DEPARTMENT OF ECONOMICS

Working Paper

Racial Disparities in the Cognition-Health Relationship

By

Owen Thompson

Working Paper 2011-02

UNIVERSITY OF MASSACHUSETTS AMHERST

Racial Disparities in the Cognition-Health Relationship*

Owen Thompson
University of Massachusetts, Amherst

owen@econs.umass.edu

Abstract:

This paper investigates how the association between cognitive achievement and self-rated health in middle age differs by race, and attempts to explain these differences. The role of cognition in health determination has received only limited empirical attention, and even less is known about how race may affect this relationship. Using data from the NLSY, I find that while whites with higher cognitive achievement scores tend to report substantially better general health, this relationship is far weaker or wholly absent among blacks. Further tests suggest that about 35% of this racial difference can be explained by behavioral decisions during adulthood, and that another portion of the disparity may trace back to prenatal and early childhood experiences. The paper closes by noting that its results are broadly consistent with explanations of the racial health gap that emphasize entrenched forms of racial discrimination.

Key words: Cognition, Health, Race, AFQT, Birth Weight

* A version of this paper is forthcoming in *The Journal of Health Economics*,

Introduction

While scores on cognitive achievement tests have played a prominent role in economic studies of racial wage gaps, measures of cognition have received scant attention in the otherwise deep literature on the socioeconomic determinants of health. Only a handful of published studies contain any empirical analysis of the relationship between cognition and health (Grossman 1975; Hartog & Oosterbeek 1998; Gottfredson & Deary 2004; Auld & Sidhu 2005; Heckman 2007; Cutler & Lleras-Muney 2010) and none of these address potential racial differences in this association.[1] The paucity of research on this topic is surprising for multiple reasons. First, the incorporation of controls for cognitive achievement adds an important and novel characteristic to be analyzed alongside more traditionally used measures of socioeconomic status such as education and earnings. Perhaps more importantly, cognitive achievement is strongly correlated with early childhood experiences, and exploring its relationship with adult health may offer otherwise elusive information regarding critical pathways between socioeconomic background and health outcomes.[2]

The present paper seeks to begin filling this gap by estimating the determinants of adult health, among them a measure of cognitive achievement, for both black and white samples. The primary finding is that while the relationship between cognition and adult health is quite strong among whites, this relationship is much weaker or even absent entirely within the black population. The paper will proceed in four sections. The first section briefly describes the data, paying particular attention to the available measures of health and cognition. The second section presents the primary results and discusses their robustness and reliability. The third section explores two possible explanations for the primary findings, and presents additional empirical evidence on each explanation's validity. The fourth section considers possible alternative explanations and interpretations of the study's overall findings and concludes.

1. Data

[1] In a working paper, Cutler and Lleras-Muney (2008) address racial differences in the education-health gradient, and find that association to be stronger among whites than among blacks. While their question is distinct from the one addressed here, their findings broadly in line with this study's results on the cognition-health gradient.

[2] There has recently been strong and increasing interest in the relationship between childhood conditions and adult health. See for example Case, Lubtosky & Paxson 2002; Case, Fertig & Paxson 2005; and Frijters et al. 2010.

The data used in this study is drawn from the National Longitudinal Survey of Youth (NLSY). The NLSY began in 1979 with a sample of 12,686 individuals between the ages of 14 and 22, and respondents were eligible to be interviewed annually until 1994 and biennially thereafter, with the most recent wave available at the time of writing occurring in 2006. Retention rates were generally high, and by the time respondents began giving detailed health information in 1998 (see below), the response rate among eligible non-deceased participants was 86.7%.

Beginning in the 1998 wave of the NLSY, respondents were asked to complete a "40 and older health module", which among other items included a self rating of general health. Specifically, respondents were asked "in general, would you say your health is…" then given 5 choices ranging from poor to excellent. I have coded their responses so that higher numbers equate to better health. Members of the youngest NLSY cohort completed the health module during the 2006 wave of the survey, creating for the first time a set of detailed health variables for the entire active sample. Since self-rated health is the most general measure of health available and not subject to biases relating to health care access and diagnoses, it is the dependant variable used throughout most of this study.[3]

The NLSY contains a reliable measure of cognitive achievement as well. In 1980, 94% of the original 1979 sample completed all 10 sections of the Armed Services Vocational Aptitude Battery (ASVAB) exam. The primary proxy of cognitive ability used in this study is the sum of the respondent's score on the arithmetic reasoning, word knowledge and paragraph comprehension sections of the ASVAB plus one half their score on the numerical operations section of the test. This measure is commonly referred to as the Armed Forces Qualification Test (AFQT), and throughout this study it is measured in standard units, i.e. z-scores.

Since NLSY respondents were of different ages and had different levels of education at the time of testing, both of which have been shown to effect performance on the AFQT, unadjusted z-scores cannot credibly be inserted directly into a regression equation. To address this issue I follow the adjustment strategy utilized by Auld & Sidhu (2005). Their procedure first uses an estimate of the causal effect of education on AFQT score reported by Hansen, Heckman & Mullen (2003), who

[3]While self-rated health may be subject to considerable measurement error (see Baker, Stabile & Deri 2004) the harmful effects of that error are limited in this case since self-rated health is being used as a dependant variable. In any case, self-rated health measures may be generally preferable to specific disease measures, which typically ask the respondent whether they have been told by a doctor that they have a given disease, introducing a strong diagnostic bias. Even allowing for the possibility of measurement error, self-rated health has been shown to be a strong independent marker of future health issues. Idler & Benyamini (1997) review 27 studies which find a positive relationship between self-rated health and subsequent mortality, and suggest that self rated health may be such a consistent predictor of mortality because it incorporates otherwise unobservable but critical aspects of health determination.

estimated that each additional year of schooling causes an increase in AFQT score of .17 standard deviations, to subtract the portion of AFQT score due to education from each observation's unadjusted AFQT score. Then, the education-adjusted AFQT score is regressed on age at the time of testing, and the residuals of this regression are used as the adjusted AFQT measure.[4]

The NLSY also contains a rich and detailed set of demographic and socioeconomic variables that are utilized in this study, and some of these warrant a brief explanation. First, beginning with the foundational work of Grossman (1972), most health economists have conceptualized of health as a stock variable which reflects both current and previous values of important health determinants. Given this, in place of current income I use the mean of each respondent's annual household income between the ages of 22 and 38, and also include the standard deviation of income to account for income variability and insecurity. [5] Income data was inflated to 2006 dollars using the CPI-U-RS and is expressed in $10,000 increments.

Another important issue is controlling for childhood conditions that may impact adult health. Unfortunately, since NLSY participants were first interviewed at ages 14-22, direct measures of childhood health and other important childhood variables are only sparsely available. To proxy for relevant genetic and childhood factors, I use variables giving the highest grade completed by both of the respondent's parents, the number of siblings in the respondent's household at age 14, and dummy variables indicating whether either or both of the respondent's parents had died before the age of 60. In the results tables below, these variables are collectively referred to as "childhood controls."

Additionally, I make use of variables indicating highest grade completed, insurance coverage and marital status. For all of these variables I use their values at the time of health reporting, which is approximately 40 for each respondent. Finally, the analysis was conducted using sampling probability weights generated by the NLSY's online custom weighting program.

2. Results

[4] Alternative adjustment strategies do exist. For example, one could simply regress the unadjusted AFQT score on age and education at time of testing, and then use the residuals of this regression as the adjusted AFQT measure. Alternatively, unadjusted AFQT score could be inserted directly into regression equations that also include age and education at the time of testing as covariates. The results of this study's preferred specification using these alternative adjustment strategies are reported in Table A1 of the web appendix, are similar to those in Section 2 below.

[5] Since the oldest NLSY respondents were 22 during the first wave of the survey in 1979 and the first respondents to report self-rated health did so at age 39, ages 22-38 is the largest age range for which all active respondents have valid income observations.

One difficulty in analyzing the relationship between cognitive achievement and health is that cognition is known to be highly correlated with other important controls commonly included in health equations, particularly education and income. To help develop a clear understanding of the nature of the correlation between health and cognition, I begin by presenting simple bivariate regressions of self-rated health on AFQT score for white and black samples. These are reported in columns one and two of Table 1, and have two important features. The first is that the relationship is strong and significant within both racial groups, while the second is that the relationship is substantially stronger for whites than for blacks. Among whites a standard deviation increase in adjusted AFQT score is associated with an improvement in self rated health of .273 points, but among blacks the comparable figure is just .168, a difference of .105 points.[6] The reported p-value shows that this difference is highly significant.

Next, I estimate specifications with progressively more controls. The model estimated in columns three and four of Table 1 adds controls for marital status, health insurance coverage, gender, and the “childhood controls” noted above. Again, since measures of income and education are likely strongly related to AFQT, they remain excluded from this second specification. The results show that the addition of demographic and childhood controls does not substantively reduce the racial gap in AFQT coefficients. The new white AFQT coefficient of .170 is twice as large as the new black coefficient of .0805, so that the difference between the two decreases only slightly to .0895 points and remains highly significant.

The fifth and sixth columns of Table 1 present results from a fully saturated model that includes educational attainment as well as average annual adult income and its standard deviation. Since the inclusion of these controls further purges possible omitted factors that could influence both health and AFQT outcomes, this is the preferred specification. The racial differences in the cognition-health association are now even more striking than in the previous specifications. While the coefficient on AFQT score is reduced somewhat within the white population and is now .0776, in the black population the AFQT coefficient is not substantively or statistically different form zero, with a point estimate that is actually slightly negative at -.0123. The .0899 point difference between the black and white coefficients is statistically significant, with a p-value of .0184. Interestingly, the coefficients

---

[6] The standard deviation of self rated health over the whole sample is equal to 1.0093. Thus while I refer to the effect of independant variables in terms of “points”, these are approximately equal to standard deviation changes in the dependant self-rated health variable.

on the education and income variables are somewhat higher for blacks than for whites, suggesting that whatever is causing the differences in the AFQT coefficients may be unique to cognitive achievement.

Figure 1 provides a graphical representation of the results from the preferred specification by using the regression coefficients to generate predicted AFQT-health gradients for blacks and whites. The values of other variables are held constant at their overall population means, and to avoid over-extrapolating into sparsely populated AFQT values, the gradients are graphed over a domain equal to the mean AFQT score of each racial group plus and minus 1.5 standard deviations. While the gradient for whites (solid line) has the expected upward slope, the black gradient (dashed line) is flat, which reflects the lack of an association between AFQT and self-rated health among blacks.

A number of specification checks were conducted to assess the robustness of the results in Table 1, and are described here then reported in the web appendix. First, one may suspect that even though AFQT has no direct impact on the health of blacks, it may still be of importance as a mediating variable. For example blacks with high AFQT scores may be better able to convert increases in education or income into health. But interactions of AFQT and these other variables within the black sample return uniformly small and insignificant results. Alternatively, it may be that there is a positive relationship between AFQT and health among blacks, but only at high levels of AFQT. However, when quadratic and cubic AFQT terms are added to the specification, they are individually and jointly insignificant within the black sample, indicating a flat gradient throughout the AFQT distribution. Also, AFQT remains insignificant within the black population even when the sample is restricted to individuals with AFQT scores above the overall population mean. Since self-rated health may vary in a proportionate instead of an absolute manner, the preferred specification was also re-estimated using the log of self-rated health, and the key results were similar to those in the linear model. Finally, the main result is robust to estimating the equations as ordered probits and to using an un-weighted version of the sample. The consistency of these results suggests it is unlikely that the racial difference in AFQT's health impact is an artifact of specification problems.

3. Explaining the Non-Effect of AFQT Score Among Blacks

Two possible explanations of the previous section's results will be analyzed here. The first is that health behaviors are an important intermediary between cognition and self-rated health, and that the observed racial differences in the AFQT-health gradient are the result of differences in the relevant behavioral relationships. The second is that the racial difference in the association between cognition and adult health is rooted in childhood and prenatal experiences, and in particular may derive from a weaker connection between cognition and health endowments among blacks than among whites. Additional evidence on these two possibilities is reported below.

3.1 The Role of Health Behaviors

Perhaps the most intuitive reason why higher AFQT score would be associated with improved health is that AFQT may be positively associated with knowledge of health determinants and in turn with better health behaviors. The basic argument is that those with better cognitive skills are more capable of acquiring and processing often complex information about the precise behaviors which will result in good health, so that they are able to produce health more efficiently and optimally maintain higher levels of health. This idea was first put forth in the economics literature by Grossman (1972) and some empirical evidence in support of it has been found by Kenkel (1991) and by Gottfredson & Deary (2004). If the relevant behavioral relationships were stronger among whites than among blacks, it would help explain why the overall AFQT-health association is stronger as well.

Since the measure of general health used in this study is self-rated health, there are actually two distinct behavior related mechanisms through which the observed racial differences could arise. On the one hand, there may be racial differences in the observed behaviors of individuals with varying cognitive abilities. On the other hand, and somewhat less intuitively, the relationship between given health behaviors and self-rated health may be different for blacks than for whites.

As a first step in analyzing the importance of health behaviors in generating this paper's main result, I assess how controlling for health behaviors effects the overall racial difference in the AFQT-health association. To do so, the final two columns of Table 1 add three measures of health related behaviors to the preferred specification: whether the respondent has ever been a smoker, whether they reported heavy drinking in the last month,[7] and whether they had a body mass index (BMI) over 30, which is a standard definition of obesity.[8] The smoking and drinking variables are direct measures of

---

[7] Heavy drinking is defined as having drank 10 or more days in the past month *and* averaging 3 or more drinks per drinking occurrence. Reasonable changes in either part of this definition do not significantly change the results.
[8] While adding these variables is useful for the current purpose of assessing the role played by racial differences in behavioral factors, the model in columns five and six of Table 1 remains the preferred specification. This is because health behaviors could be viewed as legitimate health outcomes themselves, and thus conditioning on them may obscure the primary relationship of interest.

health behaviors, while the obesity variable is intended to proxy for behaviors related to diet and exercise.

The results suggest that differences in health related behaviors are a major contributor to the racial gap in the AFQT-health gradient. Whereas before the inclusion of behavioral variables this gap was .0899, afterwards it was reduced to .0588, an overall reduction of .0311 points or 35%, and the difference is no longer statistically significant. Methodologically, this approach is similar to the one used by Cutler & Lleras-Muney (2010) to decompose the education-health behaviors gradient, and a reasonable interpretation of the reduced gap is that 35% of the overall racial difference in the association between AFQT and self-rated health is due to differences in behavioral factors. This overall reduction could be due to either a larger response of adverse health behaviors to increased AFQT among whites, or to racial differences in how a given set of behaviors affects self-rated health. I address these two possibilities in turn.

Table 2 presents the results from regressions relating observable health behaviors to AFQT by race. For each health behavior variable, estimates from both bivariate and more fully specified models are reported for white and black subsamples. To ease the interpretation of the coefficients, all models are estimated with OLS, but using other estimation strategies such as logit or probit models does not change the basic nature of the results. The covariates in the fully specified models are highest grade completed, average annual adult household income and its standard deviation, gender and childhood controls identical to those used in Table 1.[9]

With respect to smoking, the bivariate results indicate that among whites a standard deviation increase in AFQT score reduces the probability of ever having smoked by approximately 11.3%, while the comparable figure among blacks is only 7.4%, and this difference is statistically significant. After adding the additional covariates, the white coefficient falls substantially but remains statistically significant and indicates that a standard deviation increase in AFQT reduces the probability of ever having smoked by approximately 2.7%, while the black coefficient falls almost to zero and is no longer statistically significant. Also, the difference between the black and white coefficients is no longer statistically significant.

The effects of AFQT score in the models with an indicator of heavy drinking as the dependant variable yield less clear results. In the bivariate models, higher AFQT score reduces the likelihood of

---

[9] The marriage and insurance variables are left out of these models due to endogeneity concerns.

heavy drinking among both racial groups, but these effects are small and statistically insignificant. If anything, the bivariate point estimates suggest that AFQT score reduces heavy drinking more among blacks than among whites. In the more fully specified models, a one standard deviation increase in AFQT score unexpectedly increases the probability of heavy drinking among whites by a statistically significant margin of about 2%, while the effect for blacks remains small and insignificantly negative. The difference between the white and black AFQT coefficients in these models is statistically significant.

Turning to the obesity equations, the bivariate specifications show that increased AFQT score is associated with a substantially reduced probability of obesity within both racial groups, but that the effect is considerably stronger for whites. Among whites, a standard deviation increase in AFQT score reduces the probability of obesity by approximately 4.3%, while among blacks a standard deviation increase in AFQT score reduces the probability of obesity by only approximately 2.9%, although the difference between the white and black coefficients is not statistically significant. In addition to lacking statistical significance in the bivariate specification, racial differences favoring whites disappear in the more saturated model. After conditioning on the additional controls, the white AFQT-obesity relationship is effectively reduced to zero, while the relationship for blacks actually increases somewhat in magnitude, and now indicates that a standard deviation increase in AFQT reduces the probability of obesity by approximately 3.7%. Also, the difference between the white and black AFQT coefficients becomes significant at the 5% level.

Overall, the results from Table 2 suggest that AFQT does not have a more favorable impact on health behaviors for whites than for blacks. Given this, I now turn to investigating racial differences in the relationship between a given set of health behaviors and self-rated health. In particular, I analyze the coefficients on the behavioral variables in the final two columns of Table 1. The coefficients on the indicator of heavy drinking are insignificant for both racial groups, although it is noteworthy that the point estimate in the black sample of -.136 is considerably larger its counterpart of -.0372 in the white sample. However, a Chow test (not shown) indicates that this difference is not statistically significant. For the smoking and obesity indicators, the coefficients in the white sample are much larger than those for the black sample. Specifically, the white and black smoking coefficients are -.175 and -.0614, respectively and the white and black obesity coefficients are -.424 and -.272, respectively. Chow tests (not shown) indicate that both of these differences are statistically significant. These results demonstrate that when blacks avoid smoking or obesity, they report moderately better general health, but that when whites avoid these same unhealthy behavioral traits they report far greater improvements in their general health. These differences likely account for a substantial portion of the overall black-white difference in the AFQT-health gradient.

Taking into account all of the evidence presented above, it may be most accurate to say that racial differences in behavioral factors are likely to account for some, but certainly not all, of the overall racial difference in the AFQT-health gradient. Additionally, it appears that racial differences in the relationship between self-rated general health and given health behaviors are a more important factor than racial differences in the relationship between AFQT score and specific health behaviors. Taking into account the role of both mechanisms, behavioral factors can explain about one third of the overall racial gap in the AFQT-health gradient, which while certainly substantial, still leaves and a sizeable portion of the gap to be explained by other causes. The next subsection considers one such additional explanation, the role of early experiences and health endowments.

3.2 The Role of Early Experiences

While the behaviorally driven explanations explored above were causal in nature, an alternative explanation is that both high cognition and good health are associated with a third factor not controlled for in the regressions from Table 1. One possible third factor linking cognitive achievement and adult health is an individual's health endowment, which for present purposes I will define as fixed characteristics present at the time of birth or shortly thereafter which impact health through the life cycle. It is now well established that health endowments determine a substantial portion of adult health, as evidenced by the power of prenatal and early childhood environmental factors to predict later health outcomes (Wadsworth & Kuh 1997; Barker 1997; Case, Lubtosky & Paxson 2002; Case, Fertig & Paxson 2005). A large portion of cognitive ability is also determined early in life, and again early childhood experiences have been shown to play a particularly important role (Heckman 2006; Cunha, Heckman & Schennach 2010).

The prenatal and early childhood experiences of a given individual depend mostly on the decisions or circumstances of that individual's parents, and the parental practices which lead to high health endowments seem likely to overlap considerably with the parental practices that encourage high AFQT scores. Given this, we might expect to observe a positive association between AFQT score and health endowment that is driven by their shared association with a particular set of parental practices. The existence and strength of such an AFQT-health endowment association early in life could help to explain the existence and strength of the more general AFQT-health association later in life as well. Of course, any racial differences in the AFQT-health endowment association are of particular interest in the present paper.

The empirical strategy pursued in this subsection is to first quantify any racial differences in the association between cognitive achievement scores and health endowments, and then to add controls for relevant parental behaviors and observe whether any such racial differences are attenuated. In order to implement this strategy, two important issues must be resolved. First, a credible measurement of health endowment must be obtained. Second, among the same individuals for whom health endowment is measured, an indicator of cognitive achievement is needed as well. Resolving these issues required using data on the children of NLSY respondents, and I explain my approach in detail below.

As my basic measure of health endowment I use an individual's birth weight, which has been shown to be strongly associated with of a number of adult health outcomes (Godfrey & Barker 2001; Behrman & Rosenzweig 2004; Black, Deveriux & Salvanes 2007). There is good reason to believe these associations are at least in part causal, because adverse prenatal environments can exert a direct impact on organ development. This is due to the fact that when a fetus does not receive adequate nutrition for normal rates of cell division and development, it tends to focus on protecting normal brain development even when it comes at the expense of organ development, which in addition to reducing birth weight may 'pre-program' specific organs to fail later in life (Barker 1997; Smith 1999).

Beyond being a consistent marker of later health outcomes, it is reasonable to believe that parental behaviors, as opposed to solely genetic or stochastic factors, have an important impact on birth weight. The relationship between birth weight and intrauterine environment is quite strong and intrauterine environment generally plays a much larger role than genetics in determining birth weight, as evidenced by data showing that the birth weights of half siblings who share a father have a correlation coefficient of just .1, whereas the comparable statistic for those who share a mother is .58 (Barker 1997). While some of this relationship may be driven by non-genetic physiological traits such as the size of the mother's uterus, behavioral factors like smoking cessation, maternal nutrition, and prenatal medical care also seem likely to play an important role.

NLSY participants were first interviewed between ages 14 and 22, and their birth weights were never collected. Also unavailable are proxies of the prenatal environment that NLSY respondents were subject to prior to birth, such as the behaviors of their mothers during pregnancy. However, as the NLSY participants themselves became parents, the survey did collect detailed data on their own behaviors during pregnancy and recorded the birth weights of their children. It is this information on the children of NLSY respondents that I use in my analysis.

But in order to measure the association between cognition and health endowment among the children of NLSY respondents, a measure of the children's cognitive achievement is of course needed as well. One available proxy for the cognitive achievement of the children of NLSY respondents is the AFQT score of their mothers. But should we expect parental AFQT to do a reasonably good job of predicting the cognitive achievement levels of the next generation? There is a large literature on the intergenerational transmission of cognitive achievement which spans all of the social sciences as well as research by neuroscientists and biologists, and it strongly suggests that parental AFQT scores are a reasonable proxy for children's AFQT scores. Despite extensive controversy over the exact portion of IQ or general intelligence 'g' (both of which strongly correlate to AFQT score) which is environmentally as opposed to genetically determined, there is little question that performance on achievement tests is strongly correlated between generations. Flynn (2000) averages estimates from 141 studies and reports a mean estimated correlation coefficient between average parent IQ and child IQ of .71.

Given this, the first two columns of Table 3 regress birth weight measured in grams on maternal AFQT score and controls for maternal income, educational attainment and age at the time of birth for samples of white and black mothers.[10] [11] The results provide some evidence that the relationship between cognition and health endowment varies by race. The results in the first column of Table 3 indicates that among whites, a standard deviation increase in maternal AFQT score is associated with an increase in birth weight of 56 grams, and that this relationship is significant at the 5% level. In contrast, the second column shows that among blacks a standard deviation increase in maternal AFQT score is associated with an increase in child birth weight of only 31 grams, 25 grams less than among whites, and that this relationship fails to approach statistical significance at

[10] The birth weight variable, as well as the maternal behavior variables in subsequent models, are measured in reference to the first live birth of female NLSY participants who reported at least one live birth. The rationale for restricting the analysis to first live births is that higher order births may vary in systematic ways from first births, and the only order of birth that is universal to all women who have had a live birth is the first.

[11] It may be the case that eventual educational attainment and income are better representations of socioeconomic status than educational attainment and income at the time of first birth. Using these alternative measures preserves the basic nature of the results reported in Table 3, and in fact non-trivially widens the racial gap in the impact of AFQT.

conventional levels. Despite this discrepancy in point estimates, the difference between the white and black AFQT coefficients is not statistically significant.

To put these estimates in context, the mean population-wide mean birth weight in the present sample is 3,256 grams, so that the 25 gram disparity between the white and black AFQT coefficients represents .77% of average birth weight. The overall white-black difference in birth weight may be a more appropriate point of reference, given that this gap is a major area of policy concern and research (Kleinman & Kessel 1987; Nepomnyaschy 2010). Within the present data, the mean birth weights among white and black mothers are 3,296 grams and 3,068 grams, respectively. This is a difference of 228 grams, so the 25 gram discrepancy in the white and black AFQT coefficients is equivalent to about 11% of the overall racial gap in birth weights. While modest, these magnitudes are not trivial, and it is certainly plausible that they could have a discernable impact on the strength of the cognition-health relationship in adulthood.

Of course, the models estimated in columns one and two of Table 3 did not control for maternal behaviors during pregnancy, and such behaviors may be an important intermediary factor leading to an association between cognition and health endowment. Given this, the racial differences in the strength of the overall relationship observed thus far may simply be due to racial differences in the relationship between maternal cognition and maternal behaviors during pregnancy. To test whether this is the case, the third and fourth columns of Table 3 add controls for four important maternal behaviors during pregnancy. These measures are indicators of whether the mother reduced or eliminated drinking, smoking and salt consumption during pregnancy, and whether she received regular prenatal medical care. These variables are all potentially important direct determinants of child health endowment, and are likely to be associated with other important unobserved behaviors as well.

The results in columns three and four show that racial differences in the relationship between maternal AFQT and child birth weight remain after controlling for maternal behaviors during pregnancy. The effect of a standard deviation increase in AFQT on the birth weight of white children falls modestly to 49 grams and remains significant at the 10% level, while the analogous estimate for black children is virtually unchanged at 32 grams and remains insignificant. The difference in AFQT coefficients is now 17 grams, which is equivalent to about 7.5% of the overall racial gap in birth weight. These results suggest that the stronger AFQT-health endowment relationship among whites is not simply an artifact of racial differences in maternal behaviors during pregnancy, although again the difference between the white and black AFQT coefficients is not statistically significant.

In addition to the noted lack of statistical significance in the differences between the black and white AFQT coefficients, it should be pointed out that the coefficients on educational attainment and income in the black sample are considerably larger than those in the white sample. This is especially true after controlling for maternal behaviors. Since cognition, education and income are all highly related, the results leave open the possibility that despite cognition playing a different role for the two racial groups, black and white individuals with generally comparable socioeconomic backgrounds may still be reasonably expected to have similar birth weight outcomes as well. While these considerations make the evidence in Table 3 less than conclusive, the results are still suggestive of a potentially important racial difference in the relationship between cognition and health endowments, and such a difference could be a contributing factor to this paper's main result.

4. **Discussion and Conclusion**

The most important finding of this paper has been that the relationship between cognitive achievement and self-rated health at middle age is much stronger for whites than for blacks. Two lines of explanation for this result have been proposed and, to the extent possible, tested empirically. The first was that the relationship between behavioral factors and cognitive achievement varies by race. Tests using smoking, heavy drinking and obesity indicated that behavioral factors play a substantial role in generating the paper's main finding, and that most of their effect seems to be due to smoking and obesity being less closely linked to the self-rated health of blacks than they are to the self-rated health of whites. The second proposed explanation was that racial differences in the adult AFQT-health gradient may derive from differences in that gradient early in life, and in particular may derive from a weaker association between maternal cognitive ability and children's health endowment among blacks. Some evidence of a weaker relationship between maternal AFQT and child health endowment for blacks was found, and that weaker association did not appear to be an artifact of differences in the maternal behaviors of black and white mothers with similar AFQT scores. However, these racial differences were modest in scale and were not statistically significant.

In general though, a substantial portion of the core result remains unexplained. Since the two most important variables of the analysis (AFQT score and self-rated health) may have significant subjective components that could vary across cultural groups, it is natural to hypothesize that racial bias in one or both of these measures accounts for the remaining racial gap.

The question of racial bias in the AFQT was addressed as part of a large validation study conducted by the National Academy of Sciences and the Department of Defense (Wigdor & Green 1991) and overall there is little if any evidence that the AFQT scores of blacks and whites systematically differ when reasonable measures of underlying ability are held constant. For example, Wigdor & Green (1991: 179) regress objective measures of job performance onto AFQT score for individual workers within a variety of military occupations, and find that AFQT has nearly identical regression coefficients and predictive power for the job performance of blacks and whites. Multiple studies have also found that the effect of AFQT score on wages is nearly identical for blacks and whites, which to the extent that wages reflect productivity or general ability indicates an absence of racial test score bias.[12] After a review of the relevant literature, Heckman (1995) concludes that "the best available evidence indicates that IQ and achievement tests [including AFQT] are not culturally biased."

While racial bias in the AFQT does not appear to be a likely explanation for this paper's main result, the reliability of the self-rated health variable for comparisons across racial groups remains an area of potential concern. Perhaps it is the case that due to cultural differences in health perception, self-rated health varies along racial lines even when true underlying health does not. One specific form of health reporting bias that could erroneously produce this study's main finding is a "ceiling effect" among blacks, in which self-rated health measures rarely exceed a given level, irrespective of underlying health. While there is some previous evidence that self-rated health is a non-racially biased predictor of observable health conditions and mortality,[13] this issue has not received enormous attention and there is currently no consensus among researchers as to whether blacks and whites exhibit systematically different self-ratings of health.

One simple method of assessing racial health reporting biases, including a possible ceiling effect, is to visually examine the white and black distributions of self-rated health, which are presented in Figure 2. The figure shows that while the white distribution is certainly more favorable overall than the black distribution, most of this racial difference occurs in the middle range of health

[12] For example, Neal & Johnson (1996) find that for black and white men the coefficients on standardized AFQT score in log wage equations are .208 and .183, respectively, while the coefficients for black and white women are .223 and .189, respectively. Similarly, Rodgers & Spriggs (1996) used adjusted AFQT percentile score in a log wage equation and found coefficients of .0053 and .0052 for black and white men, and coefficients of .0079 and .0069 for black and white women, although it should be noted that Rodgers & Spriggs emphasize the fact that the constants in the two equations typically differ by a statistically significant amount.

[13] For example, Chendola & Dickenson (2000) report finding no evidence of ethnic group differences in the association between self-rated health and hypertension, cardiovascular disease or diabetes.

ratings, as opposed to in the tails. In particular, while blacks are less likely to report the highest possible health rating of 5 (18.4% as compared to 23.5% for whites) Figure 2 displays no obvious ceiling effect among blacks.[14] Furthermore, even if we assume that meaningful culturally generated reporting biases exist and that they reduce the overall *level* of self-rated health among blacks, that would not explain why the *effect* of a trait like AFQT score is negligible in the black sample.

Although racial biases in either the AFQT or self-rated health appear unlikely to account for this study's main results, it is noteworthy that the results are broadly consistent with a theory of racial health gaps known as "the weathering hypothesis" (Geronimous, Hicken, Keene & Bound 2006). The basic underlying concept of the weathering hypothesis is allostatic load. Allostasis refers to the ability to achieve stability through change, and allostatic load is used in a medical context to describe the cumulative health burden of defensive physiological reactions to external threats and stressors (McEwen 1998). Examples of allostatic responses are when the body elevates epinephrine (adrenaline) levels or releases cortisol when confronted with an external threat. While these reactions are ideal for short term survival, regular or prolonged periods of elevated allostatic demands may take a cumulative toll on blood pressure, heart rate, and immune system functioning (McEwen 1998; Smith 1999).

It has been shown that allostatic load levels are generally higher for blacks than for whites, even after controlling for education and income, and the weathering hypothesis holds that the remaining racial gap is due to the cumulative effects of subtle forms of discrimination and from relatively immutable features of day to day life for blacks in the US (Geronimous, Hicken, Keene & Bound 2006). These features may include residential segregation, overexposure to air and water toxins, differential treatment within the health care system, or at the most basic level simply the increased stress associated with being part of a historically marginalized minority population.

If the institutionalized forms of discrimination posited by the weathering hypothesis do play an important role in overall racial health disparities, they may also help to explain the irresponsiveness of health to increased cognitive achievement scores among blacks documented here. As one illustrative example, it is unlikely that marginal increases in AFQT score would help blacks avoid environmental hazards if those hazards are linked not to daily behavioral decisions but rather to historically-rooted residential segregation. Similar reasoning can be applied to my findings on health behaviors and

[14] The racial difference in the proportion of individuals giving the best possible health rating becomes smaller when the analysis is restricted to individuals in relatively good health. For example, among respondents who gave health ratings of either 4 or 5, 36.2% of whites and 34.8% of blacks gave the highest possible rating.

health endowments. In both cases, the evidence suggested that the relevant behavioral responses of blacks and whites to increased cognitive scores were similar, but that for blacks those behavioral changes were less strongly associated with better self-rated health or higher health endowments. A weathering based interpretation of these findings is that institutionalized discriminatory factors may prevent blacks from converting healthy behaviors into enhanced general health or higher health endowments in the next generation.

While generally consistent with the evidence presented in this paper, the weathering hypothesis clearly does not constitute a complete explanation of the residual racial difference in the relationship between cognitive achievement and health. A fully satisfactory explanation of that residual will require further research on the mechanisms through which cognition is related to health and on how those mechanisms may be interrupted.

Appendix

The first four columns of Table A1 present versions of the paper's preferred specification using alternative methods of adjusting AFQT score to account for age and education when the AFQT was taken. The first and second columns show results for the white and black samples when age and education at the time of testing are simply added as covariates. Within the white sample, the AFQT coefficient is .0943 and is highly significant, but within the black sample the AFQT coefficient is slightly negative at -.00731 and is not statistically significant. The difference between the white and black AFQT coefficients is highly significant, with a p-value of .0086.

The third and fourth columns of Table A1 show results where each respondent's adjusted AFQT measure is the residual from a regression with AFQT score as the dependant variable and age and education at the time of testing as the independent variables. With this alternative adjustment technique, the health impact of AFQT within the black sample remains slightly negative and statistically insignificant, while within the white sample the AFQT coefficient falls to .0377 and just misses the conventional cutoff for statistical significance, with a t-statistic of 1.57 and a p-value of .1160. The difference between the white and black coefficients is just on the threshold of statistical significance as well, with a p-value of .1163.

The reduction in the white AFQT coefficient is likely due to the fact that educational attainment and AFQT score are highly correlated, so that using only the portion of AFQT score which is not explained by educational attainment excludes many of the unobservable characteristics which AFQT score otherwise indexes. The presence of this issue is the reason that the adjustment method used in the main body of this paper relies on the estimate of education's causal effect on AFQT score provided by Hansen, Heckman & Mullin (2003). Note that while the white AFQT coefficient is indeed smaller under this alternative adjustment method, it remains substantively large. The association between AFQT score and adult health within the white sample is of about the same magnitude as a $10,000 increase in average annual adult income, while within the black sample it is not meaningfully different from zero.

The fifth column of Table A1 reproduces the preferred specification for the black sample, but adds interaction terms of AFQT score with education and income. Both interaction terms are small and insignificant. Columns 6 through 8 investigate potential nonlinearities in the effect of AFQT score on health within the black sample by adding quadratic and cubic terms to the preferred specification and by estimating the preferred specification on a sample of blacks with AFQT scores above the population mean. In all cases, AFQT score remains an insignificant predictor of health among blacks. Table A2 shows results from three additional variants of the preferred specification. The first two columns enter self-rated health in logs; the middle two columns use an un-weighted version of the sample; and the final two columns estimate the preferred specification as an ordered probit. In all cases, AFQT score is a large and statistically significant predictor of adult health for whites, but is small and insignificant for blacks.

References

Auld C, Sidhu N. Schooling, cognitive ability and health. Health Economics 2005;14:1019-34.

Baker M, Stabile M, Deri C. What do self-reported objective measures of health measure? Journal of Human Resources 2004;39(4):1067-93.

Barker D. Maternal nutrition, fetal nutrition and diseases later in life. Nutrition 1997;13(9):807-13.

Behrman J, Rosenzweig M. Returns to birth weight. Review of Economics and Statistics 2004;86(2):586-601.

Black S, Devereux P, Salvanes K. From the cradle to the labor market? the effect of birth weight on adult outcomes. Quarterly Journal of Economics 2007;122(1):409-39.

Case A, Fertig A, Paxson C. The lasting impact of childhood health and circumstance. Journal of Health Economics 2005;24(2):365-89.

Case A, Lubtosky D:P, C. Economic status and health in childhood: The origins of the gradient. American Economic Review 2002;92(5):1308-34.

Chandola T, Jenkinson C. Validating self-rated health in different ethnic groups. Ethnicity & Health 2000;5(2):151-9.

Cunha F, Heckman JJ, Schennach SM. Estimating the technology of cognitive and noncognitive skill formation. Econometrica 2010;78(3):883-931.

Cutler D, Lleras-Muney A. Understanding differences in health behaviors by education. Journal of Health Economics 2010;29(1):1-28.

Cutler D, Lleras-Muney A. Understanding differences in health behaviors by education. Princeton University, Mimeo 2008.

Flynn A. IS trends over time. In: K. Arrow, S. Bowles, S. Durlauf, editors. Meritocracy and economic inequality. Princeton, NJ: Princeton University Press; 2000. .

Frijters P, Hatton T, Martin R, Shields M. Childhood economic conditions and length of life: Evidence from the UK boyd orr cohort, 1937-2005. Journal of Health Economics 2010;29(1):39-47.

Geronimus A, 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(5):826-33.

Godfrey K, Barker D. Fetal programing and adult health. Public Health and Nutrition 2001;4:611-24.

Gottfredson L, Deary I. Intelligence predicts health and longevity, but why? Current Directions in Psychological Science 2004;13:1-4.

Grossman M. The correlation between health and schooling. In: N. Terleckyj, editor. Household production and consumption, studies in income and wealth. New York, New York: Columbia University Press; 1975. .

Grossman M. The demand for health: A theoretical and empirical investigation. New York, New York: National Bureau of Economic Research; 1972. .

Hansen K, Heckman J, Mullen K. The effect of schooling and ability on cognitive achievement test scores. National Bureau of Economic Research Working Paper 2003.

Hartog J, Oosterbeek H. Health, wealth and happiness: Why pursue a higher education. Economics of Education Review 1998;17(3):245-56.

Heckman J. Skill formation and the economics of investing in disadvantaged children. Science 2006;312(5782):1900-2.

Heckman J. The economics, technology, and neuroscience of human capability formation. Proceedings of the National Academy of Sciences 2007;104(33):13250-5.

Heckman J. Lessons from the bell curve. Journal of Political Economy 1995;103(5):1091-120.

Idler E, Benyamini Y. Self-rated health and mortality: A review of 27 community studies. Journal of Health and Social Behavior 1997;38(1):21-37.

Kenkel D. Health behavior, health knowledge, and schooling. Journal of Political Economy 1991;99(2):287-305.

Kleinman J, Kessel S. Racial differences in low birth weight: Trends and risk factors. The New England Journal of Medicine 1987;317(12):749-53.

McEwen B. Protective and damaging effects of stress mediators. The New England Journal of Medicine 1998;338(3):171-9.

Neal D, Johnson W. The role of premarket factors in black-white wage differences. Journal of Political Economy 1996;104(5):869-95.

Nepomnyaschy L. Race disparities in low birth weight in the US south and the rest of the nation. Social Science & Medicine 2010;70(5):684-91.

Rogers W, Spriggs W. What does the AFQT reall measure: Race, wages, schooling and the AFQT score. Review of Black Poltical Economy 1996;24(4):13-46.

Smith J. Health bodies and thick wallets: The dual relationship between health and economic status. The Journal of Economic Perspectives 1999;13(2):145-66.

Wadsworth M, Kuh D. Childhood influence on adult health a review of recent work from the british 1946 national birth cohort study, the MRC national survey of health and development. Pediatric and Perinatal Epidemiology 1997;11(1):2-20.

Widgor A, Green B. Performance assessment for the workplace. Washington, DC: National Academy Press; 1991.

Tables & Figures

Table 1: Determinants of Self-Rated Health by Race

	Bivariate		Additional Controls Added		Education & Income Added		Health Behaviors Added	
	white	black	white	black	white	black	white	black
AFQT z-Score	0.273***	0.168***	0.170***	0.0805**	0.0776***	-0.0123	0.0732**	0.0144
	(0.0220)	(0.0289)	(0.0257)	(0.0367)	(0.0272)	(0.0404)	(0.0290)	(0.0434)
Highest Grade Completed					0.0576***	0.0637***	0.0418***	0.0605***
					(0.00813)	(0.0143)	(0.00862)	(0.0159)
Average Adult Income					0.0380***	0.0513***	0.0397***	0.0322**
					(0.00816)	(0.0147)	(0.00841)	(0.0158)
Standard Deviation of Average Adult Income					-0.0110***	-0.0186**	-0.0110**	-0.0143*
					(0.00428)	(0.00814)	(0.00459)	(0.00867)
Currently Married			0.141***	0.150**	0.0787*	0.0823	0.0771	0.0569
			(0.0486)	(0.0644)	(0.0472)	(0.0647)	(0.0489)	(0.0722)
Never Married			0.0337	-0.0292	0.0251	-0.0228	0.103	-0.0207
			(0.0681)	(0.0692)	(0.0670)	(0.0681)	(0.0706)	(0.0750)
Insured			0.224***	0.0355	0.136**	-0.0473	0.119**	-0.0321
			(0.0552)	(0.0655)	(0.0561)	(0.0659)	(0.0592)	(0.0752)
Female			-0.0204	-0.294***	-0.0230	-0.297***	-0.0563*	-0.303***
			(0.0327)	(0.0513)	(0.0322)	(0.0517)	(0.0340)	(0.0577)
Ever Been a Smoker							-0.175***	-0.0614
							(0.0363)	(0.0594)
Heavy Drinker							-0.0372	-0.136
							(0.0659)	(0.115)
Obese							-0.424***	-0.272***
							(0.0391)	(0.0576)
Childhood Controls	N	N	Y	Y	Y	Y	Y	Y
Constant	5.275***	4.208***	4.703***	4.667***	4.294***	3.894***	3.930***	5.309***
	(0.673)	(0.877)	(0.712)	(1.065)	(0.698)	(1.033)	(0.838)	(1.270)
Observations	3,940	2,450	3,451	1,585	3,437	1,576	2,896	1,287
R-squared	0.045	0.016	0.064	0.049	0.096	0.074	0.145	0.093
Point Difference in Magnitude of White and Black AFQT Coefficients	0.1050		0.0895		0.0899		0.0588	
P-Value from Chow Test of the Hypothesis that White and Black AFQT Coefficients are Equal	.0031		.0124		.0184		.1459	

Notes:
Robust standard errors are in parenthesis. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.
Omitted marriage category is divorced.
"Childhood Controls" include variables indicating the highest grade completed by both of the respondent's parents, the number of siblings in the respondent's household at age 14, and dummy variables indicating whether either or both of the respondent's parents had died before the age of 60.
Heavy drinking is defined as having drank 10 or more days in the past month *and* averaging 3 or more drinks each time.
All regressions control for age when health was reported, which is usually but not always 40.

Table 2: Effect of AFQT on Health Behaviors by Race

	Ever Been a Smoker				Heavy Drinking in Previous Month				Obese			
	white	black	white	black	white	black	white	black	white	black	white	black
AFQT z-Score	-0.113***	-0.0738***	-0.0266*	-0.00278	-0.00202	-0.0111	0.0202**	-0.00630	-0.0427***	-0.0292**	0.00504	-0.0374*
	(0.0110)	(0.0142)	(0.0147)	(0.0204)	(0.00624)	(0.00736)	(0.00801)	(0.0118)	(0.0112)	(0.0147)	(0.0144)	(0.0214)
Highest Grade Completed			-0.0477***	-0.0501***			-0.0147***	-0.000461			-0.0172***	-0.00462
			(0.00436)	(0.00714)			(0.00246)	(0.00382)			(0.00414)	(0.00805)
Average Adult Income			-0.0275***	-0.0314***			-0.000201	-0.00992**			-0.00324	0.0106
			(0.00417)	(0.00769)			(0.00189)	(0.00503)			(0.00340)	(0.00812)
Standard Deviation of Average Adult Income			0.0129***	0.0105***			0.000212	0.00573			-0.00205	-0.00621
			(0.00232)	(0.00390)			(0.00108)	(0.00357)			(0.00181)	(0.00397)
Female			0.0237	-0.114***			-0.0874***	-0.0793***			-0.0666***	0.0900***
			(0.0173)	(0.0271)			(0.0100)	(0.0144)			(0.0167)	(0.0286)
Childhood Controls	N	N	Y	Y	N	N	Y	Y	N	N	Y	Y
Constant	0.567***	0.428***	1.154***	1.148***	0.0782***	0.0553***	0.270***	0.0494	0.299***	0.400***	0.694***	0.481***
	(0.00945)	(0.0142)	(0.0677)	(0.113)	(0.00551)	(0.00700)	(0.0371)	(0.0585)	(0.00966)	(0.0147)	(0.0648)	(0.125)
Observations	3,960	2,385	3,282	1,469	3,556	2,247	3,114	1,450	3,438	2,155	3,019	1,385
R-squared	0.027	0.013	0.097	0.096	0.000	0.001	0.042	0.042	0.005	0.002	0.032	0.017
Point Difference in Magnitude of White and Black AFQT Coefficients	0.0392		0.0238		-0.0091		0.0265		0.0135		0.0424	
P-Value from Chow Test of the Hypothesis that White and Black AFQT Coefficients are Equal	0.0155		0.2402		0.3165		0.0185		0.4127		0.0360	

Notes:

Robust standard errors are in parenthesis. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively

"Childhood Controls" include variables indicating the highest grade completed by both of the respondent's parents, the number of siblings in the respondent's household at age 14, and dummy variables indicating whether either or both of the respondent's parents had died before the age of 60.

Heavy drinking is defined as having drank 10 or more days in the past month and averaging 3 or more drinks each time

To ease interpretation, all models are estimated via OLS. Estimation using logits or probits does not substantively change the results

Table 3: Effect of Maternal AFQT on Child Birth Weight by Race

	white	black	white	black
AFQT z-Score	56.00**	31.41	48.76*	31.88
	(26.99)	(29.68)	(26.91)	(30.14)
High Grade at Time of Birth	12.05	22.96*	0.867	20.45
	(9.017)	(13.93)	(9.224)	(13.87)
Average Adult Income at Time of Birth	1.355	6.878	1.273	8.593
	(2.063)	(10.95)	(2.100)	(10.83)
Age at Time of Birth	-11.45***	-12.08**	-11.21***	-12.02**
	(3.634)	(6.069)	(3.578)	(5.980)
Controls for Behaviors During Pregnancy	N	N	Y	Y
Constant	3,402***	3,080***	3,532***	2,824***
	(95.84)	(141.0)	(137.8)	(187.1)
Observations	1,395	857	1,392	853
R-squared	0.012	0.010	0.032	0.032
Point Difference in Magnitude of White and Black AFQT Coefficients	24.59		16.88	
P-Value from Chow Test of the Hypothesis that White and Black AFQT Coefficients are Equal	0.5234		0.6603	

Notes:

Controls for behaviors during pregnancy include indicators of whether each individual reduced smoking during pregnancy, reduced drinking during pregnancy, reduced salt consumption during pregnancy, and received routine prenatal medical care during pregnancy.

Robust standard errors are in parenthesis. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

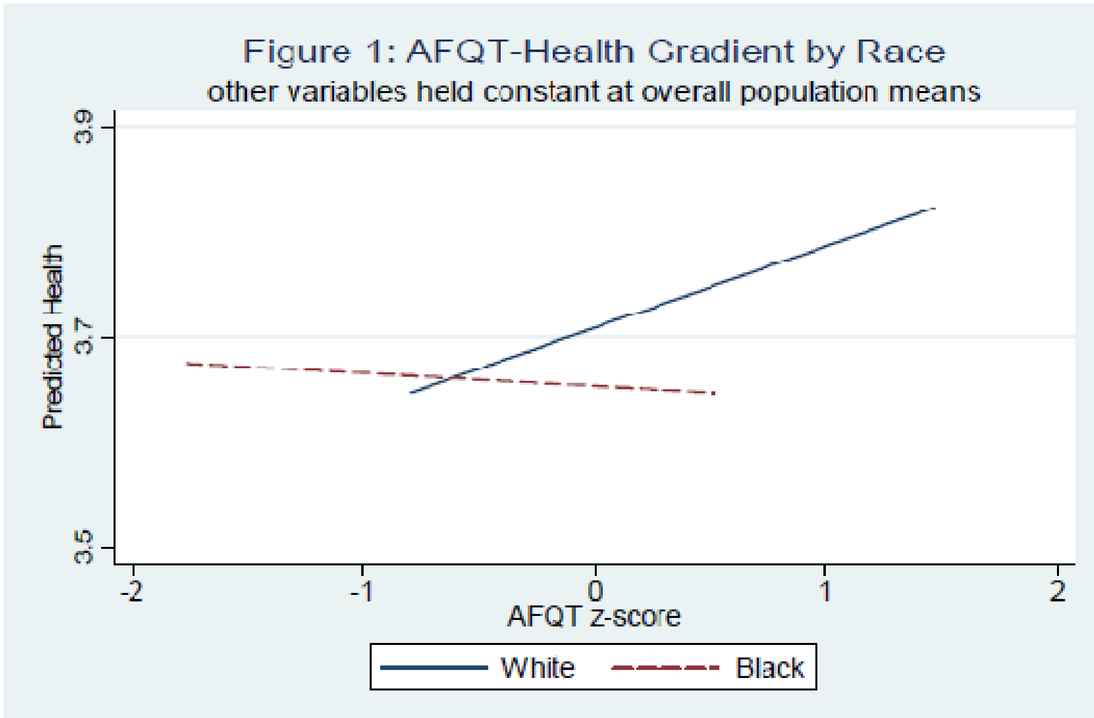

Figure 2: Self-Rated Health Distributions by Race

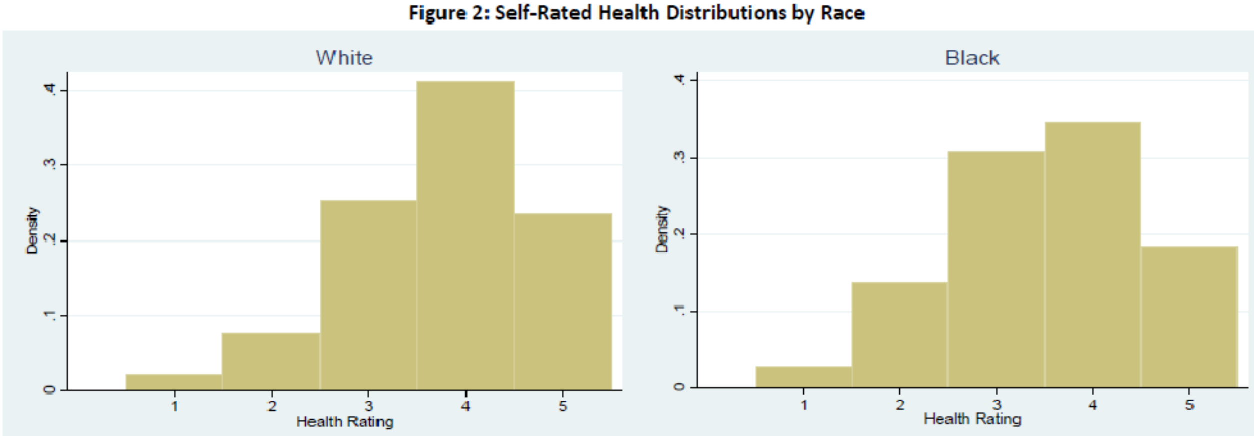

Table A1: Specification and Robustness Checks

Specification:	Age and Education at Time of Test as Covariates		AFQT "Cleansed" of Age and Education at Time of Test		Interaction Terms	Quadratic AFQT	Cubic AFQT	AFQT Above Population Mean
	white	black	white	black	black	black	black	black
AFQT z-Score	0.0943*** (0.0275)	-0.00731 (0.0414)	0.0377 (0.0254)	-0.0182 (0.0377)	0.191 (0.212)	-0.00980 (0.0487)	0.0319 (0.0645)	-0.0357 (0.133)
AFQT z-Score Squared	-	-	-	-	-	0.00251 (0.0365)	-0.0542 (0.0481)	-
AFQT z-Score Cubed	-	-	-	-	-	-	-0.0432 (0.0361)	-
(AFQT z-Score) x (Highest Grade Completed)	-	-	-	-	-0.0141 (0.0165)	-	-	-
(AFQT z-Score) x (Average Adult Income)	-	-	-	-	-0.00349 (0.0110)	-	-	-
Highest Grade Completed	0.0391*** (0.00880)	0.0569*** (0.0166)	0.0632*** (0.00789)	0.0633*** (0.0137)	0.0593*** (0.0155)	0.0636*** (0.0143)	0.0639*** (0.0143)	0.0452* (0.0271)
Average Adult Income	0.0344*** (0.00809)	0.0495*** (0.0149)	0.0392*** (0.00814)	0.0515*** (0.0146)	0.0503*** (0.0147)	0.0513*** (0.0147)	0.0517*** (0.0147)	0.0389* (0.0234)
Standard Deviation of Average Adult Income	-0.00941** (0.00423)	-0.0177** (0.00820)	-0.0115*** (0.00427)	-0.0186** (0.00813)	-0.0185** (0.00815)	-0.0186** (0.00814)	-0.0187** (0.00814)	-0.0132 (0.0133)
Currently Married	0.0760 (0.0471)	0.0838 (0.0649)	0.0791* (0.0473)	0.0827 (0.0647)	0.0810 (0.0648)	0.0825 (0.0649)	0.0809 (0.0648)	-0.0194 (0.130)
Never Married	0.0202 (0.0668)	-0.0221 (0.0682)	0.0229 (0.0670)	-0.0226 (0.0681)	-0.0217 (0.0682)	-0.0228 (0.0682)	-0.0253 (0.0679)	-0.0638 (0.141)
Insured	0.126** (0.0558)	-0.0497 (0.0662)	0.141** (0.0562)	-0.0474 (0.0659)	-0.0526 (0.0663)	-0.0474 (0.0660)	-0.0550 (0.0662)	0.299* (0.169)
Female	-0.0312 (0.0322)	-0.299*** (0.0519)	-0.0228 (0.0322)	-0.297*** (0.0518)	-0.299*** (0.0517)	-0.297*** (0.0519)	-0.298*** (0.0519)	-0.387*** (0.108)
Age at Time of AFQT	-0.0366*** (0.0132)	-0.00535 (0.0186)	-	-	-	-	-	-
Highest Grade Completed at Time of AFQT	0.0609*** (0.0172)	0.0197 (0.0267)	-	-	-	-	-	-
Constant	4.538*** (0.715)	3.937*** (1.070)	4.249*** (0.699)	3.903*** (1.027)	3.977*** (1.043)	3.898*** (1.025)	4.031*** (0.969)	5.454*** (1.986)
Observations	3,437	1,576	3,437	1,576	1,576	1,576	1,576	370
R-squared	0.103	0.075	0.094	0.074	0.075	0.074	0.076	0.093

Notes:
Robust standard errors are in parenthesis. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.
Omitted marriage category is divorced.
All models include "Childhood Controls" indicating the highest grade completed by both of the respondent's parents, the number of siblings in the respondent's household at age 14, and dummy variables indicating whether either or both of the respondent's parents had died before the age of 60. All models also control for age when health was reported, which is usually but not always 40.

Table A2: Additional Specification and Robustness Checks

Specification:	Log of Self-Rated Health		Unweighted		Ordered Probits	
	white	black	white	black	white	black
AFQT z-Score	0.0245***	-0.000978	0.0883***	0.00572	0.0845***	-0.0216
	(0.00883)	(0.0132)	(0.0267)	(0.0386)	(0.0317)	(0.0459)
Highest Grade Completed	0.0185***	0.0203***	0.0604***	0.0638***	0.0692***	0.0736***
	(0.00261)	(0.00462)	(0.00777)	(0.0138)	(0.00997)	(0.0166)
Average Adult Income	0.0126***	0.0173***	0.0378***	0.0521***	0.0464***	0.0567***
	(0.00257)	(0.00452)	(0.00797)	(0.0142)	(0.0107)	(0.0171)
Standard Deviation of Average Adult Income	-0.00416***	-0.00664***	-0.0107***	-0.0189**	-0.0118**	-0.0198**
	(0.00132)	(0.00243)	(0.00403)	(0.00805)	(0.00544)	(0.00952)
Currently Married	0.0316*	0.0342	0.0726	0.0707	0.0769	0.0910
	(0.0161)	(0.0211)	(0.0451)	(0.0624)	(0.0545)	(0.0728)
Never Married	0.0177	0.00161	0.0219	-0.0537	0.0176	-0.0333
	(0.0217)	(0.0231)	(0.0640)	(0.0661)	(0.0777)	(0.0758)
Insured	0.0386**	-0.0165	0.103*	-0.0462	0.151**	-0.0475
	(0.0194)	(0.0220)	(0.0543)	(0.0643)	(0.0624)	(0.0738)
Female	-0.0134	-0.0940***	-0.0377	-0.318***	-0.0203	-0.338***
	(0.0103)	(0.0166)	(0.0310)	(0.0496)	(0.0385)	(0.0593)
Constant	1.510***	1.276***	4.086***	3.927***	-	-
	(0.239)	(0.317)	(0.679)	(0.932)		
Observations	3,437	1,576	3,437	1,576	3,437	1,576
R-squared	0.091	0.075	0.099	0.079	-	-

Notes:

Robust standard errors are in parenthesis. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

Omitted marriage category is divorced.

All models include "Childhood Controls" indicating the highest grade completed by both of the respondent's parents, the number of siblings in the respondent's household at age 14, and dummy variables indicating whether either or both of the respondent's parents had died before the age of 60. All models also control for age when health was reported, which is usually but not always 40.