Preventive Medicine Reports 51 (2025) 102997

Contents lists available at ScienceDirect

Preventive Medicine Reports

journal homepage: www.elsevier.com/locate/pmedr

Cardiometabolic deaths in black and white men: Tracing the risks from early- to mid-adulthood

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ARTICLE INFO

Keywords:
Cardiometabolic deaths
Excess mortality
Racial disparities
Early adulthood
Period life tables

ABSTRACT

Objective: This study aimed to estimate and compare cardiometabolic disease (CMD) mortality in U.S. Black and White men during the transition from early adulthood to middle age.
Methods: Using 2022 National Vital Statistics System data and standard period life table methods, we estimated the risk of CMD death in hypothetical cohorts of Black and White men from age 25 to 45 years. We estimated cumulative risk, excess mortality, years of lost life (YLL), and proportion of deaths due to CMD, stratifying by metabolic and cardiovascular disease.
Results: Of the 325,134 Black men aged 25 years in the initial cohort, the cumulative risk of cardiometabolic death before age 45 was one in 63 individuals or 1.58 %. For White men, the risks were markedly lower. Of the 1,185,384 White men aged 25 years in the initial cohort, the cumulative risk of cardiometabolic death before age 45 was one in 158 individuals or 0.63 %. The study also found that of the 5141 expected CMD deaths in the Black cohort, 3090 or 60.10 % were excess deaths relative to the White cohort. Additionally, the proportion of all deaths due to CMD among Black men was 19.15 % rising from 6.02 % at age 25 to 38.00 % at age 45, compared with 11.10 % among White men, increasing from 4.57 % at age 25 to 19.79 % at age 45. The YLL for Black men averaged 6.72 months per person while White men averaged 2.94 months.
Conclusions: This investigation shows profound racial disparities in CMD mortality from early to mid-adulthood.

1. Introduction

The large and disproportionate burden of cardiometabolic disease (CMD) in Black compared with White adults in the United States is well documented (Joseph et al., 2022). The scope of CMD extends from cardiovascular diseases, such as hypertension, stroke, and coronary artery disease, to metabolic diseases, such as diabetes mellitus (Ren and Zhang, 2018; Alberti et al., 2009). Recent research has highlighted the appearance of incident CMD among Black men at around age 40 years in the United States (Shah et al., 2022), although the clinical precursors are already pronounced in adolescence and young adulthood (Diaz et al., 2021). Compared to their White peers, young Black men tend to have higher systolic blood pressure, lipid and glucose levels, body mass index, and exposure to environmental stress and toxicants, along with less access to nutritious food and fewer opportunities for safe physical activity (Shi et al., 2023).

Despite the clear link between these risk factors and the early onset of cardiometabolic morbidity, routine assessment of traditional cardiovascular risk factors is commonly recommended for adults ≥40 years of age (Arnett et al., 2019; Rosenzweig, and JL, Bakris GL, Berglund LF, Hivert MF, Horton ES, Kalyani RR, Murad MH, Vergès BL., 2019). In populations with generally higher risk factors, such as young Black men, practice recommendations may overlook key opportunities for early intervention or lack specific guidance for caring for at-risk groups (Blonde et al., 2022). Similarly, research into CMD mortality often overlooks younger age groups, either by omitting younger people from the study sample or by calculating age-adjusted comparisons between Black and White populations, which effectively masks the impact on

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https://doi.org/10.1016/j.pmedr.2025.102997
Received 24 October 2024; Received in revised form 1 February 2025; Accepted 3 February 2025
Available online 6 February 2025

Table 1
Life table for U.S. Black men ages 25–44 based on National Vital Statistics System 2022 data: Cumulative risk of death and proportional mortality due to cardiometabolic diseases*

Age interval (Years)	2022 Black male all-cause mortality (Deaths/ Population)	Hypothetical cohort of Black males in U.S. population alive at beginning of each age interval (N)	Expected deaths from cardiometabolic diseases (N)	Proportional Mortality: % of all deaths due to cardiometabolic diseases (%)	Expected deaths from metabolic diseases (N)	Proportional Mortality: % of all deaths due to metabolic diseases (%)	Expected deaths from cardiovascular diseases (N)	Proportional Mortality: % of all deaths due to cardiovascular diseases (%)
25–26	0.003151	325,134	58	6.0	10	1.0	49	5.0
26–27	0.003223	324,110	63	6.4	10	1.0	53	5.4
27–28	0.003311	323,065	85	8.0	22	2.1	63	5.9
28–29	0.003422	321,995	97	8.5	19	1.7	78	6.8
29–30	0.003549	320,893	101	8.3	17	1.4	85	6.9
30–31	0.003673	319,755	120	9.3	28	2.2	92	7.1
31–32	0.003793	318,580	112	8.4	23	1.7	90	6.8
32–33	0.003922	317,372	164	12.1	34	2.5	130	9.6
33–34	0.004071	316,127	176	13.3	36	2.7	140	10.6
34–35	0.004246	314,840	227	17.5	53	4.1	173	13.4
35–36	0.004450	313,503	229	17.5	42	3.2	188	14.4
36–37	0.004676	312,108	258	19.3	44	3.3	215	16.0
37–38	0.004915	310,649	298	21.5	44	3.2	254	18.3
38–39	0.005147	309,122	324	23.3	45	3.2	280	20.1
39–40	0.005365	307,531	387	26.4	38	2.6	349	23.8
40–41	0.005598	305,881	390	25.6	60	3.9	330	21.7
41–42	0.005848	304,169	404	25.8	60	3.8	344	21.9
42–43	0.006089	302,390	498	30.1	65	3.9	434	26.2
43–44	0.006323	300,549	532	32.7	65	4.0	467	28.7
44–45	0.006572	298,648	617	38.0	89	5.5	527	32.5
	Total:		5141		802		4339	
Cumulative risk:			1.58 %		0.25 %		1.33 %	
100/cumulative risk:			63		405		75	

* Rounding.

younger ages (Woodruff et al., 2023; He et al., 2023; Minhas et al., 2024). This oversight creates a notable gap in understanding the CMD mortality burden across the life cycle.

To help fill this knowledge gap, we aimed to estimate and compare premature CMD mortality in younger Black and White men in the United States using standard actuarial methods. We focus on men because cardiometabolic risk factors are more prevalent in men than premenopausal women (Gerdts and Regitz-Zagrosek, 2019). Using cross-sectional national death certificate data from 2022, we constructed synthetic cohorts of Black and White men and projected these cohorts forward from ages 25 to 45, which allowed us to reliably estimate and compare CMD mortality. Attention to early CMD mortality may aid in achieving the goal of equitably increasing heart life expectancy across the United States (Angell et al., 2020).

2. Methods

2.1. Study population

We estimated the risk of CMD death for non-Hispanic Black and White men aged 25–45 years using conventional period life table methods (Preston et al., 2001). A period life table reflects what would happen to a hypothetical cohort if it experienced the prevailing age-specific probabilities of cardiometabolic death. In our hypothetical cohorts, we followed 325,134 individuals, the population of all 25-year-old Black men in the U.S., for 20 years beginning January 2022. We used identical procedures to generate risk of death estimates for a comparison cohort of 1,191,558 White men (the population of 25-year-old White men in January 2022).

2.2. Life table construction

To construct the life tables, we first calculated the number of individuals surviving from one year to the next by multiplying the cohort population size at each age, starting at age 25, by 1 minus the probability of death from all causes at that age. Age-specific all-cause death rates for non-Hispanic Black and White men were obtained from the National Vital Statistics System (NVSS) for 2022 (Arias et al., 2023). We then applied the NVSS 2022 age-specific cardiometabolic death rates for Black and White men to the cohort populations to calculate the expected number of deaths, stratified by two groups of underlying causes: cardiovascular diseases (ICD-10 codes I00–I99, encompassing heart disease, essential hypertension, hypertensive renal disease, stroke, atherosclerosis, and other cardiovascular diseases) and metabolic diseases (ICD-10 codes E10–E14, representing diabetes) (Centers for Disease Control and Prevention, 2025). U.S. Census population estimates, the denominators in the death rates, were adjusted for the undercount of Black individuals (Khubba et al., 2020), and were shifted from a mid-year to a January 1 timeframe as life tables require the number of live individuals in each cohort at the beginning of the year.

2.3. Statistical analysis

We summed the expected number of cardiometabolic deaths from age 25 through age 45 years and computed the cumulative risk estimates, excess mortality (i.e., the difference between the Black and White estimates), proportional mortality (i.e., the percentage of all deaths attributed to a specific cause), and years of life lost (i.e., life expectancy minus age at death). Period life tables produce unbiased estimates because they are independent of the age structure of the source populations. As a sensitivity analysis, we re-estimated these parameters using pre-pandemic NVSS data from 2019 and compared the findings to the 2022 results. We report 95 % confidence intervals for relative risk estimates, calculated as the Black-White ratio of cumulative risk, using Woolf's method (Woolf, 1955).

To further place this analysis into historical context, we included a graph showing trends in cardiometabolic death rates from 1999 to 2022 for Black and White men aged 25–45 years, based on the specified ICD-10 codes. This study used publicly available, de-identified data and did not require human subjects review per University of Pennsylvania IRB

Table 2
Life table for U.S. White men ages 25–44 based on National Vital Statistics System 2022 data*: Cumulative risk of death and proportional mortality due to cardiometabolic diseases*

Age interval (Years)	2022 White male all-cause mortality (Deaths/ Population)	Hypothetical cohort of White males in U.S. population alive at beginning of each age interval (N)	Expected deaths from cardiometabolic diseases (N)	Proportional Mortality: % of all deaths due to cardiometabolic diseases (%)	Expected deaths from metabolic diseases (N)	Proportional Mortality: % of all deaths due to metabolic diseases (%)	Expected deaths from cardiovascular diseases (N)	Proportional Mortality: % of all deaths due to cardiovascular diseases (%)
25–26	0.001502	1,191,558	81	4.6	20	1.1	61	3.4
26–27	0.001627	1,189,768	110	5.7	26	1.3	84	4.3
27–28	0.001764	1,187,833	112	5.3	23	1.1	90	4.2
28–29	0.001951	1,185,737	128	5.4	28	1.2	100	4.2
29–30	0.002053	1,183,424	154	6.0	31	1.2	122	4.8
30–31	0.002198	1,180,994	188	6.7	35	1.3	153	5.5
31–32	0.002336	1,178,398	176	5.8	32	1.0	144	4.8
32–33	0.002459	1,175,646	232	7.2	44	1.4	188	5.8
33–34	0.002564	1,172,755	252	7.7	28	0.9	224	6.8
34–35	0.002659	1,169,748	276	8.2	44	1.3	231	6.9
35–36	0.002755	1,166,637	337	9.7	60	1.7	277	8.0
36–37	0.002857	1,163,423	374	10.3	44	1.2	330	9.1
37–38	0.002966	1,160,099	407	10.8	62	1.6	345	9.1
38–39	0.003084	1,156,659	463	12.0	62	1.6	402	10.4
39–40	0.003211	1,153,091	542	13.3	86	2.1	456	11.2
40–41	0.003359	1,149,389	590	13.8	81	1.9	507	11.9
41–42	0.003515	1,145,528	668	15.1	92	2.1	576	13.0
42–43	0.003661	1,141,502	717	15.7	98	2.1	619	13.6
43–44	0.003792	1,137,323	797	17.5	96	2.1	700	15.4
44–45	0.003927	1,133,010	915	19.8	117	2.5	797	17.2
	Total:		7519		1111		6407	
Cumulative risk:			0.63 %		0.09 %		0.54 %	
100/cumulative risk:			158		1072		186	

* Rounding.

guidelines.

3. Results

3.1. Cumulative risk

Of the 325,134 Black men aged 25 years in the initial cohort, the cumulative risk of cardiometabolic death before age 45 was one in 63

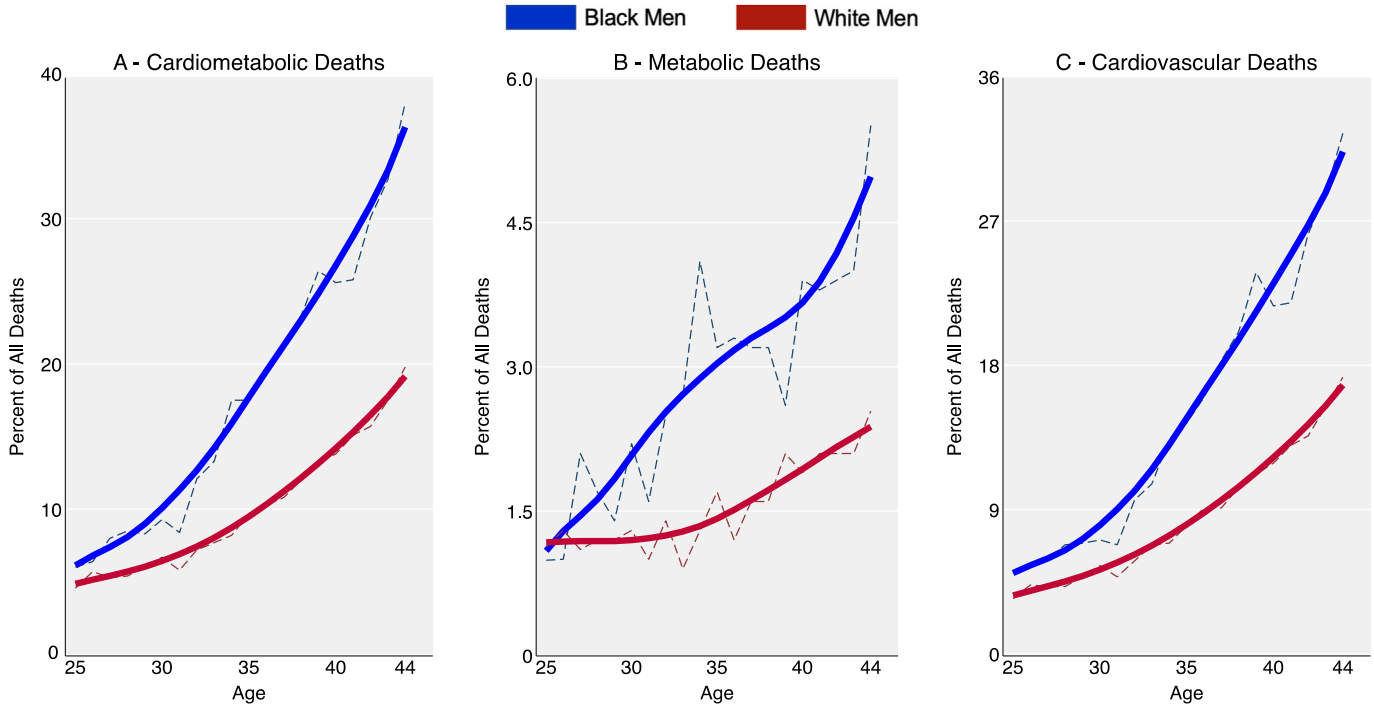

Fig. 1. Proportional mortality (percent of all deaths due to cardiometabolic diseases) for U.S. Black and White men, ages 25–45 years, based on National Vital Statistics System 2022 data*.

Table 3
Years of life lost (YLL) for U.S. Black and White men ages 25–44 from cardiometabolic deaths based on National Vital Statistics System 2022 data*

Age interval (Years)	Hypothetical cohort of Black males in U.S. population alive at beginning of each age interval (N)	Expected deaths from CMD among Black men (N)	Expected years of additional life among Black men (Years)	YLL due to CMD among Black men (Years)	Hypothetical cohort of White males in U.S. population alive at beginning of each age interval (N)	Expected deaths from CMD among White men (N)	Expected years of additional life among White men (Years)	YLL due to CMD among White men (Years)
25–26	325,134	58	46.4	2704	1,191,558	81	51.0	4153
26–27	324,110	63	45.6	2861	1,189,768	110	50.0	5490
27–28	323,065	85	44.7	3801	1,187,833	112	49.0	5503
28–29	321,995	97	43.9	4267	1,185,737	128	48.0	6139
29–30	320,893	101	43.0	4358	1,183,424	154	47.0	7215
30–31	319,755	120	42.2	5061	1,180,994	188	46.0	8641
31–32	318,580	112	41.3	4622	1,178,398	176	45.0	7932
32–33	317,372	164	40.5	6638	1,175,646	232	44.0	10,202
33–34	316,127	176	39.6	6980	1,172,755	252	43.0	10,856
34–35	314,840	227	38.8	8811	1,169,748	276	43.0	11,855
35–36	313,503	229	38.0	8715	1,166,637	337	42.0	14,160
36–37	312,108	258	37.1	9578	1,163,423	374	41.0	15,334
37–38	310,649	298	36.3	10,816	1,160,099	407	40.0	16,269
38–39	309,122	324	35.5	11,513	1,156,659	463	39.0	18,072
39–40	307,531	387	34.7	13,428	1,153,091	542	38.0	20,595
40–41	305,881	390	33.3	12,978	1,149,389	590	37.0	21,812
41–42	304,169	404	33.0	13,335	1,145,528	668	36.0	24,040
42–43	302,390	498	32.2	16,044	1,141,502	717	35.0	25,112
43–44	300,549	532	31.4	16,715	1,137,323	797	35.0	27,890
44–45	298,648	617	30.6	18,869	1,133,010	915	34.0	31,097
	Total YLL:			182,093			292,366	
Average YLL:			6.72 months				2.94 months	

* Rounding.

individuals or 1.58 % (Table 1). The cumulative risk of death from metabolic diseases was one in 405 individuals or 0.25 %, and the cumulative risk of cardiovascular death was one in 75 individuals or 1.33 %.

For White men, the risks were markedly lower. Of the 1,191,558 White men aged 25 years in the initial cohort, the cumulative risk of cardiometabolic death before age 45 was one in 158 individuals or 0.63 % (Table 2). The cumulative risk of death from metabolic diseases was one in 1072 individuals or 0.09 %, and the cumulative risk of cardiovascular death was one in 186 individuals or 0.54 %.

The Black-to-White risk ratio for cardiometabolic deaths was 2.51 (95 % CI: 2.42 to 2.60). For metabolic deaths, the risk ratio was 2.65 (95 % CI: 2.42 to 2.90). For cardiovascular deaths, the risk ratio was 2.48 (95 % CI: 2.39 to 2.58).

3.2. Excess deaths

Of the 5141 expected deaths from cardiometabolic diseases in the Black cohort, 3090 or 60.10 % were excess deaths, calculated as the cumulative mortality risk of Black men (1.58 %) minus the cumulative mortality risk of White men (0.63 %) multiplied by the number of 25-year-old men in the Black cohort (325,134). Excess metabolic deaths were estimated at 499 of the expected 802 metabolic deaths, or 62.22 %, and excess cardiovascular deaths were estimated at 2591 of the expected 4339 deaths, or 59.71 %.

3.3. Proportional mortality

This is a measure of the contribution of CMD to total mortality, computed by dividing the number of CMD deaths by the total number of deaths from all causes, and multiplying by 100 (Choi et al., 2019). Among Black men, the percent of all deaths resulting from cardiometabolic diseases was 19.15 %, increasing from 6.02 % at age 25 to 38.00 % at age 45. For metabolic diseases the proportional mortality was 3.00 %, increasing from 0.99 % to 5.51 %, and for cardiovascular diseases the proportional mortality was 16.16 %, rising from 5.04 % to 32.48 %.

Table 4
Comparison of cardiometabolic mortality risks among U.S. Black and White men ages 25–44, based on 2019 and 2022 National Vital Statistics System data*

	2019	2022
Expected CMD deaths based on life table (N)		
Black men	5083	5141
White men	7085	7519
Cumulative risk of CMD mortality (%)		
Black men	1.5	1.6
White men	0.6	0.6
100 / Cumulative risk (1 in *x* individuals)		
Black men	68	63
White men	173	158
Black to White Cumulative Risk Ratio	2.5	2.5
Excess deaths in Black cohort (%)	60.2	60.1
Proportional Mortality:		
Black men: age 25–26 (%)	5.0	6.0
White men: age 25–26 (%)	4.8	4.6
Black men: age 44–45 (%)	47.8	38.0
White men: age 44–45 (%)	23.6	19.8
Black men: entire cohort (%)	26.3	19.2
White men: entire cohort (%)	12.9	11.1
Years of Life Lost (YLL)		
Black men: total YLL (years)	187,381	182,093
White men: total YLL (years)	288,135	292,366
Black men: cohort YLL (months)	6.4	6.7
White men: cohort YLL (months)	2.8	2.9

* Rounding.

Among White men, the percent of all deaths resulting from cardiometabolic diseases was 11.10 %, increasing from 4.57 % at age 25 to 19.79 % at age 45. For metabolic diseases, the proportional mortality

was 1.64 %, increasing from 1.13 % to 2.54 %, and for cardiovascular diseases the proportional mortality was 9.46 %, increasing from 3.44 % to 17.25 % (Fig. 1).

3.4. Years of life lost (YLL)

We estimated YLL (life expectancy minus age at death from CMD) for each age interval over the 25–45-year age range (Table 3). Black men experienced a total of 182,093 YLL, with an average loss of 6.72 months of life per person in the cohort. White men had a total of 292,366 YLL, averaging 2.94 months of lost life per person.

3.5. Sensitivity analysis

The results based on the 2019 pre-pandemic data closely corresponded to the results based on the 2022 post-pandemic data (Table 4).

4. Discussion

The findings of this study reveal stark disparities in the cumulative risk of CMD mortality between Black and White men. Between age 25 and 45, Black men are 2.5 times more likely to die from CMD before middle age, with risks of one in 63 for Black men versus one in 158 for White men. Similar racial disparities were found for metabolic and cardiovascular deaths. Excess deaths accounted for over half of all CMD fatalities among Black men, approximately 3090 preventable deaths. Also concerning is the rise from early to mid-adulthood in the percentage of deaths attributable to CMD among Black men. Both racial groups were comparable at age 25 with low percentages, but by age 45 the CMD percentage increased to 38 % in Black men compared to only 20 % in White men. Analogous age-related increases were observed in the proportional mortality of metabolic and cardiovascular causes. Finally, CMD shortened the average lifespan of younger Black men by 6.7 months compared to 2.9 months for White men. In the robustness check, the 2019 pre-pandemic data analysis yielded results highly consistent with the 2022 findings.

In this manuscript, race is conceptualized as a social construct, serving as a proxy for the impact of racism (Agbonlahor et al., 2023). The disparities we report reflect the far-reaching influence of social, historical, economic, and environmental factors on the health of Black men. The meaning of race indicators in medical contexts is a sensitive issue. For example, the American Heart Association (AHA) has deliberately omitted race from its new risk calculator, stemming in part from concerns that including race might be misinterpreted as indicating biological or genetic differences (Khan et al., 2023). Instead, the AHA calculator offers users an optional solution: a zip code-based "Social Deprivation Index" (SDI) constructed from seven factors (percentage of residents living in poverty, with <12 years of education, in single-parent households, in rented housing units, in overcrowded housing units, without access to a car, and unemployed adults <65 years old) (Khan et al., 2024). The primary factor – residents living in poverty – is tightly correlated with the overall SDI (Butler et al., 2013). While the AHA-SDI focus on poverty is understandable, a concern is its neglect of race as a social signifier in the United States. It disregards the biases that race elicits, separate from poverty but pervasive in daily interactions and life opportunities, with potential severe impacts on cardiometabolic health over time (Javed et al., 2022). Yet, directly incorporating race or racism into a risk calculator is challenging to implement: as an area-level measure with SDI, it raises ecological fallacy concerns, as a patient-level factor in a clinical setting, it raises stigmatization and ethical concerns. Moreover, the biomolecular pathways by which racial adversity and chronic stress might lead to poor cardiometabolic outcomes are complex and not well characterized, though promising lines of research include pro-inflammatory signaling, cellular function, telomere shortening, and epigenetic aging (Baumer et al., 2023; Baccarelli and Ordovás, 2023; Akam et al., 2022).

Mitigating racial disparities in CMD mortality will require an ambitious multi-tiered strategy. This strategy should focus on expanding local access to high-quality healthcare and promoting culturally sensitive approaches to the prevention and management of CMDs from an early age. At the societal level, it is imperative to reform the structures that perpetuate poor health outcomes while investing in the social and built environments of disadvantaged communities (Churchwell et al., 2020). Research has an important role to play in motivating and informing these efforts (Albert et al., 2024).

A qualification is warranted. The African experience provides valuable context for cardiometabolic disparities in the U.S. In sub-Saharan Africa, cardiovascular diseases have become a leading cause of death, surpassing infectious diseases. This shift appears to coincide with urbanization and the growing prevalence of hypertension and diabetes, while resource-constrained healthcare systems may compound the burden (Minja et al., 2022). Similarly, African immigrant men exhibit worse cardiometabolic health than Black men born in the U.S., with elevated rates of diabetes, prediabetes, hypertension, and visceral adiposity, even though their obesity levels are lower. The diminished health outcomes may reflect the erosion of the "healthy immigrant effect" potentially driven by increased urbanization, reduced physical activity, and dietary changes involving processed foods prior to migration (O'Connor et al., 2014), with regional and ethnic differences in sub-Saharan Africa modifying these trends (Commodore-Mensah et al., 2015). These patterns suggest that, alongside racism, other factors likely contribute to cardiometabolic mortality.

Finally, we must consider the biological and epidemiological patterns contributing to CMD mortality among men in early and mid-adulthood. Biologically, men tend to accumulate more visceral adipose tissue and have less favorable lipid profiles compared to premenopausal women, who benefit from estrogen's cardioprotective effects (Steiner and Berry, 2022). With age, men experience a decline in metabolic efficiency and cardiovascular resilience, while accumulated cellular damage impairs repair mechanisms (Raisi-Estabragh et al., 2024; Barrientos et al., 2020). These physiological changes coincide with the progression of CMDs from subclinical to clinical stages (Merz and Cheng, 2016), as early risk factors like hypertension and dyslipidemia gradually progress into more serious disease (Bell et al., 2021). Behavioral factors amplify these risks: men are less likely to seek preventive care, have lower health literacy, and often delay seeking medical attention when symptoms arise (Oliffe et al., 2020). Occupational factors, such as manual labor and shift work, further increase CMD risk through disrupted sleep, heightened stress, and greater exposure to environmental toxins (Carpenter, 2023; Allesøe et al., 2023). Together, these biological, behavioral, and occupational influences—compounded by lifestyle and environmental exposures—help explain the silent progression of CMD and the accelerating damage across multiple systems, ultimately leading to a growing share of mortality from CMD as men approach middle age.

4.1. Strengths and limitations

To our knowledge, this study is the first to closely examine the relationship between age and CMD mortality among younger Black and White men. Strengths include unbiased mortality risk estimates and comparisons derived from period life tables (Chiang, 1984). The estimates take population attrition into account and are unconfounded by the age distributions of the source populations. This study is limited by the use of death certificate data, which may be subject to miscoding since the underlying cause of death may be uncertain in some cases. This was minimized by using established broad categories of ICD-10 codes for cardiovascular and metabolic diseases.

Another limitation is the uncertainty of future conditions, which should be considered when interpreting period life tables (Denton and Spencer, 2011). Our analysis projects CMD mortality over time for Black and White men based on 2019 and 2022 age-specific death rates.

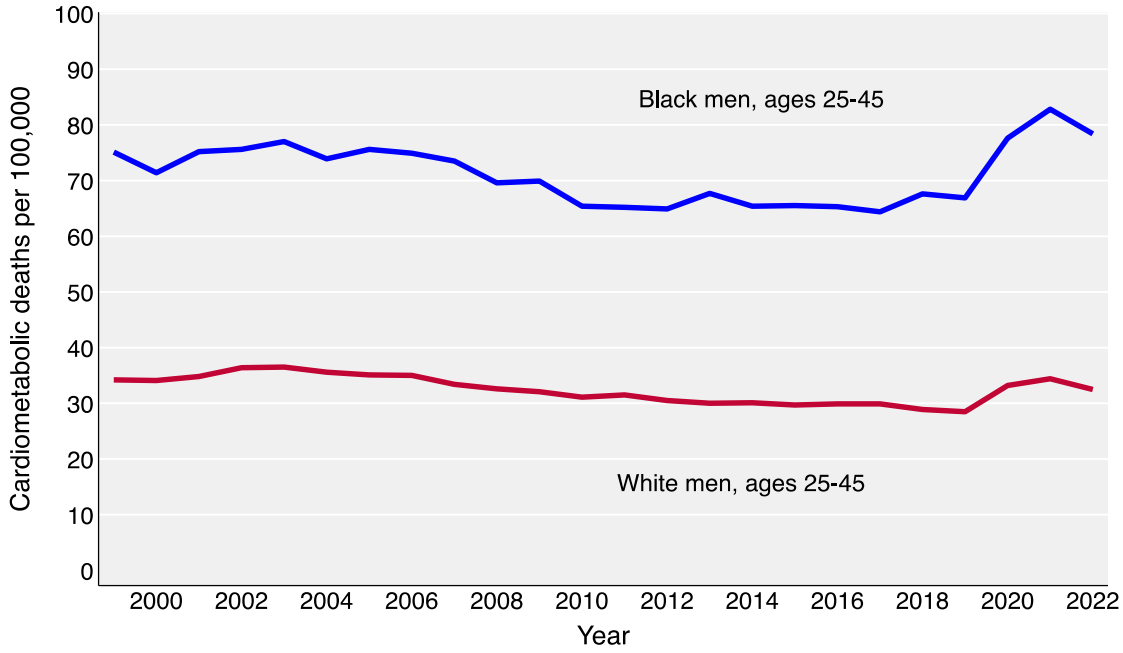

Fig. 2. U.S. Black and White male cardiometabolic mortality rates, based on 1999–2022 National Vital Statistics System data*.

However, changes in medicine, healthcare access, lifestyle, or environmental shocks could significantly alter these rates and, consequently, the long-term mortality trends.

5. Conclusion

Since 2010, CMD mortality improvements have slowed in the U.S. (Mehta et al., 2020) The COVID-19 pandemic disruptions in 2020–2021 resulted in temporary spikes, which are now subsiding, with mortality rates beginning to return to pre-pandemic levels (Fig. 2). Our life table analysis explores the implications of current CMD mortality levels, both before and after the pandemic. It is not a forecast of future trends but a rigorous, data-driven approach to project what will happen to a cohort of Black 25-year-old men before they reach 45 years of age, if current trends persist. This forward-looking method helps us to picture the health risks these young men will face, by showing the likelihood of CMD death before they reach middle-age.

Funding

Dr. Harris' work is supported by a grant from the National Institute on Drug Abuse (K23 DA054157). Dr. Khatana's work is supported by a grant from the National Heart, Lung, and Blood Institute (K23 HL153772, R01 HL171157).

CRediT authorship contribution statement

Rebecca Arden Harris: Writing – review & editing, Writing – original draft, Visualization, Methodology, Formal analysis, Data curation, Conceptualization. **Sameed Ahmed M. Khatana:** Writing – review & editing, Writing – original draft, Methodology, Conceptualization. **Judith A. Long:** Writing – review & editing, Writing – original draft, Methodology, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgment

We would like to thank Dana A. Glei of Georgetown University for helpful suggestions on an earlier draft of the manuscript.

Data availability

Data will be made available on request.

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