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Original Article

Parental Education and Children's Sleep Problems: Minorities' Diminished Returns

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Abstract

Background and aims: While increased parental education reduces children's sleep problems, less is known about racial variation in such protection. According to Minorities' Diminished Returns (MDRs) theory, economic resources such as parental education show weaker health effects for minority groups such as Blacks and Latinos than non-Latino Whites, which is due to racism and social stratification. In this study, we investigated the association between parental education and children's sleep problems, as a proxy of sleep problems, by race.

Methods: This cross-sectional study included 11718 American children aged 9-10. All participants were recruited to the Adolescent Brain Cognitive Development (ABCD) study. The independent variable was parental education, a five-level nominal variable. The dependent variable – sleep problems, was a continuous variable. Race/ethnicity was the effect modifier. Age, sex, and marital status were the covariates. Mixed-effects regression models were used for data analysis.

Results: Parental education was associated with children's sleep problems. However, there was a weaker inverse association seen in non-Latino Black and Latino families compared to non-Latino White families. This was documented by a significant statistical interaction between race and ethnicity and parental education on children's sleep problems.

Conclusion: Diminished protective effect of parental education on children's sleep problems for non-Latino Black and Latino families compared to non-Latino White families is similar to the MDRs in other domains. Worse than expected sleep may contribute to higher-than-expected health risks of middle-class Black and Latino children.

Keywords: Parental education, Children, Sleep problems

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Introduction

Race/ethnicity[1] and socioeconomic status (SES)[2-4] have inter-dependent rather than independent effects on health and health behaviors.[5-7] As race and SES have a major overlap,[8] with racial/ethnic minorities commonly having lower SES,[8] some of the racial gap in health and health behaviors of minorities (e.g., Blacks and Latinos) compared to non-Latino Whites is attributed to low SES.[9,10] As a result, the traditional assumption has been that to reduce or remove racial/ethnic inequalities in health, we need to remove the existing SES gap across racial and ethnic groups.[11] However, racial inequalities in health have remained despite enormous efforts to close the SES gap across racial and ethnic groups [12,13].

According to the Minorities' Diminished Returns (MDRs).[12,13] SES effects vary by race/ethnicity, with racial and ethnic minorities being at a relative disadvantage compared to non-Latino Whites at leveraging their SES resources and converting them into health and health behaviors.[12,13] For example, the magnitude of the SES effects tends to be weaker for Black and Latino families[14] than non-Latino White families. Thus high SES Black and Latino families remain at risk for poor health.

An extensive body of knowledge has established MDRs of parental education,[15,16] household income,[17] and family structure[18] on a wide range of developmental, health, emotional, and behavioral outcomes[15-17,19] of almost all minority groups such as non-Latino Blacks,[20] Latino,[14,21] Asian Americans,[22] Native Americans,[23] and even marginalized Whites.[24] As a result, high SES Black and Latino individuals remain at risk of depression,[19] anxiety,[25] impulsivity,[15] reduced grade point average,[17] attention deficit hyperactivity disorder (ADHD),[26] unhealthy diet,[27] lower levels of exercise,[28] substance use,[17] obesity,[29] and chronic disease,[17]. However, not enough is known about the relevance of MDRs of SES indicators related to sleep problems for Black and Latino children sleep.[30]

Aims

Given the existing gap in the contribution of MDRs in explaining the Black-White gap in sleep problems, we conducted the current study to compare racial and ethnic groups for the association between parental education and sleep problems. We hypothesized the effect of parental

education on children's sleep problems to be weaker (diminished) for Black and Latino than non-Latino White children.

Methods

Design and Settings

This secondary analysis borrowed data from the Adolescent Brain Cognitive Development (ABCD) study.[31-35] ABCD baseline data were collected in 2016 from 21 sites across the United States. For more information on the ABCD study, consult here.[31,36]

Participants and Sampling

The ABCD participants were children aged 9-10 that were selected from multiple cities across the 21 states. ABCD recruitment primarily relied on the US school system. For a detailed description of the sampling and recruitment in the ABCD, consult here.[37] Our analysis's eligibility criteria were having valid data on all the study variables, including race, parental education, and sleep problems. The analytical sample of this paper was 11,718.

Study Variables

The study variables included race, ethnicity, sex, parental education, marital status, and sleep problems. Race was self-identified: non-Latino Whites (reference category), Latinos, Blacks, Asians, and other races. The other race category reflects Native Americans, individuals that are multiracial or do not identify with any of the races listed. The sex of the child was recorded with a 1 for males and a 0 for females. Parental marital status was reported by the parents and was recorded as a 1 for married and a 0 for not married. Sleep problems were reported utilizing the Sleep Disturbance Scale for Children (SDSC). This measure was developed by Bruni and Ottaviano in 1996. The score was a continuous measure with a higher score reflecting a worse situation (more sleep problems).[38]

Data Analysis

We used the Data Exploration and Analysis Portal (DEAP) for data analysis. DEAP uses the R package for statistical calculations. We reported the mean (standard deviation [SD]) and frequency (%) of our variables overall and by race. We also performed the chi-square and analysis of variance (ANOVA) for our bivariate analysis. We used two mixed-effects regression models for multivariable modeling that allowed us to adjust to our data's nested (clustered) nature. Observations were nested to participants who were from families who were selected across sites and states. We ruled out collinearity between our independent variables in our models. We also confirmed close to a normal distribution of error terms of our regression model. Both models were performed in the overall sample. *Model 1* did not have any interaction terms between race and parental education. *Model 2* included interaction terms between race and parental education. In both models, children's sleep problems were the outcome. Regression coefficient (b), SE, 95% CI, and *P*-value were reported. Supplementary file 1 shows our modeling formula. Supplementary file 2 shows the distribution of parental education and sleep problems and residuals of our regression model.

Results

Descriptives

Overall, 11718 children aged 9-11 were analyzed. This sample was either non-Latino White (n = 6159 unweighted 52.6%; weighted 52.7%), non-Latino Black (n = 1723; unweighted 14.7%; weighted 13.1%), non-Latino (n = 2360; unweighted 20.1%; weighted 23.7%), Asian (n = 251; unweighted 2.1%; weighted 3.6%), and Other-race (n = 1225; unweighted 10.5%; weighted 6.8%).

Table 1 presents descriptive data by race. This table also compares racial groups for study variables. As this table shows, non-Latino Black and Other-race participants had the least and non-Latino White and Asian American children had the highest parental education. Similarly, Black participants had the highest rate of worst sleep problems, and non-Latino White and Asian American children had the lowest rate of sleep problems. Racial groups did not differ regarding sex. However, racial groups showed a significant difference in their age. Asian and non-Latino White children were most likely to be from married families, and non-Latino Black children were most likely to be from unmarried families.

Multivariate Models

Table 2 presents the results of two mixed-effects regression models in the overall sample. *Model 1* showed the main effects of parental education and race on children's sleep problems. Both race and parental education showed significant association with a child's sleep problems. Children whose parents had some college education were more likely to have sleep problems (b = 1.07, $P = 0.007$), while children from Other-race were more likely to have sleep problems (b = 1.10, $P < 0.001$). *Model 2* showed an interaction between parental education and race on children's sleep problems. While Postgraduate degree of parents was associated with lower sleep problem (b = -2.79, $P = 0.034$), there was an interaction between Post Graduate Degree x Black (b = 3.23, $P = 0.046$). This interaction indicated that the effect of parental education and children's sleep problems is weaker for Black than non-Latino White children.

In a similar fashion, we found interactions between parental education (bachelor) and Latino ethnicity (b = 3.31, $P = 0.023$) and between parental education (postgraduate degree) and Latino ethnicity (b = 3.73, $P = 0.010$). These interactions indicated that the effect of parental education and children's sleep problems is weaker for Latino than non-Latino White children.

Table 1. Descriptive Characteristics by Race

	Level			Non-Latino White		Non-Latino Black		Latino		Asian		Other		Unweighted *P*	*P*
N			11718		6159		1723		2360		251		1225		
				Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)		
Age (mon)		118.96 (7.46)	119.24 (7.48)	119.13 (7.49)	119.45 (7.49)	118.86 (7.24)	119.18 (7.24)	118.54 (7.52)	118.76 (7.53)	119.53 (7.77)	119.77 (7.75)	118.88 (7.40)	119.21 (7.45)	0.012	0.012
Sleep Problems		36.54 (8.25)	36.80(8.53)	36.15 (7.57)	36.57 (7.96)	37.59 (10.15)	37.71 (10.45)	36.31 (8.26)	36.58 (8.58)	35.35 (6.72)	35.50 (6.85)	37.74 (8.56)	38.21 (9.00)	< 0.001	< 0.001
				N (%)	%	N (%)	%	N (%)	%	N (%)	%	N (%)	%		
Parental education	< High School Diploma	568 (4.8)	(6.0)	36 (0.6)	(1.1)	149 (8.6)	(10.0)	343 (14.5)	(15.6)	3 (1.2)	(1.7)	37 (3.0)	(5.2)	< 0.001	< 0.001
	High School Diploma/ GED	1097 (9.4)	(11.0)	206 (3.3)	(4.8)	423 (24.6)	(26.7)	379 (16.1)	(17.3)	3 (1.2)	(1.8)	86 (7.0)	(12.0)		
	Some College	3028 (25.8)	(29.6)	1156 (18.8)	(24.3)	686 (39.8)	(41.4)	795 (33.7)	(36.2)	14 (5.6)	(6.6)	377 (30.8)	(37.6)		
	Bachelor	2996 (25.6)	(24.1)	1938 (31.5)	(30.2)	233 (13.5)	(11.9)	423 (17.9)	(16.6)	75 (29.9)	(30.6)	327 (26.7)	(23.0)		
	Post Graduate Degree	4029 (34.4)	(29.3)	2823 (45.8)	(39.6)	232 (13.5)	(10.0)	420 (17.8)	(14.3)	156 (62.2)	(59.3)	398 (32.5)	(22.1)		
Sex	Female	5621 (48.0)	(48.8)	2893 (47.0)	(48.0)	869 (50.4)	(51.6)	1136 (48.1)	(48.7)	130 (51.8)	(52.2)	593 (48.4)	(49.7)	0.083	0.178
	Male	6097 (52.0)	(51.2)	3266 (53.0)	(52.0)	854 (49.6)	(48.4)	1224 (51.9)	(51.3)	121 (48.2)	(47.8)	632 (51.6)	(50.3)		
Married	No	3757 (32.1)	(38.8)	1100 (17.9)	(25.7)	1218 (70.7)	(77.2)	984 (41.7)	(48.5)	28 (11.2)	(13.3)	427 (34.9)	(45.1)	< 0.001	< 0.001
	Yes	7961 (67.9)	(61.2)	5059 (82.1)	(74.3)	505 (29.3)	(22.8)	1376 (58.3)	(51.5)	223 (88.8)	(86.7)	798 (65.1)	(54.9)		

Table 2. Mixed Effects Regression Models Overall

Characteristic	Model 1 Main Effects			Model 2 M1 + Interactions		
	Estimate	Std. Error	*P*	Estimate	Std. Error	*P*
Parental education (HS Diploma/GED)	0.14	0.44	0.759	-2.25	1.41	0.110
Parental education (Some College)	1.07* *	0.40	0.007	-0.72	1.32	0.587
Parental education (Bachelor)	0.23	0.42	0.592	-2.21#	1.32	0.093
Parental education (Post Graduate Degree)	-0.30	0.42	0.471	-2.79*	1.31	0.034
Race/Ethnicity (Black)	-0.10	0.29	0.731	-2.44#	1.48	0.100
Race/Ethnicity (non-Latino)	-0.40	0.26	0.120	-3.24*	1.38	0.019
Race/Ethnicity (Asian)	-0.90	0.52	0.082	-4.74	4.38	0.279
Race/Ethnicity (Other)	1.10* * *	0.32	0.000	1.28	1.90	0.499
Parental education (HS Diploma/GED) x Black				3.03#	1.63	0.064
Parental education (Some College) x Black				1.18	1.54	0.442
Parental education (Bachelor) x Black				2.79#	1.61	0.084
Parental education (Post Graduate Degree) x Black				3.23*	1.62	0.046
Parental education (HS Diploma/GED) x Latino				2.47	1.54	0.108
Parental education (Some College) x Latino				2.25	1.42	0.114
Parental Education (Bachelor) x Latino				3.31*	1.45	0.023
Parental education (Post Graduate Degree) x Latino				3.73*	1.45	0.010
Parental education (HS Diploma/GED) x Asian				1.26	6.07	0.836
Parental Education (Some College) x Asian				6.81	4.82	0.157
Parental Education (Bachelor) x Asian				3.64	4.48	0.416
Parental Education (Post Graduate Degree) x Asian				3.92	4.43	0.376
Parental Education (HS Diploma/GED) x Other Race				-0.49	2.17	0.823
Parental Education (Some College) x Other Race				-1.23	1.97	0.534
Parental Education (Bachelor) x Other Race				0.23	2.00	0.906
Parental Education (Post Graduate Degree) x Other Race				0.20	1.98	0.922

# $P<0.1$, * $P<0.05$, ** $P<0.01$, *** $P<0.001$

We could not find any similar interaction in Asian or Other-race children. This lack of interactions suggested that parental education similarly associated with children's sleep problems for Asian vs non-Latino White as well as Other-race vs. non-Latino White children.

Figure 1 presents the association between parental education and sleep problems in the pooled sample. As this figure shows, compared to children whose parents did not have high school diploma, those whose parents had some college education were more likely to have sleep problems (b = 1.07, $P = 0.007$).

Figure 2 showed the interaction between parental education and Black race, as well as Latino ethnicity on children's sleep problems. These interactions indicated that the effects of parental education on children's sleep problems are weaker in non-Latino Black and Latino than non-Latino White children.

Discussion

This study showed that the association between parental education and children's sleep problems is diminished for Black and Latino than non-Latino White children. That

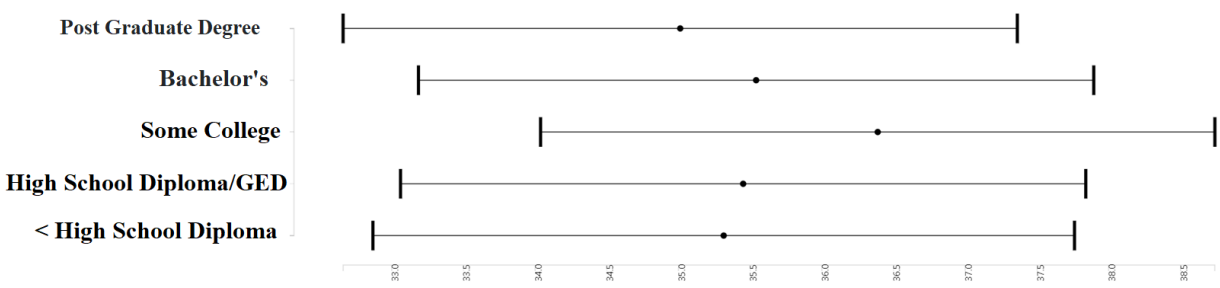

Figure 1. Association Between Parental Education and Children's Sleep Problems Overall.

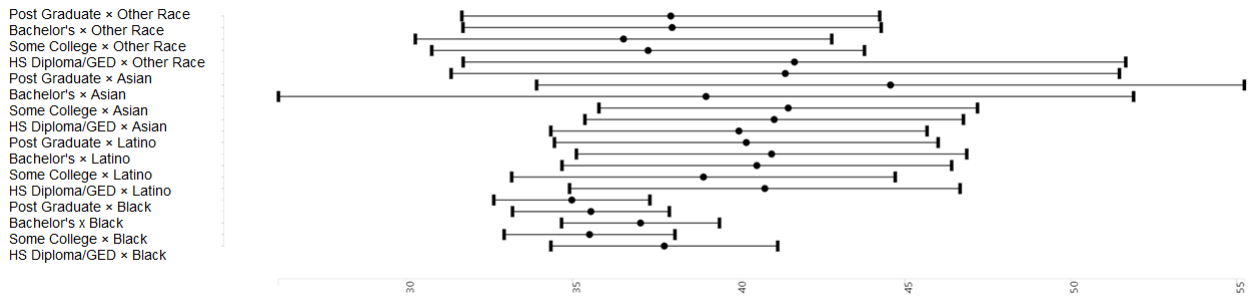

Figure 2. Association Between Parental Education and Children's Sleep Problems by Race/Ethnicity.

is, while parental education is linked to sleep problems for American children, this association is weaker in Black and Latino than non-Latino White families.

Our finding is in line with other studies that show high SES may have a diminished effect on the brain development of non-Latino Black and Latino children compared to non-Latino White children. In a study using ABCD data, high SES Black children remained at risk of depression and suicide, while high SES non-Latino White children were at lower risk of depression and suicide.[39] In other ABCD studies, high SES non-Latino Black children remained at risk of reward dependence; however, non-Latino White SES children had low reward dependency.[40,41] In other studies, high SES non-Latino Black children remained at risk of social, emotional, and behavioral problems; however, this was not the case for non-Latino White children from high SES families.[42,43] In another analysis of the ABCD, high subjective SES was independently associated with larger children's amygdala size. However, the boosting effect of high SES on total amygdala volume was weaker for non-Latino Black children than non-Latino White children. As such, high SES Black children remain at risk regarding the amygdala size, regardless of their SES, which is due to diminished return of SES on all aspects of the development of children due to racism.[44]

Our finding reflects MDRs of parental education on children's sleep problems in Black and Latino families. This is in line with what is already established on the MDRs of many economic resources such as parental education on impulsivity,[15] reward responsiveness,[40] inhibitory control,[45] attention,[46] and ADHD[26] for non-Latino Black children compared to non-Latino White children. Similar MDRs are also reported for the effects of almost all SES indicators on behavioral risks such as substance use [17], unhealthy diet,[27] lack of exercise,[28] anxiety,[25] depression,[19] and suicide.[39] These are all diminishing returns of economic resources for Black and Latino compared to non-Latino White youth.[21,47-49]

MDRs emerge because racial and ethnic minority groups face additional difficulties, mistreatment, and injustice thus minority groups will stay at risk despite high SES.[50-52] As a result of MDRs, we observe higher levels of anxiety,[25] depression,[19] and suicide[39] in high SES Black children than what is seen in high SES non-Latino White children.

These MDRs are not specific to any particular domain or outcome, suggesting that they are due to society, but not culture, behavior, or biology.[12] This is evident because similar MDRs are shown for all marginalized groups across marginalizing identities.[12,13] MDRs are not specific to non-Latino Blacks [16] but also Hispanics,[14,21,53,54] Asian Americans,[22] Native Americans,[23] or even marginalized non-Latino Whites.[24] They are also not specific to a particular SES resource, behavioral outcome, or age group. These patterns are shown for children,[15,16,55] adults,[48] and older adults.[56] This paper extends the previous work on MDRs of parental education for sleep problems in Black children.

Due to sociological and structural factors such as segregation, labor market discrimination, and racism, Black families live under tremendous stress regardless of their SES.[57-60] High SES non-Latino Black families generate less income and wealth and live in worse neighborhoods than non-Latino Whites with similar SES.[61-64] Black and Latino workers with the very same educational attainment work in worse conditions and receive a lower income than non-Latino Whites with similar education.[61]

A wide range of economic and non-economic mechanisms can explain the MDRs of parental education and economic resources on children's sleep problems in non-Latino Black than non-Latino White families. Black families experience high levels of stress across all SES levels.[65] Social mobility has been more taxing for high SES non-Latino Black than White families.[66] Exposure[67,68] and vulnerability[69] to discrimination is high for high SES non-Latino Black families. While low SES Black families struggle with food insecurity, poverty, and neighborhood disorder, high SES non-Latino Black families experience discrimination due to proximity to non-Latino Whites.[67] As discrimination reduces the chance of healthy brain development,[68,69] high SES Black children may remain at risk of impulsivity.[15] As a result, parental education, one of the main drivers of children's brain development, shows weaker effects for non-Latino Black than non-Latino White families.

While low SES and poor outcomes are one type of disadvantage in Black communities, MDRs reflect the

second type of disadvantage.[12,13] These two sources of disadvantages are qualitatively different. While the former reflects unequal outcomes and opportunities, the latter reflects the low response to the presence of individual-level resources such as parental education and SES. It is due to the latter that policymakers may observe sustained inequality despite investments. To address the latter, there is a need to address the systemic causes of inequalities. As a result of combining these two, non-Latino Black families experience double jeopardies: not only resources such as SES are scarce, their influences are also hindered and dampened due to the multitude of constraints in their environment.[12,70]

Multi-level economic and environmental mechanisms reduce the marginal returns of parental education for non-Latino Black families.[12,70] MDRs of parental education are attributed to labor market discrimination, social stratification, segregation, racism, and marginalization. These processes function across multiple societal institutions.[12,70] Racial injustice, prejudice, and discrimination have historically interfered with the gain of resources and assets in Black communities.[50,71,72] One of the many causes of MDRs may be childhood poverty.[64] As a result of historical and structural injustice, MDRs hinder the effects of existing resources and assets across settings and social groups.

Implications

High sleep problems have negative influences on the cognitive and emotional development of a child's brain.[73] Using ABCD data, we found that high SES Black and Latino children remain at risk of sleep problems across SES levels. This finding has implications for clinical work with middle-class Black and Latino children.

Limitations

The current study has some methodological limitations. This study does not infer causality. However, it is more likely that poverty impacts sedentary behavior such as sleep than children's sleep problems shape the household SES. Still, the findings reported here are correlations, not causations. To establish causal evidence, we need to have repeated measures of SES and sleep problems and test if changes in parental education precede a change in children's sleep problems. We only tested the MDRs of parental education. Previous work had established MDRs of various family SES indicators, such as household income.[40,41,74] Future research should test if similar MDRs also apply for other behaviors and time spent on other activities. We only controlled for family-SES, and all the confounders were family- and individual-level SES indicators. It is imperative to control for contextual and neighborhood-level indicators as well as health. Finally, we did not study how these MDRs change over time, how they emerge, and how family dynamics and parenting contribute to them. We also do not know how parents' sleep problems and family norms, expectations, and rules shape such MDRs. More research is needed on whether these Black-White gaps narrow, maintain, or widen over time and whether any factor can undo them. Finally, it is unknown whether MDRs related inequalities in children's sleep problems contribute to the "higher than expected" risk of obesity[16,17,29,49,75] and chronic disease[76-79] in high SES Black people.

Conclusion

Relative to non-Latino White children, Black and Latino children show weaker effects of parental education on sleep problems, meaning that sleep problems stay high in non-Latino Black and Latino children regardless of parental education. This is different from the pattern we observe for non-Latino White families. Clinicians and researchers should pay attention to the diminishing returns of parental education on lifestyle because sleep problems are a driver of a wide range of undesired educational and health outcomes such as poor school performance, anxiety, depression, injury, and chronic disease.

Conflict of Interest Disclosures

The authors declared no conflict of interests.

Ethical Approval

The ABCD study has Institutional Review Board (IRB) approval, and all participants have provided assent or consent, depending on their parental education.[36] Given that our analysis was performed on fully de-identified data, our analysis was exempt from a full IRB review.

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Supplementary Materials

Supplementary file 1. Model Formula
Supplementary file 2. Supplementary Tables

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