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Research Letter

Increasing Cholangitis-related Mortality and Persistent Disparities Among U.S. Adults, 1999–2023

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Cholangitis-related mortality may represent a potentially preventable and equity-sensitive indicator of care quality. Cholangitis is a potentially life-threatening infection of the biliary tract, most commonly associated with biliary obstruction.[1,2] Severe cases, particularly acute cholangitis, may rapidly progress to sepsis if left untreated, requiring prompt recognition and treatment.[3,4] However, population-level analyses of cholangitis-related mortality trends remain limited. Using data from the Centers for Disease Control and Prevention Wide-ranging Online Data for Epidemiologic Research (CDC WONDER), we analyzed national trends in age-adjusted mortality rates (AAMRs) for cholangitis-related deaths among U.S. adults aged ≥25 years from 1999 to 2023. Cholangitis-related deaths were identified using the International Classification of Diseases, Tenth Revision (ICD-10) code K83.0 and listed as the underlying cause of death. Temporal trends were assessed using Joinpoint regression, with $P < 0.05$ considered statistically significant.[5]

From 1999 to 2023, there were 20,777 cholangitis-related deaths among U.S. adults aged ≥25 years. Over this period, the AAMR increased from 0.25 (95% confidence interval [CI], 0.23–0.27) in 1999 to 0.46 (95% CI, 0.43–0.48) in 2023, corresponding to an average annual percent change of 2.17% (95% CI, 1.87–2.48; $P < 0.05$) (Table 1; Fig. 1), indicating a persistent increase in cholangitis-related mortality over time.

Overall, upward trends were observed among most subgroups with reliable trend estimates, with notable disparities. Adults aged ≥85 years consistently exhibited the highest crude mortality rates, reaching 5.75 per 100,000 (95% CI, 5.15–6.34) in 2023, highlighting the disproportionate burden among older adults. Although males accounted for 48.86% of cholangitis-related deaths, they consistently exhibited higher AAMRs than females throughout the study period; however, the rate of increase was greater among females, suggesting a narrowing sex disparity over time.

Marked racial and ethnic disparities were observed. Across the analyzed race-specific subgroups with reliable trend estimates, Hispanics had the highest AAMRs across most of the study period, whereas non-Hispanic White individuals experienced the most rapid increase over time. Regional differences were also evident, with the Midwest showing the largest increase, followed by the Northeast, South, and West (Fig. 1), underscoring persistent geographic inequities in cholangitis-related mortality.

These findings reveal a consistent epidemiological pattern: cholangitis-related mortality in the U.S. is increasing while exhibiting persistent and multidimensional disparities across populations, potentially reflecting differences in healthcare access, disease severity, and management patterns. The elevated AAMRs among older adults may be attributable to age-associated immune senescence and a greater burden of comorbid conditions. Higher mortality among males has also been reported and may reflect differences in underlying disease burden, healthcare utilization patterns, and other sex-related factors.[6] Racial/ethnic disparities likely arise from complex interactions among healthcare access, comorbidity burden, and socioeconomic conditions.[7] However, given the aggregate nature of CDC WONDER data, these interpretations should be considered hypothesis-generating rather than causal.

From a clinical and public health perspective, these findings underscore the need for targeted interventions. High-risk populations, particularly older adults and disproportionately affected racial/ethnic groups, may benefit from timely recognition and appropriate management. Regional disparities suggest unequal access to acute healthcare services, emphasizing the importance of optimizing healthcare delivery in high-burden areas.

This study has several limitations. First, because CDC WONDER relies on death certificate-based ICD coding, cholangitis-related deaths may be subject to potential misclassification or underreporting. In addition, cases identified using ICD-10 code K83.0 should not be assumed to represent clinically confirmed diagnoses. Second, the aggregated nature of the CDC

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Table 1. Mortality rates of cholangitis in the U.S. by demographic and geographic characteristics, 1999–2023

	Deaths, 1999	Mortality rate, 1999	Deaths, 2023	Mortality rate, 2023	Joinpoint period	APC (95% CI)[a]	AAPC (95% CI)[b]
Overall	456	0.25 (0.23-0.27)	1,276	0.46 (0.43-0.48)	1999–2023	2.17 (1.87-2.48)	2.17 (1.87-2.48)
Age group[c]							
Age group 25-44	16	NA[d]	26	0.03 (0.02-0.04)	Unreliable[e]	Unreliable[e]	Unreliable[e]
Age group 45-64	97	0.16 (0.13-0.20)	193	0.23 (0.20-0.27)	1999–2010	-0.80 (-2.50-0.92)	1.79 (0.85-2.74)
					2010–2023	4.04 (2.90-5.19)	
Age group 65-84	222	0.72 (0.63-0.82)	701	1.32 (1.22-1.42)	1999–2023	1.89 (1.51-2.27)	1.89 (1.51-2.27)
Age group 85+	121	2.91 (2.39-3.43)	356	5.75 (5.15-6.34)	1999–2023	2.49 (2.03-2.96)	2.49 (2.03-2.96)
Sex							
Male	225	0.30 (0.26-0.34)	617	0.49 (0.45-0.53)	1999–2023	1.40 (1.01-1.80)	1.40 (1.01-1.80)
Female	231	0.21 (0.18-0.24)	659	0.41 (0.38-0.44)	1999–2023	2.65 (2.31-2.99)	2.65 (2.31-2.99)
Race/Ethnicity[f]							
NH White	369	0.24 (0.22-0.27)	921	0.43 (0.41-0.46)	1999–2023	2.42 (1.99-2.84)	2.42 (1.99-2.84)
NH Black	40	0.23 (0.16-0.32)	121	0.45 (0.37-0.53)	1999–2023	1.49 (0.75-2.23)	1.49 (0.75-2.23)
Hispanic	31	0.38 (0.25-0.55)	137	0.50 (0.42-0.59)	1999–2023	0.89 (0.15-1.64)	0.89 (0.15-1.64)
NH other	14	NA[d]	85	0.50(0.40-0.62)	Unreliable[e]	Unreliable[e]	Unreliable[e]
Census region							
South	149	0.22 (0.19-0.26)	386	0.38 (0.34-0.42)	1999–2023	2.00 (1.57-2.44)	2.00 (1.57-2.44)
Northeast	115	0.30 (0.25-0.36)	273	0.54 (0.47-0.60)	1999–2023	2.42 (1.97-2.88)	2.42 (1.97-2.88)
Midwest	94	0.23 (0.18-0.28)	313	0.52 (0.46-0.58)	1999–2023	3.15 (2.53-3.77)	3.15 (2.53-3.77)
West	98	0.27 (0.22-0.33)	304	0.49 (0.43-0.54)	1999–2023	1.52 (1.01-2.04)	1.52 (1.01-2.04)

[a]Temporal trends were assessed using Joinpoint regression (version 5.1.0.0) to estimate annual percent change (APC) and average APC (AAPC). [b]AAPC with 95% CI was used to quantify the long-term temporal trend in AAMRs over the study period (1999-2023). Age-adjusted mortality rates (AAMRs) with 95% confidence intervals were calculated using the 2000 U.S. standard population. [c]Crude mortality rates per 100,000 population were reported for all age subgroups, and AAMRs per 100,000 population were reported for analyses stratified by sex, race/ethnicity, and census region. [d]"NA" indicates that the estimate was not available. [e]"Unreliable" indicates that APC and AAPC were not estimated because the trend was considered unreliable owing to sparse death counts. [f]Race categories not presented in the table, including the category labeled "Not Stated" in the CDC WONDER, were excluded due to limited sample size and/or insufficient data for reliable trend estimation. "NH other" refers to NH Asian or Pacific Islander. AAMR, age-adjusted mortality rate; AAPC, average annual percent change; APC, annual percent change; CI, confidence interval; NH, non-Hispanic.

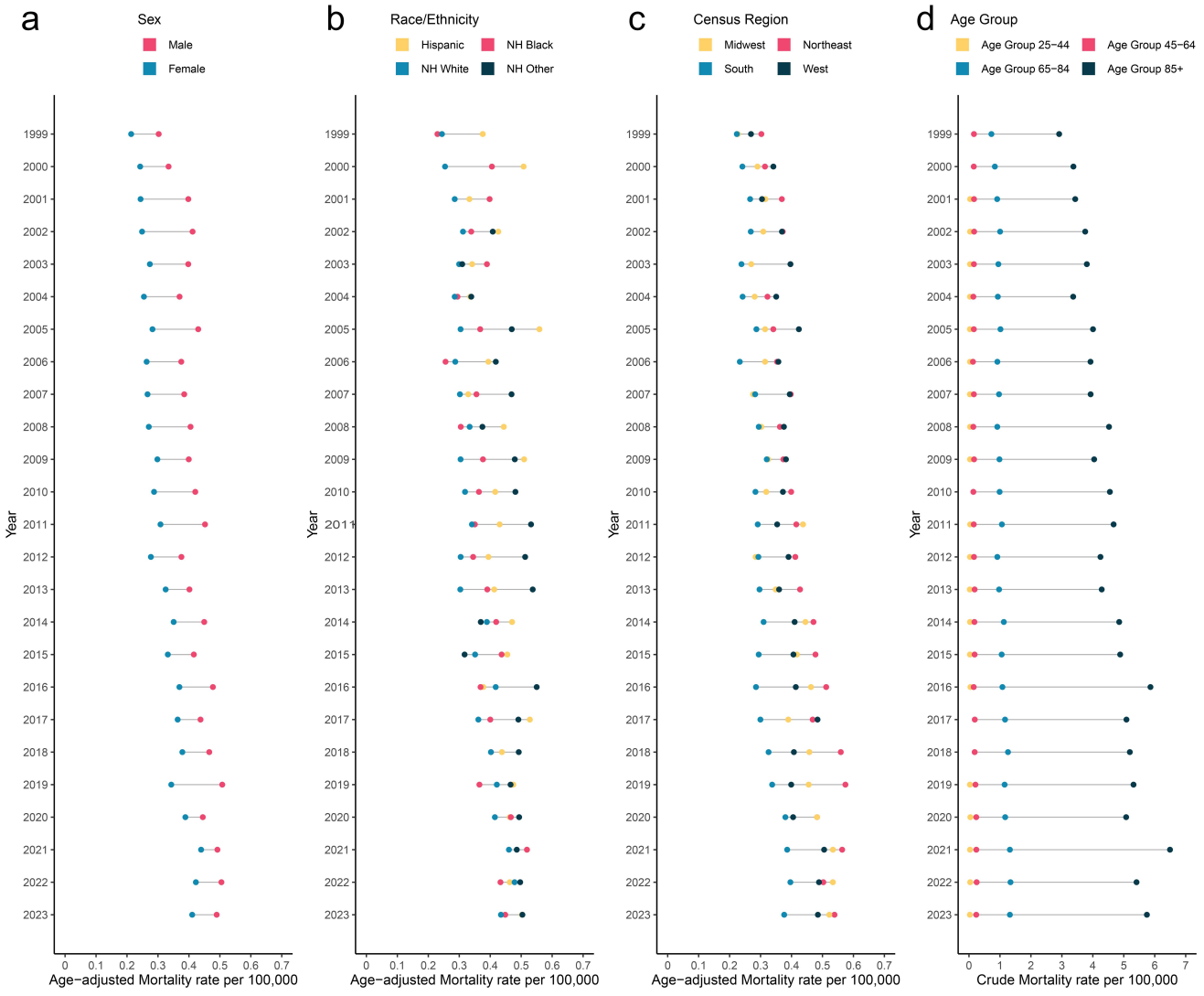

Fig. 1. Trends in age-adjusted mortality rates for cholangitis-related deaths among U.S. adults aged ≥25 years, 1999-2023. (a-c) Trends in age-adjusted mortality rates for cholangitis-related deaths stratified by sex (a), race/ethnicity (b), and U.S. census region (c). (d) Trends in crude mortality rates stratified by age group. For adults aged 25–44 years, only available annual crude mortality rates are shown descriptively; APC and AAPC were not estimated because the trend was considered unreliable owing to sparse death counts. AAPC, average annual percent change; APC, annual percent change; NH, non-Hispanic.

WONDER database does not allow adjustment for individual-level confounders, and the findings should therefore be interpreted as ecological associations. Additionally, the absence of individual-level covariates—such as socioeconomic status and lifestyle factors—limits our ability to fully account for important contributors to cholangitis-related mortality.

In conclusion, cholangitis-related mortality in the U.S. increased substantially from 1999 to 2023, with persistent disparities across demographic and geographic groups. Although the population-level mortality burden remains relatively low, cholangitis represents a low-incidence but high-acuity condition for which timely recognition and appropriate management may help reduce mortality. These findings support the need for targeted, equity-focused strategies to improve early detection, optimize acute care delivery, and reduce avoidable cholangitis-related mortality.

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Conflict of interest

The authors declare no conflicts of interest.

Author contributions

Conceptualization and supervision (MjC), statistical analysis and data analysis (AS, MrC), writing of the manuscript (LC, HJ), revision of the manuscript (AS, MrC). All authors provided intellectual input and approved the final version of the manuscript.

Ethical statement

This study used publicly available, de-identified data from the CDC WONDER database and was exempt from institutional review board approval.

Data sharing statement

The datasets analyzed in this study are publicly available from the CDC WONDER database at https://wonder.cdc.gov/.

References

[1] Buxbaum JL, Buitrago C, Lee A, Elmunzer BJ, Riaz A, Ceppa EP, *et al*. ASGE guideline on the management of cholangitis. Gastrointest Endosc 2021;94(2):207–221.e214. DOI: 10.1016/j.gie.2020.12.032, PMID: 34023065.

[2] Mohammad Alizadeh AH. Cholangitis: Diagnosis, Treatment and Prognosis. Journal of clinical and translational hepatology 2017;5(4): 404–413. DOI: 10.14218/jcth.2017.00028, PMID: 29226107.

[3] Lee JG. Diagnosis and management of acute cholangitis. Nat Rev Gastroenterol Hepatol 2009;6(9):533–541. DOI: 10.1038/nrgastro.2009.126, PMID: 19652653.

[4] Kiriyama S, Kozaka K, Takada T, Strasberg SM, Pitt HA, Gabata T, *et al*. Tokyo Guidelines 2018: diagnostic criteria and severity grading of acute cholangitis (with videos). J Hepatobiliary Pancreat Sci 2018; 25(1):17–30. DOI: 10.1002/jhbp.512, PMID: 29032610.

[5] Kim HJ, Fay MP, Feuer EJ, Midthune DN. Permutation tests for joinpoint regression with applications to cancer rates. Stat Med 2000; 19(3):335–351. DOI: 10.1002/(sici)1097-0258(20000215)19:3<335::aid-sim336>3.0.co;2-z, PMID: 10649300.

[6] Jamal MM, Yamini D, Singson Z, Samarasena J, Hashemzadeh M, Vega KJ. Decreasing hospitalization and in-hospital mortality related to cholangitis in the United States. J Clin Gastroenterol 2011;45(10): e92–e96. DOI: 10.1097/MCG.0b013e31822f364c, PMID: 21989279.

[7] Ndugga N, Hill L, Artiga S. Key Data on Health and Health Care by Race and Ethnicity. Kaiser Family Foundation; 2024. Available from: https://www.kff.org/racial-equity-and-health-policy/key-data-on-health-and-health-care-by-race-and-ethnicity. Accessed October 5, 2025.