

Trends and Patterns of Hepatitis B Associated Deaths in Hawai‘i, 2000 - 2020

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Introduction

Every 10 years the US Department of Health and Human Services’ (HHS) 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.¹ For Healthy People 2030, there are 3 objectives related to the hepatitis B virus (HBV):

- Reduce the rate of acute hepatitis B infections
- Increase the proportion of people who know they have chronic hepatitis B
- Reduce the rate of deaths with hepatitis B as a cause²
 - 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)³

HBV infections are a public health concern because they can lead to liver cirrhosis, fibrosis, cancer, and death.⁴ HBV infections disproportionately affect people who inject drugs, Asian and Pacific Islanders (APIs), and non-Hispanic Blacks, making these infections a health equity concern.⁵ In the US, Asian Americans account for more than 50% of HBV infection cases, even though they make up only 6% of the population. This is partly due to approximately 70% of Asian Americans identifying as immigrants born outside of the US, mostly from countries in Asia with moderate to high HBV infection prevalence. There is high prevalence among Pacific Islanders in the US as well. Additionally, some children born in the US to immigrant parents may not have received an HBV vaccine at birth.⁶ More than half of the residents in the state of Hawai‘i identified as Asian or Pacific Islander descent in the 2020 Census.⁷

A cross-sectional study of API uninsured patients born outside the US conducted at a large federally qualified health center in Honolulu found the prevalence of chronic HBV infection to be 5.7% as compared to the national hepatitis B prevalence of 4.3%.^{8,9} Incidence rates of acute HBV infection have steadily

declined over the last 10 years in Hawai‘i with a 43.2% reduction in rates between the periods of 2010-2014 (0.37 per 100 000 population) and 2015-2019 (0.21 per 100 000 population).^{10,11}

Overall, the current surveillance infrastructure limits the Hawai‘i State Department of Health’s (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 chronic HBV is a national concern because estimates from the Centers for Disease Control and Prevention (CDC) show that approximately two-thirds of those infected with HBV are unaware of their status.⁴ Notably, Hep Free 2030: The Hawai‘i Hepatitis Elimination Strategy 2020-2030¹² lists “Surveillance Infrastructure” as one of the strategic directions for eliminating viral hepatitis in Hawai‘i by 2030. As such, HDOH convened subject matter experts in epidemiology, data analytics, and viral hepatitis prevention, and linkage programming to develop a report that would identify current and historical trends in hepatitis B and liver cancer mortality in Hawai‘i. This article presents findings from the report on hepatitis B-associated deaths.

Methods

Hepatitis B-associated death data was gathered from the CDC WONDER Multiple Cause of Death 1999–2020 online database. All 50 US states and the District of Columbia provide data from death certificates filed at their vital records offices. Nonresident deaths (e.g., nonresident aliens, nationals living abroad, residents of US territories) and fetal deaths are excluded.¹³ Cause of death is defined as one of the multiple causes of death and is based on International Classification of Diseases, 10th Revision (ICD-10) codes. Hepatitis B-associated death was defined by the presence of any of the following ICD-10 codes in any of the fields of the death certificate: B16, B17.0, B18.0, B18.1.¹⁴ Rates are age-adjusted rates per 100 000 with US population 2000 as the standard population. According to CDC WONDER data suppression rules, data are suppressed if the total number of

deaths is less than 10, and rates are not reported and indicated as “unreliable rate” if the total number of deaths is less than 20 for each year.¹³

A 3-year moving average rate was calculated to minimize annual fluctuations and allow analysis for the underlying trend.¹⁵ The 3-year moving average rates were also calculated for selected patient characteristics, such as age and race, when numbers were large enough to produce reliable rates.

Results

Table 1 reports the annual number of hepatitis B-associated deaths and corresponding rates between Hawai‘i and the US from 2000 to 2020. The total number of hepatitis B-associated deaths in Hawai‘i during this time period ranged from 13 to 28. Based on the non-suppressed rates available (for approximately half of the years examined), rates in Hawai‘i were 2.4 to 3.3 times the national rate. As of 2019, the Hawai‘i hepatitis B-associated mortality rate (1.17 per 100 000) was almost 3 times the rate of the US (0.42 per 100 000).

Table 2 reports 3-year total number 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 3-year total number of deaths ranged from 44 to 76 statewide. Although persons aged ≥45 years accounted for 36.9% to 43.5% of the general population, they had a disproportionately higher percentage of hepatitis B-associated deaths, ranging from 84.1% to 95.3%. Data for hepatitis B-associated deaths among all other age groups was not reported because the total numbers of deaths were less than 20 for each of the 3-year periods, and rates were therefore suppressed.

Trends among persons aged ≥45 years followed the statewide mortality trend, but at a higher rate than the overall rates, for each of the 3-year periods (see **Figure 1**). Rates for persons aged ≥45 years were 2.2 to 2.6 times the rate of the statewide average. During the most recent time period, 2018-2020, the rate for persons aged ≥45 years were 2.5 times the rate of the statewide average.

Year	Hawai‘i			United States		
	Number of Deaths	Population	Age Adjusted Rate	Number of Deaths	Population	Age Adjusted Rate
2000	15	1 211 537	Unreliable ^d	1902	281 421 906	0.66
2001	14	1 225 948	Unreliable	1852	284 968 955	0.65
2002	15	1 239 613	Unreliable	1896	287 625 193	0.65
2003	17	1 251 154	Unreliable	1749	290 107 933	0.59
2004	22	1 273 569	1.6	1689	292 805 298	0.56
2005	21	1 292 729	1.45	1726	295 516 599	0.55
2006	25	1 309 731	1.74	1699	298 379 912	0.53
2007	19	1 315 675	Unreliable	1806	301 231 207	0.54
2008	19	1 332 213	Unreliable	1780	304 093 966	0.54
2009	22	1 346 717	1.4	1693	306 771 529	0.49
2010	16	1 360 301	Unreliable	1789	308 745 538	0.52
2011	20	1 374 810	1.22	1795	311 591 917	0.51
2012	28	1 392 313	1.68	1761	313 914 040	0.51
2013	23	1 404 054	1.49	1866	316 128 839	0.53
2014	25	1 419 561	1.47	1837	318 857 056	0.5
2015	13	1 431 603	Unreliable	1707	321 418 820	0.46
2016	26	1 428 557	1.5	1690	323 127 513	0.45
2017	15	1 427 538	Unreliable	1727	325 719 178	0.46
2018	14	1 420 491	Unreliable	1649	327 167 434	0.43
2019	21	1 415 872	1.17	1662	328 239 523	0.42
2020	18	1 407 006	Unreliable	1752	329 484 123	0.45

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

^b 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).

^c Data adapted from Centers for Disease Control and Prevention.¹³

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

Table 2. Three-Year Total Number and Moving Average Rates^a of Deaths with HBV Infection Listed as a Cause of Death^b Among Hawai'i Residents, 2000-2020, Statewide and Among Persons Aged ≥45 Years^c

Year	All residents				Persons aged ≥45 years			
	Number of Deaths	Population	Rate	Number of Deaths	Population	Rate	Percent of Population ^d	Percent of Deaths ^e
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
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	3.9	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
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
2018-2020	53	4 243 369	0.99	49	1 844 318	2.51	43.5	92.5

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

^b 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).

^c Data adapted from Centers for Disease Control and Prevention¹³

^d Percent from the total population for persons aged ≥45 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.

^e 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.

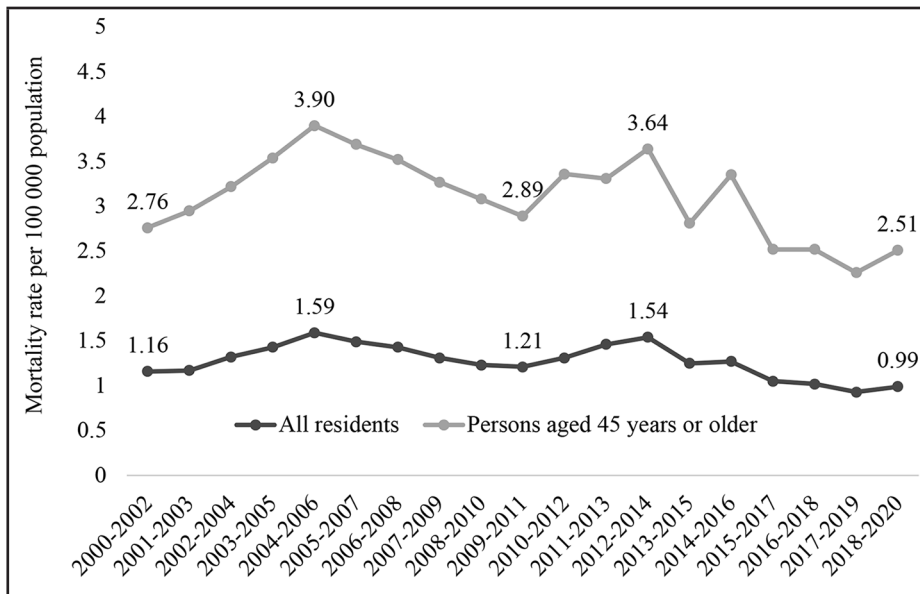


Figure 1. Three-year Moving Average Rate of Hepatitis B Associated Death among Hawai'i Residents, 2000-2020, All Residents vs Persons Aged ≥45 Years

Table 3 reports 3-year total number and moving average rates of hepatitis B-associated deaths among Hawai'i residents during 2000-2020, comparing all residents to non-Hispanic API residents. Although non-Hispanic API residents accounted for 60.1% to 65.3% of the general population, they had a disproportionately higher percentage 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 numbers of deaths were less than 20 for each of the 3-year periods, and rates were suppressed.

Trends among non-Hispanic API residents followed the statewide mortality trend, but at a higher rate for each of the 3-year periods (see **Figure 2**). Although rates have fluctuated over the last 2 decades, they appear to currently trend downward. Rates for non-Hispanic API residents were 1.2 to 1.4 times the rates of the state average. The most recent time period, 2018-2020, saw a rate for non-Hispanic API residents at 1.2 times the statewide average.

Table 3. Three-Year Total Number and Moving Average Rates ^a of Deaths with HBV Infection Listed as a Cause of Death ^b Among Hawai'i Residents, 2000-2020, Statewide and Non-Hispanic Asian or Pacific Islander (API) Residents ^c								
Year	All racial/ethnic groups			Non-Hispanic Asian or Pacific Islander				
	Number of Deaths	Population	Rate	Number of Deaths	Population	Rate	Percent of Population ^d	Percent of Deaths ^e
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	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	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	1.5	62	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	80.3
2012-2014	76	4 215 928	1.54	57	2 553 689	1.83	60.6	75
2013-2015	61	4 255 218	1.25	46	2 558 674	1.5	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
2016-2018	55	4 276 586	1.02	44	2 607 488	1.29	61	80
2017-2019	50	4 263 901	0.93	41	2 601 432	1.19	61	82
2018-2020	53	4 243 369	0.99	42	2 588 463	1.22	61	79.2

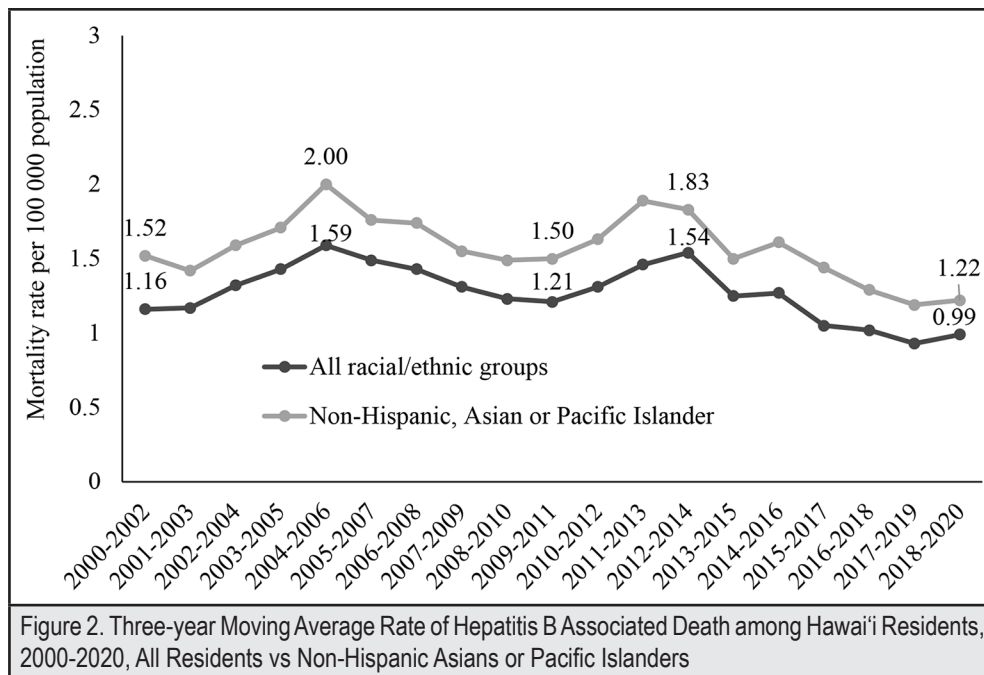
^a Rates are age-adjusted per 100 000 population with US 2000 population as the standard population.

^b 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).

^c Data adapted from Centers for Disease Control and Prevention¹³

^d Percent from the total population for non-Hispanic API residents was calculated by dividing the population for non-Hispanic API residents over the population total for all residents in Hawai'i for the same 3-year period

^e Percent from the total death for non-Hispanic API residents was calculated by dividing the total number of deaths among non-Hispanic API residents over the total number of deaths among all residents in Hawai'i for the same 3-year period.



Discussion

HBV infection is associated with premature death, elevated rates of death from all causes, and elevated rates of death from liver-associated causes, including hepatocellular carcinoma (liver cancer).¹⁶ 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 persons aged ≥ 45 years and non-Hispanic API residents, but mortality rates remained consistently higher 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, 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 persons aged ≥ 45 years were 2.5 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.

This analysis indicates that these groups are disproportionately represented among hepatitis B-associated deaths compared to the general population of Hawai'i. Persons aged ≥ 45 years accounted for less than half of the general population but made up 84.1% to 95.3% of all hepatitis B-associated 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 US (6.9%), since API communities experience the highest hepatitis B-associated death rates nationally.^{14,17} In 2019, at the national level, the rate of hepatitis B-associated deaths for API persons was 2.1, approximately 7.5 times the national rate among non-Hispanic White persons.¹⁴

A limitation of using death certificate data to characterize hepatitis B-associated deaths is underreporting of HBV infection as the underlying or contributing cause of death. A recent study reported that only 19% of chronic hepatitis B decedents and 40% of those who died of liver disease had hepatitis B reported on their death certificates.¹⁶ Hence, mortality rates reported here for Hawai'i and at the national level could have substantially underestimated the mortality burden of hepatitis B.^{14,16} In addition, 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 groups. Only the years 2018 – 2020 allowed for disaggregation between Asians and Pacific Islanders; although there was a multi-race option, Native Hawaiian could not be disaggregated from Pacific Islander categories. Finally, this report is limited to associations and cannot be used to determine causality.

Despite higher rates of hepatitis B-associated deaths in Hawai'i when compared to 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.¹⁴ Statewide, the age-adjusted hepatitis B-associated mortality rates decreased from 1.54 from 2012-2014 to 0.99 from 2018-2020. Nevertheless, to continue this progress, a 62.6% reduction from the 2018-2020 rate will be 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. Promoting screening and appropriate vaccination among all unvaccinated adults for hepatitis B should be a public health priority to achieve hepatitis B elimination in Hawai'i, in alignment with local strategies like *Hep Free 2030*.¹² In addition, enhancing surveillance infrastructure within HDOH will improve understanding of communities in need for resource allocation and targeted programming.

The complete hepatitis B and liver cancer mortality report will soon be available on the Harm Reduction Services Branch webpage at the Hawai'i State Department of Health's website (<https://health.hawaii.gov/harmreduction/>).

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