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Black White Difference in Long Term Predictive Power of Self-Rated Health on All-Cause Mortality in United States

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Abstract

Purpose—Despite the well-established association between self-rated health (SRH) and mortality, limited information exists on Black-White differences in this link. Using a nationally representative sample of adults in the United States, the current study had four aims: 1) to assess whether the association between baseline SRH and all-cause mortality over a long follow up differs for Blacks and Whites, 2) to test whether any race difference in the SRH – mortality link depends on how the SRH variable is treated (e.g., nominal, dichotomous, continuous), 3) to test if the SRH – mortality link or any differences in the association by race are explained by differences in objective health measures (chronic medical conditions [CMC]), and (4) to assess whether these associations vary by gender.

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Conflict of Interest

All authors declare that they have no conflicts of interest.

Informed Consent

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all participants included in the study.

Animal Studies

No animal studies were carried out by the authors for this article.

Ethics

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all participants included in the study. University of Michigan Institutional review board (IRB) approved the study protocol.

Authors contributions

Sarah Burgard contributed to the original study (ACL). She also contributed to the drafting and revision of the manuscript. Shervin Assari designed and analyzed this work, and contributed to draft and revision. Maryam Moghani Lankarani provided the first draft and contributed to revision. All authors confirmed the last version.

Methods—Data came from the Americans' Changing Lives Study, a nationally representative longitudinal cohort of U.S. adults 25 and older with up to 25 years of follow up. The study followed 3,361 Blacks or Whites for all-cause mortality between 1986 and 2011. The predictor of interest was a single item measure of SRH in 1986, treated as a nominal, dichotomous (fair/poor versus excellent/very good/good) and continuous variable. Confounders included baseline age, education, income, depressive symptoms, and CMC. Race (Black versus White) was the focal effect modifier. We ran Cox proportional hazard models for the pooled sample, and also stratified by race and gender, before and after adjusting for CMC.

Results—Regardless of how SRH was treated and for both men and women, we found significant interactions between race and SRH, indicating a stronger predictive role of SRH for all-cause mortality among Whites compared to Blacks. Before adjustment for chronic medical conditions, lower SRH was associated with higher risk of mortality among Blacks and Whites, but after adjustment, the SRH – mortality association was no longer significant among Blacks.

Conclusion—Baseline SRH continues to predict long term mortality among White but not Black Americans after adjustment for chronic medical conditions at baseline, and these patterns are similar for men and women. Future research should test whether the differential predictive validity of SRH across race groups arises because SRH reflects different aspects of health of Black and White Americans.

Keywords

Ethnic Groups; African Americans; self-rated health; Mortality; Chronic Medical Conditions

Use of single item self-rated health (SRH) measures has a long history, going back to community surveys in the 1950s, such as a U.S. study of occupational retirement¹ and the US Federal Civil Defense Administration Survey.² Such single item measures are brief and efficient tools for estimating the overall health of individuals, groups, and populations in community and clinical settings.^{3,4} Due to feasibility⁵ and low-cost,⁶ SRH has been widely applied in national surveys in most countries.^{6,7} In the United States, the Institute of Medicine (IOM) has recommended use of single item SRH measures to monitor population health.^{8,9}

Existing studies have shown SRH to be strongly correlated with a wide range of health outcomes including health care use,^{6,10} quality of life,¹¹ physical health,¹² medical conditions,¹³ morbidity,¹⁴ and mortality.⁸ The SRH - mortality link has been supported by considerable evidence suggesting that the association exists across populations, geographic regions, and study follow-up durations.^{8,15-19} Individuals who perceive their health to be poor have 2 to 7 times higher risk of mortality compared to those who perceive themselves to be in excellent health, after adjustment for objective health measures.^{5,6,15-18,20} The magnitude of the SRH - mortality association has been generally regarded as evidence that SRH is a valid tool for monitoring population health.^{21,22}

Despite the well-established link between the SRH and mortality, there is some evidence suggesting that the reliability and validity of SRH may depend on social factors such as social class,^{23,24} gender,²⁵⁻²⁷ and ethnicity.²⁸⁻³² Some studies report a weaker association

between SRH and mortality among those of higher social class,²³ while others find a similar association between SRH and mortality across all socioeconomic groups,³³ but most studies have shown that the SRH – mortality link is weaker among individuals with lower social class.^{34–36} However, it is not yet clear whether Blacks and Whites differ in the magnitude of the relationship between SRH and mortality overall,^{18,28} or further, if any such difference varies depending on the way SRH is measured, whether racial differences in objective health status are addressed, and/or whether any of these findings depend on an individual's gender.

Among studies that have compared the predictive power of SRH on mortality across ethnic groups,^{18,21} a subset have compared Blacks and Whites. McGee showed that in an ethnically diverse sample, fair/poor SRH was associated with at least a twofold increased risk of mortality for all racial/ethnic groups.¹⁸ There are, however, studies suggesting Black-White differences in the predictive power of SRH for all-cause mortality.^{24,32,34}

However, we still do not know whether baseline SRH similarly predicts mortality of Whites and Blacks over a very long follow up. We also push the literature forward in three additional ways. First, we explore the nature of the association between SRH and mortality more explicitly. Although most studies of the SRH – mortality link have used a dichotomous specification, SRH could have gradient, threshold or other nonlinear associations with the risk of all-cause mortality.^{8,15,16} Some studies have shown that each incremental decline from excellent to poor baseline SRH increases subsequent mortality risk, indicative of a dose–response pattern of association.^{8,15,16} We explore the possibility that gradient, threshold and/or nonlinear associations are present, and whether the choice of specifications matters for capturing potential Black-White differences in the association. Second, we consider the possibility that racial differences in the burden of health conditions may influence the long-term predictive power of SRH for mortality. Finally, we consider whether gender acts as a further moderator of all of these associations. Some prior studies have found that SRH is a stronger predictor in men than in women, possibly due to the greater influence of non-life threatening conditions on SRH reports of women.²⁷ However, in a 6-year study of survival among the 1209 African-American respondents in the Longitudinal Study on Aging (LSOA), after adjustment for all three objective health measures, SRH was an independent predictor of mortality for women, but not for men.³⁷ However, this study was not designed to explore whether gender differences in the association might vary by race.

In sum, though there is some evidence suggesting lower validity of SRH as a predictor of mortality among minorities and Blacks in the U.S.,²¹ and those of lower socioeconomic status,²³ we know relatively little about Black-White differences in the predictive role of SRH. We conducted the current study with four aims: to 1) assess whether the association between SRH and all-cause mortality over a long follow up differs for Blacks and Whites, 2) test whether race differences in the SRH – mortality link depend on how the SRH is treated (e.g., nominal, dichotomous, continuous), 3) test if the SRH – mortality link or any differences in the association by race are explained by differences in objective health measures (chronic medical conditions [CMC]), and (4) assess whether these associations vary by gender.

Methods

Design and setting

The Americans' Changing Lives (ACL), 1986 – 2011 is a nationally-representative U.S. study of U.S. adults 25 years old and older.³⁸ More information on the sampling and data collection has been published elsewhere.^{39,40}

Sampling and participants

The ACL used a stratified multistage probability sample of noninstitutionalized U.S. adults and oversampled older adults (age > 60) and Blacks. The study enrolled 3,617 adults who were 25 years or older and were living in the continental U.S. in 1986 (representing 70% of sampled households and 68% of sample individuals at baseline). Current analysis is limited to non-Hispanic Whites and Blacks (analytic N = 3,361, composed of 2,205 Whites and 1,156 Blacks).

Process

Data were collected via face to face interviews. Death certificates and National Death Index (NDI) information were used to assess date of death (discussed below).

Measures

Socio-demographics

Demographic characteristics included gender (male as the referent category), and age (a continuous variable). Socio-economic characteristics included educational attainment (years of schooling) and an 11 category measure of the income of the respondent (and spouse if present), used here as a continuous variable, both collected in 1986. Race was the moderator, defined as Black versus White (with White respondents as the referent category).

Race

ACL collected data on participant's race at baseline in 1986 with multiple survey items. Participants were asked about Hispanic origin, gave an open-ended response to the question, "In addition to being American, what do you think of as your ethnic background or origins?" and then were asked: "Are you white, black, American Indian, Asian, or another race?" and allowed to answer with multiple categories. Individuals who responded with more than one non-white group were asked to identify which "best described" their race. ACL also assessed the state or foreign country of birth. Together, these items were used to construct race categories of "Non-Hispanic White", "Non-Hispanic Black", "Non-Hispanic Native American", "Non-Hispanic Asian", and "Hispanic". We only include Non-Hispanic Whites and Non-Hispanic Blacks in this study.

Depressive Symptoms

Depressive symptoms were measured with an 11 item version of the Center for Epidemiological Studies-Depression scale (CES-D).⁴¹ CESD items measure the extent to which respondents felt depressed, happy, lonely, sad, that everything was an effort, that their sleep was restless, that people were unfriendly, that they did not feel like eating, that people

dislike them, that they could not get going, and that they enjoyed life. Positively worded items were reverse-coded. This abbreviated CES-D scale has shown acceptable reliability and a similar factor structure compared to the original version.⁴²⁻⁴⁴ Possible item responses were scored 1 (never or hardly ever) to 3 (most of the time), resulting in a continuous measure of depressive symptoms with a potential range from 11 to 33. Higher scores indicated greater severity of depressive symptoms.

Number of Chronic Medical Conditions

Baseline CMC were measured using self-reports by respondents of whether a health care provider had ever told them they had each of seven focal conditions (hypertension, diabetes, chronic lung disease, heart disease, stroke, cancer, and arthritis). Responses were summed, resulting in a score ranging from 0 to 7.^{38,40}

Self-Rated Health (SRH)

Respondents were asked to classify their self-rated health as excellent, very good, good, fair, or poor. As past literature has defined SRH in three distinct ways,⁴⁵⁻⁴⁸ we also treated SRH as a nominal variable, a dichotomous variable and as a continuous score to compare the robustness of findings across specifications. First, we used excellent as the reference category, and calculated the effects of other levels including very good, good, fair, and poor. Second, we collapsed to two categories (fair/poor vs. excellent/very good/good), a cutpoint that is common in the literature. Continuous SRH was coded from 1 (excellent) to 5 (poor), with higher values indicative of worse SRH.

Mortality

Information on all deaths from mid-1986 through 2011 was obtained through the National Death Index (NDI), death certificates, and also from informants. In most cases, time and cause of death were verified with death certificates. Mortality data were evaluated for all participants regardless of their follow up status. This means that we monitored for mortality of all respondents who were in the baseline sample, even if they failed to respond to a follow-up interview. With a handful of exceptions, we were able to determine death status of all our participants. The handful of cases where death could not be verified with death certificates were reviewed carefully, and actual death was certain in all cases. Only in these few cases, was the date of death ascertained from the informants or the NDI report, rather than the death certificate. Overall, 1,737 deceased Black or White participants were detected, while 1,624 Black or White individuals survived.

Ethics

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all participants included in the study. University of Michigan Institutional review board (IRB) approved the study protocol.

Statistical analysis

ACL used a complex sample design. We used Stata version 12 to account for the survey design of the study. To do so, we estimated all standard errors based on the survey design, using sampling and non-response weights (at baseline). Taylor series linearization was used to estimate standard errors. A series of Cox proportional hazards models were estimated. Cox proportional hazard models require two aspects of the outcome: 1) a binary outcome, and 2) the time to that outcome's occurred since baseline. Mortality was coded as 1 if death occurred due to any cause between 1986 and 2011, and 0 otherwise. Time to death, or to censoring, was defined as the number of months from baseline to month of death or the end of the year 2011. To evaluate the proportional hazard assumptions for our Cox proportional hazard models, we used `-estat phtest-` in Stata for Schoenfeld residual analysis. Our models passed the tests for proportional hazards (non-significance of the overall model).

The main predictor of interest was baseline SRH measured in 1986, while the outcome was time to the event of all-cause mortality over up to 25 years of follow up. Race was the main moderator. Covariates included baseline demographic factors (age, gender), socio-economic characteristics (education, income), depressive symptoms, and CMC measured in 1986, used to adjust for potential confounding. First, we ran models stratified by race to test if SRH treated in three distinct ways (i.e., as a nominal, dichotomous, and/or continuous variable) predicted time to death over up to 25 years of follow up. In the next step, we used the pooled sample of Blacks and White to evaluate the effects of race and SRH on mortality, while age, gender, education, income, depressive symptoms, and number of medical conditions were controlled. To test if race and SRH differently interact based on gender, we also ran our model stratified by gender. Hazard ratios with 95% confidence intervals (CI) are reported.

Results

Table 1 presents descriptive statistics for all variables used in the analysis in the pooled sample, and separately by race. Blacks had lower education and income, and higher depressive symptoms and CMC than whites. Age and gender were not significantly different across race groups. Blacks had significantly worse SRH, regardless of how we treated SRH.

Table 2 presents the results for six Cox proportional hazards models for the pooled sample, and then separately for Whites and Blacks, treating SRH as a five category nominal variable. Models 1 and 2 consider the pooled sample, before (Model 1) and after (Model 2) controlling for CMC. The results of Models 1 and 2 show a significantly higher risk of mortality for those with poorer self-rated health, and for Black respondents, net of sociodemographic characteristics. They also show a significant interaction between race and SRH, before and after controlling for CMC, that suggests a larger effect of SRH on subsequent mortality for Whites than Blacks. Models 3 and 4 represent the same set of models for Whites, while Models 5 and 6 show the same set of models for Blacks. Results from these models show that SRH is strongly and significantly related to risk of mortality among Whites, while the association is weaker for Blacks, and no longer significant after we adjust for chronic medical conditions in Model 6.

Table 3 presents the results of an analogue set of models in which SRH is treated as a continuous variable. We obtain a very similar set of results to those shown in Table 2. In the pooled sample used for Models 1 and 2, while Black race was associated with a significantly higher risk of mortality, and SRH as a linear score was also associated with a higher risk of mortality, a significant interaction was found between race and SRH, suggesting a weaker predictive role of SRH on mortality for Blacks compared to Whites. In race-specific models, SRH was associated with risk of mortality for Whites and Blacks when CMC was not in the model, but SRH did not predict mortality for Blacks when CMC was adjusted. Among Whites, net of all confounders, SRH was predictive of mortality. Table 4 presents a final analogue set of results, this time using the dichotomized measure of SRH, and results are very consistent with these shown for the other two specifications of SRH shown in Tables 2 and 3.

Table 5 shows twelve models to test the SRH - mortality link before and after adjusting for CMC, separately for men (Models 1 to 6, top panel) and women (Models 7 to 12, bottom panel). Model 1 and 7 did not include CMC in the model for the pooled sample of White and Black respondents, Model 2 and 8 did include CMC in the model for the pooled sample of Whites and Blacks, Models 3, 4, and 9, and 10 considered only Whites, and Models 5, 6, and 11, and 12 considered only Blacks. According to Models 1, 2, 7, and 8, among men and women, race interacts with SRH in predicting mortality to at least some extent. This is true in models with and without adjustment for CMC, suggesting a larger association between SRH and mortality for Whites than Blacks. Models also suggest significant associations between SRH and mortality among White men and women, while the associations among Blacks are weaker or not significant.

Discussion

Regardless of how we treat the measure of self-rated health, the link between self-rated health and mortality over a long follow up is weaker for Blacks than Whites, and we find this to be the case for both men and women. We also observe that before adjusting for a measure of objective health, SRH predicted subsequent all-cause mortality among Whites and Blacks, however, the SRH – mortality link was no longer statistically significant among Blacks after we adjusted for a count of chronic medical conditions.

Our findings that SRH predicts death among Whites are in line with previous research.^{6,8,15,16,20,21} Lee and colleagues reported a weaker effect of SRH on mortality among Blacks compared to Whites.³¹ Four year follow up of more than 16,000 subjects enrolled in the 1998 wave of the Health and Retirement Study (HRS) showed that SRH may differently predict mortality among Blacks than Whites. In Whites, poor SRH resulted in a markedly higher risk of mortality than excellent SRH (odds ratio (OR) =10.4, 95% confidence interval (CI) =8.0-13.6). In Blacks, poor SRH resulted in a much smaller increased risk of mortality (OR=2.9, 95% CI=1.5-5.5).³¹ Similar to ours, another study used 20 years of the National Health and Nutrition Examination Survey-I Epidemiologic Follow-up Study (N = 6,833) to compare Whites and Blacks and showed that baseline SRH does not predict the mortality of Blacks.³²

It is important to note that in contrast to our findings, there are a number of studies suggesting that SRH predicts subsequent mortality similarly across population groups.^{5,6,8,15,16,18} However, some studies have suggested that the predictive power of SRH for mortality was strongest for the lowest socioeconomic group.^{23,24,34} Zajacova and Dowd found that racial/ethnic minorities and adults with less education had lower reliability of SRH reports, and that there was a substantial amount of measurement error in reported SRH for Blacks and other disadvantaged socio-demographic groups.^{24,44} Lower reliability of SRH reported by Zajacova and Dowd may help to explain the weaker predictive role of SRH for mortality among Blacks in the present study.

We also found that after we adjust for objective health, SRH is no longer a significant predictor of mortality among Blacks. In a 6-year study of survival among the 1209 African-American respondents in the Longitudinal Study on Aging (LSOA), SRH was a predictor of mortality above and beyond demographic and socioeconomic status and bed days and doctor visits, but SRH failed to predict mortality of Blacks after adjustment for limitations with activities of daily living.³⁷ ADLs in that study may have captured consequences of some of the same chronic conditions we adjusted for in our own analyses. SRH may not reflect similar aspects of health for racial and ethnic minority groups compared to Whites.²⁸⁻³⁰ SRH may even have lower validity for measuring “true” health status among racial and ethnic minorities.^{21,23} Based on previous research, the meanings and determinants of SRH depend on race, ethnicity, and social class.^{21,23,24} For instance, the effect of SRH on service use is weaker for Blacks than Whites.⁴⁹ Although very little is known about race and ethnic differences in correlates of SRH,^{28-30,50,51} researchers have argued that SRH differently reflects the past, current and future health of diverse populations.^{21,23,50,52} The above results emphasize a need for more research on ethnic differences in correlates and validity of SRH.

In the U.S. race is strongly associated with SES, and our findings are in line with studies in the U.S. that have shown lower SRH to be more strongly associated with mortality for high SES adults relative to their lower SES counterparts.^{31,34,36} There are, however, at least two studies reporting a stronger association between SRH and subsequent death in lower socioeconomic groups.^{23,53} Interestingly, both studies have been conducted in Europe, one in Sweden⁵³ and one in France.²³ There are also studies failing to show any difference in SRH- mortality link based on social class,³³ so there is still debate in this literature.

The finding that SRH is not as strong a predictor of long term mortality among Blacks compared to Whites may have different explanations. Blacks with multiple medical and mental health problems may have a lower tendency than Whites to report their health as fair/poor. If this is the case, Blacks with multiple health problems better tolerate their conditions and downgrade their reports of poor SRH compared to Whites with similar health status. Thus, the discrepancy between SRH and health needs may be larger for Blacks than Whites. This is in line with the growing body of research suggesting weaker links between objective and subjective health measures among Blacks compared to Whites.^{38,54,55} Our findings thus have implications for better understanding of the Black-White health paradox, defined as better subjective health and well-being despite higher levels of objective health problems among Blacks compared to Whites.^{28,29,38,54,55}

A weaker association between baseline SRH and mortality over a long follow up in Blacks compared to Whites could indicate lower validity of a single-item SRH measure as a screening tool for detection of health needs among Blacks. Based on our results, relying on SRH will result in larger false negative (or false positive) rates for Blacks than Whites, if the goal is to detect populations at risk of premature death.^{22,24,28} This finding has implications for medicine and public health practice with Blacks.²⁴ Our findings also suggest that SRH may not be an ideal indicator of ethnic health disparities, as it does not reflect risk of death similarly among Blacks and Whites.²³ Finally, these findings also have implications for the applicability of SRH in surveys, depending on the goals of investigators and sampling universe. For example, solely relying on SRH in a survey instrument used to detect individuals who are at higher risk of mortality for community based health promotion programs may result in Black and White populations who rate similarly on SRH but actually have very different health needs. We recommend using other measures in addition to SRH to screen populations for baseline health across racially diverse populations. Future research may use vignettes to distinguish measurement biases associated with differential reporting of SRH among people from diverse ethnic and cultural backgrounds.

Our study had a number of limitations. First and foremost, SRH is likely to change over a long follow up period. As shown and discussed by Ferraro and Kelley-Moore 2001 and others,³² using SRH as a time-varying covariate may improve predictive ability of SRH, especially among Blacks, but doing so will introduce the complexity of reciprocal associations between objective health change and changing ratings of SRH as individuals age. We were focused on how early SRH predicts mortality over a long follow up. Covariates including depressive symptoms, chronic medical conditions, and income are also subject to change, but also to the complexity of reciprocal associations with changing health as people age. Countering these limitations, the nationally-representative sample and long, 25 year follow up were unique strengths of this study. The proportion of loss to follow-up was also extremely low.

To conclude, SRH may capture different aspects of health of different social groups.^{24,28,29,52} Blacks and Whites with same level of SRH may have different actual needs for health care. Future research should determine how socioeconomic status, and other factors associated with being a minority, such as discriminatory experiences, life experiences, values, culture, stigma, and access and use of health care can explain the Black White differences in the SRH- mortality link.

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Table 1

Descriptive Statistics for the analytic sample overall, and stratified by race.

	All			Whites			Blacks		
	Mean (SE)	95% CI for Mean		Mean (SE)	95% CI for Mean		Mean (SE)	95% CI for Mean	
Age	47.77(0.534)	46.69-48.84		47.96(0.601)	46.75-49.17		46.33(0.717)	44.89-47.78	
Education *	12.53(0.096)	12.34-12.73		12.69(0.105)	12.48-12.90		11.37(0.233)	10.90-11.84	
Income *	5.41(0.093)	5.22-5.60		5.57(0.101)	5.36-5.77		4.25(0.183)	3.88-4.62	
Depressive symptoms *	-0.03(0.025)	-0.08-0.02		-0.07(0.025)	-0.13--0.02		0.28(0.051)	0.18-0.38	
Chronic Medical Conditions *	0.79(0.028)	0.74-0.85		0.78(0.031)	0.71-0.84		0.91(0.052)	0.81-1.02	
Self-Rated Health *	2.30(0.024)	2.25-2.35		2.28(0.026)	2.23-2.33		2.43(0.054)	2.32-2.54	
Gender	% (SE)	95% CI for %	% (SE)	95% CI for %	% (SE)	95% CI for %			
Male	47.26(0.012)	44.86-49.68	47.82(0.013)	45.12-50.52	43.18(0.022)	38.79-47.69			
Female	52.74(0.012)	50.32-55.14	52.18(0.013)	49.48-54.88	56.82(0.022)	52.31-61.21			
Self-Rated Health *									
Good-Excellent	85.06(0.008)	83.33-86.64	85.97(0.009)	84.15-87.60	78.38(0.017)	74.68-81.68			
Poor-Fair	14.94(0.008)	13.36-16.67	14.03(0.009)	12.40-15.85	21.62(0.017)	18.32-25.32			
Self-Rated Health									
Excellent	23.52(0.011)	21.38-25.81	23.71(0.013)	21.28-26.32	22.14(0.017)	18.85-25.81			
Very Good	40.93(0.012)	38.56-43.35	41.26(0.013)	38.75-43.81	38.52(0.023)	34.06-43.19			
Good	20.61(0.008)	18.97-22.35	21.00(0.010)	19.13-23.01	17.72(0.016)	14.67-21.26			
Poor	11.83(0.007)	10.46-13.36	11.10(0.008)	9.67-12.72	17.23(0.015)	14.49-20.37			
Fair	3.11(0.004)	2.39-4.03	2.93(0.004)	2.15-3.98	4.38(0.006)	3.34-5.73			

* P<0.05 for all comparisons between Blacks and Whites

Table 2

Association between baseline Self Rated Health (SRH) specified as a nominal variable and all-cause mortality overall and stratified by race using Cox proportional hazards models

	All			Whites			Blacks		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 5	Model 6	Model 6
		HR (SE)	95% CI for HR	HR (SE)	95% CI for HR	HR (SE)	95% CI for HR	HR (SE)	95% CI for HR
All									
SRH									
Excellent	ref	ref	ref	ref	ref	ref	ref	ref	ref
Very good	1.30(0.175) [#]	0.99-1.71	1.25(0.171)	0.95-1.65	1.28(0.175) [#]	0.98-1.69	1.23(0.171)	0.93-1.63	0.98(0.189)
Good	1.65(0.255) ^{**}	1.21-2.25	1.52(0.249) ^{**}	1.09-2.11	1.61(0.255) ^{**}	1.17-2.21	1.47(0.250) [*]	1.05-2.07	0.98(0.185)
Fair	2.35(0.340) ^{***}	1.75-3.14	2.05(0.322) ^{***}	1.49-2.81	2.28(0.335) ^{***}	1.70-3.06	1.98(0.322) ^{***}	1.42-2.74	1.02(0.191)
Poor	3.98(1.147) ^{***}	2.22-7.11	3.35(1.021) ^{***}	1.81-6.19	3.83(1.156) ^{***}	2.09-7.04	3.20(1.026) ^{***}	1.68-6.10	1.47(0.341)
Female	0.55(0.038) ^{***}	0.48-0.64	0.54(0.038) ^{***}	0.47-0.63	0.54(0.040) ^{***}	0.46-0.63	0.53(0.040) ^{***}	0.45-0.61	0.53-0.82
Age	1.08(0.003) ^{***}	1.08-1.09	1.08(0.003) ^{***}	1.08-1.09	1.09(0.003) ^{***}	1.08-1.09	1.09(0.003) ^{***}	1.08-1.09	1.06(0.005) ^{***}
Education	0.99(0.012)	0.96-1.01	0.99(0.012)	0.97-1.01	0.98(0.014)	0.95-1.01	0.98(0.014)	0.96-1.01	0.97-1.03
Income	0.93(0.014) ^{***}	0.90-0.96	0.93(0.015) ^{***}	0.90-0.96	0.94(0.016) ^{***}	0.91-0.97	0.94(0.016) ^{***}	0.91-0.97	0.90(0.027) ^{**}
CES-D	1.01(0.043)	0.93-1.10	1.01(0.042)	0.92-1.09	1.03(0.052)	0.93-1.14	1.02(0.053)	0.92-1.13	0.93(0.043)
CMC			1.12(0.029) ^{***}	1.06-1.18	-	-	1.12(0.032) ^{***}	1.06-1.19	-
Black	1.95(0.439) ^{**}	1.24-3.07	1.94(0.437) ^{**}	1.23-3.05	-	-	-	-	-
SRH * Black									
Excellent	ref	ref	ref	ref	-	-	-	-	-
Very good	0.71(0.180)	0.42-1.18	0.70(0.176)	0.42-1.16	-	-	-	-	-
Good	0.60(0.152) [*]	0.36-1.00	0.59(0.148) [*]	0.36-0.98	-	-	-	-	-
Fair	0.43(0.097) ^{***}	0.27-0.68	0.43(0.096) ^{***}	0.27-0.68	-	-	-	-	-
Poor	0.32(0.112) ^{**}	0.16-0.65	0.31(0.107) ^{***}	0.16-0.62	-	-	-	-	-

SRH is entered as a nominal variable (excellent as the reference category)

CMC; Chronic Medical Conditions

CES-D; Center for Epidemiologic Studies Depression

Table 3

Association between baseline Self Rated Health (SRH) specified as a continuous variable and all-cause mortality overall and stratified by race using Cox proportional hazards models

	HR (SE)	95% CI for HR	HR (SE)	95% CI for HR	HR (SE)	95% CI for HR	HR (SE)	95% CI for HR	HR (SE)	95% CI for HR
	Whites				Blacks					
	All		Model 1		Model 2		Model 3		Model 4	
	Model 1		Model 2		Model 3		Model 4		Model 5	
	Model 6		Model 5		Model 6		Model 6		Model 6	
SRH	1.36(0.059)***	1.25-1.49	1.30(0.064)***	1.18-1.44	1.35(0.062)***	1.23-1.48	1.29(0.067)***	1.16-1.43	1.10(0.050)*	1.00-1.21
Female	0.55(0.038)***	0.48-0.63	0.54(0.038)***	0.47-0.62	0.54(0.040)***	0.46-0.62	0.52(0.040)***	0.45-0.61	0.66(0.071)***	0.53-0.82
Age	1.08(0.003)***	1.08-1.09	1.08(0.003)***	1.08-1.09	1.09(0.003)***	1.08-1.09	1.08(0.003)***	1.08-1.09	1.07(0.004)***	1.061.08-
Education	0.98(0.011)	0.96-1.01	0.99(0.012)	0.96-1.01	0.98(0.014)	0.95-1.01	0.98(0.014)	0.95-1.01	1.00(0.014)	0.97-1.03
Income	0.93(0.014)***	0.90-0.96	0.93(0.015)***	0.90-0.96	0.94(0.016)***	0.91-0.97	0.94(0.016)***	0.91-0.97	0.91(0.028)**	0.85-0.97
CES-D	1.02(0.041)	0.94-1.11	1.02(0.040)	0.94-1.10	1.04(0.049)	0.94-1.14	1.03(0.050)	0.94-1.14	0.95(0.040)	0.87-1.03
CMC	-	-	1.12(0.029)***	1.06-1.18	-	-	1.12(0.0392)**	1.06-1.19	-	-
Black	2.44(0.448)***	1.69-3.54	2.40(0.448)***	1.65-3.49	-	-	-	-	-	-
SRH * Black	0.77(0.044)***	0.68-0.86	0.77(0.044)***	0.68-0.86	-	-	-	-	-	-

SRH is entered as a continuous measure

CMC; Chronic Medical Conditions

CES-D; Center for Epidemiologic Studies Depression

Table 4

Association between baseline Self Rated Health (SRH) specified as a dichotomous variable and all-cause mortality overall and stratified by race using Cox proportional hazards models

	All			Whites			Blacks		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 5	Model 6	Model 6
SRH									
Excellent/Very Good/ Good	ref	ref	ref	ref	ref	ref	ref	ref	ref
Poor/Fair	1.82(0.137)***	1.57-2.12	1.63(0.126)***	1.40-1.91	1.78(0.138)***	1.53-2.09	1.59(0.129)***	1.22(0.114)*	1.13(0.109)
Female	0.55(0.037)***	0.48-0.63	0.54(0.037)***	0.47-0.62	0.54(0.039)***	0.46-0.62	0.52(0.039)***	0.65(0.070)***	0.65(0.074)***
Age	1.09(0.003)***	1.08-1.09	1.08(0.003)***	1.08-1.09	1.09(0.003)***	1.08-1.10	1.09(0.003)***	1.07(0.004)***	1.06(0.005)***
Education	0.98(0.012)	0.96-1.01	0.99(0.012)	0.96-1.01	0.97(0.014)#	0.95-1.00	0.99(0.014)	1.00(0.014)	1.00(0.014)
Income	0.93(0.014)***	0.90-0.96	0.93(0.014)***	0.90-0.96	0.93(0.015)***	0.90-0.96	0.93(0.015)***	0.91(0.028)**	0.91(0.028)**
CESD-11	1.06(0.038)	0.98-1.13	1.04(0.038)	0.97-1.12	1.07(0.046)#	0.99-1.17	1.06(0.046)	0.96(0.039)	0.94(0.040)
CMC			1.15(0.025)***	1.10-1.20			1.15(0.028)***		1.12(0.056)*
Black	1.35(0.118)***	1.14-1.61	1.33(0.116)**	1.12-1.59	-	-	-	-	-
SRH * Black					-	-	-	-	-
Excellent/Very Good/ Good	ref	ref	ref	ref	-	-	-	-	-
Poor/Fair * Black	0.58(0.072)***	0.45-0.74	0.58(0.073)***	0.45-0.75	-	-	-	-	-

SRH is entered as a dichotomous measure (Poor/Fair vs. Excellent/Good)

CMC; Chronic Medical Conditions

CES-D; Center for Epidemiologic Studies Depression

Table 5

Association between baseline Self Rated Health (SRH) specified as a nominal variable and all-cause mortality overall and by race and gender using Cox proportional hazards models

	All			Whites			Blacks		
	HR (SE)	95% CI for HR		HR (SE)	95% CI for HR		HR (SE)	95% CI for HR	
Men									
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6			
SRH	ref	ref	ref	ref	ref	ref	ref	ref	ref
Excellent	1.20(0.229)	1.15(0.225)	0.78-1.70	1.19(0.229)	0.80-1.75	1.14(0.226)	0.76-1.70	0.75(0.205)	0.44-1.31
Very good	1.49(0.329) [#]	1.39(0.327)	0.87-2.24	1.47(0.332) [#]	0.94-2.32	1.36(0.334)	0.83-2.23	0.80(0.192)	0.49-1.30
Good	2.08(0.451) ^{**}	1.84(0.452) [*]	1.13-3.02	2.03(0.455) ^{**}	1.29-3.18	1.78(0.462) [*]	1.05-3.00	1.12(0.311)	0.64-1.96
Fair	4.31(2.004) ^{**}	3.78(1.872) ^{**}	1.39-10.25	4.12(2.011) ^{**}	1.54-11.01	3.56(1.883) [*]	1.23-10.33	1.51(0.665)	0.62-3.68
Poor									
Age	1.08(0.004) ^{***}	1.07-1.09	1.07-1.09	1.08(0.005) ^{***}	1.07-1.09	1.08(0.005) ^{***}	1.07-1.09	1.07(0.007) ^{***}	1.06-1.09
Education	0.98(0.016)	0.95-1.01	0.95-1.01	0.98(0.018)	0.94-1.02	0.98(0.018)	0.94-1.02	0.99(0.023)	0.94-1.04
Income	0.92(0.020) ^{***}	0.88-0.97	0.88-0.97	0.92(0.023) ^{**}	0.88-0.97	0.92(0.023) ^{**}	0.88-0.97	0.93(0.037) [#]	0.85-1.00
CES-D	0.96(0.074)	0.82-1.12	0.82-1.12	0.99(0.086)	0.83-1.18	0.98(0.087)	0.82-1.18	0.82(0.063) [*]	0.70-0.96
CMC	-	1.10(0.051) [*]	1.00-1.21	-	-	1.11(0.056) [*]	1.00-1.23	-	-
Black	1.91(0.549) [*]	1.07-3.41	1.06-3.39	-	-	-	-	-	-
SRH * Black									
Excellent	ref	ref	ref	-	-	-	-	-	-
Very good	0.62(0.214)	0.31-1.24	0.31-1.22	-	-	-	-	-	-
Good	0.51(0.168) [*]	0.26-0.99	0.26-0.97	-	-	-	-	-	-
Fair	0.50(0.180) [#]	0.24-1.03	0.24-1.04	-	-	-	-	-	-
Poor	0.23(0.141) [*]	0.07-0.79	0.06-0.74	-	-	-	-	-	-
Women									
	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12			
SRH	ref	ref	ref	ref	ref	ref	ref	ref	ref
Excellent									

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	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12						
Very good	1.46(0.191)**	1.12-1.90	1.39(0.183)*	1.07-1.82	1.41(0.190)*	1.08-1.85	1.35(0.182)*	1.03-1.77	1.34(0.361)	0.78-2.31	1.27(0.351)	0.73-2.22
Good	1.84(0.249)***	1.40-2.42	1.65(0.237)***	1.24-2.21	1.78(0.249)***	1.34-2.35	1.59(0.238)**	1.18-2.15	1.41(0.393)	0.80-2.48	1.26(0.334)	0.73-2.15
Fair	2.77(0.443)***	2.00-3.82	2.35(0.395)***	1.68-3.30	2.65(0.423)***	1.92-3.66	2.25(0.382)***	1.60-3.17	1.27(0.355)	0.72-2.24	1.10(0.300)	0.63-1.91
Poor	3.78(1.033)***	2.18-6.56	3.00(0.830)***	1.72-5.24	3.61(1.048)***	2.01-6.48	2.86(0.834)***	1.59-5.15	2.33(0.814)*	1.15-4.72	1.86(0.622)#	0.95-3.66
Age	1.09(0.004)***	1.08-1.09	1.08(0.004)***	1.08-1.09	1.09(0.004)***	1.08-1.10	1.09(0.004)***	1.08-1.10	1.06(0.005)***	1.05-1.07	1.06(0.005)***	1.05-1.07
Education	0.99(0.018)	0.96-1.03	1.00(0.019)	0.96-1.04	0.98(0.020)	0.94-1.02	0.99(0.021)	0.95-1.03	1.01(0.023)	0.96-1.06	1.01(0.024)	0.97-1.06
Income	0.95(0.020)*	0.91-0.99	0.95(0.021)*	0.91-0.99	0.96(0.021)#	0.92-1.00	0.96(0.021)#	0.92-1.00	0.89(0.042)*	0.81-0.98	0.90(0.043)*	0.81-0.99
CES-D	1.05(0.043)	0.96-1.14	1.04(0.042)	0.96-1.13	1.05(0.052)	0.95-1.16	1.05(0.052)	0.95-1.16	1.01(0.062)	0.89-1.15	1.00(0.063)	0.88-1.14
CMC	-	-	1.14(0.041)***	1.07-1.23	-	-	1.15(0.044)***	1.06-1.24	-	-	1.15(0.068)*	1.02-1.30
Black	1.96(0.568)*	1.09-3.51	1.95(0.561)	1.09-3.48	-	-	-	-	-	-	-	-
SRH * Black												
Excellent	ref	ref	ref	ref	-	-	-	-	-	-	-	-
Very good	0.83(0.253)	0.45-1.53	0.81(0.250)*	0.43-1.51	-	-	-	-	-	-	-	-
Good	0.72(0.237)	0.37-1.40	0.71(0.228)	0.37-1.36	-	-	-	-	-	-	-	-
Fair	0.40(0.127)**	0.21-0.76	0.40(0.130)**	0.21-0.77	-	-	-	-	-	-	-	-
Poor	0.45(0.198)#	0.18-1.09	0.45(0.197)#	0.19-1.09	-	-	-	-	-	-	-	-

SRH is entered as a nominal variable (excellent as the reference category)

CMC; Chronic Medical Conditions

CES-D; Center for Epidemiologic Studies Depression