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Black–White Disparities in Disability Among Older Americans: Further Untangling the Role of Race and Socioeconomic Status

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Abstract

Objectives—To explore the impact of adjusting for income and education on disparities in functional limitations and limitations in activities of daily living (ADLs) between Black and White older Americans.

Method—Data from the 2003 American Community Survey were used to examine the associations of education and income, stratified by race and gender, with functional limitations and ADLs, in a sample of 16,870 non-Hispanic Blacks and 186,086 non-Hispanic Whites aged 55 to 74. Sequential logistic regressions were used to examine the relative contribution of income and education to racial disparities.

Results—Ninety percent of the Black–White difference in disability rates for men and 75% of the difference for women aged 55 to 64 were explained by income and education.

Discussion—The greatly elevated risk of disability among Blacks aged 55 to 74 is largely explained by differences in socioeconomic status. Reductions in Black–White health disparities require a better understanding of the mechanisms whereby lower income and education are associated with functional outcomes in older persons.

Keywords

African Americans; ethnicity; health inequalities; activities of daily living; functional limitations

Rates of functional limitations among older people in the United States have been declining since the early 1980s with increasing declines in the late 1990s, particularly among Black Americans (Field & Jette, 2007; Manton & Gu, 2001). Despite the declines observed, however, at every level of the disablement process (Verbrugge & Jette, 1994), from disease to functional limitations to disability (World Health Organization, 2001), older Blacks are at a considerable disadvantage compared to non-Hispanic Whites (Clark & Maddox, 1992; Ferraro & Farmer, 1996; Hummer, Benjamins, & Rogers, 2004; Kelley-Moore & Ferraro, 2004; Ostchega, Harris, Hirsch, Parsons, & Kington, 2000). These differences persist after

adjusting for a number of covariates shown to be related to both disability status and race including age, gender, self-rated health, comorbidities, and health behaviors (Kelley-Moore & Ferraro, 2004; Mendes de Leon et al., 1997; Moody-Ayers, Mehta, Lindquist, Sands, & Covinsky, 2005).

Evidence that Whites have longer healthy life expectancy, and that Blacks spend more of their lives with disabilities (Crimmins & Saito, 2001) is important to take into account in terms of quality of life in older adults. Health care costs also are an important consideration related to disability status. Previous studies indicate that disability is a “better predictor of medical and social service utilization than simple prevalence or incidence figures of disease” (Jette, 1996). Older people with disabilities have triple the medical care costs of those without such limitations (Trupin, Rice, & Max, 1996), with these costs largely explained by disabilities associated with major chronic disease (Field & Jette, 2007). With the exception of some age/gender subgroups within American Indian/Alaska Natives, older Blacks have the highest rates of activity limitations of any racial/ethnic group in the United States in later life (Hummer et al., 2004). Understanding what explains these disparities will be critical to improving the health of the Black population (LaVeist, 2005). Furthermore, the persistently higher rates of disability among Blacks compared to non-Hispanic Whites (hereafter referred to as Blacks and Whites, respectively) warrants a more specific focus on Black–White disparities.

Previous studies provide documentation of socioeconomic disparities in disability, showing that those in low socioeconomic status (SES) strata have substantially higher rates of disability than their higher SES counterparts (Breeze et al., 2001; Lantz et al., 2001; Melzer, Izmirlian, Leveille, & Guralnik, 2001; Minkler, Fuller-Thomson, & Guralnik, 2006; Schoeni, Martin, Andreski, & Freedman, 2005). Earlier work also shows that at lower educational levels, Black–White differences in healthy life expectancy are higher than at higher educational levels, with the effects of lower educational attainment particularly devastating for Blacks in terms of health and disability outcomes (Crimmins & Saito, 2001).

A few studies suggest that adjusting for SES explains Black–White differences in disability (Guralnik, Land, Blazer, Fillenbaum, & Branch, 1993; Kelley-Moore & Ferraro, 2004), whereas several others show that the elevated odds for Blacks persist after adjusting for SES (Andresen & Brownson, 2000; Liao, McGee, Cao, & Cooper, 1999; Mendes de Leon, Barnes, Bienias, Skarupski, & Evans, 2005; Schoeni et al., 2005; Tennstedt & Chang, 1998). Although a number of other studies explore race differences and disability in older Americans (see Guralnik et al., 1993; Kelley-Moore & Ferraro, 2004; Mendes de Leon et al., 2005; Schoeni et al., 2005), further research using large random samples to assess the relative contributions of race and SES to disability status is warranted. Furthermore, an explicit assessment of the joint distribution of race and SES (e.g., multiplicative modeling) and an examination of several types of disability is required.

We focus this analysis on two types of activity limitations—those restricting the ability to perform activities of daily living (ADLs) such as bathing, feeding, and toileting, and functional limitations, defined as a long-lasting condition that substantially limits such basic physical activities as walking, climbing stairs, and lifting. We hypothesize that Black–White differences in ADL limitations will be more affected by income than will differences in functional limitations, as earlier research (Minkler et al., 2006) has suggested that ADLs may be more amendable than functional limitations to amelioration through changing the physical environment.

To better examine the relative contribution of racial group and SES to functional and ADL limitations among Black and White Americans, we used data on more than 200,000

Americans aged 55 to 74 from the U.S. Census Bureau's 2003 American Community Survey (ACS). With its large sample size and high response rate (96.7%), the ACS offers an opportunity to examine this topic within the context of a nationally representative sample of older persons far larger than that typically used in such research. Our study's use of two measures of SES (education and the income relative to poverty-threshold percentage [IRPP]) across a wide-income gradient, and two measures of disability (limitations in ADLs and functional limitations) further enhances our ability to tease apart the relationship between race and SES in disability among older Americans.

Method

Sample

The ACS is an annual nationally representative survey of housing units randomly selected from the U.S. Bureau of the Census Master Address File. The ACS is designed to characterize the demographic, housing, social, and economic characteristics of the population and capture changes over time and is intended to replace the Decennial Census long considered as the primary tool for characterizing the U.S. population. The 2003 ACS sampled households monthly from November 2002 through December 2003. The monthly sample size approximates the 1 in 6 sampling ratio used for the year 2000 Decennial Census. One household respondent aged 18 or above (or in some cases, 15 and above) provides information on all members of the selected housing unit. To maximize the response rate, three modes of data collection were used: mailed questionnaire, computer-assisted telephone interview (for non-respondents to mailed questionnaire), and computer-assisted personal interview (for telephone non-respondents; U.S. Census Bureau, 2005a). The overall response rate of the 2003 ACS was 96.7% (U.S. Census Bureau, 2005b).

The total sample size of the 2003 ACS was 828,590 housing units. The total unweighted sample size of respondents aged 55 to 74 was 202,956. We restricted the sample to this age group for two reasons. First, this is the age group in which socioeconomic disparities in health are at their peak (Herd, 2006; House et al., 1990). Second, the 2003 ACS excluded respondents residing in group quarters such as nursing homes. Only 1% of the American population aged 65 to 74 is in nursing homes and thus, this limitation of the data is unlikely to cause substantial bias in our results (U.S. Department of Health and Human Services, National Center for Health Statistics, 2004). Respondents self-identified as either non-Hispanic Black ($n = 16,870$) or non-Hispanic White ($n = 186,086$).

Measures

The two outcomes examined for this study were functional limitations (FL) and limitations in ADLs. Functional limitations was specified as a dichotomous variable indicating whether a respondent had a long-lasting condition that substantially limited one or more basic physical activities such as walking, climbing stairs, reaching, lifting, or carrying. Limitations in ADLs was also specified as a dichotomous variable, indicating whether a respondent had a physical, mental, or emotional condition lasting at least 6 months that made it difficult to "dress, bathe, or get around inside the home."

Education was measured as a five-level ordinal variable indicating primary school or less, some high school, high school graduate, bachelor's degree, and graduate degree.

Household income was measured using the IRPP, a measure of household income as a percentage of the poverty threshold for households of a similar size and composition. Based on a summation of income in the preceding 12 months for all household members from all sources of income, the IRPP more accurately reflects the financial situation of the respondent than would household income unadjusted for household size. The poverty

threshold in 2003 for a two-person family was \$11,122 if the householder was aged 65 years and above and \$12,321 if the householder was aged below 65 years (Dalaker, 2005). We divided the IRPP into six categories to capture potential gradient effects (<100% of the poverty line, 100%–199%, 200%–299%, 300%–399%, 400%–499%, 500%+).

Racial/ethnic group was measured as a binary variable indicating non-Hispanic White or non-Hispanic Black. Given previous studies showing age as a confounder of disability status, two age categories were created: 55 to 64, and 65 to 74. All analyses were stratified by age, racial group, and gender (men and women).

Missing data in the ACS were imputed by the U.S. Census Bureau using a hot decking technique, in which missing values were imputed based on records of participants who were geographically close to the respondents and matched on age, gender, race, and other relevant sociodemographic characteristics (U.S. Census Bureau, 2002). Data quality was quite high, with all the above variables, except income, having an imputation rate of less than 4%. Twenty-one percent of respondents had imputed data for income (U.S. Census Bureau, 2005c).

Analysis Strategy

Analyses were stratified by race-age-gender group: Black men, 55 to 64; Black men, 65 to 74; Black women, 55 to 64; Black women, 65 to 74; White men, 55 to 64; White men, 65 to 74; White women, 55 to 64; and White women 65 to 74. First, we calculated the percentage of functional and ADL limitations for each of the six IRPP categories for each of the race-age-gender groups (Table 1). To examine the role of SES in explaining racial differences in ADL and functional limitations, three sequential (or hierarchical) logistic regression models were specified for each race-age-gender group for each outcome. Model 1 included only racial group and age in years. Race was coded with Whites as the reference group based on our findings in Table 1. Model 2 added education and Model 3 added IRPP. For each race-age-gender group, the percentage reduction in the association between disability (i.e., FL and ADL) and racial group after adjustment for education and IRPP was calculated using $([OR_{unadj} - OR_{adj}] / [OR_{unadj} - 1]) \times 100$ (Volpato et al., 2002). These percentages represent the reduction in excess risk of disability for Blacks versus Whites associated with either education or IRPP and education (Figures 1a–1d) and are called the explained fractions.

Last, to examine the joint influence of race and SES (rather than simply controlling for SES), we conducted a global test of interaction for race-by-SES for both education and IRPP and examined the associations of IRPP and education with both disability outcomes in race stratified models.

Given the high percentage of observations missing income data, sensitivity analyses were conducted by reanalyzing the data excluding the missing cases to test for any potential biases that may have resulted from using imputed data (analyses not shown). Findings using imputed data did not differ significantly from those where the missing cases were excluded. Therefore, imputed cases were retained to make use of all available data. Analyses used a weighting variable created by the Census Bureau to account for bias in the probability of selection including noninterview adjustments. Analyses were conducted using SPSS version 15.

Results

Sample characteristics are displayed in Table 1. The sample had slightly more women than men (i.e., 53% women, 47% men). Whites and persons ages 55 to 64 comprised the majority

of the sample. Forty-four percent of Black women and 36% of Black men were living below 200% of the poverty line—rates that were almost twice that of their White peers. Similarly, 34% of Black men and 33% of Black women had not graduated from high school, compared to 16% and 15% of White men and women, respectively.

The descriptive data in Figures 1a–1d shows that for individuals aged 55 to 74, there was a general downward trend in the prevalence of functional limitations and ADL limitations with each step up the income ladder for men, with the greatest racial differences having been observed among women aged 65 to 74. The difference in functional and ADL limitations from the top to the bottom of the socioeconomic spectrum was greater than racial/ethnic differences within socioeconomic strata. For example, for women aged 55 to 64, the functional limitation rates for Blacks and Whites living below the poverty line were 41% and 39%, respectively. In contrast, the rates for Blacks and Whites among those at 500% or more of the poverty line were 13% and 8%, respectively.

Multivariate logistic regression analyses indicated that Blacks had significantly higher odds of functional and ADL limitations than Whites in unadjusted models (Figures 2a–2d). This was true across gender and age groups. All but one of the eight odds ratios were above 1.60 when adjustments were made for age in years. Further adjustment for education level substantially decreased the Black–White odds ratios, for both disability outcomes, for men and women in both age groups. However, race remained a significant predictor of functional limitations for men and women aged 55 to 64 and women aged 65 to 74 and of ADL limitations for all race-age-gender groups.

When further adjustments were made for family IRPP level, the odds ratios for disability in Black versus White men were no longer significant (Figures 2a & 2c), with the exception of a slightly elevated odds ratio for limitations in ADL among Black men aged 65 to 74 (OR = 1.19 and 95% CI = 1.03, 1.37). Approximately 90% of the Black–White differences among men aged 55 to 64 in both ADL and functional limitations were explained by IRPP level and education together.

Adjusting for education and IRPP decreased but did not eliminate the elevated odds of functional and ADL limitations in Blacks versus White women (Figures 2b & 2d). For example, when only age in years was controlled in the analysis, Black women aged 65 to 74 had an age adjusted odds ratio for ADL limitations of 2.20 (95% CI = 1.99, 2.44) which decreased when education and IRPP were included in the analysis to an OR of 1.64 relative to their White peers (95% CI = 1.47, 1.82). Similarly, Black women aged 65 to 74 had 44% higher odds than White women of functional limitations when education and IRPP were controlled, down from 93% higher odds in the age-adjusted model. Among women aged 65 to 74, approximately one-half of the excess disability associated with being Black was explained by education and IRPP level, whereas there was an approximately 75% reduction in the association between functional and ADL limitations and racial group among women aged 55 to 64.

Importantly, a substantial proportion of the observed functional and ADL limitations came from the 22.5% of the population living below 200% of the poverty line, a disproportionate number of whom were Black. This socioeconomic group comprised 47% of all those with ADL limitations and 41% of those with functional limitations.

The interaction between race and both education and IRPP level are worthy of note. There were significant race-by-education interaction terms for six of the eight possible disability-type-by-age-gender groupings. The IRPP-by-race interaction terms were significant for functional limitations among both men and women aged 55 to 64 and for ADL limitations among women of both age groups. However, the explanatory value of these interactions was

modest. The joint contribution of racial group-by-education and racial group-by-IRPP interaction effects never exceeded a Nagelkerke Pseudo R^2 (Nagelkerke, 1991) value of .002.

Discussion

Our finding that approximately 90% of the Black–White differences in the rates of both functional and ADL limitations among men aged 55 to 64 and that 75% of this differential among women of this age group are explained by education and poverty level provides new evidence of the powerful role of SES in explaining racial disparities in disability. The differences in functional and ADL limitations across the SES spectrum in each racial group were much more substantial than racial differences within SES strata. Black–White disparities were driven primarily by the disproportionate number of Blacks in the lower SES income and education groups where the burden of both functional and ADL limitations was greatest, a finding consistent with previous research (Burchard, Ziv, Coyle, & Gomez, 2003; Kington & Smith, 1997; Li & Fries, 2005; Smedley, Stith, & Nelson, 2003; Tennstedt & Chang, 1998).

Examination of the explained fractions reveals potential cohort differences. In the younger cohort of women, there was approximately a 75% reduction in excess risk of disability for Blacks versus Whites when the education and IRPP variables were added to the analysis. However, in the 65-to-74-year-old cohort, there was only a 50% reduction in excess risk when the SES variables were added to the analysis. It is important to remember that 65-to-74-year-old cohort members completed their K-12 education prior to the 1954 U.S. Supreme Court decision of *Brown v. Board of Education* banning segregation in the public school, which may be a factor contributing to this finding. It is conceivable, for example, although impossible to test with this data set, that the poorer quality of education received during that time diminished the protective effects typically associated with increased levels of education. However, it is puzzling why Black men of that age group do not show the same effects as women. This is a logical area for future research on SES and disability status by race. Investigators have already begun to examine the role of civil rights policies on the socioeconomic progress of Blacks (Chay, 1998; Collins, 2003). Further research is needed to assess how these policies may be related to improvements in health outcomes.

Age discrimination is another potential explanation for the leveling of racial differences in disability in older age. Other researchers have found similar associations with SES in older age groups giving rise to the age as leveler hypothesis (Beckett, 2000; Herd, 2006; House et al., 1990). However, evidence is inconclusive (Ferraro & Farmer, 1996; Ferraro, Farmer, & Wybraniec, 1997) and does not explain why these associations might be observed among women but not among men.

The fact that education and IRPP, together, played a lesser role in explaining racial inequities for women than for men is intriguing. One promising area worthy of further study involves the far more extensive caregiving role played by older women across racial and ethnic group lines (Lee, Ensminger, & LaVeist, 2005). Although hands-on caregiving in midlife and beyond is somewhat more common among African American women than their White counterparts, differences by race are far smaller than those by gender, with American women providing almost two thirds of informal caregiving in the United States (Pandya, 2005). Earlier research has suggested that the physical and emotional demands of caregiving in middle and later life may cause or exacerbate functional limitations and/or make caregivers more aware of these limitations such that they are reported with greater frequency (Minkler, Fuller-Thomson, Miller, & Driver, 1997). Although no data available in the ACS data set allowed us to directly or even indirectly test this possible pathway and it therefore

remains a speculative one, further research on differential prevalence of hands-on caregiving by race and gender and its relationship to disability in later life should be considered.

Differential access to health care may explain some of the disparities in functional and ADL limitations by SES observed in this study. Although Medicare, in particular, has played a major role in decreasing Black–White and SES disparities in older Americans' access to and use of preventive and therapeutic care, substantial racial differences remain after taking Medicare into account (Eichner & Vladeck, 2005). Furthermore, the number of older Medicare beneficiaries who purchased individual “Medigap” policies to cover deductibles and other uncovered costs and/or had employer-sponsored supplemental insurance has declined over time (U.S. General Accounting Office, 2001). Prior to age 65, SES may play an especially important role in reduced access to care (Field & Jette, 2007). Whether covered by Medicare or private insurance, for example, lower-income individuals, including a disproportionate number of Blacks, are less likely to be able to afford the cost of deductibles, coinsurance, and uncovered services and frequently forgo procedures that could improve their functional status (Eichner & Vladeck, 2005; Field & Jette, 2007). Research suggests that even among those with comparable insurance coverage, Blacks are more likely than Whites to experience inferior medical care (Geiger, 2006; Institute of Medicine, 2002). Notwithstanding, differences in health care access have been shown in earlier studies to explain only a small percentage of the health differences across SES groups (Isaacs & Schroeder, 2004).

Still another potential avenue for further research, and one that cannot be addressed with the current data, involves the impact of differential obesity rates. As Alley and Chang (2007) have demonstrated, dramatic increases in rates of obesity among older adults are translating into increased functional limitations. Using data from the Health and Retirement Study and the Behavioral Risk Factor Surveillance System, Strum, Ringel, and Andreyeva (2004) further have extrapolated that “if current trends in obesity continue, disability rates will increase by 1% per year more in the 50–69 age group than if there were no weight gain” (p. 199). Substantially higher rates of obesity among older African American women when compared to older White women might also help explain some of the higher disability rates we observed in older Black women and could further contribute to still higher rates in the years ahead.

A number of other possibilities exist and would be likely next steps for future research aimed at exploring the mechanisms explaining these strong associations between SES and disability. Some of these include the role of social support, differences in marital status, employment grade, occupational industry, physical activity, diet, and the built environment.

We anticipated that Black–White differences in ADL limitations would be more highly associated with income than would differences in functional limitations. It has been suggested that functional limitations are less likely to be mitigated through environmental modifications than are ADL limitations (Minkler et al., 2006). Individuals in higher SES groups, for example, may be better able to afford home modifications that make navigating space more feasible. When one considers the explained fractions, however, it is apparent that in three of the four age-gender groups, adjustment for education and poverty is similarly associated with the reduction of the excess risk of both types of disabilities for Blacks versus Whites.

Men aged 65 to 74 did show a differential impact of adjustment for SES between the two types of disability, but the findings were the opposite of what we expected (i.e., ADL limitations were less strongly associated with SES than were functional limitations). One potential explanation for this finding may be related to the definition of functional and ADL

limitations. In this study, functional limitations are defined as conditions that compromise physical functioning that may be interpreted as more organic in nature, whereas ADL limitations are defined as any physical, mental, or emotional condition that impairs daily functioning. Men report less mental and emotional dysfunction than do women (Macintyre, Hunt, & Sweeting, 1996; Nuru-Jeter, Williams, & LaVeist, 2008) which may have resulted in some degree of reporting heterogeneity between genders. Furthermore, older adults tend to report fewer psychological and emotional symptoms than younger adults (Gallo, Anthony, & Muthen, 1994), which may help explain why this association was observed among the older versus younger age group in the present study. Further research is needed to understand the mechanisms through which income and education influence the relationship with each type of disability.

Although this study underscored the powerful role of SES in explaining the majority of the Black–White differences in functional and ADL limitations, poverty-by race and education-by-race interactions were significant (albeit modest) in all but one of the age-gender groups. Future research should include analyses stratified by race/ethnicity and include a broad range of SES measures, including wealth, to more fully investigate the role of SES, both between and within racial groups (Braveman et al., 2005).

In spite of the role of SES in explaining a considerable amount of the racial differences in functional and ADL limitations, significant racial differences remained for women after adjusting for SES. An important potential explanation for continuing racial disparities in disabilities after accounting for education and income is the experience of racism. Geronimus's (2002) "weathering" or premature aging hypothesis suggests that chronic exposure to or experience with social and economic stressors takes a toll on Black Americans, particularly women, resulting in a physiological wear and tear that may be reflected in a wide range of health outcomes including functional limitations (LaVeist, 2005; Williams, Neighbors, & Jackson, 2003). Similarly, allostatic load, a measure of cumulative biological stress, has been shown to be up to 3 times higher for Black versus White women suggesting more exposure to chronic stress experiences among Black women (Geronimus, Hicken, Keene, & Bound, 2006). One of the ways allostatic load has been postulated to impact health is through inflammatory markers indicative of subsequent disease processes (McEwen, 1998), including the disablement process (Cesari et al., 2004; Taaffe, Harris, Ferrucci, Rowe, & Seeman, 2000). This premature aging of Black Americans may be related both to their greater exposure and heightened response to social and economic stressors over long periods of time, including those associated with racial discrimination (Geronimus, 2002), and may be particularly problematic for women given their caretaking role and associated concerns regarding raising children in a race-conscious society (Nuru-Jeter et al., 2009). Notably, the youngest members of our sample were already in their midteens when the Civil Rights Act was passed in 1963. Although, as noted above, the current data set precludes our testing this hypothetical pathway, it may be that such historical realities, coupled with continued inequities (LaVeist, 2005; Smedley et al., 2003) may take both a direct and an indirect toll resulting in accelerated aging through the overcirculation of stress hormones in the body (Geronimus, 2000). That racial disparities in disability persist after accounting for SES in both additive and multiplicative models is consistent with other literature (Hayward, Miles, Crimmins, & Yang, 2000) and highlights the need to further explore the factors associated with the unexplained burden of disability risk among Blacks.

Finally, our findings documenting the role of lower income and educational attainment in explaining disparities in functional and ADL limitations between older Blacks and Whites suggest the potential benefit of longitudinal and intervention research for determining causal links. For example, Herd and her colleagues (Herd, Schoeni, & House, 2008) recently demonstrated the effect of state-level income support policies (i.e., Supplemental Security

Income [SSI]) on lowering rates of disability (i.e., long-standing mobility and ADL limitations) among older Americans, finding an 11% reduction in disability for a 15% to 20% increase in income. Further longitudinal studies and experimental research examining the effectiveness of policy interventions designed to reduce poverty differentials (e.g., living wage ordinances and increases in SSI) and/or improve educational access and outcomes may be useful. These studies could also help tease apart selection versus causation effects.

Our study had several important limitations. First, the data were cross-sectional, preventing us from assessing causality and from using a life-course perspective which has proven useful for elucidating the onset of disability (Guralnik, Butterworth, Wadsworth, & Kuh, 2006). Second, our measures of disability did not distinguish between onset and progression of functional and ADL limitations. Third, only self-reports of functional and ADL limitations were available, which could have resulted in some under-or overreporting (Cress et al., 1995; Kempen, Steverink, Ormel, & Deeg, 1996; Sager et al., 1992), underscoring the need to supplement this study with others that include objective assessments. Fourth, we were unable to control for such behavioral risk factors as smoking and drinking behavior which were not available in this data set. However, earlier researchers have demonstrated a strong association between functional limitations and SES even when these behavioral factors were controlled (House, 2002; Schoeni et al., 2005). We also were unable to control for comorbidities such as obesity or health insurance status, which, as stated above, may play a role in explaining the SES/disability relationship (Alley & Chang, 2007; Field & Jette, 2007). Fifth, our study's reliance solely on income rather than household wealth constitutes another limitation, particularly in studies of older people, for whom wealth measures (e.g., equity in a house) often hold particular salience (Braveman et al., 2005). Whites have higher rates of home ownership and greater wealth than Blacks (Hilber & Liu, 2008) and thus some of the Black-White disability gap not explained by IRPP and education may be partially due to marked differences in wealth (Isaacs & Schroeder, 2004; LaVeist, 2005; Navarro, 1989). Earlier research suggests that income and wealth are independent predictors of functional limitations among those with chronic conditions (Schoeni et al., 2005). Finally, as stated earlier, 1% of the American population aged 65 to 74 is in nursing homes. Although this is a small percentage, our exclusion of the institutionalized probably results in an underestimation of the Black-White differences in disability. For those aged 65 to 74, the rate of nursing home utilization among African Americans is more than twice that of White Americans (202 per 10,000 versus 85 per 10,000; CDC, 2008).

Although we found that between 50% and 90% of the association between racial group and disability was explained by the level of education and IRPP, the fact that Blacks had greatly elevated unadjusted odds of disability with rates, in some cases, exceeding twice those of Whites should be emphasized. This situation is driven, to a large extent, by the vast overrepresentation of Blacks in the lowest income and education categories where individuals are disproportionately burdened with disability (Bulatao & Anderson, 2004). Recent evidence of widening Black-White differentials in education among older Americans (Meara, Richards, & Cutler, 2008), together with studies demonstrating that income plays an even greater role than education in the onset of functional limitations (Herd, Goesling, & House, 2007; Zimmer & House, 2003), further underscore the need for more detailed examinations of the interactions among these variables and their individual and joint effects on disability outcomes. Hayward and his colleagues' (2000) findings show the role of education in explaining a significant and substantial portion of Black-White differences across a wide variety of chronic illnesses and disability endpoints. Their findings also indicate, however, strong residual effects of race on health that are unexplained by education. They show, for example, that Blacks with 16 years of education are more likely to develop hypertension compared to Whites with less than an 8th grade education. This represents a potent area for further investigation given the prominent role of chronic

illnesses in the disablement process (Field & Jette, 2007). Both the human and the economic costs of disability underscore as well the importance of better understanding the interrelated impacts of race/ethnicity and social class on functional limitations. Furthermore, and while the relationships between health, disability status, and quality of life are complex (Paul, Ayis, & Ebrahim, 2007), such improved understanding in turn may provide critical grounding for efforts to help achieve the national goals of increasing health-related quality of life and eliminating racial disparities in health (Department of Health and Human Services, 2000).

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References

- Alley DE, Chang VW. The changing relationship of obesity and disability, 1988–2004. *Journal of the American Medical Association* 2007;298:2020–2027. [PubMed: 17986695]
- Andresen EM, Brownson RC. Disability and health status: Ethnic differences among women in the United States. *Journal of Epidemiology & Community Health* 2000;54:200–206. [PubMed: 10746114]
- Beckett M. Converging health inequalities in later life—An artifact of mortality selection? *Journal of Health of Social Behavior* 2000;41(2):106–119.
- Braveman PA, Cubbin C, Egerter S, Chideya S, Marchi KS, Metzler M, et al. Socioeconomic status in health research: One size does not fit all. *Journal of the American Medical Association* 2005;294:2879–2888. [PubMed: 16352796]
- Breeze E, Fletcher AE, Leon DA, Marmot MG, Clarke RJ, Shipley MJ. Do socioeconomic disadvantages persist into old age? Self-reported morbidity in a 29-year follow-up of the Whitehall study. *American Journal of Public Health* 2001;91:277–283. [PubMed: 11211638]
- Bulatao, RA.; Anderson, NB. Understanding race and ethnic differences in later life: A research agenda. Washington, DC: National Academies Press; 2004.
- Burchard EG, Ziv E, Coyle N, Gomez SL. The importance of race and ethnic background in biomedical research and clinical practice. *New England Journal of Medicine* 2003;348:1170–1175. [PubMed: 12646676]
- Centers for Disease Control and Prevention. National Nursing Home Survey: Nursing home current residents—Demographics. 2008. Retrieved October 1, 2008, from http://www.cdc.gov/nchs/data/nnhsd/Estimates/nnhs/Estimates_Demographics_Tables.pdf#Table01
- Cesari M, Penninx B, Pahor M, Lauretani F, Corsi AM, Williams R, et al. Inflammatory markers and physical performance in older persons: The InCHIANTI Study. *Journals of Gerontology, Series A: Biological Sciences and Medical Sciences* 2004;59:M242–M248.
- Chay KY. The impact of federal civil rights policy on Black economic progress: Evidence from the Equal Employment Opportunity Act of 1972. *Industrial and Labor Relations Review* 1998;51:608–632.
- Clark DO, Maddox GL. Racial and social correlates of age-related changes in functioning. *Journals of Gerontology: Social Sciences* 1992;47:S222–S232.
- Collins WJ. The labor market impact of state-level anti-discrimination laws, 1940–1960. *Industrial and Labor Relations Review* 2003;56:244–272.
- Cress ME, Schechtman KB, Mulrow CD, Flatarone MA, Gerety MB, Buchner DM. Relationship between physical performance and self-perceived physical function. *Journal of the American Geriatrics Society* 1995;43:93–101. [PubMed: 7836655]
- Crimmins EM, Saito Y. Trends in healthy life expectancy in the United States, 1970–1990: Gender, racial, and educational differences. *Social Science & Medicine* 2001;52:1629–1641. [PubMed: 11327137]

- Dalaker, J. Alternative poverty estimates in the United States: 2003. Washington, DC: U.S. Government Printing Office; 2005.
- Department of Health and Human Services. Healthy people 2010: Understanding and improving health. Washington, DC: Author; 2000.
- Eichner J, Vladeck BC. Medicare as a catalyst for reducing health disparities. *Health Affairs* 2005;24:365–375. [PubMed: 15757920]
- Ferraro KF, Farmer MM. Double jeopardy to health hypothesis for African Americans: Analysis and critique. *Journal of Health and Social Behavior* 1996;37(1):27–43. [PubMed: 8820309]
- Ferraro KF, Farmer MM, Wybraniec JA. Health trajectories: Long-term dynamics among Black and White adults. *Journal of Health and Social Behavior* 1997;38(1):38–54. [PubMed: 9097507]
- Field, MJ.; Jette, AM. The future of disability in America: Institute of Medicine report. Washington, DC: National Academy Press; 2007.
- Gallo JJ, Anthony JC, Muthen BO. Age differences in the symptoms of depression: A latent trait analysis. *Journals of Gerontology: Psychological Sciences* 1994;49:P251–P264.
- Geiger, HJ. Health disparities: What do we know? What do we need to know? What should we know?. In: Schultz, AJ.; Mullings, L., editors. *Gender, race, class and health*. San Francisco: Jossey-Bass; 2006. p. 261–288.
- Geronimus AT. To mitigate, resist, or undo: Addressing structural influences on the health of urban populations. *American Journal of Public Health* 2000;90:867–872. [PubMed: 10846503]
- Geronimus, AT. Black–White differences in the relationship of maternal age to birthweight: A population based test of the weathering hypothesis. In: LaVeist, TA., editor. *Race, ethnicity and health: A public health reader*. San Francisco: Jossey-Bass; 2002. p. 213–230.
- Geronimus AT, Hicken M, Keene D, Bound J. “Weathering” and age patterns of allostatic load scores among Blacks and Whites in the United States. *American Journal of Public Health* 2006;96:826–833. [PubMed: 16380565]
- Guralnik JM, Land KC, Blazer D, Fillenbaum GG, Branch LG. Educational status and active life expectancy among older Blacks and Whites. *New England Journal of Medicine* 1993;329(2):110–116. [PubMed: 8510687]
- Guralnik JM, Butterworth S, Wadsworth MEJ, Kuh D. Childhood socioeconomic status predicts physical functioning a half century later. *Journals of Gerontology Series A: Biological Sciences and Medical Sciences* 2006;61:694–701.
- Hayward MD, Miles TP, Crimmins EM, Yang Y. The significance of socioeconomic status in explaining the racial gap in chronic health conditions. *American Sociological Review* 2000;65:910–930.
- Herd P. Do functional health inequalities decrease in old age? Educational status and functional decline among the 1931–1941 birth cohort. *Research on Aging* 2006;28:375–392.
- Herd P, Goesling B, House J. Explaining educational and income disparities in health: The importance of disease onset versus decline. *Journal of Health and Social Behavior* 2007;48:223–238. [PubMed: 17982865]
- Herd P, Schoeni R, House J. Fundamental causes: Does supplemental security income (SSI) affect disability among the elderly? *Milbank Quarterly* 2008;86(1):5–45. [PubMed: 18307476]
- Hilber CAL, Liu Y. Explaining the Black–White homeownership gap: The role of own wealth, parental externalities and locational preferences. *Journal of Housing Economics* 2008;17:152–174.
- House JS. Understanding social factors and inequalities in health: 20th century progress and 21st century prospects. *Journal of Health and Social Behavior* 2002;43(2):125–142. [PubMed: 12096695]
- House JS, Kessler RC, Herzog AR, Mero R, Kinney AM, Breslow M. Age, socioeconomic status, and health. *Milbank Quarterly* 1990;68:383–411. [PubMed: 2266924]
- Hummer, R.; Benjamins, M.; Rogers, R. Race/ethnic disparities in health and mortality among the elderly: A documentation and examination of social factors. In: Anderson, N.; Bulatao, B.; Cohen, B., editors. *Critical perspectives on racial and ethnic differences in health in later life*. Washington, DC: National Research Council; 2004. p. 53–94.
- Institute of Medicine. Unequal treatment: Confronting racial and ethnic disparities in health care. Washington, DC: National Academy Press; 2002.

- Isaacs SL, Schroeder SA. Class—The ignored determinant of the nation's health. *New England Journal of Medicine* 2004;351:1137–1142. [PubMed: 15356313]
- Jette, AM. Disability trends and transitions. In: Binstock, RH.; George, LK., editors. *Handbook of aging and the social sciences*. San Diego, CA: Academic Press; 1996. p. 94-116.
- Kelley-Moore JA, Ferraro KF. The Black/White disability gap: Persistent inequality in later life? *Journals of Gerontology, Series B: Psychological Sciences and Social Sciences* 2004;59B(1):S34–S43.
- Kempen GJIM, Steverink N, Ormel J, Deeg DJH. The assessment of ADL among frail elderly in an interview survey: Self-report versus performance-based tests and determinants of discrepancies. *Journals of Gerontology, Series B: Psychological Sciences and Social Sciences* 1996;51B:P254–P260.
- Kington RS, Smith JP. Socioeconomic status and racial and ethnic differences in functional status associated with chronic diseases. *American Journal of Public Health* 1997;87:805–810. [PubMed: 9184510]
- Lantz PM, Lynch JW, House JS, Lepkowski JM, Mero RP, Musick MA, et al. Socioeconomic disparities in health change in a longitudinal study of US adults: The role of health-risk behaviors. *Social Science and Medicine* 2001;53(1):29–40. [PubMed: 11380160]
- LaVeist, TA. *Minority populations and health: An introduction to health disparities in the United States*. San Francisco: Jossey-Bass; 2005.
- Lee RD, Ensminger ME, LaVeist TA. The responsibility continuum: Never primary, coresident and caregiver heterogeneity in the African American grandmother experience. *International Journal of Aging and Human Development* 2005;60:295–304. [PubMed: 15954680]
- Li LW, Fries BE. Elder disability as an explanation for racial differences in informal home care. *The Gerontologist* 2005;45:206–215. [PubMed: 15799985]
- Liao Y, McGee DL, Cao G, Cooper RS. Black–White differences in disability and morbidity in the last years of life. *American Journal of Epidemiology* 1999;149:1097–1103. [PubMed: 10369503]
- Macintyre S, Hunt K, Sweeting H. Gender differences in health: Are things really as simple as they seem? *Social Science & Medicine* 1996;42:617–624. [PubMed: 8643986]
- Manton KG, Gu XL. Changes in the prevalence of chronic disability in the United States Black and non-Black population above age 65 from 1982 to 1999. *Proceedings of the National Academy of Sciences* 2001;98:6354–6359.
- McEwen BS. Stress, adaptation, and disease: Allostasis and allostatic load. *Annals of New York Academy of Sciences* 1998;840:33–44.
- Meara ER, Richards S, Cutler DM. The gap gets bigger: Changes in mortality and life expectancy, by education, 1981–2000. *Health Affairs* 2008;27:350–360. [PubMed: 18332489]
- Melzer D, Izmirlian G, Leveille SG, Guralnik JM. Educational differences in the prevalence of mobility disability in old age: The dynamics of incidence, mortality, and recovery. *Journals of Gerontology, Series B: Psychological Sciences and Social Sciences* 2001;56B:S294–S301.
- Mendes de Leon CF, Barnes LL, Bienias JL, Skarupski KA, Evans DA. Racial disparities in disability: Recent evidence from self-reported and performance-based disability measures in a population-based study of older adults. *Journals of Gerontology, Series B: Psychological Sciences and Social Sciences* 2005;60B:S263–S271.
- Mendes de Leon CF, Beckett LA, Fillenbaum GG, Brock DB, Branch LG, Evans DA, et al. Black–White differences in risk of becoming disabled and recovering from disability in old age: A longitudinal analysis of two EPESE populations. *American Journal of Epidemiology* 1997;145:488–497. [PubMed: 9063338]
- Minkler M, Fuller-Thomson E, Guralnik JM. Gradient of disability across the socioeconomic spectrum in the United States. *New England Journal of Medicine* 2006;355:695–703. [PubMed: 16914705]
- Minkler M, Fuller-Thomson E, Miller D, Driver D. Depression in grandparents raising grandchildren: Results of a national longitudinal study. *Archives of Family Medicine* 1997;6:445–452. [PubMed: 9305687]
- Moody-Ayers SY, Mehta KM, Lindquist K, Sands L, Covinsky KE. Black–White disparities in functional decline in older persons: The role of cognitive function. *Journals of Gerontology, Series A: Biological Sciences and Medical Sciences* 2005;60:933–939.

- Nagelkerke NJD. A note on a general definition of the coefficient of determination. *Biometrika* 1991;78:691–692.
- Navarro V. Race or class, or race and class. *International Journal of Health Services* 1989;19:311–314. [PubMed: 2714925]
- Nuru-Jeter A, Dominguez TP, Hammond WP, Leu J, Skaff M, Egerter S, et al. “It’s the skin you’re in”: African-American women talk about their experiences of racism. An exploratory study to develop measures of racism for birth outcome studies. *Maternal and Child Health Journal* 2009;13(1):29–39. [PubMed: 18463971]
- Nuru-Jeter A, Williams CT, LaVeist TA. A methodological note on modeling the effects of race: The case of psychological distress. *Stress and Health* 2008;24:337–350.
- Ostchega Y, Harris TB, Hirsch R, Parsons VL, Kington R. The prevalence of functional limitations and disability in older persons in the US: Data from the National Health and Nutrition Examination survey III. *Journal of the American Geriatrics Society* 2000;48:1132–1135. [PubMed: 10983915]
- Pandya, S. Caregiving in the United States. Washington, DC: AARP Public Policy Institute; 2005.
- Paul C, Ayis S, Ebrahim DM. Disability and psychosocial outcomes in old age. *Aging and Health* 2007;19:723–741.
- Sager MA, Dunham NC, Schwantes A, Mecum L, Halverson K, Harlowe D. Measurement of activities of daily living in hospitalized elderly: A comparison of self-report and performance-based methods. *Journal of the American Geriatrics Society* 1992;40:457–462. [PubMed: 1634697]
- Schoeni RF, Martin LG, Andreski PM, Freedman VA. Persistent and growing socioeconomic disparities in disability among the elderly: 1982–2002. *American Journal of Public Health* 2005;95:2065–2070. [PubMed: 16254235]
- Smedley, BD.; Stith, AY.; Nelson, AR. Unequal treatment: Confronting racial and ethnic disparities in health care. Washington, DC: National Academy Press; 2003. Strum R, Ringel JS, Andreyeva T. Increasing obesity rates and disability trends. *Health Affairs* 2004;23:199–205. [PubMed: 15046144]
- Taaffe DR, Harris TB, Ferrucci L, Rowe J, Seeman TE. Cross-sectional and prospective relationships of interleukin-6 and C-reactive protein with physical performance in elderly persons: MacArthur studies of successful aging. *Journals of Gerontology Series A: Biological Sciences and Medical Sciences* 2000;55:M709–M715.
- Tennstedt S, Chang BH. The relative contribution of ethnicity versus socioeconomic status in explaining differences in disability and receipt of informal care. *Journals of Gerontology, Series B: Psychological Sciences and Social Sciences* 1998;53B:S61–S70.
- Trupin, L.; Rice, DP.; Max, W. Medical expenditures for people with disabilities in the United States, 1987. Washington, DC: Department of Education, National Institute on Disability and Rehabilitation Research; 1996.
- U.S. Census Bureau. Current population survey: Design and methodology (No. 63RV). 2002. Retrieved May 16, 2009, from <http://www.census.gov/prod/2002pubs/tp63rv.pdf>
- U.S. Census Bureau. American community survey: Survey basics. 2005a. Retrieved January 19, 2007, from <http://www.census.gov/acs/www/SBasics/index.htm>
- U.S. Census Bureau. American community survey: Quality measures: Response rates: Data. 2005b. Retrieved January 19, 2007, from http://www.census.gov/acs/www/acs-php/quality_measures_response_2005.php
- U.S. Census Bureau. American community survey: Quality measure: Item allocation rates. 2005c. Retrieved January 19, 2007, from http://www.census.gov/acs/www/acs_php/quality_measures_alloc_2005.php
- US Department of Health and Human Services, National Center for Health Statistics. National nursing home survey: Number and rates of current residents by selected characteristics. Hyattsville, MD: National Center for Health Statistics; 2004.
- U.S. General Accounting Office. Medigap insurance: Plans are widely available but have limited benefits and may have high costs (Rep. GAO-01-941; 7/31/2001, p.1). 2001. Retrieved May 23, 2009, from <http://www.gao.gov/new.items/d01941.pdf>

- Verbrugge L, Jette AM. The disablement process. *Social Science & Medicine* 1994;38:1–14. [PubMed: 8146699]
- Volpato S, Blaum C, Resnick H, Ferrucci L, Fried LP, Guralnik JM. Comorbidities and impairments explaining the association between diabetes and lower extremity disability: The women's health and aging study. *Diabetes Care* 2002;25:678–683. [PubMed: 11919124]
- Williams D, Neighbors HW, Jackson JJ. Racial/ethnic discrimination and health: Findings from community studies. *American Journal of Public Health* 2003;93:200–208. [PubMed: 12554570]
- World Health Organization. International classification of functioning, disability and health. Geneva, Switzerland: Author; 2001.
- Zimmer Z, House J. Education, income and functional limitation transitions. *International Journal of Epidemiology* 2003;32:1089–1097. [PubMed: 14681281]

Black and White Males and Females Rates of Limitations in Activities of Daily Living (ADL) and Functional Limitations (FL) by Family Poverty Level:

Source of Data: American Community Survey 2003

Figure 1.

Odds Ratios and 95% C.I. for Black versus White Differences in Limitations in Activities of Daily Living (ADL) and Functional Limitations (FL)
for Men and Women aged 55-74
Adjusted for Age, Age and Education, and Age, Education and Income Relative to Poverty-Threshold Level (IRPP)
Source of Data: American Community Survey 2003

Figure 2a: Males 55-64

Odds Ratio of Disability in Blacks versus Whites
 Explained Fraction for Education alone: ADL = 52%; FL = 57%
 Explained Fraction for Education and IRPP: ADL = 89%; FL = 90%

Figure 2b: Females 55-64

Odds Ratio of Disability in Blacks versus Whites
 Explained Fraction for Education alone: ADL = 36%; FL = 37%
 Explained Fraction for Education and IRPP: ADL = 75%; FL = 76%

Figure 2c: Males 65-74

Odds Ratio of Disability in Blacks versus Whites
 Explained Fraction for Education alone: ADL = 43%; FL = 80%
 Explained Fraction for Education and IRPP: ADL = 72%; FL = 100%

Figure 2d: Females 65-74

Odds Ratio of Disability in Blacks versus Whites
 Explained Fraction for Education alone: ADL = 29%; FL = 31%
 Explained Fraction for Education and IRPP: ADL = 47%; FL = 53%

Figure 2.

Table 1

Description of Sample: Unweighted Sample Sizes, and Weighted Percentages by Race/Ethnicity and Gender (Unweighted N = 202,956)

Variable	Black Male (N=7,080)	Black Female (N=9,790)	White Male (N=88,664)	White Female (N=97,422)	Total
Age					
55 – 64	4,346 63.3%	5,742 60.4%	53,043 61.2%	56,698 59.1%	119,829 60.3%
65 – 74	2734 36.7%	4,048 39.6%	35,621 38.8%	40,724 40.9%	83,127 39.7%
Poverty Index					
Less than 100%	968 14.9%	1,987 21.3%	4,445 5.4%	6,912 7.5%	14,312 7.7%
100%–199%	1441 20.6%	2,312 23.0%	10,575 12.1%	15,186 15.7%	29,514 14.8%
200%–299%	1163 15.6%	1,600 16.5%	13,377 14.7%	16,962 17.1%	33,102 15.9%
300%–399%	921 12.8%	1,244 12.9%	13,097 14.2%	14,892 14.9%	30,154 14.4%
400%–499	813 11.2%	869 8.6%	10,946 12.1%	11,388 11.6%	24,016 11.6%
500%+	1774 24.9%	1,778 17.8%	36,224 41.6%	32,082 33.3%	71,858 35.5%
Education Status					
Grades 8 or lower	923 12.4%	1,057 10.1%	5,297 5.8%	4,211 4.3%	11,488 5.6%
Grades 9–11	1,454 20.3%	2,179 22.1%	8,575 9.7%	10,660 11.1%	22,868 11.6%
High school graduate (includes some college)	3,675 53.6%	5,172 54.5%	47,879 53.8%	62,319 63.8%	119,045 58.5%
Bachelors Degree	528 6.9%	693 6.8%	14,093 16.2%	11,593 12.0%	26,907 13.2%
Graduate Degree	500 6.8%	689 6.5%	12,820 14.6%	8,639 8.9%	22,648 11.1%
Prevalence of Functional Limitations					

Variable	Black Male (N=7,080)	Black Female (N=9,790)	White Male (N=88,664)	White Female (N=97,422)	Total
55 – 64	1019 23.1%	1,534 25.7%	8,026 15.1%	8,977 16.0%	19,556 16.5%
65–74	726 25.9%	1,444 35.8%	7578 21.3%	9,041 22.5%	18,789 23.0%
Prevalence of Limitations In Activities of Daily Living					
55 – 64	260 5.7%	444 7.4%	1,776 3.4%	2,284 4.1%	4,764 4.1%
65–74	201 7.5%	427 10.7%	1,603 4.7%	2,026 5.2%	4,257 5.4%