Chapter 8: Infectious Disease
Infectious Disease

Infectious diseases are caused by microbes, tiny organisms like bacteria and viruses that require a microscope to see. These microscopic organisms are everywhere; from aerosolized droplets in the air we breathe to nearly everything we touch. Many live naturally in the human body; there are more microbial cells inside of a human body than there are human cells (1,2). Many microbes are essential for maintaining good health by helping us digest food and produce vitamins (2).

The human-microbe relationship is complex: some promote health, and others promote disease. Microbes that cause infectious disease are called pathogens. Some pathogens make a person very sick and then leave him/her immune to future attacks, while others can cause a long-term infection resulting in death. Some infectious diseases last a lifetime and cause infrequent symptoms. The discovery of antibiotics in the 20th Century is considered one of the greatest medical achievements in human history because it helped cure previously deadly infections.

Today, misuse of antibiotics (i.e. not finishing a prescribed course or unnecessary usage) contributes to the development of drug-resistant bacteria (3). Drug-resistance makes us vulnerable to infections we might otherwise be able to cure with conventional antibiotics (3).

Vaccines prevent infectious disease without contributing to disease-resistance (4). A vaccine contains part of a disease-causing microbe that has been killed or weakened and thus is no longer able to make a person sick. When a person receives a vaccine, the body's immune system develops protective antibodies that will attack the disease-causing microbes if it tries to infect a person in the future.

Despite the use of vaccines and antibiotics, infectious diseases are responsible for more deaths worldwide than any other single cause. The estimated annual cost of medical care for infectious disease treatment in the United States is about $120 billion (5).
Hepatitis B & C

Hepatitis, which means inflammation of the liver, results most frequently from heavy alcohol use or viral infections (6). Hepatitis A, B, and C are types of viral infections. Hepatitis A is an acute diarrheal disease, and people usually recover without treatment. Hepatitis B and C begin as acute infections, but have the potential to become chronic. Vaccines are available for Hepatitis A and B, but not Hepatitis C. In the United States, more than 4 million people have chronic Hepatitis B or C, but many people do not know they are infected (6,7).

Hepatitis B is spread when bodily fluids from an infected person enter the body of an uninfected person. This can occur through sexual contact, mother-to-child transmission at birth, sharing of personal items that carry fluids (i.e. toothbrushes, razors, etc.), and direct contact with blood or open sores of an infected person. Hepatitis B is a vaccine preventable disease and routine vaccination is recommended for all infants and children as well as adults at high risk for exposure to the virus.

Transmission of Hepatitis C is similar to Hepatitis B, although the likelihood of transmission via sexual contact and sharing of personal items is much lower (7).

People with acute Hepatitis B and C infections do not always have symptoms. However, when present, symptoms include fever, vomiting, stomach pain, dark urine, and being jaundiced (having yellow skin and eyes). Chronic infections may eventually produce symptoms similar to acute infections and develop into irreversible liver damage or liver cancer (6,7).

The likelihood of a Hepatitis B infection becoming chronic depends upon the age of infection. Infants and children are more likely to develop chronic Hepatitis B compared with adults. Approximately 25%–50% of children infected between the ages of 1 and 5 years develop chronic hepatitis. The development of chronic Hepatitis C is not age-dependent. Approximately 75%–85% of people who become infected with the Hepatitis C virus develop chronic infection (7).

Hepatitis B and C infections are detected with blood tests. There is no medicine to treat acute viral hepatitis infections, and there are limited treatment options for chronic hepatitis, all of which require close consultation with medical professionals. (6,7)
Between 2008 and 2012, there was no significant change in the incidence rate for reported Hepatitis B among Boston residents.
The incidence rate for reported Hepatitis B infection among Boston residents overall in 2012 was 57.9 new cases per 100,000 residents. However, the rate varied within gender, age group, and race/ethnicity. The Hepatitis B incidence rate for females was lower than for males. The rates for all age groups presented were higher than the rate for those ages 18-29. Also, the rates for Asian and Black residents were higher than the rate for White residents.

Figure 8.2 Hepatitis B by Selected Indicators, 2012

NOTE: Rates are not presented for ages <18 due to the small number of cases.

DATA SOURCE: Communicable Disease Control Division, Boston Public Health Commission
From 2008 to 2012, the incidence rate of reported Hepatitis C infection among Boston residents significantly increased by 12%.
In 2012, the Hepatitis C incidence rate among Boston residents overall was 170.2 new cases per 100,000 residents. However, the rate varied within gender, age group, and race/ethnicity. The rate for females was lower compared to the rate for males. Rates for all age groups presented, except for those 69 years or older, were higher compared to the rate for those ages 18-29. Rates for Asian and Black residents were lower than for White residents.

**Figure 8.4 Hepatitis C by Selected Indicators, 2012**

In 2012, the Hepatitis C incidence rate among Boston residents overall was 170.2 new cases per 100,000 residents. However, the rate varied within gender, age group, and race/ethnicity. The rate for females was lower compared to the rate for males. Rates for all age groups presented, except for those 69 years or older, were higher compared to the rate for those ages 18-29. Rates for Asian and Black residents were lower than for White residents.

**NOTE:** Rates are not presented for ages <18 due to the small number of cases.

**DATA SOURCE:** Communicable Disease Control Division, Boston Public Health Commission
Influenza

Influenza, or the “flu,” is a respiratory system (nose, throat, and lungs) infection caused by the influenza virus. Every year, a flu epidemic hits the United States during the fall and winter months, commonly referred to as flu season. Flu is very contagious, and an infected individual can spread it to people up to 6 feet away in the form of respiratory droplets released during coughing, sneezing, or talking (8).

The flu and common cold have similar symptoms that include fever, cough, sore throat, runny nose, body aches, and fatigue. However, the flu is different from the common cold in that symptoms are usually more intense and the severity of illness is less predictable, sometimes resulting in hospitalization or death. Although most people who get the flu recover within a few days to two weeks, complications such as pneumonia, bronchitis, and sinus and ear infections may occur. People with certain chronic medical conditions, pregnant women, young children, and the elderly, are especially vulnerable to developing serious flu-related complications (8).

The flu vaccine and frequent hand washing are the best ways to prevent becoming infected with the flu. Influenza vaccines must be developed each year to accommodate the ever-changing genetic code of the influenza virus, so the vaccine must be obtained every year accordingly (8). While the flu vaccine prevents infection of the influenza virus, there are many other circulating viruses that cause similar nonspecific flu-like symptoms. These common cold viruses can also be prevented with frequent hand washing and limiting exposure to people who have cold symptoms.

CDC guidelines suggest that people with flu-like symptoms should stay home for at least 24 hours after their fever is gone (the fever should be gone without the use of a fever-reducing medicine), except to get medical care or for other necessities. Furthermore, it is recommended that a sick individual covers his/her nose and mouth with a tissue when coughing or sneezing, and then throws the tissue in the trash thereafter. We can all minimize transmission of flu-like viruses by minimizing the amount we touch our eyes, noses, and mouths, and by cleaning and disinfecting surfaces and objects that may be contaminated by frequent touching (keyboards, telephones, etc.) (8).
The incidence rate of reported influenza among Boston residents fluctuated by year. The influenza rate during the 2012-2013 season was significantly higher than in 2011-2012 season.
During the period of November 1, 2012-March 31, 2013, the incidence rate of reported influenza among Boston residents overall was 256.8 new cases per 100,000 residents. However, the rate varied within gender, age group, and race/ethnicity. The rate for females was higher than the rate for males, and the rate was higher for all age groups presented compared to the rate for those ages 18-29. Black and Latino residents had higher rates of influenza than White residents, while the rate for Asian residents was lower than that of White residents.

Figure 8.6 Influenza by Selected Indicators, November 1, 2012-March 31, 2013

DATA SOURCE: Communicable Disease Control Division, Boston Public Health Commission
Salmonella Infection

*Salmonella* bacteria live in the intestinal tracts of infected humans and animals. Most people infected with *Salmonella* develop diarrhea, fever, vomiting, and abdominal cramps 12 to 72 hours after infection. Most *Salmonella* infections (salmonellosis) are mild, and an individual is able to recover in four to seven days without treatment. In rare instances, hospitalization may be required (9).

Salmonellosis occurs when a person eats microscopic fecal material that contains the *Salmonella* bacteria. Contamination of food with fecal material may occur during food processing or handling. Poultry, beef, milk, and eggs are often the source of *Salmonella* infection. Pets such as reptiles, baby chicks and ducklings, and small rodents are particularly likely to carry *Salmonella* even when they are healthy. Salmonellosis is more common in children than in adults (9).

There is no vaccine for salmonellosis. The best ways to prevent *Salmonella* infection are to:

- Carefully wash hands with soap and water before and after preparing food, after using the toilet, and after handling pets.
- Wash food surfaces and utensils including knives, cutting boards, counter tops, and dishes with clean soapy water before and after preparing food. Keep everything that touches food clean.
- Wash all fruits and vegetables with clean drinking water and use a brush if necessary;
- Refrigerate or freeze appropriate foods without delay. Refrigerator temperatures should be at 40°F or below. Freezer temperatures should be below 0°F.
- Heat foods to hot enough temperatures to kill bacteria.

Because most cases are mild, medical intervention is often not needed and cases go undocumented and unreported to the health department (9). For this reason, the actual number of infections in Boston is estimated to be much higher than what is included in this report.
Between 2008 and 2012, the incidence rate of reported salmonella infection among Boston residents decreased significantly by 33%.

DATA SOURCE: Communicable Disease Control Division, Boston Public Health Commission
In 2012, the incidence rate of reported salmonella infection among Boston residents overall was 17.1 new cases per 100,000 residents. The rate was higher for residents under the age of 18 compared to those ages 18-29. Rates within gender were similar to each other, as were those within race/ethnicity.

**Figure 8.8 Salmonella by Selected Indicators, 2012**

- **Boston**: 17.1
- **Female**: 15.5
- **Male**: 18.2
- **<18 yrs**: 29.7
- **18-29 yrs**: 14.7
- **30-39 yrs**: 15.3
- **40-49 yrs**: 12.4
- **50-59 yrs**: 16.5
- **60-69 yrs**: 17.2
- **70+ yrs**: 11.6
- **Asian**: 24.8
- **Black**: 20.4
- **Latino**: 9.8
- **White**: 17.9

**DATA SOURCE**: Communicable Disease Control Division, Boston Public Health Commission
Tuberculosis

Tuberculosis (TB) is an infectious disease caused by the bacterium Mycobacterium tuberculosis. The bacteria usually infect the lungs but can infect other parts of the body as well. TB is spread through the air when a person with an active infection releases respiratory particles into the air by coughing or sneezing. Not everyone exposed to TB becomes infected, and not everyone infected with TB becomes sick. In fact, most people who are infected are able to fight the bacteria, prevent it from spreading, and avoid symptoms altogether, in what is known as latent TB. A person with latent TB cannot spread the infection. However, the latent form can become active over time, at which point the infected person will become symptomatic and infectious to others. Although latent TB is often asymptomatic, treatment of latent TB is recommended to prevent the development of active TB. TB symptoms include severe cough with blood or sputum, chest pain, weakness, weight loss, chills, fever, and night sweats (10).

Tests to determine TB infection include a skin test and a blood test. A positive test result usually indicates that a person has been infected with the TB bacteria but does not necessarily mean that the person has an active TB infection. In some instances, because of cross-reactivity, people who received the BCG-vaccine will have a positive skin test even though they are not infected with the TB bacteria. BCG, or bacille Calmette-Guerin, is a vaccine for tuberculosis, which is most commonly used in countries with high prevalence of TB. It is not generally recommended for use in the United States because of the low risk of infection domestically, that it is not consistently effective at preventing the disease, and that it interferes with the skin test reactivity. In these cases, other diagnostic tests, such as blood tests, chest x-rays, and sputum samples are needed to see whether the person has TB (10).

TB can be treated by taking several drugs for 6 to 9 months. There are currently 10 drugs approved by the U.S. Food and Drug Administration (FDA) for treating TB (10). Latent TB infection can also be treated with drugs in order to prevent active TB from developing. The treatment of latent TB infection is essential for controlling and eliminating TB infection in the United States, where it has been in decline since 1992. In the United States, most cases occur within the foreign born population, often as a result of emigration from tuberculosis endemic areas (10). Although the TB incidence rate in the United States is lower than many other nations, TB represents one of the leading causes of death around the world, particularly among those infected with HIV (11).
Between 2008 and 2012, the incidence rate of reported tuberculosis among the Boston population significantly decreased by 34%.

Figure 8.9 Tuberculosis by Year

DATA SOURCE: Communicable Disease Control Division, Boston Public Health Commission
In 2012, the incidence rate of reported tuberculosis for Boston residents overall was 6.6 new cases per 100,000 residents. The incidence rate varied within gender and race/ethnicity. The incidence rate for females was lower than for males, and the rates for Asian and Black residents were higher compared to White residents. Rates within age groups were similar for those ages 40-49, 40-59, and 60-69 compared to those ages 18-29.

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</table>

NOTE: Rates are not presented for those aged less than 18, 30-39, and 70 or older, as well as Latino residents due to the small number of cases.

DATA SOURCE: Communicable Disease Control Division, Boston Public Health Commission
References


