

Article

Racial Variation in the Association between Educational Attainment and Self-Rated Health

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Abstract: Background: Minorities' Diminished Return theory can be defined as the systematically smaller effects of socioeconomic status (SES) indicators on the health and well-being of minority populations compared to Whites. To test whether Minorities' Diminished Return theory holds for self-rated health (SRH), we investigated Black–White differences in the effects of education and income on SRH. **Methods:** Data from the Health Information National Trends Survey (HINTS) 2017 was used. HINTS 2017 ($n = 3217$) is a nationally cross-sectional survey of American adults. The current analysis included 2277 adults who were either Whites ($n = 1868$; 82%) or Blacks ($n = 409$; 18%). Education and income were the independent variables. Poor/fair SRH was the dependent variable. Covariates included age, gender, obesity, and health behaviors (smoking and exercise). Race was the focal moderator. We ran logistic regressions in the overall sample, with and without race by SES (education and income) interactions. **Results:** Higher education was associated with lower risk of poor/fair SRH in the pooled sample. We found an interaction between race and education, but not race and income, in relation to SRH, suggesting a stronger association for Whites than Blacks. **Conclusions:** Minorities' Diminished Return theory is also relevant to the effects of educational attainment on SRH. The relative disadvantage of Blacks compared to Whites in gaining SRH from educational attainment may reflect structural racism that systemically hinders Blacks. There is a need for additional research on specific societal barriers that minimize Blacks' health gain from their SES resources. Policies and programs should help Black individuals leverage their SES resources.

Keywords: race; social class; education; income; socioeconomic status; social determinants of health; self-rated health

1. Background

Minorities' Diminished Return theory [1,2] is defined as the systematically smaller protective effects of SES indicators on a wide range of health outcomes for minority populations, compared to the majority group [3]. Educational attainment, for example, has weaker effects on drinking behaviors [4], chronic disease [5], body mass index [6], depression [5,7,8], and mortality [9–12] for Blacks compared to Whites. This study was conducted to test whether Minorities' Diminished Return theory also holds for the effects of education and income on self-rated health (SRH).

It is still unknown whether the Minorities' Diminished Return hypothesis also holds for the effects of SES on SRH. In a number of independent studies, SRH better predicted mortality for Whites than Blacks [13–18]. SRH also better predicts cause specific mortality for Whites than Blacks [19]. Finally, SRH better reflects health problems in Whites than Blacks [20,21]. All these suggest that the association between SES and SRH may vary for Whites and Blacks.

Minorities' Diminished Return is attributed to the qualitative differences that exist in the lives of Whites and Blacks. Such differences hinder Blacks from upwards mobility in health, even in the presence of SES resources. As the U.S. social structure treats Blacks worse than Whites, high SES Blacks do not gain access to the opportunity structure, as one would expect. As a result, despite high SES, Blacks' daily lives are still influenced by prejudice and discrimination [22–24]. Structural racism threatens Blacks' ability to gain from the resources available to them [22,25,26].

The current study had two aims. The first was to investigate the protective effects of SES (education and income) against poor SRH in the overall sample. The second was to explore racial variation in these effects. The first aim of this study was built on Link's and Phelan's (1995) Fundamental Cause Theory, which suggests that SES is a fundamental and root cause of a wide range of outcomes [27–29]. According to this model, the effect of SES is adapted through related resources such as knowledge, money, power, prestige, and beneficial social connections. These flexible resources that follow SES allow individuals to avoid risks and adopt protective strategies regardless of the type of risk, place, or time [30]. In line with this model, education and income were conceptualized as economic resources that could potentially protect individuals against poor SRH. Built on the Minorities' Diminished Return hypothesis [1–3,31], the second aim suggests that SES generates unequal gain across races, with less health gain expected to follow SES for Blacks than Whites [3]. In line with this theory, we hypothesized the health gains that follow education and income to be smaller for Blacks than Whites.

2. Methods

2.1. Design and Setting

The Health Information National Trends Survey (HINTS), 2017, is the most updated version of the HINTS, a nationally representative survey. The current study is conducted on HINTS 5, Cycle 1, which was conducted between January and May 2017. HINTS has been periodically administered by the National Cancer Institute (NCI) since 2003. The HINTS target population is non-institutionalized American adults (age ≥ 18) who reside in the United States. The primary purpose of the HINTS study is to provide a comprehensive assessment of the American adults' access to and use of information about cancer [32–34].

2.2. Ethics

All participants provided informed consent. HINTS 5 was approved by the Westat's Institutional Review Board. HINTS was deemed exempt from IRB review by the NIH Office of Human Subjects.

2.3. Sampling

The HINTS 5, Cycle 1, sampling strategy consisted of a two-stage design. The first stage was a stratified sample of addresses derived from all residential addresses. The second stage included the selection of one adult from each sampled household. The list of addresses was provided by the Marketing Systems Group (MSG). All non-vacant residential addresses in the U.S. were eligible for sampling. The sampling frame of addresses was grouped into two sampling strata: (1) areas with a high concentration of minorities and (2) areas with a low concentration of minorities. An equal-probability sample of addresses was selected from each sampling stratum [35].

2.4. Surveys

The survey was conducted exclusively by mail. A \$2 pre-paid monetary incentive was included to encourage participation. Two toll-free telephone numbers were provided to respondents: one was used for English calls and one was used for Spanish calls. The overall response rate was 32.4 percent [35].

2.5. Measures

Health and health behavior covariates in this study included obesity, ever smoking status, and exercise. Obesity was defined based on self-reported height and weight using these items: “About how tall are you without shoes?” and “About how much do you weigh, in pounds, without shoes?” We defined obesity as a BMI equal to or larger than 30 [36,37]. Obesity based on self-reported height and weight is valid [38,39]. Ever smokers were determined using the following single-item measure: “Have you smoked at least 100 cigarettes in your entire life?” The responses were No/Yes. Single-item measures have been previously used to measure smoking status [40]. Exercise was measured using the following single item: “In a typical week, how many days do you do any physical activity or exercise of at least moderate intensity, such as brisk walking, bicycling at a regular pace, and swimming at a regular pace?” Responses were (a) 1 day per week, (b) 2 days per week, (c) 3 days per week, (d) 4 days per week, (e) 5 days per week, (f) 6 days per week, and (g) 7 days per week. This variable ranged from a score of 1–7, with a higher score indicating more exercise. Exercise was operationalized as a continuous variable in this study.

2.5.1. Independent Variables

Education. Education was the main SES indicator in our study. At HINTS 2017, educational level was reported as (1) less than high school, (2) high school graduate, (3) some college, (4) bachelor’s degree, or (5) post-baccalaureate degree. Education was operationalized as a continuous measure, with a higher score reflecting more education.

Income. Household income was recorded as (1) \$0–9999, (2) \$10,000–14,999, (3) \$15,000–19,999, (4) \$20,000–34,999, (5) \$35,000–49,999, (6) \$50,000–74,999, (7) \$75,000–99,999, (8) \$100,000–199,999, and (9) \$200,000 or more. Income was treated as a continuous measure.

2.5.2. Dependent Variable

Self-Rated Health (SRH). A single item was used to measure self-rated health (SRH). Respondents were asked to classify their health as excellent, very good, good, fair, or poor. In line with previous research [41], we defined the outcome as fair/poor health versus other levels (i.e., excellent, good, and very good). Poor/fair SRH was coded as 1 [42]. SRH is recommended as an outcome for monitoring the health of Americans by the Institute of Medicine (IOM) [43]. The literature has mostly treated the SRH as a dichotomous variable, with poor/fair compared to any other category [44,45]. SRH has high validity, as it predicts mortality beyond covariates [46–50].

2.5.3. Covariates

Demographic Covariates. Age and gender were collected as our covariates. Age was a continuous measure. Gender was operationalized as a dichotomous variable (men 0 [reference group] and women 1).

2.5.4. Moderator

Race, measured as self-identified, was the moderator. Race was operationalized as a dichotomous variable (Whites 0 [reference group], Blacks 1).

2.6. Statistical Analysis

To accommodate the HINTS’s multi-stage sample design and to consider HINTS weights due to strata, clusters, and non-response, we used Stata 13.0 (Stata Corp., College Station, TX, USA) for our data analysis. Jackknife standard errors were calculated. We used sub-population survey commands for all our analyses. For univariate statistics, we described mean and proportions (frequencies). For bivariate analysis, we used independent sample *t*-tests and Pearson chi square tests to compare Blacks and Whites. For multivariable analysis, we estimated four logistic regression models.

In these logistic regression models, we used education and income as the independent variables, poor/fair SRH as the dependent variable, demographics, socio-demographics, obesity, and health behaviors as covariates, and race as the focal moderator. Obesity and health behaviors (smoking and exercise) were considered as covariates as they both correlate with SES indicators and SRH [51–54].

First, two logistic regressions were estimated in the pooled sample. The first model did not include race by SES (education and income) interactions. We then ran a model with the following two interaction terms: race by income and race by education. Subsequently, we performed race—specific logistic regressions (*Model 3* for Whites and *Model 4* for Blacks). Adjusted Odds Ratio (OR), 95% Confidence intervals (CIs), and *p*-values were reported. *p*-values less than 0.05 were considered significant.

3. Results

3.1. Descriptive Statistics

This study included 2277 adults who were either White ($n = 1868$, 82%) or Black ($n = 409$; 18%).

Table 1 provides descriptive statistics of the study variables in the overall sample and by race. Blacks had lower education and income than Whites. Blacks also had worse SRH than Whites (Table 1).

Table 1. Descriptive statistics in the overall sample and by race.

	All ($n = 2277$)		Whites ($n = 1868$)		Blacks ($n = 409$)	
	Mean	SE	Mean	SE	Mean	SE
Age	48.80	0.34	50.10	0.46	47.72	1.22
Education	3.12	0.02	3.17	0.02	3.08	0.10
Income (household)	5.60	0.05	5.87	0.07	4.68	0.22
Exercise	2.75	0.06	2.83	0.07	2.83	0.21
Gender	%	SE	%	SE	%	SE
Female	50.63	0.00	50.84	0.00	60.86	0.04
Male	49.37	0.00	49.16	0.00	39.14	0.04
Education						
Less than High School	8.37	0.01	5.54	0.01	13.69	0.03
High School Graduate	22.67	0.01	20.16	0.01	24.01	0.03
Some College	32.98	0.01	41.03	0.01	19.36	0.03
Bachelor's Degree	22.38	0.01	20.37	0.01	26.04	0.04
Post-Baccalaureate	13.60	0.01	12.91	0.01	16.91	0.04
Degree						
Obese						
No	66.80	0.01	67.79	0.02	58.24	0.04
Yes	33.20	0.01	32.21	0.02	41.76	0.04
Smoker						
No	84.78	0.01	83.53	0.02	83.68	0.03
Yes	15.22	0.01	16.47	0.02	16.32	0.03
Self-rated Health (SRH)						
Excellent-Good	83.07	0.01	85.15	0.02	80.41	0.02
Fair/poor	16.93	0.01	14.85	0.02	19.59	0.02

3.2. Multivariable Models

Table 2 presents the results of two logistic regression models in the pooled sample with education and income as the independent variables and poor/fair SRH as the dependent variable. *Model 1* only included the main effects. *Model 2* also included two interaction terms between race and SES (education and income). Based on *Model 1*, high education and high income had protective effects against poor/fair SRH above and beyond all covariates. *Model 2* showed an interaction between race and education on SRH, suggesting that the protective effect of education against poor/fair SRH is smaller for Blacks than Whites. An interaction between race and income could not be found (Table 2).

Table 2. Summary of logistic regression models in the overall sample.

	All (n = 2277)		All (n = 2277)	
	OR	95% CI.	OR	95% CI.
	<i>Model 1</i>		<i>Model 2</i>	
Race (Blacks)	0.89	0.53–1.47	0.38	0.10–1.40
Gender (Male)	1.09	0.67–1.77	1.11	0.67–1.83
Age	1.03 **	1.01–1.04	1.03 **	1.01–1.04
Education	0.81 #	0.65–1.03	0.72 *	0.55–0.96
Income	0.78 ***	0.71–0.86	0.80 ***	0.72–0.89
Obese	2.22 **	1.33–3.71	2.23 **	1.33–3.73
Smoking	2.62 *	1.25–5.51	2.54 *	1.20–5.42
Exercise	0.92	0.81–1.03	0.92	0.82–1.03
Race *				
Education	-	-	1.79 *	1.10–2.90
Race * Income	-	-	0.82	0.63–1.08
Intercept	0.23 *	0.05–0.98	0.27 #	0.06–1.25

$p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 3 presents the results of two logistic regression models in Whites and Blacks. *Model 3* showed a protective effect of education and income against poor/fair SRH for Whites. *Model 4* did not show any effect of education against poor/fair SRH for Blacks (Table 3).

Table 3. Summary of logistic regression models across races.

	Whites (n = 1868)		Blacks (n = 409)	
	OR	95% CI.	OR	95% CI.
	<i>Model 3</i>		<i>Model 4</i>	
Gender (Male)	1.24	0.72–2.14	0.55	0.17–1.79
Age	1.03 **	1.01–1.05	1.03 #	1.00–1.06
Education	0.73 *	0.55–0.96	1.24	0.85–1.81
Income	0.80 ***	0.72–0.89	0.67 *	0.52–0.85
Obese	2.25 **	1.25–4.06	1.84	0.79–4.28
Smoking	2.80 *	1.16–6.76	1.85	0.49–7.01
Exercise	0.93	0.82–1.06	0.86	0.69–1.07
Intercept	0.23	0.04–1.32	0.18	0.02–1.59

$p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

4. Discussion

This study shows two main findings: First, this study finds protective effects of education and income against poor SRH in the pooled sample. Second, higher education was associated with lower risk of poor SRH for Whites but not Blacks, suggesting that the Minorities' Diminished Return theory also holds for the effect of education on SRH in adults.

The first finding on the association between education and income against poor SRH is in line with Link's and Phelan's (1995) Fundamental Cause Theory. This theory conceptualizes class and SES as sources of resources that operate as fundamental and root causes for population health [27–29]. High SES individuals have access to higher education, money, power, prestige, and beneficial social connections that allow individuals to avoid risks and adopt protective strategies across types of risk, places, or times [30]. Several empirical studies have also shown that education [55] and income [56] are associated with better health, including SRH [57,58].

We are aware of only one other study on the effects of SES on SRH. That study used a 15 year follow up study and showed that family SES at birth (maternal education) promotes SRH of White but not Black youth when they are 15 years old [59]. Thus, the Minorities' Diminished Return hypothesis

also holds for the effects of education on SRH across age groups. The same, however, may not be the case for income. In fact, our race-specific model, which did not show an effect of education, suggested a protective effect for income against poor SRH for Blacks.

Our finding at least partially supports the Minorities' Diminished Return hypothesis [1,2,6], defined as the systemically smaller health effects of the same SES indicators for Blacks than Whites [10,22,60,61]. Similar to the smaller effects of education on SRH, educational attainment shows smaller effects on drinking patterns [4], BMI [62], insomnia, physical activity [4], depression [5], suicidal behaviors [60], and mortality [10] for Blacks than Whites.

Not only do Blacks gain less than Whites from SES but having high SES as a Black may be a risk factor for poor mental health outcomes [3,5,6,25,60,63–65]. For example, highly educated and high-income Blacks are shown likely to be repressed and, compared with Whites, are at a higher risk of an increase in symptoms of depression over time [63].

The findings reported here should not be interpreted as Blacks being unable to turn their SES resources to health outcomes. Minorities' Diminished Return is not a function of Blacks' behaviors or culture but a consequence of structural racism. Decades after slavery has ended, racism and discrimination persist. Racism is present in all settings and across levels and institutions. Deeply rooted inequalities hinder Blacks' progress and upward social mobility and reduce their ability to gains from their resources [66–68]. As long as race and skin color have influence on the treatment of individuals in our society and access to opportunity structure, true equality is impossible. Without a change, the U.S. system will continue failing middle-class and even high SES Blacks. To climb the social ladder, society is charging Blacks extra costs, which reduce the gains that are expected to follow upward social mobility for Blacks [25,65,69–73]. Several economic and public policies that are institutionalized are traditionally designed to maximize the gain of majority Whites, which sometimes means minimization of the gains of other social groups. For Blacks, having high aspirations that result in educational attainment does not mean they will be rewarded with a high paying job and wealth. Education and class better serves Whites than Blacks in purchasing power and wealth [74–76].

In this study, income was protective for Blacks but not Whites. Given that Blacks are in a systemic disadvantage relative to Whites regarding health benefits from their education [4,5], income should be regarded as a unique economic resource that can reduce the Black–White health gap across domains. In another study, where education showed a diminished return for Blacks, Blacks and Whites showed a similar gain from income with respect to mortality [10,77]. These findings suggest that income redistribution policies should be regarded as an important strategy to reduce the Black–White gap in health [1,2]. Increasing minimum pay and reducing the Black–White gap in pay will help Blacks earn more income, which will in turn translate to a gain in health [2].

In addition, obesity and smoking influence SRH for Whites but not Blacks. This diminished impact of obesity and smoking on the SRH of Blacks are in line with previous findings on smaller effects of risk factors on the health of Blacks, compared to Whites [1,2]. For instance, several studies have shown that obesity has a smaller effect on depression for Blacks compared to Whites [78–80]. These findings are in contrast to Double or Multiple Jeopardy hypotheses, which argue that health effects of risk factors are larger for Blacks and other minorities, as they are already experiencing multiple adversities [23,81–83].

Discrimination may also be a factor that limits health gain of Blacks from high SES. In a study by Hudson et al., the protective effect of SES was smaller at higher levels of discrimination [5,84]. Other studies have shown that high SES Blacks may experience higher levels of discrimination [8], which explains why high SES Blacks are at higher risk of depression [4,7,8].

4.1. Implications for Policies and Programs

SES does not generate similar health benefits across racial groups, with minorities being in a systemic disadvantage relative to the majority group. As mentioned [1,2], policy solutions must go beyond equalizing access and merely focusing on SES itself. Policies must go beyond reducing

inequalities in SES to address societal and structural barriers in the lives of Blacks and other minorities. Policies should ensure that all groups receive the same quality of education and that minority students are not discriminated against in schools. Simultaneously, Blacks may require additional assistance leveraging their available SES resources, like educational assistance. Policies should not permit education generating unequal employment, income, and insurance across groups.

4.2. Limitations and Future Research

Our study was not free of limitations. First, we conceptualized SES as a fixed variable. However, similar to most other psychosocial constructs, SES is subject to change over time. Future research should explore how race interacts with upward or downward social mobility on health. Second, our study did not include all the potential confounders, and focused only on education as an SES indicator. SES indicators that are missing from our analysis include income, marital status, household size, employment, home ownership, and wealth. This study also did not measure paternal SES, which should be examined in future research. SES is not limited to individual level indicators. Availability of resources across levels, contextual factors in the neighborhood (e.g., neighborhood racial composition), and family should also be investigated. Future research should go beyond the narrow focus of racial differences and consider the intersectionality of race, gender, nativity, place, and SES. Despite these limitations, our study makes an important contribution to the literature, as it replicates the Blacks Diminished Return [2,6,65] for the effects of education on changes in negative emotions over a period of 10 years. Strengths of the current study include a nationally representative sample, a large sample size, and longitudinal study design.

5. Conclusions

The magnitude of the effect of education on SRH is not equal between Blacks and Whites. An inequality exists for how education impacts SRH. The very same resources, like education, consistently results in a lower health return for Blacks, compared to Whites. Multi-level policy solutions should go beyond equalizing SES to minimizing unequal distribution of structural barriers in the lives of racial minority groups. Only then can racial minority groups see a comparable return to the majority group on their SES indicators.

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