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Distinct age and self-rated health crossover mortality effects for African Americans: Evidence from a national cohort study

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ABSTRACT

The predictive effects of age and self-rated health (SRH) on all-cause mortality are known to differ across race and ethnic groups. African American adults have higher mortality rates than Whites at younger ages, but this mortality disparity diminishes with advancing age and may "crossover" at about 75–80 years of age, when African Americans may show lower mortality rates. This pattern of findings reflects a lower overall association between age and mortality for African Americans than for Whites, and health-related mechanisms are typically cited as the reason for this age-based crossover mortality effect. However, a lower association between poor SRH and mortality has also been found for African Americans than for Whites, and it is not known if the reduced age and SRH associations with mortality for African Americans reflect independent or overlapping mechanisms. This study examined these two mortality predictors simultaneously in a large epidemiological study of 12,181 African Americans and 17,436 Whites. Participants were 45 or more years of age when they enrolled in the national REasons for Geographic and Racial Differences in Stroke (REGARDS) study between 2003 and 2007. Consistent with previous studies, African Americans had poorer SRH than Whites even after adjusting for demographic and health history covariates. Survival analysis models indicated statistically significant and independent race*age, race*SRH, and age*SRH interaction effects on all-cause mortality over an average 9-year follow-up period. Advanced age and poorer SRH were both weaker mortality risk factors for African Americans than for Whites. These two effects were distinct and presumably tapped different causal mechanisms. This calls into question the health-related explanation for the age-based mortality crossover effect and suggests that other mechanisms, including behavioral, social, and cultural factors, should be considered in efforts to better understand the age-based mortality crossover effect and other longevity disparities.

1. Introduction

Numerous reports of all-cause mortality in the United States have documented a persistent excess mortality rate and shorter life expectancy for African Americans compared to Whites (Heron, 2013; Hoyert and Xu, 2012; Ng-Mak et al., 1999). This excess mortality of African Americans is believed to be an important indicator of persistent health disparities (Williams, 2012), and its impact on the population could have far-reaching consequences including socioeconomic and political effects that might serve to perpetuate those disparities (Rodriguez et al., 2015) and a lack of sufficient aging-related services being developed for African American and other disadvantaged populations (Markides and Machalek, 1984). For all of these reasons, it is vital that we better understand the root causes of this excess mortality experienced by African Americans in comparison to Whites and design programs and policies that seek to reduce this important disparity.

Detailed statistical analyses often further indicate that the excess mortality of African Americans, while being pervasive, is not consistently observed across all stages of the lifespan. At younger

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ages, African Americans typically have proportionally much higher mortality rates than Whites, but this imbalance clearly diminishes with increasing age. Multiple studies have shown that the excess mortality of African Americans tends to disappear altogether for older adults, when, at approximately 75–80 years of age, the race-specific mortality rates often reach a point where elderly African Americans have lower mortality rates than age-matched Whites (Johnson, 2000; Manton et al., 1979; Markides and Machalek, 1984; Preston and Elo, 2006; Wing et al., 1985; Yao and Robert, 2011). This phenomenon, frequently referred to as the race "crossover" mortality effect, is equivalent to a statistical interaction effect such that advancing age is a stronger predictor of mortality for Whites than it is for African Americans.

A frequent interpretation of the age-based crossover mortality effect for African Americans is that it is due to a "selective survival" effect. This hypothesis maintains that, because of the higher mortality rates of younger African Americans compared to younger Whites, those in the African American population with poorer health are more likely die young, leading to a greater survival selection process and a comparatively healthier group of African Americans who survive into old age (Manton et al., 1979; Markides and Machalek, 1984; Zajacova and Burgard, 2013). This is often presented as a health-related hypothesis, although selective survival effects can also emerge for other reasons (Horiuchi and Wilmoth, 1998), including different rates of physiological aging and environmental factors (Manton et al., 1979). In addition, because each organism in a population dies only once, any cause of death not directly related to health or a biological mechanism, such as an accident or an act of violence, for example, removes the opportunity for that organism to die later from another cause, including an age-related disease condition. If this occurs frequently enough within any specific subpopulation, then this phenomenon would attenuate the significance of both age- and health-related factors as predictors of mortality for that subpopulation.

Epidemiological research examining the predictors of mortality have identified other factors besides age that may also have differential impacts on mortality across minority subgroups. One such predictor is the relatively simple rating of one's overall health as excellent, very good, good, fair, or poor. This simple self-rated health (SRH) measure is a surprisingly strong and robust predictor of mortality even after controlling for many medical, behavioral, and demographic risk factors (Benyamini et al., 2003; Benyamini and Idler, 1999; DeSalvo et al., 2006; Lima-Costa et al., 2012a; McGee et al., 1999). It is sometimes considered to be a remarkably sensitive overall summary indicator of one's health-related risk for subsequent mortality (Idler and Benyamini, 1997; Jylha, 2009). Interestingly, many studies have found minority groups to report poorer SRH in comparison to Whites even after adjusting for relevant sociodemographic, health, and physical performance covariates (Boardman, 2004; Borrell and Crawford, 2006; Ferraro, 1993; Ren and Amick, 1996; Skarupski et al., 2007; Spencer et al., 2009).

Similar to research on the age-related crossover mortality effect, some investigators have sought to determine whether the SRH–mortality association is stronger or weaker in certain demographic subgroups compared to a referent group. Data from the national Health and Retirement Study, for example, have shown that the SRH–mortality association is much weaker for African Americans than it is for Whites (Lee et al., 2007). In that analysis, poor SRH, in comparison to excellent SRH, was much more strongly linked with subsequent mortality for Whites (odds ratio (OR) = 10.4) than for African Americans (OR = 2.9). Similar findings of attenuated SRH–mortality associations have been found for Hispanics compared to Whites (McGee et al., 1999) and for those with less education or income compared to their respective reference groups (Dowd and Zajacova, 2007; Lima-Costa et al., 2012b). Socioeconomic differences, however, do not appear to explain the attenuated SRH–mortality associations that have been found for African Americans (Ferraro and Kelley-Moore, 2001; Lee et al., 2007).

It is interesting that the diminished SRH–mortality association for African Americans compared to Whites has a pattern that is quite similar to the age-based "crossover" mortality effect for African Americans. In both instances, two straightforward and replicable risk factors for mortality–poorer SRH and advancing age–show weaker associations with subsequent mortality for African Americans than for Whites. Surprisingly, in spite of the numerous studies on both age- or SRH-based mortality crossover effects for African Americans, no previous study has, to our knowledge, examined both of these possible crossover effects simultaneously. Furthermore, if the age-based mortality crossover effect is due to a health-related selective survival effect, then SRH effects in an age-based model should reduce some of the diminished age-related mortality differences between African Americans and Whites. That is, it is possible that the age-based race crossover mortality effect for African Americans is confounded, or overlapping, with a SRH-related race crossover mortality effect, and such a finding would support the health-related selective survival effect as an explanation for the age-based crossover effect. A simultaneous analysis would, therefore, determine whether these effects are overlapping or if they reflect mostly distinct phenomena due to different and independent mechanisms.

To advance understanding of these effects and inform future investigation into the root causes of race disparities in mortality, we sought to examine both age-based and SRH-related race crossover mortality effects in the national REasons for Geographic and Racial Differences in Stroke (REGARDS) study. This study enrolled a large and well-characterized national sample of African Americans and Whites who were 45 years of age or older at the time of enrollment (Howard et al., 2005) and it provides a unique opportunity to further examine African American vs. White differences in the predictors of all-cause mortality. Using rigorously collected mortality data from the REGARDS study, we conducted an independent examination of potential SRH- and age-crossover mortality effects for the two race groups enrolled in this national cohort study. Two hypotheses were advanced based on the proposition that the age-based crossover mortality effect for African Americans is due to a health-related selective survival effect. First, this selective survival effect should result in a finding that race-based differences in SRH are diminished for older participants compared to younger participants. Second, adding health history covariates, SRH, and SRH*age interaction effects to survival models should diminish the significance of the race*age interaction effect that reflects the age-based crossover mortality effect for African Americans.

2. Methods

2.1. Participants

Participants in the REGARDS study were randomly sampled from a commercially available nationwide list purchased through Genesys, Incorporated (Howard et al., 2005). Exclusion criteria included age less than 45, race other than African American or White, previous diagnosis of cancer requiring chemotherapy, or residence in or on a waiting list for a nursing home. The goals of the REGARDS study are to examine the reasons why African Americans and residents of southern states of the United States have higher rates of stroke mortality than their respective comparison groups. For this reason, African Americans and residents from the southern "stroke belt" and "stroke buckle" regions of the United States were oversampled by design based on a stratified random sampling