MINNESOTA DEPARTMENT OF HEALTH

DISEASE CONTROL NEWSLETTER

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Annual Summary of Communicable Diseases Reported to the Minnesota Department of Health, 2008

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 control professional 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.

Table 2 summarizes cases of selected communicable diseases reported during 2008 by district of the patient's residence. Pertinent observations for some of these diseases are discussed 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 may be 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). The same tick also transmits the agents of Lyme disease and babesiosis. *A. phagocytophilum* can also be transmitted by blood transfusion.

In 2008, 278 anaplasmosis cases (5.3 cases per 100,000 population) were reported (Figure 1). This represents a

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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 f
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, e
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*
Clostridium difficile

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 For criteria for reporting laboratory confirmed cases of influenza, see www.health.state.mn.us/divs/idepc/dtopics/reportable/index.html.

f 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, 2008

District*
(population per U.S. Census 2008 estimates)

Disease	Metropolitan (2,794,796)	Northwestern (153,381)	Northeastern (320,637)	Central (709,386)	West Central (228,559)	South Central (286,848)	Southeastern (484,905)	Southwestern (219,109)	Unknown Residence	Total (5,197,621)
Anaplasmosis	75	55	39	87	10	4	7	1	0	278
Arboviral disease										
LaCrosse	0	0	0	0	0	0	1	0	0	1
West Nile	1	1	0	3	3	0	1	1	0	10
Babesiosis	12	3	5	8	0	0	0	1	0	29
Campylobacteriosis	421	18	22	133	28	51	119	94	0	886
Cryptosporidiosis	31	10	21	36	17	46	45	29	0	235
Escherichia coli O157 infection	36	4	4	19	8	8	17	24	0	120
Hemolytic Uremic Syndrome	2	0	2	0	0	1	1	5	0	11
Giardiasis	446	19	36	86	25	28	64	43	18	765
Haemophilus influenzae invasive disease	31	1	9	7	6	3	10	5	0	72
HIV infection other than AIDS	219	0	0	12	0	3	8	2	0	244
AIDS (cases diagnosed in 2008)	150	1	3	10	0	1	7	1	2	175
Legionellosis	18	0	3	2	0	1	1	0	0	25
Listeriosis	6	0	0	0	0	0	1	0	0	7
Lyme disease	440	58	159	266	38	7	74	8	0	1,050
Meningococcal disease	16	1	1	2	3	2	5	0	0	30
Mumps	3	0	4	2	0	0	0	0	0	9
Pertussis	714	32	16	78	122	8	45	19	0	1,034
Salmonellosis	423	12	25	128	38	33	60	36	0	755
Sexually transmitted diseases	12,050	298	838	1,343	295	536	1,222	411	656	17,649
Chlamydia trachomatis - genital infections	9,545	272	715	1,151	278	480	1,010	359	540	14,350
Gonorrhea	2,287	25	122	181	17	50	196	50	108	3,036
Syphilis, total	218	1	1	11	0	6	16	2	8	263
Primary/secondary	102	0	1	5	0	2	4	1	1	116
Early latent*	42	0	0	2	0	1	1	0	1	47
Late latent**	74	1	0	4	0	3	11	1	6	100
Congenital	0	0	0	0	0	0	0	0	0	0
Other***	0	0	0	0	0	0	0	0	0	0
Shigellosis	219	14	5	21	3	5	10	34	0	311
Streptococcus pneumoniae invasive disease	330	29	72	109	31	38	67	36	0	712
Streptococcal invasive disease - Group A	104	6	10	19	4	16	21	5	0	185
Streptococcal invasive disease - Group B	240	14	34	38	15	22	29	26	0	418
Toxic Shock Syndrome	3	0	0	0	0	1	0	0	0	4
Tuberculosis	164	1	8	7	0	2	11	18	0	211
Viral hepatitis, type A	13	0	0	6	0	4	20	6	0	49
Viral hepatitis, type B (acute infections only, not perinatal)	14	0	1	3	0	4	0	2	1	25
Viral hepatitis, type C (acute infections only)	6	2	5	3	2	1	1	1	1	22
Yersiniosis	7	1	0	3	0	1	5	0	0	17

*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

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14% decrease from the record number of 322 anaplasmosis cases (6.2 per 100,000 population) reported in 2007 but a 54% increase from the median number of 181 cases (range, 139 to 322 cases) reported from 2004 through 2007. It is also markedly higher than the median number of cases reported annually from 1996 to 2003 (median, 56 cases; range, 14 to 149). One hundred eighty-one (65%) case-patients reported in 2008 were male. The median age of case-patients was 58 years (range, 3 to 91 years), 18 years older than the median age of Lyme disease cases. Onsets of illness were elevated from June through August and peaked in July (26% of cases). In 2008, 40% of anaplasmosis case-patients were hospitalized for their infection, for a median duration of 4 days (range, 1 to 51 days).

Anaplasmosis co-infections with Lyme disease and/or babesiosis can occur from the same tick bite. During 2008, nine (3%) anaplasmosis case-patients were also confirmed cases of Lyme disease, and four (1%) were confirmed cases of babesiosis. Because of under-detection, these numbers may underestimate the true frequency of co-infections.

The risk for anaplasmosis is highest in many of the same Minnesota counties where the risk of Lyme disease is greatest. In 2008, 93 (61%) of 153 case-patients with a single known county of exposure in Minnesota were exposed in Aitkin, Beltrami, Cass, Crow Wing, or Hubbard Counties. Nearly two-thirds of anaplasmosis case-patients in 2008 (142 [63%] of 226 cases with a known activity) were most likely exposed to *I. scapularis* ticks at their home property.

Arboviral Diseases

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, 451 human cases (including 14 fatalities) were reported from 2002 to 2008. In 2008, WNV cases were reported from 45 states; nationwide, 1,356 human cases of WNV disease were reported, including 44 fatalities. The largest WNV case counts during 2008 occurred in California (445 cases) and Arizona (114 cases).

In Minnesota, 10 cases of WNV disease were reported in 2008 (the lowest annual case total to date). Eight case-patients had West Nile (WN) fever, and two had neuroinvasive disease (meningitis or encephalitis). The median age of all WN case-patients was 47 years (range, 2 to 86 years). Seven cases occurred among residents of western and central Minnesota. Similar to previous years, onset of symptoms occurred in mid to late summer (July 18 to September 1).

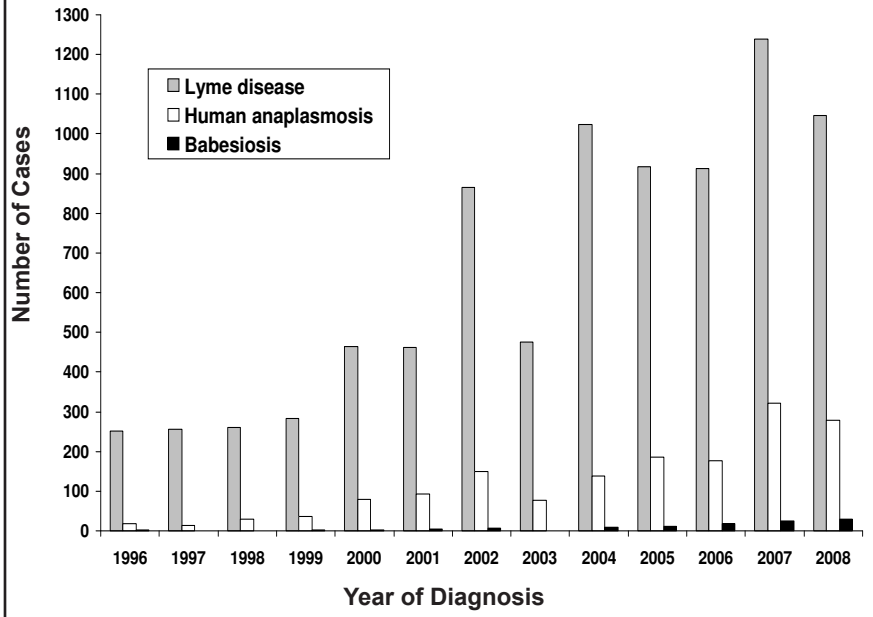
The field ecology of WNV is complex. The virus is maintained in a mosquito-to-bird transmission cycle. Several mosquito and bird species are involved in this cycle, and regional variation in vector and reservoir species is likely. In 2008, cool spring and early summer weather likely lead to delayed amplification of WNV between birds and mosquitoes, likely contributing to the decreased incidence of human cases. Interpreting the effect of weather on WNV transmission is extremely complex, leading to great difficulty in predicting how many people will become infected in a given year. WNV appears to be established throughout Minnesota; it will probably be present in the state to some extent every year. The disease risk to humans, however, will likely continue to be higher in central and western Minnesota where the primary mosquito vector, *Culex tarsalis*, is most abundant.

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 MDH PHL or CDC.

During 2008, only 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 (eg, waste tires, buckets, or cans) that provide mosquito breeding habitats are abundant. From 1985 through 2008, 124 cases were reported from 21 southeastern Minnesota counties, with a median of 5 cases (range, 1 to 13 cases) reported annually. The median case-patient age was 6 years. Disease onsets have been reported from June through September, but most onsets have occurred from mid-July through mid-September.

Aedes japonicus, an exotic Asian mosquito that has been moving across the United States since it was first

Figure 1. Reported Cases of Anaplasmosis, Babesiosis, and Lyme Disease, Minnesota, 1996-2008



Includes 8,463 Lyme disease cases, 1,596 anaplasmosis cases, and 111 babesiosis cases

found in New Jersey in 1998, has now been found in five southeastern Minnesota counties. This potential vector of LaCrosse encephalitis and WNV to humans uses the same water-holding container breeding habitats as *Ae. triseriatus*. The Metropolitan Mosquito Control District has confirmed that *Ae. japonicus* eggs successfully survived the winter of 2008-2009 in Minnesota. We anticipate that this mosquito could eventually become established across most of the state.

Babesiosis

Babesiosis is a malaria-like illness caused by the protozoan *Babesia microti* or other *Babesia* species. This parasite 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 and human anaplasmosis. *Babesia* parasites can also be transmitted by blood transfusion.

In 2008, a record number of 29 babesiosis cases (0.6 per 100,000 population) were reported. This is a 21% increase from the previous record of 24 cases (0.5 per 100,000) in 2007. The frequency of babesiosis cases since 2006 is notably higher than the median number of cases reported annually from 1996 to 2005 (median, 2 cases; range, 0 to 10). Fifteen (52%) babesiosis case-patients reported in 2008 were male. The median age of case-patients was 55 years (range, 11 to 92 years). Onsets of illness were elevated from June through September and peaked in July (25% of cases). In 2008, 68% of case-patients were hospitalized for their infection for a median duration of 9 days (range, 1 to 24 days). One case-patient died from complications of babesiosis in 2008. Three babesiosis case-patients during 2008 likely acquired their infections from blood transfusions.

Babesiosis co-infections with Lyme disease or anaplasmosis can occur from the same tick bite, although the majority of babesiosis infections are asymptomatic. During 2008, two (7%) babesiosis case-patients were also confirmed cases of Lyme disease, and four (14%) were confirmed or probable cases of anaplasmosis.

The risk for babesiosis is highest in many of the same Minnesota counties where the risk of Lyme disease and HA is greatest, especially in east-central and north-central Minnesota and western Wisconsin.

Campylobacteriosis

Campylobacter continues to be the most commonly reported bacterial enteric pathogen in Minnesota (Figure 2). There were 886 cases of culture-confirmed *Campylobacter* infections reported in 2008 (17.0 per 100,000 population). This is similar to the 907 cases reported in 2007, and to the median annual number of cases reported from 2001 to 2007 (median, 907 cases; range, 843 to 953). In 2008, 48% of cases occurred in people who resided in the metropolitan area. Of the 861 *Campylobacter* isolates confirmed and identified to species by MDH, 89% were *C. jejuni* and 9% were *C. coli*.

The median age of case-patients was 34 years (range, 1 month to 94 years). Forty-six percent of cases were between 20 and 49 years of age, and 14% were 5 years of age or younger. Fifty-five percent of cases were male. Thirteen percent of case-patients were hospitalized; the median length of hospitalization was 2 days. Forty-four percent of infections occurred during June through September. Of the 792 (89%) case-patients for whom data were available, 164 (21%) reported travel outside of the United States during the week prior to illness onset. The most common travel destinations were Mexico (n=41), Europe (n=32), Central or South America or the Caribbean (n=27), and Asia (n=16). There were two outbreaks of campylobacteriosis identified in Minnesota in 2008; both were associated with raw milk consumption.

A primary feature of public health importance among *Campylobacter* cases was the continued presence of *Campylobacter* isolates resistant to fluoroquinolone antibiotics (eg, ciprofloxacin), which are commonly used to treat campylobacteriosis. In 2008, the overall proportion of quinolone resistance among *Campylobacter* isolates tested was 24%. However, 70% 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. Twelve percent of *Campylobacter* isolates from patients who acquired the infection domestically were resistant to fluoroquinolones.

Cryptosporidiosis

During 2008, 235 confirmed cases of cryptosporidiosis (4.5 per 100,000 population) were reported. This is 27% higher than the median number of cases reported annually from 1998 to 2007 (median, 185 cases; range, 91 to 302). The median age of case-patients in 2008 was 24 years (range, 4 months to 97 years). Children 10 years of age or younger accounted for 32% of cases. Fifty-three percent of cases occurred during July through October. The incidence of cryptosporidiosis in the South Central, Southwestern, and Southeastern districts (16.0, 13.2, and 9.3 cases per 100,000, respectively) was significantly higher than the state-

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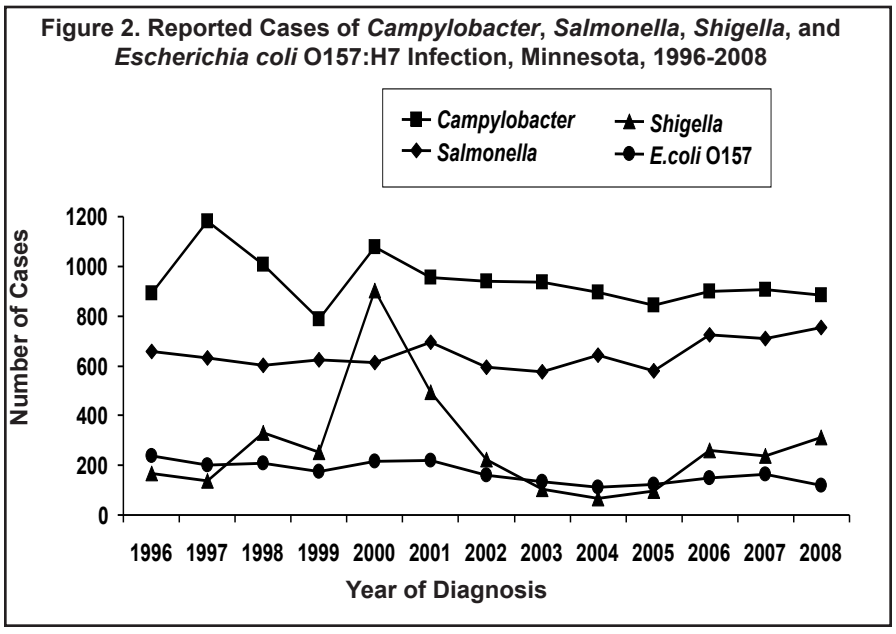
Figure 2. Reported Cases of *Campylobacter*, *Salmonella*, *Shigella*, and *Escherichia coli* O157:H7 Infection, Minnesota, 1996-2008



wide incidence. Only 31 (13%) reported cases occurred among residents of the metropolitan area (1.1 per 100,000). Forty-three (19%) case-patients required hospitalization, for a median of 2 days (range, 1 to 9 days). Two cases were known to be HIV-infected.

Three outbreaks of cryptosporidiosis were identified in 2008, accounting for 10 laboratory-confirmed cases. Three recreational waterborne outbreaks occurred, including 8 cases (1 laboratory-confirmed) associated with a membership club swimming pool, 12 cases (2 laboratory-confirmed) associated with a hotel water park, and 19 cases (7 laboratory-confirmed) associated with a membership club swimming pool.

***Escherichia coli* O157 Infection and Hemolytic Uremic Syndrome (HUS)**
During 2008, 120 culture-confirmed cases of *Escherichia coli* O157 infection (2.3 per 100,000 population) were reported. The number of reported cases represents a 26% decrease from the median number of cases reported annually from 1997 to 2007 (median, 163 cases; range, 110 to 219) and the number of cases reported in 2007 (n=163). During 2008, 36 (30%) cases occurred in the metropolitan area. One hundred five (88%) cases occurred during May through October. The median age of case-patients was 11 years (range, 2 months to 91 years). Twenty-five percent of case-patients were 4 years of age or younger. Thirty-three (28%) case-patients were hospitalized; the median duration of hospitalization was 5 days (range, 1 to 20 days). None died.

In addition to the 120 culture-confirmed *E. coli* O157 cases, 69 cases of Shiga-toxin producing *E. coli* (STEC) infection were identified in 2008. Of those, culture-confirmation was not possible in 8, and therefore it is unknown if those were O157 or another serogroup. Among the remaining 61 cases of STEC other than O157, *E. coli* O103 accounted for 17 cases, *E. coli* O111 for 16, and *E. coli* O26 for 14. These three serogroups represented 77% of all non-O157 STEC.

Six *E. coli* O157:H7 outbreaks and one *E. coli* O111:NM outbreak were identified during 2008. Five of the outbreaks involved person-to-person transmission, one involved animal contact, and the mode of transmission was undetermined in one outbreak. All seven outbreaks occurred from May through October.

In May - June, an outbreak of *E. coli* O157:H7 infections occurred at a childcare center in Murray County. The investigation identified 21 children in four different age groups (infant, toddler, pre-school, and school age) with diarrheal symptoms over the course of the outbreak. Seventeen persons tested positive for *E. coli* O157:H7 with the same pulsed-field gel electrophoresis (PFGE) subtype, including one teacher, one family member of a child that attended the center, and four persons who reported not having a recent history of gastrointestinal symptoms. Four cases were hospitalized; one developed HUS. Transmission was person-to-person.

In June, an infection control professional from a Brown County hospital reported a hospitalized case of *E. coli* O157:H7 in a resident of a long-term care facility. Two additional residents of the same wing of the facility also were hospitalized with bloody diarrhea and onset of illness on the same day as the culture-confirmed case. One of those two persons died without being tested for *E. coli* O157:H7. Among the eight residents of one wing of the facility, five ultimately tested positive for *E. coli* O157:H7, and two were hospitalized. No cases were identified among the staff, the residents of the other wing of the facility, or in the community. The environmental health evaluation did not reveal any deficiencies in food storage, handling, or preparation. This was a point-source outbreak, but the source was not identified.

Two cases of *E. coli* O157:H7 infection with the same PFGE subtype from Fillmore and Winona Counties were identified in June. The cases had contact with cattle at a farm where one of the cases worked and the other one visited.

Three *E. coli* O157:H7 infections with the same PFGE subtype in children, including a case of HUS, were identified in Olmsted County in August. The cases occurred as a result of person-to-person transmission among acquaintance households subsequent to a pool party at the home of a child with diarrhea.

In September, six children became ill with *E. coli* O157:H7 infections of the same PFGE subtype as a result of person-to-person transmission in a childcare setting in Washington County. Among the remaining nine children that attended the childcare, three children reported gastrointestinal symptoms but tested negative for *E. coli* O157:H7. None of the children were hospitalized.

Three children that attended a small home childcare and a parent were infected with *E. coli* O157:H7 due to person-to-person transmission in Stearns County in September and October. None were hospitalized.

Also in September and October, two children who attended a home childcare in Dakota County were infected with *E. coli* O111:NM. A sibling of another child that attended the home childcare tested positive at a later date. The mode of transmission was person-to-person. None of the children were hospitalized.

Hemolytic Uremic Syndrome (HUS)
In 2008, 11 HUS cases were reported. There were no fatal cases. From 1997 to 2007, the median annual number of reported HUS cases in Minnesota was 18 (range, 10 to 25), and the overall case fatality rate was 6.0%. In 2008, the median age of HUS case-patients was 5 years (range, 2 to 45 years); 9 of the 11 cases occurred in children. All 11 case-patients were hospitalized, with a median hospital stay of 8 days (range, 3 to 20 days). All 11 HUS cases reported in 2008 were post-diarrheal. *E. coli* O157:H7 was cultured from the stool of five (46%) case-patients, and *E. coli* O11:H8 was cultured from the stool of one (9%) case-patient. In addition, two (18%) HUS case-patients were positive for *E. coli* O157:H7 by serology.

Giardiasis
During 2008, 765 cases of *Giardia* infection (14.7 per 100,000) were reported. This represents a 15% decrease from the 904 cases reported in 2007 and a 34% decrease from the median number of cases reported annually from 1998 through 2007 (median, 1,166 cases; range, 851 to 1,556). Of the total number of *Giardia* cases for 2008, 19% represented positive tests during routine screenings of recent immigrants and refugees.

The median age for all case-patients reported in 2008 was 19 years (range, 1 month to 99 years). The median age among non-immigrant cases was 26.5 years (range, 1 month to 91 years). Twenty-three percent of cases were 4 years of age or younger, and only 18% of cases were over 50 years of age. There was one outbreak of giardiasis identified in Minnesota in 2008; this was an outbreak of *Giardia* and *Cryptosporidium hominis* infections associated with a membership club swimming pool.

Haemophilus influenzae Invasive Disease

Seventy-two cases of invasive *Haemophilus influenzae* disease (1.4 per 100,000 population) were reported in 2008. Case-patients ranged in age from newborn to 100 years (median, 66 years). Twenty-nine (40%) had bacteremia without another focus of infection, 26 (36%) case-patients had pneumonia, six (8%) had meningitis, two (3%) had epiglottitis, and nine (13%) had other conditions. Eight (11%) deaths were reported among these case-patients.

Of 66 *H. influenzae* isolates for which typing was performed at MDH, 12 (18%) were type f, 5 (8%) type b, 4 (6%) type e, 2 (3%) type a, 1 (2%) type d, and 42 (64%) were untypeable.

Five cases of type b (Hib) disease occurred in 2008, compared to 1 case in 2007, 4 cases in 2006, and 1 case in 2005. The Hib cases were identified in children (ages ranged from 5 months to 3 years); one child died. The five case-patients were found in five different counties in central Minnesota. Three case-patients presented with meningitis (one also had a subdural abscess), one with pneumonia, and one with epiglottitis. Three of the case-patients had not received Hib vaccination.

The eight deaths occurred in patients ranging in age from 7 months to 100 years. Four case-patients presented with pneumonia, three with bacteremia without another focus of infection, and one with meningitis. All eight case-patients had *H. influenzae* isolated from blood. Five had significant underlying medical conditions. Of the eight case-patients who died, 4 case-isolates were untypeable, 1 serotype b, 1 serotype f, 1 serotype e, and 1 case-isolate was not available from the hospital lab for typing.

HIV Infection and AIDS

Surveillance for AIDS 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 2006, state-specific AIDS rates ranged from 0.7 per 100,000 population in Montana to 29 per 100,000 in Maryland. Minnesota had the 11th lowest AIDS rate (4.1 cases per 100,000). Similar comparisons for HIV (non-AIDS) incidence rates are not possible because some states only began HIV (non-AIDS) reporting recently.

As of December 31, 2008, a cumulative total of 8,819 cases of HIV infection, 5,348 AIDS cases and 3,471 HIV (non-AIDS) cases had been reported among Minnesota residents. Of the HIV/AIDS case-patients, 2,976 (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 case-patients declined sharply, primarily due to new antiretroviral therapies, which delay the progression from HIV infection to AIDS and improve survival. In 2008, 175 new AIDS cases (Figure 3) and 54 deaths among AIDS patients were reported.

The annual number of newly diagnosed HIV (non-AIDS) cases reported in Minnesota has increased from 198 in 2004 to 244 in 2008 (a 23% increase). This trend, coupled with improved survival, has led to an increasing number of persons in Minnesota living with HIV or AIDS. Approximately 6,200 persons with HIV/AIDS were residing in Minnesota at the end of 2008.

Historically, and in 2008, nearly 90% (287/326) 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. Although whites still comprise the largest proportion of new HIV infections among males, the number of new infections in this population has decreased since 1991. In contrast to declining numbers of new HIV infections among white males, the decline among U.S.-born black males has been more gradual, falling from a peak

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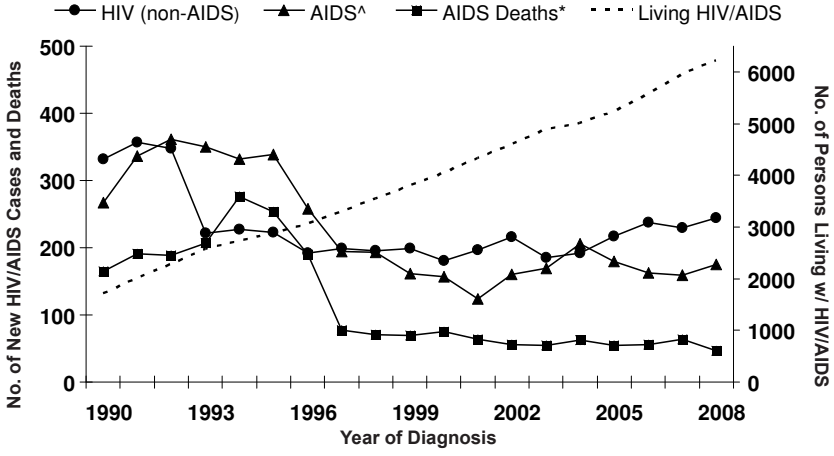
Figure 3. HIV/AIDS in Minnesota: Number of New Cases, Prevalent Cases, and Deaths by Year, 1990-2008



* Deaths among AIDS cases, regardless of cause.

^ Includes refugees in the HIV + Resettlement Program with AIDS subsequent to their arrival in the United States

of 79 new infections in 1992 to 41 new infections in 2008. The number of HIV infections diagnosed among Hispanic males decreased slightly in 2007 from the previous year (32 versus 38) and that trend continued in 2008, with 25 new infections reported among Hispanic males. The number of new infections among African-born males decreased in 2008 to 13 from 23 in 2007.

Females account for an increasing percentage of new HIV infections, from 11% of new infections in 1990 to 27% in 2008. Trends in HIV infections diagnosed annually among females also differ by race/ethnicity. Early in the epidemic, whites accounted for the majority of newly diagnosed infections in women. Since 1991, the number of new infections among women of color has exceeded that of white women. The annual number of new HIV infections diagnosed among U.S.-born black females had remained stable at 22 or fewer cases during 2001 to 2004, but increased to 28 new cases in both 2005 and 2006. In 2008 the number increased again, with 27 infections reported compared to 17 in 2007. In contrast, the number of new infections among African-born females increased greatly from 4 cases in 1996 to 41 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. In 2007, the number of new cases among African-born females increased again to 26 and decreased slightly in 2008 to 24. 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 2008, non-white men comprised approximately 12% of the male population in Minnesota and 37% of new HIV infections among men. Similarly, persons of color comprised approximately 11% of the female population and 69% 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.

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 2008, this group accounted for 52% of new infections (171/326). 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, 40% of the recent syphilis cases in Minnesota among MSM were co-infected with HIV, some for many years. “Burn out” from adopting safer sexual practices and exaggerated confidence in the efficacy of HIV treatments may be contributors to resurging risky sexual behavior among MSM. CDC recommends annual screening for sexually transmitted diseases (including HIV and syphilis) for sexually active MSM and more frequent screening for MSM who report sex with anonymous partners or in conjunction with drug use.

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 4% (13/326) in 2008. 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. Eighty-nine percent of 179 new HIV diagnoses among women between 2006 and 2008 can be attributed to heterosexual exposure after redistributing 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 2008, there were 37 new HIV infections reported among Africans. While African-born persons comprise less than 1% of the state’s population, they accounted for 11% of all HIV infections diagnosed in Minnesota in 2008. Until recently, culturally specific HIV prevention messages have not been directed to African communities in Minnesota. Taboos and other cultural barriers make it challenging to deliver such messages and to connect HIV-infected individuals with prevention and treatment services. However, in 2005, several African agencies were awarded HIV prevention funds to initiate and in some cases continue prevention programs in these communities. Additionally, collaborations between MDH, the Minnesota Department of Human Services, and community-based organizations serving African-born persons in Minnesota are continuing to address these complex issues.

One of the few success stories in the history of HIV infection is the use of medication to successfully reduce HIV perinatal transmission. Since the release of the U.S. Public Health Service guidelines in 1994, 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 seven-fold between 1990 and 2008, the rate of perinatal transmission decreased six-fold, from 18% in 1990 to 1995 to 3% in 1996–2006. The overall rate of transmission for 2006 to 2008 was 1.2%; however, it was twice that among foreign-born mothers indicating the need for additional education and prevention.

Another 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. In 2001, the number of HIV infections among young males decreased to 18 cases from 31 cases in 2000. However, there has been a steady increase in new cases among males in this age group since 2001, with 42 cases reported in 2008. The number of new HIV infections among females decreased to 13 cases in 2007 from 21 cases in 2006. However, the number of cases among female young adults and adolescents increased again in 2008 to 17 cases. From 2006 to 2008, the majority (49%) of new infections among male adolescents and young adults were white (57/117), while among females, the majority (41%) of

new cases was among African Americans (21/51). In the same time period, 91% (107/117) of new cases among males were attributed to male-to-male sex. Among females, 94% (48/51) of new cases were attributed to heterosexual sex.

Influenza

The following summary includes seasonal influenza activity from the 2008-2009 season. It does not include pandemic or novel H1N1 influenza activity that began in late April 2009.

On December 8, 2008, the PHL isolated influenza virus from a Minnesota resident for the first time during the 2008-2009 influenza season. This represented an average start of influenza activity. Since 1990-1991, the first isolate typically has been between mid-November and mid-December. Influenza activity peaked in mid-February. Nationally, a similar activity pattern was seen.

Influenza surveillance in Minnesota relies on reporting of selective individual cases from clinics, hospitals, and laboratories, as well as outbreak reporting from schools and long-term care facilities. The current system for reporting outbreaks has been in place since the 1995-1996 influenza season, and a Sentinel Provider Influenza Network was initiated in 1998-1999 to conduct active surveillance. Twenty-six sentinel sites participated during the 2008-2009 season. While the program has surpassed its goal of 20 sentinel sites (ie, one site per 250,000 population), we plan to expand the network to ensure sites represent all areas of the state. Clinics are particularly needed in the southern and northeastern regions of the state, where coverage is sparse.

MDH requests reports of all suspected or confirmed cases of influenza-related encephalopathy or encephalitis in children <18 years of age, suspected or confirmed influenza-related deaths in children <18 years of age, suspected or confirmed cases of influenza and staphylococcal co-infection, suspected or confirmed influenza in hospitalized pregnant women, and suspected cases of novel influenza.

Surveillance for pediatric (<18 years of age) influenza-related hospitalizations was established during the 2003-2004 influenza season. During the 2006-2007 season, surveillance was expanded to include adult hospitalizations. During the 2008-2009 influenza season (October 2008 - April 2009), 160 persons residing in the metropolitan area were hospitalized with influenza infection, compared to 538 persons during the 2007-2008 influenza season. Among these 160 case-patients, 89 (56%) were children and 71 (44%) were adults. Incidence was highest among adults >69 years of age and among children <1 year of age. Fifty-five percent of case-patients were diagnosed with influenza by rapid antigen testing only, 22% by viral culture only, and 20% by rapid antigen and viral culture. Sixty-five percent of case-patients had type A influenza, 32% had type B influenza, and 3% had an unknown influenza type.

Thirty (19%) of 160 case-patients were diagnosed with pneumonia. Twenty-one (13%) case-patients required admission into an intensive care unit. Of these, nine (43%) were placed on mechanical ventilation. One (<1%) case-patient died. This case-patient was an older adult with multiple chronic medical conditions. Fifty-seven (80%) adult and 49 (55%) pediatric case-patients had at least one chronic medical condition that would have put them at increased risk for influenza infection. Four (3%) case-patients had an invasive bacterial co-infection (*Acinetobacter iwoffii, Escherichia coli, Propionibacterium acnes, Streptococcus pneumoniae*). Among those with a known influenza vaccine status, 34 (53%) adult case-patients and 37 (48%) pediatric case-patients received influenza vaccine (at least 2 weeks prior to their hospitalization) during the 2008-2009 season.

There were no influenza-related deaths identified during the regular 2008-2009 influenza season. Three pediatric influenza deaths were reported during the 2007-2008 season, and 6 pediatric influenza deaths were reported during the 2006-2007 season. Prior to 2006-2007, the last reported pediatric influenza death in Minnesota occurred during the 2004-2005 season.

A probable outbreak of influenza-like illness (ILI) in a school is defined as a doubled absenteeism rate with all of the following primary influenza symptoms reported among students: rapid onset, fever, illness lasting 3 or more days, and at least one secondary influenza symptom (eg, myalgia, headache, cough, coryza, sore throat, or chills). A possible ILI outbreak in a school is defined as a doubled absenteeism rate with reported symptoms among students, including two of the primary influenza symptoms and at least one secondary influenza symptom. During the 2008-2009 season, MDH received reports of probable ILI outbreaks from 70 schools in 22 counties throughout Minnesota and possible outbreaks in 65 schools in 21 counties. A total of 135 schools in 32 counties reported suspected outbreaks in 2008-2009. The 2008-2009 surveillance period for seasonal influenza in schools ended May 8, 2009 when enhanced surveillance for novel H1N1 influenza was initiated. Since 1988-1989, the number of schools reporting suspected 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.

An influenza outbreak is suspected in a long-term care facility when three or more residents in a single unit present with a cough and fever (>101º F), or chills during a 48- to 72-hour period. An influenza outbreak is confirmed when at least one resident has a positive culture or rapid antigen test for influenza. Three facilities in one county reported confirmed influenza outbreaks in 2008-2009. This represents the lowest number of long-term care facility outbreaks reported in a single season since surveillance began in the 1988-1989 season. In all facilities, influenza was laboratory-confirmed by rapid tests or culture. Previously, the number of long-term care facilities reporting ILI outbreaks has ranged from a low of six in 1990-1991 to a high of 140 in 2004-2005.

As of May 27, 2009, 405 (62%) of 650 influenza isolates in the PHL were well-matched to one of the three strains included in the vaccine for the 2008-2009 influenza season, compared to approximately 72% nationally. Of those, 388 were identified as influenza A/H1, 13 were identified as influenza A/H3, and 4 were identified as influenza B/Florida-like. Two hundred thirty-six isolates (36%) were identified as influenza B/Malaysia-like, a different lineage than the vaccine reference strain. For 8 influenza A isolates and 1 influenza B

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isolate, a vaccine match could not be determined.

Legionellosis
During 2008, 25 confirmed cases of legionellosis (Legionnaires' disease [LD]) were reported including 18 cases (72%) among residents of the metropolitan area and 7 cases among Greater Minnesota residents. Two (8%) case-patients died. Older adults and elderly persons were more often affected, with 18 (72%) cases occurring among individuals 50 years of age and older (median, 62 years; range, 18 to 81 years). Thirteen (52%) cases had onset dates in June through September. Travel-associated legionellosis accounted for 7 (28%) cases, defined as spending at least 1 night away from the case's residence in the 10 days before onset of illness.

Confirmed LD case criteria includes X-ray confirmed pneumonia and positive results for one or more of the following tests: culture of *Legionella* spp., or detection of *L. pneumophila*, serogroup 1 infection by *Legionella* urinary antigen, direct fluorescent antigen, or by acute and convalescent antibody titers with a four-fold or greater rise to >1:128. A single antibody titer at any level is not of diagnostic value for LD. For detection of LD, the Infectious Diseases Society of America treatment guidelines for community-acquired pneumonia recommend urinary antigen assay and culture of respiratory secretions on selective media. Culture is particularly useful because environmental and clinical isolates can be compared by molecular typing in outbreaks and in investigations of healthcare-associated LD.

Starting in 2005, CDC recommended routine assessment of travel history among LD cases so that travel-associated LD clusters or outbreaks could be more readily and quickly detected.

Listeriosis
Seven cases of listeriosis were reported during 2008. All case-patients were hospitalized, and one died. The median age of case-patients was 68 years (range, 25 to 85 years). Four had *Listeria monocytogenes* isolated from blood, one from cerebral spinal fluid, one from an abscess and one from urine. None of the cases were part of a recognized outbreak. The 7 cases reported in 2008 is similar to the median annual number of cases reported from 1996 through 2007 (median, 8 cases; range, 4 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.

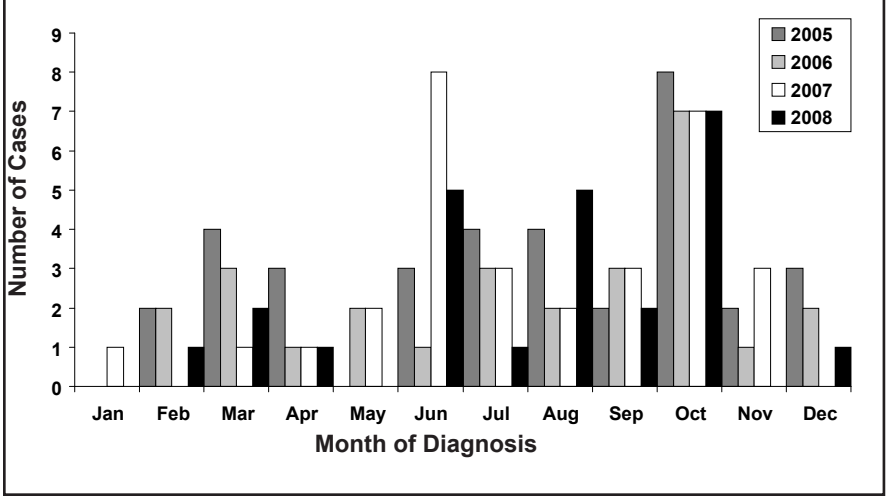
Lyme Disease
Lyme disease is caused by *Borrelia burgdorferi*, a spirochete transmitted to humans by bites from *Ixodes scapularis* (the blacklegged tick or deer tick). The same tick vector also transmits the agents of human anaplasmosis and babesiosis.

In 2008, 1,050 confirmed Lyme disease cases (20.1 cases per 100,000 population) were reported (Figure 1). This is a 15% decrease from the record number of 1,239 cases reported in 2007 but is slightly higher than the median number of 915 cases (range, 913 to 1,239 cases) reported from 2004 through 2007. The frequency of Lyme disease since 2004 has been considerably higher than the median number of cases reported annually from 1996 through 2003 (median, 374 cases; range, 252 to 867). Six hundred seventy (64%) confirmed case-patients in 2008 were male. The median age of case-patients was 40 years (range, <1 to 95 years). Physician-diagnosed erythema migrans was present in 770 (74%) cases. Two hundred eighty-seven (27%) cases had one or more late manifestations of Lyme disease (including 214 with a history of objective joint swelling, 55 with cranial neuritis, 3 with lymphocytic meningitis, 12 with radiculoneuropathy, and 7 with acute onset of 2nd or 3rd degree atrioventricular conduction defects) and confirmation by a positive Western immunoblot. Onsets of illness were elevated from June through August and peaked in July (41% of cases), corresponding to the peak activity of nymphal *I. scapularis* ticks in mid-May through mid-July.

Lyme disease co-infections with anaplasmosis and babesiosis can occur from the same tick bite. During 2008, nine (1%) Lyme disease case-patients also were confirmed or probable cases of anaplasmosis, and two (<1%) were confirmed cases of babesiosis. Because of under-detection, these numbers likely underestimate the true frequency of co-infections.

Most case-patients in 2008 either resided in or traveled to endemic counties in

Figure 4. Legionellosis Cases by Month of Diagnosis, Minnesota, 2005 - 2008



north-central, east-central, or southeast Minnesota or in western Wisconsin. Of the cases exposed to *I. scapularis* ticks in Minnesota, Crow Wing County continued to have the highest number of Lyme disease case exposures (62 [14%] of 433 cases who reported a single county of exposure). Four hundred thirty-nine (42%) cases occurred among residents of the metropolitan area, of whom only a minority (25%) were likely exposed to *I. scapularis* ticks in the metropolitan area, primarily Anoka and Washington Counties. Nearly two-thirds of Lyme disease case-patients in 2008 (460 [63%] of 726 cases with a known activity) were most likely exposed to *I. scapularis* ticks while on vacation, visiting cabins, hunting, or during outdoor recreation.

Measles
No cases of measles were reported during 2008.

Meningococcal Disease
Thirty cases of *Neisseria meningitidis* invasive disease (0.6 per 100,000 population) were reported in 2008, compared to 22 cases in 2007. There were 13 (43%) serogroup B cases, 13 (43%) serogroup C, 2 (7%) serogroup Y, and 1 (3%) serogroup Z. In addition, there was 1 culture-negative suspect case that was positive by polymerase chain reaction (PCR) in the PHL.

Case-patients ranged in age from 2 months to 92 years, with a median of 23 years. Fifty-three percent of the cases occurred in the metropolitan area. Six (20%) case-patients had bacteremia without another focus of infection and 18 (60%) had meningitis. Two cases from western Minnesota had serogroup B isolates that demonstrated fluoroquinolone resistance. These cases and a concurrent case in a North Dakota resident were the first ever documented in North America.

A cluster of serogroup B cases occurred in a southeastern Minnesota county during the first half of 2008. Three cases were residents whose isolates had nearly indistinguishable PFGE patterns. A fourth case was culture-negative, but PCR-positive, with a multilocus variable tandem-repeat analysis (MLVA) sequence very similar to the other cases. Another case of serogroup B disease, occured in an Iowa resident at the same time with a matching PFGE pattern, who had visited the same area just prior to onset of illness. No direct epidemiologic links were found for any of the cases. All other cases were sporadic, with no definite epidemiologic links.

Three deaths occurred; a 5-year-old died of bacteremia attributed to serogroup C, as well as a 33-year-old and a 53-year-old both with meningitis attributed to serogroup B.

In January 2005, a meningococcal polysaccharide-protein conjugate vaccine for serogroups A,C,Y, and W-135 (MCV4) was licensed for use in the United States for persons aged 11 to 55 years. In 2007, the license was approved to include 2 to 10 year olds. The Advisory Committee on Immunization Practices and American Academy of Pediatrics recommend immunization with the new vaccine at age 11-12 years, or at high school entry, 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 2008, 6 cases occurred among 11-22 year olds, including one college and four high school students. Three cases had serogroup B disease. The two case-patients in this age had serogroup C disease; one was in high school and was vaccinated and the other was not in school and did not receive the meningococcal vaccine. In addition, one high school student had negative bacterial cultures but had a positive PCR result for serogroup B.

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

In 1997, MDH began receiving reports of healthy young patients with MRSA infections. These patients had onset of their MRSA infections in the community and appeared to lack the established risk factors for MRSA. Although most of the reported infections were not severe, some resulted in serious illness or death. Strains of MRSA cultured from persons without HA risk factors for MRSA are known as community-associated MRSA (CA-MRSA). CA-MRSA is defined as: a positive culture for MRSA from a specimen obtained <48 hours of admission to a hospital in a patient with no history of prior MRSA infection or colonization; no presence of indwelling percutaneous devices or catheters at the time of culture; and no history of hospitalization, surgery, residence in a long-term care facility, hemodialysis, or peritoneal dialysis in the year prior to the positive MRSA culture.

MDH initiated surveillance for CA-MRSA at 12 sentinel hospital laboratories in January 2000. The laboratories (six in the metropolitan area and six in Greater Minnesota) were selected to represent various geographic regions of the state. Sentinel sites report all cases of MRSA identified at their facilities and for the first six years of surveillance submitted all CA-MRSA isolates to MDH. The purpose of this surveillance is to determine demographic and clinical characteristics of CA-MRSA infections in Minnesota, to identify possible risk factors for CA-MRSA, and to identify the antimicrobial susceptibility patterns and molecular subtypes of CA-MRSA isolates. A comparison of CA- and HA-MRSA using sentinel site surveillance data from 2000 demonstrated that CA- and HA-MRSA differ demographically and clinically, and that their respective isolates are microbiologically distinct.

In 2008, 3,605 cases of MRSA infection were reported by the 12 sentinel laboratories. Fifty-three percent of these cases were classified as CA-MRSA; 45% were classified as HA-MRSA; and 2% could not be classified. CA-MRSA infections increased from 131 cases (12% of all MRSA infections reported) in 2000 to 1,908 cases (53% of total MRSA infections reported) in 2008.

The CDC classifies MRSA isolates into pulsed-field types (PFTs) (currently USA100-1200) based on genetic relatedness. CA-MRSA isolates are most often classified as PFT USA300 or USA400. In Minnesota, the pre-

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dominant CA-MRSA PFT has changed dramatically over time. In 2000, 63% of CA-MRSA isolates were USA400 and 4% were USA300. In 2006, only 10% of CA-MRSA isolates were USA400 and 78% were USA300. Because USA400 isolates are much more likely than USA300 isolates to demonstrate inducible clindamycin resistance (ICR) on disk diffusion testing, the change in the predominant CA-MRSA PFT has also been associated with a decrease in the proportion of erythromycin-resistant, clindamycin-sensitive CA-MRSA isolates demonstrating ICR, from 93% in 2000 to 10% in 2006. A recently published article summarizes the first 6 years of surveillance (Como-Sabetti K, et al. Community-associated methicillin-resistant *Staphylococcus aureus*: Trends in case and isolate characteristics from six years of prospective surveillance. Public Health Reports. 2009;124:427-435).

In 2007, MDH started collecting isolates from CA-MRSA and HA-MRSA invasive (isolated from a normally sterile body site) infections. Antimicrobial susceptibility and PFGE testing were performed on submitted isolates. Please refer to the MDH antibiogram for details (see pp. 28-29).

In 2005, as part of the CDC 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 population and was 19.4 and 18.5 in 2006 and 2007, respectively. In 2008, surveillance was expanded to include Hennepin County. The incidence rate for MRSA infection in Ramsey and Hennepin Counties was 19.9 per 100,000 (Ramsey 25.4/100,000 and Hennepin 17.4/100,000). MRSA was most frequently isolated from blood (77%), and 11% (36/325) of cases died. Eleven percent (36/325) of cases had no reported healthcare-associated risk factors in the year prior to infection.

Critical illnesses or deaths due to community-associated *S. aureus* infection (both methicillin-susceptible and-resistant) are reportable in Minnesota, as is vancomycin-intermediate and vancomycin-resistant *S. aureus*.

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, formerly NCCLS) 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 have several underlying health conditions such as diabetes, end-stage renal disease, previous infections with MRSA, recent hospitalizations, or recent exposure to vancomycin.

In 2008, 3 cases of VISA infection were reported to MDH. Prior to this, we had confirmed only 1 VISA case, in 2000. CDC first reported VISA in 1997, and since has reported approximately 100 U.S. cases. The 4 cases had history of diabetes, non-healing MRSA-positive leg ulcers, and end-stage renal disease requiring renal dialysis. The median age was 61 years, half were male, and two died. All had a history of vancomycin use, though the length of exposure varied from a few days to several weeks.

Nationally, CDC reported that most VISA isolates were resistant to methicillin, susceptible to linezolid, and most had decreased susceptibility to daptomycin. VISA/VRSA infections are rare and reportable. If VISA/VRSA is detected, institute infection control precautions including contact precautions with use of gown/gloves for all room entries. Consult an infectious disease specialist regarding antimicrobial therapy. Infection control recommendations and laboratory detection guidelines are available at: http://www.cdc.gov/ncidod/dhqp/ar_visavrsa.html .

Mumps

During 2008, 9 cases of mumps (0.2 per 100,000) were reported. All 9 cases were laboratory confirmed, including 1 (11%) case confirmed by both positive mumps IgM serology and a demonstrated rise in mumps IgG between acute and convalescent serologic specimens, and 8 (89%) cases confirmed by mumps IgM serology only. None of the 9 total cases were epidemiologically linked to a source case, demonstrating that asymptomatic infections are occurring, and suggesting that mumps is under-diagnosed.

Case-patients ranged in age from 11 to 52 years. Six (67%) cases occurred in persons older than 21 years of age; 2 (22%) cases occurred in persons 22 through 33 years of age; 4 (44%) cases occurred in persons 34 through 49 years of age; and 1 (11%) case occurred in a person 50 years and older.

Two (22%) case-patients had a documented history of two doses of mumps-containing vaccine. The other seven (78%) case-patients had no documented history of vaccination for mumps. Of these seven case-patients, two (29%) reported a history of mumps; two (29%) reported a history of receiving two doses of mumps-containing vaccine but were not verified; one (14%) reported a history of receiving one dose of mumps-containing vaccine but was not verified; and two (29%) had unknown history of disease and vaccination, one of whom was born before 1957 and one of whom was born after 1957.

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. The CDC released new guidance in April 2008 (http://www.cdc.gov/vaccines/pubs/surv-manual/chpt09-mumps.htm) which advises that mumps infections should not be ruled out solely on the basis of negative laboratory results. Providers are advised to test for other causes of sporadic parotitis including: parainfluenza virus types 1 and 3, Epstein-Barr virus, influenza A virus, coxsackie A virus, echovirus, lymphocytic choriomeningitis virus, human immunodeficiency virus, and other noninfectious causes such as drugs, tumors, immunologic diseases, and obstruction of the salivary duct.

Neonatal Sepsis

Neonatal sepsis was added to the Minnesota Rules Governing Communicable Diseases in September 2005. Surveillance and collection of isolates in addition to neonatal sepsis caused by group B *Streptococcus* began in January 2006. Statewide surveillance includes reporting of any bacteria (other than coagulase-negative *Staphylococcus*) isolated from a sterile site in an infant <7 days of age.

In 2008, 70 cases of neonatal sepsis (0.95 cases per 1000 live births) were

reported compared to 55 case-patients (0.75 cases per 1000 live births) in 2007. Among these case-patients, all were identified via blood or cerebral spinal fluid (CSF). Most case-patients (84%) were culture-positive within the first 2 days of life. In 2008, group B Streptococcus (24) was the most common bacteria isolated followed by *Escherichia coli* (18), *Streptococcus viridians* (12), *Haemophilus influenzae* (3), *Pseudomonas aeruginosa* (2), *Klebsiella* spp. (2), *Streptococcus pneumoniae* (2), and 1 each from *Staphylococcus aureus*, *Streptococcus* spp. other, *Brachybacterium muris*, *Clostridium septicum, Stenotrophomonas*, *Enterococcus*, and *Aerococcus viridans*. Two case-patients (3%) had more than one invasive bacteria isolated from a sterile site.

Pertussis

During 2008, 1,034 cases of pertussis (19.9 per 100,000 population) were reported, compared to 393 in 2007 and a peak of 1,571 cases reported in 2005. Laboratory confirmation was available for 644 (62%) cases, 100 (16%) of which were confirmed by culture and 544 (85%) of which were confirmed by PCR. In addition to the laboratory-confirmed cases, 202 (20%) cases were epidemiologically linked to laboratory-confirmed cases, and 188 (18%) met the clinical case definition only. Seven hundred fourteen (69%) of the reported cases occurred in residents of the metropolitan area.

Paroxysmal coughing was the most commonly reported symptom. Nine hundred fifty-four (92%) of the case-patients experienced paroxysmal coughing. Nearly one-third (280, 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 420 (41%) of the cases. Infants and young children are at the highest risk for severe disease and complications. Pneumonia was diagnosed in 29 (3%) case-patients, two (7%) of whom were less than 18 months of age. Twenty-four (2%) case-patients were hospitalized; 14 (58%) of the hospitalized patients were younger than 6 months of age.

Due to waning of 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 2008, case-patients ranged in age from 16 days to 87 years. Two hundred thirty-five (23%) cases occurred in adolescents 13 to 17 years of age; 238 (23%) cases occurred in adults 18 years of age and older; 434 (42%) occurred in children 5-12 years of age; 85 (8%) occurred in children 6 months through 4 years of age; 40 (4%) occurred in infants less than 6 months of age, and 2 (<1%) occurred in persons of unknown age.

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 2008, 53 pertussis cases were reported in infants less than 1 year of age. A likely source of exposure was identified for 20 (38%) cases; nine (17%) were infected by adults 18 years of age and older, two (4%) were infected by an adolescent 13 to 17 years of age, and 6 (11%) were infected by a child less than 13 years of age. For the 33 cases with no identified source of infection, the source was likely from outside the household.

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 102 case-patients who were 7 months to 6 years of age, 74 (73%) were known to have received at least a primary series of three doses of DTP/DTaP vaccine prior to onset of illness; 13 (13%) received fewer than three doses and were considered preventable cases. Vaccine history was unavailable for the remaining 15 case-patients.

MDH reporting rules require that clinical isolates of *Bordetella pertussis* be submitted to the PHL. Of the 100 culture-confirmed cases, 94 (94%) of the isolates were received and sub-typed by PFGE and tested for antibiotic susceptibility to erythromycin, ampicillin, and trimethoprim-sulfamethoxazole. Nine distinct PFGE patterns were identified; five of these patterns occurred in only a single case isolate. The most common pattern identified accounted for 36 (38%) of the total isolates and they occurred throughout the year.

No cases of erythromycin-resistant *B. pertussis* have been identified in Minnesota since the first case was identified in 1999. Statewide, all 1,288 other isolates tested to date have had low minimum inhibitory concentrations, falling within the reference range for susceptibility to the antibiotics evaluated. Only 8 other erythromycin-resistant *B. pertussis* cases have been identified to date in the United States.

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. Direct fluorescent antibody (DFA) provides a rapid presumptive diagnosis of pertussis; however, because both false-positive and false-negative results can occur, DFA tests should not be relied upon solely for laboratory confirmation. Serological tests are not standardized and are not acceptable for laboratory confirmation at this time.

Salmonellosis

During 2008, 755 culture-confirmed cases of *Salmonella* infection (14.5 per 100,000 population) were reported. This represents a 22% increase from the median annual number of cases reported from 1998 to 2007 (median, 619 cases; range, 576 to 725) (Figure 2) and the highest incidence and number of cases identified in the state since active laboratory surveillance was initi-

continued...

ated in 1996. Of the 92 serotypes identified in 2008, five serotypes, *S. Enteritidis* (167 cases), *S.* Typhimurium (135 cases), *S.* Montevideo (52 cases), *S.* I 4,[5],12:i:- (46 cases), and *S.* Saintpaul (45 cases) accounted for 59% of cases. *Salmonella* was isolated from stool in 677 (90%), urine in 27 (4%), and blood in 41 (5%) case-patients. There were 7 cases of *S.* Typhi infection. Two of the *S. Typhi* case-patients traveled internationally (India and Indonesia), one was a recent refugee from Thailand, and one was an international student from Nepal. Twenty-five percent of salmonellosis case-patients were 11 years of age or younger. Twenty-eight percent of case-patients were hospitalized for their infection. Of the 666 case-patients who were interviewed, 101 (15%) traveled internationally during the week prior to their illness onset. Eight case-patients died: a 3-year-old case-patient died of hyperleukocytosis (leukemia) 5 days after *Salmonella* was isolated from a blood specimen; a 70-year-old case-patient died of a pulmonary embolism 5 days after *Salmonella* was isolated from a stool specimen; a 72-year-old case-patient died of end-stage lung cancer the same day *Salmonella* was isolated from a stool specimen; a 77-year-old case-patient died of a *Clostridium difficil*e infection 51 days after *Salmonella* was isolated from a stool specimen; a 78-year-old case-patient died after a diabetic coma 15 days after *Salmonella* was isolated from a stool specimen; an 85-year-old case-patient died of respiratory failure 20 days after *Salmonella* was isolated from a stool specimen; an 87-year-old case-patient died of congestive heart failure 9 days after *Salmonella* was isolated from a blood specimen; and a 90-year-old case-patient died of an upper gastrointestinal bleed/peptic ulcer 18 days after *Salmonella* was isolated from a urine specimen.

One hundred thirty-nine cases were part of 13 outbreaks of salmonellosis identified in 2008. Nine of the outbreaks involved foodborne transmission, including seven outbreaks with cases in multiple states. Two outbreaks involved contact with animals or food for animals; both had cases in multiple states. Two outbreaks were the result of person-to-person transmission.

Nine *S. Montevideo* cases (6 cases in 2007 and 3 in 2008) with isolates of the same PFGE subtype were part of an outbreak associated with a grocery store deli in Wadena County. The outbreak subtype was the same as that from an earlier outbreak in 2007 associated with contact with chickens. The chicken contact outbreak evidently resulted in infection of deli workers, leading to foodborne transmission to deli patrons. Two deli employees tested positive for the outbreak subtype of *S. Montevideo*, and one of the employees owned back-yard chickens. Infected foodworkers were most likely the source of contamination; after the two positive employees were restricted from their duties in food service, no additional cases were identified in the area.

As of January, 3 cases (1 in 2007 and 2 in 2008) with the same PFGE subtype of *S. Agona* were identified and found to have a connection with the same assisted living facility in Anoka County. Based on onset dates collected through case interviews, this outbreak was determined to be the result of person-to-person transmission. The initial source of infection was not identified.

In January, 1 case of *S. Agona* infection was part of a multi-state outbreak that resulted in 28 cases in 15 states. Puffed rice and puffed wheat cereals of the same brand were implicated as the vehicle. The outbreak subtype of *S.* Agona was also isolated from a production plant that manufactured the implicated brand of puffed cereals. This investigation resulted in a recall of the implicated product.

Two cases with the same PFGE pattern of *S. Hadar* were identified from January to April, and both had attended the same daycare facility. The outbreak was determined to be the result of person-to-person transmission.

In February, an outbreak of *S. Enteritidis* infections was found to be associated with a restaurant in Hennepin County. Eleven culture-confirmed and 4 probable patron-cases were identified. Two restaurant employees tested positive for the outbreak subtype of *S. Enteritidis*; both denied having a history of gastrointestinal symptoms. One of these employees had begun working at the restaurant shortly before the first reported meal date and had assisted in the preparation of items known to have been consumed by cases. Environmental samples tested negative for *Salmonella*. In this investigation, one foodworker was identified as the ultimate source of contamination.

From March through July, 13 cases with the same PFGE subtype of *S. Montevideo* were associated with contact with chickens and ducks or their environment. The cases reported purchasing the poultry from a single hatchery in Iowa. The outbreak strain was also isolated from environmental samples taken from two case households. The association of cases infected with this subtype of *S. Montevideo* and contact with poultry originating from the same hatchery was also seen in 2007.

From February to April, 7 cases of *S. Enteritidis* with the same PFGE subtype were identified. All cases had consumed the same brand of frozen, pre-browned, single-serving, stuffed chicken product in the week prior to illness onset. Five of the 7 cases cooked the product in the microwave, even though microwave instructions had been removed from the packaging. The same subtype of S. Enteritidis was isolated from a product which one of the cases had purchased at the same time as the products consumed before illness onset, as well as from three retail samples. MDH issued a press release notifying Minnesota consumers about the outbreak, and strongly advising against cooking these types of products in a microwave. In addition, USDA FSIS issued a consumer alert. This was the fifth outbreak of *Salmonella* infections in Minnesota associated with eating frozen, pre-browned, single-serving, stuffed chicken products.

An outbreak of *S. Enteritidis* infections associated with contact with snakes was identified in April. Two cases in Minnesota had the same PFGE subtype of *S. Enteritidis* as 7 cases in five other states that also reported snake contact. It was determined through interviews that feeder mice used by cases in different states originated from a common distributor in Illinois. Subsequent interviews revealed that 5 additional cases from other states with the same subtype of *S. Enteritidis* that did not have snake contact reported contact with pet mice from the same distributor. Samples collected from these mice tested positive for *S. Enteritidis*.

An outbreak of *S. Saintpaul* infections associated with jalapeño pep-

pers served at a restaurant in Ramsey County was identified in June. On June 7, 2008 the U.S. Food and Drug Administration (FDA) issued a national health advisory warning consumers to avoid consumption of Red Round and Roma tomatoes. This advisory followed a case-control study conducted in two states in response to a recent increase in *S. Saintpaul* infections of a specific PFGE subtype. Following the advisory, multiple cases of the same subtype were identified in Minnesota. Overall, there were 33 cases with the same PFGE pattern identified in the state and over 1,400 cases identified nationwide. Of the 33 total cases in Minnesota, 28 were associated with a single restaurant in Roseville. A case-control study revealed that diced jalapeño peppers were the only ingredient independently associated with illness among restaurant patrons. Following the results of this investigation, the outbreak strain was also found on a pepper and in irrigation water on a farm in Mexico. It is likely that jalapeños, not tomatoes, were responsible for the entire national outbreak.

Another outbreak associated with stuffed chicken products resulted in illnesses starting in June. This time cases were infected with the same PFGE pattern of *S*. I, 4, 12: i:-. Sixteen cases were identified, and nine reported eating the same brand of stuffed chicken product. The same PFGE subtype of *Salmonella* was isolated from three products that a case purchased at the same time as products consumed before illness onset, as well as from one retail sample. Additionally, *S. Enteritidis*, *S*. Infantis, *S. Kentucky* and *S. Typhimirium* were isolated from products. MDH issued a press release notifying Minnesota consumers about the outbreak, and strongly advising against cooking these types of products in the microwave. USDA FSIS issued a consumer alert reminding consumers of the importance of following package instructions and taking the internal temperature of the product with a thermometer.

Six cases of *S. Hadar* infection with the same PFGE pattern were identified from June to August, and were part of a multi-state outbreak that resulted in 61 cases in 28 states. Illness was associated with consumption of various turkey products, and the outbreak strain was found in product collected from a case household and retail samples. USDA FSIS conducted an inspection of production facilities and provided recommendations on how procedures could be improved to minimize contamination in the future.

A *S. Hadar* outbreak associated with a family gathering held at a private home in Wisconsin occurred in August. Two culture-confirmed cases and four probable cases were identified. A case-control study was conducted among nine attendees of the family gathering to identify the source of illness. Although no food items were statistically associated with illness, homemade ice cream made with raw, unpasteurized eggs may have been the source. This was the only food item consumed by all ill attendees.

Forty-four cases of *S. Typhimurium* infection in Minnesota residents with onset of illness from November 2008 to March 2009 were part of a multi-state outbreak associated with consumption of peanut butter and peanut butter-containing products. As of January 2009, isolates of *S. Typhimurium* of the outbreak subtypes were collected from 529 ill persons in 35 states. In Minnesota, 16 cases were hospitalized and 3 of these died. The outbreak strains of *S. Typhimurium* were found in both peanut butter and intact packages of peanut butter crackers. The implicated peanut butter and prepackaged peanut butter crackers were recalled, and the production facility is no longer in operation.

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, an episode of STD is not considered a case for surveillance purposes until a corresponding case report is submitted by a 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 corresponding 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 2008, 14,350 chlamydia cases (292 per 100,000 population) were reported, representing a 7% increase from 2007 (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 (1,715 per 100,000), with the next highest rate among 15 to 19-year-olds (1,164 per 100,000). The incidence of chlamydia among adults 25 to 29 years of age (760 per 100,000) is considerably lower but has increased in recent years. The chlamydia rate among females (413 per 100,000) is more than twice the rate among males (168 per 100,000), a difference most likely due to more frequent screening among women.

The incidence of chlamydia infection is highest in communities of color (Table 4). The rate among blacks (2,111 per 100,000) is 16 times higher than the rate among whites (135 per 100,000). Although blacks comprise approximately 4% of Minnesota's population, they account for 30% of reported chlamydia cases. Rates among Asian/Pacific Islanders (358 per 100,000), American Indians (574 per 100,000), and Hispanics (735 per 100,000) are three to six times higher than the rate among whites.

Chlamydia infections occur throughout the state, with the highest reported rates in Minneapolis (786 per 100,000) and St. Paul (692 per 100,000). However, in 2008 the greatest increases for chlamydia were seen in the suburbs and Greater Minnesota with increases of 9% and 10%, respectively.

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Table 3. Number of Cases and Incidence Rates (per 100,000 population) of Chlamydia, Gonorrhea, Syphilis and Chancroid, Minnesota, 2004-2008

	2004		2005		2006		2007		2008	
Disease	**No.**	**Rate**	**No.**	**Rate**	**No.**	**Rate**	**No.**	**Rate**	**No.**	**Rate**
Chlamydia	11,647	237	12,359	251	12,977	264	13,412	273	14,350	292
Gonorrhea	2, 974	60	3,505	71	3,317	67	3,459	70	3,036	62
Syphilis, Total	148	3.0	210	4.3	188	3.8	186	3.8	263	5.3
Primary/Secondary	27	0.5	71	1.4	47	1.0	59	1.2	116	2.4
Early Latent	22	0.4	48	1.0	58	1.2	55	1.1	47	1.0
Late Latent	97	2.0	88	1.8	81	1.6	72	1.5	100	2.0
Other*	1	0.0	1	0.0	0	0.0	0	0.0	0	0.0
Congenital**	1	1.4	2	2.8	2	2.8	0	0.0	0	0.0
Chancroid	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0

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

Table 4. Number of Cases and Incidence Rates (per 100,000 population) of Chlamydia, Gonorrhea, and Primary/Secondary Syphilis by Residence, Age, Gender, and Race/Ethnicity, Minnesota, 2008

	Chlamydia		Gonorrhea		Syphilis	
Demographic Group	**No.**	**Rate**	**No.**	**Rate**	**No.**	**Rate**
Total	14,350	292	3,036	62	116	2.4
*Residence**						
Minneapolis	3,008	786	1,067	279	51	13
St. Paul	1,988	692	487	170	15	5.2
Suburban**	4,549	231	733	37	36	1.8
Greater Minnesota	4,265	187	641	28	13	0.6
Age						
<15 years	152	14	24	2	0	0.0
15-19 years	4,358	1,164	800	214	3	0.8
20-24 years	5,530	1,715	988	306	24	7.4
25-29 years	2,432	760	528	165	15	2.8
30-34 years	958	271	289	82	21	5.9
35-44 years	687	83	276	33	25	3.0
≥45 years	233	14	131	8	28	1.7
Gender						
Male	4,085	168	1,379	57	110	4.6
Female	10,265	413	1,655	67	5	0.2
Transgender^^	--	--	2	--	--	--
Race^/Ethnicity						
White	5,846	135	852	20	89	2.1
Black	4,284	2,111	1,554	766	19	9.4
American Indian	465	574	64	79	0	0.0
Asian	603	358	50	30	1	0.6
Other ^^	612	--	133	--	5	--
Unknown^^	2,540	--	383	--	2	--
Hispanic^^^	1,054	735	108	75	3	2.1

* Residence information missing for 502 chlamydia cases,108 gonorrhea cases, and one P&S syphilis case.
** 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.

Gonorrhea

Gonorrhea, caused by *Neisseria gonorrhoeae*, is the second most commonly reported STD in Minnesota. In 2008, 3,036 cases (62 per 100,000 population) were reported, representing a 12% decrease from 2007 (Table 3).

Adolescents and young adults are at greatest risk for gonorrhea (Table 4), with incidence rates of 214 per 100,000 among 15 to 19-year-olds, 306 per 100,000 among 20 to 24-year olds, and 165 per 100,000 among 25 to 29-year-olds. Gonorrhea rates for males (57 per 100,000) and females (67 per 100,000) are comparable. Communities of color are disproportionately affected by gonorrhea, with one half of cases reported among blacks. The incidence of gonorrhea among blacks (766 per 100,000) is 38 times higher than the rate among whites (20 per 100,000). Rates among Asian/Pacific Islanders (30 per 100,000), American Indians (79 per 100,000), and Hispanics (75 per 100,000) are two 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 (279 per 100,000) is 60% higher than the rate in St. Paul (170 per 100,000), nearly eight times higher than the rate in the suburban metropolitan area (37 per 100,000), and 10 times higher than the rate in Greater Minnesota (28 per 100,000). However, the rate in Greater Minnesota is growing rapidly, increasing 14% in 2008 while the rest of the state is seeing large decreases.

Quinolone-resistant *N. gonorrhoeae*

The prevalence of quinolone-resistant *N. gonorrhoeae* (QRNG) has increased approximately four-fold from 1.5% in 2002 to 6.3% in 2008. Of special concern is the high prevalence among men who have sex with men (MSM), which increased sharply from 0% in 2002, to 8.9% in 2003, and to 27% in 2004. Since then the prevalence in this population has remained high (15% in 2008). In 2007, QRNG prevalence also reached a critical level in heterosexuals (4.5%), prompting the MDH to recommend non-quinolone therapy for that population as well. As a result, fluoroquinolones (eg, ciprofloxacin) are no longer recommended for treating gonorrhea in Minnesota.

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 was observed in 2002 among men who have sex with men (MSM). This sustained outbreak reached a new level in 2008, with 116 cases of primary/secondary syphilis (2.4 per 100,000 population) being reported compared to 59 (1.2 per 100,000) cases in 2007.

Early Syphilis

In 2008, the number of early syphilis cases increased by 43%, with 163 cases occurring compared to 114 cases in 2007. The incidence remains highly concentrated among MSM. Of the early syphilis cases in 2008, 158 (97%) occurred among men; 140 (89%) of these men reported having sex with other men; 46% of the MSM diagnosed with early syphilis were co-infected with HIV.

Congenital Syphilis

No cases of congenital syphilis were reported in Minnesota in 2008 (Table 3).

Chancroid

Chancroid continues to be very rare in Minnesota. No cases were reported in 2008.

Shigellosis

During 2008, 311 culture-confirmed cases of *Shigella* infection (6.0 per 100,000 population) were reported (Figure 2). This represents a 32% increase from the 238 cases reported in 2007, and a 23% increase from the median number of cases reported annually from 1999 to 2007 (median, 254 cases; range, 68 to 904).

In 2007, *S. sonnei* accounted for 283 (91%) cases, *S. flexneri* for 21 (8%), *S. boydii* for 3 (<1%), and 3 (<1%) had unknown serotype. Case-patients ranged in age from 3 months to 90 years (median, 7 years). Fifty-seven percent of case-patients were <10 years of age; children <5 years of age accounted for 37% of cases. Sixty-three (20%) case-patients were hospitalized. Seventy percent of case-patients resided in the metropolitan area, including 41% in Hennepin County and 12% in Ramsey County.

Ten outbreaks of shigellosis were identified in 2008; all were caused by *S. sonnei*. These outbreaks resulted in 54 culture-confirmed cases (representing 17% of reported *Shigella* cases). Seven person–to-person outbreaks occurred in child daycare facilities or elementary schools, and three community associated person-to-person outbreaks also occurred.

Every twentieth *Shigella* isolate received at MDH is tested for antimicrobial resistance. Fourteen isolates were tested in 2007; 93% were resistant to ampicillin and 7% were resistant to trimethoprim-sulfamethoxazole. All isolates tested were susceptible to ceftriaxone.

***Streptococcus pneumoniae* Invasive Disease**

Statewide active surveillance for invasive *Streptococcus pneumoniae* (pneumococcal) disease began in 2002, expanded from the metropolitan area, where active surveillance has been ongoing since 1995. In 2008, 712 (13.7 per 100,000 population) cases of invasive pneumococcal disease were reported. By age group, annual incidence rates per 100,000 were 23.7 cases among children aged 0-4 years; 3.9 cases among children and adults aged 5-39 years, 15.5 cases among adults 40-64 years, and 41.1 cases among adults aged 65 years and older.

In 2008, pneumonia accounted for 409 (57%) cases of invasive pneumococcal disease among all cases (ie, 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 221 (31%) cases statewide. Pneumococcal meningitis accounted for 35 (5%) cases. Sixty-three (9%) case-patients with invasive pneumococcal disease died.

In 1999, the year before the pediatric pneumococcal conjugate vaccine (Prevnar, Wyeth-Lederle [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 2000-2002 there was a major downward trend in incidence in this age group (Figure 5). Rates in each of the subsequent 4 years were somewhat higher, although there has not been a continuing upward trend (25.8 cases per 100,000 in 2003; 29.0, 27.4, 23.3,

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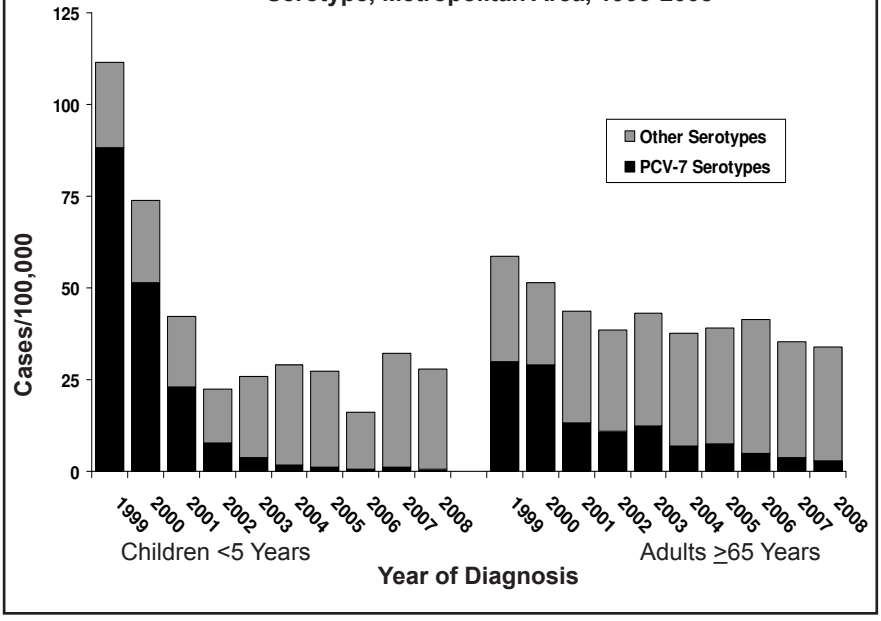
Figure 5. Invasive Pneumococcal Disease Incidence Among Children <5 Years and Adults ≥65 Years of Age, by Year and Serotype, Metropolitan Area, 1999-2008



30 and 27.8 cases per 100,000 each year from 2004-2008, respectively) (Figure 5). Based on the distribution of serotypes among isolates from these cases, this increase was limited to disease caused by non-vaccine serotypes (ie, 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. This trend supports the need for ongoing monitoring, however, because further increases due to non-vaccine serotypes are possible. In Figure 5, rates of invasive pneumococcal disease among adults aged >65 years are also shown by serotypes included and not included in PCV-7. Declines in incidence in this age group, particularly in disease due to PCV-7 serotypes, have been observed elsewhere in the United States and are likely attributable to herd immunity from use of PCV-7 among children. Among cases overall, a serotype not included in the PCV-7 vaccine, serotype 7F, is now most commonly associated with invasive pneumococcal disease in Minnesota. However, this serotype as well as five other serotypes are included in a 13-valent conjugate vaccine now awaiting licensure.

Of the 659 isolates submitted for 2008 cases, 5 (1%) isolates were resistant to penicillin and 32 (5%) exhibited intermediate-level resistance using nonmeningitis breakpoints (Note: CLSI penicillin breakpoints changed in 2008; refer to the MDH Antibiogram on pp 28-29); 110 isolates (17%) exhibited multi-drug resistance (ie, high-level resistance to two or more antibiotic classes).

Streptococcal Invasive Disease - Group A

One hundred eighty-five cases of invasive group A streptococcal (GAS) disease (3.6 per 100,000 population), including 20 deaths, were reported in 2008, compared to 173 cases and 16 deaths in 2007. Ages of case-patients ranged from 1 year to 95 years (median, 48 years). Fifty-six percent of case-patients were residents of the metropolitan area. Fifty-four (29%) case-patients had bacteremia without another focus of infection, and 47 (25%) case-patients had cellulitis. There were 25 (14%) cases of primary pneumonia and 13 (7%) cases of necrotizing fasciitis. Fifteen (8%) case-patients had septic arthritis and/or osteomyelitis, and six (3%) had streptococcal toxic shock syndrome (STSS). Eleven (6%) case-patients were residents of long-term care facilities.

The 20 deaths included 10 cases of bacteremia without another focus of infection and 2 cases of pneumonia. The eight remaining fatal cases had cellulitis (5), abscess (1), otitis (1) and the type of infection was unknown for one death. The deaths occurred in persons ranging in age from 6 to 95 years. For the 20 deaths in patients with known health histories, significant underlying medical conditions were reported for 18 of the case-patients.

Isolates were available for 166 (90%) cases, and 163 were subtyped using PFGE; 64 different molecular subtypes were identified. Forty-five subtypes were represented by 1 isolate each; other subtypes were represented by 2 to 55 isolates each. No direct epidemiologic links were noted among cases with indistinguishable subtypes.

Isolates were available for 19 of the deaths and were distributed among 12 different PFGE subtypes. Six deaths were attributed to the most common subtype, and 2 other subtypes each accounted for 2 deaths.

Streptococcal Invasive Disease - Group B

Four hundred eighteen cases of invasive group B streptococcal disease (8.0 per 100,000 population), including 24 deaths, were reported in 2008. These cases were those in which group B *Streptococcus* (GBS) was isolated from a normally sterile site. This represents the largest number of GBS cases reported since surveillance was initiated in 1995.

By age group, annual incidence was highest among case-patients <1 year of age (64.5 per 100,000 population) and those 70 years of age or older (31.2 per 100,000). Fifty-seven percent of case-patients were residents of the metropolitan area.Bacteremia without focus of infection was the most common type (41%) of infection associated with invasive GBS disease followed by cellulitis (13%), osteomyelitis (12%), pneumonia (8%), septic arthritis (6%), abscesses (4%) and meningitis (1%). The majority (70%) of case-patients had GBS isolated from blood only. Other common isolation sites included joint fluid (11%) and bone (11%).

Forty-five case-patients were infants or pregnant women (maternal case), compared to 46 case-patients in 2007. Twenty-three infants developed early-onset (within 6 days of birth) disease (0.31 cases per 1,000 live births), and 20 infants developed late-onset (7 to 89 days of age) disease. One stillbirth/spontaneous abortion was associated with two maternal GBS infections.

The *Prevention of Perinatal Group B Streptococcal Disease, Revised Guidelines* published by CDC in August 2002 included the recommendation for universal prenatal screening of all pregnant women at 35 to 37 weeks gestation and updated prophylaxis regimens for women with penicillin allergies. In light of these guidelines, MDH reviewed the maternal charts for all 23 early-onset case-patients reported during 2008. Overall, 12 (52%) of 23 women who delivered GBS-positive infants underwent prenatal screening for GBS. Of these, 5 (42%) were positive, 6 (50%) negative, and 1 (8%) had an unknown result. Among the eight women who did not receive prenatal screening, two (25%) were screened upon admission to the hospital and prior to delivery. Among the 23 women who delivered GBS-positive infants, 13 (57%) received intrapartum antimicrobial prophylaxis (IAP). All five women with a positive GBS screen received IAP. MDH continues to follow the incidence of GBS disease among infants, screening for GBS among pregnant women, and the use of IAP for GBS-positive women during labor and delivery.

Tetanus

One case of tetanus was reported during 2008. The case occurred in a 42-year-old white, non-Hispanic female with no history of tetanus and diphtheria toxoid (Td) within the previous 10 years. She sustained a puncture wound to her foot from a tack in her yard. No immediate medical attention was sought. Symptoms began 11 days after sustaining the wound, progressing from trismus to stiffness in the neck and shoulders, to spasms and cramping of leg muscles. The case-patient was hospitalized 2 days after symptom onset, and received tetanus immune globulin (TIG) and Td. All symptoms resolved within 2 weeks of onset.

This case highlights the importance of routine vaccination against tetanus including a primary series (4 properly spaced doses of Td in persons younger than 7 years of age, or 3 doses in persons 7 years of age and older) and boosters every 10 years. Tetanus cases often result from minor wounds for which individuals did not seek immediate medical attention. Wounds contaminated with soil present the greatest risk.

Toxic Shock Syndrome

In 2008, 4 cases of suspect or probable staphylococcal toxic shock syndrome (TSS) were reported. Of the reported cases, 3 were female and the median age was 18 years (range, 11 to 38 years). Two of the 4 were menstrual-associated, 1 was wound-associated, and 1 was surgical wound-associated.

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 after 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 asparate aminotransferase enzyme levels at least twice the upper limit of normal for laboratory; platelets less than 100,000/mm3; disorientation or alterations in consciousness without focal neurologic signs when fever and hypotension are absent); negative results for blood, 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

While the number of cases of tuberculosis (TB) disease reported in the United States has decreased each year since 1993, the incidence of TB in Minnesota increased throughout much of the 1990s and has fluctuated during the past decade. In 2008, 211 new cases of active TB disease were reported in Minnesota. The total number of TB cases reported in Minnesota during 2008 was similar to that in 1999. Between 1999 and 2008, however, the annual number of TB cases peaked in 2001 (239 cases) and again in 2007 (238 cases). Most notably, while the number of TB cases reported among foreign-born persons in Minnesota during 2008 was essentially the same (ie, 1 fewer case) as that in 1999, the number of cases reported among U.S.-born persons increased between those years. In particular, from 2007 to 2008, the number of TB cases reported among foreign-born persons statewide decreased 24%, while the number of cases reported among U.S.-born persons increased 60% (Figure 6). The 211 cases in 2008 represent an incidence rate of 4.0 cases per 100,000 population. In 2008, Minnesota's TB incidence rate was slightly below the national rate (4.2 cases per 100,000 population) but above both the median rate among 51 U.S. states and reporting areas (3.0 cases per 100,000 population) and the U.S. Healthy People 2010 objective of 1.0 case per 100,000 population.

Three outbreaks of TB were identified and investigated during 2008. An outbreak among a foreign-born community in rural Minnesota involved a total of 14 cases that were linked either genotypically or through strong epidemiologic links. An especially challenging characteristic of this outbreak was the very high proportion of pediatric cases, primarily U.S.-born children of foreign-born parents. Among 14 cases with genotype or epidemiologic links, 10 were children under age 14, including 8 under age 5. A second outbreak of TB involving a total of 10 cases occurred among inmates and staff at a correctional facility. The third TB outbreak consisted of a total of 6 TB cases with matching genotypes among homeless persons in the metropolitan area. Investigations remain open for the homeless and correctional facility outbreaks. None of the outbreaks involved drug resistant strains of *Mycobacterium tuberculosis*.

The most distinguishing characteristic of the epidemiology of TB disease continues to be the large proportion of TB cases reported among foreign-born persons. Eighty-two percent of TB cases reported in Minnesota from 2004 through 2008 occurred among persons born outside the United States. In contrast, 59% of TB cases reported nationwide in 2008 were foreign-born. Notably, however, 73% of TB cases reported in Minnesota during 2008 were foreign-born, which represented a 14% decrease from the 85% of foreign-born TB cases reported in 2007. This decrease can be attributed to the TB outbreaks that occurred during 2008, an increase of pediatric cases, and a declining number of refugees entering Minnesota.

The 155 foreign-born TB case-patients reported in Minnesota during 2008 represented 24 different countries of birth. The most common region of birth among foreign-born TB cases reported in 2008 was sub-Saharan Africa (59%), followed by South/Southeast Asia (22%) (Figure 7). The ethnic diversity among these foreign-born TB cases reflects the unique and constantly changing demographics of immigrant and other foreign-born populations arriving in Minnesota. 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.

One-fifth of the foreign-born TB case-patients reported in 2008 were diagnosed within 12 months after arriving in the United States. These cases likely represent persons who acquired TB infection outside the United States and began progressing to active TB disease prior to immigrating. Persons 15 years of age or older who arrive in the United States as immigrants or refugees receive a pre-immigration medical examination overseas that includes screening for pulmonary TB disease. Of 20 TB case-patients 15 years of age or older who were diagnosed in Minnesota during 2008 within 12 months of arriving in the United States and who arrived as immigrants or refugees, only four (20%) had any TB-related condition noted in their pre-immigration medical exam results. These findings highlight the need for clinicians to have a high index

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of suspicion for TB among newly arrived foreign-born persons, regardless of the results of medical exams performed overseas. Two-thirds of foreign-born TB case-patients reported in Minnesota during 2008 were diagnosed 2 or more years after arriving in the United States. These data suggest that more than half of foreign-born TB cases reported in Minnesota may be preventable by focusing on thorough domestic screening, evaluation, and treatment of latent TB infection among recently arrived refugees, immigrants, and other foreign-born persons.

The majority (70%) of foreign-born TB case-patients in 2008 were 15 to 44 years of age, whereas only 29% of U.S.-born TB cases occurred among persons in this age category. In contrast, 32% of U.S.-born TB case-patients were 45 years of age or older. The proportion of pediatric patients <5 years of age was considerably larger among U.S.-born TB cases than among foreign-born cases (39% versus 6%, respectively), although nearly all of these U.S.-born case-patients 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 or recently arrived family members who may be at increased risk for TB acquired overseas.

The majority (77%) of TB cases during 2008 were identified as a result of presenting for medical care. Other methods of case identification included TB contact investigations (13%), domestic refugee health examinations (3%), and follow-up evaluations subsequent to abnormal findings on pre-immigration exams performed overseas (2%). The remaining 5% of TB cases were identified through a variety of other means. Notably, the percentage of TB cases identified through TB contact investigations increased from an annual average of 5% from 2004 through 2007 to 13% in 2008. Again, this is reflective of the three major TB outbreaks that occurred in 2008.

Aside from foreign-born persons, other high-risk population groups comprise much smaller proportions of the TB cases. Among cases reported in 2008,

Figure 6. Tuberculosis Incidence Rates per 100,000 Population, United States and Minnesota, 1994-2008

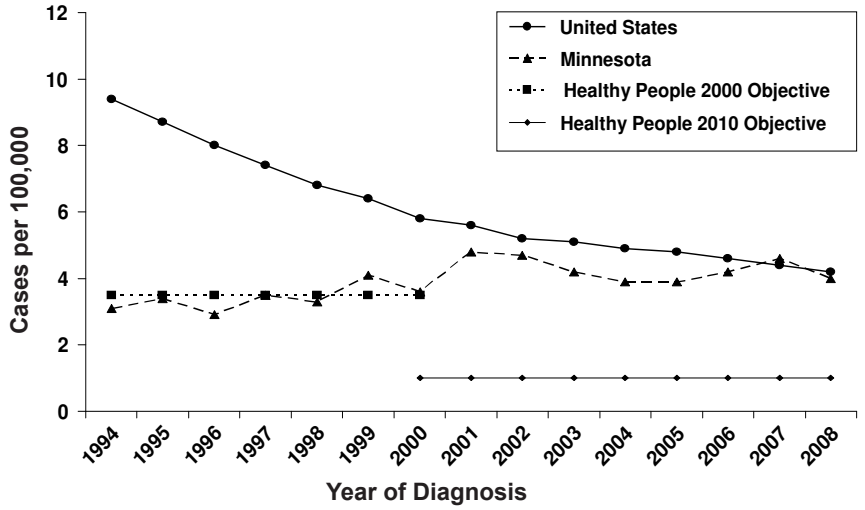


Figure 7. Foreign-Born Tuberculosis Cases by Region of Birth and Year of Diagnosis, Minnesota, 2004-2008

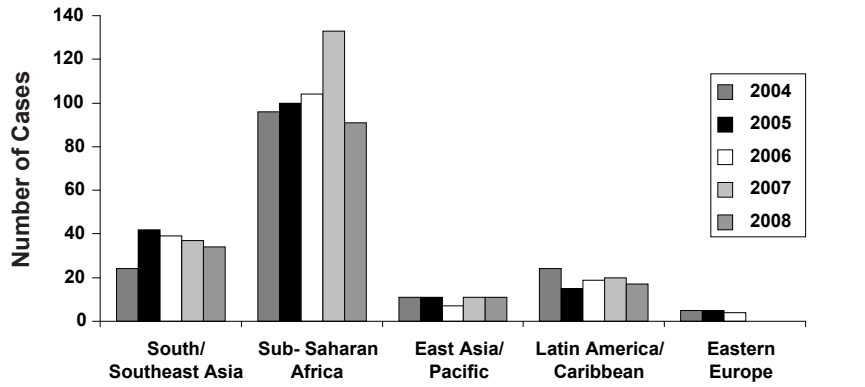
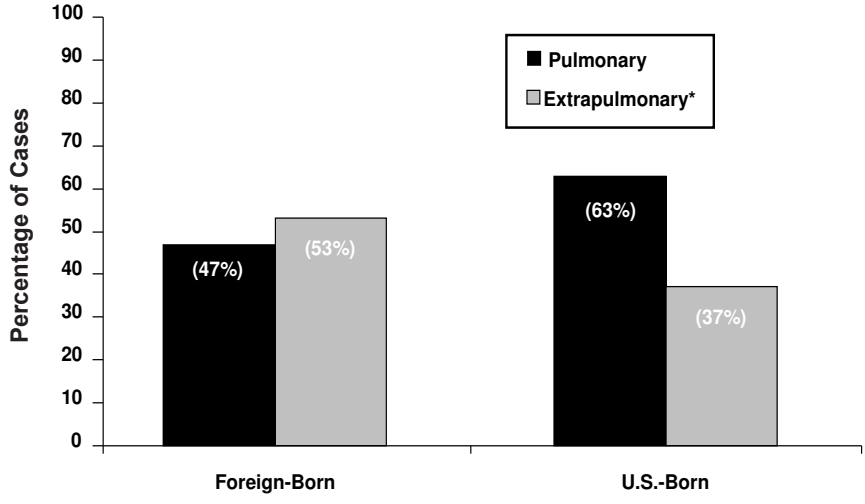


Figure 8. Tuberculosis Cases by Site of Disease and Place of Birth, Minnesota, 2004-2008



*Includes cases with both extrapulmonary and pulmonary sites of disease

persons with certain medical conditions (excluding HIV infection) that increase the risk for progression from latent TB infection to active TB disease (eg, silicosis, 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 11% of cases. Substance abuse (including alcohol abuse and/or illicit drug use) was the second most common of these other risk factors, with 10% of TB case-patients having a history of substance abuse during the 12 months prior to their TB diagnoses. Eleven (5%) of the 211 TB case-patients reported in Minnesota during 2008 were infected with HIV; nine of those HIV-infected TB case-patients were foreign-born, including three persons born in Mexico, two persons from Sudan, and one person each from Cameroon, Ethiopia, Nigeria, and South Africa. The percentage of new TB case-patients with HIV co-infection remains less than that among TB cases reported nationwide. Five percent of TB case-patients reported in Minnesota during 2008 were homeless. Other risk groups, such as correctional facility inmates and residents of nursing homes, each represented only 1-2% of TB cases reported during 2008.

Twenty-six (30%) of the state's 87 counties reported at least one case of TB disease in 2008, with the majority (78%) of cases occurring in the metropolitan area, particularly in Hennepin (46%) and Ramsey (21%) Counties, both of which have public TB clinics. Eleven percent of TB cases occurred in the five suburban metropolitan counties (ie, Anoka, Dakota, Carver, Scott, and Washington). Olmsted County, which maintains a public TB clinic staffed jointly by the Olmsted County Health Department and Mayo Clinic, represented 2% of cases reported statewide in 2008. The remaining 20% of cases occurred in primarily rural areas of Greater Minnesota. 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 2008, the highest TB incidence rate statewide was reported in Ramsey County (8.8 cases per 100,000 population), followed closely by Hennepin County (8.5 cases per 100,000 population). Both Ramsey and Hennepin counties' TB incidence rates were more than twice the statewide rate. In 2008, the incidence rates in Olmsted County (2.8 cases per 100,000), the five-county suburban metropolitan area (2.0 cases per 100,000), and Greater Minnesota (1.9 cases per 100,000) were considerably lower than that in the state overall. From 2007 to 2008, the TB incidence rates in Hennepin County, the suburban metropolitan area, and Ramsey County decreased 15%, 9%, and 6%, respectively. In contrast, the TB incidence rate in Greater Minnesota increased 36% from 2007 to 2008. Most notably, from 2007 to 2008, Olmsted County's TB incidence rate declined 80%.

Drug-resistant TB is a critical concern in the prevention and control of TB in Minnesota, as well as nationally and globally. The prevalence of drug-resistant TB in Minnesota, particularly resistance to isoniazid [INH] and multidrug resistance, exceeds comparable national figures for 2007 (the most recent year for which complete national data are available). In 2008, 23 (15%) of 149 culture-confirmed TB cases reported in Minnesota were resistant to at least one first-line anti-TB drug (ie, isoniazid [INH], rifampin, pyrazinamide, or ethambutol). In particular, 17 (11%) cases were resistant to INH, and 2 (1%) cases were multidrug-resistant (ie, resistant to at least INH and rifampin). The prevalence of MDR-TB in Minnesota has declined during the past 5 years, from 4% in 2004 to 1% in 2008. Drug resistance is more common among foreign-born TB cases than it is among U.S.-born cases in Minnesota. Of particular concern, two (13%) of 16 MDR-TB cases reported from 2004 through 2008 were resistant to all four first-line drugs. These two pan-resistant MDR-TB case-patients represented two different countries of birth (China and Somalia).

Another clinical characteristic of significance is the preponderance of extrapulmonary disease among foreign-born TB patients. Just over half (53%) of foreign-born TB case-patients from 2004 through 2008 had an extrapulmonary site of disease; in contrast, only 37% of U.S.-born TB case-patients had extrapulmonary TB (Figure 8). The most common extrapulmonary sites of TB disease are lymphatic, pleural, peritoneal, and bone/joint. The unusually high incidence of extrapulmonary TB disease exemplifies the need for clinicians to be aware of the epidemiology of TB in Minnesota 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.

The epidemiology of TB in Minnesota highlights the need to support global TB elimination strategies, as well as local TB prevention and control activities targeted to foreign-born persons. TB in Minnesota occurs primarily, although not exclusively, among foreign-born persons, with TB case-patients representing many countries of origin and varied cultural backgrounds. The prevalence of drug-resistant TB in Minnesota is higher than that nationally, and extrapulmonary sites of disease are common, especially among foreign-born cases. The proportion of TB cases occurring among persons under 5 years of age in Minnesota exceeds the comparable figure nationally, with many of these children having foreign-born parents. These trends suggest that the incidence of TB in Minnesota is not likely to significantly decrease in the foreseeable future.

Unexplained Critical Illnesses and Deaths of Possible Infectious Etiology: UNEX and MED-X

UNEX

Surveillance for unexplained critical illnesses and deaths of possible infectious etiology (UNEX) began in September 1995. Any case should be reported, regardless of the patient's age or underlying medical conditions. A subset of cases (persons up to 49 years of age with no underlying medical conditions, who died of an apparent non-nosocomial infectious process) are eligible for testing performed at CDC as part of a special project. For cases not eligible for the CDC project, some testing may be available at MDH or CDC, at the physician's request.

Eighty-eight cases (54 deaths and 34 critical illnesses) were initially reported in 2008, compared to 64 cases in 2007. The cause(s) of illness subsequently were determined for 13 cases by the reporting physician and were no longer

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considered unexplained. Twenty-six cases met the CDC testing criteria as well. Among the remaining 75 cases, 25 presented with neurologic symptoms; 17 case-patients presented with respiratory symptoms; eight presented with cardiac symptoms; seven presented with unexplained sudden death; six presented with shock/sepsis; five presented with sudden unexpected death (SUD); three presented with gastrointestinal (GI) symptoms; one presented with a hepatic syndrome; and eight had an illness that did not fit a defined syndrome (case-patients may present with more than one syndrome). The age of cases ranged from 2 days to 86 years, with a median of 17 years. Forty-six percent resided in the metropolitan area. Fifty-eight percent were male.

The UNEX program works closely with the Minnesota medical examiner offices on unexplained deaths of possible infectious etiology. MDH investigated 13 cases from the Minnesota Regional Medical Examiner Office (MRMEO) in Hastings, 4 cases from Midwest Forensic Pathology, 17 from the Hennepin County Medical Examiner Office, and 2 from the Ramsey County Medical Examiner Office.

There were 36 cases that had pathogens identified as confirmed (n=27) or possible (n=9) causes of their illness (Table 5). The most frequently identified pathogens are of public health significance and include 8 cases of influenza, 5 *N. meningitidis*, 4 *S. aureus*, and 3 *S. pneumoniae.* There were also several unique cases that had public health significance due to being caused by more uncommon pathogens identified in previously healthy individuals. One case was in a 10 year-old male with onset of acute neurologic illness following a tick bite. Serologic and PCR testing revealed an infection with Powassan virus which had not been detected in Minnesota before and is the western-most case ever identified in the United States. Cytomegalovirus was identified in 6 month-old infant who died, through viral culture from the lung and immunohistochemistry staining of the heart. *Fusobacterium* spp. was found by PCR from a lung tissue sample of a 49 year-old who died at home and had bilateral pneumonia on autopsy. Finally, 16S broad range bacterial RNA testing found *Porphyromonas endodontalis* from a 55 year-old who died suddenly and had a diagnosis of severe tooth infection with cellulitis and sepsis.

Medical Examiner Surveillance (MED-X)

MED-X is a population-based surveillance program aimed at identifying all infectious disease-related deaths that are investigated by medical examiners (MEs). MDH distributes specimen collection kits to the ME offices and materials to help guide the number and type of specimens collected. Through a combination of active and passive surveillance, ME offices are welcome to partner with MDH to track and identify infectious related deaths. While all ME offices are encouraged to participate, MDH in particular works closely with MRMEO, the Hennepin County Medical Examiner Office, Midwest Forensic Pathology, and the Ramsey County Medical Examiner Office.

There were 124 MED-X cases in 2008; 31 of these were also UNEX cases. Based on MRMEO data, the population-based rate of potential infectious disease related deaths as reported to MEs was 5,252 per 100,000 ME cases, which translates to 2,585 per 100,000 total deaths and 9.8 per 100,000 among the total population. The median age of the cases was 61 years, and 54% were female. There were 58 (48%) cases found through death investigation report review, the majority of which were cases that did not have autopsies (n=49 [84%]). MEs reported 45 (36%) cases. The most common presenting symptom was pneumonia/upper respiratory infection (n=57 [46%]). Among cases autopsied, the most common pathologic finding was also pneumonia (n=32, [56%]), with myocarditis being the second most common (n=28, [49%]). Of the 124 cases, 45 (36%) were confirmed to be due to an infectious cause, 67 (54%) were possibly due to infectious cause, and 12 (10%) were determined to not be due to an infectious cause. Pathogens that were identified as the confirmed or possible cause of death included *Streptococcus pneumoniae* (n=4), influenza A (n=4), hepatitis C (n=3), *Staphylococcus aureus* (n=2), *Clostridium difficile* (n=2), *Haemophilus influenzae* (n=2), and 1 each of influenza B, parainfluenza, adenovirus, *Citrobacter freundii*, hepatitis B, *Porphyromonas endodontalis*, cytomegalovirus, *Klebsiella pneumoniae*, and *Klebsiella oxytoca*.

Varicella and Zoster

Minnesota reporting rules require that unusual case incidence, individual critical cases, and deaths due to

Table 5. Unexplained Cases with Pathogen Identified as Possible or Confirmed Cause of Illness, 2008

Pathogen Identified as Confirmed or Possible Case of Illness	Total Cases
Adenovirus	1
Citrobacter freundii	1
Cytomegalovirus	2
Epstein-Barr virus	1
Fusobacterium necrophorum	1
Group A Streptococci	1
Influenza A virus	4
Influenza B virus	4
Influenza/Staphylococcus aureus	1
Klebsiella oxytoca	1
Mycobacterium spp.	1
Mycoplasma pneumoniae	1
Neisseria meningitidis serotype B	5
Parainfluenza virus 1	1
Parainfluenza virus 2	1
Porphyromonas endodontalis	1
Powassan virus	1
Pseudomonas spp.	1
Staphylococcus aureus	3
Staphylococcus spp.	1
Streptococcus pneumoniae	3
Total	**36**

varicella and zoster be reported. The reporting rules also allow for the use of a sentinel 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 third full year of these surveillance efforts. Over time, these data will be used to monitor trends in varicella and zoster disease in Minnesota, and will be used to extrapolate to the statewide disease burden.

No varicella-related deaths were identified in 2008. Five cases of critical varicella illness were reported. Three had underlying medical conditions but were not being treated with immunosuppressive drugs. The other case-patients had no or unknown underlying conditions and were not known to be immunosuppressed. Three of the case-patients were female. One case-patient had a documented history of one dose of varicella-containing vaccine. Three case-patients had not received varicella-containing vaccine; one was underage for vaccination and two were not vaccinated due to their immunosuppressive conditions. The other case-patient's vaccination history was unknown. Each case-patient was hospitalized for a mean of 4.4 days. Complications were reported in four case-patients and included varicella arteriopathy, encephalitis, probable hepatitis secondary to varicella, and difficulty swallowing. All five case-patients recovered.

Varicella surveillance includes reporting of outbreaks from all schools and reporting of individual cases from selected sentinel schools and childcare centers. Eighty sentinel schools were selected and participated throughout the 2006-2007 school year, 77 participated in the 2007-2008 school year and 80 participated in the 2008-2009 school year. One hundred nineteen sentinel childcare centers were selected and participated throughout 2007, and 120 participated in 2008.

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 2008-2009 school year, we received reports of outbreaks from 24 schools in 15 counties involving 261 students and no staff. By comparison, MDH received reports of outbreaks from 40 schools in 22 counties involving 487 students and no staff during the 2007-2008 school year. The number of cases per outbreak ranged from 3 to 39 (median, 8) during the 2008-2009 school year and 5 to 37 (median, 9) during the 2007-2008 school year.

A case of varicella is defined for sentinel school and childcare facility reporting as an illness with acute onset of diffuse (generalized) maculopapulovesicular rash without other apparent cause. During the 2008-2009 school year, MDH received 33 reports of varicella from 12 (15%) sentinel schools. One sentinel school reported a cluster of cases that met the outbreak definition. Thirteen (39%) of 33 reported cases were included in this outbreak. The 20 cases not associated with an outbreak represent sporadic varicella incidence. In 2008, MDH received no reports of varicella cases from the 47 sentinel childcare centers or 72 sentinel family childcares.

Based on sentinel school data, an estimated 433 sporadic cases of varicella would have been expected to occur during a school year among the 877,025 total school-aged children (in Minnesota schools with more than 99 students), representing 0.05% of this population, for an incidence rate of 49.4 per 100,000 population. All sporadic cases were reported in elementary schools, which had an estimated grade level-specific annual incidence rate of 103.2 per 100,000 (433 of 419,170) for elementary school students.

MDH currently conducts zoster surveillance in all schools and selected sentinel childcare centers. During the 2008-2009 school year, MDH received 188 reports of zoster from schools in 39 counties representing 0.02% of the total school population of 915,727 students for an incidence rate of 20.5 per 100,000. Ages ranged from 4 to 18 years. By comparison, MDH had received 128 reports of zoster in 43 counties throughout Minnesota during the 2007-2008 school year. Ages ranged from 5 to 18 years. As opposed to varicella, which is mainly diagnosed by school heath personnel and parents, most zoster cases (89%) are physician-diagnosed.

Vaccine supply issues have stabilized since the recent vaccine shortage. The two-dose requirement for kindergarteners and seventh graders enrolling in Minnesota schools will begin fall 2009. Providers are encouraged to administer the second dose as recommended if varicella vaccine is available.

Viral Hepatitis A

In 2008, 49 cases of hepatitis A (0.9 per 100,000 population) were reported. Fourteen (29%) case-patients were residents of the metropolitan area, including 10 (20%) residents of Hennepin or Ramsey Counties. Twenty-four (49%) of the cases were male. Case-patients ranged in age from 5 to 84 years (median, 40 years). Thirty-six (73%) cases were white, two (4%) were black, and one (2%) was Asian; race was unknown for 10 (20%) cases. Only 3 cases have been reported in American Indians since 2002.The incidence rate of hepatitis A in American Indians declined steadily from 10.4 per 100,000 in 1999 to 6.0, 3.7, and 2.5 per 100,000, in 2000, 2001, and 2002 respectively, demonstrating the success of targeted immunization efforts initiated in 1999. Hispanic ethnicity was reported for three cases (1.5 per 100,000).

A risk factor was identified for 40 (82%) of the 49 cases, 13 (33%) 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). Of the remaining 27 (68%) cases with a risk factor identified, 7 (18%) were associated with travel. Of these seven case-patients, three (43%) traveled to Mexico, Central, or South America.

In 2008, there were two outbreaks of hepatitis A of 3 and 4 cases respec-

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tively. Three (6%) cases were associated with a food-borne outbreak from a potluck in Wabasha County (including the source case-patient). One daycare outbreak accounted for 4 (8%) cases. HAV is now recommended for post-exposure prophylaxis of certain groups. HAV used for post-exposure prophylaxis gives longer protection than IG, is often more readily available, and is easier to administer.

Viral Hepatitis B

In 2008, 25 cases of symptomatic acute hepatitis B virus (HBV) infection (0.5 per 100,000 population) were reported, with no deaths. In addition to the 25 cases, two individuals with documented asymptomatic seroconversions 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 911 reports of newly identified cases of chronic HBV infection in 2008.

Acute cases ranged in age from 12 to 79 years (median, 43 years). Sixteen (64%) of the 25 cases were residents of the metropolitan area, including eight (32%) in Hennepin County and three (12%) in Ramsey County. Nineteen (76%) cases were male and 10 (40%) were adolescents or young adults between 13 and 39 years of age. Ten (40%) were white, nine (36%) were black, and three (12%) were Asian or Pacific Islander; race was unknown for three (12%) cases. No case-patients were known to be of Hispanic ethnicity. Although the majority of cases were white, incidence rates were higher among blacks (3.6 per 100,000) and Asians and Pacific Islanders (1.6 per 100,000) than among non-Hispanic whites (0.2 per 100,000).

MDH attempts to ascertain risk factor information and possible modes of transmission by collecting information reported by the case-patient to his/her health care provider and by interviewing the case-patient directly, if possible. A case-patient may report more than one risk factor, and may report different information to his/her health care provider than to MDH. Four (16%) case-patients reported illicit drug use. Of these, one (25%) reported injection drug use. Seven (28%) case-patients reported having sexual contact with one or more partners within 6 months prior to onset of symptoms. Of these, one (14%) reported sexual contact with two or more partners, one (14%) was a male who reported having one male sexual partner, two (29%) were males who reported sexual contact with one female partner, one (14%) case-patient was a male who reported having one sexual partner but did not report gender, and the remaining two (29%) case-patients reported sexual activity without identifying number or gender of partners. No case-patients reported having sexual contact with a known carrier of hepatitis B surface antigen (HBsAg). No risk factor was identified for 14 (67%) cases.

In addition to the 25 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 case-patients were born in 2007. 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 five infants were born in the United States and had received hepatitis B immune globulin and three doses of hepatitis B vaccine in accordance with the recommended schedule (ie, were treatment failures). Despite these treatment failures, the success of the public health prevention program is demonstrated by the fact that an additional 300 infants born to HBV-infected women during 2007 had post-serologic testing demonstrating no infection.

Viral Hepatitis C

In 2008, 22 cases of symptomatic acute hepatitis C virus (HCV) infection were reported. In addition to the 22 cases, 13 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.

Fifteen (68%) of the 22 case-patients resided in Greater Minnesota. The median age was 28 years (range, 18 to 55 years). Twelve (55%) case-patients were male. Seventeen (77%) were white, three (14%) were American Indian, and one (5%) was black; race was unknown for two (9%) cases.

MDH attempts to ascertain risk factor information for the 6 months prior to onset of symptoms by collecting information reported by the case-patient to his/her health care provider and by interviewing the case-patient, if possible. A case-patient may report more than one risk factor, and may report different information to his/her health care provider than to MDH. Among the 22 case-patients, six (27%) used injection drugs; five (23%) used intranasal drugs; two (9%) had sexual contact with a known HCV-infected partner; two (9%) had multiple sexual partners; one (5%) had sexual contact with an injection drug user; one (5%) shared home tattoo equipment; and one (5%) had an occupational exposure. No risk factor was identified for 10 (45%) cases.

MDH received 2,014 reports of newly identified anti-HCV positive persons in 2008, the vast majority of whom are chronically infected. Because most cases are asymptomatic, medical providers are encouraged to consider each patient's risk for HCV infection to determine the need for testing. Patients for whom testing is indicated include: persons with past or present injection drug use; recipients of transfusions or organ transplants before July 1992; recipients of clotting factor concentrates produced before 1987; persons on chronic hemodialysis; persons with persistently abnormal alanine aminotransferase levels; healthcare, emergency medical, and public safety workers after needle sticks, sharps, or mucosal exposures to HCV-positive blood; and children born to HCV-positive women. Infants born to HCV-infected mothers should be tested at 12 to 18 months of age, as earlier testing tends to reflect maternal antibody status. Persons who test positive for HCV should be screened for susceptibility to hepatitis A and B virus infections and immunized appropriately.

Use of Influenza A (H1N1) 2009 Monovalent Vaccine Recommendations of the Advisory Committee on Immunization Practices (ACIP), 2009

Adapted from August 28, 2009 *MMWR* (Vol. 58, No. RR-10)

This adapted report provides recommendations by CDC's Advisory Committee on Immunization Practices (ACIP) regarding the use of vaccine against infection with novel influenza A (H1N1) virus. Information on vaccination for seasonal influenza has been published previously (CDC. Prevention and control of seasonal influenza with vaccines: recommendations of the Advisory Committee on Immunization Practices [ACIP], 2009. MMWR 2009;58 [No. RR-8]). Vaccines against novel influenza A (H1N1) virus infection have not yet been licensed; however, licensed vaccine is expected to be available by mid-October 2009. These recommendations are intended to provide vaccination programs and providers with information to assist in planning and to alert providers and the public about target groups comprising an estimated 159 million persons who are recommended to be first to receive influenza A (H1N1) 2009 monovalent vaccine. The guiding principle of these recommendations is to vaccinate as many persons as possible as quickly as possible. Vaccination efforts should begin as soon as vaccine is available. State and local health officials and vaccination providers should make decisions about vaccine administration and distribution in accordance with state and local conditions. Highlights of these recommendations include 1) the identification of five initial target groups for vaccination efforts (pregnant women, persons who live with or provide care for infants aged <6 months, health-care and emergency medical services personnel, children and young adults aged 6 months-24 years, and persons aged 25-64 years who have medical conditions that put them at higher risk for influenza-related complications), 2) establishment of priority for a subset of persons within the initial target groups in the event that initial vaccine availability is unable to meet demand, and 3) guidance on use of vaccine in other adult population groups as vaccine availability increases.

Introduction

In April 2009, a new influenza A (H1N1) virus, novel influenza A (H1N1) virus, was determined to be the cause of influenza illness in two children in the United States during March and April 2009 (1,2) and the cause of outbreaks of respiratory illness in Mexico (3). This virus was transmitted in communities across North America within weeks and was identified in many areas of the world by May 2009 (4,5). On June 11, 2009, the World Health Organization (WHO) declared a worldwide pandemic, indicating uncontained community-level transmission of the novel influenza A (H1N1) virus in multiple areas of the world (5). Worldwide transmission of the novel influenza A (H1N1) virus has continued since June in both the Northern and Southern Hemispheres (6). Transmission is likely to persist and might increase in the Northern Hemisphere during fall and winter. In contrast to seasonal influenza, current evidence indicates that relatively few severe cases of novel influenza A (H1N1) virus infection have occurred among older persons, and the highest hospitalization rates for illness caused by this virus have been among persons aged <65 years (7). The signs and symptoms of novel influenza A (H1N1) virus infection are similar to those of seasonal influenza, and specific diagnostic testing is required to distinguish novel influenza A (H1N1) virus from seasonal influenza virus (7; CDC, unpublished data, 2009).

Influenza vaccination is the most effective method for preventing influenza and influenza-related complications. However, current seasonal influenza vaccines are not likely to provide protection against novel influenza A (H1N1) virus (8). Specific vaccines against the novel influenza A (H1N1) virus are being manufactured, and licensed vaccine is expected to be available in the United States by mid-October 2009 (9). However, the initial supply of these vaccines might not be enough to meet the demand for vaccine. For this reason, CDC's Advisory Committee on Immunization Practices (ACIP) recommends that certain groups at highest risk for infection or influenza-related complications should be the initial targets for vaccination. Highlights of these recommendations include 1) the identification of five initial target groups for vaccination efforts (pregnant women, persons who live with or provide care for infants aged <6 months, health-care and emergency medical services personnel, children and young adults aged 6 months-24 years, and persons aged 25-64 years who have medical conditions that put them at higher risk for influenza-related complications), 2) establishment of priority for a subset of persons within the initial target groups in the event that initial vaccine availability is unable to meet demand, and 3) guidance on use of vaccine in other adult population groups as vaccine availability increases. Because novel influenza A (H1N1) virus is continuing to cause illness in the United States and worldwide, the primary focus of vaccination efforts should be to vaccinate as many persons as possible in the recommended target groups as quickly as possible once vaccine becomes available. As vaccine availability increases, additional groups are recommended for vaccination. ACIP will review new epidemiologic and clinical data as they become available and might revise these recommendations.

Background

Human infections with the novel influenza A (H1N1) virus were first identified in April 2009 (1), and infections with this virus have been reported worldwide (5). Because serologic studies suggest that a large majority of the population is susceptible to novel influenza A (H1N1) virus, substantial potential exists for widespread infection (2). The novel influenza A (H1N1) virus is antigenically and genetically distinct from other human influenza A (H1N1) viruses in circulation since 1977 (2). As of August 1, 2009, the novel influenza A (H1N1) viruses circulating worldwide appear to be antigenically similar (11).

Clinical Features

The signs and symptoms of novel influenza A (H1N1) virus infection are similar

continued...

to those of seasonal influenza (7,12). Definitive diagnosis of novel influenza A (H1N1) virus infection requires specific testing for H1N1 viruses using real-time reverse transcriptase-polymerase chain reaction or viral culture (7,13). Rapid influenza diagnostic tests (RIDTs) for seasonal influenza sometimes can detect novel influenza A (H1N1) virus, but sensitivity has been estimated at 40%-70% (13,14). Negative RIDTs should not be used to exclude the diagnosis of novel influenza A (H1N1) virus infection (13).

The age distribution of confirmed illness, severity of illness, and prevalence of medical risk factors among persons with severe illness have been consistent among many countries and over time. As of July 31, 2009, the median age of persons with laboratory-confirmed infections in the United States was 12 years, and the highest infection incidence was among persons aged 5-24 years (7,11). The incidence of infection was lowest among persons aged ≥65 years. Similar findings have been reported in other countries (15).

A comparison of the age distribution of hospitalized persons with laboratory-confirmed novel influenza A (H1N1) also demonstrates a striking difference from seasonal influenza. As of July 31, 2009, the median age of hospitalized persons with laboratory-confirmed novel influenza A (H1N1) virus infection was 20 years, and the incidence of hospitalization was highest among young children aged <4 years (11; CDC, unpublished data, 2009). Only 282 (5%) of 5,514 hospitalizations and 29 (8%) of the 353 reported deaths had occurred among persons aged ≥65 years (CDC, unpublished data, 2009). The median age among persons who died with novel influenza A (H1N1) virus infection was 37 years. In contrast, in multiple studies of seasonal influenza, hospitalization and mortality rates have been highest among persons aged ≥65 years, and an estimated 90% of seasonal influenza-related deaths and 60% of seasonal influenza-related hospitalizations occurred among adults aged ≥65 years (16,17). As of July 31, 2009, only 282 (5%) of 5,514 hospitalizations and 29 (8%) of the 353 reported deaths attributed to novel influenza A (H1N1) virus infection had occurred among persons aged ≥65 years (CDC, unpublished data, 2009). Cumulative novel influenza A (H1N1) hospitalization rates for April-July 2009 approached or exceeded typical end-of-season cumulative rates for seasonal influenza among school-aged children and adults aged 18-49 years in the Emerging Infections Program (EIP) surveillance areas (11). However, among persons aged ≥65 years, these cumulative hospitalization rates are <20% of the rates typically observed during the winter among persons in this age group. The median age of hospitalized patients during the 2007-08 influenza season in EIP surveillance areas was 59 years, compared with a median age of 26 years for persons hospitalized in these areas during April-July 2009 (CDC, unpublished data, 2009). In addition, outbreaks attributable to novel influenza A (H1N1) viruses among older adults in long-term-care facilities have not been reported even when novel influenza A (H1N1) has been identified among health-care workers in these facilities who worked while ill.

Medical risk factors for severe infection are similar to those identified previously in studies of seasonal influenza (12). In one case series of 179 patients hospitalized with laboratory-confirmed novel influenza A (H1N1) virus infection, 117 (65%) patients had a medical risk factor previously associated with severe infection in studies of seasonal influenza (eg, chronic heart, lung, renal, liver disease; cancer or immunosuppression; or pregnancy) (12,18; CDC, unpublished data, 2009). Deaths caused by novel influenza A (H1N1) have been reported among pregnant women. In one case series, the incidence of hospitalization for confirmed novel influenza A (H1N1) virus infection among pregnant women was four times higher than that of the general population (19). Obesity (defined as body-mass index [BMI] ≥30) or morbid obesity (BMI ≥40) has been noted among hospitalized patients in some case series (20,21). However, the majority of these patients had other medical risk factors, and investigations to determine whether obesity or morbid obesity is an independent risk factor for severe infection are underway.

Vaccination Against Novel Influenza A (H1N1) Virus Infection

Limited data from serologic studies of persons who received vaccination with seasonal influenza vaccines suggest that seasonal influenza vaccines will not provide protection against novel influenza A (H1N1) virus. Among adults, cross-reactive antibody to novel influenza A (H1N1) virus at titers that correlate with protection from illness in studies of seasonal influenza vaccine was detected in 6%-9% of those aged 18-64 years and in 33% of those aged >60 years. No children tested had cross-reactive antibody to novel influenza A (H1N1) virus. Titers of cross-reactive antibody to novel influenza A (H1N1) virus did not increase after administration of seasonal influenza vaccine (2,8).

Vaccines against novel influenza A (H1N1) virus infection are being produced using methods similar to those used for seasonal influenza vaccines. Licensure of vaccines against novel influenza A (H1N1) virus will be based on the same licensure standards used for seasonal influenza vaccines, as is done routinely each year when strains are changed in the seasonal vaccine. Both live, attenuated and inactivated influenza A (H1N1) 2009 monovalent vaccine formulations will be available initially; as with seasonal influenza vaccines, neither of these vaccines will contain adjuvants. The Food and Drug Administration (FDA) and WHO have selected A/California/07/2009 (H1N1) for use as the strain for the vaccines currently being manufactured.

In previously unvaccinated persons aged <9 years, 2 doses of seasonal influenza vaccine are required to induce immunity because young children typically have had limited exposure to influenza viruses and are not immunologically primed (i.e., they do not have preexisting antibodies) (12). The lack of preexisting antibody cross-reactive with the novel influenza A (H1N1) virus among children and younger adults raises the possibility that 2 doses of vaccine (typically separated by ≥21 days) also will be needed to provide protection for persons in these age groups. Ongoing studies will provide additional information about the immune response vaccine, including which groups might need 2 doses. Updated information will be published by CDC in *MMWR* or will be available at http://www.cdc.gov/flu.

Several vaccines containing an adjuvant also are being studied but probably will not be available initially. These vaccines likely will need to be used under an Emergency Use Authorization.

Additional guidance will be provided if adjuvanted vaccines are made available.

Recommended Use of Influenza A (H1N1) 2009 Monovalent Vaccine
ACIP recommends that vaccination efforts should focus initially on persons in five target groups (See Box below) whose members are at higher risk for influenza or influenza-related complications, are likely to come in contact with influenza viruses as part of their occupation and could transmit influenza viruses to others in medical care settings, or are close contacts of infants aged <6 months (who are too young to be vaccinated). In the event that vaccine availability is unable to meet initial demand, priority should be given to a subset of the five target groups (See Box below).

Initial Target Groups
When vaccine is first available, ACIP recommends that programs and providers administer vaccine to persons in the following five target groups (order of target groups does not indicate priority):

- pregnant women,
- persons who live with or provide care for infants aged <6 months (eg, parents, siblings, and daycare providers),
- health-care and emergency medical services personnel,
- persons aged 6 months-24 years, and
- persons aged 25-64 years who have medical conditions that put them at higher risk for influenza-related complications.

These five target groups comprise an estimated 159 million persons in the United States. This estimate does not accurately account for persons who might be included in more than one category (eg, a health-care worker with a high-risk condition). Vaccination programs and providers should begin vaccination of persons in all these groups as soon as vaccine is available.

Subset of Target Groups During Limited Vaccine Availability
Current projections of initial vaccine supply indicate that establishment of a subset of the five initial target groups will not be necessary in most areas. However, demand for vaccination and initial supply might vary considerably across geographic areas. If the supply of the vaccine initially available is not adequate to meet demand for vaccination among the five target groups listed above, ACIP recommends that the following subset of the initial target groups receive priority for vaccination until vaccine availability increases (order of target groups does not indicate priority):

- pregnant women,
- persons who live with or provide care for infants aged <6 months (eg, parents, siblings, and daycare providers),
- health-care and emergency medical services personnel who have direct contact with patients or infectious material,

continued on p. 31...

Initial target groups for novel influenza A (H1N1) vaccination programs and a subset of these target groups to receive vaccine if initial vaccine availability is not sufficient to meet demand*

Initial target groups

ACIP recommends that programs and providers provide vaccine to all persons in the following five initial target groups as soon as vaccine is available (order of target groups does not indicate priority):

- pregnant women,
- persons who live with or provide care for infants aged <6 months (e.g., parents, siblings, and daycare providers),
- health-care and emergency medical services personnel,†
- children and young adults aged 6 months-24 years, and
- persons aged 25-64 years who have medical conditions that put them at higher risk for influenza-related complications.§

Subset of initial target groups

ACIP recommends that all persons in the following subset of the five initial target groups receive priority for vaccination if vaccine availability is not sufficient to meet demand (order of target groups does not indicate priority):

- pregnant women,
- persons who live with or provide care for infants aged <6 months (eg, parents, siblings, and daycare providers),
- health-care and emergency medical services personnel who have direct contact with patients or infectious material,
- children aged 6 months-4 years, and
- children and adolescents aged 5-8 years who have medical conditions that put them at higher risk for influenza-related complications.§

* Priority should be given to persons in the subset of the five target groups only if initial vaccine availability is not sufficient to meet demand for all persons in the five target groups. As vaccine availability increases, vaccination programs should be expanded to include all members of the initial target groups. Vaccination of other adult populations is recommended as vaccine availability increases.
† Health-care personnel (HCP) include all paid and unpaid persons working in health-care settings who have the potential for exposure to patients with influenza, infectious materials, including body substances, contaminated medical supplies and equipment, or contaminated environmental surfaces. HCP might include (but are not limited to) physicians, nurses, nursing assistants, therapists, technicians, emergency medical service personnel, dental personnel, pharmacists, laboratory personnel, autopsy personnel, students and trainees, contractual staff not employed by the health-care facility, and persons (e.g., clerical, dietary, housekeeping, maintenance, and volunteers) not directly involved in patient care but potentially exposed to infectious agents that can be transmitted to and from HCP. The recommendations in this report apply to HCP in acute-care hospitals, nursing homes, skilled nursing facilities, physicians' offices, urgent care centers, and outpatient clinics, and to persons who provide home health care and emergency medical services. Emergency medical services personnel might include persons in an occupation (e.g., emergency medical technicians and fire fighters) who provide emergency medical care as part of their normal job duties.
§ Medical conditions that confer a higher risk for influenza-related complications include chronic pulmonary (including asthma), cardiovascular (except hypertension), renal, hepatic, cognitive, neurologic/neuromuscular, hematologic, or metabolic disorders (including diabetes mellitus) and immunosuppression (including immunosuppression caused by medications or by human immunodeficiency virus).

continued...

Antimicrobial Susceptibilities of Selected Pathogens, 2008

On the following pages is the *Antimicrobial Susceptibilities of Selected Pathogens, 2008*, a compilation of antimicrobial susceptibilities of selected pathogens submitted to MDH during 2008 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.*

continued...

Trends, Comments, and Other Pathogens	
1 *Campylobacter* spp.	Ciprofloxacin susceptibility was determined for all isolates (n=847). Only 29% of isolates from patients returning from foreign travel were susceptible to quinolones. Most susceptibilities were determined using 2009 CLSI breakpoints for *Campylobacter*. Susceptibilities for gentamicin and azithromycin were based on an MIC ≤ 2 µg/ml.
2 *Salmonella enterica* (non-typhoidal)	Antimicrobial treatment for enteric salmonellosis generally is not recommended.
3 *Neisseria gonorrhoeae*	In 2008, 229 *Neisseria gonorrhoeae* isolates were tested for antibiotic resistance. 162 (71%) of the isolates were submitted by the Red Door Clinic in Minneapolis and 67 (29%) by Room 111 in Saint Paul. Numbers do not include samples missing susceptibility results. Resistance criteria for azithromycin have not been established; data reflect reduced susceptibility using provisional breakpoints (zone diameter < 30 mm). As of November 2008 the MDH PHL is no longer conducting routine surveillance of gonococcal susceptibilities.
4 *Neisseria meningitidis*	According to CLSI, MICs ≥ 8 µg/ml for nalidixic acid may correlate with diminished fluoroquinolone susceptibililty. In January 2008, 2 isolates from cases occurring in northwestern MN had nalidixic acid MICs > 8 µg/ml and ciprofloxacin MICs of 0.25 µg/ml indicative of resistance. Azithromycin may be used as an alternative to ciprofloxacin for chemoprophylaxis against meningococcal disease in northwestern MN (*MMWR* 2008; 57:173-5).
5 Group A *Streptococcus*	Among 6 erythromycin-resistant, clindamycin-susceptible isolates, 4 (67%) had inducible resistance to clindamycin by D-test.
6 Group B *Streptococcus*	96% (22/23) of early-onset infant, 94% (16/17) of late-onset infant, 50% (1/2) of maternal, and 85% (320/376) of other invasive GBS cases were tested. Among 65 erythromycin-resistant, clindamycin-susceptible isolates, 35 (54%) had inducible resistance to clindamycin by D-test. Overall, 64% (231/359) were susceptible to clindamycin and were D-test negative (where applicable). 72% (28/39) of infant and maternal cases were susceptible to clindamycin and were D-test negative (where applicable).
7 *Streptococcus pneumoniae*	The 659 isolates tested represented 93% of 712 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), 95% (628/659) and 95% (628/659) of isolates were susceptible to cefotaxime and ceftriaxone, respectively. By nonmeningitis breakpoints (intermediate = 4.0 µg/ml, resistant ≥ 8.0 µg/ml), 94% (622/659) of isolates were susceptible to penicillin. Isolates were screened for high-level resistance to rifampin at a single MIC; all were ≤ 2 µg/ml. 17% (110/659) of isolates were resistant to two or more antibiotic classes and 12% (79/659) 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 23 drug-resistant TB cases reported in 2008, 22 (96%) were in foreign-born persons, including 2 of 3 multidrug-resistant (MDR-TB) cases for 2008 (i.e., resistant to at least isoniazid [INH] and rifampin). There were no cases of extensively drug-resistant TB (XDR-TB) (i.e., resistance to at least INH, rifampin, any fluoroquinolone, and at least one second-line injectable drug).
Invasive methicillin-resistant *Staphylococcus aureus*	3,583 cases of MRSA infection were reported in 2008 through 12 sentinel sites, of which 303 (9%) were invasive (blood: 78%). Of these invasive cases, 73% (221/303) had an isolate submitted and antimicrobial susceptibility testing conducted. Of invasive cases with an isolate, 80% were epidemiologically classified as healthcare-associated. Susceptibilities were as follows: 100% to linezolid, quinupristin/dalfopristin, and vancomycin; 99% to daptomycin, doxycycline, minocycline, gentamicin, rifampin, trimethoprim/sulfamethoxazole; 96% to tetracycline; 95% to mupirocin; 20% to levofloxacin; 9% to erythromycin. 67% were susceptible to clindamycin by broth microdilution; however, an additional 36 isolates (16%) were positive for inducible clindamycin resistance by D-test (51% susceptible and D-test negative). For the 40 (18%) classified as community-associated (CA) cases, susceptibilities were as follows: 100% to daptomycin, doxycycline, minocycline, linezolid, quinupristin/dalfopristin, rifampin, tetracycline, trimethoprim/sulfamethoxazole, vancomycin; 98% to gentamicin; 93% to mupirocin; 43% to levofloxacin; 15% to erythromycin. 78% were susceptible to clindamycin by broth microdilution; however, an additional 3 isolates (8%) were positive for inducible clindamycin resistance by D-test (71% susceptible and D-test negative). There was 1 isolate from sentinel reporting that was nonsusceptible to daptomycin with an MIC = 2, and an additional daptomycin-nonsusceptible isolate from a non-sentinel site with an MIC = 2. In addition to sentinel reporting, MDH received reports of 3 MRSA case isolates with intermediate resistance to vancomycin (MIC 4-8 µg/ml).
Bordetella pertussis	103 *Bordetella pertussis* isolates were tested in 2008. All were susceptible to erythromycin.
Escherichia coli O157:H7	Antimicrobial treatment for *E. coli* O157:H7 infection is not recommended.

Antimicrobial Susceptibilities of Selected Pathogens, 2008

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	79	132	61	28	229	30	166	359	659	149
						% Susceptible				
ß-lactam antibiotics										
amoxicillin									93	
ampicillin		75	93	25			100	100		
penicillin					6	100	100	100	80	
cefixime					100					
cefuroxime sodium									90	
cefotaxime							100	100	91	
ceftriaxone		98	97	100	100	100			91	
meropenem						100			91	
Other antibiotics										
ciprofloxacin	77[1]	100	98	100	93	93				
levofloxacin						93	100	99	99	
azithromycin	98				97	100				
erythromycin	97						96	56	77	
clindamycin							99/97[5]	74/64[6]	91	
chloramphenicol		78	97	96		100			99	
gentamicin	89									
spectinomycin					100					
tetracycline	41				38		97		90	
trimethoprim/sulfamethoxazole		98	100	89		57			82	
vancomycin							100	100	100	
TB antibiotics										
ethambutol										98
isoniazid										89
pyrazinamide										97
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.

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

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- Ruth Lynfield, MD

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- Abinash Virk, MD

Emerging Infections from Abroad: Cases from the Newly Arrived to Minnesota
- Stephen Swanson, MD

Emerging Infections in Minnesota

Case Presentations
Moderator:
- Phil Peterson, MD

Panelists:
- David Williams, MBChB, FRCP,
- Kiran Belani, MD
- Abinash Virk, MD
- Mark Schleiss, MD
- Greg Filice, MD

(continuation of article from p. 27)

- children aged 6 months-4 years, and
- children and adolescents aged 5-18 years who have medical conditions that put them at higher risk for influenza-related complications.

This subset of the five target groups comprises approximately 42 million persons in the United States. Vaccination programs and providers should give priority to this subset of the five target groups only if vaccine availability is too limited to initiate vaccination for all persons in the five initial target groups.

Expanding Vaccination Efforts Beyond Initial Target Groups

Decisions about expanding vaccination to include additional populations beyond the five initial target groups should be made at the local level because vaccine availability and demand might vary considerably by area. Once vaccination programs and providers are meeting the demand for vaccine among the persons in the five initial target groups, vaccination should be expanded to all persons aged 25-64 years. Decisions about expanding or establishing priorities for vaccination should be made in accordance with local circumstances based on the judgment of state and local health officials and health-care providers. CDC and other public health agencies will assess the vaccine supply on a continuing basis throughout the manufacturing period. CDC and state and local health authorities will inform providers and the general public if any indication exists of a substantial delay or an inadequate supply.

Current studies indicate the risk for infection among persons aged ≥65 years is less than the risk for persons in younger age groups. Expanding vaccination recommendations to include adults aged ≥65 years is recommended only after assessment of vaccine availability and demand at the local level. Once demand for vaccine among younger age groups is being met, vaccination should be expanded to all persons aged ≥65 years. This recommendation might need to be reassessed as new epidemiologic, immunologic, or clinical trial data warrant and in the context of global need for vaccine. ACIP makes the following additional recommendations about use of influenza A (H1N1) 2009 monovalent vaccine:

- The number of doses of vaccine required for immunization against novel influenza A (H1N1) has not been established. Because vaccine availability is expected to increase over time, vaccine should not be held in reserve for patients who already have received 1 dose but might require a second dose.
- Simultaneous administration of inactivated vaccines against seasonal and novel influenza A (H1N1) viruses is permissible if different anatomic sites are used. However, simultaneous administration of live, attenuated vaccines against seasonal and novel influenza A (H1N1) virus is not recommended.
- All persons currently recommended for seasonal influenza vaccine, including those aged ≥65 years, should receive the seasonal vaccine as soon as it is available. Recommendations for use of the 2009-10 seasonal influenza vaccine have been published previously (12).

(References available at *MMWR* 2009; 58 [RR-8].)

Influenza season is here -
Increase immunization coverage of your patients and among health care providers.

Sanne Magnan, M.D. Ph.D., Commissioner of Health

Division of Infectious Disease Epidemiology, Prevention and Control

Ruth Lynfield, M.D. .....State Epidemiologist
Richard N. Danila, Ph.D., M.P.H. .....Editor/Assistant State Epidemiologist
Barbara Kizzee.....Production

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