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RESEARCH ARTICLE

Trends in Cardiovascular Disease Mortality Rates and Excess Deaths, 2010–2022

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Introduction: Cardiovascular disease (CVD) mortality increased during the initial years of the COVID-19 pandemic, but whether these trends endured in 2022 is unknown. This analysis describes temporal trends in CVD death rates from 2010 to 2022 and estimates excess CVD deaths from 2020 to 2022.

Methods: Using national mortality data from the National Vital Statistics System, deaths among adults aged ≥35 years were classified by underlying cause of death International Classification of Diseases 10th Revision codes for CVD (I00–I99), heart disease (I00–I09, I11, I13, I20–I51), and stroke (I60–I69). Analyses in Joinpoint software identified trends in CVD age-adjusted mortality rates (AAMR) per 100,000 and estimated the number of excess CVD deaths from 2020 to 2022.

Results: During 2010–2022, 10,951,403 CVD deaths occurred (75.6% heart disease, 16.9% stroke). The national CVD AAMR declined by 8.9% from 2010 to 2019 (456.6–416.0 per 100,000) and then increased by 9.3% from 2019 to 2022 to 454.5 per 100,000, which approximated the 2010 rate (456.7 per 100,000). From 2020 to 2022, 228,524 excess CVD deaths occurred, which was 9% more CVD deaths than expected based on trends from 2010 to 2019. Results varied by CVD subtype and population subgroup.

Conclusions: Despite stabilization of the public health emergency, declines in CVD mortality rates reversed in 2020 and remained high in 2022, representing almost a decade of lost progress and over 228,000 excess CVD deaths. Findings underscore the importance of prioritizing prevention and management of CVD to improve outcomes.

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INTRODUCTION

Death rates from cardiovascular diseases (CVD), which include heart disease and stroke, have declined steadily in the U.S. for decades,[1] which is often recognized as one of the top public health achievements of the 20th century.[2] However, despite this progress, heart disease and stroke remain the first and fifth leading causes of death in the U.S., respectively.[3] Prior investigations have documented increases in CVD mortality rates during the initial COVID-19 pandemic years of 2020 and 2021,[4–11] but whether these trends endured into the third year of the pandemic remains largely unknown. This study had two key objectives: (1) to describe temporal trends in CVD mortality rates among adults aged ≥35 years from 2010 to 2022 and (2) to estimate excess deaths attributable to CVD from 2020 through 2022 compared with expected deaths based on trends from 2010 to 2019.

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METHODS

Study Population

This study used mortality data from the National Vital Statistics System of the National Center for Health Statistics (NCHS), which was accessed via the Centers for Disease Control and Prevention's Wide-ranging Online Data for Epidemiologic Research (WONDER) platform.[12] CDC WONDER aggregates death certificate data for deaths occurring in 50 U.S. states and in the District of Columbia. Institutional review board approval was not required for this analysis of publicly available, de-identified surveillance data.

Measures

Mortality data from 2010 to 2022 were used to calculate age-adjusted mortality rates (AAMR) per 100,000 population for deaths with an International Classification of Diseases, 10th Revision (ICD-10) code for CVD (I00-I99) as the underlying cause of death. Deaths attributable to heart disease (I00−I09, I11, I13, I20−I51) and stroke (I60−I69) were also examined as secondary outcomes. CVD deaths with missing age or missing Hispanic origin were excluded from the analyses (approximately 0.5% of all CVD deaths).

CVD mortality estimates from 2022 used provisional estimates provided by NCHS, which were downloaded in March 2023. Provisional data are provided in real time and differ from finalized data in two ways: (1) provisional death counts do not yet include deaths undergoing review by NCHS and (2) provisional AAMR use the prior year's population estimates for the denominator in the mortality rate calculation.[13] Though incomplete, provisional data represent the most timely data available, which is critical for up-to-date reporting of mortality statistics necessary to identify adverse trends in CVD mortality.

AAMRs were calculated among adults aged ≥35 years, after direct age standardization to the 2000 U.S. standard population in 10-year age groups. Adults aged ≥35 years were selected as the population of interest because this age group is a priority population for CVD prevention and control initiatives, because CVD deaths among those aged <35 years are rare, and to exclude potential contribution of deaths attributable to congenital heart disease. Crude CVD death rates were stratified by age group and CVD AAMR were stratified by the sex (male, female) and race and Hispanic ethnicity group recorded on the death certificate. Race-stratified results present CVD AAMR for decedents of Hispanic or Latino descent and the following four race groups among non-Hispanic or Latino decedents: White, Black or African American (Black), Asian or Pacific Islander (API), and American Indian or Alaska Native (AIAN).

Statistical Analysis

Relative percent change in CVD AAMRs were calculated comparing calendar years 2010 vs 2019 and 2019 vs 2022 and calculated 95% CI by sampling normal distributions based on the underlying AAMRs and their standard errors, defining the CI as the 2.5 and 97.5 percentiles of calculations based on those samples. The starting date of 2010 was selected based on prior research indicating that it was a recent inflection point in CVD death rates.[1] Log-linear regression models in Joinpoint software (version 4.8.1.0, National Cancer Institute) identified trends in time segments and estimate average annual percent change (AAPC) across these two time periods. Excess CVD deaths from 2020 to 2022 were calculated by summing the differences in observed and expected deaths for each outcome. Expected number of deaths in 2020 through 2022 were calculated assuming the linear trend of AAMR between 2010 to 2019 continued through 2022 for each age group, sex, and race or ethnicity group and then multiplying these expected mortality rates by their respective population counts for each year. This represents the most rigorous approach given it incorporates potential trends that were observed in the preceding years in contrast with an average CVD AAMR in the preceding years.

RESULTS

A total of 10,951,403 CVD deaths occurred among adults aged ≥35 years from 2010 to 2022. Most CVD deaths (8,177,425, 74.7%) occurred from 2010 to 2019; 2,773,978 (25.3%) occurred from 2020 to 2022. Most CVD deaths were attributable to heart disease (75.6%) or stroke (16.9%); 7.5% were attributable to other forms of CVD.

From 2010 to 2019, the CVD AAMR declined by 8.9% (CI: −9.2, −8.6; AAPC: −0.9%; CI: −1.5, −0.3) from 456.6 to 416.0 per 100,000 (Figure 1, Table 1). From 2019 to 2022, the CVD AAMR increased by 9.3% (CI: 8.9, 9.6). The CVD AAMR increased in 2020 (434.7 per 100,000; CI: 433.8, 435.6), 2021 (451.8 per 100,000; CI: 450.9, 452.7), and 2022 (454.5 per 100,000; CI: 453.6, 455.5), which represented an average annual percent increase of 3.0% (CI: 1.5, 4.6) between 2019 and 2022. The most recent time the national CVD AAMR had been at the level observed in 2022 was between 2010 (456.7 per 100,000; CI: 455.6, 457.7) and 2011 (443.1 per 100,000; CI: 442.1, 444.1; Figure 1, Table 1). The trends

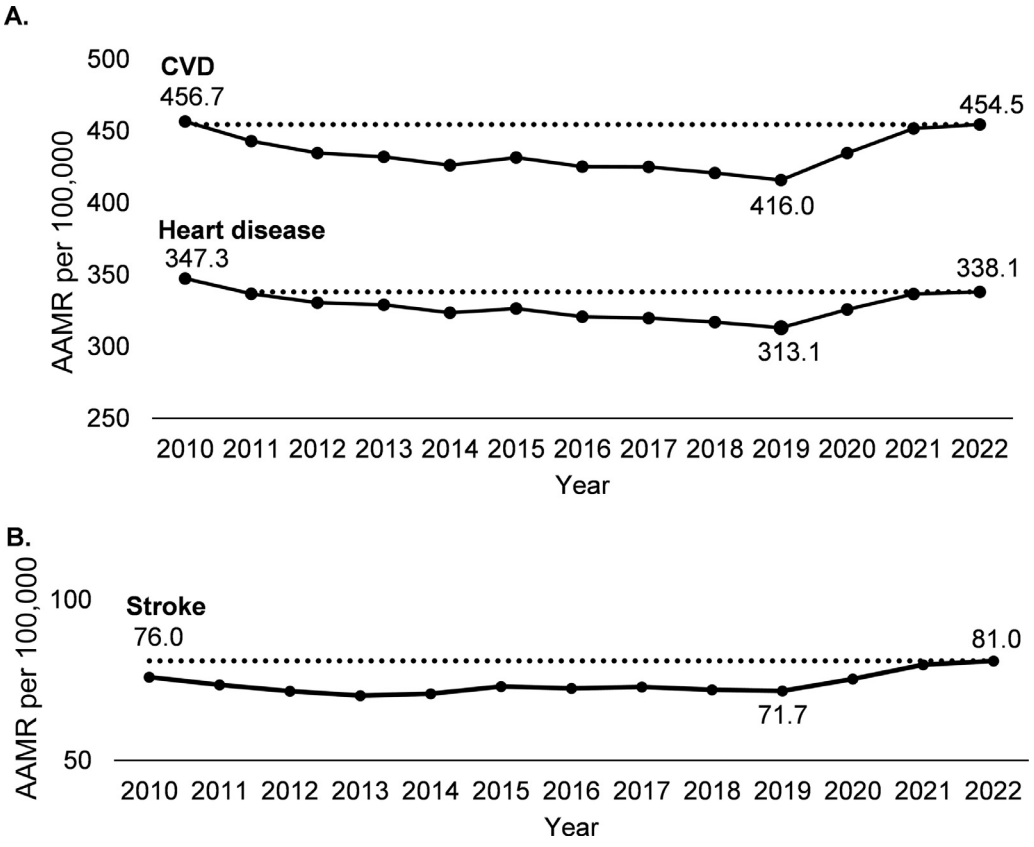

Figure 1. Age-adjusted rates of cardiovascular disease, heart disease, and stroke deaths per 100,000 adults aged ≥35 years−U. S., 2010−2022. Figure displays annual trends from 2010 to 2022 in age-adjusted mortality rate (AAMR) for deaths with International Classification of Diseases, 10th Revision, Clinical Modification codes for **A.** cardiovascular disease (CVD, I00−I99) or heart disease (I00−I09, I11, I13, I20−I51) or **B.** stroke (I60−I69) listed as the underlying cause of death. The dashed line connects the 2022 AAMR with the most recent year in which the 95% CIs overlap.

of declining AAMR from 2010 to 2019 and subsequent increases in the AAMR in 2020, 2021, and 2022 were statistically significant.

A similar temporal trend of declining CVD AAMRs from 2010 to 2019 with a reversal in trends from 2019 to 2022 occurred among adults of all sex and race and Hispanic ethnicity groups, which were driven primarily by trends among older adults (aged 65−74 years, 75−84 years, and ≥85 years; Table 1). Several subgroups experienced relative increases in CVD AAMRs from 2019 to 2022 that eliminated the reductions in CVD AAMRs over the preceding decade. For example, for adults aged 35−54 years, 65−74 years, and ≥85 years, males, females, White adults, and Black adults, the 2022 CVD AAMR approximated or exceeded the 2010 AAMR after declining from 2010 to 2019. The exception was among adults aged 55−64 years, whose CVD AAMR increased over both intervals.

An estimated 228,524 excess CVD deaths (CI: 199,980, 257,190) occurred during 2020-2022, representing 9.0% (CI: 7.8, 10.3) more deaths than expected (Table 2). The subgroups with the greatest percentage of excess deaths relative to expected deaths included adults aged 35−54 years (13.5%, CI: 11.6, 15.4), adults aged 75−84 years (10.3%, CI: 9.5, 11.0), Black adults (10.6%, CI: 8.7, 12.6) and Asian or Pacific Islander adults (12.2%, CI: 9.5, 15.0).

From 2010 to 2019, the heart disease AAMR declined by 9.9% (CI: −10.2, −9.5) from 347.3 to 313.1 deaths per 100,000 (Figure 1, Appendix Table 1). From 2019 to 2022, the heart disease AAMR increased by 8.0% (CI: 7.6, 8.4). The heart disease AAMR increased in 2020 (325.9 per 100,000; 325.1, 326.7) and 2021 (336.6 per 100,000; CI: 335.7, 337.4) and remained at a similar level in 2022 (338.1 per 100,000; CI: 337.3, 339.0), representing an average annual percent increase of 2.7 (CI: 1.4, 4.0) between 2019 and 2022. The most recent year in which the national heart disease AAMR had been at the rate observed in 2022 was in 2011 (336.8 per 100,000; CI: 335.9, 337.7). Subgroups that experienced relative

Table 1. Trends in Cardiovascular Disease[a] Mortality Rates Among Adults Aged ≥35 Years—U.S., 2010–2022

	Age-adjusted CVD mortality rate per 100,000 (95% CI)			Annual average percent change (95% CI)		Relative percent change (95% CI)	
Category	**2010**	**2019**	**2022**	**2010–2019**	**2019–2022**	**2010 vs. 2019**	**2019 vs. 2022**
Total	456.6 (455.6, 457.7)	416.0 (415.1, 416.9)	454.5 (453.6, 455.5)	−0.9 (−1.5, −0.3)	3.0 (1.5, 4.6)	−8.9 (−9.2, −8.6)	9.3 (8.9, 9.6)
Age group (years)[b]							
35–54	64.3 (63.8, 64.8)	61.8 (61.3, 62.3)	64.8 (64.3, 65.4)	0.5 (−0.1, 1.1)	0.5 (−0.1, 1.1)	−3.9 (−5.0, −2.8)	4.9 (3.7, 6.2)
55–64	231.8 (230.3, 233.4)	239.5 (238.0, 241.0)	250.9 (249.4, 252.4)	1.1 (0.7, 1.6)	1.1 (0.7, 1.6)	3.3 (2.4, 4.2)	4.8 (3.9, 5.7)
65–74	530.0 (526.9, 533.1)	505.1 (502.7, 507.6)	541.4 (538.9, 543.9)	−0.0 (−0.9, 0.8)	1.2 (0.6, 1.9)	−4.7 (−5.4, −4.0)	7.2 (6.5, 7.9)
75–84	1,577.2 (1,570.4, 1,584.0)	1,344.3 (1,338.6, 1,350.0)	1,494.5 (1,488.5, 1,500.4)	−1.6 (−1.9, −1.4)	3.5 (2.0, 5.0)	−14.8 (−15.3, −14.3)	11.2 (10.5, 11.8)
≥85	5,694.9 (5,675.0, 5,714.9)	5,138.0 (5,120.7, 5,155.3)	5,697.5 (5,678.4, 5,716.7)	−0.9 (−1.4, −0.4)	3.8 (1.1, 6.6)	−9.8 (−10.2, −9.3)	10.9 (10.4, 11.4)
Sex							
Male	549.2 (547.5, 551.0)	504.7 (503.2, 506.2)	546.5 (544.9, 548.0)	−0.8 (−1.3, −0.3)	2.7 (1.6, 3.9)	−8.1 (−8.5, −7.7)	8.3 (7.8, 8.7)
Female	382.9 (381.7, 384.1)	342.0 (341.0, 343.1)	376.9 (375.8, 378.1)	−1.1 (−1.9, −0.4)	3.3 (1.4, 5.2)	−10.7 (−11.1, −10.3)	10.2 (9.7, 10.7)
Race and Hispanic Ethnicity Group							
White, NH	454.0 (452.9, 455.2)	420.4 (419.3, 421.4)	463.2 (462.1, 464.3)	−0.6 (−1.0, −0.3)	3.6 (1.5, 5.7)	−7.4 (−7.7, −7.1)	10.2 (9.8, 10.6)
Black, NH	603.3 (599.2, 607.3)	550.1 (546.8, 553.4)	596.9 (593.4, 600.4)	−0.3 (−1.2, 0.6)	2.2 (0.3, 4.2)	−8.8 (−9.6, −8.0)	8.5 (7.6, 9.4)
Hispanic	347.1 (344.6, 349.6)	304.9 (302.3, 307.5)	333.6 (331.7, 335.4)	−0.7 (−1.5, 0.1)	2.7 (0.3, 5.3)	−12.2 (−13.3, −11.0)	9.4 (8.5, 10.3)
API, NH	285.3 (280.8, 289.8)	241.1 (238.0, 244.1)	271.2 (268.0, 274.4)	−1.5 (−2.5, −0.4)	3.4 (0.7, 6.1)	−15.5 (−17.2, −13.8)	12.5 (10.6, 14.5)
AIAN, NH	413.4 (398.5, 428.3)	358.4 (347.7, 369.2)	384.3 (372.9, 395.7)	−1.1 (−1.8, −0.5)	2.3 (−0.8, 5.6)	−13.3 (−17.4, −9.0)	7.3 (2.8, 11.7)

[a]CVD deaths were defined as having International Classification of Diseases, 10th Revision Clinical Modification codes I00–I99 listed as the underlying cause of death.
[b]Age-stratified rates are crude mortality rates that are not age-standardized.
API, Asian or Pacific Islander; AIAN, American Indian or Alaska Native; CVD, cardiovascular disease; NH, non-Hispanic.

Table 2. Excess Deaths From Cardiovascular Disease[a] Among Adults Aged ≥35 Years—U.S., 2020–2022

Category	Observed N	Expected[b] N	Excess[c] N	Excess[c] (95% CI)	Percent[d] %	Percent[d] (95% CI)
Total	2,758,591	2,530,067	228,524	199,980, 257,190	9.0	7.8, 10.3
Age group (years)						
35–54	174,971	154,151	20,820	18,239, 23,306	13.5	11.6, 15.4
55–64	329,326	310,454	18,872	15,690, 22,057	6.1	5.0, 7.2
65–74	536,728	498,677	38,051	28,913, 46,801	7.6	5.7, 9.6
75–84	697,700	632,558	65,142	60,815, 69,384	10.3	9.5, 11.0
≥85	1,019,866	934,227	85,639	76,323, 95,462	9.2	8.1, 10.3
Sex						
Male	1,446,595	1,335,240	111,355	97,111, 125,216	8.3	7.2, 9.5
Female	1,311,996	1,194,827	117,169	102,869, 131,974	9.8	8.5, 11.2
Race and Hispanic Ethnicity Group						
White, NH	2,093,635	1,928,443	165,192	147,957, 182,992	8.6	7.6, 9.6
Black, NH	368,971	333,494	35,477	29,438, 41,333	10.6	8.7, 12.6
Hispanic	198,125	180,575	17,550	14,376, 20,488	9.7	7.8, 11.5
API, NH	83,268	74,242	9,026	7,201, 10,836	12.2	9.5, 15.0
AIAN, NH	14,592	13,313	1,279	1,007, 1,540	9.6	7.4, 11.8

[a]CVD deaths were defined as having International Classification of Diseases, 10th Revision Clinical Modification codes I00–I99 listed as the underlying cause of death.
[b]Calculated by: (1) assuming that the age-adjusted/age-specific mortality rates for each age, sex, and race or ethnicity group would continue the trends through 2022 at the annual rate of 2010–2019 as identified by the Joinpoint analysis and (2) multiplying these rates by the respective population estimates in 2020, 2021, and 2022.
[c]Calculated as the difference between the observed vs expected CVD deaths for each age, sex, and race or ethnicity group in 2020–2022.
[d]Calculated by dividing excess by expected CVD deaths and multiplying by 100.
API, Asian or Pacific Islander; AIAN, American Indian or Alaska Native; CVD, cardiovascular disease; NH, non-Hispanic.

increases in heart disease AAMRs from 2019 to 2022 that eliminated reductions in heart disease AAMRs over the preceding decade included adults aged 65–74 years, aged ≥85 years, females, and White adults (Appendix Table 1).

An estimated 160,299 excess heart disease deaths (CI: 138,397, 181,781) occurred during 2020–2022, representing 8.4% (CI: 7.2, 9.7) more deaths than expected (Appendix Table 2). Excess deaths attributable to heart disease accounted for approximately 70.2% of excess deaths from CVD overall. The subgroups with the greatest percentage of excess deaths included adults aged 35–54 years (12.9%, CI: 11.3, 14.4), adults aged 75–84 years (10.0%, CI: 9.1, 10.7), Asian or Pacific Islander adults (12.0%, CI: 9.8, 14.2), and Black adults (10.1%, CI: 8.4, 11.9).

From 2010 to 2019, the stroke AAMR declined by 5.6% (CI: −6.3, −4.9) from 76.0 to 71.7 per 100,000 (Figure 1, Appendix Table 3). From 2019 to 2022, the stroke AAMR increased by 13.0% (CI: 12.1, 13.8). The stroke AAMR increased in 2020 (75.3 per 100,000; CI: 75.0, 75.7), 2021 (79.8 per 100,000; CI: 79.4, 80.2), and 2022 (81.0 per 100,000; CI: 80.6, 81.4), representing an annual average percent change of 4.0% (CI: 1.5, 6.7). The national stroke AAMR had not been at the level observed in 2022 since before 2010 (76.0 deaths per 100,000, CI: 75.5, 76.4). Subgroups that experienced net relative increases in stroke AAMRs from 2019 to 2022 that eliminated the process in reducing stroke AAMRs over the preceding decade included adults aged 35–54 years, 65–74 years, and ≥85 years, males, females, White adults and Black adults (Appendix Table 3).

An estimated 45,236 excess stroke deaths (CI: 33,169–53,247) occurred during 2020–2022, representing 10.3% (CI: 7.5, 12.4) more deaths than expected (Appendix Table 4). Excess deaths attributable to stroke accounted for approximately 19.8% of excess deaths from CVD overall. The subgroups with the greatest percentage of excess deaths included adults aged 35–54 years (15.8%, CI: 13.3, 18.3), adults aged 75–84 years (10.9%, CI: 7.3, 12.1), adults aged ≥85 years (10.4%, CI: 7.5, 12.9), White adults (10.4%, CI: 7.6, 12.3), Black adults (11.4%, CI: 8.7, 14.0), and Asian or Pacific Islander adults (12.4%, CI: 7.2, 14.4).

DISCUSSION

Increases in CVD mortality rates among adults during the initial years of the COVID-19 pandemic endured into 2022, despite stabilization of the public health emergency. This represents a reversal of sustained progress in

the preceding decades of reducing CVD mortality rates in the U.S.[1] The magnitude of the reversal translated into nearly a decade of lost progress in reducing CVD mortality rates in the U.S., with AAMR in 2022 reaching a level not previously observed since between 2010 and 2011. In addition, excess death analyses estimated that nearly a quarter of a million more CVD deaths occurred than expected among adults aged ≥35 years from 2020 to 2022. These adverse trends were primarily driven by increasing heart disease mortality rates, which represent most CVD deaths. However, increases were also observed for stroke mortality rates. For heart disease and stroke mortality rates, the relative increases in the 3-year period from 2019 to 2022 exceeded the relative declines in the rates from 2010 to 2019. Continued timely monitoring of CVD mortality trends is needed to clarify whether these increases coinciding with the COVID-19 pandemic years are temporary and will correct over time, or whether they reflect enduring setbacks in national CVD outcomes.

The observed changes in the national trajectory of CVD mortality rates through 2022 newly presented in this study have several possible explanations, which include direct and indirect sequelae of the COVID-19 pandemic. Emerging evidence suggests that acute cardiac events among adults hospitalized with COVID-19 are common and that people recovering from COVID-19 are at increased risk for new or worsening CVD up to 1 year post-infection, which may partly explain increases in CVD deaths after 2020.[14−18] Additionally, patient hesitancy to seek care and disrupted access to health care in the months after the onset of the pandemic may have led to delayed detection and treatment of acute or chronic CVD and related risk factors.[19−21] Worsening or persistent stagnating trends in CVD risk factors preceded the COVID-19 pandemic[22] and might have been accelerated by pandemic-driven disruptions to daily life that complicated efforts to engage in health-promoting behaviors known to reduce CVD risk.[23] Similar adverse trends during the COVID-19 pandemic have been observed for population-level blood pressure and weight status.[20,24] However, results from this study are concerning as they documenting persistence of worsening CVD mortality trends through the end of the COVID-19 public health emergency, when COVID-19 vaccines were widely available and the burden of COVID-19 hospitalizations and deaths were declining.

A range of population subgroups experienced disproportionately large increases in CVD mortality rates from 2019 to 2022 and excess CVD deaths, including younger adults and older adults, Black adults, and Asian or Pacific Islander adults. Disproportionate setbacks among Black adults are particularly concerning given that this population had the highest rates of CVD mortality relative to other race and ethnicity groups before the COVID-19 pandemic.[25] Previous research has documented a widening of racial and ethnic disparities in CVD mortality during the COVID-19 pandemic.[4,5] Although the mechanisms for these adverse trends remain unclear, disproportionately greater occupational exposure to COVID-19, worsening financial instability, stress, and limited ability to access high-quality health care during the pandemic are plausible explanations to be explored in future research.[26] Additionally, findings indicating increases in CVD AAMR among adults aged 55−64 years have also been reported in publications prior to the COVID-19 pandemic, signaling the importance of CVD prevention, detection, and treatment in mid-life.[27,28]

Results from this study aim to highlight the need to prioritize the prevention, detection, and treatment of both chronic and acute cardiovascular disease to address widespread increases in CVD mortality during the COVID-19 pandemic. Numerous federal initiatives currently focus on decreasing the burden of CVD in the U.S. For example, the Million Hearts® initiative offers resources for optimizing health care with a focus on health equity to prevent 1 million heart attacks and strokes within 5 years.[29] The Well-Integrated Screening and Evaluation for Women Across the Nation (WISEWOMAN) program helps women understand and reduce their risk for heart disease and stroke by providing screenings for CVD risk factors.[30] The Paul Coverdell National Acute Stroke Program funds state health departments to collect, measure, and track data to improve the quality of care for stroke patients.[31] However, the magnitude of the setbacks in CVD mortality and the range of affected subgroups speaks to the need for broader prevention efforts moving forward.

Limitations

This analysis has several limitations. First, underlying causes of death are subject to misclassification bias, though this limitation was minimized by using broad categories of ICD-10-CM codes consistent with prior publications for national surveillance of CVD mortality trends.[32] It is possible that some COVID-19 deaths could have been misclassified as CVD, particularly early in the pandemic in places where healthcare system capacity was strained and limited COVID-19 testing was available. Second, mortality data for 2022 are provisional, which indicate the results may not be replicable once the data are finalized by NCHS. Given the use of 2021 population estimates, the provisional 2022 AAMR likely underestimate CVD deaths and trends and excess deaths may be even higher than reported here.[13] Third,

demographic information is not always reliably captured on death certificates, potentially resulting in misclassification bias. For example, Hispanic ethnicity and Asian or Pacific Islander or American Indian or Alaska Native race categories are less reliably identified on death certificate data, potentially resulting in under- or over-ascertainment of CVD deaths among these populations.[33] Finally, the method used to calculate excess deaths may have overestimated CVD deaths given the assumption of a linearly declining trend from 2010 to 2019 or from differential aging of specific race and ethnicity groups. Additionally, excess deaths estimate had wide CIs, suggesting imprecision in some estimates. However, this represents a rigorous approach to incorporate changing patterns preceding COVID-19. Alternative methods to estimate excess death or differences in the comparison years may influence the absolute number of excess deaths during the COVID-19 pandemic years of 2020 through 2022,[34] but it is unlikely that this would change the key pattern of findings.

CONCLUSIONS

Findings document that increases in CVD mortality in the initial years of the COVID-19 pandemic endured into 2022 and were widespread, affecting adults from a range of age, sex, and race or Hispanic ethnicity groups. Results from this study underscore the need to prioritize the prevention, detection, and treatment of chronic and acute CVD to address persistent adverse trends during the COVID-19 pandemic.

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SUPPLEMENTAL MATERIAL

Supplemental materials associated with this article can be found in the online version at https://doi.org/10.1016/j.amepre.2023.11.009.

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