RELATIONS OF BLACK MOTHERS' AND DAUGHTERS' BODY FATNESS, PHYSICAL ACTIVITY BELIEFS AND BEHAVIOR

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Objectives: 1) Examine the association between Black mothers' and daughters' body fatness, physical activity (PA) beliefs and levels of PA, and daughters' PA behavior; 2) determine whether family sociodemographic factors influence these relationships.

Design and Setting: Cross-sectional; Black girls recruited from elementary schools in a low socioeconomic area. Data collected at the Georgia Prevention Institute.

Participants: 133 Black girls (8–12 years of age) and their mothers (24–66 years of age).

Analyses: Spearman correlations, regressions.

Outcome Measures: Body mass index (BMI) as a measure of body fatness. Moderate and vigorous PA collected from a 7-d recall. Beliefs about PA collected from questionnaires.

Results: There was a positive relation between mothers' and daughters' BMI (r_s=0.34, P<.0001). Mothers' and daughters' PA beliefs were positive but not significantly related. A significant inverse relation was seen between vigorous PA (r_s=−0.16, P<.05); and a nonsignificant correlation between moderate PA (r_s=0.05). Mothers' body fatness, PA beliefs and behavior did not predict daughters' PA. The BMI association was stronger when spouse lived in household (P<.01). Daughters' BMI was lower (P<.05) and intent to be active higher (P<.05) when more people lived in the household. Family income accentuated the relation of mothers' belief in the usefulness of PA and daughters' PA physical outcomes beliefs (P=.1). Mothers' age and education had no significant influence on daughters' PA beliefs and behaviors.

Conclusion: Mothers and daughters believed PA to have beneficial outcomes. Mothers' body fatness, PA beliefs and behaviors were not associated with daughters' PA. Family income and structure appeared to influence these relationships. (*Ethn Dis*. 2006;16:172–179)

Key Words: Maternal Influence, Obesity, Physical Activity, Psychosocial Values and Beliefs, Sociodemographic

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INTRODUCTION

In Black girls between the ages of 6 and 11, the prevalence of overweight (22.8%) is significantly higher than in White girls the same age (13.1%), based on the latest reports available from the 1999–2002 National Health and Nutrition Examination Survey.[1] National surveillance data also suggest higher rates of sedentary behavior in Black girls compared to other population groups.[2] Factors contributing to excess weight gain and the decline in the participation in physical activity (PA) and sport in young Black girls are not fully understood and are difficult to characterize due to the complexity of familial genetic factors, cultural preferences, and shared environmental influences.[3–7]

Family predisposition to obesity and physical inactivity has been reported previously to be similar in Black and White families.[7,8] However, more studies are needed to identify parental characteristics that may act as determinants of excess weight gain and sedentary lifestyle behaviors in Black families. Studies that have reported on parental influences on obesity and PA in Black children are mostly limited to evaluating Black mothers.[5,9,10]

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A useful theoretical framework for parental influences on PA behaviors in children is the Family Influence Model,[11] which is based on Bandura's Cognitive Social Learning Theory and the concept of "reciprocal determinism."[12] Precepts of the Family Influence Model are that parental characteristics (in this case the mother's) along with the effects of sociodemographic factors, influence the emerging characteristics (PA beliefs and behaviors) in the child (in this case the daughter's). The child's decision to participate in either an active or sedentary lifestyle has subsequent desirable or undesirable long-term health outcomes (eg, physical fitness and healthy weight vs increased risk for cardiovascular-related diseases such as obesity, hypertension, and type 2 diabetes).[13,14]

Guided by this theoretical framework, we investigated the following specific research questions: 1) Is there an association between Black mothers' and daughters' body fatness, PA beliefs, and levels of activity, and are these variables predictive of daughters' PA behavior? 2) Do family sociodemographic variables influence these relations?

METHODS

Subjects

This was a cross-sectional study of 133 dyads of daughters (8–12 years of age) and their mothers/female guardians (24–66 years of age). Girls were participants in the Medical College of Georgia (MCG) Exercise Project (HL64972), which was a randomized trial of an after-school intervention for prevention of obesity in Black girls. Program flyers were sent home with the Black girls in 3rd, 4th, and 5th grades of recruited schools urging interested parents to contact the Georgia Prevention Institute (GPI) for more information. All healthy girls who volunteered and were not involved in another exercise or weight-control program were eligible for this project.

Their mothers were recruited for this study when they accompanied their daughters to the orientation and consent process for the MCG Exercise Project. Mothers were asked to consider participation in a health interview and to undergo measurements of body composition. Exclusion criteria for the women were pregnancy or having a medical condition that precluded them from undergoing study measurements.

The response rate from the targeted elementary schools for the MCG Exercise program (parent project that recruited the daughters) was 43.4%. From the 178 mothers/guardians available from the parent MCG Exercise Project, 74% (n=133) volunteered to participate in the current study and signed informed consent documents in accordance with procedures of our human assurance committee.

Common Measures and Definitions

Body weight (in shorts and t-shirt) and height (without shoes) were measured with an electronic scale and stadiometer and converted to BMI (kg/m^2). Overweight for adults was defined as BMI 25.0–29.9, obesity as BMI $\geq$30.0, and morbid obesity as BMI $\geq$40.[15] Overweight in children was defined as BMI $\geq$95th percentile, and at risk for overweight was defined as BMI $\geq$85th but $<$95th percentile for age and sex based on the 2000 Centers for Disease Control and Prevention Growth Chart.[16]

Physical activity was assessed by the interviewer-administered version of the Seven Day PA Recall,[17,18] which provided the average number of minutes of PA (moderate, hard, and very hard) per day that were performed in the past seven days. Metabolic equivalents of tasks (METs) were used as conversion factors for energy intensity levels, assuming that resting energy expenditure equal 1 MET=1 kcal/min. Moderate PA were activities of 3–6 METs; vigorous PA were activities $>$6 METs. The family demographic characteristics were obtained from the mothers' health history interview and included education level, marital status, family income, and number of people in household.

Instruments Specific to Mothers

The 16-item Relative Fitness Value Scale (FITVAL) developed by Kimiecik and Horn was administered to assess the degree to which mothers valued participation in moderate-to-vigorous PA as alternatives to other activities.[19] The FITVAL was preceded by a case scenario presented to the mothers. Based on their daughters' participation in a fitness-oriented activity, assuming equal costs, time demands, and ease of participation, mothers were asked to make a relative assessment of how much they valued their daughters' participation in a fitness-oriented PA program compared to their participation in alternative activities such as taking piano lessons, playing computer games, attending academic, church-related activities, etc. The possible responses were coded according to a 7-point Likert scale which ranged from the listed activity being "much less important than a fitness-oriented PA program" (1), to the listed alternative activity being "much more important than a fitness-oriented PA program" (7). A high sum of scores on the 16 items-indicated a high relative value for the child's participation in other activities as compared to a fitness-oriented PA program. In the original assessment of White middle to high-income midwestern families, the Cronbach coefficient for the mothers' scores was .77[19] The internal consistency for our current sample of southern urban Black mothers was .89.

Four other subscales from the work of Kimiecik and Horn were used to measure mothers' beliefs about the usefulness and importance of fitness-oriented PA and sports participation for herself and her daughter.[19] The subscales had three items each: 1) how useful it was for her or her daughter to participate in PA or sports, 2) how important it was for her or her daughter to be high in physical fitness or to be good at sports, and 3) how well she or her daughter liked to participate in fitness-oriented PA or sports activities. For each scale a seven-point Likert-type response format was used with the anchors ranging from the activity being "not at all useful or important" (1) to being "very useful or important" (7) or "does not like at all" (1) to "likes a lot" (7). Cronbach's α for the subscales on mothers' beliefs about PA for her daughter were .48–75. The internal consistency for items on the mothers' beliefs about PA for herself was .80–85.

Instruments Specific to Daughters

The daughters' beliefs about PA were assessed by using subscales from questionnaires developed by Saunders et al.[20] Items were selected to correspond with the mothers' responses related to values and outcome beliefs. From the Physical Outcomes Scale, four items were selected pertaining to the daugh-

ters' beliefs about the consequences of participating in PA, (ie, ''If I were to be physically active most days it would: 1) make me tired, 2) give me energy, 3) be fun, or 4) be boring''). These items were measured on a dichotomous (yes or no) scale. Internal consistency of the items evaluated with the current sample was .63.

Self-efficacy for PA was measured by relative statements of expectancy values. Six items from the PA as a Positive Alternative Scale were selected, (eg, ''I think I can be physically active after school: 1) even if I could watch TV or play video games instead; or 2) even if my friends don't want me to.'') Responses were dichotomous (Yes or No). The internal consistency was .79.

The intention to be physically active was measured by one item. Participants selected from one of five sentences indicating intention to be physically active on most days. Responses were coded on a five-point Likert scale from ''I am sure I will not be physically active'' (1), to ''I am sure I will be physically active'' (5). The Cronbach coefficient α was .80.

Statistical Methods

Descriptive statistics and frequencies were tabulated for all study variables. Associations between mothers' and daughters' measurements were evaluated by regression models, with the mothers' measured values as independent variables to predict those of their daughters. For continuous dependent measures, linear regression with stepwise variable selection was used to develop prediction models. Statistical testing of the final models was performed with mixed model analysis of variance, to account for intercorrelation from including more than one daughter for ≈13% of mothers. For dichotomous response variables, logistic regression was used to develop predictive models, with final models tested by using generalized estimating equations. Household income was used as a continuous variable in the regression models, with spacing established by using the lower endpoint of the income ranges from the survey questionnaire. Marital status was dichotomized as ''spouse residing in household'' or ''no spouse residing in household.'' We dichotomized the variables (families with or without a spouse living in the household) to reference the dynamic effects of families without fathers present in the household. The seven-point Likert scale was dichotomized as 7 or <7 for the Importance and Usefulness of PA and Sport Participation Scales because the range of responses was narrow. Since this was an exploratory study, significance level of the statistical tests was set at $P \leq .10$.

Table 1. Participants' characteristics

	Mothers			Daughters		
	Mean	SD	Range	Mean	SD	Range
Age (y)	37.1	7.8	24–65	9.6	0.8	8–12
BMI (kg/m^2)	31.1	7.2	18–51	21.3	5.3	13–38
Weight (kg)	83.4	20.1	46–132	43.0	13.8	20–85
Height (cm)	63.5	6.4	143–182	141.0	9.0	120–166
Moderate PA (h/d)	2.1	2.0	0–10	0.3	0.4	0–2.5
Vigorous PA (h/d)	0.2	0.5	0–4	0.1	0.2	0–1.1
Family Sociodemographic Characteristics						
Household income				**Percent**		
<10,000				28.0		
10,000–19,999				18.9		
20,000–34,999				27.2		
35,000–49,999				14.4		
50,000+				11.4		
Maternal education (highest grade completed)						
<High school				17.3		
High school				27.1		
>High school				55.6		
Marital status						
Spouse residing in household				44.7		
Spouse not in household				54.5		
Number of people in household						
≤2				5.3		
3–4				61.0		
≥5				32.7		

RESULTS

Participants' Characteristics

Descriptive statistics of mother and daughter characteristics of body measurements and moderate and vigorous activity levels are seen in Table 1. Most mothers were obese (52%) or overweight (29%). Thirty-three percent of the daughters were overweight ≥95th percentile, and 18% were at-risk for overweight (85th–95th percentile). The mean BMI for the daughters corresponded to approximately the 90th percentile for this age group.

The moderate and vigorous PA means are presented separately (see Table 1). The daughters participated in 0.35 hours per day of moderate activity, which equates to ≈21 minutes of moderate activity per day, which is lower than the recommended levels of 60 minutes of PA on most, preferably all, days of the week for children.[21] The mothers reported an average of 2.1 hours per day of moderate activity. Nineteen percent of mothers and 26% of daughters reported participating in vigorous activity (mean 12 and 6 minutes per day, respectively).

Table 2. Descriptive data: mothers' values and beliefs about PA for their daughters and themselves

Scales*	Mean	SD
Relative value of daughter's fitness participation†	3.37	1.1
Importance of daughter's fitness‡	6.20	1.1
Importance of daughters' sports participation‡	5.19	1.4
How well mother believes daughter likes to participate in fitness-oriented PA‡	6.10	1.3
Importance of physical fitness for self‡	5.61	1.4
Importance of sports participation for self‡	4.40	1.8
How well mother likes to participate in fitness-oriented PA‡	5.20	1.5

* Possible range for all scales =1–7.
† Scale range: 1=much less important than fitness program; 7=much more important than fitness program.
‡ Scale range: 1=not at all useful, not at all important, or does not like at all; 7=very useful, very important, or likes to participate a lot.

The mothers' self-report of PA indicated that most of their PA was related to housework, child care, and occupational tasks such as janitorial or retail services. Very little PA was from leisure activity. The family sociodemographic variables are also shown in Table 1. Forty-seven percent of families were living below the average poverty threshold for four people living in the household.[22] In our study, the percentage of female-headed households (55%) was higher than the national percentage for Black families of 43% maintained by women with no spouse present.[23]

Description of Mothers' Beliefs about PA

The mothers' beliefs about PA for their daughters and themselves are shown in Table 2. Descriptive data for the mothers' responses to the FITVAL scale revealed that scores were in the middle range (3.37 ± 1.11) for how much they valued their daughters participating in fitness-oriented PA compared to other activities. The alternative activities (not shown in table) that were rated higher than participating in a fitness-oriented PA were participating in religious activities (mean 5.1 ± 1.6); family fun activities (mean 4.0 ± 1.8); and involvement in extracurricular academic activities outside of school (academic activities such as computer classes, language classes; mean 4.5 ± 1.6). Participating in a competitive youth sport team (eg, basketball, soccer, tennis, golf) also received a slightly higher mean score (3.8 ± 1.5). Those activities that rated lower in preference than fitness-oriented PA were participating in noncompetitive PA such as bike-riding, hiking, skiing, and swimming (mean 1.6 ± 1.0), playing computer games (mean =2.2 ± 1.8), watching TV or videos (mean 1.8 ± 1.6), and going to friends' homes (mean =2.0 ± 1.6). Mothers' scores were in the high range for the subscales pertaining to their beliefs about the importance, usefulness, and enjoyment of PA and sport for their daughters and for themselves. Mean scores for these subscales are shown in Table 2.

Description of Daughters' Beliefs about PA

The description of the daughters' beliefs about PA is shown in Table 3. The daughters' scores were in the middle-to-high range for beliefs that PA could lead to beneficial physical outcomes (mean 8.94 ± 1.93). However, when daughters were asked in relative terms how confident they were that they could participate in PA as an alternative to other non-PA behaviors, the mean score was lower (4.66 ± 1.35). The mean score of (3.86 ± 1.36) for intention to be active on most days was slightly above the middle range on the scale. Forty-nine percent of respondents said they were sure they could be active.

Table 3. Daughters' beliefs about the psychosocial determinants of PA

Scales	# Yes Responses	Percent	Scale Range
Physical outcomes beliefs			Dichotomous
If I were to be physically active most days it would:			(Yes, No)
make me tired	57	43.8	
give me energy	111	84.1	
be fun	121	91.7	
be boring	26	19.7	
PA as a positive alternative			Dichotomous
I think I can be physically active:			(Yes, No)
after school even if I could watch TV or play video games instead	93	71.0	
after school even if my friends want me to do something else	36	27.2	
even if I have to stay at home	105	79.6	
at least three times a week for the next two weeks	113	85.6	
even when I'd rather be doing something else	102	77.2	
even if my friends don't want me to	106	80.3	
Intention to be active			Likert
Intention to be active on most days during free time			1–5
I am sure I will not be physically active.	13	10.2	
I probably will not be physically active.	9	7.0	
I may or may not be physically active.	23	17.9	
I probably will be physically active.	20	15.6	
I am sure I will be physically active.	63	49.2	

Association of Mothers' and Daughters' Body Fatness, PA Beliefs, and Behaviors and Relations to Daughters' PA Behavior

The first research question was to determine whether the mothers' body fatness, PA beliefs, and behaviors were associated with their daughters' body fatness, PA beliefs, and behaviors and if these variables were predictors of daughters' PA participation. There was a significantly positive correlation between mothers' and daughters' BMI (r_s=0.34, P<.0001). Mother and daughter belief scores about PA were positive but were inversely or nonsignificantly related (not shown). Nearly no correlation was seen between mothers' and daughters' moderate PA behavior (r_s=0.05, NS). Mothers' and daughters' vigorous PA behavior was inversely associated (r_s= −0.16). When all daughters were included in the analysis, the distributions for vigorous PA were severely skewed. The P value was not available for this correlation because of the nonindependence of the observations. Using only the first-recruited daughter, the rank correlation was −0.20, P=.05. Relations between mothers' and daughters' body fatness, PA beliefs, and behavior to daughters' moderate and vigorous activity in the multivariate regression analyses were mostly nonsignificant or inverse. Some variables were not included in the final models.

The Influence of Family Sociodemographic Factors

The second research question was to determine whether the mother and daughter relationships were influenced by family sociodemographic factors. Age and education were not associated with daughters' PA beliefs and behaviors (all P values > .05). There was a significant interaction between mothers' BMI and marital status, (P<.05) such that the positive association between the mothers' and daughters' BMI was more pronounced when a spouse was in the household (Figure 1). Daughters' BMI was lower if more people were living in the household (P<.05), and daughters' level of intent to be active was higher when more people lived in the household (P<.05). The daughters' beliefs about the physical outcomes related to being physically active were significantly positively associated with household income (P<.02). The interaction between household income, mothers' belief in the usefulness for their daughters participating in PA to improve fitness, and daughters' PA outcome beliefs was significant (P=.1) (Figure 2).

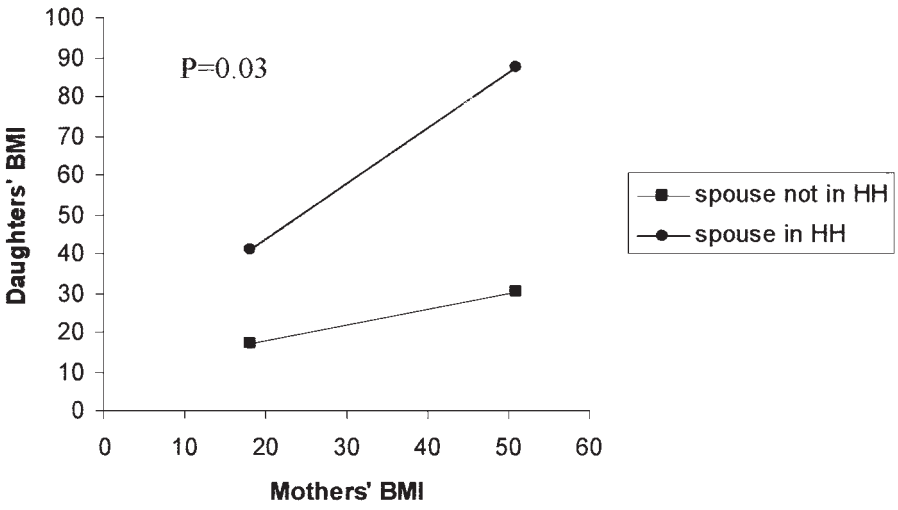

Fig 1. Interaction of mothers' BMI and presence (or absence) of spouse in household

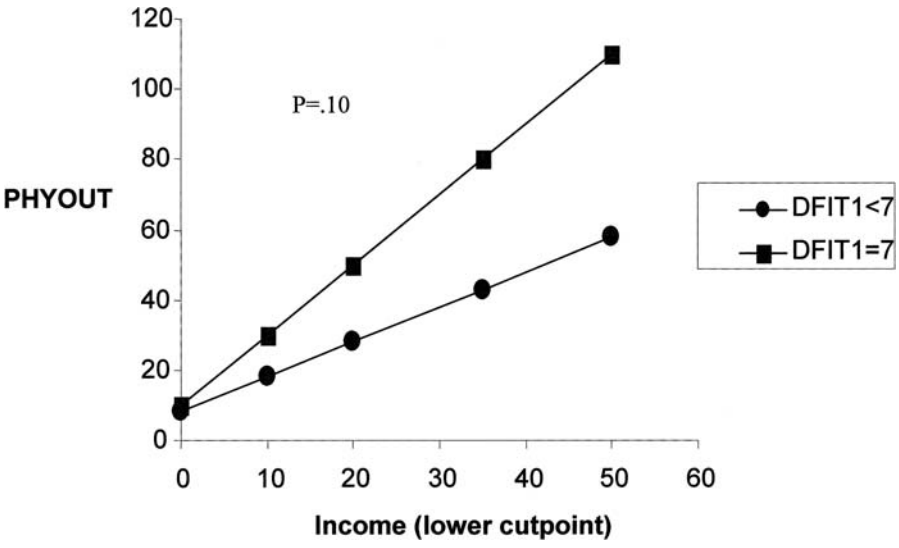

Fig 2. Interaction of mothers' usefulness for PA and family income. DFIT1= mothers' belief that PA is useful in improving daughters' physical fitness; PHYOUT= daughters' belief that PA will lead to positive physical outcomes. Income reported as annual household income from all sources.

DISCUSSION

Our results indicated that mothers' body fatness was significantly related to daughters' body fatness but not daughters' PA behavior. Mothers and daughters had positive outcome beliefs and intentions toward PA. These beliefs were not associated with daughters' actual PA participation. Associations were weak or inversely significant between mother's PA behaviors and daughters' moderate and vigorous activity. These mother and daughter relationships appeared to be influenced to a certain extent by family sociodemographic factors.

Positive correlations between mothers' and daughters' body fat status is consistent with what has been reported previously in the literature.[24,25] The lack of or weak association of mothers' and daughters' moderate and vigorous PA is consistent with some earlier research findings in mostly White parent/child clusters.[14,19,26] Parental influences on PA (being active themselves, facilitation, and encouragement) in mostly White parents were predictive of their children's activity, especially for girls.[27,28] Favorable beliefs about physical activity were also reported in a qualitative study of middle-class 8- to 10-year old Black girls and their parents conducted by Thompson et al.[29] In contrast to our study, the daughters were active in various physical activities and received maternal facilitation and encouragement (although objective measures of PA were not reported).[29]

Preferences for alternative sedentary activities reported in this present study could reflect deterrents for PA participation. Differences in values for PA and cultural preferences for certain types of PA may have further complicated mothers' motivation to engage with their daughters in fitness-oriented PA during leisure time.[30–32] Therefore, the results of this study have cultural implications for specific aspects of program planning and implementation. Pairing of fitness-oriented PA with the activities that Black mothers prefer (eg, integrating PA into church-related activities or incorporating it into family fun and after-school academic activities) may result in more successful outcomes for increased PA in young Black girls.

Mothers' and daughters' body fatness, PA beliefs, and behaviors were influenced by marital status, income, and number of people in the household. These findings support previous research studies that have reported the negative influence of low socioeconomic status and certain home environmental factors on children's PA participation, especially in Black as compared to White children.[5,33–35] Although a high percentage of the mothers in this study had at least a high school education, they were more likely to be the head of household and the principle wage earners, and their family size was larger than the average American family, which affected their socioeconomic status.[22] Family size is inversely related to the prevalence of obesity as was found in this study.[36] On the other hand, family size also has been reported to influence parent/child interactions negatively, particularly for mothers.[36] In the current study, the positive association of intention to be active with the number of people in the household may be the result of sibling influence. However, intention to be active was not related to PA behavior.

Married women tend to be heavier than single women.[37] Most mothers in this study were obese regardless of marital status. The absence of fathers in most households in the current study may have significant implications for lack of resources for the facilitation of PA and time for maternal involvement.[27]

The cross-sectional design of this study limits the conclusions regarding causal inferences made about maternal influences on their daughters' PA. Another limitation is that participants ''self-selected'' into the study, and they may have been more concerned about their own health as well as their daughters' health. Therefore, they may have lifestyle patterns and beliefs about PA that are not representative of the population and the results may not be generalizable to all Black mothers and daughters. However, the sample in this study is larger in comparison to those of several other observational studies that included low-income Black families.

. . .this study illustrates the usefulness of delineating the factors that may influence the maternal interactions that are needed for promoting healthy lifestyle behaviors in young Black girls.

In summary, this study showed that Black mothers and daughters believed that fitness-oriented activities were enjoyable and important for their health, although the daughters did not engage in PA as a result of these beliefs. The disassociation between mothers' and daughters' health beliefs and behaviors is more likely to be related to certain sociodemographic factors. The focus on maternal influences does not imply that these are the only aspects of family factors influencing the development of overweight and physical inactivity in young Black girls. However, this study illustrates the usefulness of delineating the factors that may influence the maternal interactions that are needed for promoting healthy lifestyle behaviors in young Black girls.[34,38] In light of previous research findings that Black girls need more parental support and facilitation to overcome barriers to PA than White girls,[29,39,40] tailored prevention programs should be aimed at identifying and addressing the barriers that keep Black mothers from being involved in their daughters' PA.

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REFERENCES

1. Hedley AA, Ogden CL, Johnson CL, et al. Prevalence of overweight and obesity among US children, adolescents, and adults, 1999–2002. *JAMA*. 2004;291(23):2847–2850.
2. Andersen RE, Crespo CJ, Bartlett SJ, Cheskin LJ, Pratt M. Relationship of physical activity and television watching with body weight and level of fatness among children: results from the Third National Health and Nutrition Examination Survey. *JAMA*. 1998;279(12): 938–942.
3. Livshits G, Gerber LM. Familial factors of blood pressure and adiposity covariation. *Hypertension*. 2001;37(3):928–935.
4. Whitaker RC, Wright JA, Pepe MS, Seidel KD, Dietz WH. Predicting obesity in young adulthood from childhood and parental obesity. *N Engl J Med*. 1997;337(13):869–873.
5. Sallis JF, Broyles SL, Frank-Spohrer G, et al. Child's home environment in relation to the mother's adiposity. *Int J Obes Relat Metab Disord*. 1995;19(3):190–197.
6. Sallis JF. Influences on physical activity of children, adolescents, and adults. *PCPFS Res Digest*. 2003;1(7).
7. Price RA, Reed DR, Guido NJ. Resemblance for body mass index in families of obese African-American and European-American women. *Obes Res*. 2000;8(5):360–366.
8. Kalakanis LE, Goldfield GS, Paluch RA, Epstein LH. Parental activity as a determinant of activity level and patterns of activity in obese children. *Res Q Exerc Sport*. 2001;72(3):202–209.
9. Jain A, Sherman SN, Chamberlin DL, et al. Why don't low-income mothers worry about their preschoolers being overweight? *Pediatrics*. 2001;107(5):1138–1146.
10. Baughcum AE, Chamberlin LA, Deeks CM, Powers SW, Whitaker RC. Maternal perceptions of overweight preschool children. *Pediatrics*. 2000;106(6):1380–1386.
11. Kimiecik JC, Horn TS, Shurin CS. Relationships among children's beliefs, perceptions of their parents' beliefs, and their moderate-to-vigorous physical activity. *Res Q Exerc Sport*. 1996;67(3):324–336.
12. Bandura A. Social Cognitive Theory. In: Vaster R, ed. *Annals of Child Development*. Vol 6. Greenwich, Conn: Jai Press LTD; 1989; 1–60.
13. Twisk JW, Kemper HC, van Mechelen W. Tracking of activity and fitness and the relationship with cardiovascular disease risk factors. *Med Sci Sports Exerc*. 2000;32(8): 1455–1461.
14. Sallis JF, Alcaraz JE, McKenzie TL, et al. Parental behavior in relation to physical activity and fitness in 9-year-old children. *Am J Dis Child*. 1992;146(11):1383–1388.
15. NHlBI Expert Panel on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults. Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight in Adults: The Evidence Report. *Obes Res*. 1998;6(suppl 2):51S–209S.
16. National Center for Health Statistics. *CDC Growth Charts. Tables for calculated body mass index values for selected heights and weights for ages 2–20 years*. Hyattsville, Maryland: Department of Health and Human Services; Centers for Disease Control and Prevention, 2000. Available at www.cdc.gov/nchs/about/major/nhanes/growthcharts/clincal_charts.htm. Date accessed 8/4/05.
17. Blair SN, Haskell WL, Ho P, et al. Assessment of habitual physical activity by a seven-day recall in a community survey and controlled experiments. *Am J Epidemiol*. 1985;122(5): 794–804.
18. Sallis JF, Buono MJ, Roby JJ, Micale FG, Nelson JA. Seven-day recall and other physical activity self-reports in children and adolescents. *Med Sci Sports Exerc*. 1993;25(1):99–108.
19. Kimiecik JC, Horn TS. Parental beliefs and children's moderate-to-vigorous physical activity. *Res Q Exerc Sport*. 1998;69(2): 163–175.
20. Saunders R. Development of questionnaires to measure psychosocial influences on children's physical activity. *Prev Med*. 1997;26: 241–247.
21. Department of Health and Human Services (HHS) and the Department of Agriculture (USDA). Dietary Guidelines for Americans, 6th ed. Available at: www.healthierus.gov. Accessed: 4/11/05.
22. US Census Bureau. Poverty 2002. Available at: www.census.gov. Accessed: 4/11/05.
23. US Census Bureau. *The Black Population in the United States: March 2002*. Washington, DC: US Census Bureau; 2003. *Current Population Reports*. Series P20–541.
24. Garn SM, Sullivan TV, Hawthorne VM. Fatness and obesity of the parents of obese individuals. *Am J Clin Nutr*. 1989;50(6): 1308–1313.
25. Morrison JA, Payne G, Barton BA, Khoury PR, Crawford P. Mother-daughter correlations of obesity and cardiovascular disease risk factors in Black and White households: the NHLBI Growth and Health Study. *Am J Public Health*. 1994;84(11):1761–1767.
26. Fogelholm M, Nuutinen O, Pasanen M, Myohanen E, Saatela T. Parent-child relationship of physical activity patterns and obesity. *Int J Obes Relat Metab Disord*. 1999; 23(12):1262–1268.
27. DiLorenzo TM, Stucky-Ropp RC, Vander Wal JS, Gotham HJ. Determinants of exercise among children. II. A longitudinal analysis. *Prev Med*. 1998;27(3):470–477.
28. Davison KK, Cutting TM, Birch LL. Parents' activity-related parenting practices predict girls' physical activity. *Med Sci Sports Exerc*. 2003;35(9):1589–1595.
29. Thompson VJ, Baranowski T, Cullen KW, et al. Influences on diet and physical activity among middle-class African-American 8- to 10-year-old girls at risk of becoming obese. *J Nutr Educ Behav*. 2003;35(3):115–123.
30. Ainsworth BE, Irwin ML, Addy CL, Whitt MC, Stolarczyk LM. Moderate physical activity patterns of minority women: the Cross-Cultural Activity Participation Study. *J Women's Health Gender Based Med*. 1999;8(6): 805–813.
31. Airhihenbuwa CO, Kumanyika S, Agurs TD, Lowe A. Perceptions and beliefs about exercise, rest, and health among African Americans. *Am J Health Promot*. 1995;9(6): 426–429.
32. Kumanyika S, Wilson JF, Guilford-Davenport M. Weight-related attitudes and behaviors of Black women. *J Am Diet Assoc*. 1993;93(4): 416–422.
33. Klesges RC, Eck LH, Hanson CL, Haddock CK, Klesges LM. Effects of obesity, social interactions, and physical environment on physical activity in preschoolers. *Health Psychol*. 1990;9(4):435–449.
34. White MA, Martin PD, Newton RL, et al. Mediators of weight loss in a family-based intervention presented over the internet. *Obes Res*. 2004;12(7):1050–1059.
35. Strauss RS, Knight J. Influence of the home environment on the development of obesity in children. *Pediatrics*. 1999;103(6):e85.
36. Epstein LH, Koeske R, Wing RR, Valoski A. The effect of family variables on child weight change. *Health Psychol*. 1986;5(1):1–11.
37. Kahn HS, Williamson DF, Stevens JA. Race and weight change in US women: the roles of socioeconomic and marital status. *Am J Public Health*. 1991;81(3):319–323.
38. Wu FL, Yu S, Wei IL, Yin TJ. Weight-control behavior among obese children: association with family-related factors. *J Nurs Res*. 2003; 11(1):19–30.
39. Resnicow K, Yaroch AL, Davis A, et al. GO GIRLS!: results from a nutrition and physical activity program for low-income, overweight African-American adolescent females. *Health Educ Behav*. 2000;27(5): 616–631.

40. Felton G, Dowda M, Ward D. Differences in physical activity between Black and White girls living in rural and urban areas. *J Sch Health.* 2002;72(6):250–255.

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