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Overweight and Central Adiposity in School-Age Children and Links with Hypertension

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Introduction

Substantial proportions of children and adolescents in the United States are obese, and these proportions have increased significantly in the past few decades. The continuing rise in prevalence of obesity in children is most pronounced among ethnic minority children. Recent national estimates indicate that among children 6 to 11 years old, 25.3% of Mexican American children are at or above the 95th percentile for BMI compared with 17.5% of non-Hispanic black children and 18.5% of non-Hispanic white children (Ogden, et al. 2006). Obesity in children is associated with increased prevalence of risk factors and clustering of risk factors for cardiovascular diseases and diabetes (Goodman, Dolan, Morrison, & Daniels, 2005).

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Nurses are well positioned in school settings and primary care to screen for obesity and related risk factors in children (Hayman et al., 2007); however, routine screening of children and adolescents for obesity was not recommended by the U.S. Preventive Services Task Force because there was insufficient research evidence to support it (Krebs, 2005; Moyer et al., 2005). Recent recommendations support universal assessment, universal health messages and early intervention to prevent and reduce obesity in childhood and adolescence (Barlow and the Expert Committee, 2007; National Association of Pediatric Nurse Practitioners, 2006). The screening program described in this paper was implemented through a community partnership model between a school district and the university; this model integrates research, education and practice to prevent and reduce obesity in youth (Brosnan et al., 2005).

Although evidence suggests that central adiposity in children is more closely linked with risk than BMI (Lee, Bacha, Gungor, & Arslanian, 2006; Lurbe, Alvarez, & Redon, 2001; Savva et al., 2000), waist circumference (WC) is not recommended for universal screening programs (Barlow and the Expert Committee, 2007) and has rarely been investigated in screening studies. Likewise, little is known about the true prevalence of hypertension in school age children and how measures of obesity and hypertension are interrelated for this population (Chiolero, Bovet, Paradis, & Paccaud, 2007).

The aims of this study were to 1) estimate the prevalence of overweight, central adiposity and hypertension among children in K – 6th grade in an urban school district in southeastern Texas; and 2) test which screening measures of overweight and central adiposity were most closely linked with hypertension.

Methods

A cross-sectional prevalence study was conducted with children in K – 6th grade in three schools located in a southeastern Texas School district during the months of February through April 2006. This school district, located north of a major city has a population of 56,225 students, 77% eligible for a free/reduced meal program. The ethnic/racial composition of the selected schools was similar to that of the district, which was comprised of 61% Hispanic, 32% African American, 5% non-Hispanic white, and 2% Asian students.

Sample

A stratified, by grade level, random sample of homerooms in each of three schools was selected. All children in each selected homeroom were asked to participate. The sample size estimate was based on the primary variable of interest, prevalence of BMI $\geq$ 85th percentile; it was determined that a minimum sample size of 969 would be sufficient to estimate a prevalence of 25% – 30% within five percentage points at 95% confidence.

Of the 1166 children selected into the sample, 1070 participated, a response of 92%. Nonparticipation (n = 96) was primarily due to absence from school on the day of screening (48%), or lack of consent of parent (28%) or child (14%). There were no significant differences between participants and non-participants in gender, ethnic/racial group, school or grade level. The sample was comprised of 67.2% Hispanic American, 26.1% African American, 2.8% non-Hispanic white, and 3.9% Asian and children of other ethnic/racial groups. For analysis the two smallest categories were combined in a category of “other” ethnic/racial group. The ethnic/racial distribution of the sample approximated that of the school district and the three schools. The mean age was 8.9 years (SD 2.2 years); 51% were female.

Measures

Anthropometric measurement procedures followed those outlined by Lohman, Roche and Martorell (1988). Weight was measured to the nearest 1/4th pound with a balance beam scale. A stadiometer was used to measure height to the nearest 1/4th inch. BMI was calculated using the standard formula (weight in kilograms/height in meters²). Percentiles and z-scores of BMI were based on Center for Disease Control (CDC) age-gender normative data (2000). WC (an indicator of central body fat) was ascertained with a flexible, non-stretchable tape measure and recorded to the nearest half centimeter. The tape measure was placed around the student's waist at the point of the navel by asking the student to place an index finger over his/her navel. The tape measure fit snugly and remained parallel to the floor at all points. The measurement was taken at the narrowest point between the rib cage and the superior border of the iliac crest or at the point of the navel if a narrowest point was not apparent. Percentiles of WC were based on those from the National Health and Nutrition Examination Survey (NHANES) III (Fernandez, Redden, Pietrobelli, & Allison, 2004). Cut points for waist/height ratio were derived from NHANES III data by Kahn, Imperatore and Cheng (2005). To determine the appropriate BP cuff size, the right arm circumference was measured at the midpoint between the acromion and olecranon processes and recorded to the nearest half centimeter.

Blood pressure was measured after the child had been sitting for a minimum of five minutes; three measurements of SBP and DBP were taken at one-minute intervals, with a Spacelabs oscillometric monitor, Model 90207 (Redlands, WA). The average was used in the analysis, defined as the mean of the second and third measurements in the series of three measurements. Methods, cuff sizes and normative data were based on the Fourth Report on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents (National High Blood Pressure Education Program Working Group on High Blood Pressure in Children & Adolescents, 2005). Any child with an average SBP and/or DBP reading at the Stage 2 level ($\geq 99^{\text{th}}$ percentile plus 5 mm Hg) was referred to the school nurse the day of screening. Children with an average SBP and/or DBP reading in the prehypertensive range or above ($\geq 90^{\text{th}}$ percentile) had BP measured on two more occasions within three months of the initial screening by a trained research assistant. If the BP reading remained elevated at the second and third measurements, they were classified as prehypertensive, Stage 1 or Stage 2 hypertensive (National High Blood Pressure Education Program Working Group on High Blood Pressure in Children & Adolescents, 2005). The final BP status was determined as follows: if there was no follow up, the initial screening BP was used to determine the final BP status; if BP was remeasured because the screening BP was elevated, the final BP status was based on the lowest BP observed at the second and third measurements.

Data on age, grade, gender and race/ethnicity were based on records maintained by the school district. Race/ethnicity and gender variables were used to describe differences among subgroups of the population and to identify subgroups at highest risk for overweight, central adiposity and hypertension.

Procedures

The procedures for obtaining consent from the parents/guardians were approved by the school district and the Committee for the Protection of Human Subjects at the University of Texas Health Science Center at Houston. Because the measurements were noninvasive and commonly included as part of school-based screening programs, a "passive" consent process was used. Parents were informed by postal letter in advance and were asked to return a prepaid post card if they did not wish their child to be a participant. Prior to data collection at each school, the investigators explained the protocol to the children, demonstrated the procedures, and answered questions in a general assembly format. On the day of screening the children had

opportunity to ask questions about the screening procedure and were reminded that they could decline or discontinue participation at any time.

As part of their community health clinical course in their senior year, baccalaureate nursing students were trained to implement the screening protocol. The nursing students measured height, weight, waist circumference (WC) and BP, and were supervised by doctorally prepared nursing faculty in a ratio of 10:1. Data collection stations (height, weight, WC and BP) were set up in a room designated by the school. Children were escorted to the screening area during their physical education classes, greeted by student nurses and/or research staff, asked to remove jackets, sweaters, shoes, and hats, and then they proceeded through the data collection stations. Privacy was provided with a screen or curtain at the stations for body measurements. The student nurses had a post conference with supervising faculty after each screening session to reinforce adherence to the data collection protocol and to discuss any difficulties encountered in working with the children.

All parents/guardians were sent information about their child's measurements, whether normal or abnormal. Information was provided about interpretation of the BMI percentiles and a list of recommendations for encouraging children to be active and to choose a healthy diet. In addition, specific recommendations for further evaluation and sources of care were sent to those with abnormal results.

Analysis

Data were analyzed with SPSS version 15.0 for Windows. Odds ratios were calculated to test associations between risk factors (Bland & Altman, 2000). Logistic regression analysis was used to test which screening measures of overweight and central adiposity were most closely linked with hypertension.

Results

Using national standards for BMI by age and gender (CDC, 2000), 28.7% (95% CI, 26.0 – 31.4) of the children were overweight ($\geq 95^{\text{th}}$ percentile), and an additional 17.9% (95% CI, 15.6 – 20.1) were at risk of overweight ($\geq 85^{\text{th}}$ and $< 95^{\text{th}}$ percentile); 1.3% (95% CI, 0.6 – 2.0) of the children were underweight ($< 5^{\text{th}}$ percentile). For WC, 28.8% of the children were $\geq 90^{\text{th}}$ percentile; 44.2% of the sample had a waist/height ratio ≥ 0.5 (Table 1). About one-fourth of the children (24.6%) were $\geq 95^{\text{th}}$ percentile for BMI and also above the cut-points on WC and waist/height ratio; 7.1% had elevated values on two of the three; 13.7% had only one elevated indicator of excess body mass or central body fat.

The prevalence of overweight and at risk of overweight did not vary systematically with grade level. The lowest prevalence of these categories combined was observed among 5th graders (41.1%) and the highest among 6th graders (51.8%). There was a higher prevalence of overweight and at risk of overweight among males compared with females, but the confidence intervals overlapped (Table 1). There were no significant differences between males and females in the prevalence of WC $\geq 90^{\text{th}}$ percentile or waist/height ratio ≥ 0.5 . Comparisons of the African American with Hispanic American youths indicated no significant differences in prevalence of BMI $\geq 95^{\text{th}}$ percentile, BMI $\geq 85^{\text{th}}$ percentile or WC $\geq 90^{\text{th}}$ percentile, but Hispanic Americans had a higher prevalence of waist/height ratio ≥ 0.5 (49.5%) compared with African Americans (31.2%).

There were some significant differences for gender within ethnic/racial subgroups and for ethnic/racial group within gender subgroups (Table 1). Hispanic American males had a higher prevalence of BMI $\geq 85^{\text{th}}$ percentile (52.5%) than Hispanic American females (44.2%). Hispanic American males had a higher prevalence of central adiposity as reflected by WC $\geq$

90th percentile (32.4%) and waist/height ratio ≥ 0.5 (52.2%), compared with African American males who had a prevalence of 19.6% and 26.8%, respectively. Likewise, Hispanic American females had a higher prevalence of waist/height ratio ≥ 0.5 (47.1%) than African American females (35.5%).

At initial screening, 35.9% of the children had SBP and/or DBP in the prehypertensive ($\geq 90^{\text{th}}$ and $< 95^{\text{th}}$ percentile) or hypertensive ($\geq 95^{\text{th}}$ percentile) range (Table 2); these children had their BP measured on two more occasions. The mean interval between the initial screening and the second measurement was 39.2 days (95% CI, 38.1 – 40.3 days) and between the second and the third measurements, 10.8 days (95% CI, 10.2 – 11.3 days). After the second and third measurement of children with elevated blood pressure at initial screening (99% response), 9.4% (95% CI, 7.6 – 11.1) had persistently elevated SBP and/or DBP in the prehypertensive (4.8%) or hypertensive (4.6%) range. Among the children who had elevated BP at initial screening but on subsequent measurement had BP in the normal range ($n = 284$), 53.2% had been prehypertensive at the initial screening.

After the BP measurements were complete, all parents/guardians were notified of their children's status. Letters were sent by U.S. mail recommending follow up assessment for children's weight ($n = 439$), BP ($n = 26$) or both ($n = 74$). Follow up was recommended for 50.4% of the sample.

Overweight status and central adiposity significantly increased the likelihood of having high BP (SBP and/or DBP $\geq 90^{\text{th}}$ percentile on three occasions) (Table 3). Overweight children ($\geq 95^{\text{th}}$ percentile), compared with those who were $< 85^{\text{th}}$ percentile, were 4.8 times more likely to have high BP (95% CI, 3.0 – 7.8). At risk of overweight was not significantly associated with hypertension status. Those with WC $\geq 90^{\text{th}}$ percentile for gender and age were 4.0 times more likely to have high BP (95% CI, 2.6 – 6.1) compared with those $< 90^{\text{th}}$ percentile. Children with a waist/height ratio ≥ 0.5 were more likely to have high SBP and/or DBP (odds ratio 2.8, 95% CI, 1.8 – 4.4). Associations between the screening BP and indices of overweight and central adiposity were statistically significant and in the same direction but weaker (data not shown).

Although elevated BP was closely associated with BMI and WC, a substantial portion of children with sustained high BP would have been missed if, at the first screen, only body mass and/or central obesity had been measured. In terms of sensitivity, only 58% of those with elevated BP (pre or hypertensive SBP and/or DBP) also had a WC $\geq 90^{\text{th}}$ percentile for age. Similarly, only 59% of those with elevated BP were overweight (BMI $\geq 95^{\text{th}}$ percentile). Waist/height ratio was a more sensitive measure; 67% of the 100 children with persistently elevated BP had a waist/height ratio ≥ 0.5 .

Logistic regression was conducted separately for the first screening and final BP status (Table 4). The dependent variable was SBP and/or DBP $\geq 90^{\text{th}}$ percentile (prehypertensive or above). Demographic variables and BMI were entered first. At the next step, alternative measures of central adiposity, WC (cm), waist circumference $\geq 90^{\text{th}}$ percentile, waist/height ratio, and waist/height ratio ≥ 0.5 , were candidate variables for stepwise entry. Hispanics and other ethnic groups compared with African Americans were more likely to have BP $\geq 90^{\text{th}}$ percentile at the first screening, but ethnic/racial group variables were not significant for classifying final BP status. Males were slightly more likely to have elevated final BP status, but not at the first screening. WC was significantly associated with elevated BP in both models. WC diminished the significance of z-BMI when it was added to each model, but it explained variance in elevated BP not explained by z-BMI. There were no significant interactions between ethnic/racial group and other risk factors (gender, z-BMI and WC). Thus, we concluded that the correlates of

hypertension were not significantly different for African American and Hispanic American children.

Discussion

Results indicated a high prevalence of excess BMI across genders, ethnic/racial groups and grade levels. The prevalence of overweight was higher in our sample (29%, 95% CI, 26.0 – 31.0) than the most recent national estimates (Ogden et al., 2006) and other samples in various locations in the U.S. (King, Meadows, Engelke, & Swanson, 2006; Kolbo et al., 2006; Park, Menard, & Schoolfeld, 2001; Lewis et al., 2006; Hoelscher et al., 2004). The prevalence was slightly lower than that for American Indian children in Oklahoma (Moore, Stephens, Wilson, Wilson, & Eichner, 2006). Comparisons with similar ethnic/racial groups in the Child and Adolescent Trial for Cardiovascular Health (CATCH) study (Dwyer et al., 2000), based on data collected in 1991 and 1994, indicate that our estimate of prevalence of overweight was similar to the CATCH cohort for African American children, but our estimates were higher for Hispanic American children.

Also, notable was the high prevalence of overweight even among the youngest children in our sample, indicating the need for interventions to reduce obesity in all school populations and intensive community-based efforts to prevent it beginning very early in life. This presumes that obesity in very young children tracks over time and that by preventing its emergence early in life, a reduction in complications of obesity later in life may be prevented (Hayman et al., 2007).

The prevalence of hypertension at initial screening in the present study was similar to previous studies in the U.S. (King et al., 2006; Moore et al., 2006; Sorof, Lai, Turner, Poffenbarger, & Portman, 2004). The prevalence of hypertension ($\geq 95^{\text{th}}$ percentile) after measurement on three separate occasions in the present study (4.6%) was very similar to the estimates from a study of children about 5 years older than our sample, but located in the same geographic area (4.5%) (Sorof et al., 2004). On the other hand, in a rural Oklahoma sample of children in grades K – 12 that was predominantly American Indian or white, only 2.8% had BPs that were persistently $\geq 90^{\text{th}}$ percentile (Moore et al.) compared with 9.4% in the present study.

Our findings reinforce the well known phenomenon of declining prevalence of hypertension with repeated measurements of those above the normative data on initial screening. The need to repeat BP measurement for such a large portion of children is one of the impediments to school-based screening for hypertension. BMI screening is much more common and is, in fact, recommended or mandated in some states. If we had screened only for BMI in our sample and only those $\geq 85^{\text{th}}$ percentile or underweight had had further examination including BP measurement, we would have missed 26% of the children with persistently elevated BP.

Overweight children in the present study were 4.8 (95% CI, 3.0 – 7.8) times more likely to have high BP compared to those who were not overweight. This odds ratio is consistent with those found in previous studies, although there is some variation across studies depending on the number of occasions BP was measured, ages of the children included, and the comparison group (King et al., 2006; Sorof et al., 2004; Freedman, Dietz, Srinivasan, & Berenson, 1999; Brosnan et al., 2008).

What is somewhat unique about the present study is the inclusion of WC in the screening protocol to estimate the prevalence of central adiposity in school-age children. Our study indicates that WC is relatively easy to incorporate in a school-based screening protocol. There is growing evidence that WC and related measures such as waist/height ratio are good proxy measures for abdominal visceral fat in children and adolescents (Taylor, Jones, Williams, & Goulding, 2000) as well as adults (Clasey et al., 1999). Although data on predictive validity

of specific WC cut-off scores for high risk status are scarce, studies have shown that these measures are significantly related to components of the lipid profile, BP, insulin and glucose values in children and adolescents (Janssen et al., 2005). In the present study, the odds ratio for elevated BP associated with WC $\geq$ 90th percentile was 4.0 and logistic regression indicated that WC was a significant correlate of high BP. We found in this population-based sample that WC explains variation in BP that is not explained by BMI and demographic factors such as gender and ethnic/racial group. A similar finding was reported for a small, volunteer sample of African American and white youths measured in a clinical setting (Lee, Bacha, & Arslanian, 2006). Evidence for predictive validity of childhood waist circumference as a marker of risk for adult morbidity is provided by a recent publication from the Fels Longitudinal Study (Sun et al., 2008). The first indication of waist circumference differences between adults with and without metabolic syndrome occurred at age 6 in boys and age 13 for girls.

Inclusion of large numbers of Hispanic American and African American children in the sample and measurement of WC as part of the screening protocol were strengths of this study. There was a very high participant response rate for this study and demographically the participants were similar to the non-participants; however, risk factor profiles of these two groups may have differed. A weakness is that we had no data on the rate of follow up or health outcomes for the large portion of the sample that received recommendations for further assessment. Also, lacking are cost data; however, results from cost analysis of a school-based screening program of older children in the same school district are available (Brosnan et al., 2008). The need for more research on screening costs and outcomes does not diminish the value of these data for planning interventions to prevent and reduce obesity in this community and those with similar populations.

In conclusion, we found a high prevalence of overweight and central adiposity in this population of children in K through 6th grade in southeast Texas. Overweight status and waist circumference $\geq$ 90th percentile were more closely linked with hypertension than waist/height ratio. We found that it was relatively easy to incorporate measurement of waist circumference in a school-based screening program. Further research is recommended to further evaluate the merits and outcomes of screening children for central adiposity.

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Table 1

Prevalence (% and 95% Confidence Interval) of Overweight and Central Adiposity by Sex and Race/Ethnicity

	African American	Hispanic American	Other	All Race/Ethnic Groups
Both Sexes (n)	(279)	(719)	(72)	(1070)
BMI $\geq$ 95 th percentile	24.7 (19.7-29.8)	29.9 (26.6-33.3)	31.9 (21.2-42.7)	28.7 (26.0-31.4)
BMI $\geq$ 85 th percentile	43.0 (37.2-48.8)	48.1 (44.5-51.8)	44.4 (33.0-55.9)	46.5 (43.6-49.5)
WC $\geq$ 90 th percentile	24.4 (19.3-29.4)	30.2 (26.8-33.5)	31.9 (21.2-42.7)	28.8 (26.1-31.5)
W/HR > 0.5	31.2 (25.8-36.6)	49.5 (45.9-53.2)	41.2 (30.3-53.1)	44.2 (41.2-47.2)
Males (n)	(138)	(343)	(39)	(520)
BMI $\geq$ 95 th percentile	24.6 (17.5-31.8)	33.2 (28.3-38.2)	33.3 (18.5-48.1)	31.0 (27.0-34.9)
BMI $\geq$ 85 th percentile	39.1 (31.0-47.3)	52.5 (47.2-57.8)	46.2 (30.5-61.8)	48.5 (44.2-52.8)
WC $\geq$ 90 th percentile	19.6 (13.0-26.2)	32.4 (27.4-37.3)	30.8 (16.3-45.3)	28.9 (25.0-32.7)
W/HR > 0.5	26.8 (19.4-34.2)	52.2 (46.9-57.5)	35.9 (20.8-51.0)	44.2 (40.0-48.5)
Females (n)	(141)	(376)	(33)	(550)
BMI $\geq$ 95 th percentile	24.8 (17.7-32.0)	26.9 (22.4-31.3)	30.3 (14.6-46.0)	26.6 (22.9-30.2)
BMI $\geq$ 85 th percentile	46.8 (38.6-55.0)	44.2 (39.1-49.2)	42.4 (25.6-59.3)	44.7 (40.6-48.9)
WC $\geq$ 90 th percentile	29.1 (21.6-36.6)	28.2 (23.6-32.7)	33.3 (17.3-49.4)	28.7 (25.0-32.5)
W/HR > 0.5	35.5 (27.6-43.4)	47.1 (42.0-52.1)	48.5 (31.4-65.5)	44.2 (40.0-48.3)

Abbreviations: BMI, Body Mass Index; WC, Waist Circumference; W/HR, Waist/Height Ratio

Table 2

Prevalence of Normal and Elevated Blood Pressure (BP) among 1070 children at Screening and Final Classification^a

	Screening n (%)	Final Classification ^a n (%)
SBP (only)		
Normal	726 (67.9)	976 (91.2)
Prehypertensive	159 (14.9)	47 (4.4)
Stage 1	171 (16.0)	42 (3.9)
Stage 2	14 (1.3)	5 (0.5)
DBP (only)		
Normal	945 (88.3)	1051 (98.2)
Prehypertensive	92 (8.6)	14 (1.3)
Stage 1	32 (3.0)	5 (0.5)
Stage 2	1 (0.09)	0 (0.0)
SBP & DBP		
Normal	686 (64.1)	970 (90.7)
Prehypertensive	186 (17.4)	51 (4.8)
Stage 1	183 (17.1)	44 (4.1)
Stage 2	15 (1.4)	5 (0.5)

Abbreviations: SBP, Systolic Blood Pressure; DBP, Diastolic Blood Pressure

^a after repeated measurements on two additional occasions if screening SBP and/or DBP $\geq 90^{\text{th}}$ percentile

Table 3

Odds Ratios for SBP and/or DBP $\geq 90^{\text{th}}$ percentile among 1070 Children in Relation to Indices of Overweight and Central Adiposity

		BP $\geq$ 90 th percentile	
	n (% of 1070)	n (% within group)	Odds Ratio (95% CI)
Body Mass Index			
BMI < 85 th percentile	572 (53.5)	27 (4.7)	Referent
BMI $\geq$ 85 th percentile	498 (46.5)	73 (14.7)	3.5 (2.2-5.5)
BMI $\geq$ 85 th & < 95 th percentile	191 (17.9)	14 (7.3)	1.6 (0.8-3.1)
BMI $\geq$ 95 th percentile	307 (28.7)	59 (19.2)	4.8 (3.0-7.8)
Waist Circumference			
WC < 90 th percentile	762 (71.2)	42 (5.5)	Referent
WC $\geq$ 90 th percentile	308 (28.8)	58 (18.8)	4.0 (2.6-6.1)
Waist/Height Ratio			
W/HR < 0.5	597 (55.8)	33 (5.5)	Referent
W/HR > 0.5	473 (44.2)	67 (14.2)	2.8 (1.8-4.4)

Abbreviations: BP, Blood Pressure; CI, Confidence Interval; SBP, Systolic Blood Pressure; DBP, Diastolic Blood Pressure

Table 4

Logistic Regression Models for Screening and Final BP Status, N = 1070

BP status ≥ 90th percentile at first screening					
Variable	β	(s.e.)	p	Exp(B)	(95% CI)
Male	.245	(.133)	.07	1.28	(0.99-1.66)
Hispanic ^a	.473	(.160)	.003	1.60	(1.17-2.19)
Other Ethnicity/Race ^a	.857	(.282)	.002	2.36	(1.36-4.10)
z BMI	.164	(.090)	.07	1.18	(0.99-1.40)
Waist (cm)	.028	(.007)	<.001	1.03	(1.01-1.04)
Constant	-3.184	(.474)	<.001	0.04	
Model $\chi^2 = 81.8$, df = 5, $p < 0.001$, Nagelkerke $R^2 = 0.101$					
BP status ≥ 90th percentile at final (third) screening					
Variable	β	s.e.	p	Exp(B)	95% CI
Male	.438	.221	.05	1.55	1.01-2.39
Hispanic ^a	.292	.272	.28	1.34	0.79-2.28
Other Ethnicity/Race ^a	.387	.446	.39	1.47	0.62-3.53
z BMI	.138	.161	.39	1.15	0.84-1.58
Waist (cm)	.044	.011	<.001	1.05	1.02-1.07
Constant	-6.081	.726	<.001	.002	
Model $\chi^2 = 58.7$, df = 5, $p < 0.001$, Nagelkerke $R^2 = 0.115$					

^aReference category = African American

Abbreviations: CI, Confidence Interval, BP, Blood Pressure; BMI, Body Mass Index