Sensitivity and Specificity of College Students' BMI and Perceptions of Weight in Determining Obesity Status

EA Easley, EE Freeman, SB Bailey, SH Sellhorst, WF Riner, FACSM

University of South Carolina Lancaster, Lancaster, SC

ABSTRACT

Body mass index (BMI) is commonly used to categorize individuals' health and obesity status; although it is often criticized for misclassifying individuals when considering percent body fat (%fat). Misclassification of obesity status could result in lack of risk reduction behaviors that are important to prevent chronic disease. PURPOSE: To examine sensitivity and specificity of BMI and students' perceptions of weight in determining obesity status based on %fat. METHODS: Ninety traditional-aged (18-25 yr) college students were asked to describe their weight status as slightly underweight (UW), about the right weight (ARW), slightly overweight (SOW), or very overweight (VOW). Height (cm), weight (kg), and body composition (%fat; iDXA, Lunar) were measured. The subjects were divided into categories by the measured BMI categories and then by how they identified their weight status. Sensitivity and specificity rates were calculated for BMI and students' perceptions based on %fat. A %fat >22% in men and >32% in women was defined as overfat. RESULTS: Students that were classified as UW based on BMI or perception were not included in the analysis. In men, BMI classified 26 subjects as healthy-weight (HW) and 18 subjects as overweight or obese (OWOB). The sensitivity of BMI on obesity status was 64% and the specificity was 82%. Eight men were under-classified as HW and 4 men were over-classified as OWOB. In women, BMI classified 27 subjects as HW and 16 subjects as OWOB. The sensitivity of BMI on obesity status was 58% and the specificity was 95%. Nine women were under-classified as HW and 1 was over-classified as OWOB. Twenty men identified themselves as ARW and 19 men identified as SOW or VOW. The sensitivity for their perception of their obesity status was 68% and the specificity was 77%. Twenty-nine women identified themselves as ARW and 15 women identified as SOW or VOW. The sensitivity for their perception of their obesity status was 52% and the specificity was 90%. CONCLUSIONS: Regardless of how the students were classified (either by BMI or their perceptions); the absence of obesity was easier to identify than the presence of obesity. Lack of proper identification of the presence of obesity could result in no remedial action to address the condition.

PURPOSE

Body Mass Index (BMI) is often used as a way to quickly classify health, but it often misclassifies individuals' obesity status.

- BMI may over-classify athletes or very muscular individuals as overweight or obese because it does not take into account body composition.
- BMI can also under-classify individuals as healthy weight, when they have a body fat percentage greater than the healthy range.

Young adults have a low risk perception for chronic diseases which can be dangerous if BMI classifies them as healthy-weight when they are actually overfat.

The purpose of this study was to examine sensitivity and specificity of BMI and students' perceptions of weight in determining obesity status based on %fat.

METHODS

Participants

- Ninety traditional age (18-25y) full time college students

Table 1. Subject Demographics

	Male (n = 45) Mean ± Std Dev	Female (n = 45) Mean ± Std Dev
Age (yr)	19.40 ± 1.51	19.40 ± 1.29
Height (cm)	175.56 ± 6.10	160.85 ± 7.29
Weight (kg)	79.61 ± 18.39	62.65 ± 14.23
BMI (kg/m^2)	25.77 ± 5.44	24.15 ± 4.98

Demographics Survey

Students were asked to describe their weight status as:

Slightly Underweight (UW)
About the Right Weight (ARW)
Slightly Overweight (SOW)
Very Overweight (VOW)

Anthropometric Measures

Height (cm) and weight (kg) were measured using a wall-mounted digital-read stadiometer (Seca model 869, Hamburg, Germany) and digital scale (Seca model 869, Hamburg, Germany), respectively

Body mass index was calculated and then the participants were classified as underweight, healthy-weight, overweight, or obese

BMI = weight (kg) / height (m^2)

DXA Scan

Body composition was measured by dual-energy x-ray absorptiometry (DXA) using a GE Lunar IDXA (Waukesha, Wisconsin)

Body fat percentages were then classified as within the healthy range or above the healthy range

Healthy range for men = 10 – 22%
Healthy range for women = 20 – 32%

Data Analysis

Sensitivity and Specificity rates were calculated for BMI and students' perceptions of their weight status using body fat percentage.

Sensitivity = True Positives / (True Positives + False Negatives)

A true positive = perception or measured BMI classifies them as overweight or obese and their body fat percentage classifies them as overfat

A false negative = perception or measured BMI classifies them as healthy weight, but their body fat percentage classifies them as overfat

Specificity = True Negative / (True Negatives + False Positives)

A true negative = perception or BMI classifies them as healthy weight and their body fat percentage classifies them as within the healthy range

A false positive = perception or BMI classifies them as overweight or obese, but their body fat classifies them as within the healthy range

RESULTS

Table 2. BMI Classification

	MEN (n = 44)	WOMEN (n = 43)
Healthy-weight (HW)	26	27
Overweight (OW)/ Obese (OB)	18	16

Table 3. Students' perception of weight status

	MEN (n = 39)	WOMEN (n = 43)
About the right weight (ARW)	20	29
Slightly Overweight (SOW)/ Very Overweight (VOW)	19	15

Table 4. Body fat percentage classification

	MEN (n = 45)	WOMEN (n = 45)
Healthy range	23	20
> Healthy Range	22	25

BMI Classification

Sensitivity rate was 64% in men and 58% in women
Specificity rate was 82% in men and 95% in women

Students' Perception of Obesity Status

Sensitivity rate was 68% in men and 52% in women
Specificity rate was 77% in men and 90% in women

BMI under-classified 8 men as HW and over-classified 4 men as OWOB. BMI under-classified 9 women as HW and over-classified 1 woman as OWOB.

CONCLUSIONS

Specificity rates were higher in both BMI and students' perceptions of their weight status indicating that it is easier to detect the absence of obesity than the presence of it.

Although BMI and perceptions occasionally classified individuals as underweight, the DXA did not classify any student below the healthy range of body fat.

While misclassifying individuals with increased muscle mass as overweight or obese is a problem; there is a greater issue with under-classifying individuals as healthy-weight when they are not. Young adults who appear healthy and have a BMI that reflects this perception could be at risk for chronic diseases associated with higher levels of body fat. Lack of awareness of body composition would likely result in no remedial action to reduce these risks.