

# **CHAPTER 4** Infectious Disease





# **Infectious Disease**

This chapter provides information on preventing and controlling infectious diseases, and related trends, disparities, and resources in the Commonwealth of Massachusetts. It addresses the following infectious disease topic areas:

- Foodborne Diseases
- Healthcare-Associated Infections
- Sexually Transmitted Infections
- Human Immunodeficiency Virus
- Viral Hepatitis
- Tuberculosis
- Vectorborne Diseases
- Immunization
- Selected Resources, Services, and Programs

#### **Chapter Data Highlights**

- Over 4,200 confirmed cases of foodborne disease in 2015
- HIV infections decreased by 31% from 2005 to 2014
- In 2015, hepatitis C case rates were 26 and 10 times higher, respectively, among White non-Hispanics compared to Asian non-Hispanics and Black non-Hispanics
- In 2016, 190 cases of TB were reported in Massachusetts
- Tickborne babesiosis increased 15% from 2015 to 2016
- Influenza and pneumonia ranked in the top ten leading causes of death among Massachusetts residents in 2014

# Overview

Infectious diseases have been causing human illness and death since the dawn of human existence. The effective prevention and control of these diseases is one of the major reasons for increases in life expectancy.

In 1701, Massachusetts passed legislation requiring the isolation of the sick "for better preventing the spread of infection."<sup>190</sup> Since then, Massachusetts has led the nation in infection prevention and control.

For example, Massachusetts was the only state to achieve a score of 10 out of 10 in Health Security Ranking which includes reducing healthcare-associated infections (HAIs), biosafety training in public health laboratories, public health funding commitment, national health security preparedness, public health accreditation, flu vaccination rates, climate change readiness, afety as well as a biosafety professional on staff and emergency health care access.

Reportable conditions are captured by the Massachusetts Virtual Epidemiologic Network (MAVEN). MAVEN is an integrated, web-based surveillance and case management system that enables state and local health departments to appropriately share public health, clinical, and case management data efficiently and securely over the Internet.<sup>191</sup> MAVEN provides automatic notifications 24/7/365 to state and local officials of any event requiring immediate attention.

While many infections are endemic and require relatively routine follow-up for their prevention and control, the Massachusetts Department of Public Health's (MDPH) Bureau of Infectious Disease and Laboratory Sciences (BIDLS) must maintain vigilance and surge capacity to respond at all times. Micro-organisms can be transmitted from person to person, and by vectors (e.g., animals, insects), food, water, and air. In their own effort to survive, micro-organisms evolve and create new, and unforeseen challenges. The response to emerging pathogens (e.g., antibiotic resistant organisms, Ebola virus, Zika virus) demands immediate and resilient resources, including a state of the art and responsive public health laboratory.

#### **Foodborne Diseases**

Foodborne illnesses<sup>192</sup> are common, costly, and preventable public health hazards. Food can become contaminated with bacteria, viruses, parasites, or prions at different stages of food processing, preparation, or storage. Massachusetts recorded more than 4,200 confirmed cases of foodborne disease in 2015.

#### Salmonellosis

Salmonellosis is a diarrheal disease caused by many bacteria of the genus *Salmonella*. Salmonellosis is the most frequently identified bacterial infection transmitted through food and water. Salmonellosis results in more hospitalizations than any other foodborne bacterial pathogen.<sup>193</sup>

The state public health laboratory is part of a national network of 83 laboratories (PulseNet) that perform molecular characterization of bacteria DNA which has caused foodborne illness. Once a DNA fingerprint is created, specialized software allows scientists in BIDLS to upload its pattern to the national PulseNet database. This helps investigators to find the source, alert the public, and identify gaps in food safety systems that would otherwise go unrecognized. Because results are shared within the network, public health scientists can determine whether cases within a cluster are related to each other and whether the strain might be causing illness in other states.

In Massachusetts, over 1,000 cases of salmonellosis are reported each year (Figure 4.1). The rate of salmonellosis among children under five years of age is 2.8 times the rate among adults more than 30 years of age (45 per 100,000 population versus 16 per 100,000 population, respectively).

In 2016, 14 cases were reported nationally of a new strain of *Salmonella (Salmonella* Oslo) associated with Persian mini cucumbers. Two (14%) of these cases were detected and investigated in Massachusetts.<sup>194</sup>





Figure 4.1

#### Shiga Toxin-Producing E. Coli (STEC)

*Escherichia coli*, commonly known as *E. coli*, are bacteria commonly found in the gut of humans and animals. *E. coli* can cause disease in several ways, but some strains cause disease by producing a chemical called 'Shiga-toxin' and are called Shiga-toxin producing *E. coli* (STEC). The most common symptoms of STEC infection are severe stomach cramps and diarrhea. STEC infection can occur when individuals eat or drink something that contains these organisms without proper cooking or pasteurization (e.g., ground beef or apple cider).

STEC can cause bloody diarrhea and a rare but serious and sometimes life-threatening problem called hemolytic uremic syndrome. Treatment of this complication requires hospitalization and can result in permanent damage or death.

From 2011-2015, approximately 100 cases of STEC were reported and investigated annually in Massachusetts. Children younger than 5 years of age were the most frequently affected group (females: 5.3 per 100,000 population; males: 3.5 per 100,000 population). Older children and older adults had higher incidence rates of STEC infection than adults aged 30-70 years (Figure 4.2).

#### Figure 4.2

Average Annual Incidence Rate of Shiga-Toxin Producing *E. coli* (STEC) by Sex and Age Group, 2011-2015



## **Healthcare-Associated Infections (HAI)**

Healthcare-associated infections (HAIs)<sup>195</sup> are infections people contract while they are receiving health care for another condition. HAIs can happen in any health care facility, including hospitals, ambulatory surgical centers, dialysis facilities, long-term care facilities, and outpatient settings. HAIs can be caused by bacteria, fungi, viruses, or other organisms. It has been estimated that in 2011 there were more than 720,000 HAIs, involving 1 in every 25 patients in US acute care hospitals.

#### **Clostridium difficile**

*Clostridium difficile* (*C. difficile*) is a bacterium that causes inflammation of the colon (colitis). This can result in severe and relapsing diarrhea that can be disabling and life-threatening. *Clostridium difficile* can cause HAIs because susceptible persons - especially those who have taken antibiotics recently- can be infected through contact with contaminated surfaces at a health care facility or from a health care provider's contaminated hands. The CDC classifies *Clostridium difficile* infections as an urgent threat, and a consequence of the general overuse of

antibiotics. Genetic diversity of *C. difficile* suggests that transmission occurs both inside and outside of health care facilities. Programs to prevent and control *C. difficile* infections require improving the use of antibiotics across the spectrum of health care settings.

#### **Trends/Disparities**

In 2014, Massachusetts recorded 8,746 confirmed and suspected cases of *C. difficile* through MAVEN. Females accounted for 57% (5,022 cases) and 52% (4,532 cases) were among persons aged 65 years or older.

A total of 7,222 *C. difficile* events in Massachusetts acute care hospitals were reported to the National Healthcare Safety Network (NHSN) in 2014, the surveillance system for HAI. This number increased 10% to 7,917 events in 2015.

The Massachusetts rate of death associated with *C. difficile* in 2014 was 4.3 per 100,000 population according to death certificate reports. Of these, 56% (165 deaths) were female and 89% (262 deaths) were among persons aged 65 years or older.

There were 7,293 acute care hospital admissions in Massachusetts due to or associated with *C. difficile* infection in 2014 (primary diagnoses: 2,348 cases; associated diagnoses: 4,945 cases).

#### Methicillin-Resistant Staphylococcus aureus

Methicillin-resistant *Staphylococcus aureus* (MRSA) is a bacterium that is resistant to many antibiotics. Staphylococcal infections, including those due to MRSA, can have a variety of manifestations, ranging from skin infection to bacteremia, sepsis, and pneumonia that can cause both health care and community infections.

In health care settings, MRSA is usually spread by direct contact with an infected wound, environmental contamination or from contaminated hands including those of health care providers. Additionally, individuals who carry MRSA on their skin or in their nose but do not have signs of infection, can spread the bacteria to others. Anyone can get MRSA from contact with an infected wound or by sharing personal items such as towels or razors that have touched infected skin. MRSA infection risk is heightened when a person is involved in activities or is present in places with crowding, skin-to-skin contact, and shared equipment or supplies. Athletes, children in daycare, students, military personnel in barracks, inmates in jails or prisons, and those who recently received inpatient medical care are at higher risk of MRSA infection.<sup>196</sup>

#### **Trends/Disparities**

Since 1999, aggregated test results of antibiotic susceptibility (called antibiograms) have been submitted by acute care hospitals in Massachusetts to MDPH for surveillance purposes. These data represent the antibiotic susceptibility of 11 bacteria isolated in acute care hospitals in Massachusetts. Since 2003, there have been slight improvements in the overall reported susceptibility of *S. aureus* to oxacillin/methicillin (Figure 4.3).

MRSA infections decreased in number from 484 in 2014 to 429 in 2015 (an 11% decrease) but increased from 5% to 7% as a percentage of causes of surgical site infections monitored by NHSN. The unadjusted rate of all MRSA infections in acute care hospitals was 4.9 per 100,000 patient days in 2015, a rate that exceeds previous years (2013: 4.0 per 100,000 patient days; 2014: 3.6 per 100,000 patient days).





Mean Susceptibility of *S. aureus* Isolates to Oxacillin among Reporting Facilities, Massachusetts, 1999-2016

# **Sexually-Transmitted Infections (STI)**

A number of bacteria, viruses, and parasites can be transmitted through sexual contact because sexual activity involves close contact with skin and mucous membranes of the genitals, mouth, or rectum. Some sexually-transmitted infections (STIs) cause inflammation or ulceration, which predispose to transmission of other infections. However, infections often occur without symptoms and are not detected by the affected individual or surveillance unless screening is conducted.

Prevention and control of STIs requires treatment of the infected individual and their sexual partners. With the exception of vaccines for hepatitis A, hepatitis B, and human papillomavirus virus (HPV) infections, vaccines are unavailable for most STIs. However, all STIs are preventable. In some cases, such as syphilis and gonorrhea, fear and stigma add difficulty to obtaining adequate sexual histories needed for effective prevention and control. In the US, an estimated 20 million new cases of STIs occur each year, but many more infections go undetected.<sup>197</sup>

According to the 2013-2014 Massachusetts Behavioral Risk Factor Surveillance System survey, among males and females 18–64 years of age, 9% reported two or more sexual partners in the previous year, 69% reported one partner, and 22% reported no sexual partners. Among sexually active respondents, 25% reported using a condom at last sexual encounter (males: 27%; females: 24%).

#### Chlamydia

Chlamydia is an infection caused by the bacterium *Chlamydia trachomatis* and is the most frequently reported infectious disease in Massachusetts. While most infections are treatable with any of several antibiotics, complications such as pelvic inflammatory disease, ectopic pregnancy, and infertility can particularly affect women.

In Massachusetts, the number of chlamydia cases increased over threefold from 2000 (6,697) to 2015 (23,913) (Figure 4.4). In 2015, the chlamydia incidence rate among women was 1.7 times the rate among men (442.9 per 100,000 population versus 255.5 per 100,000 population, respectively).

The chlamydia incidence rate for young adults (20–24 years of age) was 5.5 times higher than the statewide rate across all age groups in 2015 (1,933.0 per 100,000 population vs. 352.0 per 100,000 population, respectively).

Among adolescents 15 to 19 years of age, the chlamydia incidence rate was 3.3 times higher than the statewide rate across all age groups (1,150.1 per 100,000 population vs. 352.0 per 100,000 population, respectively).



Cases of Chlamydia Infection Reported in Massachusetts, Fiscal Years 2000-2015

Figure 4.4

Significant racial and ethnic disparities exist in chlamydia incidence. The estimated incidence rate of chlamydia per 100,000 populations among Black non-Hispanics was 5.3 times higher and 1.6 times higher among Hispanics in 2016 than among White non-Hispanics.

#### Figure 4.5



#### Laboratory Confirmed Chlamydia Case Counts Per Year, by Race/Ethnicity, Massachusetts, 2000-2016

# NOTE: \* THE OTHER TOTAL INCLUDES THE SUM OF THOSE REPORTED WITH RACE AND ETHNICITY AS ASIAN/PACIFIC ISLANDER, AMERICAN INDIAN/ALASKAN NATIVE, MULTI-RACIAL, AND REPORTED OTHER.

NOTE: UNKNOWNS WERE REMOVED. PLEASE SEE DATA LIMITATIONS.

#### Gonorrhea

Gonorrhea is caused by infection with the bacterium *Neisseria gonorrhoeae*. If left untreated in women, gonorrhea can cause pelvic inflammatory disease and other serious reproductive complications, including infertility, ectopic pregnancy, and chronic pelvic pain.

The bacteria that cause this infection have progressively developed resistance to the antimicrobials used for its treatment. Centers for Disease Control and Prevention (CDC) treatment guidelines now require a two-antibiotic treatment regimen for effective therapy.

#### **Trends/Disparities**

In Massachusetts, the number of reported gonorrhea cases increased 52% from 2006 to 2015 (2,428 vs. 3,688 cases, respectively).

Between 2006 and 2015, the gonorrhea incidence rate reported among men doubled (from 39.0 per 100,000 population to 81.0 per 100,000 population). The gonorrhea incidence rate among men is now 2.8 times higher than the rate among women (28.5 per 100,000 population), and is mostly associated with men who have sex with men (Figure 4.6). In 2015, the gonorrhea incidence rate among young adults (20–24 years of age) was 3.9 times the

statewide incidence rate in all ages (211.9 per 100,000 population vs. 54.3 per 100,000 population, respectively). The burden of gonorrhea incidence is higher among racial/ethnic minorities, including men who have sex with men.



#### Incidence Rate of Reported Gonorrhea Cases per 100,000 Population by Gender, Massachusetts, 2006-2015

Figure 4.6

#### **Syphilis**

Syphilis is a sexually-transmitted bacterial infection that affect many bodily systems through several stages of infection. Penicillin has been used to effectively treat syphilis for more than 70 years.

Left undiagnosed and untreated, syphilis can cause complications including permanent visual impairment, hearing loss, and other neurologic problems. If syphilis is undetected or untreated in pregnant women, there is a high risk of poor outcomes, including congenital abnormalities or fetal death.

#### **Trends/Disparities**

In Massachusetts, the number of reported infectious syphilis cases in 2015 was 6.6 times higher than reported in 2000 (792 cases vs. 120 cases, respectively) (Figure 4.7).

Between 2006 and 2015, the syphilis incidence rate reported among men more than tripled (from 6.4 per 100,000 population to 22.4 per 100,000 population, respectively). The syphilis incidence rate among men is now 14.0 times higher than the rate among women (22.4 per 100,000 population vs. 1.6 per 100,000 population, respectively).





Number of People Diagnosed with Infectious Syphilis by Year of Diagnosis, Massachusetts, Fiscal Years 2000-2015

The proportion of self-identified men who have sex with men among reported infectious syphilis cases ranged from a low of 66% in 2014 to a high of 83% in 2008 and 2010.

In 2015, the infectious syphilis incidence rates among individuals aged 20 to 24 years, 25 to 29 years, and 30 to 39 years were each approximately twice the statewide incidence rate across all age groups (28.3, 25.7, and 24.5, respectively, compared to 11.7 per 100,000 population).

In 2015, the infectious syphilis incidence rate was 3.7 times higher for Hispanic residents (28.7 cases per 100,000 population) and 3.0 times higher for Black non-Hispanic residents (23.1 cases per 100,000 population) compared to White non-Hispanic residents (7.8 cases per 100,000 population).

HIV

HIV infection has evolved from a nearly universally fatal disease to a manageable chronic infection. In the US, the populations most impacted are men who have sex with men, persons who inject drugs (PWID), and non-US born populations.

No effective cure exists for HIV infection, but with proper medical care, it can be controlled. Prevention efforts require a comprehensive strategy, starting with prevention of infection through personal preventive behaviors, use of pre-exposure prophylaxis (PrEP), screening, and universal access to treatment. Stigma and fear still play a role in preventing some people at-risk for HIV infection from getting tested and into health care that could provide them with enhanced health and survival.

The MDPH plan to end the HIV/AIDS epidemic in the Commonwealth<sup>198</sup> includes four goals:

- 1. Reduce population health disparities by optimizing services and using data-to-care initiatives to improve linkage and retention in care;
- 2. Strengthen the public health response to HIV, hepatitis C, and sexually transmitted infections by promoting high-quality laboratory services and access to testing and treatment;
- 3. Improve service system quality and sustainability; and
- **4.** Promote collaborations that improve health outcomes by strengthening partnerships and community engagement.

#### **Trends/Disparities**

The number of diagnoses of HIV infection decreased 31% from 913 in 2005 to 629 in 2014.<sup>199</sup> But the number of persons known to be living with HIV/AIDS (PLWHA) increased 26% from 15,666 in 2005 to 19,747 in 2014.

Male-to-male sex was the reported mode of exposure for 45% of all recently reported HIV infections, and men who have sex with men represented 61% of newly diagnosed cases among men from 2012 to 2014.

Among men, the rate of newly diagnosed HIV infection was 27.8 times higher among men who have sex with men (MSM) than among non-MSM for the time period 2012 to 2014 (241.9 per 100,000 population versus 8.7 per 100,000 population, respectively) **(Figure 4.9)**.

The racial and ethnic disparities in HIV infection, demonstrated in **Figure 4.8**, indicate a 10-times higher rate of newly diagnosed cases in Black non-Hispanics and more than 6 -times higher rate in Hispanics than White non-Hispanics. Among newly diagnosed women, 78% identified as Black non-Hispanic or Hispanic; and 69% of Black non-Hispanic women, 36% of Hispanic women, and 8% of White non-Hispanic women were born outside the US.





#### Average Annual Age-Adjusted Rate of HIV Infection Diagnosis, by Race/Ethnicity, Massachusetts, 2012-2014

Levels of engagement in health care and viral suppression were higher among White non-Hispanic PLWHA compared to Black non-Hispanic and Hispanic PLWHA.

A higher proportion of White non-Hispanic PLWHA (69%) were virally suppressed compared to Black non-Hispanic (63%) and Hispanic (60%) PLWHA.

#### Figure 4.9

#### Estimated Average Annual HIV Diagnosis Rate per 100,000 Population, Men who have Sex with Men (MSM) Compared to non-MSM, Aged 18-84, Massachusetts, 2012-2014



#### **Viral Hepatitis**

Hepatitis is an inflammation of the liver that can impair vital liver functions. Viral hepatitis is most frequently caused by hepatitis A, B, or C viruses. Damage to the liver among persons with viral hepatitis is exacerbated by heavy alcohol use, and certain medications and other conditions.

The various types of viral hepatitis present with similar signs and symptoms. Laboratory testing is required to identify the virus causing the infection. This distinction is critical because outcome and treatment varies by virus.

#### Hepatitis C Virus (HCV) Infection

Hepatitis C virus is an RNA virus most effectively transmitted through bloodto-blood contact. Infection is often asymptomatic for decades.

In Massachusetts, almost half of individuals infected with hepatitis C virus may be undiagnosed. Because hepatitis C is not generally associated with symptoms, surveillance for hepatitis C is based on when a diagnosis is made, not when infection occurs. Since 2011, treatment options have become more effective, tolerable, and convenient.

"Substance use and infectious diseases are interconnected; we're seeing an increase in hepatitis C lately."

Key Informant Interviewee

Since 2007 there have been almost 20,000 confirmed and probable cases of hepatitis C reported in Massachusetts among persons aged 15-29 years. The number of confirmed and probable cases among persons 15 to 29 years of age increased 35% from 2007 to 2015 (from 1,901 cases to 2,625 cases) (Figure 4.10). The rate of acute hepatitis C cases increased by 26% from 2007 to 2015 (1.4 per 100,000 population to 5.1 per 100,000 population, respectively).





#### Number of Confirmed and Probable HCV Cases among Persons Aged 15-29 Years, Massachusetts, 2007-2015

#### NOTE: DATA ARE CURRENT AS OF 11-15-2016 AND ARE SUBJECT TO CHANGE

In 2015, the rate of confirmed and probable hepatitis C cases was 26 times higher among White non-Hispanic residents compared to Asian non-Hispanic residents, and 10 times higher than among Black non-Hispanic residents.

The majority of new hepatitis C virus infections in persons younger than 30 years of age were attributable to blood exposure in the context of injection drug use.

#### **Tuberculosis**

Tuberculosis is an infection caused by *Mycobacterium tuberculosis* and is a major global cause of disability and death. Among infectious diseases, tuberculosis is the leading killer of adults in the world, with an estimated 1.8 million tuberculosis-related deaths in 2015.

Two tuberculosis-related conditions exist: latent tuberculosis infection (LTBI) and tuberculosis disease (TB). LTBI represents infection with the TB organism without disease. Among people with LTBI, 5-10% will develop active TB disease in their lifetime if they are not treated for LTBI. Diagnosis of LTBI requires a skin test or a blood test

indicating TB infection. TB disease is preventable by treatment of LTBI, and TB disease is curable with antituberculosis medications. Ongoing emergence of resistance to anti-tuberculosis medications is a growing challenge. State and local efforts to focus on high-risk populations and treat those with tuberculosis infection are key to tuberculosis elimination efforts in Massachusetts.

#### **Trends/Disparities**

The year 2016 was the fourth year in a row that the tuberculosis case count has decreased in Massachusetts, contributing to an overall decrease of approximately 12% since 2012. In Massachusetts, the 2016 tuberculosis case rate was 2.8 per 100,000 population (similar to the US national case rate of 2.9 per 100,000 population).

The number of cases of tuberculosis has declined to the current low of 190 cases in 2016. Of cases with bacteriologically confirmed TB disease and drug susceptibility testing performed, 27 out of 126 cases (21%) were resistant to one or more anti-tuberculosis medications.



#### Figure 4.11

#### Tuberculosis Cases in US and Non-US Born\* Persons, Massachusetts, 2006-2016

#### NOTE: NON-US BIRTH DEFINED AS OUTSIDE THE UNITED STATES AND ITS TERRITORIES

In 2016, 166 out of 190 cases (87%) of tuberculosis disease were reported in non-US born persons (Figure 4.11). Ten out of 190 or 5% of total cases were known to be co-infected with human immunodeficiency virus (HIV) and 6 out of 190 (3%) were in persons experiencing homelessness within the previous year.

Vietnam, India, and Haiti were the top three countries of origin among Massachusetts residents with tuberculosis who were born outside of the United States.

## **Vectorborne Diseases**

Vectorborne diseases<sup>200</sup> include infections transmitted by bites from mosquitoes, flies, ticks, or fleas. These vectors can transmit bacteria, viruses, and parasites, and cause mild to severe disease. Sometimes vectorborne diseases can be fatal. Since its emergence as a human disease in 1938, the mosquito-borne virus of eastern equine encephalitis (EEE) has caused 100 identified human cases, 55 deaths and left 80% of survivors with permanent neurological damage in Massachusetts. West Nile virus, which first appeared in the US in 1999, has caused at least 148 cases of clinical disease in Massachusetts. Lyme disease has become hyperendemic (Figure 4.12) and two other vectorborne diseases have increased in Massachusetts in recent years: human granulocytic anaplasmosis and babesiosis.



Reported Cases of Lyme Disease, Massachusetts, Fiscal Years 1997-2015

Figure 4.12

1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015

#### Human Granulocytic Anaplasmosis (HGA)

Human granulocytic anaplasmosis (HGA) is a tickborne disease caused by the bacterium *Anaplasma phagocytophilum*. Anaplasmosis is transmitted to humans through bites by *Ixodes scapularis* ticks, also called blacklegged ticks or deer ticks.

Of the four distinct phases in the tick life cycle (i.e. egg, larvae, nymph, adult), nymphal and adult ticks are associated with transmission of anaplasmosis to humans.

Typical symptoms of anaplasmosis include fever, headache, chills, and muscle aches. Usually, these symptoms occur within one to two weeks of a tick bite.

In Massachusetts, 1,624 suspect cases of anaplasmosis were investigated in 2016. A total of 828 of these were confirmed or probable cases, a 3.4 fold increase from 237 in 2011 (Figure 4.13).



#### Figure 4.13

Number of Confirmed and Probable Anaplasmosis Cases Reported, Massachusetts, 2011-2016

Massachusetts counties with the highest anaplasmosis incidence include Barnstable, Berkshire, Dukes, Nantucket, and Plymouth.

The majority of anaplasmosis cases occur in May and June. Only 38% of cases reported awareness of a recent tick bite. Approximately one third of individuals with anaplasmosis (34%) were hospitalized. The symptoms most commonly reported included fever (93%), malaise (70%), muscle aches, and pain (64%). There were at least two anaplasmosis-related fatalities in 2016.

People 60 years of age and older were at greatest risk for clinical HGA disease; 54% of patients identified with HGA were 60 years of age or older. More than half (54%) of all HGA cases were male.

#### Babesiosis

Babesiosis is caused by several microscopic parasites that infect red blood cells. In Massachusetts, all cases are caused by the parasite *Babesia microti*. The babesiosis is spread by the same tick as lyme disease and HGA. Tickborne transmission is most common in particular regions and seasons. Disease usually peaks during warm months. *Babesia* infection can range in severity from asymptomatic to life threatening. The infection is both treatable and preventable.

Because most people with babesiosis are unaware of their infection and do not have symptoms, it is possible for them to be blood donors. Babesiosis has become the number one cause of transfusion-transmitted infection in the United States. Efforts are underway to introduce donor screening to prevent transmission.

In 2016, Massachusetts had 513 confirmed and probable cases of babesiosis, a 15% increase from 2015. Overall, 1,104 suspected cases of babesiosis were investigated in 2016.

Incidence of babesiosis increased in the counties of Berkshire, Dukes, Hampshire, Nantucket, Essex, Franklin, Hampshire, Norfolk, and Worcester. Counties with the highest incidence are Barnstable, Dukes, and Nantucket. The majority of babesiosis cases occurred in June, July, and August **(Figure 4.14)**.

Only 24% of babesiosis cases reported awareness of a recent tick bite. A total of 8 confirmed cases (2%) received a blood transfusion in the six months prior to becoming ill, and three of those were confirmed or likely transfusion-transmitted cases.

Approximately one out of three (35%) reported cases were hospitalized. The symptoms most commonly reported included fatigue (78%), fever (67%), malaise (65%), muscle aches and pain (59%), and chills (54%). There were at least four babesiosis-related fatalities in 2016.

Residents 60 years of age and older continue to be at greatest risk for clinical disease; 57% of all patients identified with babesiosis were aged 60 years of age or older. Two thirds (66%) of babesiosis cases were among males.



#### Figure 4.14

Number of Confirmed and Probable Babesiosis Cases Reported in Massachusetts, by Month of Onset, 2016

### Immunization

Immunization against disease is one of the 10 greatest public health achievements in the 20<sup>th</sup> century. It is responsible for adding 25 years to the life expectancy US residents.<sup>201</sup> In Massachusetts, BIDLS promotes the health of Massachusetts residents by reducing the burden of vaccine-preventable diseases.

#### Adult Influenza Vaccination

Influenza or "flu" is a contagious respiratory illness caused by one of several influenza viruses. Infection ranges from asymptomatic or mild to severe illness. Serious outcomes of flu infection can result in hospitalization or death.

Pneumonia, bronchitis, sinus infections, and ear infections are examples of flu-related complications. The flu can exacerbate chronic health conditions. For example, people with asthma may experience asthma attacks while they have the flu, and people with chronic congestive heart failure may experience a worsening of this condition triggered by flu. Among adults, the flu can have a substantial economic impact in terms of outpatient visits and loss of work days.<sup>202</sup>

Flu and pneumonia ranked in the top ten leading causes of death among Massachusetts residents in 2014. Flu was the sixth leading cause of death among persons 85 years of age and older. The best way to prevent the flu is by getting vaccinated each year.

#### **Trends/Disparities**

Certain population groups, including older individuals, young children, and people with select health conditions, are at greatest risk for serious flu complications.

In 2015, 61% of adults 65 years of age and older in Massachusetts self-reported receiving a flu vaccine in the past 12 months. The percentage was highest among Hispanic adults (63%) and lowest among Black non-Hispanic adults (49%).



#### Figure 4.15

Percentage of Adults Aged 65 Years and Older Reporting Receipt of Flu Vaccine in the Past Year, Massachusetts, 2011-2015

# Selected Resources, Programs, and Services

Following are selected resources, services and programs that support the topics discussed in this chapter.

#### **Foodborne Disease**

• MDPH's Bureau of Infectious Disease and Laboratory Sciences (BIDLS) is implementing culture-independent diagnostic tests to detect the presence of a specific part or genetic sequence of a microorganism without first requiring culture and identification, reducing the result time for public health and clinical action.

#### **Clostridium difficile Infections**

- BIDLS and the Bureau of Health Care Safety and Quality collaborate on a program to prevent healthcareacquired infection and antimicrobial resistance.
- The *C. difficile* Infection Prevention Collaborative is a partnership between acute and long-term care facilities to:
  1) improve care coordination and communication;
  2) promote implementation of infection prevention strategies;
  3) improve surveillance; and
  4) reduce rates of healthcare-facility onset of *C. difficile* infection.

#### **MRSA Infection**

- The Massachusetts Antibiotic Resistance Subcommittee is a technical advisory group of local, national and international experts in the field of antimicrobial resistance that provides guidance, and support to the BIDLS in combating antimicrobial resistance.
- BIDLS works with computer modeling experts at Worcester Polytechnic Institute to analyze temporal trends and develop predictive models of antibiotic resistance using statewide antibiogram program data.

#### **Sexually Transmitted Infection**

• Implementation of sexually-transmitted infection testing and treatment in MDPH Office of HIV/AIDS funded sites will increase the rates of testing for HIV, Hepatitis C Virus, and sexually-transmitted infection among men who have sex with men.

#### **Chlamydia Infection**

- BIDLS is improving electronic reporting directly from electronic health records (EHR) to learn whether individuals with chlamydia infection are getting recommended treatment and whether infected females are pregnant.
- Expedited partner therapy is a program to promote health care providers treatment for chlamydia infection among the sexual partners of individuals with infection without having to see them in person as patients.

#### **Gonorrhea Infection**

- The MDPH Division of STD Prevention participates in the Centers for Disease Control and Prevention funded Sexually Transmitted Disease Surveillance Network (SSuN) that allows for enhanced surveillance with additional information collected on a sample of gonorrhea cases.
- BIDLS targets education and counseling efforts directed at men who have sex with men, and works to enhance awareness of current epidemiology, and treatment recommendations among health care providers.

#### **Syphilis Infection**

• BIDLS implements the Centers for Disease Control and Prevention (CDC) program *Call to Action: Let's Work Together to Stem the Tide of Rising Syphilis in the United States.* 

#### **HIV/AIDS Infection**

- The Office of HIV/AIDS initiatives work with clinical and non-clinical community programs, people living with HIV/AIDS, and other stakeholders to advance HIV prevention and care services.
- The HIV Drug Assistance Program provides medications for all eligible people with HIV infection.

#### **Hepatitis C Virus Infection**

• BIDLS promotes using surveillance data to develop and inform strong community and provider partnerships for policy, planning and response.

#### **Tickborne Disease**

• BIDLS supports an outreach program that provides information on tickborne diseases and prevention through a dedicated website with printed materials that can be downloaded or ordered through the Massachusetts Health Promotion Clearinghouse.

#### **Flu Infection**

- The Massachusetts Adult Immunization Coalition (MAIC), is an organization with members from more than 200 organizations who have committed to increasing adult immunization coverage and decreasing immunization disparities through education, networking, and sharing innovative and best practices.
- Public sector billing improves access to immunization by providing billing services that allow municipal health departments, public schools and visiting nurse associations to operate seasonal influenza or other vaccine clinics and receive payment for administrative and direct costs.
- BIDLS is implementing a lifespan immunization registry (the Massachusetts Immunization Information System or MIIS) which receives immunization data from more than 1,000 pharmacies as well as workplaces, health departments, community health centers, specialists, and primary care sites to consolidate adult immunization records and help providers use electronic reminders to identify and communicate with persons who have not received flu vaccine.

# References

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