Associations between paternal co-residence and child health among African American children

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Abstract

We investigated the associations between paternal co-residence and asthma, obesity, and blood pressure among children aged 3-5 years. Mother/child dyads (N=250) self-identified as African American or Black. Mothers reported on father's co-residence and child's asthma diagnosis. Height, weight, and blood pressure were measured. Regression models were used to examine paternal co-residence with child health outcomes (i.e., asthma, obesity, and blood pressure). Confounders included maternal and child age, child sex, maternal smoking, and insurance status. Children who lived with their father were less likely to have asthma (OR=0.39, 95% CI 0.18-0.79), though this association was not significant after adjustment for confounders (aOR=0.47, 95% CI 0.22-1.01). Paternal co-residence was not significantly associated with child obesity (aOR=0.78, 95% CI 0.35-1.73), systolic (β=0.57, SE=1.2, p=0.64) or diastolic (β=1.91, SE=1.0, p=0.07) blood pressure. More research is necessary to understand the diversity of family living situations and how they affect child health.

Key Words: African Americans, fathers, asthma, blood pressure, obesity

Parental co-residence and involvement is an important component of children's health and development. Nonetheless, much of the research on children's health focuses on maternal influences, thus neglecting a key component of a child's overall wellbeing. Fatherhood has been studied for decades (Lamb, 2000), and paternal involvement has been associated with better emotional and psychological health of children (Fitzgerald et al., 2021; Opondo et al., 2017). Though validated instruments exist to measure paternal involvement, they are not typically used in everyday clinical practice (Allport et al., 2018). These measures include robust assessments of father-child bonding and parenting by assessing involvement with caregiving, attachment, relationship, and social as well as financial support (Hawkins et al., 2002; Pleck, 2010). Paternal involvement in existing studies often refers to fathers co-residing in the home with children, or attendance at health care/medical appointments.

Paternal involvement, co-residence, and child health

Fewer studies have been conducted on paternal involvement, including co-residence with their children, and physical health outcomes compared to emotional and psychological health. Paternal involvement has been associated with improved child nutrition (Sato et al., 2020), which contributes to reduced risk for high blood pressure and cardiovascular disease. A recent systematic review investigated paternal involvement among chronically ill children, and found better child outcomes where fathers were more involved in health care and had higher child-father relationship quality (Taylor et al., 2020). Positive relationships between fathers and their children have also been shown to improve children's mental health (McWey & Cui, 2021), condom use in adolescence (Guilamo-Ramos et al., 2019; Henry et al., 2020) and decreased substance use (Yoon et al., 2021). Few studies were identified that examined physical residence

of father with children's blood pressure, and most studies in this area focused on parental obesity or other behaviors that influence child health (Eberle et al., 2020).

Fathers also play an important role in child physical health outcomes, including asthma. In one study, mothers and fathers each reported their perception of their own involvement in asthma care, and results suggested that while mothers were more knowledgeable about their children's asthma, fathers played a part in helping the family cope with asthma (Friedman et al., 2015). This study included children aged 5 to 9 years, and suggests that although fathers' responsibilities appear minor, they do provide a significant contribution by helping the family adjust to asthma management. Greater paternal involvement has also been found to significantly reduce children's risk of obesity in early childhood. An analysis of the Early Childhood Longitudinal Study- Birth Cohort found that having a father who went on walks or played with their children significantly reduced the odds of their children developing childhood obesity from ages 2 to 4 (Wong et al., 2017). While literature has shown benefits of paternal involvement on child development, more research needs to be conducted on the consequences of their absence, especially in the crucial developmental periods between ages 3 to 5 years.

While understanding the positive influences that fathers have in the household is important, it is also key to consider the effects of lack of a father in the home and paternal involvement have on children (Coates, 2019). The adverse outcomes associated with lack of paternal involvement is especially important for African American and Black families. More Black children are born to unmarried mothers (69.4%) than those of other races (28.2% for Whites, and 51.8% for Hispanics) (National Center for Health Statistics, 2019). A lower prevalence of marriage is not necessarily equivalent to less paternal involvement (Edin et al., 2009), as other individual and societal level factors are also at play. Individual-level factors may

influence paternal involvement, such as divorce or employed away from home (Pilarz et al., 2017) and structural racism influences such as incarceration are also important to consider. Despite overall decreases in national incarceration rates in the US, Black people are still five times more likely to be incarcerated than White people (Gramlich & Pew Research, 2020). Further, 48% of Black males in state prison and 64% of Black males in federal prison were parents of a minor child (U.S. Department of Justice, 2021). These societal factors and the disproportionate incarceration of Black men are important to study and understand, as they affect the well-being of Black children.

The study of factors influencing the health of Black children is especially urgent as they are at particularly high risk for poor health, and have higher rates of asthma, obesity, and high blood pressure than their White counterparts. According to the Centers for Disease Control and Prevention, 24.2% of non-Hispanic Black children aged 2-19 years old were obese in 2017-2018, compared to 16.1% for White children (Fryar et al., 2020). High blood pressure in childhood is associated with higher risk of cardiovascular disease in adulthood (Theodore et al., 2015). Analyses of data from the National Health and Nutrition Examination Survey found that the prevalence of high blood pressure in children aged 5-18 years was 9.3% between 1999-2015 (Sharma et al., 2018). Improved knowledge of risk factors for high blood pressure is especially important as rates of hypertension among children are rising (Kit et al., 2015), and Black and Latino youth have increased risk of atherosclerotic cardiovascular disease and risk factors which contribute to later development of hypertension (Katz et al., 2021).

Purpose

In summary, there is a lack of research on the physical health effects of paternal co-residence among Black families, especially among preschool aged children. Lack of inclusion of

young children in previous studies presents a gap in the literature that may inform health policy or clinical prevention and referral as this is a crucial time period for development and intervention. Therefore, the purpose of this cross-sectional study was to investigate the associations between paternal co-residence and child health outcomes (childhood asthma, high blood pressure, and obesity). We hypothesized that children who lived with their fathers would be less likely to have a diagnosis of asthma, have lower blood pressures, and have lower body mass index (BMI) than to those who did not.

Methods

For the present study, we conducted a secondary analysis of data from the Intergenerational Impact of Genetic and Psychological Factors on Blood Pressure Study (InterGEN). A total of 250 mother/child dyads from Connecticut were enrolled in InterGEN from 2014-2019 for a longitudinal study of gene-environment interactions on blood pressure. Mothers' eligibility included speaking English, age ≥21 years, 3) self-identifying as Black or African American, and 4) no psychological impairment [determined at screening, and if concerns were found, the Mini-Mental State Examination (MMSE) was administered (Folstein et al., 2010)]. Mothers enrolled with a biological child aged 3-5 years, for a total of N=500 participants. Demographic and psychosocial data were collected at each of four visits using Audio Computer-Assisted Self Interview (ACASI) software. The purpose of the InterGEN study was to assess the interaction effects of genomics and environmental exposures on blood pressure (Crusto et al., 2016). InterGEN received Institutional Review Board approval at Yale University (#1311012986) and Columbia University (#AAAS9653). Data are available upon request.

Parental exposures for the current analysis were measured at the baseline (Time 1) visit. At this visit, mothers completed a demographic assessment that included age, current smoking

status, family and household composition, health insurance status, income, and educational attainment. Mothers also responded to questions to ascertain if the biological father lived at home with the child (yes/no). Father information was reported by mothers as well, including age, occupation, and educational attainment. Mothers also reported history of illness for enrolled children, specifically asking if they had ever been told by a doctor that the child had asthma (yes/no).

Clinical measurements were taken by trained research assistants for children at the baseline interview according to established protocols. Blood pressure was measured with the child seated and at rest for five minutes before measurement, and according to pediatric guidelines (National High Blood Pressure Education Program Working Group on High Blood Pressure in & Adolescents, 2004). The mean of three blood pressure readings was calculated, and systolic and diastolic blood pressures were examined separately as continuous variables in statistical models. Child age was calculated from date of birth and date of interview, and mothers self-reported their age and father's age. Child height was measured on barefoot participants to the nearest tenth of an inch, and weight was measured using a high-capacity electronic scale (Tanita Tokyo, Japan). Height and weight were used to calculate child BMI (kg/m^2) percentile according to the 2000 CDC Growth Charts (0 to <20 years) by sex and age, using a published SAS macro (Prevention;, 2019). BMI was categorized as underweight (<5th percentile), normal weight (5th to 84th percentile), overweight (85th to 94th percentile), and obesity (at or above the 95th percentile) (Krebs et al., 2007; Kuczmarski et al., 2002), and also examined as a dichotomous variable (obese (≥95% percentile) vs. non-obese (<95% percentile)) and as a continuous variable.

Descriptive statistics and bivariate analyses were conducted using frequencies, Chi-square, and t-tests. Linear and logistic regression models were used to separately examine the relationship between fathers living in the household with child health outcomes (i.e., asthma, obesity, and blood pressure). Confounders were identified a priori; including maternal and child age, child sex, maternal smoking, and insurance status. Statistical analyses were conducted using SAS 9.4 (Cary, N.C.).

Results

A total of 250 children contributed data for this analysis. Demographic characteristics of children and their biological parents are presented in Table 1. The mean age of children was 49.8 months, and most children were normal weight at the baseline visit (64.5%). Most children (64.5%) had a normal weight (5^{th} – 84^{th} percentile), and 13.3% were obese (≥95th percentile). Mean systolic blood pressure for children was 90.8 mmHg, and mean diastolic was 59.0 mmHg. More female children (58.4%) were enrolled than male (41.6%), and about one quarter of children (24.8%) were ever diagnosed with asthma. Mothers enrolled in InterGEN were most frequently between the ages of 30-39 years old (49.6%), and had completed some college or more (58.0%), and reported an annual household income of less than $15,000 (46.6%). Mothers most frequently reported Medicaid as their health insurance (66.0%), and were single (unpartnered) (64.5%).

Mothers also reported demographic data on fathers (Table 1). Fathers were most frequently between the ages of 30-39 years (42.9%), and had completed high school (56.3%). About a third of fathers (31.8%) lived in the household with the enrolled child. We also examined high blood pressure as a categorical variable according to the American Academy of Pediatrics (data not shown), and only one child met the criteria for Stage 1 hypertension (systolic

Table 1. Characteristics of children enrolled in the Intergenerational Impact of Genetic and Psychological Factors on Blood Pressure (InterGEN) Study and their biological parents, 2014-2019, N=250.

	n (mean) [a]	% (s.d.) [b]
Child characteristics		
Age (months)	49.8	9.3
Sex		
Male	104	41.6
Female	146	58.4
BMI-for-age percentile [c] (kg/m^2)	61.1	31.2
BMI-for-age		
Underweight (<5th percentile)	14	5.6
Normal weight (5th to <85 percentile)	160	64.5
Overweight (85th to <95th percentile)	41	16.5
Obese (≥95th percentile)	33	13.3
Systolic blood pressure (mmHg)	90.8	8.4
Diastolic blood pressure (mmHg)	59.0	7.3
Ever diagnosed with asthma		
Yes	61	24.8
No	185	75.2
Child's mother		
Age		
20-29	105	42.0
30-39	124	49.6
40-49	21	8.4
Highest education completed		
< High School	13	5.2
High School graduate	91	36.6
Some college	82	33.0
Associate degree/College graduate or higher	62	25.0
Annual household income		
≤$15,000	111	46.6
>$15,000-$50,000	102	42.8
≥$50,000	25	10.5

Health insurance			
	Private/employer	35	15.0
	Medicaid	154	66.0
	Government/ACA	37	15.8
	Other	7	3.0
Marital status			
	Married	60	24.1
	Single	160	64.5
	Divorced	12	4.8
	Separated	3	1.2
	Living with partner	13	5.2
Child's father			
Age			
	20-29	70	29.7
	30-39	101	42.9
	40-49	48	20.4
	≥50	16	6.8
Highest education completed			
	< High School	31	13.0
	High School graduate	134	56.3
	Some college	47	19.7
	Associate degree/College graduate or higher	26	10.9
Lives in household with child			
	Yes	79	31.8
	No	169	68.1

[a] Numbers may not sum to 100 due to rounding

[b] s.d.=standard deviation

[c] Body Mass Index, kg= kilogram, m=meters

Table 2. Unadjusted and adjusted multivariable logistic and linear regression results for associations between father co-residence with childhood asthma, obesity, and blood pressure InterGEN Study, 2014-2019, N=250 children.

	Logistic regression				Linear regression					
	Unadjusted		***Adjusted***		***Unadjusted***			***Adjusted***		
	OR	*95% CI*	*OR*	*95% CI*	*β*	*SE*	*p-value*	*β*	*SE*	*p-value*
Child ever diagnosed with asthma	0.39	0.18-0.79	0.47	0.22-1.01						
Obesity (≥95 percentile)	0.67	0.32-1.42	0.78	0.35-1.73						
Systolic blood pressure (mmHg)					0.14	1.2	0.89	0.57	1.2	0.64
Diastolic blood pressure (mmHg)					1.76	1.0	0.08	1.91	1.0	0.07

OR = Odds ratios, CI = Confidence Intervals, β = Beta coefficient, SE = Standard error

Adjusted for child age and sex, maternal age, maternal smoking, insurance status

= 130-139 or diastolic = 80-89), therefore we did not examine this outcome as a categorical variable in models.

Logistic and linear regression results are presented in Table 2. There were no associations between paternal co-residence and a diagnosis of asthma after adjustment for confounders (aOR=0.47, 95% CI 0.22-1.01). Paternal co-residence was also not associated with child obesity (aOR=0.78, 95% CI 0.35-1.73). Linear regression models were used to examine the associations of paternal co-residence with child blood pressure. Living in the same household as their father was not significantly associated with systolic (β=0.57, SE=1.2, p=0.64) or diastolic (β=1.91, SE=1.0, p=0.07) blood pressure in this sample after adjustment for confounders.

Discussion

In this study, we examined the associations between paternal co-residence in the home with mother and child on child health outcomes. We did not find a statistically significant association between paternal co-residence and child health outcomes in this sample, though the direction of these associations were as hypothesized. Our reported prevalence of asthma was 24.0%, compared to 20.2% for Black children in Connecticut overall (Centers for Disease & Prevention, 2018). In addition, the prevalence of obesity among children in this study was 13.3%, which is lower than the current prevalence of obesity among Black children in the U.S. at 24.2% (Fryar et al., 2020). This comparison is limited, however, by differences between reported age ranges in our study versus the national average.

Though our findings were not statistically significant, the direction of findings were similar to previous work. Past research has suggested several reasons to explain the association between paternal co-residence and decreased risk of asthma. Some have suggested that environmental factors such as home allergens, community air pollution and air quality, and viral

respiratory infections may be the main drivers of childhood asthma (Buteau et al., 2019; Pijnenburg et al., 2021). Paternal co-residence may improve child health through various mechanisms, including fewer living spaces and improved housing conditions, lowering the risk for additional exposures to environmental asthma triggers (Allport et al., 2018). Children whose parents live together may also experience more housing stability, which has been linked to children's health and asthma incidence (Chaudhuri, 2021; Dunn, 2020). Other well documented contributors to asthma include genetic susceptibility, biological, and socioeconomic factors (Murray et al., 2021).

In addition, we would have liked to explore paternal incarceration as a potential risk factor for adverse child health outcomes in this sample. These analyses were not included in this analysis as very few fathers in the InterGEN study were incarcerated at the time of the baseline study visit (n=10, 4% of sample). Previous research on paternal incarceration and child health outcomes is limited, yet investigators found that in a racially diverse national sample of children at age 9 years, those with an incarcerated father reported a lower risk of obesity (aOR 0.81; 95% CI, 0.64-1.01) (Branigan & Wildeman, 2019). Another study with a racially diverse sample reported increased risk of high blood pressure (aOR = 1.23, 95% CI, 0.98-1.54) and asthma (aOR = 1.30, 95% CI 1.06-1.60) in young adults who had a father who was incarcerated (Lee et al., 2013). There are few published studies which include young children's blood pressures, especially for those who are Black. This may be due to the low prevalence of high blood pressure in young children, in addition to the fact that the children in our study were preschool aged and it is unlikely that they would have developed high blood pressure at this age. The fact that Black men are disproportionately incarcerated presents an important public health and human rights challenge as we strive to improve child and family health. Future research should be carefully

conducted to examine how incarceration affects child physical health and qualitatively lived experiences.

Although there is considerable literature on the role of fathers and family composition and emotional/developmental outcomes, there is less on physical health outcomes. In other fields, there has been much discussion on moving beyond more simple classifications of father involvement, however, in the health sciences, more work should be done on how these factors affect health outcomes (Bramlett & Blumberg, 2007; Garfield & Isacco Iii, 2012; Hofferth & Pinzon, 2011). This highlights the need and opportunity for more multidisciplinary collaboration in nursing research.

Our study had both strengths and limitations. One major strength was the focus on paternal co-residence and child health outcomes. Our study adds to the sparse literature on associations between paternal co-residence and child health outcomes such as high blood pressure, obesity, and asthma in an all-Black sample. One limitation of our study was the small sample size, making it difficult to detect small effects which are likely present when examining disease outcomes in very young participants. In addition, the InterGEN study was designed to study mothers and children, therefore the paternal measures as a whole were limited, and were based on maternal self-report. The cross-sectional nature of our study also limits conclusions that could be drawn on a temporal basis. We also had limited information on environmental factors that influence these health outcomes, though previous work in the same study sample indicates that the neighborhood environment and social vulnerability were associated with increased cardiovascular risk factors for mothers in the same sample (Basile Ibrahim et al., 2021).

Another limitation of our study is the use of co-residence as the main indicator of paternal involvement. As this was a secondary analysis, we were limited to the available

variables. Future research should expand on the present findings to provide a more thorough and holistic assessment of paternal involvement using a longitudinal study design, and larger sample size. Investigators have previously (Hawkins et al., 2002) examined several dimensions of paternal involvement, such as instrumental dimensions (supporting the mother and disciplining) and contemporary dimensions (attentiveness and spending time with children), which could further our understanding of the influence of paternal involvement on child health outcomes. We were limited by a lack of additional measures on paternal involvement for those fathers who may not reside in the same household, for example, time spent with children, caregiving responsibilities with children, frequency of contact with children, relationship with child, etc. More comprehensive measures of paternal involvement should be developed and examined in future research.

As the majority of the fathers in our sample did not reside in the same household, and were not incarcerated, another important area of future research is on paternal involvement for those who do not co-reside with their children. Early qualitative work in this area reported that non-resident African American fathers described sharing, providing guidance and support, and serving in culturally significant roles as integral to positive relationships (Julion et al., 2007). A growing body of literature has made recommendations for recruitment of nonresident African American fathers into research studies (Julion et al., 2018). In one qualitative analysis, African American mothers reported on their experiences as co-parents with nonresident fathers. The three main themes that emerged were 1) mothers' unwavering resolve to parent their children, 2) prioritizing the children over their own needs or childhood trauma, and 3) good communication with the child's father to maximize co-parenting success (Sumo et al., 2022). Paternal non-residence with their children has been studied in relation to youth violence, with researchers

noting that children with fathers who were more involved in their school displayed less violent behaviors (Tsuchiya et al., 2020). Other work has focused on the relationship and communication between African American non-resident fathers and their sons, finding that increased paternal involvement was associated with increased father-son communication about sex (Burns & Caldwell, 2016). This current literature can inform future work to increase and improve the quality of nonresident fathers in their children's lives. Little work has been published, however, on father involvement and physical health outcomes such as those in our study, representing an important area for future research.

Our research underscores the need for support of both maternal and paternal figures to ensure the positive health outcomes for Black children. As the literature shows, the presence of fathers in the household can be as an indicator of positive health outcomes, and specifically asthma. Future maternal-child health research should expand their scope to the family and take into consideration father's roles and responsibilities. Measures of paternal co-residence and involvement should be clearly defined and incorporated into research to better understand how different paternal roles and involvement affects child health outcomes. Research on paternal co-residence and involvement is especially relevant in light of the COVID-19 pandemic, where families may be separated due to potential work exposures. Further, future research should examine the many possibilities of levels of paternal involvement related to divorce, blended families, and other household living situations and child physical health. An improved understanding of the protective effects of fathers' presence in the household or non-residence could be useful in advocating for programs and policies to support fathers' involvement in the lives of their children, and ultimately improve family health. Finally, though mothers are most

often the parent who presents with their children for medical care, they should not be examined in isolation as the only influence on child health.

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