



# Effects of objective and perceived weight on suicidal ideation among adolescents: Findings from the 2015–2021 national Youth Risk Behavior Survey

Philip Baiden<sup>a,\*</sup>, Catalina Cañizares<sup>b,c</sup>, Catherine A. LaBrenz<sup>a</sup>, Christina M. Sellers<sup>d</sup>, Yong Li<sup>e</sup>, Raymond M. Glikpo<sup>f</sup>, Kofi Sarkodie<sup>g</sup>

<sup>a</sup> School of Social Work, The University of Texas at Arlington, 501W. Mitchell St., Box 19129, Arlington, TX 76019, USA

<sup>b</sup> Robert Stempel College of Public Health and Social Work, Florida International University, 11200 SW 8th St, Miami, FL 33199, USA

<sup>c</sup> The Steinhardt School of Culture, Education, and Human Development, Department of Applied Psychology, New York University, 196 Mercer St., 7th Floor, New York, NY, USA

<sup>d</sup> School of Social Work, Simmons University, 300 The Fenway, Boston, MA 02115, USA

<sup>e</sup> Texas Woman's University, 304 Administration Dr, Denton, TX 76204, USA

<sup>f</sup> Department of Family and Consumer Sciences, University of Ghana, P.O. Box LG 25, Legon, Accra, Ghana

<sup>g</sup> School of Behavioral and Brain Sciences, The University of Texas at Dallas, 800W. Campbell Rd, Richardson, TX 75080, USA

## ARTICLE INFO

### Keywords:

Suicidal ideation  
Weight perception  
Body mass index  
Adolescents

## ABSTRACT

This study examined the association between perceived weight, actual weight, and suicidal ideation among adolescents. Data for this study were obtained from a nationally representative sample from the Youth Behavior Risk Survey (YRBS) between 2015 and 2021. A total of  $n = 61,298$  adolescents ages 12 to 18 were included in the final analytic sample. A series of logistic regressions was conducted to examine perceived weight, BMI, and suicidal ideation, while adjusting for other demographic and control variables. Approximately one in five adolescents reported suicidal ideation. In the multivariable analyses, adolescents who perceived themselves as overweight and had BMI  $\geq$  85th percentile had 1.48 times higher odds of reporting suicidal ideation (95 % CI=1.35–1.62) and adolescents who perceived themselves as overweight but had BMI <85th percentile had 1.47 times higher odds of experiencing suicidal ideation than their peers who did not perceive themselves as overweight and had BMI <85th percentile. The findings from this study suggest that both perceived and actual BMI may be associated with suicidal ideation among adolescents. Future research could examine differences in perceived and actual BMI and identify potential interventions to proactively address mental health issues that may stem from stigma related to being overweight or obese.

## 1. Introduction

Suicide ranks as the third leading cause of death among adolescents aged 15–19 in the United States (U.S.) (Centers for Disease Control and Prevention (CDC), 2023). Estimates from the National Youth Risk Behavior Survey (YRBS) showed that in 2021, 22 % of adolescents seriously considered attempting suicide, 18 % made a suicide plan, and 10 % attempted suicide the previous year (CDC, 2023). A significant risk factor for adolescent suicide attempts and death by suicide is a history of suicidal ideation (Franklin et al., 2017). Available research indicates that whereas female adolescents are more likely to experience suicidal ideation and attempt suicide, male adolescents are more likely to die by

suicide (Garnett et al., 2022). These sex differences in suicidal thoughts and behaviors among adolescents have been observed over the past two decades (Yu and Chen, 2019). Given that suicidal ideation is one of the most significant predictors of suicide attempts and death by suicide among adolescents (Franklin et al., 2017), it is important to understand risk factors associated with suicidal ideation among adolescents. Such an understanding could help in identifying adolescents who might be most at risk of future suicide attempts and death by suicide.

Past studies have highlighted several factors that are associated with suicidal ideation among adolescents, including demographic factors such as race and sex (Baiden et al., 2020; Morris-Perez et al., 2023). Specifically, non-Hispanic Black and non-Hispanic Native American

\* Corresponding author.

E-mail address: [philip.baiden@uta.edu](mailto:philip.baiden@uta.edu) (P. Baiden).

<https://doi.org/10.1016/j.psychres.2025.116380>

Received 15 July 2024; Received in revised form 27 January 2025; Accepted 28 January 2025

Available online 29 January 2025

0165-1781/© 2025 Elsevier B.V. All rights are reserved, including those for text and data mining, AI training, and similar technologies.

adolescents exhibit the highest rates of ideation relative to their non-Hispanic White counterparts (CDC, 2023; Kernan et al., 2023). Regarding sex differences, research indicates that male adolescents have a suicide mortality rate that is almost three times higher than that of female adolescents (CDC, 2023; Garnett et al., 2022), yet, studies have consistently found that female adolescents report more frequent experiences of suicidal ideation than their male counterparts (Baiden, Kuuire, et al., 2019; Kernan et al., 2023). Additionally, factors such as depression (Grossberg and Rice, 2023; Nock et al., 2009), feelings of hopelessness (Baiden et al., 2022; Ribeiro et al., 2018; Wolfe et al., 2019), exposure to traumatic events such as school bullying (Baiden and Tadeo, 2020; Koyanagi et al., 2019), cyberbullying (Bauman et al., 2013; John et al., 2018; Ziminski et al., 2022), and substance use (Baiden, Mengo, et al., 2019; J. W. Lee et al., 2021) contribute significantly to increasing the risk of suicidal ideation.

Recently, some studies have extended the understanding of suicide risk factors to include dietary behaviors and objective weight status. Several studies have revealed a significant association between dietary behaviors and suicidal ideation, including skipping breakfast (Kim and Seo, 2023; Lee et al., 2019; Park and Lee, 2022), frequent fast-food consumption (Jin et al., 2022; Park et al., 2016), and inadequate fruit and vegetable intake (Xiao et al., 2019). Jacob et al. (2020) conducted a systematic review and meta-analysis of published studies from 32 countries and found that frequent fast-food consumption was associated with 1.31 times higher odds of reporting suicidal thoughts and behaviors. Epidemiological studies have also found significant positive associations between being overweight or obese and suicidal ideation among adolescents (Anderson et al., 2015; Dave and Rashad, 2009; Iwatate et al., 2023). Using data from the Global School-based Student Health Survey (GSHS), Zhang et al. (2022) examined the association between body mass index (BMI) and the risk of suicidal ideation and suicide attempts among adolescents in 45 low- and middle-income countries and found that overweight and obesity were significantly associated with increased odds of suicidal ideation. However, other studies failed to find any significant association between BMI and suicidal ideation among adolescents (Graham and Frisco, 2022; Zeller et al., 2013). In response to these mixed findings, some scholars have proposed a quadratic relationship between objective weight and suicidal ideation and maintained that the association between objective body weight and suicidal ideation might follow a U-shaped distribution, with peaks observed among adolescents at the extremes of the body weight spectrum (Graham and Frisco, 2022; Zuromski et al., 2017).

One notable gap in the literature regarding the association between objective weight and suicidal ideation is the lack of consideration for adolescents' perception of their own weight relative to their actual weight (Zhang et al., 2013, 2022). Weight perception has been defined as the subjective assessment of one's actual body weight including thoughts and feelings about the way one looks (Grogan, 2021). Weight perception may be influenced by factors such as self-esteem and stigma (Gillen and Lefkowitz, 2011; Kim and Fletcher, 2021). Research indicates that adolescents with objectively high BMI often perceive their weight imprecisely and eschew using labels that suggest extreme obesity (Saxton et al., 2009). In addition, due to "fat-stigmatizing", some adolescents may misperceive their weight as 'about right' in order not to be stigmatized (Hayward et al., 2014). Moreover, despite the positive effects linked to social media, such as harnessing social capital and facilitating global connections (Naslund et al., 2020), increased social media use has been associated with negative psychological impacts, including adolescents' perceptions of their body weight (Marks et al., 2020; Moorman et al., 2020). For instance, research indicates that photo-based social media platforms have worse influence on adolescent's body weight perception (obesity or extreme thinness) than non-photo-based platforms (Vandenbosch et al., 2022). Engeln et al. (2020) conducted a study and found that female college students who spent more time on Instagram were more likely to make more appearance comparisons and report being dissatisfied with their body than those who spent more time

on Facebook. Furthermore, Instagram use among adolescents and young adults has been found to be significantly associated with increased self-objectification and comparisons to the "ideal" body type (Bue, 2020; Karsay et al., 2021). Thus, perception of not having the ideal body type may lead to low self-esteem, internalization of negative thoughts about one's weight, and consequently suicidal ideation. As a result, some scholars have called for incorporating perceived weight status in understanding the link between objective weight status and suicidal ideation among adolescents given that subjective perception of body weight may be more influential than the objective measure of weight (Brochu, 2020).

To date, few studies have focused on the combined effect of objective and perceived weight on suicidal ideation among adolescents. Bridging this gap, some studies have emerged, providing valuable insights into the impact of weight perception on suicidal ideation. For instance, Seo and Lee (2013) analyzed data from the National Longitudinal Study of Adolescent Health and found that overweight perception at baseline was significantly associated with suicidal ideation at follow-up after adjusting for well-established risk factors of suicidal ideation. Song et al. (2023) found that among Korean adolescents, perception of being overweight, coupled with shorter stature, was significantly associated with an increased likelihood of suicidal thoughts in young women, irrespective of their actual BMI. Analyzing data from the 2007 and 2009 Youth Risk Behavior Survey (YRBS), Zeller et al. (2013) also found that adolescents who perceived themselves as overweight were more likely to report suicidal ideation when compared to their counterparts of a healthy weight who accurately perceived their weight. This association remained significant after controlling for age, sex, race, and feelings of sadness or hopelessness.

### 1.1. Current study

Although some studies have examined the association between objective weight status (Anderson et al., 2015; Dave and Rashad, 2009; Iwatate et al., 2023; Zhang et al., 2022), perceived weight (Liu et al., 2023; Seo and Lee, 2013; Singh et al., 2021; Song et al., 2023; Zeller et al., 2013), and suicidal ideation, to our knowledge, no study has investigated the combined effects of objective and perceived weight on suicidal ideation among adolescents. The current study seeks to examine an understudied topic by using pooled data from the 2015 to 2021 national YRBS. Using a large and nationally representative sample of adolescents, the objectives of this study were to: 1) examine the cross-sectional association between objective and perceived weight and suicidal ideation and 2) investigate sex differences of the association between objective and perceived weight and suicidal ideation. We hypothesized that after controlling for demographic factors and other risk factors, there will be an association between objective and perceived weight and suicidal ideation with a stronger association for perceived weight. We further hypothesized that the association between objective and perceived weight and suicidal ideation will be stronger for female adolescents relative to male adolescents.

## 2. Methods

### 2.1. Data source

Data for this study came from the national YRBS. The YRBS is a school-based national survey that is conducted by the CDC every two years to examine health-risk behaviors that contribute to the leading causes of death and disability among adolescents in grades 9–12 from both public and private schools in the U.S. The YRBS utilized a three-stage cluster sample design to create a nationally representative sample of high school students. The sample is diverse by design with respect to race/ethnicity and sexual identity. Detailed information about the YRBS, including its objectives, methodology, and sampling procedure, is available at [www.cdc.gov/yrbss](http://www.cdc.gov/yrbss) and has been described elsewhere

(Brener et al., 2013; Kann et al., 2018; Mpofu et al., 2023; Underwood et al., 2020) and in other publications by the authors (Baiden et al., 2023a,b, Baiden et al., 2024a–c). The YRBS was approved by the CDC's Institutional Review Board (IRB), and the de-identified data are publicly available. The lead author's institution exempted the current study from IRB approval. We followed Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines when conducting this study (Von Elm et al., 2007).

Data were pooled from 2015 to 2021 national YRBS based on the same methodology to obtain a robust sample size to examine the effects of objective weight and perceived weight on suicidal ideation among adolescents. The initial unweighted sample sizes ranged from 13,677 to 17,232, school response rates ranged from 72.7 % to 75.1 %, student response rates ranged from 79.1 % to 81 %, and overall response rates ranged from 57.5 % to 60.3 %. There were 61,298 adolescents aged 12–18 in the pooled data. Respondents aged 12 and 13 were excluded from the analysis due to small sample size (unweighted  $n = 317$ ). Missing data were handled using listwise deletion. Thus, the analyses conducted in this study were based on 39,166 adolescents aged 14–18. Respondents with missing data were not systematically different from their counterparts without missing data on demographic factors, objective weight, perceived weight, and suicidal ideation. The sample was evenly distributed by sex, with 50.7 % being female. About 84.5 % of the adolescents self-identified as straight, 8.3 % as bisexual, 5 % as other/questioning, and 2.2 % as lesbian/gay. More than half (54.3 %) of the adolescents self-identified as non-Hispanic White, 23.2 % as Hispanic, 11.7 % as non-Hispanic Black, and 10.8 % as other.

## 2.2. Variables

### 2.2.1. Outcome variable

The outcome variable investigated in this study was suicidal ideation and was measured as a binary variable based on response to the question, "During the past 12 months, did you ever seriously consider attempting suicide?" Adolescents who answered "yes" were coded as 1, whereas adolescents who answered "no" were coded as 0.

### 2.2.2. Explanatory variable

The focal explanatory variable, objective weight and perceived weight were measured using actual overweight based on BMI and perceived overweight. Objective weight was measured as a binary variable, defined as BMI  $\geq$  85th percentile for age and sex based on the 2000 CDC Growth Charts. Adolescents with BMI  $\geq$  85th percentile were coded as 1, otherwise, they were coded as 0. Perceived overweight was measured based on responses to the question, "How do you describe your weight?" with the following response options: "very underweight," "slightly underweight," "about the right weight," "slightly overweight," and "very overweight." Following the recommendation of the CDC (Kann et al., 2018) and past studies (Liu et al., 2023; Seo and Lee, 2013; Singh et al., 2021; Swahn et al., 2009), adolescents who perceived themselves as "slightly overweight" or "very overweight" were recoded as 1, otherwise, they were coded as 0. Based on these measures, a nominal variable with four categories was created by combining actual BMI with perceived overweight. Adolescents who perceived themselves as overweight and had BMI  $\geq$  85th percentile were coded as 3; adolescents who perceived themselves as overweight but had BMI  $<$ 85th percentile were coded as 2; adolescents who did not perceive themselves as overweight but had BMI  $\geq$  85th percentile were coded as 1; and adolescents who did not perceive themselves as overweight and had BMI  $<$ 85th percentile were coded as 0.

### 2.2.3. Covariates

Covariates examined in this study included victim of school bullying, victim of cyberbullying, feeling sad or hopeless, cigarette smoking, alcohol use, marijuana use, and physical activity. Victim of school bullying was measured based on response to the question, "During the

past 12 months, have you ever been bullied on school property?" Victim of cyberbullying was measured based on response to the question, "During the past 12 months, have you ever been electronically bullied? (Count being bullied through texting, Instagram, Facebook, or other social media)." Responses to both questions were coded as "0 = No" and "1 = Yes". Feeling sad or hopeless was measured based on response to the question, "During the past 12 months, did you ever feel so sad or hopeless almost every day for two weeks or more in a row that you stopped doing some usual activities?" Adolescents who answered "yes" were coded as 1; whereas those who answered "no" were coded as 0. Adolescents who smoked a cigarette at least once during the past 30 days were coded as 1; otherwise, they were coded as 0. Adolescents who reported drinking alcohol at least once during the 30 days before the survey were coded as 1; otherwise, they were coded as 0. Adolescents who reported using marijuana at least once during the past 30 days were coded as 1; otherwise, they were coded as 0. Physical activity was measured based on response to the question, "During the past 7 days, on how many days were you physically active for a total of at least 60 mins per day?" Adolescents who were physically active on five or more days were considered physically active and were coded as 1; otherwise, they were considered physically inactive and were coded as 0.

### 2.2.4. Demographic variables

The following demographic variables were included as control variables: survey year, age, sex, sexual identity, and race/ethnicity. Survey year was coded into "0 = 2015," "1 = 2017," "2 = 2019," and "3 = 2021." Age was measured in years, whereas sex was coded as "0 = Male" and "1 = Female." Sexual identity was coded as a nominal variable: "0 = Straight," "1 = Lesbian/Gay," "2 = Bisexual," and "3 = Other/questioning." Race/ethnicity was coded into the following categories: "0 = non-Hispanic White," "1 = non-Hispanic Black," "2 = Hispanic," and "3 = Other."

## 2.3. Data analyses

Data were analyzed using descriptive, bivariate, and multivariable analytic techniques. The general distribution of all the variables included in the analysis was first examined using percentages. Pearson chi-square test of association was employed to examine the distribution of the study variables by sex. The bivariate analysis involved the use of binary logistic regression to examine the association between suicidal ideation and the study variables. The multivariable analysis involved the use of binary logistic regression to examine the association between objective and perceived weight and suicidal ideation while controlling for the effects of demographic factors and other covariates. To examine sex differences of the association between objective and perceived weight and suicidal ideation, separate analyses were conducted stratified by sex. Odds ratio (OR) and adjusted odds ratio (AOR) are reported together with 95 % Confidence Intervals (C.I.). Variables were considered significant if the  $p$ -value was  $<0.05$  or the 95 % C.I. did not contain 1. All analyses were performed using Stata version 17 MP. Stata's "svyset" command was used to account for the weighting and complexity of the sampling design employed by the YRBS.

## 3. Results

### 3.1. Sample characteristics

Table 1 shows the general distribution of the study variables by sex. Of the 39,166 adolescents, 19.8 % experienced suicidal ideation, 60.0 % perceived themselves not as overweight and had BMI  $<$ 85th percentile, 22.3 % perceived themselves as overweight and had BMI  $\geq$  85th percentile, 9.3 % perceived themselves as overweight but had BMI  $<$ 85th percentile, and 8.4 % perceived themselves not as overweight but had BMI  $\geq$  85th percentile. Approximately 18 % of the adolescents were victim of school bullying, 14.7 % were victim of cyberbullying, and 34.2

**Table 1**  
Sample characteristics by sex (N = 39,166).

Variables	Sex		Chi-square (sig.)
	Frequency (Weighted %)	Male N = 19,843 (50.7 %)	
<b>Outcome variable</b>			
Suicidal ideation			956.88 (p < .001)
No	31,974 (81.6)	87.6	75.5
Yes	7192 (18.4)	12.4	24.5
<b>Explanatory variable</b>			
Objective and perceived weight			1055.24 (p < .001)
No perceived overweight/BMI <85th percentile	23,516 (60.0)	62.3	57.7
No perceived overweight/BMI ≥ 85th percentile	3298 (8.4)	10.8	5.9
Perceived overweight/BMI <85th percentile	3649 (9.3)	5.2	13.6
Perceived overweight/BMI ≥ 85th percentile	8703 (22.3)	21.7	22.8
<b>Demographic variables</b>			
Survey year			24.59 (p = .233)
2015	10,814 (27.6)	27.9	27.4
2017	9439 (24.1)	23.4	24.8
2019	8442 (21.6)	21.1	22.0
2021	10,471 (26.7)	27.6	25.8
Age			58.99 (p < .001)
14 years	7159 (13.2)	12.6	13.8
15 years	9710 (24.8)	25.1	24.4
16 years	10,040 (25.6)	25.4	25.9
17 years	9644 (24.6)	24.0	25.2
18 years	4613 (11.8)	12.9	10.7
Sexual identity			1975.16 (p < .001)
Straight	33,126 (84.5)	92.2	76.8
Lesbian/gay	842 (2.2)	1.8	2.5
Bisexual	3252 (8.3)	2.9	13.8
Other/questioning	1946 (5.0)	3.1	6.9
Race/ethnicity			3.85 (p = .631)
Non-Hispanic White	21,271 (54.3)	54.7	53.9
Non-Hispanic Black	4588 (11.7)	11.8	11.6
Hispanic	9096 (23.2)	22.9	23.6
Other race/ethnicity	4211 (10.8)	10.6	10.9
<b>Other covariates</b>			
Victim of school bullying			375.12 (p < .001)
No	32,300 (82.5)	86.1	78.7

**Table 1 (continued)**

Variables	Frequency (Weighted %)	Sex		Chi-square (sig.)
		Male N = 19,843 (50.7 %)	Female N = 19,323 (49.3 %)	
Yes	6866 (17.5)	13.9	21.3	
Victim of cyberbullying				867.62 (p < .001)
No	33,396 (85.3)	90.5	79.9	
Yes	5770 (14.7)	9.5	20.1	
Felt sad or hopeless				2099.76 (p < .001)
No	25,781 (65.8)	76.7	54.7	
Yes	13,385 (34.2)	23.3	45.3	
Current cigarette smoking				21.54 (p = .002)
No	36,530 (93.3)	92.7	93.9	
Yes	2646 (6.7)	7.3	6.1	
Current use of alcohol				146.81 (p < .001)
No	27,983 (71.4)	74.2	68.6	
Yes	11,183 (28.6)	25.8	31.4	
Current use of Marijuana				3.65 (p = .213)
No	31,862 (81.3)	81.7	81.0	
Yes	7304 (18.7)	18.3	19.0	
Physically active				1456.36 (p < .001)
No	20,437 (52.2)	72.7	61.9	
Yes	18,728 (47.8)	57.3	38.1	

% reported feeling sad or hopeless almost every day for two weeks or more, resulting in them stopping some usual activities. The distribution of current substance use was as follows: alcohol use (28.6 %), marijuana use (18.7 %), and cigarette smoking (6.7 %). Less than half (47.8 %) of the adolescents were physically active.

About one in four females (24.5 %) compared to 12.4 % of males reported suicidal ideation ( $\chi^2(1) = 956.88, p < .001$ ). There was a significant association between sex and objective and perceived weight ( $\chi^2(3) = 1055.24, p < .001$ ). Specifically, 13.6 % of female adolescents perceived themselves as overweight but had a BMI <85th percentile, compared to 5.2 % of male adolescents. Conversely, 10.8 % of male adolescents perceived themselves as not overweight but had a BMI ≥ 85th percentile, compared to 5.9 % of female adolescents. With respect to the association between sex and sexual identity, 13.8 % of females compared to 2.9 % of males self-identified as bisexual, and 6.9 % of females compared to 3.1 % of males self-identified as other/questioning ( $\chi^2(3) = 1975.16, p < .001$ ). Compared to males, females were more likely to report being a victim of school bullying (21.3 % vs. 13.9 %;  $\chi^2(1) = 375.12, p < .001$ ), being a victim of cyberbullying (20.1 % vs. 9.5 %;  $\chi^2(1) = 867.62, p < .001$ ), feeling sad or hopeless (45.3 % vs. 23.3 %;  $\chi^2(1) = 2099.76, p < .001$ ), or being involved in alcohol use (31.4 % vs. 25.8 %;  $\chi^2(1) = 146.81, p < .001$ ). Compared to females, males were more likely to report smoking cigarette (7.3 % vs. 6.1 %;  $\chi^2(1) = 21.54, p = .002$ ). More than half of male adolescents (57.3 %) compared to 38.1 % of female adolescents were physically active ( $\chi^2(1) = 1456.36, p < .001$ ).

3.2. Multivariable logistic regression results

In Table 2, we present the results from the unadjusted and adjusted logistic regression models examining the association between objective and perceived weight and suicidal ideation. In the unadjusted model, compared to adolescents who did not perceive themselves as overweight and had BMI <85th percentile, adolescents who perceived themselves as overweight but had BMI <85th percentile had more than doubled the odds of experiencing suicidal ideation (OR=2.10, 95 % CI=1.88–2.35). Adolescents who perceived themselves as overweight and had BMI ≥ 85th percentile had 1.86 times higher odds of reporting suicidal ideation (OR=1.86, 95 % CI=1.72–2.01). These significant effects were partially attenuated after controlling for demographic factors and other covariates. In the fully adjusted model, adolescents who perceived themselves as overweight and had BMI ≥ 85th percentile had 1.48 times higher odds of reporting suicidal ideation (AOR=1.48, 95 % CI=1.35–1.62) and adolescents who perceived themselves as overweight but had BMI <85th percentile had 1.47 times higher odds of experiencing suicidal ideation (AOR=1.47, 95 % CI=1.27–1.70), both compared to their counterparts who did not perceive themselves as overweight and had BMI <85th percentile.

In the fully adjusted model, adolescents who self-identified as bisexual (AOR=2.74, 95 % CI=2.45–3.07), lesbian/gay (AOR=2.43, 95 % CI=1.93–3.04), and other/questioning (AOR=2.13, 95 % CI=1.80–2.53) had more than twofold higher odds of experiencing suicidal ideation. Adolescents were more likely to experience suicidal ideation if they were victims of school bullying (AOR=1.82, 95 % CI=1.62–2.05) or victims of cyberbullying (AOR=1.43, 95 % CI=1.29–1.60), felt sad or hopeless (AOR=9.67, 95 % CI=8.58–10.89), currently smoked cigarette (AOR=1.38, 95 % CI=1.18–1.61), currently drank alcohol (AOR=1.32, 95 % CI=1.19–1.46), or currently used marijuana (AOR=1.50, 95 % CI=1.33–1.69). In the fully adjusted model, physical activity had a protective effect on suicidal ideation. Compared to adolescents who were physically inactive, adolescents who were physically active had 10 % lower odds of experiencing suicidal ideation (AOR=0.90, 95 % CI=0.82–0.99).

3.3. Sex differences of the association between objective and perceived weight and suicidal ideation

Table 3 shows the association between objective and perceived weight and suicidal ideation stratified by sex and controlling for demographic factors and other covariates. Among males, adolescents who perceived themselves as not overweight but had BMI ≥ 85th percentile had 25 % lower odds of experiencing suicidal ideation when compared to those who did not perceive themselves as overweight and had BMI <85th percentile (AOR=0.75, 95 % CI=0.57–0.99). However, male adolescents who perceived themselves as overweight but had BMI < 85th percentile (AOR=1.60, 95 % CI=1.20–2.15) and those who perceived themselves as overweight and had BMI ≥ 85th percentile (AOR=1.30, 95 % CI=1.11–1.52) had higher odds of experiencing suicidal ideation. Among females, adolescents who did not perceive themselves as overweight but had BMI ≥ 85th percentile (AOR=1.43, 95 % CI=1.11–1.82), those who perceived themselves as overweight but had BMI <85th percentile had (AOR=1.46, 95 % CI=1.26–1.70), and those who perceived themselves as overweight and had BMI ≥ 85th percentile (AOR=1.61, 95 % CI=1.42–1.83) had higher odds of experiencing suicidal ideation when compared to their female counterparts who did not perceive themselves as overweight and had BMI <85th percentile.

4. Discussion

The objectives of this study were to examine: 1) the cross-sectional association between objective and perceived weight and suicidal ideation using a large and nationally representative sample of adolescents,

Table 2

Multivariate analysis of objective and perceived weight on suicidal ideation (N = 39,166).

Variables	Model 1		Model 2	
	OR (95 % C.I.)	p-value	AOR (95 % C.I.)	p-value
<b>Objective and perceived weight (No perceived overweight/BMI &lt;85th percentile)</b>				
No perceived overweight/BMI ≥ 85th percentile	0.98 (0.84–1.14)	.775	1.05 (0.88–1.24)	.601
Perceived overweight/BMI <85th percentile	2.10 (1.88–2.35)	<	1.47 (1.27–1.70)	<
Perceived overweight/BMI ≥ 85th percentile	1.86 (1.72–2.01)	<	1.48 (1.35–1.62)	<
<b>Demographic variables</b>				
Survey year (2015)				
2017	1.02 (0.90–1.15)	.776	0.94 (0.83–1.06)	.308
2019	1.10 (0.96–1.26)	.157	0.89 (0.78–1.02)	.082
2021	1.35 (1.18–1.54)	<0.001	0.99 (0.88–1.12)	.921
Age in years	0.99 (0.96–1.02)	.554	0.96 (0.92–0.99)	.020
Sex (Male)				
Female	2.29 (2.13–2.47)	<0.001	1.09 (0.99–1.20)	.077
Sexual identity (Straight)				
Lesbian/gay	4.03 (3.37–4.82)	<	2.43 (1.93–3.04)	<
Bisexual	5.84 (5.26–6.49)	<	2.74 (2.45–3.07)	<
Other/questioning	3.15 (2.73–3.64)	<	2.13 (1.80–2.53)	<
Race/ethnicity (Non-Hispanic White)				
Non-Hispanic Black	0.81 (0.71–0.94)	.005	0.98 (0.85–1.14)	.795
Hispanic	0.97 (0.88–1.07)	.513	0.88 (0.80–0.97)	.010
Other race/ethnicity	1.18 (1.05–1.32)	.005	1.27 (1.10–1.45)	.001
<b>Victimization and mental health factors</b>				
Victim of school bullying (No)				
Yes	3.72 (3.45–4.01)	<	1.82 (1.62–2.05)	<
Victim of cyberbullying (No)				
Yes	3.92 (3.61–4.25)	<	1.43 (1.29–1.60)	<
Felt sad or hopeless (No)				
Yes	14.71 (13.18–16.43)	<	9.67 (8.58–10.89)	<
<b>Health risk behaviors</b>				
Current cigarette smoking (No)				
Yes	2.79 (2.47–3.14)	<0.001	1.38 (1.18–1.61)	<
Current use of alcohol (No)				
Yes	2.15 (2.00–2.31)	<0.001	1.32 (1.19–1.46)	<
Current use of Marijuana (No)				
Yes	2.52 (2.30–2.77)	<0.001	1.50 (1.33–1.69)	<
Physically active (No)				

(continued on next page)

**Table 2 (continued)**

Variables	Model 1		Model 2	
	OR (95 % C.I.)	p-value	AOR (95 % C.I.)	p-value
Yes	0.63 (0.59–0.68)	<0.001	0.90 (0.82–0.99)	.029

Note: Reference category is indicated in parenthesis.  
OR indicates odds ratio.  
AOR indicates adjusted odds ratio.

**Table 3**

Multivariate analysis of objective and perceived weight on suicidal ideation by sex (N = 39,166).

Variables	Male		Female	
	AOR (95 % C.I.)	p-value	AOR (95 % C.I.)	p-value
Objective and perceived weight (No perceived overweight/BMI <85th percentile)				
No perceived overweight/ BMI ≥ 85th percentile	0.75 (0.57–0.99)	.045	1.43 (1.11–1.82)	.005
Perceived overweight/ BMI <85th percentile	1.60 (1.20–2.15)	.002	1.46 (1.26–1.70)	<
Perceived overweight/ BMI ≥ 85th percentile	1.30 (1.11–1.52)	.002	1.61 (1.42–1.83)	<

Note: Reference category is indicated in parenthesis.  
AOR: adjusted odds ratio.

Model controlled for the following: age, sex, race/ethnicity, sexual identity, school bullying, cyberbullying, feeling sad or hopeless, current cigarette use, current alcohol use, current use of marijuana, and physically active.

and 2) sex differences of the association between objective and perceived weight and suicidal ideation. Whereas past research has examined the association between suicidal ideation and objective weight (Anderson et al., 2015; Dave and Rashad, 2009; Iwatate et al., 2023; Zhang et al., 2022) and perceived weight (Liu et al., 2023; Seo and Lee, 2013; Singh et al., 2021; Song et al., 2023; Zeller et al., 2013) separately, few studies have investigated the combined effects of objective and perceived weight and suicidal ideation among adolescents. To address this gap, this study examined the cross-sectional association between objective and perceived weight on suicidal ideation, using data from a large and nationally representative sample of adolescents.

We found that, between 2015 and 2021, 19.8 % of adolescents experienced suicidal ideation (24.5 % for females and 12.4 % for males). The finding that female adolescents have twofold higher odds of experiencing suicidal ideation is consistent with some past research (Baiden and Tadeo, 2020; Gaylor et al., 2023; Ivey-Stephenson et al., 2020; Wolfe et al., 2019). Gaylor et al. (2023) examined trends in suicidal thoughts and behaviors among adolescents using data from the 2019 and 2021 YRBS and found that the prevalence of suicidal ideation among female adolescents increased from 24.1 % in 2019 to 30 % in 2021, and from 13.3 % in 2019 to 14.3 % in 2021 among male adolescents. We found a significant association between sex and objective and subjective weight, with females more likely to perceive themselves as overweight regardless of their objective weight. This finding corroborates other studies that have found significant sex differences in weight perception, with females more likely to perceive themselves as overweight regardless of their objective weight when compared to their male counterparts (Mann and Serrano, 2019; Martin et al., 2009; Schell-Busey et al., 2017). Gaylis et al. (2020) examined sex differences in the relationship between body weight perception and food choices among 1212 adolescents from Southern California and found that, across all BMI categories, more females perceived themselves as

overweight and tried to control their weight, whereas more males tried to gain weight or never tried to control their weight.

We found support for our hypothesis that, after controlling for demographic factors and risk factors for suicidal ideation, there is an association between objective and perceived weight and suicidal ideation, with stronger association for perceived weight. Indeed, the results from this study showed that adolescents perceiving themselves as overweight have nearly doubled the odds of experiencing suicidal ideation compared to their counterparts who do not perceive themselves as overweight, irrespective of their objective weight status. This association persists even after adjusting for established suicidal ideation risk factors, such as feelings of hopelessness, bullying, cyberbullying, substance use, and demographic variables. The findings of this study suggest that objective weight does not fundamentally drive the association between weight and suicidal ideation; instead, it is the perception of weight that amplifies suicidal thoughts. The prevalence of overweight and obesity among adolescents in the U.S. has been increasing over the past three decades, and has become a public health issue (Graham and Frisco, 2022; Heerman et al., 2024). Social stigma and documented discrimination associated with obesity among adolescents (Puhl and Brownell, 2013) may exacerbate feelings of not belonging, potentially increasing suicidal ideation. Future research should consider testing the mechanisms from which perceived weight is associated with suicidal ideation considering stigma and discrimination.

Furthermore, our analysis indicates notable differences between sexes in the association between objective and perceived weight and suicidal ideation. Specifically, for females, the perception of being overweight, irrespective of actual BMI, was consistently associated with higher odds of suicidal ideation. In contrast, males with a high BMI who did not perceive themselves as overweight exhibited lower odds of suicidal ideation. These findings underscore the differential impact of weight perception on suicidal ideation by sex, suggesting that weight perception might have a stronger effect on female adolescents compared to male adolescents. These results extend past literature, which has found that females tend to show greater dissatisfaction with their bodies than males (Gualdi-Russo et al., 2022), regarding both their own ideal and the silhouette they consider attractive. Additionally, our findings corroborates results from previous research using data from the National Longitudinal Study of Adolescent Health, where it was reported that overweight perception significantly increased the risk for suicidal ideation in girls but not in boys, after controlling for previously well-documented risk factors of suicidal ideation (Seo and Lee, 2013).

It is possible that social media might contribute to adolescents' misperception of their weight, leading to feelings of hopelessness and suicidal ideation. A recent study examining body dissatisfaction and social media use among adolescents from Australia, Canada, Chile, Mexico, the U.K., and the U.S. found that more time spent on social media was associated with an increased likelihood of perceiving one's body as larger than ideal (Hock et al., 2024). However, this relationship varies depending on the social media platform used, with adolescents reporting higher body dissatisfaction and a greater desire to be thinner if they spent more time on Facebook, Instagram, Snapchat, and TikTok than YouTube and Twitter (Hock et al., 2024). It has been suggested that this association might stem from the media's portrayal of unrealistic beauty standards, particularly for females, causing adolescents to internalize these ideals, constantly monitor their appearance, and compare themselves to attractive peers and celebrities (Hock et al., 2024). The constant self-comparison that arises from social media use has also been found to moderate the relationship between body dissatisfaction and suicidal ideation among a convenience sample of 580 adolescents from China (Fan et al., 2023). Additionally, social media may impact mood, with research finding that more time spent scrolling through news feeds and browsing friends' pictures was associated with problem concentration, fatigue, loneliness, depressed mood, and feelings of inferiority (Aalbers et al., 2019). Beyond sex differences, future studies should consider stratifying the analysis by age and sexual

identity to find out whether the association between objective and perceived weight and suicidal ideation might differ for adolescents based on age and sexual identity.

Furthermore, the finding of this study demonstrates that feelings of sadness or hopelessness and self-identifying as a sexual minority significantly increase the odds of suicidal ideation. For instance, adolescents experiencing feelings of sadness or hopelessness have almost ten-fold higher odds of contemplating suicide. This finding corroborates existing research that underscores the links between feelings of hopelessness, symptoms of depression and suicidal ideation among adolescents (Baiden et al., 2022; Grossberg and Rice, 2023; Nock et al., 2009). Self-identifying as a sexual minority also emerges as a significant risk factor for suicidal ideation, a finding that aligns with previous research identifying sexual identity as a risk factor for suicidal thoughts among adolescents (Baiden et al., 2020).

Physical activity emerged as a protective factor against suicidal ideation. This finding is consistent with past research that has identified the protective effect of physical activity on mental health and health risk behaviors such as depression and suicidal ideation (Bakken et al., 2024; Fabiano et al., 2023; Sibold et al., 2015). Vancampfort et al. (2018) conducted a systematic review and meta-analysis of 14 published studies on physical activity and suicidal ideation among adolescents and found seven studies confirmed the protective effect of physical activity on suicidal ideation, whereas the other seven studies found that physical activity was unrelated to suicidal ideation. Vancampfort et al. (2018) attributed this mixed finding to confounding factors such as underlying eating disorders, distorted body image, or the type of physical activity rather than the levels of physical activity. In support of this, a study by Southerland et al. (2016) also found that the level of physical activity was not related to suicidal ideation, but engagement in team activities was, likely due to the support from coaches and teammates.

#### 4.1. Implications

The findings of this study have public health implications for school counselors and mental health care practitioners who support adolescents struggling with perceptions of being overweight and/or disclosing suicidal ideation. Recognizing the link between body weight perception and suicidal ideation and its potential progression to suicide attempts is important. Counseling information about weight-related behaviors among adolescents who misperceive their weight might be useful for school counselors, social work practitioners, and clinicians in their counseling efforts. For instance, if an adolescent has a healthy BMI or BMI indicating they are underweight but they perceive themselves as overweight, the clinician might want to consider assessing weight-related behaviors and targeting counseling efforts to boost self-esteem and increase feelings of belongingness so as to prevent suicidal ideation. In addition, the findings of this study underscore the need for targeted, preventive interventions to address suicide risk in adolescents.

#### 4.2. Limitations

Notwithstanding the strength of this study, there are a number of limitations that are worth noting. First, the use of a cross-sectional data limits our ability to make any causal inferences between the study variables and suicidal ideation. For instance, it is possible that some adolescents may have experienced suicidal ideation prior to perceiving themselves as overweight. Hence, only association can be inferred. A study that utilizes longitudinal data might help us establish the temporal order between the study variables and suicidal ideation. Second, the use of secondary data limits our ability to examine other theoretically important factors that are known to influence suicidal ideation beyond perception of body weight, dietary habits, eating disorder, childhood physical abuse and neglect, and mental health diagnosis. Future studies should take into account these theoretically important factors to understand the true association between objective and perceived weight

and suicidal ideation. Another limitation of this study was the use of self-report data in calculating BMI. Some studies have found error in the use of self-reported height and weight in measuring BMI among adolescents, with adolescents overestimating their height and underestimating their weight (Gorber et al., 2007; Sherry et al., 2007). However, the measure of BMI in the YRBS has been found to have strong reliability, with minimal error or bias (Brener et al., 2013).

## 5. Conclusion

Despite these limitations, the current study highlights the complex association between adolescents' perception of weight and the risk of suicidal ideation, with findings indicating that self-perceived weight may have a more substantial impact on suicidal ideation than objective weight measurements. This study also delineates the significant role of feeling sad and hopeless, sexual identity, and substance use as factors that considerably heighten the likelihood of suicidal ideation among adolescents. These insights afford school counsellors and mental health practitioners with crucial information that could inform the development of targeted interventions, including routine screening for suicide ideation, to mitigate suicidality risks in this vulnerable population.

### CRediT authorship contribution statement

**Philip Baiden:** Writing – review & editing, Investigation, Data curation, Conceptualization. **Catalina Cañizares:** Writing – review & editing, Writing – original draft, Formal analysis, Conceptualization. **Catherine A. LaBrenz:** Writing – review & editing, Writing – original draft, Conceptualization. **Christina M. Sellers:** Writing – review & editing, Writing – original draft. **Yong Li:** Writing – review & editing. **Raymond M. Glikpo:** Writing – review & editing. **Kofi Sarkodie:** Writing – review & editing.

### Declaration of competing interest

The authors declare that they have no conflicts of interests with respect to the authorship and/or the publication of this manuscript.

### References

- Aalbers, G., McNally, R.J., Heeren, A., De Wit, S., Fried, E.I., 2019. Social media and depression symptoms: a network perspective. *J. Exp. Psychol. Gen.* 148 (8), 1454–1462.
- Anderson, L.M., Hayden, B.M., Tomasula, J.L., 2015. Sexual assault, overweight, and suicide attempts in US adolescents. *Suicide Life-Threat. Behav.* 45 (5), 529–540.
- Baiden, P., Kuire, V.Z., Shrestha, N., Tonui, B.C., Dako-Gyeke, M., Peters, K.K., 2019a. Bullying victimization as a predictor of suicidal ideation and suicide attempt among senior high school students in Ghana: results from the 2012 Ghana Global School-Based Health Survey. *J. Sch. Violence* 18 (2), 300–317.
- Baiden, P., LaBrenz, C.A., Asiedua-Baiden, G., Muehlenkamp, J.J., 2020. Examining the intersection of race/ethnicity and sexual orientation on suicidal ideation and suicide attempt among adolescents: findings from the 2017 Youth Risk Behavior Survey. *J. Psychiatr Res.* 125, 13–20.
- Baiden, P., LaBrenz, C.A., Broni, M.N., Baiden, J.F., Adepoju, O.E., 2024a. Prevalence of students experiencing homelessness and its association with suicidal behaviors: Findings from a population-based study. *Psychiatry Res.* 334, 115823. <https://doi.org/10.1016/j.psychres.2024.115823>.
- Baiden, P., LaBrenz, C.A., Harrell, D.R., Wood, B., Gobodzo, E.C., Baiden, J.F., Mets, V.E., Hagedorn, A., Howry, S.K., 2024b. Exposure to neighborhood violence and suicidal behaviors among adolescents in the United States: Findings from a population-based study. *Sch. Mental Health* 16, 161–176.
- Baiden, P., LaBrenz, C.A., Onyeaka, H.K., Muoghalu, C., Nicholas, J.K., Spoor, S.P., Bock, E., Taliaferro, L.A., 2022. Perceived racial discrimination and suicidal behaviors among racial and ethnic minority adolescents in the United States: findings from the 2021 adolescent behaviors and experiences survey. *Psychiatry Res.* 317, 114877.
- Baiden, P., Mengo, C., Boateng, G.O., Small, E., 2019b. Investigating the association between age at first alcohol use and suicidal ideation among high school students: evidence from the youth risk behavior surveillance system. *J. Affect. Disord.* 242, 60–67.
- Baiden, P., Onyeaka, H.K., Aneni, K., Wood, B., LaBrenz, C.A., Hagedorn, A., Muoghalu, C., Gobodzo, E.C., Baiden, J.F., Adeku, Y., Mets, V.E., Brown, F.A., 2023a. Racial/ethnic differences in adolescents' non-response to suicide attempt: Findings

- from the Youth Risk Behavior Survey, 2015–2019. *J. Psychiatric Res.* 166, 115–121. <https://doi.org/10.1016/j.jpsychires.2023.09.015>.
- Baiden, P., Park, Y., LaBrenz, C.A., Childress, S., 2024c. Exposure to neighborhood violence and gun carrying among adolescents in the United States: Findings from a population-based study. *J. Interp. Viol.* 39 (1–5), 3396–3423. <https://doi.org/10.1177/08862605241231616>.
- Baiden, P., Tadeo, S.K., 2020. Investigating the association between bullying victimization and suicidal ideation among adolescents: evidence from the 2017 Youth Risk Behavior Survey. *Child Abuse Negl.* 102, 104417.
- Baiden, P., Wood, B., LaBrenz, C.A., Onyeaka, H.K., Hagedorn, A., Vazquez, C.E., Muoghalu, C., Gobodzo, E.C., Baiden, J.F., Adeku, Y., Mets, V.E., Brown, F.A., 2023b. Investigating the co-occurrence of marijuana use and prescription opioid misuse with multiple suicide attempts among adolescents with a history of suicidal ideation. *Psychiatry Res.* 329, 115519. <https://doi.org/10.1016/j.psychres.2023.115519>.
- Bakken, V., Lydersen, S., Skokauskas, N., Sund, A.M., Kaasbøll, J., 2024. Protective factors for suicidal ideation: a prospective study from adolescence to adulthood. *Eur. Child Adolesc. Psychiatry*. <https://doi.org/10.1007/s00787-024-02379-w>.
- Bauman, S., Toomey, R.B., Walker, J.L., 2013. Associations among bullying, cyberbullying, and suicide in high school students. *J. Adolesc.* 36 (2), 341–350.
- Brener, N.D., Kann, L., Shanklin, S., Kinchen, S., Eaton, D.K., Hawkins, J., Flint, K.H., 2013. Methodology of the youth risk behavior surveillance system—2013. *Morb. Mortal. Wkly. Rep.: Recomm. Rep.* 62 (1), 1–20.
- Brochu, P.M., 2020. Weight stigma as a risk factor for suicidality. *Int. J. Obes.* 44 (10), 1979–1980.
- Bue, A.C.C., 2020. The looking glass selfie: instagram use frequency predicts visual attention to high-anxiety body regions in young women. *Comput. Human. Behav.* 108, 106329.
- Centers for Disease Control and Prevention. (2023). Youth Risk Behavior Survey Data Summary & Trends report: 2011–2021. National Center for HIV, Viral Hepatitis, STD, and TB Prevention Division of Adolescent and School Health.
- Dave, D., Rashad, I., 2009. Overweight status, self-perception, and suicidal behaviors among adolescents. *Soc. Sci. Med.* 68 (9), 1685–1691.
- Engeln, R., Loach, R., Imundo, M.N., Zola, A., 2020. Compared to Facebook, Instagram use causes more appearance comparison and lower body satisfaction in college women. *Body Image* 34, 38–45.
- Fabiano, N., Gupta, A., Fiedorowicz, J.G., Firth, J., Stubbs, B., Vancampfort, D., Schuch, F.B., Carr, L.J., Solmi, M., 2023. The effect of exercise on suicidal ideation and behaviors: a systematic review and meta-analysis of randomized controlled trials. *J. Affect. Disord.* 330, 355–366.
- Fan, Q., Li, Y., Gao, Y., Nazari, N., Griffiths, M.D., 2023. Self-compassion moderates the association between body dissatisfaction and suicidal ideation in adolescents: a cross-sectional study. *Int. J. Ment. Health Addict.* 21 (4), 2371–2388. <https://doi.org/10.1007/s11469-021-00727-4>.
- Franklin, J.C., Ribeiro, J.D., Fox, K.R., Bentley, K.H., Kleiman, E.M., Huang, X., Musacchio, K.M., Jaroszewski, A.C., Chang, B.P., Nock, M.K., 2017. Risk factors for suicidal thoughts and behaviors: a meta-analysis of 50 years of research. *Psychol. Bull.* 143 (2), 187–232.
- Garnett, M.F., Curtin, S.C., Stone, D.M., 2022. Suicide mortality in the United States, 2000–2020. *NCHS Data Brief* 433, 1–7.
- Gaylis, J.B., Levy, S.S., Hong, M.Y., 2020. Relationships between body weight perception, body mass index, physical activity, and food choices in Southern California male and female adolescents. *Int. J. Adolesc. Youth* 25 (1), 264–275. <https://doi.org/10.1080/02673843.2019.1614465>.
- Gaylor, E.M., Krause, K.H., Welder, L.E., Cooper, A.C., Ashley, C., Mack, K.A., Crosby, A. E., Trinh, E., Ivey-Stephenson, A.Z., Whittle, L., 2023. Suicidal thoughts and behaviors among high school students—Youth Risk Behavior Survey, United States, 2021. *MMWR Suppl.* 72 (1), 45–54.
- Gillen, M.M., Lefkowitz, E.S., 2011. Body size perceptions in racially/ethnically diverse men and women: implications for body image and self-esteem. *N. Am. J. Psychol.* 13 (3), 447–467.
- Gorber, S.C., Tremblay, M., Moher, D., Gorber, B., 2007. A comparison of direct vs. self-report measures for assessing height, weight and body mass index: a systematic review. *Obes. Rev.* 8 (4), 307–326. <https://doi.org/10.1111/j.1467-789X.2007.00347.x>.
- Graham, C., Frisco, M., 2022. The relationship between obesity and suicide ideation among young adults in the United States. *SSM-Popul. Health* 18, 101106.
- Grogan, S., 2021. *Body Image: Understanding Body Dissatisfaction in Men, Women and Children*. Routledge. <https://www.taylorfrancis.com/books/mono/10.4324/9781003100041/body-image-sarah-grogan>.
- Grossberg, A., Rice, T., 2023. Depression and suicidal behavior in adolescents. *Med. Clin.* 107 (1), 169–182.
- Gualdi-Russo, E., Rinaldo, N., Masotti, S., Bramanti, B., Zaccagni, L., 2022. Sex differences in body image perception and ideals: analysis of possible determinants. *Int. J. Environ. Res. Public Health* 19 (5), 2745.
- Hayward, J., Millar, L., Petersen, S., Swinburn, B., Lewis, A., 2014. When ignorance is bliss: weight perception, body mass index and quality of life in adolescents. *Int. J. Obes.* 38 (10), 1328–1334.
- Heerman, W.J., Kenney, E., Block, J.P., Fiechtner, L., McMahon, E., Kruse, L., Sharifi, M., Edmondson, E.K., Virudachalam, S., 2024. A narrative review of public health interventions for childhood obesity. *Curr. Obes. Rep.* 13 (1), 87–97. <https://doi.org/10.1007/s13679-023-00550-z>.
- Hock, K., Vanderlee, L., White, C.M., Hammond, D., 2024. Body weight perceptions among youth from six countries and associations with social media use: findings from the international food policy study. *J. Acad. Nutr. Diet.* <https://www.sciencedirect.com/science/article/pii/S2212267224005173>.
- Ivey-Stephenson, A.Z., Demissie, Z., Crosby, A.E., Stone, D.M., Gaylor, E., Wilkins, N., Lowry, R., Brown, M., 2020. Suicidal ideation and behaviors among high school students—Youth Risk Behavior Survey, United States, 2019. *MMWR Suppl.* 69 (1), 47–55.
- Iwatate, E., Atem, F.D., Jones, E.C., Hughes, J.L., Yokoo, T., Messiah, S.E., 2023. Association of obesity, suicide behaviors, and psychosocial wellness among adolescents in the United States. *J. Adolesc. Health* 72 (4), 526–534.
- Jacob, L., Stubbs, B., Firth, J., Smith, L., Haro, J.M., Koyanagi, A., 2020. Fast food consumption and suicide attempts among adolescents aged 12–15 years from 32 countries. *J. Affect. Disord.* 266, 63–70.
- Jin, Z., Li, R., Xu, H., Rong, F., Xiao, W., Yu, W., Sun, Y., Zhang, S., Tao, F., Wan, Y., 2022. Interaction effects of screen time and fast-food consumption on suicidal behaviours: evidence from a nationwide survey among Chinese adolescents. *J. Affect. Disord.* 319, 164–171.
- John, A., Glendenning, A.C., Marchant, A., Montgomery, P., Stewart, A., Wood, S., Lloyd, K., Hawton, K., 2018. Self-harm, suicidal behaviours, and cyberbullying in children and young people: systematic review. *J. Med. Internet Res.* 20 (4), e9044.
- Kann, L., McManus, T., Harris, W.A., Shanklin, S.L., Flint, K.H., Queen, B., Lowry, R., Chyen, D., Whittle, L., & Thornton, J. (2018). Youth risk behavior surveillance—United States, 2017. *MMWR Surveillance Summaries*, 67(8), 1–114.
- Karsay, K., Treksels, J., Eggermont, S., Vandenbosch, L., 2021. I (Don't) Respect My Body": investigating the role of mass media use and self-objectification on adolescents' positive body image in a cross-national study. *Mass Commun. Soc.* 24 (1), 57–84.
- Kernan, A.R., Jones, M.S., Lehmann, P.S., Meldrum, R.C., 2023. The intersection of race, ethnicity, and gender and the prevalence of suicidal thoughts and behaviors. *Prev. Med. Rep.* 36, 102426.
- Kim, J., Fletcher, J.M., 2021. The effects of relative body weight on socioemotional and schooling outcomes among female adolescents in the United States. *Soc. Sci. Med.* 289, 114418.
- Kim, J.S., Seo, Y., 2023. Breakfast habits, sedentary behavior, and suicide among Korean adolescents: a cross-sectional national study. *PLoS One* 18 (5), e0285312.
- Koyanagi, A., Oh, H., Carvalho, A.F., Smith, L., Haro, J.M., Vancampfort, D., Stubbs, B., DeVylder, J.E., 2019. Bullying victimization and suicide attempt among adolescents aged 12–15 years from 48 countries. *J. Am. Acad. Child Adolesc. Psychiatry* 58 (9), 907–918.
- Lee, J., Jang, H., Kim, J., Min, S., 2019. Development of a suicide index model in general adolescents using the South Korea 2012–2016 national representative survey data. *Sci. Rep.* 9 (1), 1846.
- Lee, J.W., Kim, B.J., Lee, C.S., Cha, B., Lee, S.J., Lee, D., Seo, J., Lee, Y.J., Lee, Y.J., Lim, E., 2021. Association between suicide and drinking habits in adolescents. *J. Korean Acad. Child Adolesc. Psychiatry* 32 (4), 161–169.
- Liu, B.P., Jia, C.X., Li, S.X., 2023. The association of weight control attempts with suicidality: the role of objective weight status and weight perception among adolescents of United States. *J. Affect. Disord.* 325, 369–377.
- Mann, G., Serrano, E., 2019. The association between weight perception and weight intention in middle school Appalachian students. *Public Health* 171, 135–138.
- Marks, R.J., De Foe, A., Collett, J., 2020. The pursuit of wellness: social media, body image and eating disorders. *Child Youth. Serv. Rev.* 119, 105659.
- Martin, M.A., Frisco, M.L., May, A.L., 2009. Gender and race/ethnic differences in inaccurate weight perceptions among US adolescents. *Women's Health Issues* 19 (5), 292–299.
- Moorman, E.L., Warnick, J.L., Acharya, R., Janicke, D.M., 2020. The use of internet sources for nutritional information is linked to weight perception and disordered eating in young adolescents. *Appetite* 154, 104782.
- Morris-Perez, P., Abenavoli, R., Benzekri, A., Rosenbach-Jordan, S., Boccieri, G.R., 2023. Preventing adolescent suicide: recommendations for policymakers, practitioners, program developers, and researchers. *Soc. Policy Rep.* 36 (3), 1–32.
- Mpofu, J.J., Underwood, J.M., Thornton, J.E., Brener, N.D., Rico, A., Kilmer, G., Harris, W.A., Leon-Nguyen, M., Chyen, D., Lim, C., 2023. Overview and methods for the Youth Risk Behavior Surveillance System—United States, 2021. *MMWR Suppl.* 72 (1), 1–12.
- Naslund, J.A., Bondre, A., Torous, J., Aschbrenner, K.A., 2020. Social media and mental health: benefits, risks, and opportunities for research and practice. *J. Technol. Behav. Sci.* 5, 245–257.
- Nock, M.K., Hwang, I., Sampson, N., Kessler, R.C., Angermeyer, M., Beautrais, A., Borges, G., Bromet, E., Bruffaerts, R., De Girolamo, G., 2009. Cross-national analysis of the associations among mental disorders and suicidal behavior: findings from the WHO World Mental Health Surveys. *PLoS Med.* 6 (8), e1000123.
- Park, H., Lee, K., 2022. Association between breakfast consumption and suicidal attempts in adolescents. *Psychol. Res. Behav. Manage.* 15, 2529–2541.
- Park, S., Lee, Y., Lee, J.H., 2016. Association between energy drink intake, sleep, stress, and suicidality in Korean adolescents: energy drink use in isolation or in combination with junk food consumption. *Nutr. J.* 15, 1–8.
- Puhl, R., Brownell, K.D., 2013. Bias, discrimination and obesity. *Health Hum. Rights Chang. World* 581–606.
- Ribeiro, J.D., Huang, X., Fox, K.R., Franklin, J.C., 2018. Depression and hopelessness as risk factors for suicide ideation, attempts and death: meta-analysis of longitudinal studies. *Br. J. Psychiatry* 212 (5), 279–286.
- Saxton, J., Hill, C., Chadwick, P., Wardle, J., 2009. Weight status and perceived body size in children. *Arch. Dis. Child.* 94 (12), 944–949.
- Schell-Busey, N., Connell, N.M., Kahle, L., 2017. Weight, perceptions, and bullying: what kind of pounds matter? *J. Child Fam. Stud.* 26 (8), 2101–2113.
- Seo, D.C., Lee, C.G., 2013. The effect of perceived body weight on suicidal ideation among a representative sample of US adolescents. *J. Behav. Med.* 36, 498–507.

- Sherry, B., Jefferds, M.E., Grummer-Strawn, L.M., 2007. Accuracy of adolescent self-report of height and weight in assessing overweight status: a literature review. *Arch. Pediatr. Adolesc. Med.* 161 (12), 1154–1161.
- Sibold, J., Edwards, E., Murray-Close, D., Hudziak, J.J., 2015. Physical activity, sadness, and suicidality in bullied US adolescents. *J. Am. Acad. Child Adolesc. Psychiatry* 54 (10), 808–815.
- Singh, S., Thompson, C.J., Kak, R., Smith, L.N., Quainoo, N., 2021. Impact of body weight perceptions and electronic bullying on suicide-related risk behaviors among Youth: results from Youth Risk Behavior Surveillance System, 2015. *J. School Health* 91 (1), 29–36.
- Song, K., Lee, J., Lee, S., Jeon, S., Lee, H.S., Kim, H.S., Chae, H.W., 2023. Height and subjective body image are associated with suicide ideation among Korean adolescents. *Front. Psychiatry* 14, 1172940.
- Southerland, J.L., Zheng, S., Dula, M., Cao, Y., Slawson, D.L., 2016. Relationship between physical activity and suicidal behaviors among 65,182 middle school students. *J. Phys. Act. Health* 13 (8), 809–815.
- Swahn, M.H., Reynolds, M.R., Tice, M., Miranda-Pierangeli, M.C., Jones, C.R., Jones, I. R., 2009. Perceived overweight, BMI, and risk for suicide attempts: findings from the 2007 Youth Risk Behavior Survey. *J. Adolesc. Health* 45 (3), 292–295.
- Underwood, J.M., Brener, N., Thornton, J., Harris, W.A., Bryan, L.N., Shanklin, S.L., Deputy, N., Roberts, A.M., Queen, B., Chyen, D., 2020. Overview and methods for the youth risk behavior surveillance system—United States, 2019. *MMWR Suppl.* 69 (1), 1–10.
- Vancampfort, D., Hallgren, M., Firth, J., Rosenbaum, S., Schuch, F.B., Mugisha, J., Probst, M., Van Damme, T., Carvalho, A.F., Stubbs, B., 2018. Physical activity and suicidal ideation: a systematic review and meta-analysis. *J. Affect. Disord.* 225, 438–448.
- Vandenbosch, L., Fardouly, J., Tiggemann, M., 2022. Social media and body image: recent trends and future directions. *Curr. Opin. Psychol.* 45, 101289.
- Von Elm, E., Altman, D.G., Egger, M., Pocock, S.J., Gøtzsche, P.C., Vandenbroucke, J.P., 2007. The strengthening of reporting of observational studies in epidemiology (STROBE) statement: guidelines for reporting observational studies. *Lancet* 370 (9596), 1453–1457.
- Wolfe, K.L., Nakonezny, P.A., Owen, V.J., Rial, K.V., Moorehead, A.P., Kennard, B.D., Emslie, G.J., 2019. Hopelessness as a predictor of suicide ideation in depressed male and female adolescent youth. *Suicide Life-Threat. Behav.* 49 (1), 253–263.
- Xiao, Y., Romanelli, M., Lindsey, M.A., 2019. A latent class analysis of health lifestyles and suicidal behaviors among US adolescents. *J. Affect. Disord.* 255, 116–126.
- Yu, B., Chen, X., 2019. Age and birth cohort-adjusted rates of suicide mortality among US male and female youths aged 10 to 19 years from 1999 to 2017. *JAMA Netw. Open* 2 (9), e1911383. –e1911383.
- Zeller, M.H., Reiter-Purtill, J., Jenkins, T.M., Ratcliff, M.B., 2013. Adolescent suicidal behavior across the excess weight status spectrum. *Obesity* 21 (5), 1039–1045.
- Zhang, J., Yan, F., Li, Y., McKeown, R.E., 2013. Body mass index and suicidal behaviors: a critical review of epidemiological evidence. *J. Affect. Disord.* 148 (2–3), 147–160.
- Zhang, M.Z., Tang, R., Rao, W.M., Wang, M.H., Liu, M.W., Yu, H., He, Q.Q., 2022. Body mass index and the risk of suicidal ideation and suicide attempt among youth in 45 low-and middle-income countries. *J. Affect. Disord.* 298, 357–363.
- Ziminski, D., Szlyk, H.S., Baiden, P., Okine, L., Onyeaka, H.K., Muoghalu, C., Cavazos-Rehg, P., 2022. Sports-and physical activity-related concussion and mental health among adolescents: findings from the 2017 and 2019 Youth Risk Behavior Survey. *Psychiatry Res.* 312, 114542.
- Zurowski, K.L., Cero, I., Witte, T.K., Zeng, P., 2017. The quadratic relationship between body mass index and suicide ideation: a nonlinear analysis of indirect effects. *Suicide Life-Threat. Behav.* 47 (2), 155–167.