

The Current Understanding of Fathers Influence on Cardiometabolic Risk Factor Development in Adolescence: A Brief Review

Brief Review

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Abstract

The influence that parents and caregivers have on childhood development is understood and validated. Current research is focused on psychological, social, physical, and spiritual health. Though, in recent years, the early development of cardiometabolic diseases has increased among younger individuals at earlier time periods. The full extent behind the rapid development of these diseases remains unclear. Therefore, the specific influence that each parent or guardian potentially has on future cardiometabolic health development in children and adolescence is an area of growing interest. Significant research has been performed to conclude that the mother has a crucial role in proper childhood development. However, there is limited amount of published research that has isolated the specific role that fathers have on future physiological health outcomes in relation to cardiometabolic health. Thus, the focus of this brief literature review was to ascertain the current influence that a paternal parent has on cardiometabolic health development throughout childhood and adolescence. The results of the review are limited to studies focused on physical growth, nutrition, metabolism, and cardiovascular disease. For many of the studies, the father's role was assessed as a secondary or tertiary variable, and not as a primary factor or outcome. Based on the scarce amount of literature involving the father's role in influencing cardiometabolic health outcomes, a clear consensus cannot be fully ascertained and future research into this area is severely needed.

Key Words: Father, Family, Cardiometabolic health, Metabolism

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Introduction

Various research studies have presented how childhood experiences impact their overall development that can potentially lead to the development of diabetes, obesity, development delays, and mental illness¹. The interplay of biological, genetic, and environmental conditions presents a critical period during the first few years of human life as a predictor of future health outcomes². Even in war-torn areas, studies

show that aspects of the environment affect physical growth and cognitive ability during the years of development³. Factors such as parents without a social support system, unemployed parents, minority status, adverse childhood experience, and traumatic experiences all attribute to poor childhood development, such as that leading to obesity⁴. Other influencing factors in utero or during delivery have been found to have long term effects on the immune system that can be long-lasting⁵.



Within a child's environment, the family in which the individual develops is highly significant in adequate physical and mental development⁶. Poor cognitive development has been found to be associated with poorly educated parents⁷. Additionally, maternal education, household wealth, and country economic development level have significant effects on a child's health⁸. Abuse and household dysfunction during childhood has also been found to be strongly related to risk factors for the leading causes of death in adults (e.g., heart disease, cancer, liver disease) and self-rated health⁹.

Economic variables (such as the degree of wealth) have been found to influence academic and behavioral development of a child up to adolescence¹⁰. Malnutrition, as an effect of poor socioeconomic status (SES), during the first three years of life is a risk factor for poor neurological development.¹¹ Another significant factor in childhood development is the SES of the environment that the child raised and nurtured. A recent meta-analysis revealed that SES is a multifaceted, individual, familial, and community factor that has significant effects on development from an array of factors¹². Temperament is heavily influenced by the SES of the neighborhood in which the child grows¹³. Environments where the parents earn a higher income showed that their children develop earlier walking ability, higher visual acuity from DHA supplemented formula, higher cognitive ability, and greater language ability¹⁴. Overall, economic deprivation can subject children to poorer health and development¹⁵.

The mother is a highly variable factor in childhood development¹⁶. For example, an undernourished pregnant mothers can "program" the fetus which permanently changes their physiology and metabolism during these critical periods of prenatal development, leading to future health detriments.¹⁶ A mother's educational achievement, however, reduces the incidence of the child being underweight¹⁷. Additionally, maternal influence has been proven to be multifaceted with a study showing that women with higher political influence have children with improved health outcomes¹⁸. A mother's work schedule and exercise frequency have also been found to be associated with child's exercise habits and good eating habits.¹⁹ A child's behavior is another significant factor of cardiometabolic health. One study shows that both the mother's and the father's prosocial interactions with their children associate with dissuading children from antisocial behavior, especially in father and daughter relationships²⁰. There is clear evidence that the lifestyle, education, and habits of the mother has significant effects on a child's development and cardiometabolic health. The data to support the role of the father is under researched though various studies do show significant correlations. Therefore, the focus of this brief review is to extrapolate the role of the father on children's health and wellbeing as they develop.

Scientific Methods

A literature review was performed to examine the influence of father involvement and physical presence on poor cardiometabolic health outcomes. The search was performed on PubMed, Sage Journals, EBSCO Host, ScienceDirect, Google Scholar, and JSTOR. The search terms used were "fatherlessness", "fatherlessness and cardiovascular disease", "fatherlessness and hypertension", "fatherlessness and comorbidity", "fatherlessness and obesity", "fatherlessness and diabetes", and "fatherlessness and dyslipidemia". The search was concluded on August 15, 2022. Criteria required for research articles to be included in the review can be found on Table 1. All studies had to include the variable of fatherlessness to some degree. Search results were sorted based on whether the disease or illness was cardiometabolic or other. The literature review produced a total of 10,953 articles. Upon meticulous inspection of the articles, a total of 9 articles were included in the review that met inclusion criteria. Five articles focusing on physical growth and nutrition, two articles focusing on cardiovascular disease (CVD) and two articles focused on metabolic issues (See Table 2). A single investigator performed the methodological quality of included studies.

Influence of Fatherlessness on Physical Growth and Nutrition

Previous research focused on early cardiometabolic health has shown a potential correlation between a child's height, weight, and the dynamics of their parental involvement²¹. In one study from the 1980s, Garman and colleagues, analyzed the influence of one and two parent households on a child's growth and development. Their results showed no significant difference in the height of one and two parent family children, after controlling for birthweight, number of siblings, mother's height and education, and father's height²². Amirabdollahian et al. found evidence that height measurements are useful predictors of cardiometabolic risk factors²³. The primary groups of this study included the mother as head of the family, due to being widowed, separated, divorced, or single. They identified a correlation between higher rates of low birthweights and obesity (measured using height and weight and triceps skinfold measures), showing birthweight and parental height were associated with shorter stature in the children of one parent families.²⁴ Another study analyzed the impact of a father not living with the child, otherwise known as a nonresidential father.²⁵ Menning et al. showed that involvement with a nonresident father was associated with an increased likelihood of children being obese²⁵. It is believed that due to the inconsistency of the father being present, it becomes harder to maintain a healthy lifestyle and healthy habits with the irregularities of meals and meal quality²⁶. Stewart et al. showed



females who are involved with an obese father are more likely to be obese, whereas males who are involved with nonresident fathers are less likely to be underweight²⁶.

Table 1. Inclusion and exclusion criteria for review eligibility

Parameter	Inclusion	Exclusion
Population	Any population	No exclusions
Intervention	Must include the variable of fatherlessness to some degree	No variable of fatherlessness
Outcome	Must examine a disease or illness classified as a cardiometabolic disease	If no cardiometabolic diseases were examined
Study Design	Any study design (e.g., RCT's, Crossover, Cross-sectional, etc.) Published in English	Abstracts, Conference proceedings, Unpublished Theses and Dissertations

RCT = randomized controlled trial

Other studies display how the quality, not necessarily the quantity, of interactions with a nonresident father is more important to a child's overall health when compared to children growing up with resident fathers²⁶. In Cape Town, South Africa, an interview study was performed that showed a cascading effect of poverty influenced by inconsistent parenting that may lead to undernourishment and poor emotional consideration, especially from the father²⁷. Brown et al. found a lack of financial stability from the nonresident father, due to his irregular presence, was associated with dietary needs of the family not being met and being replaced with high fat and high sugar foods. Additionally, a study done in South Africa, concluded father presence was a crucial aspect of how men described their emotional and health related upbringings²⁸. Further supporting how a father's role in physical and cognitive growth, during the adolescent years, is detrimental to health-related outcomes.

Influence of Fatherlessness on Cardiovascular Diseases

Childhood has been proven to be a sensitive period for adult health as higher levels of childhood misfortune was found to be associated with a heightened risk of adult acute myocardial infarction (AMI).²⁹ Cardiovascular disease (CVD) is a significant familial variable that is attached to the likelihood of a child developing CVD later in life³⁰. Childhood misfortune was identified (in terms of the father) as a father with less than a high school education, female household lead, parental divorce, death of parent, and physical and/or emotional abuse. One study found that childhood misfortune may lead to a higher risk of smoking, which is predominately found in people with extensive smoking histories and are at greater risk for AMI. Likewise, O'Rand et al. analyzed cumulative adversity (wherein childhood adversity is compounded upon a life span) and found the several factors in determining childhood adversity, which led to AMI risk, were family instability stemming from the death of a father, demanding work of the father, or unemployed father.³¹ The additive effects of childhood misfortunes and the absence of a father may increase the likelihood of children being more susceptible to AMI's. Furthermore, Washington et al. suggests there is a high likelihood CVD can be decreased via early physicians screening techniques and blood sampling to detect risk factors associated with CVD development.³² If the absence of a father appears to be elevating AMI's and CVD risk factors, then inclusion of fatherlessness or some related variables as another risk factor, would be highly useful for physicians during CVD screenings. Thus, aiding in the early detection of CVD's before they reach more advanced stages.

Table 2. Studies Involving Father's Influence on Children and Adolescent Health

Author	Purpose	Type of study	Participants	Health Status	Assessment Marker	Results	Conclusions
A.R. Garmann 1982	Determine if there is an association between number of prnts living in the household and attained height and weight of the chldn of these families	Longitudinal study	Chldn aged 5-11 attending primary school; total - 5658 chldn; final - 4818 (4499 from two prnt homes, 319 from one prnt homes).	Healthy	Survey combined with measures of height, weight, and triceps skinfolds taken once a year.	Chldn from two prnt homes were invariably taller; one prnt family chldn had high. weight for height and triceps skinfold values with exceptions of weight for height values of Scottish boys and triceps skinfold for English girls; high prop. of one prnt families with low birthweights.	Shorter stature of this group is associated with social and biological factors instead of chldn's prntal situation; weight for height and triceps skinfold measures indicated inc.d likelihood of obesity among one prnt families.
Patricia M. Morton 2014	Examine how early life exp.s can influence later susceptibility to developing heart disease	Longitudinal study (10-year gap between assessment) through phone interviews and mail-in questionnaires	3032 men and women ages 25-74 in 1995 (W1) but 2101 participated in follow-up interview (W2) between 2004 and 2006.	Self-reported history of AMI or no history.	Telephone interviews and mail questionnaires.	Additive child. misfortune (ACM) inc.d AMI risk - each additional misfortune inc.s AMI risk by 9.5%. Positive relationship between AMI family history and AMI risk. 59.8% high. risk of AMI for those who exp.d maltreatment.	Child. is a sensitive period for adult health, child. SES did not predict AMI risk, child. maltreatment could potentially be another fundamental cause of disease; health lifestyles and psychosocial factors would mediate the effect of child. misfortune on AMI risk.
Arthur P. Froese 1980	Determine whether patients of primary familial hyperlipoproteinemia and their unaffected siblings were at inc.d risk for psychological upset	Assessment	43 afcted chldn and 23 unafcted chldn from 28 families.	Families were being treated for primary familial hyperlipoproteine mia; affected chldn indicated some sort of emotional implication.	Psychiatric assessment, interviews, Conner's Prnt Questionnaire.	FL chldn were less likely to be impulsive-hyperactive; daughters without fathers were less likely to have conduct problems and/or be impulsive-hyperactive, but more likely to be perfectionistic. FL boys had significantly high. scores for anxiety and conduct problems than FL girls.	Afcted girls handle their feelings in more socially acceptable way; afcted boys more impulsive-hyperactive and exp. conduct problems; emotional impact of premature death of afcted prnt is greater than the stress of having disease.



Ann Jacoby 1975	Understand how socioeconomic factors affect nutrient intake and nutritional status of children.	Assessment	778 children ages 7-11, 13, and 15 (all but 46 agreed to take part in medical examination).	Healthy, primarily assessed clinically to assess as being obese, good, fair, or poor nutritional status.	One-week weighed diet record, SES questionnaire, and medical examination.	FL children have a better quality of diet, though lower average daily intake of energy and nutrients (except carbs and added sugars). High proportion of FL children were found to be obese.	High proportion of FL children took school meals, thus obtained a high proportion of their weekday intakes of nutrients; high proportion of FL children were obese; Children with obese fathers experienced high mortality and are more likely to be obese. Greater father involvement increases risk of obesity; greater father involvement associated with lower risk of overweight in males; effect of father involvement on obesity is greater if father is obese in females.
Chadwick L Menning 2008	Investigate the relationship between nonresident father involvement and adolescent weight	Data from National Longitudinal Study of Adolescent Health	1983 adolescents' grades 7-12 in 1994-1995 and 1996	Healthy	Data from National Longitudinal Study of Adolescent Health.	Adolescents more involved with nonresident fathers are more likely to become obese and less likely of being overweight; father involvement is negatively related to adolescent overweight; those more involved with most highly educated fathers were less likely to be obese; increased involvement with obese fathers exacerbates risk of obesity in females.	The lack of financial involvement from fathers dramatically affects participating family's food security due to only one member earning below minimum wage. Dietary needs were not met with nutritional foods.
Melissa Judith Brown 2019	Explore the perceptions and limitations that primary caregivers have on fathers' provision of care in a resource constrained community in South Africa	Interviews	10 primary caregivers in Cape Town, South Africa	Healthy	Interview	There is a lack of involvement from fathers in the provision of nutritional care and it negatively affects mothers and grandmothers who need to provide both physical and emotional care.	The lack of financial involvement from fathers dramatically affects participating family's food security due to only one member earning below minimum wage. Dietary needs were not met with nutritional foods.
Angela M. O'Rand 2005	Examine how processes of cumulative adversity shape heart attack risk trajectories across the life course	Assessment	9760 Health and Retirement Study respondents born between 1931 and 1941	Self-reported if a doctor has told them they have had heart attack or have no history of heart attack.	Self-reported retrospective measures of early background.	Those most likely to be in high risk of heart attack trajectory are early disadvantaged (poor child health, unemployed, ever divorced, and non-exercisers); those who are FL are most likely to be classified in high and increasing risk for heart attack trajectories.	Early disadvantage and childhood illness have severe enduring effects and increase the risk for heart attack.



Tasuku Okui 2021	Examine geographic distribution of diabetes mortality in Japan and identify socioeconomic factors affecting differences in municipality-specific diabetes mortality	Assessment	1741 municipalities	Deceased with diabetes (mortality data).	Mortality data from 2013 to 2017.	High rates of single-person households and unemployment associated with a high standardized mortality ratio (SMR) for men; high rates of FL households and blue-collar workers were associated with a high SMR for women.	Socioeconomic factors of municipalities in Japan were found to affect geographic differences in diabetes mortality.
Kopano Ratele 2012	Examine discourses of fatherhood and FLness by drawing on qualitative interviews about exp.s and understandings of fatherhood	Assessment	29 men in South Africa	Healthy	Interview	Legacy of apartheid, unemployment, poverty, and inequality in post-apartheid South Africa, gender inequality, and the burden of HIV/AIDS and violence-related mortality may have negatively affected family and parental practices with a significant number of children growing up without biological fathers, either through premature death or abandonment.	Non-biological father figures and male relatives are immensely important in the fathering of South African boys and men; children are negatively impacted less by growing up in a single-parent family and more in families where there are not enough caregivers who are psychosocially present to offer care and support.

Abbreviations: affect (afct), children (chldn), childhood (child.), experience (exp.), fatherless (FL), higher (high.), increase (inc.), involvement (involv.), negatively (neg.), parent (prnt), proportion (prop.), underweight (UW)

Influence of Fatherlessness on Metabolism

The prenatal health of a child has been thoroughly studied to demonstrate how metabolic factors that lead to disease and disability are heavily influenced by familial biochemical markers³³. However, metabolism is a multilayered system that is highly influenced during childhood by the presence of the father, especially in terms of hyperlipoproteinemia³⁴. Froese et al. observed that children whose father were deceased have a higher level of anxiety and decreased impulsive hyperactivity, led to further health complications³⁴. There was also an added level of negative behavior (impulsive hyperactive behavior) among boys who came from fatherless homes due to familial hyperlipoproteinemia, which was found to be associated with an increased likelihood of misconduct problems. Previous research has identified the crucial role of parents in influencing a healthy lifestyle for their children, especially a lifestyle that prevents the risk of obesity and other metabolic diseases³⁵. One study conducted in Japan, analyzed diabetes mortality and its correlation to fatherless homes³⁶. Okui et al. found that fatherlessness was a confounding variable, in relation to high standardized mortality ratio (SMR), for women growing up with the absence of a father figure³⁶. This study is the most recently published research focused on children's health outcomes; However, the main focus is not on a father's role, but a general collective assessment of mortality relating to factors that influence the development of diabetes³⁶. If more supporting evidence were to come forward about a father's role and metabolism, we may have an idea whether fatherlessness may contribute to the development of metabolic diseases like diabetes.

Conclusions

Fatherlessness has widespread effects on the developing child, ranging from psychological distress to general health issues. Growing up without a father due to divorce, separation, or death, was shown to negatively affect the physical growth of children leading to shorter stature and a higher likelihood of obesity as the quality of time spent with the father was crucial in weight outcomes. Additionally, the irregularity of a nonresident or separated father was found to have negative effects on the diets and emotional upbringing of the child. Correlations in several studies were also seen between an absent father, increased risk of smoking, and AMI. Likewise, hyperlipoproteinemia was another factor analyzed in conjunction with an absent father, as anxiety and decreased impulsive hyperactivity, were all found to complicate a child's developing health. Lastly, fatherless homes in Japan were found to be associated with a high standardized mortality ratio in women.

The effect of fatherlessness on future cardiometabolic health of children maturing to adults has been greatly understudied based on current research. Most of the research related to the influence of fatherlessness on future cardiometabolic health is centered on the effect fathers have towards child development from a psychological perspective. Future research should focus on fatherlessness' influence on cardiometabolic health outcomes in varying degrees of father involvement to quantifying individuals who are potentially at-risk. Research on the development of cardiometabolic diseases during childhood can give light to the potentially significant influence of fatherlessness.

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