium infection were associated with a multi-state outbreak that involved 3 other cases in 3 states. A specific variety of commercially distributed prepackaged salad mix was implicated as the vehicle.

In May, 5 cases of *S.* Enteritidis infection were part of an outbreak at a Mexican-style restaurant. Chile rellenos were implicated as a vehicle and were likely cross-contaminated from raw shell eggs used during the preparation process.

From May to June, 3 cases of *S.* Chester infection were part of a multi-state outbreak that resulted in 45 cases in 18 states. A commercially distributed cheesy chicken and rice frozen entrée was implicated as the vehicle. A recall of the implicated product was issued.

In June, 3 cases of *S.* Enteritidis infection were associated with an outbreak at a Chinese-style buffet restaurant. Several food items were significantly associated with illness, including hard boiled eggs. Sanitation violations at the restaurant indicated that cross-contamination of ready-to-eat foods from raw shell eggs in the kitchen was likely.

In June, 4 cases of *S.* Muenchen infection were associated with a graduation party catered by an unlicensed caterer. No specific food item was implicated.

From June through July, 5 cases of *S.* Baildon infection were associated with a multi-state outbreak that resulted in 50 cases in 15 states. Consumption of food from a Mexican-style chain restaurant was implicated as the source of some of the infections. A commercial food product was the likely vehicle, as some of the cases had not eaten at that restaurant chain.

In July, 3 cases of *S.* Enteritidis infection were part of an outbreak at a small bistro restaurant. Eggs and Hollandaise sauce made with unpasteurized shell eggs were implicated as the vehicles.

In July, 5 cases of *S.* Enteritidis infection were associated with an outbreak at a Mexican-style restaurant. No specific food item was implicated. The infections were likely caused by cross-contamination of ready-to-eat foods from raw chicken.

In August, 6 cases of *S.* Newport infection were part of an outbreak in which commercially distributed blueberries were implicated as the vehicle.

In August, 4 cases of *S.* Infantis infection were associated with a church potluck event where macaroni salad was implicated as the vehicle. Cross-contamination of the salad from raw chicken in the preparer's kitchen was the likely mechanism of contamination.

In September, 2 cases of *S.* Enteritidis infection were part of an outbreak at a group home where residents were served multiple egg dishes in the week prior to illness onset. The group home had purchased eggs that were part of a nationwide egg recall and were the likely source of infections.

In September, 4 cases of *S.* Enteritidis infection were associated with two different wedding receptions catered by the same unlicensed caterer on consecutive days. A specific food item was not implicated for either reception.

From August 2010 to April 2011, 5 cases of *S.* Typhimurium infection in laboratory workers were associated with an ongoing multi-state outbreak that resulted in 73 cases in 35 states. The outbreak strain of *S.* Typhimurium is used as a quality control strain in clinical and teaching laboratories. Three of the Minnesota cases occurred in 2010.

The May, June, and July restaurant outbreaks and the September group home outbreak that were associated with shell eggs were part of a larger multi-state outbreak that resulted in an estimated 1,939 cases in multiple states. This outbreak resulted in recalls

of over 500 million shell eggs from two Iowa producers.

Sexually Transmitted Diseases (STDs)

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

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

Chlamydia

Chlamydia trachomatis infection is the most commonly reported infectious disease in Minnesota. In 2010, 15,294 chlamydia cases (311 per 100,000 population) were reported, representing an 8% increase from 2009 (Table 3).

Adolescents and young adults are at highest risk for acquiring chlamydial infection (Table 4). The chlamydia rate is highest among 20 to 24-year-olds (1,800 per 100,000), with the next highest rate among 15 to 19-year-olds (1,273 per 100,000). The incidence of chlamydia among adults 25 to 29 years of age (802 per 100,000) is considerably lower but has increased in recent years. The chlamydia rate among females (441 per 100,000) is more than twice the rate among males (178 per 100,000), a difference most

Table 3. Number of Cases and Rates (per 100,000 persons) of Chlamydia, Gonorrhea, Syphilis and Chancroid - Minnesota, 2006-2010

	2006		2007		2008		2009		2010	
Disease	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
Chlamydia	12,975	264	13,480	274	14,414	293	14,186	288	15,294	311
Gonorrhea	3,316	67	3,479	71	3,054	62	2,302	47	2,119	43
Syphilis, Total	188	3.8	186	3.8	263	5.3	214	4.4	347	7.1
Primary/Secondary	47	1.0	59	1.2	116	2.4	71	1.4	149	3.0
Early Latent	58	1.2	55	1.1	47	1.0	46	0.9	72	1.5
Late Latent	81	1.6	72	1.5	100	2.0	96	2.0	125	2.5
Other*	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Congenital**	2	2.8	0	0.0	0	0.0	1	1.4	1	1.4
Chancroid	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0

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

Table 4. Number of Cases and Incidence Rates (per 100,000 persons) of Chlamydia, Gonorrhea, and Primary/Secondary Syphilis by Residence, Age, Race/Ethnicity, and Gender - Minnesota, 2010

	Chlamydia		Gonorrhea		Syphilis	
Demographic Group	No.	Rate	No.	Rate	No.	Rate
Total	15,294	311	2,119	43	149	3.0
*Residence**						
Minneapolis	3,118	815	745	195	81	21.2
St. Paul	1,997	695	278	97	18	6.3
Suburban**	5,149	261	615	31	39	2.0
Greater Minnesota	4,366	192	384	17	11	0.5
Age						
<15 years	115	11	19	2	0	0.0
15-19 years	4,767	1,273	614	164	7	1.9
20-24 years	5,804	1,800	760	236	34	10.5
25-29 years	2,564	802	350	109	18	5.6
30-34 years	1,022	289	153	43	29	8.2
35-44 years	750	91	165	20	28	3.4
≥45 years	272	16	58	3	33	2.0
Gender						
Male	4327	178	871	36	140	5.7
Female	10965	441	1248	50	9	0
Transgender^^	2	-	-	-	-	-
Race^/Ethnicity						
White	6,463	150	661	15	93	2.2
Black	4,436	2,186	1,027	506	40	19.7
American Indian	390	481	47	58	1	1.2
Asian/PI	612	364	28	17	1	0.6
Other ^^	691	-	113	-	14	-
Unknown^^	2,702	-	243	-	0	-
Hispanic^^^	980	683	70	49	0	-

* Residence information missing for 664 cases of chlamydia and 97 cases of gonorrhea.
** Suburban is defined as the seven-county metropolitan area (Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, and Washington Counties), excluding the cities of Minneapolis and St. Paul.
^ Case counts include persons by race alone. Population counts used to calculate results include race alone or in combination.
^^ No comparable population data available to calculate rates.
^^^ Persons of Hispanic ethnicity may be of any race.
Note: Data exclude cases diagnosed in federal or private correctional facilities.

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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 (2,186 per 100,000) is 15 times higher than the rate among whites (150 per 100,000). Although blacks comprise approximately 4% of Minnesota's population, they account for 29% of reported chlamydia cases. Rates among Asian/Pacific Islanders (364 per 100,000), American Indians (481 per 100,000), and Hispanics (683 per 100,000) are over two to five times higher than the rate among whites. Chlamydia infections occur throughout the state, with the highest reported rates in Minneapolis (815 per 100,000) and St. Paul (695 per 100,000). While there was an overall increase across the state in 2010 the greatest increase for chlamydia was seen in the suburban area (metropolitan area excluding Minneapolis and St. Paul) with a increase of 12% shown in Table 4.

Gonorrhea
Gonorrhea, caused by *Neisseria gonorrhoeae*, is the second most commonly reported STD in Minnesota. In 2010, 2,119 cases (43 per 100,000 population) were reported, representing a 34% decrease from 2009 (Table 3).

Adolescents and young adults are at greatest risk for gonorrhea (Table 4), with incidence rates of 164 per 100,000 among 15 to 19-year-olds, 236 per 100,000 among 20 to 24-year olds, and 109 per 100,000 among 25 to 29-year-olds. Gonorrhea rates for males (36 per 100,000) and females (50 per 100,000) are comparable. Communities of color are disproportionately affected by gonorrhea, with nearly one half of cases reported among blacks. The incidence of gonorrhea among blacks (506 per 100,000) is 34 times higher than the rate among whites (15 per 100,000). Rates among Asian/Pacific Islanders (17 per 100,000), American Indians (58 per 100,000), and Hispanics (49 per 100,000) are up to four times higher than among whites.

Gonorrhea rates are highest in the cities of Minneapolis and St. Paul (Table 4). The incidence in Minneapolis (195 per 100,000) is two times higher than the rate in St. Paul (97 per 100,000), nearly six times higher than the rate in the suburban metropolitan area (31 per 100,000), and over 11 times higher than the rate in Greater Minnesota (17 per 100,000). Geographically in 2010, Minneapolis saw a 3% increase in cases with St. Paul seeing the greatest drop in cases at 31%.

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

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

Primary and Secondary Syphilis
The incidence of primary/secondary syphilis in Minnesota is lower than that of chlamydia or gonorrhea (Table 3), but has remained elevated since an outbreak began in 2002 among men who have sex with men (MSM). In 2010, there were 149 cases of primary/secondary syphilis in Minnesota (3.0 cases per 100,000 persons). Notably, this represents an increase of 110% compared to the 71 cases (1.4 per 100,000 population) reported in 2009.

Early Syphilis
In 2010, the number of early syphilis cases increased by 89%, with 221 cases occurring compared to 117 cases in 2009. The incidence remains highly concentrated among MSM. Of the early syphilis cases in 2010, 208 (94%) occurred among men; 185 (89%) of these men reported having sex with other men; 57% of the MSM diagnosed with early syphilis were co-infected with HIV.

Congenital Syphilis
One case of congenital syphilis was reported in Minnesota in 2010 (Table 3).

Chancroid
No cases were reported in 2010. The last case was reported in 1999.

Shigellosis
During 2010, 66 culture-confirmed cases of *Shigella* infection (1.3 per 100,000 population) were reported. This represents a 16% decrease from the 79 cases reported in 2009, a 71% decrease from the median number of cases reported annually from 2000 to 2009 (median, 230 cases; range, 66 to 904) and the lowest incidence and number of cases identified in the state since active laboratory surveillance was initiated in 1996 (Figure 2). In 2010, *S. sonnei* accounted for 47 (71%) cases, *S. flexneri* for 13 (20%) and *S. dysenteriae* for 4 (6%). Cases ranged in age from 1 to 70 years (median, 31 years). Thirty-nine percent of cases were 25 to 45 years of age. Twenty-six percent of cases were <10 years of age; children ≤5 years of age accounted for 17% of cases. Nine (14%) cases were hospitalized. Of the 56 cases for which travel information was available, 18 (32%) travelled internationally in the week prior to illness onset. Sixty-five percent of cases resided in the metropolitan area, including 44% in Hennepin County and 9% in Ramsey County. No outbreaks of shigellosis were identified in 2010.

Every tenth *Shigella* isolate received at MDH is tested for antimicrobial resistance. Six isolates were tested in 2010; 17% were resistant to trimethoprim-sulfamethoxazole, 33% were resistant to ampicillin, and none were resistant to both ampicillin and trimethoprim-sulfamethoxazole.

***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 2010, 649 (12.3 per 100,000) cases of invasive pneumococcal disease were reported. By age group, annual incidence rates per 100,000 were 23.9 cases among children aged 0-4 years, 3.4 cases among children and adults aged 5-39 years, 13.6 cases among adults 40-64 years, and 35.3 cases among adults aged 65 years and older.

In 2010, pneumonia accounted for 403 (62%) cases of invasive pneumococcal disease among all cases (i.e., those infections accompanied by bacteremia or isolation of pneumococci from another sterile site such as pleural fluid). Bacteremia without another focus of infection accounted for 168 (26%) cases statewide. Pneumococcal meningitis accounted for 38 (6%) cases. Sixty-three (10%) patients with invasive pneumococcal disease died. Health histories were available for 48 (76%) of the 63 cases who died. Of these, 46 had an underlying health condition reported. The conditions most frequently reported were chronic obstructive pulmonary disease (11), smoker (10), atherosclerotic cardiovascular disease (9), heart failure (9), and diabetes (7). In 1999, the year before the pediatric pneumococcal conjugate vaccine (Prevnar [PCV-7]) was licensed, the rate of invasive pneumococcal disease among children < 5 years in the metropolitan area was 111.7 cases per 100,000. Over the years 2000 through 2002 there was a major downward trend in incidence in this age group (Figure 5). Rates in each of the subsequent 8 years were somewhat higher, although there has not been a continuing upward trend (Figure 5). Based on the distribution of serotypes among isolates from these cases, this increase was limited to disease caused by non-vaccine serotypes (i.e. serotypes other than the seven included in PCV-7) (Figure 5). This small degree of replacement disease due to non-PCV-7 serotypes, similar to that seen in other parts of the country, has been far outweighed by the declines in disease caused by PCV-7 serotypes.

In March 2010, the FDA approved a new 13-valent pediatric pneumococcal conjugate vaccine (PCV-13 [Prevnar 13]) which replaces PCV-7. The new vaccine provides protection against the same serotypes in PCV-7, plus 6 additional serotypes (serotypes 1, 3, 5, 6A, 7F, and 19A). Since 2007, the majority of invasive pneumococcal disease cases among children under 5 years of age have been caused by the 6 additional serotypes included in PCV-13 (Figure 5). In 2010, 40% of cases occurring among Minnesotans of all ages were caused by 3 of the new PCV-13-included serotypes: 7F (17%), 19A (16%), and 3 (8%).

Of the 625 isolates submitted from 2010 cases, 146 (23%) isolates were resistant to penicillin using meningitis breakpoints. Using non-meningitis breakpoints, 4 (1%) of 625 isolates were resistant to penicillin and 56 (9%) exhibited intermediate level resistance (Note: CLSI penicillin breakpoints changed in 2008; refer to the MDH Antibiogram on pages 28-29 for details). Multi-drug resistance (i.e., high-level resistance to two or more antibiotic classes) was exhibited in 125 (20%) isolates.

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

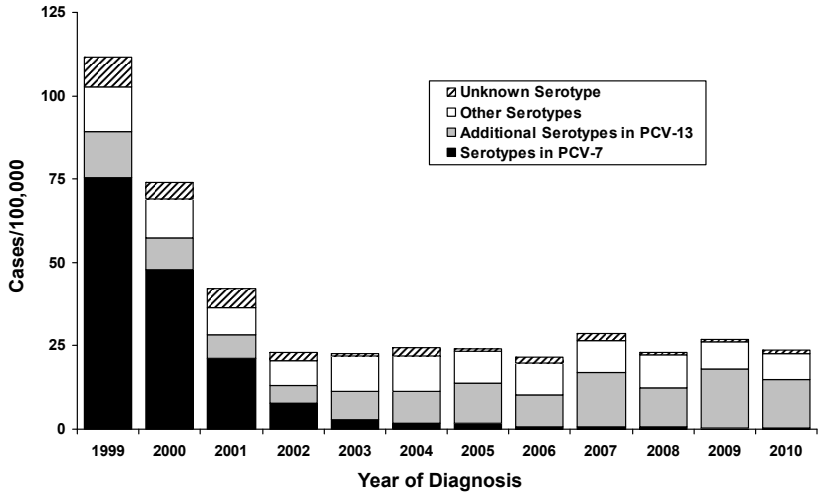
One hundred fifty-eight cases of invasive GAS disease (3.0 per 100,000), including 13 deaths, were reported in 2010, compared to 189 cases and 21 deaths in 2009. Ages of cases ranged from 2 months to 101 years (median, 54 years). Sixty-one percent of cases were residents of the metropolitan area. Thirty-six (22%) cases had bacteremia without another focus of infection, 57 (36%) cases had cellulitis, and 22 (14%) cases had an abscess. There were 14 (9%) cases of primary pneumonia and 8 (5%) cases of necrotizing fasciitis. Fourteen (9%) cases had septic arthritis and/or osteomyelitis, and 6 (3%) had STSS. Ten (6%) cases were residents of 10 different long-term care facilities.

The 13 deaths included 3 cases of bacteremia without another focus of infection, 2 cases of pneumonia, and 2 cases with cellulitis and necrotizing fasciitis. The 6 remaining fatal cases had cellulitis, myositis and STSS (1); STSS (1); necrotizing fasciitis (1); systemic inflammatory response syndrome (1); osteomyelitis (1); and septic arthritis (1). The deaths occurred in persons ranging in age from 13 years to 97 years. Health histories were available for 11 cases who died and all had underlying medical conditions. The conditions most frequently reported were diabetes (5) and congestive heart failure (5).

Streptococcal Invasive Disease - Group B

Four hundred forty-eight cases of invasive group B streptococcal disease (8.5 per 100,000 population), including 24 deaths, were reported in 2010. These cases were those in which group B Streptococcus (GBS) was isolated from a normally sterile site. The largest number of GBS cases reported since surveillance was initiated in 1995 was 454, reported in 2009.

Figure 5. Invasive Pneumococcal Disease Incidence Among Children <5 Years of Age, by Year and Serotype Group, Metropolitan Area, 1999-2001; Minnesota, 2002-2010



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)

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By age group, annual incidence was highest among infants <1 year of age (64.4 per 100,000 population) and those aged 70 years or older (30.4 per 100,000). Sixteen (67%) of the 24 deaths were among those 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 (36% of infections), followed by cellulitis (18%), osteomyelitis (12%), septic arthritis (8%), pneumonia (7%), and meningitis (3%). The majority (73%) of cases had GBS isolated from blood; other isolate sites included joint fluid (10%) and bone (11%).

Fifty-two cases were infants or pregnant women (maternal cases), compared to 43 cases in 2009. Thirty-one infants developed early-onset disease (occurred within 6 days of birth [0.44 cases per 1,000 live births]), and 14 infants developed late-onset disease (occurred at 7 to 89 days of age [0.20 cases per 1,000 live births]). Six stillbirth/spontaneous abortions were associated with 7 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, MDH reviewed the maternal charts for all 31 early-onset cases reported during 2010. Overall, 21 (68%) of 31 women who delivered GBS-positive infants underwent prenatal screening for GBS. Of these, 6 (29%) were positive, 12 (57%) negative, and 3 (14%) had an unknown result. Two of the five women who did not receive prenatal screening were screened upon admission to the hospital and prior to delivery. Of the five women for whom it was unknown if they received prenatal screening, one was screened upon admission to the hospital and prior to delivery. Among the 31 women who delivered GBS-positive infants, 17 (55%) received intrapartum antimicrobial prophylaxis (IAP). Of the six women with a positive GBS screen, four (67%) received IAP.

Toxic Shock Syndrome (Staphylococcal)

In 2010, 6 cases of suspect or probable staphylococcal toxic shock syndrome (TSS) were reported. Of the reported cases, 5 were female, and the median age was 14 years (range, 11 to 47 years). Four of the 6 were menstrual-associated, 1 was wound-associated, and 1 was unknown.

Staphylococcal toxic shock syndrome with isolate submission (if isolated) is reportable to MDH within 1 working day. MDH follows the 1997 CDC case definition which includes fever (temperature >102.0°F or 38.9°C), rash (diffuse macular erythroderma), desquamation (within 1-2 weeks aftfer onset of illness), hypotension (SBP <90 mm Hg for adults or less than fifth percentile by age for children aged <16 years; orthostatic drop in diastolic blood pressure greater than or equal to 15 mm Hg from lying to sitting, orthostatic syncope, or orthostatic dizziness), multisystem involvement (≥3 of the following: vomiting or diarrhea at onset of illness; severe myalgia or creatine phosphokinase level at least twice the upper limit of normal; vaginal, oropharyngeal, or conjunctival hyperemia; blood urea nitrogen or creatinine at least twice the upper limit of normal for laboratory or urinary sediment with pyuria (>5 leukocytes per high-power field) in the absence of urinary tract infection; total bilirubin, alanine aminotransferase enzyme, or aspartate aminotransferase enzyme levels at least twice the upper limit of normal for laboratory; platelets less than 100,000/mm^3; disorientation or alterations in consciousness without focal neurologic signs when fever and hypotension are absent); negative results for blood, throat, or cerebrospinal fluid cultures (blood culture may be positive for *Staphylococcus aureus*) or no rise in titer to Rocky Mountain spotted fever, leptospirosis, or measles (if done).

Tuberculosis

During 2010, 135 new cases of tuberculosis (TB) disease (2.6 cases per 100,000 population) were reported in Minnesota, which represents a decline of 16% in both the number of cases and incidence rate since 2009 and the lowest number of cases recorded statewide since 1996 (131 cases). In particular, from 2009 to 2010, the number of TB cases reported in Minnesota among U.S.-born persons decreased 22%, while cases among foreign-born persons decreased 15%. In 2010, Minnesota's TB incidence rate was below the national rate (3.6 cases per 100,000 population) but slightly higher than the median rate among 51 U.S. states and reporting areas (2.5 cases per 100,000 population) and well above the *U.S. Healthy People 2010* objective of 1.0 case per 100,000 population (Figure 6).

Despite a significant and ongoing decline in the number of TB cases reported among foreign-born persons in Minnesota in recent years, the most distinguishing characteristic of the epidemiology of TB disease in this state continues to be the large proportion of cases that occur among persons born outside the United States. Eighty-one percent of TB cases reported in Minnesota during 2010 occurred among foreign-born persons. In contrast, only 61% of TB cases reported nationwide in 2010 were foreign-born. The 110 foreign-born TB cases reported in Minnesota during 2010 represented 24 different countries of birth; the most common region of birth among these patients was sub-Saharan Africa (52%), followed by South/Southeast Asia (30%), and Latin America (including the Caribbean) (12%) (Figure 7). The ethnic diversity among foreign-born TB cases in Minnesota reflects the unique and constantly changing demographics of immigrant and other foreign-born populations arriving statewide. This diversity also poses significant challenges in providing culturally and linguistically appropriate TB prevention and control services for populations most affected by and at risk for TB in Minnesota.

Among foreign-born TB cases reported in Minnesota during 2010, 12% were diagnosed with TB disease less than 12 months after arriving in the United States, and an additional 9% were diagnosed 1 to 2 years after their arrival in this country. Many of these cases, particularly those diagnosed during their first year in the United States, likely represent persons who acquired TB infection prior to immigrating and began progressing to active TB disease shortly after arriving in the United States. Of 8 TB cases 15 years of age or older who were diagnosed in Minnesota within 12 months of arriving in the United States and who arrived as immigrants or refugees, only 1 (13%) 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

Figure 6. Tuberculosis Incidence Rates per 100,000 Population, United States and Minnesota, 1996-2010

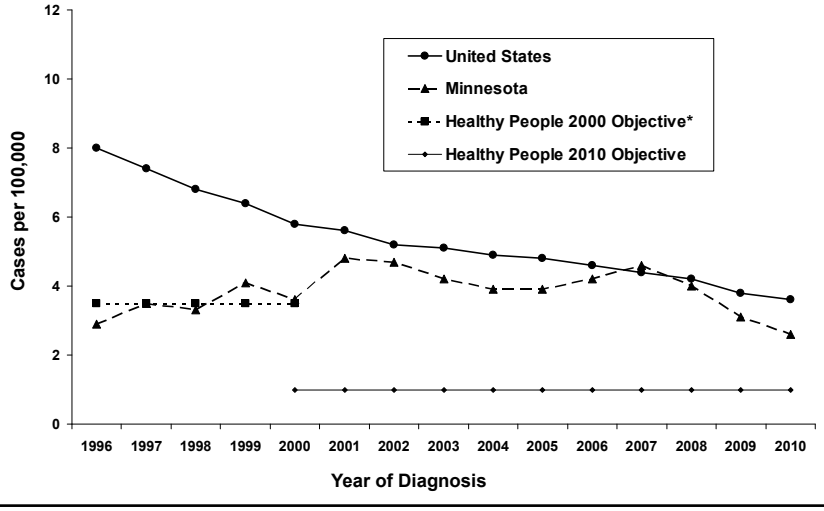
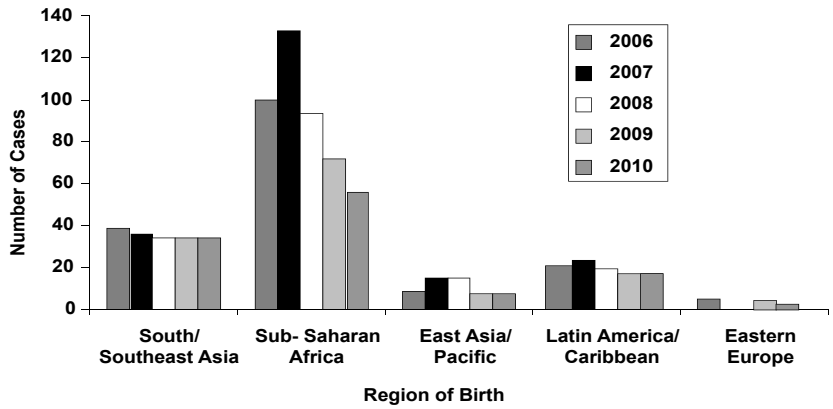


Figure 7. Foreign-Born Tuberculosis Cases by Region of Birth and Year of Diagnosis, Minnesota, 2006-2010



of suspicion for TB among newly arrived foreign-born persons, regardless of the results of medical exams performed overseas. Seventy-nine percent of foreign-born TB cases reported in Minnesota during 2010 were diagnosed more than 2 years after arriving in the United States. These data suggest that more than three-fourths of foreign-born TB cases reported in Minnesota may be preventable by focusing on thorough domestic screening and treatment of latent TB infection (LTBI) among recently arrived refugees, immigrants, and other foreign-born persons. Recent changes in the technical instructions for the pre-immigration medical evaluation required for immigrants and refugees, which were initiated in specific regions in 2007 and then gradually expanded worldwide, appear to have significantly reduced the number of TB cases reported in Minnesota among newly arrived immigrants and refugees. In particular, from 2008 to 2010, the percentage of foreign-born TB cases reported in Minnesota that were diagnosed with TB disease less than 12 months or 1 to 2 years after arrival in the United States declined 40% (20% to 12%) and 61% (23% to 9%), respectively.

The age distribution of TB cases reported in Minnesota differs markedly between U.S.-born and foreign-born patients, reflecting differing predominant risks of exposure to TB among these populations. The majority (66%) of foreign-born TB cases reported in 2010 were 15 to 44 years of age, whereas the majority of U.S.-born TB cases occurred among persons at younger and older ends of the age spectrum, with only 44% of U.S.-born TB cases occurring among persons 15 to 44 years of age. In contrast, 40% of U.S.-born TB cases were 45 years of age or older, while only 31% of foreign-born TB cases occurred in this age group. Among U.S.-born persons, older adults were alive when TB was much more prevalent than in recent decades and, therefore, are more likely than younger persons to have been infected with TB. The proportion of pediatric patients less than 15 years of age also was considerably larger among U.S.-born TB cases than among foreign-born cases (16% versus 3%, respectively), although most of these U.S.-born cases were children born in the United States to foreign-born parents. These first-generation U.S.-born children appear to experience an increased risk of TB disease that more closely resembles that of foreign-born persons. Presumably, these children may be exposed to TB as a result of travel to their parents' country of origin and/or visiting recently arrived family members who may be at increased risk for TB acquired overseas.

The majority (84%) of TB cases reported in Minnesota during 2010 were identified as a result of presenting with symptoms for medical care. Various targeted public health interventions identified the remaining 16% of cases. Such methods of case identification traditionally are considered high priority, core TB prevention and control activities; they include TB contact investigations (1%), follow-up evaluations subsequent to abnormal findings on pre-immigration exams performed overseas (1%), and domestic refugee health examinations (1%). Notably, however, an additional 14% of TB cases were identified through a variety of other means (e.g., occupational screening) that typically are considered lower priority activities. In 2010, the percentage of TB cases identified through TB contact investigations (1%), in particular, declined markedly, from an annual average of 5% for 2004 through 2007, to 13% in 2008 (which reflects two large TB outbreaks that occurred in specific populations during that year), and 6% in 2009. Overall, the 16% of TB cases identified in 2010 through targeted screening

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and other similar activities represents the smallest percentage of TB cases identified through active case-finding and screening activities since 2001, which likely reflects recently enhanced medical protocols used by overseas panel physicians screening refugees and immigrants for TB prior to travel to the United States. It also suggests potential missed opportunities for public health TB control activities.

Aside from foreign-born persons, other high-risk population groups comprise much smaller proportions of the TB cases in Minnesota. Among cases reported in 2010, persons with certain medical conditions (excluding HIV infection) that increase the risk for progression from LTBI to active TB disease (e.g., diabetes, prolonged corticosteroid therapy or other immunosuppressive therapy, end stage renal disease, etc.) were the most common of these other high risk population groups, representing 17% (23) of cases. Notably, these patients represent the largest annual proportion of TB cases reported with such medical conditions since at least 1993, when MDH initiated an electronic surveillance database that included data on TB-related risk factors among reported cases. This observation of a trend toward a growing risk category among TB cases reported in Minnesota in recent years illustrates the importance of TB screening and, if indicated, treatment for LTBI among patients with underlying medical conditions that increase the risk for progression from LTBI to active TB disease. Following these underlying medical conditions, the next most common risk factor among TB cases was substance abuse (including alcohol abuse and/or illicit drug use), with 5% of TB cases reported in 2010 having a history of substance abuse during the 12 months prior to their TB diagnoses. Six (4%) of the 135 TB cases reported in Minnesota during 2010 were infected with HIV; 4 of those HIV-infected TB cases were foreign-born, including 1 case each from Honduras, Mexico, Somalia, and Vietnam. The percentage of new TB cases with HIV co-infection in Minnesota remains less than that among TB cases reported nationwide (8.6% of those with an HIV test result). Other risk groups, such as correctional facility inmates, homeless persons, and residents of nursing homes, each represented less than 5% of TB cases reported during 2010. The percentages of TB cases that occurred among correctional facility inmates and nursing home residents both increased, from 5-year averages of 2% and 1%, respectively, for 2005 through 2009, to 3% (4 cases) and 2% (3 cases), respectively, in 2010.

Fifteen (17%) of the state's 87 counties reported at least 1 case of TB disease in 2010. This is a marked decrease from recent years, during which the number of counties where TB was reported ranged from 23 (26%) in 2009 to 29 (33%) in 2006. This likely reflects continuing decreases in the number of TB cases reported statewide and the number of primary refugee arrivals in Minnesota. The large majority (87%) of cases occurred in the metropolitan area, particularly in Hennepin (50%) and Ramsey (25%) counties, both of which have public TB clinics.

Twelve percent of TB cases reported statewide during 2010 occurred in the five suburban metropolitan counties (i.e., Anoka, Dakota, Carver, Scott, and Washington). Olmsted County, which also maintains a public TB clinic, represented 4% of cases reported in 2010. The remaining 9% of cases occurred in primarily rural areas of Greater Minnesota. The most notable changes in the geographic distribution of TB cases reported in Minnesota during 2010 were a decrease in the number of counties reporting any TB cases, an increase in the proportion of cases that occurred in Hennepin County, a decrease in the proportion of cases in Greater Minnesota (excluding Olmsted County). In particular, while the percentage of TB cases statewide that occurred in Hennepin County decreased markedly from 50% in 2005 to 38% in 2009, the county's proportion of cases rebounded to 50% in 2010. Also, the percentage of TB cases reported in Greater Minnesota (excluding Olmsted County) decreased from a 5-year average of 15% for 2005 through 2009 to 9% in 2010. MDH calculates county-specific annual TB incidence rates for Hennepin, Ramsey, and Olmsted counties, as well as for the five-county suburban metropolitan area and collectively for the remaining 79 counties in Greater Minnesota.

In 2010, the highest TB incidence rate statewide was reported in Ramsey County (6.7 cases per 100,000 population), followed by Hennepin County (5.8 cases per 100,000 population) and Olmsted County (4.2 cases per 100,000 population). In 2010, the incidence rates in the five-county suburban metropolitan area (1.3 cases per 100,000 population) and Greater Minnesota (0.5 cases per 100,000 population) were considerably lower than that in the state overall (2.6 cases per 100,000 population). From 2009 to 2010, the TB incidence rate declined statewide and in each of these county-specific categories, except Hennepin County, where the TB rate increased 9%, from 5.3 cases per 100,000 population in 2009 to 5.8 cases per 100,000 population in 2010.

The prevalence of drug-resistant TB in Minnesota, particularly resistance to isoniazid (INH) and multi-drug resistance (i.e., resistance to at least INH and rifampin), historically has exceeded comparable national figures, including in 2009 (the most recent year for which complete national data are available). In 2010, however, all forms of drug resistance routinely monitored through epidemiologic data collected by MDH declined markedly. Of 109 culture-confirmed TB cases with drug susceptibility results available, 12 (11%) were resistant to at least one first-line anti-TB drug (i.e., INH, rifampin, pyrazinamide, or ethambutol), including 5 (5%) cases that were resistant to INH. No cases of multidrug-resistant (MDR) TB were reported in 2010. In comparison, the prevalence of any first-line drug resistance, INH resistance, and MDR-TB among 120 culture-confirmed TB cases reported in Minnesota during 2009 were 17%, 10%, and 2%, respectively. Drug resistance is more common among foreign-born TB cases than it is among U.S.-born cases in Minnesota. Of particular concern, 2 (22%) of 9 MDR-TB cases reported from 2006 through 2009 were resistant to all four first-line drugs. These 2 cases were born in China and the United States.

Another clinical characteristic of

particular significance in Minnesota is the preponderance of extrapulmonary disease among foreign-born TB patients. Over half (55%) of foreign-born TB cases reported from 2006 through 2010 had an extrapulmonary site of disease; in contrast, less than one-third (32%) of U.S.-born TB cases had extrapulmonary TB. Among extrapulmonary TB cases, by far the most common sites of TB disease were lymphatic (56%), followed by pleural (8%), bone/joint (8%), peritoneal (7%), and various other sites that each represented less than 5% of such cases. The unusually high incidence of extrapulmonary TB disease in Minnesota emphasizes the need for clinicians to be aware of the local epidemiology of TB and to have a high index of suspicion for TB, particularly among foreign-born patients and even when the patient does not present with a cough or other common symptoms of pulmonary TB.

Table 5. UNEX/MED-X Cases with Pathogens Identified as Confirmed, Probable, or Possible Cause of Illness, 2010*

Pathogen Identified	UNEX (n=34)	MED-X (n=18)**
Adenovirus	1	1
Chlamydophila pneumoniae	1	
Clostridium spp.	2	2
Enterococcus		2
Enterovirus	1	
Escherichia coli		1
Fusobacterium necrophorum	1	
Group A Streptococcus		1
Group B Streptococcus		3
Haemophilus influenzae	4	
Herpes simplex virus 1	1	
Influenza A virus (seasonal)	1	1
Influenza A novel H1N1	1	
Klebsiella pneumoniae	2	1
Metapneumovirus	1	
Naegleria folweri	1	
Norovirus	1	
Picornavirus	2	2
Pseudomonas spp.		1
Respiratory syncytial virus	5	1
Staphylococcus aureus	3	2
Streptococcus pneumoniae	15	4
Other *Streptococcus* spp.	2	3
Streptomyces spp.	1	
Ureaplasma spp.	1	

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

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

The national goal of TB elimination by 2010, which was established in 1989 by the Advisory Council for the Elimination of Tuberculosis in partnership with the CDC, remains unmet, both nationally and in Minnesota. The incidence of TB disease reported annually in the United States has decreased each year since 1993, albeit at a decelerating rate of decline in recent years (averaging 3.8% per year from 2000 through 2008), with a notable exception in 2009, when an unprecedented 11.4% decrease in the national TB incidence rate was recorded. From 2009 to 2010, however, the national TB incidence rate decreased by a less substantial and more typical 3.9%. In Minnesota, the incidence of TB disease increased throughout much of the 1990s and fluctuated during the past decade, with peaks in 2001 (239 cases) and 2007 (238 cases). From 2008 through 2010, the statewide TB incidence rate decreased an average of 17% per year (including an atypically large decrease of 23% in 2009, which paralleled the unusual and unexpected decrease in the national TB rate reported for that year). While preliminary national data for 2010 suggest that the remarkable decrease reported in the TB incidence rate in the United States (and Minnesota) for 2009 likely was an aberration, the significant and sustained annual decreases in Minnesota's TB incidence rate since 2007 appear to be optimistic indicators of a real and substantial reduction in the occurrence of TB in Minnesota. This decline likely is attributable to several factors, including dramatic decreases in the number of primary refugees resettling in Minnesota in recent years (particularly a marked decline since 2006 in the number of those arriving in Minnesota from sub-Saharan Africa) and changes initiated in 2007 in the technical instructions for the overseas medical examinations required for new immigrants and refugees. Continued progress toward meeting the national goal of TB elimination will require numerous advances in various TB prevention and control strategies and tools, including better diagnostic tests and screening strategies to identify persons with LTBI and TB disease, shorter and more easily tolerated treatment regimens for LTBI and active TB disease, an effective vaccine, and improvements in both global TB control and TB prevention and control strategies targeted to disproportionately affected populations in the United States. Maintaining and disseminating current, comprehensive and detailed TB surveillance data, such as those presented here, will continue to be critical for identifying trends in the epidemiology of TB, which should inform and shape local TB prevention and control strategies.

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

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

In 2006, MDH began Medical Examiner Infectious Deaths Surveillance (MED-X) to evaluate all medical examiner (ME) cases for infectious-related deaths. MDH distributes specimen collection kits to MEs to help guide

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and increase the number and type of specimens collected. All MEs are encouraged to participate, but MDH in particular works with the Minnesota Regional Medical Examiner Office (MRMEO), the Hennepin County Medical Examiner Office, Midwest Medical Examiner's Office, Ramsey County Medical Examiner Office, and Lakeland Pathology. MEs report explained infectious and unexplained cases to MDH. Unexplained deaths in previously healthy individuals <50 years of age are included regardless of infectious hallmarks; this primarily includes Sudden Unexplained Infant Deaths (SUIDs). In addition, MDH reviews death investigations at MRMEO to capture a population-based rate that includes cases not autopsied. Cases found through active surveillance that have infectious pre-mortem and/or post-mortem findings indicating a possible infectious-related death for which a pathogen was not identified are also considered for UNEX surveillance and are followed-up with for testing if they are <50 years of age and previously healthy.

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 or fatally ill, or have no infectious disease hallmarks.

There were 172 cases that met criteria for UNEX surveillance (144 deaths and 28 critical illnesses) in 2010, compared to 201 cases in 2009. Of the 172 cases, 85 were reported by providers, 71 were found through review of ME records, 7 were found by death certificate review, and 9 were found through other reporting methods. Of the 71 found through MED-X, 14 were <50 years of age; 21 had autopsies performed. Among the 172 cases, 86 cases presented with respiratory symptoms; 21 with neurologic symptoms; 14 with an illness that did not fit a defined syndrome (or had more than one syndrome); 13 with cardiac symptoms; 13 with sudden unexpected death (SUD); 11 with gastrointestinal (GI) illness; 8 with shock/sepsis; 3 with a genitourinary (GU) illness; and 3 with a hepatic syndrome. The age of cases ranged from newborn to 103 years. The median age was 20 years among 86 reported cases, and 76 years among 86 non-reported cases, with an overall median age of 47 years. Fifty-eight percent resided in the metropolitan area and 56% were male.

There were 86 cases that had specimens tested at the PHL and/or the IDPB. Of those, 34 (40%) had one or more pathogens identified as a potential cause of the illness (Table 5). Cases were identified as confirmed (n=21), probable (n=8), or possible (n=4) based on the type of testing performed, the anatomic site of the specimen and the clinical syndrome. The pathogens most frequently identified through UNEX testing as the presumed cause of illness include 15 *S. pneumoniae*, and 5 respiratory syncytial virus (Table 5). There were also several cases caused by pathogens not expected to occur in Minnesota. One case was in a 7 year-old with fatal meningitis which was determined to be due to *Naegleria fowleri*, a fresh water ameba not previously confirmed to cause infection this far north in the United States. A 3 month-old who experienced SUID was determined to have influenza and *S. pneumoniae* co-infection through immunohistochemistry staining on lung tissue.

There were 229 MED-X cases in 2010; 134 of these also met UNEX criteria. Based on MRMEO data, the population-based rate of unexplained but potential infectious disease-related deaths as reported to MEs was 14 per 100,000. The median age of the cases was 49 years, and 56% were male. There were 104 (45%) cases found through death investigation report review, the majority of which were cases that did not have autopsies (n=78 [75%]). MEs reported 92 (40%) cases, death certificate review identified 27 (12%) cases, and 1 case was found through other reporting methods. The most common syndrome was pneumonia/upper respiratory infection (n=106 [46%]). Of the 229 cases, 58 (25%) were confirmed to have had an infectious cause, 125 (55%) had possible infectious causes, and 46 (20%) were due to non-infectious causes (Table 5).

Varicella and Zoster

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

Five cases of critical illness, but no deaths, due to varicella were reported. Four of the 5 were hospitalized for 2 to 15 days. Complications included pneumonia and bacterial super-infection. One case had an underlying medical condition and recent history of treatment with immunosuppressive drugs. The other cases had no or unknown underlying conditions and were not known to be immunosuppressed. Four cases had not received varicella-containing vaccine; 2 were too young to have received vaccine, 1 was not vaccinated due to parental refusal, and 1 was not vaccinated and had a history of varicella disease at 33 days of age. Vaccination history for the other case, age 70 years, was unknown.

An outbreak of varicella in a school is defined as 5 or more cases within a 2-month period in persons <13 years of age, or 3 or more cases within a 2-month period in persons 13 years of age and older. An outbreak is considered over when no new cases occur within 2 months after the last case is no longer contagious. During the 2010-2011 school year, MDH received reports of outbreaks from five schools in five counties involving 31 students and no staff. By comparison MDH received reports of outbreaks from 20 schools in 16 counties involving 180 students and 2 staff during the 2009-2010 school year. The number of cases per outbreak ranged from 5 to 11 (median, 5) during the 2010-2011 school year compared to 4 to 26 (median, 9) during the 2009-2010 school year.

Surveillance also includes reporting of individual cases from sentinel schools throughout Minnesota. These data are used to extrapolate to the statewide burden of sporadic disease. For the 2010-2011 school year, 78 of the 79 sentinel schools that participated in the 2009-2010 school year participated again. A case of varicella is defined for sentinel school reporting as an illness

with acute onset of diffuse (generalized) maculopapulovesicular rash without other apparent cause; however, sentinel sites have been requested to also report possible breakthrough infection that may present atypically. During the 2010-2011 school year, 18 cases were reported from 11 schools. None of the schools reported a cluster of cases that met the outbreak definition. Based on these data, an estimated 407 sporadic cases of varicella would have been expected to occur during a school year among the 870,941 total school-aged children (for schools with >99 students), representing 0.05% of this population, for an incidence rate of 46.7 per 100,000 population. Most cases occurred among elementary school students, with an estimated incidence rate of 82.4 per 100,000 (392 of 475,777).

Case-based reporting of varicella in all child care settings was initiated in February 2010. For the remaining 11 months of 2010, 111 cases were reported. Cases ranged in age from 4 months to 11 years. Ninety-eight (88%) were <6 years of age.

Viral Hepatitis A

In 2010, 37 cases of hepatitis A (HAV) (0.7 per 100,000 population) were reported. Thirteen (35%) cases were residents of the metropolitan area, including 9 residents of Hennepin or Ramsey Counties. Nineteen (51%) cases were female. Cases ranged in age from 3 to 74 years (median, 38 years). Twenty-three (62%) were white, 1 (3%) was black, 1 (3%) was American Indian, and 1 (3%) was Asian; race was unknown for 11 (30%) cases. Hispanic ethnicity was reported for 3 cases.

A risk factor was identified for 21 (57%) of the 37 cases, 7 of whom had known exposure to a confirmed hepatitis A case. These persons became infected following exposure to a close contact, representing missed opportunities to administer immune globulin (IG) or HAV vaccine. Of the remaining 14 cases with a risk factor identified, 5 were associated with travel. Of these 5 cases, 1 traveled to a Central/South American country (Chile).

In 2010, there were three outbreaks of 3, 4, and 11 cases, respectively. Three cases from an unidentified source occurred in family members from Anoka and LeSueur Counties. An outbreak in a family who recently adopted a child from Haiti accounted for 4 cases. Eleven cases were associated with an outbreak in Cottonwood County with no identified source (this outbreak was ongoing into 2011 with additional cases).

Viral Hepatitis B

In 2010, 24 cases of symptomatic acute hepatitis B virus (HBV) infection (0.5 per 100,000 population) were reported, with no deaths. In addition to these cases, 5 individuals with documented asymptomatic seroconversion were reported. Prior to 2006, both symptomatic cases and asymptomatic seroconvertors were counted as incident cases. This change in case counting criteria should be considered when examining case incidence trends.

MDH also received 623 reports of newly identified cases of confirmed chronic HBV infection in 2009. Prior to 2009, confirmed and probable chronic cases were reported in the year in which they were first reported. Beginning in 2009, only confirmed cases are reported, and cases are reported in the year in which case-confirming data are available. A total of 19,420 persons are assumed to be alive and living in Minnesota with chronic HBV. The median age of chronic HBV cases in Minnesota is 42.

The 24 acute cases ranged in age from 28 to 79 years (median, 42 years). Twelve (50%) of the 24 cases were residents of the metropolitan area, including 8 (33%) in Hennepin County and 2 (8%) in Ramsey County. Sixteen (67%) cases were male and 9 (38%) were adolescents or young adults between 13 and 39 years of age. Thirteen (54%) were white, 3 (13%) were black, 2 (8%) were American Indian, 1 (4%) was Asian, and 1 (4%) was of other race; race was unknown for 4 (17%) cases. No case was known to be of Hispanic ethnicity. Although the majority of cases were white, incidence rates were higher among blacks (1.2 per 100,000) and American Indians (3.1 per 100,000) than among non-Hispanic whites (0.3 per 100,000).

In addition to the 24 hepatitis B cases, 5 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 2009. The perinatal infections occurred in infants identified through a public health program that works to ensure appropriate prophylactic treatment of infants born to HBV-infected mothers. All four 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. Despite these treatment failures, the success of the public health prevention program is demonstrated by the fact that an additional 406 infants born to HBV-infected women during 2009 had post-serologic testing demonstrating no infection.

Viral Hepatitis C

In 2010, 15 cases of symptomatic acute hepatitis C virus (HCV) infection (0.3 per 100,000) were reported. In addition to the 15 cases, 7 individuals with asymptomatic, laboratory-confirmed acute HCV infection were reported. Prior to 2006, both symptomatic and asymptomatic acute infections were counted as incident cases. This change in case counting criteria should be considered when examining case incidence trends.

Nine (60%) of the 15 cases resided in Greater Minnesota. The median age was 43 years (range, 23 to 66 years). Eight (53%) cases were male. Seven (47%) were white, 4 (27%) were American Indian, and 1 (7%) was Asian; race was unknown for 3 (20%) cases.

MDH received 1,705 reports of newly identified anti-HCV positive persons in 2010, the vast majority of whom are chronically infected. A total of 35,241 persons are assumed to be alive and living in Minnesota with past or present HCV infection. The median age of these cases is 54. Because most cases are asymptomatic, medical providers are encouraged to consider each patient's risk for HCV infection to determine the need for testing. Persons who test positive for HCV should be screened for susceptibility to hepatitis A and B virus infections and immunized appropriately.

Ten Great Public Health Achievements - United States, 2001-2010

(Adapted from *MMWR* 2011 60 [19]; 619-23)

During the 20th century, life expectancy at birth among U.S. residents increased by 62%, from 47.3 years in 1900 to 76.8 in 2000, and unprecedented improvements in population health status were observed at every stage of life. Recently, CDC scientists nominated and selected 10 public health achievements in the United States in 2001-2010.

Vaccine-Preventable Diseases

The past decade has seen substantial declines in cases, hospitalizations, deaths, and health-care costs associated with vaccine-preventable diseases. New vaccines (i.e., rotavirus, quadrivalent meningococcal conjugate, herpes zoster, pneumococcal conjugate, and human papillomavirus vaccines, as well as tetanus, diphtheria, and acellular pertussis vaccine for adults and adolescents) were introduced, bringing to 17 the number of diseases targeted by U.S. immunization policy. A recent economic analysis indicated that vaccination of each U.S. birth cohort with the current childhood immunization schedule prevents approximately 42,000 deaths and 20 million cases of disease, with net savings of nearly $14 billion in direct costs and $69 billion in total societal costs.

The impact of two vaccines has been particularly striking. Following the introduction of pneumococcal conjugate vaccine, an estimated 211,000 serious pneumococcal infections and 13,000 deaths were prevented during 2000-2008. Routine rotavirus vaccination, implemented in 2006, now prevents an estimated 40,000-60,000 rotavirus hospitalizations each year. Advances also were made in the use of older vaccines, with reported cases of hepatitis A, hepatitis B, and varicella at record lows by the end of the decade. Age-specific mortality (i.e., deaths per million population) from varicella for persons age <20 years, declined by 97% from 0.65 in the prevaccine period (1990-1994) to 0.02 during 2005-2007. Average age-adjusted mortality (deaths per million population) from hepatitis A also declined significantly, from 0.38 in the prevaccine period (1990-1995) to 0.26 during 2000-2004.

Prevention and Control of Infectious Diseases

Improvements in state and local public health infrastructure along with innovative and targeted prevention efforts yielded significant progress in controlling infectious diseases. Examples include a 30% reduction from 2001 to 2010 in reported U.S. tuberculosis cases and a 58% decline from 2001 to 2009 in central line-associated blood stream infections. Major advances in laboratory techniques and technology and investments in disease surveillance have improved the capacity to identify contaminated foods rapidly and accurately and prevent further spread. Multiple efforts to extend HIV testing, including recommendations for expanded screening of persons aged 13-64 years, increased the number of persons diagnosed with HIV/AIDS and reduced the proportion with late diagnoses, enabling earlier access to life-saving treatment and care and giving infectious persons the information necessary to protect their partners. In 2002, information from CDC predictive models and reports of suspected West Nile virus transmission through blood transfusion spurred a national investigation, leading to the rapid development and implementation of new blood donor screening. To date, such screening has interdicted 3,000 potentially infected U.S. donations, removing them from the blood supply. Finally, in 2004, after more than 60 years of effort, canine rabies was eliminated in the United States, providing a model for controlling emerging zoonoses.

Tobacco Control

Since publication of the first Surgeon General's Report on tobacco in 1964, implementation of evidence-based policies and interventions by federal, state, and local public health authorities has reduced tobacco use significantly. By 2009, 20.6% of adults and 19.5% of youths were current smokers, compared with 23.5% of adults and 34.8% of youths 10 years earlier. However, progress in reducing smoking rates among youths and adults appears to have stalled in recent years. After a substantial decline from 1997 (36.4%) to 2003 (21.9%), smoking rates among high school students remained relatively unchanged from 2003 (21.9%) to 2009 (19.5%). Similarly, adult smoking prevalence declined steadily from 1965 (42.4%) through the 1980s, but the rate of decline began to slow in the 1990s, and the prevalence remained relatively unchanged from 2004 (20.9%) to 2009 (20.6%). Despite the progress that has been made, smoking still results in an economic burden, including medical costs and lost productivity, of approximately $193 billion per year.

Although no state had a comprehensive smoke-free law (i.e., prohibit smoking in worksites, restaurants, and bars) in 2000, that number increased to 25 states and the District of Columbia (DC) by 2010, with 16 states enacting comprehensive smoke-free laws following the release of the 2006 Surgeon General's Report.

Maternal and Infant Health

The past decade has seen significant reductions in the number of infants born with neural tube defects (NTDs) and expansion of screening of newborns for metabolic and other heritable disorders. Mandatory folic acid fortification of cereal grain products labeled as enriched in the United States beginning in 1998 contributed to a 36% reduction in NTDs from 1996 to 2006 and prevented an estimated 10,000 NTD-affected pregnancies in the past decade, resulting in a savings of $4.7 billion in direct costs.

Improvements in technology and endorsement of a uniform newborn-screening panel of diseases have led to earlier life-saving treatment and intervention for at least 3,400 additional newborns each year with selected genetic and endocrine disorders. In 2003, all but four states were screening for only six of these disorders. By April 2011, all states reported screening for at least 26 disorders on an expanded and standardized uniform panel. Newborn screening for hearing loss increased from 46.5% in 1999 to 96.9% in 2008. The percentage of infants not passing their hearing screening who were then diagnosed by an audiologist before age 3 months as either normal or having

permanent hearing loss increased from 51.8% in 1999 to 68.1 in 2008.

Motor Vehicle Safety

Motor vehicle crashes are among the top 10 causes of death for U.S. residents of all ages and the leading cause of death for persons aged 5-34 years. In terms of years of potential life lost before age 65, motor vehicle crashes ranked third in 2007, behind only cancer and heart disease, and account for an estimated $99 billion in medical and lost work costs annually. Crash-related deaths and injuries largely are preventable. From 2000 to 2009, while the number of vehicle miles traveled on the nation's roads increased by 8.5%, the death rate related to motor vehicle travel declined from 14.9 per 100,000 population to 11.0, and the injury rate declined from 1,130 to 722; among children, the number of pedestrian deaths declined by 49%, from 475 to 244, and the number of bicyclist deaths declined by 58%, from 178 to 74.

Cardiovascular Disease Prevention

Heart disease and stroke have been the first and third leading causes of death in the United States since 1921 and 1938, respectively. Preliminary data from 2009 indicate that stroke is now the fourth leading cause of death in the United States. During the past decade, the age-adjusted coronary heart disease and stroke death rates declined from 195 to 126 per 100,000 population and from 61.6 to 42.2 per 100,000 population, respectively, continuing a trend that started in the 1900s for stroke and in the 1960s for coronary heart disease. Factors contributing to these reductions include declines in the prevalence of cardiovascular risk factors such as uncontrolled hypertension, elevated cholesterol, and smoking, and improvements in treatments, medications, and quality of care.

Occupational Safety

Significant progress was made in improving working conditions and reducing the risk for workplace-associated injuries. For example, patient lifting has been a substantial cause of low back injuries among the 1.8 million U.S. health-care workers in nursing care and residential facilities. In the late 1990s, an evaluation of a best practices patient-handling program that included the use of mechanical patient-lifting equipment demonstrated reductions of 66% in the rates of workers' compensation injury claims and lost workdays and documented that the investment in lifting equipment can be recovered in less than 3 years. Following widespread dissemination and adoption of these best practices by the nursing home industry, Bureau of Labor Statistics data showed a 35% decline in low back injuries in residential and nursing care employees between 2003 and 2009.

The annual cost of farm-associated injuries among youth has been estimated at $1 billion annually. A comprehensive childhood agricultural injury prevention initiative was established to address this problem. Among its interventions was the development by the National Children's Center for Rural Agricultural Health and Safety of guidelines for parents to match chores with their child's development and physical capabilities. Follow-up data have demonstrated a 56% decline in youth farm injury rates from 1998 to 2009.

Cancer Prevention

Evidence-based screening recommendations have been established to reduce mortality from colorectal cancer and female breast and cervical cancer. Several interventions inspired by these recommendations have improved cancer screening rates. Through the collaborative efforts of federal, state, and local health agencies, professional clinician societies, not-for-profit organizations, and patient advocates, standards were developed that have significantly improved cancer screening test quality and use. The National Breast and Cervical Cancer Early Detection Program has reduced disparities by providing breast and cervical cancer screening services for uninsured women. The program's success has resulted from similar collaborative relationships. From 1998 to 2007, colorectal cancer death rates decreased from 25.6 per 100,000 population to 20.0 (2.8% per year) for men and from 18.0 per 100,000 to 14.2 (2.7% per year) for women. During this same period, smaller declines were noted for breast and cervical cancer death rates (2.2% per year and 2.4%, respectively).

Childhood Lead Poisoning Prevention

In 2000, childhood lead poisoning remained a major environmental public health problem in the United States, affecting children from all geographic areas and social and economic levels. Black children and those living in poverty and in old, poorly maintained housing were disproportionately affected. In 1990, five states had comprehensive lead poisoning prevention laws; by 2010, 23 states had such laws. Enforcement of these statutes as well as federal laws that reduce hazards in the housing with the greatest risks has significantly reduced the prevalence of lead poisoning. Findings of the National Health and Nutrition Examination Surveys from 1976-1980 to 2003-2008 reveal a steep decline, from 88.2% to 0.9%, in the percentage of children aged 1-5 years with blood lead levels ≥10 µg/dL. The risks for elevated blood lead levels based on socioeconomic status and race also were reduced significantly. The economic benefit of lowering lead levels among children by preventing lead exposure is estimated at $213 billion per year.

Public Health Preparedness and Response

After the international and domestic terrorist actions of 2001 highlighted gaps in the nation's public health preparedness, tremendous improvements have been made. In the first half of the decade, efforts were focused primarily on expanding the capacity of the public health system to respond (e.g., purchasing supplies and equipment). In the second half of the decade, the focus shifted to improving the laboratory, epidemiology, surveillance, and response capabilities of the public health system. For example, from 2006 to 2010, the percentage of Laboratory Response Network labs that passed proficiency testing for bioterrorism threat agents increased from 87% to 95%. The percentage of state public health laboratories correctly subtyping *Escherichia coli* O157:H7 and submitting the results into a national reporting system increased from 46% to 69%, and the percentage of state public health agencies prepared to use Strategic National Stockpile material increased from 70% to 98%.

During the 2009 H1N1 influenza

continued on p. 30

Antimicrobial Susceptibilities of Selected Pathogens, 2010

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

Trends, Comments, and Other Pathogens	
[1] *Campylobacter* spp.	Ciprofloxacin susceptibility was determined for all isolates (n=906). Only 32% of isolates from patients returning from foreign travel were susceptible to quinolones. Most susceptiblities were determined using 2009 CLSI breakpoints for *Campylobacter*. Susceptibilities for gentamicin were based on an MIC ≤ 4µg/ml and azithromycin were based on an MIC ≤ 2µg/ml.
[2] *Salmonella enterica* (non-typhoidal)	Antimicrobial treatment for enteric salmonellosis generally is not recommended.
[3] *Neisseria gonorrhoeae*	Routine resistance testing for *Neisseria gonorrhoeae* by MDH PHL was discontinued in 2008. Susceptibility results were obtained from the CDC Regional Laboratory in Cleveland, Ohio, and are for isolates obtained through the Gonococcal Isolate Surveillance Program. Isolates (n = 71) were received from the Red Door Clinic in Minneapolis. Numbers do not include two samples missing susceptibility results. Resistance criteria for cefixime, ceftriaxone, cefpodoxime, and azithromycin have not been established; data reflect reduced susceptibility using provisional breakpoints (minimum inhibitory concentration ≥ 0.5 µg/ml, ≥ 0.5 µg/ml and ≥ 2.0 µg/ml, respectively). Also, the number of gonorrhea isolates submitted for testing decreased from 128 in 2009 to 73 in 2010.
[4] *Neisseria meningitidis*	In 2010, 1 case-isolate demonstrated intermediate susceptibility to penicillin and ampicillin. Three cases demonstrated resistance to trimethoprim/sulfamethoxazole. There were no 2010 case-isolates with ciprofloxacin resistance. In 2008, 2 isolates obtained from cases occuring in northwestern Minnesota had nalidixic acid MICs > 8 µg/ml and ciprofloxacin MICs of 0.25 µg/ml, indicative of resistance.
[5] Group A *Streptococcus*	The 142 isolates tested represent 90% of 158 total cases. Among 18 erythromycin-resistant, clindamycin-susceptible isolates, 12 (67%) had inducible resistance to clindamycin by D-test for a total of 89% that were susceptible to clindamycin and D-test negative (where applicable).
[6] Group B *Streptococcus*	100% (31/31) of early-onset infant, 100% (14/14) of late-onset infant, 43% (3/7) of maternal, and 85% (337/396) of other invasive GBS cases were tested. Among 78 erythromycin-resistant, clindamycin-susceptible isolates, 37 (47%) had inducible resistance to clindamycin by D-test. Overall, 68% (260/385) were susceptible to clindamycin and were D-test negative (where applicable). 71% (34/48) of infant and maternal cases were susceptible to clindamycin and were D-test negative (where applicable).
[7] *Streptococcus pneumoniae*	The 625 isolates tested represent 96% of 649 total cases. Reported above are the proportions of 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). By nonmeningitis breakpoints (intermediate = 2.0 µg/ml, resistant ≥ 4.0 µg/ml), 92% (573/625) of isolates were susceptible to cefotaxime and ceftriaxone. By nonmeningitis breakpoints (intermediate = 4.0 µg/ml, resistant ≥ 8.0 µg/ml), 90% (565/625) of isolates were susceptible to penicillin. Isolates were screened for high-level resistance to rifampin at a single MIC; all were ≤ 2 µg/ml. Using meningitis breakpoints, 20% (125/625) of isolates were resistant to two or more antibiotic classes and 15% (96/625) 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).
[8] *Mycobacterium tuberculosis* (TB)	National guidelines recommend initial four-drug therapy for TB disease, at least until first-line drug susceptibility results are known. Of the 12 drug-resistant TB cases reported in 2010, 10 (83%) were in foreign-born persons. There were no multidrug-resistant (MDR-TB) cases (i.e., resistant to at least isoniazid and rifampin) reported in 2010. There were no cases of extensively drug-resistant TB (XDR-TB) (i.e., resistance to at least INH, rifampin, any fluoroquinolone, and at least one second-line injectable drug) reported in 2010.
Invasive methicillin-resistant *Staphylococcus aureus* (MRSA)	232 cases of invasive MRSA infection were reported in 2010 in Ramsey and Hennepin Counties, of which 158 (68%) were from blood. 79% (183/232) had an isolate submitted and antimicrobial susceptibility testing conducted. Of cases with an isolate, 89% (163/183) were epidemiologically classified as healthcare-associated. Susceptibilities were as follows: 100% to linezolid, minocycline, and vancomycin; 99% to gentamicin, daptomycin, doxycycline, trimethoprim/sulfamethoxazole; 98% to tetracycline; 95% to rifampin; 94% to mupirocin (MIC ≤ 4 ug/mL); 13% to levofloxacin; 8% to erythromycin. 33% were susceptible to clindamycin by broth microdilution; however, an additional 17 isolates (10%) exhibited inducible clindamycin resistance (23% susceptible and negative for inducible clindamycin resistance). For community-associated (CA) cases (76% of 25 cases had isolates submitted), susceptibilities were as follows: 100% to daptomycin, doxycycline, gentamicin, linezolid, minocycline, rifampin, tetracycline, trimethoprim/sulfamethoxazole, vancomycin; 95% to mupirocin (MIC ≤ 4 ug/mL); 40% to levofloxacin; 20% to erythromycin. 63% were susceptible to clindamycin by broth microdilution; however, 1 additional isolate (5%) exhibited inducible clindamycin resistance (58% susceptible and negative for inducible clindamycin resistance). In addition to invasive MRSA surveillance, MDH received 2 reports of isolates (1 MRSA and 1 MSSA) with intermediate resistance to vancomycin (MIC 4-8 µg/ml).
Carbapenem-resistant *Enterobacteriaceae* (CRE)	Of *Enterobacteriaceae* submitted to the MDH Public Health Laboratory because of an elevated MIC to at least one carbapenem, 18 tested positive for bla_{KPC} by PCR.
Escherichia coli O157:H7	Antimicrobial treatment for *E. coli* O157:H7 infection is not recommended.

Antimicrobial Susceptibilities of Selected Pathogens, 2010

MINNESOTA MDH DEPARTMENT OF HEALTH

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

		Campylobacter spp.[1‡]	*Salmonella* Typhimurium[2†]	Other *Salmonella* serotypes (non-typhoidal)[2‡]	*Shigella* spp.[‡]	*Neisseria gonorrhoeae*[3]	*Neisseria meningitidis*[4†§]	Group A *Streptococcus*[5†§]	Group B *Streptococcus*[6†§]	*Streptococcus pneumoniae*[7†§]	*Mycobacterium tuberculosis*[8†]
Number of Isolates Tested		90	100	55	6	71	9	142	385	625	109
		% Susceptible									
ß-lactam antibiotics	amoxicillin									90	
	ampicillin		77	93	67		89	100	100		
	penicillin					77	89	100	100	77	
	cefixime					100					
	cefuroxime sodium									86	
	cefotaxime							100	100	88	
	ceftriaxone		95	96	100	100	100			88	
	meropenem						100			87	
Other antibiotics	ciprofloxacin	76	100	100	83	76	100				
	levofloxacin						100	100	99	99	
	azithromycin	99				97	100				
	erythromycin	97						85	57	73	
	clindamycin							97/89[5]	77/68[6]	88	
	chloramphenicol		74	95	83					99	
	gentamicin	98									
	spectinomycin					100					
	tetracycline	47				23		87		87	
	trimethoprim/sulfamethoxazole		95	100	83		67			78	
	vancomycin							100	100	100	
TB antibiotics	ethambutol										100
	isoniazid										95
	pyrazinamide										94
	rifampin						100				99

The MDH Antibiogram is available on the MDH Web site at:
www.health.state.mn.us/divs/idepc/dtopics/antibioticresistance/antibiogram.html.

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

continued...

17th Annual Emerging Infections in Clinical Practice and Public Health: Progress in Prevention
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Conference Program Includes:

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- Pneumococcal Prevention - New and Future Vaccines
  Matthew Moore, M.D., M.P.H., U.S. Centers for Disease Control and Prevention
- Declination of Vaccine: Consequences and Counseling
  Mark Schleiss, M.D.
- Resurgence in Measles
  Ruth Lynfield, M.D.
- Enteric Disease: What the Clinician Needs to Know
  Kirk Smith, D.V.M., M.S., M.P.H.
- Bringing Home More than Pictures: Cases from the Travel Desk
  Abinash Virk, M.D.
- Infections in Refugees
  Pat Walker, M.D.
- Hot Topics from MDH
  Richard Danila, Ph.D., M.P.H.
- Fever and ... : Case Presentation and Panel Discussion
  Aaron DeVries, M.D., M.P.H.
  Moderator: Phil Peterson, M.D.
  Panel of Infectious Disease Specialists

(Registration Form on p. 31)

continued from p. 28

pandemic, these improvements in the ability to develop and implement a coordinated public health response in an emergency facilitated the rapid detection and characterization of the outbreak, deployment of laboratory tests, distribution of personal protective equipment from the Strategic National Stockpile, development of a candidate vaccine virus, and widespread administration of the resulting vaccine. These public health interventions prevented an estimated 5-10 million cases, 30,000 hospitalizations, and 1,500 deaths.

Conclusion

From 1999 to 2009, the age-adjusted death rate in the United States declined from 881.9 per 100,000 population to 741.0, a record low and a continuation of a steady downward trend that began during the last century. Advances in public health contributed significantly to this decline; seven of the 10 achievements described in this report targeted one or more of the 15 leading causes of death. Related Healthy People 2010 data are available at http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6019a5_addinfo.htm. The examples in this report also illustrate the effective application of core public health tools. Some, such as the establishment of surveillance systems, dissemination of guidelines, implementation of research findings, or development of effective public health programs, are classic tools by which public health has addressed the burden of disease for decades. Although not new, the judicious use of the legal system, by encouraging healthy behavior through taxation or by shaping it altogether through regulatory action, has become an increasingly important tool in modern public health practice and played a major role in many of the achievements described in this report. The creative use of the whole spectrum of available options, as demonstrated here, has enabled public health practitioners to respond effectively. Public health practice will continue to evolve to meet the new and complex challenges that lie ahead.

(References in original article)

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