Division of Communicable Disease Control

Annual Report

2016

Center for Infectious Diseases

California Department of Public Health

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Introduction

Dear Reader,

Communicable diseases place an enormous burden on the health of the people of California. In 2016, there were approximately 20 million cases of illness due to diseases overseen by the Division of Communicable Disease Control (DCDC). These diseases also caused more than 10 million chronic infections and approximately 10,000 deaths. In responding to these diseases, the more than 400 professional staff at DCDC conducted more than 60,000 laboratory tests, processed approximately 350,000 disease reports, responded to more than 140 outbreaks, and carried out a wide range of preventive activities. In addition, during 2016, DCDC played a central role in the statewide response to the Zika epidemic in the Americas. DCDC collaborated with other programs in CDPH, local health departments, local vector control agencies, and many other partners to provide diagnostic laboratory testing, monitor disease, provide training, develop response plans, and prevent Zika disease in California.

DCDC monitors, prevents, responds to, and develops policy on over 80 infectious diseases for the State of California. These diseases range from the rare, like hantavirus, to the common, like influenza and include conditions with special importance like those due to bioterrorism agents. Monitoring disease is the first step in protecting the public. Disease monitoring data guide DCDC staff as they take action to prevent and control disease. DCDC also monitors important animal and insect vectors that carry disease. DCDC houses the state infectious disease laboratories, which monitor diseases through laboratory testing. DCDC laboratories help to identify emerging threats, like Ebola, detect disease clusters, like enteric disease, and characterize pathogens, like drug-resistant tuberculosis. During the Zika response, DCDC laboratories provided diagnostic testing for the entire state until other public health laboratories developed the capability and commercial testing became available. In 2016, the Viral and Rickettsial Diseases Laboratory conducted more than 11,000 Zika tests.

In order to monitor disease, DCDC depends on different partners to report disease, including local health departments, laboratories, and health care providers around the state. DCDC supports a statewide web-based disease reporting system called the California Reportable Disease Information Exchange (CalREDIE) to enable rapid electronic reports of cases. In 2016, 90% of all reports from laboratories were received through electronic lab reporting (ELR). ELR enables more rapid, accurate, and complete reporting of disease and thus, faster recognition of public health problems. CDPH and local health departments also depend on reports of cases from health care providers, including astute recognition of unusual cases, outbreaks, and other public health problems.

DCDC works with local health departments to analyze disease monitoring data and identify problems that require action to protect public health. Working with local health departments, other state partners, and national agencies, DCDC takes actions to respond to public health issues. DCDC actions include developing and disseminating guidelines, supporting local disease control efforts, informing the public about disease threats, providing laboratory testing, and providing expert consultation. Also, before communicable disease events occur, DCDC prepares by conducting emergency planning and exercises, training specialized and expert staff, and continually improving laboratory capacity.

DCDC uses disease monitoring data to guide disease prevention activities. These include promotion of vaccination, public education, health care provider education, support for vector control activities, and support for testing and treatment of STDs, viral hepatitis, and tuberculosis. DCDC also promotes effective policies, healthy behaviors, and health care efforts to prevent disease.

We work in an rapidly changing environment, particularly in the areas of health care delivery, information technology, and laboratory technology. For example, as technology develops in diagnostic testing, fewer cultures are being done, which are often needed to link related cases together to recognize an outbreak. Whole Genome Sequencing is allowing for links to be seen among cases in a way not possible in the past – conversely it also allows us to better see when cases aren't related. New information technology creates possibilities for more complete and faster reporting of infectious diseases from electronic health records. Changes in technology require those of us working in public health to continually adapt and learn. We must keep our laboratory, information, and analytic tools up to date. As you will read, DCDC implemented significant updates in the CalREDIE disease monitoring system and the California Immunization Registry (CAIR). DCDC laboratories have been expanding the use of gene sequencing technologies. DCDC programs have also been working with new partners in the changing healthcare landscape.

In this document, we provide a high level overview of communicable disease issues in California. This report supplements more detailed annual reports issued by individual DCDC programs. We have also highlighted some special topics which are particularly relevant recently. For partners reading this report, we value and appreciate your continued support and work to make California a healthier place to live.

James P. Watt, MD, MPH

Chief, DCDC

Purpose and Structure of the Report

The purposes of this report are:

1) To summarize cases, hospitalizations, and deaths for infectious diseases reported to DCDC
2) To estimate the community burden of infectious diseases (including unrecognized cases) that DCDC tracks
3) To summarize DCDC activities across the different programs and laboratories

As release of infectious disease surveillance data from DCDC programs already occurs regularly, this report provides a broader integration and summary of data. We will cover the following infectious disease areas in separate sections:

1) Vaccine-preventable diseases
2) Viral hepatitis
3) Sexually-transmitted diseases
4) Tuberculosis
5) Enteric diseases
6) Vector-borne diseases
7) Other infectious diseases
8) Laboratory testing

Other divisions in CDPH are responsible for healthcare-associated infections (HAIs) and HIV infection.

Within most sections, we highlight infectious diseases that require additional attention because they cause high burden of disease, are emerging threats, or have other special features. This report includes data from 2016.

Summary of Reported Diseases and Burden of Disease in the Community

Approximately 360,000 cases of infectious diseases were reported to DCDC in 2016. By far, sexually-transmitted diseases are the most commonly reported infectious disease, with over 280,000 cases reported in 2016 (Table 1). Viral hepatitis, which includes hepatitis A, B, and C, was the second most commonly reported group of diseases, followed by enteric diseases. DCDC also works to monitor and control diseases that are not individually reportable, some of which are very common, like influenza.

Table 1: Reported Cases of Communicable Disease in California, by Disease Category, 2016.

Disease Category	Number of Reported Cases
Sexually Transmitted	280,845
Viral Hepatitis[1]	44,282
Enteric	20,490
Other	7,232
Vaccine Preventable[2]	2,188
Tuberculosis	2,062
Vector-borne	1,615
Total	**358,714**

[1]Includes some 2015 data.
[2]Does not include influenza and other infections that are not reported to CDPH.

To understand the actual burden of disease in the community, CDC and other experts have created estimates for selected diseases using a variety of data, including number of reported cases, healthcare utilization surveys, studies of provider practices, laboratory test performance, and expert elicitations. These data help to adjust for multiple factors, including ill patients not accessing the healthcare system and underreporting.

Based on published estimates among selected diseases, an estimated 20.4 to 23.6 million cases of acute and chronic infectious diseases that DCDC works to control are occurring in California every year (Table 2). Taking into account the California population of 2016, this estimate translates into 1 illness for every 2 Californians every year. This number of cases is likely an underestimate, because only the most common diseases are included in the estimate. This estimate only includes those diseases that DCDC works to address.

Of the common acute diseases tracked by DCDC , foodborne illnesses are likely the most common, estimated to occur in 1 in 6 Californians, followed by influenza and sexually-transmitted diseases . Among the two most common reported causes of death owing to an infectious disease in California, influenza and foodborne illness, cause an estimated 1,760 to 7,160 deaths every year in California. The methods for these disease burden estimates are described in the disease-specific sections.

Table 2: Major Contributing Diseases to Acute Infectious Disease Morbidity and Mortality in California, 2016.

Disease Type	Estimated New Cases	Estimated Deaths
Foodborne	5,760,000	360
Influenza	1,100,000 – 4,300,000	1,400 – 6,800
Sexually Transmitted (chlamydia, gonorrhea, syphilis)	787,000	--
Total	**7,647,000 – 10,847,000**	**1,760 – 7,160**

Several infectious diseases are a result of chronic infection, and most of these chronic infections do not cause symptoms when a person is first infected. Therefore, identifying when a person first becomes infected is often not possible, and a person might be diagnosed years after infection. Looking at the prevalence of a disease,

namely how many people in a population are infected with a disease at any one point in time, is another way to look at the burden caused by a disease. Of the common chronic infectious diseases with estimates available, human papilloma virus (HPV) is likely the most common, estimated to occur in 1 in 4 Californians, followed by latent tuberculosis and chronic viral hepatitis. Liver cancer and cirrhosis due to viral hepatitis is the most common reported cause of death from a chronic infectious disease in California, which is likely underreported, followed by HPV-associated cancers and tuberculosis (Table 3).

Table 3: Major Contributing Diseases to Chronic Infectious Disease Morbidity and Mortality in California, 2016.

Disease	Estimated Chronic Cases	Estimated Deaths
Sexually Transmitted (HPV)	9,600,000	(HPV-associated cancers) 975
Tuberculosis	(infections) 2,300,000	210
Viral Hepatitis	845,977	>3,254
Total	**12,745,977**	**>4,439**

Vaccine Preventable Diseases

Vaccine preventable diseases (VPDs) are infectious diseases for which an effective preventative vaccine exists. Because of vaccination, this group of diseases has declined dramatically since the pre-vaccine era. Over the years, vaccines have prevented countless cases of disease and saved millions of lives.

Influenza

Influenza viruses cause widespread respiratory disease among persons of all ages and can cause severe complications and death, particularly among older people, young children, and people with certain health conditions. In California, infections from novel strains of influenza, influenza-associated deaths among persons <65 years of age, and influenza outbreaks are reportable to public health agencies. Influenza was likely the most commonly occurring VPD in California in 2016. Many cases of influenza are not seen by healthcare providers and once influenza season has begun, healthcare providers often diagnose influenza based on clinical symptoms and do not send potential cases of influenza for confirmation by testing. Because of these factors, estimation techniques are needed to understand the burden of influenza in the community.

DCDC monitors several things to assess influenza activity , including:

- Outpatient visits for influenza-like illness (ILI) reported by volunteer sentinel providers (community physicians, nurses, physician assistants)
- Hospitalizations for pneumonia and influenza at Northern California Kaiser Permanente facilities
- Influenza-associated hospitalizations reported to the California Emerging Infections Program (Alameda, Contra Costa, and San Francisco counties)
- Detections of influenza virus infections at public health laboratories and sentinel clinical laboratories
- Influenza-associated intensive care unit admissions and fatalities in persons <65 years of age
- Influenza-associated outbreaks

Cases and Trends

One important source of influenza data is a network of laboratories around the state that test for influenza and report data to DCDC. This system enables DCDC to track the percent of specimens testing positive to monitor the trend of the influenza season, and to determine the types and subtypes of circulating influenza viruses. This helps to determine whether circulating strains are covered by the influenza vaccine for the

season and identify significant antiviral resistance. Below is a summary of laboratory monitoring data for the 2015/6 season (Table 4).

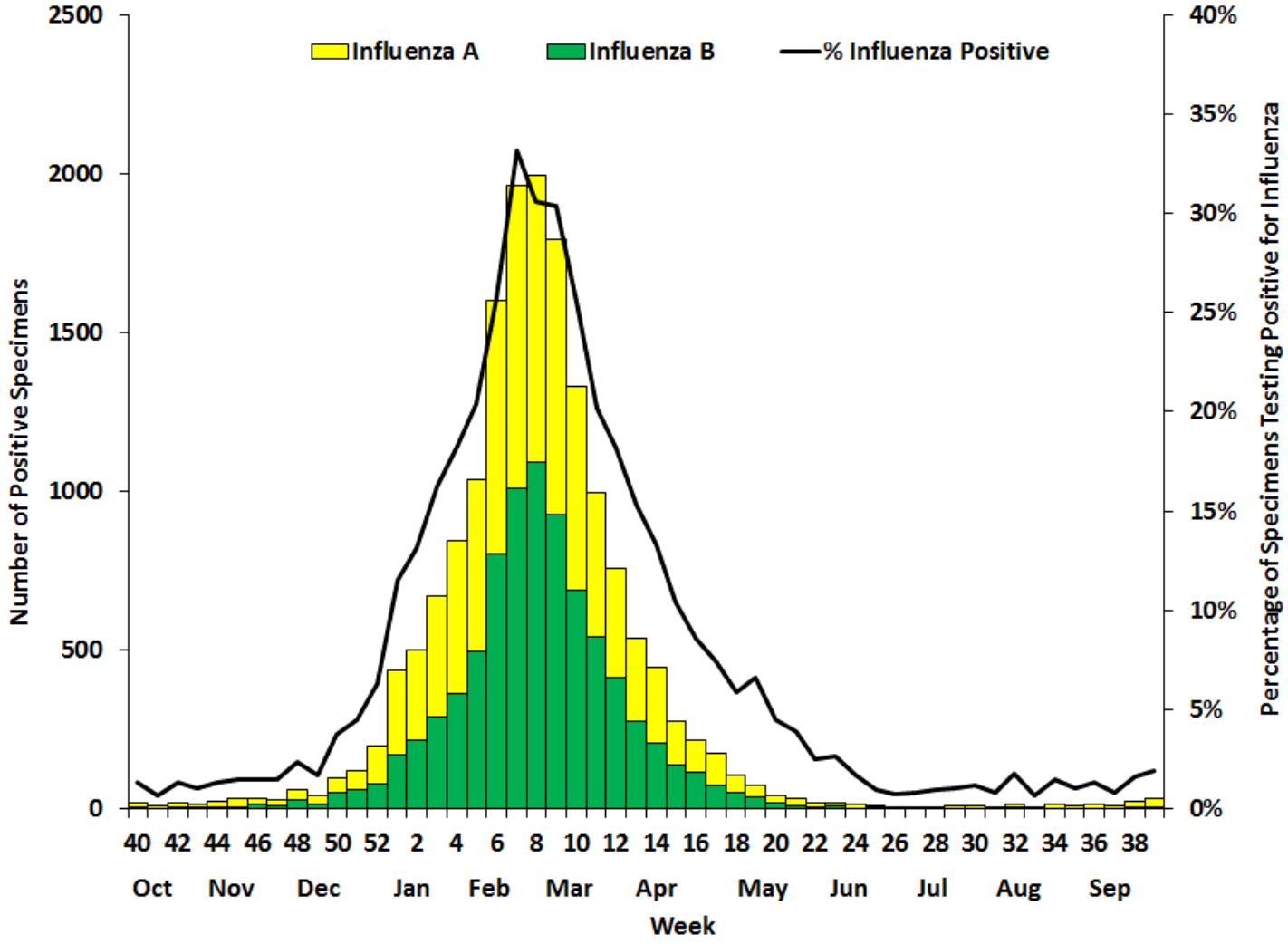
Table 4: Respiratory Specimens Testing Positive for Influenza by Influenza Type and Subtype – Respiratory Laboratory Network and Sentinel Laboratories, for 2015 – 2016 Influenza Season.

Influenza Type/Subtype	Number of Specimens
Total Specimens Tested	122,912
Influenza Positive–All Types	16,745
Type Influenza A	8,503
Subtype A (H3N2)	777
Subtype 2009 A (H1N1)	1,453
Subtype A, not subtyped	6,273
Type Influenza B	8,242
Subtype B Victoria	350
Subtype B Yamagata	698
Subtype B, not lineage-typed	7,194

Several important conclusions can be drawn from laboratory and clinical monitoring data:

- Influenza occurs year-round, but most of the disease activity occurs during October through May, usually peaking in January or February.
- During most recent seasons, influenza A viruses, either influenza A (H3N2) or 2009 A (H1N1), have predominated, with a peak in the mid-winter.
- Influenza B viruses also circulate and have had a smaller peak in the late-winter and spring.
- Influenza activity in California during the 2015-2016 season, as measured by most clinical and laboratory parameters, was more moderate compared with previous seasons. Influenza activity in California began increasing in late December and peaked in mid-February (Figure 1). No novel influenza viruses were detected in California during the 2015–2016 influenza season.
- The 2015–2016 influenza season was unusual because influenza A and B viruses circulated at about the same time and level throughout the season.

Figure 1: Percentage of specimens testing positive for influenza and influenza type in Respiratory Laboratory Network and Sentinel Laboratories, 2015–2016.



Burden Estimates

Influenza causes a very large number of cases of illness in the community. Because the great majority of persons with influenza are not conclusively diagnosed, either because they do not seek health care or do not need laboratory testing, the disease burden in the community cannot be measured by disease reporting. Estimates of the actual number of cases in the community created by CDC can be used to better understand the impact of influenza.

- Estimated number of influenza cases in the United States (2015-2016 season): 9.2–35.6 million
- Estimated number of influenza cases in California (2015-2016 season): approximately 1.1–4.3 million[1]

[1] California cases were estimated by applying the proportion of the U.S. population residing in California to the national estimates for influenza cases (https://www.cdc.gov/flu/about/disease/burden.htm).

Deaths

- 155 influenza-associated deaths in persons <65 years of age were reported in California during the 2015-2016 season. Influenza-associated deaths are only reportable in persons <65 years of age in California.
- The number of influenza-associated deaths annually across California cannot be measured by case reporting because the contribution of influenza to death is often not identified. Therefore, estimates of deaths due to influenza have been made:
    - Estimated number of deaths (all ages) associated with influenza in the United States: approximately 12,000–56,000.
    - Estimated number of deaths (all ages) associated with influenza in California: approximately 1,400–6,800.[2]

Other Vaccine-preventable Diseases

DCDC receives reports of individual cases of selected VPDs (Table 5).

Cases and Trends

Table 5: Reported Cases of Vaccine Reportable Disease in California, 2016.

Disease	Number of Reported Cases
Pertussis	1938
Mumps	94
Meningococcal Disease	82
Varicella*	48
Measles	24
Haemophilus influenzae, type b**	1
Tetanus	1
Diptheria	0
Rubella	0
Congenital rubella syndrome	0
Poliovirus infection	0
Total	**2188**

*Hospitalizations and deaths only.
**In children <5 years of age.

- Although pertussis was the VPD most commonly reported to DCDC in California during 2016, influenza was likely the most commonly occurring VPD in the community.

[2] California deaths were estimated by applying the proportion of the U.S. population residing in California to the national estimate for influenza deaths (https://www.cdc.gov/flu/about/disease/burden.html).

- The 1,938 cases of pertussis reported in California during 2016 represented a decrease in California relative to 2014 and 2015.
- The number of pertussis cases is cyclical with peaks every 3 to 5 years. In 2014, California experienced an epidemic of pertussis that caused over 11,000 reported cases, including 3 infant deaths. That was the highest number of pertussis cases reported in California in over 60 years.
- One factor thought to be associated with the increasing size of cyclical epidemics of pertussis is the use of acellular pertussis vaccines. These vaccines provide short-lived protection compared to whole cell vaccines that were used previously.

Outbreaks

- In 2016, 26 outbreaks of vaccine preventable disease were reported to CDPH. DCDC staff investigated over 20 of these outbreaks.

Deaths

- With the exception of influenza, deaths due to VPDs are rare due to widespread vaccination. In 2016, 13 deaths associated with VPDs were reported due to pertussis (2), meningococcal disease (9), and varicella (2).

Highlight: School Vaccination

Immunization requirements for school entry help protect children and communities from vaccine-preventable diseases. Each autumn, schools are required to report the immunization status of their students to CDPH.

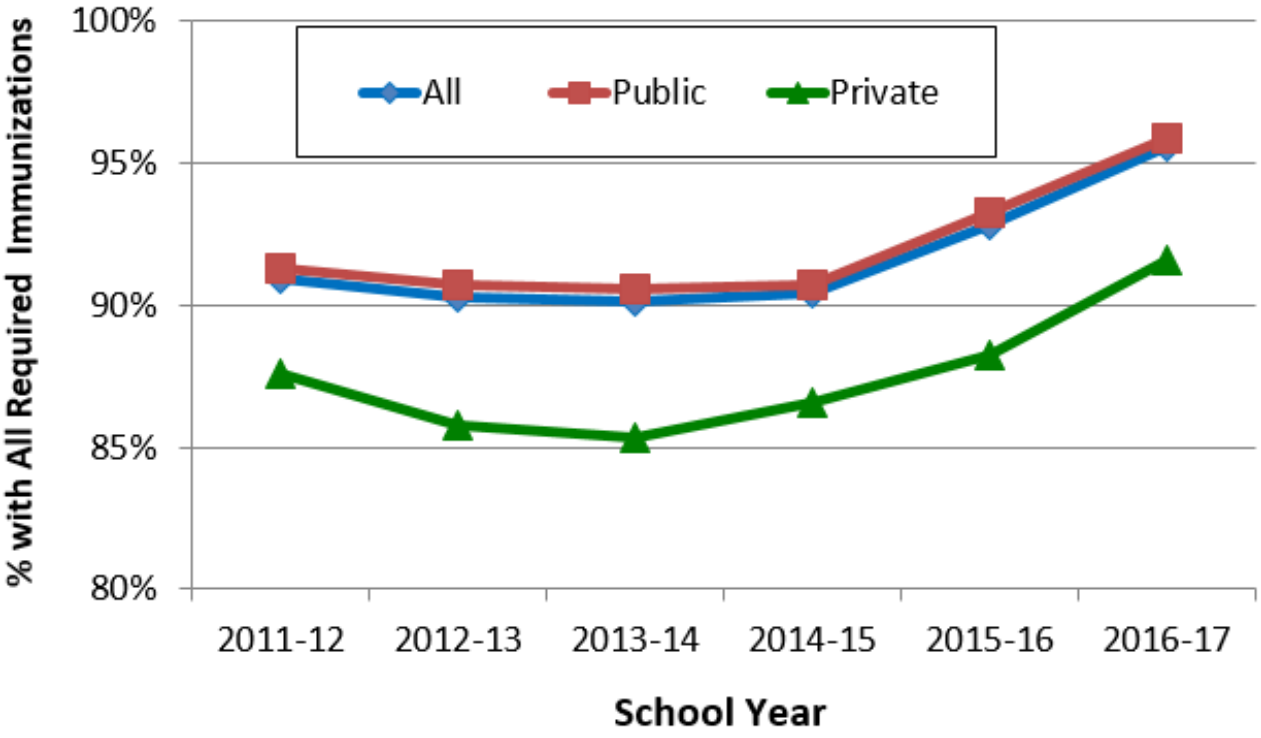
Reporting laws have changed recently. In 2014 and 2015, Assembly Bill (AB) 2109 required providers to document that information on vaccination and VPDs was given to parents seeking exemptions to required immunizations based on personal beliefs. For the 2016-2017 school year, Senate Bill (SB) 277 no longer permitted entrants to receive personal beliefs exemptions.

During the 2015-2016 and 2016-2017 school years, many public health departments in California assisted schools in correctly identifying and supporting eligible students, described as conditional entrants, who catch up with immunization requirements after entry.

Trends

- Compared to the 2015-2016 school year, the proportion of students attending kindergarten in 2016-2017 reported to have received all required vaccines rose from 92.8% to 95.6%, a 2.8% increase. This was also a 5.2% increase compared with the 2014-2015 school year (Figure 2).
- Kindergarten vaccination rates rose to the highest level in 15 years. The 2016-2017 rate is the highest reported for the set of immunization requirements for kindergarten that began in the 2001-2002 school year.

Figure 2. Percentage of Kindergarten Students with All Required Immunizations, by School Type and School Year, 2011-2012 to 2016-2017.



Highlight: Human Papilloma Virus

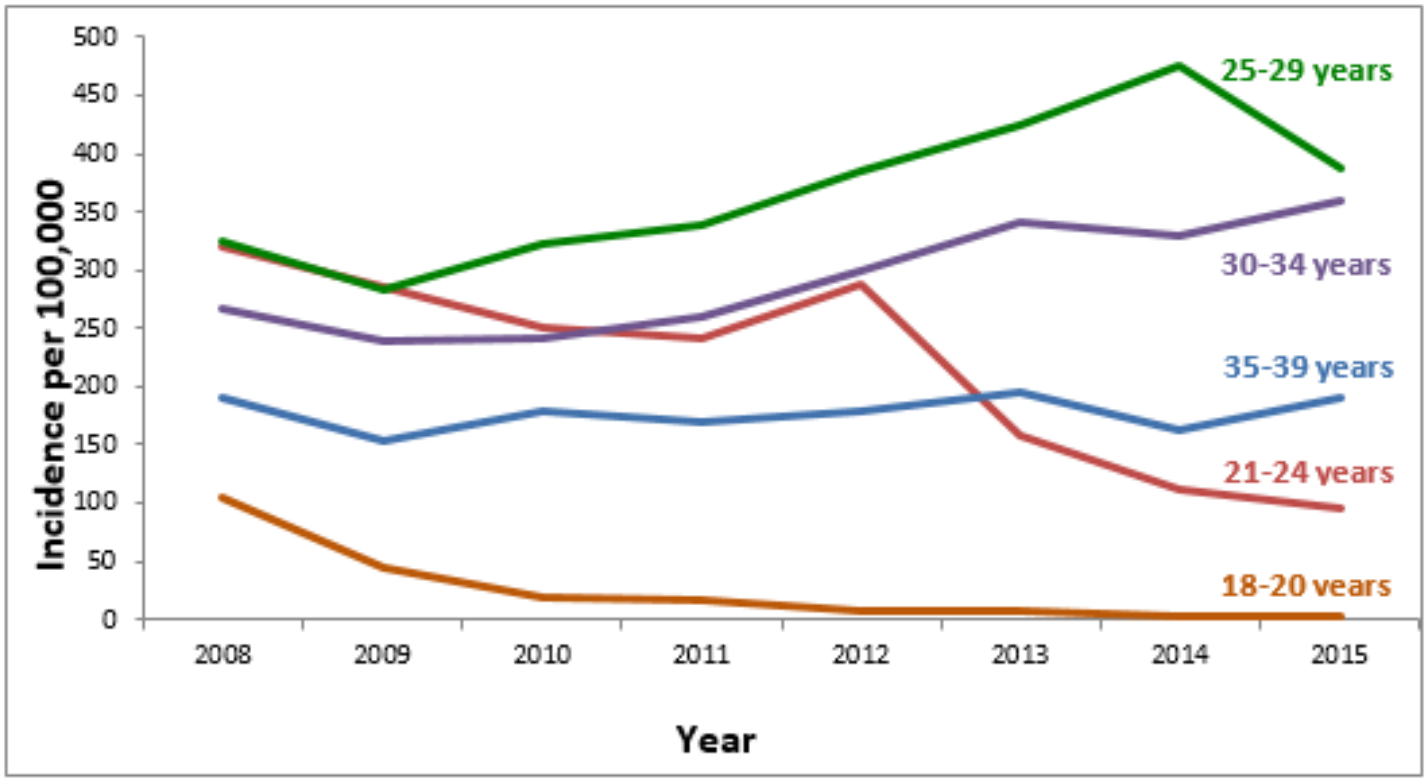
Human papilloma virus (HPV) is the most common sexually transmitted pathogen in the United States.[3] Nearly all men and women will be infected with at least one type of HPV at some point in their lives. While most HPV infections resolve on their own, some infections with high-risk HPV types will progress to cancer. HPV vaccination prevents most HPV associated cancers from occurring. However, to be effective, HPV vaccine must be given before infection. The best time to give HPV vaccine is before onset of sexual activity**.** HPV infection is not currently a reportable condition.

[3] Satterwhite CL, Torrone E, Meites E, Dunne EF, Mahajan R, Ocfemia MCB, Su J, Xu F, Weinstock H. (2013). Sexually Transmitted Infections Among US Women and Men. *Sexually Transmitted Diseases.* 40.3: 187-93.

Estimated Burden and Estimated Deaths

- About 80 million people[3]—about one in four—currently have HPV infection in the United States.
- In the United States, HPV causes an estimated 30,700 cancers[4] in men and women including cancers of the cervix, vagina, vulva, penis, anus, and throat.
- Every year in CA, HPV causes an estimated 5,200 cancers[5] in both men and women. There are an estimated 975 deaths from HPV-associated cancers in California, including more than 470 deaths[6] from cervical cancer.
- CDPH is partnering with the California Emerging Infections Program to monitor the impact of HPV vaccine in Alameda County. Since surveillance began in 2008, rates of HPV-associated cervical pre-cancer are declining in adult women, aged 18-24, who were age-eligible to have been vaccinated when younger (Figure 3).

Figure 3: Rates of Cervical Pre-Cancer in Adult Women Living in Alameda County, California, 2008-2015.



[4] CDC HPV page (https://www.cdc.gov/hpv/parents/vaccine.html)

[5] This was calculated by applying the HPV-attributable cancers by site, published by CDC (https://www.cdc.gov/cancer/hpv/statistics/cases.htm) to the site-specific cancers reported by the CA Cancer Registry in the American Cancer Society's "California Cancer Facts and Figures 2017" report (https://www.cdc.gov/cancer/hpv/statistics/cases.htm)

[6] Calculated by applying the percent of cancers attributable to HPV to the CA Cancer Registry data.

Prevention

- HPV vaccination could prevent about 4,500 cancers in California from occurring each year.
- In 2016, 60 percent of US teens aged 13-17 years received one or more doses of HPV vaccine. Three doses are recommended for the best protection (2016 CDC National Immunization Survey-Teen).
- For every 1,000 adolescents that receive the HPV vaccine, 7 cases of cervical cancer could be prevented.

Viral Hepatitis

Viral hepatitis is a liver infection caused by a virus. Hepatitis A, B, C, D, and E viruses can all cause viral hepatitis. Illness or infection due to these viruses are required to be reported to public health departments. Infections with hepatitis B and hepatitis C can lead to long-term (chronic) disease, including liver disease, liver cancer, or liver failure; hepatitis A does not cause chronic illness but can be fatal in rare instances, such as in persons with underlying liver disease.

Hepatitis A is transmitted when an infected person's stool enters the mouth of a person who isn't immune to hepatitis A. This can occur by eating contaminated food, drinking a contaminated drink, and through person-to-person contact. Hepatitis A can be prevented by vaccination.

Hepatitis B can be transmitted through sexual contact; from mother to baby during birth; sharing needles, syringes, or other injection drug equipment; getting stuck by a needle or a sharp instrument at work; or inadequate infection control in healthcare settings. Acute hepatitis B is a short-term illness that occurs within the first 6 months after someone is exposed to the hepatitis B virus. If hepatitis B virus remains in a person's body, it can lead to chronic infection. Chronic infection can be treated but not cured. Hepatitis B infection can be prevented by vaccination. Asians and Pacific Islanders are disproportionately affected by chronic hepatitis B infection in California and nationwide. Foreign-born persons account for the vast majority of prevalent chronic hepatitis B cases in the United States.

Hepatitis C can be transmitted through sharing needles, syringes, or other injection drug equipment; receiving unscreened blood or blood products (all blood products in the U.S. have been screened for hepatitis C since 1992); getting stuck by a needle or sharp instrument at work; inadequate infection control in healthcare settings; from mother to baby during birth; or rarely, through sexual contact. People with HIV are at higher risk for transmitting hepatitis C through sexual contact. Infection can be acute, but is more likely to be chronic. Hepatitis C infection can be cured.

CDC estimates that at any one point in time, there are 3.5 million people living with hepatitis C infection in the United States. Identifying when a person becomes infected is often not possible, as most people who are infected with hepatitis C don't have any symptoms. A person might be diagnosed many years after infection and therefore, the year a hepatitis C infection is newly reported might not be the year the infection occurred. In addition, people who inject drugs, who make up most of new hepatitis C infections, often do not seek

healthcare because of stigma related to drug use and poor access to healthcare. The case counts for hepatitis C are therefore also likely to be underestimates.

Cases and Trends

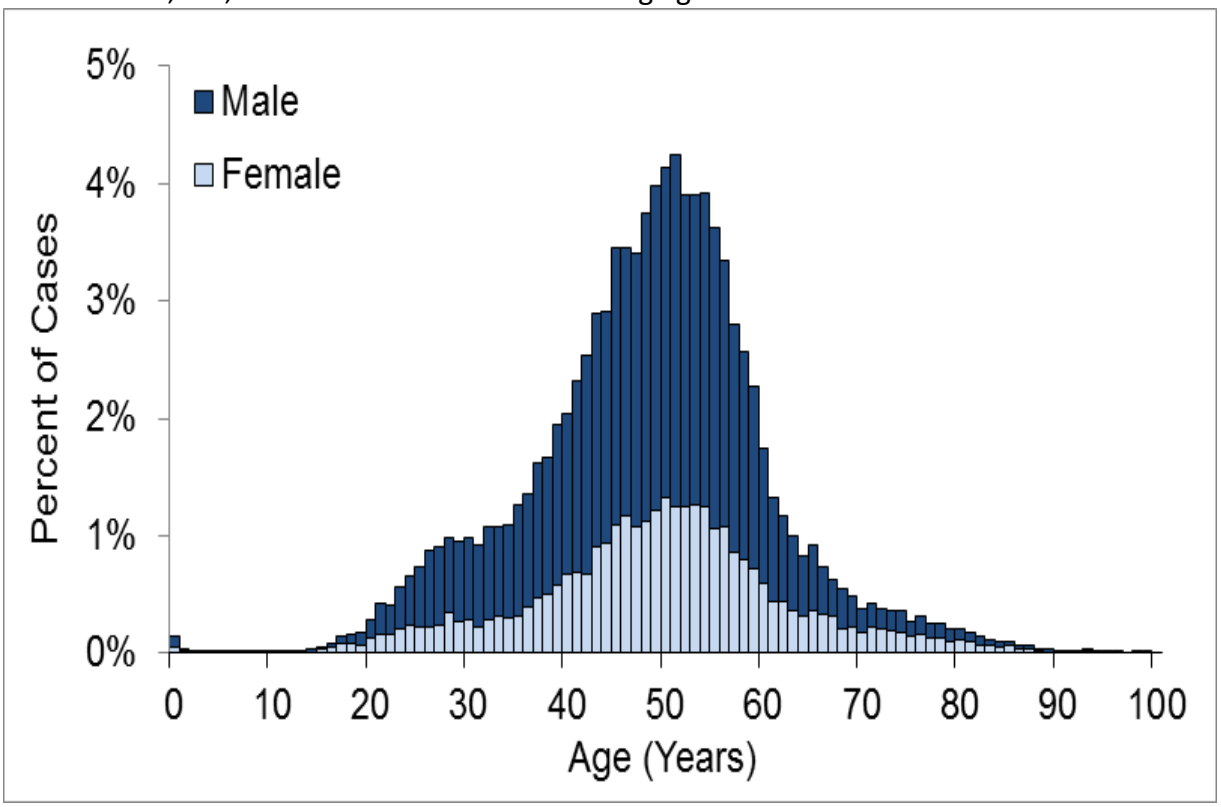
- Hepatitis A:
    - Transmission of hepatitis A in California and the United States has declined by more than 95% from the pre-vaccine era before 1995 to now due to widespread childhood vaccination.
    - Reported hepatitis A cases during 2012 – 2016 ranged from a low of 146 cases in 2014 to a high of 254 cases in 2013.
    - In 2016, 232 cases of hepatitis A were reported in California. No deaths were reported.
- Hepatitis B:
    - Transmission of hepatitis B in California has declined due to widespread vaccination of children and persons at risk of transmission. Most newly reported chronic hepatitis B is in persons infected many years in the past or in another country.
    - Acute: In 2016, 118 acute hepatitis B cases were reported to CDPH. Rates of acute HBV infection in California decreased from 0.7 cases (n=252) per 100,000 population in 2010 to 0.3 cases (n=118) per 100,000 population in 2016 as a result of childhood vaccination.
    - Chronic: The rate of newly reported chronic hepatitis B infection in California increased 10 percent between 2012 and 2016, from 22.5 to 24.8 per 100,000 persons. California has the largest burden of chronic hepatitis B in the United States, with more than 287,000 cases reported to CDPH since reporting began in 1989.
    - In 2016, there were 337 deaths attributed to Hepatitis B in California, based on CDC's WONDER reporting system, which uses death certificates to track hepatitis-related deaths.
- Hepatitis C:
    - Acute: In 2016, a total of 76 acute hepatitis C cases were reported to CDPH, for a rate of 0.19 cases per 100,000 population.
    - Chronic:
        - From 1994 to 2015, 597,861 chronic hepatitis C cases were reported to CDPH; this includes cases that are living and some that may have died.
        - The rate of newly reported chronic hepatitis C infection in California increased 5.5 percent between 2011 and 2015, from 81.9 to 86.4 per 100,000 persons.

- A growing percentage of newly reported chronic hepatitis C cases in California are likely due to recent transmission. Although people born during 1945-1965 ("baby boomers") had the highest rates of newly reported chronic hepatitis C infection in 2015 and made up more than half of newly reported cases, cases among young adults under 30 years of age are increasing (Figure 4). From 2007 to 2015, rates increased 40 percent among males aged 15-19 and 55 percent among males ages 20-29. Rates of newly reported cases of chronic hepatitis C among females aged 20-29 increased by 37 percent, raising concerns that young women who are not treated and cured of their hepatitis C infection before they become pregnant could transmit hepatitis C to their infants at birth.
- These data are consistent with increases in hepatitis C across the country in the wake of the nationwide opioid epidemic. Sharing of injection drug use equipment among young adults increases their risk of hepatitis C infection.
- Prevention strategies, including access to sterile syringes and safe injection equipment and treatment for opioid use disorders, can reduce the rate of new hepatitis C infections, among young people who inject drugs, by 60 percent.[7]

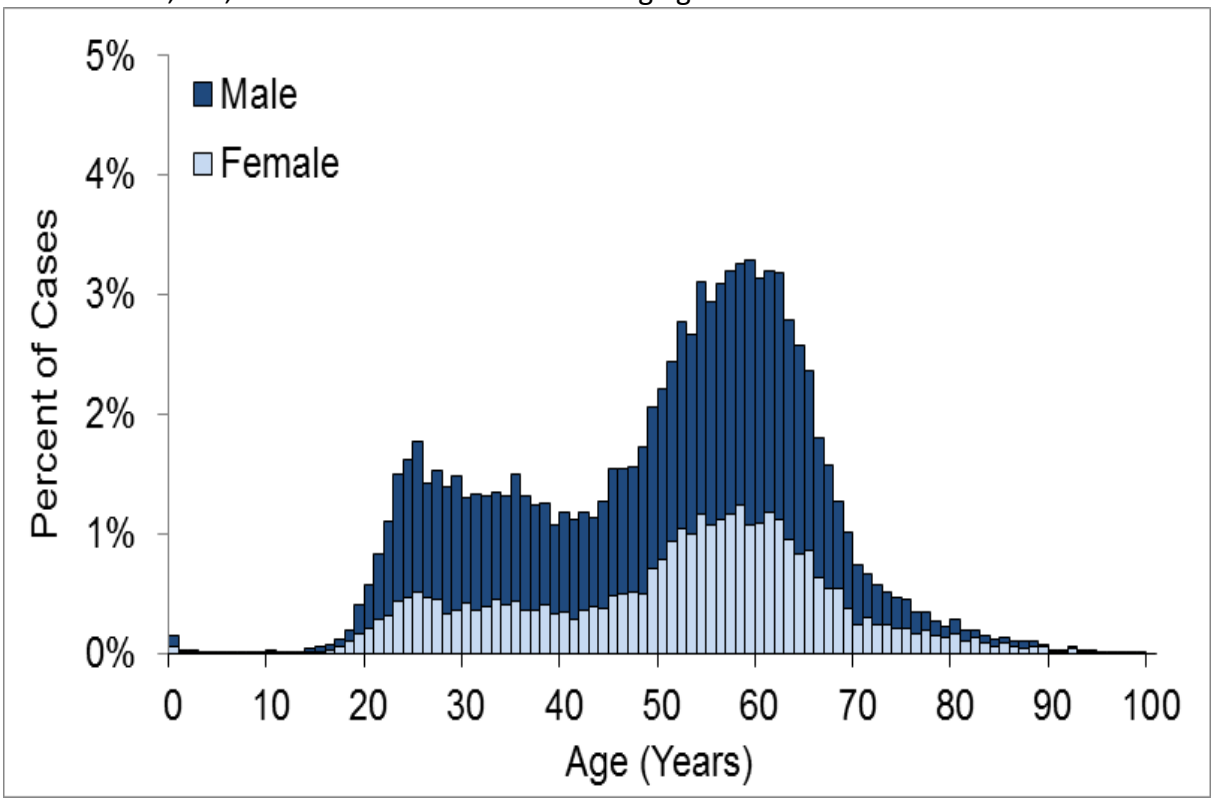
[7] Tsui J, Evans J, Luma P, et al. Association of Opioid Agonist Therapy with Lower Incidence of Hepatitis C Virus Infection in Young Adult Injection Drug Users. JAMA Intern Med., Oct 2014(E1-E8).

Figure 4. Chronic Hepatitis C – Age and sex distribution of newly reported cases in California, 2007 and 2015

2007: N = 41,037; excludes 547 cases with missing age or sex information.



2015: N = 33,454; excludes 294 cases with missing age or sex information.



[†] N = 33,454; excludes 294 cases with missing age or sex information.

- In 2016, there were 2,917 deaths attributed to Hepatitis C in California, which is also based on CDC's WONDER reporting system.
- Death counts are also likely underestimates because death certificates list hepatitis C as a cause of death in only 19% of deaths related to hepatitis C.[8] How well hepatitis C is reported on death certificates in California is not known and is probably different depending on location.

Burden Estimates

- Hepatitis B: CDPH estimates that there are at least 445,277 people with chronic hepatitis B infection living in California (Table 6). This estimate was calculated as follows: Population estimates of the number of foreign-born persons in California, by country or region of origin and literature on regional and country-specific hepatitis B prevalence throughout the world were combined with estimates of hepatitis B prevalence among U.S.-born persons to estimate the minimum chronic hepatitis B prevalence in California.

- Hepatitis C: In 2017, the Center for Disease Analysis (CDA) and Emory University completed independent estimates of the prevalence of chronic hepatitis C infections in California. CDA estimated that there are 376,900 people living with chronic hepatitis C infection with detectable virus circulating in their blood in California. Emory estimated there were approximately 424,575 people living with chronic hepatitis C infection in California. The midpoint of the CDA and Emory University estimates suggests there are approximately 400,700 individuals living with chronic hepatitis C infection in California (Table 6).

Table 6: Estimated Number of People Living with Chronic Hepatitis B and C in California, 2015.

Disease	Estimated Number of People
Chronic Hepatitis B*	445,277
Chronic Hepatitis C	400,700

* Source: Viral Hepatitis Situational Analysis – California, 2017. Prepared by the Division of Communicable Disease Control, Center for Infectious Diseases, Sexually Transmitted Diseases Control Branch, Office of Viral Hepatitis Prevention, October 2017.

Outbreaks

- No confirmed outbreaks of hepatitis A virus (HAV), hepatitis B virus (HBV), or hepatitis C virus (HCV) infection were reported in California in 2016.

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[8] Mahajan R, Xing J, Liu SJ, et al. 2014. Mortality among persons in care with hepatitis C virus infection: The Chronic Hepatitis Cohort Study (CheCS), 2006–2010. *Clinical Infectious Diseases.* 58:1055–61.

Sexually Transmitted Diseases

Sexually transmitted diseases (STDs) are caused by bacteria, viruses, and other organisms. They are very common, often do not have symptoms, and are preventable. Some STDs can be treated and cured, while others result in lifelong infections. Untreated STDs can lead to serious health problems, such as pelvic inflammatory disease, infertility, cancer, and death. Untreated STDs may also increase the risk of being infected with another STD, including HIV.

Cases, Disease Burden Estimates, and Trends

- Similar to many infectious diseases, especially those diseases which might not result in symptoms, persons with STDs often do not know they are infected or seek healthcare. Even if persons with STDs are diagnosed, they might not be reported. Therefore, estimates of the actual burden in the community is important to understand the impact on the community.
- California rates for reported STDs were higher than national rates for all three STDs in 2016. California ranked 20th highest among all states for chlamydia, 14th highest for gonorrhea, and 3rd highest for primary and secondary syphilis rates (Table 7).

Table 7: Total Number of Chlamydia, Gonorrhea, and Syphilis (all stages) Cases Reported in California, 2016.

Disease	Number of Reported Cases
Chlamydia	198,503
Gonorrhea	64,677
Syphilis (all stages)*	17,665
Total	280,845

*Includes syphilis cases staged as primary, secondary, early latent, late, and congenital.

- Estimates of the total number of new infections in California below (see Table 8) are calculated by adjusting 2008 national estimates[9] by the proportion of US cases reported from California in 2016. Then, the estimate is further adjusted by the percent increase in reported cases in California from 2008 to 2016 to account for increasing morbidity over time. All estimates are rounded to the nearest thousand cases.

[9] Satterwhite CL, Torrone E, Meites E, Dunne EF, Mahajan R, Ocfemia MCB, Su J, Xu F, Weinstock H. (2013). Sexually TransmittedInfections Among US Women and Men. *Sexually Transmitted Diseases.* 40.3: 187-93.

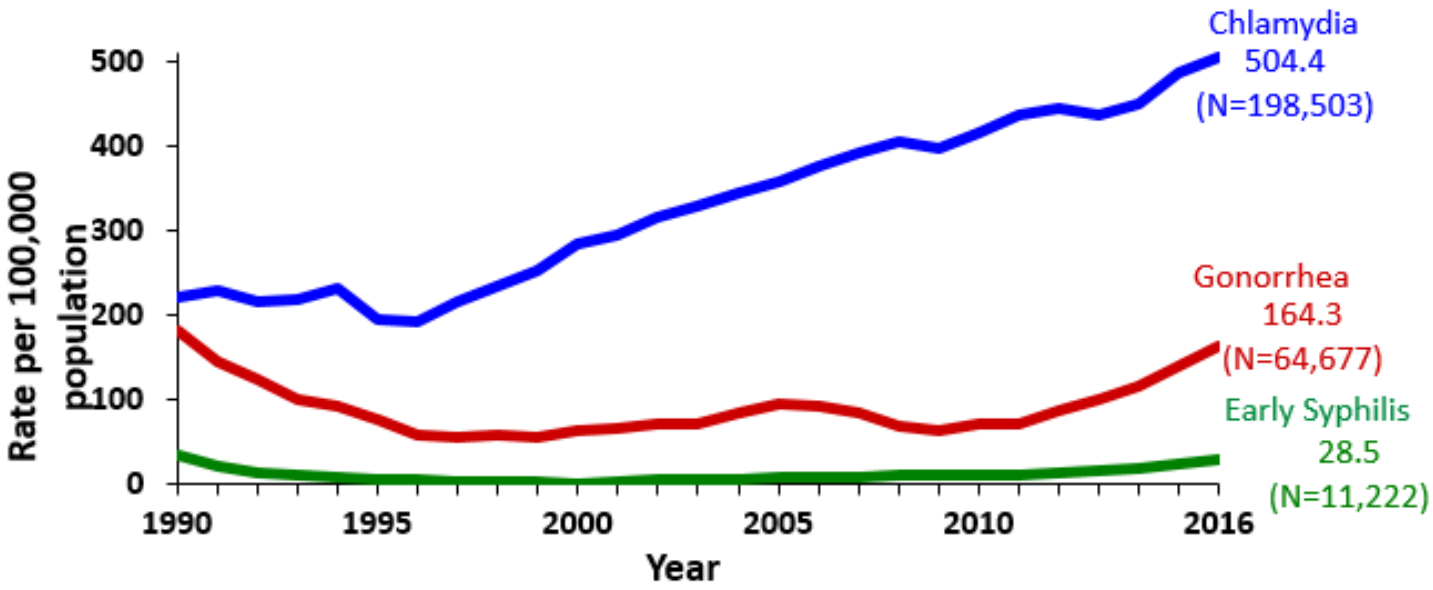
Table 8: Total Number of Estimated New Chlamydia, Gonorrhea, and Syphilis (all stages) Infections in California, 2016.

Disease	Estimated Number of New Infections
Chlamydia	472,000
Gonorrhea	287,000
Syphilis (all stages)*	28,000
Total	787,000

*Includes syphilis cases staged as primary, secondary, early latent, late, and congenital.

- Chlamydia rates have increased substantially over the past 20 years, gonorrhea rates have increased over the past five years, and rates of syphilis have increased over the past 10 years (Figure 5).

Figure 5: Incidence Rates of Chlamydia, Gonorrhea, and Early Syphilis in California, 1990-2016.



Vulnerable Populations

- Gay and bisexual men who have sex with men (MSM) continue to account for the majority of early syphilis cases as well as nearly two thirds of gonorrhea cases among men.
- Young people account for the largest proportion of chlamydia and gonorrhea infections. If left untreated, these infections can have a lasting negative effect on reproductive health.
- Racial and ethnic minorities also have disproportionate rates of all three STDs. Gonorrhea and chlamydia rates among African American adolescent and young adult women are significantly higher than among other race/ethnic groups. African American MSM rates of early syphilis are higher than among other race/ethnicity groups.

Outbreaks

- No confirmed STD outbreaks in California were reported to DCDC in 2016.

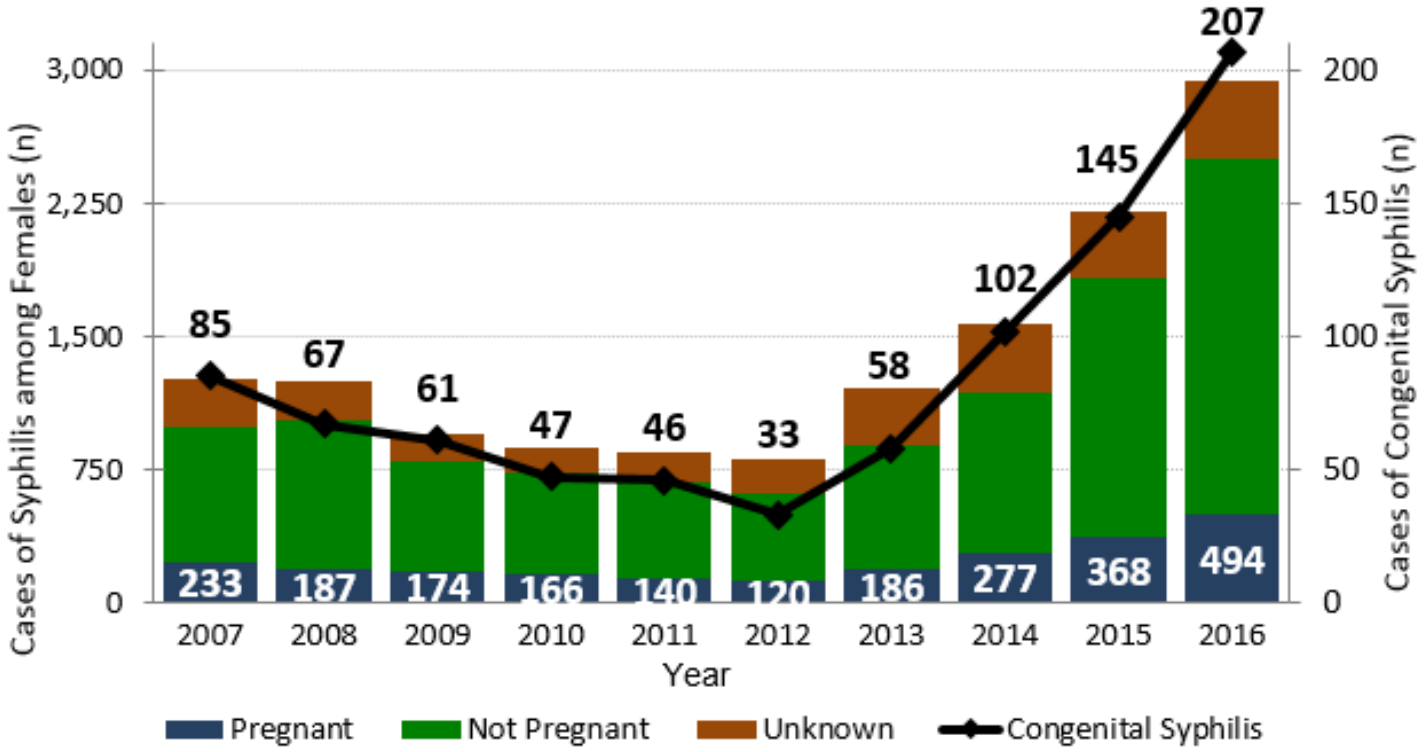
Highlight: Congenital Syphilis

Congenital syphilis occurs when syphilis is transmitted from an infected mother to her fetus during pregnancy. It is a potentially devastating disease that can cause severe illness in babies, including premature birth, low birth weight, birth defects, blindness, and hearing loss. It can also lead to stillbirth and infant death. Congenital syphilis can be prevented with early detection and timely and effective treatment of syphilis in pregnant women and women who could become pregnant.

Cases and Trends

- In 2016, 207 cases of congenital syphilis were reported in California, which is a rate of 42.4 new cases per 100,000 live births. This is the highest rate since 1997 (Figure 6).
- California has had a concerning recent increase in congenital syphilis. Based on national data for 2016, California ranked 2nd highest in the country for the rate of congenital syphilis, and this rate is 4.6 times higher than the Healthy People 2020 target of 9.1 per 100,000 live births.
- For many years, syphilis was largely confined to networks of gay and bisexual MSM. However, beginning in 2013, California started to see sharp increases in syphilis among females as well as congenital syphilis. Missed opportunities for screening and treatment of pregnant women have been identified.

Figure 6. Congenital syphilis and female syphilis* cases by pregnancy status in California, 2007–2016



Tuberculosis

Active tuberculosis (TB) is an illness caused by the bacterium *Mycobacterium tuberculosis.* Active TB usually affects the lungs and spreads through the air when a person with active TB in the lungs coughs. Not everyone infected with the bacteria becomes ill. People who have been infected but are not ill have latent tuberculosis infection (LTBI). Persons with LTBI can become ill with active TB in the future if they are not treated. TB is treatable, but treatment takes at least 6 months and requires multiple medications. Further, an important challenge in TB control is drug resistance. Multidrug-resistant TB (MDR-TB) is a form of TB that is more difficult to treat because it is resistant to the two most potent anti-TB drugs, isoniazid and rifampin. Patients with MDR-TB require much longer treatment (typically 18-24 months) and treatment with medications that are more toxic, less effective, and more expensive than treatment used for susceptible TB.

Cases and Trends

- In 2016, 2,062 cases of TB were reported to CDPH, accounting for nearly a quarter of the 9,272 cases in the United States (Table 9).
- Among persons with TB in California who were not born in the United States, the most common countries of birth were Mexico, Philippines, Vietnam, China, and India.
- In California in 2016, 28 TB cases were multidrug resistant, nearly 30 percent of the 97 total number of MDR-TB cases in the United States.
- More than 99% of active TB cases are reported[10].

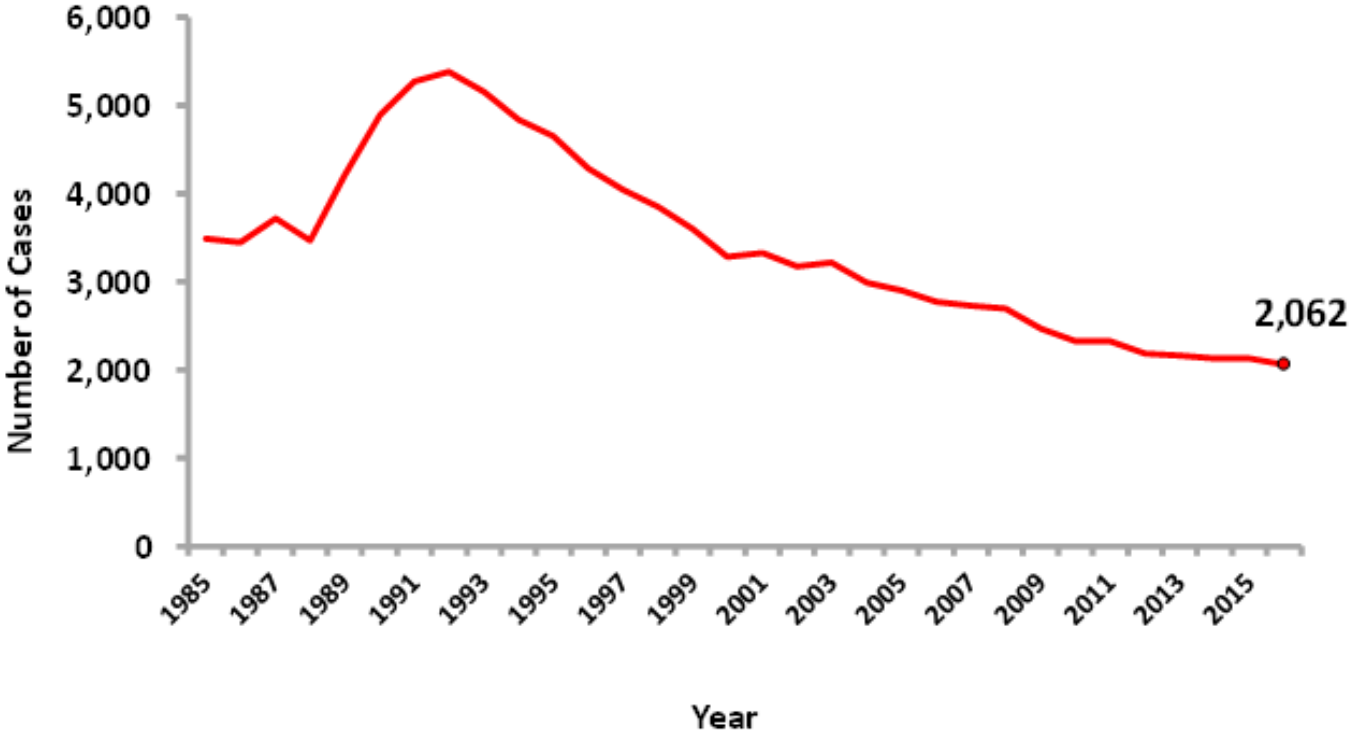
Table 9: Demographic Breakdown of Reported Cases of Active Tuberculosis in California, 2016.

Characteristic	Number of Reported Cases
Race/Ethnicity	
Asian/Pacific Islander	1096
African American/Black	107
Hispanic/Latino	707
White	146
Other	5
Unknown	1
Place of Birth	
Outside the United States	1656
United States	386
Unknown	20

[10] Curtis et al Am J Prev Med 2001;20(2):108–112

- The number of cases of active TB reported per year have declined substantially since 1992. However the decline has slowed in recent years. More than 2,000 cases of TB continue to occur every year in California meaning that every 4 hours a Californian is diagnosed with TB (Figure 7).

Figure 7: Reported Active Tuberculosis Cases in California, 1995-2015.



Deaths

- During 2012-2014, an average of 210 TB deaths occurred in California each year (10% of persons with TB), while 800 persons per year (8.3%) died with TB across the United States during those years.
- Of persons who died with TB in California, 22% died before receiving TB treatment, compared to 26% across the US.

Outbreaks and Extended Contact Investigations

- In 2016, DCDC investigated 11 new or ongoing confirmed TB outbreaks of at least 4 cases, 26 suspected or probable outbreaks, and 10 investigations of clusters of cases with a similar genetic type.
- DCDC provided technical assistance on 24 incidents with large numbers of exposed persons such as at worksites or in congregate settings.

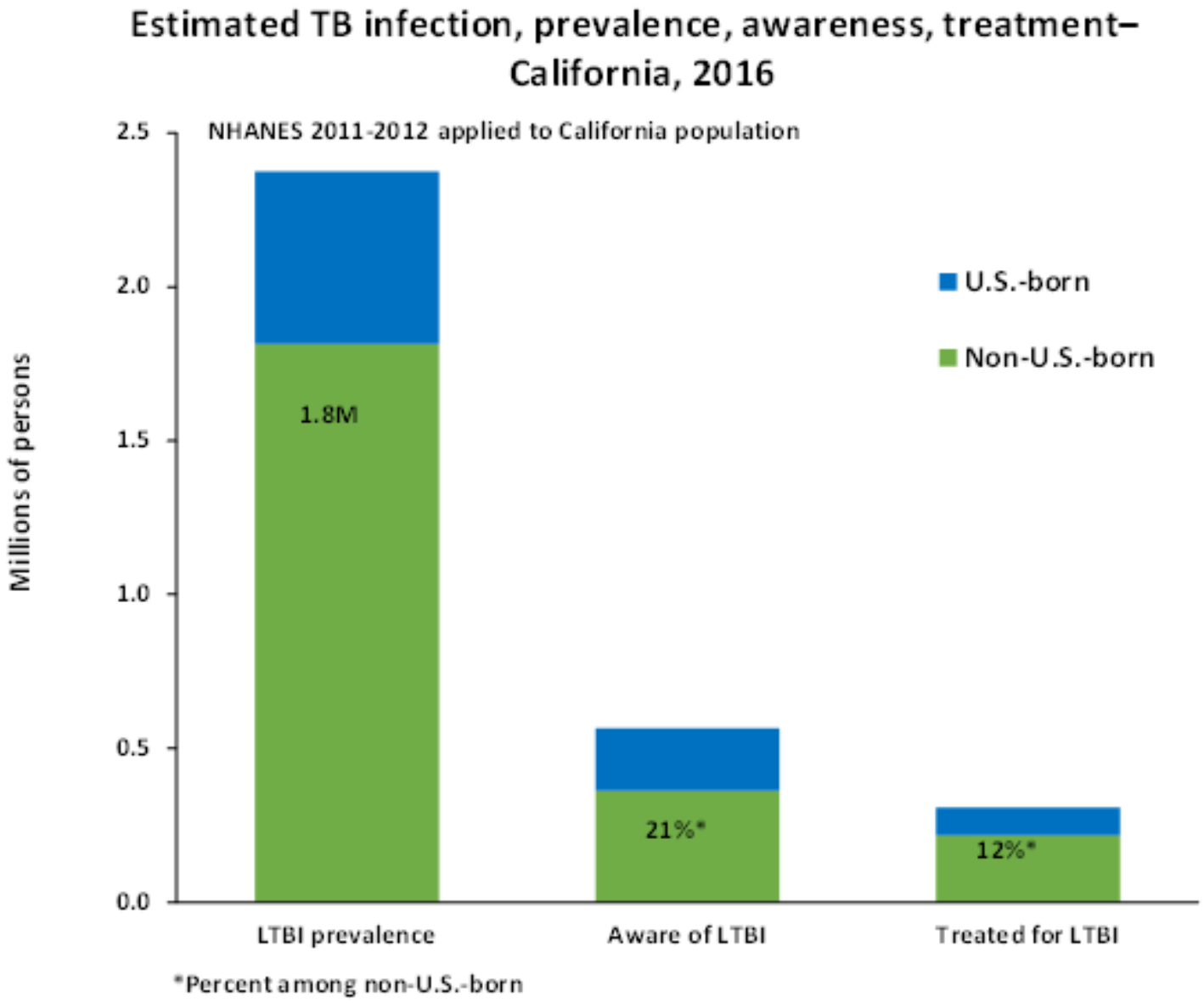
Highlight: Latent TB Infection

Approximately 80% of persons who become sick with TB have had LTBI before they develop active disease. LTBI cannot be transmitted to others. LTBI can be treated to prevent the development of active TB.

Cases and Burden Estimates

- Cases of LTBI are not currently required to be reported to public health in California. There are an estimated 2.3 million Californians who have LTBI; about three-quarters of these Californians were born outside the U.S. (Figure 8). Most are not aware of and have not been treated for LTBI and are at risk for progressing to active TB.
- LTBI is estimated to affect approximately 1 in 6 non-U.S.-born persons in California, compared with LTBI in 1 in 50 U.S.-born persons.
- LTBI rates were estimated for California by applying national LTBI estimates from the 2011–2012 National Health and Nutrition Examination Survey (NHANES) and adjusting for race/ethnicity and place of birth from the American Community Survey and the California Department of Finance.

Figure 8. Estimated TB Infection Prevalence, Awareness and Treatment in California, 2016.



Enteric Diseases

Enteric diseases are gastrointestinal illnesses resulting from infection with bacteria, viruses, or parasites. These diseases may be transmitted by eating contaminated food, drinking contaminated water, contact with contaminated animals (e.g., live poultry), or person to person. Most of the reported cases occurred individually rather than in outbreaks, and the source of infection is usually unknown. Infections caused by the bacteria *Salmonella*, Shiga toxin-producing *E.coli*, and *Listeria* are thought to be contracted primarily through contaminated foods.

Cases

The total number of reported cases of enteric illness in California in 2016 was 20,490 (Table 10).

Table 10: Reported Cases of Enteric Illness in California, 2016.

Pathogen	Number of Reported Cases
Campylobacter spp.	8505
Salmonella spp. (nontyphoidal)	4694
Enteric parasites	3538
Shigella spp.	2050
Shiga toxin-producing *E. coli*	1100
Yersinia enterocolitica	200
Listeria monocytogenes	129
Vibrio spp.	126
Typhoid Fever	61
Other enteric pathogens	87
Total	**20,490**

Burden of Disease

- The CDC estimates that every year 48 million Americans become ill and 3,000 die due to foodborne illness.[11]
- As 12% of the U.S. population lives in California, it can be estimated that there are approximately 5.76 million cases of foodborne illness in California every year, or 1 foodborne illness in every 6 Californians every year.
- It is estimated that there are approximately 360 deaths due to foodborne illness in California each year.

[11] CDC Estimates of Foodborne Illness in the United States (https://www.cdc.gov/foodborneburden/estimates-overview.html)

Outbreaks

Most outbreaks in California are managed by the local health jurisdictions, including outbreaks from a single source, like an outbreak from a local restaurant. DCDC coordinates and provides technical support on investigations that are more complex and large, multi-jurisdictional outbreaks, or multi-state outbreaks.

- The total number of reported outbreaks of enteric disease in California in 2016 was 648; of these, 275 (42%) were either confirmed or suspected norovirus outbreaks. In many outbreaks, an etiology was not identified.
- In 2016, DCDC conducted 85 in-depth outbreak investigations which required more complex methods (Table 11).

Table 11: Number of Outbreaks and Associated Cases of Enteric Illness Investigated by DCDC, 2016.

Pathogen	Number of Outbreaks Investigated by DCDC	Number of Outbreak Associated Cases
Salmonella spp. (nontyphoidal)	56	518
Shiga toxin-producing *E. coli*	15	70
Listeria monocytogenes	6	50
Hepatitis A	3	13
Other enteric outbreaks	5	171
Total	**85**	**822**

- In 2016, outbreaks of enteric illness occurred year-round in California with more cases reported during the spring and summer. Of in-depth outbreak investigations conducted by DCDC, 90% are caused by gastrointestinal bacteria commonly transmitted through food, including *Salmonella* spp., Shiga toxin-producing *E. coli*, and *Listeria*.

Highlight: Nontyphoidal Salmonellosis

Salmonellosis is a gastrointestinal disease caused by *Salmonella* bacteria, often from eating contaminated foods. In the United States, nearly all salmonellosis is caused by nontyphoidal *Salmonella*. Most cases of nontyphoidal salmonellosis resolve without treatment, but in some patients, nontyphoidal *Salmonella* infection may spread to the blood stream and to other organs in the body and can cause death unless treated with antibiotics. The elderly, infants, and those with impaired immune systems are more likely to have severe

salmonellosis. The CDC estimated that, every year, nontyphoidal *Salmonella* cause 1,027,561 foodborne illnesses in the United States, with 19,336 hospitalizations and 378 deaths.[12]

Cases

- The total number of reported cases of nontyphoidal *Salmonella* in CA in 2016 was 4694.

Burden of Disease

- Based on CDC estimates, the estimated number of cases of nontyphoidal *Salmonella* associated with food every year in California is 123,307.[13]
- Based on CDC estimates, the estimated number of hospitalizations from nontyphoidal *Salmonella* associated with food every year in California is approximately 2320.[14]
- Based on CDC estimates, the number of deaths from nontyphoidal *Salmonella* associated with food every year in California is approximately 45.[14]

[12] Foodborne Illness Acquired in the United States—Major Pathogens (http://wwwnc.cdc.gov/eid/article/17/1/pdfs/p1-1101.pdf)

[13] All California estimates were derived by using national estimates and calculating the proportion of U.S. cases in California based on the proportion of U.S. population (12%) in California. Foodborne Illness Acquired in the United States—Major Pathogens (http://wwwnc.cdc.gov/eid/article/17/1/pdfs/p1-1101.pdf). Please note these estimates are restricted to *Salmonella* infections transmitted by contaminated food and thus underestimate the overall salmonellosis burden in California which may also be due to animal contact or less frequently person-to-person transmission. Not all cases are culture-confirmed.

Vector-borne Diseases

Vector-borne diseases are diseases that are transmitted to humans by the bite of infected insects, such as mosquitoes and fleas, or arachnids, such as ticks. Important vector-borne diseases in California include West Nile virus, Lyme disease, and plague. Recently, the invasive (nonnative) *Aedes albopictus* and *Aedes aegypti* mosquitoes have spread in California. These mosquitoes can transmit several diseases including Zika, dengue, and chikungunya (Table 12).

Table 12: Reported Vector-Borne Diseases in California, 2016.

Disease*	Number of Reported Cases
Zika	492
West Nile virus disease	483
Dengue	200
Lyme Disease	141
Malaria**	121
Typhus	83
Chikungunya	57
Tick-borne relapsing fever†	13
Spotted Fever Group rickettsial diseases‡	12
Anaplasmosis	5
St. Louis encephalitis	3
Babesiosis§	3
Hantavirus pulmonary syndrome**	1
Ehrlichiosis	1
Plague[2]	0
Total	**1,615**

*Includes confirmed and probable cases except where noted.
**Includes confirmed cases only.
†Includes confirmed, probable and suspect cases.
‡Includes Rocky Mountain spotted fever, Pacific Coast tick fever, and other diseases due to Spotted Fever Group *Rickettesia.*
§Includes disease due to *B. duncani* (acquired in California)and *B. microti* (associated with travel to East Coast and Upper Midwest).

Highlight: Zika Virus

Zika virus emerged as a major public health threat in 2015 in Brazil and then spread throughout the Americas. Zika virus infection in a pregnant woman places the fetus at risk for major birth defects, most notably, a small head size (microcephaly), which can be fatal. Zika virus infection may also lead to neurological issues, such as Guillain-Barre Syndrome. About 80% of people infected with Zika virus don't have symptoms. For those with symptoms, rash, fever, joint aches, and red eyes (conjunctivitis) are most common. Zika is spread by infected

Aedes aegypti and *Aedes albopictus* mosquitoes (invasive in California), and much less commonly, through sexual exposures. Although no transmission of Zika through mosquitoes has been seen in California, hundreds of Zika infections occurred in Californians during 2016, mostly related to travel to certain areas of Mexico and Central and South America where Zika transmission is occurring.

Cases

- In California, a total of 492 infections of Zika virus were identified in 2016.
    - 319 (65%) were female
    - 484 people acquired Zika from a bite from an infected mosquito while traveling to an area with Zika transmission, 5 people were infected through sexual contact with an infected traveler who had returned to California, and 3 people were infants who were infected from their mothers during pregnancy.
    - Eighty-three people were pregnant at the time of infection.

Hospitalizations and Deaths

- In 2016, 7 cases were hospitalized. No Zika-related deaths were reported.

Highlight: West Nile Virus

Introduced to the Unites States in 1999, West Nile virus (WNV) is commonly spread by infected mosquitoes and now exists permanently throughout the United States, including California. WNV can cause fever, inflammation of the brain, or inflammation of the lining of the brain and spinal cord. People over 60 years of age are at the greatest risk for severe disease. There is no specific treatment and no vaccine.

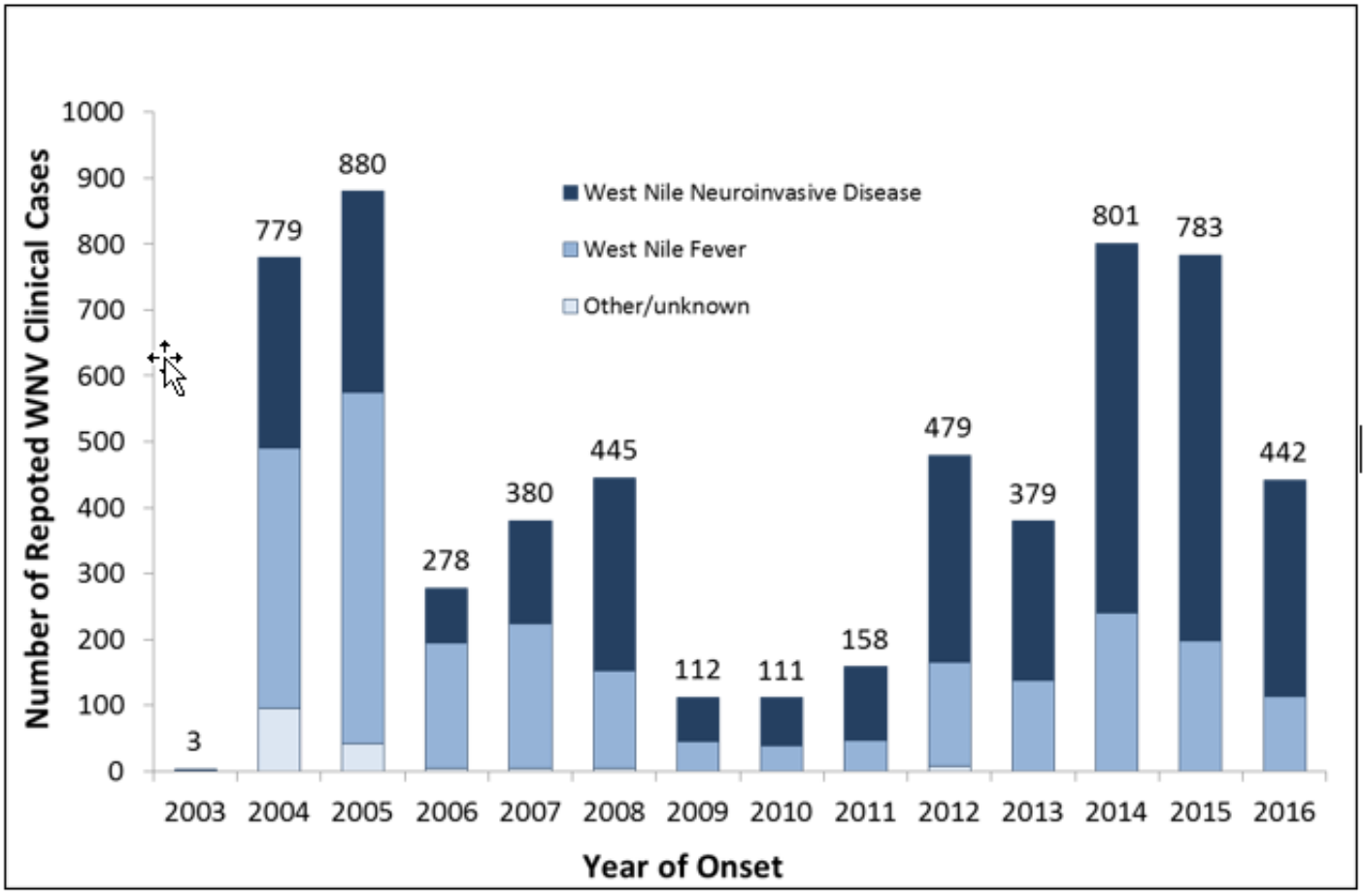
Cases

- In California, 442 infections with symptoms and 41 infections without symptoms were identified in 2016. Of these, 329 (74%) were classified as West Nile neuroinvasive disease (WNND), which includes inflammation of the brain, or inflammation of the lining of the brain and spinal cord, or paralysis; WNV disease can be fatal (Figure 9).
- Since 2004, the number of reported cases with signs or symptoms of disease per year ranged from just over 100 cases to over 800 cases.
- WNV disease occurs in cycles over time, and the reasons for this are complex and include the level of immunity to WNV in birds that harbor WNV, local weather and environmental conditions that affect mosquito population sizes and the activity of the virus, as well as human behavior.[14]

[14] Reisen, W. K. (2013). Ecology of West Nile virus in North America. *Viruses.* 5**:** 2079-2105.

- The percent of WNV cases with WNND in California has changed from a low of 35% in 2005 to over 74% in 2014 and 2015, likely due to the decline in reporting WNV cases with mild to moderate symptoms (non-WNND; also termed WN Fever).

Figure 9: West Nile Virus Cases by Year and Clinical Presentation in California, 2003-2016.



Burden of Disease

- Estimates of community burden of WNV non-neuroinvasive disease cases are based on reported WNND, which suggest that for every WNND case, there are 30-70 non-WNND cases.[15] This suggests that in 2016, there was an estimated 9,870 – 23,030 non-WNND cases in California.

Hospitalizations and Deaths

- In 2016, 354 reported cases of WNV in California were hospitalized.
- In 2016, 19 WNV-associated deaths were reported, a decrease from a peak of 53 deaths in 2015.

[15] Petersen, L. R., P. J. Carson, B. J. Biggerstaff, B. Custer, S. M. Borchardt and M. P. Busch. (2013). Estimated cumulative incidence ofWest Nile virus infection in US adults, 1999-2010. *Epidemiological Infection.* 141:591-595.

Other Infectious Diseases

DCDC also conducts surveillance for multiple other disease conditions (Table 13).[16]

Table 13: Reported Cases of Selected Diseases in California with Estimated Onset in 2016.

Disease	Number of Reported Cases
Amebiasis	311
Anthrax	0
Botulism, Other	1
Botulism, Wound	15
Brucellosis	20
Cholera	1
Ciguatera Fish Poisoning	1
Creutzfeldt-Jakob Disease and other Transmissible Spongiform Encephalopathies	21
Cryptosporidosis	431
Cyclosporiasis	22
Cysticercosis or Taeniasis	30
Domoic Acid Poisoning	0
Hepatitis E, acute infection	47
Legionellosis	592
Leprosy (Hansen's Disease)	2
Leptospirosis	6
Paralytic Shellfish Poisoning	0
Psittacosis	3
Q Fever	29
Rabies, animal	226
Rabies, human	0
Scromboid Fish Poisoning	15
Staphylococcus aureus infection (cases resulting in death or ICU)*, **	26
Streptococcal Infection (cases in food and dairy workers)	48
Toxic Shock Syndrome, Staphylococcal*	3
Trichinosis	8
Tularemia	2
Total	**1860**

*Required reporting ended June 2016.

** Staphylococcus aureus infection (only counted as a case if person dies or is admitted to an intensive care unit, has not been hospitalized or had surgery, dialysis, or residency in a long-term care facility in the past year, and did not have an indwelling catheter or percutaneous medical device at the time of culture).

[16] For Technical Notes on data source, see CDPH publication *2016 Year-end Monthly Summary Report of Selected California Reportable Diseases.*

Highlight: Coccidioidomycosis (Valley Fever)

Coccidioidomycosis, or Valley Fever, is an infectious disease caused by breathing in *Coccidioides* spp. spores of a fungus in the soil that exists permanently in the Central Valley and Central Coast in California. Coccidioidomycosis can show up as an influenza-like illness, pneumonia, or severe disease that is spread throughout the body leading to death. There are antifungal treatments but no vaccine.

After rates decreased from 2012-2014, yearly rates of coccidioidomycosis rose to 13.7 per 100,000 in 2016, which reflected the highest yearly number of cases in California recorded to date; this increasing trend was seen in each of the counties where *Coccidioides* exists permanently in the Central Valley and Central Coast of California. However, rates in areas outside of California where *Coccidioides* exists permanently, including Arizona, remained unchanged. The exact reasons for the increased rates in California are not known but climate and environmental factors that allow *Coccidioides* to grow and be released into the air, including rainfall after several years of drought, and disturbance of the soil from construction, might have contributed.[17]

Cases and trends

- In California, the number of reported cases of coccidioidomycosis in 2016 was 5,372. This was the highest yearly number of reported cases since individual cases of coccidioidomycosis became reportable in 1995.
- The yearly rate in 2016 was 13.7 cases per 100,000 people in the population, an increase of 71 percent compared to the 2015 rate of 8.0 per 100,000 population (3,140 cases).

Hospitalizations and deaths

- Hospitalization and death data for California are not yet available for 2016.
- During 2000–2011, the estimated yearly number of people with coccidioidomycosis-associated hospitalization ranged from 1,074 to 3,197.[18]
- During 2000–2013, the estimated yearly number of coccidioidomycosis-associated deaths ranged from 43 to 108.[19]

[17] Cooksey GS, Nguyen A, Knutson K, et al. *Notes from the Field:* Increase in Coccidioidomycosis — California, 2016. MMWR Morb Mortal Wkly Rep 2017;66:833–834. DOI: http://dx.doi.org/10.15585/mmwr.mm6631a4

[18] Sondermeyer G, Lee L, Gilliss D, Tabnak F, Vugia D. (2013). Coccidioidomycosis-associated Hospitalizations, CA, USA, 2000–2011. *Emerging Infectious Diseases*. 19(10):1590-1597

[19] Sondermeyer GL, Lee LA, Gilliss D, Vugia DJ. (2016). Coccidioidomycosis-Associated Deaths in CA, 2000-2013. *Public Health Rep*. 131(4):531-5

Highlight: Infant Botulism

Infant botulism is a rare disease that primarily affects infants less than 1 year of age.

Cases and Trends

- During 2013-2016, a record number of cases of infant botulism were reported in California, with an average of 45 cases per year, about one-third of the average number of yearly infant botulism cases nationwide. This number of yearly cases is >50% higher than the number of yearly cases during 2009-2012 (average of 27 cases per year).
- Reasons for the increase in reports may include better access to medical care and subsequent diagnosis, and availability of BabyBIG, the antitoxin treatment for infant botulism. No factors linking cases together were identified in any of the years.

Laboratory Testing

The major state laboratories for communicable diseases are housed within DCDC, and include the Microbial Diseases Laboratory (MDL), the Viral and Rickettsial Diseases Laboratory (VRDL), and the Infant Botulism Treatment and Prevention Program (IBTPP). The laboratories are state-of-the-art laboratories that serve as public health reference laboratories for the state. They serve a critical role in the protection of public health by detecting and characterizing communicable pathogens that cause disease in California, including viral, rickettsial, bacterial, mycobacterial, fungal, and parasitic pathogens, as well as agents of bioterrorism. Furthermore, they also conduct applied research and training. DCDC labs also serve in a leadership role coordinating local public health laboratory networks that leverage resources, testing, and alerts across the state.

A total of 64,107 tests were conducted by the Microbial Diseases Laboratory (MDL) and the Viral and Rickettsial Diseases Laboratory (VRDL) of DCDC in 2016 (Table 14).

Table 14: Laboratory Tests Performed by MDL and VRDL, 2016.

Pathogen(s)	**Type of Test(s)**	**Number of Tests Performed**
Arbovirus: Chikungunya virus	EIA, IFA, PRNT, RT-PCR	4628
Arbovirus: Dengue virus	EIA, IFA, PRNT, RT-PCR	8418
Arbovirus: St. Louis encephalitis virus	PRNT, RT-PCR	258
Arbovirus: West Nile virus	EIA, IFA, PRNT, RT-PCR	698
Arbovirus: Western equine encephalitis virus	EIA, PRNT	35
Arbovirus: Zika virus	EIA, IFA, PRNT, RT-PCR	11,212
Arbovirus: All	**All tests**	**25,249**
Respiratory Pathogen: Adenovirus	EIA, RT-PCR, Strain Typing	1021
Respiratory Pathogen: Enterovirus	RT-PCR	1426
Respiratory Pathogen: Human Coronavirus	RT-PCR	2844
Respiratory Pathogen: Human metapneumovirus	RT-PCR	711
Respiratory Pathogen: Influenza A virus	EIA, RT-PCR, Subtyping	1318
Respiratory Pathogen: Influenza B virus	EIA, RT-PCR, Lineage	913
Respiratory Pathogen: Middle East Respiratory Syndrome Coronavirus	RT-PCR	48
Respiratory Pathogen: *Mycoplamsa pneumoniae*	EIA, RT-PCR	478
Respiratory Pathogen: Parainfluenza virus	RT-PCR	2844
Respiratory Pathogen: Respiratory syncytial virus	RT-PCR	711
Respiratory Pathogen: Rhinovirus	RT-PCR, Strain typing	1163
Respiratory Pathogen: All	**All Tests**	**13,477**
Gastrointestinal, foodborne and waterborne pathogen: Astrovirus	RT-PCR	112

Pathogen(s)	Type of Test(s)	Number of Tests Performed
Gastrointestinal, foodborne and waterborne pathogen: *Campylobacter*	WGS	11
Gastrointestinal, foodborne and waterborne pathogen: *Listeria*	PFGE, WGS	195
Gastrointestinal, foodborne and waterborne pathogen: Norovirus	RT-PCR, Sequencing	82
Gastrointestinal, foodborne and waterborne pathogen: Rotavirus	RT-PCR	112
Gastrointestinal, foodborne and waterborne pathogen: Sapovirus	RT-PCR	112
Gastrointestinal, foodborne and waterborne pathogen: *Salmonella*	WGS, PFGE, MLVA, Serotyping	7678
Gastrointestinal, foodborne and waterborne pathogen: Shiga-toxin producing *E. coli* (STEC)	Identification, PFGE, MLVA, WGS	2766
Gastrointestinal, foodborne and waterborne pathogen: *Shigella*	Identification, PFGE, WGS	825
Gastrointestinal, foodborne and waterborne pathogens: All	**All Tests**	**11,893**
Retrovirus: Human Immunodeficiency Virus	EIA, IFA, WB	1690
Retrovirus: Human T-Lymphotropic Virus	EIA, IFA, WB	188
Retrovirus: All	**All Tests**	**1878**
Rickettsia and *C. burnetii: Coxiella burnetii*	IFA	21
Rickettsia and *C. burnetii: Anaplasma phagocytophilum*	IFA	6
Rickettsia and *C. burnetii: Ehrlichia chaffeensis*	IFA	64
Rickettsia and *C. burnetii: Rickettsia rickettsii*	IFA	56
Rickettsia and *C. burnetii: Rickettsia typhi*	IFA	54
Rickettsia and *C. burnetii:* Spotted Fever Group Rickettsia	RT-PCR	13
Rickettsia and *C. burnetii:* All	**All Tests**	**214**
Vaccine-preventable pathogen: *Bordatella pertussis*	Identification	1
Vaccine-preventable pathogen: *Corynebacterium diphtheriae*	Identification	3
Vaccine-preventable pathogen: *Haemophiuis influenzae*	Identification, PCR	192
Vaccine-preventable pathogen: Measles virus	EIA, IFA, RT-PCR, Genotyping	409
Vaccine-preventable pathogen: Mumps virus	EIA, IFA, RT-PCR, Genotyping	320
Vaccine-preventable pathogen: *Neisseria meningitidis*	Identification, PCR, Serogrouping	200
Vaccine-preventable pathogen: Rubella virus	EIA, RT-PCR, Genotyping	76
Vaccine-preventable pathogen: *Streptococcus pneumoniae*	Identification, PCR	149
Vaccine-preventable pathogen: Varicella Zoster Virus	EIA, RT-PCR, Genotyping	117
Vaccine-preventable pathogen: All	**All Tests**	**1467**
Mycobacterial: *Mycobacterium tuberculosis*	Culture	1080
Mycobacterial: Non-TB *Mycobacteria*	Identification	101
Mycobacterial: TB drug susceptibility	Culture, molecular	4200
Mycobacterial: All	**All Tests**	**5381**

Pathogen(s)	Type of Test(s)	Number of Tests Performed
Zoonotic and other virus: Hantavirus	EIA, RT-PCR	94
Zoonotic and other virus: Lymphocytic choriomeningitis virus	IFA	8
Zoonotic and other virus: Orf (parapox) virus	IFA	10
Zoonotic and other virus: Rabies virus	DFA, IFA	425
Zoonotic and other virus: Vaccinia virus	IFA	8
Zoonotic and other virus: All	**All Tests**	**545**
High Consequence Pathogen: *Bacillus anthracis*	Identification	10
High Consequence Pathogen: *Brucella spp.*	Identification	8
High Consequence Pathogen: *Burkholderia mallei/B. pseudomallei*	Identification	1
High Consequence Pathogen: *Francisella tularensis*	Identification	20
High Consequence Pathogen: *Yersinia pestis*	Identification	17
High Consequence Pathogen: All	**All Tests**	**56**
Other Pathogen: *Clostridium spp.*	Identification	132
Other Pathogen: Carbapenem-resistant Enterobacteriaceae, antimicrobial resistance	Gene testing	172
Other Pathogen: Cytomegalovirus	RT-PCR	18
Other Pathogen: Herpesvirus	EIA, RT-PCR	192
Other Pathogen: Epstein–Barr Virus	RT-PCR	20
Other Pathogen: Free-living amoebae	RT-PCR	39
Other Pathogen: Other bacterial pathogens*	Identification, WGS	1865
Other Pathogen: Unusual bacterial pathogens	Identification, 16 S rRNA sequencing	543
Other Pathogen: Paralytic Shellfish Poisoning	Immunogenic, mouse bioassay	1073
Other Pathogen: *Plasmodium* spp.	Identification	25
Other Pathogen: All	**All Tests**	**3947**

*Includes bacterial isolates from the California Emerging Infections Program (collaborative active sentinel surveillance system with CDC and other states).

DCDC Program Overviews and Highlights

Immunization Branch

The Immunization Branch (IZB) seeks to keep immunization levels high in California and stop transmission of vaccine-preventable diseases. IZB monitors immunization rates and vaccine supply, reinforces school immunization requirements, and helps track vaccine-preventable diseases. IZB provides technical assistance on disease investigations and control of outbreaks, develops educational materials and training for healthcare providers and the public, and manages the Vaccines for Children program, which provides vaccines to 4.9 million children statewide. IZB tracks influenza during the influenza season, tracks measles, and manages a program that helps more than 2,000 infants born to women who are infected with chronic hepatitis B.

Achievements in 2016:

- Tracked more than 5,000 cases of vaccine preventable diseases.
- Consulted on more than 400 cases of vaccine-preventable diseases.
- Investigated over 20 outbreaks, including meningitis, influenza, measles imported by an international traveler, and varicella in an immigration facility.
- Provided a wide range of technical assistance, including finding contacts of meningococcal disease and measles cases who needed treatment after being exposed to an infected person, and working with the Healthcare Associated Infections program to investigate healthcare-associated cases of acute hepatitis B.
- Led the large task of changing to a state-wide immunization registry, also known as California Immunization Registry (CAIR2), which now tracks over 19 million persons with over 163 million vaccinations.
- Provided 11.4 million doses of vaccine through the Vaccines for Children program.
- Helped conduct studies that looked at characteristics and factors associated with measles transmission, the rate of invasive meningococcal disease among HIV-infected men in California, severe and fatal influenza infections in infants <6 months of age, and the effectiveness of vaccinating pregnant women to protect their new babies from pertussis.
- Piloted activities like the human papilloma virus (HPV) vaccine Ratio Project and the HPV Clinic-based Text Message Reminder Project to improve low HPV vaccination rates throughout California.

Tuberculosis Control Branch

The Tuberculosis Control Branch (TBCB) provides leadership and resources to control tuberculosis in California. TBCB provides technical and direct assistance to local health departments to enhance tuberculosis control, including managing people with multidrug-resistant tuberculosis and identifying and investigating tuberculosis outbreaks.

Achievements in 2016:

- Visited, evaluated, and supported program improvement in 26 local TB programs.
- Conducted 16 in-person trainings on topics such as managing TB cases, finding and interviewing contacts of TB cases, and latent TB infection.
- Consulted on and reviewed all 28 reported confirmed MDR-TB cases and 23 reported suspected MDR or medically complicated cases, including interpretation of molecular diagnostic test results and guidance on clinical and public health management of cases and their contacts.
- Developed a California TB Elimination Plan. Because most active TB disease cases occur in persons who have had LTBI for years, most cases in California can be prevented by diagnosing and treating LTBI in persons with risk factors. CDPH, together with the California TB Elimination Advisory Committee and the California TB Controllers Association, developed a TB Elimination Plan which outlines actions to take over five years to work towards eliminating TB from California. The plan is calls for the following:
    - Making TB prevention a regular part of medical care by finding and testing Californians who are at risk for TB
    - Ensuring best quality treatment for LTBI
    - Monitoring and evaluating LTBI testing and treatment
    - Ensuring that patients, clinicians, and public health programs have the tools and resources needed to prevent TB.

Infectious Diseases Branch

The Infectious Diseases Branch (IDB) seeks control and prevention through conducting surveillance and investigations of over 50 communicable diseases and outbreaks of those diseases, including those associated with food, water, and vectors (like insects), and those associated with animal diseases or emerging as new public health threats. IDB assists local health jurisdictions in the investigation and response to clusters and outbreaks of several infectious diseases, including *Salmonella*, *Campylobacter*, Shiga toxin-producing *E.coli*

*(*STEC), and *Listeria.* IDB also manages diseases transmitted to people from insects and animals, including diseases transmitted by mosquitoes like West Nile, dengue, chikungunya, and Zika viruses; those transmitted by ticks like Lyme disease and Rocky Mountain Spotted Fever; and those transmitted by rodents and fleas like hantavirus and plague. In addition, IDB oversees diseases transmitted by animals, including rabies and avian influenza. Finally, IDB processes and analyzes reported disease data and provides data summaries to CDC, local health jurisdictions, and the general public.

Achievements in 2016:

- Investigated 85 gastrointestinal illness outbreaks and clusters of tick-borne relapsing fever cases; closed and supervised treatment of 2 campgrounds because of increased risk of plague transmission.
- Responded to the emergence of Zika by convening public health partners, providing consultation and training, creating and distributing plans and guidelines, tracking cases and mosquitos, and providing timely information, outreach to affected populations, and general public education.
- Responded to more than 70 Public Record Act (PRA)/Information Practice Act (IPA) requests that involved search for, extracting, and redacting more than 10,000 pages of materials from surveillance systems.
- Together with IZB, VRDL, and the Occupational Health Branch of the CDPH Center for Chronic Disease Prevention and Health Promotion, developed guidelines for tracking and protecting workers potentially exposed to avian influenza during an outbreak in a commercial poultry flock.
- Conducted 3 regional workshops (San Francisco Bay Area, Northern California, and Southern California) for local public health, environmental health, and laboratory partners to work together to improve response to outbreaks associated with food.
- Identified the source(s) of several gastrointestinal illness outbreaks, including commercial raw milk causing *E.coli* O157 infections, cheese and rotisserie chicken linked to salmonellosis, and a petting zoo linked to *E.coli* O157 infections.
- Improved reporting of outbreaks to CDC by reporting electronically and automating the process; provided data electronically to the public via CDPH's Open Data Portal.
- Collected thousands of ticks for testing for *Borrelia burgdorferi*, *Borrelia miyamotoi*, *Rickettsia philipii*, *Anaplasma phagocytophilum*, and other pathogens that cause disease through tick bites, to look for risks of transmission related to space and time.
- Collected and tested over 700 rodent and 800 flea samples to evaluate level of risk of transmission of plague; distributed and posted information on plague prevention in numerous campgrounds.

- In collaboration with Kern County, distributed over 28,000 Valley Fever brochures in English, Spanish, and Tagalog to community organizations and the general public.

Sexually Transmitted Disease Branch

The Sexually Transmitted Disease (STD) Control Branch (STDCB) seeks to reduce the transmission and impact of sexually transmitted diseases and viral hepatitis in California. STDCB tracks STDs and conducts investigations of STDs together with local partners. STDCB also develops and distributes guidelines on STDs and viral hepatitis and develops material to reduce risk of STDs and promote sexual health awareness, access to sexual health care, and drug user health.

STDCB provides statewide leadership, guidance, training, technical assistance, surge capacity, and safety net support for delivering STD services. STDCB carried out these efforts together with local health jurisdictions and stakeholders in the public and private sectors.

STDCB works closely with the Office of AIDS within the CDPH Center for Infectious Diseases, which leads coordinated state programs, services, and activities relating to HIV/AIDS.

Achievements in 2016:

- Youth Risk Behavioral Surveillance Survey: Worked with California Department of Education to collect data on priority health risk behaviors that contribute to the leading causes of death and disability among youth, including sexual behaviors, alcohol and other drug use, dietary behaviors, and much more. These behavioral data provide state-level information to guide local prevention programs.
- Chlamydia and Gonorrhea Jail Screening Pilot: Supported STD screening projects in juvenile detention centers and adult jails.
- California Healthy Youth Act: The Adolescent Sexual Health Work Group, a work group of program managers from CDPH, California Department of Education, and key non-governmental organizations, helped implement a new law that requires comprehensive sexual health and HIV/STD prevention education in public schools through enhancing curricula.
- HIV Partner Services Training and Technical Assistance: Rolled out revised, two-day Introduction to HIV Partner Services in California training.
- Congenital Syphilis Prevention: Helped local partners increase efforts addressing worsening rates of congenital syphilis, including identifying missed prevention opportunities, developing Multidisciplinary

Case Examination tools, providing feedback to local health jurisdictions on data quality and completeness, and reviewing and closing cases reported through surveillance.

- Local Capacity Building: Awarded grants to improve capacity in local STD programs. Mentored disease investigation specialists in multiple local health jurisdictions to increase local capacity to do HIV/STD case investigations.
- Antibiotic Resistant Gonorrhea: STDCB and the San Francisco Department of Public Health received a grant from CDC to monitor specimens collected at local STD clinics to identify drug-resistant gonorrhea.
- HPV: In partnership with the California Emerging Infections Program, as one of five sites around the US conducting the HPV-IMPACT Vaccine Monitoring and Surveillance effort, tracked trends in HPV-related cervical pre-cancer to identify impact of the HPV vaccine. Together with IZB, the California Cancer Registry, and the Department of Health Care Services' Medi-Cal program, helped prevent and monitor HPV-related disease through vaccination, screening, and disease tracking.
- Hepatitis C Testing and Linkage to Care Demonstration Projects: Awarded grants to five programs throughout California to conduct projects improving hepatitis C testing and linking cases to care, especially for vulnerable populations.
- California Forum on Increasing Hepatitis C Treatment Capacity in Primary Care Settings: Organized a meeting of healthcare providers and other community partners to share ways to increase the number of primary care providers treating hepatitis C, particularly in rural areas with a shortage of providers who specialize in hepatitis C.

Viral and Rickettsial Diseases Laboratory

The Viral and Rickettsial Disease Laboratory (VRDL) provides state-of-the-art reference laboratory leadership and diagnostic services, applied research, and training services in the field of viral and rickettsial diseases. VRDL performs diagnostic testing to identify 21 types of viral respiratory agents including influenza, Middle East Respiratory Syndrome (MERS), respiratory syncytial virus, rhinovirus and enterovirus. In addition, VRDL performs diagnostic testing for measles, mumps, rubella, human herpesviruses, and Rickettsiae. VRDL is also responsible for the detection and characterization of zoonotic and vector-borne disease pathogens such as rabies virus, Sin Nombre hantavirus, Zika virus and other arboviruses, and tick-borne pathogens. Furthermore, VRDL serves as a statewide reference laboratory for HIV and HTLV diagnostic testing. Finally, VRDL responds to questions regarding test availability, sample collection, shipment, and interpretation.

Achievements in 2016:

- Performed 40,410 high-complexity tests on 12,727 patient specimens, including 11,212 tests associated with Zika virus.
- Participated in several laboratory-epidemiology networks that monitor for disease, including MeaslesNet, MumpsNet, CaliciNet and the Respiratory Laboratory Network, as well as served as a Vaccine Preventable Disease Reference Center.
- Collaborated with IDB Vector-Borne Disease Section and the CDC Rickettsia team in testing over 1100 ticks for the human pathogen *Rickettsia philipii* in California, and identified 20 positive ticks in two counties.
- Tested over 150 human samples for mumps virus in response to the largest increase in mumps cases since 2006.
- Renovated and converted laboratory space for a Whole Genome Sequencing (WGS) Core Laboratory at VRDL.
- Added WGS testing of influenza viruses to track circulating viruses and to detect potential antiviral resistant strains and new strains emerging in California and other western states.
- Rapidly evaluated, validated, and implemented multiple assays to provide Zika virus testing for the state.
- Hosted a Department of a Homeland Security BioWatch laboratory which set up around-the-clock bioterror surveillance throughout the San Francisco Bay Area around Super Bowl 50.
- Implemented the improvements to increase efficiency, timeliness, and accuracy of reporting lab results.

Microbial Diseases Laboratory

The Microbial Diseases Laboratory (MDL) conducts diagnostic testing on, initiates education and research programs to identify and track, and serves as the state reference laboratory and high containment facility for bacterial, mycobacterial, fungal, and parasitic diseases, including agents of bioterrorism.

Achievements in 2016:

- Provided high-complexity testing for over 18,000 submissions.
- Represented California in several national laboratory-epidemiology networks that enhance tracking, identification, and genetic typing of pathogens that are of high public health importance.

- Serotyped 4,000 *Salmonella* isolates, which helped identify of clusters of cases associated with 10 outbreaks.
- Doubled the number of *Shigella* isolates serotyped as a result of the June 2016 regulatory revision that made *Shigella* isolate submission mandatory.
- Supported the investigation of 46 clusters of *Salmonella* cases, 13 clusters of *E. coli* O157, 1 cluster of non-O157 Shiga toxin producing *E. coli* (STEC), 5 clusters of *Listeria*, 2 clusters of *Shigella*, 1 cluster of *Staphylococcus aureus*, and 1 cluster of *Elizabethkingia anophelis* by performing genotyping.
- Developed clinical lab certification-compliant WGS methodology and deployed it for a *Salmonella* Newport outbreak, a *Salmonella* Saint Paul outbreak, and healthcare-associated infections caused by drug-resistant *Enterobacter*, *Klebsiella*, *Citrobacter*, and *E. coli*.
- Completed over 4,000 tests for molecular characterization and antimicrobial resistance detection for *Mycobacteria* in suspected tuberculosis patients.
- Carried out confirmatory testing of over 200 specimens for high-risk pathogens on the federal Select Agent List.
- Provided laboratory consultation and surge support for the federal BioWatch Select Agents Program for the Super Bowl 50.

Infant Botulism Treatment and Prevention Program

The Infant Botulism Treatment and Prevention Program (IBTPP) seeks to provide and continue to improve the treatment of infant botulism and to prevent new cases from occurring. IBTPP provides laboratory diagnosis, tracks, and conducts special investigations on infant botulism, and also provides expertise to health care providers and health jurisdictions statewide, nationally, and internationally. The IBTPP creates and is the only source of BabyBIG® (Human Botulism Immune Globulin Intravenous or BIG-IV), the only US Food and Drug Administration-licensed treatment for infant botulism, and distributes it as a public service nationwide to treat babies with suspected infant botulism.

Achievements in 2016:

- Produced Lot 6 of BabyBIG and released it for distribution to patients by the US Food and Drug Administration in July. The first patient was treated with Lot 6 on 11 September 2016.
- Provided BabyBIG treatment to 98% of all California laboratory-confirmed infant botulism patients and 97% of all US confirmed cases. Provided laboratory diagnosis to 100% of California cases.

- Conducted special investigations to improve recognition, rapid diagnosis, and treatment of infant botulism.
- Assisted state and local health department partners in Idaho and Ohio in the investigation of *Clostridium baratii* type F infant botulism cases. Infant botulism due to type F is extremely rare.

Communicable Disease Emergency Response Program

The Communicable Disease Emergency Response program (CDER) seeks to enhance DCDC's preparation for and response to infectious disease emergencies and infectious disease concerns during disasters such as fires, floods, and earthquakes. CDER prepares DCDC for bioterrorism and other communicable disease emergencies with plans, guidelines, and exercises, and assists local health departments with community mitigation and infection prevention activities.

CDER also manages the DCDC Duty Officer Program, which provides 24 hours a day/7 days a week response and support to local health departments and federal and state agencies for urgent communicable disease issues or events that cannot wait until the next business day. CDER is also responsible for the California Reportable Disease Information Exchange (CalREDIE). CalREDIE is a web-based electronic surveillance system used by thousands of healthcare providers, laboratories, and public health professionals for tracking communicable disease in California.

Achievements in 2016:

- Upgraded CalREDIE to Version 15. This upgrade included many enhancements to make CalREDIE more user-friendly and was the result of over a year of upgrade planning and preparations.
- CalREDIE received increased numbers of laboratory reports via electronic laboratory reporting (ELR). In 2016, CDPH received ELR data from over 345 laboratory submitters. Within CalREDIE, about 70% of reported incidents had at least one ELR associated with the incident.
- Managed and participated in the DCDC Duty Officer Program. In 2016:
    - 10 new duty officers were trained.
    - DCDC duty officers responded to 141 calls, of which 114 were related to DCDC.
    - DCDC duty officers responded to and triaged five select agent drills.
- Led the updating of the California Code of Regulations Title 17 reportable disease lists. The updated list went into effect in June 2016.
- Updated or completed several emergency response plans.

- Participated in the statewide preparation for Super Bowl 50.
- Reviewed the public health surveillance and epidemiological investigations section and the pandemic influenza plans for 61 local health departments requesting 2016 Public Health Emergency Preparedness funds.
- Engaged multi-agency and jurisdictional partners who had roles and responsibilities in management of travelers and migrating populations and recruited them to establish the CID Global Migration Advisory Group.
- Conducted a tabletop exercise to understand and identify gaps and areas for improvement in the communication and coordination among agencies related to Ebola and other emerging and highly-infectious diseases in travelers.