

Chronic Hepatitis B and Hepatitis C Infections in California:

Cases Newly Reported through 2011

November 2013

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STATE OF CALIFORNIA

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Preface

This report, *Chronic Hepatitis B and Hepatitis C Infections in California: Cases Newly Reported through 2011*, features disease surveillance data on chronic hepatitis B and chronic hepatitis C cases newly reported through December 31, 2011 in California.

These data are compiled to increase awareness of statewide trends in reported infections, and to guide policy and program development within the California Department of Public Health, local health departments, healthcare settings, and community programs that serve persons living with, or at risk for, chronic viral hepatitis infection.

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Website

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Acronyms and Abbreviations

API	Asian and Pacific Islander
ALT	Alanine Aminotransferase
AVSS	Automated Vital Statistics System
CalREDIE	California Reportable Disease Information Exchange
CDC	Centers for Disease Control and Prevention
CDPH	California Department of Public Health
CSTE	Council of State and Territorial Epidemiologists
DNA	Deoxyribonucleic acid
EIA	Enzyme Immunoassay
HBeAg	Hepatitis B e Antigen
HBsAg	Hepatitis B Surface Antigen
HBV	Hepatitis B Virus
HCV	Hepatitis C Virus
HIV	Human Immunodeficiency Virus
IgM	Immunoglobulin
IQR	Interquartile Range
NHANES	National Health and Nutrition Examination Survey
RIBA	Recombinant Immunoblot Assay
RNA	Ribonucleic Acid
SGPT	Serum Glutamic Pyruvic Transaminase
STD	Sexually Transmitted Disease

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1. Executive Summary

As a leading cause of liver disease, liver cancer, and liver transplants, chronic viral hepatitis is an important public health problem in California and nationwide. Between 3.5 and 5.3 million Americans have chronic hepatitis B virus (HBV) or hepatitis C virus (HCV) infection,^{1,2} nearly five times the number of people living with human immunodeficiency virus (HIV). The long-term health implications and healthcare costs of HBV and HCV infections are substantial. In California, there were more than 30,000 hospitalizations in 2010 for liver disease, liver cancer, or liver transplant-related treatments among patients with HBV or HCV.³ Hospitalization charges for these in-patient stays totaled more than \$2.3 billion. Without early diagnosis and treatment, one in four people with chronic HBV infection will die from cirrhosis, liver cancer, or liver failure.² Nationwide, over the next 20 years, annual medical costs for people with HCV are expected to increase from \$30 billion to more than \$85 billion.⁴ Since 2007, the annual number of deaths due to HCV nationwide has surpassed those due to HIV.⁵

This is the first chronic viral hepatitis surveillance report for California. It describes cumulative cases of chronic hepatitis B and hepatitis C newly reported to the California Department of Public Health (CDPH) from 1989-2011, and highlights findings from 2007-2011.

The purpose of this report is to describe demographic characteristics of newly reported chronic hepatitis B and hepatitis C cases in California and to increase awareness of statewide trends in reported infections. This information can be used to promote screening, education, and appropriate care and treatment for affected individuals to prevent and delay the onset of viral hepatitis-related liver disease (and its costs and complications), and to prevent disease transmission. The data in this report do not provide a measure of prevalence or incidence of chronic hepatitis B and hepatitis C infections in California due to the asymptomatic nature of these infections, varied levels of completeness of surveillance reporting, and because it remains unknown how many of the cases described in this report are currently living.

Key findings from this report are highlighted below:

A. Chronic Hepatitis B in California

Overall

- From 1989 through 2011, 231,644 chronic hepatitis B cases were newly reported to CDPH. In 2011, CDPH received 10,308 new reports of chronic HBV infections, which represents a rate of 27.4 newly reported cases per 100,000 persons.

By Age

- From 2007-2011, nearly two-thirds (64.5-67.8 percent) of newly reported chronic HBV infections in California were among persons aged 25-54 years.

- In 2011, Californians 35-44 years of age had the highest rate of newly reported chronic HBV infections. From 2007-2011, Californians less than 18 years of age had the lowest rate of newly reported chronic HBV infections.

By Race/Ethnicity

- From 2007-2011, Asian/Pacific Islanders (APIs) consistently accounted for nearly two-thirds (62.1-65.9 percent) of newly reported chronic hepatitis B cases in the state—a significant racial disparity given that APIs constitute only 12.7 percent of the state population.
- In 2011, all other racial/ethnic groups were underrepresented or proportionally represented among chronic hepatitis B cases: Whites were 42.4 percent of the state population but only 14.8 percent of cases; Hispanics/Latinos were 38.3 percent of the state population but only 12.6 percent of cases; African Americans/Blacks were 5.9 percent of the state population and 6.2 percent of cases; and American Indians/Alaska Natives were 0.6 percent of the population and 0.6 percent of hepatitis B cases.

By Geography

- Among populous local health jurisdictions (with $\geq 100,000$ population), San Francisco County had the highest rate of newly reported chronic hepatitis B cases in California in 2011, followed by Santa Clara, San Mateo, Alameda, and Monterey counties. All of the top five populous local health jurisdictions had rates of newly reported chronic hepatitis B case higher than the statewide rate (along with Sacramento, Los Angeles, and the City of Berkeley). Together, the top five populous local health jurisdictions accounted for 31.7 percent (n=3,832) of all newly reported chronic hepatitis B cases in California in 2011.
- Among nonpopulous jurisdictions (with $< 100,000$ population), Del Norte County had the highest rate of newly reported chronic hepatitis B cases in California in 2011, followed by Tuolumne, Sutter, Yuba, and Nevada counties. Both Del Norte and Tuolumne counties had rates of newly reported chronic hepatitis B cases higher than the statewide rate. Together, the top five nonpopulous local health jurisdictions accounted for only 0.8 percent (n=98) of all newly reported chronic hepatitis B cases in 2011.

B. Chronic Hepatitis C in California

Overall

- From 1994 through 2011, 501,664 chronic hepatitis C cases were newly reported to CDPH. In 2011, CDPH received 33,190 new reports of chronic HCV infections, which represents a rate of 88.3 newly reported cases per 100,000 persons.

By Age

- In 2011, 56.4 percent of newly reported chronic hepatitis C cases in California were among persons born during the years 1945-1965, a birth cohort known as “baby boomers”. In 2011, persons 55-64 years of age—an age group within the “baby boomer” cohort—had the highest rate of newly reported chronic HCV infections.
- Statewide, the median age of persons with newly reported chronic hepatitis C cases increased two years between 2007 and 2011, from 49.3 to 51.3.

By Gender

- From 2007-2011, more than two-thirds (66.7-69.3 percent) of chronic hepatitis C cases in California were among males, and males had twice the rate of newly reported chronic HCV infection as females.

By Race/Ethnicity

- In 2011, White, African American/Black, and American Indian/Alaska Native persons in California were disproportionately affected by chronic hepatitis C; Whites represented 42.4 percent of the general population in California, but 54.3 percent of reported chronic hepatitis C cases, while African Americans/Blacks represented 5.9 percent of the general population in California, but 12.6 percent of reported chronic hepatitis C cases; and American Indian/Alaska Natives were 0.6 percent of the population but 1.3 percent of chronic hepatitis C cases.
- In 2011, Hispanics/Latinos and APIs were underrepresented among chronic hepatitis C cases in California. Hispanics were 38.3 percent of the state population but only 28.0 percent of hepatitis C cases and APIs were 12.7 percent of the state population but 3.9 percent of cases.

By Geography

- Among populous local health jurisdictions (with $\geq 100,000$ population), San Francisco County had the highest rate of newly reported chronic hepatitis C cases in California in 2011, followed by Madera, Humboldt, Shasta, and Alameda counties. All of the top five populous jurisdictions had rates of newly reported hepatitis C cases higher than the statewide rate, as did Sacramento, San Luis Obispo, and Imperial counties, City of Berkeley, and Los Angeles County. Together, the top five populous local health jurisdictions accounted for 12.1 percent (n=4,003) of all newly reported chronic hepatitis C cases in 2011.
- Among nonpopulous jurisdictions (with $< 100,000$ population), Del Norte County had the highest rate of newly reported chronic hepatitis C cases in California in 2011, followed by Siskiyou, Tehama, Mariposa, and Mendocino counties. All of the top five nonpopulous jurisdictions had rates of newly reported hepatitis C cases higher than the statewide rate, as did Yuba, Kings, Butte, Calaveras, and Lake. Together, the top five nonpopulous local health jurisdictions accounted for only 1.0 percent (n=347) of all newly reported chronic hepatitis C cases in 2011.

C. Chronic Hepatitis C in State Prisons in California

Overall

- From 1994 through 2011, 63,794 chronic hepatitis C cases in California prisons were newly reported to CDPH. In 2011, CDPH received 5,263 new reports of chronic hepatitis C in state prison facilities; this represents a rate of 3205.5 newly reported cases per 100,000 incarcerated persons.
- Nearly 16 percent of all chronic HCV cases newly reported in California in 2011 were reported from state prisons.

By Age

- From 2007-2011, the highest rate of newly reported chronic hepatitis C cases in state prisons occurred among persons 45-59 years of age.
- From 2007-2011, rates of newly reported chronic hepatitis C cases among incarcerated persons declined for all age groups except for persons 18-34 years of age. Between 2007 and 2011, rates of newly reported cases increased 46 percent among 18-24 year olds, and 1.6 percent among 25-34 year olds. In contrast, rates of newly reported cases declined 41 percent for persons aged 35-44, 52 percent for persons aged 45-59, and 40 percent for persons aged 60 years or older.

By Race/Ethnicity

- From 2007-2011, Hispanics/Latinos represented an increasing proportion of chronic hepatitis C cases in state prisons, from 41.9 percent in 2007 to 50.4 percent in 2011.
- In 2011, Whites and Hispanics/Latinos were overrepresented among chronic hepatitis C cases in state prisons. Whites represented 25.8 percent of the population in state prisons, but 38.6 percent of reported chronic hepatitis C cases, and Hispanics/Latinos represented 43.2 percent of the population in state prisons, but 50.4 percent of chronic hepatitis C cases. In contrast, African American/Blacks were underrepresented, making up 31.0 percent of the state prison population but only 11.1 percent of chronic hepatitis C cases in state prisons in 2011.

By Geography

- Since 2008, Kern County has had the highest proportion of newly reported chronic hepatitis C cases among all cases reported in state prisons, accounting for 22.9 percent of chronic hepatitis C cases reported in state prisons in 2011. Kern County houses 13.1 percent of persons incarcerated in California state prisons and is home to three state prison reception centers.

D. Discussion

This surveillance report on chronic viral hepatitis, the first for the state of California, found that statewide trends are comparable to those occurring nationally. Notable results that warrant greater emphasis are briefly discussed below:

- From 1989 through 2011, there were 231,644 newly reported chronic hepatitis B cases in California. It is unknown how many are currently living and in California. State estimates suggest that there are approximately 350,000 people living with chronic hepatitis B in California. Possible reasons for the difference between the number of reported cases and estimated cases may include underdiagnosis, underreporting, and errors in statewide estimates. Either way, these figures suggest there are hundreds of thousands of people living with chronic HBV infection in California. Undiagnosed and unreported infections present an opportunity for increase chronic hepatitis B screening and public health surveillance, as well as for HBV prevention and linkages to care.
- From 2007-2011, nearly two-thirds of reported chronic HBV infections in California were among persons aged 25-54 years. This is consistent with recent national trends; in 2010, CDC found that, among eight sites funded to conduct enhanced viral hepatitis surveillance, 62.5 percent of chronic HBV infections were among persons aged 25-54 years.⁶
- Persons less than 18 years of age had the lowest rate of newly reported chronic HBV infection, suggesting that childhood immunization policies have been effective at reducing chronic HBV infections at the population level.^{7,8}
- In California and nationwide, APIs are disproportionately affected by chronic hepatitis B; they make up nearly two-thirds of all newly reported chronic hepatitis B cases in California and more than half of all persons living with chronic hepatitis B in the U.S.^{9,10} These findings reinforce the importance of implementing CDC recommendations for routine hepatitis B testing among all persons born in countries with a hepatitis B prevalence of two percent or higher and among U.S.-born persons not vaccinated as infants whose parents were born in countries with hepatitis B prevalence of eight percent or higher.
- From 1994 through 2011, there were 501,664 newly reported chronic hepatitis C cases in California. It is unknown how many are currently living and in California. State estimates suggest that there are approximately 750,000 people living with chronic hepatitis C in California. Possible reasons for the difference between the number of reported cases and estimated cases may include underdiagnosis, underreporting, and errors in statewide estimates. Either way, these figures suggest there are hundreds of thousands of people living with chronic HCV infection in California. Undiagnosed and unreported infections present an opportunity for increase chronic hepatitis C screening and public health surveillance, as well as for HCV prevention and linkages to care.

- Persons born during 1945-1965 make up approximately 60 percent of all chronic hepatitis C cases in California. This result is consistent with national estimates, which found that persons born during 1945-1965 compose nearly three-quarters of all chronic hepatitis C cases in the U.S.¹¹ The disproportionate impact of chronic hepatitis C on “baby boomers” underscores the importance of implementing CDC and U.S. Preventive Services Task Force (USPSTF) recommendations for one-time HCV testing for all persons born during 1945-1965, without prior ascertainment of risk.^{11,12}
- Findings that African Americans/Blacks and American Indian/Alaska Natives in California were disproportionately affected by chronic hepatitis C are similar to those observed in 2010 by eight sites across the United States funded by CDC to conduct enhanced viral hepatitis surveillance. Nationally, African Americans/Blacks made up 12.4 percent of the general population in 2010 but composed 21.1 percent of cases with known race/ethnicity among the eight enhanced surveillance sites.^{6,13} Similarly, American Indian/Alaska Natives made up 0.9 percent of the national population in 2010 but composed 1.9 percent of hepatitis C cases.^{6,13}
- Among populous local health jurisdictions, San Francisco, Madera, Humboldt, Shasta, and Alameda counties had the top five highest rates of newly reported chronic hepatitis C cases in 2011. Among nonpopulous jurisdictions, Del Norte, Siskiyou, Tehama, Mariposa, and Mendocino counties had the top five highest rates of newly reported chronic hepatitis C cases in 2011. The exact reasons for the geographic distribution of chronic HCV infections in California are unknown and may be due to a variety of factors, including differences in the distribution of age groups (i.e., persons born during 1945-1965), and risk histories (i.e., persons who have ever injected drugs) among local health jurisdictions.
- A substantial proportion (16 percent) of all newly reported chronic hepatitis C cases in California were reported from state prisons. This may be due in part to California having both a large prison population (164,186 as of June 30, 2011), and high HCV prevalence (34.3 percent) in California state prisons.^{14,9} These findings support CDC recommendations for hepatitis C screening, medical evaluation, and care in correctional settings.^{15,16}
- Increases in the rates of newly reported chronic hepatitis C cases among young persons (18-34 years of age) in California state prisons are notable. The decrease in newly reported cases among older adults is likely due to the state surveillance system having captured a large number of prevalent hepatitis C cases when laboratory reporting began in 2007, after which time newly reported cases were more likely to be young (and thus not previously reported). However, the observed increase in rates of newly reported chronic HCV cases among young persons incarcerated in state prisons merits investigation to ascertain whether it is consistent with clusters of HCV among young non-urban injection drug users in other states.^{17,18}

2. Background

A. Public Health Significance of Chronic Viral Hepatitis

As a leading cause of liver disease, liver cancer, and liver transplants, chronic viral hepatitis is an important public health problem in California and nationwide. Along with hepatitis A virus, hepatitis B and hepatitis C viruses are the most common causes of viral hepatitis. HBV and HCV are distinct from hepatitis A, however, in that they are blood-borne and can cause long-term disease (i.e., chronic liver disease and hepatocellular carcinoma). Between 3.5 and 5.3 million Americans have chronic viral hepatitis infection,^{1,2} nearly five times the number of people living with human immunodeficiency virus (HIV). In 2011, hepatitis C was the second most commonly reported communicable disease in California (after chlamydia).¹⁹

The long-term health implications and health care costs of HBV and HCV infections are substantial. In 2010, the most common reason for liver transplants in the United States was advanced liver disease due to HCV.²⁰ Chronic HBV and HCV infections cause nearly 57 percent of liver cirrhosis cases and 80 percent of cases of liver cancer, which is the fastest growing cause of cancer-related deaths.^{21,11} Each year, an estimated 5,000 Americans die from complications caused by HBV and approximately 8,000-10,000 die from the complications of liver disease caused by HCV.²² Since 2007, the annual number of deaths due to HCV in the United States has surpassed those due to HIV.⁵ Complications of chronic viral hepatitis also result in considerable medical costs. In California, there were more than 30,000 hospitalizations in 2010 for liver disease, liver cancer, or liver transplant-related treatments among patients infected with either HBV or HCV.³ Hospitalization charges for these in-patient stays totaled more than \$2.3 billion. Nationwide, over the next twenty years, annual medical costs for people with HCV are expected to increase more than 2.5 times, from \$30 billion to more than \$85 billion.⁴

B. Prevalence Estimates of Chronic Viral Hepatitis in the United States and California

The most recent estimates of national prevalence, which are based on data collected from 1999-2002 by the National Health and Nutrition Examination Survey (NHANES), suggest there are approximately 800,000-1.4 million persons in the United States living with chronic (long-term) infection with HBV and an estimated 2.7-3.9 million persons with chronic HCV infection.^{1,23} Applying these national estimates to California, which makes up for 12.1 percent of the U.S. population, there are 280,000 Californians living with chronic HBV infection and 600,000 with chronic HCV infection.²⁴ However, the true prevalence in California is likely much higher due to several key limitations of NHANES methodology and data. Specifically, NHANES data only provides HBV and HCV prevalence estimates for non-Hispanic white, non-Hispanic black, and Mexican-American persons, and not for other racial/ethnic groups.^{1,8}

NHANES survey methodology also does not use a representative sample of persons at high risk for chronic viral hepatitis, such as foreign-born persons, and excludes other high-risk populations altogether, including incarcerated and homeless individuals.^{1,8}

A substantial proportion of populations at high risk for viral hepatitis live in California. For example, one-third of all APIs in the United States live in California, and APIs account for more than half of all chronic HBV infections nationwide.^{9,10,24} APIs, in particular, are over-represented among chronic hepatitis B cases because in many Asian countries and most of the Pacific Islands, 8 to 15 percent of the population has chronic HBV infection.²⁵ Research has also found that approximately 34.3 percent of persons incarcerated in California state prisons have evidence of ever having had hepatitis C infection.¹⁵ Estimates that have been adjusted to include these high-risk populations suggest there are closer to 350,000 people with chronic hepatitis B infection and 750,000 with chronic hepatitis C infection in California.^{9,26}

C. Hepatitis B Overview

HBV may be transmitted when either blood or body fluids (e.g., semen, vaginal fluids) from an infected person enter the skin or mucous membranes of a person who is not immune to HBV.²² Most exposures to HBV occur through sexual contact, sharing needles (and/or other injection equipment) during injection drug use, from mother to child during childbirth, or occupational needle sticks or sharps exposures. However, HBV transmission can also occur among persons who have prolonged, non-sexual interpersonal contact with someone who is HBV-infected (e.g., household contacts), such as through sharing items contaminated with blood (e.g., razors or toothbrushes).²⁷

HBV transmission during childbirth can be prevented by administering hepatitis B immunoglobulin and hepatitis B vaccine to the infant at birth, followed by completion of a full hepatitis B vaccine series, as recommended by CDC and the Advisory Committee on Immunization Practices.²⁸ Effective hepatitis B vaccines were licensed in the United States in 1982, and a comprehensive strategy to eliminate HBV nationwide was implemented in the 1990s, which had multiple components, including the universal vaccination of infants, routine screening of all pregnant women for HBV infection, routine vaccination of previously unvaccinated children and adolescents, and vaccination of adults at increased risk for infection.²⁹ Adult groups currently recommended for HBV vaccination include sexual and household contacts of persons with chronic HBV infection, men who have sex with men, injection drug users, people under 60 years of age with diabetes, healthcare workers, dialysis patients, and people with HIV infection.^{28,30-32}

The presence of symptoms associated with acute HBV infections varies by age and symptoms can range from mild to severe. Most children under 5 years of age and immunosuppressed adults remain asymptomatic, whereas 30 to 50 percent of persons over 5 years of age will develop symptoms within three months (range: 60-150 days) of exposure, such as abdominal pain, fever, nausea and vomiting, loss of appetite,

weakness and fatigue, joint pain, and jaundice.³³ While symptoms of acute HBV infection typically only last for several weeks, they may persist for up to six months. After an acute phase, HBV infection can either resolve spontaneously or become a chronic infection. The risk of chronic HBV infection is highest at birth; approximately 90 percent of infants who acquire HBV infection from their mothers at birth become chronically infected, compared with 25 to 50 percent of children aged 1-5 years. Nearly all (95 percent) persons infected with HBV as adults successfully eliminate HBV and become immune to reinfection.³³ Persons who develop a chronic infection may remain asymptomatic for decades. However, without early diagnosis and treatment, between 15 and 25 percent of persons with chronic HBV infection will develop liver disease, liver cancer, or liver failure, and will serve as a source of ongoing HBV transmission.³³

To improve health outcomes of persons living with HBV, CDC issued recommendations in 2008 to guide HBV testing and public health management.²³ These guidelines stress (1) routine testing and vaccination of persons at high risk for HBV infection (e.g., all persons born in countries with a hepatitis B prevalence of two percent or higher; U.S.-born persons not vaccinated as infants whose parents were born in countries with hepatitis B prevalence of eight percent or higher; injection drug users; men who have sex with men; persons with unexplained elevated liver enzymes, and sexual, needle-sharing, and household contacts of infected persons), (2) educating patients on liver self-care, (3) vaccinating contacts who are susceptible to HBV, (4) linking persons with chronic hepatitis B to care, and (5) lifelong monitoring of persons with chronic hepatitis B infection to assess progression of liver disease or liver cancer and response to treatment, if indicated. Although there is no cure for chronic HBV infection, effective treatments such as antiviral medications are available to slow the progression of liver disease.

D. Hepatitis C Overview

HCV may be transmitted when blood from an infected person enters through the skin of an uninfected individual.²² Prior to 1992, when routine screening of the national blood supply was implemented, HCV was most commonly transmitted through blood transfusions and organ transplants. Exposures to HCV now occur predominantly through sharing needles and/or other injection equipment during injection drug use. Less frequently, HCV exposures occur through needlestick injuries and failures to adhere to infection control practices in healthcare settings, or birth to an HCV-infected mother (prophylaxis is currently not available to prevent perinatal HCV infection). Exposures to HCV via the receipt of donated blood, blood products and organs are extremely rare. Other potential, but inefficient, modes of transmission include sexual contact with a HCV-infected person or sharing items contaminated with blood (e.g., razors or toothbrushes).

Like HBV infection, after an acute phase, HCV infection can either resolve spontaneously or become a chronic infection. Most people with acute HCV infection remain asymptomatic;²⁷ only 20 to 30 percent of infected persons will develop an illness

with symptoms similar to acute HBV infection within one to three months (range: 2 weeks to 6 months), including fever, nausea, loss of appetite, fatigue, joint pain, and jaundice. For this reason, the majority of persons (45-85 percent) chronically infected with HCV remain unaware of their infection.¹¹ Often, they are unaware for several decades, while liver disease or liver cancer may be progressing undetected. The risk of an acute HCV infection progressing to chronic infection and chronic disease is high. Of every 100 persons newly infected with HCV, only 15 to 25 persons are able to clear the virus without treatment; 75 to 85 persons will develop chronic infection, 60 to 70 persons will develop chronic liver disease, 5 to 20 persons will develop cirrhosis over the course of 20-30 years, and 1 to 5 persons will die from consequences of chronic infection (i.e., liver cancer or cirrhosis).³⁴ Unlike HBV, infection with HCV does not result in immunity against future infections; persons with resolved HCV infections may become re-infected later on with the same or different genotypes of the virus, or superinfected with more than one genotype.³⁵

The complications of HCV can be prevented or mitigated by early detection and treatment with antiviral medications. Since there is currently no vaccine for HCV infection, and because prior infection does not protect against subsequent exposures, CDC recommends other primary prevention activities, including screening and testing blood donors, testing persons at risk for HCV infection, and providing them with risk-reduction counseling (including regarding safer injection practices), and consistently practicing infection control in healthcare settings.^{35,36} Persons at risk of HCV infection include: (1) those who have ever injected drugs, even if it was only once many years ago, (2) patients who have ever received long-term hemodialysis, (3) recipients of blood transfusions or solid organ transplants before 1992, (4) recipients of clotting factor concentrates made before 1987, (5) healthcare workers after needlestick injuries involving HCV-positive blood, (6) all persons with HIV infection, and (7) children born to HCV-infected mothers.³⁷ CDC also recently recommended one-time testing for all persons born from 1945 through 1965, without prior ascertainment of risk.¹¹ Since alcohol consumption and co-infection with HIV, hepatitis A virus (HAV), or HBV speed the progression of HCV-related disease, it is also recommended that all persons identified with HCV infection receive counseling to decrease or stop alcohol consumption, get vaccinated against HAV and HBV, and are referred to appropriate care for HCV infection and related conditions.¹¹

3. Viral Hepatitis Surveillance Overview

Surveillance is a core function of public health, and is critically needed to inform targeted efforts to reduce morbidity and mortality among people living with hepatitis B and hepatitis C infection and to prevent further transmission of these communicable diseases. In California, healthcare providers and laboratories report viral hepatitis cases, serving as the state's primary source of surveillance data for chronic HBV and HCV infection. Healthcare providers have been required to report HBV since 1989, with laboratories following suit in 1995. HCV reporting by healthcare providers began in 1994, and laboratory reporting of HCV test results became required in July 2007.

California requires healthcare providers to report HBV and HCV cases to the local health jurisdiction in which the patient resides.³⁸ Likewise, laboratories are required to report test results indicating HBV or HCV infection to the local health jurisdiction in which the provider who ordered the laboratory test is located and/or to the statewide laboratory reporting system.³⁹ Local health jurisdictions, in turn, have used various means for tracking cases and reporting them to CDPH, including a new statewide electronic confidential morbidity reporting and laboratory reporting system known as California Reportable Disease Information Exchange (CalREDIE), an older mechanism known as Automated Vital Statistics System (AVSS), and other local disease reporting systems.

In 2010, a collaboration of state and local agencies, community-based organizations, and community hepatitis awareness groups recommended the generation of statewide viral hepatitis surveillance reports for public distribution to local health departments and other community partners, as part of a strategic plan to reduce the impact of viral hepatitis in California.⁴⁰ However, many local health jurisdictions were overwhelmed by the large volume of HCV laboratory reports that followed the advent of mandatory HCV laboratory reporting in 2007, and were unable to process them in a timely manner, leading to a considerable backlog of chronic hepatitis C case reports. In 2011-2012, a one-time CDC grant that provided funds from the Patient Protection and Affordable Care Act enabled CDPH to process nearly 25,000 paper HCV reports dating from 2007 through 2011. To supplement these data, CDPH also requested and received line-listed reports from two major laboratories (which also serve as primary laboratories for the state prison system) for all HCV tests conducted in California during selected years: 2008–2009 for Foundation and 2007–2011 for Quest. **Appendix A** (Table 1A) shows the proportion of all chronic hepatitis C cases, by local health jurisdiction, that were identified by line-listed laboratory data directly reported to CDPH, from 2007-2011.

4. Methods

A. Data Sources and Definitions

CDPH received cumulative data on chronic hepatitis B and hepatitis C infections from various sources and disease reporting systems, including electronic case reports submitted by local health jurisdictions, paper laboratory and case reports submitted by local health jurisdictions, and line-listed data on all positive HCV test results submitted by two large private laboratories.

Given that multiple case reports regarding the same individual could have been submitted from more than one county and through various disease reporting systems, information from multiple data sources was merged and analyzed to identify and remove duplicate case reports (“deduplicated”). **Appendix B and Appendix C**, respectively, show the total number of hepatitis B and hepatitis C case reports received by CDPH, and the proportion of those reports that were determined to be duplicates (from 1989-2011 for chronic hepatitis B, and from 1994-2011 for chronic hepatitis C). For more information on how case matching was conducted, see **Appendix D**.

Although only cases with positive test results dated on or before December 31, 2011 were included in this analysis, data reported to CDPH through June 30, 2012 were included in the analysis to allow for delays in data entry at the local level.

Key information sources and definitions used in this report are explained below. For additional definitions of terms used in this report, see the glossary in **Appendix E**.

Rate of Newly Reported Cases

This report defines the “rate of newly reported cases” as the number of newly reported cases in a defined population, divided by the number of people in the defined population, and multiplied by 100,000 in order to report the rate per 100,000 persons. This method was applied to populations defined by specific demographic groups (e.g., age and gender) to calculate group-specific rates. As described in the Data Limitations section, these rates do not describe incidence of new viral hepatitis infections.

Local Health Jurisdictions

Data published by the California Department of Finance in December 2011, *California County Population Estimates and Components of Change by Year, July 1, 2000–2011*, were used to calculate county-specific rates. Data for the three city health jurisdictions (Berkeley, Long Beach, and Pasadena) enclosed in larger counties are included in the county totals and also displayed separately from their respective county totals. These rates exclude individual cases in state prisons, as well as cases whose jurisdiction at the time of first contact was outside of California. Rates were not calculated for local health jurisdictions with five or fewer cases.

Age and Gender

Rates of newly reported cases by age and gender were calculated using the California Department of Finance's *Race/Ethnic Population with Age and Sex Detail, 2000–2050*, published in July 2007. For this report, age is defined as the age of the person at the time of the first positive HBV or HCV case report; the actual time of infection is not possible to approximate without continuous testing because people may have been infected with HBV or HCV for many years prior to their first positive test result. Rates by gender are presented for females and males only. Although limited data on transgender cases are available, the data are most likely underestimates of the true number of cases among transgender individuals due to inconsistent collection of transgender identity in state and local surveillance systems; the form providers used to report cases to local health jurisdictions did not include a transgender category until January 2011.

Race/Ethnicity

Percentages, rather than rates, were used to describe newly reported cases by race/ethnicity, since race/ethnicity information was not reported for more than two-thirds of chronic hepatitis B cases (66-78 percent) and chronic hepatitis C cases (68-82 percent) during 2007-2011. Race/ethnicity was categorized as American Indian/Alaska Native, Asian/Pacific Islander, African American/Black, Hispanic/Latino, White, and Multi-race/Other Race. For the purposes of this report, Hispanic/Latino encompasses patients of Hispanic or Latino ethnicity, regardless of reported race; all other race categories presented do not include persons of Hispanic or Latino ethnicity. Starting in 2010, information regarding identification of API individuals within specific API groups (e.g., Chinese, Hmong, Vietnamese, Native Hawaiians) was collected but was only available for 3.4 percent of cases reported as API; thus it is excluded from this analysis. Rates of newly reported cases were not calculated for "Other Race" and "Multi-race" groups because current California population denominator data do not allow for differentiating between Other Race, Multi-race, and racial categories that are not specified.

Incarcerated Persons with Chronic Hepatitis C

For the purposes of this report, incarcerated individuals with chronic hepatitis C are not attributed to the local health jurisdiction in which they were incarcerated at the time of their hepatitis C case report. This is because people are often incarcerated in a different county than the one in which they would reside were they not incarcerated. In order to avoid overestimating the burden of disease in (often rural) counties with state prisons, chronic hepatitis C cases reported from state prisons are attributed to the state prison system at large. Accordingly, the HCV data highlighted in this report are presented in two separate sections—the first for the entire state (which includes cases in state prisons), and the second for hepatitis C cases in state prisons only.

Rates of newly reported cases in state prisons were calculated using data published by the California Department of Corrections and Rehabilitation, *Prison Census Data as of*

June 30, 2011. These data only describe newly reported cases in California state prisons and do not include cases reported in local jails, federal prisons, or immigration detention centers. In addition, state prison census data use different age and race/ethnicity classifications than the California Department of Finance. For this reason, data in the sections describing hepatitis C cases in prisons only are categorized using different age and race/ethnicity groups than those used in other sections of this report.

B. Case Definitions

Chronic Hepatitis B

Cases of chronic HBV infection were reported to CDPH by local health jurisdictions as either *probable* or *confirmed* based on the Council of State and Territorial Epidemiologists (CSTE) case definition for chronic hepatitis B current at the time of the case report. (Minor changes in language between the 2007 and 2011 CSTE case definitions for chronic hepatitis B did not affect how cases were counted.) This surveillance report accepted local health jurisdictions' case classifications at face value. It is not currently possible for CDPH to independently verify that each chronic hepatitis B case met the laboratory criteria for the CSTE case definition using laboratory test results. For surveillance purposes, local health jurisdictions presumed hepatitis B cases were chronic unless the cases were reported as acute. To read the 2011 CSTE case definition for chronic hepatitis B in more detail, see **Appendix F**.

Chronic Hepatitis C

This report uses the term “chronic HCV infection” to describe cases meeting the CSTE case definition for “hepatitis C, past or present.” These include some persons with HCV antibody in the blood, which indicates “past infection,” and all persons with HCV ribonucleic acid (RNA) or HCV genotype in the blood, which indicates “present infection”. (To meet the CSTE case definition, HCV antibody test results need to be above a certain threshold value established for the specific assay by CDC.) To read the 2011 CSTE case definition for “past or present” HCV infection, see **Appendix F**.

Cases of chronic HCV infection were reported to CDPH by local health jurisdictions as *confirmed* based on the CSTE case definition for “hepatitis C, past or present” current at the time of the case report. (Minor changes to the CSTE case definition for chronic hepatitis C over time did not affect how cases were counted.) This surveillance report accepted local health jurisdictions' case classifications at face value unless laboratory data (e.g., from Quest, Foundation, AVSS, or CalREDIE) were available to independently verify whether reported cases met the CSTE case definition. This report excluded chronic HCV infections reported to CDPH as *probable* because alanine aminotransferase (ALT) test results—required for a *probable* case classification—are not routinely collected by local surveillance programs.

5. Data Limitations

These data do not measure prevalence. For a number of reasons, chronic viral hepatitis surveillance data do not represent the true prevalence of chronic HBV and HCV infections in California. First, surveillance data only include those persons reported to CDPH. Cases not reported to CDPH include: (1) persons unaware of their infection (i.e., those who have not been tested, including due to lack of access to care), (2) persons who were tested before the state required that providers and laboratories report cases to the local health jurisdiction, (3) individuals whose provider or testing laboratory did not report the results to the local health jurisdiction, and (4) individuals residing in local health jurisdictions that are unable to report all cases.

Second, the migration of individuals with HBV and HCV infection, either between counties within or outside of California, might limit the accuracy of case counts for the state, as well as by local health jurisdiction.

Third, these data include both living and deceased cases of chronic hepatitis B or chronic hepatitis C in California. In order to determine prevalence, only currently living cases should be counted, a task that requires a match to state and national death records and which was beyond the scope of this surveillance report.

These data describe the number of *newly reported cases per year*; they do not measure the actual rate of new infections in the population per year (incidence). Incidence is the measure of new infections in a defined, at-risk population during a specified time period, usually a year. These data represent cases that local health jurisdictions newly reported to CDPH each year. Although the date that local health jurisdictions report a case to CDPH is used to measure newly reported infections, it does not necessarily reflect the actual date a person was initially infected or diagnosed with HBV or HCV. Due to the asymptomatic nature of chronic HBV and HCV infection, individuals may have been infected many years ago, but only tested and diagnosed when they began to experience symptoms of chronic hepatitis.

These data are more complete for chronic HCV tests reported by selected labs. CDPH received line-listed laboratory data from only two laboratories, Quest and Foundation, and not from other laboratory sources. Quest and Foundation laboratories served the state prison system for some or all of the years between 2007 and 2011. Thus the data presented in this report provide a more complete picture of hepatitis C cases reported by Quest and Foundation laboratories than by other laboratories and a more complete picture of chronic hepatitis C cases in state prisons.

Rates for populations fewer than 100,000 may appear inflated. Caution should be used when interpreting county-specific rates of newly reported cases for counties of population size fewer than 100,000; rates fluctuate widely due to their small population size.

Information is missing from these data. Despite state regulations (California Code of Regulations, Title 17, Section 2500 and Section 2505) that require providers and laboratories, respectively, to provide race/ethnicity information in case reports, this information is often missing from provider reports and is almost always missing from laboratory reports. Since the majority of viral hepatitis cases in California are reported by laboratories, and not providers, nearly three-quarters of reported viral hepatitis cases were missing race/ethnicity information in 2011. Patients' addresses are also often missing in case report forms and laboratory reports. Local health jurisdictions typically do not have sufficient resources to obtain information missing for reported cases, due to the high volume of HBV- and HCV-related laboratory reports. As a result, CDPH is currently unable to provide a complete description of the demographic characteristics of chronic hepatitis B and hepatitis C infections in California.

These data may contain errors in matching and de-duplication. It is possible that records for the same person were incorrectly matched (e.g., due to slight variations in name spelling), and thus two cases were counted instead of one. The opposite may also be true; it is possible that records for two separate persons were determined to be a match and were thus inappropriately counted as a single case. While the matching algorithm was checked for accuracy, the large volume of records made it impossible to verify that all matches and non-matches determined by the algorithm were correct prior to de-duplication. In addition, our use of probabilistic determination methods to ascertain the most likely value for demographic variables might not accurately determine correct values for age, race, sex, and other variables in all instances. However, the record linkage methodology applied here has been validated, is robust, and has been used for CDPH HIV and STD surveillance reports.^{41,42,43} For more detailed information on this methodology, see Wright (2011).⁴⁴

6. Results

1. Epidemiology of Chronic Hepatitis B in California

From 1989 through 2011, 231,644 chronic hepatitis B cases were newly reported to CDPH (**Table 1**). In 2011, CDPH received 10,308 new reports of chronic HBV infections, which represents a rate of 27.4 newly reported cases per 100,000 persons.

Table 1. Chronic Hepatitis B – Cases and Rates of Newly Reported Cases, California, 1989-2011*

Year	N	Rate
1989	36	0.1
1990	4,149	13.9
1991	7,476	24.5
1992	9,055	29.2
1993	361	1.2
1994	2,225	7.1
1995	7,418	23.4
1996	8,909	27.9
1997	10,670	32.9
1998	10,571	32.2
1999	14,759	44.2
2000	15,769	46.4
2001	17,230	49.9
2002	16,173	46.3
2003	14,310	40.4
2004	12,097	33.8
2005	12,520	34.8
2006	13,513	37.3
2007	12,082	33.1
2008	11,078	30.1
2009	11,532	31.1
2010	9,403	25.2
2011	10,308	27.4

* Cases with positive test results dated on or before December 31, 2011, and reported as of June 30, 2012.

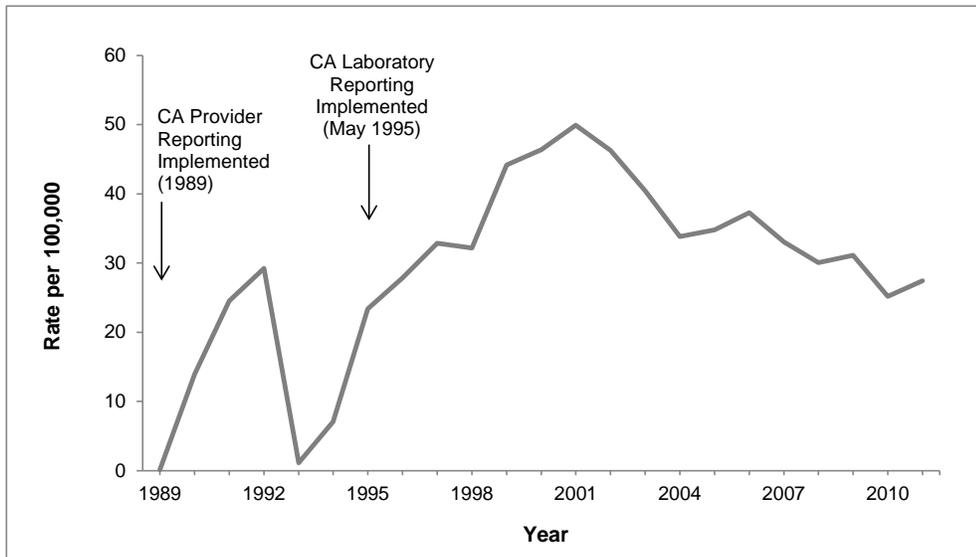
Notes: • Rates are per 100,000 population.

- A total of 231,644 chronic hepatitis B cases (*probable* and *confirmed*) were reported from 1989-2011. These data do not represent the prevalent number of people living with chronic HBV, or the incident number of chronic HBV infections, in California. Additional analysis is needed to determine how many chronic hepatitis B cases are currently living.

Source: California Department of Public Health, STD Control Branch

Reporting of chronic HBV infections by providers and laboratories began in 1989 and 1995, respectively. Changes in annual rates of newly reported cases since that time period are shown in **Figure 1**. The rate of newly reported hepatitis B cases peaked in 2001 at 49.9 cases per 100,000 persons but has decreased since that time.

Figure 1. Chronic Hepatitis B - Rate of Newly Reported Cases in California, 1989-2011



Source: California Department of Public Health, STD Control Branch

A. Age

The age distribution of chronic hepatitis B cases newly reported from 2007-2011, as well as age-specific rates of newly reported cases, are shown in **Table 2**. From 2007-2011, approximately two-thirds (64.5-67.8 percent) of reported chronic HBV infections were among persons aged 25-54 years. The median age of cases increased from 2007 to 2011, from 42.1 to 44.1.

Figure 2 shows how rates of newly reported chronic HBV infections within the various age groups have changed from 2007-2011. Although Californians 25-34 years of age had the highest rates of newly reported chronic HBV infections in 2007 (at 58.1 cases per 100,000), four years later, the highest rate of newly reported chronic HBV infections shifted to the 35-44 age group. Persons less than 18 years of age had the lowest rates of newly reported chronic HBV infections from 2007-2011.

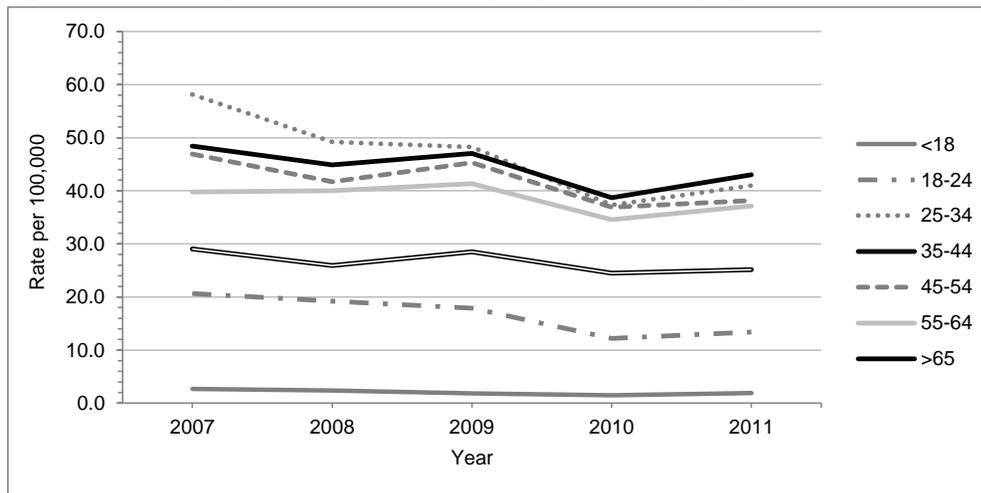
Table 2. Chronic Hepatitis B – Cases and Rates of Newly Reported Cases (per 100,000 Population) by Age, California, 2007–2011

	Total N	<18		18–24		25–34		35–44		45–54		55–64		≥65		Median Age	IQR*
		N	Rate	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate		
2007	12,082	267	2.7	792	20.7	2,903	58.1	2,756	48.4	2,527	46.9	1,512	39.8	1,189	29.0	42.1	32.2 - 53.7
2008	11,078	238	2.4	758	19.2	2,480	49.2	2,529	44.9	2,286	41.7	1,579	40.0	1,089	25.9	42.6	32.4 - 54.7
2009	11,532	186	1.9	727	17.9	2,457	48.2	2,616	47.1	2,522	45.3	1,698	41.4	1,226	28.5	43.9	33.1 - 55.3
2010	9,403	146	1.5	510	12.2	1,926	37.3	2,125	38.7	2,076	36.9	1,478	34.5	1,081	24.5	44.8	33.8 - 56.2
2011	10,308	192	1.9	574	13.4	2,151	41.0	2,341	43.0	2,158	38.2	1,646	37.1	1,141	25.1	44.1	33.5 - 56.2

* IQR = Interquartile range (25th to 75th percentile).

Source: California Department of Public Health, STD Control Branch

Figure 2. Chronic Hepatitis B – Rates of Newly Reported Cases by Age, California, 2007-2011



Source: California Department of Public Health, STD Control Branch

B. Race/Ethnicity

Table 3 shows the distribution of newly reported chronic hepatitis B cases from 2007-2011 by race/ethnicity. Throughout this time period, nearly two-thirds (62.1-65.9 percent) of newly reported chronic hepatitis B cases were among APIs.

Table 3. Chronic Hepatitis B – Cases and Percentages of Newly Reported Cases for Which Race/Ethnicity is Known, by Race/Ethnicity, California, 2007-2011

	American Indian/ Alaska Native		Asian/Pacific Islander		African American/ Black		Hispanic/ Latino		White		Known Race	Other/Multi/ Not Specified*
	N	Percent	N	Percent	N	Percent	N	Percent	N	Percent	N	N
2007	17	0.4	2,458	63.2	253	6.5	575	14.8	588	15.1	3,891	8,191
2008	9	0.3	1,973	64.5	229	7.5	381	12.4	469	15.3	3,061	8,017
2009	9	0.4	1,515	62.1	186	7.6	298	12.2	433	17.7	2,441	9,091
2010	16	0.7	1,537	65.8	175	7.5	289	12.4	319	13.7	2,336	7,067
2011	16	0.6	1,833	65.9	171	6.2	349	12.6	411	14.8	2,780	7,528

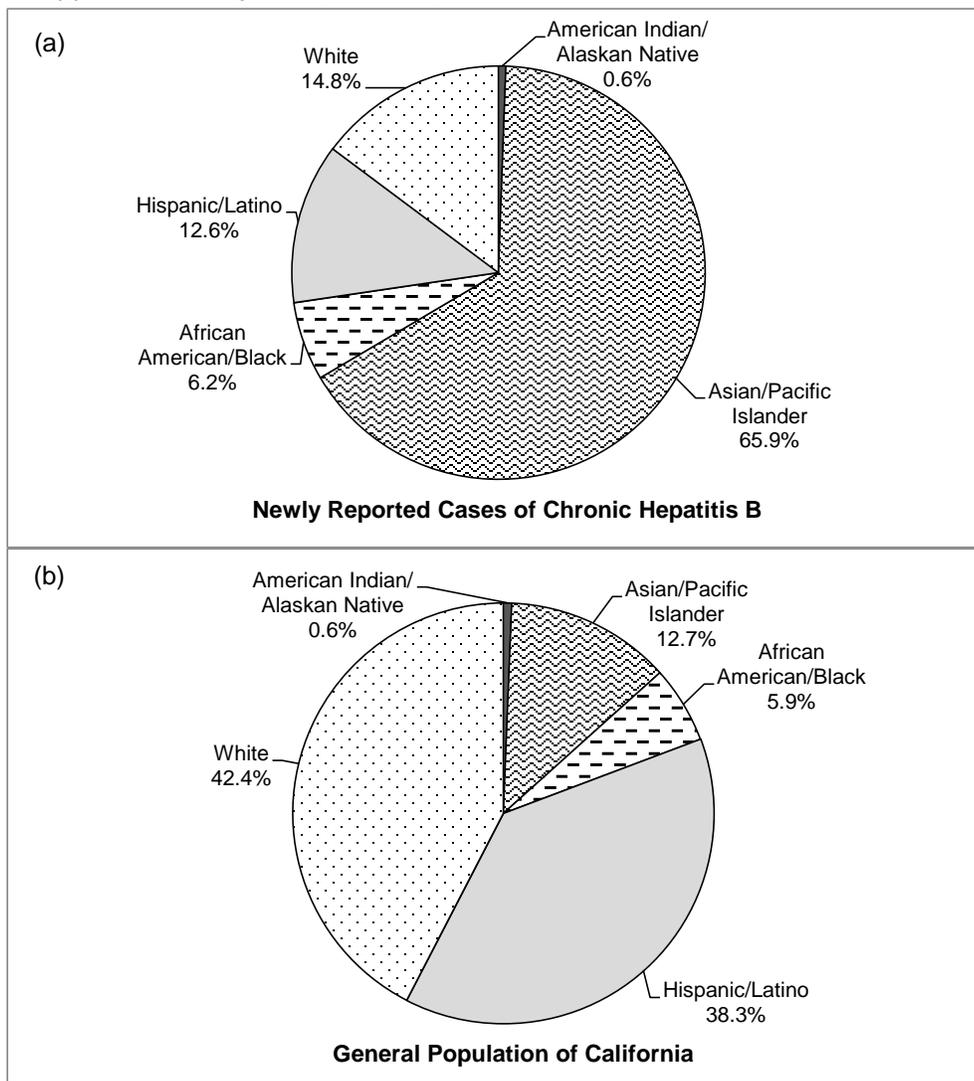
* The Other Race/Multi-race/Not Specified cases were grouped together and percentages and rates were not calculated because current surveillance data cannot separate Other Race and Multi-race from cases for which race/ethnicity was not specified.

Note: Rates of newly reported cases by race/ethnicity are not provided because race/ethnicity information was missing for more than two-thirds (67.8 to 78.8 percent) of cases from 2007-2011. Instead, percentages shown are among cases with known race/ethnicity.

Source: California Department of Public Health, STD Control Branch

Figure 3 compares the percent of newly reported cases by race/ethnicity with that of the general population in California in 2011. Although APIs constitute only 12.7 percent of the state population, 65.9 percent of newly reported chronic hepatitis B cases were API in 2011.

Figure 3. Chronic Hepatitis B – Percent of (a) Newly Reported Cases by Race/Ethnicity compared with (b) the General Population, California, 2011



Note: Percentages are shown among the cases with known race/ethnicity. Race/ethnicity information was missing for more than two-thirds (67.8 to 78.8 percent) of cases from 2007-2011

Source: California Department of Public Health, STD Control Branch

C. Gender

The gender distribution of chronic hepatitis B cases reported from 2007-2011, as well as gender-specific rates of newly reported HBV infections, are shown in **Table 4**. In 2011, rates of newly reported cases were similar for males and females (24.2 cases per 100,000 and 22.9 cases per 100,000, respectively), and chronic hepatitis B was evenly distributed among males and females (51.4 percent versus 48.6 percent, respectively).

Table 4. Chronic Hepatitis B – Cases and Rates of Newly Reported Cases (per 100,000) by Gender, California, 2007–2011

	Male		Female		Total N (Known Gender)*	Gender Not Specified N
	N	Rate	N	Rate		
2007	5,648	29.9	5,224	27.6	10,872	1,206
2008	5,169	27.1	4,662	24.3	9,831	1,244
2009	5,635	29.2	4,773	24.6	10,408	1,123
2010	4,509	23.1	3,841	19.6	8,350	1,052
2011	4,790	24.2	4,536	22.9	9,326	981

* Excludes 10 cases reported as transgender from 2007-2011, which is likely an underestimate of the true number of cases among transgender persons. Rates were not calculated for transgender persons because information on transgender identity was not consistently collected from 2007-2011; the form providers used to report cases to local health jurisdictions did not include a transgender category until January 2011.

Source: California Department of Public Health, STD Control Branch

D. Geography

From 2007-2011, chronic hepatitis B cases were reported in 51 of the 61 local health jurisdictions in California. **Table 5** shows the numbers and rates of newly reported chronic hepatitis B cases by local health jurisdiction during that time period. Rates were not calculated for local health jurisdictions with five or fewer cases.

Rates of newly reported chronic hepatitis B cases in 2011 among local health jurisdictions are ranked in decreasing order in **Figure 4**. The overall rate of reported cases in California is shown with a darker-colored bar, as a point of comparison.

Among populous local health jurisdictions (with $\geq 100,000$ population), San Francisco County had the highest rate of newly reported chronic hepatitis B cases in California in 2011, followed by Santa Clara, San Mateo, Alameda, and Monterey. All of the top five populous local health jurisdictions had rates of newly reported chronic hepatitis B case higher than the statewide rate (along with Sacramento, Los Angeles, and the City of Berkeley). Together, the top five populous local health jurisdictions accounted for 31.7 percent ($n=3,832$) of all newly reported chronic hepatitis B cases in California in 2011.

Among nonpopulous jurisdictions (with $< 100,000$ population), Del Norte County had the highest rate of newly reported chronic hepatitis B cases in California in 2011, followed

by Tuolumne, Sutter, Yuba, and Nevada counties. Both Del Norte and Tuolumne counties had rates of newly reported chronic hepatitis B cases higher than the statewide rate. Together, the top five nonpopulous local health jurisdictions accounted for only 0.8 percent (n=98) of all newly reported chronic hepatitis B cases in 2011.

Figure 5 shows a map of California counties shaded according to their rates of newly reported chronic HBV infections in 2011. Counties with rates in the top five percent are shaded with the darkest color. Subsequent categories (i.e., the next 20 percent, the next 25 percent, and the bottom 50 percent) are shaded with increasingly lighter shades of color. Counties with five or fewer cases are shaded in the lightest color.

Table 5. Chronic Hepatitis B – Cases and Rates of Newly Reported Cases (per 100,000) by Local Health Jurisdiction, California, 2007-2011

Local Health Jurisdiction	2007		2008		2009		2010		2011	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
CALIFORNIA	12,082	33.1	11,078	30.1	11,532	31.1	9,403	25.2	10,308	27.4
Alameda	772	52.3	920	61.7	897	59.6	738	48.8	845	55.4
– Berkeley *	38	34.8	45	40.8	40	35.9	27	23.9	33	28.8
Alpine	0	–	0	–	0	–	0	–	0	–
Amador	9	23.6	3	–	5	–	4	–	4	–
Butte	15	6.9	13	6.0	17	7.8	15	6.8	23	10.4
Calaveras	2	–	1	–	0	–	0	–	2	–
Colusa	0	–	0	–	0	–	0	–	0	–
Contra Costa	288	28.2	223	21.6	229	21.9	136	12.9	211	19.9
Del Norte	10	35.1	15	52.5	21	73.5	23	80.5	20	70.1
El Dorado	13	7.3	4	–	20	11.1	5	–	10	5.5
Fresno	204	22.7	161	17.6	203	22.0	150	16.1	174	18.5
Glenn	1	–	0	–	0	–	0	–	0	–
Humboldt	13	9.8	10	7.5	5	–	7	5.2	12	8.9
Imperial	15	9.0	8	4.7	17	9.8	15	8.5	27	15.2
Inyo	2	–	1	–	0	–	1	–	0	–
Kern	132	16.4	104	12.7	112	13.5	95	11.3	100	11.8
Kings	18	12.0	19	12.5	45	29.6	32	20.9	29	19.0
Lake	1	–	2	–	3	–	6	9.3	4	–
Lassen	3	–	4	–	0	–	0	–	0	–
Los Angeles	4,183	42.8	3,916	40.0	4,610	47.0	3,593	36.6	3,502	35.5
– Long Beach *	125	26.9	55	11.9	94	20.3	73	15.8	104	22.4
– Pasadena *	0	–	0	–	0	–	2	–	23	16.6
Madera	11	7.5	10	6.7	5	3.3	6	4.0	1	–
Marin	14	5.6	2	–	0	–	0	–	3	–
Mariposa	2	–	0	–	0	–	0	–	0	–
Mendocino	15	17.1	7	8.0	5	–	11	12.5	7	8.0
Merced	33	13.2	27	10.7	15	5.9	29	11.3	47	18.2
Modoc	2	–	0	–	0	–	0	–	0	–
Mono	1	–	0	–	0	–	1	–	0	–
Monterey	59	14.5	45	11.0	35	8.5	94	22.6	211	50.3
Napa	9	6.8	14	10.4	12	8.8	12	8.8	28	20.3
Nevada	3	–	2	–	8	8.1	5	–	16	16.3
Orange	718	24.2	484	16.2	404	13.5	149	4.9	502	16.5
Placer	47	14.3	24	7.1	16	4.6	60	17.1	48	13.5
Plumas	1	–	0	–	0	–	1	–	0	–
Riverside	255	12.2	235	11.1	188	8.7	286	13.0	237	10.6
Sacramento	473	34.1	299	21.3	361	25.6	428	30.1	511	35.7
San Benito	5	–	7	12.7	6	10.9	3	–	2	–
San Bernardino	274	13.7	156	7.7	112	5.5	147	7.2	290	14.1
San Diego	721	23.9	653	21.4	954	31.0	555	17.9	68	2.2
San Francisco	1,083	136.9	1,187	148.6	1,005	125.3	987	122.3	925	113.6
San Joaquin	169	25.2	180	26.7	115	16.9	92	13.4	125	18.0
San Luis Obispo	22	8.3	29	10.9	24	8.9	17	6.3	40	14.8
San Mateo	392	55.7	349	49.1	269	37.6	399	55.4	463	63.8
Santa Barbara	29	7.0	45	10.7	45	10.7	37	8.7	45	10.6

Local Health Jurisdiction	2007		2008		2009		2010		2011	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
CALIFORNIA	12,082	33.1	11,078	30.1	11,532	31.1	9,403	25.2	10,308	27.4
Santa Clara	1,598	92.0	1,443	82.0	1,359	76.6	835	46.7	1,388	76.9
Santa Cruz	23	8.9	15	5.8	8	3.1	33	12.5	30	11.3
Shasta	15	8.5	15	8.5	6	3.4	23	13.0	21	11.8
Sierra	0	–	0	–	0	–	0	–	1	–
Siskiyou	4	–	2	–	8	17.8	5	–	6	13.4
Solano	108	26.2	108	26.1	81	19.6	105	25.4	42	10.2
Sonoma	43	9.1	54	11.3	53	11.0	59	12.2	48	9.9
Stanislaus	57	11.2	47	9.2	54	10.5	42	8.2	40	7.7
Sutter	9	9.7	19	20.3	27	28.6	6	6.3	26	27.3
Tehama	0	–	2	–	1	–	2	–	1	–
Trinity	1	–	1	–	0	–	0	–	0	–
Tulare	27	6.4	31	7.2	26	5.9	26	5.9	36	8.0
Tuolumne	8	14.3	0	–	0	–	0	–	17	31.3
Ventura	91	11.3	74	9.1	79	9.7	67	8.1	49	5.9
Yolo	52	26.7	41	20.8	27	13.5	43	21.4	48	23.8
Yuba	27	38.5	67	93.8	40	55.7	18	24.9	19	26.2

* City health jurisdiction numbers are included in their respective county totals.

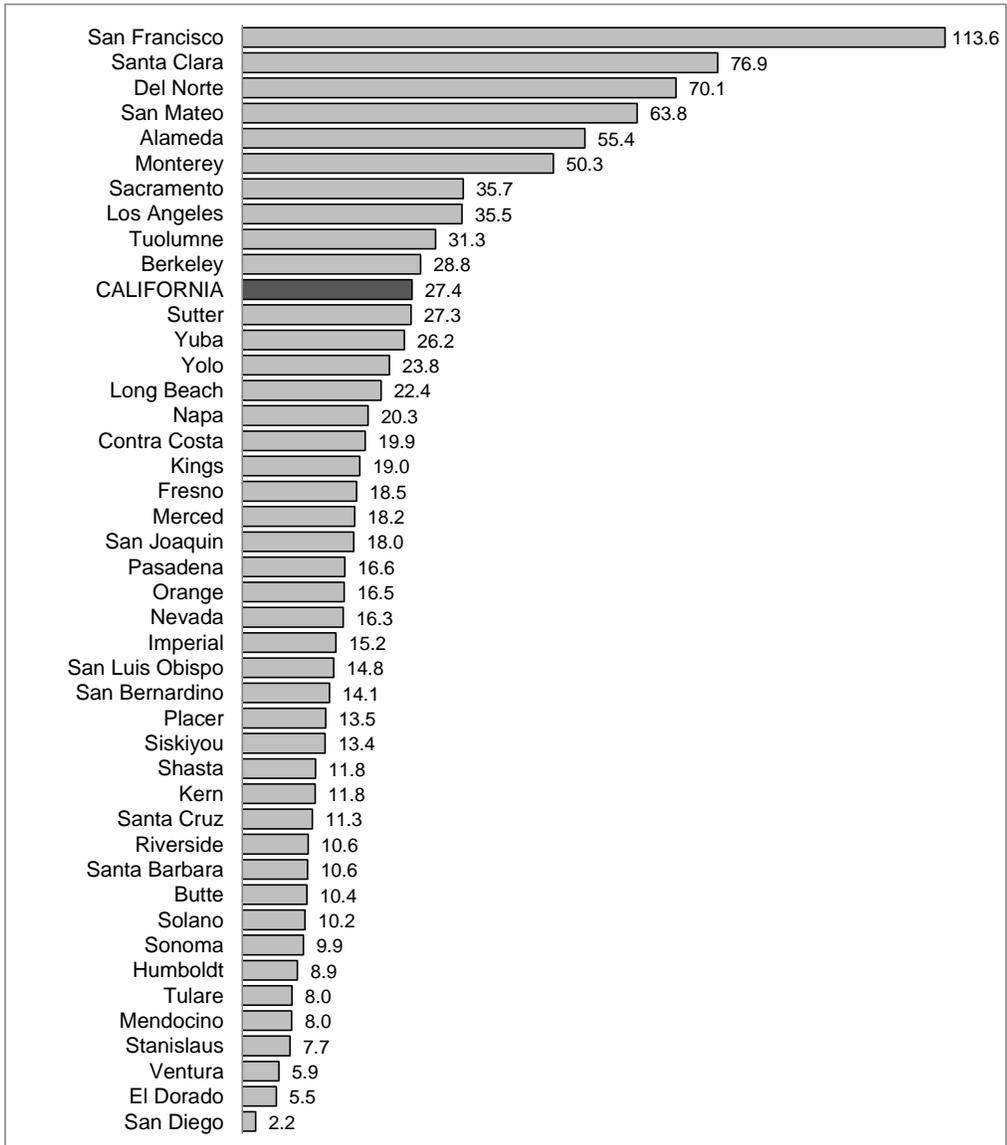
Notes:

- Rates are per 100,000 population.

- Dash (–) indicates the rate was not calculated because the local health jurisdiction reported five or fewer cases.

Source: California Department of Public Health, STD Control Branch

Figure 4. Chronic Hepatitis B – Rates of Newly Reported Cases in Ranked Order by Local Health Jurisdiction, California, 2011



Note: Rates were not calculated for the following local health jurisdictions, which reported five or fewer cases in 2011: Amador (4), Calaveras (2), Lake (4), Madera (1), Marin (3), San Benito (2), Sierra (1), and Tehama (1) counties. Alpine, Colusa, Glenn, Inyo, Lassen, Mariposa, Modoc, Mono, Plumas, and Trinity counties did not have any newly reported chronic HBV cases in 2011.

Source: California Department of Public Health, STD Control Branch

2. Epidemiology of Chronic Hepatitis C in California

In this surveillance report, data on chronic hepatitis C cases are presented in two separate sections. This section (Section 7, “Epidemiology of Chronic Hepatitis C in California”), shows data for the entire state, including chronic hepatitis C cases in state prisons. The next section (Section 8, “Epidemiology of Chronic Hepatitis C in State Prisons in California”), provides more detailed information on chronic HCV infections newly reported in state prisons only.

From 1994 through 2011, 501,664 chronic hepatitis C cases were newly reported to CDPH (**Table 6**). In 2011, CDPH received 33,190 new reports of chronic HCV infections, which represents a rate of 88.3 newly reported cases per 100,000 persons.

Table 6. Chronic Hepatitis C – Cases and Rates of Newly Reported Cases, California, 1994–2011*

Year	N	Rate
1994	1,119	3.5
1995	3,820	12.0
1996	5,292	16.6
1997	10,938	33.7
1998	17,181	52.3
1999	33,598	100.5
2000	37,493	110.3
2001	36,244	105.0
2002	32,435	92.8
2003	28,548	80.7
2004	32,047	89.6
2005	22,575	62.7
2006	28,144	77.6
2007	50,299	137.6
2008	49,066	133.1
2009	44,128	119.0
2010	35,547	95.3
2011	33,190	88.3

* Cases with positive test result dated on or before December 31, 2011, and reported as of June 30, 2012.

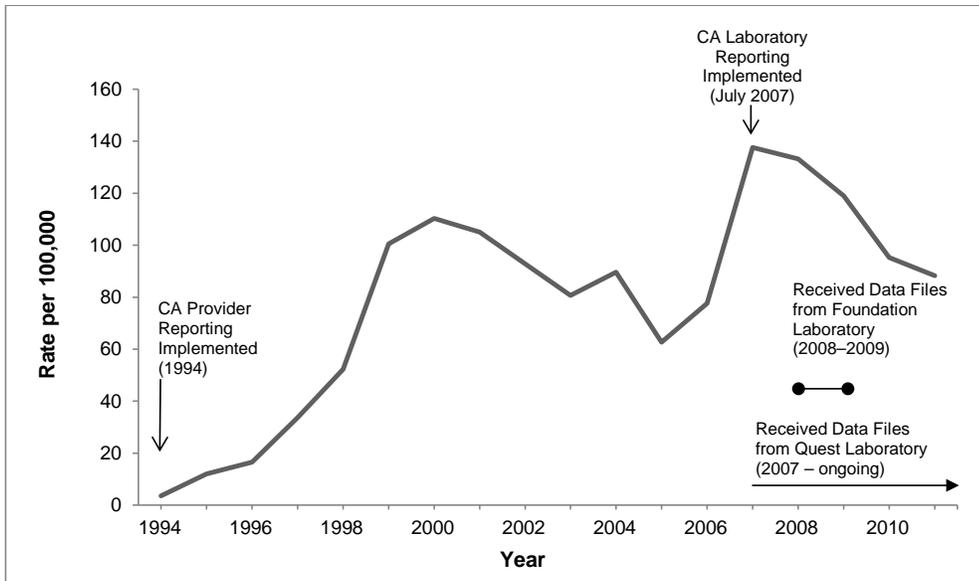
Notes: • Rates are per 100,000 population.

- A total of 501,664 *confirmed* chronic HCV infections were reported from 1994-2011. This does not represent the total number of people living with chronic hepatitis C in California. Additional analysis is needed to determine how many chronic hepatitis C cases are currently living.

Source: California Department of Public Health, STD Control Branch

Changes in annual rates of newly reported cases from 1994 through 2011 are shown in **Figure 6**. Reporting of chronic hepatitis C cases by providers and laboratories began in 1994 and 2007, respectively. The rate of newly reported HCV infections peaked in 2007 at 137.6 cases per 100,000 persons, but has decreased since that time.

Figure 6. Chronic Hepatitis C – Rate of Newly Reported Cases, California, 1994-2011



Source: California Department of Public Health, STD Control Branch

A. Age

Statewide, the median age of chronic hepatitis C cases increased two years from 2007 to 2011, from 49.3 to 51.3. **Table 7** shows the age distribution of chronic hepatitis C cases in California from 2007-2011, as well as age-specific rates. In 2011, 57.0 percent of reported chronic hepatitis C cases were among persons 45-64 years of age.

Figure 7 shows how rates of newly reported chronic HCV cases within the various age groups have changed from 2007-2011. Although Californians 45-54 years of age had the highest rates of newly reported chronic HCV infections in 2007, four years later, the highest rate of reported chronic HCV infections shifted to persons 55-64 years of age.

Figure 8a compares the proportions of newly reported chronic HCV cases across age groups. The peak of the curve shifted from persons 45-54 years of age in 2007 to persons 50-59 years of age in 2011. When individuals were categorized according to their approximate birth year, there was little difference in the shape of the curves (**Figure 8b**). In 2007 and 2011, the majority (62.9 and 56.4 percent, respectively) of persons newly reported with chronic HCV infection were born during 1945-1965.

Although young people between ages 18-34 compose a minority of newly reported chronic HCV infections, the proportion of cases from this age group increased 78.1 percent between 2007 and 2011 (from 10.5 to 18.7 percent), as shown by the left end of the age group curve (**Figure 8a**) and the right end of the year of birth curve (**Figure 8b**).

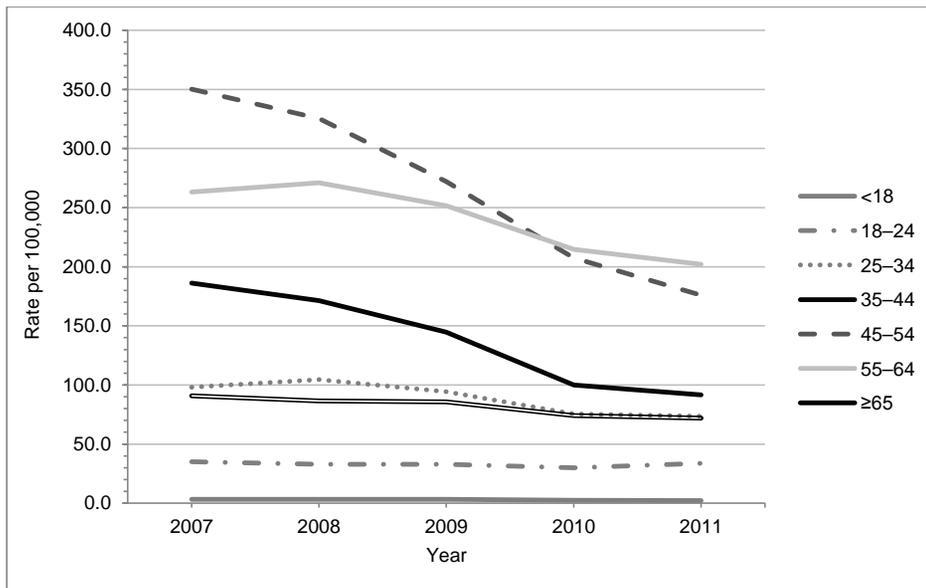
Table 7. Chronic Hepatitis C – Cases and Rates of Newly Reported Cases (per 100,000) by Age, California, 2007-2011

	Total N	<18		18–24		25–34		35–44		45–54		55–64		≥65		Age Not Specified		Median Age	IQR*
		N	Rate	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate		
2007	50,299	340	3.4	1,348	35.2	4,902	98.1	10,599	186.2	18,855	350.2	10,002	263.3	3,718	90.7	535	–	49.3	41.6–55.7
2008	49,066	330	3.3	1,302	33.0	5,268	104.5	9,651	171.3	17,840	325.5	10,695	271.0	3,635	86.6	345	–	49.6	41.5–56.3
2009	44,128	330	3.3	1,344	33.0	4,807	94.3	8,041	144.7	15,150	272.1	10,325	251.6	3,691	85.8	440	–	50.1	41.5–57.0
2010	35,547	250	2.5	1,250	29.9	3,894	75.5	5,487	99.9	11,667	207.3	9,188	214.7	3,276	74.2	535	–	51.2	42.1–58.0
2011	33,190	234	2.3	1,451	33.9	3,861	73.5	4,988	91.7	9,956	176.0	8,956	202.0	3,265	72.0	479	–	51.3	41.1–58.5

* IQR = Interquartile range (25th to 75th percentile).

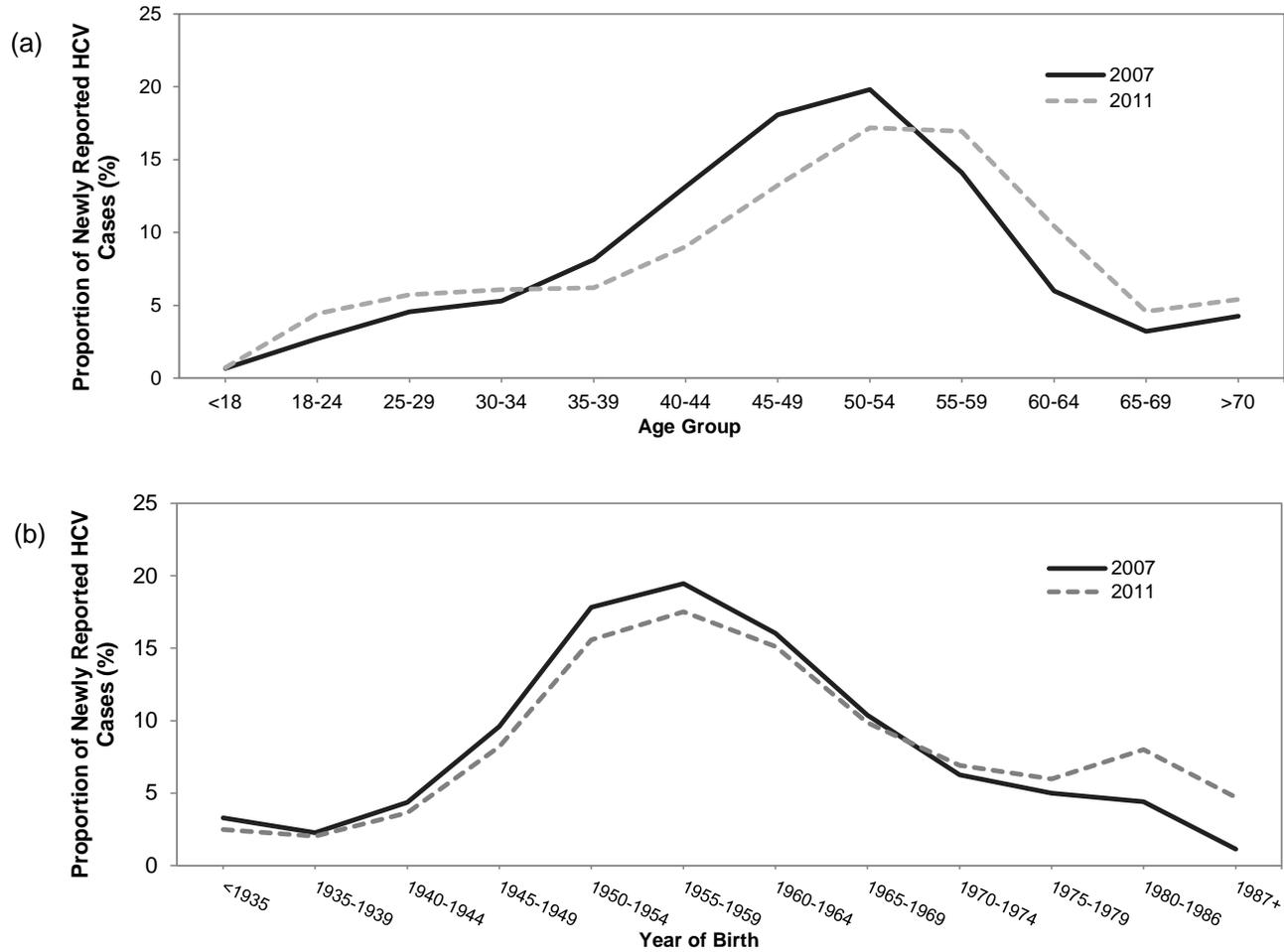
Source: California Department of Public Health, STD Control Branch

Figure 7. Chronic Hepatitis C – Rates of Newly Reported Cases by Age, California, 2007-2011



Source: California Department of Public Health, STD Control Branch

Figure 8. Chronic Hepatitis C – Proportion of Newly Reported Cases by (a) Age Group and (b) Year of Birth in 2007 and 2011, California



Source: California Department of Public Health, STD Control Branch

B. Race/Ethnicity

Table 8 shows the distribution of newly reported chronic hepatitis C cases in California from 2007-2011 by race/ethnicity. Throughout this time period, more than half of newly reported chronic hepatitis C cases were among Whites, and more than a quarter of cases were among Hispanics/Latinos (54.3 and 28.0 percent of cases in 2011, respectively).

Figure 9 compares the percent of newly reported cases by race/ethnicity with that of the general population in California in 2011 and shows that White, African American/Black, and American Indian/Alaska Native persons in California are disproportionately affected by chronic HCV infection. In 2011, Whites represented 42.4 percent of the general population in California, but 54.3 percent of reported chronic hepatitis C cases, while African American/Blacks represented 5.9 percent of the general population in California, but 12.6 percent of chronic hepatitis C cases. Similarly, American Indians/Alaska Natives accounted for 0.6 percent of the general population of California but 1.3 percent of chronic hepatitis C cases.

Table 8. Chronic Hepatitis C – Cases and Percentages of Newly Reported Cases for Which Race/Ethnicity is Known, by Race/Ethnicity, California, 2007-2011

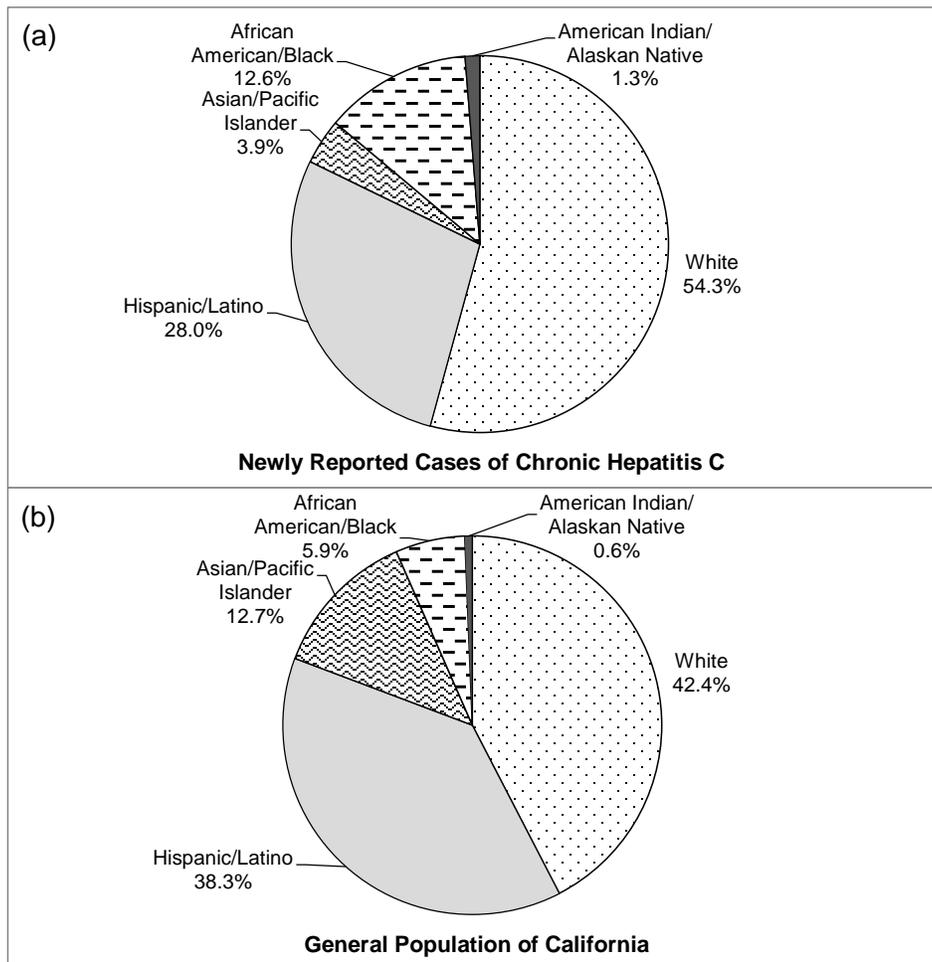
	American Indian/ Alaska Native		Asian/Pacific Islander		African American/Black		Hispanic/Latino		White		Total N (Known Race)	Other/Multi/ Not Specified* N
	N	Percent	N	Percent	N	Percent	N	Percent	N	Percent		
2007	187	1.3	484	3.3	1,597	10.9	4,915	33.4	7,511	51.1	14,694	35,605
2008	202	1.3	536	3.4	1,897	12.0	5,127	32.5	8,004	50.8	15,766	33,300
2009	123	1.2	366	3.6	1,226	12.2	3,329	33.2	4,986	49.7	10,030	34,098
2010	119	1.7	279	3.9	910	12.7	2,083	29.0	3,787	52.8	7,178	28,369
2011	76	1.3	237	3.9	764	12.6	1,692	28.0	3,284	54.3	6,053	27,137

* The Other Race/Multi-race/Not Specified cases were grouped together and percentages were not calculated because current surveillance data cannot separate Other Race and Multi-race from cases for which race/ethnicity was not specified.

Note: Rates of newly reported cases by race/ethnicity are not provided because race/ethnicity information was missing for more than two-thirds (67.9 to 81.8 percent) of cases from 2007-2011. Instead, percentages shown are among cases with known race/ethnicity.

Source: California Department of Public Health, STD Control Branch

Figure 9. Chronic Hepatitis C – Percent of (a) Newly Reported Cases for Which Race/Ethnicity is Known, by Race/Ethnicity compared with (b) the General Population, California, 2011



Note: The percentages shown are among the cases with known race/ethnicity. Race/ethnicity information was missing for more than two-thirds (67.9 to 81.8 percent) of cases from 2007-2011.

Source: California Department of Public Health, STD Control Branch

C. Gender

Table 9 shows the gender distribution of newly reported chronic hepatitis C cases in California from 2007-2011, as well as gender-specific rates of newly reported HCV cases. From 2007–2011, two-thirds of chronic hepatitis C cases in California were male, and the rate of newly reported cases for males was twice the rate for females.

Table 9. Chronic Hepatitis C – Cases and Rates of Newly Reported Cases (per 100,000), by Gender, California, 2007–2011

	Male		Female		Total N (Known Gender)*	Gender Not Specified N
	N	Rate	N	Rate		
2007	34,082	180.6	15,836	83.6	49,918	377
2008	32,473	170.1	14,362	75.0	46,835	2,225
2009	29,105	150.8	12,998	67.1	42,103	2,021
2010	22,753	116.5	11,306	57.7	34,059	1,485
2011	21,091	106.7	10,546	53.1	31,637	1,552

* Excludes 18 cases reported as transgender from 2007-2011, which is likely an underestimate of the true number of cases among transgender persons. Rates were not calculated for transgender persons because information on transgender identity was not consistently collected from 2007-2011; the form used to report cases to local health jurisdictions did not include a transgender category until 2011.

Source: California Department of Public Health, STD Control Branch

D. Age & Gender

The distribution of chronic hepatitis C cases in California in 2011 by age and gender is shown in **Table 10**. In 2011, for both males and females, approximately 57 percent of cases were among persons 45-64 years of age. Likewise, for both genders, the highest rates of newly reported cases occurred in this same age group.

As noted in the previous section, males in California had twice the rate of newly reported chronic HCV infections as females in 2011. Rates of newly reported chronic HCV infection among males aged 25-34 and 35-44 were nearly 2.4 times that of females in the same age group. A comparison of rates by gender and age shows that the gender disparity is slightly reversed for young people less than 18 years of age; rates of newly reported chronic HCV infections were 11 percent higher among females than males in this age group.

Table 10. Chronic Hepatitis C – Cases and Rates of Newly Reported Cases (per 100,000), by Age and Gender, 2011

Age Group	Male		Female		Rate Ratio (Males: Females)*	Gender Not Specified N
	N	Rate	N	Rate		
<18	111	2.2	119	2.4	0.89**	4
18–24	925	41.7	494	23.9	1.75	31
25–34	2,694	99.5	1,064	41.8	2.38	103
35–44	3,388	123.0	1,394	51.9	2.37	206
45–54	6,309	222.6	3,229	114.5	1.94	418
55–64	5,638	261.9	2,817	123.4	2.12	501
≥65	1,731	87.2	1,377	53.9	1.62	157
Age Not Specified	295	–	52	–	–	132
TOTAL	21,091	106.7	10,546	53.1	–	1,552

* In 2011, only one case of chronic hepatitis C was reported as transgender. This is likely an underestimate of the true number of cases among transgender individuals. Rates were not calculated for transgender persons because information on transgender identity was not consistently collected; the form providers used to report cases to local health jurisdictions did not include a transgender category until January 2011.

** Number differs from the ratio of the rates shown due to rounding.

Source: California Department of Public Health, STD Control Branch

E. Geography

From 2007-2011, chronic hepatitis C cases were reported in 60 of the 61 local health jurisdictions in California. **Table 11** shows the numbers and rates of newly reported chronic HCV infections by local health jurisdiction during that time period. Rates were not calculated for local health jurisdictions with five or fewer cases. Local health jurisdiction-specific rates of newly reported chronic hepatitis C cases in **Table 11** and **Table 10** (described below) exclude prison-based cases. A separate section (“Epidemiology of Chronic Hepatitis C in State Prisons in California”) contains more detailed data on chronic HCV infections newly reported in state prisons only.

Rates of reported chronic hepatitis C cases among local health jurisdictions in 2011 are ranked in decreasing order in **Figure 10**. The overall rate of newly reported cases in California is shown with a darker-colored bar, as a point of comparison.

Among populous local health jurisdictions (with ≥100,000 population), San Francisco County had the highest rate of newly reported chronic hepatitis C cases in California in 2011, followed by Madera, Humboldt, Shasta, and Alameda. All of the top five populous jurisdictions had rates of newly reported hepatitis C cases higher than the statewide rate, as did Sacramento, San Luis Obispo, and Imperial counties, City of Berkeley, and Los Angeles County. Together, the top five populous local health jurisdictions accounted for 12.1 percent (n=4,003) of all newly reported chronic hepatitis C cases in 2011.

Among nonpopulous jurisdictions (with <100,000 population), Del Norte County had the highest rate of newly reported chronic hepatitis C cases in California in 2011, followed

by Siskiyou, Tehama, Mariposa, and Mendocino counties. All of the top five nonpopulous jurisdictions had rates of newly reported hepatitis C cases higher than the statewide rate, as did Yuba, Kings, Butte, Calaveras, and Lake counties. Together, the top five nonpopulous local health jurisdictions accounted for only 1.0 percent (n=347) of all newly reported chronic hepatitis C cases in 2011.

Figure 11 shows a map of California counties shaded according to their rates of newly reported chronic HCV infections in 2011. Counties with rates in the top five percent are shaded with the darkest color. Subsequent categories (i.e., the next 20 percent, the next 25 percent, and the bottom 50 percent) are shaded with increasingly lighter shades of color. Counties with five or fewer cases are shaded in the lightest color.

Table 11. Chronic Hepatitis C – Cases and Rates of Newly Reported Cases (per 100,000) by Local Health Jurisdictions and Incarcerated Cases in State Prisons, California, 2007-2011

Local Health Jurisdiction	2007		2008		2009		2010		2011	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
CALIFORNIA	50,299	137.6	49,066	133.1	44,128	119.0	35,547	95.3	33,190	88.3
State Prisons	8,198	4731.2	8,189	4787.0	8,626	5135.1	4,816	2902.6	5,263	3205.5
Alameda	2,280	154.9	1,973	132.7	1,691	112.8	1,393	92.3	1,745	114.7
	266	243.7	268	242.9	140	125.6	91	80.6	107	93.4
Alpine	2	–	0	–	0	–	0	–	0	–
Amador	52	137.3	48	127.5	33	87.5	25	66.3	29	78.0
Butte	444	205.8	336	154.7	221	101.4	188	86.0	201	91.7
Calaveras	69	151.7	51	111.9	41	90.2	40	88.6	41	91.3
Colusa	8	38.0	4	–	8	37.8	11	51.5	2	–
Contra Costa	580	56.9	541	52.5	495	47.5	402	38.3	474	44.8
Del Norte	100	353.3	90	316.7	105	369.6	79	278.0	61	215.0
El Dorado	133	75.3	159	89.3	156	87.0	116	64.2	81	44.7
Fresno	1,274	142.5	1,183	130.3	1,035	112.7	769	82.9	482	51.4
Glenn	54	194.1	34	121.6	13	46.6	22	78.4	13	46.3
Humboldt	221	167.5	281	212.0	244	183.2	251	187.3	205	153.1
Imperial	213	127.9	164	96.6	235	136.0	163	93.0	178	100.1
Inyo	13	70.9	14	76.6	13	70.8	7	37.7	2	–
Kern	1,171	146.3	1,217	149.3	1,133	137.2	833	99.5	695	82.4
Kings	90	60.5	137	91.1	108	71.9	104	68.6	167	110.5
Lake	119	187.7	128	200.6	64	100.1	93	145.2	56	88.4
Lassen	36	101.2	22	63.0	15	43.3	7	20.2	7	20.5
Los Angeles	11,278	116.1	11,339	116.4	9,784	100.3	8,492	86.9	8,900	90.8
	387	83.3	359	77.4	300	64.9	255	55.1	198	42.7
	135	99.8	85	62.7	86	63.0	36	26.3	61	43.9
Madera	160	109.6	127	85.6	108	72.3	93	61.8	255	168.2
Marin	293	118.0	160	64.0	129	51.4	117	46.4	120	47.3
Mariposa	24	131.0	23	125.7	18	98.8	9	49.9	22	122.9
Mendocino	198	227.0	210	240.2	157	180.0	149	170.2	105	120.3
Merced	187	75.3	193	77.0	117	46.3	163	63.9	122	47.3
Modoc	12	125.8	9	94.0	5	–	5	–	6	63.2
Mono	3	–	7	49.8	6	42.7	3	–	1	–
Monterey	338	83.3	244	59.7	334	81.1	406	98.0	238	56.9
Napa	145	109.2	158	117.6	117	86.5	125	91.7	100	72.8
Nevada	110	111.9	125	126.9	140	142.5	101	102.7	76	77.5
Orange	2,098	71.0	1,437	48.3	1,249	41.8	996	33.1	972	32.0
Placer	190	57.8	261	77.5	183	53.3	235	67.2	216	60.9
Plumas	15	73.0	25	123.1	12	60.0	3	–	12	60.9
Riverside	1,875	90.5	1,703	80.6	1,322	61.6	1,231	56.4	1,062	47.9
Sacramento	2,252	163.1	1,700	122.0	1,372	97.7	1,332	94.3	1,571	110.4
San Benito	52	94.8	47	85.6	28	50.9	28	50.7	31	55.8
San Bernardino	2,384	119.8	2,697	134.6	1,994	99.2	1,929	95.2	1,018	49.7
San Diego	3,409	113.6	2,812	92.5	2,591	84.5	2,273	73.5	1,828	58.6
San Francisco	880	111.4	2,409	302.2	2,174	271.7	1,882	233.6	1,569	193.1
San Joaquin	670	100.6	550	81.9	475	70.2	420	61.5	378	54.8
San Luis Obispo	429	162.9	376	141.3	214	80.0	240	89.2	293	108.5
San Mateo	1,158	164.8	1,120	157.8	1,191	166.7	674	93.9	447	61.8
Santa Barbara	569	137.2	464	110.9	384	91.3	347	82.1	270	63.6

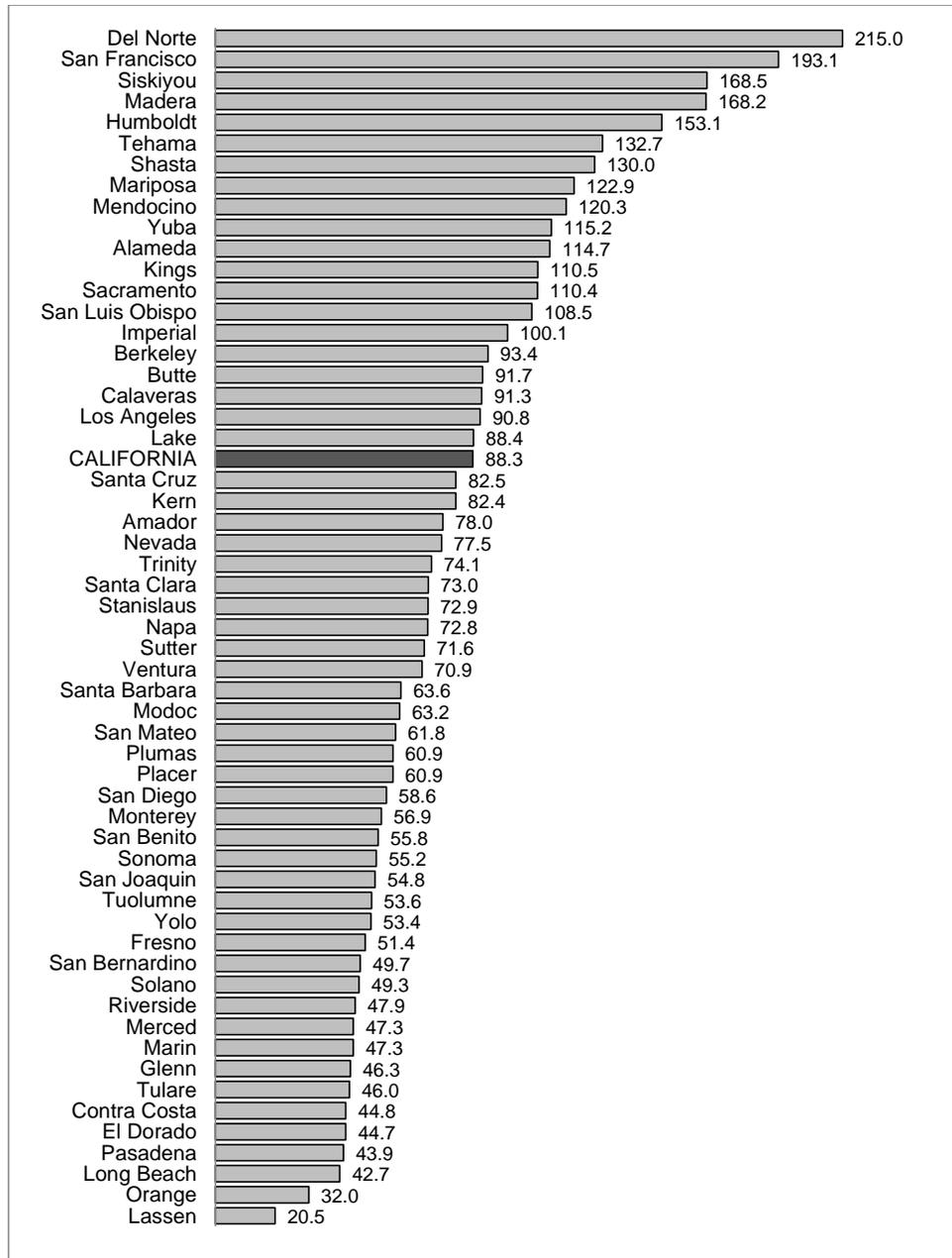
Local Health Jurisdiction	2007		2008		2009		2010		2011	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
CALIFORNIA	50,299	137.6	49,066	133.1	44,128	119.0	35,547	95.3	33,190	88.3
Santa Clara	2,213	127.9	2,018	115.1	2,260	127.8	2,126	119.3	1,315	73.0
Santa Cruz	481	187.1	400	154.3	314	120.1	251	95.6	218	82.5
Shasta	355	203.7	345	197.0	304	173.4	261	148.3	229	130.0
Sierra	2	-	3	-	4	-	0	-	1	-
Siskiyou	120	269.0	72	160.8	62	138.7	68	152.1	75	168.5
Solano	464	113.0	371	90.2	337	82.0	277	67.3	203	49.3
Sonoma	396	84.0	478	100.6	401	83.7	361	74.7	268	55.2
Stanislaus	572	113.0	549	108.1	428	84.0	397	77.4	376	72.9
Sutter	127	138.0	130	139.8	101	107.6	73	77.4	68	71.6
Tehama	117	190.3	108	173.6	95	151.6	92	145.6	84	132.7
Trinity	41	298.9	30	219.7	19	138.6	12	86.8	10	74.1
Tulare	428	101.7	544	126.9	397	91.2	289	65.6	205	46.0
Tuolumne	105	188.0	107	191.8	44	80.0	45	82.2	29	53.6
Ventura	690	85.9	578	71.4	535	65.5	483	58.7	587	70.9
Yolo	254	131.0	218	110.9	173	87.1	145	72.5	107	53.4
Yuba	140	201.2	180	254.2	124	174.1	91	126.7	83	115.2

* City health jurisdiction numbers are included in their respective county totals.

- Notes:
- Rates are per 100,000 population.
 - State prison cases were removed from local health jurisdiction totals to be included as a separate category; rates for state prisons were calculated using the total state prison population. Persons incarcerated in state prisons were removed from LHJ population totals when calculating LHJ rates.
 - Dash (-) indicates the rate was not calculated because the local health jurisdiction reported five or fewer cases.

Source: California Department of Public Health, STD Control Branch

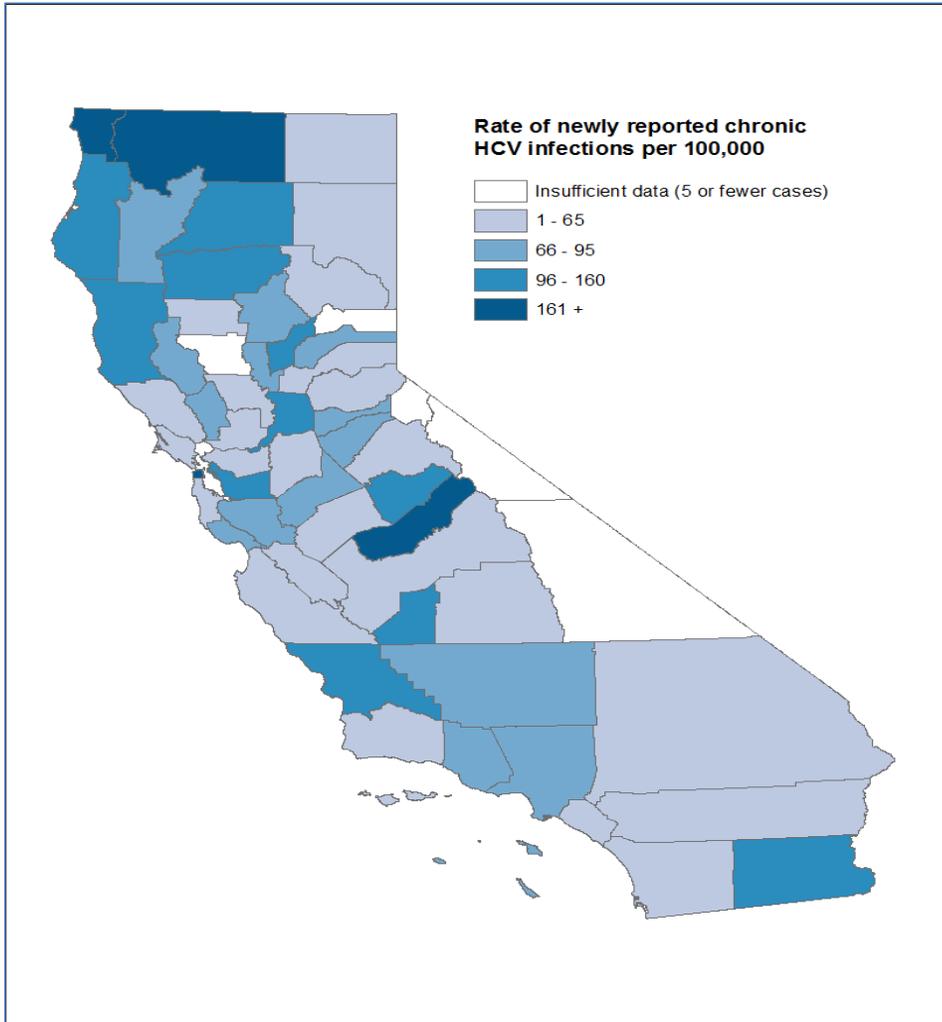
Figure 10. Chronic Hepatitis C – Rates of Newly Reported Cases (per 100,000) in Ranked Order by Local Health Jurisdiction, Excluding Cases in State Prisons, California, 2011



Notes: • Rates were not calculated for the following local health jurisdictions, which reported five or fewer cases in 2011: Alpine (0), Colusa (2), Inyo (2), Mono (1), and Sierra (1) counties.
 • State prison cases were removed from local health jurisdiction totals and attributed to the state prison system as a whole.

Source: California Department of Public Health, STD Control Branch

Figure 11. Chronic Hepatitis C – California Map, Rates of Newly Reported Cases (per 100,000) by County, Excluding Cases in State Prisons, California, 2011



- Notes:
- Rates were not calculated for the following local health jurisdictions, which reported five or fewer cases in 2011: Alpine (0), Colusa (2), Inyo (2), Mono (1), and Sierra (1) counties.
 - State prison cases were removed from local health jurisdiction totals and attributed to the state prison system as a whole.

Source: California Department of Public Health, STD Control Branch

3. Epidemiology of Chronic Hepatitis C in State Prisons in California

This section describes the epidemiologic characteristics of chronic hepatitis C cases in California state prisons. Please note that the data in this section only describe newly reported cases in California prisons and do not include cases reported in local jails, federal prisons, or immigration detention centers. In addition, state prison census data use different demographic categories (e.g., age, race/ethnicity) than the Department of Finance; thus, the age and race/ethnicity categories used in this section differ from those used in previous sections of this report.

From 1994 through 2011, 63,794 chronic HCV infections in California prisons were newly reported to CDPH (**Table 12**). In 2011, CDPH received 5,263 new reports of chronic hepatitis C in state prison facilities; this represents a rate of 3205.5 newly reported cases per 100,000 incarcerated persons, and nearly 16 percent of all HCV infections newly reported in California that year.

Table 12. Chronic Hepatitis C – Cases and Rates of Newly Reported Cases in State Prisons, California, 1994–2011*

Year	N	Rate
1994	0	0.0
1995	32	12.9
1996	124	46.8
1997	721	258.4
1998	1716	1084.7
1999	2,933	1809.8
2000	3,409	2104.3
2001	4,162	2595.9
2002	3,551	2247.9
2003	2,728	1696.1
2004	2,947	1803.8
2005	2,722	1659.4
2006	3,657	2119.9
2007	8,198	4731.2
2008	8,189	4787.0
2009	8,626	5135.1
2010	4,815	2902.0
2011	5,263	3205.5

* Cases with positive test result dated on or before December 31, 2011, and reported as of June 30, 2012.

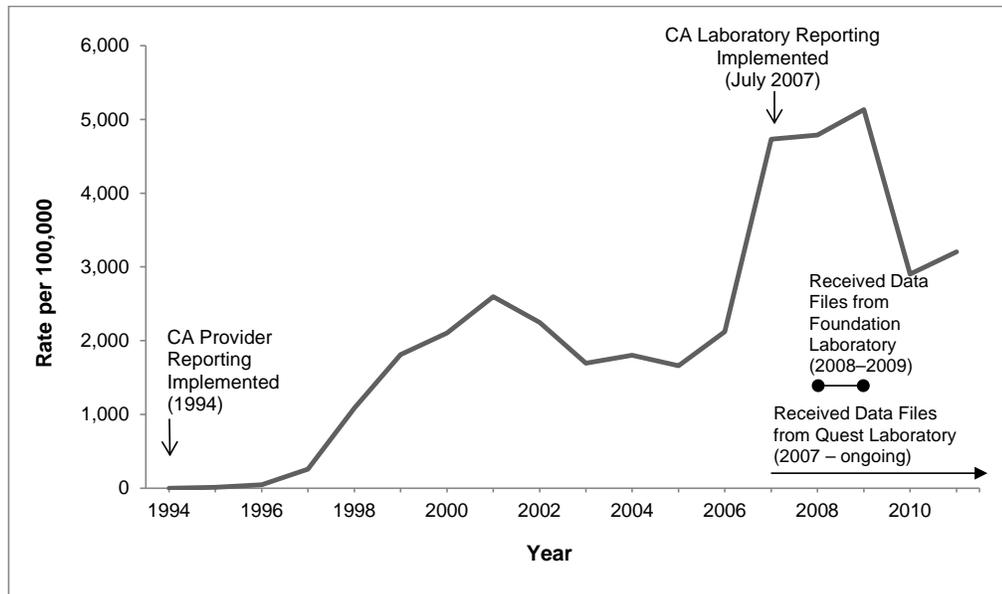
Notes: • Rates are per 100,000 population.

- A total of 63,793 *confirmed* chronic HCV infections in state prisons were reported from 1994-2011. This does not represent the total number of people in California state prisons living with chronic hepatitis C. Additional analysis is needed to determine how many chronic hepatitis C cases are currently living and are currently incarcerated.

Source: California Department of Public Health, STD Control Branch

Figure 12 shows the rate of newly reported cases of chronic hepatitis C in state prisons since reporting was implemented in California in 1994. With the introduction of lab reporting, the rate of newly reported cases of chronic hepatitis C in state prisons more than doubled to 4731.2 cases per 100,000 in 2007, from 2119.9 cases per 100,000 in 2006.

Figure 12. Chronic Hepatitis C – Rates of Newly Reported Cases in State Prisons, California, 1994-2011



Source: California Department of Public Health, STD Control Branch

A. Age

Table 13 shows the age distribution of chronic hepatitis C cases in state prisons from 2007-2011, as well as age-specific rates. From 2007-2011, persons 18-24 years of age represented an increasing proportion of chronic hepatitis C cases, from 25.1 percent in 2007 to 39.1 percent in 2011. Accordingly, the median age of cases in state prisons decreased by more than three years from 2007 to 2011, from 42.9 to 39.7.

Figure 13 shows how rates of newly reported chronic HCV infections among the various age groups have changed from 2007-2011. During that time period, the highest rates of newly reported chronic HCV infections in California prisons occurred in persons 45-59 years of age. Notably, the rates of newly reported chronic HCV infections declined for all age groups except for persons 18-34 years of age. Between 2007 and 2011, rates of newly reported cases among 18-24 year olds increased 46 percent and rates among 25-34 year olds increased only slightly (2 percent), whereas they declined by 41 percent for persons aged 35-44, 52 percent for persons aged 45-59, and 40 percent for persons aged 60 years or older.

Table 13. Chronic Hepatitis C – Cases and Rates of Newly Reported Cases (per 100,000) in State Prisons by Age*, California, 2007–2011

	Total N	18-24		25-34		35-44		45-59		≥60		Median Age	IQR**
		N	Rate	N	Rate	N	Rate	N	Rate	N	Rate		
2007	8,198	346	1463.7	1,686	2942.8	2,685	5308.4	3,159	8447.7	210	4806.6	42.9	35.0–49.3
2008	8,189	390	1695.8	1,844	3292.4	2,564	5325.4	3,093	7925.7	246	5029.6	42.6	34.0–48.9
2009	8,625	474	2096.3	2,121	3913.1	2,575	5621.4	3,131	7832.2	283	5256.3	42.0	32.9–49.2
2010	4,814	342	1521.6	1,315	2478.5	1,194	2731.3	1,657	4077.6	169	2800.8	41.2	31.1–49.5
2011	5,262	473	2137.7	1,553	2988.1	1,314	3118.3	1,657	4014.6	191	2861.9	39.7	30.3–48.7

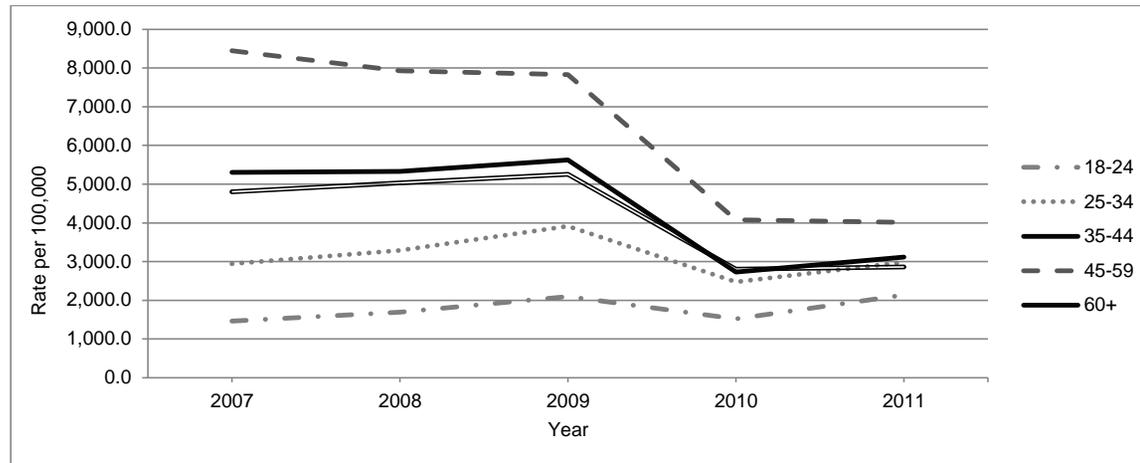
* State prison census data use different age group categories than the California Department of Finance categories used in this report to calculate age-specific rates for the total population of California.

** IQR = Interquartile range (25th to 75th percentile)

Notes: From 2007-2011, there were 3 newly reported cases of chronic HCV amongst incarcerated persons aged <18 years.

Source: California Department of Public Health, STD Control Branch

Figure 13. Chronic Hepatitis C – Rates of Newly Reported Cases in State Prisons by Age*, California, 2007–2011



* State prison census data use different age group categories than the California Department of Finance categories used in this report to calculate age-specific rates for the total population of California.

Source: California Department of Public Health, STD Control Branch

B. Race/Ethnicity

Table 14 shows the distribution of newly reported chronic hepatitis C cases in state prisons from 2007-2011 by race/ethnicity. From 2007-2011, Hispanic/Latino persons represented an increasing proportion of chronic hepatitis C cases, from 41.9 percent in 2007 to 50.4 percent in 2011.

Figure 14 shows that White and Hispanic/Latino persons in California prisons are disproportionately affected by chronic hepatitis C. Whites represent 25.8 percent of the general incarcerated population in California, but 38.6 percent of reported chronic hepatitis C cases, while Hispanics/Latinos represent 43.2 percent of the general incarcerated population in California, but 50.4 percent of chronic hepatitis C cases.

Table 14. Chronic Hepatitis C – Cases and Percentages of Newly Reported Cases in State Prisons for Which Race/Ethnicity is Known, by Race/Ethnicity*, California, 2007-2011

	African American/Black		Hispanic/Latino		White		Total N (Known Race)	Other Race/Multi/Not Specified** N
	N	Percent	N	Percent	N	Percent		
2007	512	13.5	1,587	41.9	1,686	44.5	3,785	4,413
2008	435	10.6	1,981	48.1	1,700	41.3	4,116	4,073
2009	205	10.0	1,059	51.8	781	38.2	2,045	6,581
2010	78	8.3	471	50.2	389	41.5	938	3,877
2011	92	11.1	418	50.4	320	38.6	830	4,433

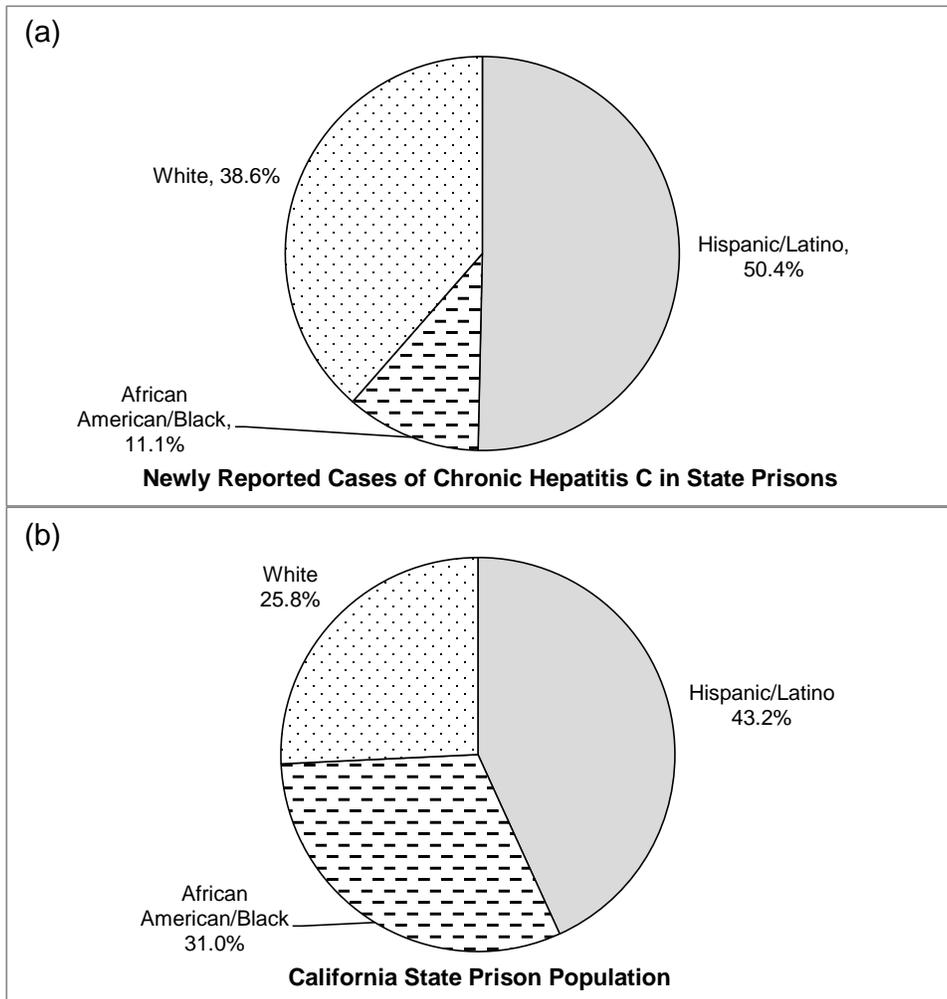
* State prison census data use different race/ethnicity categories than the California Department of Finance categories used in this report to calculate race/ethnicity-specific rates for the total population of California.

** The Other Race/Multi-race/Not Specified cases were grouped together and percentages and rates were not calculated because current surveillance data cannot separate Other Race and Multi-race from cases for which race/ethnicity was not specified.

Note: Rates of newly reported cases by race/ethnicity are not provided because race/ethnicity information is missing for half or more (49.7-84.2 percent) of cases. Instead, percentages shown are among cases with known race/ethnicity.

Source: California Department of Public Health, STD Control Branch

Figure 14. Chronic Hepatitis C – Percentages of (a) Newly Reported Cases in State Prisons by Race/Ethnicity* compared with (b) the State Prison Population, California, 2011



* State prison census data use different race/ethnicity categories than the California Department of Finance categories used in this report to calculate race/ethnicity-specific rates for the total population of California.

Note: Percentages shown are among cases with known race/ethnicity. Race/ethnicity information is missing for half or more (49.7-84.2 percent) of cases.

Source: California Department of Public Health, STD Control Branch

C. Gender

The gender distribution of chronic hepatitis C cases newly reported from 2007-2011 in state prisons, as well as gender-specific rates of newly reported HCV infections, are shown in **Table 15**.

From 2007 through 2011, nearly 95 percent of chronic hepatitis C cases among incarcerated persons were among males, and five percent were among females, which is consistent with the gender distribution in California state prisons.

Table 15. Chronic Hepatitis C – Cases and Rates of Newly Reported Cases (per 100,000) in State Prisons by Gender, California, 2007–2011

	Male		Female		Total N (Known Gender)*	Gender Not Specified
	N	Rate	N	Rate		N
2007	7,804	4835.8	393	3304.2	8,197	1
2008	7,709	4828.1	477	4183.8	8,186	3
2009	7,936	5056.5	684	6199.6	8,620	4
2010	4,508	2893.1	302	2990.7	4,810	5
2011	4,991	3231.0	272	2799.5	5,263	0

* From 2007-2011, there were two cases reported as transgender. This is likely an underestimate of the true number of cases among transgender individuals. Rates were not calculated for transgender persons because information on transgender identity was not consistently collected from 2007-2011; the form providers used to report cases to local health jurisdictions did not include a transgender category until January 2011.

Source: California Department of Public Health, STD Control Branch

D. Geography

There are 33 state prison facilities distributed among 19 counties in California. In 2011, chronic HCV infections were reported in state prisons in each of the 19 counties. **Table 16** shows the distribution of chronic hepatitis C cases in state prisons, by county, from 2007-2011. From 2007-2011, the distribution of chronic hepatitis C cases in counties with state prisons varied year-to-year. However, since 2008, Kern County has consistently ranked first among counties with state prisons as having the highest proportion (22.9-26.4 percent) of newly reported chronic hepatitis C cases.

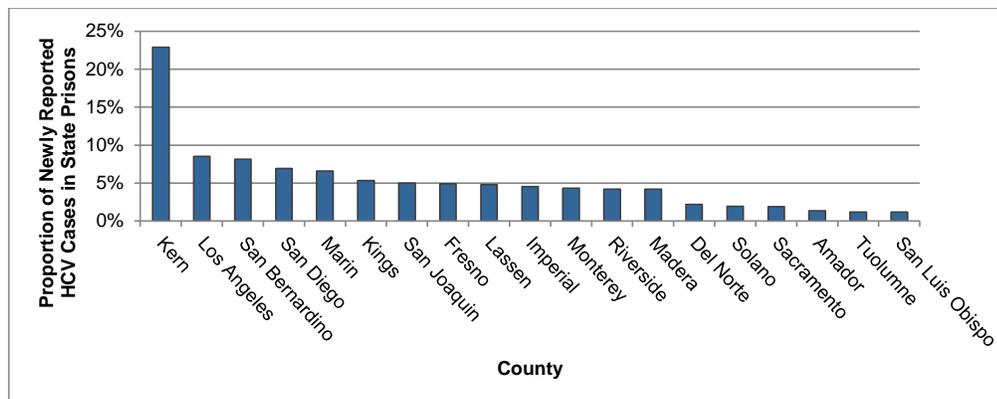
The distribution of hepatitis C cases among counties with state prisons in 2011 is shown in ranked order in **Figure 15**. In 2011, Kern County had the highest proportion (22.9 percent) of newly reported chronic hepatitis C cases in state prisons and nearly three times the case burden of the next highest county (Los Angeles). Other counties with a high proportion of prison-based chronic hepatitis C cases in 2011 included San Bernardino (8.1 percent), San Diego (6.9 percent), and Marin (6.6 percent).

Table 16. Chronic Hepatitis C – Cases and Percentages of Newly Reported Cases in State Prisons by County, California, 2007-2011

COUNTY	2007		2008		2009		2010		2011	
	N	Percent								
CALIFORNIA	8,198	100	8,189	100	8,626	100	4,815	100	5,263	100
Amador	195	2.4	166	2.0	95	1.1	73	1.5	71	1.3
Del Norte	268	3.3	228	2.8	195	2.3	119	2.5	114	2.2
Fresno	33	0.4	229	2.8	92	1.1	129	2.7	259	4.9
Imperial	211	2.6	291	3.6	343	4.0	94	2.0	238	4.5
Kern	1,354	16.5	2,098	25.6	2,259	26.2	1,270	26.4	1,205	22.9
Kings	484	5.9	640	7.8	765	8.9	578	12.0	281	5.3
Lassen	669	8.2	462	5.6	353	4.1	239	5.0	252	4.8
Los Angeles	20	0.2	71	0.9	490	5.7	1	0.0	449	8.5
Madera	383	4.7	433	5.3	589	6.8	294	6.1	220	4.2
Marin	1,436	17.5	639	7.8	459	5.3	369	7.7	346	6.6
Monterey	381	4.6	418	5.1	470	5.4	369	7.7	228	4.3
Riverside	295	3.6	644	7.9	397	4.6	223	4.6	221	4.2
Sacramento	480	5.9	334	4.1	151	1.8	109	2.3	99	1.9
San Bernardino	3	0.0	131	1.6	367	4.3	7	0.1	428	8.1
San Diego	359	4.4	137	1.7	698	8.1	238	4.9	365	6.9
San Joaquin	623	7.6	593	7.2	359	4.2	382	7.9	262	5.0
San Luis Obispo										
Obispo	70	0.9	145	1.8	164	1.9	87	1.8	62	1.2
Solano	750	9.1	415	5.1	280	3.2	161	3.3	101	1.9
Tuolumne	184	2.2	115	1.4	100	1.2	73	1.5	62	1.2

Note: Percentages shown are among all reported incarcerated cases in California for each year.
 Source: California Department of Public Health, STD Control Branch

Figure 15. Chronic Hepatitis C – Percent of Newly Reported Cases in State Prisons in Ranked Order by County in 2011, California



Source: California Department of Public Health, STD Control Branch

7. Discussion

This is the first statewide surveillance report on chronic viral hepatitis in California. In the following section, notable trends in the demographic distribution (e.g., age, gender, race/ethnicity, and geography) of chronic hepatitis B and chronic hepatitis C in California, and chronic hepatitis C in California state prisons, are discussed.

A. Chronic HBV infection in California

Overall

From 1989 through 2011, there were 231,644 newly reported chronic hepatitis B cases in California. It is unknown how many are currently living and in California. State estimates suggest that there are approximately 350,000 people living with chronic hepatitis B in California. Possible reasons for the difference between the number of reported cases and estimated cases may include underdiagnosis, underreporting, and errors in statewide estimates. Either way, these numbers suggest that there are hundreds of thousands of people living with chronic HBV infection in California. Undiagnosed and unreported infections present an opportunity for increase chronic hepatitis B screening and public health surveillance, as well as for HBV prevention and linkages to care.

In 2011, CDPH received 10,308 new reports of chronic HBV infections, which represents a rate of 27.4 newly reported cases per 100,000 persons.

By Age

From 2007-2011, nearly two-thirds of reported chronic HBV infections in California were among persons aged 25-54 years. This is consistent with recent national trends; in 2010, CDC found that, among eight sites funded to conduct enhanced viral hepatitis surveillance, 62.5 percent of chronic HBV infections were among persons aged 25-54 years.⁶

For the period 2007-2011, persons less than 18 years of age had the lowest rates of newly reported chronic HBV infections. This encouraging result can most likely be attributed to: (1) the addition of hepatitis B vaccine in routine childhood vaccination schedules in the 1990s, and (2) the implementation of the perinatal HBV program in California in 1991, which identifies HBV-infected pregnant women whose infants are at risk for acquiring HBV infection, and ensures these infants receive HBV post-exposure prophylaxis and HBV vaccination at birth.^{7,45}

By Race/Ethnicity

From 2007-2011, APIs accounted for nearly two-thirds of newly reported chronic hepatitis B cases in the state—a significant racial disparity given that APIs constitute only 12.7 percent of the state population. This result is similar to national figures, which have found that APIs account for more than half of chronic hepatitis B cases in the United States despite making up less than 5 percent of the population.¹⁰ APIs are disproportionately affected by chronic hepatitis B because in many Asian countries, and

most of the Pacific Islands, between 8 and 15 percent of the population have chronic HBV infection.²⁵ These findings highlight the importance of implementing CDC hepatitis B screening recommendations for persons born in countries with two percent or more hepatitis B prevalence and U.S.-born persons not vaccinated as infants whose parents were born in countries with eight percent hepatitis B prevalence or higher.²³

By Geography

From 2007-2011, San Francisco County had the highest rate of newly reported chronic hepatitis B cases in California. In 2011, its rate of reported cases was 4.1 times higher than the statewide rate. This may be explained by a number of factors. First, San Francisco has been funded by CDC since 2005 to conduct enhanced viral hepatitis surveillance, giving the San Francisco Department of Public Health greater capacity to identify and obtain complete case information for reported chronic hepatitis B cases. Second, a citywide HBV prevention campaign, “San Francisco Hep B Free”, was launched in 2007, which encouraged all APIs in the city to be tested, vaccinated, and treated for HBV through the provision of free or low-cost testing opportunities.⁴⁶ Lastly, a much higher proportion of residents in San Francisco County are API (32.4 percent) compared with the state overall (12.7 percent).

Similarly, nearly all of the local health jurisdictions that also had rates of newly reported HBV infections that were higher than the statewide rate (i.e., Alameda, City of Berkeley, Los Angeles, Sacramento, Santa Clara, and San Mateo counties) have high proportions of APIs in their populations (between 13.9 percent and 29.0 percent in 2011).⁴⁷

B. Chronic HCV infection in California

Overall

From 1994 through 2011, there were 501,664 newly reported chronic hepatitis C cases in California. It is unknown how many are currently living and in California. State estimates suggest that there are approximately 750,000 people living with chronic hepatitis C in California. Possible reasons for the difference between the number of reported cases and estimated cases may include underdiagnosis, underreporting, and errors in statewide estimates. Either way, these figures suggest that there are hundreds of thousands of people living with chronic HCV infection in California. Undiagnosed and unreported infections present an opportunity for increase chronic hepatitis C screening and public health surveillance, as well as for HCV prevention and linkages to care.

In 2011, CDPH received 33,190 new reports of chronic HCV infections, which represents a rate of 88.3 newly reported cases per 100,000 persons.

By Age

In 2007 and 2011, the majority (62.9 and 56.4 percent, respectively) of reported chronic hepatitis C cases in California were among persons born during 1945-1965, a birth cohort known as the “baby boomers”. In 2011, the highest rate of newly reported chronic HCV infections occurred among Californians 55-64 years of age, an age group

that closely aligns with the “baby boomer” cohort. These results mirror national trends; NHANES (1999 to 2002) found that 65.6 percent of all chronic hepatitis C cases in the United States were among “baby boomers”,¹ and in 2008, CDC found that persons 55-64 years of age had the highest rates of HCV-associated mortality.⁶ CDPH findings underscore the importance of implementing CDC recommendations for one-time HCV screening for persons born during 1945-1965, since targeted testing has the potential to increase the proportion of persons with HCV who are aware of their infection and may be linked to care.¹¹

Although Californians between ages 18-34 compose a minority of newly reported chronic hepatitis C cases, the proportion of cases from this age group increased slightly from 2007-2011, from 13.1 percent to 16.7 percent. These results are likely driven by an increase in rates of newly reported chronic hepatitis C cases observed among young persons aged 18-34 years in California state prisons between 2007 and 2011.

By Gender

From 2007-2011, two-thirds of chronic hepatitis C cases in California were in males, and males had twice the rate of newly reported chronic HCV infections as females. While these data do not measure prevalence, they are consistent with NHANES, which found higher prevalence among males than females (2.1 percent versus 1.1 percent).¹

By Race/Ethnicity

Among cases in California for whom information on race/ethnicity was available, White, African American/Black, and American Indian/Alaska Native persons were disproportionately affected by chronic hepatitis C. The overrepresentation of Whites in California differs from patterns observed in 2010 by eight enhanced viral hepatitis surveillance sites funded by CDC, where Whites represented 63.7 percent of the U.S. population but only 55.0 percent of chronic hepatitis C cases with known race/ethnicity.^{6,13} In contrast, African American/Blacks and American Indian/Alaska Natives were overrepresented in both California and the eight CDC-funded surveillance sites. Nationally, African Americans/Blacks made up 12.4 percent of the general population in 2010 but composed 21.1 percent of chronic hepatitis C cases in the eight surveillance sites, while American Indian/Alaska Natives made up 0.9 percent of the national population in 2010 but 1.9 percent of hepatitis C cases.

The reasons for these disparities are unclear. NHANES (1999-2002) found that past injection drug use was more common among non-Hispanic blacks aged 40-59 (5.3 percent) when compared with non-Hispanic whites in the same age group (2.0 percent), but this trend was reversed in younger age groups.¹ Studies of Alaska Natives with HCV infection have found risk factors similar to the general population of persons with HCV infection, including past injection drug use and having received a blood transfusion before 1992.⁴⁸ Currently, there are insufficient data to evaluate whether these demographic trends in lifetime risk factors for HCV apply to California.

Hispanics/Latinos were underrepresented among chronic hepatitis C cases compared with the California population, whereas Hispanics/Latinos were proportionally represented among the eight enhanced viral hepatitis surveillance sites, composing

16.1 percent of cases and 16.3 percent of the U.S. population.^{6,13} APIs were underrepresented among chronic hepatitis C cases in California and in the eight sites, where they accounted for 2.9 percent of cases but 5.0 percent of the U.S. population.

By Geography

From 2008-2011, San Francisco County reported the second highest rate of newly reported chronic hepatitis C cases in California and the highest rate for a populous county. In 2011, San Francisco's cases accounted for 4.7 percent (n=1,569) of total chronic HCV infections reported statewide, and its rate of newly reported cases was 2.2 times the statewide rate. This might be due in part to CDC directly funding San Francisco to conduct enhanced viral hepatitis surveillance, giving the local health department a greater capacity to identify cases. However, even with additional viral hepatitis surveillance resources, San Francisco bears a significant proportion of the chronic HCV disease burden in California. Madera, Humboldt, Shasta, and Alameda counties were also among the top five populous local health jurisdictions with the highest rates of newly reported chronic hepatitis C cases in 2011.

The exact reasons for the geographic distribution of chronic HCV infections in California are unknown and may be due to a variety of factors, including differences in the distribution of age groups (i.e., persons born during 1945-1965), and risk histories (i.e., persons who have ever injected drugs) among local health jurisdictions. For example, all of the top five populous local health jurisdictions had a higher proportion of persons 45-64 years of age (between 25.8 percent and 31.4 percent) than the statewide average (25.5 percent) in 2011. Additionally, all top five populous local health jurisdictions had substance use treatment admissions rates for heroin or methamphetamine that were higher (between 184.82 admissions per 100,000 population and 413.32 per 100,000) than the statewide rates (93.42 per 100,000 for heroin and 171.72 per 100,000 for methamphetamine) in 2008, the latest year for which data are available.⁴⁹

Among the top five nonpopulous local health jurisdictions for newly reported chronic hepatitis C cases in 2011, all had higher proportions of persons 45-64 years of age (between 28.7 percent and 36.6 percent) than the statewide average. Additionally, Tehama, Mariposa, and Mendocino counties had substance use treatment admission rates for heroin or methamphetamine that were higher (between 205.71 per 100,000 and 417.57 per 100,000) than the statewide admission rates for both drugs in 2008.⁴⁹

C. Chronic HCV infection in California State Prisons

Overall

A substantial proportion (16 percent) of all newly reported chronic hepatitis C cases were reported from state prisons. This may be due in part to California having both a large prison population (164,186 as of June 30, 2011), and high HCV prevalence (34.3 percent) in California state prisons.^{9,14} These findings support CDC recommendations for hepatitis C screening, testing, medical evaluation, and care in correctional settings.¹⁶

By Age

From 2007-2011, the age distribution and age-specific rates of newly reported chronic hepatitis C cases in California prisons differed from statewide trends. Whereas the highest rate of newly reported chronic HCV infections in the state occurred in persons 55-64 years of age in 2011, the highest rate in state prisons occurred in persons 45-59 years of age. Strikingly, from 2007-2011, the rates of newly reported chronic HCV infections among incarcerated persons declined substantially (between 40 and 52 percent) for all age groups except for persons 18-34 years of age. In that time period, rates of newly reported cases among 18-24 year olds increased 46 percent and rates of newly reported cases among 25-34 year olds increased slightly (1.6 percent).

The reason for these trends in age-specific rates of newly reported chronic hepatitis C cases is unclear. The decrease in newly reported cases among older adults is likely due to the state surveillance system having captured a large number of prevalent hepatitis C cases when laboratory reporting began in 2007, after which time newly reported cases were more likely to be young (and not previously reported). However, the observed increase in rates of newly reported chronic HCV cases among young persons incarcerated in state prisons merits investigation to ascertain whether it is consistent with clusters of HCV among young non-urban injection drug users in other states.^{17,18} These findings also support the need for targeted HCV prevention efforts among young persons at risk for HCV infection, including injection drug users.

By Race/Ethnicity

In contrast to the overall distribution of hepatitis C cases in California, Hispanic/Latino persons in California state prisons are disproportionately affected by chronic hepatitis C, making up 43.2 percent of the general incarcerated population in California, but 50.4 percent of chronic hepatitis C cases. The reasons for these disparities are unclear. However, these findings support the need for increased screening and viral hepatitis preventive services in correctional settings.

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Appendix A. Chronic Hepatitis C – Percentages of Cases Identified through Line-Listed Laboratory Data Directly Reported to CDPH, by Jurisdiction, California, 2007–2011

Table A shows the number and proportion of chronic hepatitis C cases newly reported in California during 2007–2011 that were identified through line-listed laboratory data alone. Line-listed data for all HCV tests conducted in California during select years were directly reported to CDPH by two major laboratories, which also served as primary laboratories for the state prison system (Foundation from 2008–2009 and Quest from 2007–2011).

The remaining chronic hepatitis C cases were identified based on case reports directly submitted to CDPH by local health jurisdictions. In some local health jurisdictions (e.g., Marin), nearly 80 percent of newly reported chronic hepatitis C cases were identified through line-listed laboratory data, whereas in other local health jurisdictions (e.g., Humboldt, Inyo, and Mono), all reported cases were identified through case reports submitted by the local health department to CDPH. Variations in the proportion of cases identified through either line-listed laboratory data or health department-submitted case reports are likely due to a number of factors, including the presence of state prisons in the local health jurisdiction, and whether local health jurisdictions had the capacity to process all HCV laboratory reports.

Table A. Chronic Hepatitis C – Percentages of Cases Identified through Line-listed Laboratory Data Directly Reported to CDPH, by Local Health Jurisdiction, California, 2007–2011

Local Health Jurisdiction	2007			2008			2009			2010			2011		
	All Cases N	Cases Lab-Reported Only N	Percent	All Cases N	Cases Lab-Reported Only N	Percent	All Cases N	Cases Lab-Reported Only N	Percent	All Cases N	Cases Lab-Reported Only N	Percent	All Cases N	Cases Lab-Reported Only N	Percent
CALIFORNIA	50,299	10,113	20.1%	49,066	3498	7.1%	44,128	5051	11.4%	35,547	3601	10.1%	33,190	4142	12.5%
Alameda	2,014	745	37.0%	1,705	106	6.2%	1,551	225	14.5%	1,302	255	19.6%	1,638	476	29.1%
	266	107	40.2%	268	29	10.8%	140	8	5.7%	91	8	8.8%	107	44	41.1%
Alpine	2	0	0.0%	0	0	–	0	0	–	0	0	–	0	0	–
Amador	247	55	22.3%	214	11	5.1%	128	6	4.7%	98	8	8.2%	100	3	3.0%
Butte	444	59	13.3%	336	6	1.8%	221	7	3.2%	188	6	3.2%	201	3	1.5%
Calaveras	69	12	17.4%	51	5	9.8%	41	2	4.9%	40	0	0.0%	41	0	0.0%
Colusa	8	1	12.5%	4	1	25.0%	8	1	12.5%	11	5	45.5%	2	2	100.0%
Contra Costa	580	87	15.0%	541	31	5.7%	495	41	8.3%	402	50	12.4%	474	24	5.1%
Del Norte	368	192	52.2%	318	182	57.2%	300	196	65.3%	198	121	61.1%	175	116	66.3%
El Dorado	133	15	11.3%	159	2	1.3%	156	3	1.9%	116	9	7.8%	81	6	7.4%
Fresno	1,307	203	15.5%	1,412	26	1.8%	1,127	63	5.6%	899	45	5.0%	741	72	9.7%
Glenn	54	25	46.3%	34	9	26.5%	13	6	46.2%	22	6	27.3%	13	0	0.0%
Humboldt	221	20	9.0%	281	1	0.4%	244	3	1.2%	251	4	1.6%	205	0	0.0%
Imperial	424	10	2.4%	455	24	5.3%	578	109	18.9%	257	10	3.9%	416	16	3.8%
Inyo	13	0	0.0%	14	0	0.0%	13	0	0.0%	7	0	0.0%	2	0	0.0%
Kern	2,525	33	1.3%	3,315	29	0.9%	3,392	194	5.7%	2,103	33	1.6%	1,900	571	30.1%
Kings	574	21	3.7%	777	4	0.5%	873	75	8.6%	682	3	0.4%	448	26	5.8%
Lake	119	16	13.4%	128	14	10.9%	64	19	29.7%	93	12	12.9%	56	12	21.4%
Lassen	705	156	22.1%	484	71	14.7%	368	186	50.5%	246	87	35.4%	259	147	56.8%
Los Angeles	10,776	967	9.0%	10,966	362	3.3%	9,888	225	2.3%	8,202	165	2.0%	9,090	203	2.2%
	387	14	3.6%	359	10	2.8%	300	18	6.0%	255	38	14.9%	198	43	21.7%
	135	8	5.9%	85	1	1.2%	86	18	20.9%	36	12	33.3%	61	14	23.0%
Madera	543	63	11.6%	560	36	6.4%	697	78	11.2%	387	31	8.0%	475	99	20.8%
Marin	1,729	923	53.4%	799	374	46.8%	588	353	60.0%	486	320	65.8%	466	374	80.3%
Mariposa	24	4	16.7%	23	4	17.4%	18	2	11.1%	9	7	77.8%	22	14	63.6%
Mendocino	198	43	21.7%	210	2	1.0%	157	4	2.5%	149	9	6.0%	105	6	5.7%

Local Health Jurisdiction	2007			2008			2009			2010			2011		
	All Cases N	Cases Lab-Reported Only		All Cases N	Cases Lab-Reported Only		All Cases N	Cases Lab-Reported Only		All Cases N	Cases Lab-Reported Only		All Cases N	Cases Lab-Reported Only	
		N	Percent		N	Percent		N	Percent		N	Percent		N	Percent
CALIFORNIA	50,299	10,113	20.1%	49,066	3498	7.1%	44,128	5051	11.4%	35,547	3601	10.1%	33,190	4142	12.5%
Merced	187	36	19.3%	193	2	1.0%	117	0	0.0%	163	3	1.8%	122	6	4.9%
Modoc	12	0	0.0%	9	0	0.0%	5	2	40.0%	5	1	20.0%	6	3	50.0%
Mono	3	0	0.0%	7	0	0.0%	6	0	0.0%	3	0	0.0%	1	0	0.0%
Monterey	719	59	8.2%	662	23	3.5%	804	105	13.1%	775	47	6.1%	466	18	3.9%
Napa	145	39	26.9%	158	3	1.9%	117	1	0.9%	125	4	3.2%	100	2	2.0%
Nevada	110	15	13.6%	125	9	7.2%	140	5	3.6%	101	3	3.0%	76	0	0.0%
Orange	2,098	1,394	66.4%	1,437	545	37.9%	1,249	815	65.3%	996	799	80.2%	972	778	80.0%
Placer	190	47	24.7%	261	7	2.7%	183	11	6.0%	235	2	0.9%	216	1	0.5%
Plumas	15	0	0.0%	25	0	0.0%	12	1	8.3%	3	1	33.3%	12	1	8.3%
Riverside	2,170	163	7.5%	2,347	32	1.4%	1,719	77	4.5%	1,454	32	2.2%	1,283	44	3.4%
Sacramento	2,732	1,044	38.2%	2,034	298	14.7%	1,523	555	36.4%	1,441	198	13.7%	1,670	43	2.6%
San Benito	52	16	30.8%	47	1	2.1%	28	1	3.6%	28	3	10.7%	31	2	6.5%
San Bernardino	2,387	40	1.7%	2,828	13	0.5%	2,361	31	1.3%	1,936	23	1.2%	1,446	68	4.7%
San Diego	3,768	73	1.9%	2,949	17	0.6%	3,289	55	1.7%	2,511	33	1.3%	2,193	86	3.9%
San Francisco	880	454	51.6%	2,409	81	3.4%	2,174	327	15.0%	1,882	423	22.5%	1,569	107	6.8%
San Joaquin	1,293	268	20.7%	1,143	84	7.3%	834	67	8.0%	802	93	11.6%	640	57	8.9%
San Luis Obispo	499	79	15.8%	521	8	1.5%	378	1	0.3%	327	2	0.6%	355	6	1.7%
San Mateo	1,158	767	66.2%	1,120	720	64.3%	1,191	750	63.0%	674	245	36.4%	447	60	13.4%
Santa Barbara	569	80	14.1%	464	8	1.7%	384	10	2.6%	347	7	2.0%	270	9	3.3%
Santa Clara	2,213	389	17.6%	2,018	39	1.9%	2,260	48	2.1%	2,126	50	2.4%	1,315	34	2.6%
Santa Cruz	481	125	26.0%	400	6	1.5%	314	11	3.5%	251	8	3.2%	218	9	4.1%
Shasta	355	79	22.3%	345	17	4.9%	304	31	10.2%	261	23	8.8%	229	23	10.0%
Sierra	2	0	0.0%	3	0	0.0%	4	1	25.0%	0	0	-	1	0	0.0%
Siskiyou	120	16	13.3%	72	2	2.8%	62	0	0.0%	68	5	7.4%	75	7	9.3%
Solano	1,214	510	42.0%	786	115	14.6%	617	107	17.3%	438	78	17.8%	304	125	41.1%
Sonoma	396	58	14.6%	478	9	1.9%	401	7	1.7%	361	148	41.0%	268	238	88.8%
Stanislaus	572	167	29.2%	549	21	3.8%	428	29	6.8%	397	14	3.5%	376	14	3.7%
Sutter	127	41	32.3%	130	7	5.4%	101	2	2.0%	73	4	5.5%	68	3	4.4%

Local Health Jurisdiction	2007			2008			2009			2010			2011		
	All Cases	Cases Lab-Reported Only		All Cases	Cases Lab-Reported Only		All Cases	Cases Lab-Reported Only		All Cases	Cases Lab-Reported Only		All Cases	Cases Lab-Reported Only	
	N	N	Percent	N	N	Percent	N	N	Percent	N	N	Percent	N	N	Percent
CALIFORNIA	50,299	10,113	20.1%	49,066	3498	7.1%	44,128	5051	11.4%	35,547	3601	10.1%	33,190	4142	12.5%
Tehama	117	27	23.1%	108	0	0.0%	95	2	2.1%	92	2	2.2%	84	0	0.0%
Trinity	41	19	46.3%	30	3	10.0%	19	6	31.6%	12	0	0.0%	10	0	0.0%
Tulare	428	77	18.0%	544	20	3.7%	397	23	5.8%	289	16	5.5%	205	22	10.7%
Tuolumne	289	89	30.8%	222	10	4.5%	144	41	28.5%	118	68	57.6%	91	56	61.5%
Ventura	690	62	9.0%	578	12	2.1%	535	27	5.0%	483	15	3.1%	587	33	5.6%
Yolo	254	61	24.0%	218	8	3.7%	173	7	4.0%	145	5	3.4%	107	15	14.0%
Yuba	140	33	23.6%	180	2	1.1%	124	4	3.2%	91	2	2.2%	83	1	1.2%

* City health jurisdiction numbers are NOT included in their respective county totals.

- Notes:
- Dash (-) indicates the percent was not calculated because there were no cases reported in the local health jurisdiction.
 - State prison cases are included in local health jurisdiction totals.

Source: California Department of Public Health, STD Control Branch

Appendix B. Chronic Hepatitis B – Percentages of Duplicate Reports Received by the California Department of Public Health, California, 1989–2011

The proportion of duplicate chronic hepatitis B case reports CDPH received from 1989-2011 fluctuated over time, reaching one of its lowest points in 2011, when only 16.5 percent of chronic hepatitis B case reports were found to be duplicates (**Table B** and **Figure B**).

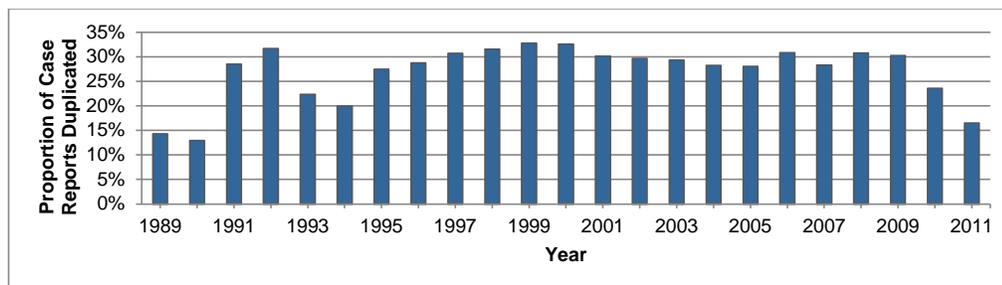
Table B. Chronic Hepatitis B –Percent of Cases* Reported to the California Department of Public Health that were Duplicates, California, 1989-2011

Year	Reports Received N	Unique Cases N	Duplicate Reports Percent
1989	42	36	14.3%
1990	4,767	4,149	13.0%
1991	10,463	7,476	28.5%
1992	13,256	9,055	31.7%
1993	465	361	22.4%
1994	2,781	2,225	20.0%
1995	10,230	7,418	27.5%
1996	12,510	8,909	28.8%
1997	15,404	10,670	30.7%
1998	15,451	10,571	31.6%
1999	21,965	14,759	32.8%
2000	23,394	15,769	32.6%
2001	24,669	17,230	30.2%
2002	22,995	16,173	29.7%
2003	20,261	14,310	29.4%
2004	16,858	12,097	28.2%
2005	17,412	12,520	28.1%
2006	19,543	13,513	30.9%
2007	16,856	12,082	28.3%
2008	16,003	11,078	30.8%
2009	16,547	11,532	30.3%
2010	12,311	9,403	23.6%
2011	12,348	10,308	16.5%

* Cases with positive test result dated on or before December 31, 2011, and reported as of June 30, 2012.

Source: California Department of Public Health, STD Control Branch

Figure B. Chronic Hepatitis B – Percentages of Cases Reported to the California Department of Public Health that were Duplicates, California, 1989-2011



Source: California Department of Public Health, STD Control Branch

Appendix C. Chronic Hepatitis C – Data Sources of Case Reports and Percentages of Duplicate Reports Received by the California Department of Public Health, California, 1994–2011

From 1994-2006, all chronic hepatitis C case reports received by CDPH were from local health jurisdictions. Since 2007, when laboratory reporting of chronic HCV infection began, case reports from Quest and Foundation laboratories have accounted for more than half of total chronic hepatitis C case reports received by CDPH. For example, 72 percent of all case reports received in 2007 were from line-listed data from private laboratories, compared with 61 percent of all case reports received in 2011.

The percentages of chronic hepatitis C case reports CDPH received from 1994-2011 that were duplicates are shown in **Table C**. In 2007, the proportion of duplicate reports received by CDPH more than doubled, from 33.7 percent in 2006 to 73.7 percent in 2007. This surge in duplicate reports received by CDPH was due to the provision of line-listed data by two private laboratories. The proportion of duplicate reports received by CDPH leveled off from 2007-2011 (**Figure C**), which suggests that the state’s chronic hepatitis C registry has become more complete and robust over time. However, as of 2011, CDPH had not received line-listed data from other laboratory sources in the state; thus it is not known how many cases remain unreported.

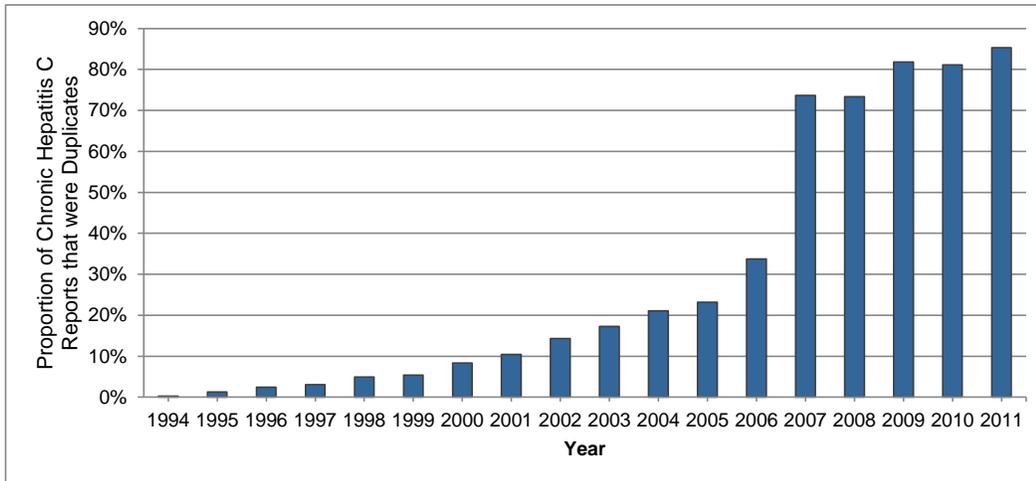
Table C. Chronic Hepatitis C – Percentages of Cases* Reported to the California Department of Public Health that were Duplicates, California, 1994–2011

Year	Reports Received N	Unique Cases N	Duplicate Reports Percent
1994	1,122	1,119	0.3%
1995	3,868	3,820	1.2%
1996	5,422	5,292	2.4%
1997	11,286	10,938	3.1%
1998	18,072	17,181	4.9%
1999	35,498	33,598	5.4%
2000	40,909	37,493	8.4%
2001	40,470	36,244	10.4%
2002	37,869	32,435	14.3%
2003	34,492	28,548	17.2%
2004	40,616	32,047	21.1%
2005	29,389	22,575	23.2%
2006	42,457	28,144	33.7%
2007	190,906	50,299	73.7%
2008	184,304	49,066	73.4%
2009	242,755	44,128	81.8%
2010	188,369	35,547	81.1%
2011	226,355	33,190	85.3%

* Cases with positive test result dated on or before December 31, 2011, and reported as of June 30, 2012.

Source: California Department of Public Health, STD Control Branch

Figure C. Chronic Hepatitis C – Percentages of Cases Reported to the California Department of Public Health that were Duplicates, California, 1994-2011



Source: California Department of Public Health, STD Control Branch

Appendix D. Registry Match Methodology

Data on chronic HBV and HCV infections from across various disease reporting systems were merged. Since multiple case reports regarding the same individual could have been submitted by more than one local health jurisdiction, case information was analyzed to identify and remove duplicate case reports (“deduplicated”). This process of deduplication was done by CDPH using probabilistic matching methods used in other analyses and described elsewhere.⁴²⁻⁴⁴ In brief, case reports were analyzed to identify pairs of case records that were potential matches (“possible matched pairs”) based on key variables. These variables included patients’ first name, last name, date of birth, and social security number, if available. For each possible matched pair, a match score was calculated by: (1) identifying *exact or near matches* on an expanded list of variables (i.e., first name, middle name, last name, date of birth, social security number, and zip code) and (2) identifying *exact matches* on additional key variables (i.e., incarceration status, gender, race/ethnicity, and local health jurisdiction). Cutoff points for “high” and “low” match scores were developed based on the distribution of the match scores in the chronic hepatitis B and chronic hepatitis C registries, respectively. Matched pairs with high match scores were considered to be duplicate records and all other pairs were considered to be distinct (unduplicated) records. **Appendix B and Appendix C**, respectively, show the number of hepatitis B and hepatitis C case reports received, and the proportion of those reports that were determined to be duplicates (from 1989-2011 for chronic hepatitis B, and from 1994-2011 for chronic hepatitis C).

Once all records were linked and duplicate records were identified, the duplicate records for each person were used to determine the best value/spelling for each demographic variable, including name, date of birth, race/ethnicity, and gender. The most commonly reported value was assigned to each person, with the exception of gender. If any record identified a person as being transgender, then their gender was assigned as transgender; otherwise, their gender was assigned as either male or female, whichever was most common. Additionally, variables were generated to determine the date at which the person was first known to be a chronic hepatitis B or chronic hepatitis C case (i.e., date of first report), the local health jurisdiction of the case at first report, and whether or not the case was incarcerated in a state prison facility at first report.

Appendix E. Glossary of Terms

Acute hepatitis: Newly acquired hepatitis that lasts less than six months.

Affordable Care Act: A law enacted in the United States in 2010 to improve health care, improve the health of populations, and reduce healthcare costs.

Asymptomatic: Showing no evidence or symptoms of disease.

Baby Boomers: For the purposes of CDC hepatitis C screening recommendations, persons born during 1945-1965.

Chronic hepatitis: Long-term hepatitis, usually lasting longer than six months. May occur in those infected with hepatitis B or hepatitis C viruses.

Cirrhosis: Scarring of the liver caused by forms of liver diseases and conditions, such as chronic viral hepatitis. Cirrhosis interferes with the normal functioning of the liver.

Deduplicate: Review records to ensure that an individual is not counted twice and remove duplicate case reports.

Hepatitis: A term meaning inflammation of the liver.

Hepatocellular carcinoma: Cancer of the liver.

Incarcerated case: For the purposes of this report, an individual who was housed in a California state prison at the time their hepatitis C infection was reported to CDPH.

Incidence: A measure of new infections in a defined, at-risk population during a specified time period, usually a year.

Jaundice: Yellow staining of the skin and whites of the eyes, caused by abnormally-high blood levels of the bile pigment bilirubin due to liver dysfunction or other causes.

Past or Present Hepatitis C: Past or present hepatitis C refers to the 2011 CSTE case definition of HCV as a reportable condition. It includes persons who cleared the virus on their own during the acute stage (typically within six months of HCV infection) or who cleared the virus through HCV treatment (past). This definition also includes persons who have long-term HCV infection (present).

Post exposure prophylaxis: A treatment administered following exposure to a harmful agent in an attempt to block or reduce injury or infection.

Prevalence: A measure of the total number of infections (new or pre-existing) in a defined population during a specified time period.

Appendix F. Council of State and Territorial Epidemiologists (CSTE) Case Definitions

Chronic Hepatitis B

2011 Case Definition

CSTE Position Statement Number: 10-ID-10

Clinical Evidence

No symptoms are required. Persons with chronic HBV infection may have no evidence of liver disease or may have a spectrum of disease ranging from chronic hepatitis to cirrhosis or liver cancer.

Laboratory criteria for diagnosis

- IgM antibodies to hepatitis B core antigen (IgM anti-HBc) negative AND a positive result on one of the following tests: hepatitis B surface antigen (HBsAg), hepatitis B e antigen (HBeAg), or hepatitis B virus (HBV) DNA, OR six months apart (any combination of these tests performed six months apart is acceptable).

Case classification

Confirmed: a case that meets either of the above laboratory criteria for diagnosis.

Probable: a person with a single HBsAg positive or HBV DNA positive or HBeAg positive lab result and does not meet the case definition for acute hepatitis B.

Comment

Multiple laboratory tests indicative of chronic HBV infection may be performed simultaneously on the same patient specimen as part of a "hepatitis panel." Testing performed in this manner may lead to seemingly discordant results, e.g., HBsAg-negative AND HBV DNA-positive. For the purposes of this case definition, any positive result among the three laboratory tests mentioned above is acceptable, regardless of other testing results. Negative HBeAg results and HBV DNA levels below positive cutoff level do not confirm the absence of HBV infection.

Hepatitis C, past or present

2011 Case Definition

CSTE Position Statement Number: 10-ID-09

Clinical Case Definition

No symptoms are required. Most HCV-infected persons are asymptomatic; however, many have chronic liver disease, which can range from mild to severe.

Laboratory Criteria for Diagnosis

One or more of the following four criteria:

1. Anti-HCV positive (repeatedly reactive) by enzyme immunoassay (EIA) verified by at least one additional more specific assay, OR
2. HCV RIBA (recombinant immunoblot assay) positive, OR
3. Nucleic Acid Test (NAT) positive for HCV RNA (including genotype), OR
4. Antibodies to hepatitis C virus (anti-HCV) screening-test-positive with a signal to cut-off ratio predictive of a true positive as determined for the particular assay and posted by CDC. (<http://www.cdc.gov/hepatitis/hcv/labtesting.htm>)

Case Classification

Confirmed: a case that is laboratory confirmed and does not meet the case definition for acute hepatitis C.

Probable: a case that is anti-HCV positive (repeat reactive) by EIA and has alanine aminotransferase (ALT) or serum glutamic pyruvic transaminase (SGPT) values above the upper limit of normal, but the anti-HCV EIA result has not been verified by an additional more specific assay or the signal to cut-off ratio is unknown.