

Blacks' Diminished Health Returns of Educational Attainment: Health and Retirement Study

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Abstract

Background: Education level reduces the risk of health problems such as poor self-rated health (SRH), high body mass index (BMI), and depressive symptoms (DS). Marginalization-related diminished returns (MDRs), however, refer to smaller health benefits of socio-economic status (SES) indicators particularly educational attainment for the members of racial minority groups such as non-Hispanic Blacks compared to the majority group (non-Hispanic Whites). It is not known, however, if MDRs also hold for middle-age and older adults over a long period of time. **Aims:** The current study used a nationally representative data set to explore racial variation in the predictive utility of baseline education level on protecting people against poor SRH, BMI, and DS. **Materials and Methods:** Data for this analysis were borrowed from the Health and Retirement Study (1992-ongoing), a nationally representative longitudinal study that followed 10,023 middle-aged and older adults (50+ years old) for up to 26 years. From this number, 1877 (18.7%) were non-Hispanic Black Americans, and 8146 (81.3%) were non-Hispanic White Americans. Education level was the independent variable. We used cluster analysis to categorize individuals to low- and high-risk groups (outcome) based on SRH, BMI, and DS over 26 years. Age and gender were the covariates. Race was the moderator. **Results:** Overall, high education level reduced the odds of poor SRH, BMI, and DS over the 26 years of follow-up. Interactions were observed between race and education on all three health outcomes indicating smaller protective effects of baseline educational attainment on poor health over time, regardless of the outcome. **Conclusions:** In line with the MDRs, highly educated non-Hispanic Black Americans remain at high risk for poor health across domains, a risk which is unexpected given their education. The risk of all health outcomes, however, is the lowest for non-Hispanic White Americans with the highest education. Policies that exclusively focus on equalizing racial gaps in SES (e.g., education) may fail to eliminate the racial and ethnic health inequalities because of the racial inequalities in the marginal health return of education. Public policies must equalize education quality and address structural and environmental barriers that are disproportionately more common in the lives of non-Hispanic Black Americans, even at high education levels. Future research should test how contextual factors, segregation, labor market practices, childhood poverty, and education quality reduces the health return of education for highly educated non-Hispanic Black Americans.

Keywords: Socio-economic position, Socio-economic status, Educational attainment, Race, Ethnic groups, African Americans, Blacks

Introduction

Socio-economic status (SES) is among the significant determinants of health and illness.^[1-5] High SES is among major risk factors of mental and physical health problems.^[1,2] High educational attainment,

one of the main indicators of low SES, increased the risk of poor self-rated health (SRH),^[6,7] high body mass index (BMI), and depressive symptoms (DS).^[8-11] High SES may, however, differently impact health and well-being of sub-populations. For example,



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education^[12] employment^[13,14] marital status,^[15] and income^[16] show smaller health effects for non-Hispanic Black than non-Hispanic White individuals. That is, middle class non-Hispanic Blacks^[16] remain at high risk of health risk behaviors, chronic disease,^[16] disability,^[17] hospitalization, and mortality. Whether these patterns remain for the effects of education on various health outcomes over a long period of time is still unclear.^[18]

According to the marginalization-related diminished returns (i.e., MDRs)^[19,20] effects of SES indicators particularly educational attainment tend to be weaker on economic, behavioral, and health outcomes for the members of socially marginalized groups in comparison to the members of the socially privileged groups. This is particularly true for racial minority groups such as non-Hispanic Blacks relative to Whites (the majority group). A large body of research has shown that educational attainment generates better and more income^[1,2,21] and employment conditions^[14,22] of non-Hispanic White than non-Hispanic Black people. Education attainment also better reduces environmental exposures for non-Hispanic Whites than non-Hispanic Blacks.^[14,23] As a result, highly educated^[24] employed^[25] married,^[26] and high income^[16] non-Hispanic Black individuals remain at risk of poor health. Similarly, educational attainment better enhances exercise,^[27] healthy diet,^[28] and even better reduces stress^[13,14,29] for non-Hispanic Whites than non-Hispanic Blacks.

As a result of these MDRs, middle-class non-Hispanic Blacks' health still suffers despite having access to SES resources. It has been shown that the effects of various SES indicators such as education,^[30,31] marital status,^[26] and employment^[32] on the risk of mortality are all weaker for non-Hispanic Blacks than non-Hispanic Whites. Similarly, education better reduces the risk of hospitalization^[33] and disability^[17] for non-Hispanic Whites than non-Hispanic Blacks. Similarly, education and income better reduce the risk of obesity,^[34,35] depression,^[30] asthma,^[36] chronic obstructive pulmonary disease,^[37] and hypertension^[38] for non-Hispanic Whites than non-Hispanic Blacks. It is, however, unknown if these effects remain stable over long periods of time.

Aims

To better understand whether the MDRs phenomena also applies to racial disparities in health over a long period of time, we compared non-Hispanic Black and non-Hispanic White middle-age and older Americans for the protective

effect of education level on average burden of SRH, BMI, and DS over 26 years of follow-up. Although research has well-documented the additive effects of race and SES (education level) on long-term health outcomes,^[39,40] very few studies have ever tested MDRs of educational attainment on morbidity over a long period of time.^[41] Such a study would require studying the non-additive and multiplicative effects of race and educational attainment on long-term data on various aspects of health. Such approach would require long-term data with follow-up of health over a long period of time. We used data from the health and retirement study (HRS), an ongoing study with a national and representative sample of middle-aged and older adults (50–59 years old at baseline). In line with the MDRs,^[19,20] we expected smaller protective effects of education level on all aspects of health over time for non-Hispanic Black compared to non-Hispanic White Americans.

Built on the HRS data, this study aimed to explore racial differences in the effects of educational attainment and income on a 26-year life expectancy of middle-aged and older American adults. In concordance with the MDRs framework,^[19,20] we expected weaker effects of baseline educational attainment on SRH, BMI, and DS of non-Hispanic Black middle-aged and older adults in comparison to their non-Hispanic White counterparts. In other terms, we expected a gr proportion of highly educated non-Hispanic Black middle-aged and older adults still die early, compared to their highly educated non-Hispanic White counterparts.

Materials and Methods

Design and setting

Data came from the first ten waves of the HRS (HRS, 1992 – ongoing). The HRS is a state-of-the-art long-term longitudinal study, with biannual repeated measurements. The study recruited and followed a nationally representative sample of American middle-aged and older adults (age 50–59 years at baseline). Although more detailed methodological information exists on study design, measures, sample, and sampling of the HRS,^[42] we provide a summary of the critical aspects of the HRS.

Sample and sampling

The HRS has used a national area probability sampling to recruit participants. The current



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analysis only included the core (primary) sample that was recruited in 1992. All participants were 50–59 years old at wave one. That means all our participants were born between 1931 and 1941. The HRS sample reflects all 50–59-year-old middle-aged and older adults who resided in US households in 1992 (Wave 1).

Analytical sample

The analytical sample of the current study was 50+ years old Americans who were non-Hispanic White or Black. Only non-Hispanic people were enrolled in our analysis. All participants in the HRS core sample could enter our analysis regardless of the duration of follow-up because our outcome was time from follow up to mortality. Thus, participants were analyzed only if they were non-Hispanic White or non-Hispanic Black ($n = 10,023$).

Data collection

The HRS study collected an extensive data collection that expended to various aspects of the participants. This data collection included demographic information, SES indicators, social factors, psychological assets and traits, health behaviors, health service utilization, and objective and subjective measures of health. While HRS collected data from both participants and their spouses, we only used the participants' data. Data were collected biannually. The HRS data were collected in either telephone or a face-to-face interview. Individuals who were not available themselves, a proxy interview was used.

Measures

Demographic factors

Age (years) and gender (0/1) were demographic factors. Age was a continuous measure (recorded as the number of years passed since birth). Gender was a dichotomous variable, coded as male = 1, female = 0. Age and gender were both measured in 1992.

SES indicator

In this study, educational attainment was a continuous measure. Education was recorded in years of schooling, which was measured at baseline (1992).

SRH

SRH was measured using the conventional single item measure. Research has shown that poor SRH predicts mortality, net of other independent risk factors. SRH was measured every 2 years from 1992 to 2016.^[43] Although this variable was continuous, we used k-mean cluster analysis to define risk categories over the 26 years of follow-up.

BMI

Height and weight were measured in wave 10. BMI was calculated as the person's weight in kilograms divided by the square of height in meters. BMI was operationalized as a continuous measure. Although this variable was continuous, we used k-mean cluster analysis to define risk categories over the 26 years of follow-up.

DS

HRS used the 8-item CES-D measure to assess DS. Items were on a 0/1 response scale. DS were measured every 2 years from 1994 to 2016. Although this variable was continuous, we used k-mean cluster analysis to define risk categories over the 24 years of follow-up (first wave did not have DS).

Data analysis

We analyzed the HRS data using SPSS 23.0 (IBM Corporation, Armonk, NY, US). For our univariate analyses, means (standard deviation: SD) and absolute/relative frequencies (n and %) were reported. To define outcomes, we used k-mean cluster analysis with all observations of either SRH, BMI, and DS as input variables. Using this approach, participants were categorized to low risk (coded as 0) or high risk (coded as 1) groups.

For multivariable analysis, we applied logistic regressions. In these models, membership of the cluster of poor SRH, BMI, and DS was considered as binary outcomes. First, we ruled out the multi-collinearity between race and educational attainment. We did not have any missing data for our outcomes because individuals could become a member of a cluster group regardless of number of observations and missing data. We ran 12 logistic regression models, three for each outcome: Model 1 was without interaction in the pooled sample, Model 2 was with the statistical interaction term between race and educational attainment in the pooled



sample, and Model 3 was in non-Hispanic White and Model 4 was in non-Hispanic Black people.

Ethics statement

The HRS study protocol was approved by the University of Michigan Institutional Review Board. All HRS participants signed written consent. The data were collected, restored, managed, and analyzed in a fully anonymous fashion. As we used fully de-identified publicly available data, this study was non-human subject research, according to the NIH definition.

Results

Descriptives

This analysis included a total of 10,023 middle-aged and older adults (50+ years old) who were followed for 26 years. From this number, 1877 (18.7%) were non-Hispanic Black Americans, and 8146 (81.3%) were non-Hispanic White Americans. Table 1 presents a summary of the descriptive characteristics of the overall sample and by race.

Logistic regressions

Table 2 summarizes the results of two logistic regressions for SRH as the outcome. Model 1

was without interactions (main effects model) while Model 2 (Main Effects + Interaction Model) had a statistical interaction between educational attainment and race. Model 1 showed that overall; higher education level is associated with lower odds of being at high risk cluster for SRH over the 26 years of follow-up, while all confounders were controlled. Model 2 showed a statistically significant interaction between the effects of race and education level on the outcome over the 26 years of follow-up, suggesting that the negative effect of education level against risk of SRH was smaller for non-Hispanic Black Americans compared to non-Hispanic White Americans.

Table 2 also summarizes the results of two identical race-specific logistic regression models for SRH as the outcome. Model 3 was performed in non-Hispanic White Americans and Model 4 was in non-Hispanic Black Americans. Model 3 and Model 4 showed that higher education level is associated with better SRH for non-Hispanic White but not non-Hispanic Black Americans [Table 2].

Table 3 summarizes the results of two logistic regressions for BMI as the outcome. Model 1 was without interactions (main effects model) while Model 2 (Main Effects + Interaction Model) had a statistical interaction between educational attainment and race. Model 1 showed that overall;

Table 1: Descriptive statistics (n=10,023)

Characteristics	ALI		Non-Hispanic Whites		Non-Hispanic Blacks	
	Mean	SD	Mean	SD	Mean	SD
Age	56.47	4.44	56.50	4.45	56.31	4.40
Education*	12.33	2.88	12.62	2.69	11.09	3.30
	n	%	n	%	n	%
Gender*						
Female	4942	49.3	3914	48.0	1028	54.8
Male	5081	50.7	4232	52.0	849	45.2
Poor SRH*						
No	5371	53.6	4698	57.7	673	35.9
Yes	4652	46.4	3448	42.3	1204	64.1
High BMI						
No	6892	68.8	5785	71.0	1107	59.0
Yes	3131	31.2	2361	29.0	770	41.0
High DS*						
No	7347	79.3	6149	81.4	1198	70.1
Yes	1914	20.7	1402	18.6	512	29.9

*P<0.05, Standard Deviation (SD). SRH: Self-rated health, BMI: Body mass index, DS: Depressive symptoms



Table 2: Pooled sample and race-specific logistic regressions for self-rated health

Characteristics	All						White			Black							
	Model 1 (main effects)			Model 2 (main Effects + Interactions)			OR	95% CI	P	OR	95% CI	P					
	OR	95% CI	P	OR	95% CI	P											
Race (black)	1.99	1.78	2.22	0.000	1.12	0.69	1.79	0.649	-	-	-	-					
Gender (male)	1.06	0.98	1.16	0.156	1.07	0.98	1.16	0.126	1.14	1.04	1.26	0.005	0.78	0.64	0.95	0.013	
Age (years)	1.04	1.03	1.05	0.000	1.04	1.03	1.05	0.000	1.05	1.04	1.06	0.000	1.03	1.00	1.05	0.025	
Education (years)	0.81	0.80	0.82	0.000	0.80	0.79	0.82	0.000	0.80	0.78	0.82	0.000	0.83	0.81	0.86	0.000	
Education (years) x race	-	-	-	-	1.05	1.01	1.09	0.015	-	-	-	-	-	-	-	-	-
Intercept	0.89			0.696	1.00			0.997	0.86			0.637	3.39				0.099

Table 3: Pooled sample and race-specific logistic regressions for body mass index

Characteristics	All						White			Black							
	Model 1 (main effects)			Model 2 (main effects + interactions)			OR	95% CI	P	OR	95% CI	P					
	OR	95% CI	P	OR	95% CI	P											
Race (black)	1.60	1.44	1.78	0.000	0.93	0.62	1.38	0.716	-	-	-	-					
Gender (male)	0.95	0.88	1.04	0.297	0.96	0.88	1.05	0.376	1.14	1.03	1.26	0.008	0.50	0.41	0.61	0.000	
Age (years)	0.96	0.95	0.97	0.000	0.96	0.95	0.97	0.000	0.96	0.95	0.97	0.000	0.96	0.94	0.99	0.001	
Education (years)	0.96	0.95	0.98	0.000	0.95	0.93	0.97	0.000	0.95	0.93	0.97	0.000	0.99	0.96	1.02	0.355	
Education (years) x race	-	-	-	-	1.05	1.01	1.08	0.005	-	-	-	-	-	-	-	-	-
Intercept	6.32			0.000	7.29			0.000	7.56			0.000	9.08				0.002



higher education level is associated with lower odds of being at high risk cluster for BMI over the 26 years of follow-up, while all confounders were controlled. Model 2 showed a statistically significant interaction between the effects of race and education level on the outcome over the 26 years of follow-up, suggesting that the negative effect of education level against risk of BMI was smaller for non-Hispanic Black Americans compared to non-Hispanic White Americans.

Table 3 also summarizes the results of two identical race-specific logistic regression models. Model 3 was performed in non-Hispanic White Americans, and Model 4 was in non-Hispanic Black Americans. Model 3 and Model 4 showed that higher education level is associated with the lower BMI for non-Hispanic White but not non-Hispanic Black Americans [Table 3].

Table 4 summarizes the results of two logistic regressions for SRH as the outcome. Model 1 was without interactions (main effects model) while Model 2 (main effects + interaction model) had a statistical interaction between educational attainment and race. Model 1 showed that overall; higher education level is associated with lower odds of being at high risk cluster for DS over the 26 years of follow-up, while all confounders were controlled. Model 2 showed a statistically significant interaction between the effects of race and education level on the outcome over the 26 years of follow-up, suggesting that the negative effect of education level against risk of DS was smaller for non-Hispanic Black Americans compared to non-Hispanic White Americans.

Table 4 also summarizes the results of two identical race-specific logistic regression models for DS as the outcome. Model 3 was performed in non-Hispanic White Americans, and Model 4 was in non-Hispanic Black Americans. Model 3 and Model 4 showed that higher education level is associated with better DS for non-Hispanic White but not non-Hispanic Black Americans [Table 4].

Discussion

This study documented two main findings: First, high education level at baseline was associated with better health status over 26-years of follow-up in the overall sample. Second, compared non-Hispanic White Americans, non-Hispanic Black Americans remained at a relative disadvantage regarding the protective effects of educational level on various aspects of health. That is because the



Table 4: Pooled sample and race-specific logistic regressions for depressive symptoms

Characteristics	All						White			Black		
	Model 1 (main effects)			Model 2 (main effects + interactions)			OR	95% CI	P	OR	95% CI	P
	OR	95% CI	P	OR	95% CI	P						
Race (black)	1.39	1.22	1.57	0.000	0.90	0.57	1.43	0.654	-	-	-	-
Gender (male)	0.67	0.60	0.74	0.000	0.67	0.60	0.75	0	0.69	0.61	0.78	0.000
Age (years)	1.00	0.98	1.01	0.487	1.00	0.98	1.01	0.521	1.00	0.99	1.01	0.983
Education (years)	0.82	0.81	0.84	0.000	0.81	0.79	0.83	0	0.81	0.79	0.83	0.000
Education (years) x race	-	-	-	-	1.04	1.00	1.08	0.058	-	-	-	-
Intercept	3.96			0.000	4.48			0	3.49			0.004
									10.40			0.004

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inverse association between education level and various aspects of morbidity is weaker for non-Hispanic Black than non-Hispanic White middle-age and older Americans.

The first finding is nothing new. Social determinants of health and social gradient in health all suggest that population health improves as education level and SES improve. The protective health effect of SES, particularly education level, is well established in the literature.^[44-46] The social gradient of health is well known.^[47,48] In fact, each additional year of schooling has a protective effect on health.^[44,45] Similarly, educational credentials have some protective effects.^[44,45] Overall, morbidity and mortality are more common at the bottom of the society, which is closely linked to SES and education.^[49-54]

The second finding is also only partially new. Studies by Navarro^[55-57] and Farmer and Ferraro^[58] have mentioned, it is race and SES, but not race or SES, that cause disparities. Our own previous research has also documented considerably weaker impact of education and other SES indicators on the health and well-being of non-Hispanic Black on than non-Hispanic White Americans.^[19,20] In various studies, education more strongly improved overall health,^[6,7,59] obesity,^[34,36] impulsivity,^[60] drinking,^[31,61] smoking,^[62,63] diet, exercise,^[27] suicide,^[64] depression,^[8,65,66] chronic disease,^[16,67] disability,^[17] hospitalization,^[33] and mortality^[32,41] for non-Hispanic White Americans than non-Hispanic Black Americans. These patterns are robust as shown for non-Hispanic Blacks,^[34,36] Hispanics,^[38] Native Americans,^[22] East Asians, and lesbian, gay, bisexual, transgenders (LGBTs).^[68] This universal pattern has suggested that MDRs are not due to group or individual behaviors but due to structural and societal processes that hinder individuals' and populations' ability to leverage their education and other SES indicators.^[19,20] Although these patterns are seen for all non-privileged groups, they are more robust for Blacks.

Many potential explanations may exist for why education shows smaller health effects for non-Hispanic Blacks than non-Hispanic Whites. Poor quality of education in predominantly non-Hispanic Black communities is one explanation for the MDRs of education for non-Hispanic Blacks.^[69-72] Manly *et al.* have suggested that poor quality of schooling and education may partially explain some of the racial differences in the protective effects of education on conditions such as Alzheimer's

disease.^[71,73-76] We have also found that education and education quality as well as school bonding^[77] and educational mobility^[12,78,79] may all have some role in this phenomenon.

Another explanation is labor market distribution.^[22,80] MDRs of education on health may be because of MDRs of education in the labor market in generating income and wealth.^[6,21,81] We know that high education level has a smaller effect on reducing the risk of poverty for non-Hispanic Black Americans, compared to non-Hispanic White Americans.^[21,81]

As a result of labor market discrimination, highly educated Blacks live in low quality and stressful jobs.^[6,14] Such condition increases environmental exposure of highly educated non-Hispanic Blacks than non-Hispanic Whites to environmental exposures with serious health hazards.^[14,23,80,82]

Another mechanism is interpersonal discrimination. High SES non-Hispanic Black Americans face more, not less discrimination.^[10,11,83,84] High SES also increases vulnerability to discrimination.^[85] This might be in part because highly educated non-Hispanic Blacks are more likely to be surrounded by White people, which increases their cross-racial conflict, discrimination, and prejudice.^[66,86-88]

Limitations

Each study has its own limitations. The current study is not an exception to that rule. To list the major methodological limitations of our study, we can refer to the measurement of CMCs. CMCs were measured using self-reported data. Future data may validate these reports using triangulation methods such as administrative and claim data in medical records. While self-reported chronic diseases are valid,^[89] some measurement bias may be present in this study. Future research may test if these results can be replicated in other data sets and settings. There is also a need to replicate these finding using other SES indicators. We also did not control for wealth. Thus, our study was at risk of omitted confounders. This study only included area-level SES indicators. There is a need to test MDRs in other racial groups, immigrants, and other marginalized people such as LGBTs.

Conclusions

In the United States, the inverse associations between education level and poor SRH, BMI, and DS are all weaker for non-Hispanic Black than non-Hispanic White middle-aged and older Americans.



As a result, we observe worse than expected SRH, BMI, and DS in highly educated non-Hispanic Black middle-aged and older Americans, a pattern that is not observed in their highly educated non-Hispanic White counterparts. The real solution to racial health disparities is public rather than purely health policies. Policy solutions should go beyond equaling the gap in years of schooling and enhance the quality of schooling and labor market practices for the non-Hispanic Black communities. There is a need for policies that specifically address structural and societal factors that reduce health returns of educational attainment for non-Hispanic Black individuals (i.e., MDRs). As contributions of MDRs are historically overlooked, there is a need to conduct more studies on the role of MDRs as a neglected mechanism that contributes to racial health disparities in US population.

Authors' Contributions

Publicly available data were used. SA conducted the data analysis and prepared the draft. He revised the paper and approved the final draft.

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Conflicts of Interest

The author declares that they have no conflicts of interest.

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