CHAPTER 5:

Infectious Diseases

INTRODUCTION

Infectious diseases are caused by pathogens, like viruses and bacteria that make people sick. Some infectious diseases are transmitted from person-to-person, such as human immunodeficiency virus (HIV) and sexually transmitted diseases (STDs). Other infectious diseases are transmitted to humans by other animals, such as ticks, or from food or water contaminated with viral or bacterial pathogens. Infectious diseases can affect all Connecticut residents, but some populations are at higher risk for some infectious diseases. Many different strategies are needed to prevent people from getting sick with infectious diseases. Some infectious diseases can be prevented with vaccines whereas prevention of other infectious diseases requires that people avoid high risk behaviors or use personal protective measures that reduce exposure to pathogens.

HIV INFECTION

HIV (human immunodeficiency virus) infection weakens the immune system reducing a person's ability to fight infections and disease. While no cure exists, with proper medical care, HIV infection can be controlled.

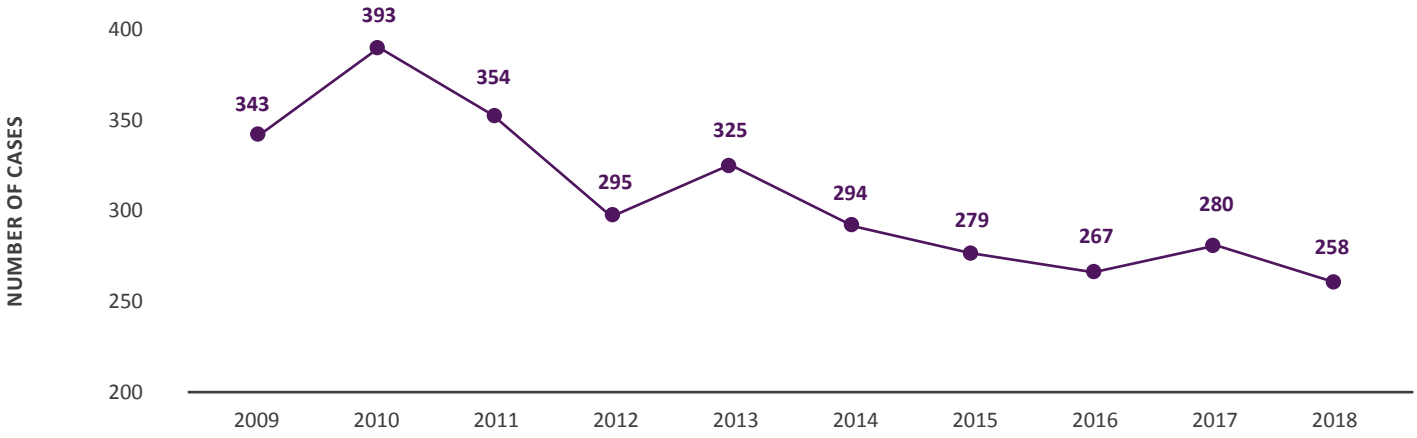
The following approaches can help to prevent HIV infection and transmission of HIV from one person to another person:

- HIV testing,
- Effective Behavioral Interventions (EBIs),[1]
- Biomedical interventions (PrEP: Pre-exposure prophylaxis and PEP: Post-exposure prophylaxis),
- Condoms distribution,
- Community-level interventions (e.g., to promote comprehensive HIV testing, create linkages to HIV care and viral suppression through treatment with antiretroviral medications), and
- Diagnosis and treatment of sexually transmitted diseases (STDs).

In 2018, 10,574 people were living with HIV in Connecticut. Over the past decade, Connecticut has seen a 25% reduction in the number of newly diagnosed HIV infections with an average of 276 cases annually diagnosed over the last five years (**Figure 5.1**).

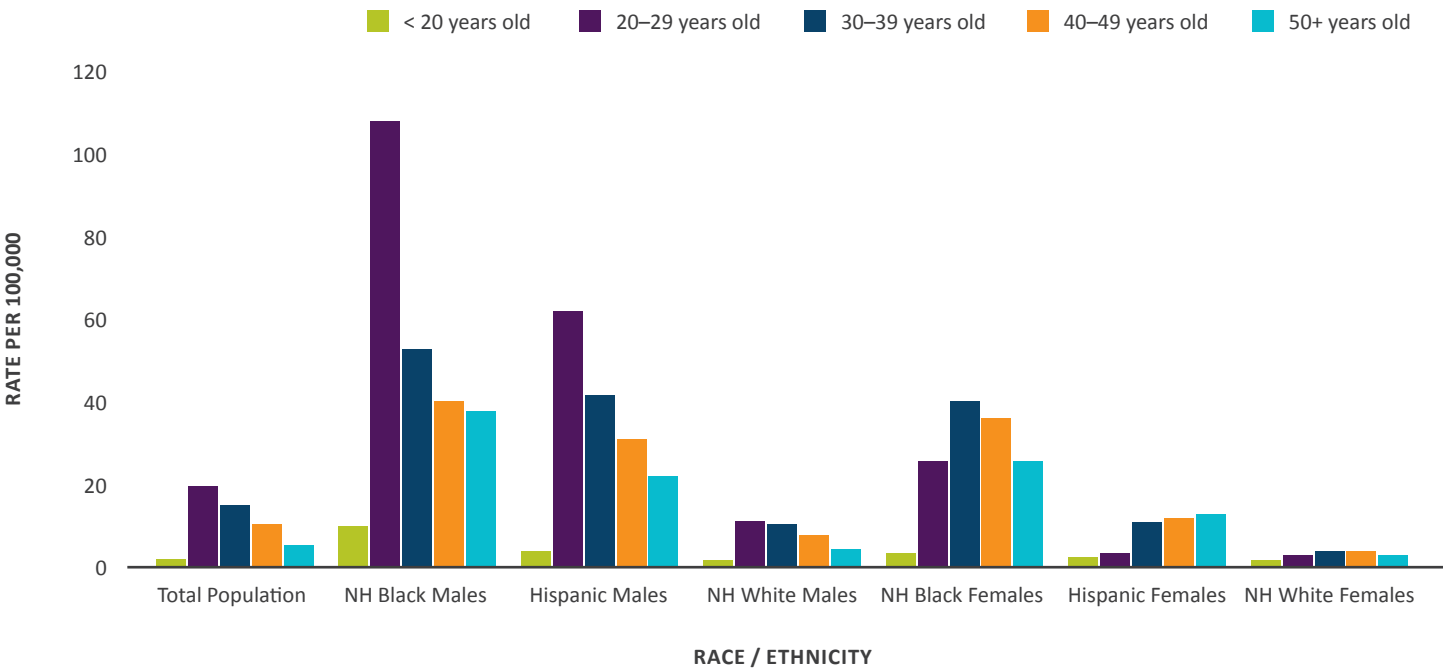
The decline in the annual number of HIV diagnoses is encouraging. However, the burden of newly diagnosed HIV is not evenly distributed among people in CT. **Figure 5.2** shows the rate of newly diagnosed HIV infections per 100,000 people in CT during 2014–2018. The rate of newly diagnosed HIV is highest in people who are in their 20s at 19 per 100,000. When sex, race and ethnicity are also considered further disparity can be seen. During 2014–2018, the rate of HIV diagnosis was highest among men of color in their 20s at 108 per 100,000 for non-Hispanic Black men and 61 per 100,000 for Hispanic men. During this period, 67% of newly HIV diagnosed men were men who have sex with men (MSM). Together, these data demonstrate that young gay and bisexual men of color are at particularly high

FIGURE 5.1: Number of newly diagnosed residents with HIV, CT, 2009–2018



Source: *CT DPH HIV Surveillance Program, HIV Surveillance Registry (cases reported to December 2019). Data analyzed January 7, 2020.*

FIGURE 5.2: Rate of newly diagnosed HIV infections by race, sex and age; CT, 2014–2018



Source: *CT DPH HIV Surveillance Program, HIV Surveillance Registry (cases reported to December 2019). Data analyzed January 7, 2020. Backus, K, Mueller, LM (2012) State-level Bridged Race Estimates for Connecticut, 2010, Connecticut Department of Public Health, Office of Health Care Quality, Statistics, Analysis & Reporting, Hartford, CT.*

Note: *Reported numbers less than 12 and accompanying rates based on these numbers for White males aged < 20 years, White females age < 20, 20-29, 30-39 years, and Hispanic females < 20 and 20-29 years should be interpreted with caution because the numbers have an underlying relative standard error greater than 30% and are considered unreliable. N=1,378.*

risk of acquiring HIV infection. These data also demonstrate a considerable disparity among women in CT during this period. Non-Hispanic Black women were diagnosed at an approximate rate of 32 times that of non-Hispanic White women and Hispanic women at a rate of 8 times that of non-Hispanic White women. HIV prevention among young gay and bisexual men of color and women of color should be prioritized to advance equity and reduce disparities.

HIV PrEP

HIV PrEP (Pre-exposure prophylaxis) is a type of medication used to effectively reduce the risk of acquiring HIV when engaging in certain high-risk behaviors (i.e., condomless sex, sharing injection materials, multiple sex partners, or multiple sexually transmitted disease diagnosis). PrEP is a once-a-day prescription pill that when taken consistently, can protect an individual engaging in high risk sexual and drug using behaviors. PrEP lowers a person's chance of contracting the virus by more than 90% via sex and 70% via intravenous drug use.[2] Truvada was FDA approved for PrEP in 2012, and it contains two medicines (tenofovir disoproxil fumarate- or TDF, and emtricitabine- commonly called FTC) that are used in combination with other medicines to treat HIV. In clinical trials, Truvada (TDF/FTC) was generally well-tolerated and serious adverse events were rare. In addition, the FDA has now approved Truvada as PrEP for high risk adolescents. A second drug for PrEP, Descovy, was just approved in 2019.

The orange line in **Figure 5.3** shows the number of people in CT who were on PrEP during 2012-2017. The number of people on PrEP increased over the period with over 6.5 times more people on PrEP in 2017 than in 2012. The purple line shows the estimated number of people at risk for acquiring HIV in CT during 2012–2017.[3] While the number of people on PrEP has increased over time, there is considerable opportunity to expand the use of PrEP among people at risk for acquiring HIV to reduce the risk of HIV transmission.

"There's the lack of competency that medical providers have and you can't be surprised by it. I have like a heterosexual primary care physician who did not know what PrEP was [...] It makes me less likely to want to seek out another provider that isn't LGBT because otherwise they won't know what I'm talking about or what I'm going through."

— STATE HEALTH ASSESSMENT FOCUS GROUP,
LGBTQ ADULTS

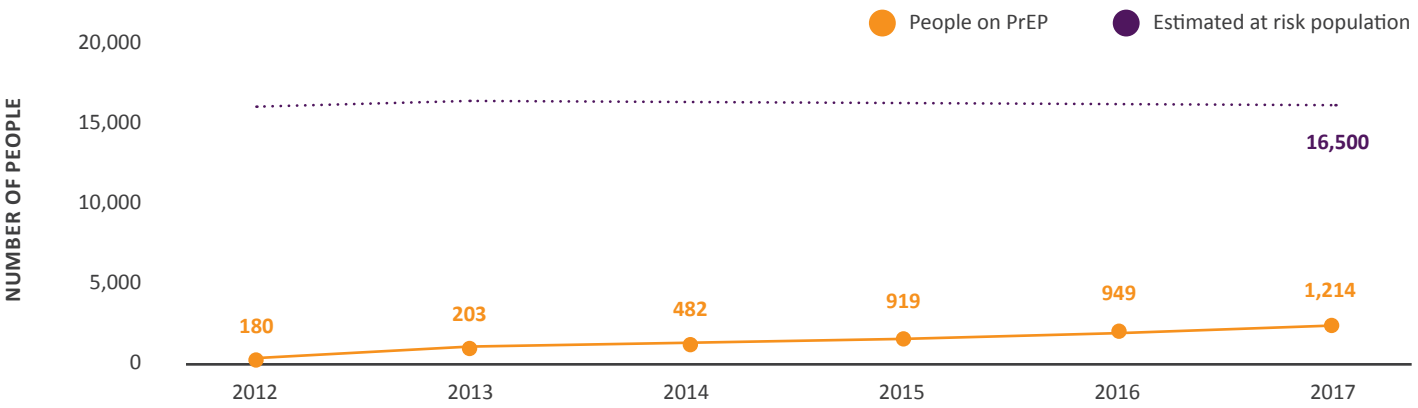
PrEP-to-Need Ratio (PnR) is the ratio of the number of PrEP users to the number of people newly diagnosed with HIV. According to AIDSvu, PnR serves as a measurement for whether PrEP use appropriately reflects the need for HIV prevention in a geographic region or demographic subgroup.

In 2017, 281 individuals were diagnosed with HIV in Connecticut, and 1,214 individuals were taking PrEP (**Figure 5.4**). The PrEP-to-Need Ratio (PnR) in Connecticut was 4.3, meaning that for every individual newly diagnosed with HIV in Connecticut, there were 4.3 HIV-negative persons using PrEP. CT's PnR is higher than that of the US overall, which was at 2.5 in 2017. Since 2012, the PnR has increased substantially (**Figure 5.5**).

Currently, in CT, 91.8% of people on PrEP are men while only 8.2% are women. PrEP use is most common among adults ages 25 to 34. In addition, the following factors influence whether an individual will be able to access and use PrEP:

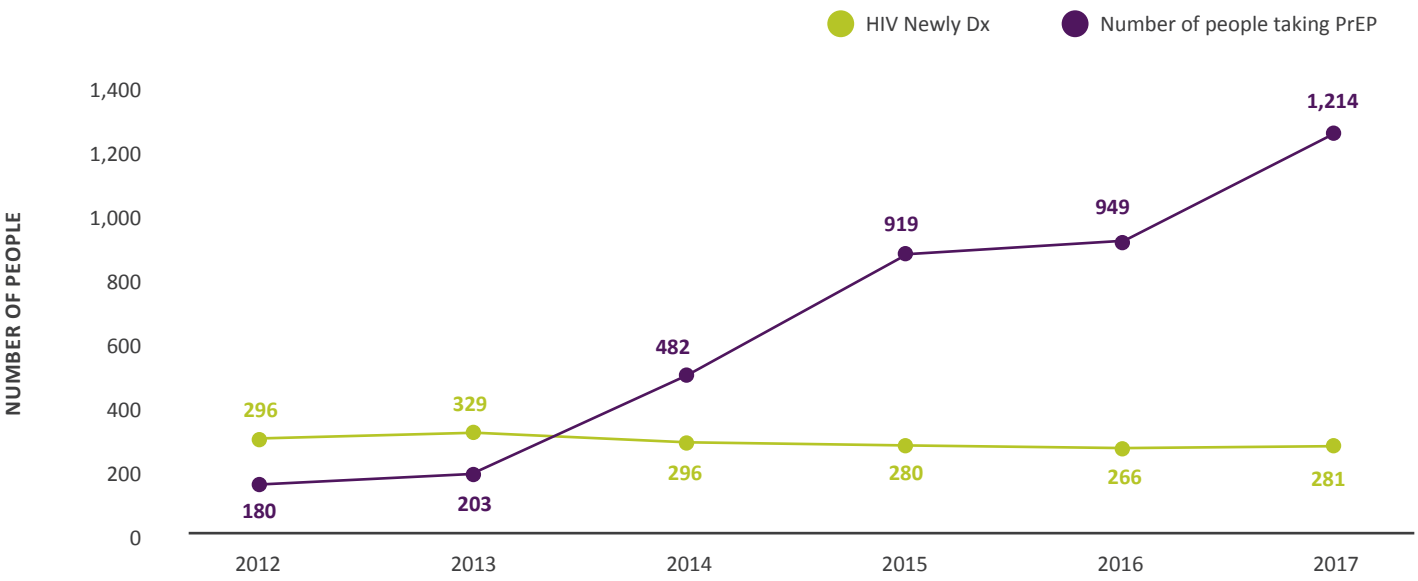
- Availability of resources to meet daily needs (e.g., safe housing). Without a safe place to live, preventing HIV does not become an immediate need. Meeting people's basic needs affords them the opportunity to concentrate on preventing HIV.
- Access to educational, economic, and job opportunities, which would allow a client's health insurance and financial stability to pay for PrEP.
- Social norms and attitudes (e.g., discrimination, racism, stigma and medical mistrust). Clients may not feel comfortable visiting a health care provider to talk about their sexual and drug use behaviors. Health care providers need to be open to these conversations and have adequate information on PrEP.
- Language/Literacy. Information on PrEP should be made available in multiple languages.

FIGURE 5.3: Number of people on pre-exposure prophylaxis (PrEP), CT, 2012–2017; and estimated number at high risk of HIV in CT



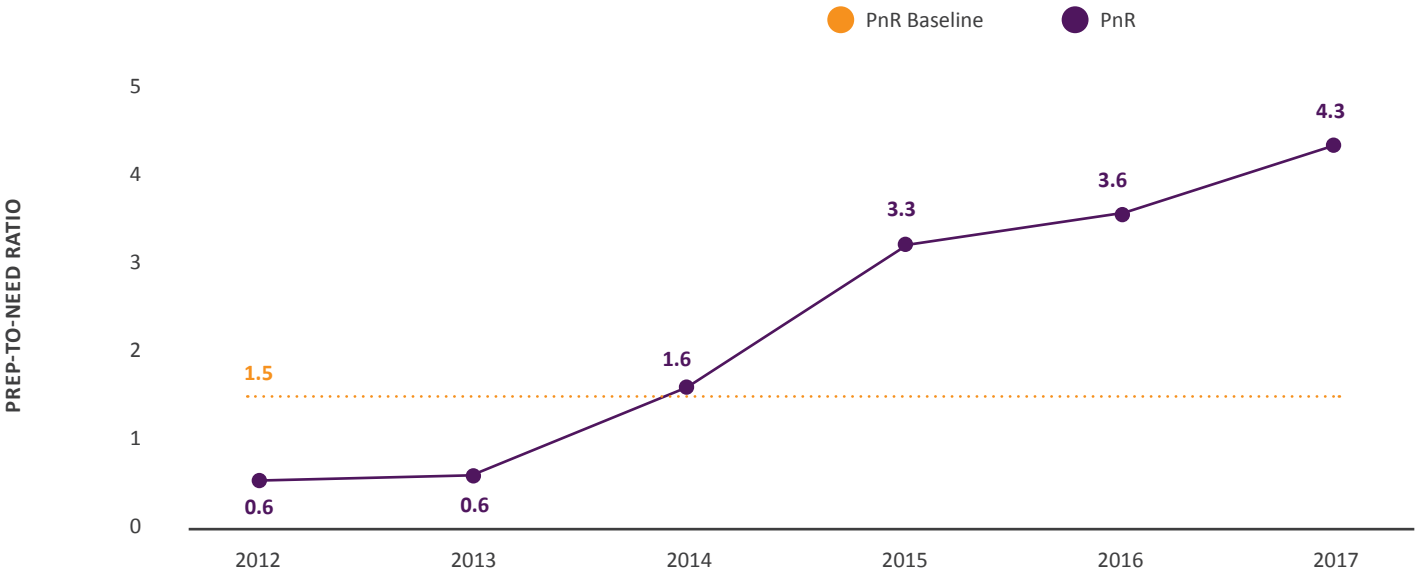
Source: *Emory University Rollins School Public Health (2019, February 2), AIDSVu PrEP Maps. Retrieved from https://map.aidsvu.org/map?prep=1. Diaz-Matos, L.F. (2019). Estimating the PrEP Eligible Population in Connecticut. Unpublished Manuscript.*

FIGURE 5.4: Number of people taking PrEP and number of people newly diagnosed with HIV, CT, 2013–2017



Source: *Emory University Rollins School Public Health (2019, February 2), AIDSVu PrEP Maps. Retrieved from https://map.aidsvu.org/map?prep=1. CT DPH HIV Surveillance Program, HIV Surveillance Registry. Data analyzed March 25, 2019.*

FIGURE 5.5: PrEP-to-need ratio (PnR) and baseline, CT, 2012–2017



Source: *Emory University Rollins School Public Health (2019, February 2), AIDSVu PrEP Maps. Retrieved from https://map.aidsvu.org/map?prep=1. CT DPH HIV Surveillance Program, HIV Surveillance Registry CT DPH HIV Surveillance Program, HIV Surveillance Registry. Data analyzed March 25, 2019.*

PROGRAM SPOTLIGHT: PREP NAVIGATION AND PROMOTION

Non-clinical sites:

- The point of entry for PrEP clients is a 4th generation HIV rapid test which typically takes about 20 minutes before results become decipherable.
- During the visit, the the person receiving the HIV test can:
  - Participate in a one-on-one counseling session.
  - Be assessed by the HIV tester or PrEP navigator for HIV related risk factors, financial barriers (including insurance), current support systems, alcohol and drug use, housing, transportation and nutrition, among others.
  - Participate in a client acuity screening (which is mandated for use by PrEP navigators) to gauge their level of need.
  - Receive active and passive referrals for supportive ancillary services.
- Following these steps, individuals are typically more receptive to attending the first appointment at the referred site.
- Each funded agency is encouraged to have standing memorandum of agreements with community partners in order to make the referral process much more seamless.

Clinical sites:

- HIV testing is routinely performed by trained staff.
- Staff test/screen about 45,000 Connecticut residents a year for HIV and other sexually transmitted infections.
- Patients can receive counseling or education on the risk factors putting them at increased risk for acquiring HIV and on PrEP and Post-exposure Prophylaxis (PEP).

HEPATITIS C

Hepatitis C (HCV) is a liver infection caused by the hepatitis C virus. HCV is transmitted through blood exposure. Infection with this virus can range from mild illness lasting only a few weeks to a chronic disease that leads to the scarring of the liver and liver failure. Most people infected develop chronic disease, and HCV is the leading cause of liver transplants and liver cancer.

There is no vaccine to prevent hepatitis C. In addition, treatment is not recommended for acute infection as it may resolve on its own. However, people with acute HCV should be followed by their doctor and treatment considered if the infection becomes chronic. Successful treatment options include protease inhibitor therapies, which can achieve sustained virologic response (SVR) 12 weeks after the completion of treatment. A SVR indicates that the HCV infection is cured. Over 90% of HCV infected persons can be cured of HCV infection with 8–12 weeks of oral therapy.[4]

An estimated 2.4 million people are living with HCV in the US.[5] In Connecticut, we have seen the rate of newly diagnosed chronic HCV decrease in recent years. However, this downward trend needs to be interpreted with caution as it is most likely due to a change in the case definition, which now only includes individuals with a positive viral load.[6] This change was made so that health departments could focus their efforts on people with current HCV to help them get care and treatment.

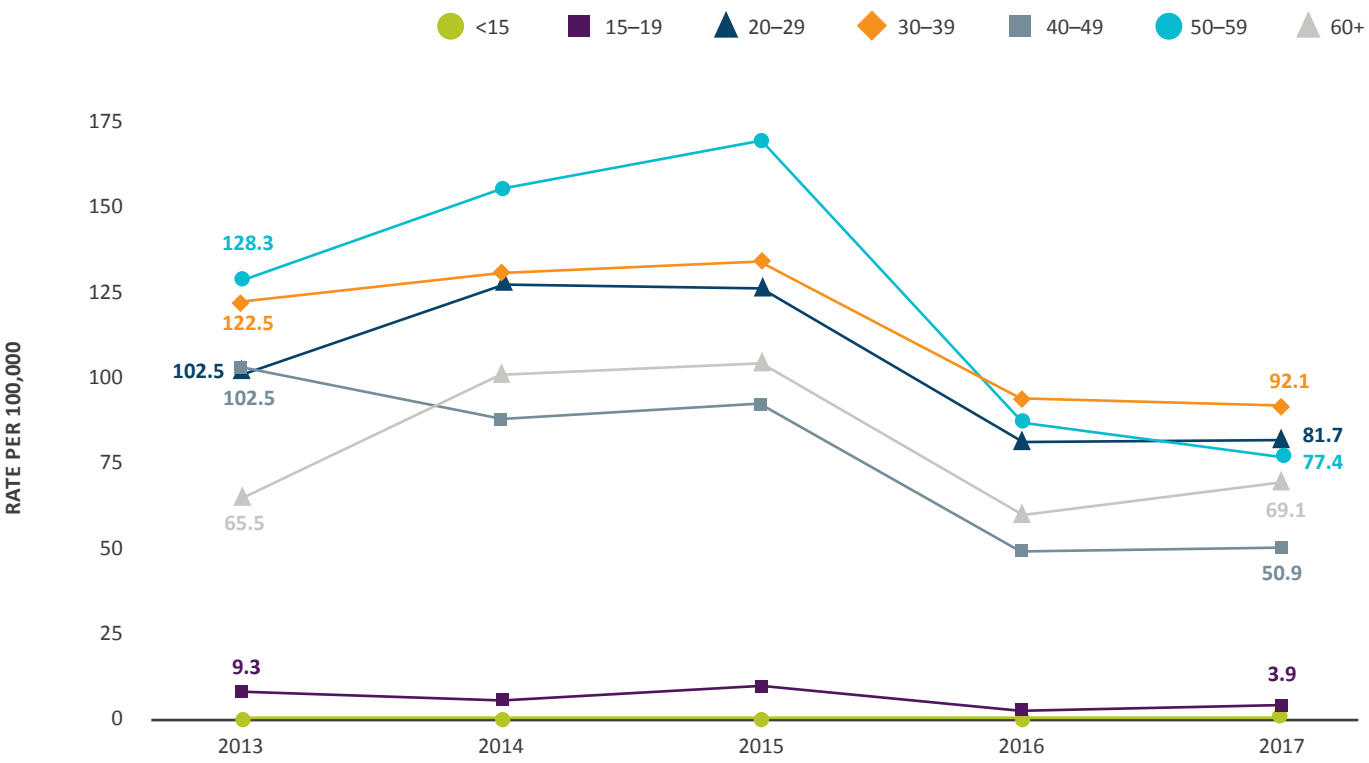
In Connecticut, males are being diagnosed with HCV infection, past or present, at a greater rate than females. In recent years, the highest rate of HCV infection had been seen in males aged 50–59; however, in 2016, HCV rates for this age group decreased below males aged 30–39 (**Figure 5.6**). Other male age groups remained relatively stable over the last 5 years. Unlike males, the highest rate of hepatitis C, past or present, was seen in young females aged 20–29 years (**Figure 5.7**).

According to the Centers for Disease Control and Prevention (CDC), the following people are at increased risk for HCV: current or former injection or intranasal drug users, people born between 1945 and 1965, recipients of blood transfusions or solid organ transplants prior to July 1992, hemodialysis patients, people with HIV, and children born to HCV positive mothers.

As such, the CDC and US Preventative Task Force recommends that the following individuals be tested for HCV:

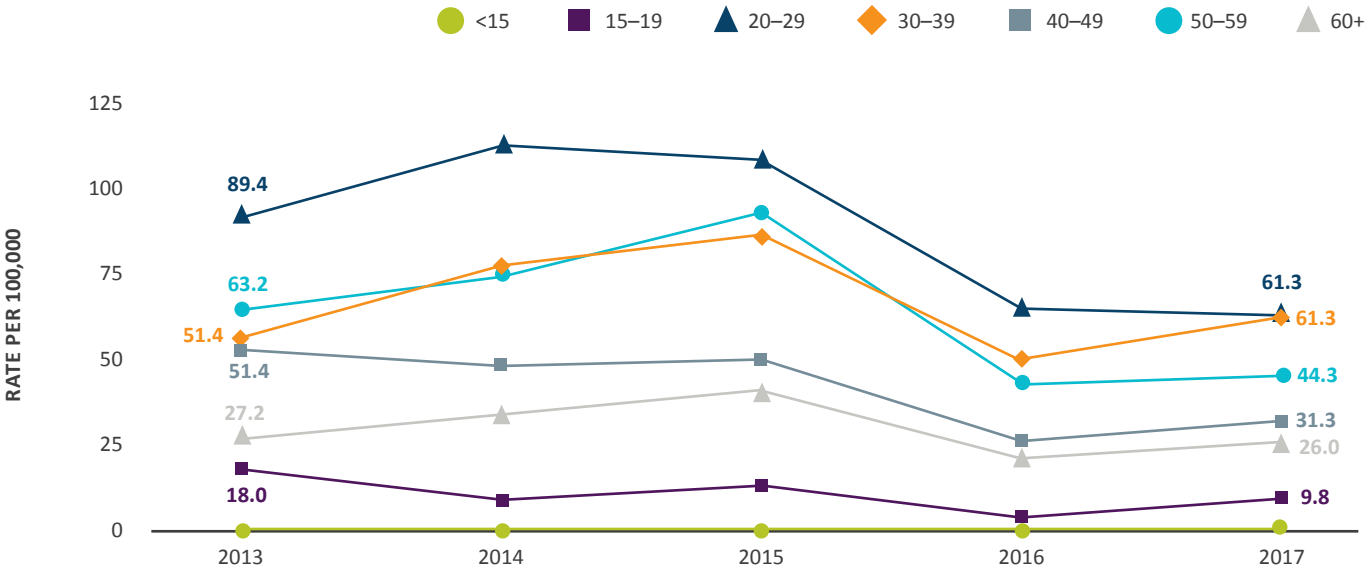
- Current or former injection drug users, including those who injected only once many years ago;
- Everyone born from 1945 to 1965;
- Anyone who received clotting factor concentrates made before 1987;
- Recipients of blood transfusions or solid organ transplants prior to July 1992;
- Long-term hemodialysis patients;
- People with known exposures to the hepatitis C virus, such as:
  - + Health care workers or public safety workers after needle sticks involving blood from someone infected with hepatitis C virus; and
  - + Recipients of blood or organs from a donor who tested positive for the hepatitis C virus;
- People with HIV infection;
- Children born to mothers with hepatitis C;
- People in jails or prisons;
- People who use drugs snorted through the nose (in addition to people who inject drugs); and
- People who get an unregulated tattoo.

FIGURE 5.6: Newly diagnosed cases of hepatitis C infection, past or present, in males by age, CT, 2013-2017



Source: *CT Electronic Disease Surveillance System (cases reported through March 2018). Data analyzed February 1, 2019 U.S. Census Bureau, 2010 Census.*

FIGURE 5.7: Newly diagnosed cases of hepatitis C infection, past or present, in females by age, CT, 2013-2017



Source: *CT Electronic Disease Surveillance System (cases reported through March 2018). Data analyzed February 1, 2019 U.S. Census Bureau, 2010 Census.*

SEXUALLY TRANSMITTED DISEASES

Sexually transmitted diseases (STDs) are among the most common infections found in the United States, accounting for more than 19 million infections among men and women and $14 billion in overall medical costs.[7] CT's Department of Public Health mandates reporting and surveillance of the three most common STDs: chlamydia, gonorrhea, and syphilis — all of which can be cured with proper treatment.

Chlamydia

Chlamydia is among the most common of all STDs, and since 1994, has comprised the largest proportion of all STDs reported to the CDC (**Figure 5.8**). Studies also demonstrate the high prevalence of chlamydial infections in the general US population, especially among young women.[8] A pregnant woman who is infected with chlamydia can give the infection to her baby during delivery. Chlamydia case rates among non-Hispanic Blacks continue to be much higher than among all other racial/ethnic groups. In addition, rates have increased in adolescents aged 15–24 years. Chlamydial infections in women are often asymptomatic; however, if left untreated, chlamydia can result in pelvic inflammatory disease (PID), which is a major cause of infertility, ectopic pregnancy, and chronic pelvic pain. The number of reported chlamydia cases in females is about two times that of males, possibly because more women than men get screened for this infection (**Figure 5.9**). To identify chlamydia infections in the population, it is recommended to annually screen females ages 25 years and under and test all pregnant women for chlamydia at their first prenatal visit.

Gonorrhea

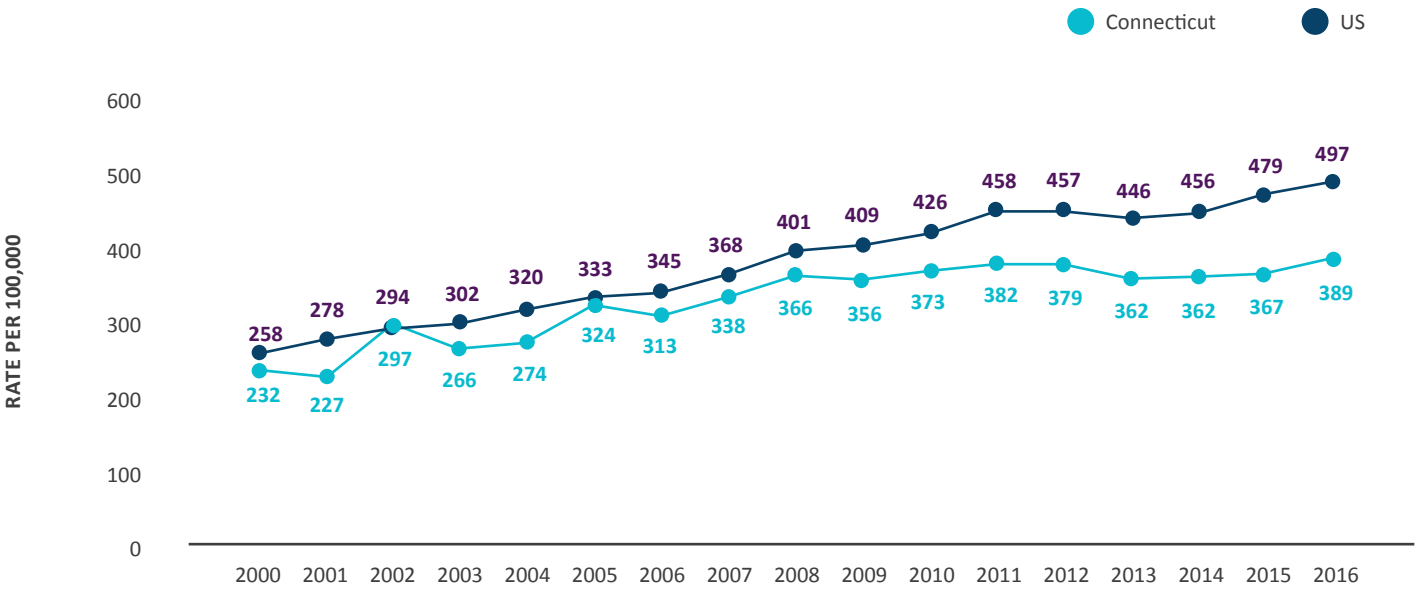
Gonorrhea is another common STD, especially among young people ages 15–24 years (**Figure 5.10**). Any sexually active person can get gonorrhea through unprotected vaginal, anal, or oral sex. In Connecticut, non-Hispanic Blacks have been the most affected racial group for the last three years. Along with chlamydia, gonorrhea infection is a major cause of PID and infertility in women. Pregnant women with gonorrhea can give the infection to her baby during delivery, causing serious health problems. Treating gonorrhea as soon as possible will make health complications less likely. In 2013, gonorrhea was called an "urgent threat" by CDC because of the increasing number of antibiotics to which the bacteria have developed resistance.

When broken out by sex and race, we see that the number of cases consistently increased from 2015–2016, following state and national trends. Male cases consistently outnumbered female cases during that period as well (**Figure 5.11**). By race/ethnicity, we see that non-Hispanic Black residents consistently carry the highest burden of gonorrhea cases (**Figure 5.12**).

PROGRAM SPOTLIGHT: EXPEDITED PARTNER THERAPY

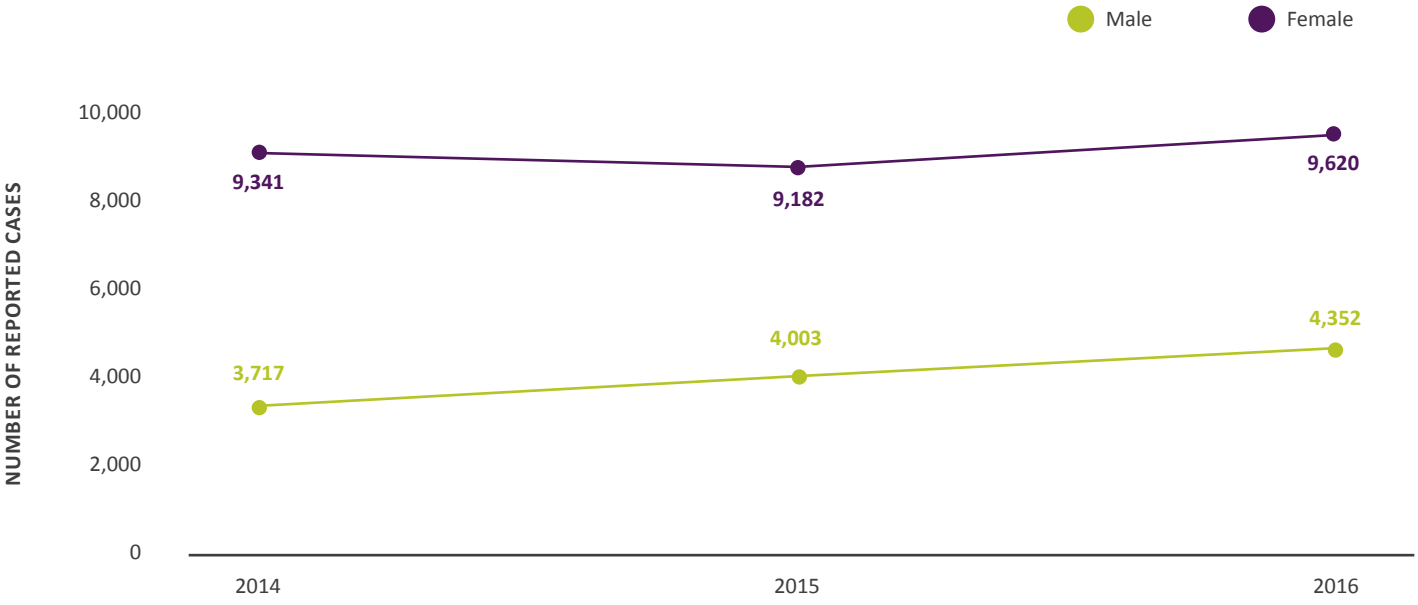
Expedited partner therapy (EPT) is the practice of giving a patient diagnosed with chlamydia or gonorrhea, medication or a prescription to give to their partner without the health care provider first examining the partner. This practice has been shown to prevent the reinfection of the initial patient diagnosed. This practice is endorsed by CDC and has been legal in Connecticut since 2011.

FIGURE 5.8: Incidence rate of chlamydia per 100,000 by year, CT and US, 2000–2016



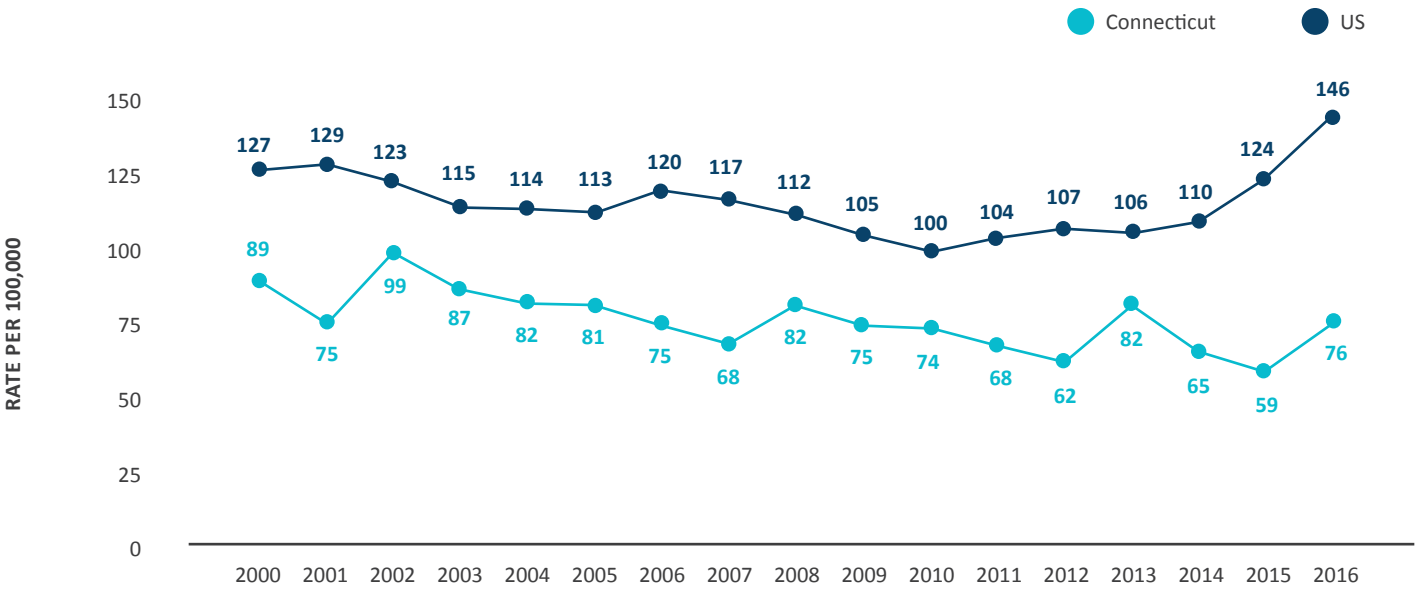
Source: *CT DPH STD Control Program, CT Electronic Disease Surveillance System. Data analyzed March 25, 2019. U.S. Census Bureau, 2000 Census. U.S. Census Bureau, 2010 Census.*

FIGURE 5.9: Number of chlamydia cases by sex, CT, 2014–2016



Source: *CT DPH STD Control Program, CT Electronic Disease Surveillance System. Data analyzed March 25, 2019.*

FIGURE 5.10: Incidence rate of gonorrhea per 100,000; CT and US, 2000–2016

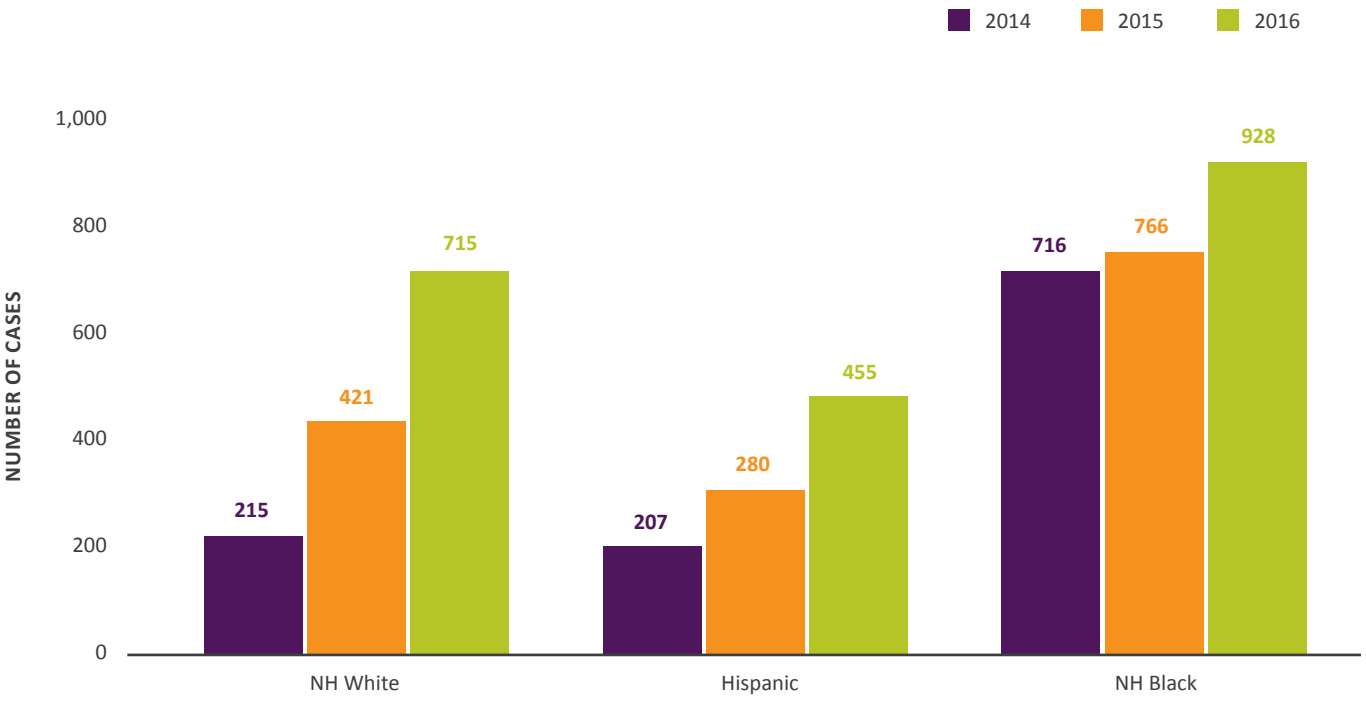


Source: *CT DPH STD Control Program, CT Electronic Disease Surveillance System. Data analyzed March 25, 2019. U.S. Census Bureau, 2000 Census. U.S. Census Bureau, 2010 Census.*

FIGURE 5.11: Number of gonorrhea cases per year by sex, CT, 2014–2016

Source: *CT DPH STD Control Program, CT Electronic Disease Surveillance System. Data analyzed March 25, 2019.*

FIGURE 5.12: Number of gonorrhea cases by race/ethnicity, CT, 2014–2016



Source: *CT DPH STD Control Program, CT Electronic Disease Surveillance System. Data analyzed March 25, 2019.*

SYPHILIS

Syphilis is a sexually transmitted infectious disease caused by a bacterium known as *Treponema pallidum*. This bacterium is typically transmitted during vaginal, anal, or oral sex. Syphilis can also be transmitted from an infected mother to her child during pregnancy resulting in congenital syphilis, which can lead to miscarriage, stillbirth, prematurity or death shortly after birth, as well as severe health problems in babies. If left untreated, syphilis can cause serious health problems.

Syphilis typically follows a progression of stages that can last for weeks, months, or years. The stages are as follows:

- Primary stage of syphilis classically presents with a single chancre (a firm, painless, non-itchy skin ulceration).
- Secondary stage of syphilis presents with a diffuse rash, which frequently involves the palms of the hands and soles of the feet.

Primary and secondary syphilis are the most infectious stages.

- Early latent syphilis occurs within one year of exposure, with little to no symptoms.
- Late latent syphilis is a stage where the infection occurred over a year ago or the exact date of exposure is unknown. Persons in this stage are asymptomatic and are not infectious. However, they can have late manifestations of the disease years later, if untreated.

Nationally, in 2017, a total of 30,644 cases of primary and secondary stage syphilis were reported, with a rate of 9.5 cases per 100,000 people.[9] Our state reported its lowest number of primary and secondary syphilis cases in 2001; since that time, rates have increased both in Connecticut and nationally (**Figure 5.13**).

Syphilis in Connecticut and nationally occurs primarily among men, especially men who have sex with men (MSM). During the period 2013–2017, 88% of newly diagnosed primary and secondary syphilis cases in CT were male. The number of men diagnosed with primary and secondary syphilis more than doubled during this period (**Figure 5.14**). The purple portion of each bar represents MSM and the green part represents heterosexual men. The number of new syphilis infections for this period was much greater for MSM than heterosexual men.

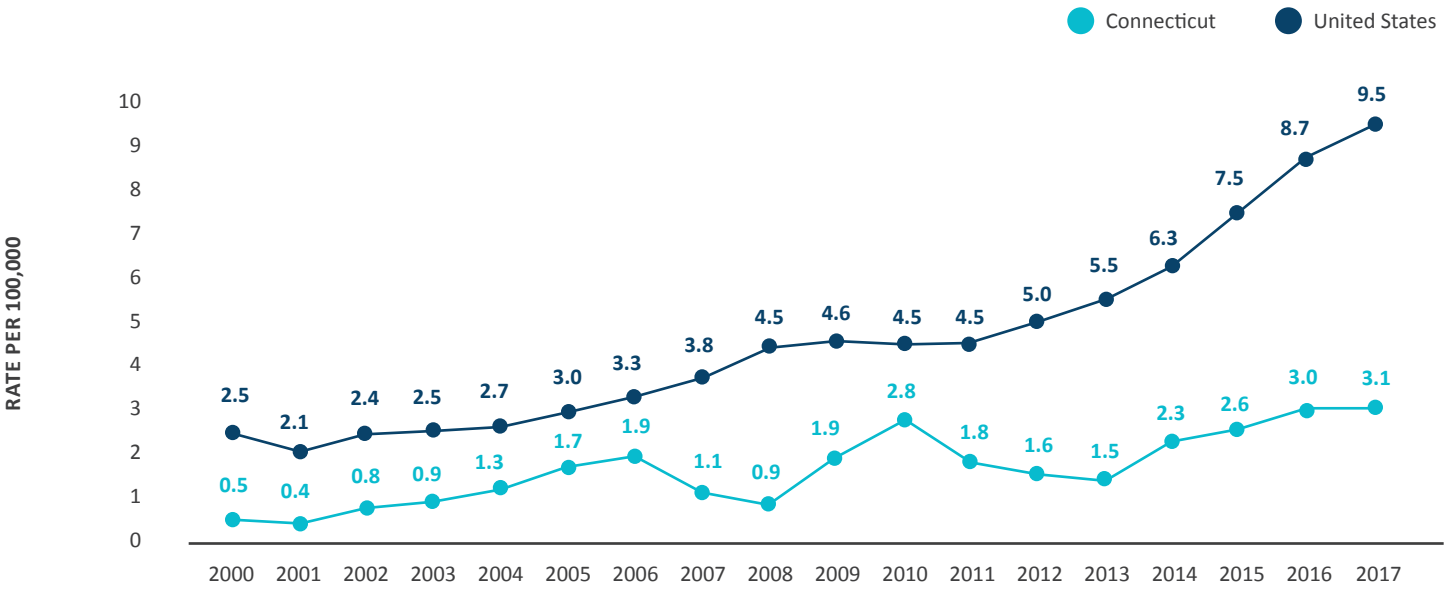
PROGRAM SPOTLIGHT: PARTNER NOTIFICATION SERVICES

The CT DPH Sexually Transmitted Diseases Program has specially trained staff called Disease Intervention Specialists (DIS) who contact persons with an STD, with a focus on syphilis and HIV, to ensure that they are appropriately treated and to talk to them about their partners. DIS will then try to find these partners and notify them of their potential exposure to ensure they are tested and treated. Partner services are confidential and an integral service provided by the STD Program, which helps to decrease the transmission of STDs in Connecticut.

The Leave It To Us campaign was recently released to promote knowledge and awareness of partner services among Connecticut health care providers and residents. https://youtu.be/oRqTxROmGb4

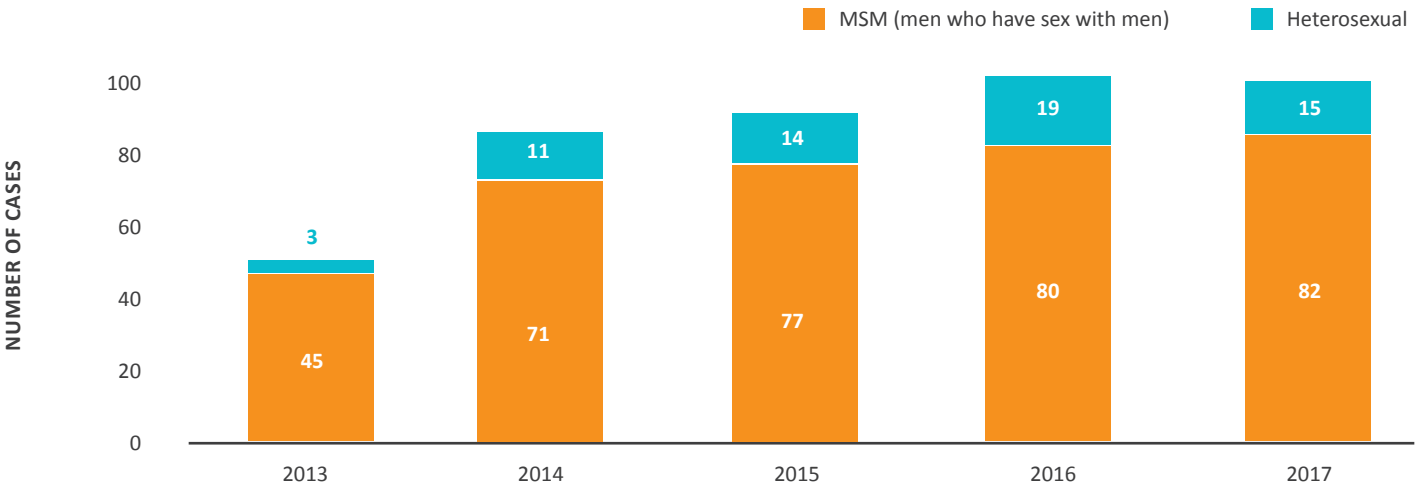
To prevent the spread of syphilis, it is important to ensure routine testing of MSM, HIV-infected persons, persons who have partners who have tested positive for syphilis, and pregnant women. MSM who have had a history of an STD, including syphilis, in the last 6 months are considered at very high risk of HIV and should consider PrEP.

FIGURE 5.13: Incidence rate of primary and secondary syphilis per 100,000; CT and US, 2000–2017



Source: *CT DPH STD Control Program, CT Electronic Disease Surveillance System. Data analyzed October 8, 2019. U.S. Census Bureau, 2000 Census. U.S. Census Bureau, 2010 Census.*

FIGURE 5.14: Number of male syphilis cases per year by sex of sex partner, CT, 2013-2017



Source: *CT DPH STD Control Program, CT Electronic Disease Surveillance System. Data analyzed January 29, 2019.*

TUBERCULOSIS

Tuberculosis (TB) is a disease caused by a bacterium called *Mycobacterium tuberculosis*. The disease is challenging to diagnose, treat, and control. The bacteria usually attack the lungs, but TB bacteria can attack any part of the body such as the kidney, spine, and brain. TB bacteria are spread from person to person when a person with TB disease of the lungs or throat coughs, sneezes, laughs, or sings, and another person breathes in the contaminated air. Not everybody infected with TB gets sick. People who are infected, but not sick, have what is called latent TB infection (LTBI).[10] TB disease can be fatal if not treated properly and TB bacteria may become resistant to the drugs used in treatment.

TB Incidence

TB was once the leading cause of death in the United States but over the past 20 years, the rates of new cases of TB have declined both nationally and in CT (**Figure 5.15**).[11] In 2016 and 2018, our state rates were the lowest ever reported, at 1.4 per 100,000 residents. Yet, both our state and the nation overall have not yet reached the Healthy People 2020 goal of reducing active TB incidence to 1.0 case per 100,000 residents. Even though fewer people have the disease, it remains a serious threat particularly to certain populations, especially those who were born in countries with a high incidence of TB.[12]

To prevent TB, it is important to:

- Promote and ensure screening and testing of persons at high risk for TB and treating them if they are positive (e.g., persons born in countries with high TB incidence);[13]
- Educate providers about at-risk groups, screening protocols, national recommendations, and guidelines and follow-up referral services for TB disease and LTBI; and
- Implement culturally congruent outreach and health care interventions for persons at risk for TB disease and LTBI.

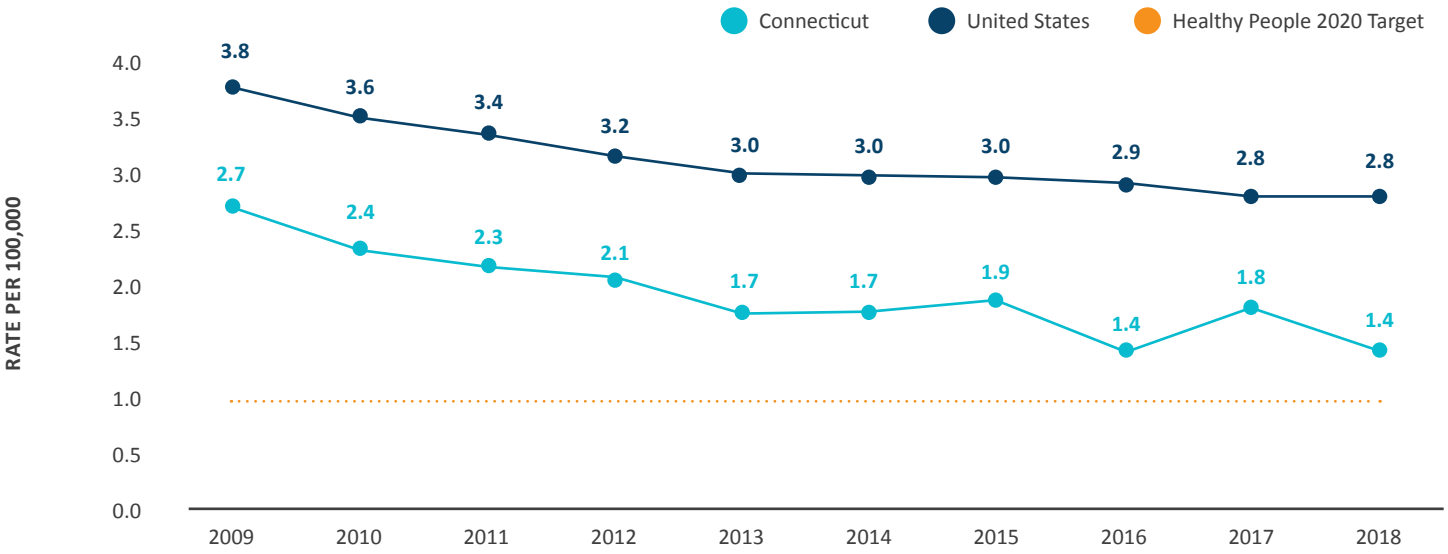
TB Treatment

Most patients sick with tuberculosis (TB) need to be on treatment with 2–4 drugs for 6–9 months and sometimes longer. Between 2013 and 2017, completion of treatment for TB patients in CT within 12 months increased, consistently meeting our state program's goal of 83% and often exceeding the national goal of 95% (**Figure 5.16**). Given the low rate of TB, a few patients not completing treatment within 12 months can easily affect the overall rate of treatment completion.

To promote the completion of treatment for TB patients, it is recommended to:

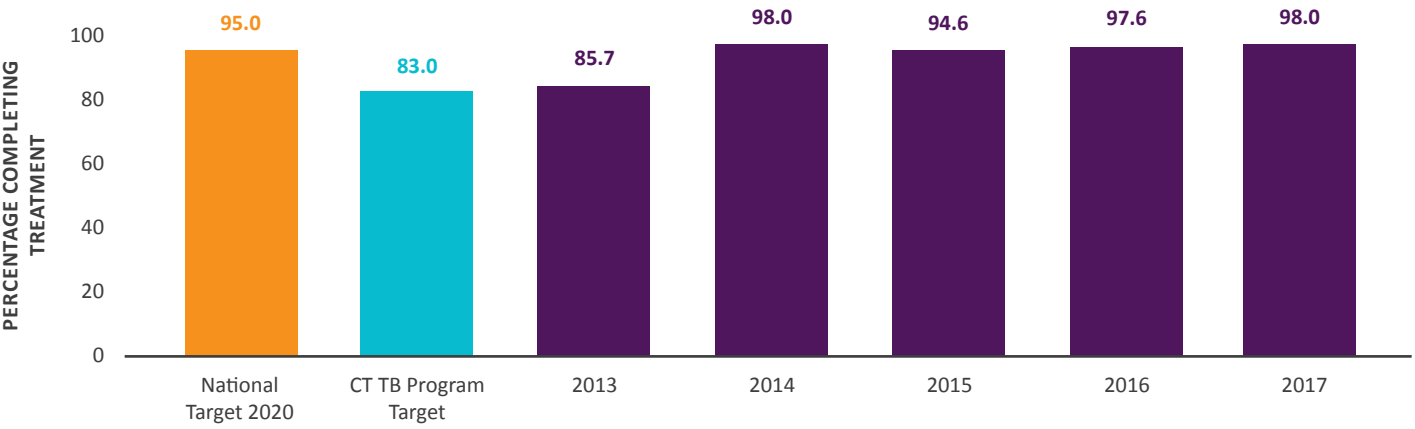
- Provide services such as free medication and reimbursement for medical care for uninsured and underinsured patients who cannot afford treatment.
- Provide directly observed therapy (DOT) or watch patients take their medication. DOT has been shown to increase treatment adherence. Giving patients incentives (small rewards to encourage them to take their medication or keep doctor appointments) and enablers (to help patients receive treatment, e.g. bus token to the doctor's office) can assist in increasing treatment completion.[5]
- Maintain DOT as the standard of care for people with TB disease and increase the use of electronic DOT.

FIGURE 5.15: Active tuberculosis (TB) disease incidence per 100,000; CT and US, 2000–2018



Source: *CT DPH Tuberculosis Control Program, CT Electronic Disease Surveillance System. CT Electronic Disease Surveillance System. Data analyzed March 7, 2019. U.S. Census Bureau, 2000 Census. U.S. Census Bureau, 2010 Census.*

FIGURE 5.16: Percentage of active tuberculosis (TB) disease patients who completed treatment within 12 months, CT, 2013–2017



Source: CT DPH Tuberculosis Control Program, CT Electronic Disease Surveillance System. Data analyzed March 7, 2019. U.S. Census Bureau, 2000 Census. U.S. Census Bureau, 2010 Census.

PROGRAM SPOTLIGHT: DIRECTLY OBSERVED THERAPY (DOT) SUPPORT FOR LOCAL HEALTH DEPARTMENTS

CT DPH Tuberculosis Control Program staff assist local health departments in performing DOT when needed and promote the use of electronic DOT, which can be more efficient for both patients and health department staff. CT DPH provides incentives and enablers to local health departments for use with TB patients.

VACCINATION

Life expectancy has increased over the course of the last century largely due to immunizations that reduced infectious disease mortality, especially among children.[14] Vaccine-preventable diseases are at or near record lows due to state vaccination laws and increased access to vaccines.[15] Vaccine coverage refers to the percentage of people in a population who have been immunized against vaccine-preventable diseases. If high enough vaccine coverage is achieved in a population, disease outbreaks can be prevented. High vaccine coverage extends protection to vulnerable populations that are not vaccinated, including infants who are too young to be vaccinated, people who have a weakened immune system, and children and adults who cannot get vaccinated for health reasons. Outbreaks can occur if vaccination coverage becomes too low, even among subpopulations, as demonstrated by recent outbreaks of measles in the US.

Connecticut has laws and regulations that support vaccination of children in the state. By law, the Connecticut Vaccine Program (CVP) provides vaccines at no cost to health care providers and local health departments to administer to children so that the cost of vaccines will not be a barrier to vaccination. Per state regulations, health care providers administering vaccinations to children are mandated to report to Connecticut's Immunization Information System (CT WiZ). Public and private schools require students to receive recommended vaccinations to attend school.[15;16]

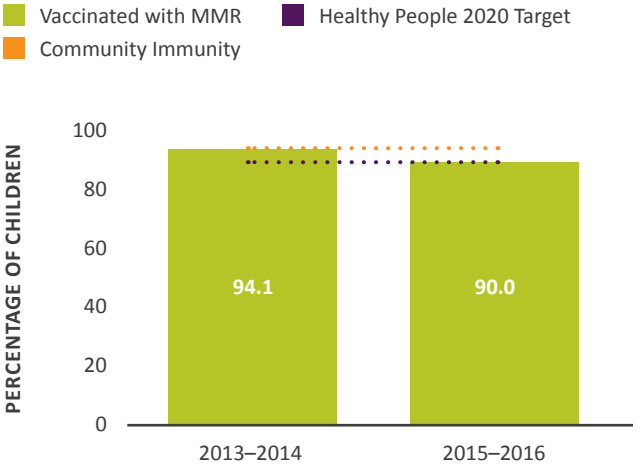
Although vaccines are proven to be effective with minimal risk, misinformation about vaccine safety and factors that may limit access to vaccines (e.g., lack of reliable transportation or unstable housing) could interfere with children, adolescents, and adults getting the right vaccines at the right time.

The MMR vaccine protects against measles, mumps and rubella. The Advisory Committee on Immunization Practices recommends that children receive their first dose of MMR vaccine at age 12 through 15 months and the second dose at age 4 through 6 years. It is important to vaccinate children against measles at the recommended ages, particularly since outbreaks have been occurring in under-vaccinated populations. During 2019, there were 1,282 reported cases of measles (as of January 27, 2020), which was the largest number reported since 1992. Over 73% of cases were linked to outbreaks in New York.[17] MMR vaccine coverage of 95% is need to achieve community immunity that prevents and contains outbreaks.[18]

Figure 5.17 presents first dose MMR coverage for CT children by age 2 years for children who were born in the years 2013–2014 and 2015–2016. MMR coverage met or exceeded the HP2020 target of 90% for children born in both time periods, although the coverage rate declined from 94.1% for the 2013–2014 birth cohort to 90.0% for the 2015–2016 birth cohort.[19] The decline brought CT further away from the 95% MMR coverage required to achieve community immunity.

Figure 5.18 presents an overview of vaccine coverage for CT adolescents 13 to 15 years during 2015–2018 for four recommended vaccines. The figure also shows how vaccine coverage for CT adolescents compares to national Healthy People 2020 (HP2020) goals. Coverage for the meningococcal conjugate vaccine that protects against meningitis and other serious meningococcal illnesses (seen in orange) has been consistently above the HP2020 target of 80%. This is also true for the Tdap/Td vaccine, that boosts tetanus and diphtheria immunity, which is shown in Figure 18 in green but is mostly obscured by the meningococcal conjugate vaccine since coverage is so similar. In contrast, the percentage of adolescents who are up-to-date with human papilloma virus (HPV) vaccine, which protects against HPV cancers, is considerably below the HP2020 target of 80%. The percentage of adolescents who received seasonal influenza vaccine increased in 2018 but is still below the HP2020 target, which is 70%.

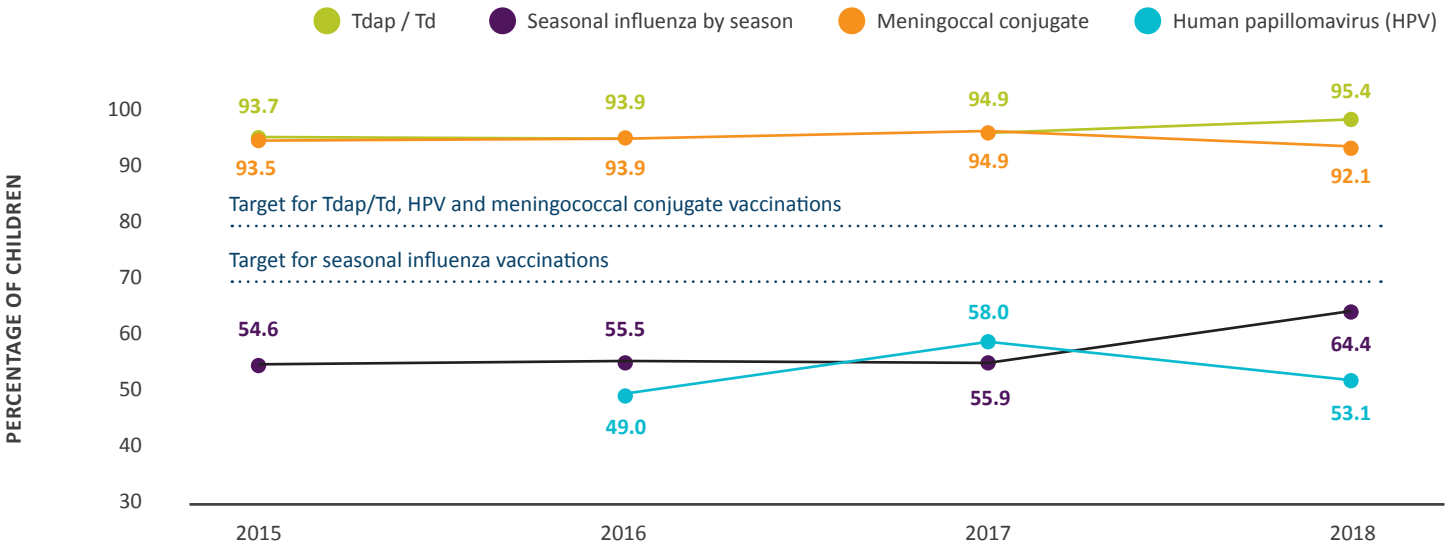
FIGURE 5.17: Percentage of children vaccinated with a first dose of measles, mumps & rubella (MMR) vaccine by 2 years of age by birth cohort, CT, 2013–2014 and 2015–2016



Source: *Centers for Disease Control and Prevention (2019, November, 13), ChildVaxView Interactive! Retrieved from www.cdc.gov/vaccines/imz-managers/coverage/childvaxview/interactive-reports/index.html.*

During 2015-2017, Tdap and meningococcal conjugate vaccinations were required for 7th grade students to attend school in CT, whereas, HPV and influenza vaccines were not. Also, whereas CVP provided Tdap and meningococcal conjugate vaccines to clinicians for immunizing any CT adolescent, privately insured adolescents in CT could not receive CVP-provided influenza vaccine or HPV vaccine before age 11 or after age 12. For the 2020 influenza season, seasonal influenza vaccine will be available to all children through CVP.

FIGURE 5.18: Vaccine coverage among adolescents 13 to 17 years old, CT, 2015–2018



Source: *Centers for Disease Control and Prevention (2019, September 3). TeenVaxView Interactive! www.cdc.gov/vaccines/imz-managers/coverage/teenvaxview/data-reports/index.html. Centers for Disease Control and Prevention (2019, September 3). FluVaxView. Results for General Population Influenza Vaccine Coverage. www.cdc.gov/flu/fluvaxview/interactive-general-population.html.*

LYME DISEASE

Tick-borne diseases are transmitted to humans through the bite of an infected tick. During 2013–2017, Lyme disease was the most commonly reported tick-borne disease in Connecticut, followed by babesiosis and anaplasmosis. Lyme disease is caused by the bacterium *Borrelia burgdorferi* and is transmitted to humans through the bite of infected blacklegged ticks. Early diagnosis and treatment of Lyme disease is important to prevent serious illness from developing.

Ticks live in grassy, brushy, or wooded areas and are most active in warmer months, although they can be active all year long. Outdoor activities are the greatest risk factors for getting sick with Lyme disease, especially doing activities where ticks are most likely to be. Protective measures that limit exposure to ticks on people, pets, and in the yard are crucial to prevent Lyme disease.[20;21]

People can limit exposure to ticks by:

- Using effective insect repellant;
- Treating clothing and gear with permethrin;
- Avoiding wooded and brushy areas with high grass or leaves; and
- Checking for ticks and showering after coming inside.

Limit exposure of pets to ticks by:

- Using effective tick prevention products on pets; and
- Checking pets for ticks.

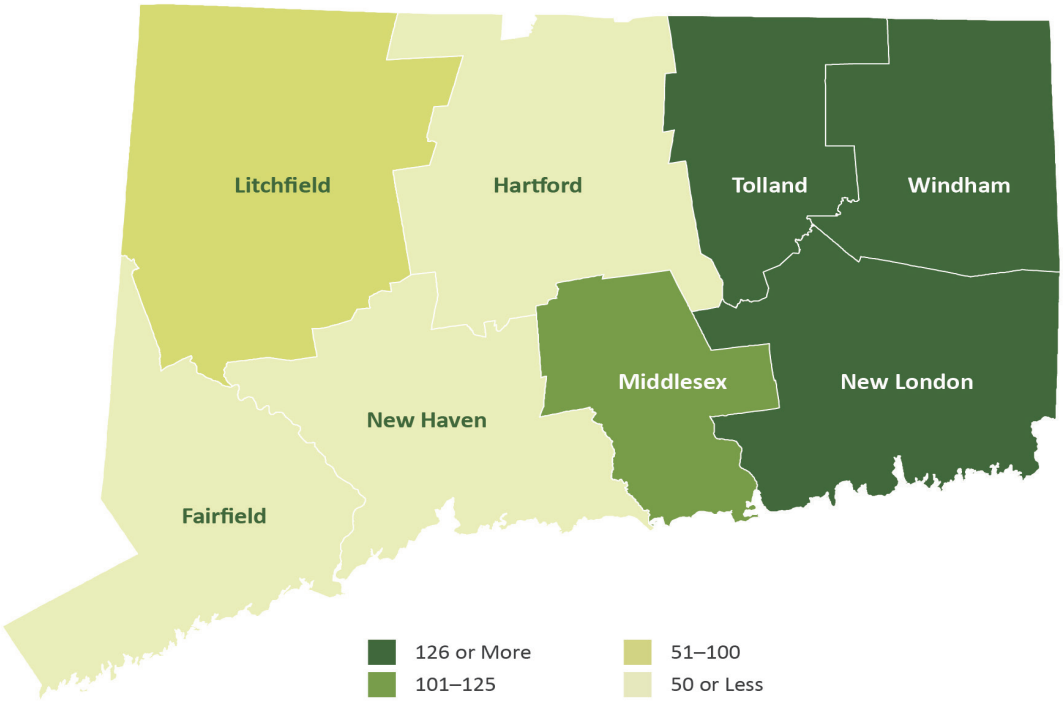
In the yard create a tick-safe zone by doing things like:

- Creating a woodchip or gravel barrier between lawn and wooded areas; and
- Clearing tall grasses and brush.

Unfortunately, although these protective measures are effective in reducing the risk for Lyme disease, people often are reluctant to adopt prevention methods.

The cumulative incidence of reported Lyme disease per 100,000 population by county in CT during 2013–2017 can be seen in **Figure 5.19**. There is considerable difference in the reported incidence of Lyme disease by county during the period with the highest incidence in New London, Tolland and Windham counties in Eastern Connecticut. Potential reasons for the geographical differences in incidence include variation in the numbers of ticks in the environment, environmental modifications made around the home, personal protective measures used by people to avoid tick bites, and variation in diagnostic methods and reporting of Lyme disease cases to CT DPH.

FIGURE 5.19: Cumulative incidence rate of Lyme disease per 100,000 population by county, CT, 2013–2017



Source: *CT DPH Epidemiology and Emerging Infections Program. CT Electronic Disease Surveillance System. Data analyzed March 3, 2019. US Census Bureau, 2010 Census.*

LEGIONELLOSIS

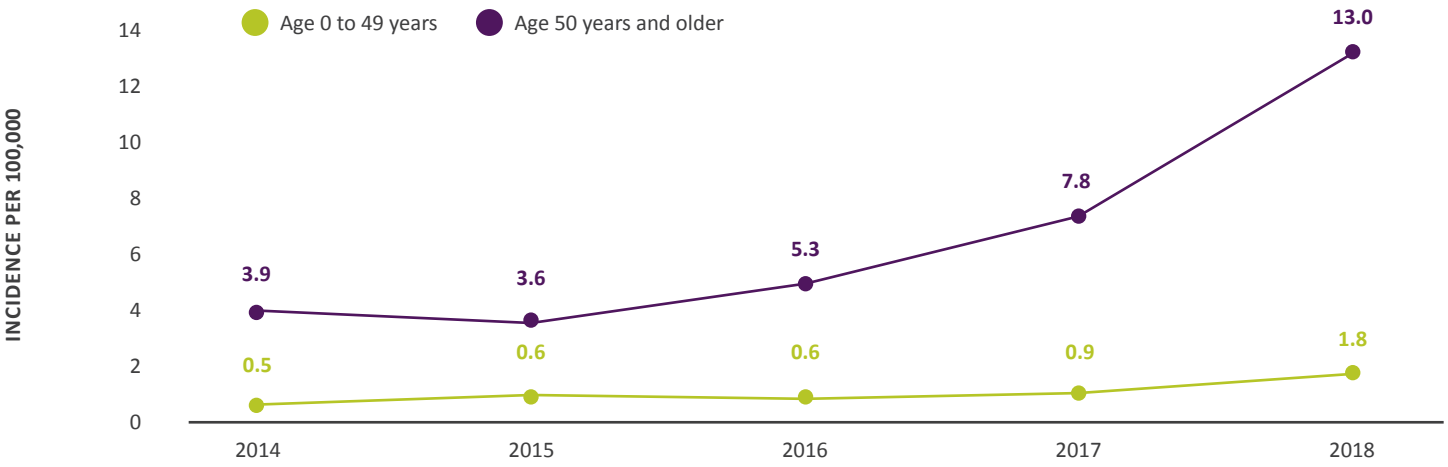
Legionella bacteria live in water and can cause a disease called legionellosis, which includes Legionnaires' disease and Pontiac fever. Legionnaires' disease is a serious type of pneumonia. About one in 10 people who get sick with Legionnaires' disease die from complications of their illness[22] and hospitalization for Legionnaires' disease is estimated to cost more than $33,000.[23]

People can get legionellosis when they breathe in mist or water that contains *Legionella* bacteria. This could happen when someone is exposed to contaminated man-made water systems including cooling towers, domestic plumbing, hot tubs or ornamental fountains. Most healthy people exposed to *Legionella* do not get sick. People 50 years or older, current or former smokers and people with underlying chronic diseases are at higher risk.

Figure 5.20 shows the incidence of legionellosis per 100,000 population in CT during 2014–2018. The incidence of legionellosis increased during this period and was consistently higher in CT residents aged 50 years and over. The difference in incidence between age groups has increased over time. Reasons for increasing legionellosis incidence may include an aging CT population, aging water-system infrastructure, changes in awareness and testing patterns and precipitation (rainfall) weather events. Analysis of legionellosis and precipitation data in Connecticut demonstrated that a one-inch increase in precipitation was associated with 9.5 times increased risk for legionellosis. It is unknown why legionellosis cases increase after a precipitation weather event, but some hypotheses are that rain may disrupt biofilms and release *Legionella* bacteria, or that rain may strain water treatment plants or contaminate ground water sources with *Legionella*.[24]

Connecticut Department of Public Health (CT DPH) provides guidance and oversight to prevent legionellosis in healthcare settings. Cases of legionellosis must be identified and investigated in a timely manner to detect clusters and outbreaks. CT DPH conducts centralized follow-up on all confirmed legionellosis cases. If people with legionellosis report common sources of exposure, for instance having been treated at the same healthcare facility or bathing in the same hot tub, a multidisciplinary investigation team from CT DPH may work together to identify and control the environmental sources of Legionella to prevent additional cases of disease.

FIGURE 5.20: Incidence rate of Legionellosis per 100,000 by age group, CT, 2014-2018



Source: *CT DPH Epidemiology and Emerging Infections. CT Electronic Disease Surveillance System. Data analyzed 11/25/2019. US Census Bureau. 2010 Census.*

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