HHS Public Access

Author manuscript

J Racial Ethn Health Disparities. Author manuscript; available in PMC 2025 September 12.

Disparities in Social Vulnerability and Premature Mortality among Decedents with Hepatitis B, United States, 2010–2019

Kathleen N. Ly[1], **Shaoman Yin**[1], **Philip R. Spradling**[1]

[1]Division of Viral Hepatitis, National Center for HIV, Viral Hepatitis, STD, and TB Prevention, US Centers for Disease Control and Prevention, 1600 Clifton Rd. NE, Mailstop US12-3, Atlanta, GA 30333, USA

Abstract

Background—Current US hepatitis B mortality rates remain three times higher than the national target. Mortality reduction will depend on addressing hepatitis B disparities influenced by social determinants of health.

Objectives—This study aims to describe characteristics of hepatitis B–listed decedents, which included US birthplace status and county social vulnerability attributes and quantify premature mortality.

Methods—We conducted a cross-sectional analysis of 17,483 hepatitis B–listed decedents using the 2010–2019 US Multiple-Cause-of-Death data merged with the county-level Social Vulnerability Index (SVI). Outcomes included the distribution of decedents according to US birthplace status and residence in higher versus lower death burden counties by sociodemographic characteristics, years of potential life lost (YPLL), and SVI quartiles.

Results—Most hepatitis B–listed decedents were US-born, male, and born during 1945–1965. Median YPLL was 17.2; 90.0% died prematurely. US-born decedents were more frequently White, non-college graduates, unmarried, and had resided in a county with < 500,000 people; non-US-born decedents were more frequently Asian/Pacific Islander, college graduates, married, and had resided in a county with ≥ 1 million people. Higher death burden (≥ 20) counties were

✉Kathleen N. Ly, KathleenLy@cdc.gov; Philip R. Spradling, PSpradling@cdc.gov.

Author Contribution All authors contributed to the study's conception and design. Material preparation, data collection, and analysis were performed by Kathleen Ly, Shaoman Yin, and Philip Spradling. The first draft of the manuscript was written by Kathleen Ly and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript. CDC scientific coauthors were involved in the design and conduct of the study; analysis and interpretation of the data; preparation, review, and approval of the manuscript; and the decision to submit the manuscript for publication. Collection and management of the original source US Multiple Cause of Death data were conducted prior to this analysis through an ongoing cooperative agreement between each state health department and the CDC's National Center for Health Statistics.

Conflict of Interest The authors declare no competing interests.

Code Availability Statistical codes used for these analyses are available upon request.

Ethical Approval This analysis did not require institutional review board review per HHS Code of Federal Regulations Title 45 Part 46 2018 because de-identified data were obtained for decedents from secondary sources.

Consent to Participate This study was deemed exempt from institutional review board review and informed consent per HHS Code of Federal Regulations Title 45 Part 46 2018 because all data were obtained from secondary sources without personally identifiable information.

Consent for Publication This study was deemed exempt from institutional review board review and informed consent per HHS Code of Federal Regulations Title 45 Part 46 2018 because all data were obtained from secondary sources without personally identifiable information.

principally located in coastal states. US-born decedents more frequently resided in counties in the highest SVI quartile for “Household Characteristics” and “Uninsured,” whereas non-US-born decedents more frequently resided in counties in the highest SVI quartile for “Racial/Ethnic Minority Status” and “Housing Type/Transportation.”

Conclusion—This analysis found substantial premature hepatitis B mortality and residence in counties ranked high in social vulnerability. Successful interventions should be tailored to disproportionately affected populations and the social vulnerability features of their geographic areas.

Keywords

Hepatitis B; Racial and ethnic disparities; Social vulnerability; Premature mortality; Social determinants of health

Introduction

One of the eight core indicators in the US Department of Health and Human Services Viral Hepatitis National Strategic Plan for 2021–2025 is to reduce the rate of hepatitis B deaths to 0.16/100,000 persons by 2030 [1]. The US hepatitis B mortality rate in 2020, however, was approximately three times higher (0.45 deaths/100,000 persons) [2]. In an analysis of hepatitis B deaths during 2010–2019, rates differed substantially across US states and were highest in coastal and Appalachian states [3, 4]. In states bordering the Pacific and Atlantic coasts, hepatitis B decedents were disproportionately non-US-born, whereas decedents in Appalachian and southern states along the Gulf of Mexico were disproportionately US-born. Compared with non-US-born decedents, US-born decedents had a significantly younger median age at death [3].

Reductions in mortality can be achieved via interventions along the hepatitis B care continuum. These include improved identification of persons with hepatitis B through universal screening, vaccination of susceptible persons, linkage of infected persons to hepatitis B–directed clinical care, use of antiviral therapy for treatment-eligible persons, and clinical surveillance for hepatocellular carcinoma (HCC) [5–8]. In US-based cohorts, persons with chronic hepatitis B (CHB) engaged in care and receiving antiviral therapy according to treatment guidelines tend to do favorably, with low frequencies of severe clinical outcomes [7, 9, 10]. However, studies have also demonstrated disparities in diagnosis and access to CHB care among certain minority and medically underserved groups [11], and that such disparities may be influenced by social determinants of health (SDOH) [12].

SDOH (e.g., socioeconomic and health insurance status, racial/ethnic inequities, limited English proficiency, housing and transportation availability) affect access to health care and treatment, as well as mortality, for a variety of conditions [12, 13]. Using Social Vulnerability Index (SVI) data, investigators have examined the adverse effects of SDOH on common chronic conditions such as cardiovascular disease and cancer, and acute conditions such as COVID-19 [14–18]. The SVI was created by the US Centers for Disease Control and Prevention (CDC)’s Agency for Toxic Substances and Disease Registry (ATSDR) as a

standardized metric that incorporates US Census tract- and county-level SDOH to identify and compare levels of vulnerability across several themes (e.g., Socioeconomic Status) [13].

Given the paucity of national and jurisdictional prevalence data, examination of hepatitis B mortality data could inform public health interventions intended to optimize diagnosis of and access to care for persons living with CHB. Moreover, the use of SVI data together with Multiple Cause of Death (MCOD) highlights the characteristics of hepatitis B–listed decedents in the context of the geographic location and social vulnerability features of the US counties in which they lived. The objectives of this analysis were to (1) describe the characteristics of hepatitis B–listed decedents, including their resident county attributes and social vulnerability profiles, and (2) quantify the magnitude and distribution of premature hepatitis B–listed mortality.

Methods

Data Sources

This analysis used 2010–2019 restricted-use US MCOD data acquired through an approved project determination to the CDC National Center for Health Statistics (NCHS) to obtain information on state/county of residence and birth [19]. We limited these analyses through the year 2019 to prevent any effect that COVID-19-related deaths would have had as a competing cause of death (COD) on reporting hepatitis B as a COD.

The CDC/ATSDR SVI data use the 2016–2020 American Community Survey to provide estimates on 16 SVI domains categorized into four themes: (1) Socioecomonic Status, (2) Household Characteristics, (3) Racial and Ethnic Minority Status, and (4) Housing and Transportation [13]. A percentile was assigned to each US county, ranging from zero to one, based on the ranked order of the estimates relative to all counties [13]. We grouped percentiles into quartile categories (0–0.2500, 0.2501–0.5000, 0.5001–0.7500, and 0.7501–1.0) to describe Least, Less, More, and Most Vulnerable counties, respectively. As an example, an SVI percentile of 0.75 means that 75% of counties in the US are less vulnerable than the county of interest and that 25% of counties are more vulnerable.

County SVI percentiles and population estimates from the SVI dataset were merged into the US MCOD dataset using residential state and county Federal Information Processing System codes.

Variables

Hepatitis B–listed deaths included decedents who resided in the 50 US states and DC. We defined hepatitis B–listed deaths through International Classification of Diseases, Tenth Revision (ICD-10) COD codes if ≥ 1 code indicative of hepatitis B (B16, B17.0, B18.0, and B18.1) was listed as the underlying cause of death (UCOD) or a contributing cause of death (CCOD) in the record axis fields [20]. The UCOD is the one condition or injury that initiated the chain of events leading directly to death [21]. CCOD included the immediate cause of death, conditions leading to the immediate cause of death, and any other significant conditions that unfavorably influenced the course of the morbid process and thus contributed to the death [21].

We calculated the median years of potential life lost (YPLL), adjusted by sex, among persons with a hepatitis B–listed death to determine the magnitude of premature mortality. Deriving this measure involved first calculating the difference between the sex-specific life expectancies (average, 76.3 years for males and 81.2 years for females), as published by CDC NCHS [22–31], and age at death during 2010–2019 [32]. For each characteristic, the median was the mid-point of YPLL values.

Decedent characteristics included US birthplace status, sex, age at death, year of birth, YPLL, race and ethnicity, education, and marital status. Comorbidities examined included 15 broad categories, as described in a previous publication [3], listed as the UCOD among decedents for whom hepatitis B was listed as a CCOD. County characteristics in the merged SVI dataset included county population size and the overall and theme-specific SVI quartiles. Because uninsurance directly impacts the ability to access health care, we separately examined the Uninsured domain, under the Socioeconomic Status theme in the SVI dataset.

Statistical Analyses

We compared decedent characteristics (including US birthplace status), county SVI quartiles according to themes, YPLL, and aggregate age-adjusted mortality rates of decedents who had resided in counties with ≥ 20 (higher burden) versus 1–19 (lower burden) hepatitis B–listed deaths. To examine the geographic distribution of hepatitis B–listed decedents in all 3143 US counties, we mapped the county of residence of all hepatitis B–listed decedents according to death burden.

The Kruskal–Wallis test was used to assess statistically significant differences between median numeric measures and Pearson chi-square test for proportions. We considered *P* values less than 0.05 as statistically significant. Statistical analyses were performed using SAS software, version 9.4 (SAS Institute, Cary, NC); the map was produced using RStudio, version 1.4.1717 (RStudio Team, Boston, MA). This analysis did not require institutional review board review per HHS Code of Federal Regulations Title 45 Part 46 2018 because de-identified data were obtained for decedents from secondary sources. We followed NCHS standards on CDC WONDER for assurance of confidentiality and statistical reliability of proportions and rates [33].

Results

Characteristics of Hepatitis B–Listed Decedents

During 2010–2019, 17,483 decedents had a hepatitis B–listed death. Most decedents were US-born (63.3%), male (73.1%), born during 1945–1965 (62.1%), and had completed high school or some college (59.2%); relative majorities for race and ethnicity and marital status were observed among non-Hispanic White (46.5%) and married (43.3%) decedents (Table 1). Compared to non-US-born decedents, US-born decedents more frequently were born during 1945–1965, non-Hispanic White or Black, not college educated, single or divorced, and had resided in a US county with < 500,000 persons. In contrast, non-US-born decedents more frequently were aged ≥ 65 years, born before 1945, Asian/Pacific Islander or Hispanic,

college graduates, married, and had resided in a county with ≥ 1 million persons. Among non-US-born decedents, 68.0% were Asian/Pacific Islander, 12.0% were Hispanic, 10.8% were White, and 9.1% were Black.

Nearly forty-three percent (42.8%) of hepatitis B–listed decedents resided in counties in the highest SVI quartile with respect to Overall Social Vulnerability (Table 1). According to SVI theme, 36.5%, of hepatitis B–listed decedents resided in counties in the highest quartile for Socioeconomic Status, 19.8% for Household Characteristics, 64.0% for Racial and Ethnic Minority Status, 49.7% for Housing Type and Transportation, and 17.5% for Uninsured.

There were no differences in the distribution of US-born and non-US-born hepatitis B–listed decedents who resided in counties in the highest quartile in Overall Social Vulnerability and Socioeconomic Status (Table 1). Compared with non-US-born decedents, US-born decedents more frequently resided in counties in the highest quartile for Household Characteristics and Uninsured. In contrast, non-US-born decedents more frequently resided in counties ranked in the highest quartile with respect to Racial and Ethnic Minority Status and Housing Type and Transportation.

Median YPLL among Hepatitis B–Listed Decedents

The overall median (interquartile range [IQR]) YPLL was 17.2 (8.5–25.0) for hepatitis B–listed decedents (Table 2). Median and IQR YPLL were higher among US-born compared with non-US-born decedents overall and for nearly all characteristics.

Median YPLL according to conditions listed as UCOD among hepatitis B–listed decedents (i.e., when decedents had hepatitis B listed as a CCOD) are shown in Table 3. In general, median YPLL were consistently higher among US-born compared with non-US-born decedents for nearly all conditions. Median YPLL were highest among decedents with UCOD listed as HIV, hepatitis C, alcohol-related liver disease, and injuries or trauma (including drug overdose, alcohol poisoning, suicide, or homicide), all of which were listed more frequently among US-born compared with non-US-born decedents.

Decedent Characteristics in Higher versus Lower Death Burden Counties

Of 3143 total US counties, 1850 (58.8%) counties had at least one hepatitis B–listed death during 2010–2019 (range: 1–908 deaths; median: 2 deaths; mean: 9.5 deaths). Of these 1850 counties, 174 (9.4%) had ≥ 20 hepatitis B–listed deaths. These 174 counties accounted for 11,544 (66.0%) of all 17,483 deaths and, though situated in 39 states and the District of Columbia, were principally located in coastal states (Fig. 1). Decedents from counties with ≥ 20 deaths, compared with decedents from counties with < 20 hepatitis B–listed deaths, were more frequently non-White, non-US-born, and from counties with ≥ 500,000 persons (Table 4). Decedents from counties with 1–19 compared with ≥ 20 hepatitis B–listed deaths were more frequently White, US-born, and from counties with < 500,000 persons. The age-adjusted hepatitis B–listed mortality rate was 0.64 deaths per 100,000 population in counties with ≥ 20 deaths and 0.37 deaths per 100,000 population in counties with 1–19 deaths.

The social vulnerability profiles of counties with higher versus lower hepatitis B–listed mortality burden differed significantly with respect to all SVI themes (Table 4). Higher compared with lower death burden counties more frequently were in the highest quartile with respect to Overall Social Vulnerability, Socioeconomic Status, Racial and Ethnic Minority Status, and Housing Type and Transportation. In contrast, lower death burden counties were more frequently in the highest SVI quartile with respect to Household Characteristics and Uninsured.

Discussion

In this cross-sectional analysis of US hepatitis B–listed deaths during 2010–2019, we observed substantial premature mortality and frequent decedent residence in counties experiencing high levels of social vulnerability. Hepatitis B–listed decedents in this analysis comprised a heterogeneous group, which varied according to county location, affiliated SVI profile, and decedent characteristics (which included co-listed causes of death and YPLL) principally related to US birthplace status. Overall, most hepatitis B–listed decedents were US-born and non-Hispanic White whereas in the Hepatitis B Research Network cohort of North American adults receiving CHB care, most were non-US-born and Asian [34]. These differences demonstrate the importance of improving efforts to promote universal hepatitis B testing, vaccination, and linkage to care of persons with CHB through tailored interventions guided by the awareness of disproportionately affected populations and the social vulnerability features of the geographic areas in which these populations reside [5, 6, 10, 35–37].

Reductions in US hepatitis B mortality, as mentioned, will be achieved through immediate adoption of universal hepatitis B testing of all adults, vaccination of susceptible persons, and prompt referral of persons with CHB to clinical providers who can deliver CHB-directed care. In many respects, a hepatitis B–listed death represents a failure in the continuum of care, be it a failure to test, vaccinate, link to care, treat, or conduct clinical HCC surveillance. Jurisdictional health departments should be cognizant of the burden of hepatitis B–listed deaths within their jurisdictions, the characteristics of these decedents, and the SVI profiles of the county or counties affected. Health departments may have difficulty estimating the hepatitis B prevalence of their jurisdictions (as opposed to county-level hepatitis B mortality) and may have limited information regarding the characteristics of CHB cases reported to public health surveillance (e.g., often missing race and ethnicity, country of birth, and comorbid conditions) [2]. Although health departments report newly identified CHB cases to CDC, most do not have the resources to maintain CHB registries [2].

The geographic distribution of US counties with higher (≥ 20) versus lower (1–19) hepatitis B–listed death counts, combined with the comparative analysis of decedent characteristics and SVI profiles of these counties, provided insights into the potential use to public health practitioners at the jurisdictional (i.e., state or county) and national levels. For example, in counties with higher death burden, racial and ethnic minority decedents predominated. These counties ranked higher in Overall Social Vulnerability, Socioeconomic Status, Racial and Ethnic Minority Status, and Housing Type and Transportation. Decedents in lower

burden counties, in contrast, were predominantly non-Hispanic White. These counties ranked higher in vulnerability with respect to Household Characteristics and Uninsured. Many of the lower death burden counties were in states reporting the highest rates of acute hepatitis B cases and drug overdose deaths during 2019–2020 (e.g., West Virginia, Maine, Kentucky, Tennessee) [38, 39]. Thus, some counties with low hepatitis B death burden, suggesting low CHB prevalence, may be in states with high acute hepatitis B incidence, indicating ongoing transmission. Although most adults with acute infection will not develop CHB, the minority who do will need linkage to hepatitis B–directed care, and many persons with acute infection will need referral to harm reduction services. Among cases of acute hepatitis B, the most reported risk behavior is injection drug use followed by multiple sexual partners [2]. Jurisdictional health departments could use hepatitis B surveillance data, mortality data, and SVI data to provide a full picture of the local hepatitis B epidemiology and potential social vulnerability barriers to vaccination, diagnosis, and access to care. Programs and outreach to promote hepatitis B services may benefit from partnerships that involve jurisdictional health departments, local medical providers, and community organizations that can identify and deliver services to disproportionately impacted and difficult-to-reach local populations [36]. Such efforts should help quantify the burden of local populations at higher risk of hepatitis B, identifying where transmission may be ongoing and where vaccination, case finding, and care referral efforts should be intensified. Though we used county-level SVI data, jurisdictional health departments with large intra-county heterogeneity can perform analyses at the US Census tract or zip code level to assess the varying levels of vulnerability within these counties.

These findings should be interpreted in the context of the data's limitations. First, hepatitis B is underdiagnosed and underreported as a COD [11, 40–42]. Second, though decedent characteristics are highly complete on death certificates, this information, obtained via second-hand sources or direct observation, is subject to misclassification [43]. Third, we could not disaggregate Asian, Native Hawaiian, and Other Pacific Islander groups during the full period, which may mask potential differences in disparities experienced among these groups [44]. Fourth, the SVI dataset provided metrics at the county level; the lower the number of hepatitis B–listed deaths in a county, the lower the certainty that decedents were representative of the county's affiliated SVI profile [45]. Fifth, information such as risk history, engagement in medical care, and uptake of CHB treatment was not available in the US MCOD data nor were we able to merge these data with decedent medical records. This additional information would have allowed for a deeper understanding of the factors and characteristics contributing to death. Sixth, because these data are cross-sectional, we could not measure the duration of hepatitis B infection and temporality between the acquisition of infection and other causes of death or risk factors. Finally, we were unable to assess the role of hepatitis D because it has been underdiagnosed and underreported as a COD [3]. Despite these limitations, decedent characteristics in MCOD data were highly complete and linkage of these data to SVI data highlights the characteristics of hepatitis B–listed decedents in the context of the social vulnerability features of the US counties in which they resided at the time of death.

In summary, this analysis of US hepatitis B–listed decedents found substantial premature mortality and pre-mortem residence in US counties ranked high in social vulnerability.

There were differences in decedent characteristics, including YPLL, geographic distribution, and affiliated county-level SVI profiles, that largely reflected US-birthplace status. Jurisdictional health departments could merge SVI data with hepatitis B surveillance and mortality data to provide a full picture of the local hepatitis B epidemiology and potential social vulnerability barriers to vaccination, diagnosis, and access to care. Tailored interventions to promote universal hepatitis B screening, vaccination, and linkage to care of persons with CHB informed by the characteristics of disproportionately affected populations and social vulnerability features of the geographic areas in which these groups reside are necessary to reduce hepatitis B mortality and premature deaths.

Acknowledgements

The authors thank the staff of state and local health departments who provide death certificate data to the National Center for Health Statistics.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

CDC Disclaimer

The findings and conclusions in this report do not necessarily reflect the official position of the Centers for Disease Control and Prevention.

Data Availability

Restricted-use US Multiple Cause of Death data were acquired through an approved project determination to the CDC National Center for Health Statistics to obtain information on state and county of decedent residence and birth. The public-use CDC Social Vulnerability Index data were obtained from the CDC's Agency for Toxic Substances and Disease Registry website.

Abbreviations

ATSDR	Agency for Toxic Substances and Disease Registry
CCOD	Contributing cause of death
CDC	US Centers for Disease Control and Prevention
CHB	Chronic hepatitis B
CI	Confidence interval
COD	Cause of death
DC	District of Columbia
DHHS	US Department of Health and Human Services
HCC	Hepatocellular carcinoma
HCV	Hepatitis C virus

HIV	Human immunodeficiency virus
HDV	Hepatitis D virus
ICD-10	International Classification of Diseases, Tenth Revision
IQR	Interquartile range
MCOD	Multiple Cause of Death
NCHS	National Center for Health Statistics
SDOH	Social determinants of health
SVI	Social vulnerability index
UCOD	Underlying cause of death
US	United States
YPLL	Years of potential life lost

References

1. US Department of Health and Human Services. 2020. Viral Hepatitis National Strategic Plan for the United States: A Roadmap to Elimination (2021–2025). Washington, DC.
2. Centers for Disease Control and Prevention. Viral hepatitis surveillance–United States. Available at https://www.cdc.gov/hepatitis/statistics/SurveillanceRpts.htm. Accessed on March 27, 2023.
3. Ly KN, Yin S, Spradling PR. Regional differences in mortality rates and characteristics of decedents with hepatitis B listed as a cause of death, United States, 2000–2019. JAMA Netw Open. 2022;5(6):e2219170. [PubMed: 35763293]
4. Harris AM, Iqbal K, Schillie S, Britton J, Kainer MA, Tressler S, Vellozzi C. Increases in acute hepatitis B virus infections - Kentucky, Tennessee, and West Virginia, 2006–2013. MMWR Morb Mortal Wkly Rep. 2016;65(3):47–50. [PubMed: 26821369]
5. Conners EE, Panagiotakopoulos L, Hofmeister MG, et al. Screening and testing for hepatitis B virus infection: CDC recommendations — United States, 2023. MMWR Recommendations and Reports. 2023;72(1):1–25.
6. Weng MK, Doshani M, Khan MA, et al. Universal hepatitis B vaccination in adults aged 19–59 years: updated recommendations of the Advisory Committee on Immunization Practices — United States, 2022. MMWR Weekly. 2022;71(13):477–83.
7. Terrault NA, Lok ASF, McMahon BJ, et al. Update on prevention, diagnosis, and treatment of chronic hepatitis B: AASLD 2018 hepatitis B guidance. Hepatology. 2018;67(4):1560–99. [PubMed: 29405329]
8. European Association for the Study of the Liver. EASL 2017 Clinical Practice Guidelines on the management of hepatitis B virus infection. J Hepatol. 2017;67(2):370–98. [PubMed: 28427875]
9. Gordon SC, Lamerato LE, Rupp LB, et al. Antiviral therapy for chronic hepatitis B virus infection and development of hepatocellular carcinoma in a US population. Clin Gastroenterol Hepatol. 2014;12(5):885–93. [PubMed: 24107395]
10. Lok AS, Perrillo R, Lalama CM, et al. Low incidence of adverse outcomes in adults with chronic hepatitis B virus infection in the era of antiviral therapy. Hepatology. 2021;73(6):2124–40. [PubMed: 32936969]
11. Kim HS, Yang JD, El-Serag HB, Kanwal F. Awareness of chronic viral hepatitis in the United States: an update from the National Health and Nutrition Examination Survey. J Viral Hepat. 2019;26(5):596–602. [PubMed: 30629790]

12. US Department of Health and Human Services. Healthy People 2030: Social determinants of health literature summaries. Available at https://health.gov/healthypeople/priority-areas/social-determinants-health/literature-summaries#block-sdohinfographics. Accessed on June 13, 2023.
13. CDC Agency for Toxic Substances and Disease Registry. CDC/ATSDR Social vulnerability index. Available at https://www.atsdr.cdc.gov/placeandhealth/svi/index.html. Accessed on January 13, 2023.
14. Bevan G, Pandey A, Griggs S, Dalton JE, Zidar D, Patel S, et al. Neighborhood-level social vulnerability and prevalence of cardiovascular risk factors and coronary heart disease. Curr Probl Cardiol. 2023;48(8):101182. 10.1016/j.cpcardiol.2022.101182. [PubMed: 35354074]
15. Ganatra S, Dani SS, Kumar A, et al. Impact of social vulnerability on comorbid cancer and cardiovascular disease mortality in the United States. JACC CardioOncol. 2022;4(3):326–37. [PubMed: 36213357]
16. Knoebel RW, Kim SJ. Impact of COVID-19 pandemic, social vulnerability, and opioid overdoses in Chicago. AJPM Focus. 2023;2(2): 100086. [PubMed: 36789246]
17. Zambrano LD, Ly KN, Link-Gelles R, et al. Investigating health disparities associated with multisystem inflammatory syndrome in children after SARS-CoV-2 infection. Pediatr Infect Dis J. 2022;41(11):891–8. [PubMed: 36102740]
18. Tipirneni R, Schmidt H, Lantz PM, Karmakar M. Associations of 4 geographic social vulnerability indices with US COVID-19 incidence and mortality. Am J Public Health. 2022;112(11):1584–8. [PubMed: 36108250]
19. CDC National Centers for Health Statistics. Restricted-use vital statistics data. Available at https://www.cdc.gov/nchs/nvss/nvss-restricted-data.htm. Accessed on January 13, 2023.
20. Organization. WH. International Statistical Classification of Diseases, Tenth Revision (ICD-10). World Health Organization; 1992.
21. Centers for Disease Control and Prevention. US standard certificate of death. Available at https://www.cdc.gov/nchs/data/dvs/death11-03final-acc.pdf. Accessed on February 20, 2024.
22. Arias E. United States life tables, 2010. Natl Vital Stat Rep. 2014;63(7):1–63.
23. Arias E. United States Life Tables, 2011. Natl Vital Stat Rep. 2015;64(11):1–63.
24. Arias E, Heron M, Xu J. United States Life Tables, 2012. Natl Vital Stat Rep. 2016;65(8):1–65.
25. Arias E, Heron M, Xu J. United States Life Tables, 2013. Natl Vital Stat Rep. 2017;66(3):1–64.
26. Arias E, Heron M, Xu J. United States Life Tables, 2014. Natl Vital Stat Rep. 2017;66(4):1–64.
27. Arias E, Xu J. United States Life Tables, 2015. Natl Vital Stat Rep. 2018;67(7):1–64.
28. Arias E, Xu J, Kochanek KD. United States Life Tables, 2016. Natl Vital Stat Rep. 2019;68(4):1–66.
29. Arias E. United States Life Tables, 2017. Natl Vital Stat Rep. 2019;68(7):1–66.
30. Arias E, Xu J. United States Life Tables, 2018. Natl Vital Stat Rep. 2020;69(12):1–45.
31. Arias E, Xu J. United States Life Tables, 2019. Natl Vital Stat Rep. 2022;70(19):1–59. [PubMed: 35319436]
32. Centers for Disease Control and Prevention. Principles of Epidemiology. Lesson 3: measures of risk. Available at https://www.cdc.gov/csels/dsepd/ss1978/lesson3/section3.html. Accessed on July 24, 2023.
33. Centers for Disease Control and Prevention. CDC WONDER Multiple Cause of Death 1999–2020 Dataset Documentation. Available at https://wonder.cdc.gov/wonder/help/mcd.html#. Accessed on June 13, 2023.
34. Ghany MG, Perrillo R, Li R, et al. Characteristics of adults in the hepatitis B research network in North America reflect their country of origin and hepatitis B virus genotype. Clin Gastroenterol Hepatol. 2015;13(1):183–92. [PubMed: 25010003]
35. Schmid KL, Rivers SE, Latimer AE, Salovey P. Targeting or tailoring? Mark Health Serv. 2008;28(1):32–7.
36. Weinbaum CM, Mast EE, Ward JW. Recommendations for identification and public health management of persons with chronic hepatitis B virus infection. Hepatology. 2009;49(5 Suppl):S35–44. [PubMed: 19399812]

37. Khalili M, Leonard KR, Ghany MG, et al. Racial disparities in treatment initiation and outcomes of chronic hepatitis B virus infection in North America. JAMA Netw Open. 2023;6(4):e237018. [PubMed: 37036707]

38. Centers for Disease Control and Prevention. 2020 Viral hepatitis surveillance report. Available at https://www.cdc.gov/hepatitis/statistics/2020surveillance/index.htm. Accessed on June 16, 2023.

39. Centers for Disease Control and Prevention. Drug overdose death rate maps & graphs. Available at https://www.cdc.gov/drugoverdose/deaths/index.html. Accessed on June 16, 2023.

40. Bixler D, Zhong Y, Ly KN, et al. Mortality among patients with chronic hepatitis B infection: The Chronic Hepatitis Cohort Study (CHeCS). Clin Infect Dis. 2019;68(6):956–63. [PubMed: 30060032]

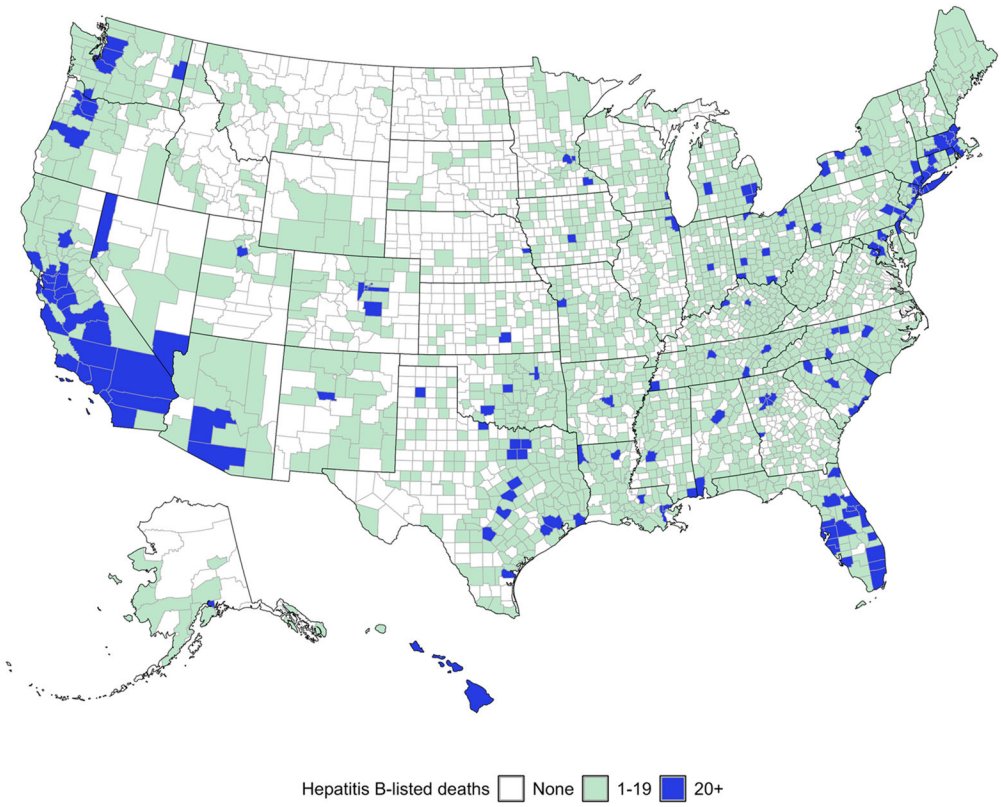
41. Ly KN, Speers S, Klevens RM, Barry V, Vogt TM. Measuring chronic liver disease mortality using an expanded cause of death definition and medical records in Connecticut, 2004. Hepatol Res. 2015;45(9):960–8. [PubMed: 25319958]

42. Manos MM, Leyden WA, Murphy RC, Terrault NA, Bell BP. Limitations of conventionally derived chronic liver disease mortality rates: results of a comprehensive assessment. Hepatology. 2008;47(4):1150–7. [PubMed: 18264998]

43. Arias E, Schauman WS, Eschbach K, Sorlie PD, Backlund E. The validity of race and Hispanic origin reporting on death certificates in the United States. Vital Health Stat 2. 2008;148:1–23.

44. Centers for Disease Control and Prevention. Public use data file documentation mortality multiple cause-of-death. Avalable at https://www.cdc.gov/nchs/nvss/mortality_public_use_data.htm. Accessed on June 26, 2023.

45. Shih YT, Bradley C, Yabroff KR. Ecological and individualistic fallacies in health disparities research. J Natl Cancer Inst. 2023;115(5):488–91. [PubMed: 36912704]



Data sources: 2010–2019 US Multiple Cause of Death, National Vital Statistics System

Fig. 1.

Distribution of county-level burden of hepatitis B–listed deaths, United States, 2010–2019. Data sources: 2010–2019 US Multiple Cause of Death, National Vital Statistics System

Table 1

Distribution of sociodemographic characteristics, years of potential life lost, and social vulnerability among decedents with hepatitis B–listed deaths based on US birthplace status[a], United States, 2010–2019

	Overall		US-born[a]		Non-US-born[a]		
Category	***N***	**% (95% CI)**	***N***	**% (95% CI)**	***N***	**% (95% CI)**	***P* value[b]**
Overall	**17,483**	**100**	**10,823**	**63.3 (62.5–64.0)**	**6285**	**36.7 (36.0–37.5)**	**< 0.001**
Sex							0.061
Male	12,779	73.1 (72.4–73.8)	7951	73.5 (72.6–74.3)	4534	72.1 (71.0–73.2)	
Female	4704	26.9 (26.2–27.6)	2872	26.5 (25.7–27.4)	1751	27.9 (26.8–29.0)	
Age							< 0.001
< 35 years	375	2.1 (1.9–2.4)	210	1.9 (1.7–2.2)	156	2.5 (2.1–2.9)	
35–44 years	1249	7.1 (6.8–7.5)	734	6.8 (6.3–7.3)	488	7.8 (7.1–8.4)	
45–64 years	9605	54.9 (54.2–55.7)	6476	59.8 (58.9–60.8)	2882	45.9 (44.6–47.1)	
≥ 65 years	6252	35.8 (35.1–36.5)	3403	31.4 (30.6–32.3)	2759	43.9 (42.7–45.1)	
Year of birth							< 0.001
After 1965	2788	15.9 (15.4–16.5)	1679	15.5 (14.8–16.2)	1037	16.5 (15.6–17.4)	
1945–1965	10,849	62.1 (61.3–62.8)	7174	66.3 (65.4–67.2)	3421	54.4 (53.2–55.7)	
Before 1945	3844	22.0 (21.4–22.6)	1970	18.2 (17.5–18.9)	1827	29.1 (27.9–30.2)	
YPLL							< 0.001
0 years	1757	10.1 (9.6–10.5)	893	8.3 (7.7–8.8)	849	13.5 (12.7–14.4)	
> 0 and < 8.50 years	2596	14.9 (14.3–15.4)	1393	12.9 (12.2–13.5)	1156	18.4 (17.4–19.4)	
8.50 and < 25.00 years	8767	50.2 (49.4–50.9)	5767	53.3 (52.3–54.2)	2801	44.6 (43.3–45.8)	
≥ 25.00 years	4361	24.9 (24.3–25.6)	2770	25.6 (24.8–26.4)	1479	23.5 (22.5–24.6)	
Race and ethnicity							< 0.001
White, non-Hispanic	8083	46.5 (45.8–47.3)	7231	67.1 (66.2–68.0)	680	10.8 (10.1–11.6)	
Black, non-Hispanic	3312	19.1 (18.5–19.6)	2664	24.7 (23.9–25.5)	568	9.1 (8.4–9.8)	
Hispanic	1359	7.8 (7.4–8.2)	588	5.5 (5.0–5.9)	753	12.0 (11.2–12.8)	
Asian/Pacific Islander, non-Hispanic	4488	25.8 (25.2–26.5)	170	1.6 (1.3–1.8)	4263	68.0 (66.9–69.2)	
American Indian/Alaska Native, non-Hispanic	132	0.8 (0.6–0.9)	125	1.2 (1.0–1.4)	4	0.1 (0.0–0.1)[c]	
Education level							< 0.001
Less than HS	4311	25.7 (25.0–26.3)	2615	24.9 (24.0–25.7)	1658	27.1 (26.0–28.2)	

Category	Overall		US-born[a]		Non-US-born[a]		*P* value[b]
	N	% (95% CI)	*N*	% (95% CI)	*N*	% (95% CI)	
4 years HS, HS diploma, GED, or some college	9947	59.2 (58.5–60.0)	6818	64.8 (63.9–65.7)	3038	49.6 (48.3–50.9)	
At least graduated college	2542	15.1 (14.6–15.7)	1086	10.3 (9.7–10.9)	1429	23.3 (22.3–24.4)	
Marital status							< 0.001
Single or never married	3808	22.2 (21.6–22.9)	2954	27.7 (26.8–28.5)	760	12.2 (11.4–13.0)	
Married	7425	43.3 (42.6–44.1)	3314	31.0 (30.2–31.9)	4041	64.8 (63.6–66.0)	
Divorced	3919	22.9 (22.2–23.5)	3183	29.8 (28.9–30.7)	698	11.2 (10.4–12.0)	
Widowed	1978	11.5 (11.1–12.0)	1226	11.5 (10.9–12.1)	738	11.8 (11.0–12.6)	
Population size of county residence[c]							< 0.001
< 50,000 persons	1790	10.2 (9.8–10.7)	1656	15.3 (14.6–16.0)	103	1.6 (1.3–2.0)	
50,000–499,999 persons	5398	30.9 (30.2–31.6)	4241	39.2 (38.3–40.1)	1047	16.7 (15.7–17.6)	
500,000–999,999 persons	4006	22.9 (22.3–23.5)	2285	21.1 (20.3–21.9)	1633	26.0 (24.9–27.1)	
≥ 1 million persons	6289	36.0 (35.3–36.7)	2641	24.4 (23.6–25.2)	3502	55.7 (54.5–56.9)	
Overall SVI							< 0.001
Q4: 0.7501–1.0 (highest)	7477	42.8 (42.0–43.5)	4580	42.3 (41.4–43.2)	2724	43.3 (42.1–44.6)	
Q3: 0.5001–0.7500	5264	30.1 (29.4–30.8)	3393	31.3 (30.5–32.2)	1757	28.0 (26.8–29.1)	
Q2: 0.2501–0.5000	3703	21.2 (20.6–21.8)	2112	19.5 (18.8–20.3)	1520	24.2 (23.1–25.2)	
Q1: 0–0.2500	1039	5.9 (5.6–6.3)	738	6.8 (6.3–7.3)	284	4.5 (4.0–5.0)	
Theme 1: Socioeconomic Status							< 0.001
Q4: 0.7501–1.0 (highest)	6380	36.5 (35.8–37.2)	3910	36.1 (35.2–37.0)	2317	36.9 (35.7–38.1)	
Q3: 0.5001–0.7500	4868	27.8 (27.2–28.5)	3326	30.7 (29.9–31.6)	1444	23.0 (21.9–24.0)	
Q2: 0.2501–0.5000	3469	19.8 (19.3–20.4)	2267	20.9 (20.2–21.7)	1135	18.1 (17.1–19.0)	
Q1: 0–0.2500	2766	15.8 (15.3–16.4)	1320	12.2 (11.6–12.8)	1389	22.1 (21.1–23.1)	
Theme 2: Household Characteristics							< 0.001
Q4: 0.7501–1.0 (highest)	3466	19.8 (19.2–20.4)	2661	24.6 (23.8–25.4)	736	11.7 (10.9–12.5)	
Q3: 0.5001–0.7500	5046	28.9 (28.2–29.5)	3473	32.1 (31.2–33.0)	1463	23.3 (22.2–24.3)	
Q2: 0.2501–0.5000	4306	24.6 (24.0–25.3)	2552	23.6 (22.8–24.4)	1656	26.3 (25.3–27.4)	
Q1: 0–0.2500	4665	26.7 (26.0–27.3)	2137	19.7 (19.0–20.5)	2430	38.7 (37.5–39.9)	
Theme 3: Racial and Ethnic Minority Status							< 0.001
Q4: 0.7501–1.0 (highest)	11,197	64.0 (63.3–64.8)	5922	54.7 (53.8–55.7)	5014	79.8 (78.8–80.8)	
Q3: 0.5001–0.7500	4125	23.6 (23.0–24.2)	2984	27.6 (26.7–28.4)	1060	16.9 (15.9–17.8)	

Category	Overall		US-born[a]		Non-US-born[a]		*P* value[b]
	N	% (95% CI)	*N*	% (95% CI)	*N*	% (95% CI)	
Q2: 0.2501–0.5000	1356	7.8 (7.4–8.2)	1163	10.7 (10.2–11.3)	175	2.8 (2.4–3.2)	
Q1: 0–0.2500	805	4.6 (4.3–4.9)	754	7.0 (6.5–7.4)	36	0.6 (0.4–0.8)	
Theme 4: Housing Type and Transportation							< 0.001
Q4: 0.7501–1.0 (highest)	8692	49.7 (49.0–50.5)	4719	43.6 (42.7–44.5)	3779	60.1 (58.9–61.3)	
Q3: 0.5001–0.7500	5570	31.9 (31.2–32.6)	3674	33.9 (33.1–34.8)	1771	28.2 (27.1–29.3)	
Q2: 0.2501–0.5000	2167	12.4 (11.9–12.9)	1671	15.4 (14.8–16.1)	461	7.3 (6.7–8.0)	
Q1: 0–0.2500	1054	6.0 (5.7–6.4)	759	7.0 (6.5–7.5)	274	4.4 (3.9–4.9)	
Uninsured							< 0.001
Q4: 0.7501–1.0 (highest)	3066	17.5 (17.0–18.1)	2258	20.9 (20.1–21.6)	741	11.8 (11.0–12.6)	
Q3: 0.5001–0.7500	4761	27.2 (26.6–27.9)	3082	28.5 (27.6–29.3)	1553	24.7 (23.6–25.8)	
Q2: 0.2501–0.5000	4566	26.1 (25.5–26.8)	2771	25.6 (24.8–26.4)	1709	27.2 (26.1–28.3)	
Q1: 0–0.2500	5090	29.1 (28.4–29.8)	2712	25.1 (24.2–25.9)	2282	36.3 (35.1–37.5)	

Data sources: 2010–2019 US Multiple Cause of Death, National Vital Statistics System and 2016–2020 Social Vulnerability Index, Agency of Toxic Substances and Disease Registry

YPLL years of potential life lost, *HS* high school, *GED* General Education Development, *SVI* Social Vulnerability Index, *Q* SVI quartile

[a] 375 (or 2.1% of) decedents with hepatitis B–listed deaths had unknown US birthplace status

[b] Chi-square test of independence to assess differences in characteristics between US-born and non-US-born decedents, where $P < 0.05$ was considered statistically significant

[c] Population size of counties of residence based on the results of the 2016–2020 American Community Survey

J Racial Ethn Health Disparities. Author manuscript; available in PMC 2025 September 12.

Table 2

Median years of potential life lost and interquartile range[a] among hepatitis B–listed decedents, by sociodemographic and social vulnerability characteristics, United States, 2010–2019

Characteristic	Overall Median YPLL (IQR)	US-born Median YPLL (IQR)	Non-US-born Median YPLL (IQR)	*P* value[b]
Overall	**17.2 (8.5–25.0)**	**18.1 (10.3–25.2)**	**15.2 (6.1–24.2)**	**< 0.001**
Sex				
Male	16.4 (9.2–23.5)	17.2 (10.3–23.4)	15.3 (6.3–24.3)	< 0.001
Female	19.1 (8.1–27.2)	21.1 (12.0–29.1)	14.1 (4.2–24.1)	< 0.001
Race and ethnicity				
White, non-Hispanic	17.2 (9.2–24.2)	17.3 (9.4–24.3)	12.3 (3.1–21.1)	< 0.001
Black, non-Hispanic	19.3 (12.3–27.3)	18.4 (12.2–26.2)	23.3 (13.1–34.2)	< 0.001
Hispanic	18.2 (10.1–25.4)	20.1 (12.3–26.4)	16.4 (8.1–25.2)	< 0.001
Asian/Pacific Islander, non-Hispanic	14.4 (5.3–23.3)	18.2 (8.2–33.3)	14.3 (5.2–23.2)	< 0.001
American Indian/Alaska Native, non-Hispanic	19.7 (12.2–29.0)	20.3 (12.2–29.4)	14.3 (10.9–25.4)	0.654
Education level				
Less than HS	18.1 (8.3–26.1)	19.5 (12.3–27.1)	13.5 (3.3–23.3)	< 0.001
4 years HS, HS diploma, GED, or some college	17.4 (10.1–25.2)	18.2 (11.2–25.1)	16.2 (7.3–25.2)	< 0.001
At least graduated college	13.3 (4.2–22.1)	12.4 (4.1–19.4)	14.3 (4.4–23.3)	< 0.001
Marital status				
Single or never married	22.4 (15.4–30.4)	22.2 (15.5–29.4)	25.3 (15.8–34.4)	< 0.001
Married	15.3 (7.2–23.2)	15.5 (8.1–23.2)	15.2 (6.4–23.4)	0.366
Divorced	18.2 (12.1–24.3)	18.2 (12.3–24.4)	17.3 (9.4–24.2)	0.011
Widowed	6.1 (0.0–15.4)	8.3 (0.0–18.1)	2.1 (0.0–10.1)	< 0.001
Population size of county residence[c]				
< 50,000 persons	19.2 (11.3–26.4)	19.3 (11.5–26.4)	15.4 (9.1–25.2)	0.025
50,000–499,999 persons	17.4 (10.2–25.2)	17.5 (10.4–25.1)	16.3 (8.2–26.1)	0.084
500,000–999,999 persons	17.1 (8.2–24.4)	18.1 (10.3–24.5)	14.4 (5.3–24.2)	< 0.001
≥ 1 million persons	16.2 (7.2–24.2)	17.3 (10.1–24.4)	15.1 (5.2–23.4)	< 0.001
Overall SVI				
Q4: 0.7501–1.0 (highest)	17.4 (9.2–25.2)	18.3 (11.1–25.4)	15.4 (6.2–24.3)	< 0.001

Characteristic	Overall Median YPLL (IQR)	US-born Median YPLL (IQR)	Non-US-born Median YPLL (IQR)	*P* value[b]
Q3: 0.5001–0.7500	17.3 (9.2–25.1)	18.2 (10.4–25.2)	15.0 (6.1–23.4)	< 0.001
Q2: 0.2501–0.5000	16.2 (7.4–23.5)	17.2 (10.1–24.1)	14.3 (4.4–24.1)	< 0.001
Q1: 0–0.2500	16.3 (8.3–24.2)	16.4 (9.2–23.5)	15.4 (6.3–24.7)	0.511
Theme 1: Socioeconomic Status				
Q4: 0.7501–1.0 (highest)	17.5 (9.2–25.4)	18.4 (11.2–26.2)	15.4 (6.1–24.3)	< 0.001
Q3: 0.5001–0.7500	17.4 (9.3–25.1)	18.3 (10.5–25.2)	15.1 (6.2–23.4)	< 0.001
Q2: 0.2501–0.5000	17.1 (8.4–24.2)	17.3 (10.2–24.2)	15.4 (6.4–24.4)	0.008
Q1: 0–0.2500	15.3 (6.4–23.3)	16.2 (9.1–23.2)	14.3 (4.3–23.4)	0.001
Theme 2: Household Characteristics				
Q4: 0.7501–1.0 (highest)	18.2 (10.4–25.3)	18.2 (11.2–25.3)	17.2 (8.5–26.2)	0.079
Q3: 0.5001–0.7500	18.2 (10.2–25.5)	18.4 (10.5–25.5)	16.4 (8.2–25.4)	0.001
Q2: 0.2501–0.5000	16.5 (8.2–24.3)	17.5 (10.3–25.1)	14.5 (4.3–23.4)	< 0.001
Q1: 0–0.2500	15.3 (6.4–23.2)	16.4 (9.3–23.4)	14.2 (4.3–23.1)	< 0.001
Theme 3: Racial and Ethnic Minority Status				
Q4: 0.7501–1.0 (highest)	16.4 (8.2–24.3)	17.4 (10.3–24.5)	15.1 (5.3–23.5)	< 0.001
Q3: 0.5001–0.7500	17.3 (9.4–24.4)	17.5 (10.3–24.4)	16.1 (7.1–25.3)	0.016
Q2: 0.2501–0.5000	18.2 (10.2–26.3)	18.2 (10.2–26.2)	17.2 (8.2–28.2)	0.780
Q1: 0–0.2500	20.5 (12.2–27.5)	21.1 (12.3–28.2)	20.7 (10.3–26.2)	0.537
Theme 4: Housing Type and Transportation				
Q4: 0.7501–1.0 (highest)	17.1 (8.2–24.4)	18.2 (10.5–25.2)	14.5 (5.1–23.4)	< 0.001
Q3: 0.5001–0.7500	17.3 (9.3–25.3)	18.1 (10.4–25.2)	15.4 (7.1–25.2)	< 0.001
Q2: 0.2501–0.5000	17.3 (9.4–25.1)	17.4 (10.2–24.4)	16.2 (7.3–26.1)	0.412
Q1: 0–0.2500	16.3 (8.3–23.3)	16.5 (9.2–23.3)	15.2 (6.3–23.3)	0.185
Uninsured				
Q4: 0.7501–1.0 (highest)	18.2 (10.2–25.3)	18.3 (11.1–25.2)	16.2 (7.2–26.2)	0.012
Q3: 0.5001–0.7500	17.3 (8.4–25.2)	18.2 (10.3–25.3)	15.2 (5.2–24.2)	< 0.001
Q2: 0.2501–0.5000	17.3 (9.3–25.1)	18.1 (11.1–25.2)	15.4 (7.1–24.3)	< 0.001
Q1: 0–0.2500	16.2 (7.4–24.2)	17.3 (10.1–24.3)	14.3 (5.1–23.3)	< 0.001

Data sources: 2010–2019 US Multiple Cause of Death, National Vital Statistics System and 2016–2020 Social Vulnerability Index, Agency of Toxic Substances and Disease Registry

YPLL years of potential life lost, *IQR* interquartile range, *HS* high school, *GED* General Education Development, *SVI* Social Vulnerability Index, *Q* SVI quartile

[a] Based on sex-specific life expectancies during 2010–2019 as published by the CDC National Center for Health Statistics

[b] Kruskal–Wallis test to assess differences in median YPLL between US-born and non-US-born decedents, where $P < 0.05$ was considered statistically significant

[c] Population size of counties of residence based on the results of the 2016–2020 American Community Survey

Table 3

Distribution and median years of potential life lost among US-born and non-US-born decedents with hepatitis B–listed deaths by coinfection status with hepatitis C, HIV, or hepatitis D and underlying cause of death, United States, 2010–2019

	US-born			Non-US-born			*P* value[a]
Category	***N***	**% (95% CI)**	**Median YPLL (IQR)**	***N***	**% (95% CI)**	**Median YPLL (IQR)**	
Overall	**10,823**	**100**	**18.1 (10.3–25.2)**	**6285**	**100**	**15.2 (6.1–24.2)**	**< 0.001**
Coinfection with HCV, HIV, or HDV							
Yes	4262	39.4 (38.5–40.3)	20.2 (14.3–26.2)	554	8.8 (8.1–9.5)	15.4 (7.3–24.3)	< 0.001
No	6561	60.6 (59.7–61.5)	16.1 (7.1–24.2)	5731	91.2 (90.5–91.9)	15.2 (5.3–24.2)	0.013
Hepatitis B underlying COD status							
Hepatitis B as the underlying COD	3272	30.2 (29.3–31.1)	18.3 (10.2–26.3)	1846	29.4 (28.2–30.5)	15.1 (5.4–24.2)	< 0.001
Hepatitis B as a contributing COD	7551	69.8 (68.9–70.6)	17.5 (10.4–24.4)	4439	70.6 (69.5–71.6)	15.2 (6.1–24.2)	< 0.001
Underlying COD when hepatitis B was listed as a contributing COD[b]							
Hepatitis C	264	3.5 (3.1–3.9)	20.1 (14.4–26.1)	33	0.7 (0.5–1.0)	14.4 (6.2–24.1)	0.006
Hepatitis A or other viral hepatitis	63	0.8 (0.6–1.1)	20.0 (12.3–29.4)	6	0.1 (0.0–0.3)[c]	18.8 (13.5–21.2)	0.609
Liver-related, alcohol	772	10.2 (9.5–10.9)	21.3 (16.2–27.1)	147	3.3 (2.8–3.9)	21.3 (14.1–29.3)	0.791
Liver-related, non-alcohol	419	5.5 (5.0–6.1)	18.1 (10.5–25.3)	169	3.8 (3.3–4.4)	13.2 (4.1–21.5)	< 0.001
Liver cancer	1556	20.6 (19.7–21.5)	16.2 (10.2–22.1)	2384	53.7 (52.2–55.2)	16.2 (7.1–24.5)	0.945
Cancer, except liver cancer	1231	16.3 (15.5–17.2)	15.2 (8.1–21.4)	733	16.5 (15.4–17.6)	14.1 (5.4–22.3)	0.486
HIV	616	8.2 (7.6–8.8)	24.2 (18.4–30.5)	82	1.8 (1.5–2.3)	25.8 (15.3–34.2)	0.698
Circulatory	949	12.6 (11.8–13.3)	15.4 (6.4–22.3)	316	7.1 (6.4–7.9)	9.2 (1.3–19.4)	< 0.001
Respiratory	345	4.6 (4.1–5.1)	14.2 (8.2–21.1)	69	1.6 (1.2–2.0)	3.3 (0.3–16.2)	< 0.001
Diabetes	194	2.6 (2.2–3.0)	16.3 (10.0–25.2)	100	2.3 (1.8–2.7)	13.1 (2.2–22.6)	0.003
Genitourinary	97	1.3 (1.0–1.6)	16.1 (9.2–24.4)	58	1.3 (1.0–1.7)	13.8 (6.3–24.0)	0.491
Injuries or trauma	278	3.7 (3.3–4.1)	23.1 (15.2–29.2)	43	1.0 (0.7–1.3)	16.1 (4.3–26.3)	0.008
Injuries or trauma (except drug overdose, alcohol poisoning, suicide, and homicide)	104	1.4 (1.1–1.7)	18.3 (9.8–25.2)	29	0.7 (0.4–0.9)	9.4 (1.2–21.2)	0.013
Drug overdose, alcohol poisoning, suicide, or homicide	174	2.3 (2.0–2.7)	24.5 (18.2–31.2)	14	0.3 (0.2–0.5)[c]	28.3 (19.3–35.5)	0.262
Mental or behavioral disorders	156	2.1 (1.8–2.4)	21.3 (10.5–29.4)	35	0.8 (0.5–1.1)	12.3 (0.0–25.4)	0.038
Digestive, extra-hepatic	129	1.7 (1.4–2.0)	17.2 (8.1–24.3)	64	1.4 (1.1–1.8)	12.5 (5.5–21.4)	0.122
Other	482	6.4 (5.8–7.0)	17.3 (9.3–25.3)	200	4.5 (3.9–5.2)	15.8 (6.2–25.2)	0.139

Data sources: 2010–2019 US Multiple Cause of Death, National Vital Statistics Systems

HCV hepatitis C virus, *HIV* human immunodeficiency virus, *HDV* hepatitis D virus, *COD* cause of death, *CI* confidence interval, *IQR* interquartile range, *YPLL* years of potential life lost, *UCOD* underlying cause of death, *CCOD* contributing cause of death

[a] Kruskal–Wallis test to assess differences in median YPLL per decedent between US-born and non-US-born decedents, where a *P* value of less than 0.05 was considered statistically significant

[b] Denominator for percent calculation of non-hepatitis B conditions listed as the UCOD was 7551 for US-born and 4439 for non-US-born

[c] Proportions where death counts were less than 20 are considered statistically unstable

Table 4

Distribution of sociodemographic characteristics, years of potential life lost, and social vulnerability among hepatitis B–listed decedents based on county-level burden of hepatitis B-listed deaths, United States, 2010–2019

	Hepatitis B–listed deaths		Counties ≥ 20 deaths		Counties 1–19 deaths		
Category	***N***	**% (95% CI)**	***N***	**% (95% CI)**	***N***	**% (95% CI)**	***P* value[a]**
Overall	**17,483**	**100**	**11,544**	**66.0 (65.3–66.7)**	**5939**	**34.0 (33.3–34.7)**	
Age-adjusted death rate (95% CI)/100,000 population	0.47 (0.46–0.48)		0.64 (0.62–0.65)		0.37 (0.36–0.38)		
US birthplace status							< 0.001
US-born	10,823	63.3 (62.5–64.0)	5921	52.5 (51.6–53.4)	4902	84.1 (83.1–85.0)	
Non-US-born	6285	36.7 (36.0–37.5)	5357	47.5 (46.6–48.4)	928	15.9 (15.0–16.9)	
Sex							0.718
Male	12,779	73.1 (72.4–73.8)	8448	73.2 (72.4–74.0)	4331	72.9 (71.8–74.1)	
Female	4704	26.9 (26.2–27.6)	3096	26.8 (26.0–27.6)	1608	27.1 (25.9–28.2)	
Age							< 0.001
< 35 years	375	2.1 (1.9–2.4)	247	2.1 (1.9–2.4)	128	2.2 (1.8–2.5)	
35–44 years	1249	7.1 (6.8–7.5)	825	7.1 (6.7–7.6)	424	7.1 (6.5–7.8)	
45–64 years	9605	54.9 (54.2–55.7)	6096	52.8 (51.9–53.7)	3509	59.1 (57.8–60.3)	
≥ 65 years	6252	35.8 (35.1–36.5)	4374	37.9 (37.0–38.8)	1878	31.6 (30.4–32.8)	
Year of birth							< 0.001
After 1965	2788	15.9 (15.4–16.5)	1783	15.4 (14.8–16.1)	1005	16.9 (16.0–17.9)	
1945–1965	10,849	62.1 (61.3–62.8)	7014	60.8 (59.9–61.7)	3835	64.6 (63.4–65.8)	
Before 1945	3844	22.0 (21.4–22.6)	2745	23.8 (23.0–24.6)	1099	18.5 (17.5–19.5)	
YPLL							< 0.001
0 years	1757	10.1 (9.6–10.5)	1305	11.3 (10.7–11.9)	452	7.6 (6.9–8.3)	
> 0 and < 8.50 years	2596	14.9 (14.3–15.4)	1803	15.6 (15.0–16.3)	793	13.4 (12.5–14.2)	
8.50 and < 25.00 years	8767	50.2 (49.4–50.9)	5674	49.2(48.2–50.1)	3093	52.1 (50.8–53.4)	
≥ 25.00 years	4361	24.9 (24.3–25.6)	2760	23.9 (23.1–24.7)	1601	27.0 (25.8–28.1)	
Race and ethnicity							< 0.001
White, non-Hispanic	8083	46.5 (45.8–47.3)	3984	34.8 (33.9–35.7)	4099	69.2 (68.1–70.4)	
Black, non-Hispanic	3312	19.1 (18.5–19.6)	2437	21.3 (20.5–22.0)	875	14.8 (13.9–15.7)	
Hispanic	1359	7.8 (7.4–8.2)	1095	9.6 (9.0–10.1)	264	4.5 (3.9–5.0)	

Category	Hepatitis B–listed deaths		Counties ≥ 20 deaths		Counties 1–19 deaths		*P* value[a]
	N	% (95% CI)	*N*	% (95% CI)	*N*	% (95% CI)	
Asian/Pacific Islander, non-Hispanic	4488	25.8 (25.2–26.5)	3894	34.0 (33.1–34.9)	594	10.0 (9.3–10.8)	
American Indian/Alaska Native, non-Hispanic	132	0.8 (0.6–0.9)	44	0.4 (0.3–0.5)	88	1.5 (1.2–1.8)	
Education level							< 0.001
Less than HS	4311	25.7 (25.0–26.3)	2701	24.4 (23.6–25.2)	1610	28.0 (26.9–29.2)	
4 years HS, HS diploma, GED, or some college	9947	59.2 (58.5–60.0)	6395	57.8 (56.9–58.8)	3552	61.8 (60.6–63.1)	
At least graduated college	2542	15.1 (14.6–15.7)	1959	17.7 (17.0–18.4)	583	10.1 (9.4–10.9)	
Marital status							< 0.001
Single or never married	3808	22.2 (21.6–22.9)	2630	23.3 (22.5–24.0)	1178	20.2 (19.2–21.3)	
Married	7425	43.3 (42.6–44.1)	5165	45.7 (44.8–46.6)	2260	38.8 (37.6–40.1)	
Divorced	3919	22.9 (22.2–23.5)	2207	19.5 (18.8–20.3)	1712	29.4 (28.2–30.6)	
Widowed	1978	11.5 (11.1–12.0)	1304	11.5 (10.9–12.1)	674	11.6 (10.8–12.4)	
Population size of county residence[b]							< 0.001
< 50,000 persons	1790	10.2 (9.8–10.7)	0		1790	30.1 (29.0–31.3)	
50,000–499,999 persons	5398	30.9 (30.2–31.6)	1586	13.7 (13.1–14.4)	3812	64.2 (63.0–65.4)	
500,000–999,999 persons	4006	22.9 (22.3–23.5)	3669	31.8 (30.9–32.6)	337	5.7 (5.1–6.3)	
≥ 1 million persons	6289	36.0 (35.3–36.7)	6289	54.5 (53.6–55.4)	0		
Overall SVI							< 0.001
Q4: 0.7501–1.0 (highest)	7477	42.8 (42.0–43.5)	5744	49.8 (48.8–50.7)	1733	29.2 (28.0–30.3)	
Q3: 0.5001–0.7500	5264	30.1 (29.4–30.8)	3445	29.8 (29.0–30.7)	1819	30.6 (29.5–31.8)	
Q2: 0.2501–0.5000	3703	21.2 (20.6–21.8)	2250	19.5 (18.8–20.2)	1453	24.5 (23.4–25.6)	
Q1: 0–0.2500	1039	5.9 (5.6–6.3)	105	0.9 (0.7–1.1)	934	15.7 (14.8–16.7)	
Theme 1: Socioeconomic status							< 0.001
Q4: 0.7501–1.0 (highest)	6380	36.5 (35.8–37.2)	4726	40.9 (40.0–41.8)	1654	27.8 (26.7–29.0)	
Q3: 0.5001–0.7500	4868	27.8 (27.2–28.5)	3174	27.5 (26.7–28.3)	1694	28.5 (27.4–29.7)	
Q2: 0.2501–0.5000	3469	19.8 (19.3–20.4)	1998	17.3 (16.6–18.0)	1471	24.8 (23.7–25.9)	
Q1: 0–0.2500	2766	15.8 (15.3–16.4)	1646	14.3 (13.6–14.9)	1120	18.9 (17.9–19.9)	
Theme 2: Household Characteristics							< 0.001
Q4: 0.7501–1.0 (highest)	3466	19.8 (19.2–20.4)	1872	16.2 (15.5–16.9)	1594	26.8 (25.7–28.0)	
Q3: 0.5001–0.7500	5046	28.9 (28.2–29.5)	3318	28.7 (27.9–29.6)	1728	29.1 (27.9–30.3)	
Q2: 0.2501–0.5000	4306	24.6 (24.0–25.3)	2941	25.5 (24.7–26.3)	1365	23.0 (21.9–24.1)	

J Racial Ethn Health Disparities. Author manuscript; available in PMC 2025 September 12.

Category	Hepatitis B–listed deaths		Counties ≥ 20 deaths		Counties 1–19 deaths		*P* value[a]
	N	% (95% CI)	*N*	% (95% CI)	*N*	% (95% CI)	
Q1: 0–0.2500	4665	26.7 (26.0–27.3)	3413	29.6 (28.7–30.4)	1252	21.1 (20.0–22.1)	
Theme 3: Racial and Ethnic Minority Status							< 0.001
Q4: 0.7501–1.0 (highest)	11,197	64.0 (63.3–64.8)	9559	82.8 (82.1–83.5)	1638	27.6 (26.4–28.7)	
Q3: 0.5001–0.7500	4125	23.6 (23.0–24.2)	1919	16.6 (15.9–17.3)	2206	37.1 (35.9–38.4)	
Q2: 0.2501–0.5000	1356	7.8 (7.4–8.2)	44	0.4 (0.3–0.5)	1312	22.1 (21.0–23.1)	
Q1: 0–0.2500	805	4.6 (4.3–4.9)	22	0.2 (0.1–0.3)	783	13.2 (12.3–14.0)	
Theme 4: Housing Type and Transportation							< 0.001
Q4: 0.7501–1.0 (highest)	8692	49.7 (49.0–50.5)	6714	58.2 (57.3–59.1)	1978	33.3 (32.1–34.5)	
Q3: 0.5001–0.7500	5570	31.9 (31.2–32.6)	3911	33.9 (33.0–34.7)	1659	27.9 (26.8–29.1)	
Q2: 0.2501–0.5000	2167	12.4 (11.9–12.9)	723	6.3 (5.8–6.7)	1444	24.3 (23.2–25.4)	
Q1: 0–0.2500	1054	6.0 (5.7–6.4)	196	1.7 (1.5–1.9)	858	14.4 (13.6–15.3)	
Uninsured							< 0.001
Q4: 0.7501–1.0 (highest)	3066	17.5 (17.0–18.1)	1792	15.5 (14.9–16.2)	1274	21.5 (20.4–22.5)	
Q3: 0.5001–0.7500	4761	27.2 (26.6–27.9)	3179	27.5 (26.7–28.4)	1582	26.6 (25.5–27.8)	
Q2: 0.2501–0.5000	4566	26.1 (25.5–26.8)	3109	26.9 (26.1–27.7)	1457	24.5 (23.4–25.6)	
Q1: 0–0.2500	5090	29.1 (28.4–29.8)	3464	30.0 (29.2–30.8)	1626	27.4 (26.2–28.5)	

Data sources: 2010–2019 US Multiple Cause of Death, National Vital Statistics System and 2016–2020 Social Vulnerability Index, Agency of Toxic Substances and Disease Registry

YPLL years of potential life lost, *IQR* interquartile range, *HS* high school, *GED* General Education Development, *SVI* Social Vulnerability Index, *Q* SVI quartile

[a]Chi-square test of independence to assess differences in characteristics between decedents from counties with ≥ 20 deaths versus decedents from counties with 1–19 deaths, where $P < 0.05$ was considered statistically significant

[b]Population size of counties of residence based on the results of the 2016–2020 American Community Survey