Widowhood and the Race Crossover in Mortality in the United States

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Overview

The race crossover in mortality is a central puzzle of modern demography. African-Americans in the United States experience much greater mortality than whites at almost all ages from birth, but the contrast reverses in old age such that black mortality falls below white mortality starting around age 87 (e.g. Kestenbaum 1992; Johnson 2000; Dupre et al. 2006). Previous attempts to explain the U.S. race crossover in mortality have focused on data quality issues and selective frailty processes. Neither of these two explanations, however, was found fully to explain the race crossover empirically.

This study departs from previous research by proposing a new substantive explanation for the race crossover in mortality in the United States that draws on established racial differences in social dynamics--specifically, the differential effects of widowhood on mortality for blacks and whites in old age. Previous research found that whites suffer a large and lasting increase in mortality upon the death of their spouse, but blacks do not experience such a "widowhood effect" (Elwert and Christakis 2006). We hypothesize that this race difference in the effect of widowhood on mortality may contribute to an explanation of the race crossover. If whites suffer a widowhood effect but blacks do not, then we would expect mortality to rise more steeply among whites than blacks in old age, when most Americans lose their spouse. Controlling for marital status transitions should therefore change the location of the race crossover in mortality by lowering white mortality relative to black mortality, thus pushing the crossover to a later age.

We investigate this hypothesis empirically using a large, longitudinal, and nationally representative cohort of elderly Americans derived specifically for this analysis from Medicare Claims databases. Medicare Claims records offer several distinct advantages for the study of the race crossover in mortality. Most importantly, they provide prospective mortality follow up for over 96 percent of the population aged 65 and older in the United States, and they include rich covariate information, including detailed medical records to adjust for differential morbidity.

Preliminary results (thus far excluding marital status) indicate that the race crossover in mortality responds substantially to covariate adjustment, but in a direction not anticipated by previous research. Controlling for baseline morbidity and socio-economic status reduces the mortality of disadvantaged African-Americans compared to whites and moves the age of the race crossover down by 5 years for men and women, from the late 80s to the early 80s. This preliminary finding suggests that the race crossover in mortality is "real" in the sense of not disappearing after adjusting for covariates, including baseline morbidity. Our planned investigation of the role of widowhood in the race crossover in mortality starts from this finding.

In the following, we offer a focused literature review, discuss our data, and describe our preliminary results. We differentiate between executed and planned analytical steps throughout this extended abstract.

Previous Research on the Race Crossover in the United States

The race crossover in mortality describes the reversal of mortality difference between black and white Americans in old age. Two complementary explanations have dominated previous research. First, scholars have argued that data errors may account for the race crossover, in that reporting errors on death certificates as well as problems with informant self-reports may systematically inflate the ages of black decedents more than white decedents. Research by Preston and colleagues has intensively investigated these possibilities and found that corrections for such errors may account for some part of the race crossover (Elo and Preston 1994; Preston et al 1996, 1999; Hill et al. 2000). However, even by these corrected estimates, a black-white race crossover is still observed, if at somewhat older ages.

Second, scholars have suspected that selective frailty processes lie behind the race crossover. Specifically, it is argued that differences in selective pressure on racial groups that are internally heterogeneous may lead to artifactual behavior in standard life-table analyses. If both blacks and whites as groups are comprised of more and less vulnerable individuals, and if blacks are exposed to greater disadvantage throughout the life course, then blacks surviving to old age should be comparatively healthier than surviving whites. Research in this tradition has been predominantly theoretical, focusing on mathematical models of population dynamics. A small amount of empirical research, attempting to reduce the unobserved heterogeneity within racial groups by controlling for observable differences at baseline, to date has not been able to account for the race crossover in mortality (e.g. Dupre et al. 2006). Empirical investigation of the frailty selection hypothesis, however, has been hampered by small sample sizes, and by the absence of controls for morbidity at baseline.

Race and Widowhood

Previous research (Elwert and Christakis 2006) has found an intriguing race difference in the social determinants of mortality between elderly blacks and whites: while white men and women suffer a large and lasting increase in mortality following the death of their spouse, black men and women suffer no detectable widowhood effect at any duration of bereavement. The long-term force of mortality for white men and women increases by between 15 percent and 18 percent following the death of their spouse. By contrast, black men and women did not appear to suffer any detectable change in their mortality following spousal death, in this amply-powered study of over 17,000 elderly black couples. The data further suggested that blacks *benefit* from marriage in terms of mortality as much as do whites, and that they differ from whites only in that they do not suffer excess mortality in widowhood.

Hypothesis: Race, Widowhood, and the Race Crossover in Mortality

We propose that the race difference in the effect of widowhood may contribute to a substantive explanation for the race crossover in mortality. Since three-quarters of all deaths occur above age 65, and since over 80 percent of individuals married at age 65 lose their spouse after age 70, we hypothesize that the lack of a widowhood effect among blacks may account for the comparatively shallow increase in the force of mortality among blacks, and that the lasting increase in mortality following the death of a spouse among whites may contribute to the comparatively sharp increase in mortality among whites at this age. Together, these factors may thus account for the race crossover in mortality.

Data

This study uses individual-level data on a cohort of 28.7 million elderly Americans enrolled in the Medicare health insurance program for the elderly, followed longitudinally from 1993 to 2002. These data represent 96 percent of all Americans aged 66 and above who where alive on January 1, 1993. Baseline information on all individuals is derived from the Medicare Denominator file and the Medicare Provider and Review Analysis (MedPAR) files. The Medicare Vital Status, populated from the Social Security Administration's Master Beneficiary Record (MBR) file, provides daily death date follow up. Kestenbaum (1992) compares the quality of age of death reporting in the MBR favorably to Census and death certificate data used in previous research on the race crossover in mortality. Records from all Medicare files were matched using unique individual level identifiers. The record linkage rate was 100 percent.

We derive race classifications for both spouses from the race and ethnicity variable in the Vital Status file. This variable was populated from the Social Security Administration's Master Beneficiary Record (MBR) and has been verified and updated against the self-reported race classifications on beneficiaries' applications for (replacement) social security cards by CMS (Arday et al. 2000). Previous research indicates that the race information in Medicare files is well suited to support comparisons between blacks and whites (Lauderdale and Goldberg 1996; Arday et al 2000; Elwert and Christakis 2006).

From the MedPAR files, we extract detailed health histories to control for differences in baseline morbidity, and we summarize the chronic disease burden in the year prior to baseline by computing so-called Charlson co-morbidity scores (Charlson et al. 1987) from hospitalization records in 1992. Since individuals typically enter Medicare at age 65, we restrict the analysis to individuals who were older than 66 at baseline in order to guarantee the availability of one year of health background controls for the entire sample. We also restrict our sample to those less than 97 years old to avoid problems with age reporting among the oldest old. Our detailed, physician-ascertained controls for health status confounding significantly exceed the (usually self-reported) health information available in the data used in previous work on race crossover in mortality.

The Denominator file provides additional individual-level demographic information (*i.e.*, age and sex) from Social Security records; information on the couple's area of residence; and a poverty indicator for the couple at baseline.

[In the next step of data development, we will subject all Medicare beneficiaries in the Denominator file to spousal identification algorithms (Iwashyna et al. 1998) to identify married couples. Past work has shown the pool of married couples identified by this algorithm to be representative of all elderly married couples in the U.S. (Iwashyna et al. 2002; Elwert and Christakis 2006; Elwert and Christakis 2008 forthcoming).]

Descriptive Statistics

At baseline in 1993, the data contain 11.4 million men and 17.2 million women, of which 8 percent are black and 92 percent are white. By the end of follow up in 2002, 5.7 million men and 7.3 million women had died. The data thus contain enough information for a flexible specification of the relationship between age, race, and mortality.

We observe drastic differences in baseline poverty between black and white individuals. Among men, 18.4 percent of blacks but only 4.7 percent of whites were poor. Among women, 36.4 percent of blacks and only 10.3 percent of whites were poor. By comparison, race differences in baseline chronic disease burden were smaller. Among men, 9 percent of blacks and 7 percent of whites had at least three severe chronic conditions (as defined by Charlson et al 1987). Among women, 8 percent of blacks, and 5 percent of whites were similarly sick.

Methods

We use flexible discrete-time hazard models to model the race crossover in mortality in old age. Individuals are followed from January 1993 to death (or censoring in January 2002). We start by grouping deaths into three-month age intervals. Next, we collapse the data along age at death, birth cohort (year), race, sex, and the values of all other control variables into a high-dimensional contingency table to render a multivariate analysis of our data computationally feasible.

We model death rates as Poisson counts, adjusted for exposure to the day. Poisson models for duration data approximate complementary log-log hazard models if age is modeled linearly (Kalbfleisch and Prentice 2000). Here, however, we enter age at death as a series of 116 independent three-month-of-age indicators, thus maintaining a high degree of flexibility in the functional form of the relationship between age and death. We model the relationship between age at death and race by including interactions between race and each of the age indicators, thus permitting the relationship between race and age of death to vary freely by age. All other covariates are entered as main effects. We estimate separate models for men and for women.

The estimates combine prospective longitudinal information from 9 years of follow up for several birth cohorts to recover death rates over the entire age range from 66 to 96. Consequently, we adjust all estimates for cohort membership, yielding estimated death rates for men who were aged 66 in 1993.

[In future steps, we will further include time-varying interactions between age-at-death, race, and marital status to account for the role of spousal loss in the generation of the race crossover in mortality. We will explore the use of semi-parametric mixed Poisson regression approach to implement the Heckman-Singer (1984) correction for unobserved frailty in hazard models, as suggested by Land, Nagin, and McCall (2001), on a computationally feasible subset of the data.]

Preliminary Results

Figure 1 shows estimated death rates for black and white men, not adjusted for covariates (besides cohort membership). Black male mortality hovers stably above white male mortality up to about age 80. At age 80, the mortality among white men increases relative to mortality among black men, and consistently exceeds black mortality from age 89. This replicates the conventional finding of the race crossover in mortality for U.S. men. [FIGURE 1 ABOUT HERE]

Figure 2 shows estimated death rates for black and white men that have been adjusted for baseline poverty, morbidity, and region of residence. Adjusting for covariates lowers the age of the crossover by five years from 89 to 84. This represents a large shift in the location of the crossover, exceeding that achieved by Preston and colleagues in cross sectional Census data, and by Dupre et al. (2006) using EPESE data. Critically, our adjustments shift the location of the crossover down rather than up. [FIGURE 2 ABOUT HERE]

Figure 3 shows estimated death rates for black and white women, not adjusted for covariates besides cohort membership. This graph replicates the familiar race crossover in mortality for U.S. women at age 86. [FIGURE 3 ABOUT HERE]

Figure 4 shows estimated death rates for black and white women that have been adjusted for baseline poverty, morbidity, and region of residence. As previously for men, adjusting death rates for black and white women for the key covariates of poverty and mortality lowers the location of the race crossover in mortality by 5 years, this time from age 86 to age 81. Also as was the case with men, covariate adjustment lowers rather than raises the age of crossover. [FIGURE 4 ABOUT HERE]

Preliminary Discussion

This analysis of near population level longitudinal data of 28 million elderly Americans shows a race crossover in mortality for both men and women. The high quality of our data (derived from Social Security Administration files that are strictly monitored for age misreporting, as payments depend on the age of the beneficiary) suggests that the race crossover in mortality in the United States is "real," i.e. not exclusively owed to age misreporting in other data sets (Census, death certificates). A surprising, and reportable, preliminary finding of this study is that adjusting for covariates (poverty, and baseline health) lowers the location of the crossover by 5 years for men and women. This further supports the conclusion that the crossover is real and may not be "pushed to infinity" by adjusting for factors related to selective frailty.

Future steps will investigate the relationship between race, mortality, and marital status.

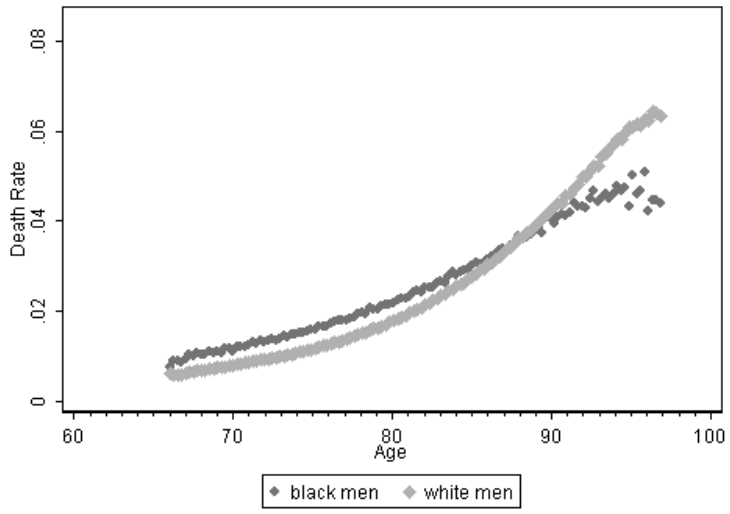

Figure 1. Cohort adjusted estimated death rates for black and white men aged 66-96, followed longitudinally from 1993 to 2002. No covariate adjustment besides cohort membership.

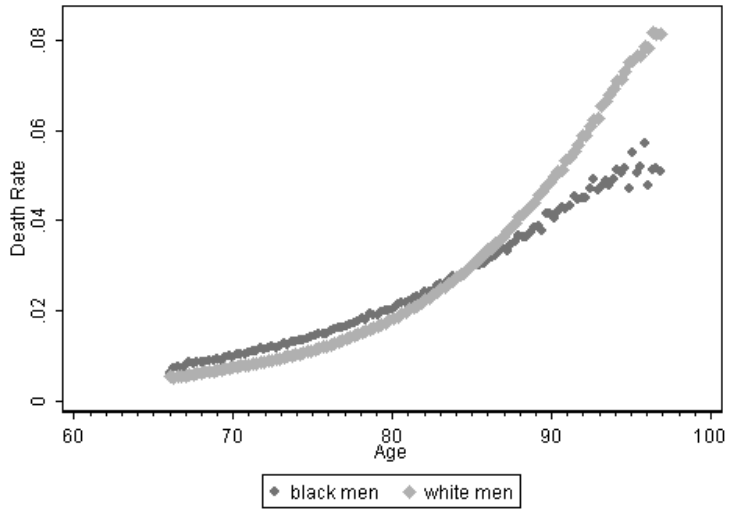

Figure 2. Covariates adjusted estimated death rates for black and white men aged 66-96, followed longitudinally from 1993 to 2002.

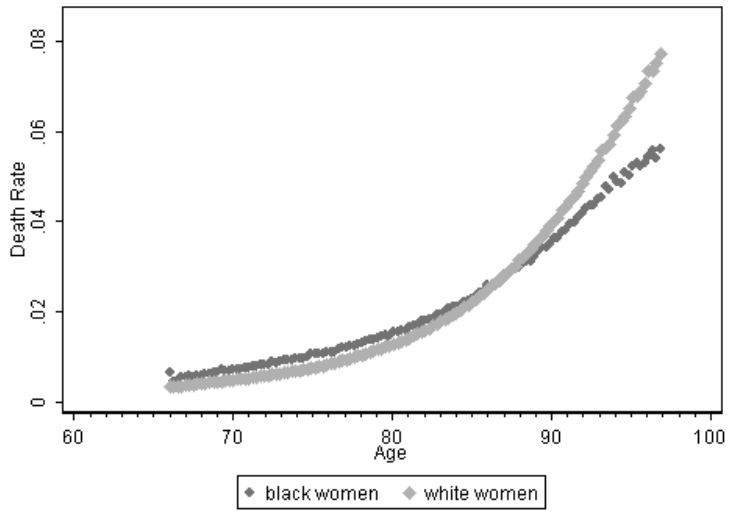

Figure 3. Cohort adjusted estimated death rates for black and white women aged 66-96, followed longitudinally from 1993 to 2002. No covariate adjustment besides cohort membership.

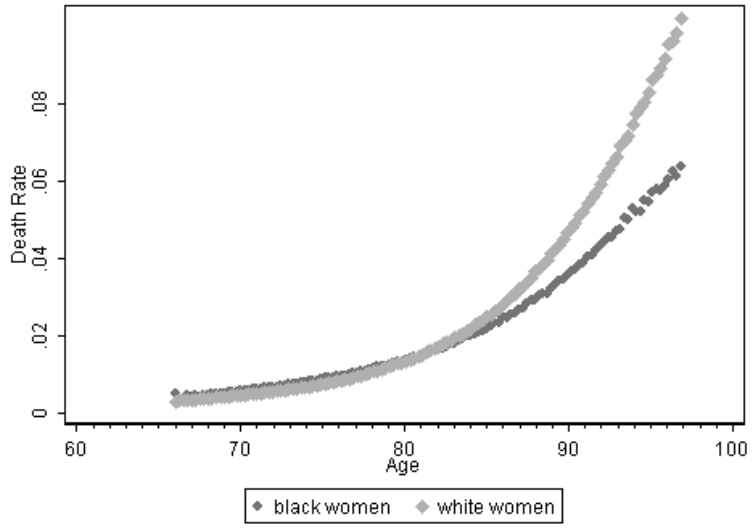

Figure 4. Covariates adjusted estimated death rates for black and white women aged 66-96, followed longitudinally from 1993 to 2002.