

Section 4. Psychology

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SELF-PERCEIVED VS ACTUAL WEIGHT STATUS: WHICH IS A STRONGER PREDICTOR OF ADOLESCENTS' SUICIDE INTENT?

Abstract

Objective: This study aims to examine if actual or self-perceived weight status plays an important role in predicting adolescents' suicide intent.

Methods: Data from the Youth Risk Behavior Surveillance System (YRBSS) 2017 was used. Three methods were used to compare the role of actual and self-perceived weight status in associating with suicide intent: bivariate analysis; two Logistic regression models using Akaike information criterion (AIC) and receiving operating characteristic (ROC) /Area under the ROC Curve (AUC) as metrics to measure if the model is a good fit; a Logistic regression model with both types of weight status to examine statistical significance.

Results: About 17% participants reported ever considering suicide. In bivariate analysis, it seems that discrepancies in suicide intent proportion is larger based on self-perceived weight status groups than that based on actual weight status groups. The model with perceived weight status has lower AIC and higher AUC than the model with actual weight status, indicating that the former is a better fit. In the model with both weight status variables, perceived weight status are statistically significant (p -values <0.05), while actual weight status groups are statistically insignificant (p -values >0.05).

Conclusion: Overall, the proportion of high school students who ever had suicide intent is high. Self-perceived weight status plays a more important role of predicting suicide intent than actual weight status.

Keywords: suicide intent, weight status, Logistic regression.

1. Introduction

In this study, we aimed to explore if BMI is related to adolescents' suicide intent, using data of a nationally representative sample from the Youth Risk Behavior Surveillance System (YRBSS). Specifically, we compared adolescents' actual weight status with their self-perceived weight, and examined which one is a stronger predictor of suicide intent.

2. Research methods

2.1 Data source

The YRBSS was developed in 1990 by the Centers for Disease Control and Prevention (CDC), aiming to monitor health-related behaviors that contribute to deaths and disabilities among youth and adults. It includes national, state, territorial, tribal government, and local school-based surveys of rep-

representative samples of students in 9th through 12th grade. These surveys are conducted every two years.

YRBSS monitors six categories of health-related behaviors:

Behaviors that contribute to unintentional injuries and violence;

Sexual behaviors related to unintended pregnancy and sexually transmitted diseases, including HIV infection;

Alcohol and other drug use;

Tobacco use;

Unhealthy dietary behaviors;

Inadequate physical activity.

For this study, we used the most recent data from year 2017. This year's data included a total of 14,765 students in 9th through 12th grades.

2.2. Variables of interest

Variables on suicide intent

In the survey, students were asked "During the past 12 months, did you ever seriously consider attempting suicide?" responses were yes or no.

Variables on weight status

Actual weight status:

Students' height and weight information was collected through two questions: How tall are you without your shoes on? How much do you weigh without your shoes on? The corresponding BMI and BMI percentile for his/her age and gender were then calculated in the YRBSS data.

Based on the percentile, we then categorized adolescents actual weight status into four categories, based on CDC standard [1].

Weight Status Category	Percentile Range
Underweight	Less than the 5th percentile
Normal or Healthy Weight	5th percentile to less than the 85th percentile
Overweight	85th to less than the 95th percentile
Obese	95th percentile or greater

According to literature, BMI does not measure body fat directly, but it is correlated with and can be considered an alternative to direct measures of body fat, such as skinfold thickness measurements².

Self-perceived weight status:

Students were asked "How do you describe your weight?", with the following answer options:

- A. Very underweight;
- B. Slightly underweight;
- C. About the right weight;
- D. Slightly overweight;
- E. Very overweight.

2.3 Statistical Analysis

I first described the study sample's profile of demographics, weight status, and suicide intent, using mean values for continuous variables (e.g., age) and percentages for categorical variables (e.g., gender).

To decide on if actual or self-perceived weight status is a better predictor, we looked at the following:

Crude/bivariate association between actual or self-perceived weight status and suicide intent

Compare two Logistic regression models, one with actual weight status and the other with self-perceived weight status, respectively, to see which model provides a better prediction of suicide intent. using Akaike information criterion (AIC) and receiving operating characteristic (ROC) [3; 4].

AIC is a measure of the relative quality of a statistical model for a given set of data. As such, AIC provides a means for model selection. The absolute value of AIC is less of focus. Its main usage is to compare in-sample fit of the candidate models. The lower AIC, the better a model is [5].

ROC is a measure of classifier performance. It is a graphic that shows the diagnostic ability of a model in predicting binary outcome as its discrimination threshold is varied. Ultimately, the focus is the area under the ROC curve, or AUROC. AUROC ranges from 0.50 to 1.00, and the higher AUROC, the better the model is. It should be noted, however, that in this study, the purpose is to compare which model

has a higher AUROC, instead of the absolute values of AUROC.

A logistic regression including both actual and self-perceived weight status.

A detailed explanation of Logistic Regression Model

Logistic Regression Modeling is a popular analytic technique to analyze the association between a set of predictors and a binary outcome. In the model, “suicide intent” (yes/no) is the outcome “y”. Actual or self-perceived weight status is the explanatory variable/predictor of interest.

In order to control for potential confounding effects of variables including age, gender, race, and academic performance, we included these variables in the Logistic regression models.

The general formula of logistic regression is:

$\ln(\text{odds of an event occurring}) =$

$$\ln\left(\frac{P}{P-1}\right) = \beta + \beta_1 \times X_1 + \beta_2 \times X_2 + \dots + \beta_n \times X_n.$$

P – is the probability of an event, which is convertible with odds. X_n – is a predictor variable, and β_n – is a regression coefficient. The relationship between the odds ratio and the coefficients is $OR = e^\beta$.

If the coefficient β of a variable X_n is larger than 0, X_n – is related to a higher odds/probability of the event. The odds ratio related to X_n is above 1 in this case.

If the coefficient of a variable X_n is equal to 0, X_n is not related to the event. The odds ratio related to X_n is equal to 1 in this case.

If the coefficient of a variable X_n is smaller than 0, X_n is related to a lower odds/probability of the event. The odds ratio related to X_n is below 1 in this case.

3. Results

3.1 Demographic profile of the study sample

After limiting to non-missing values of the key variables, the final study sample included 9,514 high school students.

The average age was 16 years. 51% were females and 49% were males. Students were proportionately from each grade of 9, 10, 11, and 12, with around 25% from each grade. In terms of race/ethnicity, the study sample included 47% Whites, 16% African Americans, 11% Hispanic/Latino, and others.

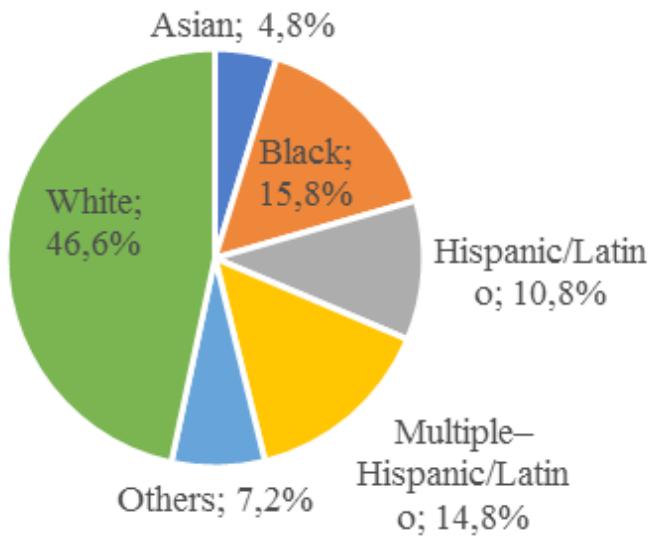


Figure 1. Racial/ethnic composition of the study sample

3.2 Descriptive results on students' suicide intent and weight status

Overall, 17% reported that they ever seriously considered attempting suicide during the past 12

months. The rate is two times higher in girls than in boys.

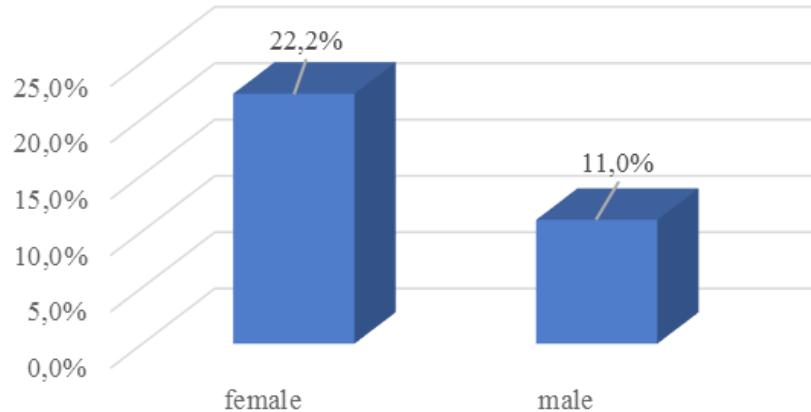


Figure 2. Proportion of considering suicide by gender

A majority (66%) is considered as normal weight based on their BMI percentile. 16.4% and 14.7% are in the overweight and obese categories.

However, when looking at self-perceived weight status, only 53% perceived themselves as “about right weight”. 31.8% perceived themselves as slightly or very overweight.

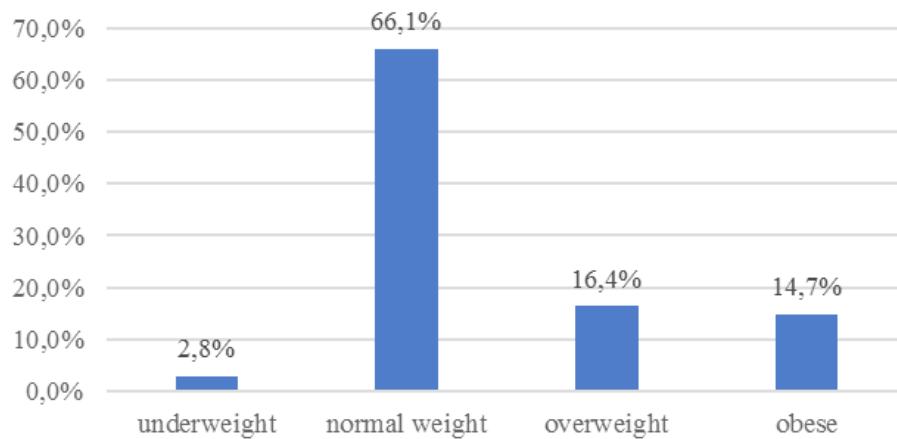


Figure 3. Actual weight status

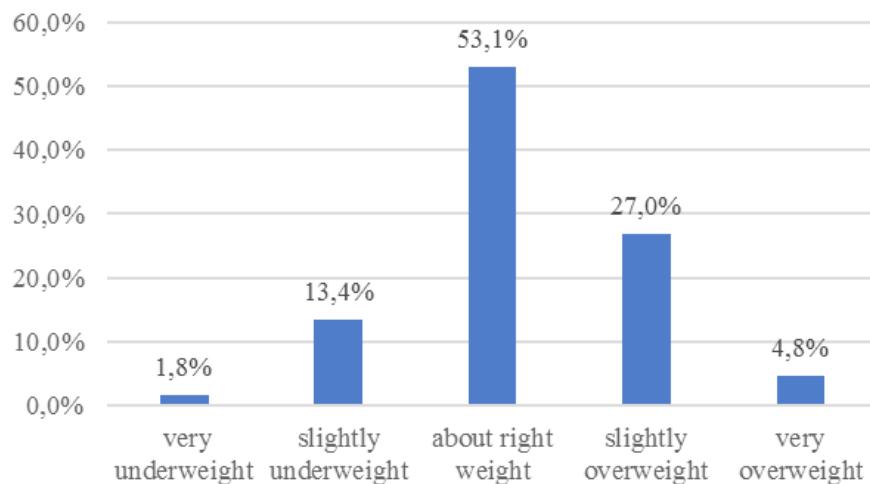


Figure 4. Perceived weight

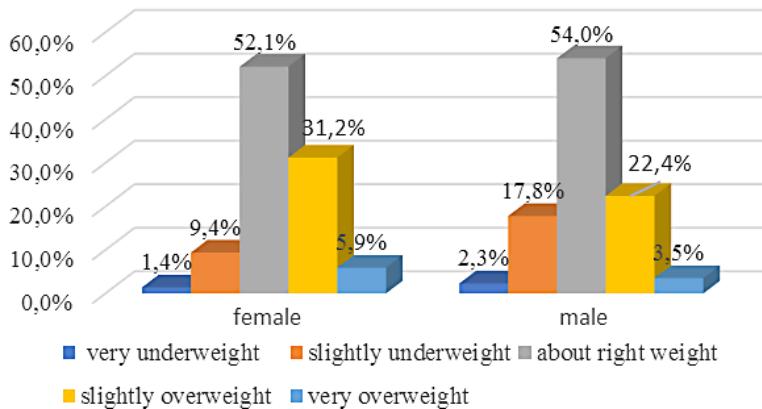


Figure 5. Perceived weight by gender

Compared with boys, girls are more likely to perceive themselves as slightly or very overweight.

Discrepancies between actual and perceived weight status:

Table 1.

actual weight status	perceived weight status			
	very underweight	slightly underweight	about right weight	slightly overweight
underweight	19,0%	51,5%	27,2%	1,5%
normal/heavy wt	1,6%	17,4%	67,1%	13,0%
overweight	0,6%	1,5%	36,6%	56,2%
obese	0,8%	1,4%	13,3%	61,9%

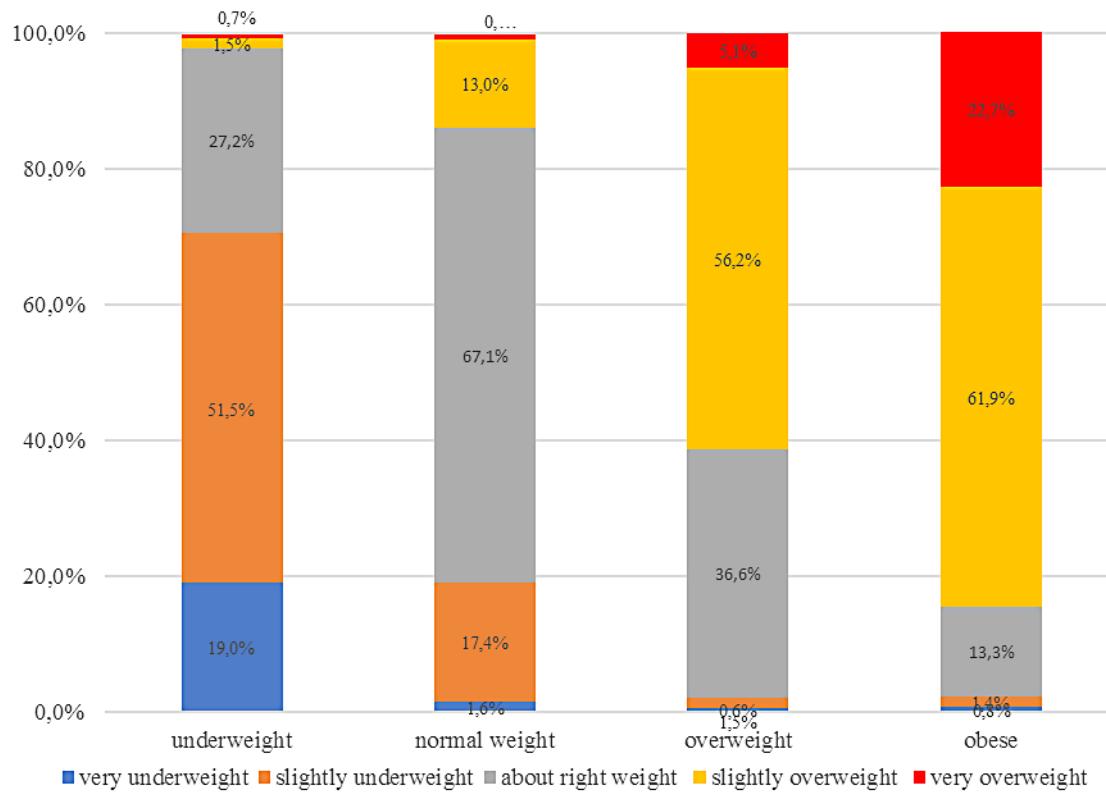


Figure 6. Perceived weight by actual weight stat

3.3 To compare which is a stronger predictor of suicide intent

1) crude relationship between weight and suicide attempt

It can be seen that the discrepancies in suicide intent proportion is larger based on self-perceived weight status groups than that based on actual weight status groups.

Table 2.

	considered suicide	
Actual weight status	yes	no
underweight	17.9%	82.1%
Normal weight	15.4%	84.6%
overweight	19.5%	80.5%
obese	20.2%	79.8%
From Chi-sq test: P value <0.0001		
Perceived weight status	considered suicide	
very underweight	24.1%	75.9%
slightly underweight	16.8%	83.2%
about right weight	12.5%	87.5%
slightly overweight	22.0%	78.0%
very overweight	33.2%	66.8%
From Chi-sq test: P value <0.0001		

2) Comparison of models

Model with only confounders:

$$\text{Log}(odds of suicide intent) = b_0 + b_1 \times \text{age} + b_2 \times \text{grade} + b_3 \times \text{academic performance} + b_4 \times \text{race / ethnicity}$$

$$\text{AIC}= 8299.9, \text{AUC}=64.5\%$$

$$\text{Log}(odds of suicide intent) = b_0 + b_1 \times \text{age} + b_2 \times \text{grade} + b_3 \times \text{academic performance} + b_4 \times \text{race / ethnicity} + b_5 \times \text{actual weight status}$$

$$\text{AIC}= 8273.4, \text{AUC}=65.3\%$$

$$\text{Log}(odds of suicide intent) = b_0 + b_1 \times \text{age} + b_2 \times \text{grade} + b_3 \times \text{academic performance} + b_4 \times \text{race / ethnicity} + b_5 \times \text{perceived weight status}$$

$$\text{AIC}= 8145.1, \text{AUC}=67.1\%$$

It can be seen that the model with perceived weight status has lower AIC and higher AUC than the model with actual weight status. Both indicate that the former is a better fit.

3) Logistic Regression model with both variables

In logistic regression, after controlling for potential confounders of age, gender, grade, race/ethnicity, and academic performance, the regression coefficients for perceived weight status are statistically significant (p-values <0.05). On the other hand, the regression coefficients for actual weight status groups are statistically *insignificant* (p-values >0.05).

Table 3.

Results from Logistic regression model								
	Estimate	Std. Error	z value	Pr(> z)		Odds Ratio	Lower CI	Upper CI
Intercept	-2.07264	0.41707	-4.97	<0.0001	***	0.125	0.0554	0.284
Perceived weight status								
reference: About the right weight								
slightly overweight	0.66111	0.07727	8.556	<0.0001	***	1.936	1.6645	2.253
slightly underweight	0.45202	0.09028	5.007	<0.0001	***	1.571	1.3146	1.873
very overweight	1.27074	0.1316	9.656	<0.0001	***	3.563	2.7505	4.608
very underweight	0.88136	0.19745	4.464	<0.0001	***	2.414	1.623	3.525
Actual weight status								
reference: normal weight								
obese	-0.16852	0.09969	-1.691	0.09093		0.844	0.6942	1.026
overweight	0.00039	0.0856	0.005	0.99641		1	0.8449	1.181
underweight	0.06309	0.17709	0.356	0.72165		1.065	0.7454	1.494
age	0.06217	0.05095	1.22	0.22231		1.064	0.963	1.175

Gender: male vs. female	-0.87447	0.06191	-14.125	<0.0001	***	0.417	0.3691	0.47
Grade	-0.05905	0.05616	-1.052	0.29301		0.942	0.8444	1.052
Academic_performance								
reference: A								
B	0.18699	0.06664	2.806	0.00502	**	1.205	1.058	1.373
C	0.47798	0.08313	5.75	<0.0001	***	1.612	1.3695	1.897
D	0.97019	0.14883	6.519	<0.0001	***	2.638	1.9622	3.519
E	1.02645	0.23207	4.423	<0.0001	***	2.791	1.7489	4.356
Race/ethnicity								
Reference: Asian								
Black	-0.32319	0.15243	-2.12	0.03398	*	0.723	0.5388	0.98
Hispanic/Latino	-0.67955	0.16515	-4.115	<0.0001	***	0.506	0.3673	0.702
Multiple– Hispanic/Latino	-0.05398	0.14862	-0.363	0.71646		0.947	0.7109	1.273
Others	0.27171	0.16099	1.688	0.09146		1.312	0.9597	1.805
White	0.01601	0.13522	0.118	0.90574		1.016	0.7838	1.332

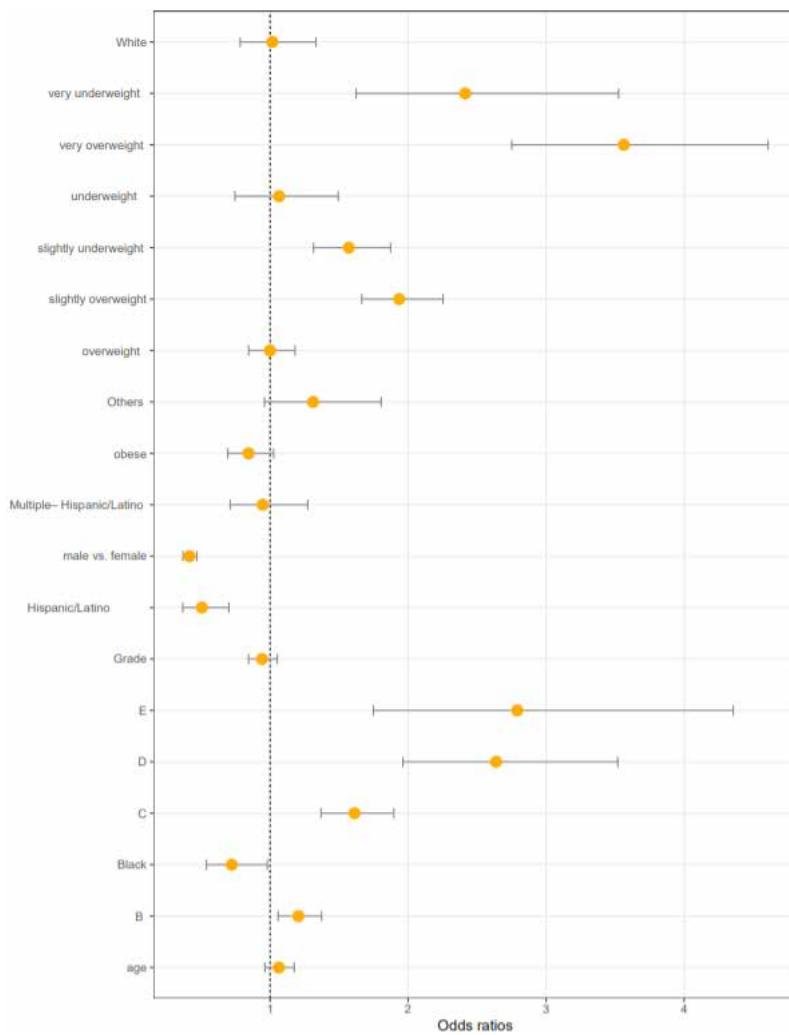


Figure 6. Results from Logistic registic regression modeling

4. Discussion

The percentage of high school students who ever considered suicide was 17%. This is an alarming number, showing importance of attention to adolescents' psychological health. Meanwhile, girls are more likely to have suicide intent than boys.

All the three methods indicate that self-perceived weight status is a stronger predictor of suicide intent than actual weight status. This is similar with another study using the YRBSS data which finds that weight perception plays a more important role in affecting adolescents' weight-loss intentions and

behaviors. Specifically, they found that "irrespective of the weight status base on self-reported weight and height, adolescents who perceive themselves as overweight have a stronger intention to lose weight, but do not develop better eating and exercise habits, compared with their counterparts of same gender and reported weight status" [6].

5. Conclusion

Overall, the proportion of high school students who ever had suicide intent is high. Self-perceived weight status plays a more important role of predicting suicide intent than actual weight status.

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