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Maternal Education at Birth and Youth Breakfast Consumption at Age 15: Blacks' Diminished Returns

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Abstract: *Background:* Based on the Marginalization-related Diminished Returns (MDRs) framework, high socioeconomic status (SES) such as parental education shows weaker effects for Blacks than Whites. For example, high SES Black individuals report a high level of depression, anxiety, suicide, chronic disease, smoking, and mortality. Limited knowledge exists on MDRs of parental education on dietary behavior. *Aims:* Built on the MDRs framework, we tested the hypothesis of whether the effect of parental education on eating breakfast differs for Black compared to White families. We hypothesized that there is an association between mothers' educational attainment and eating breakfast and compared Blacks and Whites for the effect of mothers' educational attainment on the frequency of eating breakfast. *Methods:* The Fragile Families and Child Wellbeing Study is a 15-year follow up study of a random sample of births in cities larger than 200,000 population. The predictor was parental education at birth. The outcome was the frequency of eating breakfast at age 15. Linear regression was used for data analysis. *Results:* Maternal educational attainment at birth was positively associated with youth frequency of eating breakfast among Whites, not Blacks. We also found a significant interaction between maternal educational attainment at birth and race, suggesting that the association between maternal education and youth frequency of eating breakfast at age 15 was weaker for Black than White families. *Conclusions:* Diminished returns of maternal educational attainment on healthy youth diet may contribute to the racial disparities in poor health of high SES Black families. That is, a smaller protective effect of maternal education on changing health behaviors for Black than White youth may be one of the mechanisms by which health is worse than expected in high SES Black families. The health disparities are not only due to racial differences in SES but also the diminishing returns of socioeconomic status indicators such as education for racial minorities. Research should study contextual and structural factors that reduce Black families' ability to mobilize their human capital and secure health outcomes in urban settings.

Keywords: African Americans; Blacks; maternal health; socioeconomic status; socioeconomic education; birth outcomes; low birth weight

1. Introduction

High socioeconomic status (SES), particularly parental education, is a strong social determinant of health (SDOH) [1]. Individuals with higher SES and higher parental education show better health [2]. High parental education is also among the strongest SES and SDOH indicators [3]. There are, however, variations in the effects of SES and SDOH indicators depending on social context and demographic factors [4]. In other terms, the health effects of SES and SDOH indicators such as education depend on race and place, suggesting a complex interplay between race, place, and resources on shaping populations' and individuals' health outcomes [5].

A growing body of research has suggested that SES and SDOH indicators, such as educational attainment, may be less protective for Black than White families [6,7]. Although historically neglected, attention has been recently given to Marginalization-related Diminished Returns (MDRs) contributions as a source of racial and ethnic health disparities and inequalities in middle-class Black families, particularly in urban settings [6,7]. According to the MDRs framework, SES and SDOH indicators, particularly educational attainment, show weaker effects and generate fewer outcomes for Black than White families [6,7]. As a result of these MDRs, we observe worse than expected health outcomes for youth from highly educated Black families, a pattern not seen for White families [8–10]. While parental education generates fewer health outcomes across domains for Black than White individuals [11,12], we are unaware of any longitudinal studies of differential effects of parental educational attainment (e.g., MDRs) on the frequency of eating breakfast. In one study, education of individuals (not that of their parents) showed weaker effects on the intake of fruit and vegetable for Black relative to White adults [13]. However, this study was cross-sectional, focused on adults, and measured fruit and vegetable intake rather than breakfast. Thus, any longitudinal studies on MDRs of parental education on future breakfast eating of youth would be a unique contribution to the literature.

Aims

Built on the MDRs literature [6,7] and our past work that baseline parental education has a weaker effect on the diet of Blacks than Whites [13], this study was performed with two aims: Aim (1) to test the effect of maternal education on the frequency of eating breakfast, and Aim (2) to compare the effect of maternal educational attainment on the frequency of eating breakfast between Black and White youth. We borrowed data from the Fragile Families and Child Wellbeing Study (FFCWS). We hypothesized a positive association between maternal educational attainment on the frequency of eating breakfast (Hypothesis 1) and weaker effect of maternal educational attainment on the frequency of eating breakfast for Black than White youth (Hypothesis 2). If our Hypothesis 2 is supported, Black youth would have a poor diet, regardless of their parental education, which would explain why highly educated and middle-class Black people still suffer poor health.

2. Methods

2.1. Design, Setting and the FFCWS

This longitudinal study used 15 years of follow up of a national urban sample of newborns. The Fragile Families and Child Wellbeing Study (FFCWS) was conducted from 1998 to 2016. The FFCWS is an ongoing longitudinal study. However, the most current wave of data collection occurred in the year 2016. The FFCWS has followed racially diverse and economically fragile families from their newborns' birth for 15 years when the child is 15 years old. A full description of the FFCWS sampling, design, and methodology of the study are available elsewhere [14]. Here we provide a brief description of the FFCWS sample, sampling, and methods.

2.2. FFCWS Sample and Sampling

The FFCWS recruited newborns that were from economically challenged families. These births were selected from 20 U.S. cities in which the population was 200,000+ people. The FFCWS used a

random sample of urban families. This, however, included an oversampling of non-married and Black and Hispanic couples [14]. Most births in the FFCWS were non-marital, from low SES backgrounds, and represented racial and ethnic minorities. As a result, the sample overall reflects the economically challenged and fragile families. Despite a random sample, this national sample is not representative of the U.S. general population. The baseline sample size of the FFCWS was composed of 4898 families. In the current analysis, we only included 1926 individuals who were followed from birth to age 15 and had complete data on our variables.

2.3. Analytical Sample

The baseline sample size of the FFCWS was composed of 4898 families that entered the study. 1876 were excluded from this number due to missing data on race, mixed race, interracial marriages, other races, or Hispanic ethnicity. Our eligibility also required follow-up data for 15 years [15–19]. The 15-year retention rate of Black and White families was 55%. The current analysis included births of Black and White children who had 15-year follow up data on a diet (at age 15).

2.4. Study Variables

2.4.1. Independent Variables

The main independent variable was maternal educational attainment at the time of newborn birth (wave 1). Maternal educational attainment was a four-level variable: (1) “less than high school”, (2) “high school completed”, (3) “some college education”, and (4) “college completed”. This variable was treated as a continuous measure ranging from 1 to 4, with a higher score indicating higher maternal educational attainment. We decided to include maternal, not paternal education because Black and White families are most different in the father’s presence. That means the inclusion of paternal education would place Black families at an unfair comparison because Black fathers are less likely to be present and remain involved in their children’s lives, at least as resident fathers. Thus, to avoid such bias, we only included maternal education in this study.

2.4.2. Covariate

Youth gender, maternal age at childbirth, family marital status, and family income at baseline were the study covariates. Youth gender was a dichotomous variable: 1 for males and 0 for females. Maternal age at birth was a continuous measure and reported by the mother. Household income level was also treated as a continuous measure (annual income divided by \$1000 US dollars). Family structure was a dichotomous variable: married = 1, non-married = 0.

2.4.3. Dependent Variables

Our outcome was the frequency of eating breakfast using the following item. At age 15, youth were asked how many days in a typical school week they eat breakfast. Participants were asked not to count the weekend. Responses were from 0 to 5. This variable was operationalized as a continuous measure with a higher score indicating breakfast being eaten on more days per week. These data were only available at age 15.

2.4.4. Moderator

Race, the moderator, was self-identified by the mother. This variable was operationalized as a dichotomous variable: Blacks = 1, Whites = 0. All participants were non-Hispanic.

2.5. Statistical Analysis

SPSS 22.0 (SPSS Inc., Chicago, IL, USA) was used for the data analysis. We applied univariate analyses and reported frequency (%) and mean (standard deviation) for categorical and continuous measures to describe the sample. For the multivariable analysis, we used a series of nested linear

regression models. We checked the following assumptions for our model: (1) low correlation between independent variables and moderator (race), (2) near to normal distribution of our outcome (diet at age 15), and (3) near to normal distribution of the error terms of our linear regression model. First, we ran models in the overall sample, and then we ran models specific to race. For aim 1, we ran Model 1. For aim 2, we ran three other models. In these models, youth frequency of eating breakfast at age 15 was the continuous outcome, and maternal education at birth was the independent variable. Model 1 only included the main effects. Model 2 included a race by maternal education interaction term. As educational attainment was treated as a continuous variable, our interaction term was a continuous variable ranging from 0 to 4. Models 3 and 4 tested the same models in White and Black families. As Blacks and Whites had different sample sizes, statistical power in Models 3 and 4 was different. As such, these models are not our main models to test our hypothesis. Our primary model is Model 2, which tested a statistical interaction between race and educational attainment. The results of this model are not affected by the imbalanced sample size in Whites and Blacks. Regression coefficient, standard error (S.E.), 95% confidence intervals (95% CI), and *p*-values are reported.

2.6. Ethics

The FFCWS study protocol and ethics were approved by the Institutional Review Board (IRB) of Princeton University. Mothers (and fathers, if present) provided written informed consent. Youth provided assent at age 15. All the FFCWS data were collected, stored, and analyzed anonymously. Respondents received some financial compensation for their participation.

3. Results

3.1. Descriptive Statistics

This study included 1926 families who were either Black ($n = 1429$) or White ($n = 497$). All these families were followed from birth to the time that their child was 15 years old. Thus, all of these families had data on demographics, SES at wave 1, and youth outcome (breakfast eating) at age 15.

Table 1 shows a summary of the descriptive statistics of the sample overall and by race/ethnicity. Most White and Black families were composed of married and unmarried couples. Maternal age, educational attainment, and family income were all significantly lower in Black than White families. Black youth had a lower frequency of breakfast than White youth.

Table 1. Descriptive overall and by race/ethnicity ($n = 1926$).

Characteristics	All $n = 1926$	-	Whites $n = 497$	-	Blacks $n = 1429$	-
-	n	%	n	%	n	%
Family race	-	-	-	-	-	-
White	497	25.8	497	100.0	-	-
Black	1429	74.2	-	-	1429	100.0
Child gender	-	-	-	-	-	-
Male	980	50.9	258	51.9	722	50.5
Female	946	49.1	239	48.1	707	49.5
Family structure (married parents) at birth ^a	-	-	-	-	-	-
No	1456	75.6	199	40.0	1257	88.0
Yes	470	24.4	298	60.0	172	12.0
-	Mean	SD	Mean	SD	Mean	SD
Maternal age at birth ^{a,b}	25.32	6.15	28.15	6.58	24.33	5.67
Maternal education at birth (1–4) ^{a,b}	2.25	1.01	2.90	1.05	2.03	0.88
Family income at birth (\$1000 USD) ^{a,b}	33.91	33.17	61.18	41.67	24.43	23.05
Youth breakfast frequency at age 15 (0–5) ^{a,b}	3.20	1.92	3.48	1.83	3.10	1.94

^a $p < 0.05$ (Blacks compared to Whites); ^a Pearson chi-squared test; ^b Independent sample *t*-test.

3.2. Pooled Sample Models

Table 2 shows the main results of two linear regressions that were estimated in the overall sample to test the effect of maternal education on youth frequency of eating breakfast at age 15. These models were both statistically significant, suggesting that these models explain a significant proportion of the outcome. Model 1, which did not include our interaction term, showed that high maternal education was associated with youth frequency of eating breakfast at age 15 in the overall sample. Model 2, which included an interaction term between race/ethnicity and mother's education, showed a significant interaction between race and maternal education level, suggesting a larger effect of high maternal education on youth frequency of eating breakfast at age 15 for Whites than Blacks.

Table 2. Linear regression models with youth frequency of eating breakfast at age 15 as the outcome in the overall sample.

Model	Model 1 (Main Effects)		Model 2 (M1 + Interaction)	
Characteristic	B (S.E.)	95% CI	B (S.E.)	95% CI
Race (black)	−0.27 (0.12) *	−0.51–−0.04	0.50 (0.28) #	−0.05–1.04
Gender (female)	−0.53 (0.09) ***	−0.70–−0.36	−0.52 (0.09) ***	−0.69–−0.35
Family married at birth	−0.09 (0.13)	−0.35–0.18	−0.14 (0.14)	−0.41–0.12
Mother's age at birth (years)	0.01 (0.01)	−0.01–0.02	0.01 (0.01)	−0.01–0.02
Household income at birth (\$1000)	0.00 (0.00)	0.00–0.01	0.00 (0.00)	0.00–0.00
Maternal Education at birth (1–4)	0.05 (0.06)	−0.06–0.16	0.28 (0.09) **	0.09–0.46
Maternal Education at birth × race (0–4)	–	–	−0.31 (0.10) **	−0.51–−0.11
Constant	3.33 (0.24) ***	2.87–3.79	2.78 (0.30) ***	2.20–3.36

Outcome: youth frequency of eating breakfast at age 15; confidence interval (CI). # $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

3.3. Models by Race/Ethnicity

Table 3 presents the statistics for linear regressions that were performed to assess the association between maternal education and youth frequency of eating breakfast at age 15 for race/ethnic groups. Model 3 (Whites) and Model 4 (Blacks) were both statistically significant, suggesting that these models explain a significant proportion of the outcome. Model 3 (Whites) and Model 4 (Blacks) showed an association between maternal education and youth frequency of eating breakfast at age 15 for Whites but not Blacks.

Table 3. Linear regression models with youth frequency of eating breakfast at age 15 as the outcome across races.

Model	Model 1 (White)		Model 2 (Black)	
Characteristic	B (S.E.)	95% CI	B (SE)	95% CI
Gender (female)	−0.38 (0.16) *	−0.70–−0.07	−0.56 (0.10) ***	−0.76–−0.36
Family married at birth	−0.27 (0.21)	−0.69–0.16	−0.05 (0.17)	−0.39–0.29
Mother's age at birth (years)	0.00 (0.02)	−0.03–0.03	0.01 (0.01)	−0.01–0.03
Household income at birth (\$1000)	0.01 (0.00) *	0.00–0.01	0.00 (0.00)	−0.01–0.00
Maternal education at birth	0.25 (0.10) *	0.04–0.45	0.00 (0.07)	−0.13–0.13
Constant	2.78 (0.39) ***	2.02–3.54	3.30 (0.24) ***	2.82–3.77

Outcome: youth frequency of eating breakfast at age 15; confidence interval (CI). * $p < 0.05$; *** $p < 0.001$.

4. Discussion

We showed that: (a) overall, high maternal education did not increase youth frequency of eating breakfast at age 15 while the effect of income was controlled, and (b) high maternal education promotes youth frequency of eating breakfast at age 15 for Whites but not Blacks.

We found that while highly educated White families are more likely to eat breakfast, youth with high and low educated Black families have similarly low frequency of eating breakfast at age 15.

This result indicates MDRs of maternal education on youth frequency of eating breakfast at age 15. Previously, MDRs of maternal education, family income, and household income were reported for impulsivity [18], school achievement [12], and school bonding [17]. Similarly, Black children from high SES families remain at high risk of obesity [15], anxiety [20], depression [21], as well as chronic diseases [22] such as attention deficit hyperactivity disorder (ADHD) [16] and asthma [23]. That is, Black children and youth are not much protected from their family SES, which is in line with the MDRs.

The patterns reported here may propose a behavioral explanation for why MDRs exist for both youth and adults. Our study suggests that MDRs commonly observed in adults can be traced back to childhood [23], adolescence [15,18,19], and even birth. As a result of such an unequal start of the life-course, family SES and parental education do not equally translate to Blacks' and Whites' health outcomes over the life-course.

The results reported here, and those shown by other studies, propose that MDRs are not specific to any specific health outcomes. This observation suggests that upstream socialization processes that accompany race, also called racism, are responsible for a systemic difference between Whites and Blacks in gaining health and well-being from educational attainment and other resources [6,7]. These patterns may not even be specific to race, as they are also shown for ethnicity [24–26] and sexual orientation [27,28]. Thus, it is not just racism but any form of marginalization that reduces health gain that follows SES.

The MDRs can be seen in the context of the findings by other scholars. For example, Farmer and Ferraro published work on MDRs of education on self-rated health [29]. In this study, Whites gained more than Blacks from an increase in their educational attainment. Shapiro and Oliver have studied the inequalities in wealth distribution as a consequence of unfair social policies such as Jim Crow and redlining [30,31]. Similarly, Hamilton and Darity have conducted several studies documenting the enormous wealth gap in the United States [32]. Other scholars have also published work on MDRs [33]. For example, Hudson et al. have shown a reduced gain of SES in Blacks' lives [34–36]. In a recent study, income differently reduced discrimination for Whites and Blacks [37]. These are all in line with the Navarro's argument that living conditions and health are not a function of race or class (SES) but race and class [38–40].

The MDRs phenomenon is attributed to several mechanisms and social processes [6,7]. First, they are due to structural and environmental factors [6,7]. Highly educated Black people have a higher tendency than their highly educated White counterparts to be exposed to second-hand tobacco smoke [8]. For example, highly educated ethnic minorities are more likely to be obese [15,41], have high blood pressure [26], eat worse diets [13], smoke cigarettes [10], drink alcohol [25], be depressed [21], and have multiple chronic diseases [23].

Another mechanism behind MDRs is the higher psychosocial tax that Blacks pay for upward social mobility [42]. Blacks report high levels of stress at all mobility statuses. Simultaneously, highly educated Blacks report more stress associated with race and discrimination [43]. Blacks and Whites with the same education do not have similar wealth, which operates as a buffer and protects Blacks if life conditions become out of hand [30,31]. Education also does not have the very same effects on generating income and bringing the Black family out of poverty [44].

We need to emphasize two important methodological issues in this study. First, most previous FFCWS studies have not performed data imputation for attrition in long-term follow-up. As a result, we also decided not to impute missing data due to attrition, so our result could be compared with previous related publications. In doing so, and comparing our results to the past work in the FFCWS, our results were in support of what was shown before. Not only eating breakfast (this study) but also self-rated health [19], obesity [15], ADHD [16], impulsivity [18,45], and school performance [12,46] stay poor in high SES Black families. These FFCWS results are also in line with what is known from the Adolescent Brain Cognitive Development (ABCD) [47–49], National Survey of Children's Health (NSCH) [23], Population Assessment of Tobacco and Health (PATH) [50], Flint Adolescent Study (FAS) [20], Education Longitudinal Study (ELS) [51], and Monitoring the Future (MTF) [52]

studies, all showing poor health and health behaviors of high SES Black children. We are interested in comparing our results to other FFCWS studies, and our imputation and lack of imputation in other related studies may generate bias. We added some text about this issue to our paper.

5. Implications

The current study showed a low prevalence of eating breakfast in middle-class Black youth. The result is important given the important role of eating breakfast to maintain overall health [53]. There is well-established literature composed of several cross-sectional and longitudinal studies, all documenting a positive link between breakfast and health [54]. This research refers to breakfast as the most important meal of the day [54]. In recent years it has been implicated in weight control, cardio-metabolic risk factors, and cognitive performance [55]. Regular consumption of breakfast is associated with adequate intakes of macro and micronutrients in children and adolescents [53]. Regular consumption of breakfast is associated with higher cognitive performance [54]. However, there is a larger health gain from Mediterranean “cereal breakfasts” than the “American” meat-based breakfast [56]. Children who skip breakfast have a higher body mass index and waist circumference [57].

Our findings propose policy solutions that can help reduce health disparities in the United States. Previous policies have mainly tried to reduce inequalities in access to resources and have assumed that eliminating inequalities in access would result in the elimination of inequalities in outcomes. However, our findings suggest that given the MDRs, some parts of the racial and ethnic gaps are not because of unequal access but the systemic disadvantage of Blacks and other ethnic groups in society. Without addressing MDRs, solely enhancing access to SES resources would not be enough to eliminate health disparities. Thus, MDRs may contribute to the advancement of policies to reduce health disparities [58–62].

6. Future Research

Future research should investigate the social determinants of eating breakfast and other aspects of dietary practices of various sub-groups of American youth. Similarly, there is a need to explore differences in the additive and multiplicative effects of race and SES on dietary practices across different ages. Breakfast is not the only important aspect of diet, and it is not only relevant to youth but also for younger children as well. While this study only focused on breakfast eating in American youth based on maternal education and race, literature shows that several other factors also contribute to youth and adults’ dietary behavior across generations, age groups, and developmental phases. These include health literacy, nutritional education in school, access to healthy food, the density of fast food stores, health behaviors other than diet, and family members’ eating habits. Future studies may focus on the dissimilarity and similarity between eating behaviors of parents and children. There is also a need to study how the diet of the family changes over time. This includes a comparison of diet before and after a child is born. There is also a need to study modifiable factors that influence breakfast eating in youth. Studying mediators and moderators of the effects of maternal education and race on diet may propose intervention plans that can be utilized to undo health inequities.

Such research can recommend novel and useful plans for action by the local and federal government to enhance youth dietary practices. Diet may also vary within a house from one child to another. Similar longitudinal data sets and cohort studies provide a valuable tool to study the trajectories in the dietary behaviors from childhood to youth to adulthood. Such research may also benefit from various complicated modeling such as path analysis, structural equation modeling (SEM), mediated moderation, moderated mediation, latent variable modeling, multilevel analysis, and analysis of trajectories. Finally, in this study, family income at birth and maternal education at birth were chosen as the study variables. Future research should also test if family income and maternal education when the offspring is 15-year-old are also important. Similarly, we only studied maternal education. Paternal education is also an important factor.

7. Limitations

The study has a few limitations. First, we did not have balanced samples of Blacks and Whites. The sample was not random. Other risk factors of poor diet, such as health literacy and availability of healthy choices and the parents' work and occupation schedule were not measured. The results are not generalizable to the total population of White and Black families. The FFCWS predominantly recruited economically fragile participants from large cities. Another limitation was a single-item measure. There was also no information on the content of breakfast or other meals. The FFCWS cohort, as its title suggests, reflects the economically challenged and fragile families. This study has also not matched Black and White participants for SES. Whites still have a higher income and higher parental education than Blacks. In addition, these data are from the U.S., and disparities found cannot be generalized to other countries with other ethnicities/races. This study only used the baseline (maternal education) and 15-year-old data (breakfast). Other research could include all waves of the data.

8. Conclusions

In a national sample of U.S. urban areas, high maternal education at birth was not associated with youth breakfast eating 15 years later in the over sample. We see infrequent breakfast eating at age 15 among Black families across all parental education levels. For White youth, the frequency of eating breakfast at age 15 is a function of parental educational attainment. That is, eating breakfast at age 15 is most common among White youth with highly educated mothers. For Black youth, however, the frequency of eating breakfast at age 15 remains always low, regardless of mother's educational level.

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