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Accuracy of Weight Perception Among American Indian Tribal College Students

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Abstract

Introduction—National data indicate a higher prevalence of obesity among American Indian (AI) populations and greater disparity of morbidity and mortality among younger age groups compared with other ethnicities. Diet and physical activity are important obesity preventive behaviors, but no published data exist that describe these behaviors in relation to obesity in AI young adults at tribal colleges. Study purposes were to: (1) identify fruit and vegetable and physical activity practices of AI young adults from three U.S. tribal colleges according to BMI categories; (2) identify the accuracy of body weight perceptions; and (3) identify predictor variables for weight misperception.

Methods—In this observational study during 2011–2014, a total of 1,256 participants were recruited from three participating U.S. tribal colleges to complete an online survey addressing issues related to diet, physical activity, and weight perception. Reported height and weight were used to calculate BMI categories, and differences between BMI categories were examined. Gender differences related to accuracy of weight perception by BMI categories were also examined. Analyses were conducted in 2016.

Results—Based on self-reported height and weight, 68% of the sample was overweight or obese (BMI ≥ 25) and the mean BMI was 28.9 (SD=6.9). Most did not meet recommendations for fruit intake (78.7%), vegetable intake (96.6%), or physical activity (65.6%). More than half (53.7%) who were overweight/obese underestimated their weight category. Men more often underestimated their weight category (54.2%) than women (35.1%).

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Conclusions—Interventions are needed to improve weight-related lifestyle behaviors of AI tribal college students.

Introduction

Overweight/obesity rates are persistently high among U.S. adults,¹ but higher among American Indians (AIs), who are 60% more likely to be obese than non-Hispanic whites.² AIs have seen a dramatic rise in morbidity and mortality from weight-related diseases including cardiovascular disease^{3,4} and diabetes.^{5–7} Although preventive efforts may lower diabetes incidence among AIs,⁸ diabetes and cardiovascular disease mortality rates continue to present health disparities.⁹ However, compared with other ethnic groups, little research describes the collective health behaviors contributing to obesity.

The Strong Heart Study found AIs following a healthy diet containing fruits and vegetables had lower cardiovascular disease risk factors, including BMI.¹⁰ Unfortunately, previous surveys of adult AIs indicate poor fruit and vegetable intake with as many as 85% consuming fewer than three servings per day.^{11–13} Moreover, intake has declined among AIs in some U.S. regions.¹³

Physical activity is also important for obesity prevention¹⁴ and weight control.^{15,16} Young adults should aim for 150 minutes of moderate activity or 75 minutes of vigorous activity weekly,¹⁶ yet nearly 30% of adult AIs are inactive, according to the Behavioral Risk Factor Surveillance System (BRFSS).^{11,13}

Some evidence points to poor diet and physical inactivity as predictors of weight gain for college freshmen.¹⁷ National surveys indicate that only 6.5% consume five or more servings per day of fruits and vegetables while 50.4% meet recommendations for physical activity.¹⁸

Weight perception may influence behaviors. Some have found weight misperception is more prevalent in blacks and Mexican Americans than whites,^{19–21} and others found weight underestimation is highest in Latinos compared with Caucasians, Filipino, and Korean Americans.²² Inaccurate perceptions can drive unnecessary dietary restrictions or compulsive exercise if underweight individuals misperceive themselves as overweight.^{23,24} For example, adolescent AI girls who feel overweight are more likely to engage in behaviors such as chronic dieting and laxative and diuretic abuse.²⁵ Conversely, overweight individuals who misperceive themselves as normal weight may engage in behaviors that lead to obesity.^{26,27}

No available literature describes diet and physical activity behaviors among tribal college students. Thus, this study aimed to identify: (1) fruit/vegetable intake and physical activity of AI tribal college students according to BMI categories; (2) accuracy of body weight perceptions; and (3) predictor variables for weight misperception.

Methods

Study Design and Population

Data were from an observational study of AI tribal college students. All students at three tribal colleges in the Midwest and Northern Plains were invited to participate. A total of 1,256 AI tribal college students participated between April 2011 and October 2014; analysis conducted in 2016. Eligibility criteria included: (1) self-identification as an AI person; (2) enrollment in a participating tribal college; and (3) age ≥ 18 years at time of survey. The overall response rate ranged from 15.3% (2011) to 32.1% (2014).

All study procedures were approved by the University of Kansas Medical Center IRB and the participating tribal college IRBs.

Study Measures

The online Tribal College Tobacco and Behavior Survey assessed cigarette smoking behaviors, nutrition, physical activity, weight, and alcohol intake; these questions were obtained from national surveys and other validated questionnaires.^{28–31} Table 1 shows the questions used to assess these variables.

Statistical Analysis

Weight perception was coded into three categories: underestimate, accurate, and overestimate. Perception was regressed using multinomial logistic regression to the following covariates: age, gender, upbringing, smoking, degree program, meeting the fruit/vegetable guideline, meeting the exercise guideline, gender by meeting fruit/vegetable guideline, and gender by meeting exercise guideline.

Non-response values were imputed ten times by the fully conditional specification method, and estimates were combined by Rubin's rule. Variables were selected by pooled estimate of the Bayesian information criterion. All data management and analyses were conducted in SAS, version 9.4.

Results

Of 1,256 participants, 1,138 provided height and weight for calculation of BMI. One participant's BMI was coded as missing owing to unreasonably high value (519.9), and 14 values categorized as underweight were excluded from analysis, leaving 1,123 participants.

Based on self-reported height and weight, 33% ($n=371$) were overweight and 35% ($n=398$) were obese, with mean BMI of 28.9 (SD=6.9). Most did not meet recommendations for fruit intake (78.7%), vegetable intake (96.6%), or physical activity (65.6%). More than half (53.7%) who were overweight/obese underestimated their weight category. Participants' BMI categories are provided in Table 2.

In multivariable logistic regression, only gender was selected as a predictor by the Bayesian information criterion. Table 3 shows the accuracy of weight category perception by gender. Men were more likely to underestimate their weight category than women (probability ratio

of underestimate versus accurate estimate, 2.08; 95% CI=1.60, 2.69; $p<0.0001$). Men trended less likely to overestimate (probability ratio, 0.56; 95% CI=0.29, 1.06; $p=0.08$).

Discussion

This is the first report on weight status, fruit and vegetable intake, and physical activity in AI tribal college students in the U.S. Results show higher rates of obesity than the 12.1% in the 2014 National College Health Assessment (NCHA II),¹⁸ but consistency with the 33.9% of adult AI men and 35.5% of adult AI women in BRFSS.³² Reported fruit and vegetable intake from the present study is higher than the NCHCA II¹⁸ but similar to intake of adult AIs in BRFSS.³² Fewer achieved recommended physical activity levels in the present study than the NCHA II¹⁸ but more than adult AIs in BRFSS.³²

Women had more-accurate weight perceptions than men, which is important because weight perception may be more influential in engaging in weight control behaviors for women than men.³³ Although women are more likely to perceive themselves as being overweight,²¹ more women underestimated their weight category than in a nationally representative sample.³⁴

College students identify many barriers to weight maintenance and fewer enablers,³⁵ and little is known about successful weight loss approaches targeting college students. Interventions in young adults improved body weight and suggested men may prefer exercise training programs versus the diet and behavioral interventions preferred by women, but recruitment, monitoring, and follow-up were challenging.³⁶ A recent intervention with web-delivered content and competition component produced greater weight loss in young adults compared with adults aged >35 years.³⁷ Studies are underway investigating multicomponent interventions, utilizing social media, self-monitoring, cell phone delivery, and varying degrees of behavior changes.^{38–40} None are specific to AI college students, so their effectiveness should be investigated for AI college students in particular while also using culturally tailored materials, such as the Special Diabetes Program for Indians Diabetes Prevention.⁴¹

Limitations

All data were self-reported, and included a limited number of questions related to weight, diet, and physical activity. Self-reported height and weight likely underestimate the prevalence of overweight/obesity because of the tendency to under-report weight and over-report height.⁴² Additionally, BMI has known limitations as a measure of weight status,⁴³ yet it remains the standard reference by WHO.⁴⁴ Finally, low response rates could also bias these results, as healthier individuals generally participate in surveys.

Conclusions

Interventions are needed to improve weight status, physical activity, and fruit and vegetable consumption among AI tribal college students. Given the high rate of weight misperception, health messages should target awareness of the presence and risks of overweight/obesity and health benefits of a healthy lifestyle. Future research into the role of weight misperception in

the presence or development of obesity in AI populations should include body composition assessments for greater accuracy in identifying weight misperception.

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Table 1

Variables and Questions Used for Assessment

Variable	Question
BMI	Self-reported height and weight were used to calculate BMI (kg/m ²), which was categorized into Underweight (<18.5), Normal (18.5-24.9), Overweight (25.0-29.9), and Obese (≥ 30).
Weight perception	Perceived weight was assessed through the following question: <i>How would you describe your current weight?</i> with response categories of: <i>very underweight, underweight, very overweight, overweight, about the right weight, and I don't know.</i>
Accuracy of weight perception	Accuracy of weight perception was defined by comparing weight perception to the self-reported BMI. For Normal weight (BMI 18.5–24.9) participants: accuracy of weight perception was coded as Underestimate if their weight perception was <i>very underweight</i> or <i>underweight</i> ; as Accurate if weight perception was <i>about the right weight</i> ; or as Overestimate if weight perception was <i>overweight</i> or <i>very overweight</i> . For Overweight (BMI 25.0–29.9) participants, the accuracy was coded as Underestimate if their weight perception was <i>very underweight, underweight, or about the right weight</i> ; as Accurate if weight perception was <i>overweight</i> ; or as Overestimate if weight perception was <i>very overweight</i> . For Obese (BMI ≥ 30) participants, the accuracy was coded as Underestimate if their weight perception was <i>very underweight, underweight, about the right weight, or overweight</i> ; as Accurate if weight perception was <i>very overweight</i> . Response of <i>I don't know</i> was coded as non-response.
Fruit and vegetable consumption	<i>How many servings of fruit do you usually eat per day? and How many servings of vegetables do you usually eat per day? (Keep in mind that a serving of fruit/vegetables equal to about one-half cup).</i>
Exercise	The following questions were used to ascertain levels of physical activity: <i>In the past 7 days, how many hours did you spend doing the following activities? Strenuous exercise (heart beats rapidly – i.e., biking fast, aerobics, dancing, running, basketball, swimming laps, rollerblading, tennis, soccer); Moderate exercise (not exhausting – i.e., walking quickly, baseball, easy biking, volleyball, skateboarding); and Exercise to strengthen or tone your muscles – i.e., push-ups, sit-ups, weight lifting/training);</i> with response categories (<i>None, less than ½ hour, ½-2 hours, 2.5–4 hours, 4.5–6 hours, and 6+ hours</i>).
Smoking status	The following question were used to determine current smoking status: <i>Do you smoke cigarettes now?</i> with response categories of <i>Every day, some days, and not at all</i> . Current smokers were respondents who either smoked every day or some days.

Table 2

Characteristics of Participants (n=1,123) Reporting Normal BMI (18.5-24.9), Overweight BMI 25.0–29.9, and Obese BMI (>30)

Variable	All combined		Normal BMI 18.5-24.9	Overweight BMI 25.0–29.9	Obese BMI 30	p-value ^a
	N	Total				
N	1,123		354 (31.5%)	371 (33.0%)	398 (35.4%)	NA
Age, mean in years (SD)	1,099	25.6 (9.2)	23.6 (8.0)	25.3 (8.8)	27.5 (10.1)	<0.0001
Gender	1,118					0.011
Male		469 (41.9%)	158 (33.7%)	169 (36.0%)	142 (30.3%)	
Female		649 (58.1%)	195 (30.1%)	201 (31.0%)	253 (39.0%)	
Tribal enrollment	1,113					0.87
Yes		1,044 (93.8%)	332 (31.8%)	345 (33.1%)	367 (35.2%)	
No		69 (6.2%)	20 (29.0%)	23 (33.3%)	26 (37.7%)	
Upbringing	1,115					0.39
Reservation/Tribal trust		667 (59.8%)	210 (31.5%)	227 (34.0%)	230 (34.5%)	
Rural area		195 (17.5%)	54 (27.7%)	64 (32.8%)	77 (39.5%)	
Suburban/Military base		253 (22.7%)	89 (35.2%)	75 (29.6%)	89 (35.2%)	
Current living situation	1,110					0.40
On campus		643 (57.9%)	210 (32.7%)	202 (31.4%)	231 (35.9%)	
Off campus		467 (42.1%)	140 (30.0%)	164 (35.1%)	163 (34.9%)	
Years to degree	1,113					0.19
2 year degree program		395 (35.5%)	133 (33.7%)	137 (34.7%)	125 (31.7%)	
4 year degree program		673 (60.5%)	209 (31.1%)	216 (32.1%)	248 (36.9%)	
Non-degree seeking		45 (4.0%)	9 (20.0%)	16 (35.6%)	20 (44.4%)	
Accuracy of weight perception	1,123					<0.0001
Underestimate		450 (40.0%)	37 (8.2%)	136 (30.2%)	277 (61.6%)	
Accurate		531 (47.3%)	239 (45.0%)	191 (36.0%)	101 (19.0%)	
Overestimate		57 (5.1%)	39 (68.4%)	18 (31.6%)	0	
Don't know		85 (7.6%)	39 (45.9%)	26 (30.6%)	20 (23.5%)	
Current smoker	1,123					0.047
No		753 (67.1%)	255 (33.9%)	244 (32.4%)	254 (33.7%)	
Yes		370 (32.9%)	99 (26.8%)	127 (34.3%)	144 (38.9%)	
Met fruits guideline	1,118					0.18
No		880 (78.7%)	266 (30.2%)	293 (33.3%)	321 (36.5%)	
Yes		238 (21.3%)	86 (36.1%)	77 (32.4%)	75 (31.5%)	
Met vegetable guideline	1,115					0.50

Variable	All combined		Normal BMI 18.5-24.9	Overweight BMI 25.0–29.9	Obese BMI 30	<i>p</i> -value ^a
	N	Total				
No		1,077 (96.6%)	337 (31.3%)	357 (33.2%)	383 (35.6%)	
Yes		38 (3.4%)	14 (36.8%)	14 (36.8%)	10 (26.3%)	
Met fruits/vegetable guideline (2 cups)	1,113					0.16
No		749 (67.3%)	222 (29.6%)	258 (34.4%)	269 (35.9%)	
Yes		364 (32.7%)	128 (35.2%)	112 (30.8%)	124 (34.1%)	
Met fruits/vegetable guideline (3 cups)	1,113					0.65
No		948 (85.2%)	296 (31.2%)	312 (32.9%)	340 (35.9%)	
Yes		165 (14.8%)	54 (32.7%)	58 (35.2%)	53 (32.1%)	
Met exercise guideline	1,081					0.007
No		709 (65.6%)	205 (28.9%)	231 (32.6%)	273 (38.5%)	
Yes		372 (34.4%)	133 (35.8%)	130 (35.0%)	109 (29.3%)	

Note: Boldface indicates statistical significance ($p < 0.05$)

^a2-sample t-test for age, and Chi-square test for all other variables.

Table 3Accuracy of Weight Perception by Gender^a

Variable	Underestimated	Accurate	Overestimated	Total
Female	211 (35.1%)	346 (57.6%)	44 (7.3%)	601
Male	231 (54.2%)	182 (42.7%)	13 (3.1%)	426
Total	442 (43.0%)	528 (51.4%)	57 (5.6%)	1,027

BIC, Bayesian Information Criterion

^a Only gender was selected as a predictor by BIC in the multivariable logistic regression.