Brief Report

CARDIAC RESEARCH

OPEN

Trends in gout-associated cardiovascular mortality among U.S. adults aged 55 and older, 1999 to 2024

Yuhui Zhao, MM[a,b], Jiaxuan Yang, MM[b], Jinhan Sun, MM[b], Xuran Chen, MM[b], Chunhua Kou, PhD[c], Zhongyan Xu, PhD[d], Liyun An, PhD[d,*] Min Li, PhD[a,*]

Keywords: cardiovascular disease, gout, mortality, United States, older adults, sociodemographic disparities, trend analysis, CDC WONDER

1. Introduction

Gout, the most common form of inflammatory arthritis, has become a growing public health concern in the United States (U.S.), where its burden exceeds global levels. Beyond joint involvement, gout is strongly linked to systemic comorbidities, particularly cardiovascular disease (CVD). Patients with gout in the United States face a 58% greater risk of CVD-related mortality compared with the general population, among the highest risks observed globally.[1] Despite this well-established association, long-term trends in CVD mortality among adults with gout remain poorly characterized. To address this gap, we analyzed national mortality data from 1999 to 2024 to examine sociodemographic disparities in CVD-related deaths among U.S. adults aged ≥ 55 years with gout and projected future mortality rates through 2035.

2. Methods

This descriptive analysis examined trends in CVD-related mortality among U.S. adults aged ≥ 55 years with gout from 1999 to 2024. Mortality data were obtained from the CDC Wide-ranging Online Data for Epidemiologic Research (WONDER) database, which compiles death certificate records from all 50 states. Each record includes a single underlying cause of death, up to 20 contributing causes, and demographic information. We focused on deaths in which CVD (ICD-10 codes I00–I99) was listed as the underlying cause and gout (ICD-10 code M10) was recorded as a contributing cause. Age-adjusted mortality rates (AAMRs) per 100,000 population were calculated using the 2000 U.S. standard population and further stratified by sex, race/ethnicity, census region, and age group to assess sociodemographic disparities. Temporal trends were assessed using Joinpoint Regression, which estimates annual percent change (APC) with 95% confidence intervals (CI), while overall trends were summarized using the average annual percent change (AAPC). Additionally, autoregressive integrated moving average (ARIMA) models were applied to predict mortality trends through 2035. Statistical significance was determined using two-tailed t tests with a threshold of $P < 0.05$. All analyses were conducted in R (version 4.4.0). Because the study relied on publicly available, de-identified data, institutional review board approval was not required.

3. Results

Between 1999 and 2024, a total of 22,050 CVD-related deaths with gout recorded as a contributing cause were identified in the U.S. population aged ≥ 55 years, corresponding to age-adjusted mortality rates per 100,000 population. The AAMR showed a long-term decline, from 1.50 (95% CI: 1.40–1.60) per 100,000 in 1999 to 0.96 (95% CI: 0.90–1.02) in 2024, with an AAPC of −1.68 (95% CI: −2.22 to −1.13). However, this decline was not

YZ and JY contributed to this article equally.

Supplemental Digital Content is available for this article.

[a] Department of Cardiology, Shanxi Provincial People's Hospital, Fifth Hospital of Shanxi Medical University, Taiyuan, China, [b] Department of Rheumatology, Shanxi Key Laboratory of Immunomicroecology, Second Hospital of Shanxi Medical University, Taiyuan, China, [c] Clinical Laboratory, Grand Hospital of Shuozhou, Shuozhou, China, [d] Clinical Laboratory, Bethune International Peace Hospital, Shijiazhuang, China.

* Correspondence: Min Li, Department of Cardiology, Shanxi Provincial People's Hospital, Fifth Hospital of Shanxi Medical University, Taiyuan 030012, China (e-mail: limin20190916@163.com). Liyun An, Clinical Laboratory, Bethune International Peace Hospital, 398 Zhongshan Road, Shijiazhuang 050082, China (e-mail: anly899@126.com).

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Cardiac Research (2026) 2:3

Received: 13 December 2025 / Received in final form: 23 July 2026 / Accepted: 27 July 2026

http://dx.doi.org/10.1097/re9.0000000000000029

linear, as temporal analysis revealed a fluctuating trend. Specifically, between 1999 and 2019, the AAMR experienced a net decline. A nonstatistically significant change in mortality was observed from 2019 to 2024, with the most significant rise occurring between 2019 and 2020, coinciding with the COVID-19 pandemic. After this sharp increase, the rate of rise slowed between 2020 and 2021, and mortality began to decline again from 2021 to 2024 (Fig. 1A). Based on these observed trends, forecasting analyses project that the AAMR will decline from 0.94 in 2025 to 0.72 by 2035 (Fig. S1, Supplemental Digital Content, https://links.lww.com/CARES/A23).

Sex disparities were pronounced. Men consistently exhibited higher AAMRs, decreasing from 2.58 (95% CI: 2.36–2.80) in 1999 to 1.50 (95% CI: 1.38–1.62) in 2024 (AAPC: −1.89; 95% CI: −2.53 to −1.23). Among women, the mortality rate declined numerically over the study period; however, this trend did not reach statistical significance (AAPC: −1.50; 95% CI: −4.02 to 1.09). Despite these downward trends, both sexes experienced a marked mortality increase between 2019 and 2020 (Fig. 1A). Declines were also observed across racial and ethnic groups, though disparities persisted. Non-Hispanic Black individuals maintained the highest mortality rates in most years, decreasing from 3.13 (95% CI: 2.62–3.64) in 1999 to 1.63 (95% CI: 1.37–1.93) in 2024 (AAPC: −1.93; 95% CI: −3.47 to −0.36). In contrast, non-Hispanic Asian patients experienced the steepest reduction (AAPC: −4.30; 95% CI: −4.98 to −3.62), while declines among non-Hispanic White adults were more modest (AAPC: −1.67; 95% CI: −2.04 to −1.31) (Fig. 1B). Geographic variation was evident. The Midwest and West consistently exhibited higher AAMRs in most years, with the Midwest showing the steepest decline from 1.78 (95% CI: 1.56–2.00) in 1999 to 0.90 (95% CI: 0.77–1.04) in 2024 (AAPC: −2.97; 95% CI: −3.86 to −2.07) (Fig. 1C). At the state level, Ohio recorded the largest reduction, with AAMR falling from 2.68 (95% CI: 2.08–3.41) to 0.88 (95% CI: 0.59–1.26) (AAPC: −3.95; 95% CI: −5.17 to −2.72). Mortality risk increased markedly with age, with the highest crude mortality rates in adults ≥ 85 years, followed by those aged 75 to 84, 65 to 74, and 55 to 64. All age groups showed long-term declines but shared a transient surge from 2019 to 2020. Among the oldest patients (≥ 85 years), mortality declined from 8.06 (95% CI: 7.20–8.93) in 1999 to 5.92 (95% CI: 5.33–6.52) in 2024 (AAPC: −1.38; 95% CI: −1.76 to −1.00) (Fig. 1D).

We also examined all-cause mortality among U.S. adults aged ≥ 55 years with gout from 1999 to 2024. A total of 53,254 all-cause deaths were recorded in this population over the same period (Fig. S2, Supplemental Digital

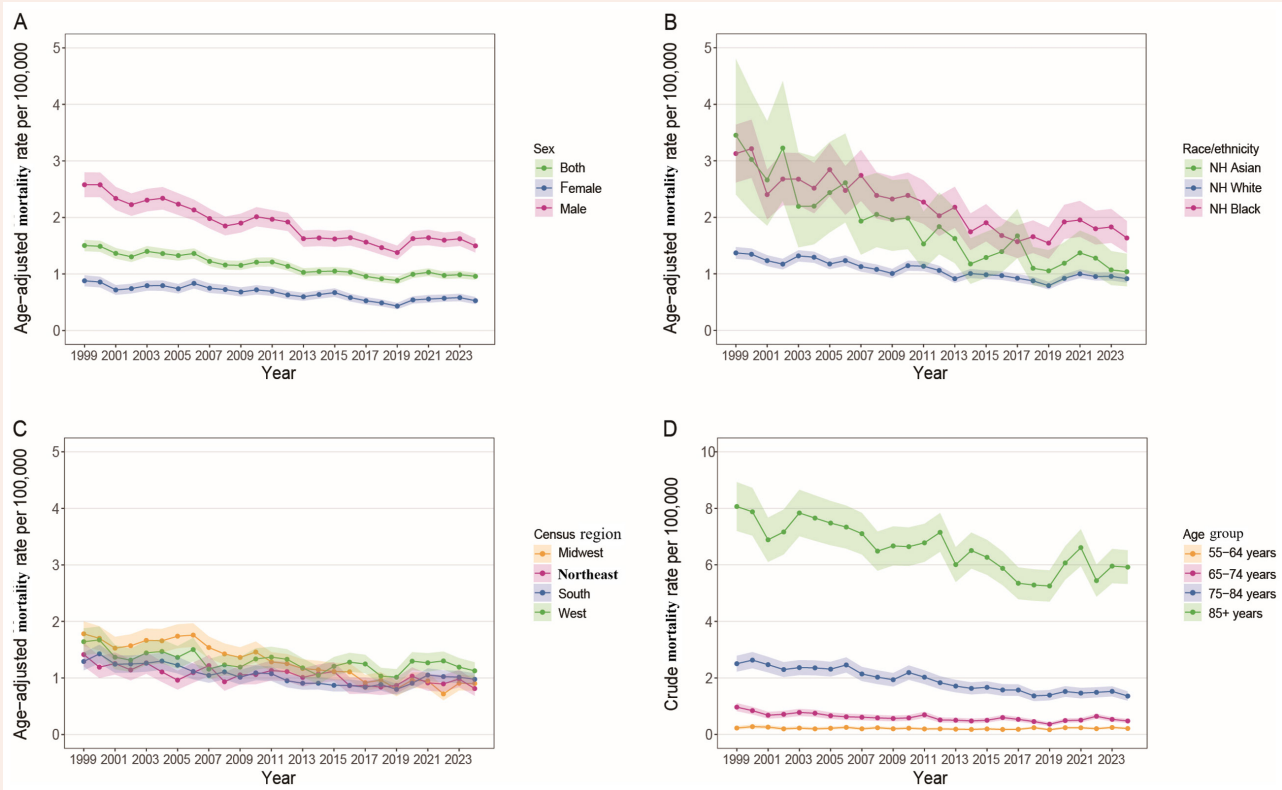


Figure 1. AAMR for gout-related CVD mortality among adults aged ≥ 55 years in the United States from 1999 to 2024. (A) Stratified by sex; (B) Stratified by race/ethnicity; (C) Stratified by census region; (D) Stratified by age group. AAMR = age-adjusted mortality rate, CVD = cardiovascular disease, NH = non-Hispanic.

Content, https://links.lww.com/CARES/A23). The AAMR for all-cause mortality showed a slight increase, rising from 2.62 (95% CI: 2.49–2.75) per 100,000 in 1999 to 2.75 (95% CI: 2.64–2.86) in 2024, with an AAPC of 0.06 (95% CI: –0.70 to 0.82). Temporal analysis revealed a fluctuating decline from 1999 to 2019, followed by a sharp increase between 2019 and 2020, mirroring national trends during the COVID-19 pandemic. The rate of increase slowed between 2020 and 2021, and mortality began to decline again from 2021 to 2024.

4. Discussion

This study found that while CVD-related mortality among older U.S. adults with gout significantly declined from 1999 to 2024, this progress was not uniform across all populations. The overall downward trend likely reflects advancements in managing cardiovascular risk factors and the increased use of urate-lowering therapies (ULT). However, the lack of significant improvement among women with gout is concerning. This may be due to a higher baseline burden of comorbidities at diagnosis, such as obesity and diabetes, compounded by postmenopausal physiological changes that elevate cardiovascular risk[2,3] (Note 1, Supplemental Digital Content, https://links.lww.com/CARES/A23). Racial and geographic disparities further complicate these trends. Non-Hispanic Black individuals experienced a persistent mortality gap, rooted in structural inequalities. These barriers, including reduced access to specialty care and lower adherence to ULT, are often a consequence of historical policies like redlining, which continue to limit healthcare access and contribute to poorer outcomes[4,5] (Note 2, Supplemental Digital Content, https://links.lww.com/CARES/A23). In contrast to racial disparities, the Midwest region, despite having a higher baseline mortality, showed the most significant downward trend. This improvement is likely due to a combination of enhanced healthcare delivery and regional environmental factors[6,7] (Note 3, Supplemental Digital Content, https://links.lww.com/CARES/A23). While ULT has been increasingly recommended following guidelines such as the 2012 ACR treat-to-target strategy, real-world implementation remains suboptimal. The temporary reversal in mortality during the 2019 to 2020 COVID-19 surge underscores the vulnerability of this population to healthcare disruptions, stemming from both the direct effects of SARS-CoV-2 and indirect effects like deferred care[8,9] (Note 4, Supplemental Digital Content, https://links.lww.com/CARES/A23). Finally, the divergence between declining CVD mortality and stable all-cause mortality highlights the complex comorbidity burden in gout. This suggests that while cardiovascular management has improved, other causes of death, potentially including infections or renal disease, have not seen the same improvements, underscoring the need for comprehensive, multidisease management strategies (Note 5, Supplemental Digital Content, https://links.lww.com/CARES/A23). Importantly, the AAMRs reported in this study reflect the population-level burden of CVD mortality, with gout recorded as a contributing cause on death certificates, and do not represent individual-level mortality risk among patients with clinically diagnosed gout, as the denominator includes the entire U.S. population.

Several limitations must be considered. Notably, the lack of data on treatment utilization and risk factor control within the CDC WONDER database prevents direct assessment of causal mechanisms. While our analysis focused on gout-specific mortality, we did not examine trends in hyperuricemia. Future research leveraging population-based data is necessary to determine whether improved management of hyperuricemia has contributed to the observed decline in mortality trends. Finally, because the CDC WONDER database provides aggregated mortality data rather than individual-level records, our analysis focused on stratified trend comparisons and could not evaluate interaction effects between demographic variables.

Acknowledgements

The authors would like to thank the U.S. Centers for Disease Control and Prevention for providing the database.

Ethical statements

Ethical approval was not required, as this study used only publicly available, de-identified data and did not involve human or animal subjects.

Conflicts of interest

The authors declared that there are no conflicts of interest.

Funding source

This research was supported by the National Supercomputing Taiyuan Center, China.

Data availability statement

The datasets analyzed during the current study are available in the CDC WONDER Database.

Author contributions

All the authors gave substantial contributions to the conception or design of the work, acquisition, analysis, or interpretation of data, drafting the work, or revising it critically for important intellectual content, and final approval of the version published.

AI statement

No AI-assisted tools were used in the writing or analysis of this manuscript.

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