Premature Deaths and Disparities Associated with Hepatitis C:
The Hawai‘i Hepatitis C Mortality Report

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EXECUTIVE SUMMARY

Hepatitis C virus (HCV) infection is a severe illness that can lead to liver cirrhosis, cancer, and death. Despite universal screening recommendations and curative treatment, deaths associated with HCV remain a public health concern for Hawai‘i. From 2016 to 2017, Hawai‘i residents with HCV-associated deaths lived to an average age of only 63 years, 17 years less than the average life expectancy for Hawai‘i in 2018.[1,2] To better understand the impact of HCV on local communities, the Hawai‘i Department of Health (HDOH) convened subject matter experts to develop this report on HCV mortality. Below are highlights from this analysis:

Premature Mortality Associated with HCV

- Among Hawai‘i residents with hepatitis C-associated deaths, the **majority (88%) did not reach age 75 years**, which was lower than the U.S. life expectancy of 76.1 years at birth in 2021.[3]
- Among Hawai‘i residents with hepatitis C-associated deaths, **more than 40% died before the average retirement age of 65 years**.

Decreasing HCV Mortality Rates in Recent Years

- During 2017-2020, hepatitis C-associated death rates in Hawai‘i were **significantly lower than the U.S. average.**
- In 2020, hepatitis C-associated death rate for Hawai‘i was 2.63 per 100,000, **surpassing the U.S. 2025 goal** (≤3.0 per 100,000) and on track to meet the U.S. 2030 goal of ≤1.44 per 100,000.

Disparities among Male and Non-Hispanic White Residents

- From 2000-2020, hepatitis C-associated death rates for **male residents and for non-Hispanic White residents were higher** than female residents and other racial/ethnic groups.
- **Male residents** accounted for nearly **three quarters (73.4%) of HCV-associated deaths** but only 53.7% of all causes of deaths and 50.2% of the general population in Hawai‘i.
- **Non-Hispanic White residents** accounted for over half **(50.7%) of HCV-associated deaths,** but only 23.3% of all causes of deaths and 21.5% of the general population in Hawai‘i.

The authors make the following recommendations for HDOH and community partners to move towards viral hepatitis elimination, in alignment with the statewide strategy, Hep Free 2030:[4]

- Increase low-threshold HCV screening and treatment, especially for affected groups;
- Promote universal HCV reflex testing for early diagnosis and treatment;
- Minimize barriers to insurance coverage for HCV testing and treatment;
- Develop and share new reports regularly, using culturally congruent methods.

[1] Kathleen N. Ly et al., “Deaths Associated with Hepatitis C Virus Infection Among Residents in 50 States and the District of Columbia, 2016–2017,” *Clinical Infectious Diseases* 71, no. 5 (2020): 1149-1160, https://doi.org/10.1093/cid/ciz976.
[2] “Life Expectancy at Birth by State,” Centers for Disease Control and Prevention, accessed December 8, 2023, https://www.cdc.gov/nchs/pressroom/sosmap/life_expectancy/life_expectancy.htm.
[3] Jiaquan Xu et al., Mortality in the United States, 2021 (Hyattsville, MD: National Center for Health Statistics, 2022), https://www.cdc.gov/nchs/data/databriefs/db456.pdf.
[4] *Hep Free Hawai‘i, Hep Free 2030: The Hawai‘i Hepatitis Elimination Strategy 2020-2030 (Honolulu: Hep Free Hawai‘i, 2020), www.hepfreehawaii.org/hep-free-2030.*

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INTRODUCTION

In the United States, the rate of acute hepatitis C virus (HCV) cases has doubled between 2014 and 2021.[5] Over 2 million people in the U.S. are living with HCV, of which one-third are unaware of their status.[6] Chronic HCV infection can lead to serious long-term health consequences, including liver cirrhosis, liver cancer (hepatocellular carcinoma), and liver failure. Up to 20% of adults with chronic HCV will develop progressive liver fibrosis and cirrhosis, which can lead to death.[7,8]

Timely screening and curative treatment can reduce the burden of HCV and its sequelae on affected communities. All-oral direct-acting antiviral (DAA) medications for HCV offer high cure rates with short, tolerable treatment courses.[9] Curative treatment for HCV has been significantly associated with a 57% decrease in all causes of mortality among people living with HCV.[10] Despite the availability of DAAs, only 1 in 3 people living with HCV in the U.S. have received timely treatment, and the treatment rate is even lower for people insured by Medicaid.[11,12]

Aligned with the global effort to eliminate HCV by 2030, the U.S. Department of Health and Human Services has set the following priority public health objectives in Healthy People 2030:

- Reduce the rate of acute hepatitis C;
- Increase the proportion of people who no longer have hepatitis C; and
- Reduce the rate of hepatitis C-related deaths to ≤ 1.44 per 100,000 population[13]

These targets are complemented by the 2025 Strategic Plan for the Division of Viral Hepatitis within the U.S. Centers for Disease Control and Prevention (CDC), which aims to reduce the rate of hepatitis C-related deaths to ≤ 3.00 per 100,000 population by 2025.[14]

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[5] "Hepatitis C Surveillance 2021," Centers for Disease Control and Prevention, last modified August 7, 2023, https://www.cdc.gov/hepatitis/statistics/2021surveillance/hepatitis-c.htm.
[6] Karon C Lewis et al., "Estimated Prevalence and Awareness of Hepatitis C Virus Infection Among US Adults: National Health and Nutrition Examination Survey, January 2017–March 2020," *Clinical Infectious Diseases* 77, no. 10 (2023): 1413–1415, https://doi.org/10.1093/cid/ciad411.
[7] "Screen All Patients for Hepatitis C," Centers for Disease Control and Prevention, last modified June 14, 2021, https://www.cdc.gov/knowmorehepatitis/hcp/Screen-All-Patients-For-HepC.htm.
[8] Sarah Schillie et al., "CDC Recommendations for Hepatitis C Screening Among Adults — United States, 2020," *MMWR Recommendations and Reports* 69, no. 2 (2020): 1–17, DOI: http://dx.doi.org/10.15585/mmwr.rr6902a1.
[9] Oluwaseun Falade-Nwulia et al., "Oral Direct-Acting Agent Therapy for Hepatitis C Virus Infection: A Systematic Review," *Annals of Internal Medicine* 166, no. 9 (2017): 637-648, DOI: 10.7326/M16-2575.
[10] Eiichi Ogawa et al., "Association of Direct-Acting Antiviral Therapy with Liver and Non-liver Complications and Long-term Mortality in Patients with Chronic Hepatitis C," *JAMA Internal Medicine* 183, no. 2 (2023): 97-105, doi:10.1001/jamainternmed.2022.5699.
[11] Carolyn Wester et al., "Hepatitis C Virus Clearance Cascade – United States, 2013–2022," *MMWR Morbidity and Mortality Weekly Report* 72, no. 26 (2023): 716–720, DOI: http://dx.doi.org/10.15585/mmwr.mm7226a3.
[12] William W. Thompson et al., "Vital Signs: Hepatitis C Treatment Among Insured Adults — United States, 2019–2020," *MMWR Morbidity and Mortality Weekly Report* 71, no. 32 (2022): 1011-1017, DOI: http://dx.doi.org/10.15585/mmwr.mm7132e1.
[13] "Reduce the rate of deaths with hepatitis C as a cause — IID-16," U.S. Department of Health and Human Services, accessed August 8, 2023, https://health.gov/healthypeople/objectives-and-data/browse-objectives/infectious-disease/reduce-rate-deaths-hepatitis-c-cause-iid-16.
[14] Centers for Disease Control and Prevention, Division of Viral Hepatitis 2025 Strategic Plan (Atlanta: Centers for Disease Control and Prevention, 2020), https://www.cdc.gov/hepatitis/pdfs/DVH-StrategicPlan2020-2025.pdf.

Despite universal screening recommendations and curative treatment, deaths associated with HCV remain a public health concern for Hawai‘i. From 2016-2017, Hawai‘i residents with HCV-associated deaths lived to an average age of only 63 years, 17 years less than the 2018 average life expectancy for Hawai‘i.[15,16] Viral hepatitis accounts for more than 75% of all liver cancer cases in Hawai‘i, and HCV infection is a leading risk factor for liver cancer in Hawai‘i.[17] Notably, persons living with HBV or HCV have similar or significantly higher risk, respectively, of developing cancer compared with an active smoker.[18] According to the Hawai‘i State Department of Health (HDOH), annual liver cancer death rates in Hawai‘i were higher than the national average from 2000 to 2020, with the statewide rate (9.41 per 100,000) at 1.3 times the U.S. rate (7.35 per 100,000) in 2020.[19] Non-Hispanic Asian and Pacific Islander (API) residents were disproportionately represented, with rates among API residents at 1.1 to 1.2 times the state average during 2000-2020.[19]

Due to insufficient surveillance infrastructure for viral hepatitis, HDOH has been unable to track and report HCV prevalence and incidence for the past ten years, with the exception of 2019 (0.5 per 100,000).[20] Nationwide, the lack of epidemiologic data poses a significant public health challenge for resource allocation and program development.[21] In *Hep Free 2030: The Hawai‘i Hepatitis Elimination Strategy 2020-2030,* “Surveillance Infrastructure” is identified as one of the strategic directions necessary for eliminating viral hepatitis in Hawai‘i by 2030.[22]

As of publication of this report, HDOH had started building surveillance infrastructure for improved monitoring and future explication of the findings in this report. In the meantime, HDOH convened subject matter experts in epidemiology, data analytics, and viral hepatitis public health programming to apply available data resources to estimate the burden of HCV in Hawai‘i, starting with the use of Multiple Cause of Death data available through CDC

[15] Kathleen N. Ly et al., “Deaths Associated with Hepatitis C Virus Infection Among Residents in 50 States and the District of Columbia, 2016–2017,” *Clinical Infectious Diseases* 71, no. 5 (2020): 1149-1160, https://doi.org/10.1093/cid/ciz976.
[16] “Life Expectancy at Birth by State,” Centers for Disease Control and Prevention, accessed December 8, 2023, https://www.cdc.gov/nchs/pressroom/sosmap/life_expectancy/life_expectancy.htm.
[17] Linda L. Wong et al., “The Changing Characteristics of Hepatocellular Cancer in Hawaii Over Time,” *American Journal of Surgery* 210, no. 1 (2015): 146-152, DOI: 10.1016/j.amjsurg.2014.06.036.
[18] H. Razavi et al., “Risk of Developing Cancer – Comparison of HBV, HCV, and Smoking” (paper presented at European Association for the Study of the Liver, Vienna, Austria, June 2023), https://www.natap.org/2023/EASL/EASL_109.htm.
[19] Fenfang Li et al., *Hawai‘i Hepatitis B and Liver Cancer Incidence and Mortality Report* (Honolulu: Hawai‘i State Department of Health, 2023), https://www.hawaiihealthmatters.org/content/sites/hawaii/Hawaii-Hep-B-and-Liver-Cancer-Mortality-Report-FINAL-1-31-2023.pdf.
[20] “https://www.cdc.gov/hepatitis/statistics/2021surveillance/hepatitis-c/table-3.1.htm” Centers for Disease Control and Prevention, last modified August 7, 2023, https://www.cdc.gov/hepatitis/statistics/2021surveillance/hepatitis-c/table-3.1.htm.
[21] HepVu, *2022 Viral Hepatitis Surveillance Status Report* (Atlanta: Emory University, 2023), https://hepvu.org/wp-content/uploads/2023/11/04-HepVu-Infographic-Viral_Report-3-FINAL-10.31.23-1.pdf.
[22] Hep Free Hawai‘i, *Hep Free 2030: The Hawai‘i Hepatitis Elimination Strategy 2020-2030* (Honolulu: Hep Free Hawai‘i, 2020), www.hepfreehawaii.org/hep-free-2030.

WONDER online databases. This report presents current and historical trends for HCV related mortality by sex, age and ethnicity to help inform programmatic and policy recommendations towards viral hepatitis elimination in Hawai‘i.

DATA SOURCES AND METHODS

Data Sources

Hepatitis C-associated death data for Hawai‘i was retrieved from the CDC WONDER Multiple Cause of Death 1999–2020[23] and 2018-2021 online databases.[24] The findings of this report will be presented with the most recent data (2018-2021) first. CDC WONDER databases compile information from all death certificates filed in the vital records offices of the fifty states and the District of Columbia. 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.[25] A hepatitis C-associated death was defined by the presence of the International Classification of Diseases, 10th Rev. (ICD-10) cause of death codes B17.1 and B18.2, for acute and chronic hepatitis C, respectively, listed as either an underlying or a contributing cause of death.[26] These are the same codes used by the CDC for its annual hepatitis C surveillance reports.[27]

Rates and Trends

Rates were adjusted to the age distribution of the 2000 U.S. standard population and expressed as per 100,000 population. Per CDC WONDER data confidentiality rules, sub-national data of both the total number and rates are suppressed if the total number of deaths is 1-9 in a year. The total number of deaths are reported, but rates are not reported and instead indicated as “unreliable rate” if the total number of deaths is 10-19 in a year.[28,29] For visualization purposes in presenting the trends over the last two decades, values of the crude rates were used to construct figures but were labeled as “UR” for “unreliable rate” for data points where the total number of deaths is 10-19 in a year.

Premature Mortality

In 2021, life expectancy at birth for the total U.S. population was 76.4 years.[30] To examine premature deaths associated with HCV infection, age distribution was analyzed by four groups

[23] “CDC WONDER Multiple Cause of Death 1999–2020,” Centers for Disease Control and Prevention, accessed April 7, 2023, http://wonder.cdc.gov/mcd-icd10.html.
[24] “CDC WONDER Multiple Cause of Death 2018–2021, Single Race,” Centers for Disease Control and Prevention, accessed April 7, 2023, https://wonder.cdc.gov/mcd-icd10-expanded.html.
[25] CDC WONDER Multiple Cause of Death 2018–2021, Single Race,” Centers for Disease Control and Prevention, accessed April 7, 2023, https://wonder.cdc.gov/mcd-icd10-expanded.html.
[26] “International Statistical Classification of Diseases and Related Health Problems (ICD),” World Health Organization, accessed August 8, 2023, https://www.who.int/classifications/classification-of-diseases.
[27] “Numbers and Rates of Deaths with Hepatitis C listed As a Cause of Death among Residents, by State or Jurisdiction — United States, 2018–2022,” Centers for Disease Control and Prevention, accessed June 5, 2024, https://www.cdc.gov/hepatitis/statistics/2022surveillance/hepatitis-c/table-3.7.htm.
[28] “Multiple Cause of Death 1999–2020,” Centers for Disease Control and Prevention, accessed April 7, 2023, https://wonder.cdc.gov/wonder/help/mcd.html.
[29] “Multiple Cause of Death by Single Race 2018–2021,” Centers for Disease Control and Prevention, accessed April 7, 2023, https://wonder.cdc.gov/wonder/help/mcd-expanded.html.
[30] Jiaquan Xu et al., *Mortality in the United States, 2021* (Hyattsville, MD: National Center for Health Statistics, 2022), https://www.cdc.gov/nchs/data/databriefs/db456.pdf.

(ages <55 years, 55-64 years, 65-74 years, and 75 years or older) among all causes of death and hepatitis C-associated deaths for the most recently available four years, using CDC WONDER online database 2018-2021.[31]

Race and Ethnicity

For race, the 1999-2020 dataset includes the following four categories: American Indian or Alaska Native (AIAN), Asian or Pacific Islander (API), Black or African American, and White.[32] The 2018-2021 dataset includes the following 6 categories: AIAN, Asian, Black or African American, Native Hawaiian or Other Pacific Islander (NHOPI), White, and More than one race.[33] As a result, trend data for race/ethnicity were examined by each dataset separately: dataset 1999-2020 for trend data of 2000-2020 and dataset 2018-2021 for trend data of 2018-2021.

To identify disparities in HCV-associated mortality, the distribution of race/ethnicity was examined among all causes of death and hepatitis C-associated deaths for the most recent four years using CDC WONDER online dataset 2018-2021.[34]

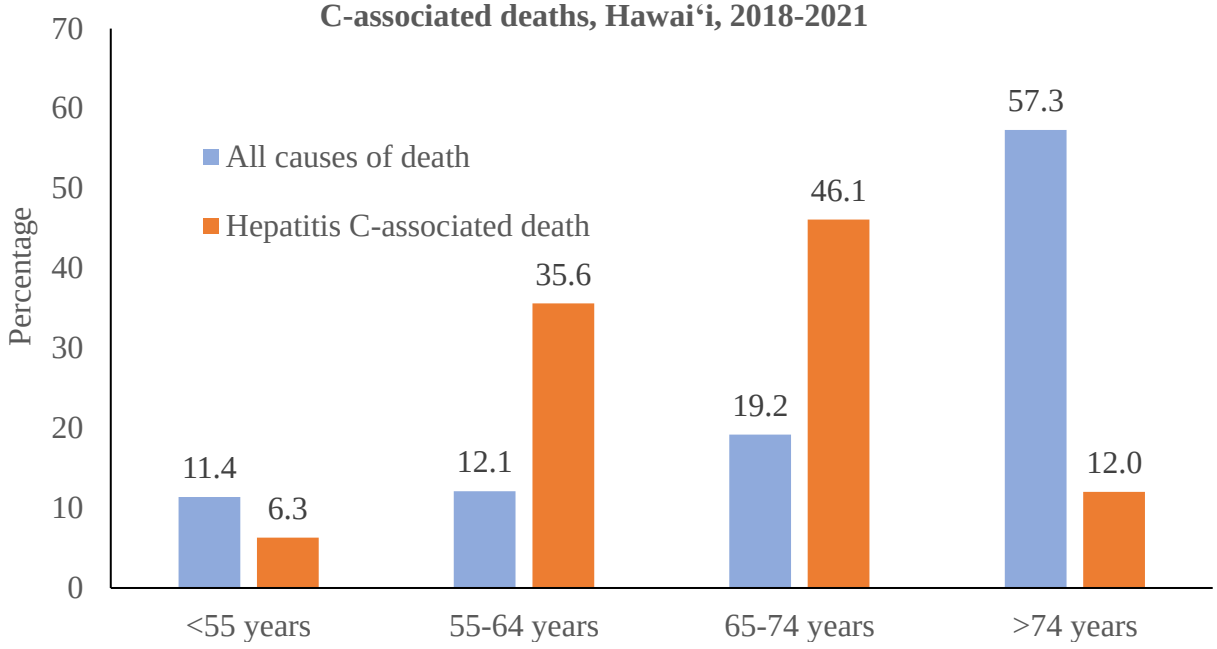
[31] "CDC WONDER Multiple Cause of Death 2018–2021, Single Race," Centers for Disease Control and Prevention, accessed April 7, 2023, https://wonder.cdc.gov/mcd-icd10-expanded.html.
[32] "Multiple Cause of Death 1999–2020," Centers for Disease Control and Prevention, accessed April 7, 2023, https://wonder.cdc.gov/wonder/help/mcd.html.
[33] "Multiple Cause of Death by Single Race 2018–2021," Centers for Disease Control and Prevention, accessed April 7, 2023, https://wonder.cdc.gov/wonder/help/mcd-expanded.html.
[34] "CDC WONDER Multiple Cause of Death 2018–2021, Single Race," Centers for Disease Control and Prevention, accessed April 7, 2023, https://wonder.cdc.gov/mcd-icd10-expanded.html.

REPORT FINDINGS: RECENT TRENDS (2018-2021)

FINDING 1: Premature Deaths Associated with HCV in Hawai‘i

Figure 1 shows premature death associated with hepatitis C infection. Persons aged 55-74 years accounted for less than a third of all causes of death but accounted for 81.7% of hepatitis C-associated deaths. In contrast, persons aged 75 years or over accounted for 57.3% of all causes of deaths but only 12.0% of hepatitis C-associated deaths. In other words, among persons who died of hepatitis C-associated deaths, 88% did not reach age 75, which was lower than the U.S. life expectancy at birth in 2021 of 76.4 years.[35]

Figure 1. Distribution of age among all causes of death and Hepatitis C-associated deaths, Hawai‘i, 2018-2021



[35] “Life Expectancy at Birth by State,” Centers for Disease Control and Prevention, accessed December 8, 2023, https://www.cdc.gov/nchs/pressroom/sosmap/life_expectancy/life_expectancy.htm.

FINDING 2: Racial Disparities in HCV-associated Mortality in Hawai‘i

Across different races/ethnicities from 2018-2021, non-Hispanic White residents had a disproportionately higher percentage of HCV-associated deaths (45.5%) compared to their proportion among all causes of death (23.2%), or among the general population (21.5%) (**Table 1**). In contrast, Asian residents accounted for 14.7% of HCV-associated deaths but 45.9% of all causes of death and 36.1% of the general population. For both Hispanic residents and persons of multiple races, their proportions among HCV-associated deaths (6.8% and 18.8%, respectively) were slightly higher than their proportions among all causes of death (5.2% and 16.1%, respectively) but slightly lower than their proportions among the general populations (10.2% and 20.0%, respectively). Data for HCV-associated deaths among American Indian or Alaska Native, Black or African American, or Native Hawaiian and Pacific Islander residents were suppressed because the total number of deaths was between 1 and 9 during 2018-2021.

Table 1. Cumulative number and percentage of residents in the general population compared to all causes of death and hepatitis C-associated deaths, 2018-2021 combined, Hawaii*

Race/ethnicity	Total number			Percentage		
	General Population	All causes of death	HCV-associated** death	General population	All causes of death	HCV-associated death
State total***	5,684,922	47,823	191	100	100	100
Hispanic, all races	616,298	2,497	13	10.8	5.2	6.8
American Indian or Alaska Native	12,084	68	DS (<10)****	0.2	0.1	DS (<10)****
Asian	2,050,877	21,929	28	36.1	45.9	14.7
Black/African American	110,755	388	DS (<10)****	1.9	0.8	DS (<10)****
Native Hawaiian or Pacific Islander	543,160	3,484	DS (<10)****	9.6	7.3	DS (<10)****
White	1,224,867	11,089	87	21.5	23.2	45.5
More than one race	1,126,881	7,683	36	20	16	18.80

* CDC WONDER Multiple Cause of Death online datasets 2018-2021. Accessed on April 7, 2023. Available at https://wonder.cdc.gov/wonder/help/mcd-expanded.html.

** 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 B17.1 and B18.2 (hepatitis C).

*** State total included persons regarding whom Hispanic origin is not stated on the death certificate.

**** DS: data suppressed.

Table 2 presents trend data of the total number and age-adjusted rates of hepatitis C-associated deaths during 2018-2021, comparing all residents in Hawaii to non-Hispanic White residents, using CDC Wonder online dataset 2018-2021. The 2021 rate for non-Hispanic White residents was 3.2, down from the rate of 4.2 in 2020. This rate is close to the national 2025 goal of ≤3.0 per 100,000 population, but still exceeds the national 2030 goal of ≤1.44 per 100,000. Data for all other racial/ethnic groups were not reported because the total number of deaths was between 1 and 19, and rates were either indicated as unreliable or suppressed for all years.

Table 2. Total numbers and rates* of deaths with hepatitis C virus infection listed as a cause of death** among residents of Hawai‘i, 2018-2021, comparing all residents to non-Hispanic White residents

	All residents			Non-Hispanic White residents				
Year	Number	Population	Rate	Number	Population	Rate	Percent population	Percent death
2018	49	1,420,491	2.42	25	309,043	4.7	21.8	51.0
2019	45	1,415,872	2.38	19	306,622	Unreliable	21.7	42.2
2020	55	1,407,006	2.63	23	301,007	4.2	30.1	60.0
2021	42	1,441,553	1.85	20	308,195	3.2	21.4	47.6

Source: CDC WONDER Multiple Cause of Death Online datasets 2018-2021. Accessed on April 7, 2023. Available at https://wonder.cdc.gov/wonder/help/mcd-expanded.html.

* Rates are age-adjusted per 100,000 population with U.S. 2000 population as the standard population. Rates are indicated as unreliable when death counts were 10 to 19 in that year (1, 2).

** 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 B17.1 and B18.2 for hepatitis C infection.

REPORT FINDINGS: HISTORICAL TRENDS (2000-2020)

FINDING 3: Lower HCV Mortality Rates in Hawai‘i in Recent Years

The rates and trends of HCV-associated deaths during 2000-2020 are presented in **Table 3** and **Figure 2**, comparing Hawai‘i to the U.S. The total number of deaths in Hawai‘i increased steadily from 2000 (n=23) to 2008 (n=94), followed by fluctuations up to 2014 (n=87) and a steady decrease by 2020 (n=55). For the nation, the total number increased steadily from 2000 (n=8,920) to 2015 (n=19,566), followed by a steady decrease till 2020 (n=14,863).

Table 3. Numbers and rates* of deaths with hepatitis C virus infection listed as a cause of death among residents, 2000-2020, comparing Hawai‘i to the United States**

	Hawai‘i			United States		
Year	Number	Age-adjusted rate	95% confidence interval of rate	Number	Age-adjusted rate	95% confidence interval of rate
2000	23	1.86	1.18 – 2.78	8920	3.2	3.13 – 3.26
2001	39	3.03	2.15 – 4.14	9,820	3.43	3.36 – 3.49
2002	30	2.27	1.53 – 3.23	10,819	3.71	3.64 – 3.78
2003	48	3.49	2.57 – 4.62	11,016	3.69	3.62 – 3.76
2004	48	3.42	2.52 – 4.53	11,268	3.69	3.63 – 3.76
2005	58	3.95	3.0 – 5.11	11,806	3.79	3.72 – 3.85
2006	73	4.96	3.88 – 6.25	13,910	4.33	4.26 – 4.44
2007	85	5.56	4.43 – 6.90	15,053	4.55	4.48 – 4.63
2008	94	5.91	4.76 – 7.24	15,708	4.63	4.56 – 4.71
2009	64	3.87	2.97 – 4.97	16,209	4.66	4.59 – 4.73
2010	70	4.29	3.32 – 5.44	16,601	4.64	4.57 – 4.71
2011	82	4.91	3.89 – 6.12	17,688	4.82	4.74 – 4.89
2012	68	3.80	29.4 – 4.83	18,600	4.94	4.87 – 5.01
2013	67	3.78	2.91 – 4.82	19,319	5.03	4.95 – 5.10
2014	87	4.99	3.97 – 6.18	19,613	5.01	4.93 – 5.08
2015	68	3.70	2.86 – 4.72	19,566	4.91	4.84 – 4.98
2016	70	3.75	2.90 – 4.79	18,093	4.42	4.36 – 4.49
2017	67	3.48	2.68 – 4.44	17,253	4.13	4.07 – 4.20
2018	49	2.42	1.78 – 3.22	15,713	3.72	3.66 – 3.78
2019	45	2.38	1.72 – 3.22	14,242	3.33	3.28 – 3.39
2020	55	2.63	1.97 – 3.44	14,863	3.45	3.39 – 3.50

Source: CDC WONDER Multiple Cause of Death online dataset 1999–2020. Accessed on April 7, 2023. Available at http://wonder.cdc.gov/mcd-icd10.html and https://wonder.cdc.gov/wonder/help/mcd-expanded.html.

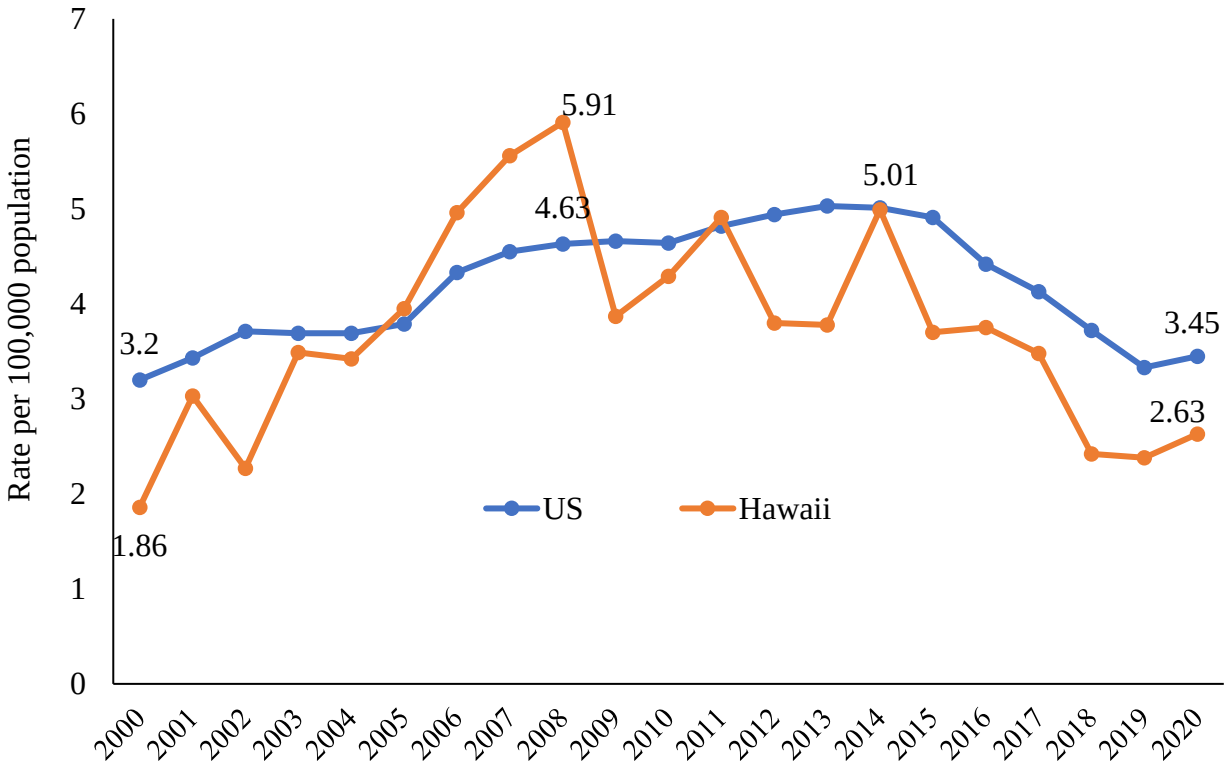
* Rates are age-adjusted per 100,000 population with U.S. 2000 population as the standard population.

** 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 B17.1 and B18.2 for hepatitis C infection.

As shown in **Figure 2**, there was a four-fold increase in HCV-related mortality rates in Hawai‘i from 2000 to 2008, peaking at 5.91 per 100,000 population. This was followed by fluctuations up to 2014 and a steady decrease by 2020 to 2.63 per 100,000 population.

Hepatitis C-associated mortality rates in Hawai‘i are generally lower than the U.S. average. After temporarily exceeding national levels in a three-year period from 2005 to 2008, Hawai‘i rates remained lower than the U.S. rate from 2012-2020. During the most recent 4-year period (2017-2020), rates in Hawai‘i were significantly lower than the U.S. average. In 2020, the rate for Hawai‘i was 2.63, already surpassing the national 2025 goal of ≤3.0 and on track to meet the national 2030 goal of ≤1.44. However, HCV-associated mortality disparately affects different populations in Hawai‘i, as discussed later in the report.

Figure 2. Age-adjusted rates of hepatitis C-associated death, 2000 to 2020, comparing Hawai‘i to the United States



FINDING 4: Higher HCV Mortality Rates among Male Residents in Hawai‘i

HCV-associated mortality was concentrated among male residents. Male residents accounted for about half (50.2%) of the general population during the past two decades, yet they accounted for nearly three quarters (73.4%) of all HCV-associated deaths **(Table 4).** Data for female residents were not reported because the total number was between 1 and 19, and rates were indicated as unreliable or suppressed for most of the years. Data for nonbinary residents were not available.

Table 4. Total numbers and rates * of deaths with hepatitis C virus infection listed as a cause of death** among residents of Hawai‘i, 2000-2020, comparing all residents to male residents

	All residents			Male residents				
Year	Number	Population	Rate	Number	Population	Rate	Percent population	Percent death
2000	23	1,211,537	1.86	16	608,671	Unreliable	50.2	69.6
2001	39	1,225,948	3.03	27	616,759	4.29	50.3	69.2
2002	30	1,239,613	2.27	19	623,421	Unreliable	50.3	63.3
2003	48	1,251,154	3.49	33	627,401	4.96	50.1	68.8
2004	48	1,273,569	3.42	35	636,705	5.02	50.0	72.9
2005	58	1,292,729	3.95	42	647,916	5.87	50.1	72.4
2006	73	1,309,731	4.96	54	657,380	7.46	50.2	74.0
2007	85	1,315,675	5.56	61	658,490	7.98	50.0	71.8
2008	94	1,332,213	5.91	73	666,900	9.19	50.1	77.7
2009	64	1,346,717	3.87	52	673,642	6.28	50.0	81.3
2010	70	1,360,301	4.29	47	681,243	5.82	50.1	67.1
2011	82	1,374,810	4.91	60	689,805	7.32	50.2	73.2
2012	68	1,392,313	3.8	52	701,965	6.00	50.4	76.5
2013	67	1,404,054	3.78	54	709,614	6.06	50.5	80.6
2014	87	1,419,561	4.99	61	718,099	7.14	50.6	70.1
2015	68	1,431,603	3.7	51	725,372	5.55	50.7	75.0
2016	70	1,428,557	3.75	53	717,615	5.64	50.2	75.7
2017	67	1,427,538	3.48	47	716,087	4.96	50.2	70.1
2018	49	1,420,491	2.42	38	711,002	3.94	50.1	77.6
2019	45	1,415,872	2.38	38	708,040	4.11	50.0	84.4
2020	55	1,407,006	2.63	42	704,366	4.14	50.1	76.4

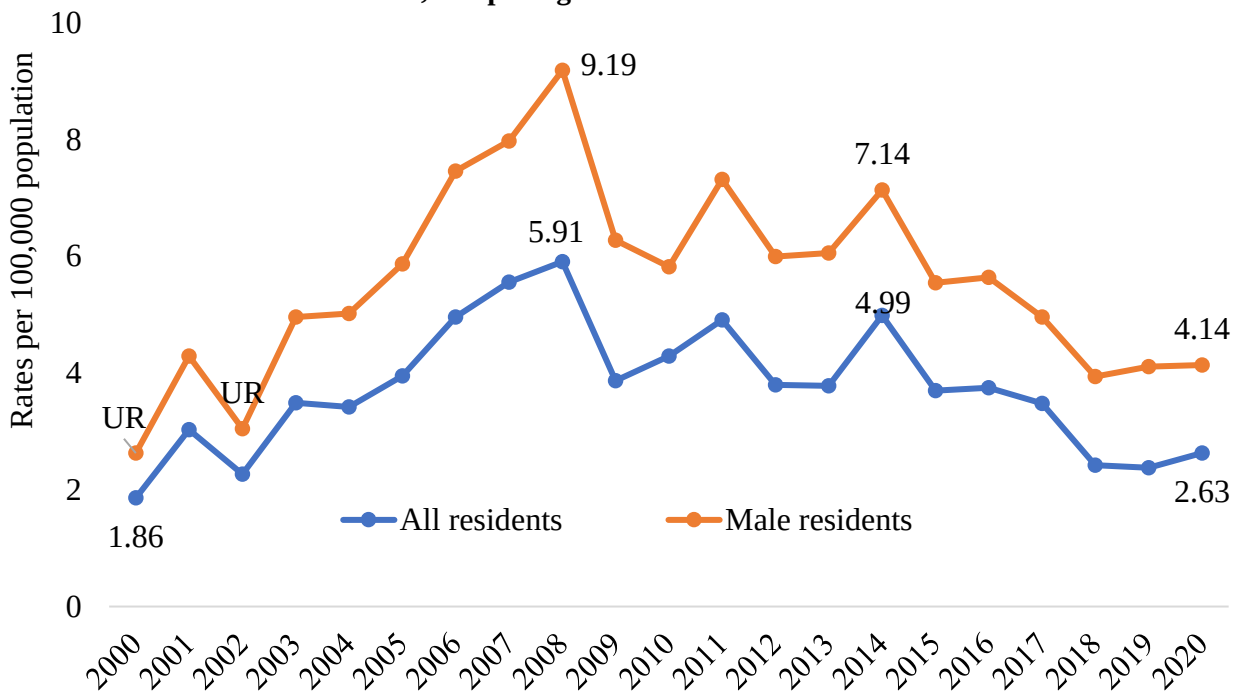
Source: CDC WONDER Multiple Cause of Death online dataset 1999–2020. Accessed on April 7, 2023. Available at http://wonder.cdc.gov/mcd-icd10.html and https://wonder.cdc.gov/wonder/help/mcd-expanded.html.

* Rates are age-adjusted per 100,000 population with U.S. 2000 population as the standard population. Rates are indicated as unreliable when death counts were 10 to 19.

** 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 B17.1 and B18.2 for hepatitis C infection.

As shown in **Figure 3**, trends in HCV-associated deaths among male residents are similar to those described for all residents, although the rates were 1.3 to 1.7 times the state average. Rates among male residents peaked in 2008 at 9.19 per 100,000, followed by a decrease to 4.14 per 100,000 in 2020, which still exceeds the 2025 national goal of ≤3.0 per 100,000 population.[36]

Figure 3. Age-adjusted rates* of hepatitis C-associated deaths in Hawai‘i, 2000-2020, comparing all residents to male residents



*Per CDC WONDER policy on data confidentiality, rates were not reported but indicated as “unreliable rate” if the total number of deaths is 10-19 in any given year. For visualization purposes, we used values of the crude rates to construct figures but labelled these data points as “UR” for “unreliable rate”.

[36] Centers for Disease Control and Prevention, *Division of Viral Hepatitis 2025 Strategic Plan* (Atlanta: Centers for Disease Control and Prevention, 2020), https://www.cdc.gov/hepatitis/pdfs/DVH-StrategicPlan2020-2025.pdf.

FINDING 5: Higher HCV Mortality Rates among White Residents in Hawai‘i

With respect to race/ethnicity, deaths were highest among non-Hispanic White residents. These residents accounted for about a quarter (26.3%) of the general population but over half (50.7%) of all HCV-associated deaths across the 21-year study period (**Table 5**). Data for all other racial/ethnic groups were not reported because the total number of deaths was between 1 and 19, and rates were either indicated as unreliable or suppressed for most of the years.

Table 5. Total numbers and rates* of deaths with hepatitis C virus infection listed as a cause of death** among residents of Hawai‘i, 2000-2020, comparing all residents to non-Hispanic White residents

	All residents			Non-Hispanic White residents				
Year	Number	Population	Rate	Number	Population	Rate	Percent population	Percent death
2000	23	1,211,537	1.86	12	321,739	Unreliable	26.6	52.2
2001	39	1,225,948	3.03	19	325,086	Unreliable	26.5	48.7
2002	30	1,239,613	2.27	13	329,581	Unreliable	26.6	43.3
2003	48	1,251,154	3.49	28	332,322	6.72	26.6	58.3
2004	48	1,273,569	3.42	20	338,695	4.47	26.6	41.7
2005	58	1,292,729	3.95	25	345,967	5.37	26.8	43.1
2006	73	1,309,731	4.96	38	352,227	8.38	26.9	52.1
2007	85	1,315,675	5.56	44	350,688	9.56	26.7	51.8
2008	94	1,332,213	5.91	48	355,214	9.95	26.7	51.1
2009	64	1,346,717	3.87	40	357,114	7.96	26.5	62.5
2010	70	1,360,301	4.29	35	360,318	6.96	26.5	50.0
2011	82	1,374,810	4.91	41	365,729	7.93	26.6	50.0
2012	68	1,392,313	3.8	42	369,051	8.03	26.5	61.8
2013	67	1,404,054	3.78	36	374,620	7.02	26.7	53.7
2014	87	1,419,561	4.99	38	377,241	7.17	26.6	43.7
2015	68	1,431,603	3.7	32	378,823	5.90	26.5	47.1
2016	70	1,428,557	3.75	28	368,734	5.04	25.8	40.0
2017	67	1,427,538	3.48	36	365,185	6.56	25.6	53.7
2018	49	1,420,491	2.42	25	361,718	4.36	25.5	51.0
2019	45	1,415,872	2.38	23	359,481	3.96	25.4	51.1
2020	55	1,407,006	2.63	28	354,204	4.75	30.1	60.0

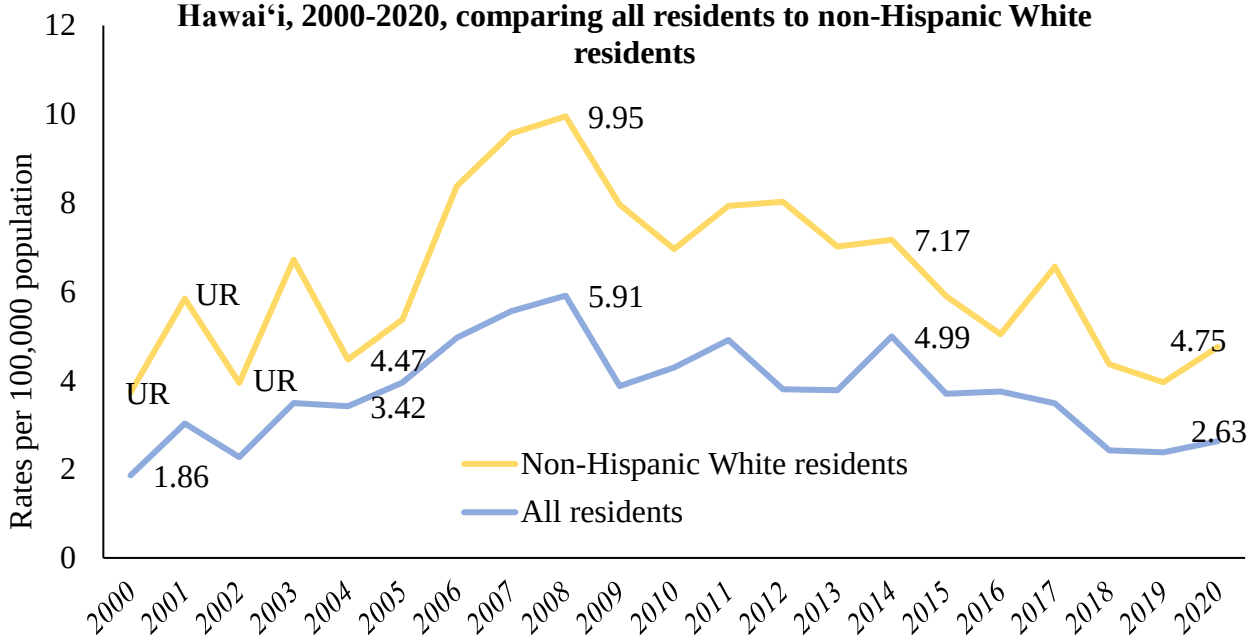
Source: CDC WONDER Multiple Cause of Death online datasets 1999–2020. Accessed on April 7, 2023. Available at http://wonder.cdc.gov/mcd-icd10.html.

* Rates are age-adjusted per 100,000 population with U.S. 2000 population as the standard population. Rates are indicated as unreliable when death counts were 10 to 19.

** 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 B17.1 and B18.2 for hepatitis C.

When compared to HCV mortality rates among all residents of Hawai‘i, the overall trend for non-Hispanic White residents was consistently higher than state averages (**Figure 4**). In 2020, the rate among non-Hispanic White residents was 4.75. This is not only 1.8 times the state average, but also exceeds national 2025 and 2030 general population goals of ≤3.0 and ≤1.44 per 100,000, respectively.[37]

Figure 4. Age-adjusted rates* of hepatitis C-associated deaths in Hawai‘i, 2000-2020, comparing all residents to non-Hispanic White residents



*Per CDC WONDER policy on data confidentiality, rates were not reported but indicated as “unreliable rate” if the total number of deaths is 10-19 in any given year. For visualization purposes, we used values of the crude rates to construct figures but labelled these data points as “UR” for “unreliable rate”.

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

REPORT LIMITATIONS

A limitation of using death certificate data is the underreporting of hepatitis C infection as a cause of death. The Chronic Hepatitis Cohort Study (CHeCS) reported that, of all the decedents diagnosed with chronic HCV, only 19% of the death certificates listed HCV. Among decedents diagnosed with HCV and liver disease in CheCS, only 30% had HCV on their death certificate.[38] Additionally, about one third of people in the U.S. living with HCV are undiagnosed,[39] likely contributing to the undercounting of HCV-associated deaths.

By using multiple causes of death instead of only underlying causes of death, there is potential for inclusion of accidental deaths. Ideally, surveillance data would be used to link hepatitis C cases with liver cancer cases and death certificates, especially since liver cancer is associated with multiple other causes, such as hepatitis B and alcohol consumption.[40] However, insufficient capacity for surveillance of hepatitis C remains an issue for most states, including Hawai‘i.[41,42] Although HDOH receives electronic laboratory reports and provider case reports, dedicated staff to conduct surveillance have not been available until January 2024. Lacking surveillance data on HCV—including incidence and prevalence, duration of infection, and ongoing risk factors (such as substance use)—limited our capacity to examine hepatitis C mortality rates and disparities across various racial and other sociodemographic groups.

The number and rate of reported HCV-associated deaths may have been affected by the COVID-19 pandemic, consistent with reports of patients less likely to complete therapy and laboratory monitoring.[43,44] A small rise in mortality rates in 2020 could be attributed to additional deaths caused by COVID-19 or reduced access to and initiation of treatment. Recent WHO data showed that in 2020, hepatitis B vaccination and HCV therapy were among some of the most frequently disrupted services.[45]

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[38] Reena Mahajan et al., “Mortality Among Persons in Care with Hepatitis C Virus Infection: The Chronic Hepatitis Cohort Study (CHeCS), 2006-2010,” Clinical Infectious Disease 58, no. 8 (2014): 1055-1061, https://doi.org/10.1093/cid/ciu077.
[39] Karon C Lewis et al., “Estimated Prevalence and Awareness of Hepatitis C Virus Infection Among US Adults: National Health and Nutrition Examination Survey, January 2017–March 2020,” *Clinical Infectious Diseases* 77, no. 10 (2023): 1413–1415, https://doi.org/10.1093/cid/ciad411.
[40] “Hepatitis C Surveillance 2020,” Centers for Disease Control and Prevention, last modified August 19, 2022, https://www.cdc.gov/hepatitis/statistics/2020surveillance/hepatitis-c.htm.
[41] Miranda Moore et al., “Comprehensive Nationwide Chronic Hepatitis C Surveillance is Necessary for Accurate State-Level Prevalence Estimates,” *Journal of Viral Hepatitis* 26, no. 9 (2019): 1124-1126, doi:10.1111/jvh.13124.
[42] HepVu, *2022 Viral Hepatitis Surveillance Status Report* (Atlanta: Emory University, 2023), https://hepvu.org/wp-content/uploads/2023/11/04-HepVu-Infographic-Viral_Report-3-FINAL-10.31.23-1.pdf.
[43] Megan P. Cooper et al., “Impact of the COVID-19 Pandemic on Hepatitis C Outcomes at a Health-System Specialty Pharmacy,” Journal of Managed Care and Specialty Pharmacy 28, no. 6 (2022): 667-672, doi: 10.18553/jmcp.2022.28.6.667.
[44] Harvey W. Kaufman et al., “Decreases in Hepatitis C Testing and Treatment During the COVID-19 Pandemic,” *American Journal of Preventive Medicine* 61, no. 3 (2021): 369-376, https://doi.org/10.1016/j.amepre.2021.03.011.
[45] Harshad Devarbhavi et al., “Global Burden of Liver Disease: 2023 Update,” *Journal of Hepatology* 79, no. 2 (2023): 516-537, doi:10.1016/j.jhep.2023.03.017.

Lastly, different race categories between the 1999-2020 and 2018-2021 datasets made it not feasible to address racial disparity or trend data for race through 2021. Instead, the historical trend data for race only included data for 2000-2020, while racial disparity was addressed using the more recent dataset, 2018-2021.

Despite the limitations, this report demonstrated the utility of using publicly available data sources to provide estimates on the burden of hepatitis C-related mortality in Hawai‘i. Although HDOH is currently building infrastructure for a more robust hepatitis C surveillance program, such organizational and programmatic changes take time. Thus, this report provides an approach for Hawai‘i and other jurisdictions with limited surveillance capacity.

Where is data for all racial and ethnic groups?

Without access to individual death records, the authors could not identify other disparities and associations. Due to data suppression rules and the overall small number of deaths each year, this study was not able to show data for AIAN, African American, or NHPI residents, or to characterize heterogeneity among the Asian and Pacific Islander population in Hawai‘i (including subgroups like Filipino, Samoan, and Native Hawaiian residents). As a result, using CDC WONDER limits the depth of analysis possible for various racial and other sociodemographic groups. For example, Hawai‘i has the largest percentage in the U.S. of residents (25%) identifying as two or more races,[46] but analysis of multiple race combinations is not possible with CDC WONDER. However, if individual death records were available to analyze, residents with two or more race identities could be regrouped into single-race groups by same algorithm used by HDOH’s Office of Health Status Monitoring.[47] Disparities by gender identity and sexual orientation also could not be analyzed due to lack of standardized data collection and reporting on death certificates.

[46] “Race and Ethnicity in the United States: 2010 Census and 2020 Census,” U.S. Census Bureau, last modified August 18, 2022, https://www.census.gov/library/visualizations/interactive/race-and-ethnicity-in-the-united-state-2010-and-2020-census.html.
[47] “Death Data Release Notes,” Hawaii Health Data Warehouse, accessed December 14, 2023, https://hhdw.org/report/resource/DeathDataReleases.html.

RECOMMENDATIONS FOR HAWAIʻI

Since 2014, HCV-associated mortality rates in Hawaiʻi have been lower than national rates. However, rates for HCV-associated deaths from 2000-2020 were consistently higher for male and/or non-Hispanic White residents in Hawaiʻi, compared to the rest of the state. Most importantly, 88% of people with hepatitis C-associated deaths did not reach age 75, lower than the U.S. life expectancy (76.4 years) at birth in 2021. More than 40% of Hawaiʻi residents with HCV died before the average retirement age of 65, demonstrating the economic impact of HCV mortality on the workforce.

Since HCV is curable, these premature deaths could reflect barriers to timely HCV services in Hawaiʻi, especially among affected communities like people who inject drugs (PWID). These barriers include low uptake of universal adult screening;[48] insurance barriers to curative medication;[49] or misconceptions about current treatment options.[50] These preventable deaths may be exacerbated by limited access to certain evidence-based harm reduction services (e.g., needs-based syringe exchange, safer smoking supplies), amidst the ongoing opioid and substance use epidemic. If so, low-threshold hepatitis C prevention, screening, diagnosis, and treatment should be rapidly expanded to reduce premature deaths in Hawaiʻi, in alignment with Healthy People 2030, the 2025 National Viral Hepatitis Strategy, and the statewide Hep Free 2030 strategy.[51] Increased uptake of universal HCV testing of adults, as recommended by the CDC, would also improve completeness of underlying conditions for mortality data.

Although there is a demonstrable burden of HCV-associated mortality in Hawaiʻi, more complete data collection, analysis, and reporting are needed to allocate resources and direct action. In January 2024, HDOH increased staffing and programming for HCV surveillance. With increased capacity, HDOH is currently focusing on actionable data projects including estimating HCV care cascades, prevalence, and incidence. Long-term projects will include improving data completeness and reporting on demographics, social determinants of health, and gender identity

[48] Cathy R. Balsom, Alison Farrell, and Deborah V. Kelly, "Barriers and Enablers to Testing for Hepatitis C Virus Infection in People Who Inject Drugs - a Scoping Review of the Qualitative Evidence," *BMC Public Health* 23, 1038 (2023), doi:10.1186/s12889-023-16017-8.
[49] William W. Thompson et al., "Vital Signs: Hepatitis C Treatment Among Insured Adults — United States, 2019–2020," *MMWR Morbidity and Mortality Weekly Report* 71, no. 32 (2022): 1011-1017, DOI: http://dx.doi.org/10.15585/mmwr.mm7132e1.
[50] Thaddeus Pham and D. German, "*I Wanna Live a Full Life": Perceptions of Hepatitis C Treatment Access among People Who Use Drugs in Honolulu, Hawai'i* (Honolulu: Hawai'i State Department of Health, 2023), https://health.hawaii.gov/harmreduction/files/2023/06/Report-HCV-Among-PWUD-in-HI-FINAL-6-23-2023.pdf.
[51] Hep Free Hawai'i, *Hep Free 2030: The Hawai'i Hepatitis Elimination Strategy 2020-2030* (Honolulu: Hep Free Hawai'i, 2020), www.hepfreehawaii.org/hep-free-2030.

and sexual orientation. Inclusion of viral hepatitis questions in population-based surveys would help provide data for estimating HCV prevalence in Hawai‘i. Additional research should also include culturally based, qualitative modalities to enrich the understanding of quantitative reports such as this one. For example, interviews with people who use drugs in Hawai‘i have provided strategies for increased uptake of HCV treatment.[52]

Based on the report findings and discussion above, the authors make the following recommendations to move towards viral hepatitis elimination in Hawai‘i:

RECOMMENDATIONS TO REDUCE HCV MORTALITY IN HAWAI‘I

Data

- Publish **updated HDOH reports** (every 3 to 5 years), using existing and novel data sources to show progress in elimination plans (e.g., Hep Free 2030, Healthy People 2030);
- Establish **population-based surveillance** of HCV infection in Hawai‘i to enable more comprehensive **analysis of racial and ethnic disparities**;
- Develop and share **accessible data products for action** by affected communities, policymakers, and the general public.

Program

- Increase **universal HCV reflex testing**, as recommended by the CDC, for early diagnosis and treatment, as well as improved quality of mortality data;
- Increase **low-threshold HCV curative treatment** to reduce infections and sequelae. Consider treatment in high-impact settings (eg, syringe exchange, jails, prisons) as well as removal of insurance and pharmacy barriers (eg, prior authorizations)

[52] Thaddeus Pham and D. German, *“I Wanna Live a Full Life”: Perceptions of Hepatitis C Treatment Access among People Who Use Drugs in Honolulu, Hawai‘i* (Honolulu: Hawai‘i State Department of Health, 2023), https://health.hawaii.gov/harmreduction/files/2023/06/Report-HCV-Among-PWUD-in-HI-FINAL-6-23-2023.pdf.

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