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Occurrence and Correlates of Overweight and Obesity among Island Puerto Rican Youth

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Abstract

Objective & Main Outcome Measures—This paper provides 2005–08 population-based prevalence data on obesity and overweight among youth residing in Puerto Rico.

Design & Setting—Data for this report are from the "Asthma, Depression, and Anxiety in Puerto Rican Youth" (ADA) study. Measures included height and weight level data on youth in Puerto Rico ages 10 to 19 with and without asthma as well as BMI data on their caregivers.

Participants—A total of 436 youth-caregiver dyads were selected and weighted to represent the general population of youth in Puerto Rico using 2008 U.S. Census data.

Results—Household surveys demonstrated that 40% of youth ages 10 to 19 were overweight or obese. Twenty-five percent met moderate-to-vigorous intensity physical activity guidelines; however: physical activity was not associated with overweight or obesity in this sample. In multivariate analyses, females were 50% less likely than males to be overweight or obese. Older youth were 73% less likely to be overweight or obese than younger youth. Youth whose parents were obese were more than two times more likely to be overweight or obese than those whose parents were at a desirable weight.

Conclusions—Youth in Puerto Rico have higher rates of overweight and obesity and lower compliance to moderate-to-vigorous intensity physical activity guidelines than rates reported for youth on the mainland. More population-based research is needed to understand the epidemiology of obesity and overweight among island Puerto Rican youth and the contribution of physical activity to the phenomenon.

Keywords

Child; Overweight/epidemiology; Obesity/epidemiology; Physical Activity; Prevalence; Puerto Rico/epidemiology

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INTRODUCTION

Obesity has been described as an epidemic because of the relatively high number of individuals who have become overweight or obese over the past 20 years.[1] The rise in obesity is a worldwide phenomenon affecting both children and adults.[1–2] It is a societal health challenge because excess body weight is the sixth most important risk factor contributing to the overall burden of disease globally, increasing the risk of various chronic diseases.[2–3]

Childhood and adolescence (collectively, "youth") have been proposed as critical periods for the development of this condition.[2,4] Obesity in early life is of particular concern as approximately one-half of overweight adolescents and over one-third of overweight children remain obese as adults.[2,5] Childhood obesity is associated with a wide range of serious complications in the short-term, and, if it persists into adulthood, increases the risk of excess illness and premature death later in life.[6] Generally, higher rates of overweight and obesity are associated with lower physical activity participation.[7–9] Moreover, a parallel increase in physical inactivity among youth is worrisome, as daily physical activity fosters optimal physical and cognitive development.[10] For these reasons, several countries and their territories view the prevention of obesity as a public health priority that requires a concomitant focus on physical activity.[2,3]

The U.S. Commonwealth of Puerto Rico, where public health practitioners have been struggling with an increasing prevalence of pediatric obesity and inactivity-related diseases —such as diabetes, high blood pressure and heart disease—is no exception.[11–14] According to the Centers for Disease Control and Prevention's (CDC) 2005 High School Youth Risk Behavior Survey (YRBS), the most recent data available on overweight/obesity among island Puerto Rican youth, 14% of youth in Puerto Rico are overweight and 12% obese.[15] These island estimates are similar to the 15.8% overweight and 12.0% obese rates published most recently on mainland youth in the 2009 YRBS.[16] Other studies in Puerto Rico that included children recruited from schools and clinics have reported obesity rates as high as 24.6% and 36%, respectively.[12,13] The 2005 YRBS survey also shows that among those 14 years and older, fewer Puerto Rican high school students (20.8%) met physical activity guidelines than youth (35.8%) in the U.S. mainland.[15] Accumulation of at least 60 min of moderate-to-vigorous intensity physical activity daily (MVPA) is recommended for youth.[17–19] Examples of MVPA include moderate-intensity aerobic activity, such as brisk walking, and vigorous-intensity activity, such as running.[19] The lower rates of MVPA in Puerto Rico are troubling given that the U.S. Department of Agriculture (USDA) and the U.S. Department of Health and Human Services recommend regular physical activity to facilitate weight control.[18,19] While popular media and a small handful of empirical studies have reported on the relationship between obesity and inactivity among youth in Puerto Rico, more population-based research is needed that examines island youth.[11–14, 20–22] The current literature on obesity among youth in Puerto Rico, including the YRBS, is limited by the use of clinical- or school-based rather than population-based samples, and it has mostly failed to include determinants of obesity, such as level of physical activity and familial or social characteristics.

In this study, we sought to determine the strength of the associations between correlates of youth overweight/obesity and physical activity, sociodemographics and parental/caregiver variables using youth- or parent-reported data from the Asthma, Depression and Anxiety in Puerto Rican Youth (ADA) study.[23,24] The ADA study also collected simple measures of obesity, as well as physical activity, which allowed us to describe the occurrence and correlates of these variables among youth and their caregivers in the data set. With respect to social variables, while a number of mainland studies have documented higher rates of

overweight and obesity among low-socioeconomic groups, there has been a paucity of such studies in Puerto Rico.[25,26] This study therefore explores the relationship between social variables such as, perception of poverty, household income, and parental education, among other variables, with youth overweight and obesity status. This study is unique because it uses a larger, population-based sample compared with prior studies, and it examines the prevalence and correlates of early life (10 to 19 years of age) overweight/obesity and physical activity on the island.

METHODS

Data for this study are from the third wave (2005–2008) of the ADA study which was specifically designed to assess the associations of asthma and asthma care with child and parental psychiatric disorders among Puerto Rican children 4 to 17 years of age.[23,24] We were however, able to collect some limited information on obesity and physical activity in this third wave. Wave one and two did not include these questions; thus, the analyses presented here involve cross-sectional data from wave three. Wave one was conducted from 1999–2000, and wave two was a one-year follow-up from 2000–2001. Details regarding the sampling design and procedures have been previously described for wave one and two.[23,24] Therefore, the sample and measures are described briefly, with particular focus paid to describing wave three of the study, which has not been previously reported.

Youth between the ages of 4 and 17 years living on the island of Puerto Rico comprised an island-wide household probability sample stratified by four dimensions: urban versus rural areas, Puerto Rico's health reform areas, child's age, and gender. A total of 2,102 children from the community were deemed eligible. At wave one, 1,886 children and their caregivers were interviewed for a response rate of 90.1%. A total of 1,789 caregiver-youth dyads from wave one were interviewed at wave two, for a 94.9% retention rate at one-year follow-up.

For wave three, we used direct mail to recruit participants from wave two. The goal for the ADA study was to obtain a representative community sample including youth and young adults stratified into four groups (asthma and anxiety/depression; asthma no anxiety/depression; anxiety/depression no asthma; neither asthma nor anxiety/depression). Using simple random selection, 825 households were contacted, from which 656 youth and young adults, 10 to 25 years old, were interviewed for a response rate of 79.5%. Because the current study focuses only on youth and not young adults (because some of the youth in wave 1 were young adults by wave three), we included caregiver-youth dyads with male and female youth between 10 and 19 years old (n=436) at the time of wave three data collection.[23,24]

Blinded interviewers conducted interviews in the families' homes and different interviewers were used for the youth/young adult and caregiver interviews. The adult informant was the participant's biological mother for ~89% of the interviews. All interviews were audiotaped, and 15% were randomly reviewed for quality control. The study protocol was approved by the institutional review boards (IRBs) of the University of Puerto Rico, Medical Sciences Campus and the University of California Los Angeles. Caregiver consent and child assent were obtained for youth under the age of eighteen years. Consent was obtained for participants eighteen years and older. In order for a youth/young adult to participate, caregivers were also required to participate in the study to provide information about themselves and their progeny.

The survey collected demographic information, BMI, and physical activity level, among other measures.[23,24,27–29] Parent-reported demographic variables included parental education, marital status, work status, household income, household composition, perception

of poverty, and child's age and sex.[31] BMI was based on child height and weight information obtained from parental report for youth below age 17 years. Youth 17 to 19 years old provided information on their own weight and height. For youth under the age of 20, the 85th percentile for age- and gender-specific BMI levels using CDC growth chart norms was used as the cutpoint for child classification as overweight and the 95th percentile for classification as obese.[27] All youth weight below the 85th percentile was termed, "desirable weight." Weight status was interpreted for caregivers (≥ 20 years) using CDC-defined standard weight status categories (i.e., desirable weight, overweight, obese).[27,28] We used a measure of youth compliance to the federal recommendation of at least 60 minutes of MVPA daily.[18] A two-item PACE+ Adolescent Physical Activity Measure assessed the number of days youth had accumulated at least 60 minutes of MVPA per day during the past seven days and for a typical week.[29] Information regarding MVPA was obtained by parental report for children younger than 17 years old, while youth 17 to 19 years old provided their own information. We report a composite average of the two items, yielding a score of the number of days per week during which the youth accumulated 60 minutes of MVPA.[29] Five or more days per week met the federal guideline for youth.[29]

Analyses were weighted to account for the complex sampling design, to correct for differential nonresponse, and to represent the general population of youth in Puerto Rico using 2008 U.S. Census data. The estimation of design weights used to make our sample representative of youth in Puerto Rico was accomplished in two stages. We estimated the subjects' probability of selection during the third wave and made an additional adjustment for the response rate. The probability of selection took into account that for wave three we selected a different number of subjects from four strata of different sizes. The inverse of this final probability was used to estimate the initial design weights. The design weight estimated during this first stage made our sample representative of the youth population in Puerto Rico in the year 2000 using 2000 U.S. Census Data. In the second stage we made an additional adjustment to our design weights by post-stratifying the data to the population of youth in Puerto Rico as documented in 2008 U.S. Census data. The results were estimated with SUDAAN 10 software to adjust standard errors for multistage sampling, with youth-caretaker dyads nested within households and households nested within primary sampling units.[30]

Chi-square tests and logistic regression models were used to examine associations among youth overweight/obesity with physical activity, socioeconomic status (SES), parent marital status and parent body mass index (BMI).

RESULTS

Of the entire youth sample, 17.9% were reported as overweight and 21.5% were reported as obese. According to the unadjusted results in Table 1, the odds of youth 15 to 19 years old being overweight/obese were 35 percent (OR= .35, 95% CI = .22, .58) of the odds that youth 10 to 14 years old reported being overweight/obese than. Female youth were (marginally) 37 percent (OR=.63, 95% CI = .38, 1.02)) less likely to be overweight/obese than males. Youth whose parents reported an annual household income of $6,000 or less were 2.06 (95% CI = . 96, 4.42) times more likely to be overweight/obese than those from households with annual family incomes over $25,000.

In terms of parents' demographic characteristics, 67% of the sample was married; over 70% were high school or college educated and 55% perceived their family as living well financially. Overweight caregivers comprised 35.0% of the sample, and 36.3% were obese. Obese caregivers were more likely (OR = 2.69, 95% CI = 1.34, 5.37) to have overweight or obese children than desirable weight parents. Approximately 25% of youth complied with

the federal MVPA recommendation, while 36% of parents reported their children as meeting the recommendation.

Table 2 shows the adjusted results for the associations involving demographic factors and physical activity with youth overweight/obese status. Older youth had lower odds (OR = 0.27, 95% CI = 0.16, 0.47) of being overweight or obese than younger youth. Female youth had lower odds (OR= 0.50, 95% CI = 0.28, 0.91) of being overweight or obese than male youth. Youth reporting more days per week of at least 60 minutes of exercise were moderately less likely to be overweight or obese (OR = .96, 95% CI = .88, 1.05). Obese caregivers were more likely (OR = 2.78, 95% CI = 1.38, 5.61) to have overweight or obese children than desirable weight parents.

CONCLUSION

Our prevalence estimates of overweight and obesity among island Puerto Rican youth differ from previous published studies. For example, the CDC's 2005 YRBS, which used a school-based sample, provides the most current estimates available for the island. It found that 14% and 12% of Puerto Rican 9th through 12th graders were overweight and obese, respectively, compared with 15.7% and 13.1% for U.S. mainland youth.[15] Compared with the latest estimates of the general U.S. mainland youth, our estimates are higher; they are higher than the 15.8% overweight and 12.0% obese reported among high school youth by the CDC's 2009 YRBS and the 18.1% obese reported by the 2007–2008 National Health and Nutrition Examination Survey.[16, 32] With respect to youth physical activity, our estimates of the percentage of Puerto Rican youth meeting federally recommended MVPA guidelines were higher than the 20.8% reported for Puerto Rican island youth in the 2005 YRBS.[15]

Regarding our estimates of overweight/obesity, in comparison, a study of U.S. Latino children seen at community health centers in medically underserved areas (including Puerto Rico) reported an obesity estimate of 24.6%.[13] A separate study of 158 children receiving pediatric care at the San Juan City Hospital and a primary care clinic in Puerto Rico reported an obesity prevalence rate of 36%.[12] Two possible reasons for these differences in findings are the following: first, school samples are skewed towards non representation of older adolescents in places such as Puerto Rico where school truancy is high; and second, some of the studies included clinical samples with characteristics that might place them at higher risk for being overweight or obese compared to our broader, more representative sample.

The fact that older youth in our study exhibited lower odds of being overweight or obese than younger youth indicates a significant inverse effect of age. This finding is inconsistent with the current literature which shows that overweight children are more likely to become overweight in adolescence and adulthood than before adolescence.[1–5, 33] Our observation may be partially explained by the common growth spurt that occurs during the adolescent years.[34,35] A good fraction of youth in our sample are experiencing such growth spurts, and to the extent that their height is increasing faster than their weight, this would help to explain the decline in obesity risk with increasing age in this population as measured by BMI. Should this in some way help explain the inverse finding, it may merely demonstrate a temporary artifact of how youth physical development affects BMI and may not be related to lifestyle choices known to affect weight long term.

The lower odds of Puerto Rican female youth in our study for being overweight/obese compared with male youth is consistent with national data on sex differences among Latinos and stand in contrast to the sex differences among African American adolescents, where girls are at higher risk than boys.[36] Further study of sex differences in weight status among

Puerto Rican youth is important because the causes of overweight/obesity may differ in girls and boys and be mediated by race and ethnicity.[36,37]

We did not find a significant relationship between social variables such as, perception of poverty, household income, and parental education, with youth overweight and obesity. While it has been well-documented that low-socioeconomic-status groups are disproportionately affected by obesity at all ages,[25,26] our null findings may be an artifact of examining these relationships in an island population that is generally low-income (45% of the population live below the poverty level);[38] over 70% of our sample reported annual household incomes of $25,000 or less.

The ~70% of parents who were overweight or obese in our study is higher than previously reported prevalence estimates for adults in Puerto Rico.[22] The observation that overweight or obese parents were more likely to have overweight or obese children is consistent with studies showing that young children with at least one obese parent have greater odds for becoming obese themselves than children with desirable weight parents.[39–45]

In sum, a greater percentage of island youth are overweight and obese compared with corresponding estimates for U.S. mainland youth. We also report lower Puerto Rican youth compliance to federal physical activity guidelines than is the case for mainland youth. Our findings also suggest a trends towards more male youth being overweight/obese than female youth. Children of obese parents were more likely to be overweight/obese themselves than those with desirable weight parents. Developers of policies and programs designed to prevent or reduce youth obesity in Puerto Rico would do well to take these correlates of obesity into account in design interventions tailored for specific subgroups and in designing future observational research.

LIMITATIONS

There are limitations that should be considered when interpreting these results. First, our findings are based on self-report rather than objective measures of height, weight, and physical activity. Studies have shown that parental reported weight and height may under-estimate true weight among girls and overestimate height in boys.[46] Although typically obesity prevalence estimates derived from self-report are likely to be lower than they would be were objective measures available, they are nonetheless useful for tracking trends over time and for comparing Island estimates to comparable mainland estimates.[47] Further, BMI-for-age percentile (based on self-reported height and weight) is a proxy measure of weight status, correlates with body fat, and is recommended for assessing weight status in youth ages 2–20.[48,49] Similarly, while it is not ideal to base physical activity prevalence estimates on self-report measures because of the potential for inaccuracy and bias, self-report was the only feasible validated approach for the present study.[50] The composite physical activity measure employed has been shown previously to provide a reliable estimate of adolescents' physical activity behavior and to correlate significantly with an objective measure of physical activity.[29,50] Finally, it is important to note that wave three of the ADA study stratified the selection of subjects based on the youth's asthma and anxiety and depression statuses in wave two; however, we accounted for this stratification in the analyses using sampling weights. Given the limited state of the literature on this topic within the population, we believe that our new weighted, population-based data provide insight into the occurrence of obesity and MVPA among Puerto Rican island youth.

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Table 1

Unadjusted Associations of Youth and Family/Parental Characteristics with Youth Overweight/Obesity Status

	N=436		Overweight/ obese (n=152)	Desirable weight (Not Overweight/ not obese) (n=227)	OR (95% CI)
Characteristics	**N**	**%/mean**	**%/mean (SE)**	**%/mean (SE)**	
YOUTH CHARACTERISTICS					
Age Category					
10 to 14 years	157	47.25	52.26 (4.97)	47.74 (4.97)	Reference
15 to 19 years	222	52.75	27.98 (3.38)	72.02 (3.38)	.35 (.22–.58)
Male	196	50.59	44.96 (4.42)	55.04 (4.42)	Reference
Female	183	49.41	33.81 (4.10)	66.19 (4.10)	.63 (.38–1.02)
Physical Activity (number of days in usual week exercised 60+ minutes)	376	3.46	3.46 (0.23)	3.46 (0.21)	1.00 (.92–1.09)
Smoke Exposure					
No	238	68.47	39.16 (3.66)	60.84 (3.66)	Reference
Yes	132	31.53	40.88 (5.57)	59.12 (5.57)	1.07 (.64–1.82)
Youth Self-Report PACE+ Adolescent Physical Activity Measure					
Not met moderate to vigorous physical activity guidelines	283	74.72	40.30 (3.60)	59.70 (3.60)	Reference
Met moderate to vigorous physical activity guidelines	92	25.28	35.73 (5.39)	64.27 (5.39)	.82 (.50–1.37)
Caregiver* Report PACE+ Adolescent Physical Activity Measure					
Not met moderate to vigorous physical activity guidelines	235	63.94	39.12 (3.81)	60.88 (3.81)	Reference
Met moderate to vigorous physical activity guidelines	138	36.06	40.44 (5.00)	59.56 (5.00)	1.06 (.65–1.71)
FAMILY/PARENTAL CHARACTERISTICS					
Household composition (number of people in household)	379	4.17~	4.21 (0.12)	4.14 (0.08)	1.05 (.88–1.25)
Maternal Figure Education					
Less than high school	60	15.27	35.13 (7.44)	64.87 (7.44)	.83 (.40–1.69)
High School	120	31.12	40.79 (5.71)	59.21 (5.71)	1.05 (.59–1.86)

Characteristics	N=436 N	%/mean	Overweight/ obese (n=152) %/mean (SE)	Desirable weight (Not Overweight/ not obese) (n=227) %/mean (SE)	OR (95% CI)
Some college	194	53.62	39.63 (4.21)	60.37 (4.21)	Reference
Paternal Figure Education					
Less than high school	74	28.24	38.00 (7.18)	62.00 (7.18)	.96 (.46–1.99)
High School	87	31.28	38.42 (6.50)	61.58 (6.50)	.97 (.47–2.04)
Some college	96	40.49	39.05 (5.80)	60.95 (5.80)	Reference
Income					
6,000 or less	77	20.21	51.99 (6.97)	48.01 (6.97)	2.06 (.96–4.42)
6,001–12,000	81	23.63	33.93 (5.76)	66.07 (5.76)	.98 (.49–1.94)
12,001–25,000	98	27.78	38.71 (5.44)	61.29 (5.44)	1.20 (.62–2.34)
over 25,000	94	28.39	34.45 (5.75)	65.55 (5.75)	Reference
Perception of poverty					
Live Poorly	40	7.66	33.41 (7.69)	66.59 (7.69)	.64 (.30–1.39)
Live Check to Check	140	37.81	34.00 (4.52)	66.00 (4.52)	.66 (.39–1.12)
Live well	197	54.53	43.89 (4.55)	56.11 (4.55)	Reference
Employment (maternal figure)					
No	170	43.50	42.92 (4.42)	57.08 (4.42)	Reference
Yes	204	56.50	36.52 (4.05)	63.48 (4.05)	.77 (.48–1.22)
Employment (paternal figure)					
No	65	27.69	36.57 (7.22)	63.43 (7.22)	Reference
Yes	192	72.31	39.32 (4.38)	60.68 (4.38)	1.12 (.57–2.24)
Caregiver marital status					
Married/living with couple	255	67.13	38.45 (3.86)	61.55 (3.86)	Reference
Separated/Divorced/Widowed	101	27.70	41.80 (5.99)	58.20 (5.99)	1.15 (.64–2.07)
Never married	21	5.17	37.86 (12.65)	62.14 (12.65)	.98 (.33–2.91)
Caregiver BMI Weight Status Categories *					
Underweight	5	1.37	56.75 (26.32)	43.25 (26.32)	3.11 (.34–28.36)
Normal weight	101	27.67	29.69 (6.03)	70.31 (6.03)	Reference
Overweight	128	34.67	33.20 (4.41)	66.80 (4.41)	1.18 (.59–2.34)

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Characteristics	N=436 N	%/mean	Overweight/ obese (n=152) %/mean (SE)	Desirable weight (Not Overweight/ not obese) (n=227) %/mean (SE)	OR (95% CI)
Obese	134	36.30	53.15 (5.21)	46.85 (5.21)	2.69 (1.34–5.37)

*Primary caregiver could be the mother or father, but mostly they were mothers (~89%)

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Table 2

Multivariate Associations of Physical Activity and Parental BMI with Youth Overweight/Obesity Status*

Variables	OR (95% CI)
Age Category	
10 to 14 years	Reference
15 to 19 years	.27 (.16–.47)
Gender	
Male	Reference
Female	.50 (.28–.91)
Income	
6,000 or less	1.70 (.76–3.80)
6,001–12,000	.90 (.44–1.83)
12,001–25,000	.97 (.44–2.14)
over 25,000	Reference
Physical Activity (number of days in usual week exercise 60 minutes)	.96 (.88–1.05)
Caregiver BMI Weight Status Categories †	
Underweight	3.48 (.36–33.67)
Normal weight	Reference
Overweight	1.43 (.70–2.91)
Obese	2.78 (1.38–5.61)

*For this regression, we used 341 cases out of a total of 436; missing data caused 105 to be dropped through listwise deletion

†Primary caregiver could be the mother or father, but mostly they were mothers (~89%)