

**Hawai'i Hepatitis B Mortality and Liver Cancer
Incidence and Mortality Report**

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EXECUTIVE SUMMARY

Hepatitis B virus (HBV) infection can lead to liver cirrhosis, cancer, and even death.^{1,2} Due to the unique demographic makeup of Hawai‘i, hepatitis B is an important public health concern for the state. Unfortunately, there is limited surveillance infrastructure to determine incidence rates for hepatitis B. This poses a significant public health issue in terms of appropriate resource allocation and program development to address this preventable disease.

The Hawai‘i Department of Health (HDOH) convened subject matter experts in epidemiology, data analytics, and viral hepatitis programming to develop this report on historical trends and current knowledge of mortality for hepatitis B and liver cancer. Below are highlights from this analysis:

Hepatitis B Mortality

- Hawai‘i has one of the **highest hepatitis B-associated death rates nationwide**. In 2019, the rate for Hawai‘i (1.17 per 100,000) was almost 3 times the national rate (0.42 per 100,000). A 68.4% reduction from the 2019 rate is needed for Hawai‘i to meet the national 2025 goal of 0.37 deaths per 100,000 population.
- Hepatitis-B associated death rates were **higher among male residents and Asian and Pacific Islander (API) residents in Hawai‘i**. Rates for male residents were 1.3 to 1.7 times the state average and rates for API people were 1.2 to 1.4 times the rates of state average.
- During 2000 to 2020, the total **number of hepatitis B-associated deaths each year ranged from 13 to 28** in Hawai‘i.
- Age-adjusted, three-year average **hepatitis B-associated death rates decreased** from 1.54 during 2012-2014 to 0.99 during 2018-2020 in Hawai‘i.
- Estimated counts and mortality rates reported for Hawai‘i and at the national level could **substantially underestimate the mortality burden** of hepatitis B. For example, only 19% of chronic hepatitis B decedents and 40% of those dying of liver disease had hepatitis B reported on their death certificates.³

Liver Cancer Incidence

- Incidence rates of **liver and intrahepatic bile duct cancer in the state of Hawai‘i increased** from 8.4 per 100,000 in 1999 to 12.2 per 100,000 in 2013, followed by a gradual decrease to 8.6 per 100,000 in 2019.
- Although they were considerably higher than the national average from 1999 to 2017, **liver and intrahepatic bile duct cancer incidence rates in Hawai‘i were similar to the national average** in more recent years. For 2018 and 2019, rates for Hawai‘i were 8.9

¹“Hepatitis B Questions and Answers for Health Professionals,” Centers for Disease Control and Prevention, last modified March 30, 2022, <https://www.cdc.gov/hepatitis/hbv/hbvfaq.htm#overview>.

²“People Born Outside of the United States and Viral Hepatitis,” Centers for Disease Control and Prevention, last modified September 24, 2020, <https://www.cdc.gov/hepatitis/populations/Born-Outside-United-States.htm>.

³Danae Bixler et al., “Mortality Among Patients with Chronic Hepatitis B Infection: The Chronic Hepatitis Cohort Study (CHeCS),” *Clinical Infectious Diseases* 68, no. 6 (March 2019): 956-963, doi:10.1093/cid/ciy598.

per 100,000 and 8.6 per 100,000, respectively, while rates for the US were 8.6 per 100,000 and 8.4 per 100,000 respectively.

Liver Cancer Mortality

- **Liver and intrahepatic bile duct cancer-associated death rates** in Hawai‘i were consistently higher than the national average, with Hawai‘i rates 1.1 to 1.8 times of the national rates. In 2020, the rate in Hawai‘i (9.41 per 100,000) was 1.3 times the national average (7.35 per 100,000).
- The overall trend was **driven by male residents, non-Hispanic API residents, and residents from Honolulu County**.
- During 2000 to 2020, the total **number of deaths associated with liver and intrahepatic bile duct each year ranged from 100 to 193** in Hawai‘i.
- Age-adjusted liver and intrahepatic bile duct cancer-associated death rates in Hawai‘i fluctuated over time with an **overall increase from 7.96 per 100,000 in 2000 to 9.41 per 100,000 in 2020**.

The authors make the following recommendations for community members in Hawai‘i to move towards viral hepatitis elimination, in alignment with the statewide strategy, Hep Free 2030⁴

- Increase and improve access to and uptake of hepatitis B services such as immunizations, screening, care coordination, linkage to treatment, and primary care provider training, especially for those who are male, of API descent, and living in Honolulu county;
- Update report regularly every 3 to 5 years with new data from existing and novel sources as well as progress towards targets in relevant plans (e.g., Hep Free 2030, Healthy People 2030);
- Increase consistent and complete surveillance data collection and analysis;
- Increase and maintain HDOH staffing and infrastructure to monitor and respond to acute and chronic HBV infections;
- Establish and maintain data-sharing among HDOH entities (e.g., Maternal Child Health Branch, Chronic Disease Branch, Office of Health Status Monitoring) to ensure coordination of care and response;
- Establish and maintain data-sharing among external entities to improve understanding of HBV related to cancer mortality (e.g., linking liver cancer cases with hepatitis B death certificates);
- Disaggregate race categories to separate Asian, Pacific Islander, and Native Hawaiian groups and subgroups to better focus public health programming;
- Encourage and support culturally congruent data collection and dissemination methods, including qualitative data reports and in-language instruments;
- Ensure dissemination of data in understandable, and in meaningful formats for awareness and action by affected communities, policymakers, and the general public.

⁴Hep Free 2030: The Hawai‘i Hepatitis Elimination Strategy 2020-2030 (Honolulu: Hep Free Hawai‘i, 2020). Accessed at <https://www.hepfreehawaii.org/hep-free-2030>.

INTRODUCTION

Every ten years, the U.S. Department of Health and Human Services' Office of Disease Prevention and Health Promotion updates Healthy People, a national public health initiative that sets measurable priorities based on feedback from subject matter experts, health organizations, and the public.⁵ This decade's priorities, termed Healthy People 2030, includes three objectives related to hepatitis B to meet by 2030:

- Reduce the rate of acute hepatitis B;
- Increase the proportion of people who know they have chronic hepatitis B;
- Reduce the rate of deaths with hepatitis B as a cause⁶
 - Target: 0.16 deaths with hepatitis B as the underlying or contributing cause of death per 100,000 population (age-adjusted to the year 2000 standard population);⁷

In Healthy People 2030, the first two objectives for hepatitis B (listed above) are also noted to impact liver cancer and disease. Accordingly, hepatitis B is a public health concern because it can lead to liver cirrhosis, cancer, and even death.⁸ Since hepatitis B disproportionately affects people who inject drugs, Asian and Pacific Islander (API) people, and non-Hispanic Black people, addressing this disease is also an important health equity concern.⁹ In the United States, API people account for about 70% of chronic HBV infection cases, even though they make up only 6% of the population.¹⁰ Approximately 70% of Asian Americans identifying as immigrants born in countries with moderate to high HBV infection prevalence.¹¹ In the U.S., HBV infection

⁵"Healthy people 2030," U.S. Department of Health and Human Services, last modified April 6, 2022, <https://health.gov/our-work/national-health-initiatives/healthy-people/healthy-people-2030>.

⁶"Immunization and infectious disease workgroup," U.S. Department of Health and Human Services, accessed August 29, 2022, <https://health.gov/healthypeople/about/workgroups/immunization-and-infectious-diseases-workgroup>.

⁷"Reduce the rate of deaths with hepatitis B as a cause – IID-15," U.S. Department of Health and Human Services, accessed June 13, 2022. <https://health.gov/healthypeople/objectives-and-data/browse-objectives/infectious-disease/reduce-rate-deaths-hepatitis-b-cause-iid-15>.

⁸"Hepatitis B Questions and Answers for Health Professionals," Centers for Disease Control and Prevention, last modified March 30, 2022, <https://www.cdc.gov/hepatitis/hbv/hbvfaq.htm#overview>.

⁹"Priority populations," U.S. Department of Health and Human Services, last modified January 6, 2021, <https://www.hhs.gov/hepatitis/viral-hepatitis-national-strategic-plan/priority-populations/index.html>.

¹⁰Henry Roberts et al., "Prevalence of HBV Infection, Vaccine-Induced Immunity, and Susceptibility Among At-Risk Populations: US Households, 2013-2018," *Hepatology* 74, no.5 (November 2021): 2353-2365, <https://doi.org/10.1002/hep.31991>.

¹¹"People Born Outside of the United States and Viral Hepatitis," Centers for Disease Control and Prevention, last modified September 24, 2020, <https://www.cdc.gov/hepatitis/populations/Born-Outside-United-States.htm>.

has been associated with premature death and elevated rates of death from all causes, including liver-associated causes such as liver cancer.¹²

Almost half of Hawai‘i residents are of API descent and about one-fifth are foreign-born.¹³ A cross-sectional study of uninsured, foreign-born API patients at a large federally qualified health center in Honolulu found the prevalence of chronic HBV infection to be 5.7%¹⁴, as compared to the national prevalence of past or present HBV infection among housed individuals of 4.3%.¹⁵ According to Hawai‘i Department of Health’s Disease Outbreak and Control Division, the total number of confirmed acute hepatitis B cases ranged from 0 to 10 per year from 2009 to 2018.¹⁶ With such low reported case numbers, estimated incidence rates for Hawai‘i are too unstable to compare to national rates, which remained fairly consistent from 0.88 to 1.10 per 100,000 between 2009 and 2018.¹⁷ Notably, the Centers for Disease Control and Prevention estimated that acute hepatitis B cases are underreported by a factor of 6.5.^{18,19} Underdiagnosis of hepatitis B may contribute to undercounting, with only 19% of privately insured patients in the US estimated to have been diagnosed.²⁰

Viral hepatitis accounts for more than 75% of all liver cancer cases in Hawai‘i, and HBV infection is a leading risk factor for liver cancer in Hawai‘i.²¹ Compared to the entire United States, Hawai‘i has higher rates of liver cancer incidence and mortality. From 2015-2019, the

¹²Danae Bixler et al., “Mortality Among Patients with Chronic Hepatitis B Infection: The Chronic Hepatitis Cohort Study (CHeCS),” *Clinical Infectious Diseases* 68, no. 6 (March 2019): 956-963, doi:10.1093/cid/ciy598.

¹³“QuickFacts: Hawaii,” U.S. Census Bureau, accessed July 5, 2022, <https://www.census.gov/quickfacts/HI>.

¹⁴Aileen Ferrer et al., “Hepatitis B Prevalence and Risk Factors in a Foreign-Born Asian and Pacific Islander Population at a Community Health Center in Hawai‘i,” *Asia Pacific Journal of Public Health* 30, no. 8 (September 2018): 727-736, doi:10.1177/1010539518800359.

¹⁵Deanna Kruszon-Moran et al., “Prevalence and trends in hepatitis B virus infection in the United States, 2015-2019,” NCHS Data Brief, no. 361 (March 2020), <https://www.cdc.gov/nchs/products/databriefs/db361.htm>.

¹⁶“Historical Summary of Reported Cases of Notifiable Diseases, Hawai‘i, 2009 – 2018,” Hawai‘i Department of Health, accessed August 31, 2022, https://health.hawaii.gov/docd/files/2019/08/Disease-Summary-Table-2009-2018_State.pdf.

¹⁷“Viral Hepatitis Surveillance – United States [annual reports for 2009–2018],” Centers for Disease Control and Prevention, last modified May 19, 2021, <https://www.cdc.gov/hepatitis/statistics/SurveillanceRpts.htm>.

¹⁸“Number of reported cases of acute hepatitis B virus infection and estimated infections-United States, 2013-2020,” Centers for Disease Control and Prevention, last modified August 18, 2022, <https://www.cdc.gov/hepatitis/statistics/2020surveillance/hepatitis-b/figure-2.1.htm>.

¹⁹R. Monina Klevens et al., “Estimating Acute Viral Hepatitis Infections from Nationally Reported Cases,” *American Journal of Public Health* 104, no.3 (March 2014): 482–487, doi:10.2105/AJPH.2013.301601.

²⁰Eiichi Ogawa et al., “Diagnosis Rates of Chronic Hepatitis B in Previously Insured Patients in the United States,” *JAMA Network Open* 3, no. 4 (April 2020): e201844, doi:10.1001/jamanetworkopen.2020.1844.

²¹Linda L. Wong et al., “The Changing characteristics of hepatocellular cancer in Hawaii over time,” *American Journal of Surgery* 210, no. 1 (July 2015): 146-152, doi:10.1016/j.amjsurg.2014.06.036.

age-adjusted rate of new cases of liver cancer in Hawai‘i was 10.2 per 100,000 compared with 8.6 per 100,000 in the United States, and the rate of death from liver cancer in Hawai‘i was 7.8 per 100,000 compared with 6.6 per 100,000 in the United States.²² Hawai‘i is also one of 12 states where the hepatitis B-associated death rate is significantly higher than the national rate.²³

Overall, the current surveillance infrastructure limits HDOH’s ability to determine incidence, prevalence, and mortality rates related to HBV infection. This poses a significant public health issue in terms of appropriate resource allocation and program development to address this preventable disease. Limited surveillance of both acute and chronic HBV is a national concern since the CDC estimates that approximately two-thirds of persons living with hepatitis B are unaware of their status.²⁴ Notably, *Hep Free 2030: The Hawai‘i Hepatitis Elimination Strategy 2020-2030* lists “Surveillance Infrastructure” as one of the strategic directions necessary for eliminating viral hepatitis in Hawai‘i by 2030.²⁵ Hepatitis B prevention is also listed as an important priority in the Hawai‘i State Cancer Plan (2016-2020).²⁶

To address these gaps, the Hawai‘i Department of Health (HDOH) convened subject matter experts in epidemiology, data analytics, and viral hepatitis public health programming to develop this report on hepatitis B-related mortality in Hawai‘i. The purpose of this report is to identify current and historical trends in mortality for hepatitis B and incidence and mortality for liver cancer. Although mortality data on liver and intrahepatic bile duct cancer used in this analysis are due to all causes (not only hepatitis B), the authors determined the trends to be useful for contextualizing hepatitis B findings. The report concludes with programmatic and data recommendations for HDOH and hepatitis B constituents in Hawai‘i to move towards viral hepatitis elimination.

²²“United States Cancer Statistics: Data Visualizations,” Centers for Disease Control and Prevention, accessed June 22, 2022, <https://gis.cdc.gov/Cancer/USCS/#/AtAGlance/>.

²³Kathleen N. Ly et al., “Regional Differences in Mortality Rates and Characteristics of Decedents with Hepatitis B Listed as a Cause of Death, United States, 2000-2019,” *JAMA Network Open* 5, no. 6 (June 2022): e2219170, doi:10.1001/jamanetworkopen.2022.19170.

²⁴“Hepatitis B Questions and Answers for Health Professionals,” Centers for Disease Control and Prevention, last modified March 30, 2022, <https://www.cdc.gov/hepatitis/hbv/hbvfaq.htm#overview>.

²⁵*Hep Free 2030: The Hawai‘i Hepatitis Elimination Strategy 2020-2030* (Honolulu: Hep Free Hawai‘i, 2020). Accessed at www.hepfreehawaii.org/hep-free-2030.

²⁶Hawai‘i State Cancer Plan 2016-2020 (Honolulu: Hawai‘i Comprehensive Cancer Coalition, 2015).

DATA SOURCES AND METHODS

Hepatitis B Mortality

Hepatitis B-associated death data are from the CDC WONDER Multiple Cause of Death 1999–2020 online database.²⁷ CDC WONDER Multiple Cause of Death data are based on information from all death certificates filed in the vital records offices of the fifty states and the District of Columbia.²⁸ Deaths of nonresidents (e.g., undocumented immigrants, nationals living abroad, residents of Puerto Rico, Guam, the Virgin Islands, and other U.S. territories) and fetal deaths are excluded. A hepatitis B-associated death was defined by the presence of any of the International Classification of Diseases, 10th Rev. (ICD-10) cause of death codes—B16, B17.0, B18.0, B18.1—listed in any of the multiple (e.g., underlying and contributing) causes of death fields on death certificates. Rates were adjusted to the age distribution of the 2000 US standard population and expressed as per 100,000 population. Per CDC WONDER data confidentiality rules, sub-national data are suppressed if the total number of deaths is less than 10. Rates are not reported but indicated as “unreliable rate” if the total number of deaths is less than 20 for each year.²⁹

A three-year moving average rate was calculated to minimize annual fluctuations and allow analysis for the underlying trend.³⁰ The 3-year moving average rates were also calculated for select decedent characteristics such as birth sex, race, and county of residence, when data was large enough to produce reliable rates.

Liver Cancer Incidence

State and national incidence data for liver and intrahepatic bile duct cancers were obtained from CDC and National Cancer Institutes’ United States Cancer Statistics Data Visualizations Tool 1999-2019.³¹ New cases of liver and intrahepatic bile duct cancer are those classified with a behavior code of 3 (invasive, primary site only) based on the International Classification of

²⁷“CDC WONDER: Multiple Cause of Death 1999–2019,” Centers for Disease Control and Prevention, accessed May 6, 2022, <http://wonder.cdc.gov/mcd-icd10.html>.

²⁸“CDC WONDER: Multiple Cause of Death 1999–2019,” Centers for Disease Control and Prevention, accessed May 6, 2022, <http://wonder.cdc.gov/mcd-icd10.html>.

²⁹“CDC WONDER: Multiple Cause of Death 1999–2019,” Centers for Disease Control and Prevention, accessed May 6, 2022, <http://wonder.cdc.gov/mcd-icd10.html>.

³⁰Rosanne Freak-Poli et al., “Trends in Cancer Mortality During the 20th Century in Australia,” *Australian Health Review* 31, no. 4 (November 2007): 557-564, doi: 10.1071/ah070557.

³¹“United States Cancer Statistics: Data Visualizations,” Centers for Disease Control and Prevention, accessed June 22, 2022, <https://gis.cdc.gov/Cancer/USCS/#/AtAGlance/>.

Diseases for Oncology, Third Edition (ICD-O-3) within registries participating in the Centers for Disease Control and Prevention's (CDC's) National Program of Cancer Registries (NPCR) and the National Cancer Institute's (NCI's) Surveillance, Epidemiology, and End Results (SEER) Program.³² Rates were adjusted to the age distribution of 2000 US standard population and expressed as per 100,000 population.

Liver Cancer Mortality

Liver and intrahepatic bile duct cancer-associated death data are from the CDC WONDER Multiple Cause of Death 1999–2020 online database.³³ CDC WONDER Multiple Cause of Death data are based on information from all death certificates filed in the vital records offices of the fifty states and the District of Columbia.³⁴ Deaths of nonresidents (e.g., undocumented immigrants, nationals living abroad, residents of Puerto Rico, Guam, the Virgin Islands, and other U.S. territories) and fetal deaths are excluded. Cause of death is defined as one of the multiple causes of death and is based on the following International Classification of Diseases, 10th Rev. (ICD-10) codes C22.0, C22.1, C22.2, C22.3, C22.4, C22.7, and C22.9. A liver and intrahepatic bile duct cancer-associated death was defined by the presence of any of the ICD-10 codes described above in any of the death certificate fields. Rates are age-adjusted rates per 100,000 population using the US population 2000 as the standard population. Per CDC WONDER data suppression rules, data are suppressed if the total number of deaths is less than 10, and rates are not reported but indicated as “unreliable rate” if the total number of deaths is less than 20 for each year.³⁵ Rates were calculated and reported for select decedent characteristics such as birth sex, race, and county of residence, when data was large enough to produce reliable rates.

³²“Incidence Data Sources,” Centers for Disease Control and Prevention, last modified June 6, 2022, https://www.cdc.gov/cancer/uscs/technical_notes/data_sources/incidence.htm.

³³“CDC WONDER: Multiple Cause of Death 1999–2019,” Centers for Disease Control and Prevention, accessed May 6, 2022, <http://wonder.cdc.gov/mcd-icd10.html>.

³⁴“CDC WONDER: Multiple Cause of Death 1999–2019,” Centers for Disease Control and Prevention, accessed May 6, 2022, <http://wonder.cdc.gov/mcd-icd10.html>.

³⁵“CDC WONDER: Multiple Cause of Death 1999–2019,” Centers for Disease Control and Prevention, accessed May 6, 2022, <http://wonder.cdc.gov/mcd-icd10.html>.

DATA FINDINGS

I. Hepatitis B-Associated Deaths in Hawai‘i, 2000-2020

Table 1 reports the numbers and rates of hepatitis B-associated deaths during 2000-2020, comparing Hawai‘i to the U.S. during 2000–2020. Rates were suppressed for 11 out of the 21 years in the study period, with the total number of hepatitis B-associated deaths ranging from 13 to 28 per year in Hawai‘i. During 2000-2020, rates in Hawai‘i were 2.4 to 3.3 times the national rate. For the U.S., the total number of hepatitis B-associated deaths ranged from 1,649 to 1,902 each year, and rates of hepatitis B-associated deaths decreased from 0.66 in 2000 to 0.50 in 2014, remaining relatively consistent around 0.45 from 2015 to 2020.

Table 1. Numbers and rates* of deaths with hepatitis B virus infection listed as a cause of death** among residents, 2000–2020, comparing Hawai‘i to U.S.

Year	Hawai‘i			U.S.		
	Number	Population	Rate	Number	Population	Rate
2000	15	1,211,537	Unreliable***	1,902	281,421,906	0.66
2001	14	1,225,948	Unreliable	1,852	284,968,955	0.65
2002	15	1,239,613	Unreliable	1,896	287,625,193	0.65
2003	17	1,251,154	Unreliable	1,749	290,107,933	0.59
2004	22	1,273,569	1.6	1,689	292,805,298	0.56
2005	21	1,292,729	1.45	1,726	295,516,599	0.55
2006	25	1,309,731	1.74	1,699	298,379,912	0.53
2007	19	1,315,675	Unreliable	1,806	301,231,207	0.54
2008	19	1,332,213	Unreliable	1,780	304,093,966	0.54
2009	22	1,346,717	1.4	1,693	306,771,529	0.49
2010	16	1,360,301	Unreliable	1,789	308,745,538	0.52
2011	20	1,374,810	1.22	1,795	311,591,917	0.51
2012	28	1,392,313	1.68	1,761	313,914,040	0.51
2013	23	1,404,054	1.49	1,866	316,128,839	0.53
2014	25	1,419,561	1.47	1,837	318,857,056	0.50
2015	13	1,431,603	Unreliable	1,707	321,418,820	0.46
2016	26	1,428,557	1.5	1,690	323,127,513	0.45
2017	15	1,427,538	Unreliable	1,727	325,719,178	0.46
2018	14	1,420,491	Unreliable	1,649	327,167,434	0.43
2019	21	1,415,872	1.17	1,662	328,239,523	0.42
2020	18	1,407,006	Unreliable	1,752	329,484,123	0.45

Source: CDC, National Center for Health Statistics, Multiple Cause of Death 1999–2019 on CDC WONDER Online Database. Accessed on May 6, 2022 available at <http://wonder.cdc.gov/mcd-icd10.html>

* Rates are age-adjusted per 100,000 population with US 2000 population as the standard population.

** Cause of death is defined as one of the multiple causes of death and is based on the International Classification of Diseases, 10th Rev. (ICD-10) codes B16, B17.0, B18.0, B18.1 (hepatitis B).

*** Rates are indicated as unreliable when the total count of death was <20 because of the instability associated with those rates.

Table 2 reports the three-year total numbers and moving average rates of hepatitis B-associated deaths among Hawai‘i residents during 2000-2020, comparing all residents to residents aged ≥ 45 years. The three-year total number of deaths ranged from 44 to 76 statewide. Data among persons aged < 45 years were not reported because the total number was less than 20 for each three-year period, and rates would be suppressed. Persons aged ≥ 45 years accounted for 36.9% to 43.5% of the general population, yet they accounted for 84.1% - 95.3% of hepatitis B-associated deaths.

Table 2. Three-year total numbers and moving average rates* of deaths with hepatitis B virus infection listed as a cause of death** among residents of Hawai‘i, 2000-2020, statewide vs residents aged ≥ 45 years

Year	All residents			Persons aged ≥ 45 years				
	Number	Population	Rate	Number	Population	Rate	Percent population***	Percent death***
2000-2002	44	3,677,098	1.16	37	1,358,684	2.76	36.9	84.1
2001-2003	46	3,716,715	1.17	41	1,399,673	2.95	37.7	89.1
2002-2004	54	3,764,336	1.32	47	1,441,545	3.22	38.3	87.0
2003-2005	60	3,817,452	1.43	53	1,483,860	3.54	38.9	88.3
2004-2006	68	3,876,029	1.59	60	1,524,948	3.90	39.3	88.2
2005-2007	65	3,918,135	1.49	58	1,561,558	3.69	39.9	89.2
2006-2008	63	3,957,619	1.43	56	1,596,460	3.52	40.3	88.9
2007-2009	60	3,994,605	1.31	54	1,630,729	3.27	40.8	90.0
2008-2010	57	4,039,231	1.23	52	1,663,138	3.08	41.2	91.2
2009-2011	58	4,081,828	1.21	51	1,690,982	2.89	41.4	87.9
2010-2012	64	4,127,424	1.31	59	1,714,478	3.36	41.5	92.2
2011-2013	71	4,171,177	1.46	60	1,729,297	3.31	41.5	84.5
2012-2014	76	4,215,928	1.54	67	1,743,809	3.64	41.4	88.2
2013-2015	61	4,255,218	1.25	52	1,757,392	2.81	41.3	85.2
2014-2016	64	4,279,721	1.27	61	1,784,747	3.35	41.7	95.3
2015-2017	54	4,287,698	1.05	48	1,810,254	2.52	42.2	88.9
2016-2018	55	4,276,586	1.02	50	1,830,606	2.52	42.8	90.9
2017-2019	50	4,263,901	0.93	45	1,839,299	2.26	43.1	90.0
2018-2020	53	4,243,369	0.99	49	1,844,318	2.51	43.5	92.5

Source: CDC, National Center for Health Statistics, Multiple Cause of Death 1999–2019 on CDC WONDER Online Database. Accessed on May 6, 2022 available at <http://wonder.cdc.gov/mcd-icd10.html>

* Rates are age-adjusted per 100,000 population with US 2000 population as the standard population.

** Cause of death is defined as one of the multiple causes of death and is based on the International Classification of Diseases, 10th Rev. (ICD-10) codes B16, B17.0, B18.0, B18.1 (hepatitis B).

*** Percent from the total population for persons aged ≥ 45 years was calculated by dividing the population total for persons aged ≥ 45 years over the population total for all residents in Hawai‘i for the same 3-year period. Percent from the total death for persons aged ≥ 45 years was calculated by dividing the total number of deaths among persons aged ≥ 45 years over the total number of deaths among all residents in Hawai‘i for the same 3-year period.

Figure 1 shows rates of hepatitis B- associated deaths in Hawai‘i, as a 3-year moving average comparing rates among persons aged ≥ 45 years with the state average, based on the values from **Table 2**. Statewide, rates of hepatitis B-associated death increased from 1.16 during 2000-2002 to 1.59 during 2004-2006, followed by a decrease until 2009-2011 to 1.21. It then increased steadily until 2012-2014 to 1.54, followed by a steady decrease to 0.99 during 2018-2020.

Trends among persons aged ≥ 45 years followed the statewide mortality trend, but at a much higher rate for each of the 3-year periods. Rates among persons aged ≥ 45 years increased from 2.76 during 2000-2002 to 3.90 during 2004-2006, followed by a decrease until 2009-2011 to 2.89. Rates then increased steadily until 2012-2014 to 3.64, followed by a gradual decrease to 2.51 during 2018-2020. Rates for persons aged ≥ 45 years were 2.2 to 2.6 times the statewide average. During the 2018-2020 period, the rate for persons aged ≥ 45 years was 2.5 times the statewide.

Figure 1. Three-year moving average rate of hepatitis B-associated death among Hawai‘i residents, 2000-2020, all residents vs residents aged ≥ 45 years

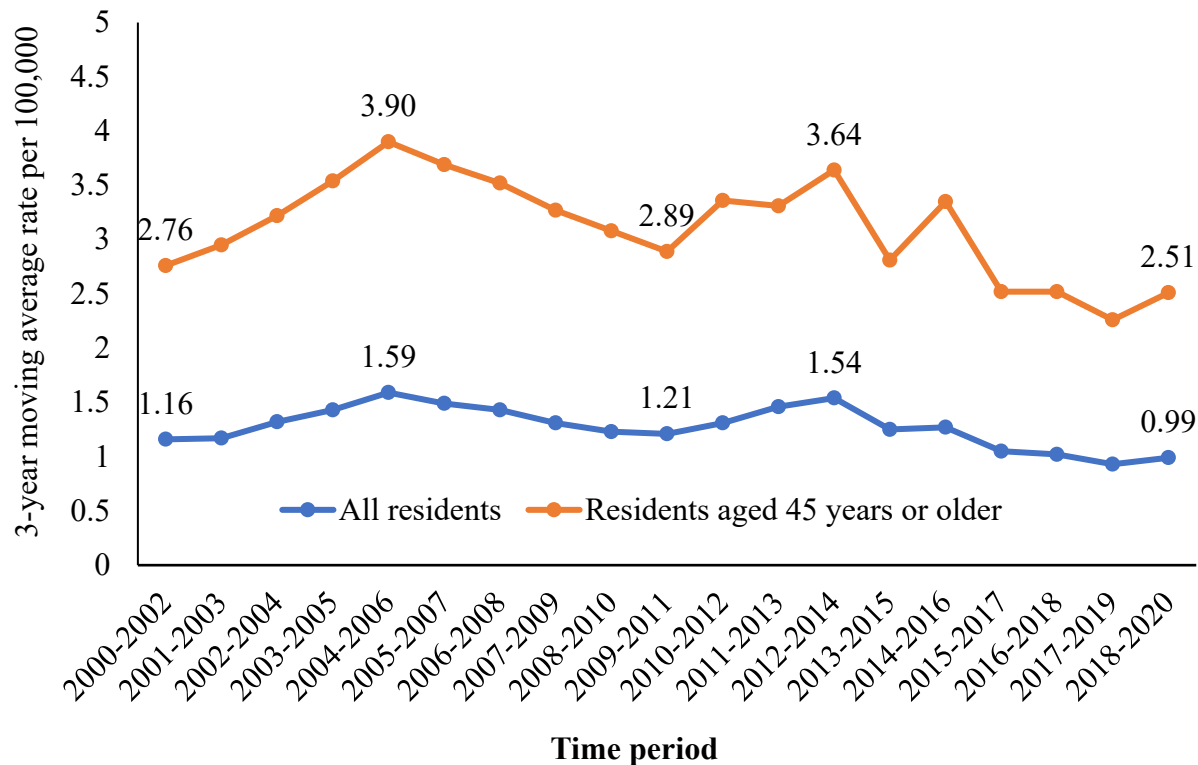


Table 3 reports the three-year total numbers and moving average rates of hepatitis B-associated deaths among Hawai‘i residents during 2000-2020, comparing all residents to male residents. Although male residents accounted for around half (50.1% to 50.6%) of the general population, they accounted for disproportionately higher percentages of all hepatitis B-associated deaths, ranging from 76.7% to 98.2% during the study period. Data for female residents was not reported because the total number of hepatitis B-associated deaths was less than 20 for most of the three-year periods, and rates would be suppressed.

Table 3. Three-year total numbers and moving average rates* of deaths with hepatitis B virus infection listed as a cause of death** among residents of Hawai‘i, 2000-2020, statewide vs male residents

Year	All residents			Male Residents				
	Number	Population	Rate	Number	Population	Rate	Percent population***	Percent death***
2000-2002	44	3,677,098	1.16	31	1,848,851	1.72	50.3	79.5
2001-2003	46	3,716,715	1.17	34	1,867,581	1.81	50.2	89.5
2002-2004	54	3,764,336	1.32	38	1,887,527	1.94	50.1	86.4
2003-2005	60	3,817,452	1.43	41	1,912,022	1.98	50.1	85.4
2004-2006	68	3,876,029	1.59	45	1,942,001	2.14	50.1	78.9
2005-2007	65	3,918,135	1.49	45	1,963,786	2.10	50.1	88.2
2006-2008	63	3,957,619	1.43	42	1,982,770	1.93	50.1	82.4
2007-2009	60	3,994,605	1.31	42	1,999,032	1.88	50.0	85.7
2008-2010	57	4,039,231	1.23	41	2,021,785	1.77	50.1	85.4
2009-2011	58	4,081,828	1.21	44	2,044,690	1.89	50.1	93.6
2010-2012	64	4,127,424	1.31	49	2,073,013	2.10	50.2	96.1
2011-2013	71	4,171,177	1.46	56	2,101,384	2.40	50.4	98.2
2012-2014	76	4,215,928	1.54	58	2,129,678	2.45	50.5	96.7
2013-2015	61	4,255,218	1.25	46	2,153,085	1.91	50.6	92.0
2014-2016	64	4,279,721	1.27	48	2,161,086	1.96	50.5	87.3
2015-2017	54	4,287,698	1.05	43	2,159,074	1.77	50.4	87.8
2016-2018	55	4,276,586	1.02	42	2,144,704	1.64	50.1	89.4
2017-2019	50	4,263,901	0.93	33	2,135,129	1.22	50.1	76.7
2018-2020	53	4,243,369	0.99	35	2,123,408	1.36	50.0	79.5

Source: CDC, National Center for Health Statistics, Multiple Cause of Death 1999–2019 on CDC WONDER Online Database. Accessed on May 6, 2022, available at <http://wonder.cdc.gov/mcd-icd10.html>

* Rates are age-adjusted per 100,000 population with US 2000 population as the standard population.

** Cause of death is defined as one of the multiple causes of death and is based on the International Classification of Diseases, 10th Rev. (ICD-10) codes B16, B17.0, B18.0, B18.1 (hepatitis B).

*** Percent from the total population for male residents was calculated by dividing the population total for male residents over the population total for all residents in Hawai‘i for the same 3-year period. Percent from the total death for male residents was calculated by dividing the total number of deaths among male residents over the total number of deaths among all residents in Hawai‘i for the same 3-year period.

Figure 2 shows the rates of hepatitis B-associated death in Hawai‘i as a three-year moving average, comparing rates among male residents to the state average, based on the values from **Table 3**. Statewide, rates of hepatitis B-associated death increased from 1.16 during 2000-2002 to 1.59 during 2004-2006, followed by a decrease until 2009-2011 to 1.21. They then increased steadily until 2012-2014 to 1.54, followed by steady decrease to 0.99 during 2018-2020.

The trend in death rate among male residents followed the statewide trend but was 1.3 to 1.7 times higher for each three-year period. Rates among male residents increased from 1.72 during 2000-2002 to 2.14 during 2004-2006, followed by a decrease until 2008-2010 to 1.77. It then increased steadily until 2012-2014 to 2.45, followed by a sharp decrease to 1.36 during 2018-2020. During 2018-2020, the rate for male residents was 1.4 times the rate of the state average.

Figure 2. Three-year moving average rate of hepatitis B-associated death among Hawai‘i residents, 2000-2020, all vs male residents

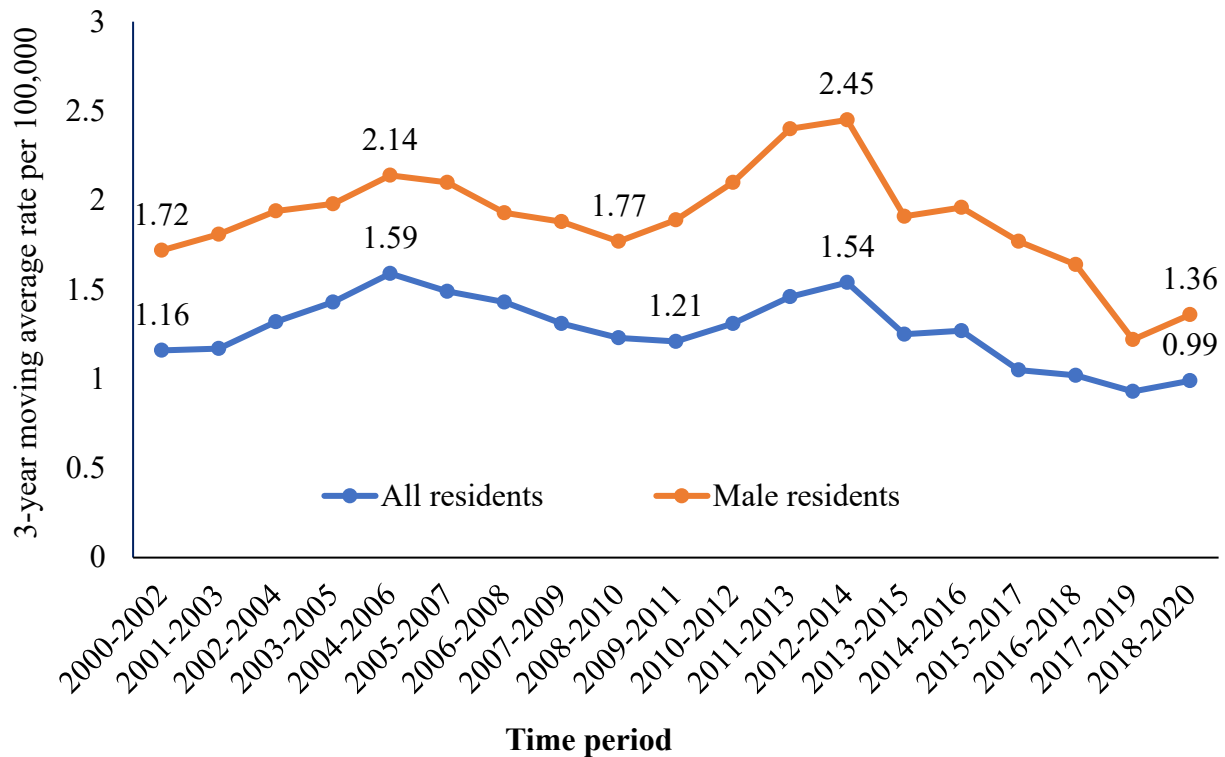


Table 4 reports three-year total numbers and moving average rates of hepatitis B-associated deaths among Hawai‘i residents during 2000-2020, comparing all residents to Non-Hispanic Asian or Pacific Islander (API) residents. Although API people accounted for 60.1% to 65.3% of the general population, they accounted for disproportionately higher percentages of hepatitis B-associated deaths, ranging from 75% to 87% across the 21-year study period. Data for hepatitis B-associated deaths among all other racial/ethnic groups were not reported because the total number of deaths was less than 20 for each three-year period, and rates would be suppressed.

Table 4. Three-year total numbers and moving average rates* of deaths with hepatitis B virus infection listed as a cause of death** among residents of Hawai‘i, 2000-2020, statewide vs non-Hispanic Asian or Pacific Islander (API) residents

Year	All racial/ethnic groups			Non-Hispanic Asian or Pacific Islander				
	Number	Population	Rate	Number	Population	Rate	Percent population***	Percent death***
2000-2002	44	3,677,098	1.16	38	2,329,867	1.52	63.4	86.4
2001-2003	46	3,716,715	1.17	37	2,345,993	1.42	63.1	80.4
2002-2004	54	3,764,336	1.32	43	2,369,748	1.59	63.0	79.6
2003-2005	60	3,817,452	1.43	47	2,397,136	1.71	62.8	78.3
2004-2006	68	3,876,029	1.59	56	2,424,841	2.00	62.6	82.4
2005-2007	65	3,918,135	1.49	50	2,445,537	1.76	62.4	76.9
2006-2008	63	3,957,619	1.43	50	2,466,139	1.74	62.3	79.4
2007-2009	60	3,994,605	1.31	46	2,488,562	1.55	62.3	76.7
2008-2010	57	4,039,231	1.23	45	2,513,814	1.49	62.2	78.9
2009-2011	58	4,081,828	1.21	45	2,529,421	1.50	62.0	77.6
2010-2012	64	4,127,424	1.31	51	2,542,939	1.63	61.6	79.7
2011-2013	71	4,171,177	1.46	57	2,544,575	1.89	61.0	80.3
2012-2014	76	4,215,928	1.54	57	2,553,689	1.83	60.6	75.0
2013-2015	61	4,255,218	1.25	46	2,558,674	1.50	60.1	75.4
2014-2016	64	4,279,721	1.27	55	2,793,163	1.61	65.3	85.9
2015-2017	54	4,287,698	1.05	47	2,597,832	1.44	60.6	87.0
2016-2018	55	4,276,586	1.02	44	2,607,488	1.29	61.0	80.0
2017-2019	50	4,263,901	0.93	41	2,601,432	1.19	61.0	82.0
2018-2020	53	4,243,369	0.99	42	2,588,463	1.22	61.0	79.2

Source: CDC, National Center for Health Statistics, Multiple Cause of Death 1999–2019 on CDC WONDER Online Database. Accessed on May 6, 2022 available at <http://wonder.cdc.gov/mcd-icd10.html>

* Rates are age-adjusted per 100,000 population with US 2000 population as the standard population.

** Cause of death is defined as one of the multiple causes of death and is based on the International Classification of Diseases, 10th Rev. (ICD-10) codes B16, B17.0, B18.0, B18.1 (hepatitis B).

*** Percent from the total population for API people was calculated by dividing the population total for API persons over the population total for all residents in Hawai‘i for the same 3-year period. Percent from the total death for API residents was calculated by dividing the total number of deaths among API residents over the total number of deaths among all residents in Hawai‘i for the same 3-year period.

Figure 3 shows the rates of hepatitis B-associated death in Hawai‘i as a three-year moving average, comparing rates among API residents in the state to the state average, based on the values from **Table 4**. Statewide, rates of hepatitis B-associated death increased from 1.16 during 2000-2002 to 1.59 during 2004-2006, followed by a decrease till 2009-2011 to 1.21. It then increased steadily till 2012-2014 to 1.54, followed by a steady decrease to 0.99 during 2018-2020.

The trend among API residents followed the statewide mortality trend, but 1.2-1.4 times higher for each three-year period. Rates among API people increased from 1.52 during 2000-2002 to 2.00 during 2004-2006, followed by a decrease until 2009-2011 to 1.50. It then increased steadily until 2012-2014 to 1.83, followed by a steady decrease to 1.22 during 2018-2020. During the most recent period (2018-2020), the rate for API people was 1.2 times the rate of the state average.

Figure 3. Three-year moving average rate of hepatitis B-associated death among Hawai‘i residents, 2000-2020, all residents vs non-Hispanic Asian or Pacific Islander residents

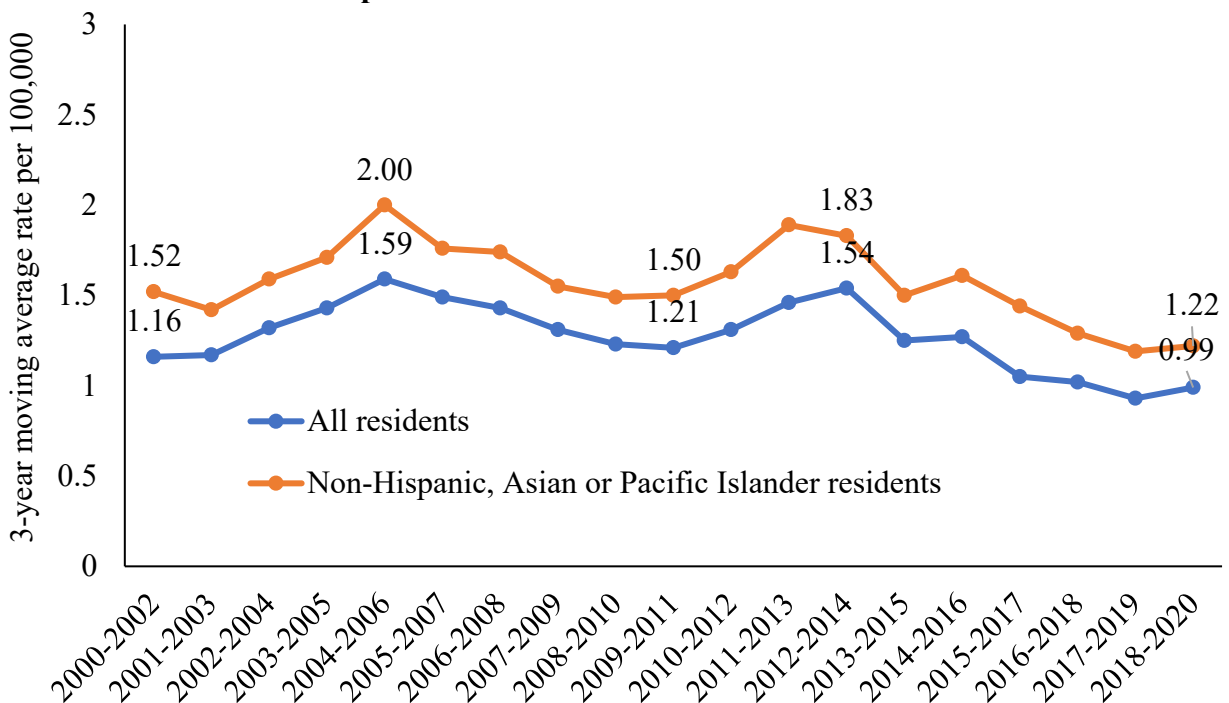


Table 5 reports three-year total number and moving average rates of hepatitis B-associated deaths among Hawai‘i residents during 2000-2020, comparing all state of Hawai‘i residents to Honolulu County residents. For most of the three-year periods, residents from Honolulu County accounted for a slightly higher percentage among hepatitis B-associated deaths (from 68.9% to 87.7%) than that of the general population (from 69.0% to 72.1%). Data for hepatitis B-associated deaths among residents from the other three counties were not reported because the total number of deaths was less than 20 for each 3-year period, and rates would be suppressed.

Table 5. Three-year total numbers and moving average rates* of deaths with hepatitis B virus infection listed as a cause of death** among residents of Hawai‘i, 2000-2020, statewide vs Honolulu County

Year	All residents			Residents from Honolulu County				
	Number	Population	Rate	Number	Population	Rate	Percent population***	Percent death***
2000-2002	44	3,677,098	1.16	38	2,649,384	1.41	72.1	86.4
2001-2003	46	3,716,715	1.17	37	2,667,539	1.33	71.8	80.4
2002-2004	54	3,764,336	1.32	41	2,692,781	1.45	71.5	75.9
2003-2005	60	3,817,452	1.43	43	2,720,489	1.46	71.3	71.7
2004-2006	68	3,876,029	1.59	48	2,753,132	1.59	71.0	70.6
2005-2007	65	3,918,135	1.49	47	2,770,470	1.54	70.7	72.3
2006-2008	63	3,957,619	1.43	49	2,785,969	1.59	70.4	77.8
2007-2009	60	3,994,605	1.31	51	2,802,192	1.63	70.1	85.0
2008-2010	57	4,039,231	1.23	50	2,830,064	1.58	70.1	87.7
2009-2011	58	4,081,828	1.21	49	2,859,991	1.50	70.1	84.5
2010-2012	64	4,127,424	1.31	53	2,893,186	1.55	70.1	82.8
2011-2013	71	4,171,177	1.46	55	2,923,408	1.60	70.1	77.5
2012-2014	76	4,215,928	1.54	57	2,951,589	1.63	70.0	75.0
2013-2015	61	4,255,218	1.25	42	2,973,931	1.21	69.9	68.9
2014-2016	64	4,279,721	1.27	46	2,983,107	1.32	69.7	71.9
2015-2017	54	4,287,698	1.05	38	2,979,969	1.09	69.5	70.4
2016-2018	55	4,276,586	1.02	43	2,961,335	1.19	69.2	78.2
2017-2019	50	4,263,901	0.93	38	2,943,293	1.02	69.0	76.0
2018-2020	53	4,243,369	0.99	40	2,918,469	1.09	68.8	75.5

Source: CDC, National Center for Health Statistics, Multiple Cause of Death 1999–2019 on CDC WONDER Online Database. Accessed on May 6, 2022 available at <http://wonder.cdc.gov/mcd-icd10.html>

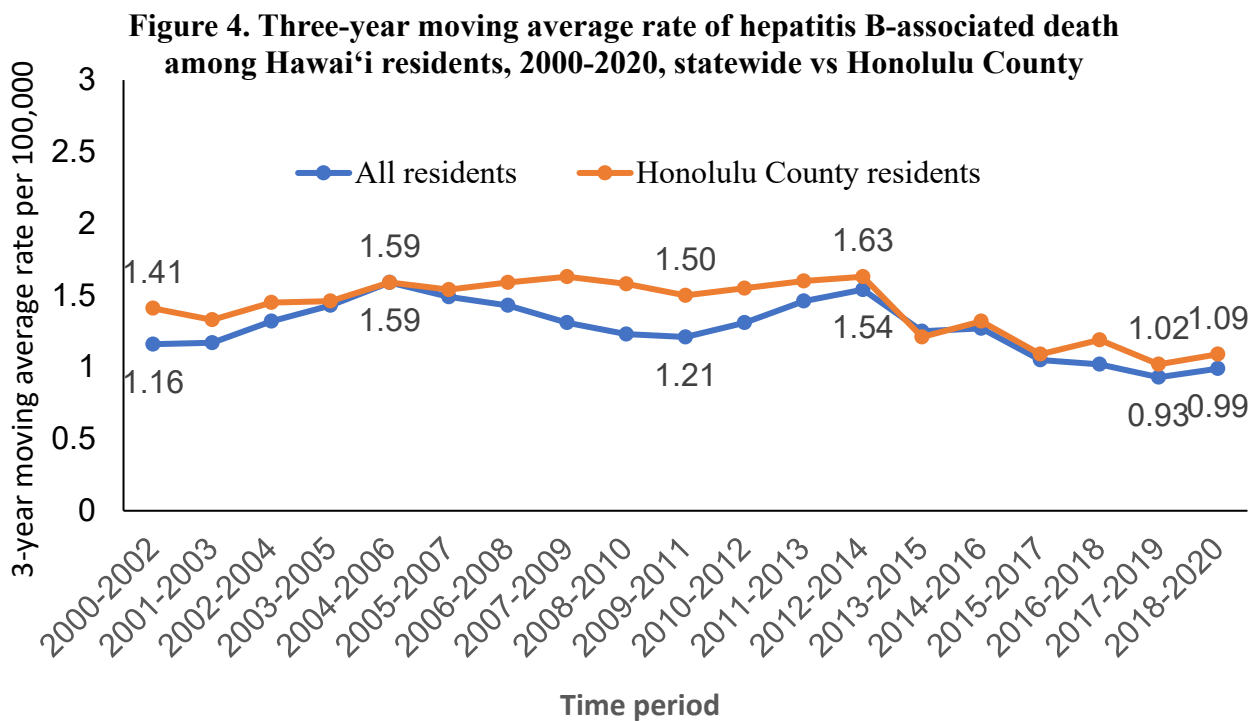
* Rates are age-adjusted per 100,000 population with US 2000 population as the standard population.

** Cause of death is defined as one of the multiple causes of death and is based on the International Classification of Diseases, 10th Rev. (ICD-10) codes B16, B17.0, B18.0, B18.1 (hepatitis B).

*** Percent from the total population for Honolulu County was calculated by dividing the population total for Honolulu County over the population total for all residents in Hawai‘i for the same 3-year period. Percent from the total death for Honolulu County was calculated by dividing the total number of deaths among residents from Honolulu County over the total number of deaths among all residents in Hawai‘i for the same 3-year period.

Figure 4 shows the rates of hepatitis B-associated death in Hawai‘i as a three-year moving average, comparing rates among residents from Honolulu County to the state average, based on data from **Table 5**. Statewide, rates of hepatitis B-associated death increased from 1.16 during 2000-2002 to 1.59 during 2004-2006, followed by a decrease until 2009-2011 to 1.21. They then increased steadily until 2012-2014 to 1.54, followed by a steady decrease until 2018-2020 at 0.99.

The trend among residents from Honolulu County followed the statewide mortality trend, but at a slightly higher rate for most three-year periods. Rates for Honolulu County residents increased from 1.41 during 2000-2002 to 1.63 during 2012-2014, followed by a decrease until 2018-2020 to 1.09. From 2012-2014 to 2018-2020, rates for Honolulu County residents were very close to the state average. During the most recent period (2018-2020), the rate was 1.09 for Honolulu County residents and 0.99 statewide.



Summary of Hepatitis B Mortality Findings

Hepatitis B Mortality Rates in Hawai‘i Are Changing

During 2000–2020, the total number of hepatitis B-associated deaths each year ranged from 13 to 28 in Hawai‘i. The age-adjusted three-year moving average rates of hepatitis B-associated deaths increased gradually from 2000-2002 (1.16) to 2012-2014 (1.54), followed by a gradual decrease to 0.99 during 2018-2020.

Disproportionately Higher Rates among Male and/or API Residents

When examined by selected population characteristics, similar trends were observed among residents who were male, API, and/or ≥ 45 years old, but at consistently higher rates during each three-year period. Overall, rates for male residents were 1.3 to 1.7 times the state average, and rates for API people were 1.2 to 1.4 times the state average. Rates for residents ≥ 45 years old were 2.2 to 2.6 times the state average. During the most recent period (2018-2020), the rate for male residents was 1.4 times the rate of the state average; the rate for API residents was 1.2 times the rate of the state average; and the rate for residents ≥ 45 years old was 2.5 times the rate of the state average.

Male residents and/or API residents are disproportionately represented in hepatitis B-associated deaths, compared to the overall population in Hawai‘i. For example, male residents accounted for half of the general population but represented 76.7% to 98.2% of all deaths. API residents accounted for 60.1% to 65.3% of the general population but represented 75% to 87% of all deaths. The disproportionately high rates among residents ≥ 45 years old are likely explained by the high correlation between increasing age and all-cause mortality.³⁶

Hawai‘i has the one of the highest hepatitis B-associated death rates nationwide. In 2019, the rate for Hawai‘i (1.17 per 100,000) was almost 3 times the national rate (0.42 per 100,000). API populations experience the highest hepatitis B-associated death rate in the nation, compared to other racial ethnic groups.³⁷ As such, disproportionately higher hepatitis B-associated death rates

³⁶National Academies of Sciences, Engineering, and Medicine, *High and Rising Mortality Rates Among Working-Age Adults* (Washington, DC: The National Academies Press, 2021), 55-94. Chapter 3 “[U.S. Trends in All-Cause Mortality Among Working-Age Adults](#)” in.

³⁷“2021 National Viral Hepatitis Progress Report,” Centers for Disease Control and Prevention, last modified June 3, 2021, <https://www.cdc.gov/hepatitis/policy/NPR/2021/NationalProgressReport-HepB-ReduceDeaths.htm>.

in Hawai'i might be partially explained by the fact that Hawai'i has a higher percentage of API people compared to the U.S. Notably, API residents accounted for 60.1% to 65.3% of the general population in Hawai'i but make up only 6.9% of the general populations in the U.S.³⁸ In 2019, at the national level, the rate of hepatitis B-associated death for API people were 2.1 per 100,000, approximately 7.5 times the rate among non-Hispanic White persons.³⁹

Decreasing Mortality Rates Indicate Progress

Although rates in Hawai'i were much higher than the national rate, there has been progress in reducing hepatitis B-associated deaths both statewide and among API people in Hawai'i. This is evident when comparing the age-adjusted hepatitis B-associated mortality rates from 2012-2014 to 2018-2020, which decreased from 1.54 to 0.99 per 100,000 statewide. To continue this progress, a 62.6% reduction from the 2018-2020 rate is needed for Hawai'i to meet the national 2025 goal of 0.37 deaths per 100,000 population. Among API people, the age-adjusted hepatitis B-associated mortality rates decreased from 1.83 per 100,000 during 2011-2013 to 1.22 per 100,000 during 2018-2020, which is below the national 2025 goal of 1.84 per 100,000 population for API people living in the US.⁴⁰

³⁸“Annual Estimates of the Resident Population by Sex, Race, and Hispanic Origin: April 1, 2010 to July 1, 2019,” U.S. Census Bureau, accessed May 18, 2022. <https://www.census.gov/data/tables/time-series/demo/popest/2010s-national-detail.html>.

³⁹“2021 National Viral Hepatitis Progress Report,” Centers for Disease Control and Prevention, last modified June 3, 2021, <https://www.cdc.gov/hepatitis/policy/NPR/2021/NationalProgressReport-HepB-ReduceDeaths.htm>.

⁴⁰“2021 National Viral Hepatitis Progress Report,” Centers for Disease Control and Prevention, last modified June 3, 2021, <https://www.cdc.gov/hepatitis/policy/NPR/2021/NationalProgressReport-HepB-ReduceDeaths.htm>.

II. Incidence of Liver and Intrahepatic Bile Duct Cancers in Hawai‘i, 1999-2019

Table 6 reports the number and age-adjusted rates of confirmed cases of liver and intrahepatic bile duct cancer during 1999-2019, comparing Hawai‘i to the U.S. For Hawai‘i, the total number of cases ranged from 103 to 218 per year, while the U.S case count ranged from 13,109 to 35,803 per year.

Table 6. Numbers and rates* of new cases of liver and intrahepatic bile duct cancer**, 1999-2019, comparing Hawai‘i to U.S.

Year	Hawai‘i			U.S.		
	Number	Population	Rate	Number	Population	Rate
1999	103	1,210,300	8.4	13,109	275,461,348	4.8
2000	103	1,213,519	8.2	14,108	278,558,214	5.1
2001	131	1,225,948	10.1	14,155	282,115,961	5
2002	117	1,239,613	8.8	15,157	284,766,512	5.3
2003	136	1,251,154	10.1	16,289	290,107,933	5.5
2004	126	1,273,569	9.1	17,613	292,805,298	5.9
2005	155	1,292,729	10.7	18,674	295,516,599	6.1
2006	145	1,309,731	10.1	19,872	298,379,912	6.3
2007	161	1,315,675	10.6	21,579	301,231,207	6.7
2008	168	1,332,213	10.7	22,995	304,093,966	6.9
2009	154	1,346,717	9.9	25,093	306,771,529	7.4
2010	187	1,364,004	11.4	25,956	309,327,143	7.4
2011	177	1,379,562	10.7	27,455	311,583,481	7.6
2012	199	1,395,199	11.6	29,473	313,877,662	8
2013	215	1,408,822	12.2	30,929	316,059,947	8.2
2014	208	1,415,335	11.5	32,969	318,386,329	8.5
2015	218	1,422,999	11.5	34,521	320,738,994	8.7
2016	210	1,428,885	11	35,296	323,071,755	8.7
2017	209	1,425,763	11	35,898	325,122,128	8.7
2018	170	1,423,102	8.9	35,803	323,807,474	8.6
2019	171	1,415,615	8.6	35,563	325,239,182	8.4

Source: CDC and National Cancer Institute, U.S. Cancer Statistics Data Visualizations Tool, based on 2021 submission data (1999-2019). Accessed on July 25, 2022 available at

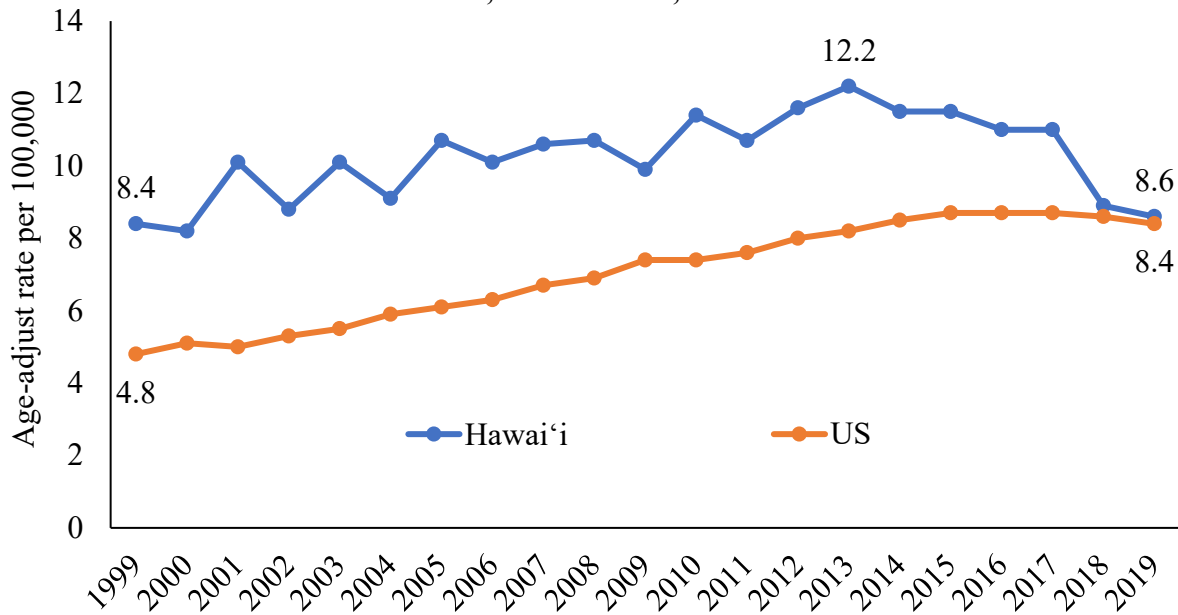
<https://gis.cdc.gov/Cancer/USCS/#/Trends/>.

* Rates are age-adjusted per 100,000 population with US 2000 population as the standard population.

** New cases of liver and intrahepatic bile duct cancer are those classified with a behavior code 3 (invasive, primary site only) based on the International Classification of Diseases for Oncology, Third Edition (ICD-O-3) within registries participating in the Centers for Disease Control and Prevention’s (CDC’s) National Program of Cancer Registries (NPCR) and the National Cancer Institute’s (NCI’s) Surveillance, Epidemiology, and End Results (SEER) Program.

Figure 5 shows the annual age-adjusted incidence rate of liver and intrahepatic bile duct cancer in the state of Hawai‘i from 1999 to 2019, compared to the national average. An increasing trend was seen from 1999 to 2013, when rates plateaued and began to decrease. In the following years, the rates gradually decreased until reaching 8.6 per 100,000 in 2019. In comparison, US incidence rates steadily increased during the same time period, and remained lower than Hawai‘i rates throughout. From 1999 to 2008, rates in Hawai‘i were 1.5 to 2 times of the national average. From 2009 to 2019, differences in the rates between Hawai‘i and US average decreased and by 2018 and 2019, rates in Hawai‘i were almost the same level as the national average.

Figure 5. Age-adjusted rates of liver and intrahepatic bile duct cancer incidence, 1999 to 2019, Hawai‘i vs U.S.



III. Liver and Intrahepatic Bile Duct Cancer-Associated Deaths in Hawai'i, 2000-2020

Table 7 shows the numbers and age-adjusted rates of deaths associated with liver and intrahepatic bile duct cancers during 2000-2020, comparing Hawai'i to the U.S. For Hawai'i, the total number of deaths increased from 100 to 193 per year, and the death count for the U.S increased substantially from 14,015 to 31,660 during the same time period.

Table 7. Numbers and rates* of deaths with liver and intrahepatic bile duct cancer listed as a cause of death** among residents, 2000-2020, comparing Hawai'i to U.S.

Year	Hawai'i			U.S.		
	Number	Population	Rate	Number	Population	Rate
2000	100	1,211,537	7.96	14,015	281,421,906	5.04
2001	100	1,225,948	7.75	14,506	284,968,955	5.12
2002	105	1,239,613	7.93	15,225	287,625,193	5.3
2003	106	1,251,154	7.86	15,842	290,107,933	5.39
2004	136	1,273,569	9.79	16,439	292,805,298	5.5
2005	128	1,292,729	8.89	17,242	295,516,599	5.64
2006	106	1,309,731	7.16	17,822	298,379,912	5.71
2007	117	1,315,675	7.65	18,476	301,231,207	5.79
2008	129	1,332,213	8.22	19,723	304,093,966	6.03
2009	119	1,346,717	7.65	20,923	306,771,529	6.24
2010	139	1,360,301	8.52	21,862	308,745,538	6.41
2011	136	1,374,810	8.19	23,297	311,591,917	6.62
2012	160	1,392,313	9.37	24,823	313,914,040	6.87
2013	153	1,404,054	9.04	25,968	316,128,839	7
2014	189	1,419,561	10.73	26,794	318,857,056	7.06
2015	169	1,431,603	9.34	28,026	321,418,820	7.22
2016	174	1,428,557	8.97	29,005	323,127,513	7.29
2017	169	1,427,538	8.59	29,790	325,719,178	7.35
2018	149	1,420,491	7.81	30,481	327,167,434	7.34
2019	169	1,415,872	8.66	30,898	328,239,523	7.31
2020	193	1,407,006	9.41	31,660	329,484,123	7.35

Source: CDC, National Center for Health Statistics, Multiple Cause of Death 1999–2019 on CDC WONDER Online Database. Accessed on July 25, 2022 available at <http://wonder.cdc.gov/mcd-icd10.html>

* Rates are age-adjusted per 100,000 population with US 2000 population as the standard population.

** Cause of death is defined as one of the multiple causes of death and is based on the International Classification of Diseases, 10th Rev. (ICD-10) codes C22.0, C22.1, C22.2, C22.3, C22.4, C22.7, and C22.9 (liver and intrahepatic bile duct cancer).

Figure 6 shows liver and intrahepatic bile duct cancer-associated mortality rates from 2000 to 2020, comparing Hawai‘i to the national average, based on values from **Table 7**. In Hawai‘i, the overall trend was an increase from 7.96 per 100,000 in 2000 to 10.73 per 100,000 in 2014, followed by a decrease to 7.81 per 100,000 in 2018. In the subsequent two years, the rates increased again to 9.41 per 100,000 in 2020. In contrast, national rates increased steadily from 5.04 per 100,000 in 2000 to 7.35 per 100,000 in 2020. Rates in Hawai‘i were consistently higher than the national average, with Hawai‘i rates 1.1 to 1.8 times the national rates. In 2020, the rate in Hawai‘i was 1.3 times the national average.

Figure 6. Age-adjusted rates of liver and intrahepatic bile duct cancer death among Hawai‘i residents, 2000-2020, Hawai‘i vs U.S.

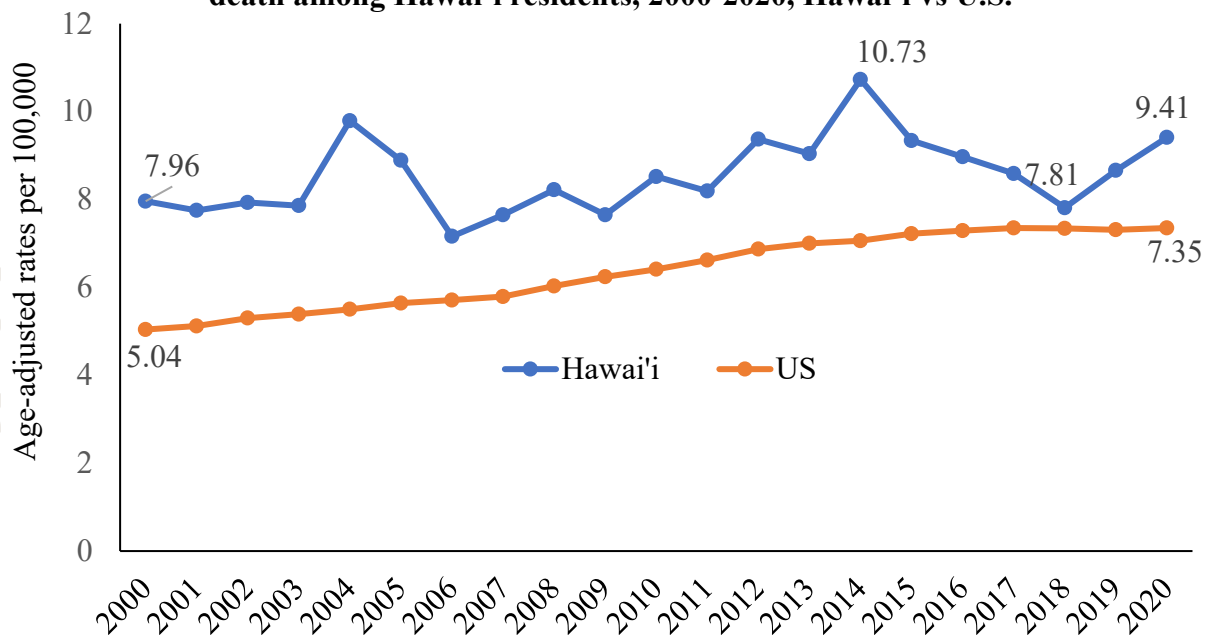


Table 8 reports the number and age-adjusted rates of deaths associated with liver and intrahepatic bile duct cancers during 2000-2020, comparing Hawai'i female and male residents to the statewide average. Although male residents accounted for about half (50.0% to 50.7%) of the general population, they accounted for a disproportionately higher percentages of all deaths associated with liver and intrahepatic bile duct cancer, ranging from 60.7% to 74.0% during the study period.

Table 8. Numbers and rates* of deaths with liver and intrahepatic bile duct cancer listed as a cause of death** among residents of Hawai'i, 2000-2020, by sex at birth

Year	Female			Male			All sexes in Hawai'i		
	Number	Population	Rate	Number	Population	Rate	Number	Population	Rate
2000	34	602,866	5.02	66	608,671	11.35	100	1,211,537	7.96
2001	33	609,189	4.67	67	616,759	11.41	100	1,225,948	7.75
2002	32	616,192	4.44	73	623,421	12.07	105	1,239,613	7.93
2003	34	623,753	4.68	72	627,401	11.51	106	1,251,154	7.86
2004	43	636,864	5.64	93	636,705	14.32	136	1,273,569	9.79
2005	49	644,813	6.13	79	647,916	12.09	128	1,292,729	8.89
2006	32	652,351	3.92	74	657,380	10.7	106	1,309,731	7.16
2007	46	657,185	5.46	71	658,490	9.92	117	1,315,675	7.65
2008	36	665,313	4.15	93	666,900	12.81	129	1,332,213	8.22
2009	38	673,075	4.44	81	673,642	11.21	119	1,346,717	7.65
2010	41	679,058	4.4	98	681,243	13.03	139	1,360,301	8.52
2011	53	685,005	5.71	83	689,805	10.65	136	1,374,810	8.19
2012	58	690,348	6.17	102	701,965	12.93	160	1,392,313	9.37
2013	42	694,440	4.48	111	709,614	14.05	153	1,404,054	9.04
2014	63	701,462	6.4	126	718,099	15.58	189	1,419,561	10.73
2015	57	706,231	5.69	112	725,372	13.44	169	1,431,603	9.34
2016	59	710,942	5.35	115	717,615	13.25	174	1,428,557	8.97
2017	44	711,451	4.12	125	716,087	13.9	169	1,427,538	8.59
2018	46	709,489	4.17	103	711,002	11.66	149	1,420,491	7.81
2019	54	707,832	5.05	115	708,040	12.96	169	1,415,872	8.66
2020	65	702,640	5.75	128	704,366	13.71	193	1,407,006	9.41

Source: CDC, National Center for Health Statistics, Multiple Cause of Death 1999–2019 on CDC WONDER Online Database. Accessed on July 25, 2022 available at <http://wonder.cdc.gov/mcd-icd10.html>

* Rates are age-adjusted per 100,000 population with US 2000 population as the standard population.

** Cause of death is defined as one of the multiple causes of death and is based on the International Classification of Diseases, 10th Rev. (ICD-10) codes C22.0, C22.1, C22.2, C22.3, C22.4, C22.7, and C22.9 (liver and intrahepatic bile duct cancer).

Figure 7 shows liver and intrahepatic bile duct cancer-associated mortality rates among female and male residents in Hawai'i between 2000 and 2020, based on data from **Table 8**. During the study period, the overall trend for both female and male residents followed a similar pattern to the state average, which increased from 2000 to 2014, followed by a decrease till 2018. Rates then increased again in the most recent two years. Rates among male residents were consistently higher than the state average, while rates among female residents were consistently lower than the state average. Rates among male residents were 1.8 to 3.4 times the rates among female residents. In 2020, the rate among male residents was 2.4 times the rate of female residents.

Figure 7. Age-adjusted rates of liver and intrahepatic bile duct cancer death among residents, 2000-2020, all vs female vs male residents

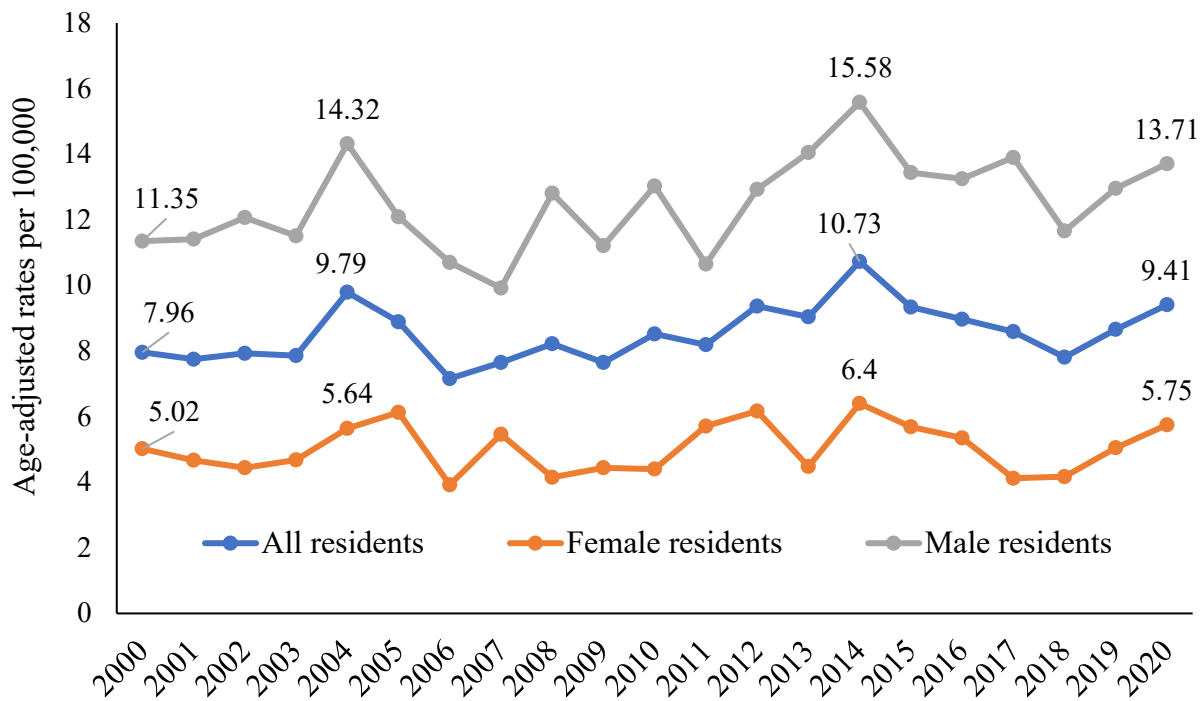


Table 9 reports the number and age-adjusted rates of deaths associated with liver and intrahepatic bile duct cancers during 2000-2020, comparing non-Hispanic Asian or Pacific Islander (API) residents to the statewide average. Although API residents made up between 64.8% to 67.4% of the population between 2000 and 2020, they accounted for disproportionately higher percentages of deaths associated with liver and intrahepatic bile duct cancer, ranging from 68.9% to 85.8% during the study period. Data for other racial/ethnic groups were not presented because the total number of deaths was less than 20 for most years, and rates would be suppressed.

Table 9. Numbers and rates* of deaths with liver and intrahepatic bile duct cancer listed as a cause of death** among residents of Hawai‘i, 2000-2020, statewide vs non-Hispanic Asian or Pacific Islander (API) residents

Year	All racial/ethnic groups			Non-Hispanic Asian or Pacific Islander				
	Number	Population	Rate	Number	Population	Rate	Percent population***	Percent death***
2000	100	1,211,537	7.96	82	816,218	9.1	67.4	82.0
2001	100	1,225,948	7.75	83	823,147	8.99	67.1	83.0
2002	105	1,239,613	7.93	86	828,889	9.16	66.9	81.9
2003	106	1,251,154	7.86	91	837,056	9.53	66.9	85.8
2004	136	1,273,569	9.79	106	852,273	10.86	66.9	77.9
2005	128	1,292,729	8.89	103	861,818	10.13	66.7	80.5
2006	106	1,309,731	7.16	73	870,882	7.13	66.5	68.9
2007	117	1,315,675	7.65	85	879,253	8.15	66.8	72.6
2008	129	1,332,213	8.22	97	889,527	8.93	66.8	75.2
2009	119	1,346,717	7.65	86	900,614	7.89	66.9	72.3
2010	139	1,360,301	8.52	101	910,638	8.97	66.9	72.7
2011	136	1,374,810	8.19	102	909,176	8.87	66.1	75.0
2012	160	1,392,313	9.37	113	917,473	9.46	65.9	70.6
2013	153	1,404,054	9.04	112	915,836	9.65	65.2	73.2
2014	189	1,419,561	10.73	146	922,982	12.13	65.0	77.2
2015	169	1,431,603	9.34	124	927,227	10.17	64.8	73.4
2016	174	1,428,557	8.97	132	942,954	9.94	66.0	75.9
2017	169	1,427,538	8.59	120	944,282	8.86	66.1	71.0
2018	149	1,420,491	7.81	113	940,001	8.67	66.2	75.8
2019	169	1,415,872	8.66	127	937,458	9.44	66.2	75.1
2020	193	1,407,006	9.41	142	934,235	10.22	66.4	73.6

Source: CDC, National Center for Health Statistics, Multiple Cause of Death 1999–2019 on CDC WONDER Online Database. Accessed on July 25, 2022 available at <http://wonder.cdc.gov/mcd-icd10.html>

* Rates are age-adjusted per 100,000 population with US 2000 population as the standard population.

** Cause of death is defined as one of the multiple causes of death and is based on the International Classification of Diseases, 10th Rev. (ICD-10) codes C22.0, C22.1, C22.2, C22.3, C22.4, C22.7, and C22.9 (liver and intrahepatic bile duct cancer).

*** Percent from the total population for API people was calculated by dividing the population total for API persons over the population total for all residents in Hawai‘i for the same year. Percent from the total death for API residents was calculated by dividing the total number of deaths among API residents over the total number of deaths among all residents in Hawai‘i for the same year.

Figure 8 shows liver and intrahepatic bile duct cancer-associated mortality rates from 2000 to 2020, comparing non-Hispanic API residents to the state average, based on data from **Table 9**. The overall trend among API residents resembled the trend for the state but at consistently higher rates, ranging from 1.01 to 1.21 times the national rates each year.

Figure 8. Age-adjusted liver and intrahepatic bile duct cancer death among residents, 2000-2020, all residents vs Asian or Pacific Islander residents

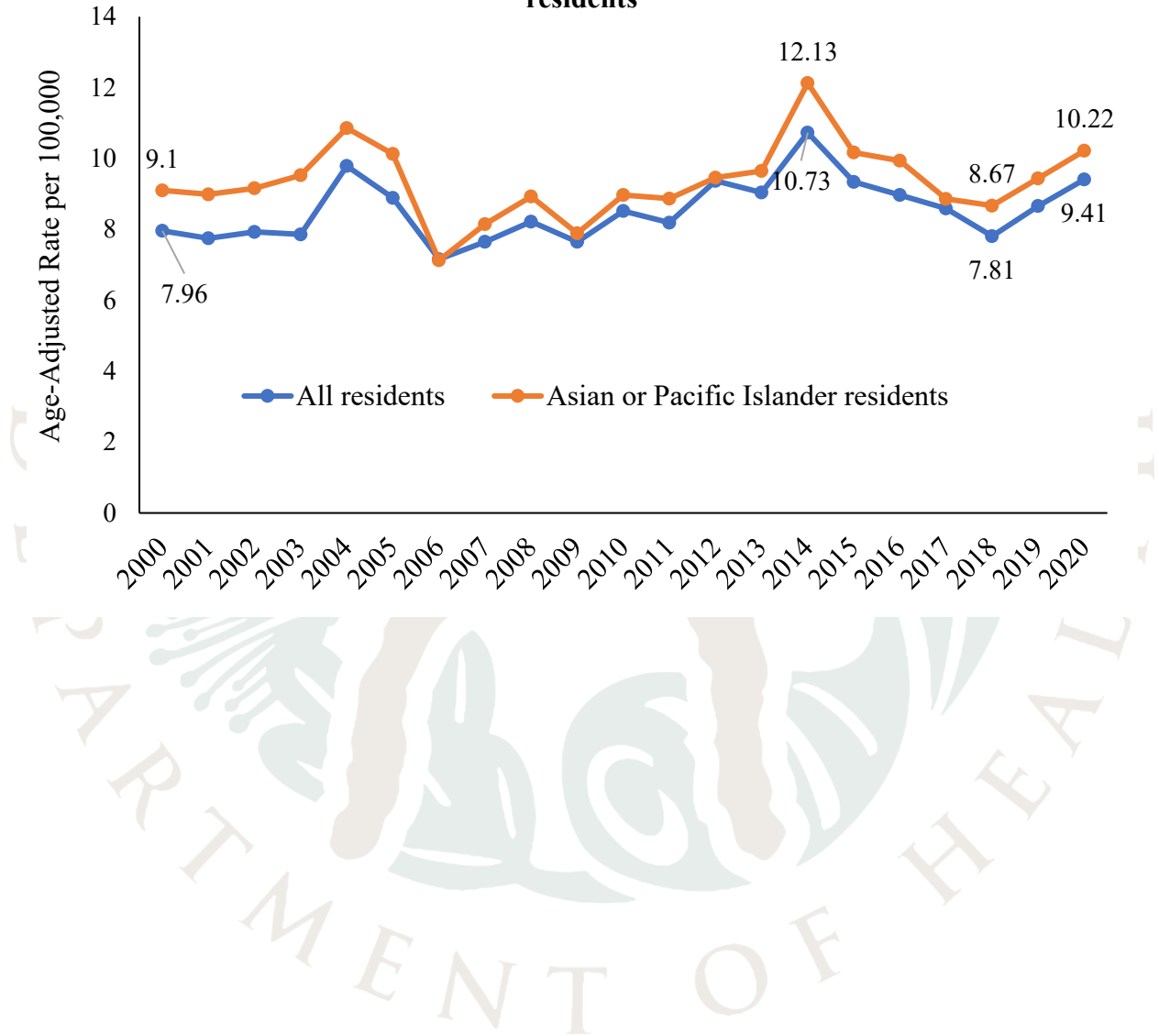


Table 10 reports the number and age-adjusted rates of deaths associated with liver and intrahepatic bile duct cancers during 2000-2020, comparing Honolulu County residents to the state average. For most years, residents from Honolulu County accounted for a slightly higher percentage among deaths associated with liver and intrahepatic bile duct cancers (from 63.8% to 79.0%) than that of the general population (from 68.5% to 72.3%). Data for all other counties were not reported because the total number of deaths was less than 20 for most years, and rates would be suppressed.

Table 10. Numbers and rates* of deaths with liver and intrahepatic bile duct cancer listed as a cause of death** among residents of Hawai‘i, 2000-2020, statewide vs Honolulu County

Year	All residents			Residents from Honolulu County				
	Number	Population	Rate	Number	Population	Rate	Percent population***	Percent death***
2000	100	1,211,537	7.96	79	876,156	8.67	72.3	79.0
2001	100	1,225,948	7.75	73	882,755	7.87	72.0	73.0
2002	105	1,239,613	7.93	75	890,473	7.92	71.8	71.4
2003	106	1,251,154	7.86	84	894,311	8.72	71.5	79.2
2004	136	1,273,569	9.79	101	907,997	10.31	71.3	74.3
2005	128	1,292,729	8.89	100	918,181	9.73	71.0	78.1
2006	106	1,309,731	7.16	78	926,954	7.52	70.8	73.6
2007	117	1,315,675	7.65	78	925,335	7.34	70.3	66.7
2008	129	1,332,213	8.22	91	933,680	8.44	70.1	70.5
2009	119	1,346,717	7.65	86	943,177	7.9	70.0	72.3
2010	139	1,360,301	8.52	92	953,207	8.05	70.1	66.2
2011	136	1,374,810	8.19	103	963,607	9.08	70.1	75.7
2012	160	1,392,313	9.37	122	976,372	10.37	70.1	76.3
2013	153	1,404,054	9.04	114	983,429	9.82	70.0	74.5
2014	189	1,419,561	10.73	132	991,788	11.04	69.9	69.8
2015	169	1,431,603	9.34	129	998,714	10.4	69.8	76.3
2016	174	1,428,557	8.97	111	992,605	8.55	69.5	63.8
2017	169	1,427,538	8.59	120	988,650	9.14	69.3	71.0
2018	149	1,420,491	7.81	107	980,080	8.49	69.0	71.8
2019	169	1,415,872	8.66	114	974,563	8.95	68.8	67.5
2020	193	1,407,006	9.41	131	963,826	9.64	68.5	67.9

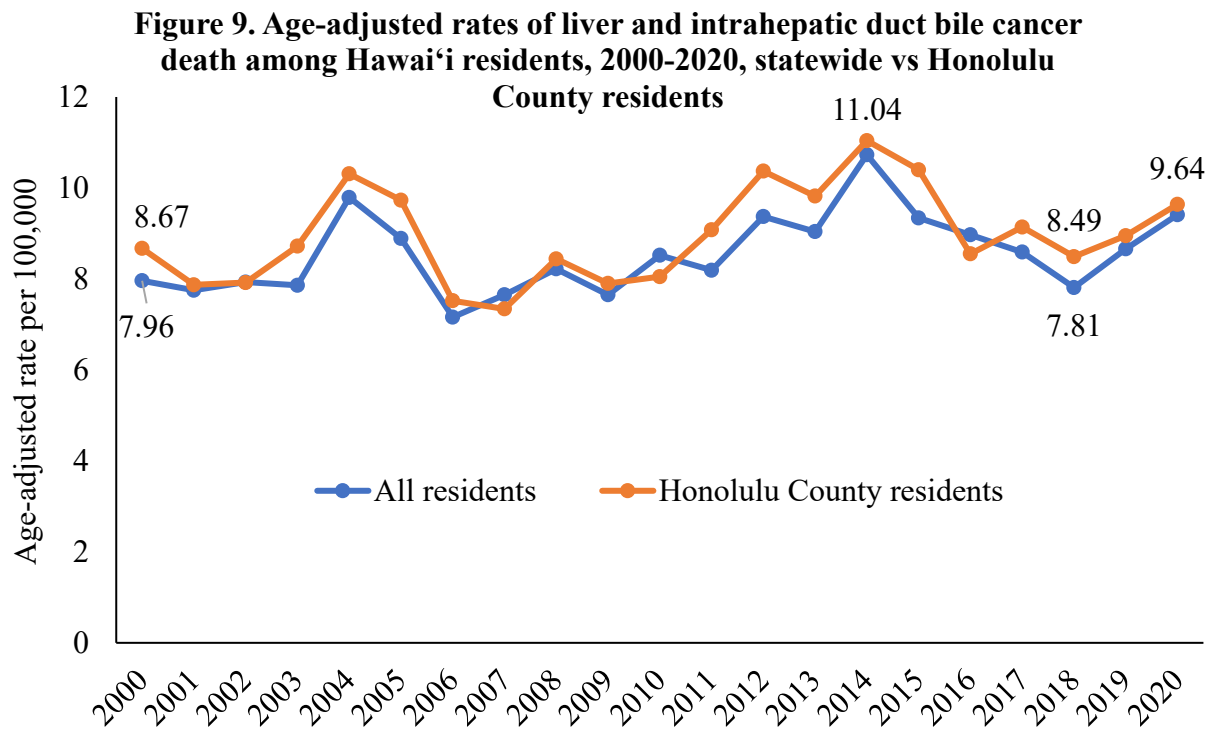
Source: CDC, National Center for Health Statistics, Multiple Cause of Death 1999–2019 on CDC WONDER Online Database. Accessed on July 25, 2022 available at <http://wonder.cdc.gov/mcd-icd10.html>

* Rates are age-adjusted per 100,000 population with US 2000 population as the standard population.

** Cause of death is defined as one of the multiple causes of death and is based on the International Classification of Diseases, 10th Rev. (ICD-10) codes C220.0, C22.1, C22.2, C22.3, C22.4, C22.7, and C22.9 (liver and intrahepatic bile duct cancer).

*** Percent from the total population for Honolulu County was calculated by dividing the population total for Honolulu County over the population total for all residents in Hawai‘i for the same year. Percent from the total death for Honolulu County was calculated by dividing the total number of deaths among residents from Honolulu County over the total number of deaths among all residents in Hawai‘i for the same year.

Figure 9 shows liver and intrahepatic bile duct cancer-associated mortality rates between 2000 and 2020, comparing Honolulu County residents to the state average, based on data from **Table 10**. The trend for residents from Honolulu County resembled the statewide trend, but at a slightly higher rate for most years. Overall, it increased from 8.67 per 100,000 in 2000 to 11.04 per 100,000 in 2014, followed by a decrease to 8.49 in 2018. It then slightly increased in the most recent two years, where rates among residents of Honolulu County were close to the state average.



DISCUSSION OF FINDINGS

Between 2000 and 2020, the total annual number of hepatitis B-associated deaths ranged from 13 to 28 in Hawai‘i. The age-adjusted three-year moving average rates of hepatitis B-associated deaths increased gradually from 2000-2002 (1.16) to 2012-2014 (1.54), followed by a gradual decrease to 0.99 during 2018-2020.

When examined by selected population characteristics, similar trends were observed among male residents, residents aged ≥ 45 years, and non-Hispanic API residents, but at consistently higher rates during each of the 3-year periods. Rates of hepatitis B-associated deaths for persons aged ≥ 45 years were 2.2 to 2.6 times the rates of the state average. Rates for male residents were 1.3 to 1.7 times the state average, while rates for non-Hispanic API residents were 1.2 to 1.4 times the rate of the statewide average. During the most recent time period (2018-2020), the rate for residents aged ≥ 45 years were 2.5 times the rate of the state average, the rate for male residents was 1.4 times the rate of the state average, and the rate for non-Hispanic API residents was 1.2 times the rate of the state average.

Such findings indicate that these groups are disproportionately represented among hepatitis B-associated deaths compared to the general population of Hawai‘i. Male persons accounted for half of the general population but represented 76.7% to 98.2% of all deaths. Similarly, non-Hispanic API residents accounted for 60.1% to 65.3% of the general population, but made up 75% to 87% of all hepatitis B-associated deaths.

Hawai‘i has the highest hepatitis B-associated death rate nationwide. In 2019, the rate for Hawai‘i (1.17 per 100,000) was almost 3 times the national rate (0.42 per 100,000). This might be partially explained by the fact that Hawai‘i has a higher percentage of non-Hispanic API residents (60.1% to 65.3%) compared to the general U.S. (6.9%), since API communities experience the highest hepatitis B-associated death rates nationally.^{41,42} In 2019, at the national

⁴¹“2021 National Viral Hepatitis Progress Report,” Centers for Disease Control and Prevention, last modified June 3, 2021, <https://www.cdc.gov/hepatitis/policy/NPR/2021/NationalProgressReport-HepB-ReduceDeaths.htm>.

⁴²“Annual Estimates of the Resident Population by Sex, Race, and Hispanic Origin: April 1, 2010 to July 1, 2019,” U.S. Census Bureau, accessed May 18, 2022. <https://www.census.gov/data/tables/time-series/demo/popest/2010s-national-detail.html>.

level, the rate of hepatitis B-associated deaths for API persons was 2.1 per 100,000, approximately 7.5 times the rate among non-Hispanic White persons.⁴³

Although rates in Hawai‘i were much higher than the national rate, there has been progress in reducing hepatitis B-associated deaths both among the general population and among non-Hispanic API residents statewide. Among non-Hispanic API residents, the age-adjusted hepatitis B-associated mortality rates decreased from 1.83 during 2012-2014 to 1.22 during 2018-2020, which is below the CDC’s Division of Viral Hepatitis 2025 Strategic Plan goal of 1.84 per 100,000 population for API persons.⁴⁴ Statewide, the age-adjusted hepatitis B-associated mortality rates decreased from 1.54 from 2012-2014 to 0.99 from 2018-2020. To continue this progress, a 62.6% reduction from the 2018-2020 rate is needed for Hawai‘i to meet the CDC’s national 2025 goal of 0.37 deaths per 100,000 population. Furthermore, to meet the Healthy People 2030 goal of 0.16 per 100,000, an 83.8% reduction from the 2018-2020 rate is needed. Recommendations for possible strategies to achieve these reductions are discussed in the next section.

Similar patterns and trends were found in deaths associated with liver and intrahepatic bile duct cancer in Hawai‘i. Age-adjusted mortality rates in Hawai‘i were 1.1 to 1.8 times of the national average. In the state of Hawai‘i, male residents and non-Hispanic API residents are disproportionately represented among liver and intrahepatic bile duct cancer-associated deaths. Rates among male residents were 1.3 to 1.6 times of the state average, while rates among non-Hispanic API residents were 1.1 to 1.2 times of the state average.

Different trends of liver and intrahepatic bile duct cancer-associated death rates were observed when comparing Hawai‘i to the national average. In Hawai‘i, rates increased from 7.96 per 100,000 in 2000 to 10.73 per 100,000 in 2014, followed by a decrease to 7.81 per 100,000 in 2018. In the subsequent two years, the rates increased again to 9.41 per 100,000 in 2020. In contrast, national rates increased steadily from 5.04 per 100,000 in 2000 to 7.35 per 100,000 in 2020. The trend of liver and intrahepatic bile duct cancer-associated death rates in Hawai‘i

⁴³“2021 National Viral Hepatitis Progress Report,” Centers for Disease Control and Prevention, last modified June 3, 2021, <https://www.cdc.gov/hepatitis/policy/NPR/2021/NationalProgressReport-HepB-ReduceDeaths.htm>.

⁴⁴“2021 National Viral Hepatitis Progress Report,” Centers for Disease Control and Prevention, last modified June 3, 2021, <https://www.cdc.gov/hepatitis/policy/NPR/2021/NationalProgressReport-HepB-ReduceDeaths.htm>.

resembled the trend of hepatitis-B associated death rates where both rates increased from 2000 to 2014, followed by a decrease from 2014 to 2020. This makes sense given the association between hepatitis B and liver cancer,⁴⁵ but it is important to note that liver cancer has multiple other causes, including hepatitis C.^{46,47} Still, the decrease in both death rates may possibly be attributed to local efforts such as: increasing HBV vaccination rates since the mid-1990s among people born outside of the United States, particularly those from moderate to high HBV prevalence countries in Asia; integrating community-based HBV screenings among at-risk populations through DOH and partners like Hep Free Hawai‘i; and promoting culturally-congruent HBV education and awareness efforts.

Finally, the increase in death rates associated with liver and intrahepatic bile duct cancer in the most recent two years (2019 and 2020) in Hawai‘i warrants further investigation. More data points are needed for us to determine whether this is a temporary change possibly due to normal variability, or it will follow the national trend of a steady increase. For this very reason, we recommend that such report to be updated every 3 to 5 years. Future studies which access individual death records could further examine the observed racial/ethnic disparities and other associations, such as the ongoing national opioid crisis and increased liver cancer-associated death.⁴⁸ For now, the HBV mortality rates for the state overall and among specific sociodemographic and geographic groups—residents who are male, API, and/or live in Honolulu County—indicate the need to deploy strategies to reduce the burden on Hawai‘i.

⁴⁵“Viral Hepatitis and Liver Cancer,” Centers for Disease Control and Prevention, March 2016, <https://www.cdc.gov/nchhstp/newsroom/docs/factsheets/viral-hep-liver-cancer.pdf>.

⁴⁶Linda L. Wong et al., “The Changing characteristics of hepatocellular cancer in Hawaii over time,” *American Journal of Surgery* 210, no. 1 (July 2015): 146-152, doi:10.1016/j.amjsurg.2014.06.036.

⁴⁷“Viral Hepatitis and Liver Cancer,” Centers for Disease Control and Prevention, March 2016, <https://www.cdc.gov/nchhstp/newsroom/docs/factsheets/viral-hep-liver-cancer.pdf>.

⁴⁸Hassan Soleimanpour et al., “Opioid Drugs in Patients with Liver Disease: A Systematic Review,” *Hepatitis Monthly* 16, no. 4 (April 2016): e32636, doi:10.5812/hepatmon.32636.

DATA LIMITATIONS

Multiple limitations were identified throughout the process of compiling this report. Currently, HDOH does not surveil nor report chronic hepatitis B (CHB), limiting understanding of the true burden in Hawai‘i. Limited state capacity for surveillance of CHB is a national issue,⁴⁹ especially since the CDC estimates that two-thirds of those living with hepatitis B are unaware of their status.⁵⁰ CHB surveillance data is needed to better understand the impact of hepatitis B and to ensure persons living with CHB are linked to timely and appropriate care and treatment. Surveillance data is also necessary to improve the ability to link HBV cases with liver cancer cases and death certificates, especially since liver cancer is associated with multiple other causes such as hepatitis C.^{51,52}

A limitation of using death certificate data to characterize hepatitis B-associated deaths is underreporting of HBV infection as a cause of death. A recent study reported that only 19% of chronic hepatitis B decedents and 40% of those dying of liver disease had hepatitis B reported on their death certificates.⁵³ The number and rate of reported hepatitis B-associated deaths may also have been affected by the early COVID-19 pandemic in 2020, with reports of reduced access and initiation of screening, care, and treatment.⁵⁴ Hence, mortality rates reported for Hawai‘i and at the national level could have substantially underestimated the mortality burden of hepatitis B.^{55,56} Notably, universal hepatitis B screening recommendations are expected to be published

⁴⁹Chari Cohen et al., “Underestimation of Chronic Hepatitis B Virus Infection in the United States of America.” *Journal of Viral Hepatitis* 15, no. 1 (January 2008): 12-13, <https://doi.org/10.1111/j.1365-2893.2007.00888.x>.

⁵⁰“Hepatitis B Questions and Answers for Health Professionals,” Centers for Disease Control and Prevention, last modified March 30, 2022, <https://www.cdc.gov/hepatitis/hbv/hbvfaq.htm#overview>.

⁵¹Linda L. Wong et al., “The Changing characteristics of hepatocellular cancer in Hawaii over time,” *American Journal of Surgery* 210, no. 1 (July 2015): 146-152, doi:10.1016/j.amjsurg.2014.06.036.

⁵²“Viral Hepatitis and Liver Cancer,” Centers for Disease Control and Prevention, March 2016, <https://www.cdc.gov/nchhstp/newsroom/docs/factsheets/viral-hep-liver-cancer.pdf>.

⁵³Danae Bixler et al., “Mortality Among Patients with Chronic Hepatitis B Infection: The Chronic Hepatitis Cohort Study (CHeCS),” *Clinical Infectious Diseases* 68, no. 6 (March 2019): 956-963, doi:10.1093/cid/ciy598.

⁵⁴Kate Moraras, “The Impact of COVID-19 on People Living with Hepatitis B,” *National Foundation for Infectious Disease* (Blog), May 20, 2021, <https://www.nfid.org/2021/05/20/the-impact-of-covid-19-on-people-living-with-hepatitis-b/>.

⁵⁵“2021 National Viral Hepatitis Progress Report,” Centers for Disease Control and Prevention, last modified June 3, 2021, <https://www.cdc.gov/hepatitis/policy/NPR/2021/NationalProgressReport-HepB-ReduceDeaths.htm>.

⁵⁶Danae Bixler et al., “Mortality Among Patients with Chronic Hepatitis B Infection: The Chronic Hepatitis Cohort Study (CHeCS),” *Clinical Infectious Diseases* 68, no. 6 (March 2019): 956-963, doi:10.1093/cid/ciy598.

by CDC in 2023, which will ideally improve provider reporting of hepatitis B as a cause of death.⁵⁷

Without access to individual death records, the authors were unable to identify other disparities and associations. Using CDC Wonder limits the depth of analysis possible for various racial and other sociodemographic groups. Conflation of Asian, Pacific Islander, and Native Hawaiian categories perpetuates health inequities by masking heterogenous effects of different health issues.⁵⁸ Only the years 2018-2020 allowed for disaggregation between Asians and Pacific Islander categories; although there was a multi-race option, Native Hawaiian could not be disaggregated from Pacific Islander categories. An additional opportunity for disaggregation would be obtaining data on the stage of liver cancer at diagnoses by race and ethnicity, which could be used to develop focused interventions for early diagnosis.

Despite data limitations, this report demonstrated the utility of using multiple complementary standalone data sources to provide estimates on the burden of HBV-related morbidity and mortality in Hawai'i. Although the Hawai'i Department of Health is currently enhancing the infrastructure for a more robust CHB surveillance program, such organizational and programmatic changes take time. This report thus provides a novel approach for Hawai'i and other jurisdictions with limited surveillance capacity.

⁵⁷“Peer Review Plan for Recommendations for Hepatitis B Screening and Testing,” Centers for Disease Control and Prevention, last modified April 6, 2022, <https://www.cdc.gov/hepatitis/policy/isireview/HepBScreeningAndTesting.htm>.

⁵⁸Steven Sasa et al., “Just Data Representation for Native Hawaiians and Pacific Islanders: A Critical Review of Systemic Indigenous Erasure in Census and Recommendations for Psychologists,” *American Journal of Community Psychology* 69, no. 3-4 (June 2022): 343-354, doi:10.1002/ajcp.12569.

RECOMMENDATIONS FOR HAWAI‘I

In alignment with Healthy People 2030 as well the statewide *Hep Free 2030* strategy (www.hepfreehawaii.org/hep-free-2030), hepatitis B prevention and treatment initiatives—especially immunizations, screening, care coordination, linkage to treatment, and provider education—should be scaled up to ameliorate the impact of hepatitis B mortality, especially for Hawai‘i residents who are male and/or of API descent. For example, the state and community partners should align activities with recent CDC recommendations on universal HBV vaccinations among all adults aged 19-59.⁵⁹ Per the CDC, additional opportunities to reduce hepatitis mortality include enhanced telemedicine infrastructure, improved coverage by insurance plans, and further research into anti-viral therapies.⁶⁰

Although there is demonstrable burden of hepatitis B on communities throughout the state, more complete data collection, analysis, and reporting is needed. Additional research should also include culturally based, qualitative modalities to enrich understanding of quantitative reports such as this one.⁶¹ Based on the report findings and in consultation with relevant hepatitis B constituents, the authors make the following recommendations for policymakers in Hawai‘i to move towards viral hepatitis elimination:

- Update report regularly every 3 to 5 years with new data from existing and novel sources as well as progress towards targets in relevant plans (e.g., Hep Free 2030, Healthy People 2030), such as:
 - Examining additional risk factors for HBV mortality, adjusting for age and other possible confounding factors;
 - Examining premature HBV mortality rates;
 - Examining vaccination completion rates among adults;
- Increase consistent and complete surveillance data collection and analysis;

⁵⁹ Mark K. Weng 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 Morbidity and Mortality Weekly Report* 71, no. 13 (April 2022): 477-483, <http://dx.doi.org/10.15585/mmwr.mm7113a1>.

⁶⁰ “Reduce Reported Rate of Hepatitis B-related Deaths by 20% or More,” Centers for Disease Control and Prevention, last modified September 1, 2022, <https://www.cdc.gov/hepatitis/policy/npr/2022/reduce-reported-hepatitis-b-deaths.htm>.

⁶¹ J. Wallace et al., “More than a Virus: A Qualitative Study of the Social Implications of Hepatitis B Infection in China,” *International Journal for Equity in Health* 16, no. 1 (August 2017): 137, doi: 10.1186/s12939-017-0637-4.

- Increase and maintain HDOH staffing and infrastructure to monitor and respond to acute and chronic HBV infections;
- Establish and maintain data-sharing among HDOH entities (e.g., Maternal Child Health Branch, Chronic Disease Branch, Office of Health Status Monitoring) to ensure coordination of care and response;
- Establish and maintain data-sharing among external entities to improve understanding of HBV related to cancer mortality (e.g., linking liver cancer cases with hepatitis B death certificates);
- Disaggregate race categories to separate Asian, Pacific Islander, and Native Hawaiian groups and subgroups to better focus public health programming;
- Encourage and support culturally congruent data collection and dissemination methods, including qualitative data reports and in-language instruments;
- Ensure dissemination of data in understandable, and in meaningful formats for awareness and action by affected communities, policymakers, and the general public.



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