Title

Differences in the Association of Physical Activity and Children's Overweight and Obesity Status Among the Major Racial and Ethnic Groups of U.S. Children

Journal

Health Education & Behavior, 44(3)

ISSN

1090-1981

Authors

Guerrero, Alma D
Flores, Martiniano
Vangala, Sitaram
et al.

Publication Date

2017-06-01

DOI

10.1177/1090198116667719

Peer reviewed

HHS Public Access

Author manuscript

Health Educ Behav. Author manuscript; available in PMC 2017 July 17.

Published in final edited form as:

Health Educ Behav. 2017 June ; 44(3): 411–420. doi:10.1177/1090198116667719.

Differences in the Association of Physical Activity and Children's Overweight and Obesity Status Among the Major Racial and Ethnic Groups of U.S. Children

Alma D. Guerrero, MD, MPH[1,2], **Martiniano Flores, MS**[1,3], **Sitaram Vangala, MS**[1], and **Paul J. Chung, MD, MS**[1,2,3,4]

[1]David Geffen School of Medicine at UCLA, Los Angeles, CA, USA

[2]Mattel Children's Hospital UCLA, Los Angeles, CA, USA

[3]UCLA Fielding School of Public Health, Los Angeles, CA, USA

[4]The Rand Corporation, Santa Monica, CA, USA

Abstract

Objective—To examine the relationship of exercise with overweight and obesity among an ethnically diverse sample of U.S. children.

Method—Data from the 2011–2012 National Survey of Children's Health were analyzed to examine the relationship of daily exercise with children's weight status. Propensity score covariate adjustment and multivariate logistic regression with survey weights were used to control for child, home, and community characteristics.

Results—Approximately 22% of all children ages 10 to 17 years engaged in daily exercise for at least 20 minutes. In the adjusted model for the entire sample, daily exercise was associated with children having a lower likelihood of being overweight or obese (odds ratio = 0.79; 95% confidence interval = 0.68–0.91). In a stratified analysis of the major racial and ethnic groups, however, while White children who exercised daily were found to have a lower odds of being overweight or obese (odds ratio = 0.70; 95% confidence interval = 0.60–0.82), this relationship was not found for most minority children.

Conclusions—Racial and ethnic minority children were not found to have the same weight status *relationship* with exercising daily. These findings suggest that some population-average exercise recommendations may not be as applicable to minority children.

Keywords

body mass index; BMI; physical activity; racial and ethnic disparities

Corresponding Author: Alma D. Guerrero, UCLA Department of Pediatrics General Pediatrics Division, 10833 Le Conte Avenue 12-358 MDCC, Los Angeles, CA 90095, USA. aguerrero@mednet.ucla.edu.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

The prevalence of pediatric obesity makes it imperative to evaluate the multiple determinants of children's weight status, including lifestyle habits and practices. This is particularly important for African American and Latino children who experience significant racial and ethnic disparities in pediatric obesity (Guerrero et al., 2016; Ogden, Carroll, Kit, & Flegal, 2014). Physical activity has been shown to vary across ethnic groups of children, particularly South Asians and African Americans compared to Whites of European descent (Eyre & Duncan, 2013). Findings examining the contribution of physical activity to racial and ethnic weight disparities, however, have been mixed. Part of the challenge is that there are few available randomized controlled trials demonstrating that physical activity, as a standalone treatment intervention, is an effective strategy to decrease adiposity in school-age children (Laframboise & Degraauw, 2011). Furthermore, few studies involve minority children; those that do have shown a weak or nonsignificant relationship between exercise and body mass index (BMI; Barr-Anderson, Adams-Wynn, DiSantis, & Kumanyika, 2013; Butte, Puyau, Adolph, Vohra, & Zakeri, 2007; Thompson et al., 2004). Addressing these gaps in the literature is important as interventions, clinical counseling, and professional guidelines emphasize physical activity as an important mechanism to decrease or maintain weight. It is possible that emphasizing other factors for specific populations may be more critical for weight status.

To evaluate the contribution of physical activity to weight status in the absence of studies that can account for the complex social determinants of weight, a research study carefully designed to minimize the likelihood of selection biases might be useful in examining the relationship. Propensity scoring adjustment can be one way to account for the contribution of unmeasured confounders to the outcome of interest between two groups. Some studies have suggested that propensity score adjustment can remove more than 90% of the bias in observational studies when randomization is lacking (Austin, 2011; Giordano, 2015). Propensity score adjustment can be used with a number of observational studies, including cross-sectional studies. Given that numerous factors contribute to children's weight status that may or may not be available in cross-sectional data, propensity score adjustment may provide a method to minimize the contribution of such potential confounders and therefore provide statistical adjustment for not just the measured variables but unmeasured variables as well.

To that end, the purpose of this study was to use a racially and ethnically diverse sample of U.S. children to examine the direction and strength of the relationship between physical activity and weight status among minority children using a propensity score analysis.

Method

Study Sample

The data source for this study was the 2011–2012 National Survey of Children's Health (NSCH) sponsored by the U.S. Department of Health and Human Services, Health Resources and Services Administration Maternal and Child Health Bureau. The study population of the NSCH represents a nationally representative sample of parents of children 0 to 17 years. The NSCH was designed to estimate a variety of physical, emotional, behavioral, child health, and health care indicators. Data were collected via telephone using

a stratified random digit sampling of households with children under the age of 18 years. Informed consent of adult respondents for study participation was obtained using a consent script describing the voluntary nature of the survey, confidentiality of responses, survey content, and expected duration. Interviews were conducted in 52% of sampled households with children, with an overall weighted response rate of 54% for landline and 41% for cell phone. A total of 95,677 interviews were completed in English, Spanish, Mandarin, Cantonese, Vietnamese, and Korean. Details on NSCH survey design, operation, methods, and weighting procedures are described elsewhere (Blumberg et al., 2012).

Because our outcome of interest was children's overweight or obese status, we excluded children younger than 10 years of age for whom weight and height data were not collected. Therefore, our final analytic sample included all children 10 to 17 years old who had complete data for all of the measures of interest in our a priori model. The final study sample was 38% (36,401) of the original sample. This study was exempt from review by the University of California–Los Angeles Institutional Review Board.

Measures

The primary outcome for this study was children's weight status. We used the NSCH BMI variable that was created using caregiver responses to questions about their child's height and weight and the Centers of Disease Control and Prevention national growth charts, which provide age- and sex-specific BMI cutoffs, to determine children's weight status. BMI calculations for this study are not based on objective measures of height and weight. They are calculated from parental reports of child height and weight, which are subject to biases due to under- or overestimations in height and/or weight. Nonetheless, the NSCH and many other large surveys in childhood populations use parent reports given the cost and time in obtaining objective measures (Himes, 2009; Huybrechts et al., 2011). The NSCH categories of BMI included underweight (BMI < 5%), normal weight (BMI < 85%), overweight (BMI = 85% to 94%), and obese (BMI ≥ 95%). For this study, children with BMI <5% were excluded from the analysis, and children's BMI was categorized as normal weight (BMI < 85%) or overweight or obese (BMI ≥ 85%).

The primary independent variable of interest for this study was whether children participated in daily physical activity. Caregivers were asked, "During the past week, on how many days did [child] exercise, play a sport, or participate in physical activity for at least 20 minutes that made [him/her] sweat and breathe hard?" Responses ranged from 0 to 7 days as reported by caregivers. Responses were collapsed into 7 days or <7 days to reflect the daily physical activity recommended by professional guidelines, although the guidelines recommend a longer duration of daily exercise (Barlow, 2007).

Covariates for this study included the child's race and ethnicity, age, and sex. We used the NSCH parent-reported child race and ethnicity data to classify race and ethnicity as Latino, non-Latino Whites, Black, and American Indian/Alaskan Native/Other referred to hereafter as European American, Latino, African American, and Other children. Latino children were further stratified based on the primary language spoken at home. Children's general health status was also included, as well as health insurance, and the presence of a special health care need that was based on the NSCH's Child and Adolescent Health Measurement

Initiative 5-item screener (Centers for Disease Control and Prevention, 2013). Household characteristics known to be associated with weight status were also included. Family poverty status was included and based on the Department of Health and Human Services poverty guidelines and categorized as 0% to 99%, 100% to 199%, 200% to 399%, and ≥400% of the federal poverty threshold for a family of four in 2011. Maternal educational attainment was also a relevant household factor that was included as a covariate in this study. Well-established factors associated with children's weight status were also included as covariates that included television screen time, which was dichotomized as watching television <2 hours or ≥2 hours per day; whether a park or playground area was in the neighborhood; parents' perceived level of neighborhood social support and capital based on an NSCH indicator capturing parental level of agreement on whether neighbors help each other, watch out for each other's children, are people parents can count on, and are people parents trust to help their children; and neighborhood safety based on parental report about whether their neighborhood or community is never safe for children.

Approach

Propensity score adjustment is one way to improve the covariate balance in the estimation of the effect of treatment with observational studies because it allows for the adjustment of possible confounding factors when participants are not randomly assigned to a treatment or control group. This methodology reduces bias when the comparison of outcomes is performed using treatment and control participants so that the groups are as similar as possible with regard to confounding factors. In this study, predictors of daily physical exercise were included in a logistic regression model to estimate propensity scores, which were then divided into deciles. The association between children's weight status and daily physical was evaluated adjusting for propensity score deciles to improve covariate balance between the groups of children who exercised 7 days a week compared to those who did not, in order to improve the estimation of the effect of physical activity.

Analyses

Analyses account for the complex survey design of NSCH and to yield national estimates using survey weights. The study sample was examined as a whole and then stratified by age, gender, and race and ethnicity, and European American, Latino, and African American children were examined independently. Descriptive statistics and frequency distributions were computed for all variables. Predictors of daily physical exercise were included in a logistic regression model used to estimate propensity scores. The association between children's weight status and daily exercise was evaluated using a logistic regression model controlling for the propensity score deciles in addition to all predictors of daily exercise or children's weight status. All analyses were completed using SAS Version. 9.4 (SAS Institute Inc., Cary, NC).

Results

The total sample size included 36,041 children of whom 25,844 were European American, 3,212 were African American, 3,890 were Latino, and 3,455 were Other (Table 1). The age range of the study population was 10 to 17 years (the average was about 14 years), and the

average age was similar across all the racial and ethnic subgroups of children. About half of all children were female. Over half of African American and Latino children in Spanish-speaking homes resided in homes with family incomes under 200% of the federal poverty level. In contrast, only 20% of European American children resided in homes with family incomes under 200% federal poverty level. Differences in the availability of a park or playground area in the neighborhood were found across the racial and ethnic subgroups of children, with Latino parents regardless of language spoken in the home reporting less availability than European American or African Americans. Differences in the perceived safety of neighborhood and community were also observed with approximately 5% of European American parents reporting that the neighborhood is usually or always unsafe for their children compared to 21% of African American and 23% of Latino parents in Spanish-speaking households.

In bivariate analyses, European American children who exercised daily for at least 20 minutes were more likely to have a normal weight status than European American children who did not exercise daily (Table 2). No other racial or ethnic groups of children were found to have a significant bivariate relationship between daily exercise and weight status. The multivariable regression with propensity score decile covariate adjustment as well as adjustment for child, household, and community covariates showed that, overall, children who engaged in daily exercise were less likely to be overweight or obese (odds ratio = 0.79; 95% confidence = 0.69–0.91). Stratified multivariable regression analyses, using the same method of propensity score adjustment, were completed for gender and age, and were also completed for each of the major racial and ethnic groups in the study. In these analyses, younger children were found to have significantly lower odds of being overweight or obese with daily exercise and this relationship was no longer significant in adolescents 14 to 17 years of age (Table 3). Males were also more likely to have lower odds of being overweight or obese with daily exercise, while female weight status did not have a relationship with daily exercise (Table 4). Last, European American and Latino children residing in primarily Spanish-speaking homes were found to have significantly lower odds of being overweight or obese with daily exercise (Table 5). The weight status of African American and Latino children residing in primary English-speaking households was not associated with daily exercise.

Sensitivity Analyses

A sensitivity analysis was completed to determine whether our findings between exercise and our two-weight category variable (overweight and obese children compared to normal weight status children) would have looked different if a three-weight category outcome had been used. As such a proportional odds logistic regression was completed to examine the relationship between exercise and a three-category weight variable (normal weight, overweight, and obese). The results showed almost identical odds ratios results for exercise and the three-weight categories. Given these minimal changes, we present the two-weight category variable for ease of interpretation in the article.

In addition, a sensitivity analysis was completed to examine whether the direction and magnitude of the odds ratios between exercise and weight status would differ without

propensity score adjustment. We therefore examined the relationship between exercise and a two-weight outcome using a logistic regression model that did not control for both the propensity score deciles of daily exercise. The results generated very similar findings with odds ratios that changed minimally in magnitude and did not change in direction.

Discussion

Our study shows a significant and inverse relationship between daily exercise and being overweight or obese among White children ages 10 to 17 years, but this relationship was not found among similar-aged Black or Latino children in English-speaking homes. These findings would not have been noticed if the study sample had not been stratified by race and ethnic group and then reanalyzed. There is a significant relationship between physical exercise and weight status when the study sample is examined as a whole, but our results show that this relationship is likely driven by the strength of the relationship found among White children. This is the first study to our knowledge that has used a propensity adjusted analysis to evaluate the relationship between physical activity and weight among U.S. children. This methodology provides a mechanism to at least somewhat statistically adjust for both measured and unmeasured variables in the absence of a randomized cohort. A sensitivity analysis showed that a logistic regression without a propensity score adjustment can generate similar results, which provides reassurance for this more commonly used approach.

Our results suggest that for some minority children, physical activity may be less associated with weight status. Although the current literature shows mixed findings on the relationship between physical activity and weight status, our results are consistent with those that have shown no association between the independent effect of exercise and weight status among minority populations. For example, both young children and adolescent African American females in prospective, longitudinal, and cross-sectional studies have demonstrated no associations between moderate-vigorous physical activity and changes in waist circumference, BMI, or obesity regardless of whether physical activity was based on self-report or objectively measured using accelerometers (Anderson, Economos, & Must, 2008; Thompson et al., 2004; White & Jago, 2012). The possibility that exercise for pediatric minority populations may not be a critical factor for weight status may have some underpinnings in a few small studies that have shown a lower resting metabolic rate, lower fat oxidation, and lower energy expenditure during exercise among African American girls and adolescents when compared to their European American counterparts (S. Lee & Arslanian, 2008; Richardson et al., 2014; Willig et al., 2011; Wong et al., 1999). Fewer studies are available examining the independent effect of exercise and weight status among Latino children; however, some indicate the strength of the association is low to none (Butte et al., 2007). Furthermore, similar to our findings, English-speaking preferences among Mexican American adolescents have been negatively associated with accelerometer measured exercise (H. Lee, Cardinal, & Loprinzi, 2012). Thus, there are population and clinical studies suggesting that the weight benefits of exercise may differ among African American, Latino, and European American children. The possibility that weight status among minority pediatric populations may be less sensitive to physical activity is important for clinicians and researchers to consider.

The disproportionate rates of pediatric obesity in minority populations against this backdrop of emerging evidence seems to confirm that changing the prevalence of pediatric obesity may require different strategies for different populations. There is ample evidence, for instance, on the relationship of poor nutrient-dense food consumption and children's weight status, and high concentrations of liquor stores, convenient stores, and fast food establishments combined with poor access to fresh foods and grocery stores make it easy for children and families to consume foods that contribute to an unhealthy weight (Ford & Dzewaltowski, 2008). These types of obesogenic food environments are found disproportionately in minority communities (Fleischhacker, Evenson, Rodriguez, & Ammerman, 2011; R. E. Lee, Heinrich, Reese-Smith, Regan, & Adamus-Leach, 2014; Neckerman et al., 2010). Although physical activity is important for overall health regardless of race or ethnicity, activity may not be able to impact weight status in minority pediatric populations without concomitant broad changes to the food environment and policies that promote access and consumption of high-nutrient dense foods or other combinations of interventions.

Our study findings show that in younger children and males, exercise seems to have a positive relationship with weight status that aligns well with the existing physical activity literature that often indicates that older children, adolescents, and females have lower levels of activity compared to their younger and male counterparts (Carson, Staiano, & Katzmarzyk, 2015; May, Kuklina, & Yoon, 2012). Our results and those of others by no means suggest overlooking the health benefits of exercise or not including physical activity in weight loss or management plans. There is ample evidence that exercise reduces cardiovascular disease and all causes of mortality (Hupin et al., 2015; Stewart, Benatar, & Maddison, 2015) as well as positive benefits in cognitive and emotional domains of health (Archer, Josefsson, & Lindwall, 2014). Our findings may be important to consider only in the context of weight loss, not in the context of overall health. The strengths of the study are the use of a representative racially and ethnically diverse sample of U.S. pediatric children with large enough subsamples to stratify by race and ethnicity, and the application of a propensity analysis to minimize as many potential confounders between children who exercise daily versus less than daily and its relationship to children's weight status.

This study, however, also has several limitations. All variables, including weight and physical activity, are based on caregiver report, which introduces the possibility of bias from caregiver recall. In particular, child height, weight, and physical activity practices have been shown to have weak to moderate associations between parental report and objective measurements (Colley et al., 2012; Himes, 2009). As such, these findings should be interpreted with caution and an awareness of the limitations from parental reports. Nonetheless, very few studies have evaluated whether the accuracy of parent-reported measures vary by race or ethnicity and this area requires further research. Second, the study was limited by examining children from ages 10 to 17 years as BMI data were not available for younger children. It is possible that the independent effect of daily physical activity with children's weight status may look different for younger children. Last, the survey had a slightly lower response rate compared to other large national pediatric surveys so the results may need to be interpreted with a nonresponse bias; however, large national data sets

explore a nonresponse bias analysis to ensure there is not a substantial bias as a result of nonresponse.

Conclusion

Minority pediatric populations are disproportionately overweight or obese. The determinants of weight status are complex, and our study along with others seem to suggest that weight status among minority pediatric populations may be less sensitive to physical activity. The lack of a relationship between daily physical activity and weight status among older African American and Latino children from English-speaking households has important implications for clinicians and researchers who are targeting weight or BMI changes in these specific populations.

Acknowledgments

Funding

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This study was supported in part by Grant K23 HD080461-01A1 to Dr. Guerrero from the Eunice Kennedy Shriver National Institute of Child Health and Human Development and by the National Institutes of Health/National Center for Advancing Translational Science UCLA CTSI Grant UL1TR000124.

References

Anderson SE, Economos CD, Must A. Active play and screen time in US children aged 4 to 11 years in relation to sociodemographic and weight status characteristics: A nationally representative cross-sectional analysis. BMC Public Health. 2008; 8:366. [PubMed: 18945351]

Archer T, Josefsson T, Lindwall M. Effects of physical exercise on depressive symptoms and biomarkers in depression. CNS & Neurological Disorders Drug Targets. 2014; 13:1640–1653. [PubMed: 25470398]

Austin PC. An introduction to propensity score methods for reducing the effects of confounding in observational studies. Multivariate Behavioral Research. 2011; 46:399–424. [PubMed: 21818162]

Barlow SE. Expert committee recommendations regarding the prevention, assessment, and treatment of child and adolescent overweight and obesity: Summary report. Pediatrics. 2007; 120(Suppl. 4):S164–S192. [PubMed: 18055651]

Barr-Anderson DJ, Adams-Wynn AW, DiSantis KI, Kumanyika S. Family-focused physical activity, diet and obesity interventions in African-American girls: A systematic review. Obesity Review. 2013; 14:29–51.

Blumberg SJ, Foster EB, Frasier AM, Satorius J, Skalland BJ, Nysse-Carris KL, O'Connor KS. Design and operation of the National Survey of Children's Health, 2007. Vital Health Statistics. 2012; 1:1–149.

Butte NF, Puyau MR, Adolph AL, Vohra FA, Zakeri I. Physical activity in nonoverweight and overweight Hispanic children and adolescents. Medicine & Science in Sports & Exercise. 2007; 39:1257–1266. [PubMed: 17762358]

Carson V, Staiano AE, Katzmarzyk PT. Physical activity, screen time, and sitting among US adolescents. Pediatric Exercise Science. 2015; 27:151–159. [PubMed: 25050541]

Centers for Disease Control and Prevention, National Center for Health Statistics, & State and Local Area Integrated Telephone Survey. 2011–2012: National Survey of Children's Health frequently asked questions. 2013. Retrieved from http://ftp.cdc.gov/pub/Health_Statistics/NCHs/slaits/nsch_2011_2012/01_Frequently_asked_questions/NSCH_2011_2012_FAQs.pdf

Colley RC, Wong SL, Garriguet D, Janssen I, Connor Gorber S, Tremblay MS. Physical activity, sedentary behaviour and sleep in Canadian children: Parent-report versus direct measures and relative associations with health risk. Health Report. 2012; 23:45–52.

Eyre EL, Duncan MJ. The impact of ethnicity on objectively measured physical activity in children. ISRN Obesity. 2013; 2013:757431. [PubMed: 24555154]

Fleischhacker SE, Evenson KR, Rodriguez DA, Ammerman AS. A systematic review of fast food access studies. Obesity Reviews. 2011; 12:e460–e471. [PubMed: 20149118]

Ford PB, Dzewaltowski DA. Disparities in obesity prevalence due to variation in the retail food environment: Three testable hypotheses. Nutrition Reviews. 2008; 66:216–228. [PubMed: 18366535]

Giordano SH. Comparative effectiveness research in cancer with observational data. American Society of Clinical Oncology Educational Book. 2015; 35:e330–e335.

Guerrero AD, Mao C, Fuller B, Bridges M, Franke T, Kuo AA. Racial and ethnic disparities in early childhood obesity: Growth trajectories in body mass index. Journal of Racial and Ethnic Health Disparities. 2015; 3:129–137. [PubMed: 26896112]

Himes JH. Challenges of accurately measuring and using BMI and other indicators of obesity in children. Pediatrics. 2009; 124(Suppl. 1):S3–S22. [PubMed: 19720665]

Hupin D, Roche F, Gremeaux V, Chatard JC, Oriol M, Gaspoz JM, Edouard P. Even a low-dose of moderate-to-vigorous physical activity reduces mortality by 22% in adults aged ≥60 years: A systematic review and meta-analysis. British Journal of Sports Medicine. 2015; 49:1262–1267. [PubMed: 26238869]

Huybrechts I, Himes JH, Ottevaere C, De Vriendt T, De Keyzer W, Cox B, De Henauw S. Validity of parent-reported weight and height of preschool children measured at home or estimated without home measurement: A validation study. BMC Pediatrics. 2011; 11:63. [PubMed: 21736757]

Laframboise MA, Degraauw C. The effects of aerobic physical activity on adiposity in school-aged children and youth: A systematic review of randomized controlled trials. Journal of the Canadian Chiropractic Association. 2011; 55:256–268. [PubMed: 22131562]

Lee H, Cardinal BJ, Loprinzi PD. Effects of socioeconomic status and acculturation on accelerometer-measured moderate-to-vigorous physical activity among Mexican American adolescents: Findings from NHANES 2003–2004. Journal of Physical Activity & Health. 2012; 9:1155–1162. [PubMed: 22207251]

Lee RE, Heinrich KM, Reese-Smith JY, Regan GR, Adamus-Leach HJ. Obesogenic and youth oriented restaurant marketing in public housing neighborhoods. American Journal of Health Behavior. 2014; 38:218–224. [PubMed: 24629550]

Lee S, Arslanian SA. Fat oxidation in black and white youth: A metabolic phenotype potentially predisposing black girls to obesity. Journal of Clinical Endocrinology & Metabolism. 2008; 93:4547–4551. [PubMed: 18782873]

May AL, Kuklina EV, Yoon PW. Prevalence of cardiovascular disease risk factors among US adolescents, 1999–2008. Pediatrics. 2012; 129:1035–1041. [PubMed: 22614778]

Neckerman KM, Bader MD, Richards CA, Purciel M, Quinn JW, Thomas JS, Rundle A. Disparities in the food environments of New York City public schools. American Journal of Preventive Medicine. 2010; 39:195–202. [PubMed: 20709250]

Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of childhood and adult obesity in the United States, 2011–2012. Journal of the American Medical Association. 2014; 311:806–814. [PubMed: 24570244]

Richardson AS, North KE, Graff M, Young KM, Mohlke KL, Lange LA, Gordon-Larsen P. Moderate to vigorous physical activity interactions with genetic variants and body mass index in a large US ethnically diverse cohort. Pediatric Obesity. 2014; 9:e35–e46. [PubMed: 23529959]

Stewart RA, Benatar J, Maddison R. Living longer by sitting less and moving more. Current Opinion in Cardiology. 2015; 30:551–557. [PubMed: 26204494]

Thompson D, Jago R, Baranowski T, Watson K, Zakeri I, Cullen KW, Matheson DM. Covariability in diet and physical activity in African-American girls. Obesity Research. 2004; 12(Suppl):46S–54S. [PubMed: 15489467]

White J, Jago R. Prospective associations between physical activity and obesity among adolescent girls: Racial differences and implications for prevention. Archives of Pediatrics & Adolescent Medicine. 2012; 166:522–527. [PubMed: 22665029]

Willig AL, Hunter GR, Casazza K, Heimburger DC, Beasley TM, Fernandez JR. Body fat and racial genetic admixture are associated with aerobic fitness levels in a multiethnic pediatric population. Obesity (Silver Spring). 2011; 19:2222–2227. [PubMed: 21546928]

Wong WW, Butte NF, Ellis KJ, Hergenroeder AC, Hill RB, Stuff JE, Smith EO. Pubertal African-American girls expend less energy at rest and during physical activity than Caucasian girls. Journal of Clinical Endocrinology & Metabolism. 1999; 84:906–911. [PubMed: 10084569]

Health Educ Behav. Author manuscript; available in PMC 2017 July 17.

Table 1

Characteristics of U.S. Children 10 to 17 Years Old and Their Parents.

Characteristic	Overall (*N* = 36,401)	European American (*n* = 25,844)	African American (*n* = 3,212)	Latino, English speaking (*n* = 2,610)	Latino, Spanish speaking (*n* = 1,280)	Other (*n* = 3,455)
Child overweight or obese (%)	29.9	26.5	44.0	34.7	48.2	31.6
Child age (mean years)	13.7	13.8	13.5	13.5	13.4	13.5
Child sex (%)						
Female	48.3	47.9	49.2	47.0	48.2	50.7
Child exercise 20 min/day (%)	22.1	22.5	21.8	22.9	12.4	23.2
Child TV viewing >2 h/weekday (%)	76.6	79.4	59.5	73.0	69.8	76.8
Child health status (%)						
Excellent/very good	88.0	91.0	82.2	84.4	57.5	85.4
Family income (%)						
<100% FPT	11.3	7.2	25.6	15.3	45.1	13.8
100% to 199% FPT	16.1	13.7	22.7	20.4	36.4	17.3
200% to 299% FPT	16.7	17.1	15.2	17.3	8.9	17.1
300% to 399% FPT	15.1	16.6	11.1	12.8	4.3	13.2
≥400% FPT	40.8	45.4	25.4	34.2	5.3	38.6
Maternal education (%)						
Less than high school degree	6.2	3.5	8.0	8.6	50.9	6.6
High school degree	19.2	18.0	24.1	22.6	23.9	19.0
More than high School degree	74.6	78.5	67.9	68.8	25.2	74.4
Health insurance (%)						
Private	74.2	81.1	51.7	65.2	24.1	69.4
Public	21.4	15.5	44.0	30.4	54.3	25.7
Uninsured	4.4	3.4	4.3	4.5	21.6	4.9
Special health care needs (%)	25.8	26.3	26.9	26.3	12.0	25.7
No neighborhood park nearby (%)	18.5	19.4	18.4	14.3	14.1	16.3
Unsupportive neighborhood[a] (%)	88.5	91.7	77.2	82.1	73.8	85.3
Unsafe neighborhood (%)	7.8	4.6	21.1	12.1	23.1	10.4

Note. FPT = federal poverty threshold; NSCH = National Survey of Children's Health.

[a] Supportive neighborhoods: NSCH indicator based on parental level of agreement on whether neighbors help each other, watch out for each other's children, are people parents can count on, and are people parents trust to help their children.

Table 2

Bivariate Analysis of Weight Status by Daily Exercise Among All Children and the Major Racial and Ethnic Groups of Children.

	Overall (*N*= 36,401)		European American (*n* = 25,844)		African American (*n* = 3,212)		Latino, English speaking (*n* = 2,610)		Latino, Spanish speaking (*n*= 1,280)		Other (*n* = 3,455)	
Characteristic	**Normal weight**	**Overweight or obese**	**Normal weight**	**Overweight or obese**	**Normal weight**	**Overweight or obese**	**Normal weight**	**Overweight or obese**	**Normal weight**	**Overweight or obese**	**Normal weight**	**Overweight or obese**
Child exercise 20 min/day	23.6	21.8	24.9	21.5[a]	23.1	23.0	21.9	29.5	16.1	11.1	22.7	25.2

[a]Denotes variables that differed significantly <.05 across normal weight and overweight/obese.

Table 3

Odds Ratios (95% CI) of Overweight and Obese Status by Daily Exercise Among All Children Stratified by Sex.

	Overall (*N* = 36,401)		Male (*n* = 18,828)		Female (*n* = 17,573)	
Characteristic	**AOR**	**95% CI**	**AOR**	**95% CI**	**AOR**	**95% CI**
Child exercise 20 min/day	**0.83**	**0.72–0.96** *	**0.70**	**0.59–0.84** *	0.96	0.77–1.19
Child age	**0.86**	**0.81–0.91** *	**0.92**	**0.85–0.99** *	**0.79**	**0.73–0.87** *
Child's race/ethnicity						
White (Reference)						
Black	**1.48**	**1.25–1.75** *	**1.36**	**1.09–1.71** *	**1.69**	**1.31–2.18** *
Latino (Spanish)	1.11	0.63–1.93	1.68	0.80–3.50	0.74	0.32–1.71
Latino (English)	1.24	1.00–1.53	1.18	0.89–1.56	1.35	0.97–1.87
Other	1.06	0.88–1.29	0.95	0.71–1.28	1.23	0.96–1.58
Child TV viewing >2 h/weekday	0.80	0.64–1.01	**0.7**	**0.52–0.94** *	0.99	0.63–1.55
Child health status						
Excellent/very good	**0.66**	**0.52–0.83** *	**0.55**	**0.40–0.76** *	0.79	0.55–1.14
Child health insurance						
Private (Reference)						
Public	1.17	0.93–1.47	0.92	0.67–1.25	**1.51**	**1.09–2.11** *
Uninsured	1.17	0.87–1.58	1.23	0.82–1.83	0.99	0.63–1.55
Special health care needs	**1.18**	**1.04–1.33** *	0.96	0.82–1.13	**1.50**	**1.23–1.84** *
Maternal education						
Less than high school (Reference)						
High school degree	0.84	0.67–1.05	0.85	0.63–1.15	0.86	0.62–1.19
More than high school degree	**0.66**	**0.55–0.83** *	**0.63**	**0.47–0.86** *	0.72	0.51–1.01
Income						
<100% FPT (Reference)						
100% to 199% FPT	0.97	0.79–1.18	1.04	0.80–1.35	0.87	0.65–1.16
200% to 299% FPT	0.90	0.70–1.16	1.01	0.72–1.40	0.77	0.53–1.13
300% to 399% FPT	0.80	0.59–1.10	1.09	0.73–1.65	**0.55**	**0.34–0.88** *
≥400% FPT	**0.71**	**0.54–0.92** *	0.97	0.68–1.39	**0.46**	**0.31–0.69** *

	Overall (*N* = 36,401)		Male (*n* = 18,828)		Female (*n* = 17,573)	
Characteristic	**AOR**	**95% CI**	**AOR**	**95% CI**	**AOR**	**95% CI**
No neighborhood park nearby	1.04	0.90–1.19	1.11	0.93–1.33	0.96	0.78–1.19
Unsupportive neighborhood	**0.76**	**0.62–0.91** *	**0.65**	**0.51–0.84** *	0.88	0.66–1.17
Unsafe neighborhood	1.07	0.87–1.32	1.14	0.85–1.53	1.02	0.76–1.37

Note. AOR = adjusted odds ratio; CI = confidence interval; FPT = federal poverty threshold.

* Boldface indicates odds ratios found to be statistically significant at the $p = 0.05$ value.

Table 4

Odds Ratios (95% CI) of Overweight and Obese Status by Daily Exercise Among All Children Stratified by Age.

	Overall (*N* = 36,401)		10–11 years (*n* = 8,267)		12–13 years (*n* = 8,659)		14–15 years (*n* = 9,142)		16–17 years (*n*= 10,333)	
Characteristic	**AOR**	**95% CI**	**AOR**	**95% CI**	**AOR**	**95% CI**	**AOR**	**95% CI**	**AOR**	**95% CI**
Child exercise 20 min/day	**0.85**	**0.75–0.98** *	**0.71**	**0.56–0.89** *	**0.72**	**0.57–0.93** *	0.78	0.58–1.05	1.09	0.81–1.46
Child sex (female)	0.72	0.50–1.04	1.36	0.69–2.69	0.98	0.55–1.76	**0.35**	**0.17–0.72** *	**0.47**	**0.24–0.94** *
Child's race/ethnicity										
White (Reference)										
Black	**1.50**	**1.27–1.76** *	**1.95**	**1.42–2.66** *	1.3	0.95–1.77	**1.6**	**1.12–2.30** *	1.4	1.0–1.96
Latino (Spanish)	1.1 1	0.64–1.89	2.25	0.87–5.83	2.24	0.89–5.62	0.21	0.07–0.64 *	1.06	0.39–2.92
Latino (English)	**1.3**	**1.05–1.60** *	1.46	0.98–2.17	**1.49**	**1.03–2.15** *	1.01	0.65–1.57	1.17	0.73–1.88
Other	1.06	0.88–1.29	0.96	0.68–1.34	1.24	0.86–1.79	1.02	0.65–1.61	1.06	0.73–1.53
Child TV viewing >2 h/weekday	0.92	0.70–1.20	0.62	0.37–1.04	0.72	0.46–1.14	1.47	0.85–2.56	0.93	0.57–1.52
Child health status										
Excellent/very good	**0.69**	**0.54–0.88** *	**0.53**	**0.33–0.85** *	**0.51**	**0.33–0.77** *	1.02	0.64–1.61	0.75	0.48–1.17
Child health insurance										
Private (Reference)										
Public	**1.27**	**1.02–1.59** *	1.06	0.68–1.65	0.94	0.64–1.37	**1.94**	**1.25–3.01** *	1.19	0.79–1.79
Uninsured	1.21	0.92–1.61	1.10	0.65–1.86	1.40	0.83–2.67	1.49	0.83–2.67	1.06	0.64–1.76
Special health care needs	1.13	0.99–1.30	1.03	0.79–1.34	1.1 1	0.87–1.41	1.34	1.0–1.78	1.30	1.0–1.69
Maternal education										
Less than high school (Reference)										
High school degree	0.84	0.68–1.05	**0.66**	**0.45–0.98** *	0.73	0.49–1.09	0.74	0.48–1.16	1.27	0.76–2.12
More than high school degree	**0.69**	**0.55–0.86** *	**0.49**	**0.33–0.73** *	**0.63**	**0.43–0.92** *	**0.49**	**0.31–0.76** *	1.15	0.67–1.97
Income										
<100% FPT (Reference)										
100% to 199% FPT	0.93	0.76–1.14	0.69	0.47–1.01	1.13	0.79–1.63	0.71	0.47–1.08	1.33	0.90–1.95
200% to 299% FPT	0.84	0.64–1.09	0.94	0.58–1.53	0.88	0.56–1.37	0.62	0.36–1.07	0.88	0.54–1.45
300% to 399% FPT	0.80	0.57–1.12	0.97	0.52–1.80	0.73	0.42–1.27	0.57	0.30–1.08	0.86	0.45–1.64

Health Educ Behav. Author manuscript; available in PMC 2017 July 17.

	Overall (*N* = 36,401)		10–11 years (*n* = 8,267)		12–13 years (*n* = 8,659)		14–15 years (*n* = 9,142)		16–17 years (*n*= 10,333)	
Characteristic	**AOR**	**95% CI**	**AOR**	**95% CI**	**AOR**	**95% CI**	**AOR**	**95% CI**	**AOR**	**95% CI**
≥400% FPT	**0.67**	**0.50–0.91** *	0.81	0.46–1.41	0.68	0.41–1.13	**0.47**	**0.26–0.86** *	0.76	0.43–1.33
No neighborhood park nearby	1.03	0.90–1.19	1.23	0.95–1.61	1.19	0.92–1.55	0.85	0.66–1.1 1	1.05	0.80–1.38
Unsupportive neighborhood	**0.77**	**0.64–0.93** *	**0.62**	**0.43–0.89** *	0.91	0.64–1.30	0.86	0.61–1.23	0.70	0.48–1.20
Unsafe neighborhood	1.12	0.91–1.38	1.05	0.73–1.50	1.35	0.93–1.96	0.72	0.46–1.12	1.12	0.72–1.73

Note. AOR = adjusted odds ratio; CI = confidence interval; FPT = federal poverty threshold.

* Boldface indicates odds ratios found to be statistically significant at the $p = 0.05$ value.

Table 5

Odds Ratios (95% CI) of Overweight and Obese Status by Daily Exercise Among All Children and the Major Racial and Ethnic Groups of Children.

	Overall (*N* = 36,401)		European American (*n* = 25,844)		African Americans (*n* = 3,212)		Latinos, English speaking (*n* = 2,610)		Latinos, Spanish speaking (*n* = 1,280)		Other (*n* = 3,455)	
Characteristic	**AOR**	**95% CI**	**AOR**	**95% CI**	**AOR**	**95% CI**	**AOR**	**95% CI**	**AOR**	**95% CI**	**AOR**	**95% CI**
Child exercise 20 min/day	**0.79**	**0.69–0.91** *	**0.70**	**0.60–0.82** *	0.88	0.63–1.24	1.20	0.75–1.90	**0.47**	**0.24–0.91** *	1.07	0.68–1.68
Child age	**0.86**	**0.81–0.91** *	**0.88**	**0.82–0.95** *	**0.79**	**0.70–0.90** *	0.88	0.72–1.08	**0.72**	**0.56–0.91** *	0.94	0.79–1.12
Child sex (female)	**0.68**	**0.47–0.99** *	**0.60**	**0.38–0.96** *	0.65	0.28–1.50	1.23	0.33–4.59	**0.32**	**0.07–1.49** *	1.37	0.45–4.16
Child TV viewing >2 h/weekday	0.81	0.62–1.06	0.82	0.59–1.13	1.06	0.59–1.92	0.85	0.34–2.12	1.10	0.34–3.53	0.50	0.22–1.13
Child health status												
Excellent/very good	**0.65**	**0.50–0.86** *	**0.63**	**0.45–0.89** *	0.77	0.42–1.40	0.52	0.21–1.28	1.00	0.34–3.00	**0.41**	**0.18–0.94** *
Child health insurance												
Private (Reference)												
Public	**1.28**	**1.03–1.60** *	**1.66**	**1.26–2.19** *	0.93	0.58–1.51	0.87	0.40–1.89	1.21	0.45–3.22	0.93	0.50–1.74
Uninsured	1.20	0.91–1.58	1.06	0.76–1.50	1.26	0.61–2.61	1.51	0.57–3.97	1.37	0.57–3.30	0.64	0.31–1.26
Special health care needs	1.12	0.99–1.28	1.12	0.96–1.31	1.33	0.97–1.83	0.85	0.53–1.36	1.26	0.60–2.63	1.26	0.87–1.83
Maternal education												
Less than high school (Reference)												
High school degree	0.87	0.69–1.06	0.95	0.71–1.26	1.02	0.62–1.70	**0.43**	**0.21–0.90** *	1.06	0.53–2.13	**0.48**	**0.25–0.92** *
More than high school degree	**0.68**	**0.55–0.848**	**0.71**	**0.53–0.93** *	0.87	0.54–1.41	**0.32**	**0.15–0.65** *	1.07	0.51 −2.23	**0.48**	**0.26–0.87** *
Income												
<100% FPT (Reference)												
100% to 199% FPT	0.92	0.75–1.12	0.92	0.71–1.19	**0.57**	**0.38–0.86** *	1.01	0.53–1.95	1.24	0.66–2.34	0.76	0.41–1.38
200% to 299% FPT	0.82	0.64–1.06	0.92	0.68–1.26	**0.54**	**0.31–0.94** *	1.33	0.58–3.03	0.44	0.13–1.52	0.83	0.38–1.79
300% to 399% FPT	0.73	0.54–1.00	0.78	0.54–1.13	**0.43**	**0.21–0.85** *	1.46	0.50–4.26	0.63	0.13–3.17	0.95	0.36–2.50
≥400% FPT	**0.63**	**0.49–0.83** *	0.73	0.53–1.00	**0.44**	**0.24–0.82** *	0.75	0.32–1.80	0.28	0.06–1.26	0.80	0.34–1.86
No neighborhood park nearby	1.01	0.88–1.16	1.1 1	0.95–1.29	1.11	0.80–1.55	1.11	0.62–1.99	0.56	0.29–1.09	0.99	0.68–1.45
Unsupportive neighborhood	**0.77**	**0.62–0.92** *	**0.73**	**0.56–0.93** *	1.32	0.88–1.97	0.62	0.32–1.22	0.68	0.33–1.38	0.70	0.40–1.21
Unsafe neighborhood	US	0.93–1.42	1.13	0.84–1.51	1.06	0.75–1.51	1.14	0.58–2.24	0.92	0.54–1.57	1.30	0.69–2.46

Note. AOR = adjusted odds ratio; CI = confidence interval; FPT = federal poverty threshold.

* Boldface indicates odds ratios found to be statistically significant at the $p = 0.05$ value.