

The Unique and Interactive Associations Between Discrimination and Economic Hardship Predicting Black Children’s Basal Cortisol Levels

By Otiti A. Mayo¹, Meriah L. Dejoseph², Keira B. Leneman³, Vanessa Anyanso¹, Daniel Berry¹

¹University of Minnesota, ²Stanford University, ³Macalester College

Abstract: Disparities between Black and White populations have been attributed to racial discrimination and socioeconomic inequalities because of historic and systemic oppression. Prior research has demonstrated how experiences of discrimination and economic strain may shape children’s developing stress response systems. Effects of chronic stress, proximally measured via cortisol, a stress hormone, are correlated with mental health outcomes. Using data from the Family Life Project, a prospective longitudinal sample of Black children living in predominantly low-income communities (N = 550), this study explored the unique and interactive relations between parents’ experiences of economic strain and racial discrimination with individual differences in Black children’s basal cortisol levels at age 48 months. Hierarchical regression analysis revealed that there were no significant main or interactive effects of discrimination and measures of socioeconomic status of children’s basal cortisol levels. Despite these null findings, this study highlights the importance of considering the multi-level aspects of social and racial identities when exploring children’s developmental outcomes.

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In the United States, centuries of discriminatory institutional practices, such as red-lining, segregation, and exclusion from certain universities or work opportunities, have led to noticeable disparities between Black and White Americans. Specifically, educational

attainment, income, home ownership, and, subsequently, social class have been disproportionately lower for racial minorities in America due to institutional practices—such as race-based housing discrimination and over-policing—that oppress non-White Americans (Williams & Collins, 2001). Such enduring disparity combined with cumulative discrimination places increased stress on parents and children, with intergenerational

implications for health and wellbeing. Indeed, studies have shown that early childhood experiences of economic hardship and systemic racism are predictive of a litany of poor physical and mental health outcomes (Le Menestrel & Duncan, 2019). Alterations to children's developing stress response systems may reflect the demonstrated links between these systemic stressors and child outcomes (Tran, 2014). The present study aims to examine the main and interactive effects between parents' discrimination and economic stress on Black children's daily cortisol fluctuations at 48 months.

In the introduction, we first provide historical context that describes the root causes of the intertwined nature of intergenerational racial trauma and class-based inequity and the impact it has had on Black Americans and their children. This section aims to put our research questions into important context by addressing the longstanding structural dynamics that directly inform our hypotheses about the role parental experience of discrimination and socioeconomic status have on child outcomes. Next, we discuss how the intersections of race and class lead to unique family stressors that can become "biologically embedded." Throughout, the importance of applying an intersectional framework (i.e., accounting for individuals' multiple identities that affect and are affected by lived experiences) is highlighted to examine the interacting effects of racial discrimination and economic strain on the developmental outcomes of Black youth in America.

Intersections of Race and Socioeconomic Status: The Importance of Historical Context

Intersectionality, credited to Black feminist Kimberlé Crenshaw (1991), is a framework used to examine the different ways that identities of race, class, gender, and sexuality interlock and are affected by social and economic systems of power and oppression (Cooper, 2015). Research has shown that multiple systems of oppression overlap to affect peoples' day-to-day life (Santos & Toomey, 2018). A Black woman may face racial discrimination, and if she is low income, that often comes with its own forms of marginalization that is a unique experience compared to an individual that is White and impoverished. An understanding of historical forms of racism are important for placing our research questions into context and mapping out how the experience of the economically disadvantaged Black American is unique and inseparable from their Black identity.

The intersection of racial experiences with SES, a measure that encompasses education level, income, and social class (Cutler et al., 2008), is an integral part of studying economic and race-based inequities, as well as the mechanisms through which these inequities constitute intergenerational trauma. Intergenerational trauma occurs when historical events and practices of subjugation and oppression continue to negatively impact present-day members of a marginalized group in ways that are enduring across time, social settings, and domains (Blank, 2005; Henderson et al., 2021). This means that, regardless of their own direct experiences, a child can be indirectly affected by the traumatic experiences of their parents.

The history of discriminatory social policies—and their role in undermining upward mobility—provides context for how this intersection of economic status and racialization came to be, and the mechanisms by which cumulative discrimination (Blank, 2005) influences the health of Black American parents and is transferred onto their children. Cumulative discrimination is a measure of the effects of dynamic and systemic discriminatory practices that occur across and within social domains such that the social and individual discrimination effects in one generation might compound and affect future ones (e.g., the effects of educational discrimination on wealth accumulation may later affect the earning opportunities for an individual’s children) (Blank, 2005; Bombay et al., 2014). In the United States, social and institutional practices have created a divide in educational attainment, income, and home ownership between racial minorities, particularly Black Americans and White Americans. (Noël, 2018; Williams & Collins, 2001). As a result, Black Americans experience greater difficulty accruing wealth and moving up the socioeconomic ladder compared to White Americans. The effects of lower socioeconomic attainment create a cycle of inequity in housing quality, health outcomes, food access, and educational achievement (Blank, 2005; Coleman-Jensen et al., 2012).

A flashpoint in the United States’ long, arduous history with social and institutionalized discrimination is the Trans-Atlantic Slave Trade. The Three-Fifths Compromise systematically categorized Black slaves as less than White people, effectively cementing racism—the belief of inferiority used to validate unequal treatment of populations deemed as

inferior—into law (Williams & Collins, 2001; Finkelman, 2016). Although slavery was eventually outlawed, the institutional classification of “Black” as other was irreversible and everlasting. Black Americans were no longer enslaved, but via 18th and 19th century Jim Crow Laws, the social and economic subjugation of Black people persisted and has had a cross-generational impact.

Jim Crow Laws and other minority suppression laws that have contributed to the disproportionately high number of Black men who have been incarcerated across generations. By 2007, more Black Americans were under some form of correctional control than were enslaved in 1850. As of 2020, 1 in 20 Black American men are in prisons or jails, meaning several generations of children have had to—and continue to—grow up with fathers who are behind bars (Alexander, 2010; Gramlich, 2020). This has effectively limited parental resources and household income for their children (Western & McClanahan, 2000). Studies have also linked the high rates of single-parent households among Black Americans to severe social and economic distress (Western & Wildeman, 2008). Research has shown that children in two-parent households generally have better educational attainment, due in part to higher socioeconomic resources and lower stress and family instability risks (Cross, 2020).

Many forms of institutionalized racism in the 20th century, such as discriminatory lending practices, were explicitly designed to physically separate Black Americans from White Americans (Williams & Collins, 2001). One such example was the practice of “redlining” by the Home-Owners Loan Corporation (HOLC),

a former federal agency, which began in the mid-1930s under the direction of the Federal Home Loan Bank Board (FHLBB). The HOLC drew maps for over 200 cities and rated each residential area based on the relative lending risks for banks, and the racial makeup of neighborhoods played a key role in how the neighborhoods were ranked. The ratings ranged from “A” (low risk) through “D” (high risk), and the lower risk areas were drawn in red, hence the term “redlining.” The lower rated “D” areas often had the highest percentages of Black residents, with virtually no Black residents in “A” and “B” areas (Aaronson et al., 2018; Hillier, 2005). Federal housing policies in conjunction with discriminatory bank-loan lending, real estate practices, and social fears, meant that housing options for Black Americans became limited to the least desirable residential areas (Williams & Collins, 2001). Although these practices are now illegal, their consequences persist. For example, the Black-White dissimilarity index (a measure of segregation) was .55 in 2020, meaning that 55% of Black Americans would have to move to eliminate segregation (Menendian et al., 2021). Residence also remains a large determinant of healthcare outcomes with one study finding that residents living in neighborhoods that were redlined are at a 14% higher risk of cardiovascular events compared to non-redlined neighborhoods. The disparities between Black and White adults' experiences of hypertension were also significantly reduced in high-poverty, low-segregation areas, further supporting a need for research which examines the interaction between racial and economic marginalization (Khan, 2024).

Race remains a large determining factor for economic immobility, SES, and mental health outcomes. The combination of income and economic strain measures used in this proposed study is intended to account for the reality of how these historic forms of segregation continue to overtly and covertly influence long-term physical and mental health disparities between Black and White families. Additionally, intersections of race within federal housing and loan policies, among other deep-rooted legislative forms of discrimination, underscore the growing concern that income and other broad sociodemographic indicators alone cannot capture the full influences of poverty and racism on early child development.

Applying Intersectionality to Understand the Intergenerational Effects of Discrimination and Economic Strain on Stress Physiology

Government policies, both implicit and explicit, have systematically undermined the equitable distribution of education, income, and other socioeconomic resources that are critical for healthy development across generations. Black families also experience ongoing social racism, which can undermine early development of children's physiological stress systems, primarily via parental experiences of racial discrimination. For example, research has shown that parental experiences of discrimination, through its effect on parenting behaviors and parent-child interactions, are positively correlated with emotional and behavioral problems (such as internalizing behaviors) in their children (Anderson et al., 2015; Kessler, 2012). Research has also found that among children growing up in persistently high-stress environments, biomarkers like

cortisol reactivity are predictors of externalizing and internalizing behaviors (Kao et al., 2018). Children with intersecting marginalized identities—such as being impoverished and a racial minority—often experience chronic stress brought on by historical inequities (e.g., income, residency, etc.) and acute discrimination (e.g., through parental experiences). Chronic stress is generally what happens when the body’s physiological homeostasis is repeatedly disrupted in response to long periods of stressful conditions such as poverty, crime, and discrimination (Stephens & Wand, 2012).

Among its many functions, the hypothalamic pituitary adrenal (HPA) axis controls the release of cortisol both diurnally—in a distinct pattern that occurs in a daily cycle—and due to being activated by a stressful experience. When activated, hormones (i.e., Corticotrophin-releasing factor (CRF) and Adrenocorticoid hormone (ACTH)) are released from the hypothalamus and pituitary glands. These hormones travel into the bloodstream and trigger the release of cortisol from the adrenal cortex. When well-regulated, a negative feedback loop occurs in which cortisol then acts on the hypothalamus and pituitary gland to stop the continued release of cortisol. However, among individuals who experience chronic stress, this axis of cortisol release may become dysregulated (Pariante and Lightman, 2008). Additionally, because of cortisol’s role in recruiting physiological systems to prepare the body to face stressful challenges, chronic cortisol dysregulation may have cascading effects on physiological regulation. (Stephens & Wand, 2012; Kao et al., 2018). For instance, reports of chronic stress have been associated with significant differences in their cortisol. Studies

have also found that differences in basal diurnal cortisol levels between Black and White children emerge as early as 12 months and are associated with parental experiences of discrimination (Dismukes et al., 2018).

Normative development of physiological stress systems, such as the HPA axis, are important for developing healthy behaviors and appropriate responses to stressful events (Tarullo & Gunnar, 2006). Via both diurnal fluctuations throughout the day and acute responses to real-time environmental challenges, the HPA axis helps us navigate the ups and downs of daily life. However, when the HPA axis is habitually engaged (i.e., due to experiences of racism, prejudice, and discrimination), it leads to wear and tear on a wide range of cardiometabolic, immune, and neural systems. (Dedovic et al., 2009). Researchers have found differences in diurnal cortisol patterns to be predictive of experiences of chronic stress. Specifically, individuals who report chronic stress were found to be at predictive risk of decreased slope of change in baseline cortisol levels throughout the day, meaning their cortisol levels do not decrease as sharply throughout the day compared to healthy individuals (Kinney et al., 2024). The early emergence of these disparities for Black children in the United States may stem from interactions between the risks associated with experiences of socioeconomic inequality as well as maturing in families that are forced to navigate racism in their daily lives.

Hyperactivation of the HPA axis from experiencing chronic stress such as cumulative discrimination and economic strain is associated with increased negative mental and

physical health outcomes across the lifespan and can be transmitted to the next generation (Evans and English, 2002; Finegood et al., 2017; Jackson et al., 2010). In a study of Black adolescents, instances of their parents' racial discrimination were associated with general anxiety, depression, and overall distress, independently of the child's racial discrimination experiences (Pachter & Garcia Coll, 2009). In a 2010 study from the sample the current study examines, the authors found that perceived discrimination served as a predictor of mother's depression symptomology among low-income, rural Black mothers (Odom & Vernon-Feagans, 2010). Additionally, prolonged periods of stress in childhood have been significantly associated with hypertension and diabetes in adulthood as well as chronic inflammation, a known predictor of cognitive impairment (James et al., 2023). Studies have further shown that caregiver behavior and cortisol patterns—which may be altered within a caregiver struggling with depression—are significantly associated with child mental health and cortisol reactivity among low-income parent-child dyads (Baaren et al., 2020; Mckee et al., 2008). Thus, maternal experiences of depression may function as an underlying mechanism that mothers' experiences of depression, discrimination, and SES on children's HPA functioning and subsequent outcomes. Research supports usage of salivary cortisol as proxy for HPA axis stress regulation to predict child adjustment outcomes, and chronic traumatic experiences have been associated with differences in basal cortisol compared to healthy individual (Berry et al., 2012; Kinney et al., 2024).

The Present Study

The current study examines the unique and interactive effects of low family socioeconomic status and parental experiences of racial discrimination on children's stress physiology. Specifically, this study examines the extent to which the relationship between experiences of early poverty and child basal cortisol levels may be compounded by maternal experiences of racial discrimination. Importantly, this study fills a gap to better understand the mechanisms of the impact of institutional and societal stressors on low-income Black children. Prior research on minority stress generally focuses on single social identities (e.g., race, sex, gender) and does not look at how the current systems of oppression interlock. The few that do generally examine the intersections between sexual orientation and race (Harari & Lee, 2021; Parra & Hastings, 2015). Furthermore, much of prior research does not examine how children, who also interact within these systems, may be influenced by them.

The current study also builds on prior work from families participating in the Family Life Project by examining modifications of HPA reactivity due to the interactions between racial discrimination and socioeconomic disadvantage. We tested two specific questions: (1) whether variations in family income (measured by income-to-needs-ratio) and economic strain significantly predict child basal cortisol at 48 months of age and (2) whether the association between our socioeconomic variables and child cortisol varies as a function of parents' experiences of racial discrimination. We hypothesized that lower income would be

associated with higher basal cortisol levels among Black children at 48 months of age. We further hypothesized that this effect would vary as a function of parent perceptions of discrimination-related stress, such that children whose parents report experiencing higher rates of discrimination will demonstrate higher basal cortisol levels.

Methods

Participants & Procedure

The Family Life Project (FLP; Vernon-Feagans et al., 2013) is a longitudinal study of predominantly low-income families from rural areas of the United States with high poverty levels. Specifically, families were sampled from three counties in North Carolina (NC) and Pennsylvania (PA). The areas were chosen to represent the Black South and Appalachia, representative of major geographical regions of the United States with high poverty rates (Dill, 1999). A developmental epidemiological design was implemented to engage families living in these areas to amass a sample of 1,292 children of varying ages. In both states, low-income families were oversampled, yet due to Black individuals being less than 5% of the population of the target communities in PA, Black families were only oversampled in NC. For a comprehensive description of sampling plan and recruitment procedures, see Vernon-Feagans & Cox (2013). Because the current analysis focuses on the effects of racial discrimination, only data collected from children identifying as Black are included in the present study (N = 550).

Data for this analysis comes from two- to three-hour home visits when the children

were approximately 48 months old. The primary caregiver, the mother 99% of the time, filled out questionnaires regarding family demographics, income, economic hardship, discrimination experiences, and child behavior. At the 48-month visit, children's cortisol levels were collected via saliva. In the current analytic sample of children, all were Black, 49.8% were female, and all lived in NC.

Measures

Income-to-Needs Ratio (INR)

The FLP investigators opted to base family income on the total number of individuals who resided in each participant's household. Residents were defined as individuals who spent three or more nights per week in the child's home. The total income from all sources and total number of adults and children in the household was self-reported by the primary caregiver. Family annual income was then divided by the federal threshold for poverty based on family size. INR was averaged across six to 48 months to get a mean score of family financial resources.

Economic Strain

Economic strain (ES) and material need were self-reported by the primary caregiver via a six-item Economic Strain Questionnaire (ESQ, Conger et al., 1994). Of the six items, two items were dedicated to assessing the difficulty level for paying bills and how often the family ran out of money each month (i.e., economic need), and four items assessed the how well the family felt that they were able to appropriately meet their housing, clothing, food, and medical care needs (i.e., economic sufficiency). The scores ranged from 1 (a great deal of difficulty) to 5 (no

difficulty at all) on a Likert-type scale. For example, caregivers were asked “How difficult is it for you to pay your family’s bills each month?” with higher scores corresponding to experiencing higher levels of economic strain. Items on the ESQ were empirically examined to test and adjust for possible measurement non-invariance across INR, race, sex, and development and were subsequently converted to factor scores (see DeJoseph et al., 2021 for details). For the purposes of this study, ES factor scores were averaged across the six to 35-month time points to generate a mean factor score of family economic strain.

Perceived Race-Related Discrimination

At the 35-month visit, mothers reported on race-related stressful events that the mother had experienced over the last 5 years using the Schedule of Racist Events (SRE, Landrine & Klonoff, 1996). The SRE is a brief, 18-item questionnaire that was developed to assess perceptions of racial discrimination. Respondents rate their experiences on a five-point scale from 0 (did not happen) to 4 (very stressful) and include items such as “[you have been] treated unfairly by coworkers, classmates, or colleagues because of your race.” This scale has high reliability (Cronbach’s $\alpha = .95$). Items were summed to create a total score representing levels of cumulative race-related discriminatory and stressful events experienced by the mother over the last five years prior to (and including) the 35-month visit.

Cortisol

The children’s resting levels of cortisol were measured at 48 months. Saliva samples were assayed for cortisol in duplicate using

ELISA technology, a highly sensitive enzyme immunoassay (Salimetrics, Carlsbad, CA). We used the term “resting” to denote that the saliva sample was collected approximately 15- to 20-minutes after the research assistant arrived at the participant’s homes—allowing the child time to acclimate to arrival yet occurring prior to conducting tasks that could stimulate HPA-axis activity. The modal time of day for the saliva collections was 10:00 a.m. Given the diurnal cycle of cortisol across the day, we adjusted for time-of-day in all models. Raw cortisol levels were subjected to natural log transformation to correct positive skew and outliers three standard deviations from the mean were removed.

Covariates

Child sex (1=Female; 0=Male) and child age (at the 48-month visit) were included as covariates. The time of day for which saliva was collected in the 48-month visit was also included to adjust for diurnal patterns and variability in sampling.

Child temperament at age 6 months was also included as a covariate. Using the Rothbart Infant Behavior Questionnaire (IBQ; Gartstein and Rothbart, 2003), parents reported on their children’s exhibition of several behaviors (e.g., fear, cuddliness, and distress to limitations) at 6 months. Specifically, parents read a brief description of a behavior and then were asked to rate how often their child displayed said behavior on a 7-point Likert scale from 1 (never) to 7 (always). Specifically, responses from the distress to novelty subscale were used as covariates due to research which suggests a relationship between variability in this scale and child cortisol reactivity (Reck et al., 2013).

Missing data

Missingness across the variables was handled via full information maximum likelihood (FIML).

Statistical Analysis

Hierarchical regression models were estimated using the R statistical platform (R version 4.4.2 [2024-10-31]), to examine how perceived discrimination and family economic strain relate to child basal cortisol levels at age 48 months. The lme4 package in R was used to examine the main effects. Specifically, we estimated a series of models—first constructing a baseline control covariate model, then gradually adding the respective main and interactive effects of economic strain and acute discrimination to the model (see Table A2). All continuous predictor variables were mean centered to facilitate interpretation.

Results

Descriptive Statistics

As a first step, correlations and descriptive statistics (see Table A1 in the appendix) were consulted to explore preliminary associations and functional forms of the relations between the variables of interest. Correlations demonstrated minimal to moderate associations (Figure A1). Specifically, cortisol was most strongly and negatively related to time of day ($r = -0.35$) such that cortisol levels tended to decrease as the day went on. This was expected given the natural daily rhythm of the HPA axis, with greater waking cortisol values that naturally decrease throughout the day (Berry et al., 2012). Cortisol was very minimally correlated with the other predictors (range: $r = -$

$0.03 - 0.05$); however, these relationships were not found to be significant. With respect to relations among the predictors themselves, INR and economic strain were found to have a moderately negative correlation ($r = -0.23$), meaning higher INR was associated with lower reported economic strain experienced by the family. Additionally, INR and child temperament were moderately, negatively correlated as well ($r = -0.22$). Lastly, there was a modest, positive correlation between stress due to race-related discrimination and INR ($r = 0.14$) and economic strain ($r = 0.16$). This means racial stress increased as both economic strain and INR increased. See Figure A1 for correlations among the variables of interest.

Scatterplots were then examined to explore possible outliers and functional forms. See Figure A3 for scatterplots on the raw data. For INR and racial stress, there appeared to be several outliers that were potentially problematic. Given their skewed distributions, we removed values above the 95th percentile. While model results did not change, the model assumptions were not met when outliers were included.

Linear Regression Models Predicting Child Basal Cortisol at 48 Months

A series of hierarchical regression models were fitted to examine whether individual differences in racial discrimination and socioeconomic status, measured by INR and economic strain, were additively and interactively associated with children's cortisol levels at 48-months of age. The first model included our covariates: parent-reported child sex (male or female), child age, and time of day of basal cortisol collection. We then added in

the effects of income, as measured by INR in the second model. The third model included covariates, INR effects and the effects of stress due to instances of racial discrimination. The fourth model added the effects of economic strain. The fifth and final model included all previously added variables along with the interactions between economic strain and stress. At each step, we examined the statistical significance of our predictors along with changes in R² (i.e., the amount of variance explained by the model).

We did not find any statistically significant main or interactive effects among our predictors of interest (income-to-needs ratio, economic strain, and perceived race related discrimination), which does not provide support for our hypothesis (see Table A2). Of the covariates included in the model, only time of day was found to be significantly associated with basal cortisol measures taken at 48 months ($B = -0.091407$; $p < .001$; see Table A2). In other words, cortisol measures taken later in the day were associated with a .091 lower basal cortisol.

Discussion

The present study explored how low-income, Black parents' experiences of economic hardship and racial discrimination across the first few years of their child's life are related to children's developing stress response systems. Prior research has found links between early exposure to environmental stressors, parenting, and neurohormones related to stress (Blair et al., 2011). Based on this prior literature, we examined the potential role of parent-level stressors stemming from social and racial inequalities that may affect Black children. We sought to apply an intersectional framework by

exploring how parents' economic hardship and experiences of discrimination uniquely and interactively predict Black children's cortisol levels at 48 months of age. To examine these associations, we leveraged data from the Family Life Project (Vernon-Feagans et al., 2013).

Findings for Aim 1: Main Effects of Socioeconomic Inequality on Child Cortisol

Our first aim was to examine how variations in family income (measured by INR) and economic strain would predict child basal cortisol at 48 months of age. Prior literature suggests an association between chronic stress experienced during early childhood poverty and a disruption of physiological stress systems which in part control cortisol levels (Evans and Schamberg, 2009). We predicted that children from families on the lower end of INR, comparatively, would have higher basal cortisol levels. We also predicted that children whose families reported experiencing higher levels of economic strain would exhibit higher measures of basal cortisol—even after adjusting for actual financial resources. Neither INR nor economic strain were found to be significant main or interactive predictors of child basal cortisol, which does not provide support for our hypothesis. It is possible that because low-income families were oversampled in the data, we were unable to adequately compare the high and low ends of the INR spectrum. One prospective study in which low-income ($\leq \$35,000$) and high-income ($\geq \$35,000$) were more equally sampled found psychological stress decreased as income increased, particularly among Black Americans in their participant pool (Redmond et al, 2013).

In an exploratory model of our sample where INR was excluded from the model, controlling for all other variables, parental experience of economic strain significantly explained child cortisol variance. This suggests that INR may not have been relevant in our model due to the largely economically homogenous population. This supports research showing that economic uncertainty and fluctuations in ability to make ends meet is a more robust predictor of the barriers of poverty. Future studies may also seek to study the longitudinal dynamics of child social functioning as their family unit attains upward social mobility. A future analysis may aim to use a participant pool in which both high- and low-income families are included at equivalent sampling. In addition to unequal sampling of INR, our participants were also sampled from rural areas of the United States. There may also be certain characteristics of low-income, rural communities—such as more supportive social networks which may buffer the effects of stress—that were not captured in the current study. One study which examined the effects of rural and urban poverty on psychological wellbeing (i.e. self-reported happiness, depression, and health), found that low-income Black Americans reported higher psychological well-being than their urban counterparts (Amato and Zuo, 1992). A future study may aim to conduct a comparative analysis between low-income urban and rural communities and the interactions with discrimination on child cortisol.

Findings for Aim 2: Interactions with Racial Discrimination

Race and socioeconomic status have both been found to be predictors of health and stress-related outcomes (Jackson & Williams, 2006). However, there is a dearth of research which examines both categories as predictors of stress effects, particularly among children. To address the role that intersectional identities may play in influencing child cortisol, our second aim was to examine whether the association between our socioeconomic variables and child cortisol vary as a function of parents' experiences of racial discrimination. Prior research has found that experiences of racial discrimination predict parental stress and depression (Odom and Vernon-Feagans, 2010), which may in turn affect parenting practices that could subsequently influence children's stress levels. Thus, we predicted that parents' experiences of racial discrimination would exacerbate the relationship between income and child cortisol. In other words, children who had greater economic strain or lower income, plus greater parent discrimination, would exhibit higher basal cortisol levels.

Contrary to our hypotheses, we found the interaction between economic strain and stress due to discrimination did not predict any meaningful variation in cortisol nor did stress due to discrimination have any significant main effect on cortisol. If true, our findings suggest that perhaps the concept of intergenerational transfer of these stresses may not be occurring, at least via our physiological measure, in children of this age. Many studies that investigate the impact of chronic stress via cortisol often use multiple collections

throughout the day to explore stressors as predictors for cortisol dynamics (James et al., 2023). Therefore, it is possible that a single saliva collection as with our sample may not be a precise measure of the associations with our predictors. It is also possible that our families were shielded from the effects of racial discrimination, as assessed by our racial stress measure. Most parents reported relative low levels of race-based stress (Figure A2) thereby creating a sample with low variability, making it challenging to fully model how variability in racial stress affects the relationship between economic strain and basal cortisol. Racial discrimination is also said to be perceived as stressful as a function of frequency (Ajrouch et al., 2010); if families are residing in majority-Black communities, they may not experience interpersonal discrimination frequently enough to be reportable. Future studies that aim to capture the effects of racial discrimination should perhaps sample from populations that are more racially diverse. In addition, studies have proposed that examinations of the influence of distress may be incomplete without considering the buffering effect of social support (Arjouch et al., 2010).

The discrimination measure used in this study was based on parent-report due to a lack of a direct measure of child perception. In the context of this study, this generates a variable that presumes children's ability to pick up on parental experiences of discrimination at 48 months. It is possible that the children included in this study were too young to comprehend that their parents were experiencing racial discrimination, and this lack of comprehension may serve as a buffer for changes in physiological response. Researchers have

identified that children can distinguish racial categories as early as six months, with Black infants demonstrating a greater sensitivity to racial cues than White/European American children (Bennett, 2011). This ability is found to be particularly biased towards the facial characteristics and race of the children's caregivers (Pickron et al., 2017). Researchers' examinations of children's perceptions and experiences with discrimination found that most children are aware of discrimination and often describe it as name calling, unfair sharing of toys, and being socially excluded. Additionally, researchers have found that from ages three to six years, children base their definitions of social identities on physical features such as hair length, skin color, and clothing. However, research has also noted that young children may be unable to fully conceptualize discrimination related to social identities. (Bennett, 2011); young children in this age group may also generally attribute discriminatory behavior as unintentional by the perpetrator or blame the target as responsible for the negative behavior. (Brown and Bigler, 2005). It is also speculated that development of abstract thought in middle childhood, ages seven to 10 years, grant this age group the abilities of social categorization and social comparison to be able to form more complete, multifaceted ethnic and social identities (Rogers et al., 2012). Therefore, it is possible that our age group of 48-month-old children are unable to fully grasp the wider implications of identities and parents' experiences of discrimination at this stage of development (Bennett, 2011). Future researchers may choose to include measures that capture child perception and attribution of discrimination.

We also speculate that there may be a parental influence of shielding children from the effects of racial discrimination via racial socialization. Racial (or ethnic) socialization refers to the conversations racial minority parents and caregivers have with their children about the values, roles, motives, and skills that are related to their position in society as a minority (Bentley et al., 2008). Among Black families, racial socialization often includes discussing the constructs of systemic racism in the United States, maintaining cultural pride in their children, as well as strategies for coping with discrimination to succeed in mainstream society. (Hughes et al., 2006). Racial socialization has been found to be a protective factor for psychological adjustment among Black adolescents (Neblett et al., 2008). Future analysis may also include the effects of racial socialization as a moderator of child outcomes.

Limitations and Future Analysis

Although this study had many strengths, such as the use of a predominately low-income sample of Black families and multiple measures of economic stress and discrimination, there are several limitations worth noting. First, a limitation of this design is that moderation is often considered insufficient to address questions about intersectional identities and the nuanced role they play on family and child outcomes (Juan et al., 2016). Future research leveraging mixed methods is warranted to better understand the lived experiences of individuals and families who are affected by specific intersecting identities (Levant and Wong, 2013). Second, we relied on the use of parent self-report (e.g., perceived stress due to racial discrimination and economic strain). These

variables possibly have inherent reporting biases. Relatedly, our measure of basal cortisol was highly confounded by variation in time of day, and it is possible that cortisol reactivity or diurnal patterns may be a better index of stress system functioning that we were not able to examine in the current study. Despite the use of home visits to alleviate the effects of novelty on child cortisol, future studies should also consider multiple cortisol collections as the presence of a novel examiner may have a confounding effect on a single measurement. Due to the potential biases of parent reports of economic and racial stress, to adequately capture the transmittance of such stress from parent to child, a future study design may consider inclusion of child perception of parental experience of racial discrimination or economic stress. Future studies might also seek to include measures which ask to report whether their child had been present during these stressful occurrences.

Despite the limitations of the study, the implications of these findings should not be discounted. The study sought to expand on our understanding of how multiple conceptions of social identities may additively and interactively influence early childhood functioning—from the level of biology, with links to future mental and physical health outcomes. Our results have important implications for how the stress effects of SES and discrimination may be passed on. It is possible that children who grow up within a rural context are shielded from exposure to inequalities, and further work could explore the role of rurality in influencing the effects of intergeneration transfer of stress and inequality. However, as children develop into and through school-age outside the home, future studies

should examine whether the effects of protective factors persist beyond the potential impacts of race-based discrimination and economic hardship. Our results suggest that assessments which combine the nuance of the experience economic hardship with empirical measures of relative income may be best for modeling the effects of financial strain within families. We recognize that there is limited knowledge on developmental processes among racial minorities and their children, so studies that center these populations are critical for creating programs and policies aimed at reducing structural racial and social inequalities. Additionally, Black youth encounter unique challenges and environments that stem from societal discrimination and experiences of

poverty. Although our findings did not seem to shed much light on important associations between class, race, and child outcomes, future research is needed to better understand how adversity due to race-related discrimination and the experiences of poverty may be intergenerational. Such work has implications for fostering resilient youth. The hope for this work is to underscore that those under the umbrella of Blackness are not a monolith; they are resilient people and a sea of complex, interwoven identities, that deserve to be explored at an equal capacity to build a better tomorrow for Black Americans and their families.

Tables and Figures

Variable	N	Min	Max	Mean
<i>Covariates</i>				
Child Age (years)		3.81	4.74	4.02
Female	274			
Male	276			
Time (hours out of 24)		7.51	21.06	12.79
IBQ		1.06	6.63	3.20
<i>Predictors</i>				
PRRD		0	68	6.98
Economic Strain		-1.77	2.78	0.42
Income-to-Needs Ratio		0	8.41	1.16
Child Resting Cortisol (log)		0.011	3.61	0.019

Table A1. Participant characteristics in the analytic sample and descriptive statistics among the variables of interest. Note. *Child resting cortisol has been log transformed. Time = time of basal cortisol collection in 24-hour time. Child temperament = child temperament at age 6 months from the Rothbart's Infant Behavior Questionnaire. PRRD = Stress due to perceived race-related discrimination.*

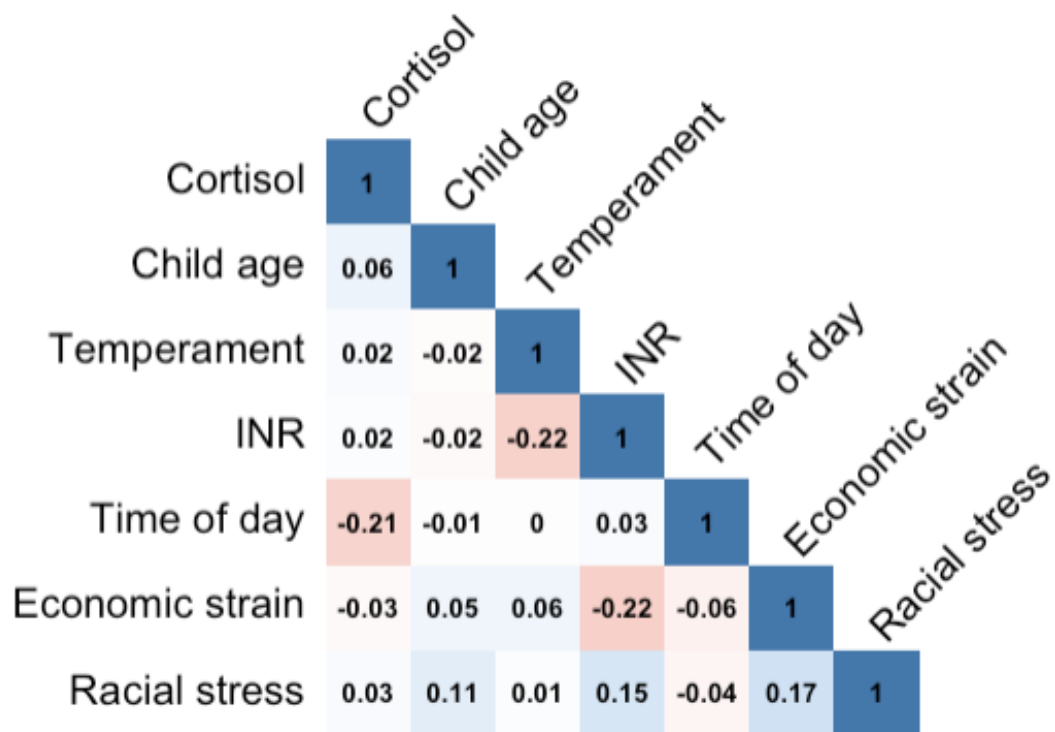


Figure A1. Correlation coefficients between the variables of interest.

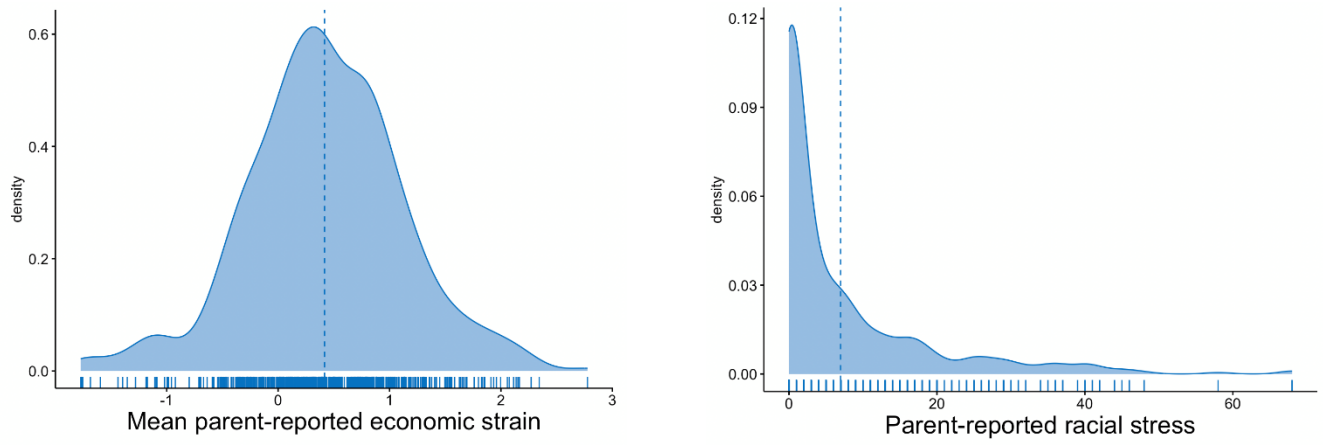


Figure A2. Density plots of parent-reported economic strain (left) and racial stress (right). Dashed line indicates sample mean.

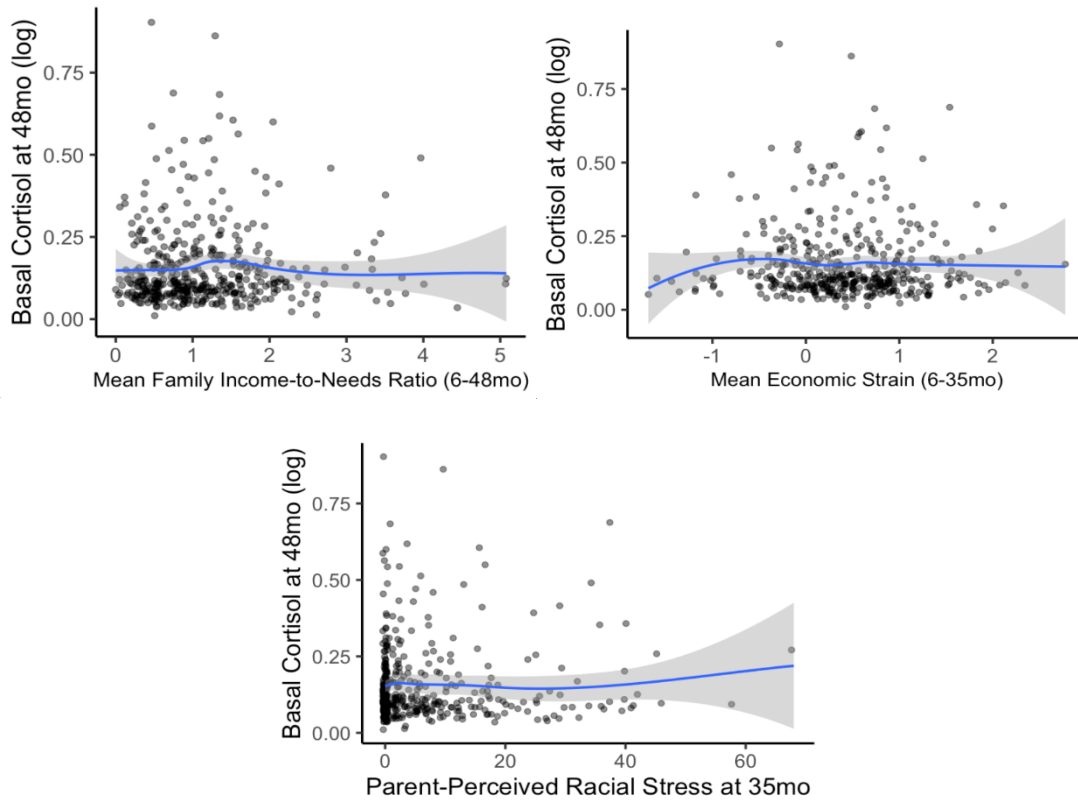


Figure A3. Scatterplots illustrating the raw associations between the predictors of interest (x-axes) and child basal cortisol at 48 months (y-axis). Note. *Black dots represent individual raw data points and blue lines represent the trend lines with confidence bands.*

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
	B	SE	B	SE	B	SE	B	SE	B	SE
<i>Covariates</i>										
Age	0.0477	0.0476	0.0569	0.0506	0.0549	0.0606	0.0587	0.0605	0.0601	0.0606
Female	0.00957	0.0129	0.0144	0.0132	0.0168	0.0137	0.0183	0.0137	0.0192	0.0138
Time	-0.0125**	0.00234	-0.0130**	0.00239	-0.0124**	0.00248	-0.0125**	0.00248	-0.0125**	0.00248
IBQ	0.00126	0.00633	0.000678	0.00655	0.00185	0.00672	0.00196	0.00672	0.00219	0.00672
<i>Predictors</i>										
INR			0.0110	0.0113	0.0124	0.0116	0.00887	0.0118	0.00850	0.0118
PRRD					-0.000750	0.000918	-0.000412	0.000944	0.0000187	0.00104
ES							-0.0159	0.0106	-0.0171	0.0107
PRRD: ES									-0.00141	0.00146
Multiple R ²	0.0725		0.0806		0.0782		0.0845		0.0871	

** $p < .001$

Table A2. Final model output predicting child basal cortisol levels at 48 months. Note. The betas (B) as well as standard error (SE) of all variables included in the model are listed. Note: Age= Child age. Female = Child sex (Female coded as 1; Male coded as 0). Time = time of basal cortisol collection. IBQ = child temperament at age 6 months from the Rothbart's Infant Behavior Questionnaire. INR = Income-to-Needs Ratio. PRRD = Stress due to perceived race-related discrimination. ES = economic strain.

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