Education as the Great Equalizer?: Racial and Ethnic Differences in Returns of Education on Cognitive Functioning in Later Life

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Introduction

In January of 2011, President Barack Obama signed the National Alzheimer's Project Act into law, cementing the federal government's commitment to addressing the high prevalence of dementia and cognitive impairment in the United States. Though recent evidence suggests that the prevalence of severe cognitive impairment has declined significantly between 2000-2012 (Langa et al. 2017), there still exists a disproportionate burden of ill cognitive health for people of color. Indeed, numerous studies have found that relative to whites, blacks and Hispanics suffer from poorer cognitive functioning across the lifespan (Castora-Binkley et al. 2013; Glymour and Manly 2008; Masel and Peek 2004; Zhang, Hayward, and Yu 2016). A significant portion of the racial/ethnic difference in cognitive functioning in late life can be attributed to differences in education, income, and adulthood health/health behaviors (Mehta et al. 2004; Zhang et al. 2016).

While neurodegenerative pathologies are highly associated with later life cognitive functioning, said pathologies do not account for the majority of cognitive decline (Boyle et al. 2013). Consequently, investigators have turned to social determinants to help explain age-related declines in cognitive functioning. Level of education has consistently been shown to be a robust predictor of cognitive functioning in later life (Alley, Suthers, and Crimmins, 2007). While many studies typically include indicators of education as a mediator and attempt to explain away racial differences in cognitive functioning by including measures of education in statistical models (Castora-Binkley et al. 2013; Díaz-Venegas et al., 2016; Mehta et al. 2004; Zhang et al. 2016),

no studies to our knowledge have examined whether the effect of education beyond other measures of socioeconomic status (SES) on cognitive impairment is the same across race/ethnicity in older adults. In this paper, we investigate whether the returns of education on cognitive impairment in later life are different across race and ethnicity – specifically considering the impact on non-Hispanic black and Mexican American older adults. Drawing on data from the 2012 wave of the nationally representative Health and Retirement Study (HRS), we estimate a series of nested logistic regression models to determine differential returns of years of schooling on cognitive impairment. This paper advances the literature on cognitive aging disparities further by examining the effects of education on cognitive functioning at the nexus of race and ethnicity.

Background

That there is an inverse relationship between socioeconomic status (SES) and good health has become somewhat of an axiom in the literature on the social stratification of health (see Williams and Collins 1995). Mechanisms underlying the association between SES and health largely include relative access to various forms of capital and resources which individuals can then mobilize to stave off adverse health (Adler 2001; Link and Phelan 1995; Mirowski and Ross 2003). For a more concrete example, individuals with more income are likely to afford healthier foods or be able to afford better healthcare treatment than those of lower income.

SES is essentially a proxy of social class and is measured as some combination of education, income, wealth, and occupational status/prestige, but a number of studies have focused explicitly on education. Indeed, as noted by Shuey and Willson (2008), education seems to both directly and indirectly impact the other indicators of SES. In the context of cognitive functioning, explicit focus on education is also warranted because of its consistent and robust

association with cognition (e.g. Albert and Teresi 1999; Alley et al. 2007). Given the strong relationship between education and cognition as well as the strong evidence for racial/ethnic disparities in cognitive impairment (Castora-Binkley et al. 2013; Glymour and Manly 2008), it is worth investigating whether differences in education drive said disparities in cognitive aging. And if so, how? Does education serve to mediate the relationship between race/ethnicity and cognitive impairment, or rather does education operate differently across race/ethnicity?

Existing research of cognitive impairment in later life has delved into the investigation of education as a mechanism for racial/ethnic disparities. Though no study to our knowledge has explicitly investigated racial/ethnic differences in the returns of education on cognitive functioning in later life, previous research on other health outcomes help to provide a foundation for the present analysis. Evidence for differential benefits of SES is mixed. Whereas Huie and colleagues (2003) investigation of wealth and mortality yielded no support for the notion that wealth operated differently across race, Farmer and Ferraro (2005) find that blacks do not receive as great a benefit from education as whites with regards to self-rated health. Similarly, Shuey and Willson's (2008) study of black-white disparities in life-course health trajectories provided support education being less protective for blacks than it is for whites when predicting health trajectories. The inconsistency in findings is likely due to the assessment of various indicators of SES (wealth vs. income vs. education vs. occupational prestige) across studies as well as the different health outcomes investigated.

Not only is evidence supporting the differential effects of SES on health across race mixed, but for studies that find differential effects of SES, there is no consensus on whether SES operates more strongly for racial minorities or their white peers. In their examination of the conditionality of socioeconomic status in determining racial disparities in self-rated health,

Farmer and Ferraro (2005) test two competing hypotheses: the diminishing returns hypothesis and the minority poverty hypothesis. As summarized by Farmer and Ferraro (2005), the *minority poverty hypothesis* posits that the health of racial and ethnic minorities is more negatively impacted by low SES than whites. Conversely, the *diminishing returns hypothesis* predicts that, while health disparities across social categories exist at all levels of SES, the disparities are greatest at high levels of SES and reflect a process where racial/ethnic minorities are not able to translate their human capital into resources to benefit their health. The jury is still out with regards to which hypothesis is more correct, with some evidence supporting the minority poverty hypothesis (e.g. Cockerham 1990; Hayward et al. 2000) and other research providing support for diminishing returns (Farmer and Ferraro 2005). In sum, both the minority poverty and diminishing returns hypotheses posit that the effects of SES on health are conditional on race, but articulate different effects of low and high SES.

In line with previous research regarding the stratification of cognitive health across racial and ethnic lines, we formulate the following hypothesis:

H1: Relative to non-Hispanic whites, non-Hispanic blacks and Mexican Americans are at greater risk of cognitive impairment.

As previously mentioned, it has been shown that differences in years of education explains a portion of the racial/ethnic gap in cognitive functioning. As such, we articulate our second hypothesis:

H2: Years of education will partially mediate the racial/ethnic difference in cognitive functioning.

Our central argument is that education's impact on cognitive functioning varies across race/ethnicity, in particular that the racial/ethnic disparity in cognitive functioning would be

largest at higher levels of education and smallest at lower levels of education. Thefore, we make the following hypothesis.

H3: The effect of higher levels of education on cognitive impairment is weaker for blacks and Mexican Americans than it is for their white peers, particularly at higher levels of education.

Whereas our third hypothesis is consistent with the diminishing returns hypothesis, it is also possible that education impacts whites and racial/ethnic minorities differently at the low end. In other words, we would expect racial/ethnic differences in cognitive functioning to be greatest at lower levels of education. Thus, inspired by the minority poverty hypothesis we formulate our fourth hypothesis.

H4: The effect of higher levels of education on cognitive impairment is weaker for blacks and Mexican Americans than it is for their white peers, particularly at lower levels of education.

In testing the aforementioned hypotheses, this paper builds on the existing literature in two key ways. First, we test the idea of differential returns of education to cognitive health, an outcome that has, to our knowledge, not been considered before in this context. Second, while previous studies have restricted their analyses to non-Hispanic blacks and whites, we expand on existing work and include Hispanics, specifically Mexican American. In so doing, we examine the largest Hispanic ethnic group in the US which is currently beginning to experience the health-associated consequences of aging.

Data and Methods

Sample

Data for this study were drawn from the 2012 nationally representative, longitudinal Health and Retirement Study (HRS). The HRS is sponsored by the National Institute on Aging (grant number NIA U01AG009740) and is conducted by the University of Michigan. Initiated in

1992, the HRS and its sister survey Study of Asset and Health Dynamics Among the Oldest Old (AHEAD) were both conducted separately and biennially, before being integrated in 1998. The HRS collects measures on the health, employment, and familial conditions of non-institutionalized older adults aged 50+ in the United States via in-person interview or by telephone.

One feature of the HRS is its inclusion of various cohort samples to better represent the range of birth cohorts from the 1900s to later in the 21st century. In total, the HRS consists of six cohorts: the AHEAD cohort (born before 1923), the HRS cohort (1931-1941), the Children of the Great Depression (CODA) cohort (1924-1936), the War Babies cohort (1942-1947), the Early Baby Boomers (1948-1953), and the Mid Baby Boomers (1954-1959). While the AHEAD, HRS, CODA, and War Babies were all included in the integrated 1998 assessment, the Early and Mid Baby Boomers were not added until 2004 and 2010, respectively. The 2012 wave includes all the surveyed cohorts to date.

The HRS employs a multi-stage national area probability sample design. During the first stage, U.S. Metropolitan Statistical Areas (MSAs) and non-MSA counties were selected using probability proportionate to size (PPS). Second, area segments were selected from the sampled primary sampling units (PSUs). Third, once a complete enumeration of all the housing units within the boundaries of the identified area segments is completed, housing units are selected systematically. The fourth and last stage consist of the selection of the specific household financial unit. Additionally, the HRS includes an oversampling of blacks and Latinos as well as an oversample of Floridians to ensure adequate numbers of members of these groups.

The data source is highly appropriate for the present analyses for several reasons. First, the coverage of older Americans across a wide age range gives us the ability to assess cognitive

functioning across older adults, broadly defined. Second, the oversampling of blacks and Mexican Americans ensures that we will have adequate statistical power to make meaningful comparisons across race and ethnicity. Third, in addition to containing an extensive battery of cognitive tests that tap into key domains of cognition, the HRS also a number of sociodemographic, health and health behavior variables that allow for a thorough examination of cognitive functioning and the various factors associated with said functioning. To extract the data, we relied on the RAND HRS Data file as well as "fat files" found on the HRS website (http://hrsonline.isr.umich.edu/).

Our analytic sample consists of respondents, aged 65+ in 2012 (*N= 8,903)*. We limit the analyses to blacks, whites, and Mexican Americans (the largest Hispanic group surveyed in the HRS). To account for the oversampling of blacks and Mexican Americans, we used sampling weights to adjust point estimates and standard errors.

Measures

Cognitive impairment, dichotomized to reflect those who are afflicted with impairment (1) and those who are unimpaired (0) served as our dependent variable. To construct the dependent variable, we relied on the modified Telephone Interview for Cognitive Status (TICS) which contains several tasks including object naming, serial subtraction, and both immediate and delayed word recall. The scores from the modified TICS range from 0 to 35, with higher scores denoting better cognitive functioning. In accordance with previous research (Lievre, Alley, and Crimmins 2008; Reuser, Willekens, and Bonneux 2011; Zhang et al. 2016), we used a cutoff of 9, with those at or below 9 being characterized as cognitively impaired, while those above 9 were characterized as unimpaired.[1]

[1] Freedman et al. 2002 recommend using a cutoff of 8 to denote cognitive impairment, while the cutoff point of 9 is recommended to account for practice effects in the HRS.

Focal Independent Variables

Our focal independent variables included years of education, race, and ethnicity. *Years of education* (0-17) is treated as a continuous measure denoting the respondent's educational attainment. *Race* is a binary variable coded '1' for non-Hispanic blacks, while *ethnicity* is a binary variable coded '1' for Mexican Americans with non-Hispanic whites serving as the reference group. To test the hypothesis that the returns of education vary across race and ethnicity, we also constructed interaction terms (race x education; ethnicity x education).

Additional Covariates

We also included a number of covariates that have known associations with cognitive health. *Number of health conditions* was treated as a continuous variable and represented the number of self-reported diagnosed diseases (arthritis, cancer, diabetes, heart disease, hypertension, lung disease, and/or stroke. *Psychiatric diagnosis* was a binary variable based on self-report of ever being diagnosed with an emotional, nervous, or psychiatric problem (0=no, 1=yes). We also used the CES-D cut-off of ≥3 symptoms as indicating *depression* (0=no, 1=yes) (Wallace et al., 2000). *Obesity* was treated as a binary indicator that indicated obese individuals if their BMI ≥ 30 (0=not obese, 1=obese). These measures tap into the overall health of the respondent.

To capture health behaviors, we included indicators for exercise, smoking and drinking. To capture *exercise intensity* we combined two measures of frequency of moderate and vigorous physical activity. We categorized individuals as hardly ever or never (reference), sometimes (once a week or one to three times a month), or frequently (once a week) engaging in either

moderate or vigorous physical activity. *Smoking status* was constructed using responses to inquiries into whether a respondent never smoked, were former smokers, or current smokers. We constructed *drinking status* by examining two questions asked of respondents: whether respondents ever drank an alcoholic beverage, and the number of alcoholic drinks consumed daily. Based on these responses, we generated three categories: those who never drank (coded '0'), current moderate drinkers who reported drinking 1-2 drinks on days when drinking alcohol (coded '1'), and current heavy drinkers who reported drinking ≥3 drinks per day when drinking alcohol (coded '3').[2]

Sociodemographic controls include *age* (continuous, ranging from 65-102), *married/partnered* (0=no, 1=yes) and *sex* (0=male, 1=female). We also included measures of *household income* and *wealth*. Due to skewness of income and wealth variables, both were logged transformed. For both income and wealth (calculated as assets minus debts), a constant of $1 was added to each value before taking the log of the absolute value of each. This ensured that individuals reporting $0 in income or wealth were not lost during the log transformation. Then, for those individuals who originally had negative values of wealth, their log transformed values were multiplied by -1 (Haas & Rohlfsen, 2010)

Analytic Strategy

We began by generating weighted descriptive statistics for the analytic sample. Table 1 presents said statistics, stratified by race and ethnicity. Next, to assess our research hypotheses, we estimated a series of nested logistic regression models. The binary nature of our dependent variable made the use of logistic regression more appropriate than ordinary least squares

[2] We relied on the 2015-2020 Dietary Guidelines for Americans, published by the U.S. Departments of Health and Human Services and Agriculture. Moderate drinking is defined as 1 drink per day for women, and up to 2 drinks per day for men.

regression. Table 2 presents parameter estimates from logistic regression models. Model I examined the direct effect of race and ethnicity on cognitive impairment controlling for sociodemographic and health characteristics. Next, Model II included years of education into the model, and tested for the mediation effect of education on racial/ethnic disparities in cognitive impairment. Collectively, Models I and II provide a test of H1 and H2, respectively. Lastly, we tested race/ethnicity x education interaction terms to assess whether the effects of education are different across race/ethnicity. We generated graphs for all statistically significant interaction terms. Figures 1-2 display visualizations of said interactions. Visualizations of the interactions allowed us to test both H3 and H4. All analyses were conducted using Stata 15.

Missing Data

As with all surveys, the HRS is not without missing values. To address missing data, we began by examining patterns of missing data across independent variables and controls. The extent of missing data was low, with no variables having more than 1% missing. We relied on the Rand Corporation's income, wealth, and cognition imputation. For all other analyses, we used listwise deletion.

Results

Descriptive Statistics

Table 1 presents descriptive statistics for all measures. We show proportions for categorical variables and mean values for continuous variables for the entire sample as well make comparisons across race/ethnicity and gender using the adjusted Wald's test. Blacks and Mexican Americans have lower TICS scores compared to whites, with black men having the largest proportion of adults meeting the ≤9 cutoff at 6.74%. Compared to white men and women, blacks and Mexican Americans in the sample are of lower SES. For example, Mexican

Americans report the fewer years of education (8.93 for men and 7.93 for women). Black and Mexican American women report less income compared to both white men as well as their racial/ethnic male counterparts. Less wealth compared to whites is also reported by blacks and Mexican Americans, with black women having less wealth than black men. Differences in marital/partnered status are indicated, with women of all racial/ethnic groups being less likely to married/partnered than men.

Racial/ethnic and gender differences are also noted for behavioral risk factors. Black women report a higher prevalence of obesity than both white and black men (44.33% compared to 28.82% and 31.71% respectively). White and black women are more likely to report never participating in moderate/vigorous physical activity compared to their male counterparts. Black and Mexican American men compared to women are more likely to be current smokers, while men across all racial/ethnic groups are more likely than women to be heavy drinkers.

In regards to physical health, white and black women report more health conditions compared to men. Racial/ethnic and gender differences are also present for the two measures of mental health. First, women report a greater prevalence of ever being diagnosed with a psychiatric problem than men regardless of race/ethnicity. However, black men report a lower prevalence of ever-diagnosed psychiatric problems compared to white men (9.61% vs. 13.94%). Similar to psychiatric diagnoses, having a CES-D ≥3 as an indication of depression is more common in white and black women than men. Additionally, Mexican American men are more likely than white men to have CES-D scores ≥3.

[INSERT TABLE 1 ABOUT HERE]

Multivariate Analyses

Table 2 presents results from the multivariate logistic regression analyses testing our hypotheses. All models control for demographics (age, gender, log income, log wealth, and marital/partnership status), health status (number of health conditions, psychiatric diagnoses, and CES-D score), and behavioral risks (obesity, moderate/vigorous physical activity, smoking status, and alcohol use). First, Model 1 shows that blacks have a greater likelihood than whites of being cognitively impaired (OR:3.56, CI:2.44-5.19, $p<0.001$). Mexican Americans also were more likely than whites to fall within the cognitively impaired category (OR:1.96, CI:0.99-3.90, $p<0.1$). Therefore, Model 1 represents the baseline disparity in cognitive impairment for black and Mexican American older adults compared to whites even after accounting for multiple sociodemographic and health related factors.

Turning to Model 2, education altered the relationship between race/ethnicity and odds of cognitive impairment. The main effect of being non-Hispanic black fell from 256% higher odds relative to non-Hispanic whites to 166% higher odds. The non-Hispanic black-white difference remained highly significant, but the magnitude of the odds ratio was reduced by a little over a third. This attenuation in the main effect provides some evidence for partial mediation. Whereas there was partial mediation of the race effect for non-Hispanic blacks, education completely mediated the difference between Mexican Americans and non-Hispanic whites. Indeed, the point estimate for the ethnicity effect went from significant, to not significant. Moreover, after accounting for education, Mexican Americans had *lower* odds than non-Hispanic whites of being cognitively impaired. In terms of H2, then, we found mixed evidence. There was slight mediation of education for blacks, and complete mediation for Mexican Americans.

[INSERT TABLE 2 ABOUT HERE]

Conditionality on Race/Ethnicity

Figures 1 and 2 provide visual displays of the statistically significant interaction terms identified in our third logistic regression equation. First, Figure 1 displays the statistically significant interaction between race and education. As the figure indicates, non-Hispanic blacks displayed a higher predicted probability of cognitive impairment relative to non-Hispanic whites, but the disparity in probability of poor cognitive health began to shrink as education increased. The convergence in the predicted probability of cognitive impairment was found to be driven by the stronger effect of education for non-Hispanic blacks relative to their non-Hispanic white peers. The patterns displayed here do not provide support for H3, and instead are more in line with the prediction made by H4.

[INSERT FIGURE 1 ABOUT HERE]

Figure 2 graphs the detected interaction between Mexican ethnicity and education. While non-Hispanic blacks were found to experience higher predicted probabilities of cognitive impairment than non-Hispanic whites at all levels of education, Mexican Americans had a *lower* predicted probability of being cognitively impaired than non-Hispanic whites. This pattern played out at all levels of education up until around 12 years. After 12 years of education (equivalent of high school graduate), non-Hispanic whites displayed a lower probability of impairment. The pattern of disparity in cognitive impairment across ethnicity is driven largely by the stronger returns of education for non-Hispanic whites than for Mexican Americans. Indeed, Mexican Americans maintain a low probability of impairment across years of education and experience only a marginal return to their cognitive health. Results herein are contrary to both H3, while H4 receives some support. Mexican Americans display weaker returns of education to their cognitive functioning in late life, specifically at higher levels of education. That being said, the disparity at the highest level of education is marginal, at best.

[INSERT FIGURE 2 HERE]

Discussion

This study examined the association between education and cognitive impairment by race/ethnicity among a nationally representative sample of US adults ≥65 years of age. We set out to test the hypothesis that non-Hispanic blacks and Mexican Americans would have a greater risk for cognitive impairment compared to non-Hispanic whites. We also assessed if years of education would operate to mediate racial/ethnic differences in cognitive impairment. Furthermore, we aimed to test two hypotheses proposed in the literature to explain how SES might operate on health – the diminishing returns hypothesis and the minority poverty hypothesis. We tested whether increasing years of education would provide blacks and Mexican Americans similar protection against cognitive impairment as for whites. Support for the diminishing returns hypothesis would entail blacks and Mexican Americans maintaining greater likelihood of cognitive functioning than whites even at the highest level of education. Conversely, narrowing of the gap in cognitive impairment between blacks or Mexican Americans and whites with increasing years of education would provide evidence for the minority poverty hypothesis.

We find that black and Mexican American older adults have higher odds of being cognitively impaired compared to their white peers. For example, blacks were found to have 256% higher odds of being cognitively impaired compared to whites, while Mexican Americans had a 96% higher odds of cognitive impairment than whites. These disparities were present even with the inclusion of various sociodemographic, health status, and behavioral risk measures. Thus, we examined specifically the impact of years of education on these racial/ethnic

disparities. We found that years of education fully attenuated the difference in odds of cognitive impairment for Mexican Americans; however, blacks continued to have 166% higher odds of cognitive impairment compared to whites.

Next, our analysis of interaction terms between years of education and race and ethnicity showed support for *both* the diminishing returns hypothesis and minority poverty hypothesis. First, we find that blacks significantly benefit from more years of education, such that the cognitive impairment gap between blacks and whites steadily decreases with increasing years of education and ultimately closes at the highest level of education. Thus, this provides support for the minority poverty hypothesis as more educational attainment appears to reduce black adults' likelihood of cognitive impairment. Future research should parse out which aspects of educational attainment contribute to better cognitive functioning in later life, as well as consider how education may differentially impact cognition across cohorts of midlife and older adults may exhibit given the sociopolitical implications over time that have affected access to and quality of education for US blacks.

However, comparing the effect of education on cognitive impairment between Mexican Americans and whites reveals a different story. We find that at the lowest level of education, whites actually have a greater risk for cognitive impairment. With increasing years of education, whites exhibit lowering of the odds of being cognitively impaired. Still, the impact of increasing years of education is minimal for Mexican Americans. Therefore, this suggests diminishing returns of education of cognitive impairment for Mexican American older adults. Moreover, this should be interpreted within the context of the Hispanic Health Paradox, which posits that even in spite of lower SES Hispanics in the US fair better than their non-Hispanic white counterparts in regards to health (Markides & Coreil, 1986). While this phenomenon is consistently shown for

various health conditions and mortality, research using cognition as an outcome presents mixed results (Hill et al., 2012). Though we did not examine differences in the returns on education for cognitive impairment by foreign-born status, time of immigration into the US, or years lived in the US, this is an important area for future research to expand our understanding of cognitive aging processes in Mexican Americans. For example, previous research has suggested that English-language proficiency may be a mediator of the relationship between acculturation and cognitive functioning for Hispanic immigrants (Miranda et al., 2011).

This study is not without some limitations. First, we conducted cross-sectional analyses. Therefore, we can only assess the impact of education on cognitive impairment at one point in time. Future research should assess multiple waves of data to assess how education and other measures of SES may impact the timing of onset of cognitive impairment. We did not examine interactions with education and gender. Given the gender-based differences across multiple key measures shown in our descriptive statistics, future research should include models stratified by gender to test for a two-way interaction with education as well as three-way interactions with education and race/ethnicity. This analysis will contribute to the growing body of research applying an intersectional approach to understand health disparities.

One strength of the present study is that it draws on a large sample of racially and ethnically diverse US adults ≥65 years of age. We were able to focus on a specific Hispanic ethnic group – Mexican Americans. Given the cultural, immigration, and socioeconomic diversity of Hispanics in the US, focusing on Mexican Americans alone allows for generalizability of results for targeted intervention to reduce health disparities. Because the HRS provides several sociodemographic and health measures, we were able to control for multiple variables to better identify the role of education beyond other factors important for cognition.

Furthermore, we utilized a validated measure of cognitive functioning that encompasses within a population-based study.

In summary, we find that blacks and Mexican Americans are at increased risk for cognitive impairment in older adulthood compared to their white peers. Moreover, education operates differentially by race and ethnicity to impact cognitive impairment. This research contributes to the literature on cognitive functioning disparities. In particular, we extend the existing body of work on the social stratification of health to cognitive impairment. Thus, these findings can inform future research aimed at improving our understanding of the social determinants of cognitive aging outcomes.

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Table 1: Weighted descriptive statistics (proportions and means) by race/ethnicity and gender, Health and Retirement Study, 2012 wave >=65 years of age (n=8,903)

	Total (8,903)	White (7,162)		Black (1,268)		Mexican American (473)	
		Men (3,042)	Women (4,120)	Men (464)	Women (804)	Men (203)	Women (270)
Tot Cog	21.87	22.03	22.60*	18.49*	18.85*	18.99*	18.65*
Cognitively Impaired (TCIS<=9)	2.09%	1.64%	1.72%	6.74%*	4.78%*	3.35%	3.09%+
Age	74.37	74.01	75.03*	72.64*	73.73!	72.05*	72.37*
Edu Years	12.90	13.51	13.06*	11.41*	11.91*!	8.39*	7.93*
Log Wealth	4.86	5.15	4.98*	3.90*	3.20*!	3.92*	3.66*
Log Income	4.57	4.71	4.55*	4.45*	4.25*!	4.30*	4.08*!
Married/Partnered	58.26	74.54	48.62*	56.29*	27.80*!	84.29*	47.23*!
Obese	29.63%	28.82%	27.98%	31.71%	44.33%*!	32.58%	37.36%+
Moderate/Vigorous Activity							
Never	22.14%	17.68%	24.77%*	21.45%	31.93%*!	21.07%	19.42%
Sometimes	25.65%	24.44%	24.88%	36.26%*	29.94%*$	30.92%	31.36%*
Frequent	52.21%	57.88%	50.35%*	42.28%*	38.13%*	48.01%*	49.23%*
Smoke							
Never smoked	42.21%	31.92%	50.18%*	29.18%	49.40%*!	25.53%+	58.41%*!
Former smoker	48.36%	58.97%	40.87%*	54.29%*	41.23%*!	58.62%	32.60%*!
Current smoker	9.43%	9.12%	8.96%	16.53%*	9.37%!	15.85%+	8.99%
Alcohol							
Never	63.31%	52.93%	67.45%*	69.85%*	84.00%*!	60.23%*	89.34%*!
Moderate	31.21%	37.37%	30.61%*	19.01%*	14.47%*	23.24%*	7.72%*!
Heavy	5.49%	9.71%	1.94%*	11.14%	1.53%*!	16.52%*	2.93%*!
Total Number of Health Conditions	2.36	2.39	2.30*	2.41	2.67*!	2.19+	2.31
Psychiatric Diagnosis	17.37%	13.94%	20.69%*	9.61%*	15.35%!	14.49%	22.14%*!
CESD score >=3	18.43%	13.73%	20.68%*	15.42%	24.23%*!	26.53%*	31.91%*

* sig diff p<0.05 from white men

+ sig diff p<0.1 from white men

! Sig diff p<0.05 bw genders w/i race/ethnicity

$ Sig diff p<0.1 bw genders w/i race/ethnicity

Table 2: Logistic regression models examining cognitive impairment among US adults >=65, HRS 2012 (n=8,903)

	Model 1		Model 2	
	OR (95% CI)	**p value**	**OR (95% CI)**	**p value**
Black	3.56 (2.44 - 5.19)	***	2.66 (1.86 - 3.81)	***
Mexican American	1.96 (0.99 - 3.90)	+	0.64 (0.28 - 1.44)	
Education			0.84 (0.79 - 0.89)	***
Black*Education				
Mexican American*Education				
Constant	0.00002 (1.02e-06 - .0003)	***	0.00004 (2.09e-06 - 0.001)	***

Note: All models control for Demographics: age, gender, log income, log wealth, marital/partnership status; Health Factors: number of health conditions, psychiatric diagnoses, CES-D score; Behavioral Risks: obesity, moderate/vigorous physical activity, smoking status, and alcohol use

+p<0.1

***p<0.001

Figure 1. Race by Education Interaction Predicting Cognitive Impairment, HRS 2012

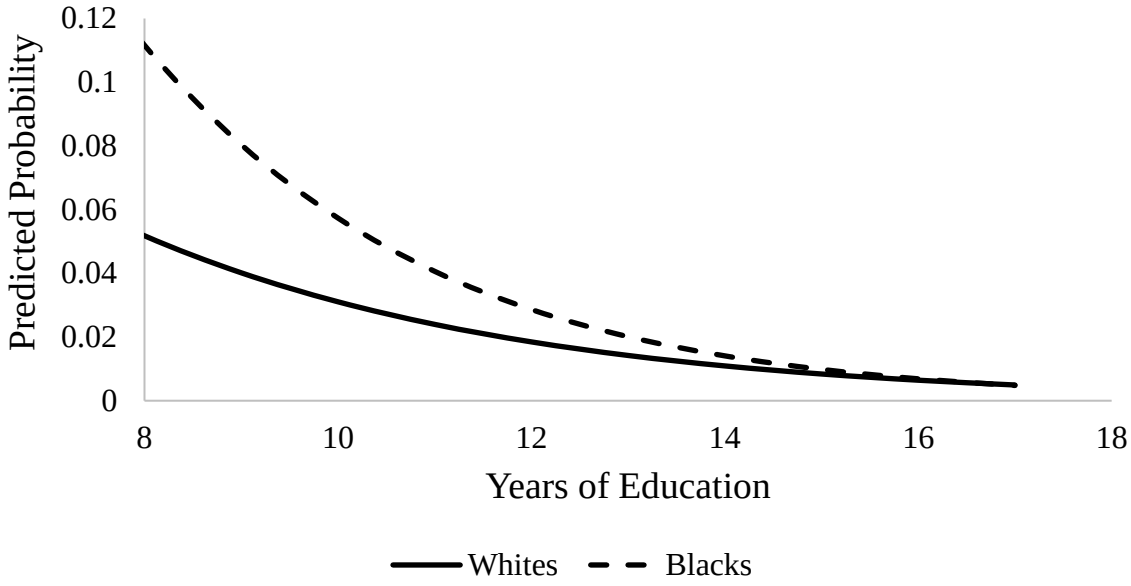

Figure 2. Ethnicity by Education Interaction Predicting Cognitive Impairment, HRS 2012