

OBESITY RESEARCH AND THE FORGOTTEN AFRICAN AMERICAN CHILD

Background/Objectives: Obesity/overweight is the most prevalent nutritional problem in adult and pediatric populations in the United States. We review up-to-date data on obesity in general, with emphasis on research findings in children. We also focus on non-Hispanic Blacks, an ethnic group that is relatively under-researched, despite having higher rates of obesity than Whites.

Methods: An electronic search of MEDLINE/PubMed and several other bibliographic databases, including JSTOR, EBSCO, and ProQuest, was conducted, and all relevant articles in English were retrieved.

Results: Risk factors for childhood obesity are attributable to a combination of genetic and environmental factors. Literature has focused on the general population and genetic transmission from parents to children. Researchers agree that although genetics plays a major role, the risk of a child becoming obese is highly correlated with environment, as well. Relatively little research has been conducted to delineate obesity risk factors among Blacks, and virtually nothing is known on the determinants of obesity and obesity phenotype acquisition in the Black child.

Conclusions: Genetic and environmental factors play a role in the development of childhood obesity. Despite the rich body of work on the topic, data that specifically address childhood obesity in Blacks are scanty. We need more information on childhood obesity in Blacks so that evidence-based prevention measures can be formulated to reduce the high prevalence of obesity in that population. (*Ethn Dis.* 2006;16:569-575)

Key Words: African American, Child, Obesity

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INTRODUCTION

The increasing prevalence of obesity worldwide has instigated invigorated interest among researchers in recent years. Despite renewed interest, one population that stands at a significantly higher risk for obesity has consistently remained neglected and under-researched: Blacks. The extent of this neglect and the identification of known risk factors for obesity with emphasis on Black children are the focus of this study.

Definitions of, and strategies for, measuring obesity vary from study to study. Although researchers measure obesity/overweight by using everything from thickness of skin folds¹ and waist-to-hip ratio (WHR)² to underwater weighing,³ the most commonly employed strategy involves use of body mass index (BMI). According to the Centers for Disease Control and Prevention, adults with a BMI between 25 and 29.9 kg/m² are considered overweight, and those with BMI ≥ 30 kg/m² are considered obese.⁴ Although different measurements are used in the United States when discussing obesity/overweight in children, this study will use the international standard, in which no distinction is drawn between adults and children.

METHODS

An electronic search of MEDLINE/PubMed and several other bibliographic databases, including JSTOR, EBSCO research databases and ProQuest databases, was conducted with terms referring to the population of interest. All relevant articles in English were retrieved.

Additional searches were then conducted based on references cited in the retrieved articles, and supplementary studies were identified. Searches were also done in specific topical journals, such as the *International Journal of Obesity*, *Obesity Research*, and *Journal of Nutrition*. The electronic search was not time limited and focused mainly on peer-reviewed articles, although all categories of articles, such as original research, literature reviews, and other data-based reports were considered and included. All studies cited in this study were identified and abstracted by the authors.

Figures 1 and 2 were developed by using data derived from the Third National Health and Nutrition Examination Survey (NHANES III).⁵ The relative risk of overweight, obesity, and extreme obesity for Blacks in comparison to Whites in the United States was determined by dividing the percentage of Blacks who were obese/overweight in a certain demographic group with that of obese/overweight Whites in the same demographic group.

RESULTS

Prevalence

The World Health Organization estimates that, globally, >1 billion adults are overweight, and of those, 300 million are obese. The prevalence of obesity/overweight has increased drastically since 1980 in both developed and developing nations. The scope of the problem extends to young children and adolescents, with 17.6 million children under age five currently categorized as overweight.⁶

According to data from NHANES III, an estimated 65.7% of adults

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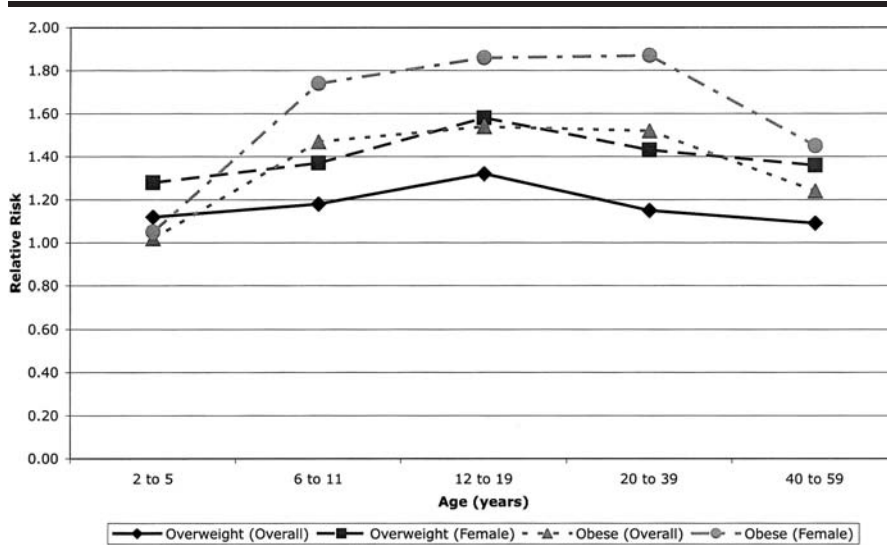


Fig 1. Relative risk of overweight and obesity in Blacks in comparison to Whites in the United States

(≥ 20 years) in the United States are overweight and 30.6% are obese.⁵ This percentage is more than a 100% increase from the 13.4% and 15% of adults who were obese in 1960 and 1980, respectively.⁷ Among people ages 6–19 years, $\approx 31.0\%$ are overweight and 16.0% are obese, and among children ages 2–5 years, $\approx 22.5\%$ are overweight and 10.3% are obese. Over the last two decades, a two-fold increase

has been observed in the prevalence of childhood and adolescent obesity,⁸ and a three-fold increase has occurred in the prevalence of pediatric overweight.⁹ Blacks are overweight and obese at above-average rates in almost all age groups: 20.5% of Blacks ages 6–19 years are overweight, and 70.7% and 39.4% of Blacks over age 20 are overweight and obese, respectively. This disparity can be accounted for entirely

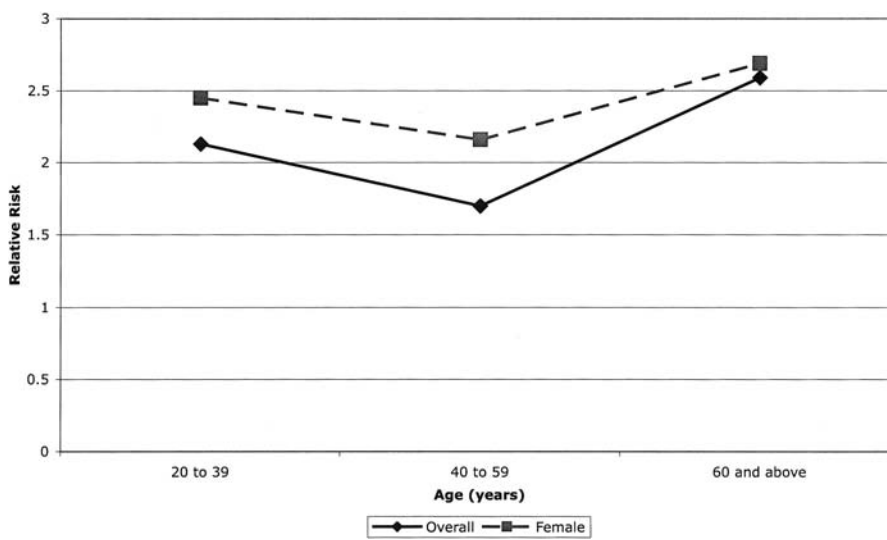


Fig 2. Relative risk of extreme obesity in Blacks in comparison to Whites in the United States

by Black females, who make up the most obese ethnicity-sex group out of non-Hispanic White, non-Hispanic Black, and Mexican American males and females. Ratios of Black prevalence of obesity/overweight to White prevalence of obesity/overweight for six age groups are displayed in Figure 1.

The ratio of the prevalence of obesity/overweight in Black females to that in White females is strikingly large. Although the prevalence of obesity in Black and White females is nearly equal for young children ages 2–5 years, the ratio increases as they grow into childhood (ages 6–11), adolescence (ages 12–19), and adulthood (ages 20–39). The ratio is highest for adults ages 20–39 years, among whom Black women are almost twice as likely to be obese. Although the ratio levels out in the 40- to 59- and ≥ 60 -year age groups, Black women are still by far the most obese, with $>50\%$ obese in both age groups.

Figure 2 illustrates the age-related trend in the incidence of extreme obesity (corresponding to a BMI ≥ 40), a severe and morbid form of the disease. Whereas Black men and White men are equally as likely to be extremely obese, Black women are much more likely than any other group to be extremely obese. Among Black and White women ages ≥ 20 years, Black women are more than twice as likely to be extremely obese.⁶ Black girls are very much at risk of becoming obese and suffering from social, psychological, and health consequences of the disease.

Consequences

Health

Obesity/overweight in children and adolescents have been shown to have serious health consequences.^{10,11} From an exhaustive review of literature on complications of childhood obesity, Reilly et al concluded that obese children are more likely than nonobese children to have a host of cardiovascular problems, similar to those that occur in

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overweight and obese adults, including high blood pressure and hyperinsulinemia.¹¹ Pinhas-Hamiel et al found an association between childhood and adolescent obesity and occurrence of noninsulin-dependent diabetes mellitus among adolescents.¹² Castro-Rodriguez et al performed a longitudinal study in which they concluded that females ages 6–11 years who were overweight or obese were seven times more likely to develop new asthma symptoms at age 11 or 13.¹³

The ramifications of childhood and adolescent obesity/overweight extend into adulthood. Freedman et al found that obese children ages 2–5 were more than four times likely than nonobese children ages 2–5 to become overweight adults, and that childhood BMIs were positively associated with adult BMIs for all ages.¹⁴ Further, people who are obese during adolescence experience higher rates of cardiovascular disease and diabetes; and men who are obese during adolescence experience a higher level of morbidity and mortality from cardiovascular disease and colon cancer.¹⁵ A longitudinal study in the Netherlands concluded that men who are overweight and obese by age 18 have an increased risk of death by age 38.¹⁶

Social and Psychological

Overweight and obese children and adolescents experience an increased risk for social and psychological problems both during childhood and adulthood.

Some researchers have found that obese children are more likely than nonobese children to experience social and psychological problems, particularly self-esteem and behavioral problems¹⁰; however, this effect may not be seen in adult self-esteem levels.¹⁷ Children who are overweight or obese have a social stigma that accompanies their physical handicap.^{18,19} A 2001 study by Latner and Stunkard found that children ages 10–11 have a 40% stronger dislike for obese children, as compared to healthy children, than they did in 1961.²⁰ Obesity in adolescence has social effects in adulthood. Men and women who are obese during late adolescence and early adulthood have a lower rate of marriage than those who are not.¹⁷

Other researchers have focused on the fact that the accompanying psychological burdens of anxiety and depression are transferred to members of society who are not overweight or obese and, therefore, are not merely the burden of the obese/overweight.²¹ For Black children, being obese would be one more label to add to those automatically associated with their skin color or socioeconomic status.

Economic

Overweight and obese individuals are estimated to spend more on medical expenses because of treatment of obesity-related diseases. One study showed that among men ages 45–54 years, costs rise from \$19,600 for those with BMI <22.5 to \$24,000, \$29,600, and \$36,500 for those with BMIs of 27.5, 32.5, and 37.5, respectively.²⁰ Adult females who were obese in late adolescence and early adulthood have, on average, fewer years of education, lower family incomes, and higher poverty rates than females who were not obese in late adolescence or early adulthood, even when controlling for baseline socioeconomic status, aptitude test scores, height, age, parental education, and ethnicity.¹⁷

Other researchers have noted staggering economic consequences of the

obesity epidemic for nonobese individuals, pointing out that healthcare costs of obesity/overweight do not rest solely on the shoulders of obese individuals.²¹ The total cost of obesity is >9% of the national healthcare expenditure in the United States.^{22–24}

Genetic Risk Factors

Research over the last decade has established the role and influence of genetic inheritance on BMI. As early as the late 1990s, numerous studies had demonstrated the recessive major gene inheritance of BMI in Whites, but nothing comparable had been established in Blacks.²⁵ This finding is significant because documented genetic differences exist between ethnicities in codominant modes of transmission and parent-offspring correlations.²⁶

Genetic differences suggest moderate heritability and greater environmental variability for factors related to obesity phenotypes among Blacks. An analysis of 146 same-sex Black twins found additive genetic influence on the three obesity phenotypes that were measured: WHR, waist circumference (WC), and BMI.²⁷ This study confirms genetic and environmental influences on overall fat and abdominal fat with similar effects on abdominal fat (measured by WHR and WC) that are independent of BMI.

The relative deficiency of genetic research on obese Blacks and the comparative lack of specificity in variables studied combine to pose a formidable hurdle for gene-linkage research on obesity phenotypes of Blacks. Indeed, the genetic mode of transmission among Blacks appears far more complex to be identified by BMI and WC alone. As a result, a family study of obese Blacks is needed, with a comprehensive set of measurements including, but not limited to, BMI, abdominal visceral fat, and skin-fold measurements of fat distribution (such as SF6 measurements used in the Québec family study²⁸). If established, cross-trait resemblance for

BMI and precise patterns of fat storage among obese and nonobese family members could provide a route toward ultimately identifying gene linkage between obesity phenotypes.

A number of phenotypes pertain to obesity, such as distribution of visceral and subcutaneous fat stores: abdominal visceral fat deposits are lower in Blacks than in Whites²⁹ in the normal-weight and overweight groups of adults³⁰ and children³¹; differences in fat deposits are greater in men than in women³⁰; obese Black adults compared with obese White adults with identical BMI and weight profiles show lower levels of visceral abdominal fat,³² which suggests a higher ratio of subcutaneous to visceral fat in Blacks; and Blacks in general have greater subcutaneous abdominal adipose tissue than Whites.³³

Two recent studies have complicated our understanding of the correlation between ethnicity and subcutaneous fat storage preferences in obese children. A study of Black and White children with a family history of cardiovascular disease found that ethnicity, sex, and socioeconomic status (SES) had joint effects on adiposity levels (measured by skin-fold thicknesses); but the rate of adiposity from childhood to adulthood was influenced only by sex and SES, and not by ethnicity.³⁴ Another study of body fat composition in obese children and adolescents failed to identify sex or ethnic differences in patterns of fat distribution, but researchers suggested a number of other factors that may have overshadowed the ethnic effect of visceral fat levels.³¹ Possible factors include comparably larger deposits of subcutaneous fat in Blacks not being distributed across the body in a pattern similar to Whites and higher ratios of subcutaneous to visceral fat among Blacks, meaning that measures of subcutaneous fat may have more explanatory power in this population.

Concerns also arise when discussing measurement methods to assess distribution of subcutaneous fat storage, specifically skin-fold measurements. To our

knowledge, no family study of obese Blacks has attempted to correlate skin-fold measurements of parents or siblings as in the multiple and extensive cross-trait resemblance studies of Whites, some of which were conducted >10 years ago.³⁵

Information about gene linkages for obesity phenotypes among Blacks is also rare. Gene/marker information specific to Blacks represented only 3% of the positive evidence for genetic linkage.³⁶ Moreover, of the 41 obesity-related phenotypes presented in the 2003 update of the Human Obesity Genome Map, evidence pertaining to Blacks was limited to only one phenotype: BMI. A study of a mixed sample of Blacks and Whites yielded evidence of suggestive linkage for three phenotypes: generalized obesity, WC, and WHR, but whether these findings will remain applicable to Blacks as the information is further refined is unclear.³⁷ Findings published since then have offered evidence of significant linkage for body fat percentage (BFP) and evidence of suggestive linkage for BMI, BFP, and fat mass (FM) in Blacks.³⁸ In addition to these findings, several studies, at least one including Blacks,³⁹ have implicated the chromosome 2p region as a locus for levels of serum leptin.⁴⁰

One area that has received a lot of attention is the correlation of parent-child BMI. Several studies report that overweight or obese parents are more likely to have overweight or obese children⁴¹⁻⁴⁴ and that family history of the disease predicts increases in child body mass.⁴⁵ In particular, the mother's BMI has been found to be a predictor of childhood obesity,^{42,46} especially in female offspring.^{41,47,48} Despite extensive research on its effect on the development of childhood obesity, very little is known about the relationship between genetic parent-child determinants of obesity in the Black child.

Environmental Risk Factors

Research has demonstrated that, along with genetic make-up, environ-

mental factors are strongly correlated with obesity.⁴⁶ These risk factors include family, school, and general community environments. Family ethnic identity, cultural beliefs,⁴⁹ and habits make the Black child more susceptible to weight gain. This type of familial obesity can be contrasted with isolated obesity, in which the child's personal choice of activities and dietary intake is the primary link to his/her obese condition. These two types of obesity, familial and isolated, are alluded to throughout literature; however, we have found no study that specifically addresses the two types of obesity and their prevalence among Blacks. Regardless of the type, environmental factors have been shown to affect child obesity.

Much research has shown that parental dietary and exercise habits can greatly influence children's food intake and level of physical activity,^{50,51} which can, in turn, contribute to negative health effects, such as high cholesterol levels as children age.⁵² Unfortunately, literature on the effect of Black parents' behaviors on their children's habits is slim, and little is known as to how much culture influences social correlates of dietary behaviors.^{53,54} Nevertheless, some studies have determined that family cultural beliefs influence obesity, especially among Blacks, as their perceptions of health and body habitus varies.⁵⁵

The research reviewed established that school nutrition and physical education policies are subjecting students to the risk of becoming more obese. Many studies have alluded to public schools' failure to provide proper nutrition and physical activity.⁴⁶ School nutrition programs have been heavily scrutinized as consisting of foods of convenience instead of sufficient nutrients.⁵⁶ The increased presence of snack machines in schools⁵⁷ and the displacement of milk, fruits, and vegetables from children's diets by sweetened drinks have led to greater weight gain.⁵⁸ To make matters worse, school children

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are exercising less than the recommended 60 minutes of moderate physical activity most days of the week.⁵⁹ A national study of elementary school students found that children only engage in 25 minutes per week of moderate-to-vigorous physical activity in school physical education, less than half of the recommended time.^{60,61} Another study reported that, in 1997, only 27.4% of children attended physical education class daily.⁴⁶

The effect of a child's community on his/her weight status has also been delineated through research. Community environmental factors include demographic and social elements. The social status of a family and its community affect all of these factors, which affect the family and child's food intake, physical behavior, and, eventually, weight status.^{62,63}

Though obesity has infiltrated American middle and upper classes, research clearly links obesity to poverty. For example, after controlling for numerous variables (eg, parental overweight, dietary intake, activity/inactivity, birth weight, and breastfeeding), Danielzik et al found that children from low SES backgrounds were more frequently overweight than children from higher SES backgrounds (SES was

measured by using highest level of parental educational attainment as a proxy).⁶⁴ After controlling for level of access to healthcare services, children ages 6–11 with low parental educational attainment and those from a household with an income below 125% of the poverty level had a 38% and 43% greater risk of obesity, respectively, as compared to children ages 6–11 with higher SES in these areas.⁶³

The relationship between poor neighborhoods and rates of obesity has also been linked to the types of foods available in the communities⁶⁵ as well as the types of leisure activity available in the community⁶⁶ and the safety of a neighborhood as a determinant of children's freedom to be outdoors versus indoors.⁶⁷

CONCLUSIONS

Despite extensive literature on obesity, much more research is needed specifically addressing Blacks, especially during childhood. Many risk factors studied have addressed White and/or international populations or included a small percentage of Blacks, but these studies are not sufficient to make valid conclusions that could guide policymakers, health providers, and prevention program planning. Furthermore, risk factors are often studied separately, although their interconnectedness/interrelatedness has clearly been determined throughout the literature. Studies should not only closely examine interconnections between various risk factors but also determine the types of obesity, frequency, and patterns of obesity phenotypes (eg, phenotypic distribution) and magnitude of associated morbidity burden on Blacks, especially during childhood.

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