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Differences in Weight Perception Among Blacks and Whites

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Abstract

Background: The prevalence of obesity is higher in blacks than whites, especially in black women, and is known to be associated with major cardiovascular disease risk factors, which are also more prevalent in blacks than whites. Weight perception may contribute to these differences if blacks are more likely to underestimate their weight. We explored race and gender differences in underestimation of weight using body mass index (BMI) and waist circumference (WC), after adjusting for other cardiovascular risk factors.

Methods and Results: We studied 219 white and 240 black women and men as part of the META-Health Study. Perceived weight was assessed over the phone and categorized into three categories: underweight or normal weight, overweight, or obesity. Height, weight, and WC were measured at a subsequent visit, and BMI was calculated. Logistic regression was used to compare the likelihood of underestimating actual weight category by race, before and after adjusting for sociodemographic, lifestyle factors, and medical history. In multivariate analysis, the odds of underestimating BMI category was greater than threefold in blacks compared with whites (OR 3.1, 95% CI 1.9–4.8) and was larger for black women than for black men ($p < 0.01$ for interaction). When abdominal adiposity was taken into account by utilizing WC as a measure of weight, the observed difference in weight underestimation remained.

Conclusion: Our data reveal a significant misperception of weight among blacks, particularly black women, who have the highest burden of obesity. A multifaceted approach with efficient identification of social, cultural, and environmental factors that give rise to obesity tolerance in blacks will provide potential targets for intervention, which may ameliorate weight misperception and the prevalence of excess weight in the black population.

Introduction

Overweight and obesity are established risk factors for cardiovascular disease and a growing problem in the United States.[1] The World Health Organization (WHO) classifies overweight and obesity based on body mass index (BMI), with overweight defined as a BMI between 25.0 and 29.9 and obesity as a BMI of 30 or more.[2] In 2003–2004, the prevalence of overweight or obesity was 66% among U.S. adults compared with 56% in 1988–1994.[3,4] These prevalence rates have increased even further in more recent years to 68%.[5]

Excess body weight is associated with cardiovascular risk factors, including hypertension, hypercholesterolemia, and diabetes. In addition, excess body weight is a substantial burden to society in terms of costs. In 2000, the estimated total costs associated with obesity in the United States accounted for 1.2% gross domestic product.[6] The estimated medical costs approached $147 billion per year by 2008.[7]

Excess body weight may serve as a major contributor to ethnic disparities in cardiovascular disease, since the prevalence of obesity is higher in blacks than whites, especially in women. A gradient of increasing risk of diabetes, hypertension, and coronary heart disease with increasing BMI has been demonstrated in multiple ethnic groups.[8,9] In 2007–2008, approximately 74% of black adults were overweight or obese compared with 68% of white adults. The prevalence of overweight and obesity among black women is even higher, 78%, compared with 61% among white women.[5]

How one perceives body weight has been strongly associated with attempts at weight loss. Those who perceived

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themselves to be overweight were more likely to attempt weight loss than those without this perception.[10] Thus, differences in weight perception may contribute to differences in the prevalence of obesity between blacks and whites if blacks, especially black women, are more likely to underestimate their weight. Although racial differences in weight perception have been reported,[11–13] few studies have compared such measures with actual weight measurements, including both BMI and measures of abdominal adiposity, such as waist circumference (WC). Consideration of WC is important because it is a more robust indicator of cardiovascular risk than BMI and it differs dramatically by race.[14–16] Accordingly, the objective of our study was to explore race and gender differences in self-described weight versus measured BMI and WC, after adjusting for other cardiovascular risk factors.

Methods

Study population

The META-Health Study (Morehouse and Emory Team up to eliminate cardiovascular Health disparities) is a two-stage study including a random digit–dialing interview of white and black residents of metro Atlanta, aged 30–66 years, followed by a clinic visit with detailed testing in a subsample. A total of 3391 individuals were interviewed by phone. All individuals interviewed were asked to come in for a clinic visit. Of these, 219 white and 240 black men and women were examined at the subsequent clinic visit, constituting approximately 14% of those interviewed by phone.

We excluded individuals with missing or incomplete data in any study variables ($n = 13$), individuals who refused to describe their weight perception ($n = 2$), or refused to report their height and weight ($n = 16$). Therefore, 206 white (71 men and 135 women) and 223 black (69 men and 154 women) persons were included in the analysis.

Measurements

During the phone interview, weight perception was obtained with a question derived in part from the National Health and Nutrition Examination Survey (NHANES) Questionnaire: "How do you describe your weight? Would you say underweight, about the right weight, overweight, or obese?" The respondents answer yielded *self-described body weight*. In addition, self-reported height in feet and inches or in centimeters and weight in pounds or kilograms were obtained during the phone interview by asking, "About how tall are you without shoes?" and "About how much do you weigh without shoes?" These values were then used to calculate *BMI from self-reported body measures*.

During the clinic visit, height was measured with a Portable Shorr Height Measuring Board. All jewelry and hair dressings were removed and participants were left wearing a disposable lightweight gown and shoes, both provided by the study. Participants were asked to stand straight with their back against the measuring board, Frank line horizontal, and heels close together and legs straight. Height was recorded in centimeters to 0.1 cm. Body weight was measured with the S 6600 High Capacity Floor Scale and weight was recorded in kilograms rounding to the nearest 0.1 kg. From these data we computed the body mass index (BMI = weight [kg]/height[m]^2), which is referred to, in our article, as the *actual BMI*. Both actual BMI and BMI from self-reported height and weight were categorized utilizing a standard classification of underweight (BMI < 18.5), normal weight ($18.5 \leq$ BMI ≤ 24.9), overweight ($25.0 \leq$ BMI < 30), and obesity (BMI $\geq 30\,kg/m^2$).[17] Given the small number of underweight participants, the underweight category was combined with the normal weight category for analysis.

WC was measured based on NHANES III Body Measurement 1988. WC was measured at the high point of the iliac crest, using a nonelastic, laminated measuring tape with width boundaries ranging from 0 to 150 cm. The research staff used a wall mirror as an adjunct to the measuring process in order to ensure that the tape measure was aligned in a straight position around the waist (parallel to the floor), snug, and not compressing the participant's waist. WC was recorded during minimal respiration to the nearest 0.1 cm. For very obese people for whom the iliac crest was difficult to palpate or impalpable, the research staff used the umbilicus as the reference point and measured the most outward circumference of the waist, without lifting up the abdomen, and while avoiding getting the tape measure in an abdominal fold or crease. The average of three measures was used to define WC. For analysis, WC was categorized into obese WC (≥ 102 cm in men and ≥ 88 cm in women) and nonobese WC utilizing established WC values associated with obesity.[18]

Bioelectrical impedance analysis was used to assess fat free mass, as percentage of weight, to derive an objective assessment of body fat. It measures the impedance or opposition to the flow of an electric current through body fluids contained mainly in the lean and fat tissue. Bioelectrical impedance analysis was conducted with the Body Composition Analyzer Quantum II. Briefly, a small constant voltage current, typically 800 μA at a fixed frequency, usually 50 kHz, is passed between electrodes spanning the body. The voltage drop between electrodes provides a measure of impedance.[19,20] Prediction equations, previously generated by correlating impedance measures against an independent estimate of total body water, are subsequently used to convert the measured impedance to a corresponding estimate of total body water. Lean body mass is then calculated from this estimate using an assumed hydration fraction for lean tissue. Fat mass is calculated as the difference between body weight and lean body mass. The research participant should have abstained from exercise and sauna use within 8 hours of the measurements and from alcohol intake for the 12 hours prior to the measurements. Only the data that contained valid resistance and reactance values were used in this study. Bioimpedance has been validated in previous studies and has similar accuracy across ethnicities.[21, 22]

Age, race, and gender were self-identified. Socioeconomic status measures included individual's highest educational attainment and financial stress. Financial stress questions inquired about the worry of not having enough money to eat, go to see a doctor, or pay bills and have been used by previous studies.[23,24] The original variables were scored on a 4-point Likert scale: 1, never; 2, once in a while; 3, fairly often; and 4, very often. The Cronbach alpha coefficient was 0.844. The scores were recoded to (0, 1) for never vs. experienced financial stress, prior to creating the overall financial stress score (range: 0–3), which was analyzed as a continuous variable. A high score on this scale indicates greater financial stress. Smoking status was self-reported and defined as current,

previous, or never smoked. In addition, self-reported medical history was obtained, including the presence of cardiovascular risk factors and/or cardiovascular disease. Cardiovascular risk factor variables included history of hypertension, diabetes mellitus, hyperlipidemia, or vascular event (stroke or myocardial infarction).

Statistical analysis

BMI categories were ordered as follows: 1, normal weight/about the right weight; 2, overweight; and 3, obese. The difference between perceived versus actual body weight was examined in two ways: (1) by subtracting actual BMI category from self-described body weight category; and (2) by subtracting actual BMI category from BMI category based on self-reported body measures. Therefore, a positive result would indicate underestimation, while a zero or negative result would indicate non-underestimation of weight. Underestimation of BMI was defined as having a self-described weight category that was lower than the corresponding BMI. Underestimation of obesity was defined as having a self-described weight category of less than obese while having a measured BMI in the obese category. In order to assess the influence of abdominal adiposity on obesity underestimation by race, we performed a similar analysis in which WC in the obese category was used in place of BMI. The proportion of participants who underestimated their weight was calculated in whites and blacks. Logistic regression was used to compare the likelihood of underestimating actual weight category by race, before and after adjusting for sociodemographic and lifestyle factors (age, socioeconomic status variables, and smoking status) and medical history (hypertension, diabetes mellitus, hypercholesterolemia, previous myocardial infarction, and previous stroke). Because misperception of weight has been found to be more common in men than women, the analysis was stratified by gender.[12] In order to validate body measurements, an additional analysis was conducted to assess differences in fat free mass (as percentage of weight) by race, therefore accounting for body weight composition, stratified by gender. All analyses were conducted utilizing SAS software, version 9.2.

This study was approved by the Emory and Morehouse institutional review boards and all participants gave informed consent.

Results

Characteristics of study population

Table 1 outlines baseline demographics and clinical characteristics by race. Sixty-seven percent of the participants were women. Compared with whites, blacks were younger and less likely to be college educated. In addition, blacks had a larger WC (99.9 ± 17.6 cm vs. 96.4 ± 16.7 cm, $p = 0.03$) and more often reported a history of hypertension (44.8% vs. 31.6%, $p = 0.004$) and diabetes (12.6% vs. 4.4%, $p = 0.003$) compared with whites.

A total of 409 participants had valid data on body composition. Among women, blacks had an average fat free mass as percentage of weight of 59.2 vs. 65.6 in white women ($p < 0.001$). Among men, blacks had an average fat free mass percentage of weight of 72.4 vs. 73.4 in white men ($p < 0.001$).

Actual and perceived body weight

The average measured BMI was higher in blacks (31.4 ± 7.6) than whites (28.0 ± 6.6) ($p < 0.001$; Table 1), but this difference was driven by women. Among women, measured BMI was 31.8 ± 7.8 for black women and 27.2 ± 6.7 for white women ($p < 0.001$). Excess body weight (overweight or obesity) was noted in 80.5% of black women and 54.0% of white women; obesity was twice as common in black women (53.2%) than in white women (24.4%) ($p < 0.001$). BMI calculated from self-reported height and weight was also higher in black women (30.0 ± 6.8) than white women (26.0 ± 5.9) ($p < 0.001$). However, when asked to describe their weight, only 64.3% of black women described themselves as overweight or obese compared with 49.6% of white women ($p = 0.005$).

In contrast to the women, there were no differences among men in either measured or self-reported BMI by race. Measured BMI was 30.5 ± 7.1 for black men and 29.6 ± 6.1 for white men ($p = 0.52$). Excess body weight was noted in 84.1% of black men and 80.2% of white men; obesity in 46.4% and 39.4%, respectively ($p = 0.68$). Self-reported BMI was 29.4 ± 6.1 for black men and 28.4 ± 5.2 for white men ($p = 0.33$). Self-described weight was also similar: 49.3% of black men described their weight as excessive compared with 57.7% of white men ($p = 0.60$).

Underestimation of weight

When weight underestimation was defined as the difference between actual BMI and self-described body weight category, a large proportion of participants (49.0%) underestimated their weight. Blacks were more likely to underestimate their weight than whites: 64.1% vs. 32.5%. Figures 1 and 2 demonstrate that despite being more often obese, blacks were less likely to describe themselves as obese compared with whites (4.9% vs. 8.3%). Again, these differences were mostly driven by women. Figure 3 illustrates that 62.3% of black women compared with 21.5% of white women underestimated their weight ($p < 0.001$). In contrast, 68.1% of black men compared with 53.5% of white men underestimated their weight ($p = 0.08$). When looking specifically at obesity, 48.7% of black women compared with 16.3% of white women underestimated obesity ($p < 0.001$), while 40.6% of black men compared with 32.4% of white men underestimated obesity utilizing BMI ($p = 0.31$; Fig. 4).

When weight underestimation was defined as the difference between actual BMI and BMI calculated from self-reported body measures, no differences in underestimation were found by race (Fig. 1); this was true for both men and women.

In multivariate analysis adjusting for sociodemographic factors and comorbidities, overall blacks had 3.1 (95% CI, 1.9–4.8) greater odds of underestimating their weight than their white counterparts, utilizing measured BMI versus self-described weight category. Among women, after adjusting for the same factors, black women had 4.6 (95% CI 2.5–8.2) greater odds of underestimating weight than white women. The estimate among men was 1.7 (95% CI 0.8–3.8); $p = 0.006$ for the interaction between gender and race.

Specifically with regard to obesity, the results were similar. In multivariate analysis adjusting for sociodemographic and comorbidities, overall blacks had 2.4 (95% CI, 1.5–3.9) greater odds of underestimating obesity than their white

Table 1. Comparison of Demographics and Clinical Characteristics Between Blacks and Whites

	Total sample (n = *429*)	*Blacks* (n = *223*)	*Whites* (n = *206*)	p *value*
Age in years	50.4 ± 9.4	49.1 ± 9.3	51.7 ± 9.5	0.004
Female gender	289 (67.2)	154 (69.1)	135 (65.5)	
College education	233 (54.2)	86 (38.6)	147 (71.4)	<0.0001
Financial stress scale score	1.18 ± 1.19	1.49 ± 1.18	0.85 ± 1.1	0.25
BMI (calculated from measured HT and WT) (kg/m^2)	29.8 ± 7.3	31.4 ± 7.6	28.0 ± 6.6	<0.0001
BMI (calculated from self-reported HT and WT) (kg/m^2)	28.4 ± 6.4	29.8 ± 6.6	26.9 ± 5.7	<0.0001
Waist circumference (cm)	98.3 ± 17.2	99.9 ± 17.6	96.4 ± 16.7	
BMI categories (based on measured HT and WT)				<0.0001
Normal	117 (27.2)	41 (18.4)	76 (36.9)	
Overweight	138 (32.1)	68 (30.5)	69 (33.5)	
Obese	175 (40.7)	114 (51.1)	61 (29.6)	
BMI categories (based on self-reported HT and WT)				<0.0001
Normal	146 (34.0)	60 (26.9)	86 (41.7)	
Overweight	142 (33.0)	66 (29.6)	75 (36.4)	
Obese	142 (33.0)	97 (43.5)	45 (21.8)	
Self-described BMI categories				0.07
Normal	188 (43.7)	90 (40.4)	98 (47.6)	
Overweight	214 (49.8)	122 (54.7)	91 (44.2)	
Obese	28 (6.5)	11 (4.9)	17 (8.3)	
Underestimate A (measured BMI vs. perceived body weight)	210 (48.8)	143 (64.1)	67 (32.5)	<0.0001
Underestimate B (measured BMI vs. BMI from self-reported HT and WT)	67 (15.6)	37 (16.6)	30 (14.6)	
Underestimate BMI obesity (BMI ≥ 30 vs. perceived obesity)	148 (34.2)	103 (46.2)	45 (21.8)	<0.0001
Underestimate WC obesity (WC ≥ 102 men; ≥88 women vs. perceived obesity)	150 (35.0)	94 (42.2)	56 (27.2)	
Fat free mass	65.7 ± 9.6	63.3 ± 10.3	68.3 ± 8.0	<0.0001
Smoking				0.03
Nonsmoker	249 (57.9)	138 (57.8)	119 (57.8)	
Current smoker	70 (16.3)	45 (20.2)	25 (12.1)	
Previous smoker	111 (25.8)	49 (22.0)	62 (30.1)	
History of hypertension	165 (38.4)	100 (44.8)	65 (31.6)	0.004
History of diabetes	37 (8.6)	28 (12.6)	9 (4.37)	0.003
History of high blood cholesterol	163 (37.9)	85 (38.1)	77 (37.4)	
History of CVD	30 (7.0)	20 (9.0)	10 (4.85)	0.10

Data for continuous variables are expressed as means ± standard deviations; data for categorical variables are expressed as *N* (%).
BMI, body mass index; HT, height; WT, weight; WC, waist circumference; CVD, cardiovascular disease.

counterparts. Among women, after adjusting for the same factors, black women had 3.4 (95% CI 1.8–6.4) greater odds of underestimating obesity than white women. The estimate among men was 1.3 (95% CI 0.6–3.0); $p = 0.006$ for the interaction between gender and race.

Predictors outside of race and gender were also found to be significant in multivariate analysis. Current smoking and hypertension were significant predictors of underestimation of weight utilizing BMI. While current smokers were less likely to underestimate weight compared with those who never smoked (OR 0.5, 95% CI 0.3–0.9), individuals with a history of hypertension were more likely to underestimate weight compared with those without hypertension (OR 2.5, 95% CI 1.6–4.1).

Role of fat distribution

In order to assess if fat distribution affected the association between race and underestimation of weight, we utilized WC in place of BMI for the definition of obesity. This analysis yielded similar results as for BMI. Overall, 35.0% of participants underestimated obesity utilizing the WC definition. Among women, 45.5% of black women underestimated obesity compared with 21.5% of white women ($p < 0.001$); while among men, 34.8% of black men underestimated obesity compared with 38.0% of white men ($p = 0.51$) (Fig. 4). In multivariate analysis adjusting for sociodemographic factors and comorbidities, the OR for underestimating obesity in black women compared with white women was 2.0 (95% CI 1.1–3.6) when the WC definition was used. The corresponding estimate among men was 0.8 (95% CI 0.4–1.9); $p = 0.003$ for the interaction between gender and race.

Discussion

We found a notable difference in weight perception between blacks and whites, particularly among black women. Despite being more often obese, black women were less likely to describe themselves as obese compared with white women. When taking into account fat distribution by utilizing WC as a

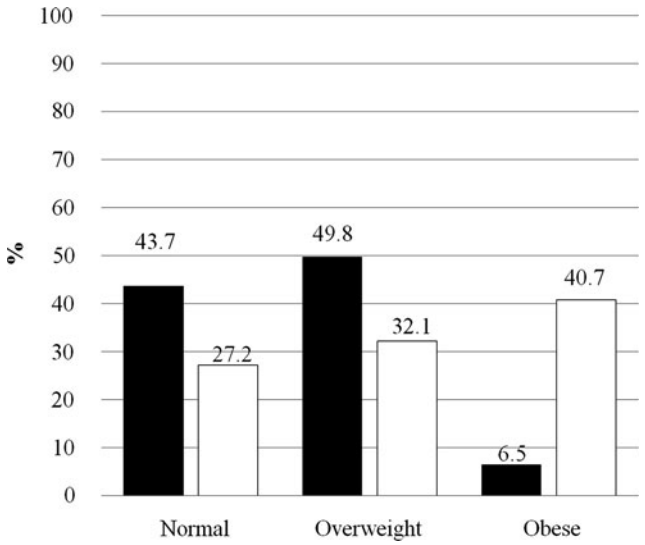

FIG. 1. Body mass index (BMI) categories for blacks. Unadjusted prevalence of BMI categories by type of measure among blacks in the META-Health study, 2005–2009. Legend: black = self-described BMI; white = measured BMI.

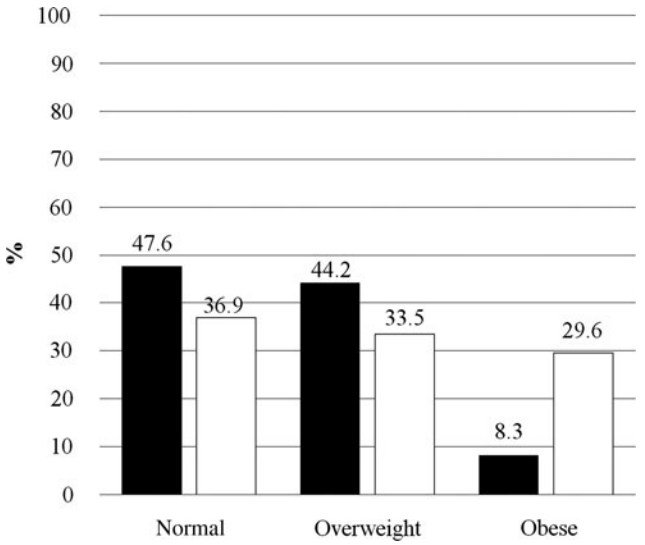

FIG. 2. Body mass index categories for whites. Unadjusted prevalence of BMI categories by type of measure among whites in the META-Health study, 2005–2009. Legend: black = self-described BMI; white = measured BMI.

measure of visceral adiposity, the observed difference in obesity underestimation between black and white women decreased but remained significant. Differences in weight underestimation were not due to underestimating weight measurement, since there were no differences in weight underestimation when BMI calculated from self-reported height and weight was considered. Therefore, racial differences in weight underestimation appear to be due to differences in weight perception, presumably secondary to cultural differences or a knowledge gap in interpreting what constitutes excess body weight and body weight satisfaction, thereby making an individual's culture a potential risk factor for obesity.

Racial differences in body weight perception have been previously examined, but have limitations. In a large sample of individuals, Johnson et al.[25] assessed ethnic differences in self-reported and measured obesity and found that self-reported height and weight foreshadow underestimation of obesity prevalence. They also found the overestimation of height and the underestimation of weight and BMI occurred more in black women than white women. This study, however, did not compare self-described weight; that is, how one perceives his or her weight. Our study found no significant differences between self-reported and measured height and weight in both blacks and whites, while there was a substantial difference in the perception of overweight and obesity. Paeratakul et al.[12] conducted a study on self-perception of weight and found that misperception of weight was higher among blacks compared with whites of the same weight. They also found weight misperception to be higher among men than women. This study only utilized self-reported measurements of body weight and height though. In a study conducted by Dorsey et al.[26] based on NHANES, minorities and persons with lower educational levels were more likely to have a weight misperception. This study, however, did not take into account the presence or absence of cardiovascular risk factors other than diabetes, which may differ by race and may affect weight perception. In addition, it did not take into account other measures of obesity such as WC, which may influence weight perception and is associated with cardiovascular risk independent of BMI.[27,28]

The continued increase in prevalence of overweight and obesity, largely preventable conditions, in the United States is detrimental to the population and the health-care system because it is associated with substantial morbidity and mortality and health-care costs. The prevalence of diabetes mellitus is 2% among normal weight, 5% among overweight, and 10%–12% among obese individuals; the prevalence of hypertension is also dramatically higher among overweight and obese people than among normal weight people.[9] It is known that higher rates of overweight and obesity exist in blacks compared with whites. An inaccurate perception of weight may be a significant barrier in initiating a change in lifestyle. Our data suggest that cultural differences in the perception of body weight could play an important role in the larger

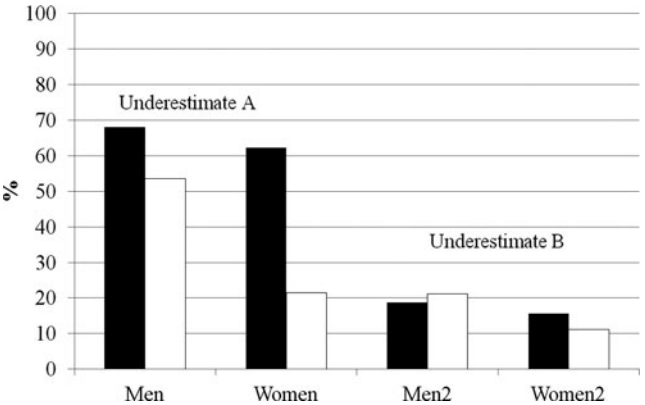

FIG. 3. Prevalence of weight underestimation by race and gender. Underestimate A compares self-described BMI with measured BMI. Underestimate B compares BMI from self-reported HT and WT to measured BMI. Legend: black = blacks; white = whites.

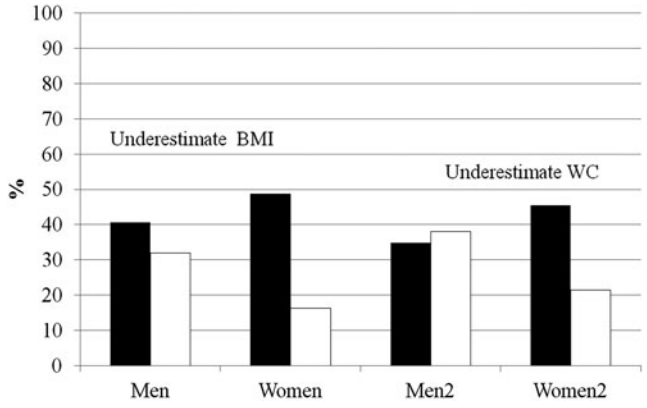

FIG. 4. Underestimation of obesity by race and gender. Prevalence of obesity underestimation assessed by BMI and waist circumference (WC) by race and gender. Legend: black = blacks; white = whites.

prevalence of overweight and obesity among blacks, particularly among black women. That there are cultural differences in weight perception related to race and ethnicity is suggested by a study of differences in self-perceived versus ideal body size in whites and blacks. Although blacks had higher prevalence of obesity compared with whites, researchers found that blacks had a smaller discrepancy between perceived and ideal body size, suggesting that blacks were more comfortable with their weight. Black participants tended to select larger ideal figures than white participants.[29] In addition, cultural values in the black community place more weight on self acceptance and character over physical appearance.[30,31]

The findings of this study should be considered within the context of potential limitations. Health literacy was not measured in this study, which may contribute to race-related differences in weight perception. The use of a single item for weight perception may fail to reliably capture this psychological construct. However, this single item has been utilized in similar studies to assess weight perception.[26,32] The modification of the NHANES questionnaire item on weight perception to include obesity could potentially affect its validity. However, this modification allowed for a more comprehensive analysis of weight perception in comparison with actual weight. Another limitation is that the sample was drawn from one metropolitan area, Atlanta, where the prevalence of overweight and obesity is higher than other geographic locations. However, populations with a high burden of obesity are those that could potentially benefit most from intervention. In addition, due to the high representation of blacks and their distribution across all socioeconomic classes, Atlanta is an ideal setting for the study of racial differences in risk factors and behaviors.

A multi-faceted community-based approach focusing on social and environmental factors and their effect on obesity in predominantly black communities may help elucidate etiologies for weight misperception and provide potential avenues for intervention. One facet is determining the important factors that contribute to change in cultural concepts of ideal weight in blacks. Yet another facet is evaluating any disparities between commonly held beliefs and evidence-based observations on the effects of excess weight. Although multiple studies have shown that minority neighborhoods have decreased access to healthy food choices, there are few longitudinal studies evaluating the effects of healthy food availability on weight in minority communities. Furthermore, there are few intervention studies addressing access and availability of healthy food choices and their effects on weight in minority communities.[33–35] Adequately funded and evidence-based changes in policy and social infrastructure that promotes health education and a healthy lifestyle will likely have a significant impact not only on weight misperception but the prevalence of excess weight in this population.

In conclusion, our data reveal a significant misperception of weight among blacks, particularly black women, who have the highest burden of obesity. A comprehensive approach with efficient identification of social, cultural, and environmental factors that give rise to obesity tolerance in blacks may provide potential targets for intervention to ameliorate weight misperception and the prevalence of excess weight in blacks. Future studies should test the effectiveness of such strategies toward curbing the obesity epidemic among blacks, especially women.

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Disclosure Statement

The authors have no conflicts of interest to report.

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