# Socioeconomic and Race/Ethnic Disparities in Later Life Physical Performance[1]

**Steven A. Haas**
*Center for Population Dynamics*
*Arizona State University*

**Patrick M. Krueger**
*University of Texas-Houston, School of Public Health*
*University of Texas-Austin, Population Research Center*
*University of Colorado-Boulder, Population Program*
*University of Pennsylvania, Leonard Davis Institute of Health Economics*

**Leah S. Rohlfsen**
*Department of Sociology*
*St. Lawrence University*

[1] Extended abstract submitted to the 2009 Annual Meeting of the Population Association of America. Please do not cite or quote without permission from the author. Address correspondence to Steven Haas, Center for Population Dynamics, Arizona State University, PO Box 873701, Tempe, AZ, 85287-3701; steven.haas@asu.edu. We acknowledge administrative support from the University of Texas-Population Research Center (NICHD R24 HD42849), and the University of Colorado Population Program (NICHD R21 HD51146).

## INTRODUCTION

There are persistent race/ethnic disparities in health in the U.S. that persist well into old age. Compared to Whites, Blacks have shorter life expectancies and spend more of their years living with chronic health problems (Hayward and Heron 1999). Although some research finds that Hispanics have shorter lives than Whites (Hayward and Heron 1999), others find that older Mexican Americans live somewhat longer than Whites (Elo et al. 2004). Socioeconomic status (SES) is often invoked as a key determinant of race/ethnic differences in health in later life, but few surveys offer (1) a nationally representative sample with adequate numbers of Hispanics, in addition to Blacks and Whites, (2) detailed information on multiple measures of SES including education, income, wealth, and income and asset portfolios, and (3) objective indicators of physical performance. We draw on data from the Health and Retirement Study to examine whether SES mediates and moderates race/ethnic disparities in measures of physical performance including grip strength, peak expiratory flow, and gait speed.

### Race/Ethnicity and Socioeconomic Status

Socioeconomic status (SES) plays an important role in accounting for race/ethnic differences in health (Williams and Collins 1995). Although SES is unable to fully account for all of the observed Black/White differences in health, SES persistently accounts for a greater share of those disparities than unhealthy behaviors (Hayward et al. 2000; Bond Huie et al. 2003; Kahn and Fazio 2005). In contrast, some research has suggested the presence of a “Hispanic paradox,” wherein Hispanics (including Mexican Americans) ostensibly have similar or even better health than Whites after adjusting for SES (Elo et al. 2004; Markides and Eschbach 2005). High levels of SES may impact health and mortality outcomes by allowing individuals to effectively cope with stress, permitting access to appropriate medical care, providing access to

safe housing in safe neighborhoods, or by fostering social psychological resources and knowledge than can be used in combination with adequate material resources to improve health (Link and Phelan 1995; Robert 1999; Mirowsky and Ross 2003; Krueger and Chang 2008).

We focus on four dimensions of SES that we expect will mediate the relationship between race/ethnicity and health: education, wealth, income, and an income and asset portfolio. Education lays the foundation for all other dimensions of SES because it is typically established early in life, before the onset of age related poor health, and it sets individuals on employment and earning trajectories that will inform the rest of their life course. Education is associated with increased knowledge, but it also provides individuals with the cognitive and social psychological skills to use their knowledge and material resources effectively in ways that may improve their health and wellbeing (Mirowsky and Ross 1998). Although race/ethnic disparities in education have been closing in recent years, the disparities remain large among older adults; among adults aged 65 and older, Blacks average 2 fewer and Mexican Americans average 3.5 fewer years of education than their White counterparts (DiPrete and Buchman 2006; Everett et al. 2008).

Wealth is a key component of material wellbeing among older adults because it often peaks in individuals' final years in the labor force and then provides a long term and relatively stable resource in the remaining decades of life (Ghez and Becker 1975). Wealth may also play an important role in health disparities. Wealth is accumulated over the life course and across generations, and because Blacks and Hispanics begin their lives in families with lower levels of wealth than their White counterparts, race/ethnic disparities in wealth tend to grow greater as they age (Oliver and Shapiro 1997).

Income, unlike education or wealth, suggests a flow of resources that are immediately available for individuals to use without, say, mortgaging their homes or liquidating their

financial assets. However, the relationship between income and health often declines with age (House, Kessler, and Herzog 1990; Krueger et al. 2003), perhaps because earnings decline among older adults and because social security income may help to equalize the earnings of all older adults. Thus, at the older ages, income may understate the material advantages that some individuals have enjoyed for a substantial share of their lives. Nevertheless, there are persistent race/ethnic differences in income even at the older ages.

Finally, we also examine an income portfolio that captures the diversity of income sources that are coming into the household. Like wealth, diverse income portfolios can indicate long term financial security because individuals who have many income sources may prosper even if any single source should fail, but like income, income portfolios also suggest that individuals have flows of income upon which they can draw immediately (Krueger et al. 2003). To our knowledge, prior work has not examined race/ethnic differences in income portfolios and health.

There are important reasons to think that the same level of SES may moderate the relationship between SES and health. Compared to Whites, older Blacks and Hispanics have had lower quality educations, as indicated by term length and student-to-teacher ratios (Card and Krueger 1992). Further, Blacks and Hispanics may experience discrimination or have restricted social networks that limit their ability to make high earnings, access the most prestigious occupations, or live in the best neighborhoods (Oliver and Shapiro 1997; Grodsky and Pager 2001). As such, higher levels of SES may be less protective of the health of Blacks than of Whites, a finding that is supported by some research (Kahn and Fazio 2005). However, others have found that various measures of SES have similar impacts on the health of Blacks and

Whites (Hayward et al. 2000; Bond Huie, Hummer, and Rogers 2002), although we are not aware of prior research that has examined this relationship among Hispanics.

**Physical Performance**

Race/ethnic differences have been established with various measures of health, although some of those health measures have well-documented limitations. Self rated health or self-reports of medical conditions may be problematic if individuals have limited information about their own health or if they seldom visit doctors and have their health evaluated. Similarly, self-reported activity limitations may be inaccurate if adults do not routinely undertake the activities that are asked (e.g., balance a checkbook, walk a flight of stairs). At the older ages, mortality can also be somewhat problematic, especially when examining Mexican Americans, as older Mexican Americans may be likely to return to Mexico where their deaths are not recorded in the National Death Index (Palloni and Arias 2004).

Although the measures that are used in prior work are valuable, an important advance of our paper is our reliance on several objectively collected measures of physical performance, including grip strength, peak expiratory flow, and gait speed. Hand grip strength measures the presence of arthritis in the hand and the overall strength of the skeletal muscle. Grip strength is associated with old age disability, functional limitation, and mortality (Giampaou et al. 1999; Rantanen et al. 1999; Snih et al. 2002). Peak expiratory flow is a measure of lung function and as an indicator of obstructive lung disease such as asthma and emphysema and has been shown to be associated with mortality and physical decline (Cook et al. 1991; Seeman et al. 1994). Gait speed is an indicator of mobility (and, by extension, balance, coordination, and muscle tone), and has previously been found to predict mortality, disability, and self-rated health in older populations (Guralnik et al. 1994, 1995; Ostir et al. 1998; Jylha et al. 2001). We make use of

recent data from the Health and Retirement Study that has access to objective measures of physical performance for a large, diverse, nationally representative sample of the U.S. population.

**Aims**

Two aims guide our analyses. First, we will examine whether various measures of SES mediate the relationship between race/ethnicity and physical performance measures. We are particularly sensitive to the changing composition of SES among older adults. Second, we will examine whether SES moderates the relationship between race/ethnicity and physical performance measures. Specifically, some research suggests that racial and ethnic minorities may be less able to turn their socioeconomic resources into better health, especially if their SES is indicative of lifelong disparities in earnings or education.

**DATA AND METHODS**

This study utilizes data from the Health and Retirement Study (HRS), an ongoing panel study of older Americans begun in 1992 and designed to investigate economic and health transitions associated with retirement (Juster and Suzman 1995). The original HRS cohort was composed of 12,652 individuals aged 51-61. Respondents were selected from a sample of housing units generated using a multi-stage, clustered area probability sample. The HRS conducts face-to-face, in-home interviews at baseline, with follow-up interviews every second year and interviews with knowledgeable others if respondents die. The HRS includes over-sampling of Hispanics, Blacks, and Florida residents. Respondents who did not report information on their racial or ethnic background were dropped from the analysis. In 1998 the HRS was merged with its sister survey, the Asset and Health Dynamics of the Oldest Old (AHEAD) survey (N=8,222), which includes those born before 1924. In 1998 two additional

cohorts, the Children of the Depression (CODA) born between 1924-1930 (N=2,320), and the War Babies (WB) born between 1942-1947 (N=2,529) were added to the study.

**Measures**

In 2004 the HRS began to collect physical performance measures on a subsample of respondents, excluding those who were living in nursing homes, proxy interviews, or who were interviewed by telephone. The sample was representative of all ages covered by the HRS and included approximately 100 individual in each age between 51-80 and declining numbers for ages 81+ yielding 3,900 respondents. Physical performance assessments were gathered from a final sample of 3,339 respondents in 2004. In 2006 a random one half of the total HRS sample was selected to receive face-to-face interviews including physical performance assessments.

We analyze three measures of physical performance. First, peak expiratory flow was measured using the Mini-Wright Peak Flow Meter. Three assessments were taken 30 seconds apart, and we used the best of the three measures. Second, two measures of hand grip strength were taken for each hand, and we use the best measure from the dominant hand. Finally, gait speed is measured using a timed walk of a 98.5 inch span. We use the best out of two measure times recorded. The timed walk was only assessed for respondents aged 65 and older.

Our key independent variables are race/ethnicity and socioeconomic status. Race/ethnicity is measured categorically as Non-Hispanic White (reference), Non-Hispanic Black, Hispanic, and non-Hispanic other. Unfortunately, there are too few Mexican Americans in the subsample of those who provided data on the physical performance measures to separate them from other Hispanics. A continuous measure of education that indicates the number of years of schooling completed was utilized. We focus on education in our preliminary analyses (presented here). But, before PAA we will further examine other measures of socioeconomic

position including total family income, the net worth of all household assets, and a count of the number of sources of income from work, self employment, social security (except for reasons of disability), pensions, interest, dividends, and other sources of non-poverty related income. We will also explore the relative impact of childhood and adult socioeconomic position on later life physical performance.

Our control variables include age in years, gender, current marital status, and region of residence. We also control for current health status measured with indicators of BMI (normal, overweight, obese, underweight), smoking (current, former, never), and the number of co-morbid chronic conditions. In the models of peak expiratory flow we also control for height, because height is correlated with total lung volume. All control variables are measured in 2004.

**Statistical Analysis**

Out preliminary results are based on cross-sectional OLS regression models that used the pooled data from 2004 and 2006. We cluster on individual-specific identifiers to account for the correlated errors among the individuals who are measured in both years. We estimate three models for each outcome. Model 1 examines race/ethnic differences in physical performance when adjusting for sociodemographic background and baseline health. Model 2 further includes educational attainment, and indicates whether it mediates race/ethnic differences in physical performance. Model 3 includes interactions between education and race/ethnicity to examine whether education moderates race/ethnic differences in physical performance.

**RESULTS**

Table 1 presents unstandardized OLS regression coefficients from models of peak respiratory flow. Model 1 finds large and significant race/ethnic disparities in lung function. Non-Hispanic Blacks and Hispanics had average peak expiratory flow rates that were

approximately 29 liters/minute lower than those of Non-Hispanic whites. Importantly these differences exist after controlling for differences in smoking, height, and other demographic and health variables. Model 2 further adjusts for educational attainment and shows that education exerts a significant impact on lung function. Each additional year of schooling increases peak flow by 5.8 liters/minute. Further, controlling for education reduces the race/ethnic differences in lung function. The black-white gap in lung function is reduced by 15% while the gap between whites and Hispanics is reduced by 70% and is no longer statistically significant. Model 3 includes interactions between race/ethnicity and education, and shows that education appears to have a similar relationship with lung function across the race/ethnic groups.

[Table 1 here]

Table 2 presents unstandardized OLS regression coefficients for models of grip strength. Model 1 shows that Hispanics have significantly lower grip strength compared to non-Hispanic whites, although there are no significant differences between non-Hispanic Blacks and Whites. Model 2 shows that, as with lung function, education is positively associated with grip strength. Further, controlling for educational attainment attenuates the difference in grip strength between Hispanics and non-Hispanic whites by about 22% though this difference remains significant. Model 3 finds no evidence that the relationship between education and grip strength varies by race/ethnicity.

[Table 2 here]

Table 3 presents unstandardized OLS regression coefficients from a model that predicts gait speed. Higher values indicate greater times to walk the same distance thus slower gait speed. Model 1 shows that non-Hispanic Blacks have slower walking speeds than their non-Hispanic White peers, although the walking speed of Hispanics was not significantly different from that of

non-Hispanic Whites. Model 2 finds no significant relationship between educational attainment and gait speed, although adding education does reduces the Black-White gap in walking speed by 13%. Model 3 finds no significant interaction effects between education and race.

[Table 3]

## CONCLUSION

Several important patterns emerge in our preliminary analyses. First, depending on the particular measure of physical performance, Blacks and Hispanics either have worse or similar performance as Whites, and none of our models document better performance among Blacks and Hispanics. Second, higher levels of educational attainment are associated with better peak respiratory flow and grip strength measures, but not with faster gait speeds. In addressing our first aim, we also find that education partially mediates race/ethnic differences in all of the physical performance measures. In other words, at least one measure of socioeconomic status partially accounts for race/ethnic differences in physical performance. Finally, in addressing our second aim, we find that education does not have a significantly different relationship with any of the physical performance measures, across the race/ethnic groups.

## FUTURE DIRECTIONS

We plan to revise and extend our analyses in three ways before PAA. First, we will estimate a series of models that include more detailed measures of socioeconomic status, including family income, household wealth, and an income and asset portfolio. Each measure may tap a different dimension of socioeconomic status that may be especially important in a sample of older adults.

Second, we will estimate models that test for race/ethnic differences in the physical performance measures before entering the health behavior and health status variables. Further, we will test a series of different lags of the independent variables—including income, wealth, the income and asset portfolio, and the health status variables. Different model specifications will allow us greater insight into race/ethnic disparities in health.

Third, the current analysis examines socioeconomic and race/ethnic differences in physical performance by pooling two waves of data and treating them as cross-sections. Subsequent analyses will estimate longitudinal models of change in physical performance using random effects and fixed effects models, to make better use of the longitudinal structure of our data.

**REFERENCES**

Bond Huie S. A., Hummer R. A., and Rogers R. G. (2002). "Individual and Contextual Risks of Death among Race and Ethnic Groups in the United States." *Journal of Health and Social Behavior* 43:359-381.

Bond Huie S. A., Krueger P. M., Rogers R. G., and Hummer R. A. (2003). "Wealth, Race, and Mortality." *Social Science Quarterly* 84:667-684.

Card D. and Krueger A. B. (1992). "School Quality and Black-White Relative Earnings: A Direct Assessment." *The Quarterly Journal of Economics* 107:151-200.

DiPrete T. A. and Buchman C. (2006). "Gender Specific Trends in the Value of Education and the Emerging Gender Gap in College Completion." *Demography* 41:1-24.

Elo I. T., Turra C. M., Kestenbaum B., and Ferguson B. R. (2004). "Mortality among Elderly Hispanics in the United States: Past Evidence and New Results." *Demography* 41:109-128.

Everett B. G., Rogers R. G., Krueger P. M., and Hummer R. A. (2008). "Trends in Educational Attainment by Sex, Race/Ethnicity, and Nativity in the United States, 1989-2005." *Paper presented at the 2008 meetings of the Population Association of America*.

Ghez G. R. and Becker G. S. (1975). *The Allocation of Time and Goods over the Life Cycle*. New York: Columbia University.

Grodsky E. and Pager D. (2001). "The Structure of Disadvantage: Individual and Occupational Determinants of the Black-White Wage Gap." *American Sociological Review* 66:542-567.

Hayward M. D., Crimmins E. M., Miles T., and Yang Y. (2000). "The Significance of Socioeconomic Status in Explaning the Racial Gap in Chronic Health Conditions." *American Sociological Review* 65:910-930.

Hayward M. D. and Heron M. (1999). "Racial Inequality in Active Life among Adult Americans." *Demography* 36:77-91.

House J. S., Kessler R. C., and Herzog R. (1990). "Age, Socioeconomic Status, and Health." *The Milbank Quarterly* 68:383-411.

Juster F. T. and Suzman R. (1995). "An Overview of the Health and Retirement Survey." *Journal of Human Resources* 30:S7-S56.

Kahn J. R. and Fazio E. M. (2005). "Economic Status over the Life Course and Racial Disparities in Health." *Journal of Gerontology: Social Sciences* 60B:76-84.

Krueger P. M. and Chang V. (2008). "Being Poor and Coping with Stress: Health Behaviors and the Risk of Death." *American Journal of Public Health* 98:889-896.

Krueger P. M., Rogers R. G., Hummer R. A., LeClere F. B., and Bond Huie S. A. (2003). "Socioeconomic Status and Age: The Effect of Income Sources and Portfolios on Adult Mortality in the United States." *Sociological Forum* 18:465-482.

Link B. G. and Phelan J. (1995). "Social Conditions as Fundamental Causes of Disease." *Journal of Health and Social Behavior* Extra Issue:80-94.

Markides K. S. and Eschbach K. (2005). "Aging, Migration, and Mortality: Current Status of Research on the Hispanic Paradox." *Journals of Gerontology: Social Sciences* 60B:S68-75.

Mirowsky J. and Ross C. E. (1998). "Education, Personal Control, Lifestyle and Health: A Human Capital Hypothesis." *Research on Aging* 20:415-49.

—. (2003). *Education, Social Status, and Health*. Hawthorne, NY: Aldine De Gruyter.

Oliver M. L. and Shapiro T. M. (1997). *Black Wealth/White Wealth: A New Perspective on Racial Inequality*. New York: Routledge.

Palloni A. and Arias E. (2004). "Paradox Lost: Explaining the Hispanic Adult Mortality Advantage." *Demography* 41:385-415.

Robert S. A. (1999). "Socioeconomic Position and Health: The Independent Contribution of Community Socioeconomic Context." *Annual Review of Sociology* 25:489-516.

Williams D. R. and Collins C. (1995). "U.S. Socioeconomic and Racial Differences in Health: Patterns and Explanations." *Annual Review of Sociology* 21:349-386.

Table 1.
Linear Regression of Peak Expiratory Flow

| | Model 1 | Model 2 | Model 3 |
|---|---|---|---|
| *Race/Ethnicity* | | | |
| Non-Hispanic Black | -28.890 ** | -24.522 ** | 20.126 |
| Hispanic | -29.030 ** | -7.054 | -41.853 |
| Other | -24.325 | -18.633 | -3.001 |
| Education (years) | | 5.791 *** | 5.176 ** |
| *Control Variables* | | | |
| Age | 0.073 | 0.054 | 0.053 |
| Gender | -126.250 *** | -125.850 *** | -126.290 *** |
| Marital Status | | | |
| Divorced/Seperated | -7.039 | -5.749 | -6.263 |
| Widowed | -27.252 | -24.201 | -21.951 |
| Never Married | -19.848 * | -18.500 * | -18.849 * |
| Region of Residence | | | |
| Midwest | 20.581 * | 24.274 ** | 23.385 ** |
| South | 8.029 | 9.283 | 8.546 |
| West | 24.723 ** | 21.558 * | 21.565 * |
| # Chronic Conditions | -12.130 *** | -10.993 *** | -11.184 *** |
| Body Mass Index | | | |
| Underweight | -54.602 | -59.350 * | -59.857 * |
| Overweight | 21.030 ** | 20.996 ** | 20.985 ** |
| Obese | 17.059 * | 20.950 ** | 21.294 ** |
| Height | 53.601 *** | 50.927 *** | 50.725 *** |
| Current Smoker | -32.441 *** | -25.594 *** | -27.391 *** |
| Former Smoker | 0.904 | 2.807 | 1.652 |
| Non-HispBlack*Education | | | -3.501 |
| Hispanic*Education | | | 3.072 |
| Non-HispOther*Education | | | -1.229 |
| R-square | 0.4318 | 0.4435 | 0.4454 |

** p< .05; ** p< .01; *** p< .001*

Table 2.
Linear Regression of Grip Strength

| | Model 1 | Model 2 | Model 3 |
|---|---|---|---|
| *Race/Ethnicity* | | | |
| Non-Hispanic Black | -0.452 | -0.178 | -0.352 |
| Hispanic | -4.236 *** | -3.272 *** | -2.290 |
| Other | -1.666 | -1.531 | -3.842 |
| Education (years) | | 0.235 ** | 0.247 ** |
| *Control Variables* | | | |
| Age | -0.158 | -0.015 | -0.153 |
| Gender | -16.779 *** | -16.715 *** | -16.713 *** |
| Marital Status | | | |
| Divorced/Seperated | 0.551 | 0.560 | 0.563 |
| Widowed | -1.243 | -1.022 | -1.023 |
| Never Married | -0.447 | -0.410 | -0.423 |
| Region of Residence | | | |
| Midwest | 0.542 | 0.542 | 0.547 |
| South | -0.033 | 0.031 | 0.032 |
| West | 1.364 * | 1.248 | 1.248 |
| # Chronic Conditions | -1.611 *** | -1.538 *** | -1.537 *** |
| Body Mass Index | | | |
| Underweight | -3.922 *** | -3.909 *** | -3.910 *** |
| Overweight | 2.671 *** | 2.733 *** | 2.733 *** |
| Obese | 3.438 *** | 3.581 *** | 3.585 *** |
| Current Smoker | 0.185 | 0.388 | 0.408 |
| Former Smoker | -0.334 | -0.341 | -0.336 |
| Non-HispBlack*Education | | | 0.016 |
| Hispanic*Education | | | -0.101 |
| Non-HispOther*Education | | | 0.180 |
| R-square | 0.2381 | 0.2396 | 0.2397 |

** p< .05; ** p< .01; *** p< .001*

Table 3.
Linear Regression of Gait Speed

| | Model 1 | Model 2 | Model 3 |
|---|---|---|---|
| *Race/Ethnicity* | | | |
| Non-Hispanic Black | 0.936 *** | 0.817 *** | 1.831 |
| Hispanic | 0.154 | -0.178 | -0.074 |
| Other | -0.466 | -0.530 | 0.519 |
| Education (years) | | -0.074 | -0.060 |
| *Control Variables* | | | |
| Age | 0.084 *** | 0.081 *** | 0.081 *** |
| Gender | -0.016 | -0.028 | -0.016 |
| Marital Status | | | |
| Divorced/Seperated | 0.537 | 0.546 | 0.563 |
| Widowed | 0.710 | 0.669 | 0.671 |
| Never Married | 0.163 | 0.173 | 0.169 |
| Region of Residence | | | |
| Midwest | 0.159 | 0.148 | 0.152 |
| South | -0.089 | -0.109 | -0.113 |
| West | 0.412 | 0.461 | 0.456 |
| # Chronic Conditions | 0.176 | 0.162 | 0.162 |
| Body Mass Index | | | |
| Underweight | -0.492 | -0.485 | -0.485 |
| Overweight | -0.740 | -0.762 | -0.758 |
| Obese | -0.348 | -0.390 | -0.385 |
| Current Smoker | -0.024 | -0.100 | -0.098 |
| Former Smoker | 0.257 | 0.253 | 0.259 |
| Non-HispBlack*Education | | | -0.090 |
| Hispanic*Education | | | -0.005 |
| Non-HispOther*Education | | | -0.085 |
| R-square | 0.0074 | 0.0077 | 0.0077 |

** p< .05; ** p< .01; *** p< .001*