CDPH
California Department of Public Health

California Hepatitis B Landscape Analysis 2025

Executive Summary

The California Department of Public Health (CDPH) is working with local health jurisdictions, health care providers, and community-based organizations in California to find ways to strengthen hepatitis B virus (HBV) prevention, testing, and care. California's Budget Act (2022 – 2024) committed funds for CDPH to describe the landscape of HBV infection in California and allocated $8 million for the establishment of hepatitis B demonstration projects with goals of strengthening new and existing programs with respect to HBV vaccination, screening, linkage to care, and retention in care in California. The California Hepatitis B Landscape Analysis uses the most recent years of data available at the time of publication (2017 – 2023) and covers four areas:

- **Surveillance**
- **Prevalence**
- **Mortality**
- **Testing**

Key Findings are as follows:

Surveillance

In 2023, 95 *acute* hepatitis B cases were reported in California. California ranked 41st among all U.S. states in the incidence of acute hepatitis B with a rate of 0.2 per 100,000 persons. Adults over 40 years of age, males and patients identifying as Black or African American are disproportionately affected by acute hepatitis B. In 2023, 10,928 newly reported chronic hepatitis B (CHB) cases were reported in California. Adults over 50 years of age, males, and patients identifying as Asian American or Pacific Islander are over-represented in new CHB reports. Since 2017, fewer than five confirmed perinatal hepatitis B cases have been reported in California, annually.

Prevalence

CDPH used several methods and data types to estimate the CHB prevalence to be 0.4-1.0 percent of the state's population in 2022, which corresponds to 149,716–381,966 people living with CHB in California. This rate is up to two times higher than the estimated prevalence rate for the United States. When prevalent cases are compared to cases reported to public health, more than two thirds of estimated CHB infections in California have not been diagnosed and reported.

Mortality

Although hepatitis B mortality rates have been decreasing in California over the last few decades, the mortality rate (0.8 per 100,000) in 2021 was 1.7 times higher than the overall rate in the U.S. More than two thirds of hepatitis B deaths in Californians occurred in persons younger than 75 years of age, indicating that hepatitis B is associated with premature death compared to other causes. Asian Americans and Hispanic or Latinos died

from hepatitis B, on average, 18 years earlier than expected. During 2017–2021, the Bay Area region consistently reported higher hepatitis B related mortality rates compared to all other California regions.

Testing

Between 2022–2023, there was an increase both in testing for HBV at the state's federally qualified health centers (FQHCs) and in positive tests reported to CDPH for hepatitis B surface antigen (HBsAg). Further investigation is needed to understand if these trends have resulted from recent changes in hepatitis B screening recommendations and a state-level screening requirement effective in 2022 (Assembly Bill 789, 2021).

Conclusion

This landscape analysis may be used to help providers and communities plan strategies to decrease hepatitis B morbidity and mortality. California has a significant burden of newly reported chronic hepatitis B, specifically among Asian/Pacific Islander populations and screening efforts should continue to address this disparity. There is a need for culturally specific and sensitive approaches to hepatitis B prevention, detection and linkage to care to reduce disparities in hepatitis B mortality in California. Future research should investigate potential disparities in testing by patient demographics, geography and region, healthcare provider and insurance type so that all adults can have the opportunity to receive hepatitis B testing and care.

Contents

Introduction

Hepatitis B is a vaccine-preventable disease caused by the hepatitis B virus (HBV). It is transmitted through contact with blood or bodily fluids, by sexual contact, or perinatally when an infant is born to a parent with hepatitis B.[1] HBV causes both acute and chronic infections. There is no cure for hepatitis B. Symptoms of acute illness include abdominal pain, nausea, vomiting, fever, and jaundice although many people have no symptoms.[1]

Acute hepatitis B can lead to chronic hepatitis B (CHB). CHB can cause severe liver complications, including cirrhosis, hepatocellular carcinoma, and death. The risk of developing CHB is highest for those who are infected as infants, with 80%-90% progressing to CHB.[1] Although newly identified cases of acute and chronic hepatitis B are reported to public health for investigation and monitoring, CDC findings show that up to two thirds of those living with hepatitis B in the U.S. do not know they have it and therefore cannot begin treatment to delay progression of disease and prevent death.[2,3]

Vaccines against hepatitis B have been available in the United States since 1982. Children in the U.S. are recommended to receive three doses of hepatitis B containing vaccine, one dose: at birth, at 1-2 months of age, and at 6-18 months of age.[4] In 2022, the Centers for Disease Control and Prevention (CDC) recommended hepatitis B vaccination for all adults 19-59 years of age as well as adults ≥60 years of age with risk factors for hepatitis B infection.[5] In the United States, transmission of HBV is largely controlled by childhood vaccination and the case management of pregnant persons with HBV so that their newborns receive post-exposure prophylaxis to prevent infection. However, U.S. adults born prior to 1982, those with risk factors for acute infection, and those born in a country

[1] Schillie S, Vellozzi C, Reingold A, et al. Prevention of Hepatitis B Virus Infection in the United States: Recommendations of the Advisory Committee on Immunization Practices. *MMWR Recomm Rep*. Jan 12 2018; 67(1): 1-31. doi: 10.15585/mmwr.rr6701a1

[2] Bixler D, Barker L, Lewis K, Peretz L, Teshale E. Prevalence and awareness of Hepatitis B virus infection in the United States: January 2017 - March 2020. *Hepatol Commun*. Apr 1 2023; 7(4) doi:10.1097/hc9.0000000000000118

[3] Roberts H, Kruszon-Moran D, Ly KN, et al. Prevalence of chronic hepatitis B virus (HBV) infection in U.S. households: National Health and Nutrition Examination Survey (NHANES), 1988-2012. *Hepatology*. Feb 2016; 63(2): 388-97. doi:10.1002/hep.28109

[4] Centers for Disease Control and Prevention. Child and Adolescent Immunization Schedule by Age. Accessed January 24, 2025, Child and Adolescent Immunization Schedule by Age (Addendum updated August 7, 2025) | Vaccines & Immunizations | CDC

[5] Weng MK, Doshani M, Khan MA, et al. Universal Hepatitis B Vaccination in Adults Aged 19-59 Years: Updated Recommendations of the Advisory Committee on Immunization Practices - United States, 2022. *MMWR Morb Mortal Wkly Rep*. Apr 1 2022;71(13):477-483. doi:10.15585/mmwr.mm7113a1

where hepatitis B is endemic who may have acquired HBV at a young age make up the majority of CHB cases in the U.S.[2,6]

The California Department of Public Health (CDPH) is working with local health jurisdictions, health care providers, and community-based organizations to find ways to strengthen hepatitis B prevention, testing and care. In 2022, the California Legislature passed a law that primary care providers must offer hepatitis B screening for all adults who are eligible for testing.[7] In the same year, CDC expanded hepatitis B vaccination recommendations to include universal hepatitis B *vaccination* in all adults ages 19–59.[5] In 2023, CDC expanded hepatitis B screening recommendations to include universal adult screening with three laboratory tests at least once during a lifetime.

This landscape analysis of hepatitis B in California is a summary of data that local health jurisdictions, providers and community stakeholders can use to better implement services to prevent and identify hepatitis B infection and improve outcomes for Californian's living with CHB. California-specific findings are presented in four areas:

- **Surveillance**
- **Prevalence**
- **Testing**
- **Mortality**

Each section incorporates multiple data sources and analysis methods to account for limitations and challenges in available surveillance data. Data included provides a population-based, state-wide description of the epidemiology of hepatitis B in California.

[6] Centers for Disease Control and Prevention. Viral Hepatitis Surveillance Report – United States, 2023. Centers for Disease Control and Prevention. Accessed May 2, 2025, 2023 Viral Hepatitis Surveillance Report | 2023 Hepatitis Surveillance | CDC

[7] AB-789 Health care services, 789 (2021-2022). Bill Text - AB-789 Health care services.

Surveillance

Key Findings

- In 2023, 95 acute hepatitis B cases and 10,928 newly reported chronic hepatitis B cases were reported.
- The rate of acute hepatitis B decreased in 2020 but in 2023 neared pre-2020 levels. In contrast, the rate of newly reported chronic hepatitis B has surpassed 2019 levels.
- Adults over 40 years of age, males or identifying as Black/African American are disproportionately affected by acute hepatitis B.
- Adults over 50 years of age, males, or identifying as Asian American or Pacific Islander are over-represented in newly reported cases of chronic hepatitis B.
- Since 2017, fewer than five confirmed perinatal hepatitis B cases have been reported in California annually, with only one case reported in 2022.

Hepatitis B Surveillance in the United States

In 2023, 2,214 new cases of acute hepatitis B were reported in the US, for a rate of 0.6 acute HBV infections per 100,000 persons.[1,2] The rate of new infections has been consistent for the last several years.

Nationally, the highest rates of confirmed acute hepatitis B in 2023 were among those aged 40-49 years (1.4 per 100,000) and 50-59 years (1.2 per 100,000). The rate of acute hepatitis B was 60% higher in males than females (0.8 per 100,000 and 0.5 per 100,000, respectively); the rate among non-Hispanic Black persons was 90% higher than the rate among non-Hispanic White persons (1.1 per 100,000 vs 0.6 per 100,000). Nationally, the most common risk factors reported among cases with acute hepatitis B in 2023 were injection drug use and having multiple sex partners.[1]

In 2023, there were 17,650 newly reported confirmed cases of CHB in the U.S.[1] Cases of CHB are not reportable in all U.S. jurisdictions and confirmed cases are recognized to represent only a portion of true disease burden. For these reasons, data reported for the U.S. in the CDC annual hepatitis report are not comparable to California-specific data and are not included in this analysis.

In the United States, the Perinatal Hepatitis B Prevention Program (PHBPP), established by the Centers for Disease Control and Prevention (CDC) in 1990, oversees public health

[1] Centers for Disease Control and Prevention. Viral Hepatitis Surveillance Report – United States, 2023. Centers for Disease Control and Prevention. Accessed May 2, 2025, 2023 Viral Hepatitis Surveillance Report | 2023 Hepatitis Surveillance | CDC

[2] Klevens RM, Liu S, Roberts H, Jiles RB, Holmberg SD. Estimating acute viral hepatitis infections from nationally reported cases. *Am J Public Health*. Mar 2014;104(3):482-7. doi:10.2105/AJPH.2013.301601

efforts to reduce perinatal HBV transmission.[3,4] Through this program, pregnant persons with hepatitis B receive case management services from local public health personnel, who work to ensure these parents and their infants receive the appropriate HBV testing, vaccination, postexposure prophylaxis (PEP), and treatment. In 2023, two cases of perinatal hepatitis B infections were reported nationally.[1]

Hepatitis B Surveillance in California

In California, acute, chronic and perinatal hepatitis B cases and hepatitis B laboratory reports are required to be reported by healthcare providers and laboratories to the appropriate local public health department. Data collected on persons with hepatitis B include demographics, laboratory test results, clinical signs and symptoms, and epidemiologic risk factors. Cases are classified as either acute or chronic according to the Council of State and Territorial Epidemiologists (CSTE) national surveillance case definitions.[5,6] Cases of acute hepatitis B were included in this analysis if they met the CSTE confirmed case definition. For a more comprehensive description of demographics and rates, chronic hepatitis B cases were included if they met the CSTE confirmed or probable case definitions.

All acute hepatitis B case reports are investigated by staff at local public health departments. Public health investigators gather information about possible exposures that may have put them at risk for HBV infection in the six-month period before they were diagnosed. Risk factors include contact with another person with acute or chronic hepatitis B, having multiple sex partners, identifying as a man having sex with men (MSM), recent drug use, receiving a piercing or tattoo, history of incarceration in a correctional facility, and having a health care procedure with potential exposure to blood. When more than one risk factor is reported, the most likely route of exposure is determined.

Due to the high volume of chronic HBV infections reported to public health, not all patients with chronic HBV are investigated by local public health staff. Newly reported probable and confirmed cases are summarized by demographics and geography. Rates of CHB in

[3] Smith EA, Jacques-Carroll L, Walker TY, Sirotkin B, Murphy TV. The national Perinatal Hepatitis B Prevention Program, 1994-2008. *Pediatrics*. Apr 2012; 129(4): 609-16. doi:10.1542/peds.2011-2866

[4] Koneru A, Fenlon N, Schillie S, Williams C, Weng MK, Nelson N. National Perinatal Hepatitis B Prevention Program: 2009-2017. *Pediatrics*. Mar 2021; 147(3) doi:10.1542/peds.2020-1823

[5] National Notifiable Diseases Surveillance System. Hepatitis B, acute (historical version) 2012 Case Definition. Centers for Disease Control and Prevention. Hepatitis B, acute (historical version) 2012 Case Definition | CDC

[6] National Notifiable Diseases Surveillance System. Hepatitis B, chronic (historical version). Centers for Disease Control and Prevention. Hepatitis B, chronic (historical version)| CDC

California are calculated using population denominators published by the California Department of Finance.[7]

For perinatal transmission surveillance, data for pregnant persons with HBV and their infants were collected from laboratory reports, medical records, and patient interviews, and reported to the California Perinatal Hepatitis B Prevention Program (PHBPP). Additional details about the PHBPP have been previously described.[3,4]

Acute Hepatitis B

Statewide Findings

In 2023, 95 acute hepatitis B cases were reported to CDPH (Figure 1). In 2023, California ranked 41st among states in the incidence rate of acute hepatitis B; the California rate was 0.2 per 100,000 persons as compared with 0.7 per 100,000 persons nationwide (Figure 1). Although incidence of acute hepatitis B decreased in 2020 compared to 2019, coinciding with the COVID-19 pandemic, the number and incidence rate of acute hepatitis B has increased year over year from 2021 to 2023 (Figure 1). From 2019 to 2023, 251 (64.1%) of patients with acute HBV infection were hospitalized, and 8 (2.1%) died. The proportion of reported cases that were hospitalized or died each year has remained constant since 2019.

Disparities by Region

During 2019-2023, the rate of acute hepatitis B was highest in the Central (0.26 per 100,000) and Southwest (0.26 per 100,000) regions of California (Figure 2). All California regions have rates of acute hepatitis B that are lower than those reported nationally.

Disparities by Age

From 2019 to 2023, the highest incidence rates of acute hepatitis B were among persons 50-59 years of age (0.47 per 100,000) and 40-49 years of age (0.45 per 100,000) (Figure 3). Ninety-five percent of acute HBV infections were reported among adults 30 years of age and older. Rates of acute HBV in California remain lower than national rates across all age groups.

Disparities by Sex

Overall, rates of acute hepatitis B were consistently higher among males than females (Figure 4). This disparity exists both in California and nationally.

Disparities in Race and Ethnicity

From 2019 to 2023, the incidence rate of acute hepatitis B in California was highest among Black or African American persons (0.36 per 100,000), followed by White persons (0.19 per

[7] State of California Department of Finance Population Estimates. Estimates | Department of Finance

100,000) and Hispanic or Latino persons (0.16 per 100,000) and (Figure 5). This trend is consistent with the trend observed nationally, though the rates in California remain lower than those reported nationally. Additionally, Black or African American persons account for 11% of newly reported acute hepatitis B infections in California but only make up 5% of California's overall population (Figure 6). No other racial or ethnic group had an overrepresentation of cases compared to their share of the state's population during this time.

Risk Factors

Of the acute hepatitis B cases reported from 2019-2023 who reported at least one risk factor, 32% had at least one sexual risk factor, such as having multiple sexual partners or identifying as a man who has sex with men (Figure 7). This proportion is higher than what was reported nationally in 2023 (32% vs 9%). Nine percent of cases reported injection drug use, compared to 8% in the U.S. (Figure 7). Thirty-two percent of patients in California had unknown risk factors, compared to 48% nationally.

Chronic Hepatitis B Surveillance

Statewide Findings

The Centers for Disease Control and Prevention publishes CHB data for confirmed cases, only. Nationally, this rate in 2023 is 6.1 per 100,000 population, which is higher than the rate of confirmed cases reported in California (3.7 per 100,000 population). However, the burden of disease based on confirmed cases only is limited and recognized by CDC and many states as an underestimate due to restrictive criteria of the confirmed case definition. Newly reported confirmed and probable cases of CHB are presented in this report, hereafter.

In 2023, there were 10,928 newly reported cases of CHB in California, corresponding to a rate of 27.9 per 100,000 persons (Figure 8). As with cases of acute hepatitis B, the rate in 2020 decreased compared to 2019. Since 2020, the number and rate of reported cases steadily increased; the case count and rate in 2023 surpassed those of 2019 (Figure 8).

Disparities by Region

From 2019 to 2023, the rate of newly reported cases of chronic HBV infection was highest in the Bay Area region (30.4 per 100,000) and the Southwest region (25.1 per 100,000) (Figure 9). However, rates across all five California regions have increased since 2020.

Disparities by Age Group

From 2019 to 2023, the highest rates of newly reported CHB were among persons 50-59 years of age (33.1 per 100,000) and 30-39 years of age (32.3 per 100,000). Sixty-nine percent of chronic HBV infections were reported among adults 40 years of age and older.

Since 2020, rates increased across all age groups, and either reached or surpassed the rate in 2019 (Figure 10). CHB rates remain low in the pediatric population.

Disparities by Sex

Overall, rates of newly reported chronic HBV infections were consistently higher among patients identifying as male than among patients identifying as female (Figure 11). However, rates among both male and female persons have steadily increased since 2020. The rates in 2023 exceeded those in 2019 in both population groups.

Disparities in Race and Ethnicity

Rates of newly reported chronic HBV increased across all racial and ethnic groups in California since 2020 (Figure 12). From 2019 to 2023, the rate of newly reported CHB was highest among Asian/Pacific Islanders (31.7 per 100,000) (Figure 12). Similarly, Asian/Pacific Islanders accounted for 45% of newly reported cases of chronic HBV, but only 15% of the California population (Figure 13). Prevalence of chronic HBV was highest among those born in regions where HBV infection is considered endemic, such as Africa (8.6%), Asia (5.9%), and Oceania (4.5%).[8,9]

Perinatal Hepatitis B Surveillance

Statewide Findings

From 2016 to 2022, the number of infants born to birthing parents with HBV infection and case managed by the PHBPP has been decreasing both nationally and in California (Figure 14). In the United States, 7,327 infants born in 2022 were enrolled in PHBPP case management; 1,013 (14%) of these infants were born in California.

Over the same time-period, over 97% of case-managed infants born in California received PEP on time (within 12 hours), a key accomplishment of the PHBPP (Figure 15). However, compared to the national program, the California PHBPP has reported lower proportions of infants who completed the hepatitis B vaccine series (78% vs 87%) and infants completing post vaccination serologic testing (PVST) (56% vs 66%) by the end of the reporting period. California's PHBPP has observed consistent improvement over time, with 89% of infants completing the vaccine series and 59% of infants completing PVST in 2022 (Figures 16 and 17).

In total, efforts by the PHBPP have been associated with a substantial reduction in the number of HBsAg-positive infants. Since 2017, fewer than five confirmed perinatal

[8] Wong RJ, Brosgart CL, Welch S, et al. An Updated Assessment of Chronic Hepatitis B Prevalence Among Foreign-Born Persons Living in the United States. *Hepatology*. Aug 2021; 74(2): 607-626. doi:10.1002/hep.31782

[9] Conners EE, Panagiotakopoulos L, Hofmeister MG, et al. Screening and Testing for Hepatitis B Virus Infection: CDC Recommendations - United States, 2023. *MMWR Recomm Rep*. Mar 10 2023; 72(1): 1-25. doi:10.15585/mmwr.rr7201a1

hepatitis B cases have been reported in California, annually, with only one case reported in 2022 (Figure 18).

Limitations

Surveillance data are limited to only those cases that are reported to public health. Because patients with hepatitis B are often asymptomatic, they may go undiagnosed and may not be reported to public health. Cases of infection might be reported at any time during illness and may not reflect true trends and disparities in all new acute HBV infections. Additionally, the data do not represent true incidence or prevalence of chronic HBV in the California population. Nevertheless, these data can highlight temporal trends and disproportionately affected populations and inform strategies related to care and prevention.

Public Health Implications

These findings can be used to promote screening and vaccination for hepatitis B in the communities with higher rates of reported infection. California has a significant burden of newly reported chronic hepatitis B, specifically among Asian/Pacific Islander populations and screening efforts should continue to include these populations. CDC's recently updated hepatitis B screening and vaccination recommendations for adults will also enhance these efforts, by increasing HBV prevention and increasing detection of CHB among all adults in California.

In terms of perinatal infection, the PHBPP has been associated with reductions in cases in the United States and in California. However, due to the large burden of CHB in California, timely screening and care for pregnant persons and their families to prevent severe liver disease and death remains a public health priority. The California PHBPP continues to support local health departments and providers in ensuring parents and infants receive the appropriate testing and care to prevent perinatal HBV infections

Surveillance Figures

Figure 1. Number and rate of reported acute HBV in California, 2019-2023

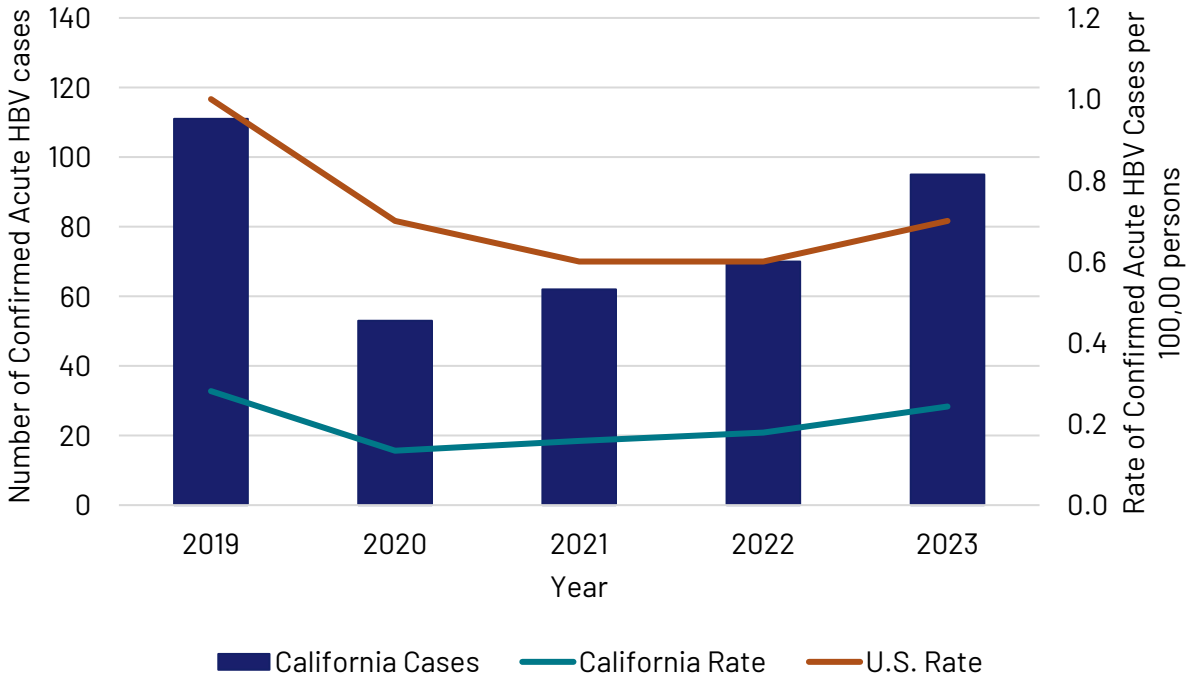
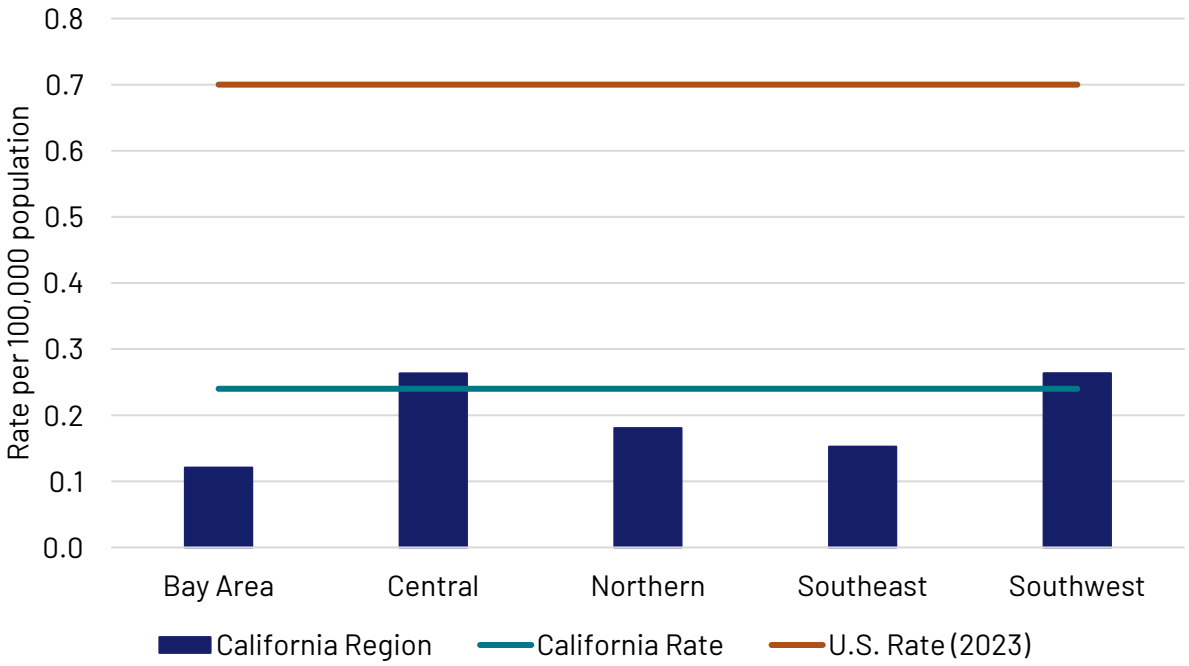


Figure 2. Five-year rates of newly reported cases of acute hepatitis B by region, California, 2019-2023[a]



[a] Counties were categorized into regions per CDPH usual data protocol, as follows:
Bay Area: Alameda, Berkeley, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Santa Cruz, Solano, Sonoma.
Central: Calaveras, Fresno, Inyo, Kings, Madera, Mariposa, Merced, Mono, Monterey, San Benito, San Joaquin, Stanislaus, Tulare, Tuolumne.
Northern: Alpine, Amador, Butte, Colusa, Del Norte, El Dorado, Glenn, Humboldt, Lake, Lassen, Mendocino, Modoc, Nevada, Placer, Plumas, Sacramento, Shasta, Sierra, Siskiyou, Sutter, Tehama, Trinity, Yolo, Yuba.
Southeast: Imperial, Orange, Riverside, San Bernadino, San Diego.
Southwest: Kern, Los Angeles, Long Beach, Pasadena, San Luis Obispo, Santa Barbara, Ventura.

Figure 3. Five-year rates of newly reported cases of acute hepatitis B by age group in California, 2019-2023

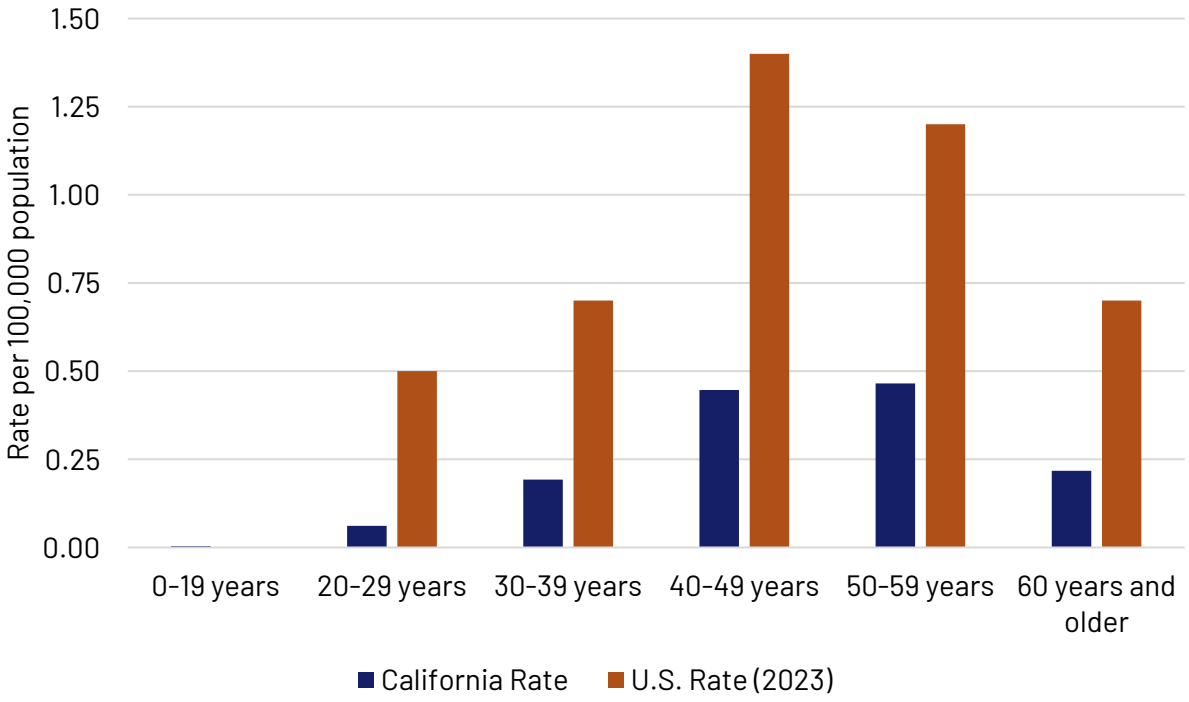


Figure 4. Five-year rates of newly reported cases of acute hepatitis B by sex in California, 2019-2023

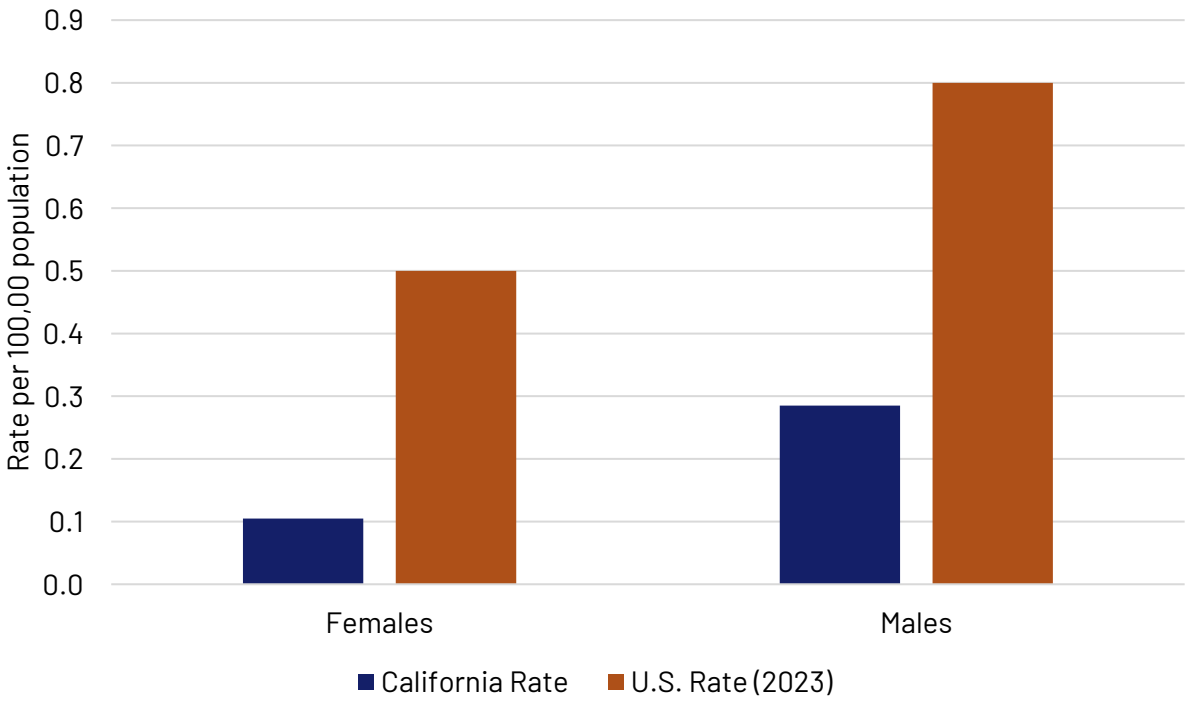


Figure 5. Five-year rate of reported acute hepatitis B cases by race and ethnicity in California, 2019-2023

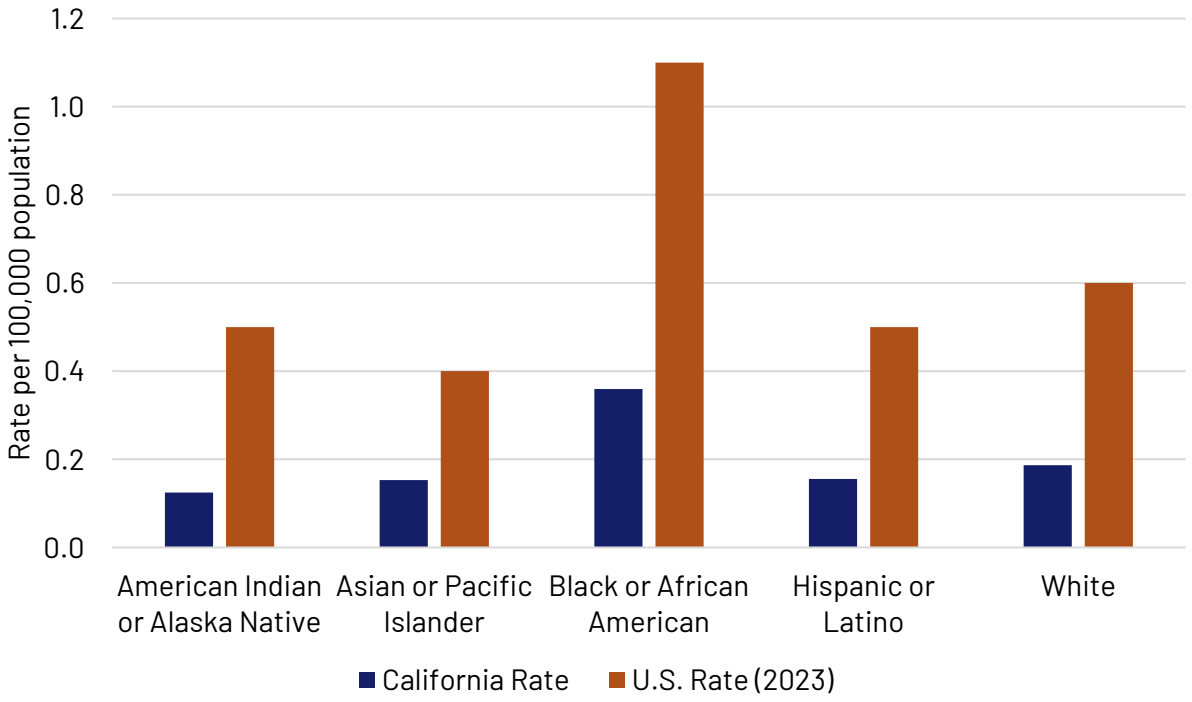
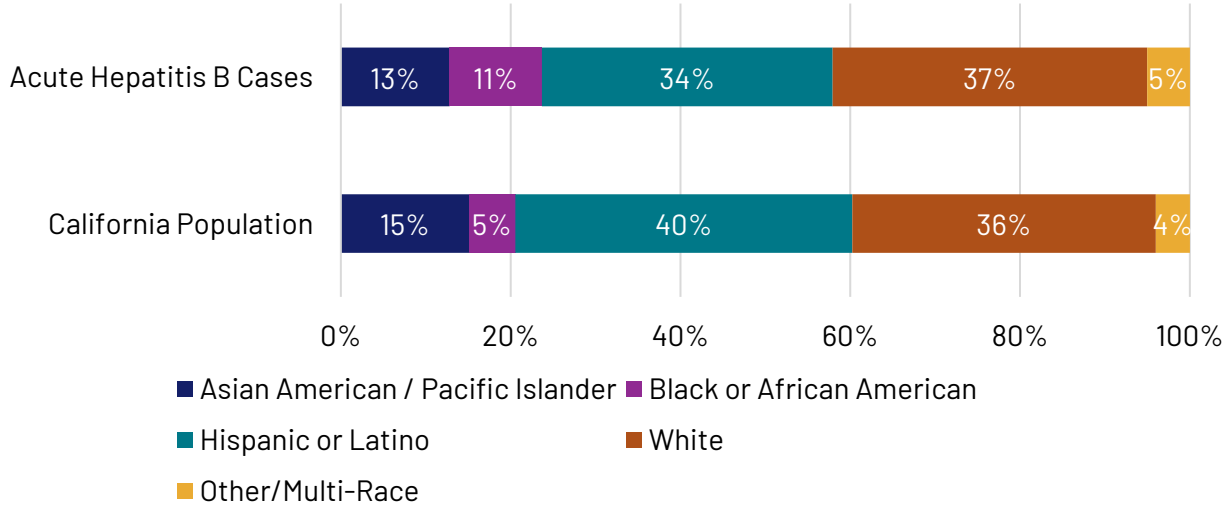


Figure 6. Percentage of reported acute hepatitis B cases by race and ethnicity compared to general population in California, 2019-2023[b]



[b] American Indian or Alaska Native represent 0.3% of acute hepatitis B cases and 0.4% of the California population.

Figure 7. Proportion of newly reported cases of acute hepatitis B by risk factor, California, 2019-2023[c,d]

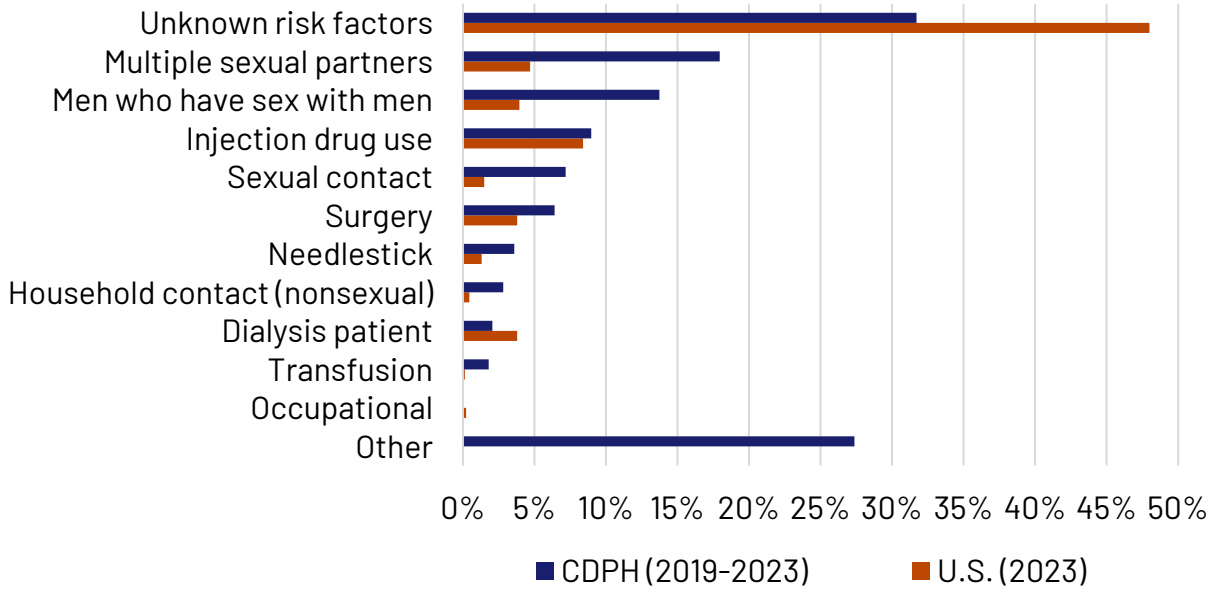
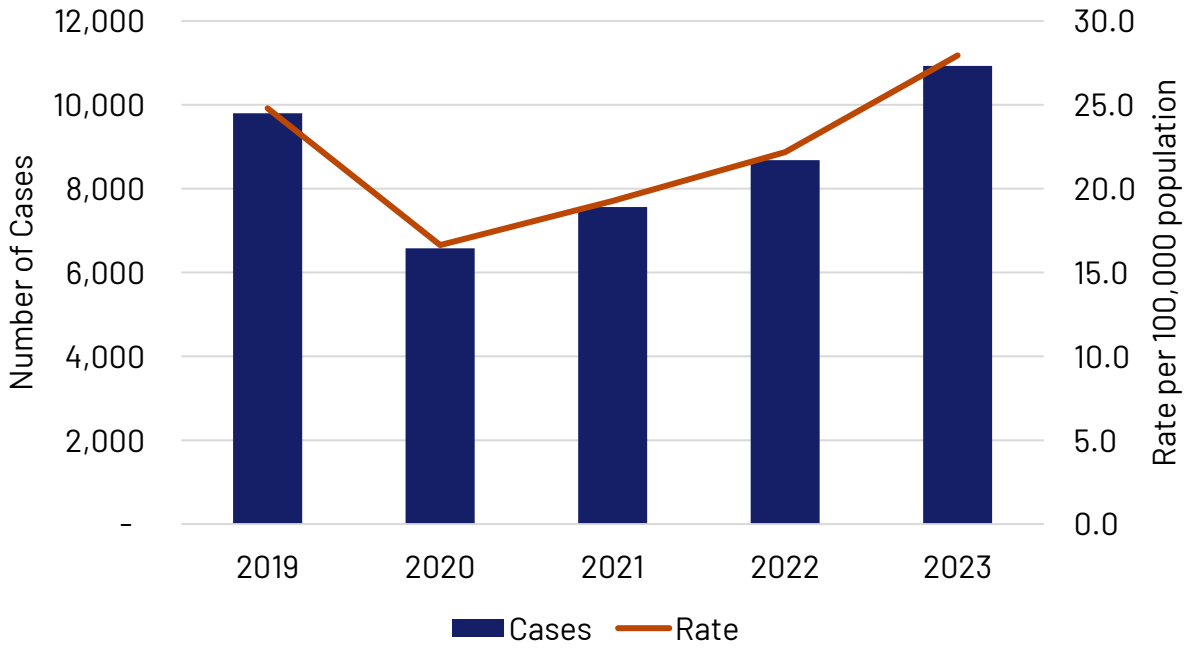


Figure 8. Number and rate of reported chronic HBV in California, 2019-2023



[c] Cases may report more than one risk factor.
[d] Other includes non-injection drug use, history of incarceration, history of a sexual transmitted infection, recent cosmetic procedure, other contact with a confirmed case, and other recent healthcare exposure

Figure 9. Rates of newly reported cases of chronic hepatitis B by region and year in California, 2019-2023[a]

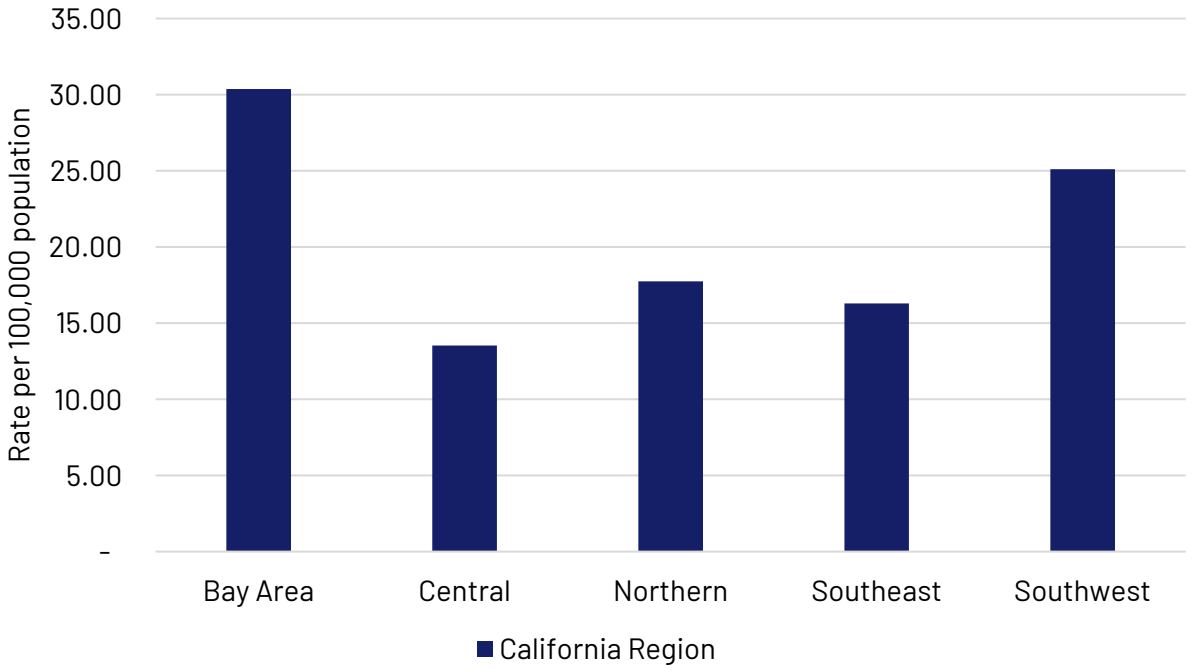


Figure 10. Rates of newly reported cases of chronic hepatitis B by age and year in California, 2019-2023

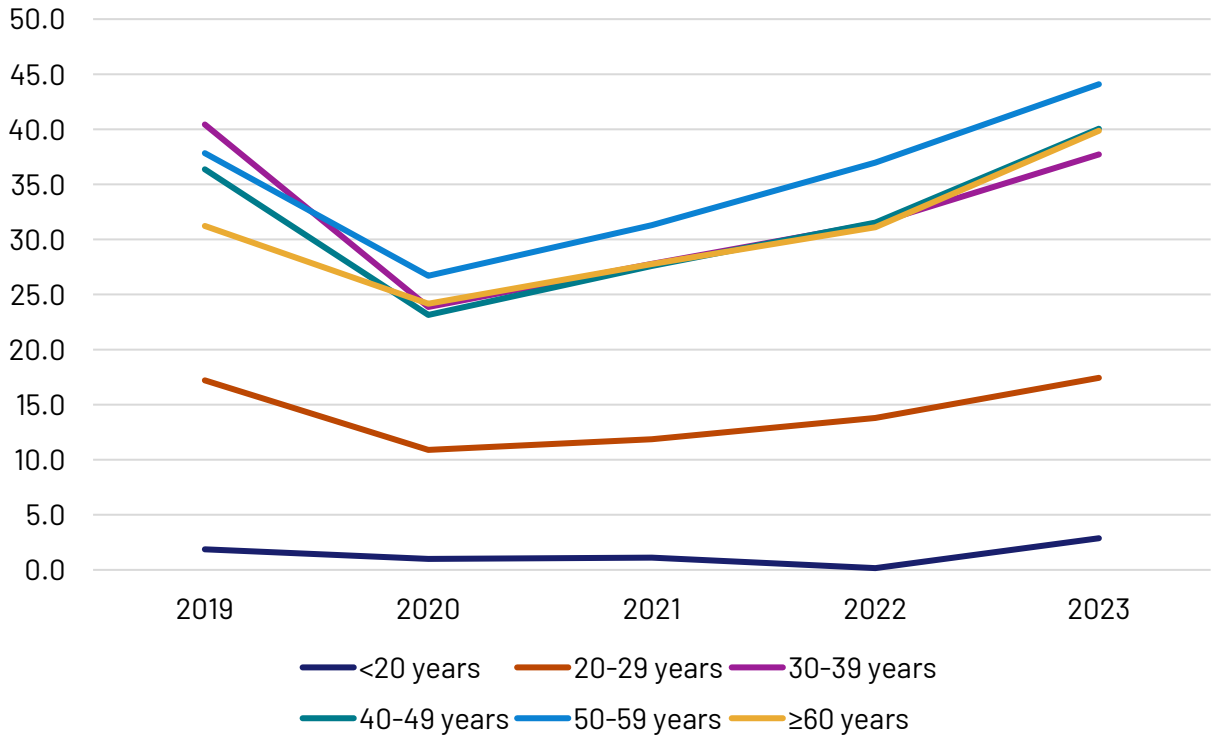


Figure 11. Rates of newly reported cases of chronic hepatitis B by sex and year in California, 2019-2023

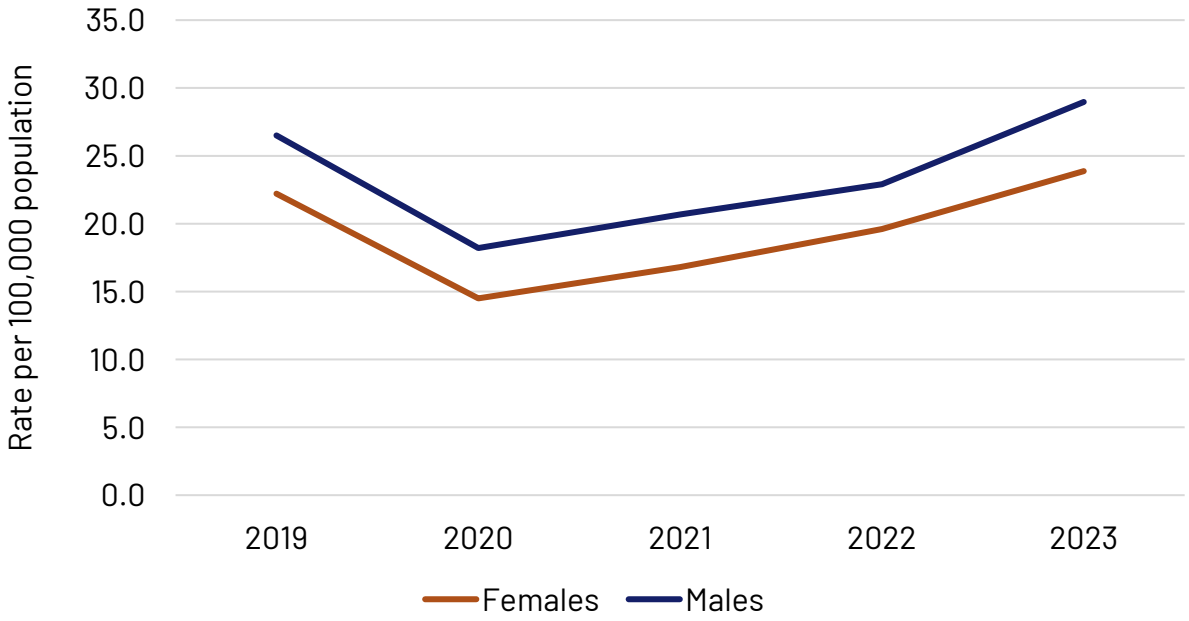


Figure 12. Rates of newly reported cases of chronic hepatitis B by race/ethnicity and year in California, 2019-2023

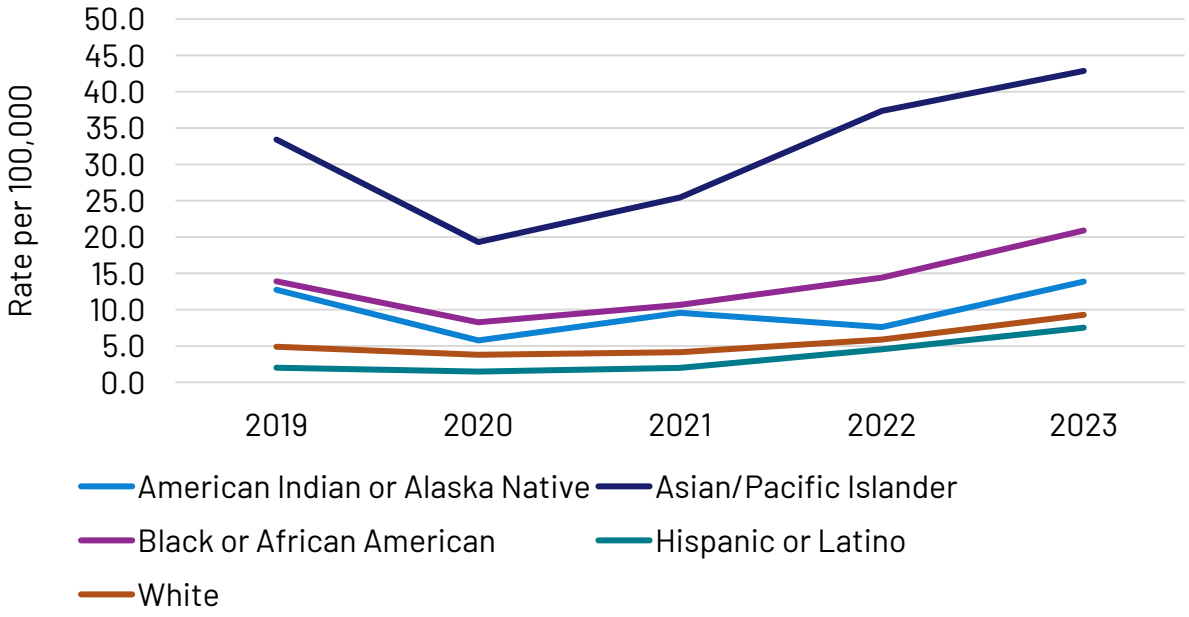


Figure 13. Percentage of reported chronic hepatitis B cases by race and ethnicity compared to general population in California, 2019-2023[e]

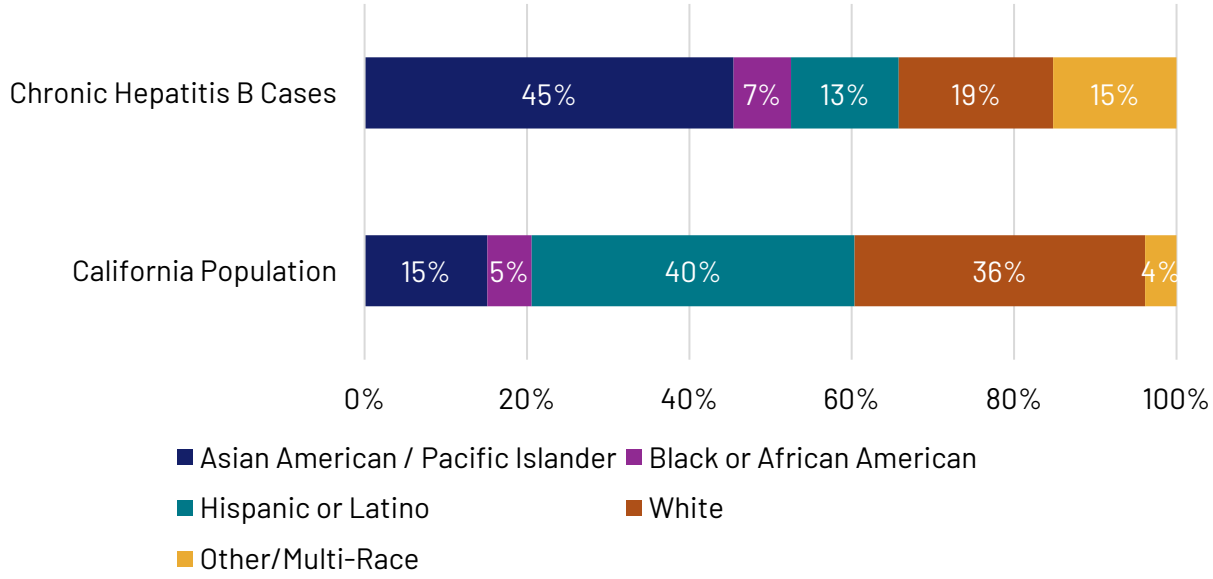
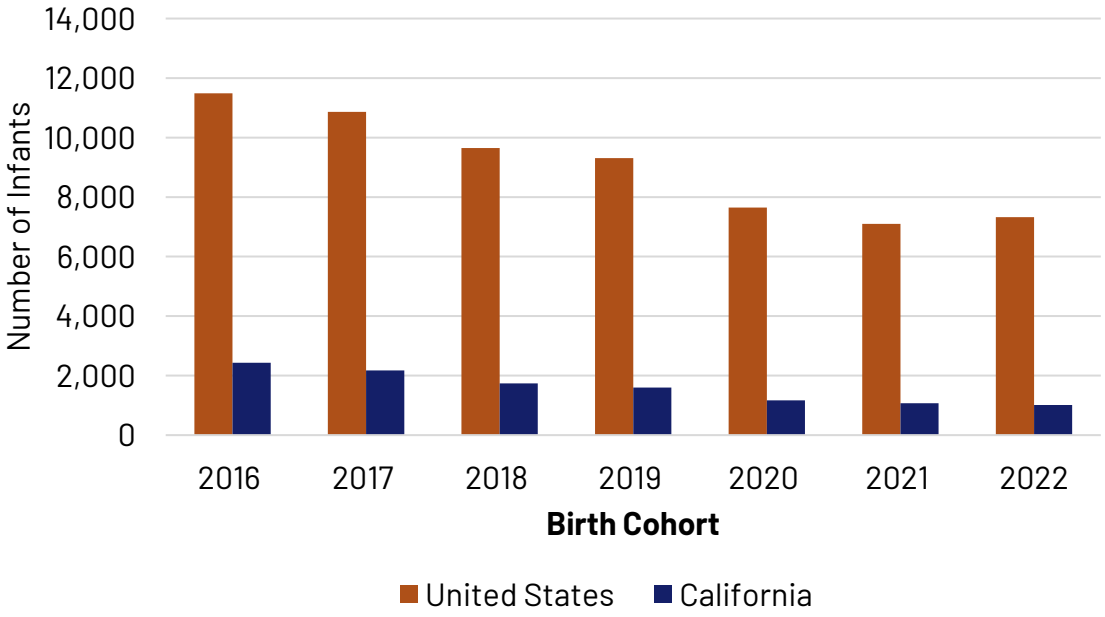


Figure 14. Number of infants case-managed by the Perinatal Hepatitis B Prevention Program (PHPP)



[e] American Indian or Alaska Native represent 0.4% of chronic hepatitis B cases and 0.4% of the California population.

Figure 15. Proportion of infants receiving timely hepatitis B post exposure prophylaxis

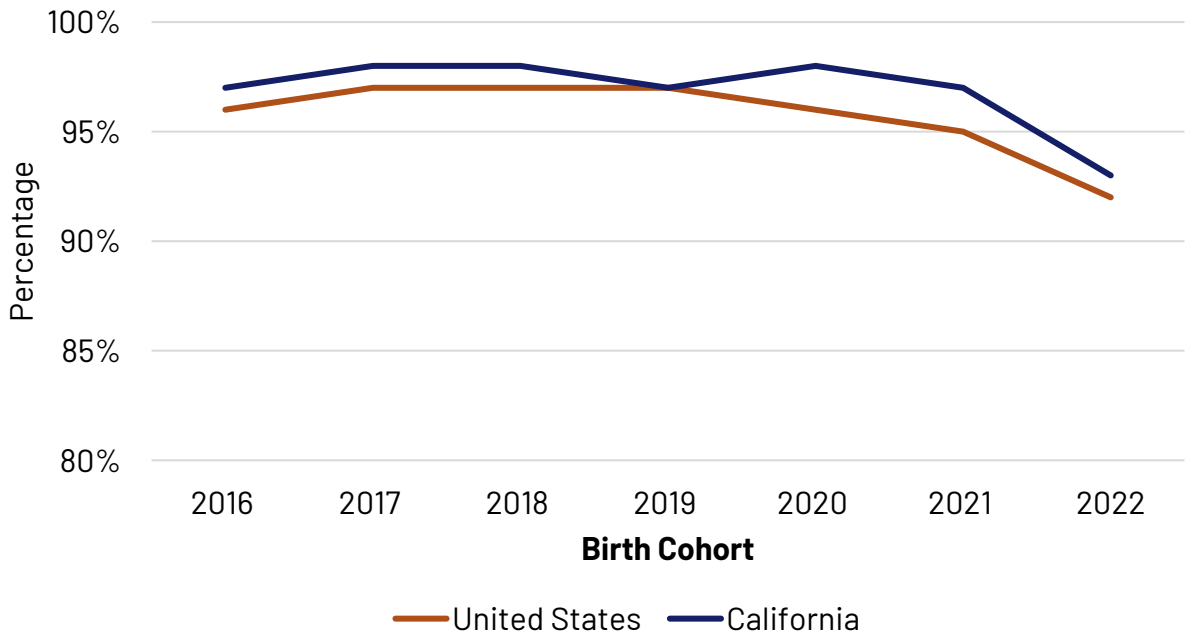


Figure 16. Proportion of infants completing the hepatitis B vaccine series

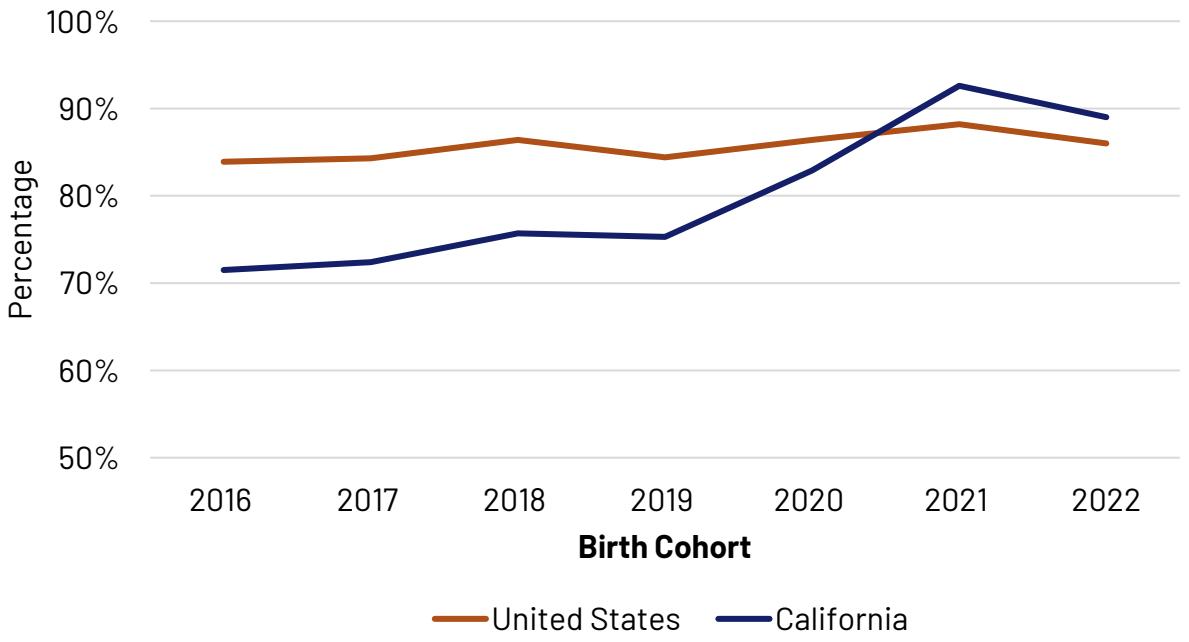


Figure 17. Proportion of infants with complete post vaccination serologic testing

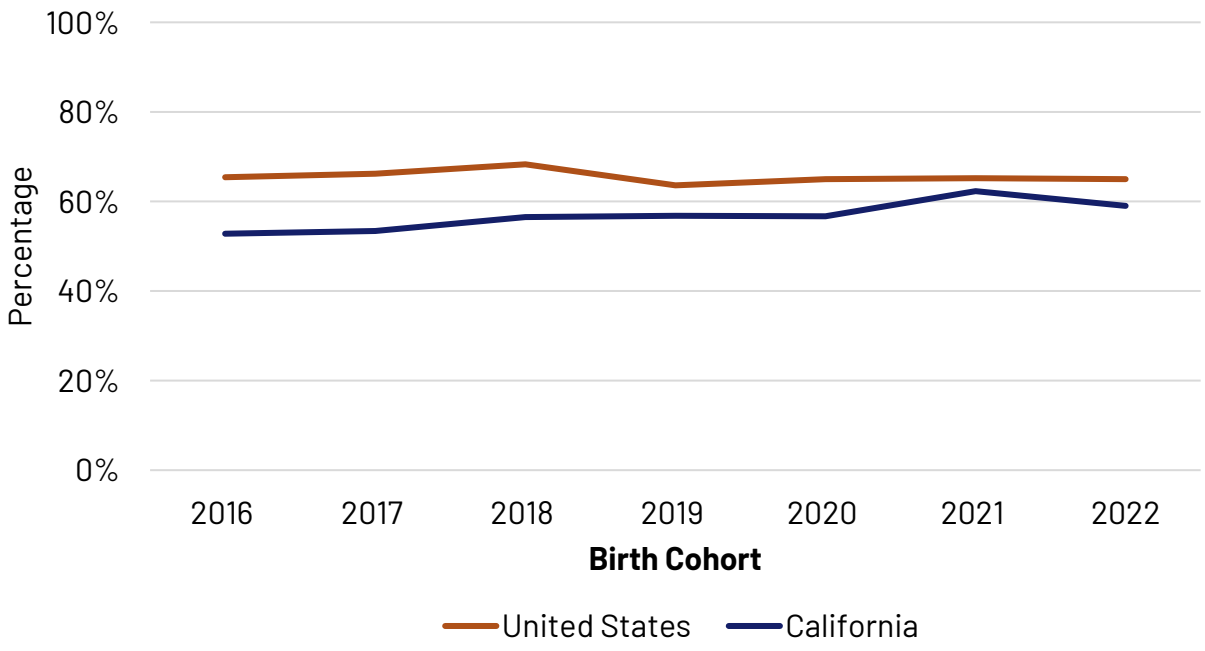
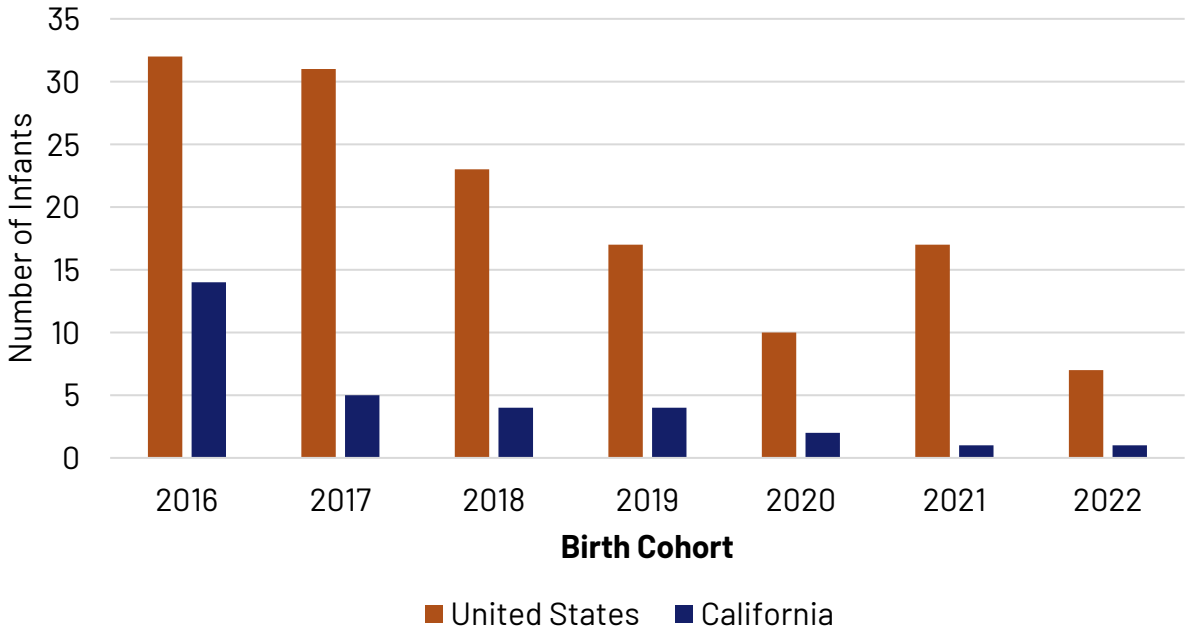


Figure 18. Number of HBsAg-positive infants



Chronic Hepatitis B Prevalence in California

Key Findings

- CDPH used several methods and data sources to estimate the CHB prevalence to be 0.4-1.0% of the state's population.
- An estimated 148,106-381,966 people were living with CHB in California as of 2022. This prevalence is up to two times higher than the estimated prevalence for the United States.[1,2]
- When prevalent cases are compared to cases reported to public health, more than two thirds of estimated CHB infections in California have not been diagnosed and reported.

Background: Global & U.S. Chronic Hepatitis B Prevalence

There are an estimated 254 million people living with CHB worldwide. The highest prevalence is observed in Africa and Asia, where hepatitis B is endemic; over half of global cases are found in these regions.[3] Prevalence within these regions varies, with the highest rates in mainland China, southeast Asia, and sub-Saharan Africa.[4] Increased prevalence in these regions can be attributed to a variety of factors, including transmission of HBV from mother to infant during the perinatal period or during early childhood, as well as gaps in routine HBV vaccination in infancy.[3] In the U.S. it is estimated that between 60-90% of persons with CHB were born outside the U.S.[5]

In 2021, the CDC estimated the prevalence of CHB in the U.S. to range from 580,000 to 2.4 million.[2,5,6] While CHB prevalence is lower in the U.S. compared to other regions of the world, some racial and ethnic groups are more likely to be infected. In the U.S., Asian

[1] Bixler D, Barker L, Lewis K, Peretz L, Teshale E. Prevalence and awareness of Hepatitis B virus infection in the United States: January 2017 - March 2020. *Hepatol Commun*. Apr 1 2023; 7(4) doi:10.1097/hc9.0000000000000118

[2] Wong RJ, Brosgart CL, Welch S, et al. An Updated Assessment of Chronic Hepatitis B Prevalence Among Foreign-Born Persons Living in the United States. *Hepatology*. Aug 2021; 74(2): 607-626. doi:10.1002/hep.31782

[3] World Health Organization. Hepatitis B. World Health Organization. Hepatitis B

[4] Centers for Disease Control and Prevention. Global Viral Hepatitis. Centers for Disease Control and Prevention. Global Viral Hepatitis | Viral Hepatitis | CDC

[5] Conners EE, Panagiotakopoulos L, Hofmeister MG, et al. Screening and Testing for Hepatitis B Virus Infection: CDC Recommendations - United States, 2023. *MMWR Recomm Rep*. Mar 10 2023; 72(1):1-25. doi:10.15585/mmwr.rr7201a1

[6] Roberts H, Ly KN, Yin S, Hughes E, Teshale E, Jiles R. Prevalence of HBV Infection, Vaccine-Induced Immunity, and Susceptibility Among At-Risk Populations: US Households, 2013-2018. Hepatology. Nov 2021;74(5):2353-2365. doi:10.1002/hep.31991

Americans, Pacific Islanders, and non-Hispanic Blacks are most impacted by CHB.[7] In a 2020 National Health and Nutrition Examination Survey (NHANES) analysis, higher prevalence was observed among those born outside the U.S. as compared with those who were born in the U.S.; almost half of infections were noted among non-Hispanic Asian Americans.[1]

Prevalence of Chronic Hepatitis B in California

A CHB prevalence estimate includes both people with infection that has been detected and reported to public health, as well as those who are not reported or diagnosed. CDPH used three methods to estimate CHB prevalence in California:

- **Estimate One: A calculated five-year period prevalence based on test data reported to CDPH**
- **Estimate Two: Prevalence extrapolated from national data adjusted to reflect California's demographics**
- **Estimate Three: Prevalence based on global region of birth of those living in California**

Estimate One: A Calculated Five-Year Period Prevalence Based on Tests reported to CDPH

Methods

In California, CHB is a reportable condition, and all positive results of HBV diagnostic tests are reported to local public health departments and to CDPH. For this analysis, a case of CHB was defined as an individual with at least two positive HBV tests that indicate current infection (HBsAg, HBV DNA, HBeAg, or HBV genotype) with collection dates greater than 180 days apart. Cases with at least one test date between 2018-2022 indicating active infection during the 5-year period were included. This method allowed for analysis of case-level demographic data including geographic area (zip code), age, race and ethnicity and sex. Race and ethnicity were defined in the CDPH CHB case registry to align with California Department of Finance population denominators.[8] Race and Hispanic origin were categorized in a single race and ethnicity variable, categorized as follows: Hispanic or Latino, non-Hispanic Asian American or Pacific Islander, non-Hispanic Black, non-Hispanic White, non-Hispanic Native American or Alaskan Native, and non-Hispanic Multi-race. To assess for disparities in prevalence by neighborhood-level indicators of health, zip code of residence was used to assign the Healthy Places Index (HPI) based on statewide quartile.[9] HPI does not include adjustments for race and ethnicity. A similar

[7] Le MH, Yeo YH, Cheung R, Henry L, Lok AS, Nguyen MH. Chronic Hepatitis B Prevalence Among Foreign-Born and U.S.-Born Adults in the United States, 1999-2016. *Hepatology*. Feb 2020; 71(2): 431-443. doi:10.1002/hep.30831

[8] State of California DoF. Population Projections. Projections | Department of Finance

[9] Healthy Places Index. California Healthy Places Index (HPI). Healthy Places Index (HPI)

method has been used to estimate CHB prevalence in Alameda County, California.[10] Rates were calculated using the population estimates published by the California Department of Finance as a denominator.[8]

Findings

The calculated five-year period CHB prevalence for 2018-2022 was 212.4 per 100,000 or 0.2% of the California population based on a case count of 84,506. The highest rates were among Californians in older and middle age, including those aged 60-69 years (448.4 per 100,000 population), 50-59 years (425.6 per 100,000), and 40-49 years (362.3 per 100,000 (Table 1). Prevalence was similar by sex overall, though higher among females aged 20-29 years compared to males.

Thirty-eight percent of cases were reported from quartile four zip codes (the healthiest HPI quartile); most persons with living with CHB and living in quartile four zip codes were in the Bay Area region (Figure 1).

With respect to race and ethnicity, 77% of cases were among Asian Americans and Pacific Islanders. CHB prevalence was overrepresented in California counties and regions with relatively higher proportions of Asian American residents. For instance, San Francisco, Santa Clara, Contra Costa, Alameda, and Los Angeles Counties accounted for 60% of all prevalent CHB cases reported to CDPH, but only 39% of the state population.[8]

Limitations

Prevalence estimates based on public health surveillance data do not account for individuals who have HBV infection but have not been tested for HBV, or who were tested outside of the state. While surveillance data can provide detailed person-level information in key areas such as demographics and geography, these data are frequently incomplete for reported cases. Asian American and Pacific Islander were combined as a single category and could not be disaggregated in this analysis.

Estimate Two: California Prevalence Estimate Based on NHANES, Adjusted for Race and Ethnicity and Additional Subgroups

Method

California CHB prevalence was estimated using national findings from the 2017-2020 National Health and Nutrition Examination Survey (NHANES). NHANES is a continuous health survey of adults and children in the general population throughout the U.S. conducted by CDC; HBV testing is included in the survey for all participants over 6 years

[10] Yette E, Marusinec R, Conlon C, et al. Epidemiology of Chronic Hepatitis B Virus Infection, Alameda County, California, 2017-2021. *J Public Health Manag Pract*. Sep 12 2024; doi:10.1097/phh.0000000000002011

old.[11] CDPH used hepatitis B surface antigen (HBsAg) data collected by NHANES to calculate national CHB prevalence rates by race and ethnicity. These rates were calculated according to NHANES analytic guidelines and applied to California's 2020 population over 6 years old (Table 2). The race and ethnicity variable analyzed combines race and Hispanic origin in a single race and ethnicity field, categorizing Hispanic (includes Mexican Americans and Other Hispanic), non-Hispanic Asian, non-Hispanic Black, non-Hispanic White, and Other (includes non-Hispanic Multi-race and non-Hispanic Native Hawaiian or Pacific Islander).[8]

The NHANES survey design excludes people experiencing homelessness, people who are incarcerated, active-duty military personnel, and those living in nursing homes.[11] To account for non-NHANES groups, literature reviews were conducted to identify CHB prevalence[12,13,14,15,16] and population sizes for each group in California[17,18,19,20] (Table 3). The number of cases expected from NHANES national prevalence estimates applied to the California population was added to case estimates for additional subgroups[8] (Table 4). The

[11] Centers for Disease Control and Prevention. NHANES Analytic Guidance and Brief Overview for the 2017-March 2020 Pre-Pandemic Data Files. National Center for Health Statistics. NHANES Analytic Guidance and Brief Overview for the 2017-March 2020 Pre-Pandemic Data Files

[12] Harzke AJ, Goodman KJ, Mullen PD, Baillargeon J. Heterogeneity in hepatitis B virus (HBV) seroprevalence estimates from U.S. adult incarcerated populations. *Ann Epidemiol*. Sep 2009; 19(9):647-50. doi:10.1016/j.annepidem.2009.04.001

[13] Gelberg L, Robertson MJ, Leake B, et al. Hepatitis B among homeless and other impoverished US military veterans in residential care in Los Angeles. *Public Health*. Jul 2001; 115(4):286-91. doi:10.1038/sj/ph/1900783

[14] Noska AJ, Belperio PS, Loomis TP, O'Toole TP, Backus LI. Prevalence of Human Immunodeficiency Virus, Hepatitis C Virus, and Hepatitis B Virus Among Homeless and Nonhomeless United States Veterans. *Clin Infect Dis*. Jul 15 2017; 65(2):252-258. doi:10.1093/cid/cix295

[15] Scott PT, Cohen RL, Brett-Major DM, et al. Hepatitis B seroprevalence in the U.S. military and its impact on potential screening strategies. *Mil Med*. Sep 18 2020; 185(9-10):e1654-e1661. doi:10.1093/milmed/usaa131

[16] Sugauchi F, Mizokami M, Orito E, et al. Hepatitis B virus infection among residents of a nursing home for the elderly: seroepidemiological study and molecular evolutionary analysis. *J Med Virol*. Dec 2000; 62(4):456-62. doi:10.1002/1096-9071(200012)62:4<456::aid-jmv10>3.0.co;2-3

[17] Senate Housing Committee. Fact sheet: Homelessness in California 2020. Homelessness in CA 2020 Numbers.pdf

[18] Hepatitis B Foundation. (2025, May 7). Recommendations for expanding hepatitis B screening and prevention in corrections [White paper]. Corrections Policy Brief

[19] U.S. Department of Defense. *2020 Demographics Profile of the Military Community*. *2020 Demographics Profile of the Military Community*

[20] Kaiser Family Foundation. Total Number of Residents in Certified Nursing Facilities. Total Number of Residents in Certified Nursing Facilities | KFF State Health Facts

population estimate for people experiencing homelessness was added to the California Department of Finance (DOF) population estimates to calculate statewide prevalence rate; population estimates for people who are incarcerated, active-duty military personnel, and those living in nursing homes were already accounted for in DOF population estimates. A similar method has been used to estimate statewide hepatitis C prevalence using NHANES data.[21]

Findings

The estimated prevalence based on NHANES, adjusted for race and ethnicity and additional subgroups, was 398-434 per 100,000 or 0.4% of the California population based on a case count of 148,106-161,556 cases. This is double the prevalence for the U.S. in the 2020 NHANES estimate.[1] Prevalence from additional subgroups contributed an estimated 7,956-21,406 cases to the California estimate (Table 3), or 5-13% of the total.

The highest estimated CHB prevalence in California was in non-Hispanic Asian Americans (1,720.0 per 100,000 population) followed by Blacks (340.0 per 100,000) (Table 2). 69% of estimated cases were among non-Hispanic Asian Americans, and an additional 21% of cases among Hispanics. (Figure 2).

Limitations

This NHANES-based estimate does not account for country of birth or race and ethnicity subgroups, and prevalence can vary widely by country of birth and race and ethnicity subgroup. NHANES includes Pacific Islander in the Other race and ethnicity category and prevented an analysis of AAPI, combined. Estimating prevalence in populations excluded from NHANES has limitations both in data sources used to estimate prevalence in those groups and in estimates of the size of these populations in California. This estimate was not age-adjusted and did not account for variations in prevalence by age.

Estimate Three: California Prevalence Estimate Based on Meta-Analysis of Prevalence by Country, Adjusting for Global Region of Birth

Prevalence was calculated based on the findings of a meta-analysis of prevalence estimates, during 2009-2019 for over 99 countries, based on HBsAg detection.[2] Rates specific to global regions were applied to the population of California that was born in each global region.[22] The global regions of birth used for this analysis include: Africa, the Americas (excluding the U.S.), Asia, Europe, Oceania (includes Pacific Islands), and the U.S.[2] (Table 5). CHB prevalence was calculated by region of birth rather than country of birth due to relatively small populations and fewer hepatitis B serologic studies for some

[21] Kinnard EN, Taylor LE, Galárraga O, Marshall BD. Estimating the true prevalence of hepatitis C in Rhode Island. *R I Med J (2013)*. Jul 1 2014; 97(7):19-24.
[22] U.S. Census Bureau. Place of Birth for the Foreign-Born Population in the United States, American Community Survey, ACS 5-Year Estimates Detailed Tables, Table B05006. B05006: Place of Birth for the ... - Census Bureau Table

countries. U.S. Census Bureau data were used for California population denominators by region of birth.[22]

Prevalence from Estimate One was compared to this prevalence (Estimate Three) to find the difference between the global region of birth estimate and the five-year reported prevalence as an indication of undetected CHB by county. Counties were categorized into quartiles based on how many times higher the estimate adjusting for global region of birth was (Estimate Three) compared to the reported prevalence (Estimate One).

Findings

The estimated prevalence based on region of birth was 971 per 100,000 or 1.0% of the California population based on a case count of 381,966 cases. Of these persons estimated with CHB living in California, 65% were born in Asia (Table 5). The gap between the number of reported prevalent cases and the estimate that adjusted for global region of birth was smallest in the Bay Area counties (Figure 3).

Limitations

The region-of-birth estimate is not segmented by country and is not adjusted for race and ethnicity; prevalence can vary widely by country and across racial and ethnic subgroups. This estimate also assumes that prevalence rates are the same for those who immigrate to the U.S. as they are for the population residing in each country. These limitations may lead to under- or over-estimation of CHB prevalence. This estimate was not age-adjusted and did not account for variations in prevalence by age.

Public Health Implications

Methods that estimate CHB prevalence by adjusting for race and ethnicity and region of birth show that California is uniquely affected by CHB, due to a large Asian American population, many of whom are foreign-born. The prevalence estimated in this analysis ranged from 0.4% - 1.0% of the California population. These findings are consistent with a previous prevalence estimate for California of 0.8% by Toy et al. which used NHANES data combined with health systems data and accounted for differences in CHB by age, country of birth, and racial groups.[23]

County-level estimates using each of three methods are provided in Table 6. Of the three methods, the prevalence adjusted for global region of birth (Estimate Three) is expected to be the closest estimate to actual CHB prevalence and thus useful when planning efforts to increase detection. Comparing CHB cases reported to CDPH with Estimate Three suggests that over two-thirds of CHB cases in California have not been detected. National studies have also found up to two-thirds of those with hepatitis B are not aware of their diagnosis.[1,5] The difference between reported and estimate prevalence varied by county

[23] Toy M, Wei B, Virdi TS, et al. Racial/ethnic- and county-specific prevalence of chronic hepatitis B and its burden in California. *Hepatol Med Policy*. 2018; 3:6. doi:10.1186/s41124-018-0034-7

and suggests areas of California where CHB may be underdiagnosed. Counties with smaller populations may not represent a large number of undiagnosed cases even though the difference between reported and estimated case number is high.

California's population includes higher proportions of individuals belonging to groups that have elevated risk of CHB;[1,2,5,7] the disparate CHB prevalence among these groups is a critical area of focus for screening and medical care.

Based on public health surveillance data, the highest prevalence of CHB was among Californians aged 50-69 years. Prevalence was also higher among females aged 20-29 years compared to males, though high prevalence among females may reflect HBV screening among pregnant persons.[24]

A pattern of higher CHB prevalence in high HPI areas was particularly marked in the Bay Area. The Bay Area has a large population of residents who were born in Asia, where CHB is endemic, and also has many of the state's healthiest communities.[4,8,22] Persons residing in the Bay Area may also be more likely to be tested for HBV due to increased community awareness and advocacy, as well as good healthcare access and attention to HBV in the medical community. More granular analyses reveal that prevalence varies by HPI within communities and can be higher among relatively unhealthy communities.[10]

[24] Centers for Disease Control and Prevention. Clinical Guidance for Perinatal Hepatitis B Testing. Centers for Disease Control and Prevention. Accessed November 7, 2024, Clinical Guidance for Perinatal Hepatitis B Testing | Hepatitis B | CDC

Prevalence Tables and Figures

Table 1. Chronic hepatitis B calculated five-year period prevalence (2018-2022) by age and sex, California

	Cases	Rate per 100,000 Population[a]
Total[b]	84,506	212.3
Age Group[c]		
0-19	316	3.1
20-29	1,524	26.8
30-39	9,817	188.4
40-49	18,416	362.3
40-59	21,475	425.6
60-69	19,573	448.4
70+	13,345	316.5
Sex[d]		
Male	42,150	212.5
Female	42,320	212.1
Transgender	12	n/a

[a] State of California DoF. Population Projections. Projections | Department of Finance
[b] Prevalence is underestimated because laboratory data used to supplement case report data were not available from all counties.
[c] Forty cases with age group missing or unknown.
[d] Twenty-four cases with sex missing or unknown; n/a: not applicable.

Table 2. Estimated chronic hepatitis B prevalence from NHANES (2017-2020) adjusted by race and ethnicity of California's population

Race and Ethnicity	U.S. Race-specific case rate (% of U.S. population living with CHB)	CA Population[a,b]	CA Case Estimate	Rate per 100,000 Population[a,b]
Hispanic	0.20	14,437,036	28,874	200.0
Non-Hispanic White	0.03	13,219,830	3,966	30.0
Non-Hispanic Black	0.34	1,995,795	6,786	340.0
Non-Hispanic Asian	1.72	5,642,057	97,043	1,720.0
Other Race/Multi-Racial	0.20	1,740,573	3,481	200.0
Total		37,035,291	140,150	378.4

Table 3. Estimated chronic hepatitis B prevalence in population groups excluded from the NHANES survey, California

Population	CHB prevalence from literature (%)	CA Population[c]	Case Estimate
People experiencing homelessness	1-3	161,548	1,615-4,846
Incarcerated	0.9-11.4	97,328	876-11,095
Active military duty	0.2	162,936	326
Nursing home residents	5.0	102,781	5,139
Total			7,956-21,406

[a] State of California DoF. Population Projections. Projections | Department of Finance
[b] California population age six and older.
[c] Senate Housing Committee. Fact sheet: Homelessness in California 2020; Hepatitis B Foundation: Corrections Policy Brief; U.S. Department of Defense. 2020 Demographics Profile of the Military Community; Kaiser Family Foundation. Total Number of Residents in Certified Nursing Facilities.

Table 4. Estimated chronic hepatitis B prevalence in California based on NHANES national prevalence and additional subgroups

Estimate Source	Case Estimate	Reported Prevalence (%)
NHANES (race-adjusted for CA population)	140,150	0.38
Additional subgroups	7,956-21,406	n/a
Total	148,106-161,556	0.40-0.44

Table 5. Chronic hepatitis B prevalence estimated by region of birth, California

World Region	Prevalence (% of population with CHB)	CA Population[a]	CA Case Estimate
Asia	5.88	4,197,463	246,811
Africa	8.65	213,728	18,487
Americas (excluding U.S.)	1.12	5,265,760	58,977
Europe	1.54	679,384	10,463
Oceania	4.46	86,519	3,859
United States	0.15	28,913,250	43,370
Total		39,356,104	381,966

[a] U.S. Census Bureau. Place of Birth for the Foreign-Born Population in the United States, American Community Survey, ACS 5-Year Estimates Detailed Tables, Table B05006.

Table 6. Chronic hepatitis B prevalent cases by California county and method of estimate, 2022

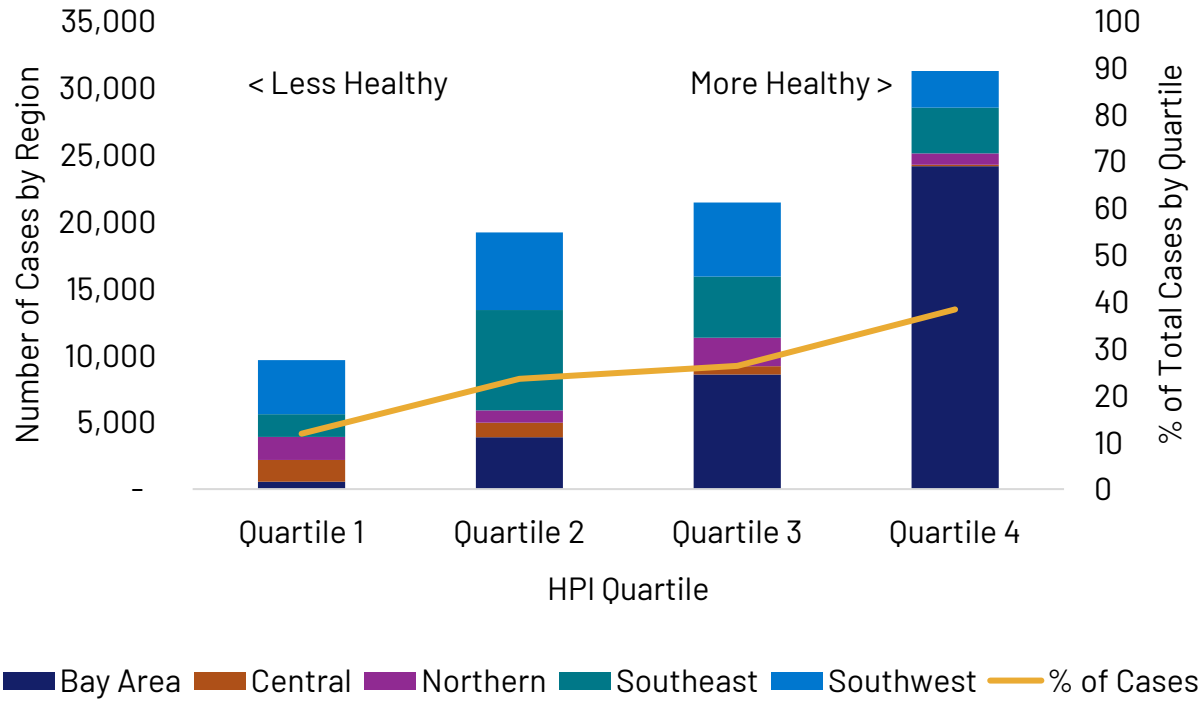
County	Estimate One: Calculated 5-year prevalence[a]	Estimate Two: NHANES-based rates for California counties[b]	Estimate Three: Region of birth
California, statewide	84,506	148,106-161,556	381,966
Alameda	8,380	10,187	26,737
Alpine	-	1	3
Amador	25	35	114
Butte	156	311	776
Calaveras	11	39	129
Colusa	2	33	97
Contra Costa	2,291	4,572	12,435
Del Norte	16	38	90
El Dorado	96	264	827
Fresno	1,170	3,036	6,519
Glenn	9	41	101
Humboldt	75	151	422
Imperial	47	352	900
Inyo	3	21	52
Kern	481	1,903	4,858
Kings	73	300	724
Lake	19	66	224
Lassen	30	35	87
Los Angeles	16,839	37,177	109,726

[a] Laboratory data were not available with reports from San Diego County and county-level prevalence using Estimate One could not be calculated.
[b] Estimate Two prevalence on the county level represents only the application of NHANES prevalence estimates adjusted for the race and ethnicity of each county and does not include prevalence for groups excluded from NHANES, which were only be calculated at a state level.

County	Estimate One: Calculated 5-year prevalence[a]	Estimate Two: NHANES-based rates for California counties[b]	Estimate Three: Region of birth
Madera	42	268	686
Marin	306	453	1,636
Mariposa	4	16	54
Mendocino	23	100	314
Merced	201	703	1,751
Modoc	1	7	22
Mono	2	14	76
Monterey	269	991	2,729
Napa	163	304	860
Nevada	19	75	299
Orange	11,625	13,948	38,561
Placer	330	805	2,414
Plumas	4	12	46
Riverside	1,879	5,805	15,156
Sacramento	4,539	5,866	15,099
San Benito	12	117	291
San Bernardino	2,045	5,794	14,270
San Diego	2,111	9,856	27,843
San Francisco	8,880	5,570	13,544
San Joaquin	1,198	3,049	7,090
San Luis Obispo	101	378	1,006
San Mateo	3,608	4,310	11,314
Santa Barbara	215	914	2,527
Santa Clara	14,252	13,680	36,895
Santa Cruz	170	450	1,325
Shasta	95	198	557
Sierra	-	2	5

County	Estimate One: Calculated 5-year prevalence[a]	Estimate Two: NHANES-based rates for California counties[b]	Estimate Three: Region of birth
Siskiyou	8	85	125
Solano	716	1,639	3,754
Sonoma	457	791	2,448
Stanislaus	346	1,172	3,376
Sutter	51	379	893
Tehama	8	69	203
Trinity	2	37	53
Tulare	125	908	2,210
Tuolumne	15	46	146
Ventura	624	1,910	5,376
Yolo	278	706	1,828
Yuba	59	158	367

Figure 1. Chronic hepatitis B reported prevalence from CDPH (2018-2022) total cases[a] and % of cases by Healthy Places Index (HPI) quartile and California region[b]



[a] Four percent of total cases (3,048) are missing HPI.

[b] Counties were categorized into regions per CDPH usual data protocol, as follows:

Bay Area: Alameda, Berkeley, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Santa Cruz, Solano, Sonoma.

Central: Calaveras, Fresno, Inyo, Kings, Madera, Mariposa, Merced, Mono, Monterey, San Benito, San Joaquin, Stanislaus, Tulare, Tuolumne.

Northern: Alpine, Amador, Butte, Colusa, Del Norte, El Dorado, Glenn, Humboldt, Lake, Lassen, Mendocino, Modoc, Nevada, Placer, Plumas, Sacramento, Shasta, Sierra, Siskiyou, Sutter, Tehama, Trinity, Yolo, Yuba.

Southeast: Imperial, Orange, Riverside, San Bernadino, San Diego.

Southwest: Kern, Los Angeles, Long Beach, Pasadena, San Luis Obispo, Santa Barbara, Ventura.

Figure 2. Chronic hepatitis B prevalence estimate from NHANES (2017-2020) and California population (2020) by race and ethnicity, California

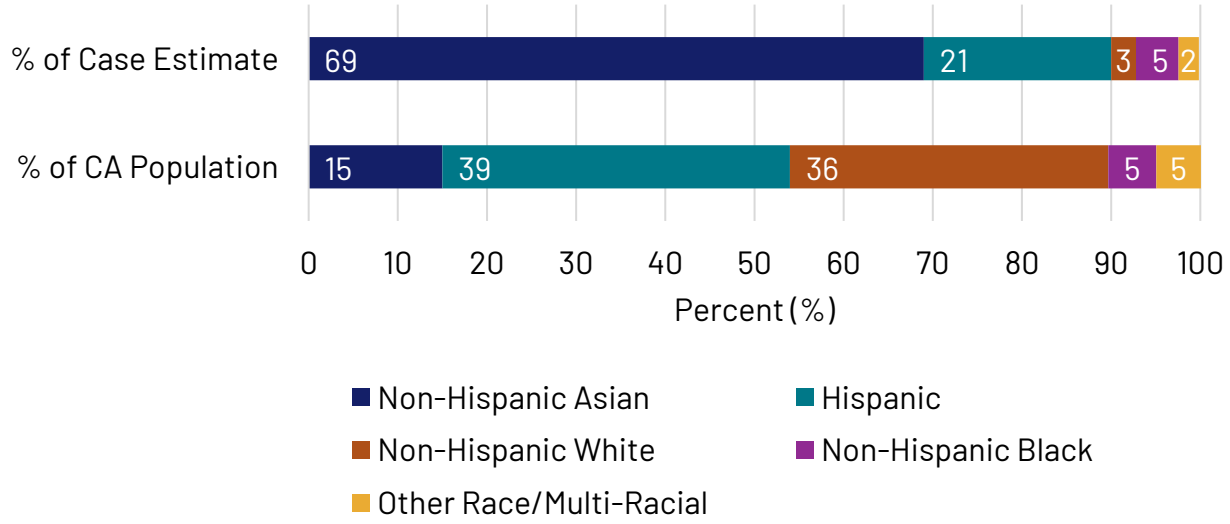
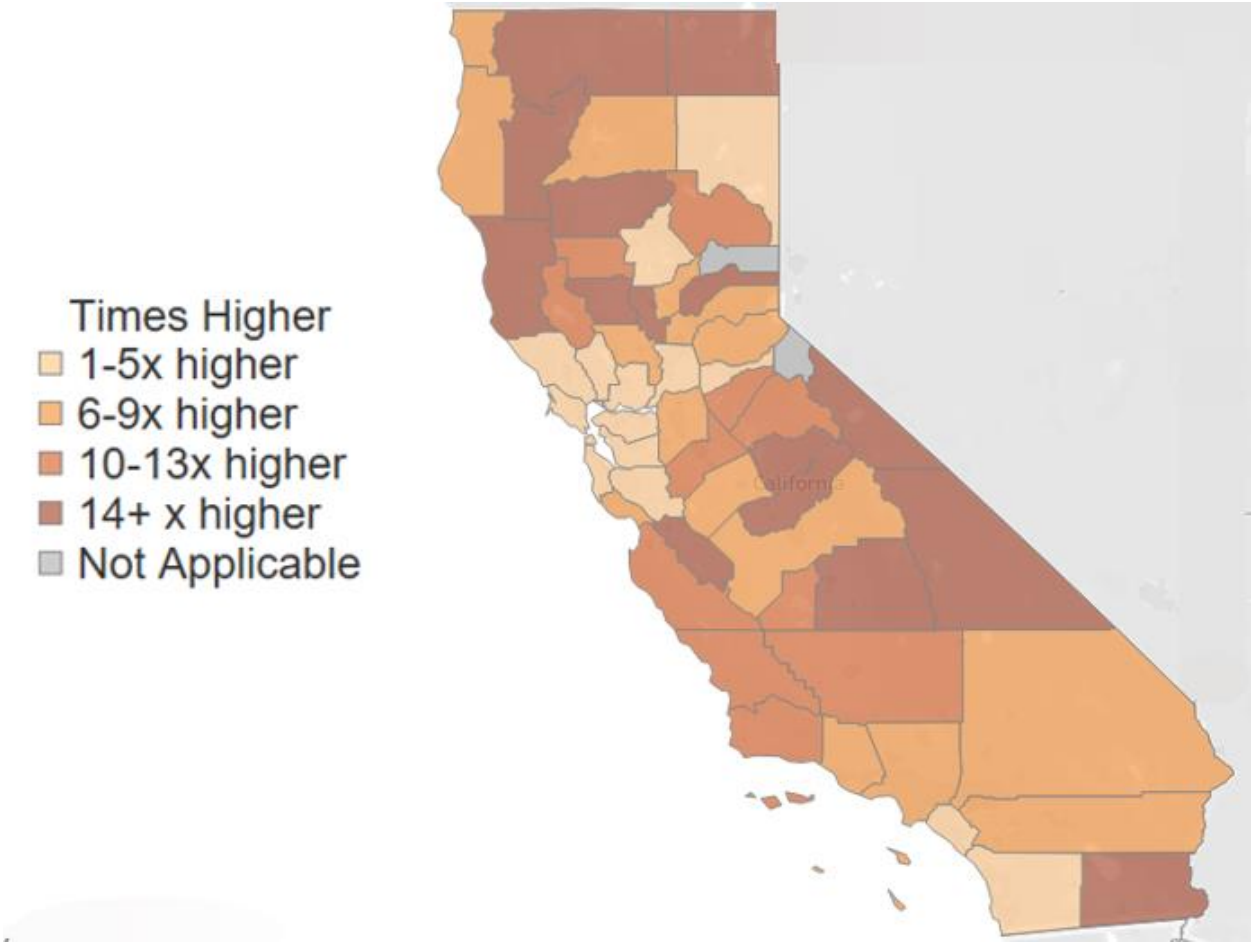


Figure 3. Higher chronic hepatitis B prevalence estimated from global region of birth (2020) when compared to the reported prevalence (2018-2022), California



Hepatitis B Mortality in California

Key Findings

- Hepatitis B mortality rates have been decreasing in California over the last few decades, but California's hepatitis B age-adjusted mortality rate is 1.7 times higher than the U.S. as a whole and California ranks among the top 5 states with respect to hepatitis B mortality.
- 68% of hepatitis B deaths in Californians occurred in persons younger than 75 years of age, indicating that hepatitis B is associated with premature death.
- Asian Americans and Hispanic or Latinos died from hepatitis B, on average, 18 years earlier than expected.
- During 2017-2021, the Bay Area region consistently reported higher hepatitis B related mortality rates compared to all other California regions.

Background: Global & U.S. Hepatitis B Mortality

Hepatitis B has a high burden of disease in many regions of the world. In 2022, hepatitis B caused 1.1 million deaths worldwide.[1] Both acute and chronic hepatitis B infections are associated with health complications and increased risk of death. Approximately 25% of those with chronic hepatitis B (CHB) will develop liver cancer, cirrhosis, or other related conditions; these complications lead to death in 15-25% of affected persons.[2] Hepatitis B prevalence and mortality are highest in regions where hepatitis B is considered endemic.[1] In the U.S., the risk of death related to CHB is highest for those who were born in these regions.[3,4] In 2022, there were 1,797 hepatitis B deaths in the U.S. or 0.4 deaths per 100,000.[5]

[1] World Health Organization. Hepatitis B. World Health Organization. Hepatitis B
[2] Centers for Disease Control and Prevention. *Epidemiology and Prevention of Vaccine-Preventable Diseases*. 14th ed. Public Health Foundation; 2021.
[3] Le MH, Yeo YH, Cheung R, Henry L, Lok AS, Nguyen MH. Chronic Hepatitis B Prevalence Among Foreign-Born and U.S.-Born Adults in the United States, 1999-2016. *Hepatology*. Feb 2020; 71(2):431-443. doi:10.1002/hep.30831
[4] Bixler D, Barker L, Lewis K, Peretz L, Teshale E. Prevalence and awareness of Hepatitis B virus infection in the United States: January 2017 - March 2020. *Hepatol Commun*. Apr 1 2023; 7(4) doi:10.1097/hc9.0000000000000118
[5] Centers for Disease Control and Prevention. Table 2.7 – Death Rates by Jurisdiction. Table 2.7 – Hepatitis B: Death Rates by Jurisdiction | 2022 Hepatitis Surveillance | CDC

Mortality for Hepatitis B in California

CDPH estimated hepatitis B mortality using death certificate data from CDPH Vital Records (CDPH-VR).[6,7] Mortality data from all U.S. jurisdictions is reported publicly via CDC Wonder and was used to compare hepatitis B-related mortality in California to the U.S. overall and to other states. Both CDPH-VR and CDC Wonder contain death certificate data for the same deaths, however, CDPH-VR includes more granularity than CDC Wonder that allows for analysis at a sub-state level.

Methods: Age-Adjusted Mortality Rates Calculated using California Vital Records Data

CDPH-VR for deaths during 2017-2021 were used to characterize hepatitis B-relate deaths in California residents and intra-state comparison of hepatitis B mortality across California regions.[7] Death certificates include a single underlying cause of death, up to twenty additional multiple causes, and demographic data. Deaths were determined to be hepatitis B-related if a hepatitis B-specific ICD-10 code was reported as either an underlying or contributing cause of death. Underlying cause of death as defined by the World Health Organization is "the disease or injury which initiated the chain of events leading directly to death, or the circumstances of the accident or violence which produced the fatal injury," while contributing cause of death is any other significant condition that contributed to the outcome.[6] The following ICD-10 codes were used to identify hepatitis B related deaths:

- **B16 (Acute hepatitis B)**
- **B17.0 (Acute delta-(super)infection of hepatitis B carrier)**
- **B18.0 (Chronic viral hepatitis B with delta-agent)**
- **B18.1 (Chronic viral hepatitis B without delta-agent)**

Deaths with hepatitis B ICD-10 codes in the underlying or contributing cause of death fields as reported by the presiding physician on the death certificates were determined to be hepatitis B deaths. Rates of viral hepatitis-related deaths have previously been estimated by CDC and state health departments using these methods.[8] The same criteria were used to compare California to U.S. deaths reported via CDC Wonder.

To assess disparities in prevalence by neighborhood-level indicators of health, zip code of residence was used to assign the Healthy Places Index (HPI) quartiles.[9] Age-adjusted

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[6] Centers for Disease Control and Prevention. National Center for Health Statistics Mortality Data on CDC WONDER. Accessed September 6, 2024, Multiple Cause of Death Data on CDC WONDER

[7] California Department of Public Health. Vital Records. California Department of Public Health. Accessed November 26, 2024, Vital Records

[8] Li F, Fukuda N, Goto R, Pham T. *Hawai'i Hepatitis B and Liver Cancer Incidence and Mortality Report*. 2023. Hawaii-Hep-B-and-Liver-Cancer-Mortality-Report-FINAL-1-31-2023.pdf

[9] Healthy Places Index. California Healthy Places Index (HPI). Healthy Places Index (HPI)

mortality rates statewide and by region per 100,000 population were calculated using the direct age standardization method applied to the 2000 U.S. population. The age distribution was categorized into the following age groupings: 20-44, 45-64, 65 years or older. Age under 20 was not assessed as there were no hepatitis B deaths under age 20 years. Where the number of deaths was <20, mortality rates were considered unreliable. The variable for county represents county of residence as reported at death.

Findings

In 2021, the hepatitis B mortality rate for California was 1.7 times higher than the rate for the U.S. overall (0.8 vs. 0.4 per 100,000) (Figure 1) and 5th highest among all U.S. states. Hepatitis B mortality has steadily decreased in California and in the U.S over the last several decades. In California, the hepatitis B mortality rate has decreased 40% since 1999, but California consistently has higher mortality rates compared to the U.S. overall (Figure 1).

In 2021, U.S. Health and Human Services, in collaboration with CDC, released a strategic plan for viral hepatitis elimination. This plan set a goal of decreasing U.S. hepatitis B mortality rates by 20% by 2025,[10] which for California would be at or below 0.64 per 100,000 population by 2025. Based on these analyses, neither California nor the U.S. are on track to reach the goal by 2025.[11]

Asian Americans and Pacific Islanders represent 15% of the California population but accounted for 60% of the total hepatitis B deaths in California.[12] Based on 5 years of data, the highest age-adjusted hepatitis B mortality rate was among Asian Americans (3.92) and Blacks (1.10) followed by Native Hawaiians or Other Pacific Islanders (0.97) (Table 1).

Hepatitis B was associated with premature mortality. Sixty-eight percent of hepatitis B deaths were among people under age 75. In contrast, only 48% of deaths from all causes were among people under age 75 (Table 2). Hispanics and Asian Americans had the largest gap between average age of death from hepatitis B and life expectancy[13] (Table 3).

Consistent with the gender disparity seen in newly reported chronic hepatitis B cases in California (Figure 11, Surveillance), hepatitis B mortality was higher among males than females. From 2017-2021, the age-adjusted death rate for men was consistently almost 3 times higher for males than females. These findings are mirrored in national data: in 2022

[10] U.S. Department of Health and Human Services. *Viral Hepatitis National Strategic Plan for the United States: A Roadmap to Elimination (2021–2025)*. 2020. Viral Hepatitis National Strategic Plan for the United States: A Roadmap to Elimination (2021-2025)
[11] Centers for Disease Control and Prevention. Hepatitis B Virus – Reduce Deaths. Accessed December 6, 2024, Hepatitis B Virus – Reduce Deaths | Viral Hepatitis | CDC
[12] State of California DoF. E-4 Population Projections. Projections | Department of Finance
[13] California Health Care Foundation. Health Disparities by Race and Ethnicity in California Almanac — 2024 Edition. Health Disparities by Race and Ethnicity in California Almanac, 2024

the hepatitis B mortality rate was 3 times higher in males (0.66 per 100,000) than females (0.22) in the U.S.[5]

The Bay Area region consistently reported higher hepatitis B related mortality rates compared to all other California regions during the 2017-2021 study period. During this time, the Bay Area (1.47 per 100,000 population) and Northen (1.19) regions reported higher age-adjusted mortality rates than California overall (1.03) (Figure 2).

Hepatitis B deaths were reported at similar levels across HPI quartiles. Deaths rates ranged from 3.9 deaths (quartile 3) to 4.6 (quartile 2) per 100,000 population. (Table 4) Although prevalence of CHB was higher in quartiles 3 and 4, mortality did not demonstrate the same pattern of higher rates in healthier quartiles.

Limitations

Death certificate cause(s) of death, while classified according to national guidance, are subject to physician judgement about conditions and incidents leading up to and ultimately causing death. Death certificates often contain errors in cause of death classification and hepatitis B may not be reported as a related cause among those with CHB infection.[14] This analysis thus may underestimate the true mortality burden of hepatitis B.

Public Health Implications

While hepatitis B mortality has been decreasing over the last several decades, California continues to see higher hepatitis B prevalence and mortality compared to the U.S. overall. The highest hepatitis-B related mortality rates were reported in counties and regions of California with higher CHB prevalence. California findings are consistent with other studies that individuals with hepatitis B die at younger ages compared to the rest of the population. Ly. et. al, found that 90% of those who died with hepatitis B died prematurely.[15] A 2019 study of mortality among CHB patients found that individuals with hepatitis B had high rates of deaths from all causes in addition to hepatitis B deaths, and patients with CHB died at an average age of 60, which is 14 years younger than the general U.S. population.[16]

Hepatitis B mortality rates are highest among Asian Americans and Pacific Islanders in California. This aligns with the estimate that in 2020 over 70% of California's chronic hepatitis B cases were among Asian Americans. Although the number of deaths among the

[14] Centers for Disease Control and Prevention. Understanding Death Data Quality: Cause of Death from Death Certificates.
[15] Ly KN, Yin S, Spradling PR. Regional Differences in Mortality Rates and Characteristics of Decedents With Hepatitis B Listed as a Cause of Death, United States, 2000-2019. *JAMA Netw Open*. Jun 1 2022; 5(6):e2219170. doi:10.1001/jamanetworkopen.2022.19170
[16] Bixler D, Zhong Y, Ly KN, et al. Mortality Among Patients With Chronic Hepatitis B Infection: The Chronic Hepatitis Cohort Study (CHeCS). *Clin Infect Dis*. Mar 5 2019; 68(6):956-963. doi:10.1093/cid/ciy598

Native Hawaiians or Pacific Islander group is small, the high mortality rate may warrant special outreach. Furthermore, 65% of hepatitis B-related deaths in California during 2010-2019 were among those who were non-U.S.-born.[15] These findings point to a need for culturally specific and sensitive approaches to hepatitis B prevention, detection, and linkage to care to reduce disparities in hepatitis B mortality in California.

In addition to race and ethnic disparities in CHB mortality, this analysis found age and gender-based factors. There was an increased rate of hepatitis B related death among men when compared to women. While rates of newly reported chronic hepatitis B cases, presented in the Surveillance chapter of this report, were higher among males, the CDPH prevalence estimates show similar rates of men and women who are living with CHB. More study is needed to understand gaps between hepatitis B infection, diagnosis, treatment, and mortality in California.

Mortality Tables and Figures

Table 1. Hepatitis B deaths by race and Hispanic origin, California 2017-2021, CDPH-VR data

Race and Ethnicity[a]	Deaths[a]	Age Adjusted Rate per 100,000 population
Asian American and Pacific Islander	1,021	3.92
Black/African American	98	1.10
Hispanic/Latino	168	0.39
Multi-race	12	0.37
Native American/Alaska Native	7	0.97
White	377	0.47

Table 2. Hepatitis B deaths by age group, California, 2021, CDC Wonder

Age Group	Hepatitis B Deaths	Hepatitis B Deaths (% of Total Deaths)	Deaths from All Causes[b]	Death from All Causes (% of Total Deaths)
<55	52	15	48,819	15
55-64	87	24	45,027	14
65-74	103	29	64,875	19
>75	112	32	174,507	52
CA Total	354		333,228	

[a] Nine deaths were missing race and ethnicity information.
[b] Twenty-one deaths from all causes were missing age.

Table 3. Hepatitis B deaths by average age, race and ethnicity compared to life expectancy, California, 2017-2021, CDPH-VR data

Race and Ethnicity	Deaths[a]	Average Age at Death	Life Expectancy[b]	Difference (years)
California, statewide	1,703	66.6	81.1	14.5
Asian American	994	67.9	85.7	17.8
Black or African American	98	62.9	74.6	11.7
Hispanic/Latino	168	63.1	82.1	19.0
Multi-race/Other	12	56.2	n/a	n/a
Native American or Alaska Native	7	61.3	78.1	16.8
Native Hawaiian or Pacific Islander	30	61.7	76.4	14.7
White	380	66.7	80.9	14.2

Table 4. Hepatitis B deaths by Healthy Places Index (HPI) quartile, California, 2017-2021, CDPH-VR data

HPI Quartile	Deaths	Rate per 100,000 population
Quartile 1 – Least healthy	394	4.1
Quartile 2	469	4.6
Quartile 3	387	3.9
Quartile 4 – Most healthy	419	4.5

[a] Fourteen deaths were not included due to missing race and ethnicity or age.
[b] Health Disparities by Race and Ethnicity in California Almanac — 2024 Edition

Figure 1. Hepatitis B age-adjusted death rates (all ages) in California and the U.S., 1999-2021

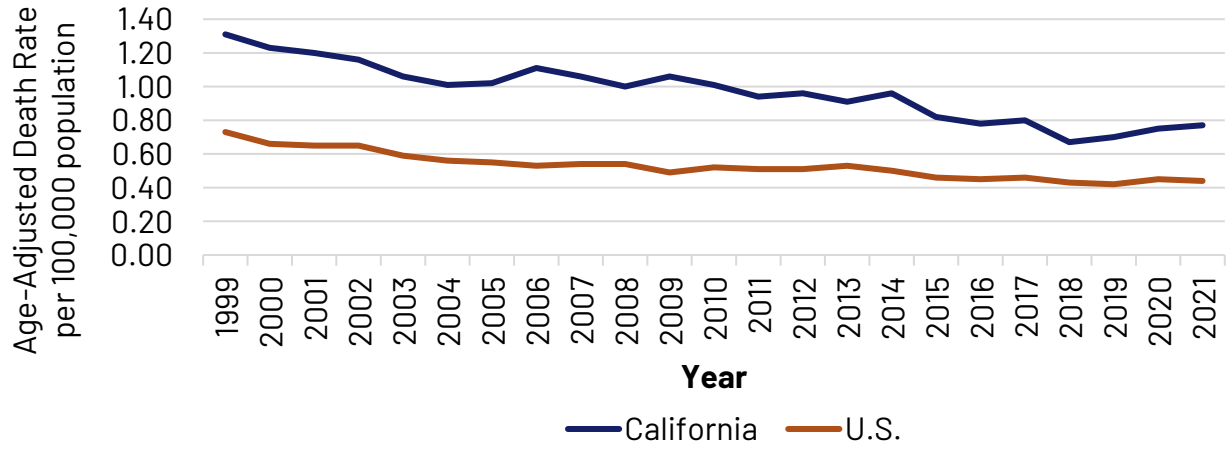
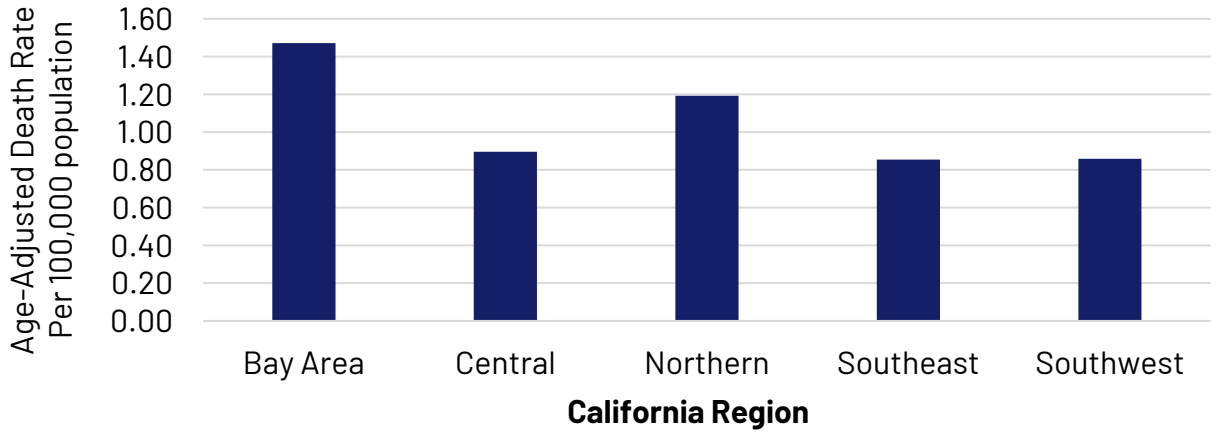


Figure 2. Hepatitis B age-adjusted death rates by California region[a] from CDPH-VR, 2017-2021



[a] Counties were categorized into regions per CDPH usual data protocol, as follows: **Bay Area:** Alameda, Berkeley, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Santa Cruz, Solano, Sonoma. **Central:** Calaveras, Fresno, Inyo, Kings, Madera, Mariposa, Merced, Mono, Monterey, San Benito, San Joaquin, Stanislaus, Tulare, Tuolumne. **Northern:** Alpine, Amador, Butte, Colusa, Del Norte, El Dorado, Glenn, Humboldt, Lake, Lassen, Mendocino, Modoc, Nevada, Placer, Plumas, Sacramento, Shasta, Sierra, Siskiyou, Sutter, Tehama, Trinity, Yolo, Yuba. **Southeast:** Imperial, Orange, Riverside, San Bernadino, San Diego. **Southwest:** Kern, Los Angeles, Long Beach, Pasadena, San Luis Obispo, Santa Barbara, Ventura

Hepatitis B Screening and Testing in California

Key Findings

- Since 2022, HBV-related testing in the state's federally qualified health centers (FQHCs) has increased. This testing increase has been accompanied by an increase in positive HBsAg test results reported to CDPH.
- Further work is needed to better understand if these trends can be attributed to recent changes in hepatitis B screening recommendations and state-level screening requirements, as well as how remaining gaps in screening can be addressed.

Background: U.S. Hepatitis B Screening and Testing

The United States Preventative Services Task Force (USPSTF) has recommended hepatitis B surface antigen (HBsAg) screening for all adolescents and adults at increased risk for HBV infection since 2014.[1] Groups with an estimated CHB prevalence of ≥2% are considered at high risk of infection, including persons born in HBV endemic regions, persons who inject drugs, men who have sex with men, persons with HIV, and sexual and household contacts of persons with hepatitis B.[1] HBV testing is also routinely ordered in a range of clinical scenarios. For example, all pregnant persons are recommended to receive a HBsAg screening test early in each pregnancy, regardless of their previous HBV history.[2] Additionally, patients with chronic HBV infection are recommended to receive routine HBV testing to monitor their disease progression and determine treatment eligibility.[3,4]

It can be difficult for providers to properly assess a patient's HBV risk due to time and resource limitations; the stigma associated with certain behavioral risk factors such as sexual activity and drug use may discourage patients from sharing that information with

[1] U.S. Preventive Services Task Force. Hepatitis B Virus Infection in Adolescents and Adults: Screening. Accessed October 15, 2024, Recommendation: Hepatitis B Virus Infection in Adolescents and Adults: Screening | United States Preventive Services Taskforce

[2] Schillie S, Vellozzi C, Reingold A, et al. Prevention of Hepatitis B Virus Infection in the United States: Recommendations of the Advisory Committee on Immunization Practices. *MMWR Recomm Rep*. Jan 12 2018; 67(1):1-31. doi:10.15585/mmwr.rr6701a1

[3] Tang AS, Thornton K, HBV Primary Care Workgroup. Hepatitis B Management: Guidance for the Primary Care Provider. Hepatitis B Management: Guidance for the Primary Care Provider - HBV Primary Care Workgroup - Hepatitis B Online

[4] Terrault NA, Lok ASF, McMahon BJ, et al. Update on Prevention, Diagnosis, and Treatment of Chronic Hepatitis B: AASLD 2018 Hepatitis B Guidance. *Clin Liver Dis (Hoboken)*. Jul 2018; 12(1):33-34. doi:10.1002/cld.728

their healthcare provider.[5] In the years since the 2014 USPSTF recommendations, further efforts have been made to increase HBV screening in the adult population. In 2023, CDC updated its hepatitis B screening guidance, recommending that all adults receive at least one screening test during their lifetime, in addition to periodic HBV testing for those adults deemed at high risk of infection.[5] Adults who are screened should receive a test for HBsAg, antibody to HBsAg (anti-HBs) and total antibody to hepatitis B core antigen (anti-HBc total) to determine the patient's infection and immunity status.[5] In California, Assembly Bill 789, which went into effect on January 1, 2022, requires any facility offering primary care services to adults to offer hepatitis B screening according to USPSTF recommendations.[6] This legislation also requires providers to offer follow-up care to patients with a positive screening test or to refer them to an appropriate healthcare provider.[6]

Analyzing Hepatitis B Testing Practices in California

To understand current trends in hepatitis B testing in California, multiple data sources were included in this analysis, each representing a different California patient population. However, due to the various ways that hepatitis B tests are used clinically, our analysis is unable to distinguish among screening (ordered on asymptomatic patients with or without known risks for hepatitis B), testing (ordered when a patient presents with symptoms), and monitoring (ordered when a patient has already been diagnosed with CHB). For simplicity, we will refer to all three practices as "testing" throughout this chapter, regardless of the reason for testing.

Data Source One: California Health Center Program Data (2017-2023)

Methods

Hepatitis B testing trends were analyzed using data reported to the U.S. Health Resources and Services Administration (HRSA) by California's federally qualified health centers (FQHCs) and FQHC look-alike (LAL) health centers. The California Health Center Program Uniform Data System, overseen by HRSA, collects data from supported health centers on their clinical services, health outcomes, staffing, and costs. FQHCs and LALs receive funding to provide primary care services to under-resourced communities and are required to report data to HRSA annually.[7]

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[5] Conners EE, Panagiotakopoulos L, Hofmeister MG, et al. Screening and Testing for Hepatitis B Virus Infection: CDC Recommendations - United States, 2023. *MMWR Recomm Rep*. Mar 10 2023;72(1):1-25. doi:10.15585/mmwr.rr7201a1

[6] AB-789 Health care services, 789 (2021-2022).

[7] Health Resources and Services Administration. Health Center Program Compliance Manual: Chapter 18 – Program Monitoring and Data Reporting Systems. Bureau of Primary Health Care, U.S. Department of Health and Human Services. Chapter 18: Program Monitoring and Data Reporting Systems | Bureau of Primary Health Care

Data on both hepatitis B testing and diagnoses from 2017 to 2023 were used in this analysis. HRSA collects the number of patients with a hepatitis B diagnosis in their medical record as well as the number of patients with a hepatitis B screening or diagnostic test listed in their medical record in a given calendar year.[7] Hepatitis B diagnoses are enumerated using pre-specified International Classification of Diseases, 10th Revision (ICD-10) codes indicative of HBV infection to identify patients living with hepatitis B. Patients receiving hepatitis B testing were enumerated using pre-specified Current Procedural Terminology 4th Edition (CPT-4) codes for HBV screening and diagnostic tests[7] (Appendix Tables 1 and 2). Linear regression analysis was used to test for change in the annual number of patients tested and diagnosed over time.

Findings

According to data from the Health Center Program Uniform Data System, the number of California patients receiving at least one HBV test increased from 128,645 in 2017 to 306,074 in 2023 (Figure 1A). The proportion of the health centers' patient population who received an HBV test also increased from 2.6% in 2017 to 5.3% in 2023. Both the number and proportion of patients tested decreased in 2020, likely because of the COVID-19 pandemic and the resulting stay-at-home orders. However, in 2021, HBV testing appeared to recover, surpassing both the number and proportion of patients who were tested in 2019. The number and proportion of patients tested continued to rise in 2022 and again in 2023, resulting in a statistically significant increase in HBV testing across the seven-year period (Table 1). The increases in 2022 and 2023 also align with the passage of Assembly Bill 789, which went into effect on January 1, 2022, and CDC's updated HBV screening recommendations, which were released in 2023. While this increase cannot be definitively attributed to either of these interventions, the upward trend is encouraging and should continue to be studied.

In comparison, the number of patients with a diagnosis of hepatitis B remained relatively constant during this same time. In 2017, 12,358 patients were reported with an HBV diagnosis, while 14,846 patients were reported in 2023 (Figure 1B). The same stability was seen in the proportion of the patient population with a hepatitis B diagnosis, with 0.25% of patients having an HBV diagnosis in 2017 compared to 0.26% having a hepatitis B diagnosis in 2023 (Figure 1B).

The lack of an increase observed among the number of patients diagnosed with HBV suggests that the observed increase in patients tested in these health settings may represent an increase in monitoring existing infections and/or screening of low-risk patients, rather than the identification of persons with previously undiagnosed hepatitis B. CDC also updated adult HBV vaccination recommendations in April 2022 which may have led to an increase in pre-vaccination HBsAg screening during the study period.

Data Source Two: California Healthcare Payments Data (2018-2021)

Methods

Hepatitis B testing frequency was analyzed using data from the California Department of Healthcare Access and Information's Healthcare Payments Data Snapshot. These data consist of the number of service and enrollment records associated with the healthcare encounters and claims that are submitted by California health insurance payers. As of 2021, the California Healthcare Payments Data System represented 89% of California's insured population, and 82% of California's total population.[8]

The same CPT-4 codes used by the California Health Center Program Uniform Data System were used to identify claims for HBsAg tests from 2018 to 2021 (Appendix Table 1). The trends in testing claims were also analyzed across healthcare payer type (commercial, Medi-Cal, and Medicare).[9] Due to only having data for four years of healthcare payments, no linear regression analyses were performed.

Findings

Overall, there were 1,381,747 healthcare claims for an HBsAg test in 2018, in available data reflecting insurance claims from 86.3% of California's insured population. Claims for testing increased in 2019 before decreasing in 2020, a trend that was observed in other data sources. However, while the number of claims for a HBsAg test increased again in 2021, they did not reach the levels seen prior to the COVID-19 pandemic, despite the proportion of insured Californians represented by the data surpassing those from each of the prior years (Figure 2). This suggests that despite the expanded reach of the California Healthcare Payments Data System, a corresponding increase in HBsAg testing was not observed. However, due to the absence of data from 2022 and 2023, we are unable to determine if this disparity persisted following the passage of Assembly Bill 789 in California or after the release of the CDC's updated hepatitis B screening recommendations.

Similar trends over time were observed across payer types. Across all calendar years, a greater number of HBsAg testing claims were made by commercial insurance payers compared to both Medi-Cal payers and Medicare payers (Figure 3). Additionally, HBsAg testing claims were slightly under-represented among patients with Medi-Cal insurance and slightly over-represented among patients with commercial insurance. While commercial payers represented 43.3% of the patient population with at least one medical service claim between 2018-2021, they accounted for 49.5% of all HBsAg testing claims (Figure 4). On the other hand, while Medi-Cal patients represented 38.1% of the patient

[8] HCAI Healthcare Payments Database. Healthcare Payments Data (HPD) Healthcare Measures. Healthcare Payments Data (HPD) Measures: Health Conditions, Utilization, and Demographics - HCAI

[9] HCAI Healthcare Payments Data. Healthcare Payments Data Snapshot, 2018-2021. Healthcare Payments Data (HPD) Snapshot - HCAI

population with at least one claim, they accounted for only 30.3% of HBsAg testing claims (Figure 4). These findings suggest there may be additional provider education or interventions needed to ensure that patients with Medi-Cal receive appropriate hepatitis B testing.

Data Source Three: California Chronic Hepatitis B Surveillance Data (2018-2023)

Methods

To assess hepatitis B testing practices using reportable disease surveillance data, we examined the number of positive HBsAg tests reported to CDPH from January 1, 2018 to December 31, 2023. In California, all positive laboratory results that indicate current hepatitis B infection (e.g. HBsAg, HBeAg, and HBV DNA) must be reported to the local health department.[10] Positive HBsAg tests were selected as a proxy for screening activity due to their reportability in California and their inclusion in USPSTF and CDC screening recommendations.[1,5] As a proxy for CHB diagnoses, these findings were compared to trends in the number of newly reported confirmed and probable CHB cases from the same time period. Newly reported cases of CHB infection were classified as confirmed or probable according to the 2012 CSTE case definition.[11] Linear regression was performed to assess trends in monthly testing and case counts from 2018-2019, from 2020-2021, and from 2022-2023 to examine possible changes in testing and reporting practices that occurred before, during, and after the COVID-19 pandemic.

Findings

From 2018 to 2023, the number of positive HBsAg tests reported to the California Department of Public Health annually increased from 36,728 in 2018 to 47,532 in 2023 (Figure 5). During this time, the number of monthly positive HBsAg tests remained relatively stable from January 2018 to December 2019 (p-value: 0.44), prior to decreasing in 2020, because of the COVID-19 pandemic. Despite this initial drop in reported testing, we observed an average monthly increase of 34.2 (95% CI: 11.1, 57.3) additional HBsAg tests reported from January 2020 to December 2021, likely representing a return to baseline testing levels following COVID-19 related disruptions in care (Table 2). However, beginning in January 2022, we observed a statistically significant increase in monthly testing numbers, with an average of 66.8 (95% CI: 52.2, 81.4) additional tests reported (a monthly increase of 1.9%) (Table 2).

[10] California Department of Public Health. Title 17, California Code of Regulations (CCR) §2500, §2593, §2641.5-2643.20, and §2800-2812 Reportable Diseases and Conditions. Updated 06/2025. Title 17, California Code of Regulations (CCR) 2500, 2593, 2641.5-2643.20, and 2800-2812 Reportable Diseases and Conditions

[11] National Notifiable Diseases Surveillance System. Hepatitis B, chronic (historical version). Centers for Disease Control and Prevention. Hepatitis B, chronic (historical version)| CDC

From January 2018 to December 2019, we observed a small but significant decrease of 6.3 (95% CI: -11.1, -1.6) newly reported confirmed and probable chronic HBV cases every month (Table 3). From January 2020 to December 2021, there was no observed change in the monthly number of newly reported cases, followed by a significant increase of 15.1 (95% CI: 10.9, 19.3) additional newly reported cases each month beginning in January 2022 (monthly increase of 1.8%) (Table 3).

As was observed in the data from health centers, the increase in positive HBsAg tests in 2022 coincided with the passage of Assembly Bill 789, which went into effect on January 1, 2022. CDC also updated their HBV vaccination recommendations for adults in April 2022, which may have also contributed to increases in pre-vaccination HBsAg screening, thus making causality difficult to determine. Unlike the trends observed in California FQHCs and LALs, the monthly increase in newly reported confirmed and probable CHB cases beginning in 2022 was statistically significant, suggesting that this increase in screening may be helping to detect patients with previously undiagnosed HBV infection.

Limitations of Hepatitis B Testing Estimates in California

The data sources used to estimate hepatitis B screening and testing practices have limitations which must be considered. First, none of the available data sources contain information on the reason why a hepatitis B test was ordered. Tests may be used for routine screening of asymptomatic individuals, pre-vaccination screening for HBV immunity, diagnostic testing for patients with clinical symptoms or liver disease, or for long-term monitoring patients with CHB. Without additional information, we cannot definitively attribute the observed increase in testing performed to increased screening practices.

In addition, there are limitations to specific data sources. First, the California Health Center Program Uniform Data System, which relies on CPT-4 codes and ICD-10 codes, evaluates which codes to include on an annual basis. As a result, the specific set of codes may have changed over the time period studied, making it challenging to assess the true trend in testing over time. Second, submission of data to the Healthcare Payments Data System is voluntary for some health plans; while the number of patients represented by the system is relatively high, it may not be generalizable to the entire California population. Third, only positive HBsAg tests are reportable to the CDPH, and negative HBsAg results are not required to be submitted. This prevents the CDPH from fully estimating the scope of hepatitis B testing in California, as well as calculating the percent of those tests which are positive for hepatitis B.

Public Health Implications

This chapter reviews the available hepatitis B testing data from various sources to evaluate current screening and testing practices. These results can be used to further promote HBV screening and diagnostic testing, with the goal of providing education and care to those living with CHB. Future research should investigate potential disparities in testing by patient demographics, geography and region, and healthcare provider and

insurance type so that all adults can have the opportunity to receive hepatitis B testing and care.

Screening and Testing Tables, Figures and Appendices

Table 1. Linear regression model results for hepatitis B screening and testing and for hepatitis B diagnoses from 2017-2023, California Health Center Program Uniform Data System

	Annual Change in Testing (95% Confidence Interval)	Adjusted R^2	P-Value
Patients with hepatitis B test	26,131 (7,697, 44,565)	0.67	0.014
Patients with diagnosis of hepatitis B	331.1 (-171.7, 833.8)	0.16	0.158

Table 2. Model results from linear regression analysis of positive HBsAg test results reported to CDPH, 2018-2023, California chronic hepatitis B disease surveillance data

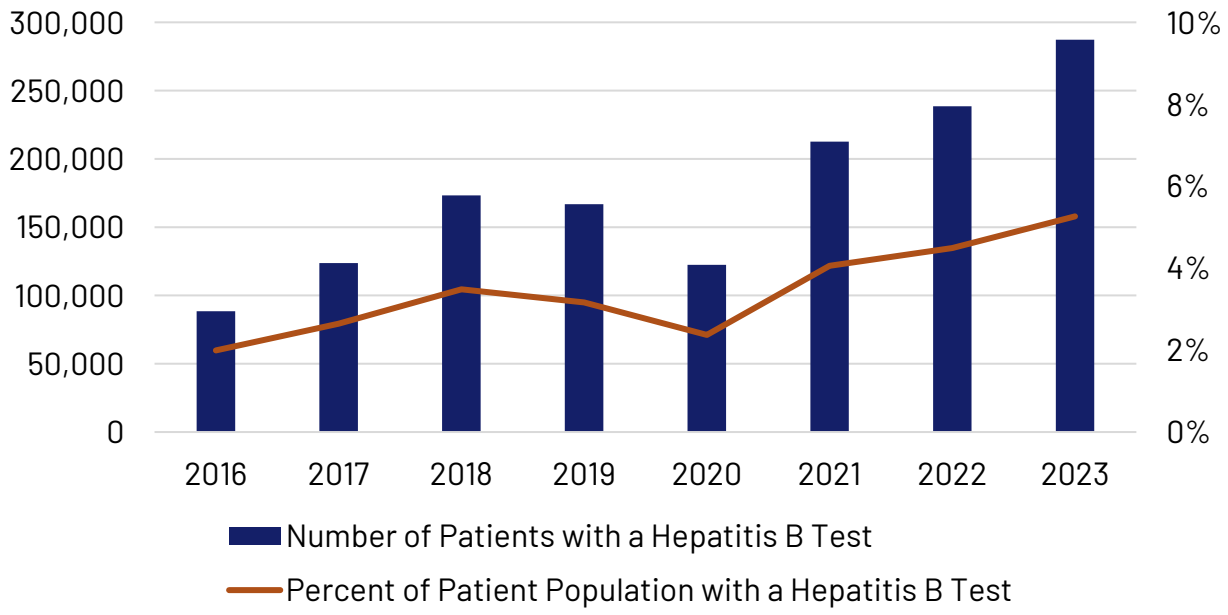
Time Period	Monthly change in number of positive HBsAg tests (95% Confidence Interval)	Adjusted R^2	P-Value	P-Value (Interaction)
2018-2019	-5.4 (-19.4, 8.7)	-0.016	0.437	-
2020-2021	34.2 (11.1, 57.3)	0.269	0.006	0.001
2022-2023	66.8 (52.2, 81.4)	0.794	<0.0001	<0.0001

Table 3. Model results from linear regression analysis of newly reported confirmed and probable chronic hepatitis B cases reported to CDPH, 2018-2023, California chronic hepatitis B (HBV) disease surveillance data

Time Period	Monthly change in number of chronic HBV cases (95% Confidence Interval)	Adjusted R^2	P-Value	P-Value (Interaction)
2018-2019	-6.3 (-11.1, -1.6)	0.223	0.011	-
2020-2021	5.0 (-2.1, 12.2)	0.047	0.159	0.002
2022-2023	15.1 (10.5, 19.7)	0.661	<0.0001	<0.0001

Figure 1. Number and percentage of individual patients from 2017-2023 with an A) hepatitis B screening or diagnosis test code, or B) hepatitis B diagnosis code, California Health Center Program Uniform Data System

A)



B)

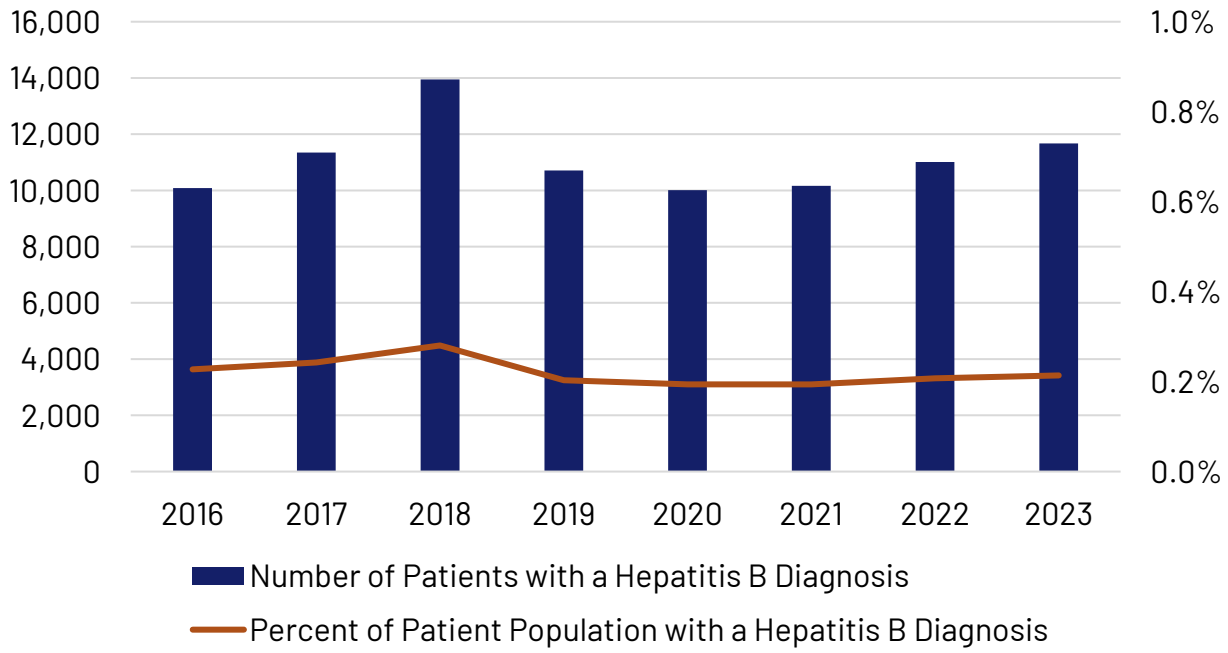


Figure 2. Number of healthcare payer claims for an HBsAg screening or diagnostic test by calendar year and percentage of the insurance California population that is included in the healthcare payer data, California Health Payment Data

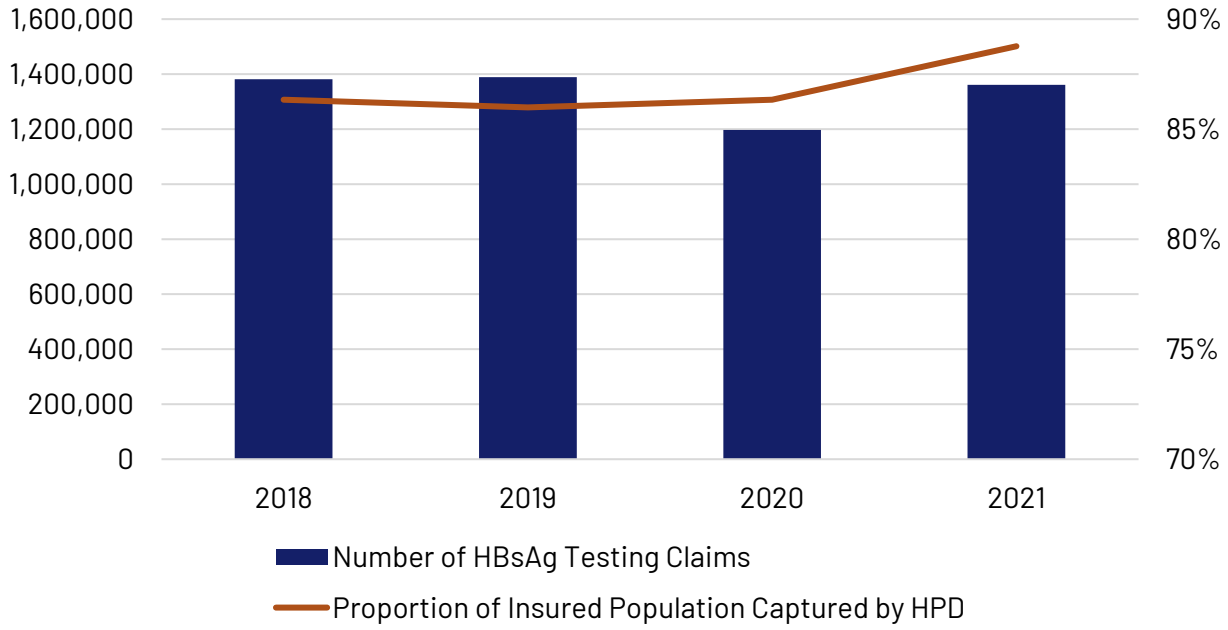


Figure 3. Number of healthcare payer claims for an HBsAg test by calendar year and insurance payer, California Health Payment Data

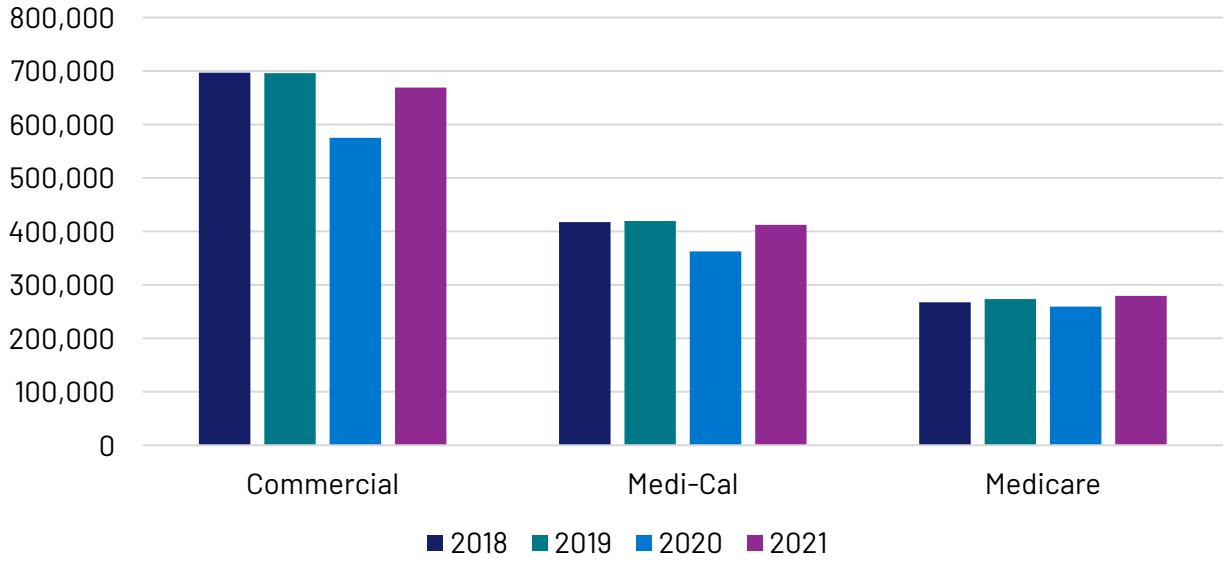
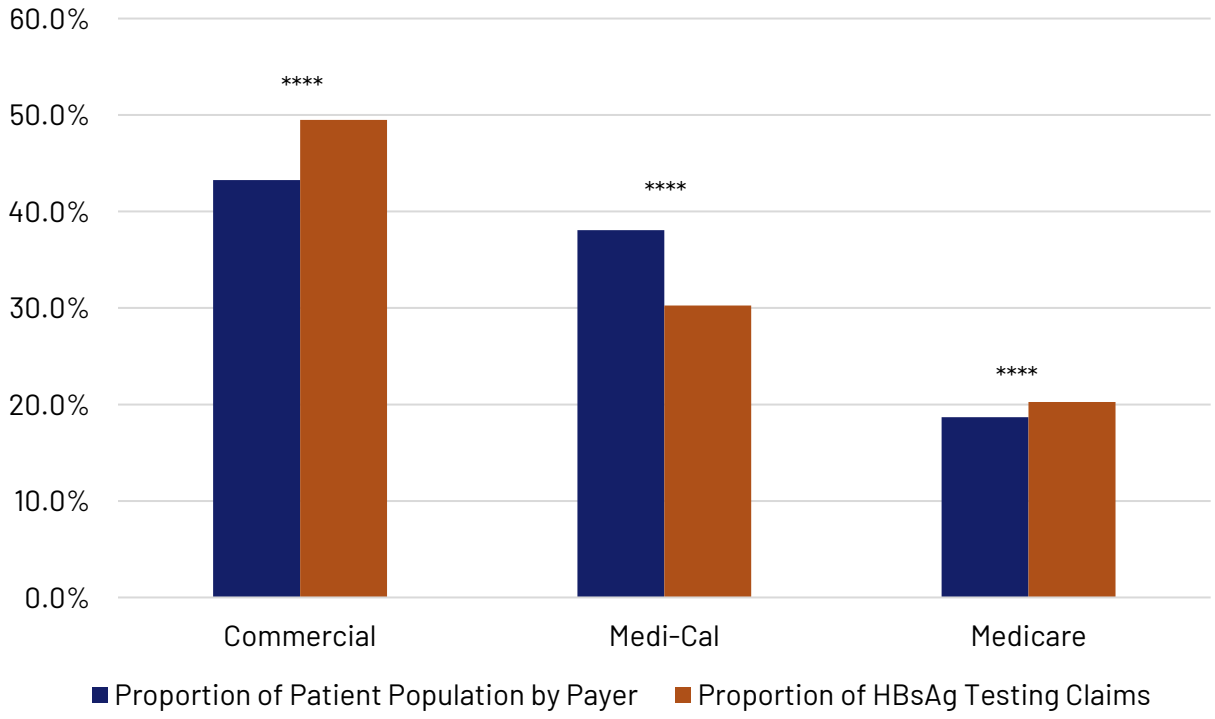
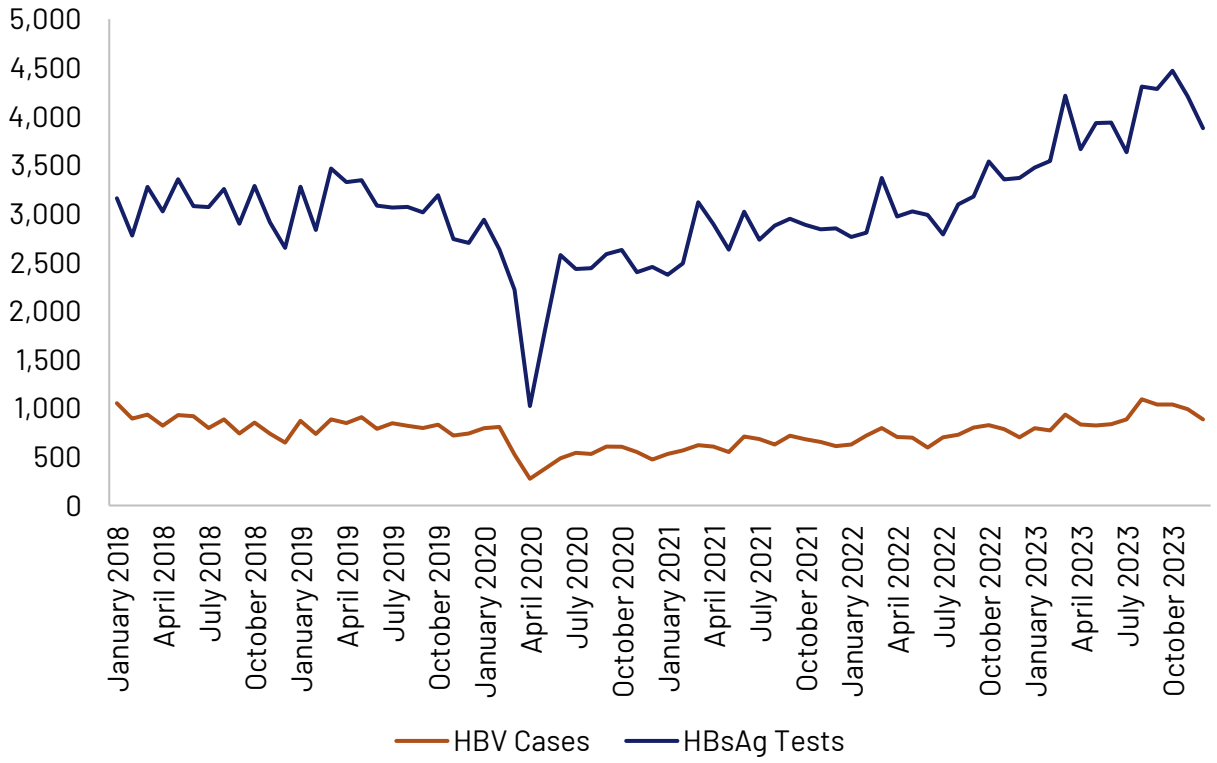


Figure 4. Proportion of HBsAg testing claims and proportion of patient population by payer type, California Health Payment Data



*p<0.05; **p<0.01; ***p<0.001; ****p<0.0001

Figure 5. Number of monthly positive HBsAg tests reported and newly reported confirmed and probable chronic hepatitis B cases to CDPH from January 1, 2018 to December 31, 2023, California chronic hepatitis B disease surveillance data



Appendix Table 1. Current Procedural Terminology, 4th edition (CPT-4) codes used to identify hepatitis B virus (HBV) cases

Code	Test Type
80074	Acute Hepatitis Panel (anti-HAV IgM, anti-HBc IgM, HBsAg, anti-HCV)
86704	Total Hepatitis B Core Antibodies (anti-HBc total)
86705	Immunoglobulin M antibodies to hepatitis B core antigen (anti-HBc IgM)
86706	Hepatitis B surface antibodies (anti-HBs)
86707	Hepatitis Be antibody (anti-HBe)
87340	Hepatitis B surface antigen, qualitative (HBsAg)
87341	Hepatitis B surface antigen (HBsAg), qualitative, with neutralization
87350	Hepatitis Be Antigen (HBeAg)
87467	Hepatitis B surface antigen (HBsAg), quantitative
87515	Hepatitis B virus nucleic acid (HBV DNA), retired on 12/31/2017
87516	Hepatitis B virus nucleic acid (HBV DNA)
87517	Hepatitis B virus nucleic acid (HBV DNA), quantitative
87912	Hepatitis B virus genotype

Appendix Table 2. International Classification of Diseases, 10th revision (ICD-10) codes used to identify hepatitis B virus (HBV) infection diagnoses

Code	Test Type
B16.0	Acute hepatitis B with delta-agent with hepatic coma
B16.1	Acute hepatitis B with delta-agent without hepatic coma.
B16.2	Acute hepatitis B without delta-agent with hepatic coma.
B16.9	Acute hepatitis B without delta-agent and without hepatic coma.
B17.0	Acute delta-(super) infection of hepatitis B carrier
B18.0	Chronic viral hepatitis B with delta-agent
B18.1	Chronic viral hepatitis B without delta-agent
B19.10	Unspecified viral hepatitis B without hepatic coma.
B19.11	Unspecified viral hepatitis B with hepatic coma.
O98.4	Viral hepatitis complicating pregnancy, childbirth, and the puerperium
Z22.51	Carrier of viral hepatitis B