POPULATIONS AT RISK

Factors Associated with Misperception of Weight in the Stroke Belt

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BACKGROUND: Understanding the reasons for overweight and obesity is critical to addressing the obesity epidemic. Often the decision to lose weight is based as much on one's self-perception of being overweight as on inherent health benefits.

OBJECTIVE: Examine the relationships between self-reported health and demographic factors and measured health risk status and the misperception of actual weight status.

DESIGN: Cross-sectional study of factors associated with self-perceived overweight status in participants who self-selected to participate in stroke risk factor screenings. Participants were asked, "Are you overweight?" before their body mass index (BMI) was determined from measured weight and self-reported height. Demographics including, sex, race, education, and location; and health status variables including level of exercise and history of high blood pressure and cholesterol were collected.

RESULTS: Mean BMI for the group was 30 kg/m^2. Most women (53.1%) perceived themselves to be overweight, whereas most men (59.6%) perceived themselves not to be overweight. Factors related to misperception of weight status varied by actual BMI category. Among individuals with normal BMI, sedentary individuals had 63% higher odds of misperceiving themselves as overweight. Sedentary individuals with obese BMI were at 55% reduced odds of misperceiving themselves as normal weight.

CONCLUSIONS: Active obese and overweight individuals may be more likely to incorrectly perceive themselves as normal weight, and thus misperceive their risk for stroke. Thus, it is not enough to only counsel individuals to be active. Physicians and other health professionals need to counsel their clients to both be active and to attain and maintain a healthy weight.

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INTRODUCTION

Being overweight is among the most commonly cited risk factors for hypertension, cardiovascular disease, type 2 diabetes, and many other chronic diseases such as cancer and osteoporosis.[1] Despite its impact on the health of Americans, the prevalence of overweight and obesity based on body mass index (BMI) continues to rise among all sections of the population. Prevalence of overweight and obesity among non-Hispanic whites is 66.3% and for non-Hispanic blacks the proportion is 76.1%, according to data from the National Health and Nutrition Examination Survey (NHANES) gathered during 2003–2004.[2] Men, both white and black, have similar prevalence of overweight and obesity at 70.6% and 69.1%, respectively. Among women, however, 81.6% of non-Hispanic blacks were overweight or obese, compared to 58.0% of non-Hispanic whites. Being obese has a profound effect on length and quality of life, particularly among women. Muennig et al. (2006) found that obese men and women lost 1.9 million and 3.4 million quality adjusted life years, respectively, compared to their normal counterparts.[3] When it comes to stroke risk, the impact of overweight is most severe for blacks and particularly black women. Blacks are at 4 times greater risk for stroke by 45 years of age than are whites.[4]

Trying to reduce the proportion of people in a population who are overweight or obese could reduce health risks. Even modest weight reduction has been shown to have beneficial results in the reduction of one's risk for cardiovascular disease, type 2 diabetes, and hypertension.[5–8] However, to achieve an effect, people must be motivated to engage in new behaviors to reduce their weight. Past studies have concluded that self-perception of overweight status may have more of an impact on one's decision to lose weight than objective weight status.[9–11] Chang and Christakis (2001 and 2003), using 2 nationally representative samples of the U.S. adult population from the 1991 National Health Interview Survey (NHIS) and NHANES III, found that, whereas many people correctly perceive their overweight status, a significant proportion do not.[9,10] The disparity between perception and objective weight status was evident across demographics such as sex, age, race/ethnicity, income, and education. The extent of the disparity appeared to be greater for blacks relative to whites and women relative to men.

As incorrect perceptions of weight status may affect motivation to lose weight, factors that are related to incorrect perceptions of weight may play a vital role in planning or executing efforts to reduce overweight in a population. Therefore, the purpose of this paper is to examine the relationships between demographic factors and self-reported and measured health risk status and the misperception of actual weight status. These relationships are examined in a population volunteering for stroke risk factor screenings in Forsyth County, NC, a part of the Stroke Belt.[11] Residents of the Stroke Belt, the southeastern region of the United States, are at 50% greater risk of dying from stroke than residents of other regions.[4] Practitioners of general Internal Medicine aware of the variety of factors associated with misperceiving ones actual weight status will be better able to provide effective advice and counseling to patients on maintaining a healthy weight.

METHODS

Project Participants

The sample for this project was adults 18 years or older who presented at mobile screening units at churches, workplaces, and health fairs between December 7, 2004 and June 16, 2006. All participants were volunteers and self-selected into the study. The project was part of the Community Initiative to Eliminate Stroke (CITIES), a U.S. Department of Health and Human Services funded demonstration project. All participants provided written consent, and the study was approved by the institutional review board at Novant Health Inc. The goal of CITIES was to reduce incidence of stroke among residents of Forsyth and Guilford counties in North Carolina, and the objectives were to: (1) maximize the number of persons knowledgeable of individual risk and treatments to prevent stroke, (2) increase the number of community education programs that promote stroke risk factor reduction while increasing protective factors, and (3) increase community awareness of stroke prevention. The screening consisted of completion of a risk factor assessment form with 3 components—demographic characteristics, self-reported risk factors, and measured or calculated risk factors. Self-perception of weight appropriateness was only collected in Forsyth County, so the study population is limited to only CITIES participants in Forsyth County. Persons of color, rural residents, persons using English as a second language, and persons earning less than $35,000 were the primary target populations of the CITIES project. To serve this population, the project staff strived to schedule screenings at sites, at which they expected at least 70% of individuals who presented for screening to be a member of at least one of the target populations.

Measures

BMI status was based on the subject's self-reported height and measured weight. The following cut points were used for the classifying participants: obese (BMI $\geq$30), overweight (BMI 25–29.9), normal (BMI 18.5–24.9), and underweight (BMI $\leq$18.5). These cut points were based on national directives from the National Heart, Lung and Blood Institute (NHLBI).[10,13]

The self-reported risk factor data were collected by trained personnel. Participants were asked if they were overweight, if they smoked, if they had a history of cardiovascular disease (CVD) and their level of exercise (sedentary, defined as <30 minutes a day, 4 days a week, versus sufficient exercise). Participants self-reported having high blood pressure, high cholesterol, diabetes, and stress. For stress, participants responded to the following question, "Do you suffer from high-level stress on a daily basis that leads you to function poorly and/or sleep abnormally everyday?".

The choice of demographic variables in this project was guided by previous work documenting their association with BMI.[9,10,14,15] Age, education, and race data were based on self-report during the interview. Annual income data were gathered as a dichotomous item with a $35,000 cut point. No distinction was made between family and individual income. Urbanization was determined by the participant's answer to the question, "Do you live within a city's limits."

Subjects, wearing indoor clothes, were weighed by registered nurses on a calibrated Healthometer model 320 KL. Subjects were asked, "How tall are you?" in feet and inches. BMI was calculated using the following formula: weight in kilograms/height in meters.[2]

Statistical Analysis

First, self-perceived weight status, BMI, and demographic characteristics of the sample stratified by sex were described with percentages. Second, the sample was stratified by the obese, overweight, and normal BMI categories; and for each BMI category, unadjusted associations between self-perceived weight status and sociodemographic factors, health behaviors, and self-reported health conditions were estimated with bivariate logistic regression models. Next, 3 multivariate logistic regression models (one for each BMI category) were estimated to explore the association of self-perceived weight status with, the full panel of collected sociodemographic factors, health behaviors, and self-reported health conditions adjusted for one another, by BMI category. Finally, the 3 full models were reduced to models that most parsimoniously describe the association between self-perceived weight status and level of exercise. The full models were reduced to the parsimonious models by removing covariates one by one so long as its (1) odds ratio (OR) estimate included a 95% confidence interval (CI) that contained 1.00, and (2) removal did not change the association between the level of exercise and self-perceived weight status seen in the full model by more than 20%. All statements about odds refer to odds of perceiving one's weight status as different from one's calculated BMI (i.e., the odds of a person saying they are not overweight when their BMI falls into the overweight or obese category or the odds of a person saying they are overweight when their BMI falls into the normal category). The underweight BMI category was omitted from all the modeling because of a small *n*. Statistical analysis was performed with SPSS 14.0 software (SPSS Corporation, Chicago, IL).

RESULTS

The sample of 4,008 individuals included 1,423 men and 2,583 women (two subjects participated anonymously) who participated in the screenings. Table 1 lists the sample's demographic characteristics. The mean BMI for the sample was 30 kg/m^2. Although 75.5% of the sample was overweight or obese, only 40.4% of men and 53.1% of women recognized themselves as such. (Table 1).

Table 2 presents the associations found between the demographic and self-reported stroke risk factors and self-perception of being overweight in the normal BMI stratum. Women with a normal BMI had much greater odds of identifying self as overweight than did men. Sedentary individuals had 1.63 times greater odds of identifying oneself as overweight than did individuals who reported sufficient exercise even after adjusting for the other covariates (CI=1.03–2.57). In contrast, individuals with normal BMIs who reported having been told they have high blood pressure or high cholesterol had reduced odds of identifying oneself as overweight even after adjusting for covariates.

Table 3 presents the associations found between the demographic and self-reported stroke risk factors and self-perception of being normal weight in the overweight BMI stratum. Sedentary, overweight individuals' odds of identifying oneself as having normal weight were only 0.58 times those of overweight individuals who reported sufficient exercise (CI=0.45–0.73) after adjustment for the covariates. Women with an overweight BMI also had reduced odds of identifying oneself as having normal weight compared to men, as did individuals who reported individual income >$35,000 or stress. Blacks and those residing in a more rural area had elevated odds of identifying oneself as having normal weight.

Table 1. Personal Characteristics of Study Sample*

	Women (*n*=2583)	Men (*n*=1423)	Total (*n*=4006)
Body mass index (mean kg/m^2)	30.4	29.2	30.0
Obese (BMI ≥ 30)	45	39	42
Overweight (BMI 25–29.9)	30	38	33
Normal (BMI 18.5–24.9)	24	22	23
Underweight (BMI ≤ 18.5)	1	1	1
Self-perceived overweight			
Yes	53	40	49
No	47	60	51
Age (years)			
18–34	17	17	17
35–54	48	54	50
≥55	35	29	33
Race			
White/Caucasian	35	38	36
Black/African American	60	55	58
Other/unreported	5	7	6
Income			
>$35,000	23	36	28
≤$35,000	77	64	72
Education			
> High school	59	56	58
High school/General Educational Development diploma	32	34	33
< High school	9	10	10
Urbanization			
Urban	73	72	73
Rural	27	28	27
Level of exercise†			
Sedentary	61	53	58
Sufficient	39	47	42

* All numbers in the 3 right hand columns below the second row are percentages rounded to the nearest whole number.
† Sedentary exercise refers to < 30 minutes a day, 4 days a week of exercise and sufficient exercise refers to ≥ that amount.

Table 2. Predictors of Self-perceived Overweight in the Normal Weight Population

	OR (95% CI)	OR (95% CI)	OR (95% CI)
Variable	Unadjusted Model	Full Model	Parsimonious Model
Female vs male	7.19 (3.28–5.72)	6.15 (2.75–3.79)	7.32 (3.33–16.07)
Age (years)			
18–34	1.09 (0.57–2.09)	0.48 (0.22–1.05)	
35–54	1.67 (1.00–2.80)	1.19 (0.66–2.13)	
55+	1.00	1.00	
Race			
White	1.00	1.00	
Black	0.63 (0.39–1.00)	0.72 (0.42–1.21)	
Other	1.27 (0.61–2.64)	1.16 (0.49–2.70)	
Education			
> High school	1.00	1.00	
High school/General Educational Development diploma	0.74 (0.34–1.60)	0.81 (0.34–1.91)	
< High school	0.75 (0.46–1.22)	0.71 (0.40–1.23)	
Rural vs urban	0.78 (0.48–1.29)	0.53 (0.30–0.92)	
>$35,000 vs < $35,000	0.73 (0.44–1.24)	0.58 (0.32–1.05)	
History of Cardiovascular Disease vs no history of Cardiovascular Disease	0.67 (0.26–1.70)	1.30 (0.47–3.62)	
Smoker vs non-smoker	0.70 (0.43–1.15)	0.83 (0.48–1.46)	
Sedentary vs sufficient exercise*	1.85 (1.19–2.89)	1.72 (1.06–2.80)	1.63 (1.03–2.57)
Self-reported stress vs no reported stress	1.47 (0.96–2.26)	1.36 (0.85–2.19)	
Self-reported high blood pressure vs normal blood pressure	0.45 (0.23–0.86)	0.48 (0.23–0.98)	0.51 (0.26–1.00)
Self-reported high cholesterol vs normal cholesterol	0.41 (0.20–0.87)	0.43 (0.19–0.95)	0.43 (0.20–0.92)
Self-reported diabetes vs no reported diabetes	0.42 (0.10–1.75)	0.62 (0.14–2.83)	

* Sedentary exercise refers to < 30 minutes a day, 4 days a week of exercise and sufficient exercise refers to ≥ that amount.

Table 4 presents the associations found between the demographic and self-reported stroke risk factors and self-perception of being normal weight among the obese BMI stratum. Sedentary individuals in the obese BMI group had less than half the odds of identifying oneself as having normal weight compared to those who reported sufficient exercise (CI=0.35–0.57) after adjustment for covariates. Women, those under 55 years of age and those reporting themselves under stress, also had reduced odds of identifying oneself as having normal weight. Blacks, those residing in a more rural area and smokers, had elevated odds of identifying oneself as having normal weight.

Table 3. Predictors of Self-perceived Normal Weight in the Overweight Population

	OR (95% CI)	OR (95% CI)	OR (95% CI)
Variable	Unadjusted Model	Full Model	Parsimonious Model
Female vs male	0.47 (0.38–0.60)	0.43 (0.33–0.55)	0.43 (0.33–0.55)
Age (years)			
18–34	0.94 (0.67–1.31)	0.96 (0.64–1.44)	
35–54	0.99 (0.78–1.25)	1.08 (0.81–1.45)	
55+	1.00	1.00	
Race			
White	1.00	1.00	1.00
Black	1.90 (1.51–2.39)	2.34 (1.78–3.08)	2.27 (1.74–2.97)
Other	1.40 (0.87–2.25)	1.43 (0.83–2.45)	1.61 (0.97–2.70)
Education			
> High school	1.00	1.00	
High school/ General Educational Development diploma	1.52 (1.04–2.22)	1.44 (0.92–2.25)	
< High school	1.01 (0.79–1.28)	1.01 (0.76–1.33)	
Rural vs urban	1.32 (1.03–1.69)	1.91 (1.43–2.55)	1.81 (1.36–2.41)
>$35,000 vs < $35,000	0.80 (0.63–1.02)	0.67 (0.50–0.89)	0.64 (0.49–0.84)
History of Cardiovascular Disease vs no history of Cardiovascular Disease	1.58 (1.04–2.39)	1.44 (0.89–2.31)	
Smoker vs non-smoker	1.34 (1.04–1.73)	1.14 (0.85–1.53)	
Sedentary vs sufficient exercise	0.59 (0.47–0.73)	0.57 (0.44–0.73)	0.58 (0.45–0.73)
Self-reported stress vs no reported stress	0.61 (0.48–0.76)	0.71 (0.55–0.92)	0.73 (0.57–0.93)
Self-reported high blood pressure vs normal blood pressure	1.09 (0.86–1.37)	0.95 (0.71–1.27)	
Self-reported high cholesterol vs normal cholesterol	0.82 (0.64–1.05)	0.79 (0.59–1.05)	
Self-reported diabetes vs no reported diabetes	1.23 (0.80–1.89)	0.98 (0.59–1.64)	

* Sedentary exercise refers to < 30 minutes a day, 4 days a week of exercise and sufficient exercise refers to ≥ that amount.

Table 4. Predictors of Self-perceived Normal Weight in the Obese Population

	OR (95% CI)	OR (95% CI)	OR (95% CI)
Variable	Unadjusted Model	Full Model	Parsimonious Model
Female vs male	0.71 (0.56–0.89)	0.70 (0.54–0.91)	0.71 (0.56–0.91)
Age (years)			
18–34	0.58 (0.41–0.83)	0.45 (0.30–0.70)	0.57 (0.39–0.82)
35–54	0.77 (0.60–0.98)	0.69 (0.52–0.93)	0.73 (0.56–0.95)
55+	1.00	1.00	1.00
Race			
White	1.00	1.00	1.00
Black	1.81 (1.38–2.37)	2.31 (1.68–3.16)	2.10 (1.56–2.82)
Other	1.57 (0.85–2.88)	2.13 (1.08–4.18)	1.95 (1.03–3.69)
Education			
> High school	1.00	1.00	
High school/ General Educational Development diploma	1.22 (0.82–1.82)	1.09 (0.69–1.71)	
< High school	1.25 (0.98–1.59)	1.11 (0.84–1.46)	
Rural vs urban	1.19 (0.93–1.52)	1.51 (1.13–2.01)	1.53 (1.17–2.01)
>$35,000 vs < $35,000	0.89 (0.68–1.16)	0.82 (0.60–1.11)	
History of Cardiovascular Disease vs no history of Cardiovascular Disease	1.46 (1.03–2.05)	1.56 (1.05–2.30)	
Smoker vs non-smoker	1.24 (0.94–1.63)	1.26 (0.93–1.72)	1.42 (1.07–1.90)
Sedentary vs sufficient exercise	0.42 (0.34–0.53)	0.44 (0.35–0.57)	0.45 (0.35–0.57)
Self-reported stress vs no reported stress	0.63 (0.50–0.80)	0.72 (0.56–0.93)	0.71 (0.57–0.91)
Self-reported high blood pressure vs normal blood pressure	0.98 (0.78–1.22)	0.82 (0.62–1.09)	
Self-reported high cholesterol vs normal cholesterol	0.95 (0.74–1.23)	0.92 (0.68–1.23)	
Self-reported diabetes vs no reported diabetes	0.86 (0.62–1.19)	0.78 (0.53–1.13)	

* Sedentary exercise refers to < 30 minutes a day, 4 days a week of exercise and sufficient exercise refers to ≥ that amount.

DISCUSSION

In this study, the factors related to misperception of weight status varied by actual BMI category. Among individuals with normal BMI, sedentary individuals and women were at elevated odds of misperceiving themselves as overweight.

Among individuals with overweight or obese BMI, active individuals and men were at elevated odds of misperceiving themselves as having normal weight.

The study has several notable strengths. Most importantly, it is the first study to explore the association between misperceiving one's weight and self-reported risk factors for stroke, such as level of exercise, stress, history of cardiovascular disease, high blood pressure or high cholesterol, and smoking status—frequently collected at community stroke screenings. Second, the study population was a large majority black sample in the Stroke Belt and the role of previously identified predictors[9–10,12] of misperceiving one's weight—sex, race, and age—were accounted for in the multivariate models. Third, the predictors of misperceiving ones weight was examined separately for the normal, overweight, and obese BMI strata.

There are important limitations in this study. First, the sample self-selected to participate in the demonstration/intervention project. The sample was comprised mostly of women (65%). The majority (60%) of those women was black and most of the sample (72%) earned less than $35,000. Second, BMI was obtained using self-reported height. Studies have shown that men on average overreport their height by as much 1.45 cm and women by 0.58 cm.[16,17] This could indicate that the mean BMI of ~30 kg/m^2 in this study sample is an underestimation. Further, BMI does not take into account the ratio of muscle to fat. If the mean BMI for men was closer to 26, an argument could be made for the difference in adiposity between men and women; men, compared to women, have a higher muscle-to-fat ratio, a factor that cannot be measured by the BMI.[10] However, given the high mean BMI for both men and women in this study, that possibility no longer appears viable. The nature of the study sample further limited the results in that only 49 (1.2%) of the participants were underweight, none of whom thought they were overweight. Finally, the study's observational, cross-sectional design limits our ability to draw causal inferences from the results.

Chang and Christakis found similar discrepancies between races and between men and women's self-perception of overweight in studies on 2 large national samples—NHIS and NHANES III. However, the NHANES III study sample collected between 1988 and 1994 had a mean BMI of 26 compared to a mean BMI of 30 in the current study sample.[9,10]

A possible explanation for the marked difference in BMI between the study samples is the setting of the study. NHANES III was a random national sample, whereas the CITIES sample was composed of individuals who self-selected to participate in stroke risk screenings. Self-selection may have also influenced the age of the sample. In the NHANES III sample, 63% of the participants were over 35 years old, whereas in the current study ~83% were more than 35 years old. Resting metabolic rate, the largest contributor to overall energy utilization, slows with age.[18] Ogden et al. found that the prevalence of overweight and obesity in adults more than 40 years of age in a national sample increased from 68% in 1999–2000 to 73.1% in 2003–2004.[2] Increased prevalence of obesity over time in American adults may have also contributed in part to the higher BMI in the CITIES sample, which was interviewed at least 10 years after the NHANES III sample.

Kumanyika feared that the high prevalence of obesity in blacks and in black women in particular, may result in an overacceptance of the condition by both patients and practitioners.[19] With the increased obesity prevalence rates now seen among men, both black and white, further research could determine whether there is also an overacceptance of obesity among men and their physicians.[2] Men also have lower weight loss expectations for themselves than do women, which, as demonstrated by this current study and others, may result from not perceiving themselves as overweight.[20]

The current study suggests that active obese and overweight individuals may be more likely to incorrectly perceive themselves as having normal weight, and thus misperceive their risk for stroke. Thus, it is not enough to only counsel individuals to be more active. Our results suggest that physicians and other health professionals need to counsel their patients to both be physically active and to attain and maintain a healthy weight.

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