

DISEASE CONTROL NEWSLETTER

Volume 49, Number 1 (pages 1-28)

2023

Annual Summary of Communicable Diseases Reported to the Minnesota Department of Health, 2021

Introduction

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

In Minnesota, communicable disease reporting is centralized, whereby reporting sources submit standardized reports to MDH. Cases of disease are reported pursuant to [Minnesota Rules Governing Communicable Diseases \(Minnesota Rules 4605.7000-4605.7800\)](#). The diseases listed in Table 1 must be reported to MDH. As stated in the rules, physicians, health care facilities, laboratories, veterinarians, and others are required to report these diseases. Reporting sources may designate an individual within an institution to perform routine reporting duties (e.g., an infection preventionist for a hospital).

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

Isolates of pathogens from certain diseases are required to be submitted to MDH (Table 1: [Minnesota Rules Governing Communicable Diseases \(Minnesota Rules 4605.7000-4605.7800\)](#)). The MDH Public Health Laboratory (PHL) performs microbiologic and molecular evaluation of isolates, such as pulsed-field gel electrophoresis (PFGE) and whole genome sequencing (WGS), to determine whether isolates (e.g., enteric pathogens such as *Salmonella* and *Escherichia coli* O157:H7) are related and potentially associated with a common source. Testing of submitted isolates also allows detection and monitoring of antimicrobial resistance.

Table 2 summarizes cases of selected communicable diseases reported during 2021 by district of the patient's residence. Pertinent observations for some of these diseases are presented below. Incidence rates in this report were calculated using disease-specific numerator data collected by MDH and a standardized set of denominator data derived from U.S. Census data. Disease incidence is categorized as occurring within the seven-county Twin Cities metropolitan area (metropolitan area) or outside of it in Greater Minnesota (unless otherwise indicated).

Due to the COVID-19 pandemic, data collection was eliminated or greatly delayed for some diseases.

Anaplasmosis

Anaplasmosis is a rickettsial disease caused by the bacteria *Anaplasma phagocytophilum*, which is transmitted by bites from *Ixodes scapularis*, the blacklegged tick. Although the organism that causes anaplasmosis has been known by other names and was once thought to be a part of the genus Ehrlichia, anaplasmosis and ehrlichiosis are distinct diseases caused by different rickettsial species. The same tick vector also transmits the etiologic agents of Lyme disease, babesiosis, ehrlichiosis (due to *E. muris*), and Powassan virus. In rare circumstances, *A. phagocytophilum* may be transmitted by blood transfusion.

In 2021, 603 confirmed and probable cases of anaplasmosis (10.5 cases per 100,000) were reported, up from the 407 cases reported in 2019. Although case numbers were a bit lower the last few years, the 2021 total is more in keeping with the trend we saw through the mid-2010s. A median of 613 cases per year have reported since 2010 (Figure 1). In 2021, 382 (63%) confirmed and probable cases reported were male. The median age for cases was 64 years (range, 1 to 96), 19 years older than the median age of confirmed Lyme disease cases, but close to the median age of confirmed or probable babesiosis cases (69 years). As is typical, most cases had illness onsets during the summer months, with 66% of cases reporting illness onsets in May, June, or July. This timing is consistent with exposures occurring during the typical peak season for blacklegged tick activity in Minnesota. In 2021, 173 (29%) cases were hospitalized for their anaplasmosis infection, with a median duration of 4 days (range, 1 to 44 days). Forty-seven (8%) cases reported complications (e.g., organ failure) due to anaplasmosis infection.

Table 1. Diseases Reportable to the Minnesota Department of Health

Reportable Diseases, MN Rules 4605.7000 to 4605.7900

Diseases Reportable to the Minnesota Department of Health

651-201-5414 or 1-877-676-5414 | 24 hours a day, 7 days a week | www.health.state.mn.us/diseasesreport

REPORT IMMEDIATELY BY TELEPHONE

Anthrax (*Bacillus anthracis*)¹
 Botulism (*Clostridium botulinum*)
 Brucellosis (*Brucella* spp.)¹
 Cholera (*Vibrio cholerae*)¹
 Diphtheria (*Corynebacterium diphtheriae*)¹
 Free-living amoebic infection¹
 (including at least: *Acanthamoeba* spp., *Naegleria fowleri*, *Balamuthia* spp.,
Sappinia spp.)¹
 Glanders (*Burkholderia mallei*)¹
 Hemolytic uremic syndrome¹
 Measles (rubeola)¹
 Melioidosis (*Burkholderia pseudomallei*)¹
 Meningococcal disease (*Neisseria meningitidis*) (invasive)¹²

Middle East Respiratory Syndrome (MERS)¹
 Orthopox virus¹
 Plague (*Yersinia pestis*)¹
 Potomac fever¹
 Q fever (*Coxiella burnetii*)¹
 Rabies (animal and human cases and suspected cases)¹
 Rubella and congenital rubella syndrome¹
 Severe Acute Respiratory Syndrome (SARS)¹
 Smallpox (variola)¹
 Tularemia (*Francisella tularensis*)¹
 Unusual or increased case incidence of any suspect infectious illness¹
 Viral hemorrhagic fever¹
 (including but not limited to Ebola virus disease, Lassa fever, Marburg virus)

REPORT WITHIN ONE WORKING DAY

Amebiasis (*Entamoeba histolytica/dispar*)
 Anaplasmosis (*Anaplasma phagocytophilum*)
 Arboviral disease
 (including, but not limited to, La Crosse encephalitis, eastern equine
 encephalitis, western equine encephalitis, St. Louis encephalitis, West Nile
 virus disease, Powassan virus disease, and Jamestown Canyon virus disease)
 Babesiosis (*Babesia* spp.)
 Blastomycosis (*Blastomyces dermatitidis*)
 Campylobacteriosis (*Campylobacter* spp.)¹
 Candida auris¹
 Carbapenem-resistant Enterobacteriaceae (CRE)¹
 Carbapenem-resistant Acinetobacter baumannii¹
 Cat scratch disease (infection caused by *Bartonella* species)
 Chancroid (*Haemophilus ducreyi*)
 Chikungunya virus disease
 Chlamydia trachomatis infections
 Coccioidiomycosis
 Coronavirus Disease 2019 (COVID-19/SARS-CoV-2)
 Creutzfeldt-Jakob in infants under one year of age¹
 Cryptosporidiosis (*Cryptosporidium* spp.)¹
 Cyclosporiasis (*Cyclospora* spp.)¹
 Dengue virus infection
 Diphtheria/tetanus/diphtheria infection
 Ehrlichiosis (*Ehrlichia* spp.)
 Encephalitis (caused by viral agents)¹
 Enteric *Escherichia coli* infection¹
 (E. coli O157:H7, other Shiga toxin-producing E. coli, enterohemorrhagic
 E. coli, enteropathogenic E. coli, enterotoxigenic E. coli, enterocytotoxic
 E. coli, enterotoxigenic E. coli, or other pathogenic E. coli)
 Giardiasis (*Giardia lamblia*)
 Gonorrhea (*Neisseria gonorrhoeae* infection)
 Haemophilus influenzae disease (all invasive diseases)¹
 Herpesvirus infection
 hepatitis (all primary viral types including A, B, C, D, and E)¹
 Histoplasmosis (*Histoplasma capsulatum*)
 Human immunodeficiency virus (HIV) infection,
 including Acquired Immunodeficiency Syndrome (AIDS)¹
 Influenza¹
 (unusual case incidence, critical illness, or laboratory-confirmed cases)
 Kawasaki disease
 Leptospirosis (invasive only)¹
 Legionellosis (*Legionella* spp.)¹
 Leprosy (Hansen's disease) (*Mycobacterium leprae*)

Leptospirosis (*Leptospira interrogans*)
 Listeriosis (*Listeria monocytogenes*)¹
 Lyme disease (*Borrelia burgdorferi*, and other *Borrelia* spp.)
 Malaria (*Plasmodium* spp.)
 Meningitis (caused by viral agents)
 Mumps¹
 Neonatal sepsis¹
 (bacteria isolated from a sterile site, excluding coagulase-negative
 Staphylococcus less than seven days after birth)
 Pertussis (*Bordetella pertussis*)¹
 Plague (*Yersinia pestis*)
 Rotavirus infections
 Salmonellosis, including typhoid (*Salmonella* spp.)¹
 Shigellosis (*Shigella* spp.)¹
 Spotted fever (tickborne)
 (Rickettsia spp. infections, including Rocky Mountain spotted fever)
 Staphylococcus aureus¹
 (only vancomycin-intermediate Staphylococcus aureus (VISA), vancomycin-
 resistant Staphylococcus aureus (VRSA), and death or critical illness due to
 community-associated Staphylococcus aureus in a previously healthy individual)
 Streptococcal disease - invasive disease caused by Group A and B streptococci
 and *S. pneumoniae*¹
 Streptococcal disease - non-invasive *S. pneumoniae*
 (urine antigen laboratory-confirmed pneumonia)
 Syphilis (*Treponema pallidum*)¹
 Tetanus (*Clostridium tetani*)
 Toxic shock syndrome¹
 Trachyonychia (*Trachonychia parvif*)
 Transmissible spongiform encephalopathy
 Trichinosis (*Trichinella spiralis*)
 Tuberculosis (*Mycobacterium tuberculosis* complex)¹
 (pulmonary or extrapulmonary sites of disease, including clinically diagnosed
 disease). Latent tuberculosis infection is not reportable.
 Typhus (*Rickettsia* spp.)
 Unexplained deaths and unexplained critical illness
 (possibly due to infectious cause)¹
 Varicella (chickenpox)¹
 Yersinia spp.¹
 Yellow fever
 Yersiniosis (enteric Yersinia spp. regardless of specimen source)¹
 Zika virus disease¹
 Zoster (shingles)¹
 (all cases <18 years old; unusual case incidence/complications regardless of age)

SENTINEL SURVEILLANCE

Diseases reportable through sentinel surveillance are reportable based on the residence of the patient or the specific health care facility. Sentinel surveillance is not statewide reporting.

Candidiasis (all invasive diseases)¹
 Carbapenem-resistant Pseudomonas aeruginosa (CR-PA)¹
 Clostridium difficile¹
 Enteric *Escherichia coli* (all invasive diseases)¹
 Staphylococcus aureus (all invasive diseases)¹
 Respiratory syncytial virus (RSV)
 Non-tuberculous Mycobacteria (NTM), pulmonary and extrapulmonary

FOOTNOTES

- ¹ Submission of clinical material required. Submit isolate or, if an isolate is not available, submit material containing the infectious agent in the following order of preference: a patient specimen, nucleic acid, or other laboratory material. More information is available at www.health.state.mn.us/diseasesreport.
- ² Invasive disease only; isolated from a normally sterile site, e.g., blood, CSF, joint fluid, etc. In the event of a nosocomial or another severe respiratory outbreak, also report cases of health care workers hospitalized for pneumonia or acute respiratory distress syndrome.
- ³ Also reports pregnancy in a person with AIDS; or a person chronically infected with hepatitis B, HIV, or syphilis.
- ⁴ Reportable under the Minnesota Communicable Disease Rules, Chapter 4605.7000 (see diseases and syndromes).

TO REPORT

For immediate reporting call: 651-201-5414 or 1-877-676-5414.
 Report forms can be downloaded at www.health.state.mn.us/diseasesreport



4/2023

Table 2. Cases of Selected Communicable Diseases Reported to the Minnesota Department of Health by District of Residence, 2021

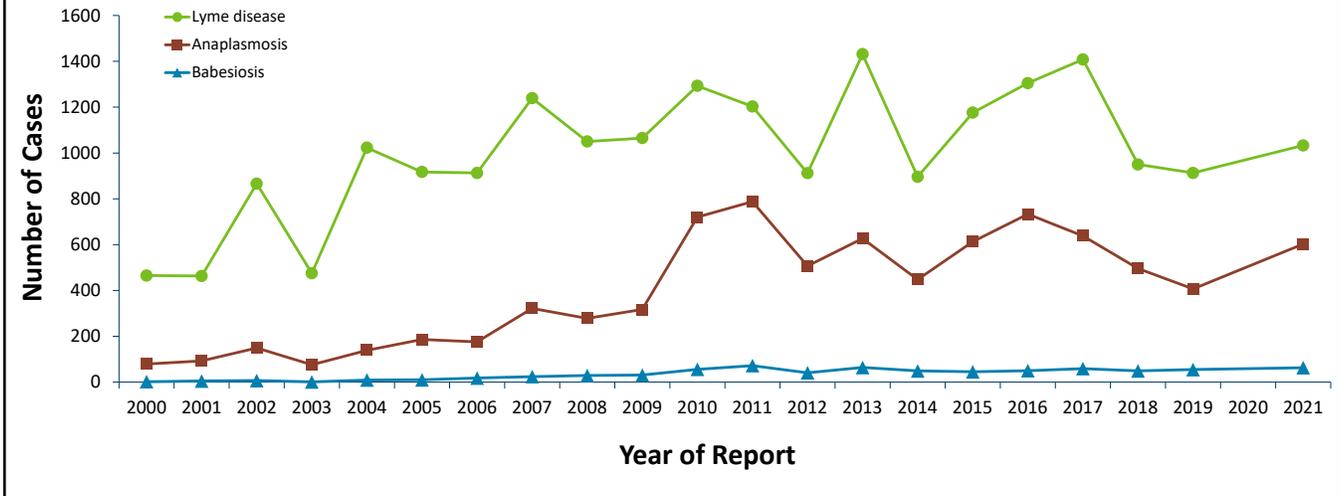
Disease	District (population per U.S. Census 2020 estimates)									
	Total	Metropolitan (3,130,769)	Central (779,498)	Southwestern (214,402)	South Central (292,503)	Southeastern (512,691)	West Central (244,473)	Northwestern (159,468)	Northeastern (323,538)	Unknown Residence
Anaplasmosis	603	144	140	1	9	52	45	97	115	0
Babesiosis	63	13	14	0	2	9	5	10	10	0
Blastomycosis	82	25	12	1	3	14	1	8	18	0
Botulism (Infant)	1	1	0	0	0	0	0	0	0	0
Bruceellosis	19	18	0	0	0	0	1	0	0	0
Campylobacteriosis	1192	570	182	100	89	161	38	19	33	0
Cryptosporidiosis	373	86	53	33	51	88	40	7	15	0
Cyclosporiasis	66	21	3	15	4	11	4	0	8	0
<i>Escherichia coli</i> O157 infection	69	32	7	1	4	0	7	8	10	0
Hemolytic uremic syndrome	11	3	3	1	0	3	1	0	0	0
Giardiasis	388	184	36	28	28	27	21	9	55	0
<i>Haemophilus influenzae</i> disease	56	21	10	4	6	2	7	3	3	0
Histoplasmosis	190	84	21	14	23	19	21	3	5	0
HIV (non-AIDS)	245	184	25	7	3	10	8	2	6	0
AIDS (diagnosed in 2020)	81	64	6	2	0	7	0	0	2	0
Legionnaires' disease	130	79	9	6	10	13	1	1	11	0
Listeriosis	12	9	1	0	0	0	1	0	1	0
Lyme disease	1033	458	232	9	14	113	33	44	130	0
Measles (rubeola)	0	0	0	0	0	0	0	0	0	0
Mumps	0	0	0	0	0	0	0	0	0	0
Pertussis	29	20	2	1	0	1	1	0	4	0
Q Fever (acute)	5	1	2	0	0	1	1	0	0	0
Q Fever (chronic)	1	0	0	0	1	0	0	0	0	0
Salmonellosis	853	448	118	63	54	64	41	25	39	1
Sexually transmitted diseases	33709	22910	3196	741	973	1994	1143	681	1579	465
<i>Chlamydia trachomatis</i> - genital infections	22578	14729	2329	585	758	1495	810	455	1075	315
Gonorrhea	9671	7141	749	143	176	453	291	143	425	150
Syphilis, total	1460	1040	118	13	39	46	42	83	79	0
Primary/Secondary	565	419	40	2	12	15	16	22	39	0
Early non-Primary non-Secondary*	415	303	30	1	7	13	10	33	18	0
Unknown Duration or Late**	466	309	48	10	20	18	15	24	22	0
Congenital	14	9	0	0	0	0	1	4	0	0
Other***	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Shigellosis	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Streptococcal invasive disease - Group A	214	118	24	2	1	16	15	16	22	0
Streptococcal invasive disease - Group B	584	293	97	16	36	54	29	16	43	0
<i>Streptococcus pneumoniae</i> disease	309	138	58	15	21	22	16	10	29	0
Toxoplasmosis	7	5	0	0	0	2	0	0	0	0
Tuberculosis	134	102	8	9	4	6	2	2	1	0
Tularemia	1	0	0	0	0	0	0	1	0	0
Varicella	169	97	22	5	11	9	14	1	10	0
Viral hepatitis A	12	10	1	1	0	0	0	0	0	0
Viral hepatitis B (acute infections only)	10	6	0	0	1	2	1	0	0	0
Viral hepatitis C (acute infections only)	66	50	3	1	0	1	5	3	3	0
West Nile virus disease	36	28	1	1	2	0	2	2	0	0

* 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
 Central - Benton, Cass, Chisago, Crow Wing, Isanti, Kanabec, Mille Lacs, Morrison, Pine, Sherburne, Stearns, Todd, Wadena, Wright
 Southwestern - Big Stone, Chippewa, Cottonwood, Jackson, Kandiyohi, Lac Qui Parle, Lincoln, Lyon, Murray, Nobles, Pipestone, Redwood, Renville, Rock, Swift, Yellow
 Medicine
 South Central - Blue Earth, Brown, Faribault, Le Sueur, McLeod, Martin, Meeker, Nicollet, Sibley, Waseca, Watonwan
 Southeastern - Dodge, Fillmore, Freeborn, Goodhue, Houston, Mower, Olmsted, Rice, Steele, Wabasha, Winona
 West Central - Becker, Clay, Douglas, Grant, Mahanomen, Norman, Otter Tail, Pope, Stevens, Traversa, Wilkin
 Northwestern - Beltrami, Clearwater, Hubbard, Kittson, Lake of the Woods, Marshall, Pennington, Polk, Red Lake, Roseau
 Northeastern - Aitkin, Carlton, Cook, Itasca, Koochiching, Lake, St. Louis

Figure 1. Reported *I. scapularis*-borne Disease Cases in Minnesota by Year of Report



Arboviral Diseases

Endemic Mosquitoborne Arboviral Diseases

Historically, the primary arboviral encephalitides found in Minnesota have been La Crosse encephalitis, Western equine encephalitis (WEE), and West Nile virus (WNV) encephalitis, but in recent years other viruses like Jamestown Canyon have emerged as significant causes of disease. While WNV and WEE are maintained in mosquito-to-bird transmission cycles involving several different species of each, La Crosse and Jamestown Canyon viruses use mammals instead of birds as part of their transmission cycles. WNV is established throughout Minnesota, and will probably be present in the state to some extent every year, whereas human cases of other diseases may occur more sporadically. Interpreting the effect of weather on arboviral transmission is complex, making it difficult to predict the number of people who will become infected in any given year.

In 2021, Minnesota reported 36 WNV disease cases and 19 asymptomatic blood donors. Of the reported cases, 27 (75%) had neuroinvasive presentations including encephalitis or meningitis, while the remaining nine had West Nile fever. None of the cases died. Fifty percent (18) of the cases were male, and the median age of all cases was 62 years old (range, 10 to 82). Thirty (83%) cases were hospitalized, with a median stay of 9 days (range, 2 to 40). The majority of cases, 92%, reported symptom onset in August or September. Although cases are reported from

across Minnesota, risks for human WNV infection continue to be higher in central and western Minnesota where the primary mosquito vector, *Culex tarsalis*, is most abundant.

In 2021, there were no reported cases of La Crosse encephalitis in Minnesota, which is consistent with the trend of fewer cases in the last few years. The disease, which primarily affects children, is transmitted through the bite of infected *Aedes triseriatus* (Eastern Tree Hole) mosquitoes and is maintained in a cycle that includes mosquitoes and small mammals. Exposure to infected mosquitoes typically occurs in wooded or shaded areas inhabited by this species, especially in areas where water-holding containers (e.g., waste tires, buckets, or cans) that provide breeding habitats are abundant. Since 1985, 145 cases have been reported from 22 Minnesota counties, primarily in the southeastern part of the state. Many people who are infected have no apparent symptoms, but severe disease is more common in children. Most people report an illness onset during the typical arboviral season from mid-July through mid-September.

In 2021, six cases of Jamestown Canyon virus disease, a California group virus related to La Crosse, were reported. The virus is transmitted by *Aedes* mosquitoes, and the maintenance cycle in nature is thought to include deer and other large mammals. Much remains unknown about the clinical spectrum of Jamestown Canyon virus, but the typical presentation includes fever, and in more severe cases, meningitis or encephalitis. The virus is likely

widespread in Minnesota. Cases were aged 34 to 74 years, with a median of 42 years, and all but one of the cases were male. Four cases (67%) presented with neuroinvasive disease, including meningitis and encephalitis, and three of the cases were residents of counties in northeastern Minnesota. Due to the mosquito vectors involved in the transmission cycle for this virus, disease onsets can occur from late spring through the early part of the fall.

Endemic Tickborne Arboviral Disease

Powassan virus (POW) is a tickborne flavivirus that includes a strain (lineage II or “deer tick virus”) that is transmitted by *Ixodes scapularis*. Based on findings from routine tick surveillance activities, the virus appears to be widely distributed in the same wooded parts of the state that are endemic to other pathogens transmitted by the blacklegged tick. The virus can cause encephalitis or meningitis, and long-term sequelae occur in approximately half of those patients. Approximately 10-15% of cases are fatal. Since the first case in 2008, there have been cases every year except for 2014 and 2015, with a peak of 11 cases in 2011 (range, 1 to 11). Five cases of POW were reported in 2021. All five cases were male in 2021, and ages ranged from 44 to 75 years. All the cases in 2021 had disease that progressed to severe illness with meningitis or encephalitis, and two cases died. Similar to other tickborne diseases, the majority of patients report being exposed to ticks in north central Minnesota. Interestingly, four of the cases experienced illness onset in October, with the other patient first experiencing symptoms in June.

Babesiosis

Babesiosis is a malaria-like illness caused by a protozoan parasite, typically *Babesia microti*, which infects red blood cells. *B. microti* is transmitted to humans by bites from *Ixodes scapularis* (the blacklegged tick), the same vector that transmits the agents of Lyme disease, anaplasmosis, one form of ehrlichiosis, and a strain of Powassan virus. *Babesia* parasites can also be transmitted by blood transfusion. Although most people infected with *Babesia* have asymptomatic infections, people with weak immune systems, other co-morbidities, and the elderly can become seriously ill.

In 2021, there were 63 confirmed and probable cases reported (1.1 cases per 100,000), a slight increase from the 55 cases in 2019. Over the past decade, slight annual fluctuations in reported cases have been observed,

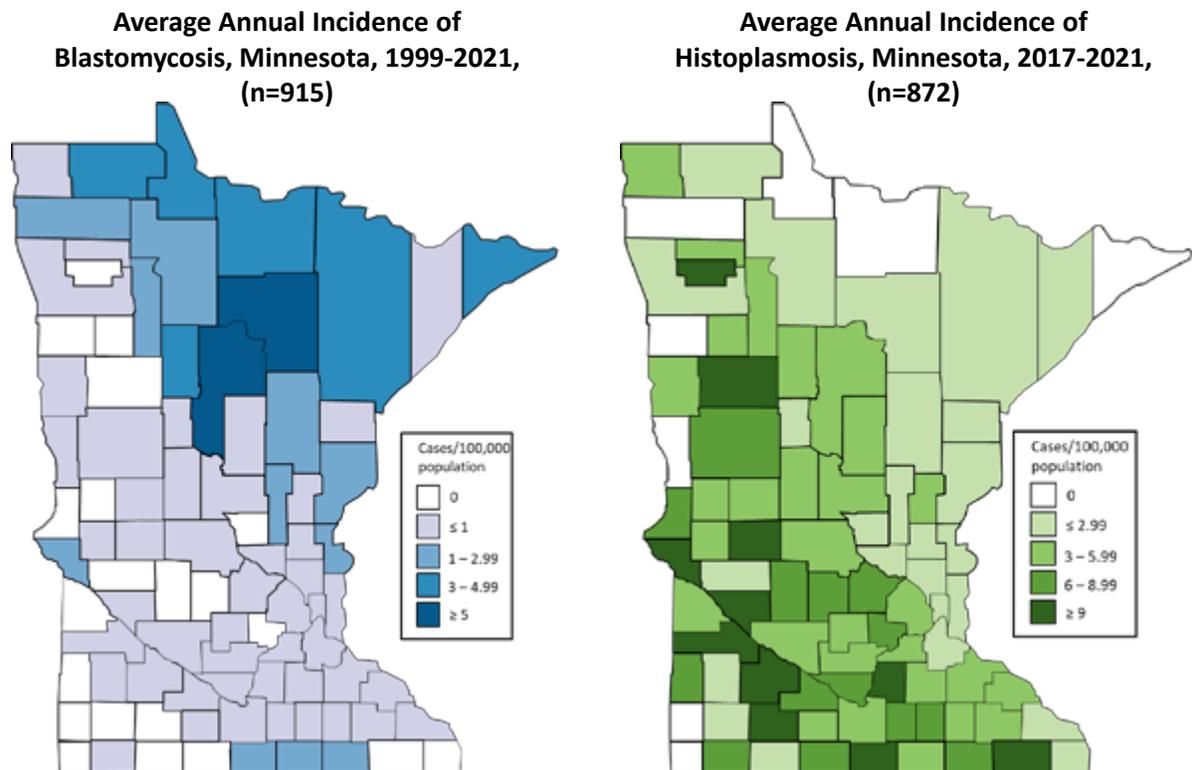
however, reported case numbers continue to trend upward (range, 41 to 72) and are consistently higher than annual cases reported in the previous decade, 2000-2010 (range, 1 to 56) (Figure 1). In recent years, case demographics were similar. In 2021, 37 (59%) of the cases occurred in males. The median case age was 69 years (range, 2 to 92), up slightly from 67 in 2019, and older than the median ages for both anaplasmosis (64 years) and Lyme disease (45 years). Illness onset dates peaked in the summer months: 44 (80%) of the 55 cases with known onset date reported first experiencing symptoms in June, July, or August. Twenty (32%) cases were hospitalized due to their infection in 2021 with a median admission duration of 6 days (range, 2 to 18). Seven patients reported severe complications (e.g., organ failure), and one patient with complications died as a result of their babesiosis infection.

Blastomycosis

Blastomycosis is an infection caused by a fungus called *Blastomyces*. In 2021, 82 blastomycosis cases were reported. This continues an increase in cases reported in the past 5 years, with a median of 79 cases/year from 2017 to 2021 compared to a median of 33 cases/year for the prior 18 years.

The median age of blastomycosis cases in 2021 was 56.5 years (range, 8 to 89 years), and 51 (62%) were male. In 2021, cases were more likely to be older and female than in previous years. Of the 77 cases for whom race and ethnicity was reported, 63 (82%) cases were white, 6 (8%) were American Indian/Alaska Native, 5 (7%) were Asian, 1 (1%) was Black/African American, and 2 were of another race. One case (1%) was Hispanic.

Figure 2. Comparison of Average Annual Incidence of Endemic Fungal Diseases in Minnesota



Note the difference in geographical distribution of Minnesota's endemic fungal diseases, blastomycosis and histoplasmosis. Blastomycosis occurs more frequently in northern and northeastern counties, and histoplasmosis occurs more often in western and southern counties. While clinicians should test for both diseases when clinical illness is consistent with a fungal infection, these maps may trigger questions about travel or otherwise help assess risk.

When hospitalization status was known, 54 of 80 (68%) cases were hospitalized, for a median of 8 days (range, 1 to 54 days). Nineteen (23%) cases died, which is a significantly higher case fatality rate (CFR) than the 10% mean CFR during 1999-2020. Blastomycosis was the listed cause of death for 12 cases, 3 cases had other causes of death listed, and the cause of death was unknown for 4 cases. When it was possible to identify the body system infected by *Blastomyces*, 51 (64%) cases had a pulmonary-only infection, 22 (27%) had a disseminated infection, and 7 (9%) had an extra-pulmonary infection.

There were two blastomycosis outbreaks identified in 2021. One case was part of an ongoing outbreak associated with a family cabin property in Pine County. This outbreak began in 2019 and resulted in 4 cases through 2021. A second outbreak-related case was exposed at a dam worksite in Wisconsin; the other case in that outbreak was a Wisconsin resident.

From 1999 to 2021, 916 cases of blastomycosis in Minnesota residents were reported. Exposure information is available for 662 cases. The largest number, 138 (21%), were likely exposed in St. Louis County. Eighty (12%) cases were likely exposed in Itasca County, 61 (9%) in Cass County, 24 (4%) in Hennepin County, and 20 (3%) in Beltrami County. Seventy-six cases (11%) were exposed in Wisconsin.

In 2021, the statewide incidence was 1.4 cases/100,000 population, compared to a 1999-2020 median annual incidence of 0.63 cases/100,000. A map of average annual incidence of blastomycosis from 1999 to 2021 clearly shows the highly endemic regions, which include the northern and northeastern counties of Minnesota (Figure 2). This is in contrast to the other endemic fungal disease found in Minnesota, histoplasmosis, which has higher incidence levels in southern and western counties. While clinicians should test for both diseases when clinical illness is consistent with a fungal infection, these maps may help assess differential risk in various regions of the state.

Botulism

Botulinum toxin, a neurotoxin, is produced by the spore-forming bacteria *Clostridium botulinum* and other related *Clostridium* species. There are 8 distinct toxin types: A, B, C, D, E, F, G, and H. Toxin types A, B, E, F, and H can cause human intoxication. Botulism is characterized by a descending, bilateral paralysis that can be fatal without treatment. Botulism spores are ubiquitous in the environment and cause three main forms of intoxication: foodborne, wound, and intestinal toxemia, which includes infant botulism and intestinal toxemia. Infant botulism, which is the most common form in the United States, results from the ingestion of *C. botulinum* spores that germinate into vegetative bacteria that colonize the intestinal tract, producing toxin that is absorbed into the circulation.

In 2021, one infant botulism and one intestinal toxemia botulism case were reported. The infant botulism case occurred in a 21-week-old male. He received botulism immune globulin (BabyBIG) and recovered. The disease was caused by toxin type B. The intestinal colonization case occurred in a 10-year-old female with a medical history including short bowel syndrome, G-tube dependence, and D-lactic acidosis. Despite receiving heptavalent botulism antitoxin, she succumbed to the disease. Her illness was caused by toxin type A.

From 2001 to 2021, 16 cases of infant botulism, 2 cases of foodborne botulism, 2 cases of intestinal toxemia botulism, and 1 case of possible iatrogenic botulism were identified among Minnesota residents. The median age of affected infants was 21 weeks (range, 5 to 41 weeks). Twelve (75%) infant botulism cases were caused by botulinum toxin type B and 4 (25%) by toxin type A. Thirteen infants were known to be hospitalized, for a median of 15 days (range, 8 to 30 days); one infant did not require hospitalization. The 2 foodborne cases, caused by toxin type A occurred in 2009 in two men who consumed home-canned asparagus. Both cases were hospitalized, for 6 and 16 days. No deaths occurred among the infant or foodborne botulism cases.

Brucellosis

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

In 2021, 19 confirmed cases were reported. Eleven of these cases were part of an outbreak of brucellosis linked to unpasteurized queso fresco, a homemade soft cheese, likely made with goat milk, imported from Mexico by a private seller and distributed in the Twin Cities. The eleven cases tested positive for *Brucella melitensis* and *B. melitensis* was isolated from a sample of the cheese. The median age of outbreak cases was 44 years (range, 16-52 years), 7 (64%) were male, and all were Hispanic. Ten (91%) cases were hospitalized for a median of 7 days (range, 1-13 days). Some cases experienced severe complications, including endocarditis (n=3), sepsis (n=2), splenomegaly (n=1), and hepatitis (n=1).

Of the eight sporadic cases, four were exposed in Somalia, one in Ethiopia, one in Russia, and one who ate boar meat from Oklahoma. One case had an unknown exposure location. The median age of sporadic cases was 44 (range, 14-76); 5(63%) were female. Complications of brucellosis among sporadic cases included three (38%) cases who experienced osteomyelitis and three (38%) with sepsis. All 2021 brucellosis cases survived their infection.

From 2007 to 2021, 46 confirmed cases were reported. Thirty likely acquired their infection outside the United States, and 16 were domestically acquired. The median number of cases reported annually was 2 (range, 0 to 19). Thirty-six were infected with *B. melitensis*, seven with *B. suis*, two with *B.*

abortus, and one with an unidentified *Brucella* species diagnosed by serology only. The median age of cases was 47 years (range, 3 to 86). Twenty of the 42 cases for which race was known were black, 18 were white (of which 11 identified as Hispanic), and four were Asian/Pacific Islander.

Campylobacteriosis

During 2021, 1,562 *Campylobacter* cases were reported. Of those, 1,192 were culture-confirmed, and 370 were only tested by a culture-independent diagnostic test (CIDT) and not subsequently culture-confirmed. The rate of culture-confirmed *Campylobacter* cases reported in 2021 was 20.9 per 100,000 population. The 1,192 culture-confirmed *Campylobacter* cases represent a 50% increase from the 793 cases reported in 2020, and a 22% increase from the annual median of 975 cases reported from 2011 to 2020 (range, 793 to 1,238). In 2021, 48% of cases occurred in people who resided in the metropolitan area. Of the 1,104 *Campylobacter* isolates confirmed and identified to species by MDH, 85% were *C. jejuni* and 9% were *C. coli*.

The median age of culture-confirmed cases was 41 years (range, 2 months

to 99 years). Thirty-eight percent were between 20 and 49 years of age, and 11% were ≤5 years of age. Fifty-four percent were male. Seventeen percent were hospitalized; the median length of hospitalization was 3 days. Two (0.2%) cases died. Forty-nine percent of infections occurred during June through September. Of the 982 cases for whom data were available, 62 (6%) reported travel outside the United States during the week prior to illness onset. The most common travel destination was Mexico (n=21).

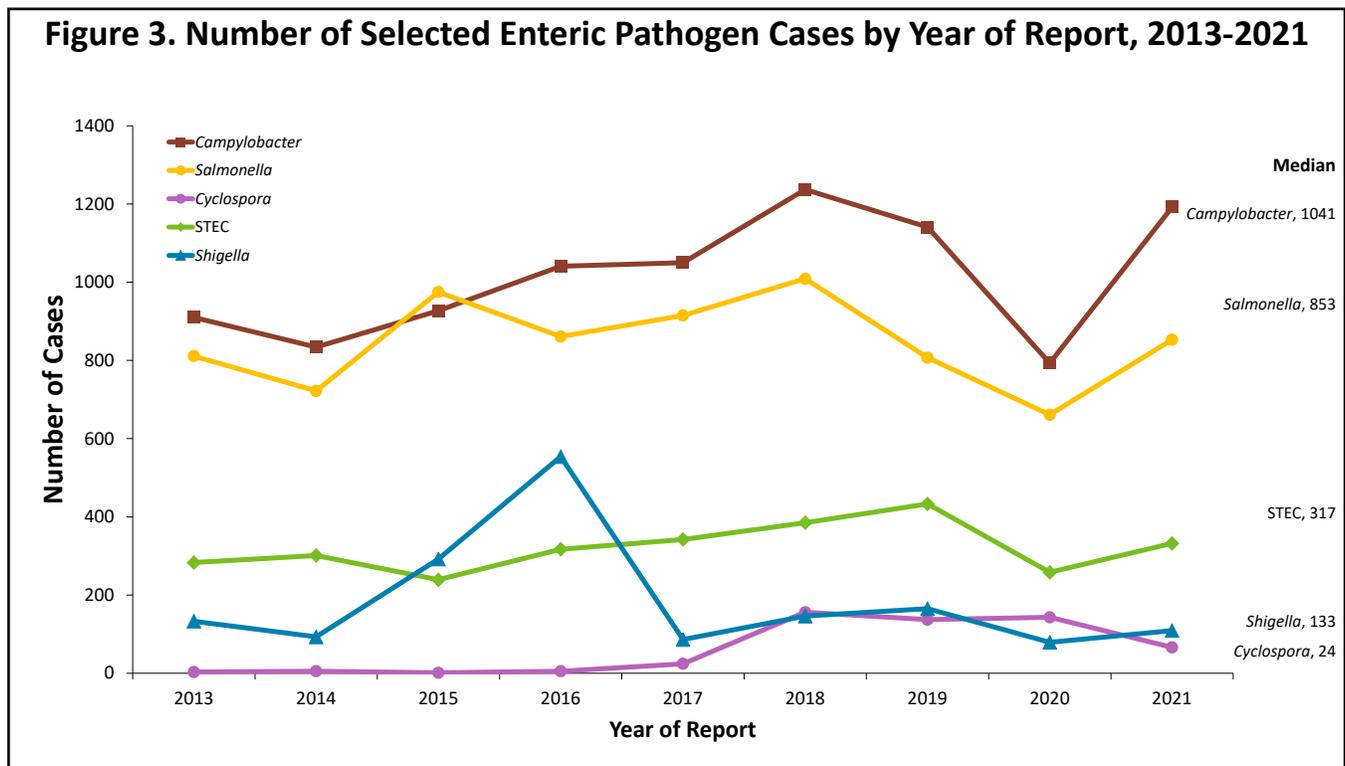
In 2009, a CIDT became commercially available for the qualitative detection of *Campylobacter* antigens in stool. In 2021, 40 patients were positive for *Campylobacter* by an antigen detection CIDT conducted in a clinical laboratory. However, only 19 (48%) of the specimens were subsequently culture-confirmed. Beginning in 2015, some clinical laboratories in Minnesota began testing stool specimens with PCR-based gastrointestinal pathogen panels, another type of CIDT. In 2021, 1,353 patients were positive for *Campylobacter* by a PCR gastrointestinal panel; 1,005 (74%) of these specimens were culture-confirmed. The median age of the CIDT-positive only cases was 49 years (range, 1 month to 93 years). Sixty-eight (18%) cases were hospitalized;

the median hospital stay was 3 days (range, 1 to 123 days). No CIDT-only cases died.

Four outbreaks of *Campylobacter* infections were identified in 2021. Nineteen cases were associated with poultry contact at a farm and garden center, 13 cases were associated with person-to-person transmission among men who have sex with men (MSM) contact, two cases were associated with chicken liver yakitori at a restaurant, and two cases were associated with multiple food items at a restaurant.

A primary feature of public health importance among *Campylobacter* cases was the continued presence of *Campylobacter* isolates resistant to fluoroquinolone antibiotics (e.g., ciprofloxacin), which are commonly used to treat campylobacteriosis. In 2021, the overall proportion of ciprofloxacin resistance among *Campylobacter* isolates tested was 26%. However, historically, 80-90% 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 as compared to approximately 20% of *Campylobacter* isolates from patients who acquired their infection domestically.

Figure 3. Number of Selected Enteric Pathogen Cases by Year of Report, 2013-2021



Candidemia

In 2017, surveillance began for candidemia among residents of the metropolitan area. Candidemia is a bloodstream infection caused by the *Candida* fungal species and is one of the most common types of healthcare-associated bloodstream infections in the United States. Risk factors include prolonged hospitalization in an intensive care unit, having a central venous catheter, a weakened immune system, recent surgery (especially abdominal surgery), recently receipt of antibiotics, total parenteral nutrition, kidney failure, hemodialysis, and diabetes.

In 2021, 160 cases were reported among residents of the metropolitan area. The overall incidence rate was 5.2 per 100,000, and the highest county-level incidence was in Ramsey County (7.0 per 100,000). The median age was 59 years (range, newborn to 97 years). Seventy-seven cases (48%) were male; 108 (69%) were white, 27 (17%) were black, 11 (7%) were Asian/Pacific Islander, and race was unknown for 8 cases.

Of the 160 cases, 99% were hospitalized at time of diagnosis, and 45 (29%) died while hospitalized. Underlying conditions included malignancy (29%), chronic lung condition (28%), diabetes (39%), renal disease (28%), neurologic condition (36%), skin condition (16%), and chronic liver disease (11%). Healthcare risk factors included receiving systemic antibiotics in the 14 days prior to diagnosis (83%); presence of a central venous catheter in the 2 days prior to diagnosis (67%); being admitted to the ICU within 14 days prior to or 14 days after diagnosis (50%); and having surgery in the 90 days before diagnosis (23%).

More than 17 different *Candida* species are known to be agents of human infection; however, the two most common species comprised over 50% of candidemia infections. Of the 160 cases, 38% were *C. albicans*, 37% *C. glabrata*, 10% *C. parapsilosis*, 3% *C. tropicalis*, 3% *C. dubliniensis*, 1% *C. kefyr*, 1% *C. krusei*, and 3% with other species including *C. nivariensis*, *C. guilliermondii*, and *C. lusitanae*. Six cases (4%) were co-infected with multiple species of *Candida* at the time of incident specimen collection.

As primarily a healthcare-associated infection, injection drug use (IDU) has not been considered a common risk factor for candidemia. However, with the increasing opioid epidemic, IDU has been reported as an increasingly common condition associated with candidemia. In 2017, only 2/143 (1.4%) cases had IDU documented in their medical chart. However, in 2018, 15 (11%) cases, in 2019, 16 (10%) cases, in 2020, 13 (7%) cases, and in 2021, 14 (9%) cases had IDU documented in their medical chart. MDH began collecting additional information regarding IDU in 2019 to monitor the changing trends in IDU and candidemia epidemiology.

Carbapenem-resistant *Enterobacteriaceae* (CRE), *Acinetobacter baumannii* (CRAB), and *Pseudomonas aeruginosa* (CRPA)

Carbapenem-resistant *Enterobacteriales* (CRE), *Acinetobacter baumannii* (CRAB), and *Pseudomonas aeruginosa* (CRPA) are gram-negative bacilli that most commonly occur among patients with significant healthcare exposures, co-morbid conditions, invasive devices, and those who have received extended courses of antibiotics. Invasive infections caused by CRE, such as carbapenem-resistant *Klebsiella pneumoniae*, are associated with higher morbidity and mortality than those caused by carbapenem-susceptible *Enterobacteriales*. CRAB is increasingly recognized as one of the leading causes of healthcare-associated infections worldwide and is associated with high mortality rates and unfavorable clinical outcomes. Invasive infections caused by CRPA are associated with higher morbidity and mortality than those caused by carbapenem-susceptible *P. aeruginosa*.

Carbapenem resistance can be acquired through a variety of mechanisms including transmissible genetic elements. Some CRE, CRAB, and CRPA carry resistance genes that produce enzymes called carbapenemases. Certain carbapenemases (e.g., *K. pneumoniae* carbapenemase [KPC]) can easily spread between bacteria of similar species. KPC is the predominant carbapenemase

in the United States while other carbapenemases (e.g., New Delhi metallo- β -lactamase [NDM], Verona integron-encoded metallo- β -lactamase [VIM], and oxacillinase-48 [OXA-48]) are more frequently identified in other countries. Resistance can also be acquired through the production of a β -lactamase effective against third generation cephalosporins (e.g., AmpC β -lactamases or extended-spectrum β -lactamases [ESBLs]) when combined with porin mutations that prevent carbapenem antibiotics from entering the cell.

MDH first identified a KPC-producing CRE in February 2009, and began voluntary reporting, including isolate submission, for all *Enterobacteriales* and *A. baumannii* resistant to imipenem, meropenem, doripenem, or ertapenem using current Clinical and Laboratory Standards Institute (CLSI) breakpoints (ertapenem excluded for *A. baumannii* isolates). In 2012, MDH used standardized CRE and CRAB definitions developed by the Emerging Infections Program (EIP) Multi-site Gram-negative Surveillance Initiative (MuGSI) and initiated active laboratory- and population-based surveillance in Hennepin and Ramsey Counties. As a subset of statewide reporting, MuGSI surveillance includes all isolates from normally sterile sites or urine of the three most common types of CRE (*Escherichia coli*, *Enterobacter* spp., or *Klebsiella* spp.) and *A. baumannii*. A MuGSI incident case is defined as the first eligible isolate of each species collected from a Hennepin or Ramsey County resident in 30 days.

In 2016, MDH initiated statewide CRE surveillance for *E. coli*, *Enterobacter* spp., *Klebsiella* spp., and *Citrobacter* spp.; MDH also tracks other *Enterobacteriales* including, but not limited to, *Morganella* spp., *Proteus* spp., and *Providencia* spp. The MDH Public Health Laboratory (PHL) tests all CRE isolates for carbapenemase production using a phenotypic assay (modified carbapenem inactivation method [mCIM] or CarbaNP) and conducts PCR on isolates with a positive phenotypic test for KPC, NDM, OXA-48-like, VIM, and IMP genes. All CRAB isolates are tested by PCR for KPC, NDM, OXA-48, VIM, and IMP genes, along with *Acinetobacter*-specific OXA genes (OXA-23, OXA-24, and OXA-58).

In 2017, the Centers for Disease Control and Prevention (CDC) released *Interim Guidance for a Public Health Response to Contain Novel or Targeted Multidrug-resistant Organisms (MDROs)* for state and local public health departments responding to cases of novel or targeted MDROs, including carbapenemase-producing organisms (CPO). Novel or targeted MDROs are epidemiologically important because these organisms cause severe, difficult-to-treat infections and have the potential to spread within healthcare settings. MDH utilizes the Containment Strategy in response to all single cases of carbapenemase-producing CRE, CRAB, and CRPA in Minnesota. This rapid and comprehensive action includes prompt identification of the organism, notification and investigation with healthcare facilities, and response or “containing the spread” to slow the spread of novel or targeted MDROs in Minnesota.

In 2021, 479 CRE incident cases representing 439 patients were identified from clinical cultures among Minnesota residents; median age was 73 years (range, <1 to 99) and 265 (60%) identified as female. The most common organism for incident cases was *Enterobacter* spp. (183) followed by *Klebsiella* spp. (98) and *E. coli* (94). Other CRE organisms included *Serratia* spp. (30), *Proteus* spp. (26), *Citrobacter* spp. (24), *Providencia* spp. (16), *Morganella* spp. (2), and other *Enterobacteriales* (6). Among 479 incident cases, there were 127 CRE MuGSI incident cases (representing 112 patients) reported among residents of Hennepin and Ramsey Counties. Fifty-eight (46%) isolates were *Enterobacter* spp., 40 (31%) were *E. coli*, and 29 (23%) were *Klebsiella* spp. with 12 isolates demonstrating carbapenemase production (five NDM, five OXA-48-like, and two KPC). CRE MuGSI incident cases were most frequently isolated from urine (117) followed by blood (7) and other sterile sites (3).

Among 479 CRE incident cases, 43 (9%) were carbapenemase-producing organisms. Twenty cases (from 18 patients) were KPC positive (*E. cloacae* [7], *K. pneumoniae* [7], *K. oxytoca* [4], *C. freundii* [1], and *Hafnia alvei* [1]), nine cases (from 5 patients) were NDM positive (*E. coli* [8] and *P. mirabilis* [1]), nine cases (from 8 patients) were IMP positive (*P. rettgeri* [6], *P. mirabilis* [1], *M. morgani* [1], and *E. cloacae* [1]), and five cases (from 4 patients)

were OXA-48 positive (*K. pneumoniae* [4] and *E. coli* [1]). Urine (27) was the most common isolate source followed by blood (5), sputum (5), other non-sterile sites (2), wound (2), bone (1), and peritoneal fluid (1). We identified seven additional CRE surveillance cases (from 7 patients) through colonization screening harboring NDM (3), KPC (2), OXA-48 (1), and NDM & OXA-48 dual mechanism (1). Among surveillance cases with known organism, there was one isolate each of *E. coli*, *K. pneumoniae*, and *E. cloacae*. Among 35 Minnesota residents infected with carbapenemase-producing CRE, the median age was 68 years (range, 32 to 89) and 18 (51%) identified as female. There were cases in 18 counties; 13 (37%) were residents of Hennepin or Ramsey Counties, six (17%) were residents of other counties within the Twin Cities metro area, and the remaining 16 (46%) were residents of 12 different counties in greater Minnesota.

In 2021, 18 CRAB incident cases representing 14 patients were identified from clinical cultures among Minnesota residents. Among these 14 patients, the median age was 53 years (range, 1 to 85) and 8 (62%) identified as male. Wound (8) was the most common isolate source followed by urine (6), sputum (3), and tissue (1). Of 18 CRAB incident cases, eight cases were reported for MuGSI isolated from wound (4), urine (3), and sputum (1). Three CRAB incident isolates (from two patients) possessed genes for carbapenemase production both of which were OXA-23.

Active laboratory- and population-based surveillance for CRPA was initiated on August 1, 2016 in Hennepin and Ramsey Counties as part of MuGSI and ended on July 31, 2018. This surveillance included all CRPA isolates collected from normally sterile sites, wounds, urine, sputum, throat cultures from cystic fibrosis (CF) patients, or other lower respiratory sites that are resistant to imipenem, meropenem, or doripenem using current CLSI breakpoints. An incident case was defined as the first report of CRPA, or a subsequent report of CRPA ≥ 30 days after the last incident report. Despite surveillance discontinuation in 2018, PHL continues to test any submitted CRPA isolates for carbapenemase production. In 2021, five CRPA isolates demonstrated carbapenemase production (4 KPC and 1 NDM). The CRPA isolates harboring KPC carbapenemase were

part of an outbreak associated with a contaminated endoscope.

Clostridioides difficile

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

In the early 2000s, a marked increase in the number of CDI cases and mortality due to CDI was noted across the United States, Canada, and England. Most notable was a series of large-scale outbreaks in Quebec first reported in March 2003. During this period, Quebec hospitals reported a 5-fold increase in healthcare-acquired CDI. These and other healthcare facility (e.g., long-term care facilities) outbreaks have been associated with the emergence of a more virulent strain of *C. difficile*, designated North American PFGE type 1 (NAP1), toxinotype III.

In 2009, in an effort to better understand the burden of CDI in Minnesota, the MDH Emerging Infection Program (EIP) initiated population-based, sentinel surveillance for CDI at clinical laboratories serving Stearns, Benton, Morrison, and Todd Counties; in 2012 Olmsted County was added. CDIs that occur outside the traditional healthcare settings (i.e., community-associated) have also been receiving increased attention. Community-associated (CA) CDI data from 2009-2011 across 10 EIP sites showed that 64% of CA CDI patients received prior antibiotics, and 82% had some outpatient healthcare exposure.

A CDI case is defined as a positive *C. difficile* toxin assay on an incident stool specimen from a resident (≥ 1 year of age) of one of the five counties. A CDI

case is classified as healthcare facility-onset (HCFO) if the initial specimen was collected >3 days after admission to a healthcare facility. Community-onset (CO) cases who had an overnight stay at a healthcare facility in the 12 weeks prior to the initial specimen are classified as CO-HCFA, whereas CO cases without documented overnight stay in a healthcare facility in the 12 weeks prior to the initial specimen result are classified as CA. A more detailed set of case definitions is available upon request.

In 2021, 808 incident cases of CDI were reported in the five sentinel counties (192 per 100,000 population), an increase from 180 per 100,000 population in 2020. Sixty-one percent of these cases were classified as CA, 22% as CO-HCFA, and 16% as HCFO. The median ages for CA, CO-HCFA, and HCFO cases were 58 years, 64 years, and 70 years, respectively. Forty-nine percent of CA cases were prescribed antibiotics in the 12 weeks prior to stool specimen collection compared to 86% of HCFO cases and 88% of CO-HCFA cases. Due to the COVID-19 pandemic, interviews were only conducted on putative CA cases after July 1, 2021. 227 putative CA cases prior to that date were not contacted for interview. Of the remaining 268 putative CA cases eligible for interview, 155 were interviewed and confirmed as CA cases. Forty-seven percent of CA cases reported antibiotic use in the 12 weeks prior to illness onset date. Most common uses of antibiotics included treatment of ear, sinus, or upper respiratory infections (28%); urinary tract infections (24%); and dental procedures (22%).

Cryptosporidiosis

During 2021, 429 cases of cryptosporidiosis were reported. Of those, 56 were positive only on a rapid antigen screening test and were considered probable cases.

The 373 confirmed cases of cryptosporidiosis (6.6 per 100,000 population) in 2021 is similar to the median number of confirmed cases reported annually from 2013 to 2020 (median, 353 cases; range, 224 to 439). The median age of confirmed cases in 2021 was 26 years (range, 9 months to 85 years). Children 10 years of age or younger accounted for 25% of cases. Sixty-one percent were female. Of the 353 cases for which

race was reported, 305 (86%) were white, 28 (8%) were Black, 6 (2%) were Asian American, 1 (<1%) was American Indian, and 13 (4%) reported being other or multiple races. Fourteen (4%) were Hispanic. Sixty percent of cases occurred from July through October. The incidence of cryptosporidiosis in the South Central, Southeastern, West Central, and Southwestern districts (17.5, 17.4, 16.5, and 15.2 cases per 100,000, respectively) was significantly higher than the statewide incidence. Only 86 (23%) cases occurred among residents of the metropolitan area (2.7 per 100,000). Fifty-four (15%) cases required hospitalization, for a median of 2 days. Two deaths were reported.

Three confirmed outbreaks of cryptosporidiosis were identified in Minnesota in 2021, accounting for 17 cases (5 laboratory-confirmed). All were due to person-to-person transmission in childcare settings. Two of these outbreaks occurred in Hennepin County and one in Dodge County. In addition, 4 laboratory-confirmed cases were part of an outbreak that occurred at a hotel waterpark in South Dakota.

Cyclosporiasis

There were 66 *Cyclospora* cases reported in 2021 (1.17 per 100,000 population). This is markedly higher than the median number of cases reported from 2011 to 2020 (median, 4.5; range, 0 to 156 per year). In 2021, 32% of cases occurred in people who resided in the metropolitan area.

The median age of cases was 52.5 years (range, 6 to 84 years). Fifty-five percent were female. Of the 63 cases where race was reported, 56 (89%) were white, 2 (3%) were Black, and 5 (8%) were Other race. Seven (11%) were Hispanic. Six percent were hospitalized; the median length of hospitalization was 4 days (range, 2 to 7 days). Eighty-two percent of infections occurred from May through July. Of the 34 non-outbreak cases for whom data were available, 7 (21%) reported travel outside the United States during the 2 weeks prior to illness onset.

Two foodborne outbreaks of cyclosporiasis were identified in Minnesota in 2021. The first was a multi-state outbreak associated with pre-packaged romaine lettuce, accounting for 22 laboratory-confirmed

Minnesota cases. The second was a multi-state outbreak associated with butter lettuce, accounting for 2 laboratory-confirmed Minnesota cases.

Escherichia coli O157 Infection, Other Shiga Toxin-producing E. coli, and Hemolytic Uremic Syndrome (HUS)

During 2021, 584 Shiga toxin-producing *Escherichia coli* (STEC) cases were reported. Of those, 69 were culture-confirmed *E. coli* O157, 263 were culture-confirmed non-O157 STEC, and 252 were only positive by a culture-independent test (CIDT) and not subsequently culture-confirmed.

The 69 culture-confirmed cases of *E. coli* O157 infection (1.22 per 100,000 population) reported in 2021 represents a 42% decrease from the median number of culture-confirmed cases reported annually from 2011 to 2020 (median, 119 cases; range, 65 to 146). During 2021, 32 (46%) cases occurred in the metropolitan area. Fifty-five (80%) cases occurred during May through October. The median age of the cases was 17 years (range, 11 months to 79 years). Twenty-nine percent of the cases were 4 years of age or younger. Twenty-four (35%) cases were hospitalized; the median hospital stay was 3 days (range, 1 to 31 days). No cases died.

The 263 culture-confirmed non-O157 cases (4.65 per 100,000 population) reported in 2021 represents a 53% increase from the median number of culture-confirmed cases reported annually from 2011 to 2020 (median, 172 cases; range, 105 to 322). *E. coli* O103 was the serogroup for 42 (17%) cases, *E. coli* O26 for 34 (17%), *E. coli* O111 for 33 (13%), *E. coli* O145 for 19 (4%), *E. coli* O121 for 15 (5%), and *E. coli* O45 for 6 (2%). The median age of the non-O157 STEC cases was 31 years (range, 4 months to 96 years). Fifty (19%) cases were hospitalized; the median hospital stay was 3 days (range, 1 to 32 days). No cases died.

During 2021, 252 cases were reported with specimens that were positive by a CIDT conducted at a clinical laboratory, but were not subsequently culture-confirmed. CIDTs have become widely adopted by clinical laboratories for the detection of Shiga toxin or Shiga toxin genes in stool. The median age of the CIDT-positive only cases was 41 years

(range, 4 months to 97 years). Seventy (27%) cases were hospitalized; the median hospital stay was 3 days (range, 1 to 56 days). Two cases died.

Two *E. coli* O157 outbreaks were identified during 2021. One outbreak was due to animal contact, and the other was due to foodborne transmission. In August, an outbreak of *E. coli* O157 infections was likely associated with indirect contact with a calf and sheep at a private home; three cases, all laboratory-confirmed, were identified. Two cases developed hemolytic uremic syndrome (HUS), but none of the cases died. In November, a national outbreak of *E. coli* O157 infections was associated with spinach. Two cases were identified in Minnesota, both laboratory-confirmed. Neither developed HUS nor died.

Four non-O157 STEC outbreaks were identified during 2021. One outbreak was due to person-to-person transmission in a childcare setting, one was due to foodborne transmission, one was due to animal contact, and one had an unknown transmission route. In July, an outbreak of *E. coli* O103:H11 infections associated with person-to-person transmission occurred at a childcare facility in Polk County. Nineteen cases, one laboratory-confirmed, were identified. No cases developed HUS nor died. In August, an outbreak of *E. coli* O145:H28 infections with an unknown transmission route was identified. Three cases, all laboratory-confirmed, were identified. No cases developed HUS nor died. In October, an outbreak of *E. coli* O111:H8 infections was associated with contact with calves at an apple orchard. Two cases, both laboratory-confirmed, were identified. Neither case developed HUS nor died. In December, a national outbreak of *E. coli* O121:H19 infections was associated with romaine lettuce. Two cases were identified in Minnesota. Neither developed HUS nor died.

Hemolytic Uremic Syndrome (HUS)

In 2021, 11 HUS cases were reported. The number of reported cases is the same as the median number of cases reported annually from 2011 to 2020 (median, 11 cases; range, 3 to 17). In 2021, the median age of HUS cases was 2 years (range, 1 to 11 years). All 11 cases were hospitalized, with a median hospital stay of 13

days (range, 1 to 31 days). No cases died. From 1997 through 2021, the overall case fatality rate among HUS cases was 5.1%. *E. coli* O157:H7 was cultured from the stool of 7 (64%) cases. *E. coli* O5:H9 was cultured from the stool of one case and *E. coli* O-genotype untypeable:H8 was cultured from the stool of one case. Two cases were Shiga toxin positive by PCR but not culture-confirmed. In 2021, there were two outbreak-associated HUS cases.

Giardiasis

During 2021, 388 cases of *Giardia* infection (6.9 per 100,000 population) were reported. This represents a 38% decrease from the median number of cases reported annually from 2011 through 2020 (median, 629.5 cases; range, 416 to 692). Recent immigrants and refugees accounted for 6% of cases. An additional 8% of cases reported international travel in the 3 weeks prior to illness onset. Excluding recent immigrants and refugees, the median age of cases was 39 years (range, 5 months to 94 years). Eighteen percent of cases were less than 10 years of age, and 38% were more than 50 years of age. Fifty-six percent of non-immigrant and refugee cases were male. *Giardia* infections had a summer/fall seasonality; 47% of non-immigrant and refugee cases occurred during July through October. Twenty-eight (7%) cases required hospitalization, for a median of 4 days (range, 2 to 17 days). No outbreaks of giardiasis were identified.

Haemophilus influenzae

Fifty-six *Haemophilus influenzae* disease cases (1.0 per 100,000 population) were reported in 2021. Cases ranged in age from newborn to 95 years (median 64 years). Allowing for more than one syndrome per case, 26 (46%) cases had pneumonia, 5 (9%) bacteremia, 8 (14%) septic shock, 13 (23%) meningitis, 2 (4%) osteomyelitis, 3 (5%) empyema, and the following each had 1 (2%): cellulitis, abscess, septic arthritis, otitis media, epiglottitis. Eight (14%) cases died.

Of 45 *H. influenzae* isolates for which typing was performed, 12 were type a, 2 type b (Hib), 1 type e, 3 type f,

and 27 were nontypeable. There were 2 Hib disease cases in 2021 compared to 1 case in 2020, 3 in 2019, 1 in 2018, 2 in 2017, 5 in 2016, and 2 in 2015. Among the 2021 Hib disease cases, one was a 2-year old child who had meningitis and survived; this child had not received any Hib vaccination. The second was in a 6-month old who had meningitis and survived; this child had documentation of one dose of Hib vaccine.

The eight deaths occurred in patients ranging in age from 56 to 92 years. Three decedents had pneumonia, two had septic shock, two had pneumonia and septic shock, and one had pneumonia, meningitis and septic shock. Co-morbidities were reported in seven patients and serotypes were nontypeable (5) or type f (1); two isolates were not available for serotyping.

Histoplasmosis

Histoplasmosis is caused by the soil-dwelling dimorphic fungus *Histoplasma capsulatum*. Infection typically results from inhalation of aerosolized spores, and symptomatic infections usually involve pulmonary disease, though disseminated or non-pulmonary infections are possible. Common activities associated with exposure include farming, exposure to soil enriched with bird or bat guano, remodeling or demolition of old buildings, and clearing trees or brush in which birds have roosted.

In 2021, there were 38 confirmed and 152 probable cases of histoplasmosis reported. These numbers are consistent with the case counts from the years prior to the COVID-19 pandemic.

The median age of cases was 48 years (range, 0 to 88 years), and 112 (59%) were male. Of the 133 cases for whom race was reported, 112 (84%) were white, 11 (8%) were Black, 6 (5%) were Asian, 2 (1.5%) were American Indian/Alaska Native, 1 (<1%) was Native Hawaiian/Pacific Islander and 1 (<1%) was more than one race. Of the 130 for whom ethnicity was reported, 4 (3%) were Hispanic. When hospitalization status was reported, 38 of 70 (54%) cases were hospitalized. Median hospitalization duration was 5 days (range, 1 to 47 days). There were 2 deaths among the 54 cases for which outcome was

reported, a case fatality rate of 4%. Histoplasmosis was the primary cause of death for both of those cases.

From 2017 to 2021, 872 cases of histoplasmosis were reported. The annual incidence of histoplasmosis in Minnesota in 2021 was 3.3 cases per 100,000 population, similar to the average annual incidence of 3.0 cases per 100,000 for 2017-2020. The average annual incidence of histoplasmosis by county shows that cases occur more frequently in southern and western counties (Figure 2). This is in contrast to the other endemic fungal disease found in Minnesota, blastomycosis, for which the highly endemic region includes the northern and northeastern counties of Minnesota. While clinicians should test for both diseases when clinical illness is consistent with a fungal infection, these maps may help assess possible risks in different parts of the state.

HIV Infection and AIDS

HIV/AIDS incidence in Minnesota remains moderately low. The most state-specific recent rate data is from 2020, which shows that state-specific

HIV infection rates ranged from 1.5 per 100,000 population in Montana to 22.1 per 100,000 in Georgia. Minnesota had the 14th lowest rate (4.8 cases per 100,000 population).

As of December 31, 2021, a cumulative total of 12,643 cases of HIV infection (2,418 AIDS at first diagnosis, and 10,225 HIV [non-AIDS] cases) were reported among Minnesota residents. By the end of 2021, an estimated 9,696 persons with HIV/AIDS were living in Minnesota.

The annual number of AIDS cases reported in Minnesota increased steadily from 1982 through the early 1990s, reaching a peak of 361 cases in 1992. Beginning in 1996, the annual number of new AIDS diagnoses and deaths declined sharply, primarily due to better antiretroviral therapies. In **2021**, 81 new AIDS cases (Figure 4) and 99 deaths among persons living with HIV infection in Minnesota were reported.

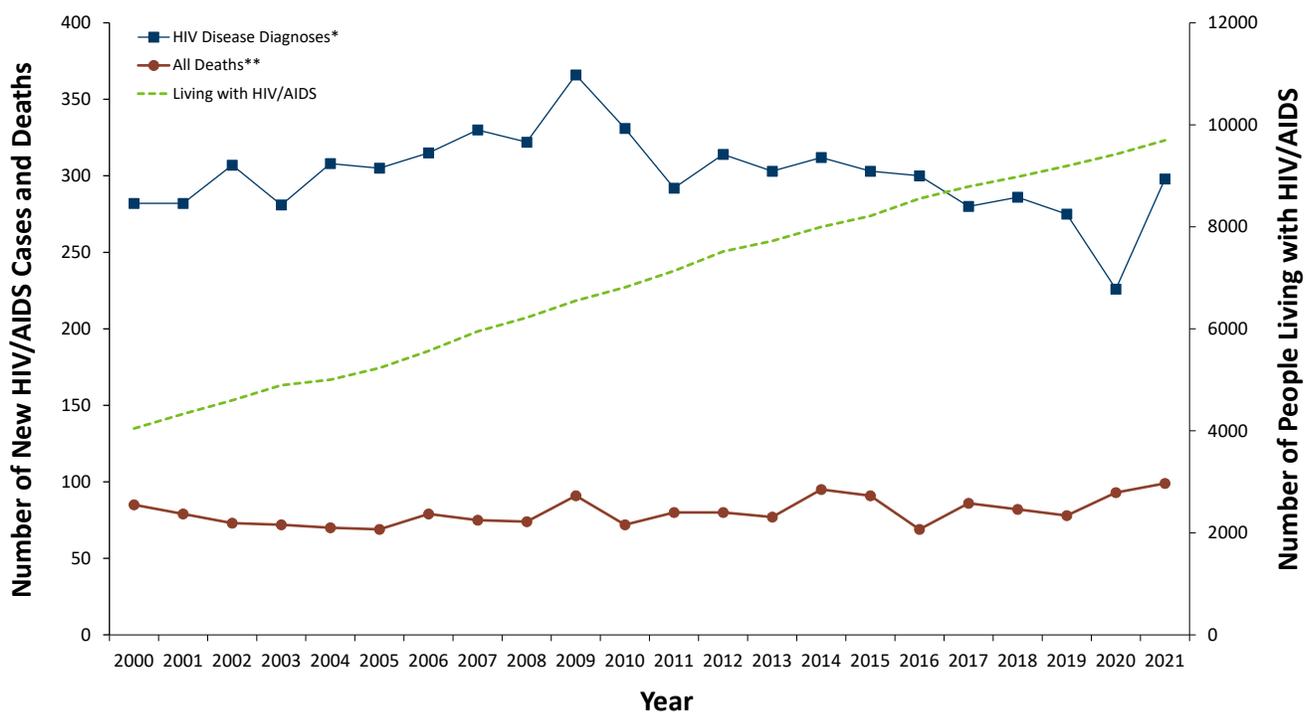
The number of HIV (non-AIDS) diagnoses has varied over the past decade. There was a peak of 278

newly diagnosed HIV (non-AIDS) cases in 2009, and a low of 183 new HIV (non-AIDS) cases reported in 2020. Before 2020, the lowest number of cases reported was 215 new HIV (non-AIDS) cases, reported in 2017.

In 2021, 74% (222/298) of new HIV diagnoses (both HIV [non-AIDS] and AIDS at first diagnosis) occurred in the metropolitan area. In Greater Minnesota there were 76 cases in 29 of 80 counties. HIV infection is most common in areas with higher population densities and greater poverty.

The majority of new HIV infections in Minnesota occur among males. Trends in the annual number of new HIV infections diagnosed among males differ by race/ethnicity. New infections occurred primarily among white males in the 1980s and early 1990s. Whites still comprise the largest number of HIV infections among males, but the proportion of cases accounted for by white males account is decreasing. In 2021, there were 87 new infections among white males, which is 37% of new HIV infections among males. Among black African American males, there

Figure 4. HIV/AIDS: Number of New Cases, Prevalent Cases, and Deaths by Year



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

**Deaths in Minnesota among people with HIV/AIDS, regardless of location of diagnosis and cause.

were 68 new HIV diagnoses in **2021**, which is about a third of new HIV infections among males (29%). Among Hispanic males of any race and black African-born males, there were 41 and 21 new HIV infections in 2021, respectively.

Females account for an increasing percentage of new HIV infections, from 11% of new infections in 1990 to 21% in 2021. Trends in HIV infections diagnosed annually among females also differ by race/ethnicity. Early in the epidemic, whites accounted for the majority of newly diagnosed infections. Since 1991, the number of new infections among women of color has exceeded that of white women.

In 2021, women of color accounted for 73% of new HIV infections among females in Minnesota. The number of diagnoses among African-born women has been increasing over the past decade. In 2021, the number of new cases among African-born women was 25, accounting for 39% of all new diagnoses among women. In 2021, there were 10 cases (16%) diagnosed among African American women.

Despite relatively small numbers of cases, HIV/AIDS affects persons of color disproportionately in Minnesota. In 2021, men of color comprised approximately 17% of the male population in Minnesota and 61% of new HIV diagnoses among men. Similarly, persons of color comprised approximately 17% of the female population in Minnesota and 73% of new HIV infections among women. It bears noting the use of race can be a proxy for other risk factors, including lower socioeconomic status and education. Race is not considered a biological cause of disparities in the occurrence of HIV.

Historically, race/ethnicity data for HIV/AIDS in Minnesota have grouped non-African born blacks and black African-born persons together as “black.” In 2001, MDH began analyzing these groups separately, and a marked trend of increasing numbers of new HIV infections among black African-born persons was observed. In 2021, there were 46 new HIV infections reported among black Africans. While black African-born persons comprise about 2% of the state’s

population, they accounted for 15% of all HIV infections diagnosed in Minnesota in 2021.

In 2021, there were 88 diagnosed with HIV less than 30 years of age, accounting for 34% of all cases. Most of the cases were among young males, where 87% of cases were less than 30 years of age.

Since the beginning of the epidemic, male-to-male sex (men who have sex with men; MSM) has been the predominant mode of exposure to HIV reported in Minnesota. In 2021, MSM (including MSM who also inject drugs) accounted for 53% of new diagnoses among men. IDU was the predominant mode of exposure for women (of those with known exposure).

In the fall of 2019, an outbreak was declared among persons who inject drugs (PWID) diagnosed with HIV in Minnesota. Statewide there was a two-fold increase among PWID with 11 cases in 2018 increasing to 22 cases in 2019. The outbreak area included residents of Hennepin and Ramsey counties, where an alert was indicated among PWID. At the end of 2020, the outbreak included 101 cases. Persons likely to be at high risk for HIV infection include sex partners or syringe-sharing partners of people known to be living with HIV, PWID and their sex partners and needle sharing partners, persons who exchange sex for income or other items they need, and persons who experienced or are currently experiencing homelessness.

In the fall of 2020, an alert for the Duluth area was indicated among newly diagnosed HIV infections, after which an outbreak was declared in March 2021. There were 23 cases associated with the outbreak between September 2019 and the beginning of 2021. Typically, there are from one to five cases of HIV per year in St. Louis County. The health alert also indicated a rise in the number of syphilis cases in the Duluth area. Both declared outbreaks are currently on-going.

HIV perinatal transmission in the United States decreased 90% since the early 1990s. The trend in Minnesota has been similar. While the number of births to HIV-

infected women increased nearly 7-fold between 1990 and 2019, with 60 births to pregnant persons in 2021, the rate of perinatal transmission decreased, from 15% in 1994-1996 to 0% over the last 4 years (2018-2021), with the last HIV-positive Minnesota birth in 2017.

Influenza

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

Hospitalized Cases

Surveillance for pediatric (<18 years of age) laboratory-confirmed hospitalized cases of influenza in the metropolitan area was established during the 2003-2004 influenza season and expanded to include adults for the 2005-2006 influenza season. For the 2008-2009 season surveillance was expanded statewide. Since the 2013-2014 season, clinicians have been encouraged to collect a throat or nasopharyngeal swab, or other specimen from all patients admitted to a hospital with suspect influenza and submit the specimen to the Public Health Lab (PHL) for influenza testing. For the 2014-2015 season, influenza B subtyping was added.

During the 2020-2021 influenza season (October 1, 2020 – April 30, 2021), there were 35 laboratory-confirmed hospitalized cases reported. This represents a rate of 0.62 cases per 100,000 persons, compared to 71.3 cases per 100,000 in 2019-2020 and 44.6 cases per 100,000 in 2018-2019. Cases included 11 influenza A (all unknown A type) and 24 influenza B (all unknown lineage). Among the cases, 9% were 0-18, 17% were 19-49, 14% were 50-64, and 60% were 65 years of age and older. Median age was 69 years. Residents of the metropolitan area made up 57% of cases.

Case report forms have been completed on 100% of the 20 metropolitan area cases that were selected for review. Of these, 28% were diagnosed with pneumonia, 17% required admission into an intensive care unit, and 11% were placed on mechanical ventilation. An invasive bacterial co-infection was present in 22% of hospitalized cases.

Antiviral treatment was prescribed for 67% of cases. Overall, 82% of adult and 0% of pediatric cases had at least one chronic medical condition that would have put them at increased risk for influenza disease.

Pediatric Deaths

There were 0 pediatric influenza-associated deaths during this season.

Laboratory Data

The Minnesota Laboratory System (MLS) Laboratory Influenza Surveillance Program is made up of more than 110 clinic- and hospital-based laboratories which voluntarily submit testing data on a weekly basis. These laboratories perform rapid testing for influenza and respiratory syncytial virus. Significantly fewer laboratories perform viral culture testing. Some laboratories perform PCR testing for influenza, and others also perform PCR testing for other respiratory viruses. The PHL provides further characterization of submitted influenza isolates to determine the hemagglutinin serotype. Tracking laboratory results assists healthcare providers with patient diagnosis of influenza-like illness (ILI) and provides an indicator of the progression of the influenza season, as well as prevalence of disease in the community. Between October 4, 2020–May 22, 2021, laboratories reported data on 54,981 influenza molecular tests, 24 (<1%) of which were positive for influenza. Of these, 0 were positive for influenza A (H3), 0 were positive for influenza A (H1N1)pdm09, 10 (42%) were positive for influenza A-not subtyped, and 14 (58%) were positive for influenza B.

Sentinel Surveillance

We conduct sentinel surveillance for ILI (fever >100° F, and cough, and/or sore throat in the absence of known cause other than influenza) through outpatient medical providers, including those in private practice, public health clinics, urgent care centers, emergency rooms, and university student health centers. There were 85 sites in 39 counties. Participating providers report the total number of patient visits each week and number of patient visits for ILI by age group (0-4 years, 5-24 years, 25-64 years, ≥65 years). The percentage of ILI peaked during the week October 4-10, 2020, at 0.9%.

Influenza Incidence Surveillance

MDH continued to participate in Optional Influenza Surveillance Enhancements during the 2020-2021

influenza season. Each week, nine clinic sites reported the number of ILI patients divided by the total patients seen by the following age groups: 0-4 years, 5-24 years, 25-49 years, 50-64 years, and ≥65 years. Clinical specimens were collected on the first 10 patients with acute respiratory illness for PCR testing performed by the PHL for influenza, SARS-CoV-2, and 13 other respiratory pathogens.

Minimal demographic information and clinical data were provided with each specimen. From October 4, 2020–May 22, 2021, these clinics saw 1,777 ILI patients. They submitted 984 specimens for influenza testing; none were positive for influenza.

ILI Outbreaks in Schools and Long-term Care Facilities

Since 2009, schools report outbreaks when the number of students absent with ILI reaches 5% of total enrollment, or when three or more students with ILI were absent from the same elementary classroom. Six schools in 3 counties reported ILI outbreaks during the 2020-2021 school year. The number of schools reporting ILI outbreaks since the 2009-2010 school year ranged from a low of 6 in 2020-2021 to a high of 1,302 in 2009-2010.

An influenza outbreak is suspected in a long-term care facility (LTCF) when two or more residents in a facility develop symptoms consistent with influenza during a 48- to 72-hour period. An influenza outbreak is confirmed when at least one resident has a positive culture, PCR, or rapid antigen test for influenza and there are other cases of respiratory illness in the same unit. Six facilities in 5 counties reported confirmed outbreaks during the 2020-2021 influenza season. The number of LTCFs reporting outbreaks ranged from a low of three in 2008- 2009 to a high of 212 in 2017-2018.

Legionnaires' Disease

In 2021, 130 confirmed cases of Legionnaires' disease (2.3 per 100,000 population) were reported. This is a 38% increase from the 94 cases reported in 2020 and a 13% increase from the median number of cases reported annually from 2016 to 2020 (median, 115; range, 94 to 152).

Of the 130 confirmed cases, 123 (95%) were hospitalized, with a median

duration of hospitalization of 5 days (range, 1 to 43 days). Of those hospitalized, 36 (29%) were admitted to an intensive care unit, and 23 (19%) required mechanical ventilation. Nine (7%) cases died. Seventy-five (58%) cases were male. Older adults were more often affected, with 105 (81%) cases occurring among individuals ≥50 years (overall median age, 64 years; range, 29 to 90 years). Of the 129 cases for which race and ethnicity were reported, 114 (88%) were white (of which 2 were Hispanic), 11 (9%) were Black, two (2%) were Asian American, one (<1%) was American Indian, and one (<1%) was other race. Sixty-six (51%) cases were diagnosed during June through September. Seventy-nine (61%) were residents of the Twin Cities metropolitan area and 51 (39%) were residents of Greater Minnesota. Three (2%) confirmed cases were part of an outbreak associated with a hotel spa pool (the outbreak had 2 additional confirmed cases who were non-Minnesota residents).

Although most cases are diagnosed by Legionella urinary antigen test, culture is useful for public health purposes because clinical and environmental isolates can be compared by molecular typing in outbreak investigations. MDH requests that clinical laboratories submit Legionella isolates, as well as available lower respiratory tract (sputum, BAL) specimens from confirmed and suspect cases for culture and molecular typing.

Listeriosis

Twelve culture-confirmed listeriosis cases were reported in 2021. All were hospitalized, and three died. The median age of cases was 68 years (range, 44 to 93 years). Ten (83%) cases had *Listeria monocytogenes* isolated from blood and two from cerebrospinal fluid (CSF). There were no pregnancy-associated cases among culture-confirmed cases in 2021. Nine cases were white, two were Asian, and three were Black; none were of Hispanic ethnicity. The 12 cases are slightly greater than the median number of cases reported from 1996 through 2020 (median, 8 cases; range, 3 to 19). Three cases were part of outbreaks in 2021; two cases were part of a multi-state outbreak associated with an unknown commercially distributed vehicle, and one 2021 case was part of a multi-

state outbreak associated with leafy greens that occurred from 2014 to 2022.

In 2019, national case definitions were modified to include “probable” and “suspected” cases of listeriosis. In 2021, three probable or suspected cases were identified. Two probable cases were a maternal-neonate pair; the neonate had a CSF specimen test positive by a culture-independent diagnostic test that was not subsequently culture-confirmed at the MDH PHL, and the mother was not tested. One suspected case was identified in an individual with *L. monocytogenes* isolated from an ankle swab at a clinical laboratory.

Lyme Disease

Lyme disease is caused by *Borrelia burgdorferi*, a spirochete transmitted to humans by bites from *Ixodes scapularis*, the blacklegged tick. Recently, a new species, *B. mayonii*, has also been identified as a cause of human disease, and 11 cases have been reported in Minnesota residents since 2013, 1 in 2021. Data for these cases is included in the summary data below. In Minnesota, the same tick vector also transmits the agents of babesiosis, anaplasmosis, one form of ehrlichiosis, and a strain of Powassan virus.

In 2021, 1,033 confirmed Lyme disease cases (18 cases per 100,000 population) were reported. In addition, 869 probable cases (physician-diagnosed cases that did not meet clinical evidence criteria for a confirmed case but that had laboratory evidence of infection) were reported. Overall, the number of reported cases of Lyme disease has been increasing for many years, despite yearly fluctuations. The median number of cases from 2010 through 2019 (median, 1,190; range, 896 to 1,431) was higher compared to the median from 2000 to 2009 (median, 915; range, 463 to 1,239) (Figure 1). Data for 2020 are not available due to surveillance changes made during the COVID-19 pandemic.

Of the confirmed Lyme disease cases reported, 642 (62%) cases were male, and the median case age was 45 years (range, 2 to 94). Physician-diagnosed erythema migrans (EM) was present in 697 (67%) cases. Three hundred seventy-one (36%) cases had one or more late manifestations of Lyme

disease, including 241 with a history of objective joint swelling, 108 with cranial neuritis including Bell’s Palsy, 6 with lymphocytic meningitis, 16 with acute onset of 2nd or 3rd degree atrioventricular conduction defects, and 1 with radiculoneuropathy, and confirmation by Western immunoblot (positive IgM \leq 30 days post-onset or positive IgG). Of the 934 cases with known onset dates, onset of symptoms peaked from June through August, with 68% of EM cases experiencing symptom onset in June or July. This timing corresponds with peak activity of nymphal *I. scapularis* ticks in mid-May through mid-July. Most cases either resided in or traveled to endemic counties in north-central, east-central, or southeast Minnesota, or Wisconsin.

Malaria

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

In 2021, 64 cases (1.1 per 100,000 population) were reported. Fifty-six (88%) cases were identified with *P. falciparum*, 2 (3%) with *P. vivax*, 2 (3%) with *P. ovale*, 1 (2%) with *P. malariae* and 1 (2%) with mixed *Plasmodium* species infection. In 2 cases (3%), the testing performed was unable to identify a species. The median age of cases was 40 years (range, 3 to 81). Of the 53 cases with known race, 48 (91%) were Black, 3 (5%) were white, 1 (2%) was Asian, and 1 (2%) identified as other race. Sixty-three cases were Minnesota residents at the time of their illness, 48 (75%) of whom resided in the seven-county metropolitan area. Of the 36 cases with known country of birth, 4 (6%) were born in the United States. Exposure and travel information was not available for 3 cases, while 60 (94%) cases likely acquired malaria in Africa, and 1 patient reported travel to Asia. Sixteen countries were considered possible exposure locations in Africa for malaria infections, including Liberia (17), Nigeria (8), Cameroon (6), Kenya

(5), and Togo (5), as well as several other countries in sub-Saharan Africa. The case reporting Asian travel had visited Thailand.

Meningococcal Disease

No meningococcal cases were reported in 2021.

Mumps

No mumps cases were reported in 2021.

Neonatal Sepsis

Statewide surveillance for neonatal sepsis includes reporting of any bacteria (other than coagulase-negative *Staphylococcus*) isolated from a sterile site in an infant <7 days of age, and mandatory submission of isolates. In 2021, 43 cases (0.68 cases per 1,000 live births) were reported compared to 45 cases in 2020. There were 5 deaths. All were identified via blood. Most cases (81%) were culture-positive within the first 2 days of life. Group B *Streptococcus* was most common (13) followed by, *Escherichia coli* (12), *Streptococcus viridans* (6), *Enterococcus* spp. (4), *Haemophilus influenzae* (2), and 1 each of *Actinomyces*, *Brevibacterium* spp., *Gordonia* spp., *Streptococcus pneumoniae*, and *Staphylococcus aureus*.

Pertussis

In 2021, 29 pertussis cases (1 per 100,000 population) were reported. Laboratory confirmation was available for 26 (90%) cases, none (0%) of which were confirmed by culture and 8 (28%) of which were confirmed by PCR. In addition, 7 (24%) cases met the clinical case definition and were epidemiologically linked to laboratory confirmed cases, and 3 (10%) met the clinical case definition only. Twenty (69%) cases occurred in residents of the metropolitan area.

Paroxysmal coughing was the most common reported symptom, which 24 (83%) cases experienced. Approximately 36% (10) reported

whooping. Although commonly referred to as “whooping cough,” very young children, older individuals, and persons previously immunized may not have the typical “whoop”. Post-tussive vomiting was reported in 14 (49%) cases. Infants and young children are at the highest risk for severe disease and complications. In 2021, no cases were diagnosed with Pneumonia, none were hospitalized, and no deaths occurred.

Pertussis is increasingly recognized in older children and adults. During 2021, cases ranged in age from 9 months to 74 years. No cases were diagnosed in children <6 months of age, 5 (19%) in children 6 months through 4 years, none in children 5-12 years, two (8%) cases occurred in adolescents 13-17 years, and 19 (73%) in adults ≥18 years. The median age of cases was 38 years. Infection in older children and adults may result in exposure of unprotected infants. During 2021, one case was in an infant <1 year of age. A likely source of exposure wasn't identified for that case. ACIP recommends vaccination of women at ≥20 weeks gestation during each pregnancy to protect young infants. Ensuring up-to-date vaccination of children, adolescents, and adults, especially those in contact with young children, is also important. Children aged 7 and under receive the DTaP vaccine, while older children and adults receive the Tdap vaccine. Vaccinating adolescents and adults with Tdap will decrease the incidence of pertussis in the community and thereby minimize infant exposures.

Although unvaccinated children are at highest risk for pertussis, fully immunized children may also develop disease, particularly as the number of years since vaccination increases. Disease in those previously immunized is usually mild. Efficacy for currently licensed DTaP vaccines is estimated to be 71-84% in preventing typical disease within the first 3 years of completing the series. Waning immunity sharply increases at 7 years of age, and most are susceptible by 11-12 years of age when the Tdap booster is recommended. Recent studies suggest that immunity wanes sharply 2 years from receipt of Tdap. Of the 8 (28%) cases who were 7 months to 6 years of age, 5 (63%) were known to have received at least a primary series of 3 doses of

DTaP/ DTaP vaccine prior to onset of illness; 3 (38%) received fewer than 3 doses and were considered preventable cases.

Reporting rules require clinical isolates of *Bordetella pertussis* be submitted to the PHL to track changes in circulating strains. Isolates were not subtyped using pulsed-field gel electrophoresis (PFGE). Nationally, isolates have had low minimum inhibitory concentrations (falling within the reference range for susceptibility) to erythromycin and azithromycin. Only 11 erythromycin-resistant *B. pertussis* cases have been identified in the United States.

Laboratory tests should be performed on all suspected cases. *B. pertussis* is rarely identified late in the illness, therefore, a negative culture does not rule out disease. A positive PCR result is considered confirmatory in patients with a 2-week history of cough illness. PCR can detect non-viable organisms. Consequently, a positive PCR result does not necessarily indicate current infectiousness. Patients with a 3-week or longer history of cough illness, regardless of PCR result, may not benefit from antibiotic therapy. Whenever possible, culture should be done in conjunction with PCR testing. Serological tests may be useful for those with coughs >2 weeks.

Pertussis remains endemic despite an effective vaccine and high coverage rates with the primary series. Reported incidence of pertussis has consistently increased over the past 10 years, particularly in middle school-aged children, adolescents, and adults.

Q Fever

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

In 2021, six confirmed cases of Q fever were reported, including one chronic case and five acute cases. The confirmed chronic case was a 71-year-old male whose illness

included splenomegaly, vasculitis, and endocarditis. He was likely exposed through drinking raw milk in the past. The median age of the acute cases was 36 years (range, 9 to 67 years); all were male. Four (80%) identified as white, one (20%) identified as Black, and all identified as non-Hispanic. All were likely exposed through contact with animals, including goats, camels, and sheep. One (20%) case was likely acquired internationally. Three (60%) cases were hospitalized for a median of 3 days (range, 3 to 17 days). Three (60%) acute cases developed hepatitis as a result of their infection, one (20%) developed hepatosplenomegaly, and one (20%) developed myocarditis.

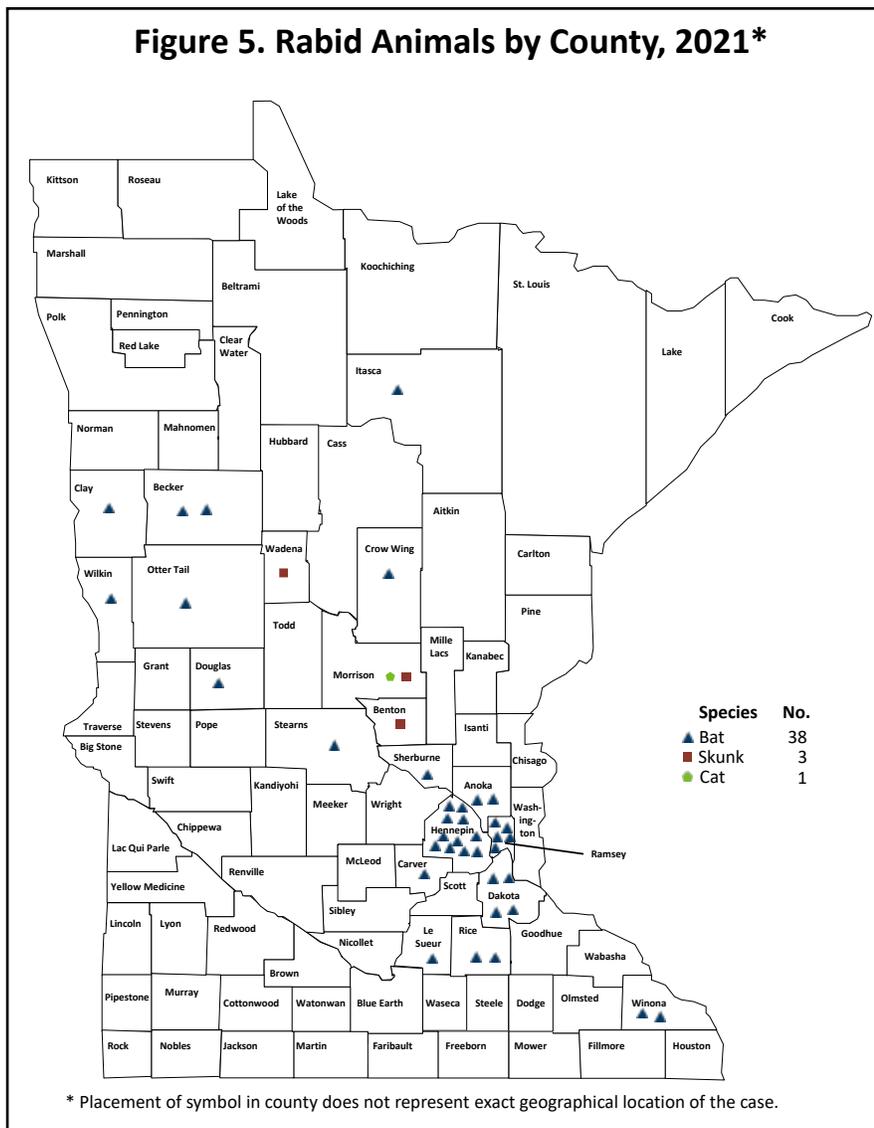
From 1997 to 2021, 32 confirmed acute cases and 11 chronic cases of Q fever were reported. The median age of acute cases was 60 years (range, 11 to 77 years); the median age of chronic cases was also 60 years (range, 5 to 78 years). Twenty-four (86%) of the 28 cases for which both race and ethnicity were known identified as White, non-Hispanic; 3 (11%) identified as Black, non-Hispanic; and 1 (4%) identified as mixed race, non-Hispanic. During this time, 26 (79%) of the 33 cases for whom exposure information was available were likely exposed through direct or indirect contact with animals; 4 (12%) were likely exposed through ingestion of unpasteurized dairy products; and, 3 (9%) were likely exposed through a tick bite. Ten (36%) of the 28 cases with known occupations were employed in an agriculture-related occupation at the time of their exposure.

Rabies

In Minnesota, the animal reservoirs for rabies are skunks, which carry the North-central U.S. skunk rabies virus variant and multiple bat species, each with their own host-adapted rabies virus variant. Dogs, cats, and livestock are generally exposed to rabies through encounters with skunks. Vaccinating these domestic animals for rabies provides a buffer between wildlife and people.

In 2021, 42 (2.2%) of 1,932 animals tested were positive for rabies. This is similar to those identified in 2020 (40, [1.9%] of 2,114 animals tested) and similar to the number of positives identified annually in the previous

Figure 5. Rabid Animals by County, 2021*



decade. In 2021, 90% (38/42) of rabid animals were bats followed by skunks (3/42 [7%]). There was one rabid domestic animal, a cat (Figure 5).

Cases of human rabies in the United States are rare, with 1 to 6 cases reported annually. In 2021, Minnesota reported its first human rabies case since 2007. This case was bitten by a rabid bat, received timely and appropriate rabies post-exposure prophylaxis (PEP), yet developed rabies 6 months after the bite. This was the first documented failure of rabies PEP in the western hemisphere and the first to involve bat variant rabies virus. An extensive investigation was conducted and determined that this case had a previously unrecognized, impaired immune system, which likely prevented an appropriate immune

response against the rabies virus. Ensuring adequate immune response to rabies vaccines is increasingly important given the rising prevalence of immunocompromised adults in the United States. This investigation does not challenge the high efficacy or safety profile of rabies PEP biologics.

From 2003 to 2021, 983 (2.3%) of 43,621 animals tested in Minnesota were positive for rabies. The median number of rabies-positive animals identified annually was 48 (range 28 to 94). From 2003 to 2021, 337/761 (44.3%) skunks, 57/966 (5.9%) cattle, 490/12,978 (3.8%) bats, 9/375 (2.4%) horses, 49/12,729 (0.4%) cats, 29/12,419 (0.2%) dogs, 1/1,323 (0.1%) raccoons, and 12/2,137 (0.6%) other animals (fox [6], goat [3], woodchuck, bison, deer) tested were positive for rabies. In contrast to the eastern

United States, where raccoons carry a raccoon host-adapted variant of the virus and are the most common source of terrestrial rabies, rabies in raccoons is rare in Minnesota.

Respiratory Syncytial Virus (RSV)

Laboratory-confirmed respiratory syncytial virus disease (RSV) became reportable for all hospitalized residents of the metropolitan area in September 2016. Any death occurring statewide within 60 days of a positive RSV test is also reportable. Typically, RSV circulates during the colder months of the year (October-April), however RSV activity has differed in recent years from the usual seasonality.

From October 1, 2021 – April 30, 2022, 623 cases were reported. From May 1, 2022 – September 30, 2022, 365 cases were reported. Combined, from October 1, 2021 – September 30, 2022, there were 988 cases reported (32 cases per 100,000 persons), compared to 670 cases were reported (22 cases per 100,000 persons) from October 2020 – September 2021. The overall median age was 11 months (range: 0 days – 98 years). Sixty-eight percent (674) were <2 years of age: 35% (347) were <6 months, 17% (163) were 6 months – 11 months, and 17% (164) were 1 year – <2 years. Fourteen percent (137) were 2-4 years, 4% (36) were 5 – 17 years, 3% (30) were 18 – 49 years, 3% (27) were 50 – 64 years, and 9% (84) were >65 years of age. Overall, 51% of RSV cases were male and 50% were white.

Thirty-nine percent (393) of cases had a co-morbid condition at the time of their illness and presence of a co-morbid condition increased significantly as age increased. The most common co-morbid conditions for cases <2 years of age were prematurity (58%), chronic lung disease (19%) and cardiovascular disease (15%). For cases 2 – 17 years of age, the most common co-morbid conditions were chronic lung disease (55%), neurologic conditions (42%), cardiovascular disease (24%), and feeding tube dependent (18%). The most common underlying conditions for adults 18-64 years of age and older adults (≥65 years) were chronic metabolic disease (38% and 52% respectively), cardiovascular disease (48% and 66% respectively), chronic lung disease (56% and 49% respectively),

and hypertension (46% and 81% respectively).

Thirteen RSV-associated deaths were reported during the regular the 2021-2022 respiratory season. Eleven deaths occurred during hospitalization and 3 within 60 days of hospital discharge. From May 1, 2021 – September 30, 2021, 3 deaths were reported: 2 during hospitalization and 1 within 60 days of hospital discharge. The median age of all deaths was 78 years (range 69 years to 96 years), and all 17 deaths had co-morbid conditions. Identification of additional RSV-associated deaths is ongoing.

Salmonellosis

During 2021, 1,024 *Salmonella* cases were reported. Of those, 853 were culture-confirmed *Salmonella* and 171 only tested positive by a culture-independent diagnostic test (CIDT) and not subsequently culture-confirmed. The 853 culture-confirmed cases of *Salmonella* infection (15.1 per 100,000 population) reported in 2021 represents a 6% increase from the median number of culture-confirmed cases reported annually from 2011 to 2020 (median, 808 cases; range, 660 to 1,009) (Figure 2).

Of the 91 serotypes identified among culture-confirmed cases in 2021, 6 serotypes, *S. Enteritidis* (191), *S. Typhimurium* (108), *S. I 4, [5], 12: i: -* (90), *S. Infantis* (63), *S. Newport* (51), and *S. Oranienburg* (40) accounted for 64% of cases. *Salmonella* was isolated from stool in 741 (87%), urine in 58 (7%), and blood in 48 (6%) cases. Other specimen sources included body fluid, groin, left knee, perineal swab, skin/subcutaneous tissue, and vaginal swab.

The incidence of *Salmonella* infections was 16.2 per 100,000 population among cases who reported Black race, 14.3 among cases who reported Asian race, 12.5 among cases who reported white race, and 11.2 among cases who reported American Indian/Alaska Native race. The incidence of *Salmonella* infections was 20.8 per 100,000 population for cases who reported Hispanic ethnicity.

One hundred eighty-four (22%) culture-confirmed cases were hospitalized; the median length of hospital stay was 4 days (range, 1 to

70 days). Two culture-confirmed cases died. An 80 year-old died of bacteremia, *Salmonella* infection, and respiratory distress 7 days after *S. Newport* was isolated from blood. A 76 year-old died of respiratory failure, air embolism, septic shock, and *Salmonella* infection 9 days after *S. Paratyphi B* var. L(+) tartrate+ (formerly Java) was isolated from stool.

Of the 730 culture-confirmed cases with known travel history, 94 (13%) had traveled internationally during the week prior to their illness onset. There were three *S. Typhi* cases; one travelled to Sierra Leone, one traveled to Mexico, and one had no known international travel. There was one *S. Paratyphi A* case with no known international travel.

During 2021, 171 cases with specimens that were positive by a CIDT conducted at a clinical laboratory, but were not subsequently culture-confirmed, were reported. CIDTs have become widely adopted by clinical laboratories for the detection of *Salmonella* in stool. The median age of the CIDT-positive only cases was 52 years (range, 0 to 92 years). Fifty (29%) cases were hospitalized; the median hospital stay was 6 days (range, 2 to 66 days). Two cases died.

One hundred sixty-eight laboratory-confirmed (166 culture-confirmed and 2 CIDT-positive only) cases were part of 20 *Salmonella* outbreaks in 2021. Sixteen of the 20 outbreaks involved foodborne transmission, and 4 were due to animal contact. Twelve of the outbreaks involved cases with exposure in multiple states. The 20 outbreaks resulted in a median of 3 culture-confirmed cases per outbreak (range, 1 to 56). In addition, there was one multi-state investigation that included two Minnesota cases, which CDC classified as an outbreak with an unknown source.

Five culture-confirmed cases and two probable (clinically defined illness) cases of *S. I 4, [5], 12: i: -* infection were associated with a funeral event that served food prepared in private homes. The source of contamination and vehicle of transmission were not identified.

Four culture-confirmed cases of *S. Enteritidis* infection were part of a

multi-state outbreak associated with a specific producer of raw, frozen, breaded, stuffed chicken products that included 36 cases in 11 states. This was the 10th outbreak associated with this type of product in Minnesota, and the 5th with products from the same producer since 1998.

Three culture-confirmed cases of *S. Javiana* infection were part of a multi-state outbreak of 4 cases from 2 states associated with pre-packaged Napa salad. The Napa cabbage component was the most plausible contaminated ingredient. However, the source or mechanism of contamination could not be determined.

Two culture-confirmed cases of *S. Muenster* infection were part of a multi-state outbreak associated with contact with bearded dragons. The genetic relatedness of isolates from this outbreak to *S. Muenster* isolates from a previous 2020 outbreak associated with bearded dragons indicates a continuing source of contamination in the pet bearded dragon industry.

One culture-confirmed case of *S. Vitkin* infection was part of a multi-state outbreak of 12 cases from 10 states associated with contact with bearded dragons.

Two culture-confirmed cases of *S. Uganda* infection were part of a multi-state outbreak of 56 cases from 26 states associated with contact with bearded dragons.

Seven culture-confirmed cases and one probable case of *S. Enteritidis* infection were linked to a Mexican-style restaurant where the potential vehicle was chicken or guacamole salad. Improper cold holding and lack of adequate cleaning/sanitization may have contributed to the outbreak.

One culture-confirmed case of *S. Typhimurium* infection and one culture-confirmed case of *S. Infantis* infection were part of a multi-state outbreak that included 40 cases (26 *S. Typhimurium* and 14 *S. Infantis*) from 17 states. The outbreak vehicle was antipasto trays containing various Italian-style meats.

Twenty-four laboratory-confirmed (22 culture-confirmed and 2 CIDT-positive only) cases and four probable cases of *S. Enteritidis* infection were associated with watermelon consumption at an Asian-style buffet restaurant. The

most likely cause of the outbreak was cross contamination from raw meat to watermelon, partially due to the use of a spray hose. This was the third *S. Enteritidis* outbreak associated with this restaurant since 2018.

Eight culture-confirmed cases and nine probable cases of *S. Typhimurium* infection were associated with a graduation party. The vehicle of transmission was not identified.

Two culture-confirmed cases of *S. Enteritidis* infection were part of a multi-state outbreak for which the suspected vehicle was chicken. There were 50 cases from 20 states.

Twenty-eight culture-confirmed cases and 10 probable cases of *S. Oranienburg* infection were part of a multi-state outbreak associated with whole, fresh onions imported from Mexico that included 1,040 cases in 39 states. Following a 2020 multi-state *S. Newport* outbreak, this was the second consecutive year in which there was a multi-state outbreak of over 1,000 *Salmonella* infections associated with onions.

Two culture-confirmed cases of *S. Thompson* infection were part of a multi-state outbreak associated with seafood primarily from a distributor in Colorado. There were 115 cases from 15 states, and one of the Minnesota cases was part of a subcluster in Colorado.

Three culture-confirmed cases of *S. I 4,5,12:i:-* infection were part of a multi-state outbreak associated with Italian-style meat sticks that included 36 cases from 11 states. Timely and detailed reinterviewing of cases allowed MDH staff to rapidly identify the outbreak vehicle with only three cases.

Three culture-confirmed cases of *S. Typhimurium* infection were linked to a Minnesota restaurant where the vehicle of transmission was not identified. Poor hand-washing and bare-hand contact practices at the restaurant might have contributed to the outbreak.

Ten culture-confirmed cases and one probable case of *S. Typhimurium* infection were linked to a Minnesota Mexican-style restaurant. Lettuce was a possible vehicle of transmission. An infected food worker was the most plausible source of contamination, and therefore any ready-to-eat food item could have been a vehicle of transmission.

One culture-confirmed case and four probable cases of *S. Enteritidis* infection, plus a culture-confirmed case in an out-of-state resident, were linked to the same Asian-style buffet restaurant that was the source of another *S. Enteritidis* outbreak that occurred earlier in 2021 (reported above). No specific food vehicle was identified, but extensive issues in the restaurant created a high risk for

contamination of equipment, food preparation surfaces, and ready-to-eat food items.

Two culture-confirmed cases of *S. Newport* infection were likely associated with a college cafeteria; however, a vehicle was not identified.

One culture-confirmed case of *S. Saintpaul* infection was part of a multi-state outbreak of 60 cases from 14 states that was likely associated with tomatoes. One specific grower in Florida was identified as a common source of tomatoes for three subcluster establishments by traceback.

Fifty-six culture-confirmed cases of *Salmonella* infection with various serotypes (*S. Infantis* [37], *S. Enteritidis* [9], *S. Hadar* [8], *S. Mbandaka* [1], and *S. Muenchen* [1]) were associated with a multi-state outbreak linked to live poultry contact. Nationally, there were 1,135 people infected with the outbreak strains across 48 states, with illness onset dates ranging from December 15, 2020 to October 10, 2021.

Sexually Transmitted Diseases

Gonorrhea and chlamydia are monitored through a mostly passive surveillance system involving review of submitted case reports and laboratory reports. Syphilis is monitored

Table 3. Number of Cases and Incidence Rates (per 100,000 Persons) of Chlamydia, Gonorrhea, and Syphilis

Disease	2017		2018		2019		2020		2021	
	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
Chlamydia	23,528	444	23,564	444	24,535	463	21,942	413.7	22,578	425.7
Gonorrhea	6,519	123	7,542	142	8,063	152	10,217	192.6	9,671	182.3
Syphilis, Total	934	17.6	918	17.3	1127	21.2	1093	20.6	1457	27.5
Primary/ Secondary	292	5.5	292	5.5	385	7.3	461	7.8	564	10.6
Early NP/NS*	313	5.9	286	5.4	367	6.9	365	6.9	415	7.8
Unknown/Late	327	6.2	330	6.2	354	6.7	303	5.7	463	8.7
Congenital**	2	3	10	15.1	21	32.3	7	11.2	15	23.6

*NP=Non-primary; NS=Non-secondary

**Congenital syphilis rate per 100,000 live births.

Note: Data exclude cases diagnosed in federal or private correctional facilities.

Table 4. Number of Cases and Incidence Rates (per 100,000 Persons) of Chlamydia, Gonorrhea, and Primary/Secondary Syphilis by Residence, Age, Race/Ethnicity, and Gender, 2021

Disease	Chlamydia		Gonorrhea		Primary/Secondary Syphilis	
	No.	Rate	No.	Rate	No.	Rate
Total	22,578	426	9,606	181	564	10.6
Residence						
Minneapolis	4,613	1206	2,923	764	190	49.7
St. Paul	2,548	894	1,466	514	81	28.4
Suburban**	7,585	348	2,755	126	147	6.7
Greater Minnesota	7,519	306	2,377	97	146	5.9
Age						
<15 years	166	16	64	6	1	0.1
15-19 years	5,494	1494	1,328	361	18	4.9
20-24 years	7,997	2249	2,282	642	61	17.2
25-29 years	3,880	1041	1,982	532	105	28.2
30-34 years	2,293	669	1,595	465	113	33.0
35-39 years	1,267	386	1067	325	78	23.8
40-44 years	649	184	594	168	60	17.0
45-49 years	361	89	319	79	30	7.4
50-54 years	222	55	188	47	41	10.2
55+ years	249	19	252	19	57	4.3
Gender						
Male	8109	308	5,306	202	420	16
Female	14452	541	4,351	163	143	5.4
Transgender/ unknown^^	17		14		1	
Race^/Ethnicity						
White, non-Hispanic	9,066	196	3,075	67	239	5.2
Black, non-Hispanic	5,687	2024	3,849	1370	144	51.3
American Indian/ Alaska Native	653	970	410	609	58	86.1
Asian/PI	844	382	216	98	15	6.8
Other^^	625		169		53	
Unknown^^	3,450		1,328		15	
Hispanic^^^	2,253	900	559	223	40	16.0

*Residence information missing for 247 cases of chlamydia and 75 cases of gonorrhea.

**Suburban is defined as the metropolitan area (Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, and Washington Counties), excluding the cities of Minneapolis and St. Paul.

^Case counts include persons by race alone. Population counts used to calculate results include race alone or in combination.

^^No comparable population data available to calculate rates.

^^^Persons of Hispanic ethnicity may be of any race.

Note: Data exclude cases diagnosed in federal or private correctional facilities.

through active surveillance, which involves immediate follow-up with the clinician upon receipt of a positive laboratory report. Although overall incidence rates for sexually transmitted diseases (STDs) in Minnesota are lower than those in many other areas of the United States, certain population subgroups 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 2021, 22,578 chlamydia cases (425 per 100,000 population) were reported. This is a 3% increase compared to 2020 (Table 3).

Adolescents and young adults are at highest risk for acquiring a *chlamydia* infection (Table 4). The chlamydia rate is highest among 20 to 24-year-olds (2,249 per 100,000), followed by the 15 to 19-year-old age group (1,494 per 100,000). The incidence of chlamydia among adults 25 to 29 years of age (1,041 per 100,000) is considerably lower but has increased in recent years. The chlamydia rate among females (541 per 100,000) is nearly twice the rate among males (308 per 100,000), most likely due to more frequent screening among females.

Chlamydia infection incidence is highest in communities of color (Table 4). The rate among black non-Hispanics (2,024 per 100,000) is 10.3 times higher than the rate among white non-Hispanics (196 per 100,000). Although black, non-Hispanic persons comprise approximately 5% of Minnesota's population, they account for 25% of reported chlamydia cases. Rates among Asian/Pacific Islanders (382 per 100,000), Hispanic, any race (900 per 100,000), and American Indian/Alaska Natives (970 per 100,000) are 4.6 to 4.9 times higher than the rate among white, non-Hispanic persons.

Chlamydia infections occur throughout the state, with the highest reported rates in Minneapolis (1,206 per 100,000) and St. Paul (894 per 100,000). All geographical areas around our state saw an increase in the rate of chlamydia between 2020 and 2021. Every county in Minnesota had at least 2 cases in 2021.

Gonorrhea

Gonorrhea is the second most commonly reported STD in Minnesota. In 2021, 9,671 cases (182 per 100,000 population) were reported. This is a 5% decrease compared to 2020 (Table 4). Adolescents and young adults are at greatest risk for gonorrhea (Table 4), with rates of 361 per 100,000 among 15 to 19-year-olds, 642 per 100,000 among 20 to 24-year old, and 532 per 100,000 among 25 to 29-year-olds. Gonorrhea rates for males (202 per 100,000) were higher than females (163 per 100,000).

Communities of color are disproportionately affected by gonorrhea. The incidence of gonorrhea among black, non-Hispanics (1370 per 100,000) is 20.6 times higher than the rate among white, non-Hispanics (67 per 100,000). Rates among Asian/Pacific Islanders (98 per 100,000), Hispanic, any race (249 per 100,000), and American Indian/Alaska Natives (609 per 100,000) are up to 9 times higher than among white, non-Hispanic persons.

Gonorrhea rates are highest in the cities of Minneapolis and St. Paul (Table 4). The incidence in Minneapolis (764 per 100,000) is over 1.5 times higher than the rate in St. Paul (514 per 100,000), almost 6 times higher than the rate in the suburban metropolitan area (126 per 100,000), and almost 8 times higher than the rate in Greater Minnesota (97 per 100,000).

Syphilis

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

The incidence of primary/secondary syphilis in Minnesota is lower than that of chlamydia or gonorrhea (Table 3), but has remained elevated since an outbreak began in 2002 among men who have sex with men (MSM). In 2021, there were 564

cases of primary/secondary syphilis in Minnesota (10.6 cases per 100,000 persons), which is a 35% increase compared to 2020.

In 2021, the number of early syphilis cases increased by 25%, with 979 cases, compared to 783 cases in 2020. The incidence remains highly concentrated among MSM. Of the early syphilis cases in 2021, 723 (73%) occurred among men; 444 (61%) of these were MSM. Thirty-one percent of the MSM diagnosed with early syphilis were co-infected with HIV. The number of women reported has continued to increase over the past 10 years from 13 early syphilis cases in 2011 to the near historic high of 253 cases reported in 2021.

14 congenital syphilis cases were reported in 2021. Syphilis may be passed from a pregnant person to the unborn baby through the placenta. The infection can cause miscarriages and stillbirths. Infants born with congenital syphilis can suffer a variety of serious health problems, including deformities, seizures, anemia, and jaundice. The CDC reported this fall that the number of infants born with syphilis has increased more than 200% in the past four years and last year reached a 20-year high. In Minnesota, the number and rate of congenital syphilis cases among infants has increased from 2.9 in 2015 to 23.6 per 100,000 live births in 2021.

Shigellosis

In 2021, 220 *Shigella* cases were reported. Of those, 109 were culture-confirmed (1.9 per 100,000 population). The remaining 111 were only tested by a culture-independent diagnostic test (CIDT) and not subsequently confirmed. The 220 culture-confirmed *Shigella* cases represents a 38% increase from the 79 cases reported in 2020, and is 22% less than the median annual number of cases reported from 2011 to 2020 (median, 140 per year; range, 79 to 556). *S. flexneri* accounted for 76 (70%) cases, *S. sonnei* for 28 (26%) cases, *S. boydii* for 2 (2%) cases, and *S. dysenteriae* for 1 (1%) case. The species was not identified for 2 (2%) cases. Culture-confirmed cases ranged in age from 1 to 89 years (median, 32 years). Nine percent of cases were ≤5 years of age; 85% of cases were 18 years of age or older. Seventy-five percent of cases were male. Twenty-

three (21%) cases were hospitalized. No cases died.

In 2021, of the 220 reported cases, 217 patients were positive for *Shigella* by a CIDT conducted in a clinical laboratory. Of the 208 corresponding specimens that were received at MDH, 104 (50%) were subsequently culture-confirmed. The remaining 111 cases only had specimens that were positive by a CIDT conducted at a clinical laboratory and were not subsequently culture-confirmed. The median age of the CIDT-positive only cases was 32 years (range, 1 to 89 years). Thirteen (12%) CIDT-positive only cases were hospitalized; the median hospital stay was 2 days (range, 1 to 7 days). One CIDT-positive only case died.

Thirty-eight percent of cases reported either non-white race (30 of 100 cases) or Hispanic ethnicity (16 of 100 cases). Of the 93 cases for which travel information was available, 21 (23%) travelled internationally (8 of 25 [32%] *S. sonnei* and 12 of 65 [18%] *S. flexneri*). Eighty-four percent of cases resided in the Twin Cities metropolitan area, including 61% in Hennepin County and 17% in Ramsey County.

There was one outbreak of shigellosis associated with a restaurant.

In 2021, 35 of the 103 *Shigella* isolates received at MDH were tested for antimicrobial resistance. Of the 35 isolates, 74% (26 isolates) were resistant to ampicillin, 74% (26 isolates) were resistant to trimethoprim-sulfamethoxazole, and 46% (16 isolates) had decreased susceptibility to azithromycin (DSA). All but one of the 16 of the DSA isolates were collected from adult males; the remaining isolate was collected from an adult female with no history of international travel. Among the 10 adult male cases with DSA infection and available information, 7 (70%) reported sexual contact with a male during the week before illness onset.

Staphylococcus aureus

Invasive *Staphylococcus aureus* (SA) infections are classified into one of three categories: hospital-onset (HO-SA); healthcare-associated, community-onset (HACO-SA); and community-associated (CA-SA). SA must be isolated from a normally sterile body site greater than three days after the date of initial hospital admission for a

case to be considered HO-SA. HACO-SA cases have at least one healthcare-associated (HA) risk factor identified in the year prior to infection. Examples of HA risk factors include residence in a long-term care facility, recent hospitalization(s), dialysis, presence of an indwelling central venous catheter, and surgery. CA-SA cases do not have any identifiable HA risk factors present in the year prior to infection.

In 2005, as part of the Emerging Infections Program (EIP) Active Bacterial Core surveillance (ABCs) population-based surveillance of invasive methicillin-resistant *S. aureus* (MRSA) was initiated in Ramsey County. Surveillance was expanded to include Hennepin County in 2008. The incidence rate was 15.8 per 100,000 in 2021 compared to 14.8 per 100,000 population in 2020. In 2021, MRSA was most frequently isolated from blood (88%, 250/286), and 15% (43/286) of the cases died in the hospital. HACO-MRSA cases comprised the majority (61%, 175/286) of invasive MRSA infections in 2021, CA-MRSA cases accounted for 27% (76/286) and 12% (35/286) cases were HO-MRSA. The median age for all cases was 50 years (range, 3 to 98); the median age was 53 (range, 3 to 98), 52 (range, 9 to 89), and 43 (range, 3 to 93) for HO-, HACO-, and CA-MRSA cases, respectively.

In August 2014, as part of the EIP Active Bacterial Core surveillance (ABCs) population-based surveillance of invasive methicillin-sensitive *S. aureus* (MSSA) was initiated in Hennepin and Ramsey Counties. The incidence rate was 29.5 per 100,000 in 2021 compared to 30.6 per 100,000 population in 2020. In 2021, MSSA was most frequently isolated from blood (80%, 425/533), and 11% (60/533) of the cases died in the hospital. HACO-MSSA cases comprised the majority (54%, 291/533) of invasive MSSA infections in 2021, CA-MSSA cases accounted for 35% (189/533) and 10% (53/533) cases were HO-MSSA. The median age for all cases was 58 years (range, <1 to 97); the median age was 61 (range, 4 to 97), 54 (range, <1 to 78), and 53 (range, 2 to 97) for HO-, HACO-, and CA-MSSA cases, respectively.

Vancomycin-intermediate *S. aureus* (VISA) and vancomycin-resistant *S. aureus* (VRSA) are reportable in Minnesota, as detected and defined according to Clinical and Laboratory Standards Institute approved standards and recommendations. These recommendations stipulate a minimum inhibitory concentration (MIC)=4-8 µg/ml for VISA and MIC≥16 µg/ml for

VRSA. Patients at risk for VISA and VRSA generally have underlying health conditions, such as diabetes and end stage renal disease requiring dialysis, previous MRSA infections, recent hospitalizations, and recent exposure to vancomycin. There have been no VRSA cases in Minnesota (MN). There were no VISA cases reported in 2021. Between 2008 and 2021, we had 19 VISA confirmed cases: 2008 (3), 2009 (3), 2010 (2), 2011 (5), 2013 (3), 2016 (2) and 2019 (1). Among all cases of VISA in MN, 11 (58%) were male and the median age was 64 years (range, 27 to 86). Of those cases with known history (18), 89% reported recent exposure to vancomycin.

Streptococcal Invasive Disease – Group A

Invasive Group A Streptococcus disease (GAS) is defined as GAS isolated from a usually sterile site such as blood, cerebrospinal fluid, or a wound when accompanied with necrotizing fasciitis or streptococcal toxic shock syndrome (STSS). Two-hundred and fourteen cases (3.8 cases per 100,000 population), including 19 deaths, were reported in 2021, compared to 271 cases and 20 deaths in 2020. The median age of cases was 55 years (range, 6 months to 93 years). Fifty-five percent of cases were residents of the metropolitan area. Allowing for multiple presentations per patient, 105 (49%) had cellulitis, 42 (20%) bacteremia without another focus of infection, 30 (14%) septic shock, 29 (13.5%) had septic arthritis and/or osteomyelitis, 16 (7.5%) abscess (not skin), 16 (7.5%) pneumonia, and 11 (5%) necrotizing fasciitis. Forty-three (20%) cases were injection drug users in 2021, including one death, compared to 48 cases (18%) and 0 deaths in 2020. Twelve (5.6%) cases were residents of long-term care facilities. Ten facilities had a single case, one facility had 2 cases.

Allowing for multiple infection types per patient, the 19 deaths included 11 that were diagnosed with septic shock, 11 cellulitis, 2 bacteremia without another focus of infection, 1 abscess (not skin), 1 necrotizing fasciitis, 1 pneumonia, and 1 with STSS. Of the 19 deaths, the most frequently reported underlying conditions were diabetes (11), chronic kidney disease (7), atherosclerotic cardiovascular disease (6), current tobacco smoker (6),

heart failure (5), chronic obstructive pulmonary disease (4), solid organ malignancy (3), and obesity (3). Sixteen fatal cases had two or more underlying conditions, and 1 had none reported.

Streptococcal Invasive Disease – Group B

Five-hundred-eighty-four cases of invasive group B Streptococcus (GBS) disease (10.3 per 100,000 population), including 41 deaths, were reported in 2021. By age group, annual incidence was highest among infants <1 year of age (49.7 per 100,000 population) and cases aged ≥70 years (30.1 per 100,000). Nineteen (46%) of the 41 deaths were among cases ≥65 years. Fifty percent of cases were residents of the metropolitan area. Bacteremia without a focus of infection occurred most frequently (27%), followed by cellulitis (20%), septic arthritis (10%), osteomyelitis (9%), septic shock (9%), pneumonia (6%), abscess (5%), and meningitis (1%). The majority (85%) of cases had GBS isolated from blood; other isolate sites included joint fluid (9%), peritoneal fluid (3%), cerebrospinal fluid (<1%), and bone (<1%).

Thirty-four cases were infants and 4 were maternal cases, compared to 33 cases in 2020. Thirteen infants developed early-onset disease (occurred within 6 days of birth [0.2 cases per 1,000 live births]), and 17 infants developed late-onset disease (occurred at 7 to 89 days [0.3 cases per 1,000 live births]). One stillbirth/spontaneous abortion was associated with the 4 maternal GBS infections.

Since 2002, there has been a recommendation for universal prenatal screening of all pregnant women at 35 to 37 weeks gestation. In light of this, we reviewed the maternal charts for all early-onset cases reported in 2021. Overall, 7 of 13 women who delivered GBS-positive infants underwent prenatal screening for GBS. Of these, 2 were positive and 5 were negative. One of the 6 women who did not receive prenatal screening was screened upon admission to the hospital prior to delivery and was positive. Among the 13 women who delivered GBS-positive infants, 7 received intrapartum antimicrobial prophylaxis. An update of GBS perinatal prevention guidance was published by the American College of Obstetricians and

Gynecologists, and by the American Academy of Pediatrics in July 2019.

Streptococcus pneumoniae Invasive Disease

In 2021, 309 (5.5 per 100,000) cases of invasive pneumococcal disease (IPD) were reported. By age group, annual incidence rates per 100,000 were 7.2 cases among children aged ≤5 years, 1.3 cases among children and adults aged 5-39 years, 7.9 cases among adults 40-64 years, and 13.1 cases among adults aged ≥65 years.

Pneumonia occurred most frequently (48% of infections), followed by bacteremia without another focus of infection (16%), septic shock (11%), and meningitis (6%). Forty-six (15%) cases died. Health histories were available for 45 deaths, of which 40 had an underlying health condition. The conditions most frequently reported were current tobacco smoker (16), diabetes (14), solid organ

malignancy (10), emphysema/chronic obstructive pulmonary disease (10), current alcohol abuse (9), obesity (9), atherosclerotic cardiovascular disease/ coronary artery disease (7), chronic kidney disease (6), and heart failure (6).

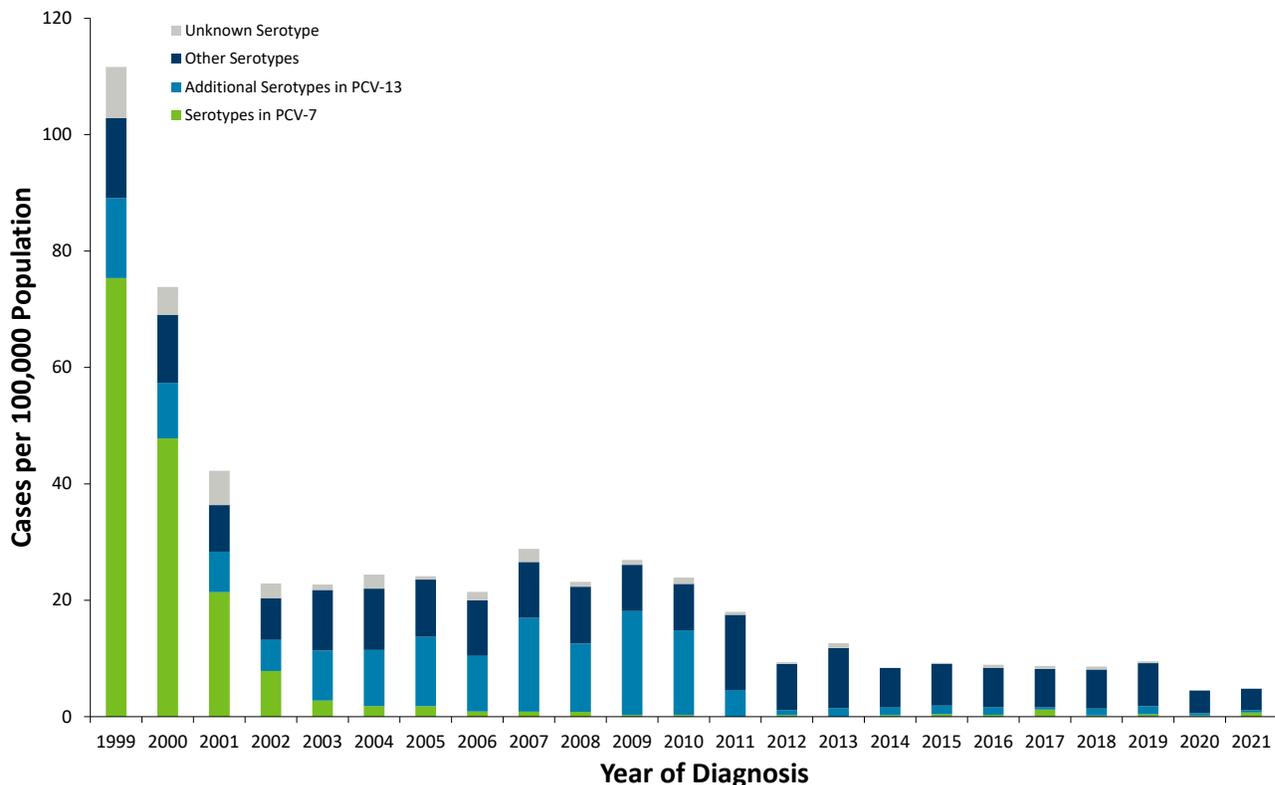
In 1999, the year before the pediatric pneumococcal conjugate vaccine (Pneumovax [PCV-7]) was licensed, the rate of IPD among children <5 years of age in the metropolitan area was 111.7 cases/100,000. Over the years 2000-2002 there was a major downward trend in incidence in this age group (Figure 6). Rates in each of the subsequent 8 years were level or somewhat higher. Based on the distribution of serotypes among isolates from these cases, this increase was limited to disease caused by non-vaccine serotypes (i.e., serotypes other than the 7 included in PCV-7) (Figure 6).

In March 2010, the U.S. Food and Drug Administration approved a 13-valent pediatric pneumococcal conjugate

vaccine (PCV-13 [Pneumovax 13]) which replaced PCV-7. This vaccine provides protection against the same serotypes in PCV-7, plus 6 additional serotypes (serotypes 1, 3, 5, 6A, 7F, and 19A). From 2007 to 2010, the majority of IPD cases among children <5 years of age was caused by the 6 new serotypes included in PCV-13 (Figure 6). Since 2011, the majority of IPD cases among children <5 years of age has been caused by serotypes not included in PCV-13. In 2021, 13% of cases with isolates available for testing were caused by 7 of the PCV-13-included serotypes: 3 (13%), 19F (5%), 19A (2%), 4 (1%), 18C (<1%), and 6B (<1%).

In August 2014, the Advisory Committee on Immunization Practices (ACIP) recommended that all adults ≥65 years receive 1 dose of PCV-13 followed by 1 dose of 23-valent pneumococcal polysaccharide vaccine 6 to 12 months later. Among adults ≥65 years, 11% of cases in 2021 had PCV-13 serotypes.

Figure 6. Invasive Pneumococcal Disease Incidence Among Children <5 Years of Age, by Year and Serotype Group, Metropolitan Area



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

Toxoplasmosis

Toxoplasmosis is an illness caused by the coccidian protozoan *Toxoplasma gondii*. Cats are the primary reservoir and definitive host for *T. gondii*. *T. gondii* transmission in the United States is primarily foodborne, through handling or consumption of undercooked pork, lamb, or venison containing bradyzoites, the microscopic tissue cyst form of the parasite. People also can be infected through direct contact with cat feces or soil that contains *Toxoplasma* oocysts, or through consumption of food or water that has been contaminated with oocysts.

In 2021, 7 cases were reported (6 confirmed and 1 probable). This was similar to the annual median of 9 cases reported from 2013 to 2020 (range, 2 to 14 cases). Fourteen confirmed cases were identified in 2019 but only 2 confirmed cases were identified in 2020, likely reflecting challenges in toxoplasmosis surveillance resulting from the COVID-19 response.

In 2021, two cases were diagnosed with ocular toxoplasmosis, 3 cases with generalized toxoplasmosis, and 2 with cerebral toxoplasmosis. All 7 cases were acquired; no cases were congenital. There were no pregnancies reported among cases. Three cases had immunocompromising conditions. The median age of cases was 43 years (range, 36 to 62 years). Five cases (71%) were male. Two cases were Asian/Pacific Islander, 1 case was Black/African American, 1 case was white, and 3 were of unknown race; four cases were non-Hispanic, 2 were Hispanic, and 1 was of unknown ethnicity.

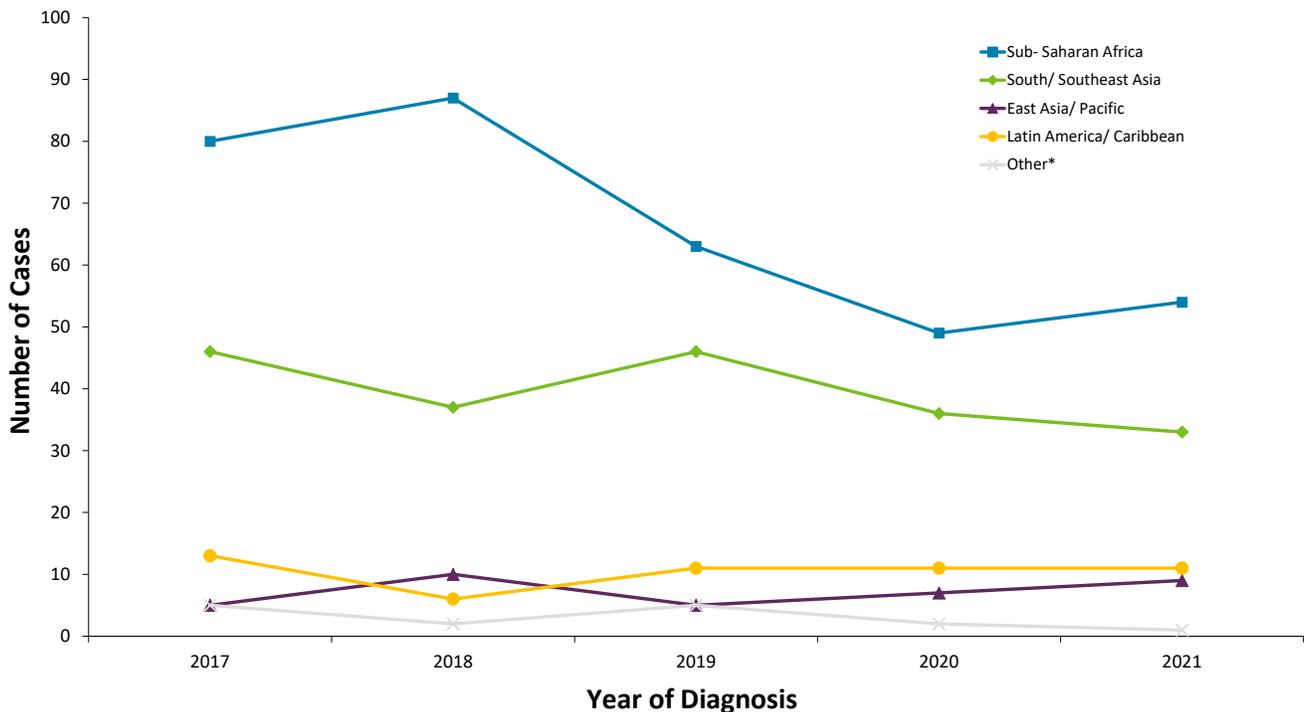
Tuberculosis

In 2021, 134 tuberculosis (TB) cases (2.4 per 100,000 population) were reported. This represents a 15% increase in the number of cases compared to 2020, when there were 117 newly reported cases. Despite this rebound in the number of new cases in 2021, it was still 9% below the case count in 2019. This followed

a similar trend seen at the national level, most likely reflecting lingering effects of the COVID-19 pandemic. This could be due to a combination of factors, including delayed diagnosis or misdiagnosis of TB from shifting resources in public health and underutilization of healthcare services, together with a true decrease in TB incidence from COVID-19 mitigation strategies during the pandemic. The TB incidence rate in Minnesota was the same as the overall rate in the United States. Fourteen cases (10%) from 2021 have died as of March 2023, 11 (8%) due to TB disease.

Twenty-six counties (30%) reported at least one case in 2021. The majority of TB cases (76%) occurred in the metropolitan area, primarily in Hennepin (24%) and Ramsey Counties (30%). Thirty cases (22%) were from the other five metropolitan counties, and the remaining 24% of cases were reported from greater Minnesota. Among metropolitan area counties, the highest TB incidence rate in 2021 was reported in Ramsey County (7.3 per 100,000), followed

Figure 7. Non U.S.-Born Tuberculosis Cases by Region of Birth and Year of Report



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

by Anoka County (3.6 per 100,000). The combined TB incidence rate for the 7-county metropolitan area was 3.3 per 100,000, compared to 1.3 per 100,000 for all greater Minnesota counties.

The largest groups of new TB cases were those 25-44 and 45-64 years of age at time of diagnosis (28% each), followed by cases 65 years of age and older (20%). Eight patients (6%) were <5 years of age when they were diagnosed.

Most TB cases (79%) were identified only after seeking medical care for symptoms of disease. Targeted public health interventions identified a portion of the remaining 21% of cases, including contact investigations surrounding potentially infectious patients (9%) and screening of new refugee arrivals (2%). An additional 6% were identified through other targeted testing for TB, including employment screening and other medical examinations for immigration purposes. The remaining five cases (4%) were diagnosed with active TB disease incidentally while being evaluated for another medical condition.

TB incidence is disproportionately high among racial and ethnic minorities in Minnesota, as well as nationally. In 2021, 11 cases occurred among non-Hispanic whites, a case rate of 0.2 per 100,000. In comparison, among non-Hispanic persons of other races, 56 cases occurred among blacks/African-born persons (12.8 cases per 100,000), 52 among Asians or Pacific Islanders (16.5 cases per 100,000), and one case among American Indian or Alaska Native persons (1.5 cases per 100,000). Fourteen cases were Hispanic/Latino persons of any race (4.4 cases per 100,000). The majority of Hispanic/Latino (79%), Asian/Pacific Islander (79%), and black/African-born cases (96%) were non-U.S. born.

In 2021, the percentage of TB cases in Minnesota occurring in persons born outside the United States was 81%, compared to 71% of TB cases reported nationally. The 108 non-U.S.-born TB cases represented 33 different countries of birth; the most common region of birth among these cases was Sub-Saharan Africa (50% of non-

U.S. born cases), followed by South/Southeast Asia (31%), Latin America (including the Caribbean) (10%), East Asia/Pacific (8%), and Eastern Europe (<1%). (Figure 7).

Compared to the percentage of cases who have lived in areas of the world where TB is more common, individuals in other high-risk groups comprised smaller proportions of the cases. Note that patients may fall under more than one risk category. Fifty percent occurred in persons with certain medical conditions (not including HIV/AIDS), which increase the risk for progression from latent TB infection to active TB disease (e.g., diabetes, COVID-19 infection, active smoking, prolonged corticosteroid or other immunosuppressive therapy, end stage renal disease). One percent of cases were co-infected with HIV. Substance use (including excess alcohol use and/or injection and non-injection drug use) during the 12 months prior to their TB diagnosis was reported by 3% of cases, and one percent reported experiencing homelessness during the 12 months prior to diagnosis.

By site of disease, 65% of cases had pulmonary disease exclusively. Another 9% had both pulmonary and extrapulmonary sites of disease, and 26% had extrapulmonary disease exclusively. Among the 47 patients with an extrapulmonary site of disease, the most common sites were lymphatic (45%), followed by peritoneal (19%) and musculoskeletal (19%). Extrapulmonary disease is generally more common among persons born outside the United States, as seen in cases reported nationally as well as in Minnesota. Thirty-eight percent of non-U.S.-born cases in Minnesota had at least one extrapulmonary site of disease, compared to only 23% of U.S.-born cases.

Of 94 culture-confirmed TB cases with drug susceptibility results available, 10 (11%) were resistant to at least one first-line anti-TB drug (i.e., isoniazid [INH], rifampin, pyrazinamide, or ethambutol), including 9 cases (10%) resistant to at least INH. There were 4 new cases of multidrug-resistant TB (MDR-TB, or resistance to at least INH and rifampin) reported in 2021, making up 4% of culture-confirmed cases.

Tularemia

Tularemia is an acute illness caused by *Francisella tularensis* subspecies *tularensis* (type A) or *holarctica* (type B). Routes of transmission include arthropod bites (particularly ticks and deer flies), contact with infected animals, and exposure to contaminated water or soil. There are six main clinical forms of disease and all include fever: ulceroglandular, glandular, pneumonic, oropharyngeal, oculoglandular, and typhoidal.

In 2021, one probable glandular tularemia case was reported. The case was a 13-year-old female who was likely exposed through a tick bite.

From 2007 to 2021, 24 tularemia cases were reported in Minnesota, with a range of 0 to 6 cases annually. Twelve cases had ulceroglandular, 7 had glandular, 2 had pneumonic, and 3 had typhoidal tularemia. Ten of 15 cases with a known tularemia subtype had type B, and 5 had type A. The median age of cases was 40 years (range, 2 to 87 years). Thirteen cases were likely exposed through a tick or biting fly bite, 2 through water exposure, 3 through a cat scratch or bite, and 2 by inhaling the bacteria; likely exposures for 3 cases could not be determined. Sixteen of 20 cases for whom race was known were White, 1 was Black, 2 were American Indian/Alaska Native, and 1 was Asian/Pacific Islander.

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

MDH conducts surveillance for unexplained deaths and critical illnesses in an effort to identify those that may have an infectious etiology. This surveillance is performed through two complementary surveillance systems, Unexplained Critical Illnesses and Deaths of Possible Infectious Etiology (known as UNEX), and Medical Examiner (ME) Infectious Deaths Surveillance (known as MED-X), which is not limited to deaths with infectious hallmarks. Focus is given to cases <50 years of age with no significant underlying conditions; however, any case should be reported regardless of the patient's age or underlying medical

conditions to determine if further testing conducted or facilitated by MDH may be indicated. Testing of pre-mortem and post-mortem specimens is conducted by the MDH Public Health Lab (PHL) and the CDC Infectious Diseases Pathology Branch (IDPB).

In 2021, 206 cases met UNEX criteria (191 deaths, 15 critical illnesses), compared to 131 cases in 2020. Of the 206, 193 (94%) were reported by providers and 13 deaths were found by death certificate review. One hundred twenty-five (60.5%) cases presented with respiratory symptoms; 55 (27%) with sudden unexpected death; 14 (7%) with neurologic symptoms; 4 (2%) with shock/sepsis; 5 (2%) with gastrointestinal symptoms; 2 (1%) with cardiac symptoms; 1 (0.5%) with multiple symptoms. The age of cases ranged from 8 days to 89 years, with a median age of 47 years. Fifty-one percent resided in the 7-county metropolitan area, 64% were male, and 16% were non-MN residents who were either hospitalized in MN or investigated by a MN medical examiner.

There were 554 MED-X cases in 2021; 191 of these also met UNEX criteria. The median age of the cases was 48.5 years, and 62% were male. There were 262 (47%) cases found through death certificate review and MEs reported 292 (53%) cases. The most common syndrome was pneumonia/upper respiratory infection (n=319 [58%]).

There were 582 potential UNEX or MED-X cases that had specimens tested at the PHL and/or the IDPB. Two hundred and sixty-one cases were determined to be non-infectious. One hundred forty-five cases had pathogens identified as confirmed, probable, or possible cause of illness, including 139 UNEX deaths (Table 5). Among 49 unexplained deaths occurring in those <50 years of age without any immunocompromising conditions, UNEX helped to identify the pathogen(s) involved in 28 (57%) cases. MED-X surveillance detected an additional 129 cases with pathogens identified by MEs as the cause of death (Table 5). Cases with pathogens of public health importance detected included an 84-year-old male who developed neurologic symptoms 5 months after being bitten by a rabid bat

Table 5. UNEX/MED-X Pathogens Identified as Confirmed, Probable, or Possible Cause of Illness, 2021*

Pathogen Identified	UNEX (n=145)	MED-X (n=129)**
<i>Aspergillus</i> spp.	0	1
<i>Blastomyces dermatitidis</i>	1	0
<i>Candida albicans</i>	0	1
<i>Clostridioides difficile</i>	0	1
<i>Enterococcus</i> spp.	0	1
<i>Enterococcus faecalis</i>	0	3
<i>Escherichia coli</i>	2	6
<i>Fusobacterium</i> spp.	1	1
Group A <i>Streptococcus</i> / <i>Streptococcus pyogenes</i>	2	2
Group B <i>Streptococcus</i>	1	3
<i>Haemophilus</i> spp.	1	0
<i>Haemophilus haemolyticus</i>	1	0
<i>Haemophilus influenzae</i>	2	1
<i>Histoplasma capsulatum</i>	0	1
Influenza A virus (no hemagglutinin typing information available)	1	1
Influenza A – H3	2	0
<i>Klebsiella oxytoca</i>	0	1
<i>Klebsiella pneumoniae</i>	2	0
<i>Legionella pneumophila</i>	4	0
Metapneumovirus	1	0
<i>Mycobacterium</i> spp.	0	1
<i>Pneumocystis jirovecii</i>	0	1
Powassan virus	1	0
<i>Pseudomonas aeruginosa</i>	0	1
Rabies virus	1	0
Respiratory Syncytial virus	0	2
Rhinovirus	1	0
Rhinovirus/Enterovirus	1	0
SARS-CoV-2 virus	105	86
<i>Staphylococcus</i> spp.	2	0
<i>Staphylococcus aureus</i>	2	6
<i>Staphylococcus aureus</i> - MRSA	4	4
<i>Staphylococcus epidermiditis</i>	0	1
<i>Streptococcus</i> spp.	7	0
<i>Streptococcus anginosus</i>	1	0
<i>Streptococcus pneumoniae</i>	10	8
<i>Ureaplasma</i> spp.	1	0

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

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

and received appropriate rabies post exposure prophylaxis (PEP). An autopsy revealed meningoencephalitis consistent with rabies virus and postmortem samples submitted to IDPB and the CDC Rabies Branch confirmed the presence of rabies virus. This case represented the first documented rabies PEP failure since the introduction of modern cell-culture vaccines and was contributed to the patient having previously unrecognized impaired immunocompromising condition. The UNEX program also identified 102 deaths due to SARS-CoV-2 virus that occurred outside of traditional healthcare facilities such as hospitals or congregate care settings.

Due to the COVID-19 pandemic, the UNEX/MED-X team expanded surveillance testing to include swab autopsies that were performed on suspect infectious deaths that did not have an autopsy performed. Nasal pharyngeal swabs were collected from decedents at funeral homes, decedents' homes and at long-term care facilities. A total of 52 specimens were submitted to MDH. 43 decedents had known symptoms prior to death. Of those, 25 (58%) had potential pathogens detected, including SARS-CoV-2 (n=24) and influenza A (n=1).

Varicella and Zoster

In 2021, 169 varicella cases were reported (3.0 per 100,000 population). Ninety-seven cases (57%) were from the metropolitan area. Case ages ranged from 95 days to 69 years. Thirty-two cases (19%) were < 1 year, 73 (43%) were 1-6 years, 36 (21%) were 7-12 years, 10 (6%) were 13-17 years, and 18 (11%) were ≥ 18 years of age. Four cases were hospitalized; 1 was < 1 year, one was 1-6 years, and 2 were >18 years. Two of the hospitalized cases had not been vaccinated; one had medical contraindications and one was underage for vaccination. The vaccination status of the other two hospitalized cases was not available.

Varicella cases are often identified by parents/guardians reporting to schools and childcare facilities, rather than directly reported by a clinician. In 2021, 108 cases (64%) had visited a health care provider, 21 (12%) had consulted a provider or clinic by telephone, 16 (10%) had been identified by a school health professional, and 24 (14%) had not consulted a health care provider. Of the 168 cases for which information

regarding laboratory testing was available, 64 (38%) had appropriate testing performed.

One outbreak, defined as ≥5 cases in the same setting, was reported in 2021. This occurred in an infant room at a daycare center and included 5 cases, 4 of which were unvaccinated due to being underage (first dose recommended at age 12-15 months).

Zoster cases in children <18 years of age are reportable in Minnesota; 34 cases were reported in 2021. Cases may be reported by school health personnel, childcare staff, or healthcare providers. Ages ranged from 10 months to 16 years (median 11 years). Varicella vaccine became a requirement for entry into kindergarten and 7th grade in 2004, and the incidence of zoster in children has declined from 15.7 per 100,000 population in 2006 to 2.6 per 100,000 population in 2021.

Zoster with dissemination or complications (other than post-herpetic neuralgia) in persons of any age is also reportable; 56 cases were reported, and 44 (79%) were hospitalized. Cases ranged from 2 to 94 years of age, with a median age of 60. Thirty-seven (66%) had co-morbidities or were being treated with immunosuppressive drugs. Fourteen had disseminated rash or disease, 17 had meningitis, 11 had cellulitis or other bacterial superinfection, 8 had encephalitis, 3 had meningoencephalitis and 7 had Ramsay-Hunt Syndrome. Cases with disseminated rash or disease tended to be older than cases with meningitis without dissemination (median age of 63 vs. 43 years) and were more likely to have immunocompromising conditions or immunosuppressive drug treatment (64% vs. 27%). Five deaths occurred; two had encephalitis, two had meningoencephalitis, and one had meningitis and Ramsay Hunt Syndrome. All deaths were in cases > 65 years. Only 19% of cases ≥50 years of age had a record of receiving zoster vaccine.

Vibriosis

There were 91 *Vibrio* spp. (several species) cases reported in 2021. Of those, 24 were culture-confirmed and 67 were positive by culture-independent diagnostic tests (CIDT) and not subsequently culture-confirmed.

The 24 culture-confirmed cases of *Vibrio* spp. infection reported in 2021

represent a 71% increase from the 14 cases reported in 2020, and a 20% increase from the median annual number of cases reported from 2010 to 2020 (median, 20 cases; range, 9 to 40). *V. parahaemolyticus* accounted for 12 (50%) cases, *V. alginolyticus*, *V. cholerae*, and *V. fluvialis* for 3 (13%) each, and *V. vulnificus* for 1 (4%). Two isolates were not received by the MDH Public Health Laboratory for confirmation and species identification. Serotyping was performed on all three *V. cholerae* specimens, and all were non-O1/non-O139.

Vibrio was isolated from stool in 16 (67%) cases, wounds in 3 (13%) cases, blood in 2 (8%) cases, ear effusion in 2 (8%) cases, and urine in 1 (4%) case. Three (13%) cases were hospitalized for a median of 3 days (range, 1 to 4 days), and one case died. Travel history was available for 21 cases. Fourteen (67%) cases traveled out of Minnesota in the week before their symptom onset, including five (24%) who traveled internationally. Two cases traveled to Mexico, and one case each to the Bahamas, Egypt, and Somalia. Of the 16 cases with *Vibrio* isolated from stool who were able to be interviewed about exposure to seafood in the week before illness onset, 10 (63%) reported consuming oysters. Of the remaining six cases, three had other raw or undercooked seafood.

In 2021, 74 patients were positive by CIDTs conducted at a clinical laboratory. Of these 67 (91%) were not culture-confirmed and thus were classified as probable cases. Eight (12%) specimens were not received by the public health laboratory for culture confirmation. Fifty-nine (79%) were received at MDH and tested negative by culture. Fifteen (22%) probable cases were hospitalized and two (3%) died.

Ten (19%) of the 53 probable cases who were interviewed traveled outside Minnesota, and five (9%) traveled internationally (one each to Cameroon, France, Mexico, New Zealand, and Somalia). Among the 43 probable cases interviewed about food exposures, three (7%) reported eating raw oysters, and three (7%) reported eating another type of raw seafood in the week prior to illness onset. Thus, probable cases differed markedly from culture-confirmed cases regarding exposures, suggesting a high proportion of CIDT-positive tests represented false positives.

There were no outbreaks of *Vibrio* spp. infections identified in 2021.

Viral Hepatitis A

In 2021, 12 cases of hepatitis A (0.2 per 100,000 population) were reported. Ten cases were residents of the metropolitan area. Six cases were male. The median age was 33.5 years (range 3 to 85). Race was known for all cases; 9 (75%) were white, one (8.3%) was Asian, and two (16.7%) were reported as other race. Three (25%) cases were known to be of Hispanic ethnicity.

Ongoing outbreaks of hepatitis A have been occurring in states across the country since 2016, with at least 37 states reporting outbreaks. An outbreak was declared in Minnesota in August 2019 and 1 case was identified as a part of the outbreak in 2021. This case did not report risk factors, but traveled to states with ongoing outbreaks. The end of the Minnesota outbreak was declared in September 2021. There were a total of 128 cases identified over the course of the outbreak. Of these cases, 89 (70%) were hospitalized and there was one death.

Of the 11 cases not associated with the outbreak, 6 cases were associated with international travel and two cases are presumed to be a result of foodborne exposure. No risk factor was identified for the three remaining cases.

Viral Hepatitis B

In 2021, 10 cases of acute hepatitis B virus (HBV) infection (0.2 per 100,000 population) were reported. In 2012, the case definition for acute hepatitis B was revised to include laboratory confirmed asymptomatic acute cases. Five of the 10 cases were asymptomatic, laboratory-confirmed infections.

The median age was 43 years (range 21 to 72). Six cases were residents of the metropolitan area. Six cases were male. Race was known for 9 cases: four (44%) were White, one (11%) was Asian, two (22%) were Black, one (11%) was reported as multi-racial, and one (11%) was reported as other race. One (10%) case was known to be of Hispanic ethnicity.

MDH received 190 reports of newly identified chronic hepatitis B infections in 2021. A total of 27,464 persons are estimated to be alive and living in Minnesota with chronic HBV infection. The median age of chronic HBV cases in Minnesota is 48 years.

In 2021, no perinatal hepatitis B infections were identified in infants born to hepatitis B-positive mothers. Three hundred and six infants born to hepatitis B-positive women during 2020 had post-serologic testing demonstrating no infection.

Viral Hepatitis C

In 2021, 66 cases of acute hepatitis C virus (HCV) infection (1.2 per 100,000) were reported. In 2012, the case definition for acute hepatitis C changed to include documented asymptomatic seroconversion. Of the 66 cases, 25 (38%) were asymptomatic, laboratory-confirmed acute infection.

Fifty (76%) were residents of the metropolitan area. The median age was 32 years (range, 18 to 66). Thirty-nine (59%) cases were male. Race was known for 61 cases: 29 (48%) were White, 18 (30%) were American Indian/Alaskan Native, 7 (11%) were Black, one (2%) was Asian, three (5%) were reported as multi-racial, and three (5%) were reported as other race. Six (10%) cases were known to be of Hispanic ethnicity.

MDH received 1,049 reports of newly identified chronic hepatitis C infections in 2021. In 2016, the case definition for chronic hepatitis C changed to exclude those reported as having resolved their infection. A total of 32,810 persons are estimated to be alive and living in Minnesota with chronic HCV infection. The median age of these cases is 60 years.

In 2018, perinatal hepatitis C was added as a nationally notifiable condition. In 2021, one case of perinatal hepatitis C was reported. This case was known to be White, non-Hispanic.



Brooke Cunningham, Commissioner of Health

Division of Infectious Disease Epidemiology, Prevention and Control (IDEPC)

Beth Gyllstrom, PhD, MPH..... Editor

Ruth Lynfield, M.D..... State Epidemiologist

Elly Pretzel Production

The Disease Control Newsletter is available on the MDH IDCN web site:
(<http://www.health.state.mn.us/divs/idepc/newsletters/dcn/index.html>)