and elimination of waiver requirements[4]; these changes might differentially affect young adults, who might be less likely to access health care.[5] The reasons for decreases among young adults are unclear but might reflect lower opioid use disorder prevalence or changes in treatment-seeking behaviors or health care coverage among young adults with substance use disorders and should be further explored. Despite some positive trends, buprenorphine dispensing to adolescents and young adults remains low. In 2023, 712 000 adolescents and young adults aged 12 to 25 years had opioid use disorder.[1] Meanwhile, in this study, 38 907 adolescents and young adults aged 10 to 24 years were dispensed buprenorphine in 2023, indicating that many adolescents and young adults who might benefit from this treatment did not receive it. Barriers to buprenorphine among adolescents and young adults may include few treatment facilities, lack of comfort with medications for opioid use disorder among youth-serving clinicians, and stigma related to opioid use disorder.[6]

Study limitations include a lack of data on diagnoses, prescriptions dispensed outside retail pharmacies, prescriptions written (vs dispensed), and the clinical setting or specialty for nurse practitioners and physician assistants.

Youth-serving clinicians and health systems can expand access to buprenorphine for adolescents and young adults through clinician education, improving resources to support substance use care for youths, linking to medications for opioid use disorder and behavioral health services, and addressing stigma and other barriers to care.[6]

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Accepted for Publication: October 26, 2024.

Published Online: December 23, 2024. doi:10.1001/jama.2024.24121

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Author Contributions: Drs Lee and Rikard had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.
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Administrative, technical, or material support: Lee, Guy, Terranella.
Supervision: Guy, Terranella.

Conflict of Interest Disclosures: None reported.

Disclaimer: The findings and conclusions in this article are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Data Sharing Statement: See the Supplement.

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CLIMATE CHANGE AND HEALTH

Cold-Related Deaths in the US

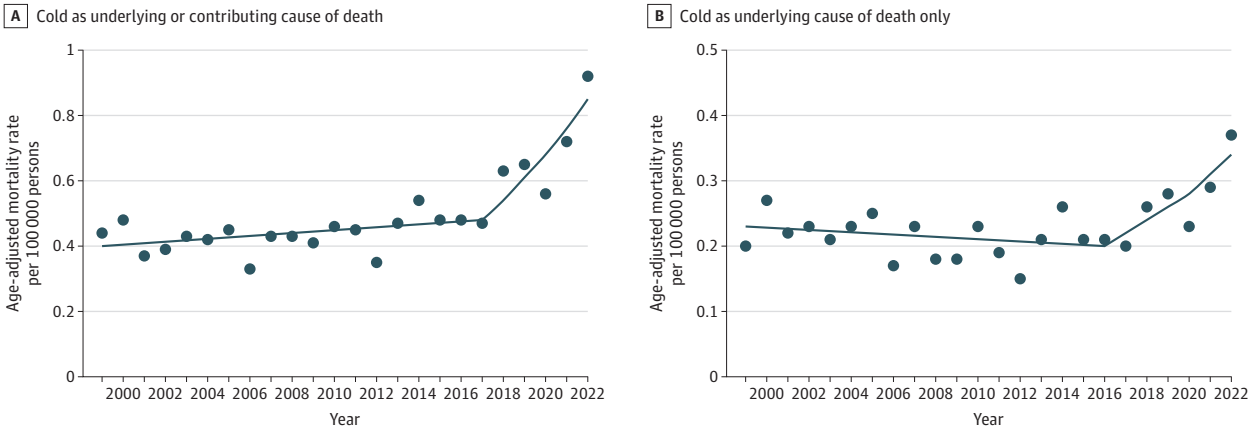
Although mean temperatures are increasing in the US, studies have found that climate change has been linked with more frequent episodes of severe winter weather in the US over the past few decades, which may in turn be associated with increased cold-related mortality.[1-3] However, little is known about the burden of cold-related mortality and how this varies across different population groups. This study assessed trends in cold-related mortality overall and by demographic characteristics between 1999 and 2022.

Supplemental content

Methods | We used the Centers for Disease Control and Prevention's WONDER (Wide-Ranging Online Data for Epidemiologic Research) platform to analyze death certificates from 1999 to 2022 in which cold was recorded as either an underlying or contributing cause of death. Cold-related deaths were identified using the *International Statistical Classification of Diseases and Related Health Problems, 10th Revision* codes X31 (exposure to excessive natural cold), T68 (hypothermia), or T69 (other effects of reduced temperature), per the US Environmental Protection Agency definition.[4]

We obtained cold-related age-adjusted (to the 2000 US Census population) mortality rates (AAMRs) per 100 000 persons for the population overall and by age, sex, race, ethnicity, and region. Joinpoint regression was used to characterize trends and assess slope changes in AAMRs between 1999 and 2022, with results reported as annual percentage changes (APCs). A sensitivity analysis with cold as the underlying cause of death was performed. Statistical significance was defined as 2-sided $P < .05$. All analyses were performed using Joinpoint version 5.2.0. Institutional review board approval was not required (use of publicly available deidentified data).

Figure. Age-Adjusted Cold-Related Mortality Rates in the US, 1999-2022



Mortality rates were age-adjusted to the US population in 2000. Cold-related mortality rates are plotted as dots, with a Joinpoint model plotted as a line and a single Joinpoint in either 2017 (panel A) or 2016 (panel B).

Table. Cold-Related Mortality in the US by Age, Sex, Race, Ethnicity, and Region, 1999-2022[a]

	Total deaths, No.	AAMR per 100 000 persons (95% CI)		APC (95% CI), %	*P* value
		1999	2022		
Overall	40 079	0.44 (0.42 to 0.47)	0.92 (0.88 to 0.95)	3.4 (2.4 to 4.3)	<.001
Age, y					
≤24	1896	0.06 (0.04 to 0.08)	0.05 (0.04 to 0.06)	1.7 (−1.3 to 4.8)	.22
25-44	6334	0.21 (0.18 to 0.24)	0.66 (0.61 to 0.72)	3.7 (2.2 to 5.0)	<.001
45-74	19 441	0.58 (0.52 to 0.63)	1.54 (1.47 to 1.61)	4.8 (3.7 to 5.6)	<.001
≥75	12 351	3.23 (2.95 to 3.50)	4.23 (3.97 to 4.49)	2.0 (1.0 to 3.0)	<.001
Sex					
Male	13 032	0.69 (0.64 to 0.74)	1.34 (1.28 to 1.39)	3.0 (2.2 to 3.9)	<.001
Female	27 047	0.23 (0.21 to 0.26)	0.51 (0.48 to 0.54)	3.1 (2.2 to 4.0)	<.001
Race and ethnicity[b]					
American Indian or Alaska Native	2389	4.48 (3.40 to 5.79)	6.26 (5.25 to 7.27)	1.0 (0.2 to 3.1)	.02
Black	6259	1.00 (0.88 to 1.13)	1.50 (1.38 to 1.62)	1.5 (0.3 to 2.8)	.02
Hispanic	2217	0.21 (0.14 to 0.29)	0.51 (0.45 to 0.57)	4.1 (3.2 to 5.3)	<.001
White	28 235	0.37 (0.35 to 0.40)	0.88 (0.84 to 0.92)	3.9 (2.9 to 4.7)	<.001
Region					
Northeast	7095	0.50 (0.44 to 0.56)	0.77 (0.70 to 0.84)	1.9 (0.6 to 3.1)	.008
Midwest	11 729	0.51 (0.46 to 0.57)	1.41 (1.32 to 1.49)	4.3 (2.8 to 5.6)	<.001
South	11 367	0.37 (0.33 to 0.41)	0.71 (0.67 to 0.75)	2.5 (1.0 to 3.9)	.002
West	9888	0.47 (0.41 to 0.52)	0.94 (0.88 to 1.01)	3.6 (2.6 to 4.6)	<.001

Abbreviations: AAMR, age-adjusted mortality rate; APC, annual percentage change.

[a] Cold-related mortality was identified as all deaths with cold listed as an underlying or contributing cause using *International Statistical Classification of Diseases and Related Health Problems, 10th Revision* codes X31, T68, and T69.

[b] Race and ethnicity were assessed in this study because of local-level data demonstrating that racial and ethnic minority populations were disproportionately impacted by cold exposure.[5] Race and ethnicity were recorded on death certificates and provided by the Centers for Disease Control and Prevention following 1997 Office of Management and Budget standards for the collection of data on race and ethnicity.

Results | There were 63 550 429 deaths in the US between 1999 and 2022; a total of 40 079 deaths (0.06%) had cold recorded as an underlying or contributing cause of death. Cold-related AAMRs during this period increased from 0.44 (95% CI, 0.42-0.47) per 100 000 persons in 1999 to 0.92 (95% CI, 0.88-0.95) per 100 000 persons in 2022 (109% increase) (**Figure**). There was a 3.4% (95% CI, 2.4%-4.3%; $P < .001$) annual increase in the cold-related AAMR over the study period, with a nonsignificant increase from 1999 to 2017 (APC, 1.0% [95% CI, −0.9% to 2.2%]; $P = .20$) followed by a significant annual increase from 2017 to 2022 (APC, 12.1% [95% CI, 6.3%-27.1%]; $P < .001$). Results were consistent when cold was specified as the underlying cause of death only, with no change in AAMRs from 1999 to 2016 and a significant annual increase from 2016 to 2022 (APC, 9.1% [95% CI, 3.1%-27.9%]; $P = .001$).

Cold-related AAMRs were highest among adults 75 years or older (4.23 [95% CI, 3.97-4.49] per 100 000 persons in 2022), although adults aged 45 to 74 years experienced the largest annual increase (APC, 4.8% [95% CI, 3.7%-5.6%]; $P < .001$) between 1999 and 2022 (**Table**). Males had higher AAMRs than females, although both groups experienced significant increases over the study period. Across racial and ethnic groups, the highest cold-related AAMRs were

observed among American Indian or Alaska Native (6.26 [95% CI, 5.25-7.27] per 100 000 persons in 2022) and Black (1.50 [95% CI, 1.38-1.62] per 100 000 persons in 2022) people. However, annual increases in cold-related AAMRs were largest among Hispanic (APC, 4.1% [95% CI, 3.2%-5.3%]; $P < .001$) and White (APC, 3.9% [95% CI, 2.9%-4.7%]; $P < .001$) people. Across regions, the Midwest experienced the highest mortality rates (1.41 [95% CI, 1.32-1.49] per 100 000 persons in 2022) and the largest annual increase (APC, 4.3% [95% CI, 2.8%-5.6%]; $P < .001$).

Discussion | Cold-related mortality rates more than doubled in the US between 1999 and 2022. Prior research suggests that cold temperatures account for most temperature-related mortality.[3] This study identified an increase in such deaths over the past 6 years. The underlying drivers of this trend warrant further research and may include more frequent extreme winter weather events and/or the rising burden of risk factors for cold-related mortality such as homelessness, social isolation, and substance use.[5]

Cold-related mortality was highest among older adults, who are more susceptible to cold weather due to limited thermoregulatory response and greater prevalence of chronic conditions.[6] The burden of cold-related deaths was also high among American Indian, Alaska Native, and Black people, consistent with the disproportionate exposure of racial and ethnic minority groups to structural risk factors such as lack of home insulation or heat.[5] The recent and rapid increase in cold-related deaths warrants public health interventions to improve access to warming centers and indoor heating for vulnerable populations.

Limitations of this study include potential underestimation of cold-related mortality using death certificates and lack of data about individual-level risk factors.

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Accepted for Publication: November 7, 2024.

Published Online: December 19, 2024. doi:10.1001/jama.2024.25194

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Author Contributions: Mr Liu and Dr Patel had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.
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Conflict of Interest Disclosures: Dr Wadhera reported receiving research support from the National Heart, Lung, and Blood Institute (R01HL164561, R01HL174549) and the National Institute of Nursing Research (R01NR021686) at the National Institutes of Health; the American Heart Association Established Investigator Award (24EIA1258487); and the Donaghue Foundation and serving as a consultant for Abbott, CVS Health, and Chambercardio, outside the submitted work. No other disclosures were reported.

Funding/Support: This work was supported by the American Heart Association's Established Investigator Award (24EIA1258487).

Role of the Funder/Sponsor: The American Heart Association had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

Data Sharing Statement: See the Supplement.

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Antibody Response to Respiratory Syncytial Virus Vaccination in Immunocompromised Persons

Respiratory syncytial virus (RSV) infection causes high morbidity in immunocompromised persons.[1] Novel prefusion F (preF)–containing RSV vaccines showed 13- to 14-fold increases in antibody titers 1 month after vaccination and 82.6% efficacy against confirmed RSV-related lower respiratory tract disease in immunocompetent populations.[2] There are no published data regarding antibody titers after RSV vaccines in immunocompromised populations or their correlation with vaccine effectiveness.[3] This study measured antibody response to RSV vaccinations in immunocompromised individuals.

Supplemental content

Methods | Within a prospective, national cohort studying viral vaccination and infections, persons with self-reported immunocompromising conditions were enrolled beginning on October 10, 2023, and followed up through July 1, 2024. The Johns Hopkins University approved this study and participants provided written informed consent. Participants reporting plans to receive adjuvanted RSVPreF3-AS01$_E$ (RSVA-AS01$_E$, GSK) or nonadjuvanted RSVpreF (RSV-A/B, Pfizer) vaccination were asked to provide prevaccine (baseline) and 2-, 4-, and 12-week postvaccination blood samples.

Participants with paired baseline and 4-week postvaccination samples who had not received immunoglobulin products were tested for preF IgG at each postvaccination time