Annals of Internal Medicine ORIGINAL RESEARCH

Excess Mortality Rate in Black Children Since 1950 in the United States: A 70-Year Population-Based Study of Racial Inequalities

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Background: Black Americans have lower wealth, income, and education and higher mortality rates than White Americans, especially during childhood.

Objective: To document the extent and persistence of excess infant and childhood mortality in Black Americans between 1950 and 2019.

Design: Population-based surveillance study.

Setting: The United States of America.

Patients: The entire population of the United States.

Measurements: The investigators analyzed mortality data collected by the Centers for Disease Control and Prevention and the U.S. Census Bureau from 1950 to 2019 and calculated mortality rates, life expectancy, and years of potential life lost for White and Black Americans to estimate the absolute and relative sex- and age-specific excess mortality burden among Black Americans compared with White Americans.

Results: The gaps in absolute life expectancy and age-standardized mortality between Black and White Americans decreased over the 70-year period beginning in 1950, but relative mortality in infants and children increased during this same period. The mortality rates in the 1950s for White and Black infants were 2703 and 5181 deaths per 100 000 persons, respectively, for an excess mortality ratio of 1.92 (95% CI, 1.91 to 1.93). In the 2010s, the mortality rates were 499 deaths per 100 000 persons in White infants and 1073 deaths per 100 000 persons in Black infants, for an excess mortality ratio of 2.15 (CI, 2.13 to 2.17). A total of 5.0 million excess deaths of Black Americans (including 522 617 infants) could have been avoided during these 7 decades if their mortality rates were equal to those of White Americans.

Limitation: The effect of health inequities was measured without inquiring about the causes of these differences.

Conclusion: Black infants, children, and adults have experienced persistent excess mortality in the United States since the 1950s relative to the White population.

Primary Funding Source: None.

Ann Intern Med. doi:10.7326/ANNALS-24-02794
For author, article, and disclosure information, see end of text.
This article was published at Annals.org on 25 March 2025.

The landmark 1985 Report of the Secretary's Task Force on Black and Minority Health (1) found approximately 60 000 annual excess deaths in Black Americans relative to the White population. Since then, several studies have found that large racial disparities in health outcomes have persisted in the United States of America (2–4). Black Americans currently have higher infant mortality (5), maternal mortality (6, 7), and age-standardized mortality than White Americans, along with lower life expectancy (8, 9) and a larger burden of disease (3, 10–13). The question of whether this excess burden of death contributes to persistent disparities in both childhood and adult mortality is important for the optimal targeting of policy and public health interventions but has been addressed only by studies focused on recent and relatively limited time periods (11, 13).

Racial disparities in mortality arise from a complex interplay of factors. A long history of systematic racism in the United States has been an important contributing factor. Redlining and housing segregation, employment discrimination, discrimination in the criminal justice system, and other inequitable policies and practices have contributed to worse health outcomes for Black Americans (14, 15). In health care, the quality of and access to care for Black Americans have been shown to be suboptimal compared with those of White Americans (16), and the design of research studies and clinical tools may harm their care (17). Evidence also indicates the negative effects on health caused by ongoing stress created by discrimination (18, 19). A history of discriminatory behaviors and practices in medicine has led to a mistrust of the medical system, resulting in delayed seeking of care (15).

Although some mortality analyses have found that racial inequalities in health have decreased over time, others point to an increase in inequities. A recent study found 1.6 million excess deaths for 22 years up to 2020 among Black Americans relative to White Americans (11).

See also:

Editorial comment

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Another study found that the cost resulting from racial disparities in Black people was $312 billion in 2018 alone for the United States (12). A previous study (4) also found approximately 50 000 to 67 000 annual excess deaths in Black Americans between 1940 and 1960 and about 97 000 to 104 000 annual excess deaths between 1990 and 1998. However, to our knowledge, no previous analysis has systematically examined data across the entire postwar era (from the 1950s to the present day) to assess long-term trends in race-based mortality disparities in the United States across the age spectrum (11, 13).

We addressed this research gap by analyzing 7 decades of racial inequities in cause-specific mortality in the United States, focusing on the toll of excess deaths in Black children since 1950. By investigating racial inequities in infant and childhood mortality in the United States, we hope to shed light on how these may have contributed to the decrease in the overall life expectancy of Black Americans since the 1950s.

METHODS

Data and Population

We analyzed age-specific crude and age-standardized mortality rates in the U.S. population stratified by race, age group, and sex between 1950 and 2019, as well as causes of deaths from 1960 to 2019, aiming to quantify the effect of racial inequities on excess childhood mortality and burden of disease among Black people relative to White people in the United States.

We gathered individual-level data on death certificates in the United States for the years 1960 to 2019, collected and published by the National Vital Statistics System of the National Center for Health Statistics of the Centers for Disease Control and Prevention (20) and processed by the National Bureau of Economic Research (21). These records contain individual-level multiple-cause-of-death data from 1960 to 2019. For 1950 to 1959, we used death counts from the Vital Statistics of the United States reports published by the U.S. Census Bureau.

For population data between 1950 and 1959, we used the race-, sex-, and age-specific counts of the U.S. Census in 1950 and 1960 and imputed the population of each year using linear interpolation. For 1960 to 1969, we used national-level population data from the U.S. Census Bureau, which were stratified by sex, age, and race. For population data between 1970 and 2019, we used estimates from SEER (Surveillance, Epidemiology, and End Results), a program of the U.S. National Institutes of Health. These data aggregate population by county, age, race, and sex, which we then combined into national data.

Variable Definitions

We classified race according to the 3 recorded categories available since 1950. We did not differentiate the population during the entire time frame according to Hispanic and non-Hispanic ethnicity because this category was added to death certificate records between 1978 and 1997 (varying by state) and was not available during the entire 70-year study time frame. We added a sensitivity analysis of the non-Hispanic Black and White population between 2000 and 2019.

Age was categorized as less than 1 year, 1 to 4 years, 5 to 9 years, 10 to 14 years, and in 5-year intervals up to 85 years or more for all analyses, according to data from the U.S. National Vital Statistics Reports and death certificates. Infant deaths were all those before age 1 year. We used sex defined as male and female because further categorization of gender was not available for the 70-year time frame.

The causes of death were analyzed using the reported classification of the Centers for Disease Control and Prevention from 1960 to 2019 where individual-level data from death certificates were available. The National Center for Health Statistics classifies causes of death according to the International Classification of Diseases, using revisions 7 (1960 to 1967), 8 (1968 to 1978), 9 (1979 to 1998), and 10 (1999 to 2019). We further aggregated the causes of death according to a modified version of a classification scheme by the Organisation for Economic Co-operation and Development, which largely tracks with International Classification of Diseases categories (22). **Supplement Table 1** (available at Annals.org) details the codes of causes of death used for the analyses for each International Classification of Diseases revision.

Statistical Analysis

We calculated annual crude and age-standardized mortality rates, life expectancy, and years of life lost for Black and White Americans for every year in the study period. Because mortality data for 1972 were incomplete, we used linear interpolation to impute mortality by age group, race, sex, and cause of death for that year (**Supplement Table 1**) and rounded the estimate to the nearest integer.

Age-standardized mortality rates were estimated by year, sex, cause of death, and race, using the population of 2000, according to standardization methods recommended by the Centers for Disease Control and Prevention (23). For age standardization, we first calculated the expected number of deaths using the age-specific standardized population and summed these values to divide them by the total standardized population of the United States in 2000. The rates were also calculated by decade and were weighted by the population in each year. We estimated the excess difference and the excess mortality rate ratio of deaths in Black Americans relative to White Americans for each age group. The 95% CIs of the mortality ratio were calculated assuming a Poisson distribution.

Life expectancies at birth and for each age interval were calculated using the Lee and Carter method (24). This is based on the linear relationship between

the logarithm of the mortality rate and explanatory variables, such as age and time, and is valid for nonstationary populations, where the analysis functions depend on the cohort time (24–26). The estimation process used was singular value decomposition (27).

Years of life lost were calculated by summing, for all age groups, the product of the number of deaths with the life expectancy remaining in each age group. We calculated excess years of life lost in Black Americans by first calculating the rate of years of life lost per population in each age group for Black and White Americans. Then, we calculated the difference in the rate of years of life lost between Black and White Americans and multiplied this difference by the Black population in each decade and age group. Finally, we summed the years of life lost across all age groups. The life expectancies used to calculate the excess years of life lost were the age-specific life expectancies in the White population.

We repeated the analysis in the non-Hispanic Black and non-Hispanic White populations between 2000 and 2019 as a sensitivity analysis to account for the increased number of Hispanic people, especially during this time frame. We constructed scenarios of equality in crude mortality rates during childhood for Black and White Americans, assuming Black children had the same crude mortality as White children. Then, we calculated life expectancies and excess years of life lost, according to the methodology described above. All analyses were done in R, version 4.4.0 (R Foundation), using the "demography" package, version 2.0 (27).

Role of the Funding Source

This study did not receive any funding.

RESULTS

Trends and Cumulative Excess Burden in Black Americans

Life expectancy at birth increased among Black Americans a total of 15.5 years over the 7 decades from the 1950s to the 2010s (a 20.4% increase, from 60.5 to 76.0 years) and 10.3 years among White Americans (a 13.0% increase, from 69.0 to 79.3 years) (**Figure 1**, *A*). The all-cause age-standardized mortality rate was 1727.3 deaths per 100 000 persons in the Black population in the 1950s, decreasing to 864.5 deaths per 100 000 persons during the 2010s (**Table** and **Figure 1**, *B*). For the White population, the comparable age-standardized mortality rates were 1409.9 and 730.8 deaths per 100 000 persons for the 1950s and 2010s, respectively.

During the 1950s, the Black population in the United States had a 23% higher age-standardized mortality rate than White Americans; by the 2010s, this mortality ratio narrowed by 4% but remained 18% higher than in the White population (**Figure 1**, *C*). The corresponding lost life expectancy at birth in the Black population went from 8.5 years in the 1950s to 3.3 years during the 2010s. This amounts to 24.0 million and 20.6 million excess years of life lost in the Black population of the United States during the 1950s and 2010s, respectively. The **Table** shows the mortality rates and life expectancy in both Black and White populations of all ages, as well as the number, rate, and ratio of excess deaths and the life expectancy and years of life lost by the Black population.

Compared with a hypothetical baseline of equal mortality between the Black and White populations of the United States, there were 5 019 340 excess deaths in the Black population over 7 decades since 1950, which translates to 173.6 million excess years of life lost by the Black population.

Figure 2 shows that most of the excess deaths since 1960 were caused by noncommunicable diseases (72.2%), followed by infectious, maternal, or perinatal causes (17.4%) and external causes (10.3%).

Diseases of the digestive, respiratory, and nervous systems had higher age-standardized mortality in White Americans between 2015 and 2019. The excess age-standardized mortality rate was highest for diseases of the cardiovascular system for all years (**Supplement Figures 1 to 3**, available at Annals.org); in 2015 to 2019, for the remainder of the causes, the excess age-standardized mortality rate ranged from 66.9 deaths per 100 000 persons to no excess mortality. External causes of death (homicides, suicides, trauma, and accidental causes of death) occurred more often in White Americans during 2010 to 2014 (**Supplement Figures 1 to 3**). Of the 16 categories of causes of death (listed in **Supplement Table 1**), the diseases of the respiratory system, nervous system, and digestive system showed greater age-standardized mortality rates in the White population of the United States during the 2010s.

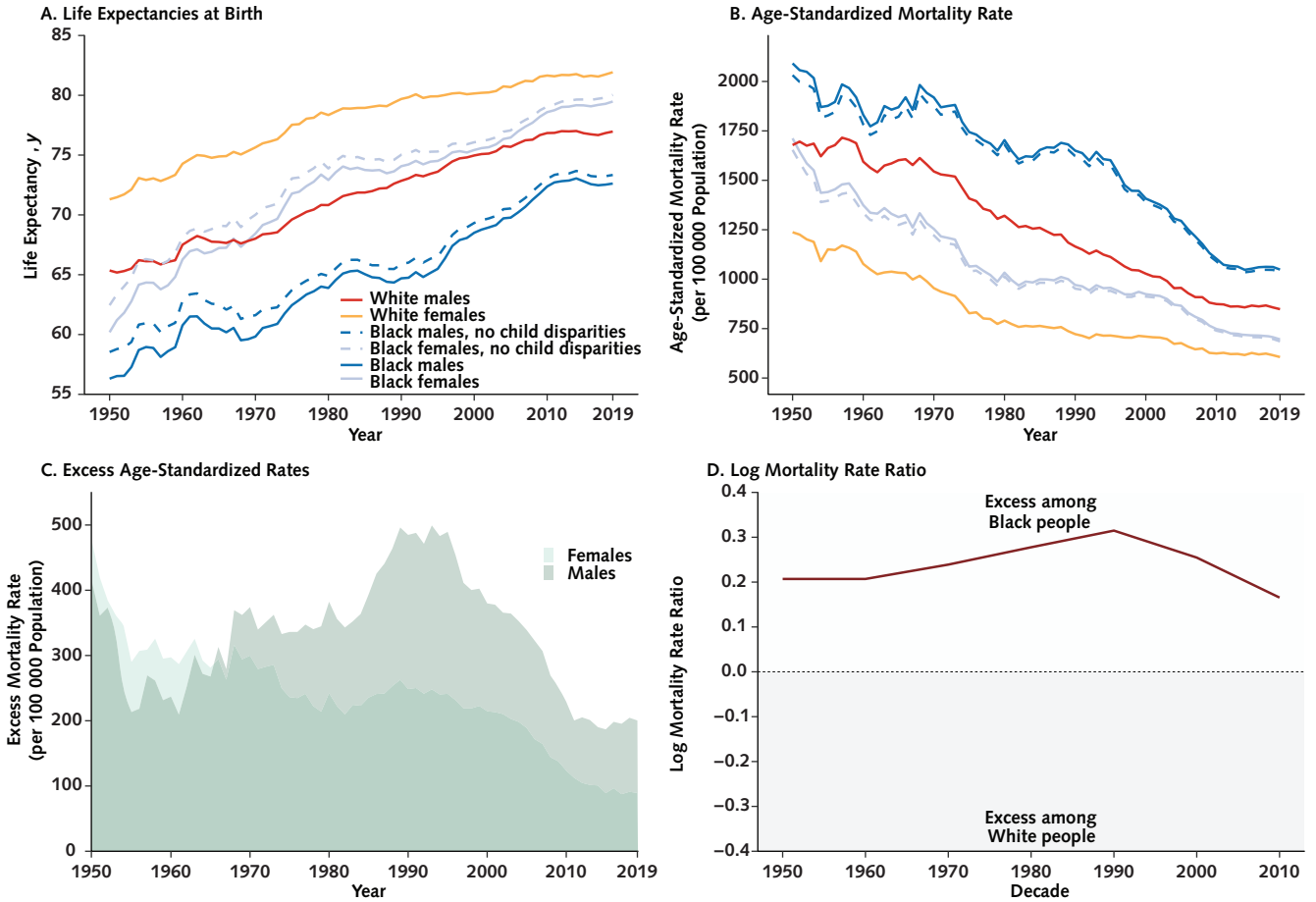
Compared with all Black and White people, non-Hispanic Black and White people had age-standardized mortality rates that were 1.9% and 1.1% higher, respectively, in the 2000s and 3.3% and 2.9% higher, respectively, in the 2010s (**Supplement Table 2**, available at Annals.org).

Excess Burden in Black Children

In Black children, a total of 522 617 excess deaths in infancy (<1 year old) and 689 724 during childhood (age 0 to 19 years) were quantified during the 7 decades since 1950, representing 10.4% and 13.7% of all excess deaths, respectively.

The mortality rate in the 1950s was 2703 deaths per 100 000 persons in White infants and 5181 deaths per 100 000 persons in Black infants; this means 92% greater mortality in Black infants, with an excess mortality ratio of 1.92 (95% CI, 1.91 to 1.93) (**Figure 3**). The mortality rates decreased in the 2010s to 1073 deaths per 100 000 persons in Black infants and 499 deaths per 100 000 persons in White infants, but the mortality ratio increased, with Black infants dying 115% more frequently than White infants, for a mortality ratio of 2.15 (CI, 2.13 to 2.17) in the 2010s. These trends are

Figure 1. Trends in U.S. life expectancies at birth (*A*) and age-standardized mortality rates (*B*), stratified by sex and race, the excess age-standardized mortality rate (*C*), and the log mortality ratio of the age-standardized mortality rate in the Black vs. White population of the United States (*D*).



shown in **Supplement Figure 4** (available at Annals.org).

Under a hypothetical scenario that assumes equal mortality rates in Black and White children (age 0 to 19 years), the difference in life expectancy between Black and White children would be 2.8 years (from the observed lost life expectancy at birth of 3.3 years), a 13.3% reduction of inequalities, for an absolute difference of 0.43 years (or approximately 5 months) between observed lost life expectancy and the expected value in this scenario (**Supplement Table 3**, available at Annals.org). Furthermore, if mortality were equal in Black and White children, the excess years of life lost among Black Americans during the 2010s would decline from the calculated 20.6 million to 16.5 million (a 20.2% reduction).

Medical conditions during the perinatal period were the largest cause of excess death in Black children younger than 5 years in the 2010s (compared with White children during the same time frame). In contrast, external causes (including homicides, suicides, trauma, and accidental causes of death) were the most frequent cause of excess mortality in Black children between 5 and 19 years of age. During midlife (20 to 59 years of age) in the 2010s, the largest excess mortality in Black people occurred in diseases of the circulatory system. **Supplement Figures 5 to 9** (available at Annals.org) detail these results.

DISCUSSION

Our analyses underscore the large racial inequalities in childhood mortality that have been present since the 1950s in the United States. We found that although excess mortality among Black children has decreased over the intervening 7 decades, these children still have double the risk for death of White children. This disparity has not decreased since the 1950s in the United States. Our analyses point to the need for increased public health and policy actions to reduce this gap. Our results indicate that about 690 000 deaths of Black children (including about 523 000 infant deaths) would have been avoided in the past 70 years if mortality rates of Black and White children had been equal. Our findings further show that the life expectancy

Table. Excess Burden of Disease in the Black Population of the United States Compared With White Americans, in Each Decade Between the 1960s and 2010s

Decade	Black		White		Black Burden				
	Mortality Rate per 100 000 Persons*	Life Expectancy at Birth, *y*	Mortality Rate per 100 000 Persons*	Life Expectancy at Birth, *y*	Excess Deaths, *n (thousands)*	Excess Mortality Rate per 100 000 Persons	Relative Excess Mortality: Rate Ratio (95% CI)†	Life Expectancy at Birth Lost, *y*	Excess Years of Life Lost, *n (millions)*
1950s	1727.3	60.5	1409.9	69.0	596.3	317.3	1.23 (1.22–1.23)	8.5	24.0
1960s	1572.9	63.8	1276.5	71.2	675.9	296.5	1.23 (1.23–1.23)	7.4	26.4
1970s	1402.3	66.5	1101.5	73.2	660.4	300.8	1.27 (1.27–1.27)	6.7	24.0
1980s	1271.6	69.2	962.6	75.4	718.2	309.1	1.32 (1.32–1.32)	6.2	24.1
1990s	1197.0	70.4	876.0	76.9	873.3	321.0	1.37 (1.36–1.37)	6.5	29.7
2000s	1031.4	73.4	797.3	78.3	775.0	234.1	1.29 (1.29–1.30)	4.9	24.8
2010s	864.5	76.0	730.8	79.3	606.7	133.7	1.18 (1.18–1.19)	3.3	20.6

* Age-standardized mortality rate.
† Ratio between the age-standardized mortality rate in the Black population and that in the White population in the United States.

in the Black population of the United States would have been 5 months longer during the 2010s if Black and White populations had similar mortality rates during childhood.

Although previous studies have demonstrated similar inequality in mortality rates between U.S. Black and White populations, they evaluated shorter time frames, and notification systems before the 1930s did not include all states. One study analyzed the racial inequalities in mortality between 1940 and 1999, estimating 4.3 to 4.5 million excess deaths during this time frame in the Black population of the United States (4). A second study estimated 1.6 million excess deaths between 1999 and 2000 among the Black population (11). The economic toll of these inequalities has also been noted; for example, a third study found that in 2018 alone, the economic burden of these inequalities was about $312 billion (12). We chose not to examine data before 1950 because of the effect of World War II on adult mortality (that is, casualties from war), which would obscure the effect of health care practices within the United States. Furthermore, public health reporting systems before the 1930s did not include all states.

The underlying causes of the inequalities in mortality documented here are embedded in a history of race-based inequity and discrimination against the Black population of the United States. Being Black in the United States is associated with less wealth (28), income (29), and education (30, 31). A cohort study (32) showed that several unfavorable social determinants of health were associated with increased rates of mortality among the Black population, including lower income, food insecurity, less education, and worse health insurance coverage; furthermore, this study showed that the gaps in the mortality rate disparities disappeared after adjustment for these factors.

Socioeconomic status may be part of the persistent mortality gaps between Black and White people of the United States. Low educational attainment and low transfers of intergenerational wealth (33) are correlated with both Black race and low socioeconomic status. These factors and the segregationist laws that began to end with the Civil Rights Act of 1964 are associated with the increase in mortality rates in the Black population of the United States during the past

Figure 2. Cumulative age-specific excess deaths among the Black population of the United States, by cause of death.

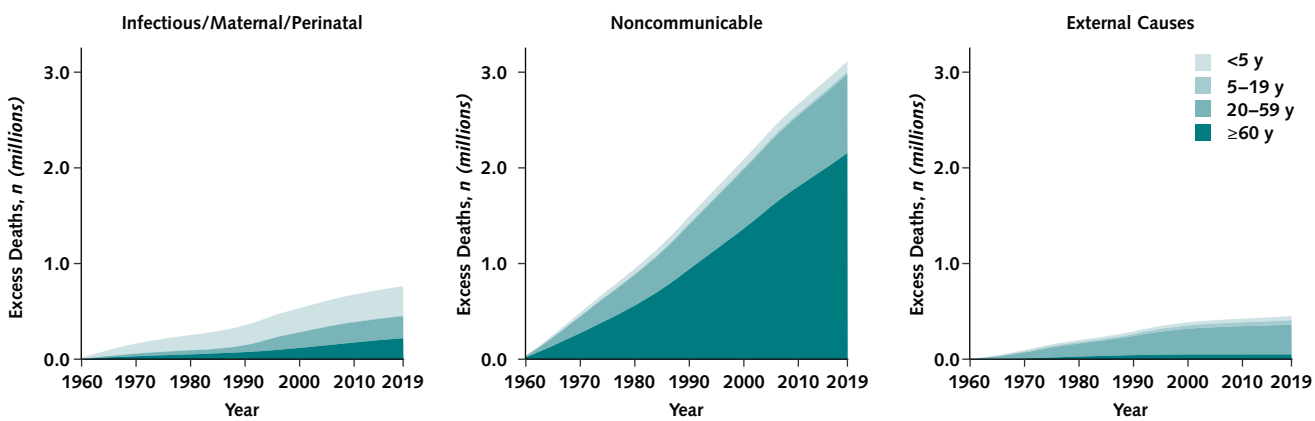
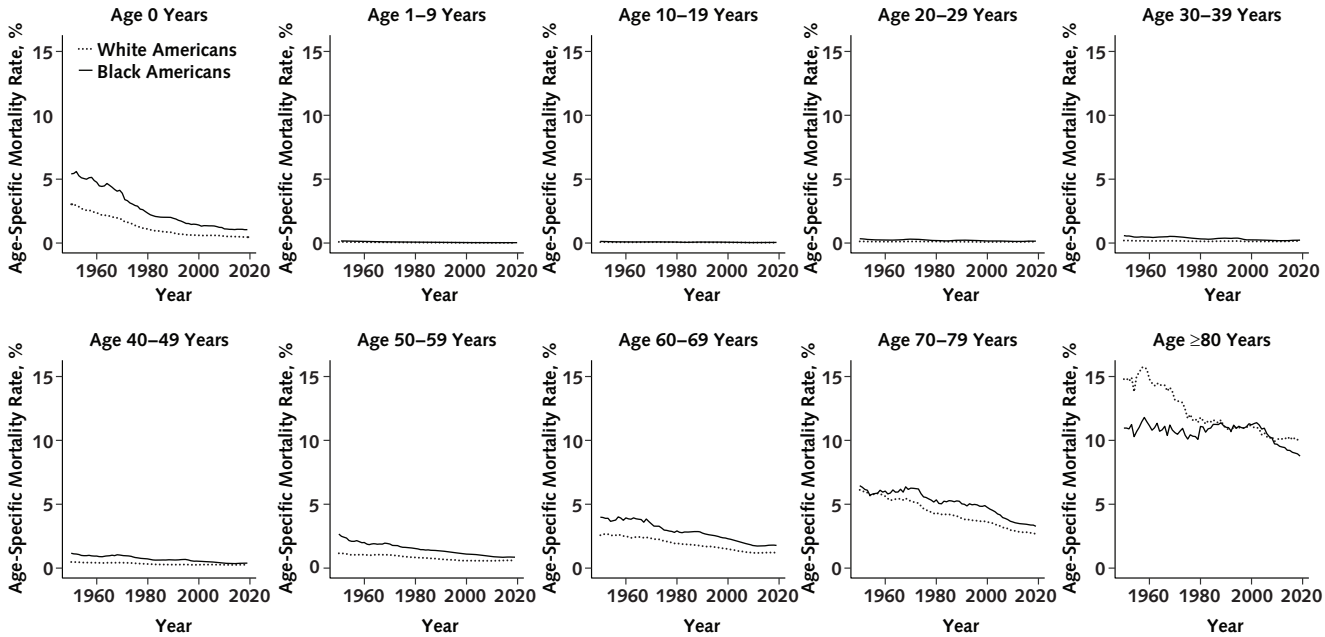


Figure 3. Trends in age-specific mortality rates, by race, in the United States.



7 decades. We did not include a measure of socioeconomic status in our analysis and focused on the public health effect on mortality rates of being Black in America without discerning the causes of these differentials.

We specifically excluded excess mortality among the Black population during the COVID-19 pandemic, instead focusing on the steady-state nature of inequalities in health outcomes over the past 70 years. Several studies have shown that the pandemic exacerbated many existing problems of the U.S. health care system (34), and this holds for racial inequalities across several health indicators, such as mortality (35, 36). Increased inequalities in mortality derived from COVID-19 among the Black population are expected to persist (37). Thus, our results are likely conservative estimates of current excess Black deaths in the United States.

Our analysis has several limitations. The most important limitation is the potential for secular trends of underreporting of deaths over the 7 decades of this analysis. This potential bias would most likely occur in disadvantaged populations without access to health care, and Black Americans have less income than the White population (38). This means that for the Black population there is, on average, likely more underreporting of deaths, and therefore the excess burden of disease in Black Americans could be underestimated in this report. Although this is a possibility, we consider this potential bias to be small because of the strength of the mandatory notification system in the United States. We reduced the potential information bias of this large population-based analysis by relying on official statistics from the U.S. Census Bureau during the first 10 years and individual-level data of all death certificates during the remaining 60 years.

Another potential limitation is related to the assignment of underlying causes of death over the last 6 decades. Changes in the notification, diagnosis, and assessment of different causes of death are reflected in our results. An important example is the diagnosis of hypertension and the historical trends therein during the study time frame. Hypertension is a major cause of death and a major risk factor for cardiovascular events. It was not defined before 1977 and since then has had several changes in its diagnosis and treatment, reflecting our increasing knowledge about this condition (39). These changes are expected in the last 60 years of available data because they reflect large improvements in modern medicine and health care delivery over time. We also had to impute data for the year 1972 because the data set in this year underreported deaths in the United States.

In conclusion, racial inequalities in infant and childhood mortality between Black and White Americans have not decreased in 70 years in the United States, with Black infants and children consistently having nearly twice the risk for death of White infants and children. Given these persistent differences, we recommend both redoubled public health efforts to address this excess risk and innovative social, economic, and health care policies such as increasing the transparency of quality of care outcomes (40) to address the

structural causes of inequity that underlie the worse mortality outcomes we evidenced in Black infants and children of the United States.

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Disclosures: Disclosure forms are available with the article online.

Reproducible Research Statement: *Study protocol*: Not available. *Statistical code and data set*: Available from Dr. Paternina-Caicedo (e-mail, ajpaterninac@unal.edu.co).

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Author contributions are available at Annals.org.

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