



Educational Attainment Better Increases the Chance of Breast Physical Exam for Non-Hispanic Than Hispanic American Women: National Health Interview Survey

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Abstract

Background: The Minorities' Diminished Returns (MDRs) theory suggests that the health effect of educational attainment is considerably smaller for members of racial and ethnic minority groups than for Whites.

Objective: The current study explored the racial and ethnic differences in the association between educational attainment and breast physical exam (BPE) among women in the U.S.

Methods: The National Health Interview Survey (NHIS 2015) included 12 510 women who were Hispanic or non-Hispanic Black or White people. The independent variable was the level of educational attainment. The dependent variable was lifetime BPE. Age, region, marital status, and employment were the covariates. Race and ethnicity were the focal moderators. Logistic regressions were used for data analysis.

Results: Overall, higher educational attainment was associated with higher odds of BPE, net of all confounders (odds ratio [OR] = 1.11, 95% CI = 1.09-1.13). Ethnicity showed a significant statistical interaction with educational attainment on BPE (OR = 0.96, 95% CI = 0.93-1.00), which was suggestive of a smaller effect of high education attainment on BPE for Hispanic than non-Hispanic women. The same interaction could not be found for the comparison of White and Black women (OR = 0.98, 95% CI = 0.94-1.02).

Conclusion: In line with other domains, non-Hispanic White women show a larger amount of health gain from their educational attainment than Hispanic women. It is not ethnicity or class but ethnicity and class that shapes how people engage in pro-health behaviors. This result may help hospitals and healthcare systems to better reduce health disparities in their target populations.

Keywords: Population Groups, Socioeconomic Status, Education, Breast, Screening

1. Background

The Minorities' Diminished Returns (MDRs) theory refers to the systemically weaker effects of educational attainment and other socioeconomic status (SES) indicators on the health and well-being of racial and ethnic minority groups relative to the majority group.^{1,2} In the U.S., MDRs are well-documented for educational attainment,³ income,⁴ employment,⁵ and marital status⁶ and have been shown on a wide range of outcomes. First, MDRs are shown for health-related behaviors such as exercise,^{7,8} drinking,^{9,10} suicide,¹¹ smoking,¹² impulsivity,¹³ diet,¹⁴ and exercise.^{7,8} Second, MDRs are shown for mental health outcomes such as depression,¹⁵ anxiety,⁶ and self-rated mental health.¹⁶ Third, MDRs are documented for physical health outcomes such as obesity,¹⁷ asthma,⁴ attention-deficit/hyperactivity disorder,¹⁸ hypertension,¹⁹ chronic obstructive pulmonary disease,²⁰ number of chronic diseases,⁴ self-rated physical

health,¹⁶ and mortality²¹.

Such universal nature of MDRs suggests that some upstream social processes interfere with the ability of marginalized populations to transfer, translate, and mobilize their SES indicators and human capital to health outcomes. As MDRs are shown for Blacks,³ Hispanics,^{22, 23} and sexual minorities,²⁴ it has been suggested that these MDRs are not specific to any particular group and might be seen in any marginalized group.

The MDRs of education and other SES indicators provide one explanation for why racial and ethnic health gaps have persisted over the past several decades, despite enormous investment directed toward closing them.^{1,2} They also suggest new strategies for eliminating health disparities.^{1,2} Traditionally, the focus of policy-makers has been to eliminate the SES gap between racial and ethnic groups.^{1,2} By providing evidence that racial and ethnic

inequalities persist across SES levels, they advocate for investing in changing the social structures and functions that generate MDRs and cause disparities in middle-class ethnic minority groups.^{1,2} They introduce new mechanisms and thus advocate for different types of solutions to health disparities.^{1,2}

Several studies have previously documented the existing MDRs for the effects of SES indicators, particularly education level, on health behaviors and lifestyle.^{8,9,12,14,22,25} Although these behaviors are relevant to health, they are related to lifestyle. Another type of health behavior which may be relevant to MDRs is healthcare use.^{26,27} We are aware of two studies on the MDRs of SES on these types of behaviors. First was a study on unmet dental health care needs.²⁶ The second study was on MDRs of SES on patient-doctor communication about lung cancer screening.²⁷ We are not aware of any previous research on MDRs of educational attainment across race and ethnic groups of women.

2. Objective

To investigate the MDRs of educational attainment on breast physical exam (BPE) among Black and Hispanic women, racial and ethnic groups of women were compared for the link between education and BPE. Informed by the MDRs theory,^{1,2} a weaker association between educational attainment and BPE was expected for Black and Hispanic women in comparison to non-Hispanic White women. In other terms, a larger proportion of highly educated Black and Hispanic women were expected to report no-BPE compared to highly educated White women.

3. Methods

Data came from the National Health Interview Survey (NHIS 2015), one of the main surveys that monitor the health and wellbeing of American adults. The National Center for Health Statistics (NCHS) at the Centers for Disease Control and Prevention (CDC) is responsible for the NHIS data collection. Data are collected using face-to-face interviews conducted in participants' homes followed by a telephone interview for some participants.

3.1. Participants

To enroll the NHIS sample, the study uses a multi-stage sampling. This multi-stage sampling generates results that are generalizable to the U.S. population but requires adjustment for the survey weight variables in the data analysis.

3.2. Inclusion and Exclusion Criteria

The NHIS samples are (a) U.S. residents, (b) civilians, (3) noninstitutionalized individuals, and (4) adults. The current study also limited that sample to women.

3.3. Analytical Sample

A total number of 12,510 adult women who participated in the NHIS, were Non-Hispanic or Hispanic White or Black,

and had valid data on BPE were included in this analysis.

3.4. Measures

3.4.1. Moderator

Race and Ethnicity. Race and ethnicity were self-reported and were treated as dichotomous variables. Race comprised Blacks/African Americans=1, Whites=0 (reference category). Ethnicity was Hispanic=1, Non-Hispanic=0 (reference category).

3.4.2. Predictor

Educational Attainment (EA). Education level, treated as a continuous measure, was years of schooling. This variable had a potential range between 0 and 21; a higher score reflected higher educational attainment.

3.4.3. Dependent Variable

Breast physical exam (BPE). Participants were asked if they had ever conducted a breast physical exam. The answers could be yes, no, or no answer. This variable was treated as a dichotomous variable: 0: BPE-, 1: BPE+.

3.4.4. Covariates (Confounders)

Demographic factors. Demographic factors in this study were age, employment status, marital status, and region. Age (years) was a continuous variable. The region was either Northeast, Midwest, South, or West. Employment was measured in the last week, and employment status was a dichotomous variable (1 employed, 0 other status). Marital status was also a dichotomous variable (married 1, unmarried 0).

3.5. Statistical Analysis

To accommodate the NHIS multi-stage sample design, the survey weights were adjusted. The design variables (strata, clusters, and non-response) were implemented in this analysis using Taylor series linearization for the re-estimation of all standard errors (SEs). Weighted means and frequencies were used to describe the sample. Multivariable analyses were conducted in the overall sample using two logistic regression models were applied. In all models, education level was the independent variable, BPE was the dependent variable, and race and ethnicity were the moderators. The first two models were calculated in the pooled sample. *Model 1* did not include race and ethnicity by educational attainment interaction terms, but *Model 2* did. All analyses were done using SPSS 23.0 (IBM Inc, NY, USA).

4. Results

This study included 12,510 women who were either White (n=10 439, 83.1%), Black (n=2116, 16.9%), Hispanic (n=1352, 10.8%), or non-Hispanic (n=11203, 89.2%). [Table 1](#) provides a summary of the descriptive characteristics of the participating women. From all women, only 12.3% had never had a BPE. The remaining 87.7% had received BPE at least once in their life ([Table 1](#)).

Table 1. Descriptive Statistics of Participating Women (n = 12510)

Characteristics	Mean	SE
Age (y)	56.47	15.81
Education (y)	15.20	3.21
	n	%
Race		
White	10439	83.1
Black	2116	16.9
Ethnicity		
Non-Hispanic	11203	89.2
Hispanic	1352	10.8
Region		
Northeast	2251	17.9
Midwest	2788	22.2
South	4650	37.0
West	2866	22.8
Employment		
No		
Yes		
Marital status		
Other	7095	56.5
Married	5460	43.5
Employed		
No	6736	53.7
Yes	5819	46.3
BPE		
No	1542	12.3
Yes	11013	87.7

Abbreviation: BPE, Breast Physical Exam.

Table 2 provides a summary of two logistic regression models. Both models were statistically significant. Model 1 showed a good fit (Cox & Snell R Square = 0.045, Nagelkerke R Square = 0.085). Model 1 showed a better fit (Cox & Snell R Square = 0.045, Nagelkerke R Square = 0.086). Based on Model 1 (the model with no interaction terms), high educational attainment was correlated with higher odds of BPE, the net of all study confounders (odds ratio [OR] = 1.11, 95% CI = 1.09-1.13, $P = 0.000$). Other indicators that shaped BPE were race and ethnicity.

Compared to White women, Black women had lower odds of BPE (OR = 0.70, 95% CI = 0.60-0.80, $P = 0.000$). Similarly, compared to non-Hispanic Whites, Hispanic Whites had lower odds of BPE as well (OR = 0.42, 95% CI = 0.36-0.49, $P = 0.000$). In addition, age (OR = 1.02, 95% CI = 1.01-1.02, $P = 0.000$) and marital status (OR = 1.42, 95% CI = 1.26-1.60, $P = 0.000$) also correlated with odds of BPE.

Model 2 (the model with the interaction terms) showed a negative interaction term between ethnicity and educational attainment (OR = 0.96, 95% CI = 0.93-1.00, $P = 0.035$), which was suggestive of a smaller effect of educational attainment on the odds of BPE for Hispanic than for non-Hispanic women. The same interaction could not be found between race and education (OR = 0.98, 95% CI = 0.94-1.02, $P = 0.221$), suggesting a similar effect of education on BPE for Black and White women (**Table 2**).

5. Discussion

This study showed that educational attainment had a weaker effect on BPE in Hispanic than in non-Hispanic women. No racial difference was found in the effects of education on BPE between Black and White women. The results may be applied by hospitals and healthcare systems to promote health equity.

MDRs of educational attainment could be documented on Hispanic but not on Black women's BPE. The findings in Hispanic women is in line with the literature on MDRs.^{1,2} In the U.S., education is not "the great equalizer."^{28,29} Zajacova^{28,29} and others³⁰⁻³² have shown that education better promotes the health of the mainstream than it does for the minority groups; however, most of the existing work is focused mainly on the comparison of non-Hispanic Whites and non-Hispanic Blacks.

The findings in Hispanic women are in line with the growing literature showing a larger magnitude of the effects of educational attainment and other economic and human resources (SES and social determinants of health) on obesity,¹⁷ chronic disease,⁴ self-rated health,¹⁶ happiness,³³ depression,¹⁵ suicide,¹¹ smoking,¹² drinking,^{9,10} diet,¹⁴ and

Table 2. Logistic Regression on the Link Between Education Attainment and CBE in the Pooled Sample of American Women

	OR	95% CI	P	OR	95% CI	P
Race (Blacks)	0.70	0.60-0.80	0.001	1.00	0.56-1.80	0.997
Ethnicity (Hispanics)	0.42	0.36-0.49	0.001	0.68	0.42-1.11	0.122
Region						
Northeast	1.08	0.89-1.29	0.435	1.08	0.89-1.29	0.439
Midwest	0.90	0.76-1.07	0.229	0.91	0.76-1.08	0.267
South	0.85	0.74-0.99	0.040	0.86	0.74-1.00	0.052
West						
Age	1.02	1.01-1.02	0.001	1.02	1.01-1.02	0.001
Married	1.42	1.26-1.60	0.001	1.41	1.25-1.58	0.001
Employed	1.09	0.96-1.24	0.180	1.08	0.95-1.23	0.214
Education (y)	1.11	1.09-1.13	0.001	1.13	1.10-1.16	0.001
Education (y) × Race (AA)	-	-	-	0.98	0.94-1.02	0.221
Education (y) × Ethnicity (Hispanics)	-	-	-	0.96	0.93-1.00	0.035
Intercept	0.75		0.144	0.56		0.015

impulsivity¹³ for ethnic minorities than for the mainstream population; however, again, most of the literature regards a comparison of Whites and Blacks.

The lower-than-expected effect of educational level on pro-health behaviors in ethnic minorities may be explained by the differential education quality of Hispanics and non-Hispanics. The scarcity of educational resources in urban and inner-city schools where most racial and ethnic minority populations live might be why MDRs of educational attainment are observed for Hispanics. Because of a lower quality of education, the magnitude of the effects of education on building human capital and healthy behavior profiles may decline in people of ethnic minorities. In addition, the effects of education are in part due to how the labor market hires various ethnic groups. Under discrimination by the labor market, education is not well translated to occupation, income, or wealth, all of which are required for a healthy lifestyle. We argue that the U.S. system has historically given the largest rewards to non-Hispanic Whites. Because of differential treatment, ethnic minority groups have a lower chance to translate their available human resources into measurable and tangible health and economic outcomes.^{33,34} It is under discrimination that ethnic minority status bounds the health gains that are expected to follow education.^{3,12,24,26,35-37}

Due to residential segregation, racial and ethnic minorities have a higher tendency to live in low-income, unsafe, resource-scarce urban areas. This also applies to high SES Hispanic and Blacks who still live in predominantly Hispanic or Black neighborhoods. These areas do not promote health as they have fewer available resources for healthy eating, exercise, and healthcare use.^{17,38} Thus, health may not be a priority or an option in neighborhoods that have higher levels of stress and are poor in resources.³⁹⁻⁴³ Thus, even if an individual is motivated to seek care, their environmental conditions may suppress their potentials and move them to an unhealthy lifestyle. For example, high crime and violence limit the ability of ethnic minority people to engage in a healthy lifestyle in inner cities.³⁹⁻⁴³ Thus, compared to high SES non-Hispanic Whites, high SES Hispanics and Black people may not have the same chance for pro-health behaviors. It is necessary to study the effects of such contextual constraints in generating racial and ethnic gaps in health and health behaviors, particularly between high SES Whites, Blacks, and Hispanics.¹⁷

5.1. Implications

There is a particular interest in enhancing cancer screening practices in racial and ethnic minorities, because lower adherence to cancer screening is one of the mechanisms by which racial and ethnic disparities in cancer outcomes emerge. If the gap between early cancer screening and racial and ethnic minorities can be narrowed, we would be one step forward to closing the unfair inequalities in cancer outcomes. In this regard, breast cancer screening is of particular interest given the wide gap in breast cancer

outcomes and the high prevalence and incidence of breast cancer as main sources of cancer disparities.

5.2. Limitations

This study had various limitations. First, similar to other studies with a cross-sectional design, the current results are suggestive of associations rather than causal effects. Longitudinal research with multiple observations is needed to test causal effects between changes in SES over time and changes in health-seeking behaviors. Second, several SES indicators were left out. Wealth, access, medical needs, competing needs, and other factors were not a part of the current study. Future research should also explore how area-level factors, both physical and social environment ones, as well as distance to healthcare facilities and public transportation contribute to the differential effects observed here. Third, the ethnic differences were merely described in this study. This study did not seek the explanatory variables that could mediate such effects. In addition, the current study had a simplistic view of BPE, which was measured using a single self-reported item. There is a need to study healthcare use using comprehensive measures with a link to administrative and claim data. In addition to self-reports, the outcome can be verified by accessing health insurance and chart data. Finally, this study was limited to Black, Hispanic, and White women. Future research should include other ethnic groups and also explore variations within Latinos/Hispanics based on the country of origin, nativity, and immigration status.^{7,44-48}

6. Conclusion

In summary, ethnicity seems to modify the magnitude of the effect of educational attainment on BPE for American women. In this study, educational attainment seemed to better increase the chance of having a BPE for non-Hispanic than Hispanic women, although the same pattern was not observed when comparing White and Black women. The current finding is in line with the growing literature on MDRs. Education level seems to generate significantly less health for ethnic minority groups than for the majority group. This result may help hospitals and healthcare systems to reduce health disparities in their target population.

Authors' Contributions

SA and MB contributed equally to this study.

Research Highlights

What Is Already Known?

Education enhances pro-health behaviors and health utilization for prevention and early diagnosis.

What This Study Adds?

Education shows a stronger effect on increasing the chance of breast physical exam in non-Hispanic than Hispanic women.

Conflict of Interest Disclosures

The authors declare no conflicts of interest.

Ethical Approval

The data used for this study was publicly available and fully de-identified. Thus, this non-human subject research was except from an IRB review.

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