



Differential Association Between Actual and Perceived Obesity Between African Americans and Whites in the United States

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Abstract

Background and aims: Although actual and perceived obesity are associated, some research has shown that this association may differ across racial and ethnic groups. Accordingly, this cross-sectional study tested racial differences regarding the association between actual and perceived obesity among American adults.

Methods: The Health Information National Trends Survey (HINTS 5- Cycle 3) is a representative survey of American adults conducted in 2019. A total number of 3731 adults entered our analysis, including 3054 (81.9%) non-Hispanic Whites and 677 (18.1%) African Americans (AAs). The independent variable was actual obesity, which was defined as a body mass index of 30 or greater. The outcome was perceived as obesity. In addition, age, gender, marital status, education, and income were considered as control variables (confounders), and the race was the focal effect modifier. Finally, logistic regressions without and with interaction terms were utilized to analyze the data.

Results: Overall, actual and perceived obesity were associated, with obese individuals having higher odds of seeing themselves as obese (odds ratio [OR]=25.82, 95% CI=18.58-35.89, $P<0.001$). Furthermore, race showed a statistical interaction with actual on perceived obesity (OR=0.27, 95% CI=0.14-0.55, $P<0.001$), indicating a weaker link between the two for AAs compared to non-Hispanic Whites. Race-stratified models also confirmed the same pattern with the actual and perceived obesity, showing a weaker association for AAs (OR=15.61, 95% CI=9.53-25.59, $P<0.001$) in comparison with non-Hispanic Whites (OR=46.23, 95% CI=27.01-709.14, $P<0.001$).

Conclusion: AAs compared to non-Hispanic Whites differed in the effect of their actual obesity on their perceived obesity. This may explain the looser association of obesity and depression in AAs as compared to Whites.

Keywords: Population groups, Obesity, Body mass index, Perceived weight

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Introduction

Excess fat, either in terms of overweight or obesity, is associated with an increased risk of hypertension, diabetes, cardiovascular disease (CVD), cancer, and all-cause mortality.^{1,2} The increased risk of chronic obesity and associated morbidity and mortality is one of the major contributing factors to health disparities between African Americans (AAs) and Whites.

The accurate perception of weight is an essential component of maintaining a healthy weight.³ Weight underestimation, which is defined as a weakened association between actual and perceived obesity,⁴ is a risk factor for CVD.^{5,6} Individuals with substantial weight bias may not feel the perceived threat of CVD due to their biased evaluation of self, despite being obese.⁵ Such individuals are less likely to adopt actions that are necessary for losing weight.⁷ In addition, they are less

likely to adjust their diet and are less willing to exercise for weight loss. Obesity prevention strategies may need to leverage the perceived CVD threat through messaging and self-motivation to engage in behaviors that are needed for a healthy weight.⁸

There are some racial differences in the effect of actual obesity on perceived weight.⁹ This is supported by a study that used data from the Health Behavior in School-Aged Children (2009-2010) study, which included 6581 (74.28%) White and 2279 (25.72%) AA children. The study defined actual obesity (the independent variable) as the body mass index (BMI) greater than 95% of the age- and gender-percentile and perceived obesity (self-reported) as the main outcome. Then, linear regression models with and without interaction terms were applied based on the aim of the study. Although actual obesity was associated with higher perceived obesity in the pooled

sample, an interaction term was found between race and actual obesity, suggesting a stronger association between actual and perceived obesity for White compared to AA children.¹⁰ Another study involved 920 adults aged 35-78 years. In that study, participants' anthropometry (e.g., weight and BMI) were measured, and their body image perception, risk factors, and weight changes were obtained in the 4th year of the follow-up. The results of the study showed that most obese adults underestimated their weight (between 79% and 85%). The underestimation of own weight was associated with 1.6 times lower perceived CVD threats. Similarly, individuals who had discordant weight status were less likely to indicate their willingness to lose weight.¹¹ As shown above, the same trend of AA-White difference holds for children¹⁰ and adults.¹¹

Thus, although actual obesity is expected to be associated with perceived obesity, at least, some research suggests that this link may be smaller for AAs as compared to Whites.^{10,12} In addition, the inaccurate perception of obesity and weight may be one of the mechanisms that may explain the disproportionately higher rate of obesity burden among AA children and adults in the United States.^{13,14} Furthermore, AA children and adults with obesity who do not perceive themselves as overweight or obese may not engage in weight control behaviors, thus may develop more chronic, severe, and disabling, along with the disabling consequences of obesity. Accordingly, public health and clinical programs should include pieces of training and messages that specifically target AAs to increase their perceived obesity. Such programs are expected to contribute to the elimination of racial inequalities by reducing the burden of obesity among AA children, youth, and adults.¹⁰

Objective

This study aimed to understand why AAs with obesity are less likely to be depressed¹⁵⁻¹⁸ and to expand the existing literature on the association between actual and perceived obesity by race and ethnicity.^{10,12} Therefore, this cross-sectional study used a nationally representative sample of American adults to explore racial and ethnic variations regarding the association between actual and perceived obesity among American adults. In line with previous works,^{10,12} as well as differential effect hypothesis,¹⁹ a weaker link was expected between actual and perceived obesity among AAs in comparison with non-Hispanic Whites.

Materials and Methods

Design and Settings

The Health Information National Trends Survey (HINTS) is a National Cancer Institute (NCI) - sponsored survey of American adults. HINTS surveys have been administered on an annual basis since 2003. The primary goal of the HINTS is to describe US adults regarding access to and

the use of cancer-related health information.

HINTS Participants

In the HINTS, the target population includes civilians, non-institutionalized adults, defined as those who were 18 years or older and were living in the United States at the time of the survey. It should be noted that participants in the HINTS are nationally representative. A multi-stage random sample is utilized to recruit a nationally representative random sample of US adults to the HINTS.

Current Analysis

The current analysis was performed on the most recent version of the HINTS, referred to as Cycle 3 of the HINTS 5, which included four data collection cycles over a four-year period. The data collection of Cycle 3 of the HINTS was performed between January 22 and April 30, 2019. Detailed data on the methodology, sampling, data collection protocols, and weights of Cycle 3 of the HINTS data are available.²⁰ Cycle 3 of the HINTS 5 is a multimodal data collection including a web survey and a regular mail survey.

Eligibility

Of a total number of 5590 questionnaires that were returned to the HINTS office, 65, 45, and 42 cases were excluded because they were returned blank, incompletely filled out, and identified as duplicates, respectively. The remaining questionnaires (n= 5438) were enrolled in the HINTS study. HINTS defined a questionnaire as incomplete if more than 50% of the required items were left unanswered in Sections A and B of the research instrument.

Analytical Sample

This study was limited to non-Hispanic Whites and AAs. Our analytical sample encompassed a total of 3731 adults, including 3054 (81.9%) non-Hispanic Whites and 677 (18.1%) AAs. Thus, any other racial or ethnic groups such as Latino background, multi-ethnicity, native Americans, Asian-American, or unknown race/ethnicity were excluded from this analysis.

Variables and Measures

Study variables included race/ethnicity, gender, age, marital status, depressive symptoms, and self-reported physician-diagnosed depression.

Moderating Variable

Race/ethnicity. Race and ethnicity were self-identified by the participants. Individuals reported if they were from any Latino background. Participants also reported if they were White/European or African American.

Confounders

Socioeconomic factors. Age was self-reported and measured in years. In addition, gender was a dichotomous variable with men and women as 1 and 0, respectively. Furthermore, marital status was a dichotomous variable (1 = Married and 0 = Any other situation).

Educational Attainment. This variable was measured by a single item as “What is the highest grade or level of schooling you completed?” Education levels included less than 11 years, 12 years or completed high school, some college courses, and a college graduate. In this study, educational attainment was treated as a categorical variable with four levels.

Income. It was self-reported and measured using the item of “Thinking about the members of your family living in this household, what is your combined annual income, meaning the total pre-tax income from all sources earned in the past year?” The responses included \$0 to \$9 999, \$10 000 to \$14 999, \$15 000 to \$19 999, \$20 000 to \$34 999, \$35 000 to \$49 999, \$50 000 to \$74 999, \$75 000 to \$99 999, \$100 000 to \$199 999, and \$200 000 or more. This variable was treated as a continuous measure and a higher value indicated higher incomes.

Predictor (Independent Variable)

Body mass index (BMI). Participants were asked about “How tall are you without shoes?” and “How much do you weigh, in pounds, without shoes?” The study measured BMI using participants’ self-reported height and weight. Height and weight were measured in feet and inches, and pounds, respectively. These two variables were converted to meters and kilograms to calculate BMI, which was estimated by dividing weight (kilograms) by height squared (meters squared). BMI based on self-reported height and weight was validated in previous research.^{21,22} However, self-reported BMI is biased compared to measured BMI.

Outcome (Dependent Variable)

Perceived self as overweight. This variable was measured using a single item as “Right now, do you feel you are overweight, slightly overweight, just about the right weight, underweight, or slightly underweight?” The response options included underweight, slightly underweight, just about the right weight, overweight, and slightly overweight. The outcome was dichotomized as perceived self as overweight versus all other responses.

Statistics

SPSS 23.0 (IBM Inc, NY, US) was applied to perform data analysis. In addition, means and proportions (frequencies), as well as the chi-square test or independent sample *t* test were used for descriptive statistics and bivariate analysis, respectively. Four logistic regression models were also run for multivariable models. It should be noted that actual obesity and perceived self as overweight were considered

as independent and dependent variables in all models, respectively. Demographic factors (age and gender) and socioeconomic status (SES) (i.e., education, income, and marital status) were the control variables and race/ethnicity was the focal moderator. The first two logistic regression models were estimated in the total sample that included AAs and non-Hispanic Whites. *Model 1* did not include race by actual obesity interaction terms. In *Model 2*, the race by perceived self as overweight interaction term was added. Finally, race-specific logistic models were tested in non-Hispanic Whites and AAs in *Models 3* and *4*. Odds ratios (ORs), 95% confidence intervals (95% CI), and *P*-values were reported, and $P \leq 0.05$ was considered statistically significant.

Results

Descriptive Statistics

Table 1 summarizes the descriptive statistics of the participants both overall and by race/ethnicity. In general, 3731 adults entered our analysis, including 3054 (81.9%) non-Hispanic Whites and 677 (18.1%) African Americans (AAs). AA and non-Hispanic Whites participants were compared for demographic factors, SES, actual obesity, and perceived overweight. Based on data in Table 1, AA and non-Hispanic Whites differed in terms of age, gender, educational attainment, income, marital status, actual obesity, and perceived overweight. Compared to non-Hispanic Whites, AA participants had lower educational attainment and lower income. Furthermore, they were less likely to be married and males and had higher actual obesity and perceived overweight.

Overall Logistic Regressions

Table 2 provides a summary of the results of two logistic regression models that were conducted in the pooled sample. In these models, actual obesity was associated with the higher odds of perceiving oneself as overweight, above and beyond the effects of covariates. Based on the results, a statistically significant interaction was found between race and actual obesity on perceived obesity. This finding suggested that the effect of actual obesity on perceived obesity was weaker for AAs compared to non-Hispanic Whites.

Race-stratified Regressions

A summary of the results of race-stratified logistic regression models is presented in Table 3. Actual obesity was associated with the higher odds of perceived overweight, above and beyond the effects of covariates. However, this effect was more prominent for non-Hispanic Whites than AAs.

Discussion

The findings of the current study showed an association between actual and perceived overweight status among US adults, although this association was more prominent for

Table 1. Descriptive Statistics of All Participants by Race/Ethnicity

	All		Non-Hispanic White		AA	
	n	%	n	%	n	%
Race*						
Non-Hispanic White	3054	81.9	3054	100.0	-	-
AA	677	18.1	-	-	677	100.0
Gender*						
Female	2155	58.1	1703	56.1	452	67.3
Male	1554	41.9	1334	43.9	220	32.7
Married*						
No	1852	50.1	1391	45.9	461	68.9
Yes	1846	49.9	1638	54.1	208	31.1
Obese (BMI ≥30)*						
No	2406	65.9	2070	69.2	336	51.1
Yes	1243	34.1	921	30.8	322	48.9
Perceived overweight*						
No	2862	78.0	2304	76.7	558	83.9
Yes	808	22.0	701	23.3	107	16.1
	Mean	SD	Mean	SD	Mean	SD
Age (y)*	57.48	16.49	57.78	16.76	56.11	15.15
Education*	5.20	1.49	5.28	1.46	4.82	1.50
Income*	5.75	2.22	5.98	2.11	4.67	2.35

Note. SD: Standard deviation; BMI: Body mass index; AA: African Americans. * *P* < 0.05 for the comparison of non-Hispanic White and AA.

non-Hispanic Whites than AAs.

Literature Review

These racial heterogeneities in the correlates of obesity and BMI are shown in community-based and clinical settings. Similar results are also found in children,²³ youth,²⁴ and adults.²⁵ In a study, the underestimation of own weight was associated with 1.6 times lower perceived CVD

threat. Similarly, individuals who have discordant weight status are less likely to indicate their willingness to lose weight.¹¹ As shown above, the same trend of AA-White difference holds for children¹⁰ and adults.¹¹ Moreover, obesity is differently correlated with SES indicators such as education and income.^{10,23,26} The link between SES and obesity is reported to be weaker in AAs compared to Whites. This finding was replicated in cross-sectional^{10,23,26} and longitudinal studies.²⁴

Previous research documented racial differences regarding the effects of actual obesity on perceived weight.⁹ Additionally, multiple studies have shown that the effect of actual obesity on perceived weight may be diminished in AA compared to White children¹⁰ and adults.¹¹ These results, by generating additional epidemiological knowledge on the correlates of untreated obesity, may be helpful for reducing morbidity and mortality at a population level.^{27,28}

Thus, the link between actual and perceived obesity is weaker for AAs as compared to Whites.^{10,12} The inaccurate perception of obesity in the presence of obesity may partially explain why obesity is common among AA children, youth, and adults.^{13,14} This observation may also explain the high chronicity of obesity in this population. AA children, youth, and adults with obesity are particularly at the increased risk of long-term complications because they are not likely to perceive themselves as obese. Therefore, AAs with obesity are less likely to engage in weight control behaviors such as diet and exercise. As a result of such inaction toward their obesity, chronic, severe, and disabling consequences of obesity are more common among AA communities. This is in line with the result of a study that showed obesity at baseline is more likely to result in stroke for AAs than Whites.²⁹

Implications for Program and Practice

Table 2. Summary of Regressions in the Pooled Sample

	Model 1 All Main Effects			Model 2 All M1 + Interactions				
	OR	95% CI	P Value	OR	95% CI	P Value		
Race (AAs)	0.55	0.44	0.69	0.000	0.65	0.51	0.83	0.001
Gender (male)	0.71	0.60	0.84	0.000	0.71	0.60	0.83	0.000
Age (year)	1.01	1.00	1.01	0.006	1.01	1.00	1.01	0.008
Education				0.000				0.000
High school	1.76	1.07	2.89	0.026	1.76	1.07	2.88	0.025
Some college	2.70	1.66	4.39	0.000	2.68	1.65	4.34	0.000
College graduate	2.45	1.50	4.01	0.000	2.44	1.50	3.97	0.000
Income	1.07	1.03	1.12	0.002	1.08	1.03	1.12	0.002
Married	1.04	0.87	1.24	0.661	1.04	0.87	1.25	0.646
BMI ≥ 30	25.82	18.58	35.89	0.000	47.73	27.87	81.75	0.000
BMI ≥ 30 x Race (AAs)					0.27	0.14	0.55	0.000
Constant	0.32			0.000	0.31			0.000

Note. OR: odds ratio; CI: confidence interval; NHW: Non-Hispanic White; AA: African American; BMI: body mass index.

Table 3. Summary of Regressions by Race

	Model 3 Non-Hispanic Whites				Model 4 AAs			
	OR	95% CI		P Value	OR	95% CI		P Value
Gender (male)	0.81	0.68	0.97	0.019	0.37	0.24	0.57	0.000
Age (y)	1.01	1.00	1.01	0.024	1.01	1.00	1.02	0.189
Education				0.009				0.000
High school	1.54	0.84	2.81	0.161	1.83	0.75	4.47	0.185
Some college	2.23	1.23	4.02	0.008	3.69	1.54	8.85	0.004
College graduate	1.83	1.01	3.30	0.045	5.45	2.14	13.87	0.000
Income	1.07	1.02	1.13	0.006	1.08	0.98	1.20	0.137
Married	1.10	0.90	1.33	0.359	0.94	0.59	1.49	0.778
BMI \geq 30	46.23	27.01	79.14	0.000	15.61	9.53	25.59	0.000
Constant	0.38			0.006	0.15			0.002

Note. OR: odds ratio; CI: Confidence interval; BMI: body mass index; AA: African American

In the US, racial groups are not equal in how their actual health problems impact their perceived health issues,³⁰⁻⁴² implying that many AAs with a health problem do not recognize their health issue as a concern. In this situation, health problems may become a more serious risk and cause more impairment because of the existing chasm between their actual and perceived health. To properly respond to this disparity, there is a need to compensate for and fill the gap between actual and perceived health needs in AA communities.

This is an indicator of an increased need for creating an accurate body image perception among AAs with obesity.¹¹ In the absence of such interventions and programs, most obese adults underestimated their weight (85% vs. 79%). However, this is more challenging in AAs than Whites.¹⁰ Public health and clinical programs should include pieces of training and messages that particularly target AAs in order to specifically increase their accuracy of perceived weight and obesity. Such programs are expected to contribute to the elimination of racial inequalities by reducing the burden of obesity among AA children, youth, and adults.¹⁰

The results have implications for the reduction of racial disparities in the burden of obesity. Being overweight/obese is associated with an increased risk of hypertension, diabetes, CVD, cancer, and all-cause mortality.^{1,2} As a result, any epidemiological knowledge on the correlates of untreated obesity may be helpful in reducing morbidity and mortality at a population level.^{27,28} AAs are at a high risk of obesity-related health problems,⁴³ and their increased obesity burden contributes to CVD and other mortality differentials across races.⁴⁴⁻⁴⁶ It is argued that one of the reasons for the increased risk of undesired outcomes in AAs with obesity includes their tendency to a misperception about their body weight.^{47,48}

It is hoped that we can reduce the obesity gap when AAs with obesity do not believe that they are obese. As a result of an inconsistency between the actual health problem and perception of the health problem, AAs with obesity

may remain at the risk of undesired outcomes without any attempt to seek care. It is hard to achieve equality and equity unless we address inequality in the perception of health problems.

Accordingly, interventions should try to convey more accurate representations of obesity to obese AAs. Spreading an accurate perception of weight among individuals with obesity is an essential component of helping them realize that there is a need for weight control. Such efforts may increase the enrollment of AAs with obesity to programs for maintaining a healthy weight.³ However, there is also a need for addressing weight underestimation and weight bias at the population level. A weakened association between actual and perceived obesity may impose individuals to risk for undesired long-term outcomes.⁴ Such a realization may reduce the CVD risk as well.^{5,6} On the other hand, individuals with substantial weight bias may not feel the perceived threat of CVD due to their biased evaluation of self despite their obesity.⁵ Such individuals are less likely to take necessary actions for weight loss⁷ or to adjust their diet and are less willing to exercise for weight loss.⁴⁹ In this regard, messaging and self-motivation programs may help AAs with obesity to engage in behaviors that are needed for a healthy weight.⁸

Mental Health Implications of the Findings

As a result of a systemic weight misperception, AAs with obesity can maintain their mental health. Due to this gap between actual and perceived health, AAs with poor physical health are also able to avoid depression, which explains the AA-White mental health paradox.⁵⁰ Previous research has documented the racial and ethnic variations in medical, psychological, and socially correlated factors of obesity and body mass index (BMI).^{23,25} For example, obesity has shown weaker effects on depression for AAs compared to Whites.

Therefore, obesity differently correlates with major depressive disorder, depression, or depressive

symptoms.^{17,18,25,51} In several studies, AAs with obesity demonstrated a low risk of depression and anxiety.¹⁵⁻¹⁸ Similarly, AAs with frequency and severity of medical conditions represented good mental health according to the reports of various studies.^{36,37,40} However, the medical complications of obesity may be greater for AAs in comparison with Whites. In a longitudinal study, obesity had a larger effect on the future cerebrovascular death of AAs when compared to Whites.²⁹ Thus, Jackson and Mezuk et al proposed that this misperception may be an adaptive response to maintain mental health.⁵²⁻⁵⁴

Limitations

Our study has some limitations. The first limitation is the cross-sectional design of our study. Considering the study design, no causal inferences can be drawn from self-reported or physician-diagnosed anxiety/depression based on depressive symptoms. Accordingly, longitudinal studies with more detailed data on the changes in weight and perception of overweight are necessary. In addition, this study did not include other factors that may explain differential associations between actual and perceived overweight, and its contribution to the low depression of AAs with obesity. The differential validity of our measure on actual and perceived obesity may explain why these factors are differently linked between AAs and non-Hispanic Whites. Furthermore, this study relied on self-reported BMI and perceived obesity while not measuring perceived norms and the prevalence of obesity in the social network of the participants. Thus, research may replicate these findings using various sources of data such as chart reviews or structured interviews.

Conclusion

In general, the link between actual and perceived obesity was weaker for AAs compared to non-Hispanic Whites. This may be due to the high acceptability of obesity in the AA population. This may also be an adaptive response to poverty, poor access to care, scarcity of healthy food, greens, and parks. Eventually, the necessity of coping with stressed situations using emotional eating may also be a potential contributor.

Conflict of Interest Disclosures

None.

Ethical Approval

All participants provided written consent. In addition, the study protocol was approved by the NIH IRB. The current analysis was exempt from a separate IRB review because we only used fully de-identified data.

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