

DISEASE CONTROL NEWSLETTER

Annual Summary of Communicable Diseases Reported to the Minnesota Department of Health, 2022

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 2022 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).

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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/diseasereport

REPORT IMMEDIATELY BY TELEPHONE

<p>Anthrax (<i>Bacillus anthracis</i>)^M Botulism (<i>Clostridium botulinum</i>) Brucellosis (<i>Brucella</i> spp.)^M Cholera (<i>Vibrio cholerae</i>)^M Diphtheria (<i>Corynebacterium diphtheriae</i>)^M Free-living amebic infection^M (including at least: <i>Acanthamoeba</i> spp., <i>Naegleria fowleri</i>, <i>Balamuthia</i> spp., <i>Sappinia</i> spp.)^M Glanders (<i>Burkholderia mallei</i>)^{M*} Hemolytic uremic syndrome^M Measles (rubeola)^M Melioidosis (<i>Burkholderia pseudomallei</i>)^{M*} Meningococcal disease (<i>Neisseria meningitidis</i>) (invasive)^{M5}</p>	<p>Middle East Respiratory Syndrome (MERS)^M Orthopox virus (including mpox)^M Plague (<i>Yersinia pestis</i>)^M Poliomyelitis^M Q fever (<i>Coxiella burnetii</i>)^M Rabies (animal and human cases and suspected cases) Rubella and congenital rubella syndrome^M Severe Acute Respiratory Syndrome (SARS)^{M*} Smallpox (variola)^M Tularemia (<i>Francisella tularensis</i>)^M Unusual or increased case incidence of any suspect infectious illness^M Viral hemorrhagic fever^M (including but not limited to Ebola virus disease, Lassa fever, Marburg virus)</p>
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REPORT WITHIN ONE WORKING DAY

<p>Amebiasis (<i>Entamoeba histolytica/dispar</i>) Anaplasmosis (<i>Anaplasma phagocytophilum</i>) 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 (<i>Babesia</i> spp.) Blastomycosis (<i>Blastomyces dermatitidis</i>) Campylobacteriosis (<i>Campylobacter</i> spp.)^M <i>Candida auris</i>^{M*} Carbapenem-resistant Enterobacteriaceae (CRE)^M Carbapenem-resistant <i>Acinetobacter baumannii</i>^{M*} Cat scratch disease (infection caused by <i>Bartonella</i> species) Chancroid (<i>Haemophilus ducreyi</i>) Chikungunya virus disease Chlamydia trachomatis infections Coccidioidomycosis Coronavirus Disease 2019 (COVID-19)/SARS-CoV-2^{M*} <i>Cronobacter sakazakii</i> in infants under one year of age^M Cryptosporidiosis (<i>Cryptosporidium</i> spp.)^M Cyclosporiasis (<i>Cyclospora</i> spp.)^M Dengue virus infection <i>Diphyllobothrium latum</i> infection Ehrlichiosis (<i>Ehrlichia</i> spp.) Encephalitis (caused by viral agents) Enteric <i>Escherichia coli</i> infection^M (<i>E. coli</i> O157:H7, other Shiga toxin-producing <i>E. coli</i>, enterohemorrhagic <i>E. coli</i>, enteropathogenic <i>E. coli</i>, enteroinvasive <i>E. coli</i>, enteroaggregative <i>E. coli</i>, enterotoxigenic <i>E. coli</i>, or other pathogenic <i>E. coli</i>) Giardiasis (<i>Giardia intestinalis</i>) Gonorrhea (<i>Neisseria gonorrhoeae</i> infections) <i>Haemophilus influenzae</i> disease (all invasive disease)^{M5} Hantavirus infection Hepatitis (all primary viral types including A, B, C, D, and E)^B Histoplasmosis (<i>Histoplasma capsulatum</i>) Human immunodeficiency virus (HIV) infection, including Acquired Immunodeficiency Syndrome (AIDS)^B Influenza^M (unusual case incidence, critical illness, or laboratory-confirmed cases) Kawasaki disease <i>Kingella</i> spp. (invasive only)^{M5} Legionellosis (<i>Legionella</i> spp.)^M Leprosy (Hansen's disease, <i>Mycobacterium leprae</i>)</p>	<p>Leptospirosis (<i>Leptospira interrogans</i>) Listeriosis (<i>Listeria monocytogenes</i>)^M Lyme disease (<i>Borrelia burgdorferi</i> and other <i>Borrelia</i> spp.) Malaria (<i>Plasmodium</i> spp.) Meningitis (caused by viral agents) Mumps^M Neonatal sepsis^{M5} (bacteria isolated from a sterile site, excluding coagulase-negative <i>Staphylococcus</i>) less than seven days after birth Pertussis (<i>Bordetella pertussis</i>)^M Psittacosis (<i>Chlamydia psittaci</i>) Retrovirus infections Salmonellosis, including typhoid (<i>Salmonella</i> spp.)^M Shigellosis (<i>Shigella</i> spp.)^M Spotted fever rickettsiosis (<i>Rickettsia</i> spp. infections, including Rocky Mountain spotted fever) <i>Staphylococcus aureus</i>^M (only vancomycin-intermediate <i>Staphylococcus aureus</i> [VISA], vancomycin-resistant <i>Staphylococcus aureus</i> [VRSA], and death or critical illness due to community-associated <i>Staphylococcus aureus</i> in a previously healthy individual) Streptococcal disease - invasive disease caused by Groups A and B streptococci and <i>S. pneumoniae</i>^{M5} Streptococcal disease - non-invasive <i>S. pneumoniae</i> (urine antigen laboratory-confirmed pneumonia) Syphilis (<i>Treponema pallidum</i>)^B Tetanus (<i>Clostridium tetani</i>) Toxic shock syndrome^M Toxoplasmosis (<i>Toxoplasma gondii</i>) Transmissible spongiform encephalopathy Trichinosis (<i>Trichinella spiralis</i>) Tuberculosis (<i>Mycobacterium tuberculosis</i> complex)^M (pulmonary or extrapulmonary sites of disease, including clinically diagnosed disease). Latent tuberculosis infection is not reportable. Typhus (<i>Rickettsia</i> spp.) Unexplained deaths and unexplained critical illness (possibly due to infectious cause)^M Varicella (chickenpox)^M <i>Vibrio</i> spp.^M Yellow fever Yersiniosis (enteric <i>Yersinia</i> spp. regardless of specimen source)^M Zika virus disease^B Zoster (shingles)^M (all cases <18 years old; unusual case incidence/complications regardless of age)</p>
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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 for selected sites only.

- Candidiasis (all invasive disease)^{M5}
- Clostridioides difficile*^M
- Escherichia coli* (all invasive disease)^{M5}
- Staphylococcus aureus* (all invasive disease)^{M5}
- Respiratory syncytial virus (RSV)
- Nontuberculous Mycobacteria (NTM), pulmonary and extrapulmonary

FOOTNOTES

- ^M Submission of clinical materials required. Submit isolates 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/diseasereport.
- ^S Invasive disease only: isolated from a normally sterile site, e.g.: blood, CSF, joint fluid, etc.
- ^R In the event of SARS or another severe respiratory outbreak, also report cases of health care workers hospitalized for pneumonia or acute respiratory distress syndrome.
- ^B Also report a pregnancy in a person with Zika; or a person chronically infected with hepatitis B, HIV, or syphilis.
- ^{*} Reportable under the Minnesota Communicable Disease Rules, Chapter 4605.7080 (new 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/diseasereport

Table 2. Cases of Selected Communicable Diseases Reported to the Minnesota Department of Health by District of Residence, 2022

Disease	District (population per U.S. Census 2020 estimates)									
	Total (5,657,342)	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	540	114	167	3	4	26	44	60	122	0
Babesiosis	61	13	13	0	1	5	9	8	12	0
Blastomycosis	117	42	22	4	5	6	1	12	25	0
Botulism (Infant)	1	1	0	0	0	0	0	0	0	0
Brucellosis	5	4	0	0	0	0	1	0	0	0
Campylobacteriosis	1,095	529	170	78	82	147	29	18	42	0
Cryptosporidiosis	355	110	47	41	29	75	23	11	19	0
Cyclosporiasis	42	24	3	2	2	8	2	1	1	0
<i>Escherichia coli</i> O157 infection	62	30	11	7	4	5	1	0	4	0
Hemolytic uremic syndrome	15	6	2	1	2	3	1	0	0	0
Giardiasis	472	261	62	25	16	29	12	6	61	0
<i>Haemophilus influenzae</i> disease	122	51	26	9	7	10	5	4	10	0
Histoplasmosis	194	70	28	12	27	28	22	3	3	0
HIV (non-AIDS)	223	172	18	3	3	10	8	1	7	0
AIDS (diagnosed in 2020)	102	79	10	1	2	3	4	1	2	0
Legionnaires' disease	109	66	9	6	5	12	2	2	7	0
Listeriosis	12	6	2	1	1	2	0	0	0	0
Lyme disease	2,685	1,092	697	27	46	232	101	142	348	0
Measles (rubeola)	22	22	0	0	0	0	0	0	0	0
Mumps	7	3	0	0	0	2	2	0	0	0
<i>Neisseria meningitidis</i> (invasive)	3	3	0	0	0	0	0	0	0	0
Pertussis	32	17	9	3	0	0	2	0	1	0
Q Fever (acute)	7	2	0	0	2	2	0	1	0	0
Q Fever (chronic)	1	1	0	0	0	0	0	0	0	0
Salmonellosis	925	427	136	90	64	87	40	27	54	0
Sexually transmitted diseases										
<i>Chlamydia trachomatis</i> - genital infections	22,079	14,800	2,051	520	816	1,609	530	626	919	108
Gonorrhea	8161	6328	497	73	148	342	232	128	352	61
Syphilis, total	1830	1334	170	32	37	47	49	51	106	0
Primary/Secondary	676	504	53	16	12	15	14	10	52	0
Early non-Primary non-Secondary*	534	417	37	7	9	10	12	15	27	0
Unknown Duration or Late**	601	402	73	9	16	20	21	35	25	0
Congenital	19	11	1	0	0	2	2	1	2	0
Other***	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Shigellosis	86	71	6	1	0	3	1	1	3	0
Streptococcal invasive disease - Group A	310	175	46	11	6	22	12	19	19	0
Streptococcal invasive disease - Group B	543	263	82	24	45	50	29	14	36	0
<i>Streptococcus pneumoniae</i> disease	473	210	79	24	33	45	24	18	40	0
Toxoplasmosis	12	8	2	0	0	2	0	0	0	0
Tuberculosis	132	100	7	6	5	10	1	3	0	0
Tularemia	3	2	0	0	0	1	0	0	0	0
Varicella	204	109	51	12	6	11	5	3	7	0
Viral hepatitis A	15	8	2	0	2	0	0	1	2	15
Viral hepatitis B (acute infections only)	15	11	2	0	1	0	0	1	0	15
Viral hepatitis C (acute infections only)	53	33	5	3	0	5	2	3	2	53
West Nile virus disease	22	2	1	7	3	2	6	0	1	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, Meeke, Nicollet, Sibley, Waseca, Watonwan
 Southeastern - Dodge, Fillmore, Freeborn, Goodhue, Houston, Mower, Olmsted, Rice, Steele, Wabasha, Winona
 West Central - Becker, Clay, Douglas, Grant, Mahnomon, Norman, Otter Tail, Pope, Stevens, Traverse, 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



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 2022, 540 confirmed and probable cases of anaplasmosis (9.3 cases per 100,000) were reported, slightly down from the 603 cases reported in 2021. Although case numbers were a bit lower the last few years, the 2022 total is keeping with the trend we saw through the mid-2010s. A median of 608 cases per year have been reported since 2010. In 2021, 341 (63%) confirmed and probable cases reported were male. The median age for cases was 65 years (range, 3 to 93), 13 years older than the median age of confirmed Lyme disease cases, but equal to the median age of confirmed or probable babesiosis cases (65 years). As is typical, most cases had illness onsets during the summer months, with 70% of 505 cases with a known onset date reporting illness 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 four days (range, 1 to 55 days). Ninety-eight (18%) cases reported complications (e.g., organ failure) due to anaplasmosis infection.

Arboviral Diseases

Endemic Mosquito-borne 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. These infections can cause inflammation in the brain, which in some cases results in severe disease and mortality. 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. However, 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 2022, Minnesota reported 22 WNV disease cases and 4 asymptomatic blood donors. Of the reported cases, 17 (77%) had neuroinvasive presentations including encephalitis or meningitis, while the remaining five had West Nile fever. One case died. Thirteen (59%) of the cases were male, and the median age of all cases was 66 years old (range, 24 to 88). Seventeen (77%) cases were hospitalized, with a median stay of 9 days (range, 4 to 43). The majority of cases (82%) 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 2022, three cases of La Crosse encephalitis were reported in Minnesota, which is consistent with the trend of fewer cases in the last few years. Cases were aged 4 and 6 years, and all but one of the cases were male. All three cases presented with neuroinvasive disease, including meningitis and encephalitis, and were all residents of counties in southeastern Minnesota. 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, 148 cases have been reported from 24 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 2022, one case of Jamestown Canyon virus disease, a California group virus related to La Crosse, was reported in a Minnesota resident. The case was a 74-year-old male who presented with meningitis. He had illness onset in late June and a likely exposure in north central Minnesota. 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. 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). Eight cases of POW were reported in 2022. Six (75%) of the reported cases were male, and ages of all cases ranged from 3 to 76 years. All but one of the cases in 2022 had disease that progressed to severe illness with meningitis or encephalitis, and one case died. Similar to other tickborne diseases, the majority of patients report being exposed to ticks in north central Minnesota. Most of the cases experienced illness onset in late spring to mid-summer, with additional cases appearing in fall, which corresponds with peak blacklegged tick activity.

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 2022, there were 61 confirmed and probable cases reported (1.1 cases per 100,000), a slight decrease from the 63 cases in 2021. 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). In recent years, case demographics were similar. In 2022, 37 (61%) of the cases occurred in males. The median case age was 65 years (range, 4 to 87), down slightly from 69 in 2021. This is equal to the median age for anaplasmosis (65 years), but older than the median age for Lyme disease (52 years). Illness onset dates peaked in the summer months: 41 (67%) of the 61 cases with known onset date reported first experiencing symptoms in June, July, or August. Twenty-three (38%) of the 60 cases where hospitalization status was obtained were hospitalized due to their infection in 2022 with a median admission duration of four days (range, 3 to 16). Although fifteen patients reported severe complications (e.g., organ failure), no patients died as a result of their babesiosis infection.

Blastomycosis

Blastomycosis is a fungal infection typically acquired by breathing in spores of the fungi *Blastomyces dermatitidis* or *Blastomyces gilchristii*. These fungi can be found in moist soils, particularly in wooded areas and along waterways. Blastomycosis occurs most often in people living in the Midwest, South-Central, and Southeastern United States, and in eastern Canada.

In Minnesota, blastomycosis is most common in Northeastern counties, but can occur throughout the state (Figure 1).

In 2022, 117 blastomycosis cases were reported, a 39% increase over the previous high of 84 cases in 2020. While it is possible that some of the observed increase was due to an increase in testing or reporting, it was more likely a true increase due to local environmental conditions. There was also a substantial increase in blastomycosis cases in animals during the same timeframe, suggesting a true increase in human cases. In Minnesota, some highly endemic areas for *Blastomyces* experienced significant drought in 2021, followed by a much wetter than normal 2022, possibly leading to proliferation and dissemination of the organism. Additionally, clusters of blastomycosis cases associated with flooding events are known to occur.

In 2022, the median age of blastomycosis cases was 46 years (range, 3 to 90 years), and 42 cases (36%) were female. Of the 113 cases for whom race and ethnicity were reported, 75 (66%) cases were white, 18 (16%) were American Indian/Alaska Native, 8 (7%) were Asian, 6 (5%) were Black/African American, 1 (<1%) was Native Hawaiian/Pacific Islander and 5 (4%) were of another race. Five cases (4%) were Hispanic.

When hospitalization status was known, 70 of 113 (62%) cases were hospitalized, for a median of 9 days (range, 1 to 80 days). Fourteen cases (12%) died and blastomycosis was the listed cause of death for nine of these; other causes of death were listed for three cases, and the cause of death was unknown for two cases. When the body system infected by *Blastomyces* was known, 88 (75%) cases had a pulmonary-only infection, 17 (14%) had a disseminated infection, and 12 (10%) had an extra-pulmonary infection.

Figure 1. Comparison of Average Annual Incidence of Endemic Fungal Diseases in Minnesota

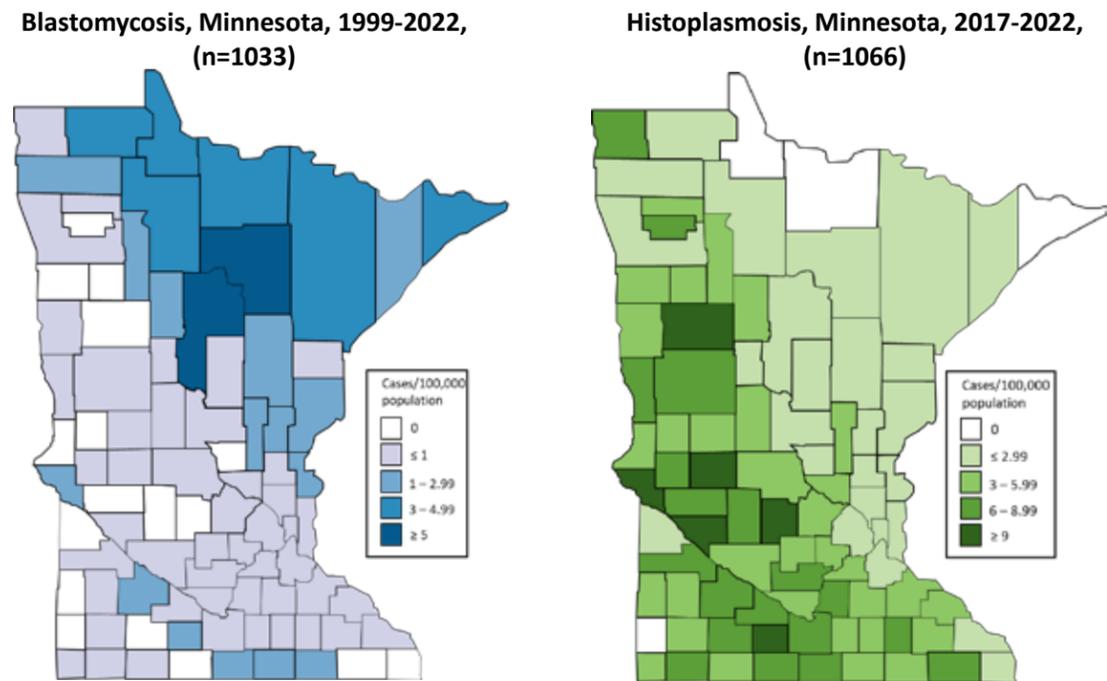


Figure 2. Note the difference in geographical distribution of Minnesota's endemic fungal diseases, blastomycosis and histoplasmosis. Blastomycosis occurs more frequently in northern and northeastern counties, and histoplasmosis occurs more often in western and southern counties. While clinicians should 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. Incidence rates are calculated using county of residence for each case.

There were four blastomycosis outbreaks identified in 2022. In the first, seven cases were associated with a family cabin on a lake in St. Louis County, which also affected three dogs and one person in 2021. In the second outbreak, three cases were exposed at a dam worksite in Wisconsin. The third outbreak involved three unrelated cases who reported visiting the same beach on a lake in Cass County. Lastly, two outbreak cases were part of a previously identified outbreak associated with a family cabin property in Pine County. This outbreak began in 2019 and now includes a total of six cases.

In 2022, 14 cases of blastomycosis occurred in Cass County residents, three times the annual median case

count of five cases reported during 2017-2021. There were also six additional cases who live elsewhere but were likely exposed in Cass County. In addition to the outbreak listed above, a cluster of cases occurred around Cass Lake, but many of these cases reported numerous outdoor locations in addition to their residence, so exposure could not be attributed to a specific area.

From 1999 to 2022, 1,033 cases of blastomycosis in Minnesota residents were reported. Exposure information was available for 727 cases; of these, 151 (21%), were likely exposed in St. Louis County, 87 (12%) in Itasca County, 82 (11%) in Cass County, 26 (4%) in Hennepin County, and 23 (3%) in Beltrami County. Eighty-one cases (11%) were exposed in Wisconsin.

In 2022, the statewide incidence was 2.0 cases per 100,000 population, compared to a 1999-2021 median annual incidence of 0.63 cases per 100,000. A map of average annual incidence of blastomycosis from 1999 to 2022 clearly shows the highly endemic regions, which include the northern and northeastern counties of Minnesota (Figure 1). 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 can 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 bilateral, descending paralysis that can be fatal without treatment. Botulinum 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 2022, one infant botulism case was reported. The infant botulism case occurred in an 11-week-old female from Dakota County. She received botulinum immune globulin (BabyBIG) and recovered. The disease was caused by toxin type A.

From 2001 to 2022, 17 cases of infant botulism, two cases of foodborne botulism, two cases of intestinal toxemia botulism, and one case of possible iatrogenic botulism due to a complication of Onabotulinumtoxin A (BOTOX) administration, were identified among Minnesota residents. The median age of affected infants was 21 weeks (range, 5 to 41 weeks). Twelve (71%) infant botulism cases were caused by botulinum toxin type B and five (29%) by toxin type A. Fourteen infants were known to be hospitalized, for a median of 16 days (range, 8 to 30 days); one infant did not require hospitalization. The two 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*, for 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 2022, five confirmed cases were reported. Three of these cases were exposed in East Africa, one in Saudi Arabia, and one hunted feral swine in Texas. The median age of cases was 46 years (range, 27 to 61 years); three (60%) were male. Complications of brucellosis included one case with sepsis and one case with epididymitis, orchitis, and septic arthritis. All brucellosis cases in 2022 survived their infection.

From 2007 to 2022, 51 confirmed brucellosis cases were reported. Thirty-one cases likely acquired their infection outside the United States, and 20 were domestically acquired. The median number of cases reported annually was three (range, 0 to 19). Forty were infected with *B. melitensis*, eight with *B. suis*, two with *B. abortus*, and one with an unidentified *Brucella* species diagnosed by serology only. The median age of cases was 45 years (range, 3 to 86 years). Twenty-four of the 47 cases for which race was known were black, 19 were white, and four were Asian/Pacific Islander. Fourteen identified as Hispanic.

Campylobacteriosis

Campylobacteriosis is caused by *Campylobacter* bacteria and results in intestinal illness. It is the most common bacterial cause of diarrheal illness in the U.S. During 2022, 1,540 *Campylobacter* cases were reported. Of those, 1,095 were culture-confirmed, and 445 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 21.1 per 100,000 population. The 1,095 culture-confirmed *Campylobacter* cases represent an 8% decrease from the 1,192 cases reported in 2021, and a 5% increase from the annual median of 1,046 cases reported from 2012 to 2021 (range, 793 to 1,237). In 2022, 48% of cases occurred in people who resided in the metropolitan area. Of the 1,021 *Campylobacter* isolates confirmed and identified to species by MDH, 82% were *C. jejuni* and 12% were *C. coli*.

The median age of culture-confirmed cases was 41 years (range, one month to 94 years). Forty percent were between 20 and 49 years of age, and 10% were ≤5 years of age. Fifty-two percent were male. Fifteen percent were hospitalized; the median length of hospitalization was three days. Six (0.6%) cases died. Forty-eight percent of infections occurred during June through September. Of the 834 cases for which data were available, 131 (16%) reported travel outside the United States during the week prior to illness onset. The most common travel destination was Mexico (n=30).

In 2009, a CIDT became commercially available for the qualitative detection of *Campylobacter* antigens in stool. In 2022, 41 patients were positive for *Campylobacter* by an antigen detection CIDT conducted in a clinical

laboratory. However, only 13 (32%) 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 2022, 1,362 patients were positive for *Campylobacter* by a PCR gastrointestinal panel; 945 (69%) of these specimens were culture-confirmed. The median age of the CIDT-positive only cases was 48 years (range, one month to 100 years). Seventy-one (16%) cases were hospitalized; the median hospital stay was 3 days (range, one to 155 days). Three (0.7%) CIDT-only cases died.

Three outbreaks of *Campylobacter* infections were identified in 2022. Two cases were associated with animal contact at a dairy farm, two cases were associated with an event at a private home, and one outbreak was associated with chicken sourced from a Minnesota farm.

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. Historically, 80-90% of *Campylobacter* isolates from patients with a history of foreign travel during the week prior to illness onset, regardless of destination, are resistant to fluoroquinolones as compared to approximately 20% of *Campylobacter* isolates from patients who acquire their infection domestically.

Candidemia

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 2017,

surveillance began for candidemia among residents of the metropolitan area.

In 2022, 185 cases were reported among residents of the metropolitan area. The overall incidence rate was 6.0 per 100,000, and the highest county-level incidence was in Hennepin County (7.2 per 100,000). The median age was 56 years (range, newborn to 91 years). One hundred cases (54%) were male; 127 (69%) were white, 36 (20%) were black, 7 (4%) were Asian/Pacific Islander, and race was unknown for two cases.

Of the 185 cases, 99% were hospitalized at time of diagnosis, and 59 (32%) died while hospitalized. Underlying conditions included malignancy (26%), chronic lung condition (23%), diabetes (34%), renal disease (27%), neurologic condition (32%), skin condition (16%), and chronic liver disease (17%). 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 (64%); being admitted to the ICU within 14 days prior to or 14

days after diagnosis (58%); and having surgery in the 90 days before diagnosis (70%).

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 185 cases, 52% were *C. albicans*, 25% *C. glabrata*, 8% *C. parapsilosis*, 2% *C. tropicalis*, 2% *C. dubliniensis*, 2% *C. kefyr*, 2% *C. krusei*, and 1% with other species including *C. guilliermondii*, and *C. lusitaniae*. Eleven cases (6%) 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, in 2021, 14 (9%) cases, and in 2022, 10 (5%) cases had IDU documented in their medical chart.

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.

Carbapenems (CRE, CR, CRPA)

Carbapenem-resistant *Enterobacterales* (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 *Enterobacterales*. CRAB is increasingly recognized as one of

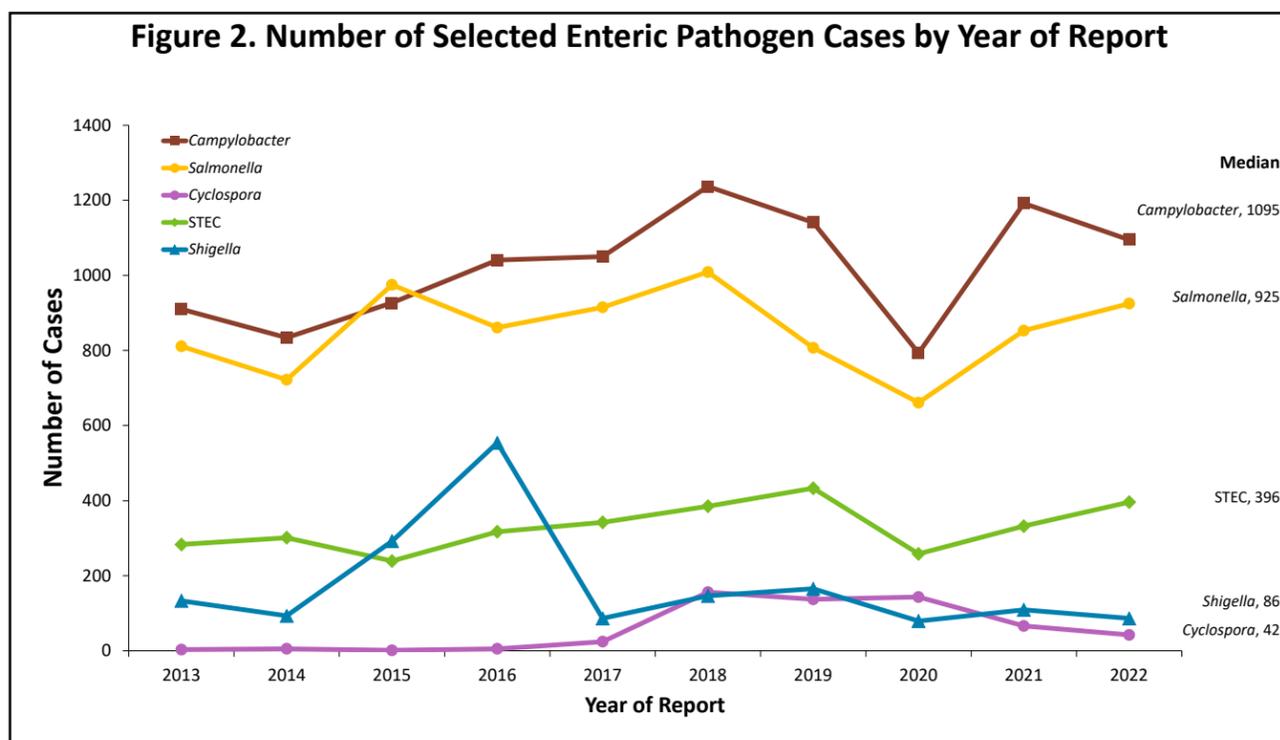
MDH first identified a KPC-producing CRE in February 2009, and began voluntary reporting, including isolate submission, for all *Enterobacterales* and *A. baumannii* resistant to imipenem, meropenem, doripenem, or ertapenem using current Clinical and Laboratory Standards Institute (CLSI) breakpoints (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 *Enterobacterales* 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 2022, 432 CRE incident cases representing 399 patients were



identified from clinical cultures among Minnesota residents; median age was 69 years (range, <1 to 103) and 233 (58%) identified as female. The most common organism for incident cases was *Enterobacter* spp. (180) followed by *Klebsiella* spp. (76) and *E. coli* (86). Other CRE organisms included *Serratia* spp. (23), *Proteus* spp. (17), *Citrobacter* spp. (26), *Providencia* spp. (11), *Morganella* spp. (6), and other Enterobacterales (7). Among 432 incident cases, there were 86 CRE MuGSI incident cases reported among residents of Hennepin and Ramsey Counties. Among 432 CRE incident cases, 69 (16%) were carbapenemase-producing organisms. Thirty-four cases were KPC positive, seventeen cases were NDM positive, eight cases were IMP positive, and ten cases were OXA-48 positive.

In 2022, 28 CRAB incident cases representing 16 patients were identified from clinical cultures among Minnesota residents. Among these 16 patients, the median age was 63 years (range, 31 to 87) and 11 (69%) identified as male. Wound (9) was the most common isolate source followed by sputum (8), and urine (3). Of 20 CRAB incident cases, ten cases were reported for MuGSI isolated from wound (6), sputum (3), and urine (1). Five CRAB incident isolates possessed genes for carbapenemase production including both OXA-23 and OXA-24.

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 \geq 30 days after the last incident report. Despite surveillance discontinuation in 2018, PHL continues

to test any submitted CRPA isolates for carbapenemase production. In 2022, three CRPA isolates demonstrated carbapenemase production (2 VIM and 1 NDM). The CRPA isolates harboring VIM carbapenemase were not related to the national outbreak associated with contaminated artificial tears.

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, as part of EIP, MDH initiated population-based, sentinel surveillance for CDI at clinical laboratories serving

Stearns, Benton, Morrison, and Todd Counties; in 2012 Olmsted County was added. CDIs that occur outside the traditional healthcare settings (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 (\geq 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 2022, 798 incident cases of CDI were reported in the five sentinel counties (187 per 100,000 population), a decrease from 192 per 100,000 population in 2021. Sixty-four percent of these cases were classified as CA, 21% as CO-HCFA, and 15% as HCFO. The median ages for CA, CO-HCFA, and HCFO cases were 58 years, 67 years, and 73 years, respectively. Fifty-one percent of CA cases were prescribed antibiotics in the 12 weeks prior to stool specimen collection compared to 79% of CO-HCFA cases and 87% of HCFO cases. Of the 514 putative CA cases eligible for interview, 302 were interviewed and confirmed as CA cases. Forty-six 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 (29%); dental procedures (18%); and urinary tract infections (17%).

Cryptosporidiosis

Cryptosporidium is a parasite that causes the diarrheal disease cryptosporidiosis. During 2022, 528 cases of cryptosporidiosis were reported. Of those, 173 were positive only on a rapid antigen screening test and were considered probable cases. The 355 confirmed cases of cryptosporidiosis (6.3 per 100,000 population) in 2022 was similar to the median number of confirmed cases reported annually from 2012 to 2021 (median, 360 cases; range, 224 to 439).

The median age of confirmed cases in 2022 was 29 years (range, one year to 89 years). Children 10 years of age or younger accounted for 23% of cases. Fifty-five percent were female. Of the 348 cases for which race was reported, 304 (87%) were white, 26 (7%) were Black, 5 (1%) were Asian American, 3 (<1%) were American Indian, and 10 (3%) reported being other or multiple races. Sixteen (5%) were Hispanic. Sixty-five percent of cases occurred from July through October. The incidence of cryptosporidiosis in the Southwestern, Southeastern, South Central, and West Central regions (19.1, 14.6, 9.9, and 9.4 cases per 100,000, respectively) was significantly higher than the statewide incidence. Only 110 (31%) cases occurred among residents of the metropolitan area (3.1 per 100,000). Thirty (8%) cases required hospitalization, for a median of 4 days. No deaths were reported.

One confirmed outbreak of cryptosporidiosis was identified in Minnesota in 2022, accounting for two laboratory-confirmed cases. This outbreak was due to animal contact at a petting zoo in Scott County.

Cyclosporiasis

Cyclosporiasis is an intestinal illness caused by the parasite *Cyclospora cayatanensis*. People can become infected by ingesting food or water contaminated with the parasite. There were 42 *Cyclospora* cases reported in 2022 (0.74 per 100,000 population). This is markedly higher than the median number of cases reported from 2012 to 2021 (median, 14; range, 0 to 156 per year). In 2022, 59% of cases occurred in people who resided in the metropolitan area.

The median age of cases was 37.5 years (range, 21 to 79 years). Fifty-seven percent were female. Of the 41 cases for which race was reported, 36 (88%) were white, one (2%) was Black, one (2%) was Asian, and three (7%) were other race. Four (10%) were hospitalized; the median length of hospitalization was 11 days (range, 7 to 15 days). Fifty-five percent of infections occurred from May through July. Of the 36 non-outbreak cases for whom data were available, 10 (28%) reported travel outside the United States during the two weeks prior to illness onset.

One foodborne outbreak of cyclosporiasis was identified in Minnesota in 2022. This was an outbreak associated with an unknown vehicle at a restaurant, accounting for 6 laboratory-confirmed cases.

***Escherichia coli* O157 and other Shiga Toxin-Producing *E. Coli* Infection and Hemolytic Uremic Syndrome**

During 2022, 698 Shiga toxin-producing *Escherichia coli* (STEC) cases were reported. Of those, 62 were culture-confirmed *E. coli* O157, 334 were culture-confirmed non-O157 STEC, and 302 were only positive by a culture-independent test (CIDT) and not subsequently culture-confirmed.

The 62 culture-confirmed cases of *E. coli* O157 infection (1.08 per 100,000 population) reported in 2022 represents a 46% decrease from the median number of culture-confirmed cases reported annually from 2012 to 2021 (median, 115 cases; range, 65 to 143). During 2022, 30 (48%) cases occurred in the metropolitan area. Forty-six (74%) cases occurred during May through October. The median age of the cases was 32 years (range, 11 months to 91 years). Eighteen percent of the cases were 4 years of age or younger. Nineteen (31%) cases were hospitalized; the median hospital stay was 6 days (range, 1 to 15 days). No cases died.

The 334 culture-confirmed non-O157 cases (5.84 per 100,000 population) reported in 2022 represents a 71% increase from the median number of culture-confirmed cases reported annually from 2012 to 2021 (median, 195 cases; range, 101 to 269). Six STEC serogroups accounted for 59% of non-O157 cases: *E. coli* O111 was the serogroup for 59 (18%) cases, *E. coli* O103 for 53 (16%), *E. coli* O26 for 33 (10%), *E. coli* O145 for 25 (7%), *E. coli* O121 for 16 (5%), and *E. coli* O45 for 12 (4%). The median age of the non-O157 STEC cases was 30 years (range, 5 months to

93 years). Sixty-five (19%) cases were hospitalized; the median hospital stay was 2 days (range, 1 to 32 days). Two cases died: an 84 year-old died of *Clostridioides difficile*, chronic renal disease, and diabetes the same day that *E. coli* O17/44/77:H18 was isolated from stool; and, an 84 year-old died of sepsis and intra-abdominal infection 2 days after *E. coli* 9:H30 was isolated from stool.

During 2022, 302 STEC cases with specimens that were positive by a CIDT conducted at a clinical laboratory and not subsequently culture-confirmed were reported. 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 36 years (range, 19 days to 92 years). Forty-five (15%) cases were hospitalized; the median hospital stay was 3 days (range, 1 to 19 days). Three cases died: a three year-old died of complications from rotavirus and respiratory infections the same day as a stool specimen tested positive for STEC by CIDT; a five year-old died of complications from a norovirus infection the same day as a stool specimen tested positive for STEC by CIDT; and, a 70 year-old died of metastatic rectal and colon cancer and norovirus infection 11 days after a stool specimen tested positive for STEC by CIDT.

Two *E. coli* O157 outbreaks were identified during 2022. One outbreak was due to foodborne transmission, and the other was due to person-to-person transmission in a childcare setting.

In August, a national outbreak of *E. coli* O157 infections was associated with spinach. Two laboratory-confirmed cases were identified in Minnesota. Neither case developed hemolytic uremic syndrome (HUS) nor died.

In September, an outbreak of *E. coli* O157 infections associated with person-to-person transmission occurred at a childcare facility in Scott County; nine cases, including four laboratory-confirmed, were identified. No cases developed HUS nor died.

Seven non-O157 STEC outbreaks were identified during 2022. Three outbreaks were due to foodborne transmission, three were due to person-to-person transmission in childcare settings, and one was due to animal contact.

In July, an outbreak of *E. coli* O111:H8 infections was associated with a restaurant. A cabbage and carrot mix was statistically associated with illness, but bean sprouts, basil, and mint could not conclusively be ruled out as potential vehicles. The source of contamination was not identified. Fourteen patron cases were identified, including four that were laboratory-confirmed. Three laboratory-confirmed food workers were also identified. No cases developed HUS nor died.

In August, an outbreak of *E. coli* O26:H11 infections was associated with a restaurant. Sirloin steak and parsley were identified as potential vehicles. Eight cases, five laboratory-confirmed, were identified. No cases developed HUS nor died.

In August, an outbreak of *E. coli* O111:H8 infections was associated with animal contact at a county fair. Six cases, four laboratory-confirmed, were identified. Environmental testing revealed evidence of STEC contamination in a barnyard and show arena barn. Two cases developed HUS, but none died.

In August, an outbreak of *E. coli* O45:H2 infections associated with person-to-person transmission occurred at a childcare facility in Carver County. Twenty-one cases, five laboratory-confirmed, were identified. No cases developed HUS nor died.

In August, an outbreak of *E. coli* O111:H8 infections associated with person-to-person transmission occurred at a childcare facility in Waseca County. Eleven cases, seven laboratory-confirmed, were identified. One case developed HUS, but none died.

In October, an outbreak of *E. coli* O71:H11 infections was associated with a restaurant. House-made chip dip and hamburgers were identified as potential vehicles. Three cases, two laboratory-confirmed, were identified. No cases developed HUS nor died.

In October, an outbreak of *E. coli* O111:H8 infections associated with person-to-person transmission occurred at a childcare facility in Dakota County. Two cases, both laboratory-confirmed, were identified. Neither case developed HUS nor died.

Hemolytic Uremic Syndrome (HUS)

In 2022, 15 HUS cases were reported. The number of reported cases was 36% higher than the median number of cases reported annually from 2012 to 2021 (median, 11 cases; range, 4 to 17). In 2022, the median age of HUS cases was 20 years (range, 8 months to 81 years). All 15 cases were hospitalized, with a median hospital stay of 12 days (range, 4 to 18 days). No cases died. *E. coli* O157:H7 was cultured from the stool of 5 (33%) cases. *E. coli* O111:H8 was cultured from the stool of two cases, *E. coli* O145:H28 was cultured from the stool of two cases, *E. coli* O168:H8 was cultured from the stool of one case, and *E. coli* O17/44/77:H18 was cultured from the stool of one case. Four cases were Shiga toxin positive by PCR but not culture-confirmed. In 2022, there were three outbreak-associated HUS cases. From 1997 through 2022, the overall case fatality rate among HUS cases was 4.9%.

Giardia

During 2022, 472 cases of *Giardia* infection (8.3 per 100,000 population) were reported. This represents a 24% decrease from the median number of cases reported annually from 2012 through 2021 (median, 623 cases; range, 416 to 656). Recent immigrants and refugees accounted for 17% of cases. An additional 13% of cases reported international travel in the 3 weeks prior to illness onset. Excluding recent immigrants and refugees, the median age of cases was 46 years (range, 1 to 90 years). Fourteen percent of cases were less than 10 years of age, and 43% were greater than 50 years of age. Fifty-six percent of non-immigrant and refugee cases were male. *Giardia* infections had a summer/fall seasonality; 51% of non-immigrant and refugee cases occurred during July through October. Twenty-five (5%) cases required hospitalization, for a median of 6 days (range, 1 to 43 days). One outbreak of giardiasis was identified in Minnesota, accounting for one-laboratory-confirmed case. The outbreak was associated with person-to-person transmission in a childcare setting.

Haemophilus Influenza

Haemophilus influenzae disease is a name for any illness caused by the bacteria *H. influenzae*. Some of these diseases are mild, like ear infections, while others cause more severe disease. *H. influenzae* does not cause influenza (flu). There were 122 *H. influenzae* disease cases (2.0 per 100,000 population) reported in 2022. Cases ranged in age from 62 days to 93 years (median 63 years). Allowing for more than one syndrome per case, 57 (47%) cases had pneumonia, 25 (20%) septic shock, 23 (19%) bacteremia, 18 (15%) meningitis, four (3%) abscess, three

(2%) cellulitis, three (2%) empyema, three (2%) epiglottitis, two (2%) otitis, and one (2%) septic arthritis. Sixteen (13%) cases died.

Of 108 *H. influenzae* isolates for which typing was performed, 19 were type a, two type b (Hib), four type e, 12 type f, and 71 were non-typeable. There were two Hib disease cases in 2022 compared to two in 2021, one in 2020, three in 2019, one in 2018, two in 2017, and five in 2016. Among the 2022 Hib disease cases, one was a 4-year-old child with underlying health conditions who had pneumonia and septic shock and survived; this child had received three doses of Hib vaccination. The second was in a 29-year-old who had pneumonia and survived; this person had unknown Hib vaccination status. The 16 deaths occurred in patients ranging in age from 43 to 93 years. Six decedents had pneumonia, two had septic shock, six had pneumonia and septic shock, one had empyema, and one had bacteremia. Underlying conditions were reported in 15 decedents and serotypes were non-typeable (13), type a (2) or e (1).

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 illness 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 2022, there were 45 confirmed and 149 probable cases of histoplasmosis reported. These numbers are consistent with the case counts from previous years, with the exception

of 2020. There was one outbreak of histoplasmosis, from the demolition of a chimney in an old farmhouse in Sibley County, which affected three people. The chimney was filled with bat or bird guano, and the people involved were not wearing respiratory protection while working on the chimney. Two of the outbreak-associated cases died.

The median age of histoplasmosis cases in 2022 was 55 years (range, 1 to 87 years), and 103 (53%) were male. Of the 175 cases for whom race was reported, 157 (90%) were white, 9 (5%) were Black, 4 (2%) were Asian, 3 (2%) were American Indian/Alaska Native, 1 (<1%) was Native Hawaiian/Pacific Islander and 1 (<1%) was more than one race. Of the 167 for whom ethnicity was reported, 8 (5%) were Hispanic. When hospitalization status was reported, 80 of 180 (44%) cases were hospitalized. Median hospitalization duration was 5 days (range, 1 to 72 days). There were 12 deaths, a case fatality rate of 6%. Histoplasmosis was listed as the primary cause of death for 4 of the 12 cases, while the others had other illness listed or the data were not available.

From 2017 to 2022, 1,066 cases of histoplasmosis were reported. The annual incidence of histoplasmosis in Minnesota in 2022 was 3.3 cases per 100,000 population, similar to the annual incidence of 3.2 to 3.7 cases per 100,000 since 2017. The average annual incidence of histoplasmosis by county shows that cases occur more frequently in southern and western counties of Minnesota (Figure 1). This is in contrast to the other endemic fungal disease found in Minnesota, blastomycosis, which has higher incidence levels in northern and northeastern counties of Minnesota. While clinicians should test for both diseases when clinical illness is consistent with a fungal infection, these maps can help assess possible risks in different parts of the state.

HIV Infection and AIDS

HIV/AIDS incidence in Minnesota remains moderately low. The most recent state-specific incidence rate data from the CDC is from 2020. Data 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, 2022, a cumulative total of 12,912 cases of HIV infection (2,468 AIDS at first diagnosis, and 10,444 HIV [non-AIDS] cases) were reported among Minnesota residents. By the end of 2022, an estimated 9,805 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 2022, 39 new AIDS cases (Figure 3) and 121 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 280 newly diagnosed HIV (non-AIDS) cases in 2009, and a low of 186 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 2022, 76% (200/262) of new HIV diagnoses (both HIV [non-AIDS] and AIDS at first diagnosis) occurred in the metropolitan area. In Greater Minnesota there were 62 cases in 23 of 80 counties. HIV infection is most common in areas with higher population densities and poverty levels.

The majority of new HIV infections in Minnesota occurred among males.

Trends in the annual number of new HIV infections diagnosed among males differed 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 in white males is decreasing. In 2022, there were 79 new infections among white males, comprising 37% of new HIV infections among males. Among black African American males, there were 62 new HIV diagnoses in 2022, 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 35 and 13 new HIV infections in 2022, respectively.

Females account for an increasing percentage of new HIV infections, from 11% of new infections in 1990 to 19% in 2022. Trends in annual, diagnosed HIV infections among females also differed 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 2022, women of color accounted for 71% of new HIV infections among females in Minnesota. The number of diagnoses among African-born women has been increasing over the past decade. In 2022, the number of new cases among African-born women was 10, accounting for 20% of all new diagnoses among women. In 2022, there were 15 cases (29%) diagnosed among African American women.

Despite relatively small numbers of cases, HIV/AIDS affects persons of color disproportionately in Minnesota. In 2022, men of color comprised approximately 17% of the male population in Minnesota and 60% of new HIV diagnoses among men. Similarly, persons of color comprised approximately 17% of the female population in Minnesota and 71% of new HIV infections among women. The use of race can be a proxy for other risk factors, such as lower socioeconomic status and education level. Race is not considered a biological cause of disparities in the occurrence of HIV.

Historically, race/ethnicity data for HIV/AIDS in Minnesota has 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 2022, there were 23 new HIV infections reported among black Africans. While black African-born persons comprise about 2% of the state’s population, they accounted for 9% of all HIV infections diagnosed in Minnesota in 2022.

In 2022, there were 105 people diagnosed with HIV who were less than 30 years of age, accounting for 40% of all cases. Most of the cases were among young males, where 45% of male cases were less than 30 years of age and 72% were males younger than 40 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 2022, MSM (including MSM who also inject drugs) accounted for 60% of new diagnoses among men. Injection Drug Use (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. There was a statewide, 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. In 2022, the case definition was split into two groups based on molecular data and epidemiological links: Encampment-related and MSM/IDU & IDU-related. At the end of 2022, there were 168 cases (73 encampment-related and 95 MSM/IDU & IDU non-encampment-related)

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 35 cases associated with the outbreak between September 2019 and the end of 2023. 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 37 births to pregnant persons in 2022, the rate of perinatal transmission decreased, from 15% in 1994-1996 to 0% over the last 5 years (2018-2022). The last HIV-positive Minnesota birth occurred in 2017.

Influenza

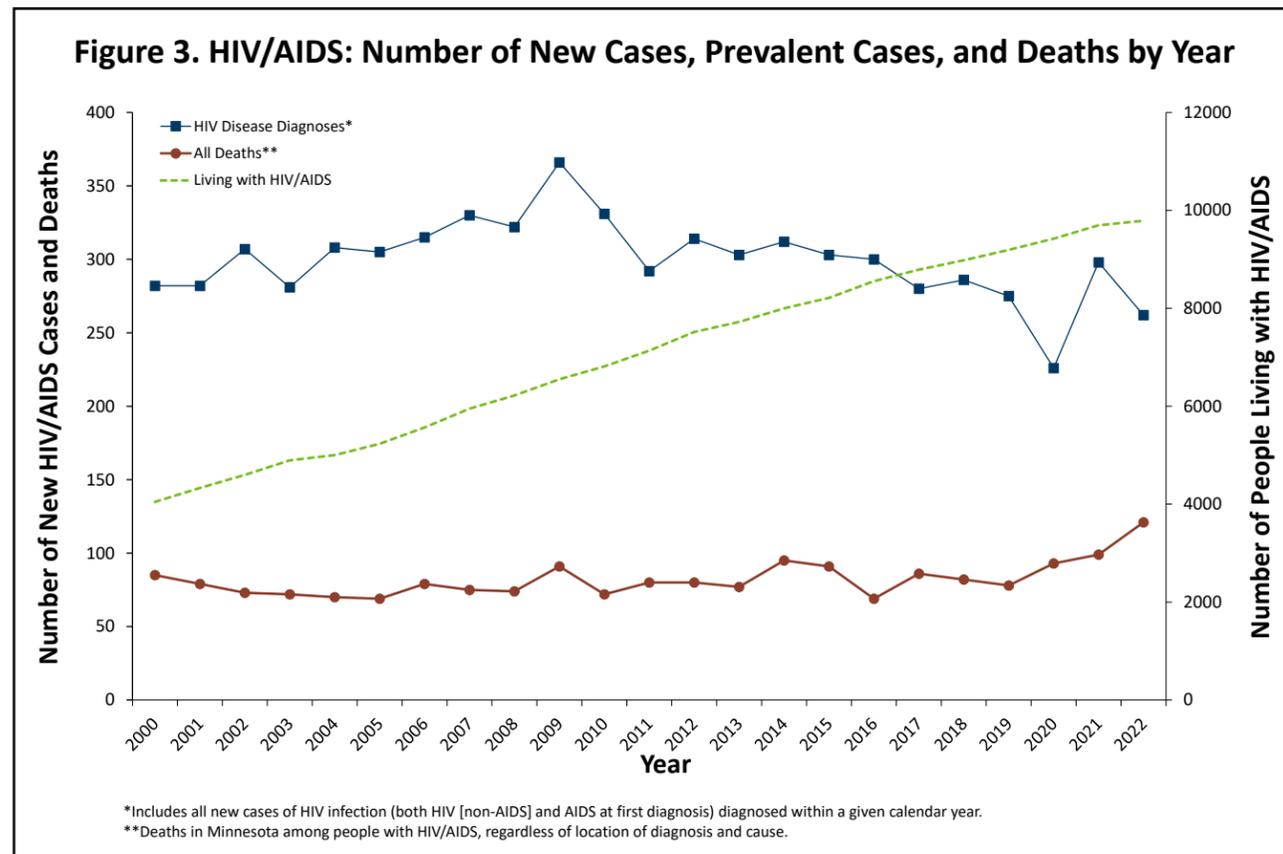
Several influenza surveillance methods are employed. Data are summarized by influenza season (generally October-May) rather than calendar year. This year’s newsletter includes data from the 2021-2022 and the 2022-2023 influenza seasons.

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. Surveillance was expanded statewide for the 2008-2009 season. 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 MDH for influenza testing. For the 2014-2015 season, influenza B subtyping was added.

During the 2021-2022 influenza season (October 3, 2021 – May 20, 2022; MMWR weeks 40-20), there were 904 laboratory-confirmed hospitalized cases reported (15.98 cases per 100,000 persons) compared to 0.62 cases per 100,000 in 2020-2021 and 71.3 cases per 100,000 in 2019-2020. Cases included 889 influenza A (168 [19%] H3 and 721 [80%] unknown A type), 13 (1.4%) influenza B (all of unknown lineage), and two (0.2%) coinfections of influenza A and B. Among the cases, 16% were 0-18, 19% were 19-49, 17% were 50-64, and 47% were 65 years of age and older. Median age was 64 years. Residents of the metropolitan area made up 52% of cases.

During the 2022-2023 influenza season (October 2, 2022 – May 21, 2023; MMWR weeks 40-20), there were 3,338 laboratory-confirmed hospitalized cases (58.49 cases per



100,000 persons) reported, compared to 15.98 cases per 100,000 in 2021-2022. Cases included 3,248 (97.3%) influenza A (785 [24%] H3, 110 [3%] [H1N1]pdm09 and 2,353 [70%] unknown A type), 86 (2.6%) influenza B (7 [0.2%] of Victoria lineage and 78 [2.3%] of unknown lineage), and three (0.09%) coinfections of influenza A and B. Among the cases, 17% were 0-18, 16% were 19-49, 17% were 50-64, and 50% were 65 years of age and older. Median age was 64 years. Residents of the metropolitan area made up 60% of cases.

Case report forms were completed on 100% of the 467 metropolitan area cases for the 2021-2022 season. Of these, 24% were diagnosed with pneumonia, 11% required admission into an intensive care unit, and 5% were placed on mechanical ventilation. An invasive bacterial co-infection was present in 13% of hospitalized cases. Antiviral treatment was prescribed for 70% of cases. Overall, 95% of adult and 58% of pediatric cases had at least one chronic medical condition that would have put them at increased risk for influenza disease.

Case report forms were completed on 100% of the 1,955 metropolitan area cases for the 2022-2023 season. Of these, 28% were diagnosed with pneumonia, 14% required admission into an intensive care unit, and 6% were placed on mechanical ventilation. An invasive bacterial co-infection was present in 16% of hospitalized cases. Antiviral treatment was prescribed for 78% of cases. Overall, 96% of adult and 50% 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 two pediatric influenza-associated deaths in the 2021-2022 season (one positive for influenza A

H3 and one positive for influenza A no subtype). There were two pediatric influenza-associated deaths in the 2022-2023 season (both positive for influenza A [H1N1]pdm09).

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 MDH Public Health Lab (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.

From October 3, 2021–May 21, 2022, laboratories reported data on 174,423 influenza molecular tests, 9,486 (5%) of which were positive for influenza. Of these, 230 (2.4%) were positive for influenza A (H3), one ($\leq 0.1\%$) was positive for influenza A (H1N1)pdm09, 9,197 (97%) were positive for influenza A-not subtyped, and 58 (0.6%) were positive for influenza B. From October 2, 2022–May 20, 2023, laboratories reported data on 135,209 influenza molecular tests, 17,440 (13%) of which were positive for influenza. Of these, 305 (1.7%) were positive for influenza A (H3), 43 (0.3%) were positive for influenza A (H1N1)pdm09, 16,530 (94.8%) were positive for influenza A-not subtyped, and 562 (3.2%) were positive for influenza B.

Sentinel Surveillance

MDH conducts sentinel surveillance for ILI (fever $>100^{\circ}$ F, and cough, and/or sore throat) through outpatient medical providers, including those in private practice, public health clinics, urgent care centers, emergency rooms, and university student health centers. During the 2021-2022 and 2022-2023 seasons, there were approximately 72 sentinel surveillance sites in 34 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, 25-49 years, 50-64 years, ≥ 65 years). In the 2021-2022 season, the percentage of ILI peaked during the week beginning December 26, 2021, at 6.6%. In the 2022-2023 season, the percentage of ILI peaked during the week November 22, 2022, at 6.1%.

Influenza Incidence Surveillance

MDH continued to participate in Optional Influenza Surveillance Enhancements during the 2021-2022 and 2022-2023 influenza seasons. Each week, 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 3, 2021–May 21, 2022, these clinics saw 837 ILI patients. They submitted 662 specimens for influenza testing; 74 (11%) were positive for influenza. From October 2, 2022–May 20, 2023, these clinics saw 321 ILI patients. They submitted 443 specimens for influenza testing; 58 (13%) were positive for influenza. Note that some

sites were able to submit specimens but not report ILI visits during the COVID-19 pandemic period.

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. During the 2021-2022 school year, 346 schools in 60 counties reported ILI outbreaks; during the 2022-2023 school year, 1,021 schools in 85 counties reported ILI outbreaks. 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-like illness outbreak in a long-term care facility (LTCF) is defined as at least two cases of laboratory-confirmed influenza (or RSV) identified within 72 hours of each other in residents on the same unit. During the 2021-2022 influenza season, 49 facilities in 33 counties reported confirmed outbreaks; during the 2022-2023 influenza season, 107 facilities in 54 counties reported confirmed outbreaks. 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

Legionnaires' Disease is caused by the bacteria *Legionella* and is characterized by severe pneumonia, as well as other symptoms. *Legionella* bacteria are found naturally in freshwater environments, such as lakes and streams, but become a health concern when they grow and spread in human-made water systems.

Infection can occur when people breathe in small droplets containing the bacteria. In 2022, 109 confirmed cases of Legionnaires' disease (1.9 per 100,000 population) were reported. This is a 16% decrease from the 130 cases reported in 2021 and an 8% decrease from the median number of cases reported annually from 2017 to 2021 (median, 118; range, 94 to 152).

Of the 109 confirmed cases, 107 (98%) were hospitalized, with a median duration of hospitalization of 6 days (range, 1 to 49 days). Of those hospitalized, 30 (28%) were admitted to an intensive care unit, and 17 (16%) required mechanical ventilation. Eight (7%) cases died. Seventy (64%) cases were male. Older adults were more often affected, with 90 (83%) cases occurring among individuals ≥ 50 years (overall median age, 64 years; range, 22 to 92 years). Of the 109 cases, 94 (86%) were white (of which two were Hispanic), 13 (12%) were Black (of which one was Hispanic), and two (2%) were American Indian. Fifty-two (48%) cases were diagnosed during June through September. Sixty-six (61%) were residents of the Twin Cities metropolitan area and 43 (39%) were residents of Greater Minnesota. Two (2%) confirmed cases were part of an outbreak associated with an apartment building, and one (1%) confirmed case was part of an outbreak associated with a vacation rental (this outbreak had one additional confirmed case who was a non-Minnesota resident).

Although most cases are diagnosed by *Legionella* urinary antigen test, culture on selective media 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 2022. Eleven (92%) were hospitalized, and two (17%) died. The median age of cases was 72 years (range, 14 to 95 years). Eleven (92%) cases had *Listeria monocytogenes* isolated from blood and one from peritoneal fluid. There were no pregnancy-associated cases among culture-confirmed cases in 2022. Seven cases were white, three were Black, one was Asian, and one reported another race; one was of Hispanic ethnicity. The 12 cases were slightly greater than the median number of cases reported from 1996 through 2021 (median, 9 cases; range, 3 to 19). One 2022 case was part of a Florida outbreak associated with commercially distributed ice cream, and one 2022 case (who was not hospitalized) was linked to *Listeria*-based cancer immunotherapy.

In 2019, national case definitions were modified to include "probable" and "suspected" cases of listeriosis. In 2022, one suspected case was identified in an individual with *L. monocytogenes* isolated from an elbow 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 13 cases have been reported in Minnesota residents since 2013, two in 2022. 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 2022, a new national case definition for Lyme disease surveillance went into effect, and as a result, MDH changed its surveillance methods. As a high-incidence state for Lyme disease, Minnesota is no longer required to collect clinical information to classify each case and instead reports totals based on the number of people who have confirmatory lab testing. Because of this change, case numbers appear to have increased dramatically in 2022, but they are comparable to prior years. For a portion of Minnesota counties that are in emerging and low-incidence areas of the state, MDH continued to collect detailed data and will summarize that below.

Under the new case definition, Minnesota identified 2,685 probable Lyme disease cases (46 cases per 100,000 population) based on confirmatory laboratory evidence. In addition, 24 suspect cases with only supportive laboratory results were also reported. The total number of laboratory reports for Lyme disease received in 2022 (3,148) was nearly identical to what was received in 2021 (3,128). The overall median age for all reports was 52 years old, which is comparable to past years.

Of the 2,685 probable Lyme disease cases reported, 188 (7%) cases occurred in counties that are considered low incidence for Lyme and other tickborne diseases. Traditional case follow-up was performed for these cases and similar to the laboratory only data, the majority (56%) of cases were male. The median case age was 42 years (range, 2 to 96). Physician-diagnosed erythema migrans (EM) was present in 46 (24%) cases. Twenty-six (14%) cases had one or more late manifestations of Lyme disease, including 12 with a history of objective joint swelling, 10 with cranial neuritis including Bell's

Palsy, and three with acute onset of 2nd or 3rd degree atrioventricular conduction defects. Of the 150 (80%) cases with known onset dates, onset of symptoms peaked from May through September. This timing corresponds with the typical peaks in tick activity in the spring and early summer. 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 2022, 72 cases (1.2 per 100,000 population) were reported. Sixty-seven (93%) cases were identified with *P. falciparum*, two (3%) with *P. vivax*, and two (3%) with *P. malariae*. In one case (1%), the testing performed was unable to identify a species. The median age of cases was 39 years (range, 2 to 78). Of the 68 cases with known race, 62 (91%) were Black, 5 (7%) were white, and one (1%) identified as other race. All 72 cases were Minnesota residents at the time of their illness, 62 (86%) of whom resided in the seven-county metropolitan area. Of the 51 cases with known country of birth, 10 (20%) were born in the United States. Exposure and travel information was available for all cases, and while 70 (97%) cases likely acquired malaria in Africa, one patient reported travel to Asia, and one patient reported travel to

Central and South America. Twenty countries were considered possible exposure locations in Africa for malaria infections, including Liberia (17), Cameroon (9), Guinea (8), Ghana (6), Sierra Leone (6), Togo (6), Uganda (6), and Ethiopia (5), as well as several other countries in sub-Saharan Africa.

Measles

Measles is an acute viral respiratory illness, which spreads easily when an infected person breathes, coughs, or sneezes. In 2022, 22 measles cases were reported as a result of unrelated travel importations in multiple families. Eleven cases were residents of Hennepin County, and the remaining were residents of Ramsey (6), Dakota (4), and Scott (1) counties. All 22 cases were laboratory confirmed by PCR and genotyped as B3. All 22 cases were unvaccinated for measles. All 22 cases were Black/African American and non-Hispanic. Eighteen (82%) of the cases reported 1 or more complications including otitis, diarrhea, dehydration, vomiting, pneumonia, or thrombocytopenia. The age range of the cases was 1 to 13 years, with a median of 5 years. Ten (45%) of the cases were hospitalized.

The first family travel cluster (2 cases) occurred in June as a result of international travel and no transmission occurred. In August, another family travel cluster (4 cases, unrelated to the June cases) occurred involving family members who had also traveled internationally and then developed measles upon return to the U.S. In mid-late September, two additional travel clusters (8 cases; 2 clusters of 4 cases each) were identified that were unrelated to the August cluster and to one another.

The second of the September clusters went on to transmit to four individuals; this included two family members (2 cases) that lived outside of the household, one child in a healthcare setting (1 case, October) and one child in a daycare (1 case, November – with delayed onset due to receipt of immune globulin). The child with exposure in a healthcare setting then exposed three unvaccinated siblings in the household setting and caused three more cases. Complete information on source could not be obtained for one case because the parent refused a full interview; however, it is suspected that this case was a contact of the first September cluster.

Working with healthcare, local public health, and community partners, MDH was able to identify and test the cases early and make sure they were in isolation and that the additional exposed siblings were in exclusion, so additional transmission outside of the household did not take place.

Meningococcal Disease

Meningococcal disease is a rare, serious illness caused by the bacteria *Neisseria meningitidis*. Three *N. meningitidis* (NM) invasive disease cases (0.05 per 100,000 population) were reported in 2022; there were no cases in 2021, 6 cases in 2020, four cases in 2019, no cases in 2018, and 5 cases in 2017. Among 2022 cases, one was serogroup B, and 2 were non-groupable. All cases were sporadic.

Cases ranged in age from 19 to 52 years. All cases occurred in the metropolitan area and all cases had meningitis. Two of the cases (non-groupable serotype) had received MenACWY vaccination. There were no deaths. The quadrivalent conjugate vaccine,

MenACWY is recommended at age 11- 12 years with a booster at age 16. Meningococcal B vaccine is recommended for persons 10 years of age and older with specific risk factors. It should also be considered and offered to those 16-23 years of age, especially in outbreak situations. Data on meningococcal vaccination rates in Minnesota can be found here: [Adolescent Immunization Coverage Over Time \(https://www.health.state.mn.us/people/immunize/stats/adol/coverdatatime.html\)](https://www.health.state.mn.us/people/immunize/stats/adol/coverdatatime.html).

Rates of meningococcal disease have declined in the United States since the 1990s and remain low today. Anyone can get meningococcal disease, but rates of disease are highest in children younger than one year old, followed by a second peak in adolescence. Among adolescents and young adults, those 16 through 23 years old have the highest rates of meningococcal disease nationally.

Mumps

Mumps is a viral disease, which typically spreads from person to person via prolonged and close contact with infected persons. In 2022, seven mumps cases were reported. One (14%) was classified as confirmed (tested positive by PCR), but failed to be successfully genotyped. Six cases (86%) were classified as probable (tested positive by IgM serology). Five (71%) cases reported receiving at least one dose of mumps vaccine (MMR). Two (29%) cases were unvaccinated. No case reported a previous history of mumps disease.

Six (86%) cases acquired mumps in Minnesota and were not linked to outbreaks occurring elsewhere, and one (14%) acquired mumps from international travel. The median

age of cases was 28 years (range 8 to 42). All 7 cases experienced parotitis. None were hospitalized.

Mumps surveillance is complicated by nonspecific clinical presentation in nearly half of cases, asymptomatic infections in an estimated 30% of cases, improper laboratory test ordering, and suboptimal sensitivity and specificity of serologic testing. Several viruses can cause sporadic parotitis including parainfluenza virus types 1 and 3, influenza A virus, human herpes virus 6, enterovirus, Epstein-Barr, lymphocytic choriomeningitis virus, bocavirus, and human immunodeficiency virus. Acute bacterial parotitis may present with unilateral swelling. Noninfectious causes include drugs, tumors, and immunologic diseases.

Neonatal Sepsis

Neonatal sepsis refers to an infection involving the bloodstream in young infants, with bacterial infections being the most common cause of sepsis in newborns. Statewide surveillance for neonatal sepsis includes reporting of any bacteria (other than coagulase-negative *Staphylococcus*) isolated from a sterile site in an infant younger than seven days of age, and mandatory submission of isolates. In 2022, 42 cases (0.66 cases per 1,000 live births) were reported compared to 43 cases in 2021. There were no deaths. All were identified via blood or cerebral spinal fluid (CSF). Most cases (83%) were culture-positive within the first 2 days of life. *Escherichia coli* (14) was most common, followed by Group B *Streptococcus* (9), *Streptococcus viridans* (9), *Streptococcus pneumoniae* (3), other *Streptococcus* spp. (3), *Enterococcus* spp. (2), and one each of *Pseudomonas aeruginosa* and *Staphylococcus aureus*.

Non-tuberculous mycobacteria

Non-tuberculous mycobacteria (NTM) consist of species of mycobacteria, excluding *M. tuberculosis* and *M. leprae* (the causative agents of tuberculosis and Hansen's disease, respectively). NTM are acid fast bacilli that are commonly found in water, soil, and dust. They are generally categorized as slow or rapid growers. Slow growing NTM include members of the *M. avium* complex (*M. avium*, *M. intracellulare*, *M. chimaera*), *M. kansasii*, and *M. marinum* among others. Rapid growers include members of *M. abscessus* complex, *M. chelonae* complex, and *M. fortuitum* group, as well as numerous other species.

For the purposes of surveillance, NTM cases are further categorized as pulmonary and extrapulmonary (ENTM). NTM most commonly causes pulmonary disease but can also cause disease in many other parts of the body including lymph nodes, soft tissue, skin, and blood. NTM disease most commonly affects those with underlying lung disease (chronic obstructive pulmonary disease, cystic fibrosis, bronchiectasis) and immune suppression (HIV/AIDS, chemotherapy, rheumatoid arthritis, multiple sclerosis, tissue/organ transplant). Although many patients with pulmonary NTM infection do not know where or how exposure occurred, some pulmonary infections have been linked to contaminated water supplies in health care facilities, which can go on to contaminate medical devices. ENTM disease often occurs through direct inoculation, such as exposure of open wounds to freshwater or dirt, injection of medication or other substances with non-sterile devices or diluent, or traumatic wounds with sharp objects such as metal nails or staples. For both pulmonary and

extrapulmonary NTM, transmission from person to person is rare. Some types of NTM infections are difficult to treat due to multi-drug resistance of the organisms and the need for a long duration of treatment. Treatment is often managed with pulmonary, surgical, and/or infectious disease specialists.

Surveillance for NTM began in 2019 in Hennepin and Ramsey Counties. A case of pulmonary NTM is considered confirmed if NTM is identified (by culture or culture-independent test) in either one bronchoalveolar lavage/washing specimen or one specimen from a lung biopsy, or two sputum or tracheal aspirate specimens that have NTM identified within 12 months. An ENTM case is confirmed in a patient who has NTM identified in a non-pulmonary specimen (excluding stool or rectal swabs). In 2021 surveillance expanded statewide for ENTM cases. In 2021 there were 113 ENTM cases reported statewide, with an incidence rate of 1.8 cases per 100,000 persons. 148 confirmed pulmonary cases were reported in Hennepin and Ramsey Counties with an incidence rate of 5.7 per 100,000. In 2022, there were 106 ENTM cases statewide with an incidence rate of 1.8 per 100,000. 144 confirmed pulmonary cases were reported in Hennepin and Ramsey Counties with an incidence rate of 6.8 per 100,000.

Of the 106 ENTM cases, 31% resided in Hennepin County and 10% resided in Ramsey County; 56% of cases were male and median age was 53 years (range 1 to 88 years). Seventy percent of cases were White, 9% Black, 6% Asian, 4% American Indian/Alaskan Native, and 11% were of unknown race. Eight percent of ENTM cases were Hispanic.

Of index specimens collected, 30% were of the *M. avium* complex (MAC) group and 70% were of non-*M. avium* complex

mycobacteria. Of non-*M. avium* complex species isolated, 53% belonged to *M. abscessus* complex, *M. chelonae* complex, and *M. fortuitum* group. Lymph node (19%), skin (17%), and surgical wounds (15%) were the most common specimen collection sites. The most common infection types diagnosed were lymphadenitis (17%), abscess-not skin (11%), and surgical site infection (9%). The most common underlying condition was diabetes (19%) and 43% of those cases (n=9) had chronic complications associated with diabetes, such as nephropathy, chronic kidney disease, and retinopathy. The most common exposure as documented in the medical record, was a surgical procedure in the 12 months prior to index specimen collection, at 47% of cases, with 65% occurring at the site of infection.

Of the 144 confirmed pulmonary cases, 80% of cases were residents of Hennepin County and 20% of Ramsey County. 56% of cases were female and 44% are male. The median age of cases was 67 years (range 18 to 90 years). Seventy percent of cases were white, 15%, 12% Asian, 1% American Indian/Alaskan Native, and 4% unknown. Only one case was of Hispanic ethnicity. Sixty-eight percent of index specimens collected were of the *M. avium* complex group and 78% of those specimens were not speciated further. The most common index specimen type was sputum (54%) and bronchoalveolar lavage/wash (42%). The most common underlying condition for pulmonary NTM was chronic lung disease, which includes, but is not limited to, chronic obstructive pulmonary disease emphysema, chronic bronchitis, asthma, interstitial lung disease, bronchiectasis, and reactive airway disease. Forty-nine percent of cases had a history of smoking tobacco.

Pertussis

Pertussis, also known as whooping cough, is a contagious respiratory disease caused by the bacteria *Bordetella pertussis*. In 2022, 32 pertussis cases (1 per 100,000 population) were reported. Laboratory confirmation was available for 15(47%) cases, one (1%) of which was confirmed by culture, and 15 (47%) of which were confirmed by PCR. In addition, five (16%) cases met the clinical case definition and were epidemiologically linked to laboratory confirmed cases. None of the cases (0%) met the clinical case definition only. Seventeen (53%) cases occurred in residents of the metropolitan area.

Paroxysmal coughing was the most common reported symptom, which 27 (84%) cases experienced. Approximately 12 cases (38%) 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 17 (53%) cases. Infants and young children are at the highest risk for severe disease and complications. In 2022, no cases were diagnosed with pneumonia, two were hospitalized, and no deaths occurred.

Pertussis is increasingly recognized in older children and adults. During 2022, cases ranged in age from 8 months to 76 years. No cases were diagnosed in children <6 months of age, seven (23%) in children 6 months through 4 years, twelve (39%) in children 5-12 years, one (3%) case occurred in adolescents 13-17 years, and 11 (36%) in adults ≥18 years. The median age of cases was 24 years. Infection in older children and adults may result in exposure of unprotected infants. During 2022, two cases were in

infants <1 year of age. A likely source of exposure wasn't identified for those cases. Vaccination is recommended for pregnant people 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 three 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 two years from receipt of Tdap. Of the 13 (40%) cases who were 7 months to 6 years of age, three (25%) were known to have received at least a primary series of 3 doses of DTP/DTaP vaccine prior to onset of illness; 6 (46%) received fewer than three doses and were considered preventable cases.

Reporting rules require clinical isolates of *B. pertussis* be submitted to the MDH Public Health Lab (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.

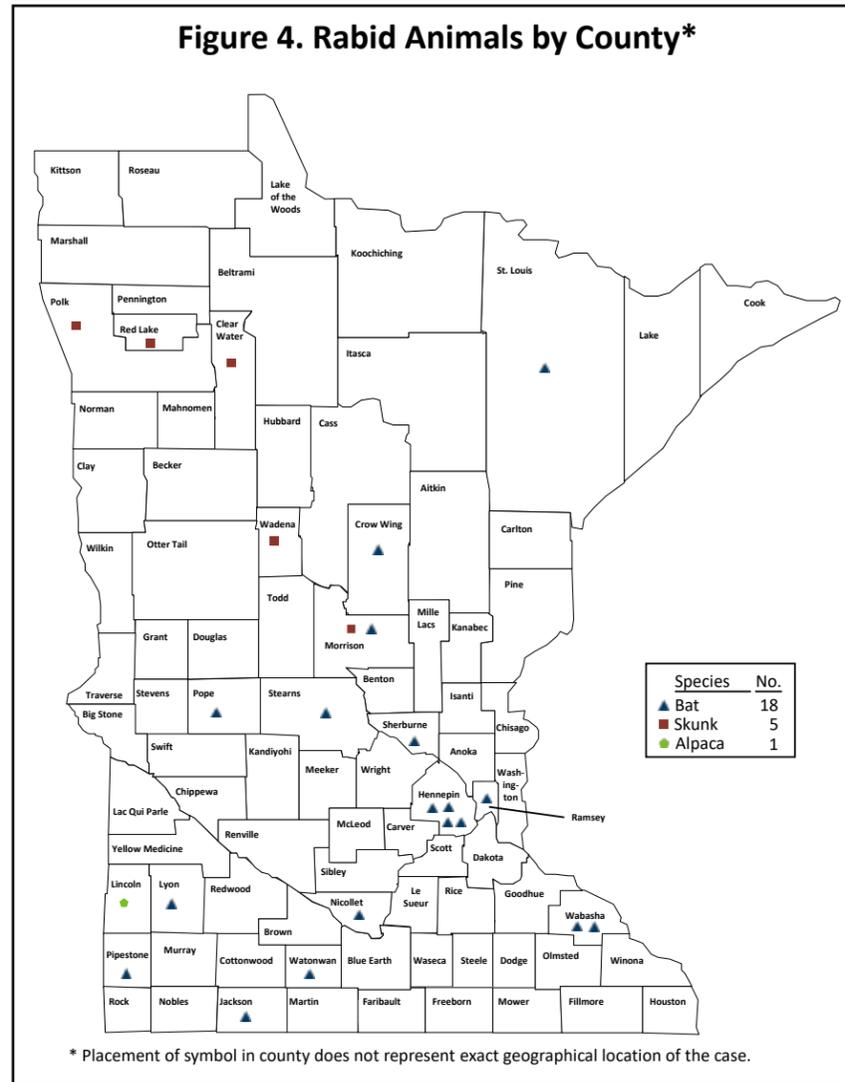
Q Fever

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 2022, eight confirmed cases of Q fever were reported, including one chronic case and seven acute cases. The confirmed chronic case was a 78-year-old male whose illness included sepsis and osteomyelitis. He had not been diagnosed as an acute Q fever case previously and

his exposure was unknown. The median age of the acute cases was 51 years (range, 27 to 55 years). Six (86%) acute cases were male. Six (86%) identified as white, one (14%) identified as Black, and all identified as non-Hispanic. Two (29%) reported drinking unpasteurized milk internationally, two (29%) reported direct contact with goats or cattle, one (14%) likely had an indirect exposure to contaminated clothing, and two (29%) had unknown exposures. The case with indirect exposure lived with two roommates who worked on a sheep farm and did not change clothes after they came home from work. He did not have any other plausible exposures. Six (86%) acute cases were hospitalized for a median of 4 days (range, 1 to 14 days). Two cases developed hepatosplenomegaly as a result of their infection, one case developed sepsis, and one developed duodenitis.

From 1997 to 2022, 39 confirmed acute Q fever cases and 12 chronic Q fever cases were reported. The median age of acute cases was 58 years (range, 11 to 77 years); the median age of chronic cases was 69 years (range, 5 to 78 years). Thirty-one (82%) of the 35 cases for whom both race and ethnicity were known identified as White, non-Hispanic; four (11%) identified as Black, non-Hispanic; and one (3%) identified as mixed race, non-Hispanic. During this time, 31 (82%) of the 38 cases for whom exposure information was available were likely exposed through direct or indirect contact with animals; four (11%) were likely exposed through ingestion of unpasteurized dairy products; and three (8%) were likely exposed through a tick bite. Eleven (32%) of the 34 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 not only protects the animals but also helps protect people from being exposed to rabies.

In 2022, 24 (1.1%) of 2,188 animals tested were positive for rabies.

This is a substantial decrease in rabies-positive animals compared to 2021 (42, [2.2%] of 1,932 animals tested) and is the lowest number of rabies-positive animals identified in Minnesota in the last 20 years. In 2022, 18 (75%) of the 24 rabid animals were bats, followed by 5 (21%) skunks. There was one rabid domestic animal, an alpaca, that had not been vaccinated for rabies (Figure 4). There were no human cases of rabies.

From 2003 to 2022, 1,007 (2.2%) of 45,809 animals tested in

Minnesota were positive for rabies. The median number of rabies-positive animals identified annually was 45 (range, 24 to 94). From 2003 to 2022, 342/773 (44.2%) skunks, 57/991 (5.8%) cattle, 508/13,739 (3.7%) bats, 9/386 (2.3%) horses, 49/13,227 (0.4%) cats, 29/13,142 (0.2%) dogs, 1/1,372 (0.1%) raccoons, and 13/2,232 (0.6%) other animals (6 fox, three goats, and one each of woodchuck, bison, deer, and alpaca) 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

Respiratory syncytial virus (RSV) is a common respiratory virus that usually cause mild, cold-like symptoms. However, RSV can be serious and infants and older adults are more likely to develop severe RSV and need hospitalization. Laboratory-confirmed RSV disease 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, 2022 – April 30, 2023, 1,812 cases were reported. From May 1, 2023 – September 30, 2023, 26 cases were reported. Combined, from October 1, 2022 – September 30, 2023, there were 1,838 cases reported (59 cases per 100,000 persons), compared to 988 cases reported (32 cases per 100,000 persons) from October

2021 – September 2022. The overall median age was 1.5 years (range: 0 days – 104 years). Fifty-five percent (1,015) were <2 years of age: 25% (467) were <6 months, 14% (255) were 6 months – 11 months, and 16% (293) were 1 year – <2 years. Sixteen percent (291) were 2-4 years, 5% (90) were 5 – 17 years, 4% (69) were 18 – 49 years, 5% (87) were 50 – 64 years, and 16% (286) were >65 years of age. Overall, 53% of RSV cases were male and 58% were white.

Forty-eight percent (887) 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 (54%), chronic lung disease (22%) and cardiovascular disease (20%). For cases 2 – 17 years of age it was chronic lung disease (55%), neurologic conditions (32%), cardiovascular disease (16%), and feeding tube dependence (16%). The most common underlying conditions for adults 18-64 years of age and older adults (≥65 years) were chronic metabolic disease (32% and 50% respectively), cardiovascular disease (36% and 73% respectively), chronic lung disease (50% and 55% respectively), hypertension (46% and 82% respectively), and depression (30% and 28%, respectively)

Forty-four RSV-associated deaths were reported during the regular the 2022-2023 respiratory season: 21 during hospitalization, and 20 within 60 days of hospital discharge and one outpatient. All deaths occurred between September 30, 2022, and May 1, 2023. The median age of all deaths was 70 years (range 6 months to 104 years), and 40 deaths had co-morbid conditions. Identification of additional RSV-associated deaths is ongoing.

Salmonellosis

Salmonellosis is a disease caused by the bacteria, *Salmonella*, which typically causes gastrointestinal symptoms. During 2022, 1,045 *Salmonella* cases were reported. Of those, 925 were culture-confirmed and 120 only tested positive by a culture-independent diagnostic test (CIDT) and were not subsequently culture-confirmed. The 925 culture-confirmed cases of *Salmonella* infection (16.4 per 100,000 population) reported in 2022 represents an 11% increase from the median number of culture-confirmed cases reported annually from 2012 to 2021 (median, 832 cases; range, 660 to 1,009) (Figure 1).

Of the 100 serotypes identified among culture-confirmed cases in 2022, 5 serotypes accounted for 61% of cases: *S. Enteritidis* (272), *S. Typhimurium* (103), *S. I 4,[5],12:i:-* (83), *S. Newport* (59), and *S. Infantis* (44). *Salmonella* was isolated from stool in 789 (85%) cases, blood in 62 (7%), and urine in 60 (6%). Other specimen sources included wound (2), abscess, body fluid, peritoneal fluid, pleural fluid, synovial fluid, bile, bone, intervertebral disc, ear, hip structure, elbow structure, and spleen.

The incidence of *Salmonella* infections, based on reported case rate, was 17.7 per 100,000 population among Asian Minnesotans, 14.9 among Black Minnesotans, 14.6 among white Minnesotans, and 12.3 among American Indian/Alaska Native Minnesotans. The incidence of *Salmonella* infections was 15.2 per 100,000 population for Hispanic Minnesotans. The median age of culture-confirmed cases was 41 years (range, 0 to 96 years).

Two hundred and seven (22%) culture-confirmed cases were hospitalized; the median length of hospital stay was 4 days (range, 1 to 113 days). Eight culture-confirmed cases died. *Salmonella* I 4,[5],12:i:- was isolated from a post-mortem blood specimen from a one year-old who died of *Salmonella* sepsis. *S. Ituri* was isolated from post-mortem blood and spleen tissue from a different one year-old who also died of *Salmonella* sepsis. A 51-year-old died of acute hypoxic respiratory failure and COVID-19 27 days after *S. Dublin* was isolated from blood. A 60-year-old died of respiratory failure, stroke, spinal cord infarct, and myasthenia gravis 23 days after *S. Infantis* was isolated from stool. A 72-year-old died of metastasized pancreatic cancer and severe sepsis “with abdominal source” 23 days after *S. Enteritidis* was isolated from blood. A 73-year-old died of severe sepsis with shock, ischemic colitis, enterococcus and Gram negative rod bacteremia, and multi-organ failure 2 days after *S. IV 48:g,z51:-* was isolated from blood. A 76-year-old died of sepsis and *Salmonella* bacteremia 13 days after *S. Dublin* was isolated from blood. A 95-year-old died of kidney failure 5 days after *S. Infantis* was isolated from stool.

Of the 715 culture-confirmed cases with known travel history, 152 (21%) had traveled internationally during the week prior to their illness onset. There were three *S. Typhi* cases; one travelled to India, one was unable to be interviewed, and one had no known international travel. There was one *S. Paratyphi A* case who was unable to be interviewed.

During 2022, 120 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 47 years (range, 0 to 95 years). Thirty (25%) cases were hospitalized; the median hospital stay was 5 days (range, 2 to 29 days). Two cases died. One hundred twenty laboratory-confirmed (118 culture-confirmed and 2 CIDT-positive only) cases were part of eight *Salmonella* outbreaks in 2022, including four cases that were part of an outbreak that began before 2022 and one case that was part of a sapovirus outbreak. Three of the eight outbreaks involved foodborne transmission, two involved person-to-person transmission, one was due to animal contact, and one had an unknown source of transmission. Three of the outbreaks involved cases with exposure in multiple states. The eight outbreaks resulted in a median of 4 culture-confirmed cases per outbreak (range, 0 to 69).

Four culture-confirmed cases of *S. Enteritidis* infection were associated with travel to Jamaica. The cases were part of a larger multi-state outbreak that also included cases with no travel; the source of exposure and route of transmission were unknown. Three culture-confirmed and one probable case of *S. Panama* infection were associated with a person-to-person outbreak in the infant room at a childcare center. Thirty-three culture-confirmed cases of *Salmonella* infection with various serotypes (*S. I 4:i:-* [15], *S. Berta* [9], *S. Agona* [7], and *S. Infantis* [2]) were associated with direct or indirect exposure to a live animal market in Minnesota. *S. enterica* was found in 17 of 40 (43%) environmental swabs collected at the market, including isolates highly related to the *S. Berta*, *S. Agona*, and *S. Infantis* case isolates. Four culture-confirmed cases of *S. Typhimurium* infection were part of a multi-state outbreak of

88 cases from 11 states that was associated with cantaloupe from a packing facility in Indiana. The source and mechanism of contamination were not identified, but positive environmental samples and past *Salmonella* outbreaks in 2012 and 2020, also linked to cantaloupe grown in southwestern Indiana, suggest persistent environmental *Salmonella* reservoirs in the growing region. One culture-confirmed case of *S. IIIb 61:z52:z53* infection was part of a multi-state outbreak of 20 cases from 15 states associated with contact with bearded dragons. State and national partners worked with two primary dragon suppliers on *Salmonella* prevention activities. Four culture-confirmed cases of *S. Braenderup* infection in 2022 were associated with a Minnesota breakfast restaurant outbreak that included 10 cases from April 17, 2021 to September 18, 2023. The source of contamination and vehicle of transmission were not identified. The long duration of the outbreak was indicative of environmental contamination at the restaurant leading to cross-contamination of food products. A positive environmental sample matching the outbreak strain confirmed this as the outbreak source. One probable case of *Salmonella* infection (who was also positive for sapovirus) was associated with a person-to-person outbreak of sapovirus gastroenteritis in the infant and toddler rooms at a childcare center. The outbreak included a total of 2 laboratory-confirmed and 7 probable sapovirus cases. Sixty-nine culture-confirmed cases of *Salmonella* infection with various serotypes (*S. Enteritidis* [51], *S. Infantis* [13], *S. Hadar* [4], and *S. Mbandaka* [1]) were associated with a multi-state outbreak linked to live poultry contact. Nationally, there were 1,230 people infected with the outbreak strains across 49 states, the District of Columbia, and Puerto Rico, with illness onset dates ranging from January 24, 2022 to October 18, 2022.

Sexually Transmitted Diseases (STDs)

Gonorrhea and chlamydia are monitored through a mostly passive surveillance system involving review of submitted case reports and laboratory reports. Syphilis is monitored through active surveillance, which involves immediate follow-up with the clinician upon receipt of a positive laboratory report. Although overall incidence rates for 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 STD infectious disease in Minnesota. In 2022, 22,079 chlamydia cases (416 per 100,000 population) were reported. This is a 2% decrease compared to 2021 (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 (2,164 per 100,000), followed by the 15 to 19-year-old age group (1,421 per 100,000). The incidence of chlamydia among adults 25 to 29 years of age (1,015 per 100,000) is considerably lower but has increased in recent years. The chlamydia rate among females (520 per 100,000) is nearly twice the rate among males (311 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 (2,127 per 100,000) is 11.7 times higher than the rate among white non-Hispanics (182 per 100,000). Although black, non-Hispanic persons comprise approximately 5% of Minnesota’s population, they account for 27% of reported chlamydia cases. Rates among Asian/Pacific Islanders (402 per 100,000), Hispanic, any race (895 per 100,000), and American Indian/Alaska Natives (1014 per 100,000) are 4.9 to 5.6 times higher than the rate among white, non-Hispanic persons. Chlamydia infections occur throughout the state, with the highest reported rates in Minneapolis (1,267 per 100,000) and St. Paul (896 per

100,000). Every county in Minnesota had at least 2 cases in 2022.

Gonorrhea

Gonorrhea is the second most commonly reported STD in Minnesota. In 2022, 8,161 cases (153.9 per 100,000 population) were reported. This is a 16% decrease compared to 2021 (Table 4). Adolescents and young adults are at greatest risk for gonorrhea (Table 4), with rates of 320 per 100,000 among 15 to 19-year-olds, 553 per 100,000 among 20 to 24-year olds, and 427 per 100,000 among 25 to 29-year-olds. Gonorrhea rates for males (178 per 100,000) were higher than females (130 per 100,000).

Communities of color are disproportionately affected by gonorrhea. The incidence of gonorrhea among black, non-Hispanics (1102 per 100,000) is 19.2 times higher than the rate among white, non-Hispanics (57 per 100,000). Rates among Asian/Pacific Islanders (98 per 100,000), Hispanic, any race (249 per 100,000), and American Indian/Alaska Natives (547 per 100,000) are up to 9.5 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

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

Disease	2018		2019		2020		2021		2022	
	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
Chlamydia	23,564	444	24,535	463	21,942	413.7	22,578	425.7	22,079	416
Gonorrhea	7,542	142	8,063	152	10,217	192.6	9,671	182.3	8,161	154
Syphilis, Total	918	17.3	1127	21.2	1093	20.6	1457	27.5	1831	34.5
Primary/Secondary	292	5.5	385	7.3	461	7.8	564	10.6	676	12.7
Early NP/NS*	286	5.4	367	6.9	365	6.9	415	7.8	535	10.1
Unknown/Late	330	6.2	354	6.7	303	5.7	463	8.7	601	11.3
Congenital**	10	15.1	21	32.3	7	11.2	15	23.6	20	31.7

* 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

Disease	Chlamydia		Gonorrhea		Primary/Secondary Syphilis	
	No.	Rate	No.	Rate	No.	Rate
Total	22,079	416	8,161	154	676	12.7
Residence						
Minneapolis	4,849	1267	2,650	693	240	62.7
St. Paul	2,553	896	1,261	442	84	29.5
Suburban**	7,503	344	2,420	111	181	8.3
Greater Minnesota	7,067	288	1,769	72	171	7.0
Age						
<15 years	153	14	37	3	0	0.0
15-19 years	5,226	1421	1,177	320	24	6.5
20-24 years	7,697	2164	1,965	553	79	22.2
25-29 years	3,784	1015	1,592	427	95	25.5
30-34 years	2,270	662	1,400	408	136	39.7
35-39 years	1,320	402	850	259	118	36.0
40-44 years	722	205	471	133	73	20.7
45-49 years	381	94	258	64	39	9.6
50-54 years	261	65	177	44	44	11.0
55+ years	265	20	234	18	68	5.2
Gender						
Male	8,179	311	4,674	178	481	18.3
Female	13,899	520	3,481	130	195	7.3
Transgender/unknown^^	1		0		1	
Race^/Ethnicity						
White, non-Hispanic	8,415	182	2,650	57	280	6.1
Black, non-Hispanic	5,976	2,127	3,097	1102	188	66.9
American Indian/Alaska Native	683	1,014	368	547	60	89.1
Asian/PI	887	402	196	89	18	8.2
Other^^	615		272		36	
Unknown^^	3,263		1,064		10	
Hispanic^^^	2,240	895	514	205	84	33.6

* 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.

Minneapolis (693 per 100,000) is over 1.5 times higher than the rate in St. Paul (442 per 100,000), more than 6 times higher than the rate in the suburban metropolitan area (111 per 100,000), and more than 9 times higher than the rate in Greater Minnesota (72 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 2022, there were 676 cases of primary/secondary syphilis in Minnesota (12.7 cases per 100,000 persons), which is a 20% increase compared to 2021.

In 2022, the number of early syphilis cases increased by 24%, with 1,211 cases, compared to 979 cases in 2021. The incidence remains highly concentrated among MSM. Of the early syphilis cases in 2022, 866 (71%) occurred among men; 511 (59%) of these were MSM. Thirty-one percent of the MSM diagnosed with early syphilis were co-infected with HIV. The number of reported cases in women has continued to increase over the past 10 years from 18 early syphilis cases in 2012 to the near historic high of 345 cases reported in 2022.

Twenty congenital syphilis cases were reported in 2022. 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. Nationally, 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 15.1 in 2018 to 31.7 per 100,000 live births in 2022.

Shigellosis

Shigellosis is an infection caused by the bacteria *Shigella* and can spread easily from person to person. In 2022, 206 *Shigella* cases were reported. Of those, 86 were culture-confirmed (1.5 per 100,000 population). The remaining 120 were only tested by a culture-independent diagnostic test (CIDT) and not subsequently confirmed. The 86 culture-confirmed *Shigella* cases represent a 21% decrease from the 109 cases reported in 2021, and is 39% less than the median annual number of cases reported from 2012 to 2020 (median, 140 per year; range, 79 to 554). *S. flexneri* accounted for 53 (62%) cases, *S. sonnei* for 28 (33%) cases, *S. boydii* for two (2%) cases, and *S. dysenteriae* for two (2%) cases. The species was not identified for one (1%) case. Culture-confirmed cases ranged in age from one to 78 years (median, 35 years). Twelve percent of cases were ≤5 years of age; 74% of cases were 18 years of age or older. Seventy percent of cases were male. Eighteen (21%) cases were hospitalized. No cases died.

In 2022, of the 206 reported cases, 201 patients were positive for *Shigella* by a CIDT conducted in a clinical laboratory. Of the 195 corresponding specimens that were received at MDH, 81 (42%) were subsequently culture-confirmed. The remaining 114 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, one to 90 years). Twelve (11%) CIDT-positive only cases were hospitalized; the median hospital stay was three days (range, 2 to 15 days). No CIDT-positive only cases died.

Forty-five percent of cases reported either non-white race (36 of 86 cases) or Hispanic ethnicity (6 of 86 cases). Of the 65 cases for which travel information was available, 22 (34%) travelled internationally (15 of 23 [65%] *S. sonnei* and 6 of 38 [16%] *S. flexneri*). Eighty-three percent of cases resided in the Twin Cities metropolitan area, including 52% in Hennepin County and 8% in Ramsey County.

There were no outbreaks of shigellosis reported in 2022.

Staphylococcus Aureus

Staphylococcus aureus is a bacteria, which typically isn't harmful, however in some cases can cause infections. In healthcare settings *S. aureus* infections can be serious or fatal, particularly infections that spread to the bloodstream, lungs, heart, or bone. In 2005, as part of the 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 14.6 per 100,000 in 2022 compared to 15.8 per 100,000 population in 2021. In 2022, MRSA was most frequently isolated from blood (84%, 221/263), and 13% (35/263) of the cases died in the hospital. The median age for all cases was 62 years (range, <1 to 97).

In August 2014, as part of the EIP ABCs program, population-based surveillance of invasive methicillin-susceptible *S. aureus* (MSSA) was initiated in Hennepin and Ramsey Counties. The incidence rate was 31.9 per 100,000 in 2022 compared to 29.5 per 100,000 population in 2021. In 2022, MSSA was most frequently isolated from blood (81%, 467/574), and 12% (69/574) of the cases died in the hospital. The median age for all cases was 61 years (range, <1 to 94).

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: 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 2022. Between 2008 and 2022, we confirmed 19 VISA 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). There were 310 cases (5.2 cases per 100,000 population), including 29 deaths, reported in 2022, compared to 214 cases and 19 deaths in 2021. The median age of cases was 56 years (range, 5 months to 101 years). Fifty-seven percent of cases were residents of the metropolitan area. Allowing for multiple presentations per patient, 114 (37%) had cellulitis, 70 (23%) septic shock, 54 (17%) bacteremia without another focus of infection, 36 (12%) pneumonia, 31 (10%) had septic arthritis and/or osteomyelitis, 27 (9%) abscess (not skin), 13 (4%) necrotizing fasciitis, and 10 (3%) STSS. Twenty-seven (9%) cases were injection drug users in 2022 compared to 43 cases (20%) in 2021. There were no deaths in 2022 compared to one death in 2021. Twenty-nine (9%) cases were residents of long-term care facilities (LTCFs). Among 2022 LTCF-associated iGAS cases only, twelve facilities had a single case, two facilities had 2 cases, and 4 facilities had more than 2 cases.

Allowing for multiple infection types per patient, the 29 deaths included 22 that were diagnosed with septic shock, 7 with cellulitis, 5 with pneumonia, 5 with necrotizing fasciitis, three with bacteremia without another focus of infection, and one with STSS. Of the 29 deaths, the most frequently reported underlying conditions were chronic kidney disease (12), heart failure (12), atherosclerotic cardiovascular disease (8), chronic obstructive pulmonary disease (8), obesity (8), diabetes (6), current tobacco smoker (5), and solid organ malignancy (5). Twenty fatal cases had two or more underlying conditions, three had none reported, and two had unknown underlying conditions.

Streptococcal Invasive Disease: Group B

Streptococcus group B is a common bacterium that can cause a variety of diseases, ranging from mild to severe. Invasive disease is defined when bacteria invade parts of the body that are typically free from bacteria, such as the blood. Five-hundred-forty-three cases of invasive group B *Streptococcus* (GBS) disease (9.6 per 100,000 population), including 32 deaths, were reported in 2022. By age group, annual incidence was highest among infants less than one year of age (48.2 per 100,000 population) and cases aged ≥ 70 years (33.9 per 100,000). Twenty-three (72%) of the 32 deaths were among cases ≥ 65 years. Forty-eight percent of cases were residents of the metropolitan area. Bacteremia without a focus of infection occurred most frequently (30%), followed by cellulitis (25%), septic arthritis (14%), septic shock (12%), osteomyelitis (10%), pneumonia (10%), abscess (6%), and meningitis (2%). The majority (84%) of cases had GBS isolated from blood; other isolate sites included joint fluid (9%), peritoneal fluid (2%), bone (1%), and cerebrospinal fluid (<1%).

Thirty-one cases were infants and two were maternal cases, compared to 34 cases in 2021. Nine infants developed early-onset disease (occurred within 6 days of birth [0.1 cases per 1,000 live births]), and 22 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 2 maternal GBS infections.

Since 2002, there has been a recommendation for universal prenatal screening of all pregnant women for GBS at 35 to 37 weeks gestation. MDH reviewed the maternal charts for all early-onset cases reported in 2021. Overall, 6 of 9 women who delivered GBS-positive infants underwent prenatal screening for GBS. Of these, two were positive and four were negative. One of the three women who did not receive prenatal screening was screened upon admission to the hospital prior to delivery and was positive. Among the 9 women who delivered GBS-positive infants, four 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.

Streptococcal Pneumoniae Invasive Disease

Streptococcus pneumoniae is a bacteria that causes acute infection. Some infections are considered invasive when the infection occurs in parts of the body that are normally sterile, such as blood. In 2022, 473 (8.4 per 100,000) cases of invasive pneumococcal disease (IPD) were reported. By age group, annual incidence rates per 100,000 were 12.1 cases among children aged ≤ 5 years, 2.8 cases among children and adults aged 5-39 years, 8.6 cases among adults 40-64 years, and 21.7 cases among adults aged ≥ 65 years.

Pneumonia occurred most frequently (53% of infections), followed by bacteremia without another focus of infection (12%), septic shock (11%), and meningitis (7%). Forty-eight (10%) cases died. Health histories were available for 47 deaths, of which 37 had an underlying health condition. The conditions most frequently reported were current tobacco smoker (17), diabetes (13), chronic kidney disease (11), solid organ malignancy (10), obesity (9), heart failure (9), current alcohol abuse (9), emphysema/chronic obstructive pulmonary disease (8), atherosclerotic cardiovascular disease/ coronary artery disease (6), cerebral vascular accident/ stroke (6), and cirrhosis (6).

In 1999, the year before the pediatric pneumococcal conjugate vaccine (Prevnar [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 5). 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 5).

In March 2010, the U.S. Food and Drug Administration approved a 13-valent pediatric pneumococcal conjugate vaccine (PCV-13 [Prevnar 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 5). Since 2011, the majority of IPD cases among children <5 years of age has been caused by serotypes not included in PCV-13. In 2022, 25% of cases with isolates available for testing were caused by 7 of the PCV-13-included serotypes: 3 (14%), 19F (8%), 19A (1%), 4 (1%), 18C (<1%), 7F (<1%), and 1 (<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, 15% of cases in 2021 had PCV-13 serotypes.

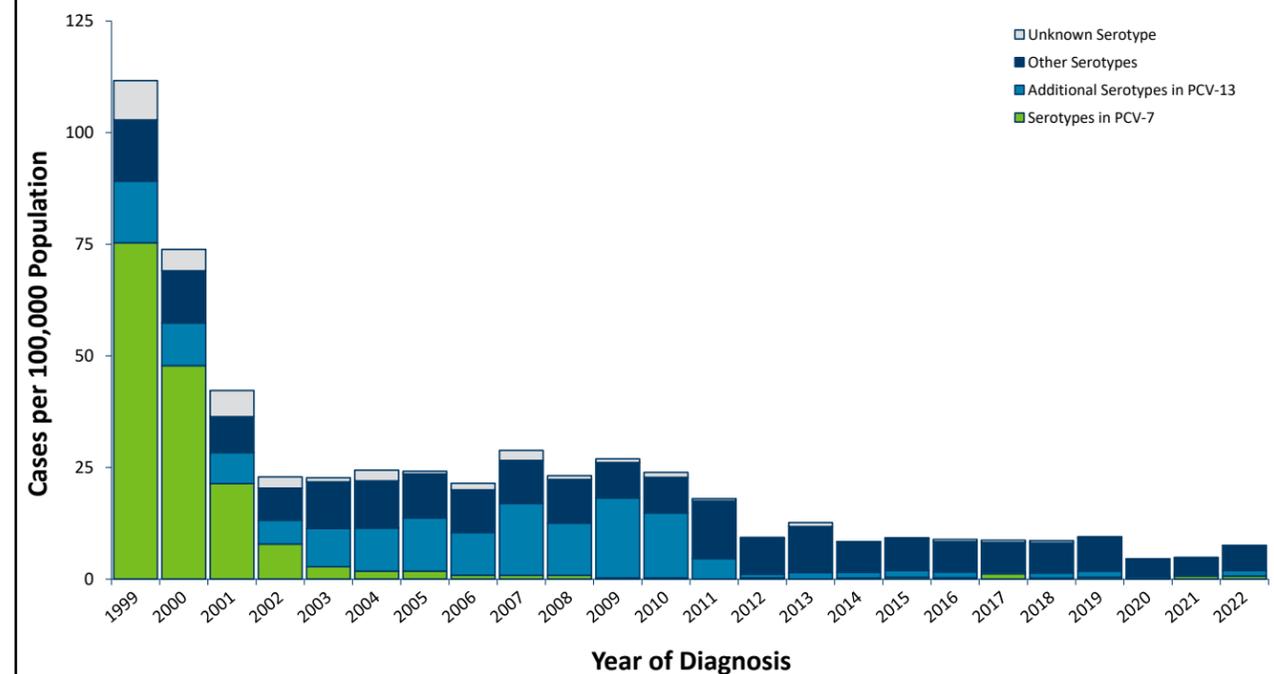
Toxoplasmosis

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

In 2022, 12 cases were reported (10 confirmed and 2 probable). This was similar to the annual median of 9 cases reported from 2013 to 2021 (range, 2 to 14 cases). Six confirmed cases were

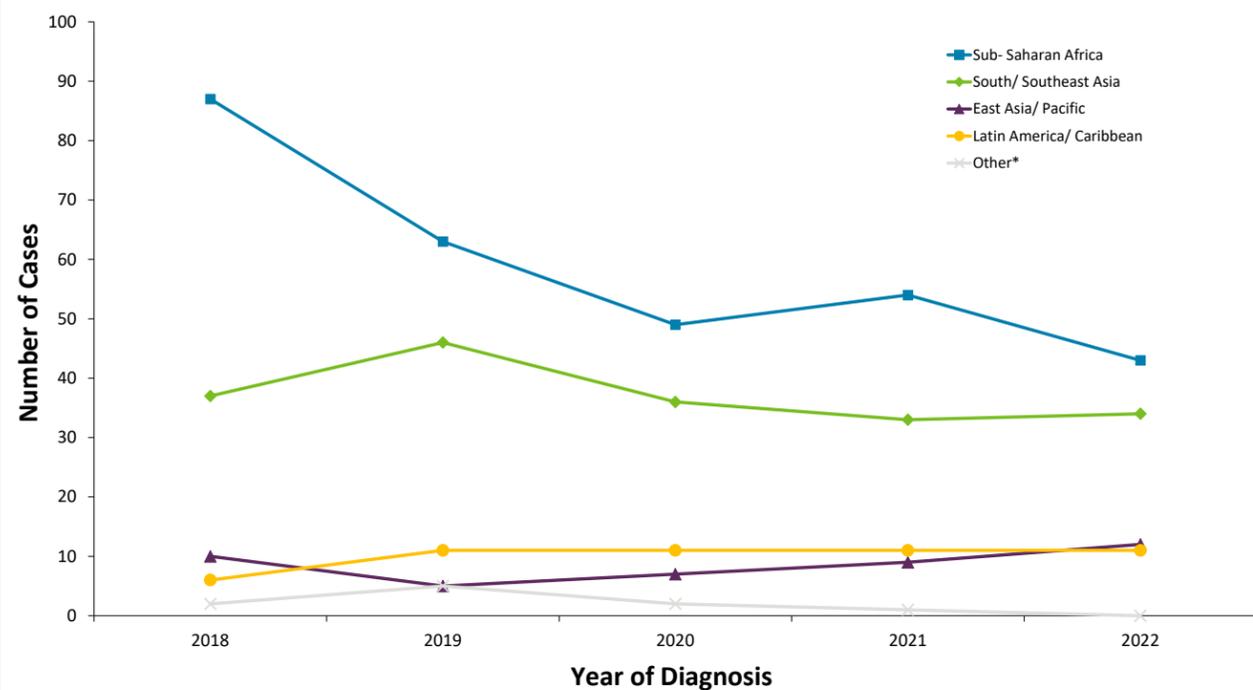
identified in 2021, but only two confirmed cases were identified in 2020, likely reflecting challenges in toxoplasmosis surveillance during the COVID-19 response. Thirteen confirmed cases were identified in 2019. In 2022, seven cases were diagnosed with ocular toxoplasmosis, four cases with generalized toxoplasmosis, and one with cerebral toxoplasmosis. Five cases had immunocompromising conditions. Eleven cases were acquired, and one case was congenital, in a baby born to a woman infected during pregnancy. The baby was born alive at 37 weeks with congenital manifestations of toxoplasmosis including retinochoroiditis, hydrocephalus, microcephaly, and intracranial calcifications. The median age of cases was 58 years (range, newborn to 68 years). Nine cases (75%) were male. Six cases were white, three cases were Asian/Pacific Islander, one case was Black/African American, and two were of unknown race; nine cases were non-Hispanic, and three were of unknown ethnicity.

Figure 5. 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).

Figure 6. Non U.S.-Born Tuberculosis Cases by Region of Birth and Year of Report



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

Tuberculosis

Tuberculosis (TB) is caused by a bacterium called *Mycobacterium tuberculosis*. The bacteria typically attack the lungs but can affect other body systems. Not everyone infected with TB bacteria becomes sick. As a result, two related conditions exist: latent TB infection (LTBI) and TB disease. In 2022, 132 tuberculosis cases (2.3 per 100,000 population) were reported. This represents a 1.5% decrease in the number of cases compared to 2021, when there were 134 newly reported cases. Despite the rebound in the number of new cases in 2021 from a low of 117 in 2020, the average TB case count in Minnesota from the last two years (2021-2022) was 133, compared to an average of 160 cases in the two years before the COVID-19 pandemic started (2018-2019). This follows a trend seen at the national level and most likely reflects the lingering effects of the pandemic. The TB incidence rate in Minnesota was

slightly lower than the overall rate in the United States (2.5 per 100,000). Ten cases (8%) from 2022 have died as of October 2023, 9 (7%) due to TB disease.

Twenty-two counties (25%) reported at least one case in 2022. The majority of TB cases (76%) occurred in the metropolitan area, primarily in Hennepin (33%) and Ramsey Counties (21%). Twenty-eight cases (21%) 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 2022 was reported in Ramsey County (5.1 per 100,000), followed by Anoka County (4.2 per 100,000) and Hennepin County (3.5 per 100,000). The combined TB incidence rate for the 7-county metropolitan area was 3.2 per 100,000, compared to 1.3 per 100,000 for all greater Minnesota counties. The two largest groups of new TB cases were those 25-44 (36%) and 65 years of age and older (20%) at time of diagnosis.

Eight patients (6%) were <5 years of age when they were diagnosed.

Most TB cases (83%) were identified only after seeking medical care for symptoms of disease. Targeted public health interventions identified a portion of the remaining 17% of cases, including contact investigations surrounding potentially infectious patients (8%), screening of new refugee arrivals (2%), and follow up to pre-immigration exams (1%). An additional 4% were identified through other targeted testing for TB, including employment screening, screening at medical visits and during immigration detention. The remaining four cases (3%) 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 2022, 9 cases occurred among non-Hispanic whites, a case rate of 0.2 per 100,000.

In comparison, among non-Hispanic persons of other races, 52 cases occurred among Black/African-born persons (11.9 cases per 100,000), 55 among Asian/Pacific Islanders (17.4 cases per 100,000), and two cases among American Indian/Alaska Native persons (2.9 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 (84%), and black/African-born cases (83%) were non-U.S.-born.

In 2022, the percentage of TB cases in Minnesota occurring in persons born outside the United States was 76%, compared to 73% of TB cases reported nationally. The non-U.S.-born percentage among Minnesota cases has consistently been higher than the national average, but the gap in 2022 was smaller than usual. The 100 non-U.S.-born TB cases represented 26 different countries of birth; the most common region of birth among these cases was Sub-Saharan Africa (43% of non-U.S. born cases), followed by South/Southeast Asia (34%), East Asia/Pacific (12%), and Latin America (including the Caribbean) (11%). (Figure 6).

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-one 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). Two 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 9% of cases, and 2% reported experiencing homelessness during the 12 months prior to diagnosis. Two patients were in

a congregate setting at time of diagnosis: one in an immigration detention center and another one in a long-term care facility.

By site of disease, 61% of cases had pulmonary disease exclusively. Another 14% had both pulmonary and extrapulmonary sites of disease, and 24% had extrapulmonary disease exclusively. Among the 51 patients with an extrapulmonary site of disease, the most common sites were lymphatic (41%), followed by pleural (25%), and musculoskeletal (16%). Extrapulmonary disease is generally more common among persons born outside the United States, as seen in cases reported nationally as well as in Minnesota. However, in 2022, the difference between the two groups was much smaller than in previous years. Thirty-nine percent of non-U.S.-born cases in Minnesota had at least one extrapulmonary site of disease, compared with 38% of U.S.-born cases.

Of 103 culture-confirmed TB cases with conventional drug susceptibility results available, 13 (13%) were resistant to at least one first-line anti-TB drug (i.e., isoniazid [INH], rifampin, pyrazinamide, or ethambutol), including 11 cases (11%) resistant to at least INH. There were three new cases of multidrug-resistant TB (MDR-TB, or resistance to at least INH and rifampin) reported in 2022, making up 3% of culture-confirmed cases.

Unexplained Deaths and Critical Illnesses (UNEX)

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 2022, 134 cases met UNEX criteria (120 deaths, 15 critical illnesses), compared to 206 cases in 2021. Of the 134, 123 (92%) were reported by providers and 11 deaths were found by death certificate review. Seventy-eight (57.4%) cases presented with respiratory symptoms; 31 (23.1%) with sudden unexpected death; 11 (8.2%) with neurologic symptoms; 8 (5.9%) with shock/sepsis; 5 (3.6%) with gastrointestinal symptoms; one (0.6%) with cardiac symptoms; one (0.6%) with hepatic symptoms; one (0.6%) with multiple symptoms. The age of cases ranged from newborn to 89 years, with a median age of 35.5 years. Fifty-seven percent resided in the 7-county metropolitan area, 63% were male, and 11% were non-MN residents who were either hospitalized in MN or investigated by a MN medical examiner.

There were 376 MED-X cases in 2022; 120 of these also met UNEX criteria. The median age of the cases was 45 years, and 60% were male. There were 141 (38%) cases found through death certificate review and MEs reported 235 (62%) cases. The most common syndrome was pneumonia/upper respiratory infection (n=168 [45%]).

There were 370 potential UNEX or MED-X cases that had specimens tested at the PHL and/or the IDPB. One hundred and eighty-one cases were determined to be non-infectious. Seventy-seven cases had pathogens identified as confirmed, probable, or possible cause of illness, including 67 UNEX deaths (Table 5). Among 53 unexplained deaths occurring in those <50 years of age without any immunocompromising conditions,

were initially thought to have community acquired pneumonia. Autopsies revealed budding yeast in the lungs that was confirmed as *Blastomyces dermatitidis* in both decedents.

The UNEX program also identified 35 deaths due to SARS-CoV-2 virus that

UNEX helped to identify the pathogen(s) involved in 24 (45%) cases. MED-X surveillance detected an additional 50 cases with pathogens identified by MEs as the cause of death (Table 5). Cases with pathogens of public health importance detected included a 35 year old woman and a 52 year old male who

occurred outside of traditional healthcare facilities, such as hospitals or congregate care settings. Due to the ongoing 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 and decedents' homes. A total of 39 specimens were submitted to MDH and all decedents had known symptoms prior to death. Of those, 17 (43%) had potential pathogens detected, including SARS-CoV-2 (n=14), respiratory syncytial virus (n=1), bocavirus (n=1) and rhinovirus (n=1).

Varicella

Varicella, also known as chickenpox, is caused by the varicella-zoster virus. It is highly contagious and typically causes an itchy, blister-like rash, but can cause serious illness. In 2022, 204 varicella cases were reported (3.6 per 100,000 population). One hundred and nine cases (53%) were from the metropolitan area. Case ages ranged from 92 days to 66 years. Twenty-eight cases (14%) were < 1 year, 78 (38%) were 1-6 years, 41 (20%) were 7-12 years, 11 (5%) were 13-17 years, and 46 (23%) were ≥ 18 years of age. Five cases were hospitalized; one was 1-6 years, one was 7-12 years, one was 13-17 years, and two were >18 years. Three of the hospitalized cases had not been vaccinated; one was born outside of the United States, one case due to parental refusal, and one for unknown reasons. The other two hospitalized cases had been vaccinated.

Varicella cases are often identified by parents/guardians reporting to schools and childcare facilities, rather than directly reported by a clinician. In 2022, 153 cases (75%) had visited a health care provider, 12 (6%) had consulted a provider or clinic by telephone, five (2%) had been identified by a school health professional, and 34 (17%) had not consulted a health care provider. Of

the 104 cases for which information regarding laboratory testing was available, 98 (94%) had appropriate testing performed.

Two outbreaks, defined as ≥5 cases in the same setting, were reported in 2022. One outbreak occurred in a household setting and included 6 cases, one of which was unvaccinated due to being born outside of the United States. One outbreak occurred in a daycare setting and included 5 cases, four of which were unvaccinated due to being underage (first dose recommended at age 12-15 months) and one of which was unvaccinated due to parental refusal.

Zoster cases in children <18 years of age are reportable in Minnesota and 36 cases were reported in 2022. Cases may be reported by school health personnel, childcare staff, or healthcare providers. Ages ranged from 1 year to 16 years (median 5.5 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 2.7 per 100,000 population in 2022.

Zoster with dissemination or complications (other than post-herpetic neuralgia) in persons of any age is also reportable. Eight-seven of such cases were reported, of which 65 (75%) were hospitalized in 2022. Cases ranged from 16 to 95 years of age, with a median age of 62. Fifty-six (64%) had co-morbidities or were being treated with immunosuppressive drugs. Twenty-five had disseminated rash or disease, 20 had meningitis, 11 had cellulitis or other bacterial superinfection, one had pneumonia, 18 had encephalitis, one had Bells-like Palsy, 8 had meningoencephalitis, and two had Ramsay-Hunt Syndrome. Cases with disseminated rash or disease tended to be older than cases with meningitis without dissemination (median age of 64 vs. 42 years) and were more likely to have

immunocompromising conditions or immunosuppressive drug treatment (76% vs. 20%). One death occurred; one had disseminated infection. The death was in a case < 65 years old. Only 20% of cases ≥50 years of age had a record of receiving zoster vaccine.

Vibriosis

There were 91 *Vibrio* spp. cases reported in 2022. Of those, 20 were culture-confirmed and 71 were positive by culture-independent diagnostic tests (CIDT) and not subsequently culture-confirmed. The 20 culture-confirmed cases of *Vibrio* spp. infection reported in 2022 represent a 17% decrease from the 24 cases reported in 2021, and a 9% decrease from the median annual number of cases reported from 2011 to 2021 (median, 22 cases; range, 9 to 40). *V. parahaemolyticus* accounted for seven (36%) cases, *V. cholerae* for six (32%), and *V. alginolyticus* and *V. fluvialis* for three (16%) each. One isolate was not received at the MDH Public Health Laboratory for confirmation and species identification. Serotyping was performed on all *V. cholerae* specimens, and all were non-O1/non-O139. There were no outbreaks of *Vibrio* spp. infection identified in 2022.

Vibrio was isolated from stool in 17 (85%) of the 20 culture-confirmed cases. The specimen source for the remaining three cases were wound, blood, and ear effusion. Two (10%) cases were hospitalized for a median of 4.5 days (range, 1 to 8 days), and no cases died. Travel history was available for 19 cases. Fifteen (79%) of these cases traveled outside of Minnesota in the week before their symptom onset, including eight (44%) who traveled internationally. Three cases traveled to Mexico, and one case each to Belize, French Polynesia, Guatemala, and Kenya. One traveled to Kenya and Somalia. Of the 12 cases with *Vibrio*

isolated from stool who were able to be interviewed about exposure to seafood in the week before illness onset, seven (58%) had raw or undercooked seafood exposure, including four (33%) who reported consuming raw oysters.

In 2022, 87 patients were positive for *Vibrio* spp. by CIDTs conducted at a clinical laboratory. Of these, 71 (82%) were not culture-confirmed and thus were classified as probable cases. Nine (10%) specimens were not received at the MDH Public Health Laboratory for culture confirmation, and 62 (87%) were received at MDH and tested negative by culture. Seventeen (24%) probable cases were hospitalized and one (1%) died. Ten (19%) of the 54 probable cases who were interviewed traveled outside of Minnesota, and 6 (11%) traveled internationally (2 to Nigeria, 1 each to Cambodia, Dominican Republic, Mexico, and Vietnam). Among the 47 probable cases interviewed about food exposures, four (9%) reported eating raw oysters, and no additional cases 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 that a high proportion of CIDT-positive tests represented false positives.

Viral Hepatitis A

In 2022, 15 cases of hepatitis A (0.3 per 100,000 population) were reported. Eight cases were residents of the metropolitan area. Eight cases were male. The median age was 50 years (range 16 to 92). Race was known for 14 cases; 11 (79%) were white, one (7%) was Black, one (7%) was American Indian, and one (7%) was reported as other race. Three (20%) cases were known to be of Hispanic ethnicity. Four cases were associated with international travel and five cases are presumed to be a result of foodborne exposure. No risk factors were identified for the six remaining cases. No outbreaks occurred.

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

Pathogen Identified	UNEX (n=67)	MED-X (n=50)**
<i>Blastomyces dermatitidis</i>	2	0
<i>Chlamydia pneumoniae</i>	1	0
Cytomegalovirus	1	0
<i>Enterococcus faecalis</i>	0	1
Enterovirus	1	0
Echovirus 11	1	0
<i>Escherichia coli</i>	0	3
Group A <i>Streptococcus</i> / <i>Streptococcus pyogenes</i>	3	0
Group B <i>Streptococcus</i>	0	1
<i>Haemophilus influenzae</i>	1	1
Herpes simplex virus	0	1
Influenza A – H3	6	0
<i>Klebsiella pneumoniae</i>	1	2
<i>Legionella pneumophila</i>	1	0
Norovirus	1	0
<i>Proteus mirabilis</i>	0	1
<i>Pseudomonas aeruginosa</i>	1	1
Respiratory Syncytial virus	2	2
Rhinovirus	1	0
<i>Salmonella</i> 4,[5],12:i:-	1	0
SARS-CoV-2 virus	35	23
<i>Staphylococcus</i> spp.	0	1
<i>Staphylococcus aureus</i>	3	6
<i>Staphylococcus aureus</i> - MRSA	1	3
<i>Staphylococcus epidermiditis</i>	0	1
<i>Stenotrophomonas maltophilia</i>	0	1
<i>Streptococcus</i> spp.	1	1
<i>Streptococcus pneumoniae</i>	4	3

* 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.

Viral Hepatitis B

In 2022, 15 cases of acute hepatitis B virus (HBV) infection (0.3 per 100,000 population) were reported. The median age was 51 years (range 24 to 84). Eleven cases were residents of the metropolitan area. Nine cases were male. Race was known for 14 cases: eight (57.1%) were White, three (21.4%) was Asian, and three (21.4%) were Black. Two (13.3%) cases were known to be of Hispanic ethnicity.

MDH received 180 reports of newly identified confirmed chronic hepatitis B and 602 reports of newly identified probable chronic hepatitis B in 2022. A total of 28,202 persons are estimated to be alive and living in Minnesota with chronic HBV infection. The median age of chronic HBV cases in Minnesota is 49 years.

In 2022, two perinatal hepatitis B infections were identified in infants born to hepatitis B-positive mothers. Both cases were Asian, non-Hispanic. Two hundred and eight-five infants born to hepatitis B-positive women during 2021 had post-serologic testing demonstrating no infection.

Viral Hepatitis C

In 2022, 53 cases of acute hepatitis C virus (HCV) infection (0.9 per 100,000) were reported. Thirty-three (62%) were residents of the metropolitan area. The median age was 40 years (range, 15 to 70). Thirty-three (62%) cases were male. Race was known for 51 cases: 24 (47%) were White, 11 (22%) were American Indian/Alaskan Native, 7 (14%) were Black, one (2%) was Asian, two (4%) were Native Hawaiian/Pacific Islander, and six (12%) were reported as other race. Five (10%) cases were known to be of Hispanic ethnicity.

MDH received 1,047 reports of newly identified confirmed chronic hepatitis C infections in 2022. In 2016, the case definition for chronic hepatitis C changed to exclude those reported as having resolved their infection. A total of 32,543 persons are estimated to be alive and living in Minnesota with chronic HCV infection. The median age of these cases is 61 years.

In 2018, perinatal hepatitis C was added as a nationally notifiable condition. In 2022, three cases of perinatal hepatitis C were reported. One case was White and two cases were reported as other race. One case was known to be of Hispanic ethnicity.



Brooke Cunningham, Commissioner of Health

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