The Longevity Gap Between Black and White Men in the United States at the Beginning and End of the 20th Century

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Objectives. We sought to assess whether the disparity in mortality rates between Black and White men decreased from the beginning to the end of the 20th century.

Methods. We used Cox proportional hazard models for mortality to estimate differences in longevity between Black and White Civil War veterans from 1900 to 1914 (using data from a pension program) and a later cohort of male participants (using data from the 1992 to 2006 Health and Retirement Study). In sensitivity analysis, we compared relative survival of veterans for alternative baseline years through 1914.

Results. In our survival analysis, the Black–White male difference in mortality, both unadjusted and adjusted for other influences, did not decrease from the beginning to the end of the 20th century. A 17% difference in Black–White mortality remained for the later cohort even after we controlled for other influences. Although we could control for fewer other influences on longevity, the Black–White differences in mortality for the earlier cohort was 18%.

Conclusions. In spite of overall improvements in longevity, a major difference in Black–White male mortality persists. (*Am J Public Health.* 2010;100:357–363. doi:10.2105/AJPH.2008.158188)

Substantial improvements in health and longevity occurred during the 20th century.[1–4] Nevertheless, disparities in health and health care in the US population between Black and White races persist.[5,6] In the past 20 years there was an initial increase in the Black–White mortality differential followed by a slight convergence in the 1990s.[7,8] Although short-term fluctuations in differentials are to be expected, a more meaningful indicator of progress in eliminating disparities is evidence of narrowing differentials over the longer term.

We hypothesized that, in view of the substantial growth in spending on personal health care services and implementation of large-scale public health insurance programs, Black–White mortality differences would have decreased over the century. We used data from a major data collection effort spanning the late 19th and early 20th centuries, which converted paper records on health and longevity to data in machine-readable form on US males, both Black and White.[9–12] We used these data in combination with more recent data on comparably aged men to compare Black–White differences in longevity between the early and late 20th century.

METHODS

We used data from 2 sources. One was longitudinal data from Union Army pension program records. This program covered 85% of Union Army veterans by 1900 and 90% by 1910.[13]

Union Army Veterans Data

The program began in 1862, providing pensions to veterans severely disabled from military service. In 1890, the program was expanded to encompass all disability. Although old age was not statutorily recognized as sufficient for a pension until 1907, a minimum pension was granted to all veterans aged 65 years and older before this year unless they were "unusually vigorous."[14] The mortality experience of these veterans is representative of White men in 1900, indicating that mortality at older ages for these veterans reflected various factors rather than wartime experience.[13]

Black regiments were formed in 1862. By 1865, 186 000 men had entered US Colored Troop units. The sample of Black veterans, selected from 51 infantry companies, is representative of US Colored Troops in geographical location of residence and slave status.[15] About 78% of eligible Black men in Northern states served in the Union Army. Thirty-four percent came from border states and 11% from the Confederacy.[15] Black veterans in our sample were more likely to live in the North, to have higher occupational status, and to have lived in urban areas than the Black population overall in 1900.[15]

The "Surgeon's Certificates" data contain findings on veterans who received and who were denied pensions on the basis of physical examinations by 3 physicians. These records were matched with the 1900 US Census of Population, from which we obtained birth date, occupation, literacy, and place of residence. Dates of death and marital status came from Union Army pension records.

The total Surgeons' Certificate sample included 17 280 White men who had applied for a pension by 1900, 3931 of whom had died by 1900. We excluded veterans who were aged younger than 16 years and aged 50 years or older in 1865 (suggesting errors in these veterans' birth dates) and those for whom birth or death dates were lacking. These exclusions reduced the sample to 9864. For Blacks, 5673 records were abstracted from pension files. Applying the above screens yielded an analysis sample of 926 Black men.

We used 1900 as the baseline year for several reasons. First, before 1890, the pension program only covered service-connected disabilities. The eligibility expansion of 1890 substantially extended the number of pension-eligible veterans. Second, 1900 was a year for which occupation, marital status, literacy, and home ownership information from the Census was matched with Surgeons' Certificates. Third, 1900 was the first Census after the major expansion in pension eligibility in 1890.

Matches were done manually based on the veteran's name and place of residence.[9–12]

Health and Retirement Study Data

For comparison purposes, we used data from the first 8 waves of the Health and Retirement Study (HRS), years 1992 to 2006, with 1992 the baseline year. The HRS is a longitudinal national panel study with the main respondents being persons in the birth cohorts 1931 to 1941 and their spouses, who could be of any age. The HRS, conducted biennially, oversamples Blacks, Hispanics, and Florida residents, but otherwise is representative of the US population at this age.[16] Starting with 5867 men responding to the 1992 HRS, we dropped respondents not White or Black (n=218), not aged between 51 and 85 years in 1992 (n=292), and for whom information on the study's variables was missing (n=62), yielding an analysis sample of 820 Black and 4485 White men. Year of death was determined from National Death Index data.

Analysis

We estimated Cox proportional mortality hazards models with Stata version 10.0 (StataCorp LP, College Station, TX). We analyzed determinants of mortality of men interviewed in 1992 and followed through 2006 in the HRS; for Union Army veterans, we tracked survival from 1900 to 1914.

The principal covariate in the hazard models was a binary variable for Black race. We first estimated hazard models with Black race as the only covariate. Second, we included covariates for age, marital status, foreign birth, occupation, and home ownership. Third, we added covariates for education, urbanization, and family income.

In the veterans' analysis, all covariates other than for race, age, marital status, and foreign birth, which came from pension records, came from the 1900 US Census. This Census asked separate questions about whether the person could read and write. The binary variable for "literate" was set to 1 if the man said he could read and write. The Census gave place of residence; we defined binary variables for "very large city" as population exceeding 250 000, and for "large city" as population 26 000 to 250 000 in 1900. Occupations were farmer, farm worker, manual laborer, service worker, artisan, and a category for nonemployed men called "unproductive," with professionals and managers as the omitted reference group. (See supplementary table for complete definitions of occupations from the 1900 Census available as part of the online version of this article at http://www.ajph.org.) We included a binary variable for home ownership to measure the veteran's wealth. The 1900 Census did not obtain information on annual family income. When there were missing values on a covariate, we set the value of the covariate to 0 and defined another covariate to 1.

Major changes in ethnic mix occurred over the study period. In 1890, nearly all Blacks were US born whereas nearly 17% of Whites were foreign born. Two thirds of foreign-born Whites came from Germany or the British Isles, and more than 97% came from Europe or Canada. In 1990, 5% of Blacks and Whites were foreign born, 44% of whom were born in Central or South America and 27% in Europe or Canada.[17,18]

The HRS analysis included binary variables for Hispanic ethnicity and foreign birth but not of Hispanic origin. There were virtually no persons of Hispanic origin in the Union Army sample. We also used data on occupational categories at the 2-digit level. Respondents were assigned to occupational categories based on the 2-digit occupational codes. The fraction of men classified as farmers in the HRS seemed implausibly low; thus, we included a binary variable for living on a farm instead.

For the HRS analysis, we defined binary variables for completed college, completed some college, and completed high school; those with less than a high school education were the omitted group. We included a binary variable for home ownership and annual family income (in $10 000s).

A limitation of this analysis is that, especially for the earlier cohort, persons surviving to middle age were likely to have been healthier than others. Moreover, this selection effect may have been greater for Black than for White men. If so, using 1900 as a baseline period may understate the Black–White differential in mortality for the veterans' cohort. Disadvantages of using data for earlier baseline years are that Census data have not been merged with pension records before 1900, and war-related disability was the criterion for receiving a pension then.

Sensitivity Analysis

To ascertain whether our findings could reflect selection, in sensitivity analysis, we estimated Cox proportional hazard models, first only including a covariate for Black race for 1865 to 1914, 1880 to 1914, and 1890 to 1914. Second, we added covariates for age and presence or absence of wounds, diarrhea, syphilis, malaria, tuberculosis, measles, typhoid, and respiratory conditions reported to have occurred during the Civil War. Third, using the main analysis period (1900 to 1914), we estimated a Cox model including covariates for Black race, age, and the covariates for illness and injury as of 1865.

In additional sensitivity analysis, we included covariates for state of residence as reported in the 1900 Census in analyses of mortality from 1900 to 1914. Variables included were Deep South (Louisiana, Mississippi, Alabama, Georgia, and South Carolina), Other South (Florida, Arkansas, North Carolina, Virginia, Tennessee, and Texas), and Border States (Delaware, Kentucky, Maryland, Missouri, and West Virginia), with other states the omitted reference group. We also performed this analysis on the Black veterans sample only.

RESULTS

Union Army veterans were aged 61.1 years in 1900 on average versus 57.5 years for HRS sample men in 1992 (Table 1; $P<.001$). Of the veterans' sample, 8.6% were Black versus 15.5% for the HRS ($P<.001$). The major difference in distribution of men by occupation between the 1900 and 1992 cohorts was for "unproductive," reflecting a much higher propensity to retire at earlier ages in the HRS cohort. The share of Black men who were married declined from 81.6% in 1900 to 69.1% in 1992. In 1992, 6.7% of Blacks and 4.2% of Whites were foreign born but not Hispanic compared with 0.8% and 15.8%, respectively, in 1900. Among the HRS cohort, 8.9% of Whites were Hispanic versus 1.0% of Blacks. Of Black Union Army veterans, 43.7% reported ability to read and write versus virtually all White veterans (93.9%). Although measured in an entirely different way, the differential in educational attainment persisted in the more recent sample; 47.6% of Black

TABLE 1—Descriptive Statistics of Union Army Veterans, 1900, and of Male Participants in the Health and Retirement Study (HRS), 1992

	Union Army[a]			HRS[b]		
	Black (n = 926)	White (n = 9864)	Full Sample (n = 10 790)	Black (n = 820)	White (n = 4485)	Full Sample (n = 5305)
Age, y, mean (SE)	61.430 (6.813)	61.046 (6.284)	61.079 (6.332)	57.335 (5.053)	57.575 (4.897)	57.538 (4.922)
Race/ethnicity, %						
Black	100		8.6	100		15.5
Hispanic				1.0	8.9	7.6
Married, %	81.6	83.6	83.5	69.1	86.6	83.9
Foreign-born, %	0.8	15.8	14.5	6.7	4.2	4.6
Occupation, %						
Unproductive	3.0	4.6	4.4	38.4	25.3	27.3
Manual laborer	37.2	12.9	15.6	19.0	12.2	13.2
Service worker	5.0	6.9	6.7	15.9	16.0	16.0
Artisan	5.5	14.5	13.5	10.2	13.4	12.9
Farmer	32.4	38.2	37.6			
Farm worker	8.3	3.8	4.3			
Residence, %						
Very large city	15.6	11.0	11.5			
Large city	9.0	10.0	9.9			
Farm				0.7	5.9	5.1
Literate, %	43.7	93.9	89.6			
Education, %						
College				7.9	22.1	19.9
Some college				16.3	18.9	18.5
High school				29.1	35.9	34.8
Home ownership, %	45.6	71.6	69.4	67.3	86.4	83.5
Income (in $10 000s)				3.517	5.356	5.072

[a]0.3% have marital status missing; 26.8% have occupation missing; 13.2% have home ownership status missing; 57.11% have urban versus rural status missing.
[b]3.0% have occupation missing.

men in the HRS had less than a high school education, whereas only 23.1% of White men did. Home ownership and family income were also appreciably higher for Whites than for Blacks in 1992.

Nearly half (45.7%; not presented) of veterans alive in 1900 had died by 1914: 54.1% of all Blacks and 45.0% of all Whites. Among those who died during 1900 to 1914, mean age at death was 70.9 years for Whites and 70.4 years for Blacks (P=.16). By the end of 2006, 25.3% of men in the HRS analysis sample had died: 35.1% of all Blacks and 23.6% of all Whites. Mean age at death was 68.3 years for Whites and 67.0 years for Blacks (P<.01).

Unadjusted for other factors, being a Black man increased the probability of death among a cohort alive in 1900 by 26% (hazard ratio [HR]=1.263; 95% confidence interval [CI]=1.150, 1.387; Table 2). In the HRS analysis, the corresponding unadjusted differential was 63% (HR=1.627; 95% CI=1.425, 1.857; Table 2). When we controlled for age, Hispanic ethnicity (HRS only), marital status, foreign birth, occupation, and home ownership, the Black–White differential in the probability of death decreased to 23% for Union Army veterans (HR=1.228; 95% CI=1.113, 1.356) and to 25% for HRS respondents (HR=1.247; 95% CI=1.084, 1.433). Adding literacy and urbanization further reduced the Black–White differential in the probability of death to 18% (HR=1.184; 95% CI=1.061, 1.322) among Union Army veterans. The hazard ratio on literacy was less than 1.0, implying that literate men had longer longevity, but this result was statistically insignificant. However, being a homeowner decreased mortality by 15% (HR=0.850; 95% CI=0.794, 0.909) in the Union Army sample.

Adding covariates for educational attainment, home ownership, and family income to the analysis of HRS data decreased the Black–White mortality probability difference from 25% to 17% (HR=1.170; 95% CI=1.014, 1.351). Even though the HRS analysis contained covariates for education and income that the veterans' analysis lacked, the Black–White differential was virtually the same as for Union Army veterans.

Among the veterans, being "unproductive" or a service worker increased the probability of death relative to professionals or managers. Foreign-born individuals also had an increased probability of death compared with natives. In the HRS analysis, being "unproductive" also decreased longevity. Individuals of Hispanic ethnicity, college graduates, homeowners, and more-affluent individuals had higher longevity, accounting for the other covariates, than did non-Hispanics, those not completing high school, non-homeowners, and the less affluent.

In sensitivity analysis, we included individuals who died before 1900 to explore whether our selection criterion biased our results. Being a Black man increased the probability of death by 53% for 1865 to 1914 (HR=1.528; 95% CI=1.438, 1.624; Table 3) and 35% for 1880 to 1914 (HR=1.353; 95% CI=1.272, 1.439). Blacks had a 23% higher probability of death than did Whites for 1890 to 1914 (HR=1.225; 95% CI=1.147, 1.308), very similar to the 26% increased probability of death for Black men in the main analysis. Including variables for age, Civil War–related wounds, and illnesses (Table 4), the Black–White differential for the main analysis period was 25% (HR=1.253; 95% CI=1.140, 1.376). Including age, injury, and illness covariates raised the Black–White differential from 53% to 69% for 1865 to 1914 (HR=1.686; 95% CI=1.580, 1.798) and from 35% to 48% for 1880 to 1914 (HR=1.476; 95% CI=1.383, 1.575). For 1890 to 1914, including these covariates increased the probability of death for Black

TABLE 2—Race and Other Determinants of Mortality in Union Army Veterans, 1900–1914, and in Male Participants in the Health and Retirement Study (HRS), 1992–2006

	HR[a] (95% CI)	HR[b] (95% CI)	HR[c] (95% CI)
	Union army (N = 10 790)		
Black	1.263 (1.150, 1.387)	1.228 (1.113, 1.356)	1.184 (1.061, 1.322)
Age		1.023 (1.016, 1.031)	1.023 (1.016, 1.031)
Married		0.919 (0.849, 0.995)	0.921 (0.850, 0.997)
Foreign-born		1.125 (1.046, 1.211)	1.119 (1.039, 1.204)
Occupation			
Unproductive		1.273 (1.094, 1.482)	1.278 (1.098, 1.487)
Manual laborer		1.113 (0.993, 1.248)	1.115 (0.993, 1.251)
Service worker		1.173 (1.017, 1.354)	1.174 (1.017, 1.355)
Artisan		1.099 (0.978, 1.235)	1.104 (0.982, 1.240)
Farmer		0.996 (0.905, 1.097)	1.016 (0.917, 1.126)
Farm worker		0.959 (0.800, 1.150)	0.974 (0.810, 1.171)
Residence			
Very large city			1.098 (0.966, 1.249)
Large city			0.980 (0.850, 1.131)
Literate			0.936 (0.851, 1.030)
Home ownership		0.843 (0.789, 0.901)	0.850 (0.794, 0.909)
	HRS (N = 5305)		
Race/ethnicity			
Black	1.627 (1.425, 1.857)	1.247 (1.084, 1.433)	1.170 (1.014, 1.351)
Hispanic		0.777 (0.631, 0.958)	0.711 (0.574, 0.880)
Age		1.009 (0.993, 1.026)	1.006 (0.989, 1.023)
Married		0.760 (0.655, 0.882)	0.794 (0.682, 0.924)
Foreign-born		0.797 (0.609, 1.044)	0.830 (0.633, 1.087)
Occupation			
Unproductive		2.565 (2.153, 3.057)	1.993 (1.638, 2.426)
Manual laborer		1.380 (1.108, 1.718)	1.071 (0.848, 1.353)
Service worker		1.238 (1.002, 1.529)	1.027 (0.824, 1.279)
Artisan		1.286 (1.028, 1.608)	1.006 (0.793, 1.276)
Lives on farm		1.475 (1.110, 1.960)	1.179 (0.880, 1.579)
Education			
College			0.723 (0.588, 0.889)
Some college			1.054 (0.896, 1.241)
High school			0.945 (0.824, 1.083)
Home ownership		0.719 (0.622, 0.832)	0.769 (0.664, 0.891)
Income (in $10 000s)			0.961 (0.935, 0.987)

Notes. CI = confidence interval; HR = hazard ratio.
[a]Adjusts for Black race/ethnicity.
[b]Adjusts for Black race/ethnicity, demographics, occupation, and home ownership.
[c]Adjusts for all covariates listed in this table.

relative to White men to 32% (HR=1.319; 95% CI=1.231, 1.413). Including individuals who died before 1900 increased the Black–White mortality differential, but did not reverse our conclusion that disparities have not narrowed.

Including variables for region of residence in 1900 did not materially affect our results (not presented). An analysis of only Black veterans revealed no statistically significant differences by geographic residence. Lack of findings suggests that the nonrepresentativeness of the Black sample geographically did not affect the Black–White survival differential reported above for 1900 to 1914.

DISCUSSION

Race is a social rather than a biological construct. There is substantially more variation genetically within racial categories than between them.[19] Persons identified as Black according to skin color or on some other basis have suffered discrimination in the United States for centuries. One manifestation of this is continuing differences in health and health care use.

The difference in mortality, unadjusted and adjusted for other influences, between Black and White men did not decrease between the beginning and the end of the 20th century. No real progress was made in reducing the differential in spite of substantial improvement in the productivity of medical care, implementation of public health insurance programs and other public health interventions, social insurance programs, public laws, and public and private programs aimed at improving the well-being of minorities in the United States.[1–4,20,21]

Our finding of the lack of progress in mortality rates is not entirely new. For example, one study, which used aggregate data and which did not control for other factors, documented persisting mortality difference by race.[22] A contribution of our study is in accounting for factors other than race, including educational attainment, income, labor market, and marital status at the level of the individual, as potential causes of the mortality differentials. The differentials persisted even after we accounted for these other factors.

In contrast to earnings differentials by race, comparatively little research has been conducted on relative long-term trends in health by race. One study assessed the association between enactment of civil rights laws and expansion of public health funding in the mid-1960s and Black–White infant mortality rates before and after these statutory changes.[23] The study found substantially improved survival of Black infants relative to White infants. Convergence of Black–White infant mortality rates was strongest in the South, where there were relatively large increases in the percentage

TABLE 3—Race and Other Determinants of Mortality for Union Army Veterans, 1865–1914

Union Army Data	1900–1914, HR (95% CI)	1865–1914, HR (95% CI)	1880–1914, HR (95% CI)	1890–1914, HR (95% CI)
Black only	1.263 (1.150, 1.387)	1.528 (1.438, 1.624)	1.353 (1.272, 1.439)	1.225 (1.147, 1.308)
Race and other determinants of mortality[a]				
Black	1.253 (1.140, 1.376)	1.686 (1.580, 1.798)	1.476 (1.383, 1.575)	1.319 (1.231, 1.413)
Wound	1.047 (0.987, 1.111)	1.071 (1.024, 1.121)	1.053 (1.006, 1.102)	1.029 (0.982, 1.079)
Diarrhea	1.018 (0.958, 1.081)	1.038 (0.991, 1.087)	1.030 (0.984, 1.079)	1.030 (0.981, 1.080)
Syphilis	1.020 (0.785, 1.326)	1.044 (0.862, 1.264)	1.036 (0.855, 1.256)	1.075 (0.880, 1.312)
Malaria	1.106 (0.929, 1.316)	1.018 (0.891, 1.165)	1.037 (0.907, 1.186)	1.053 (0.916, 1.209)
Tuberculosis	1.140 (0.921, 1.411)	1.271 (1.083, 1.491)	1.256 (1.069, 1.476)	1.172 (0.989, 1.389)
Measles	0.828 (0.711, 0.965)	0.851 (0.754, 0.962)	0.845 (0.748, 0.955)	0.852 (0.750, 0.967)
Typhoid	0.877 (0.789, 0.976)	0.880 (0.810, 0.957)	0.882 (0.811, 0.959)	0.880 (0.807, 0.960)
Respiratory disease	1.092 (1.010, 1.181)	1.054 (0.992, 1.119)	1.043 (0.982, 1.107)	1.028 (0.966, 1.095)
Missing		3.023 (2.851, 3.205)	2.843 (2.680, 3.015)	2.788 (2.615, 2.973)
Total sample	10 790	18 071	17 663	16 455

Notes. CI = confidence interval; HR = hazard ratio.
[a]Controls for age.

of Black births occurring in hospitals. However, the observational period was only 1955 to 1975. Another study examined effects of New Deal programs on infant mortality from 1930 to 1939 in the South, and concluded that New Deal programs had mixed effects on infant mortality rates during this period.[24]

Some important research has examined the impact of area characteristics—for example, income on mortality by race—finding that such characteristics as income of the area influences longevity.[25,26] Although our study did not control for geographic area characteristics, we did control for individual characteristics.

Geronimus et al. found higher allostatic load scores, which are significantly associated with mortality, for Blacks compared with Whites regardless of economic status.[27] Cummings and Jackson,[28] studying self-assessed health, found that Black men were significantly more likely to report worse health than White men. However, after Cummings and Jackson accounted for other covariates, Blacks did not differ in self-assessed health from Whites. These results are not directly comparable to ours because we examined mortality, not self-assessed health.

The finding of persistent disparities in mortality by White versus Black race raises several questions. Most important, is our finding accurate or misleading? First, we selected data for men who were aged 50 years or older at baseline. Thus, we performed sensitivity analysis to expand our sample group to all individuals receiving pensions following the Civil War, which revealed a mortality differential prior to 1900 greater than that reported in the main analysis. This is consistent with a research finding that mortality among Black men relative to Whites was particularly high before age 50 years during the 19th[29] and the 20th centuries.[30]

Second, a high proportion of veterans could not be matched with 1900 Census records, raising the possibility that our analysis sample may be unrepresentative. However, according to the hazard ratios on indicators for missing values (not reported), those veterans not matched with Census data had the same probability of death on average as did those veterans who were matched.

A related potential concern is the nonrepresentativeness of the Union Army sample geographically. However, in sensitivity analysis, when we controlled for state of residence in the 1900 Census, we found no statistically significant differences among Black veterans by region.

There is an argument that the environments in which the men lived in the 2 periods were so different that no direct comparison of mortality experiences is possible. Indicative of this is the use of the term "unproductive" for persons not engaged in market work in 1900, the population shift from farm to city, and the substantial improvement in educational attainment during the 20th century. Although these changes occurred, the argument could work both ways. If implementation of social insurance programs accompanied a change in attitudes toward persons not engaged in market work, one might have hoped that Black–White disparities would have diminished as well.

Although the Black–White difference in mortality rates for men did not decline over the century, Black mortality fell in absolute terms,[22] and it might be argued that the more relevant metric is the absolute improvement for Black men rather than the change relative to that of White men. Indeed, for our analysis cohorts, the probability that a Black man survived 14 years from baseline increased by 19 percentage points between the 1900 and 1992 baseline years. But for White men, the corresponding increase in survival probabilities was even higher—21 percentage points. This same type of issue arises in other areas, for example, in educational attainment and such job market indicators as earnings differentials.[31,32] In the end, however, it is not only absolute improvements that seem to matter to people.

TABLE 4—Descriptive Statistics of Wounds and Illnesses of Veterans With Pensions Sustained During the Civil War, 1900

	Black (n = 926), %	White (n = 9864), %	Full Sample (n = 10 790), %
Wound	17.7	32.8	31.5
Syphilis	0.8	1.2	1.2
Diarrhea	21.1	30.5	29.7
Malaria	3.5	2.2	2.3
Respiratory disease	11.8	14.2	14.0
Tuberculosis	1.0	1.5	1.4
Typhoid	6.2	7.9	7.8
Measles	1.5	4.7	4.4

The disparity possibly would have been even larger at the end of the 20th century if public programs designed to reduce disparities had not been implemented. Large disparities in use of health services by race continue to exist and have been amply documented.[6,33] Recent data document a widening racial mortality gap in the 1980s followed by a slight convergence in the 1990s, caused in large part by increasing HIV and homicide rates among Blacks that subsequently improved, but only time and further research will tell whether these relative improvements are sustainable.

Strengths of this study include the use of Union Army pension data merged with US Census data on individual characteristics and analysis of more recent data to compare historical rates of Black–White mortality differentials. Also, our key findings were robust in sensitivity analysis.

We acknowledge several limitations. The Union Army data provide a very rich source of information on characteristics of men alive more than a century ago. However, the gain in knowledge of individual characteristics of sample persons comes at the cost of some loss of national representativeness of the US population in 1900. Census records in 1900 did not differentiate individuals into racial or ethnic categories beyond Black and White, and the categorization of individuals was based on interviewer's observations.[22,34] Further, substantial changes in the ethnic composition of the US population occurred from 1890 to 1990, most notably a large increase in individuals born in Mexico.[17,18] We included a binary variable for Hispanic ethnicity in the later analysis to account for this change.

Although we dealt with sample selection in sensitivity analysis, selection processes we could not control for may still remain.[28] For example, Blacks were less likely to receive pensions, which have been shown to have a protective effect on mortality.[35] Age misreporting among elderly Blacks has been demonstrated in a number of studies. Preston et al.[36,37] reported that too many deaths among Blacks are recorded as occurring at ages 95 years and older because birth dates are misreported. However, this finding may not apply to our study. First, our data on age came from enlistment records. Second, we excluded persons who were obviously too young or too old to have been Civil War soldiers. By contrast, Preston et al. did not have records recording birth dates other than birth records from early in the individual's life course.

In sum, differences in Black–White mortality rates persisted among elderly individuals born in the early 19th century compared with those born about 100 years later, even after we controlled for covariates systematically related to race. Despite great increases in life expectancy overall, Whites continued to have substantially greater longevity, even after adjustment for age, health, and demographic characteristics. ■

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Contributors

F. A. Sloan designed and originated the study, acquired the data, assisted in analyzing and interpreting the data, assisted in drafting and revising the article, obtained funding, and supervised the study. P. Ayyagari, M. Salm, and D. Grossman assisted in analyzing and interpreting the data, drafting and revising the article, and statistical analysis.

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Human Participant Protection

No protocol approval was necessary.

References

1. Costa DL. Understanding mid-life and older age mortality declines: evidence from union army veterans. *J Econometrics.* 2003;112(1):175–192.

2. Cutler D. *Your Money or Your Life: Strong Medicine for America's Health Care System.* Oxford, England: Oxford University Press; 2004.

3. Cutler D, Deaton A, Lleras-Muney A. The determinants of mortality. *J Econ Perspect.* 2006;20(3): 97–120.

4. Fogel RW. New findings on secular trends in nutrition and mortality: some implications for population theory. In: Rosenzweig MR, Stark O, eds. *Handbook of Population and Family Economics.* Amsterdam, The Netherlands: Elsevier; 1993:433–481.

5. Behrman JR, Sickles R, Taubman P, et al. Black-white mortality inequalities. *J Econom.* 1991;50(1–2): 183–203.

6. Institute of Medicine of the National Academies. *Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care.* Washington, DC: The National Academies Press; 2002.

7. Harper S, Lynch J, Burris S, Smith GD. Trends in the black-white life expectancy gap in the United States, 1983-2003. *JAMA.* 2007;297:1224–1232.

8. Meara ER, Richards S, Cutler DM. The gap gets bigger: changes in mortality and life expectancy, by education, 1981–2000. *Health Aff (Millwood).* 2008; 27:350–360.

9. Fogel RW, University of Chicago, Center for Population Economics. Aging of veterans of the Union Army: surgeons' certificates, version S-1 standardized, bibliographic citation: 1862–1940 [computer file]. ICPSR03417-v1. Ann Arbor, MI: Inter-university Consortium for Political and Social Research; 1999. P01 AG10120. Available at: http://www.cpe.uchicago.edu. Accessed December 19, 2008.

10. Fogel RW, University of Chicago, Center for Population Economics. Aging of veterans of the Union Army: military, pension, and medical records, 1820–1940 [computer file]. ICPSR06837-v6. Ann Arbor, MI: Inter-university Consortium for Political and Social Research; 2000. P01 AG10120. Available at: http://www.cpe.uchicago.edu. Accessed December 19, 2008.

11. Fogel RW, University of Chicago, Center for Population Economics. Aging of veterans of the Union Army: United States federal census records, 1850, 1860, 1900, 1910 [computer file]. ICPSR06836-v6. Ann Arbor, MI: Inter-university Consortium for Political and Social Research; 2000. P01 AG10120. Available at: http://www.cpe.uchicago.edu. Accessed December 19, 2008.

12. Fogel RW, University of Chicago, Center for Population Economics. Public use sample on the aging of Veterans of the United States Colored Troops, 1860-1930. 2001. P01 AG10120. Available at: http://www.cpe.uchicago.edu. Accessed December 19, 2008.

13. Costa DL. *The Evolution of Retirement: An American Economic History.* Chicago, IL: University of Chicago Press; 2000.

14. Costa DL. Pensions and retirement—evidence from union army veterans. *Q J Econ.* 1995;110(2):297–319.

15. Costa DL, Kahn ME. Forging a new identity: the costs and benefits of diversity in Civil War combat units for black slaves and freemen. *J Econ Hist.* 2006;66(4): 936–962.

16. Juster FT, Suzman R. An overview of the health and retirement study. *J Hum Resour.* 1995;30(5):S7–S56.

17. Report on population of the United States at the Eleventh Census: 1890. Washington, DC: Department of the Interior Census Office; 1895. Available at: http://www2.census.gov/prod2/decennial/documents/1890a_v1-01.pdf. Accessed April 2, 2009.

18. Gibson CJ, Lennon E. Historical census statistics on the foreign-born population of the United States: 1850-1990. Washington, DC: Population Division, US Bureau of the Census; 1999. Population Division working paper no. 29. Available at: http://www.census.gov/population/www/documentation/twps0029/twps0029.html. Accessed April 2, 2009.

19. Brown RA, Armelagos GJ. Apportionment of racial diversity: a review. *Evol Anthropol.* 2001;10:34–40.

20. Nordhaus WD. Irving Fisher and the contribution of improved longevity to living standards. *Am J Econ Sociol.* 2005;64(1):367–392.

21. Rosenbaum S, Markus A, Darnell J. US civil rights policy and access to health care by minority Americans: implications for a changing health system. *Med Care Res Rev.* 2000;57(Supp 1):236–259.

22. Haines MR. Ethnic differences in demographic behavior in the United States–Has there been convergence? *Hist Methods.* 2003;36(4):157–195.

23. Chay KY, Greenstone M. The convergence in black-white infant mortality rates during the 1960's. *Am Econ Rev.* 2000;90(2):326–332.

24. Fishback PV, Haines MR, Kantor S. The impact of the New Deal on black and white infant mortality in the South. *Explor Econ Hist.* 2001;38(1):93–122.

25. Geronimus AT, Bound J, Waidmann TA, Colen CG, Steffick D. Inequality in life expectancy, functional status, and active life expectancy across selected black and white populations in the United States. *Demography.* 2001;38(2):227–251.

26. Geronimus AT, Bound J, Waidmann TA. Poverty, time, and place: variation in excess mortality across selected US populations, 1980-1990. *J Epidemiol Community Health.* 1999;53(6):325–334.

27. Geronimus AT, Hicken M, Keene D, Bound J. "Weathering" and age patterns of allostatic load scores among blacks and whites in the United States. *Am J Public Health.* 2006;96(5):826–833.

28. Cummings JL, Jackson PB. Race, gender, and SES disparities in self-assessed health, 1974-2004. *Res Aging.* 2008;30(2):137–168.

29. United States life tables: 1890, 1901, 1910, and 1901-1910. Washington, DC: United States Bureau of the Census; 1921. Available at: http://www.cdc.gov/nchs/data/lifetables/life1890-1910.pdf. Accessed December 18, 2008.

30. Arias E. United States life tables, 2000. *Natl Vital Stat Rep.* 2002;51(3):1–42.

31. Black D, Haviland A, Sanders S, Taylor L. Why do minority men earn less? A study of wage differentials among the highly educated. *Rev Econ Stat.* 2006;88(2):300–313.

32. Neal DA, Johnson WR. The role of premarket factors in black-white wage differences. *J Polit Econ.* 1996;104(5):869–895.

33. Shin MS. Redressing wounds: finding a legal framework to remedy racial disparities in medical care. *Calif Law Rev.* 2002;90(6):2047–2100.

34. Elo IT. New African American life tables from 1935-1940 to 1985-1990. *Demography.* 2001;38(1):97–114.

35. Logue LM, Blanck P. "Benefit of the Doubt": African-American Civil War veterans and pensions. *J Interdiscip Hist.* 2008;38(3):377–399.

36. Preston SH, Elo IT, Rosenwaike I, Hill M. African-American mortality at older ages: results of a matching study. *Demography.* 1996;33(2):193–209.

37. Preston SH, Elo IT, Stewart Q. Effects of age misreporting on mortality estimates at older ages. *Popul Stud (Camb).* 1999;53(2):165–177.