

## ORIGINAL RESEARCH

# Association of Obesity With Psychological Distress in Young Adults

## Patterns by Sex and Race or Ethnicity



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## ABSTRACT

**BACKGROUND** Recent studies have emphasized the intricate relationship between obesity and psychological distress, unraveling the complex interplay of biological, psychological, and sociocultural factors. However, a conspicuous knowledge gap persists in understanding the association between obesity severity and psychological distress, particularly in young adults, marked by limited empirical data.

**OBJECTIVES** This study comprehensively investigates the link between obesity and psychological distress among young adults, emphasizing potential variations based on gender and race or ethnicity. Addressing this gap is crucial for informing targeted interventions and understanding the nuanced impact of obesity on mental health in this demographic.

**METHODS** Utilizing data from the 2013 to 2018 National Health Interview Survey, individuals aged 18 to 26 years were analyzed. Body mass index served as the primary exposure variable, with the Kessler Psychological Distress Scale assessing the primary outcome. Fully-adjusted ordinal regression models were employed for analyses.

**RESULTS** Among the 20,954 participants included in this study, representing 35,564,990 adults, 27% were overweight and 24% had obesity. In class III obesity, individuals experienced 1.4 times more psychological distress than those with normal weight (OR: 1.393; 95% CI: 1.181-1.644;  $P < 0.001$ ). Subgroup analyses revealed consistent trends in non-Hispanic White (OR: 1.615; 95% CI: 1.283-2.032;  $P < 0.001$ ) and female participants (OR: 1.408; 95% CI: 1.408-2.096;  $P < 0.001$ ).

**CONCLUSIONS** This study underscores the association between obesity and psychological distress in young adults, notably impacting non-Hispanic White and female populations. The findings bear significant implications for shaping future health policies, addressing the mental health crisis, and mitigating the increasing prevalence of obesity among young U.S. adults. (JACC Adv 2024;3:101115) © 2024 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Young adults, commonly defined as those aged 18 to 26 years, represent a critical phase in the human life course marked by numerous physical, psychological, and social transformations.<sup>1,2</sup>

During this stage, individuals grapple with the demands of higher education, employment, and interpersonal relationships, each of which can impose significant stressors.<sup>1-3</sup> Consequently, young adults

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**ABBREVIATIONS  
AND ACRONYMS****BMI** = body mass index**NHIS** = National Health  
Interview Survey**SDoH** = social determinants of  
health

not only contend with societal expectations regarding beauty standards and concerns related to body image but also encounter unique psychosocial stressors that have the potential to affect their mental well-being.

The increasing prevalence of overweight and obesity among the young and nonelderly population in the United States has emerged as a global public health challenge, with profound implications for both physical and mental well-being.<sup>4-6</sup> Recent studies have emphasized the complex relationship between obesity and psychological distress, shedding light on the intricate interplay among biological, psychological, and sociocultural factors.<sup>7-9</sup> However, the existing literature on the association between obesity severity and psychological distress, especially in young adults, reveals a notable knowledge gap marked by limited empirical data and evidence. Understanding these dynamics is crucial, as psychological distress, encompassing conditions such as depression and anxiety, represents a substantial burden on individuals and societies alike.

Within this context, the associations between obesity and psychological distress assume particular prominence, providing valuable insights for targeted public health strategies that can address the diverse needs of this critical demographic. Therefore, the objective of this study is to thoroughly investigate the complex link between obesity and psychological distress among young adults, with a particular emphasis on understanding how these connections may differ depending on gender and race or ethnicity.

**METHODS**

**STUDY POPULATION.** We utilized data from the National Health Interview Survey (NHIS), which is conducted annually by the National Center for Health Statistics, a part of the Centers for Disease Control and Prevention.<sup>10</sup> The NHIS is a survey covering the U.S. civilian, noninstitutionalized population. Sampling and interviews take place throughout the year, with respondents providing information on socio-demographic characteristics, health status, disability, behavior indicators, and patterns of health care access and utilization. The NHIS comprises six data files: family, household, persons, sample adult, sample child, and para-data files. For our analysis, we utilized data from the family, person, and sample adult files. To address missing data on family income and personal earnings, we merged these files with supplementary imputed income files. Comprehensive details on the multiple-imputation methodology for each survey year can be found on the NHIS website.<sup>11</sup>

We utilized data from individuals aged 18 to 26 years, extracted from the 2013 to 2018 NHIS. Approval from the institutional review board at Houston Methodist was deemed unnecessary for this study, as the data are publicly accessible and de-identified.

**PRIMARY EXPOSURE.** The primary exposure of the study was body mass index (BMI). BMI ( $\text{kg}/\text{m}^2$ ) was calculated using two components: height, measured by the question "How tall are you without shoes?" and weight, assessed through the question "How much do you weigh without shoes?" In the interviewed adult population, we excluded individuals with a BMI classified as underweight ( $<18.5 \text{ kg}/\text{m}^2$ ) due to its common association with comorbidities. Respondents in the study were categorized into distinct BMI groups based on the following ranges: normal weight ( $18.5$  to  $<25.0 \text{ kg}/\text{m}^2$ ), overweight ( $25$  to  $<30 \text{ kg}/\text{m}^2$ ), class I obesity ( $30$  to  $<35 \text{ kg}/\text{m}^2$ ), class II obesity ( $35$  to  $<40 \text{ kg}/\text{m}^2$ ), and class III obesity ( $\geq 40 \text{ kg}/\text{m}^2$ ).

**COVARIATES.** We used Healthy People 2030 and the Kaiser Family Foundation's Social Determinants of Health (SDoH) frameworks to structure NHIS data across six domains: economic stability, neighborhood/physical environment, community and social context, food insecurity, education, and health care system. Each respondent's SDoH variable was scored 0 or 1 (favorable or unfavorable). For example, a person's family income level received a "0" for middle-high income and "1" for low income. This scoring method was consistently applied to 40 SDoH variables from 2013 to 2018, and the values were aggregated for each respondent. Refer to [Supplemental Table 1](#) for the survey items collecting SDoH information.

Other covariates included age, sex (men and women), race or ethnicity (non-Hispanic White, non-Hispanic Black, and Hispanic), and comorbidities. The comorbidities included hypertension, diabetes, smoking status, cancer, arthritis, atherosclerotic cardiovascular disease (encompassing diagnoses like angina pectoris, myocardial infarction, coronary heart disease, or stroke), asthma, chronic liver disease, and chronic kidney disease.

**OUTCOMES.** The primary outcome of this study was psychological distress as assessed through the K6, a concise 6-item scale within the Kessler Psychological Distress Scale.<sup>12</sup> Developed for general-purpose health surveys, the K6 is valued for its brevity, robust psychometric properties, and its consistent ability to differentiate between Diagnostic and Statistical Manual of Mental Disorders-Fourth Edition

**TABLE 1** Baseline Characteristics of Study Population According to Obesity Status

	Total (N = 20,954)	Nonobese (n = 16,231)	Obese (n = 4,723)	P Value
Age, y	22.4 ± 2.5	22.3 ± 2.5	22.7 ± 2.5	<0.001
Sex				
Male	10,236 (48.8%)	8,175 (50.4%)	2,061 (43.6%)	<0.001
Female	10,718 (51.2%)	8,056 (49.6%)	2,662 (56.4%)	
Race or ethnicity				
Non-Hispanic White	11,961 (57.1%)	9,542 (58.8%)	2,419 (51.2%)	<0.001
Non-Hispanic Black	2,923 (13.9%)	2,036 (12.5%)	887 (18.8%)	
Hispanic	4,312 (20.6%)	3,153 (19.4%)	1,159 (24.5%)	
BMI categories				
Normal	10,489 (50.1%)	10,489 (64.6%)	0 (0.0%)	<0.001
Overweight	5,742 (27.4%)	5,742 (35.4%)	0 (0.0%)	
Class I	2,576 (12.3%)	0 (0.0%)	2,576 (54.5%)	
Class II	1,073 (5.1%)	0 (0.0%)	1,073 (22.7%)	
Class III	1,074 (5.1%)	0 (0.0%)	1,074 (22.7%)	
Hypertension	1,232 (5.9%)	650 (4.0%)	582 (12.3%)	<0.001
Diabetes mellitus	218 (1.0%)	109 (0.7%)	109 (2.3%)	<0.001
ASCVD status	132 (0.6%)	86 (0.5%)	46 (1.0%)	<0.001
Coronary heart disease	94 (0.4%)	60 (0.4%)	34 (0.7%)	0.002
Stroke	39 (0.2%)	27 (0.2%)	12 (0.3%)	0.22
Smoking status	3,246 (15.5%)	2,429 (15.0%)	817 (17.3%)	<0.001
COPD	40 (0.2%)	36 (0.2%)	4 (0.1%)	0.057
Cancer	168 (0.8%)	124 (0.8%)	44 (0.9%)	0.26
Kidney failure	99 (0.5%)	71 (0.4%)	28 (0.6%)	0.17
Chronic liver disease	69 (0.3%)	50 (0.3%)	19 (0.4%)	0.32
Low-income	10,888 (54.5%)	8,333 (53.8%)	2,555 (57.3%)	<0.001
≤ High school	7,689 (36.7%)	5,555 (34.3%)	2,134 (45.3%)	<0.001
Food insecurity	2,600 (12.4%)	1,797 (11.1%)	803 (17.0%)	<0.001
Uninsured	3,598 (17.5%)	2,669 (16.8%)	929 (20.0%)	<0.001
Aggregated SDoH score	11.5 (5.1)	11.2 (5.0)	12.5 (5.5)	<0.001
SDoH quartile groups				
SDoH-Q1	6,827 (32.6%)	5,629 (34.7%)	1,198 (25.4%)	<0.001
SDoH-Q2	3,996 (19.1%)	3,199 (19.7%)	797 (16.9%)	
SDoH-Q3	5,193 (24.8%)	3,915 (24.1%)	1,278 (27.1%)	
SDoH-Q4	4,938 (23.6%)	3,488 (21.5%)	1,450 (30.7%)	
Kessler K6 Scale (0-24)	2.9 ± 3.8	2.8 ± 3.7	3.3 ± 4.1	<0.001
Kessler K6 Classes				
No-law	17,925 (85.5%)	14,044 (86.5%)	3,881 (82.2%)	<0.001
Mild/moderate	2,369 (11.3%)	1,735 (10.7%)	634 (13.4%)	
Severe	660 (3.1%)	452 (2.8%)	208 (4.4%)	

Values are mean ± SD or n (%).  
 ASCVD = atherosclerotic cardiovascular disease; BMI = body mass index; COPD = chronic obstructive pulmonary disease; SDoH = social determinants of health.

cases and noncases across various sociodemographic subsamples.<sup>13</sup>

The K6 inquiries revolve around how frequently, during the past 30 days, respondents felt nervous, hopeless, restless, or fidgety; experienced such deep depression that nothing could uplift their spirits; believed that everything was an effort; or felt worthless. Responses are gauged on a 4-point scale (none of the time, a little of the time, most of the time, or all of the time). The sum of the response codes for the 6 items yields a score ranging from 0 to 24, where higher scores indicate greater psychological

distress. Both the continuous and categorical versions of the K6 score were analyzed in the present study. Categories of K6 scores were established utilizing cut-points from previous literature: no/low psychological distress (0-6), mild-moderate psychological distress (7-12), and severe distress (13-24).<sup>12</sup>

**STATISTICAL ANALYSES.** Participant characteristics were summarized with mean and standard deviation for continuous variables and frequencies with percentages for categorical variables.

We conducted a series of ordinal regression analyses, both univariable and multivariable, to explore

**TABLE 2 Uni-Multivariable Ordinal Regression Results Across Weight Categories**

	OR (95% CI)	P Value
<b>Unadjusted</b>		
Normal	1.000 (ref)	N/A
Overweight	1.040 (0.948-1.143)	0.401
Class I	1.240 (1.101-1.397)	<0.001
Class II	1.499 (1.272-1.765)	<0.001
Class III	1.816 (1.554-2.121)	<0.001
<b>Age-adjusted</b>		
Normal	1.000 (ref)	N/A
Overweight	1.043 (0.950-1.145)	0.378
Class I	1.243 (1.104-1.401)	<0.001
Class II	1.504 (1.277-1.771)	<0.001
Class III	1.822 (1.277-1.771)	<0.001
<b>Age, sex, and race-adjusted</b>		
Normal	1.000 (ref)	N/A
Overweight	1.089 (0.991-1.197)	0.076
Class I	1.260 (1.117-1.420)	<0.001
Class II	1.508 (1.279-1.778)	<0.001
Class III	1.726 (1.476-2.019)	<0.001
<b>Age, sex, race, and comorbidities-adjusted</b>		
Normal	1.000 (ref)	N/A
Overweight	1.055 (0.957-1.163)	0.285
Class I	1.101 (0.970-1.250)	0.138
Class II	1.330 (1.119-1.582)	0.001
Class III	1.422 (1.199-1.687)	<0.001
<b>Age, sex, race, and SDoH-adjusted</b>		
Normal	1.000 (ref)	N/A
Overweight	1.089 (0.989-1.199)	0.083
Class I	1.222 (1.083-1.380)	0.001
Class II	1.450 (1.228-1.713)	<0.001
Class III	1.610 (1.374-1.888)	<0.001
<b>Fully (age, sex, race, comorbidities, and SDoH) adjusted</b>		
Normal	1.000 (ref)	N/A
Overweight	1.061 (0.964-1.169)	0.223
Class I	1.119 (0.987-1.267)	0.077
Class II	1.293 (1.088-1.535)	<0.001
Class III	1.393 (1.181-1.644)	<0.001

SDoH = social determinants of health.

the independent associations between weight categories and categories of K6 score. Similar models were developed to examine subgroups based on sex and race or ethnicity. Additionally, we employed fully-adjusted multivariable linear models to assess the continuous Kessler score (ranging from 0 to 24) within subgroups defined by weight categories, sex, and race or ethnicity. Finally, a restricted fully-adjusted cubic spline regression model with 4 knots was used to display the association between both continuous BMI and Kessler K6 scale.

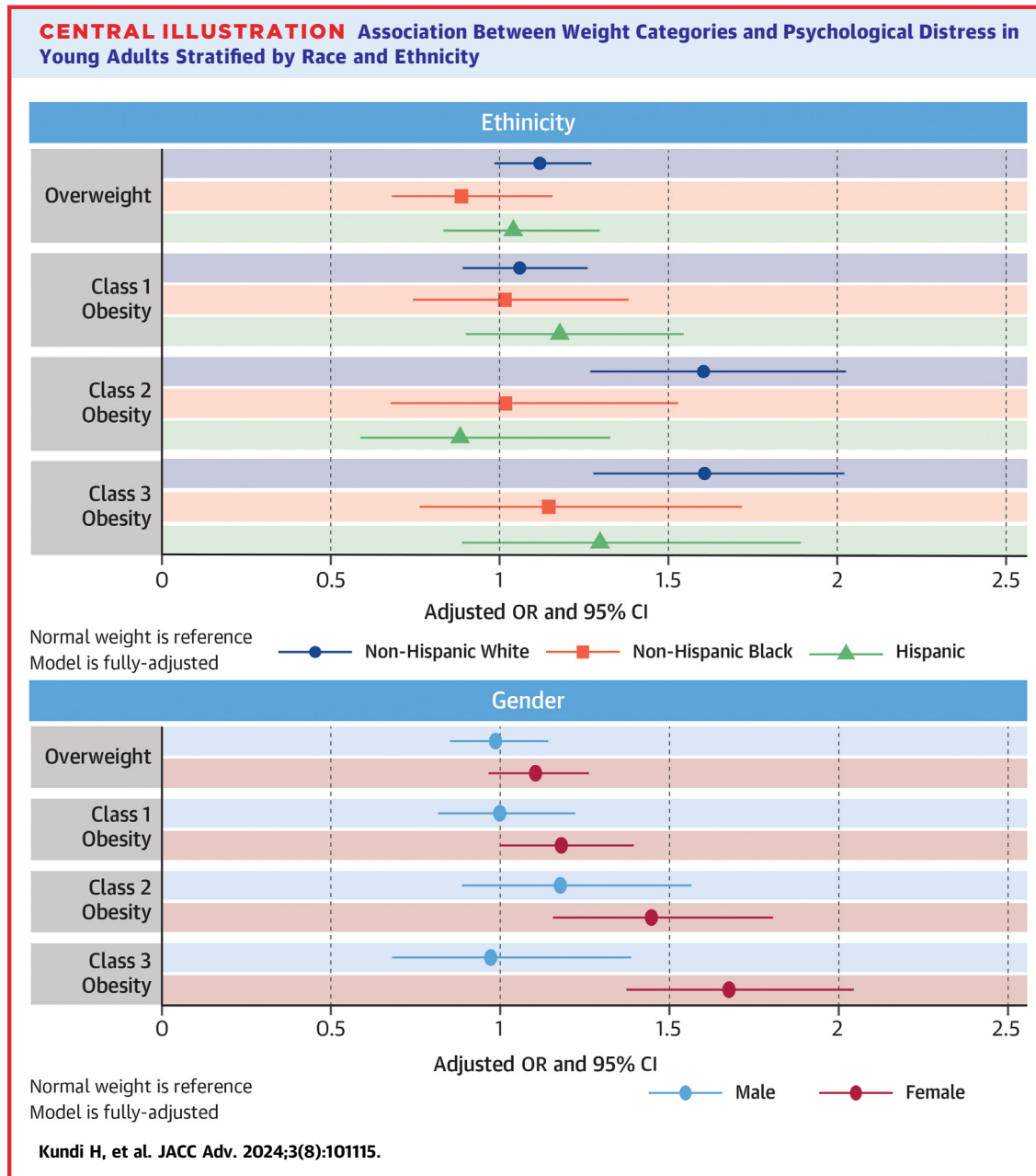
All statistical analyses were carried out using Stata MP version 17.0 (StataCorp), with a 2-tailed *P* value of <0.05 considered statistically significant.

## RESULTS

Final analytic sample included 20,954 participants representing 35,564,990 U.S. adults (49% women; 57.1% non-Hispanic White, 13.9% non-Hispanic Black, and 20.6% Hispanic). The prevalence of overweight and obesity in the study population were 27% and 24% (13% class I obesity, 6% class II obesity, and 5% class III obesity), respectively. The mean Kessler K6 score for the entire population was  $2.9 \pm 3.8$ . Mean K6 score was higher in individuals with obesity ( $3.3 \pm 4.1$ ) than those with healthy weight ( $2.8 \pm 3.7$ ),  $P < 0.001$ . Similarly, the prevalence of mild/moderate and severe psychological distress was relatively higher among the obesity group (mild/moderate = 13.4%; severe = 4.4%) compared to healthy weight individuals (mild/moderate = 10.7%; severe = 2.8%) ( $P < 0.001$ ) (Table 1).

As shown in Table 2, ordinal regression analyses revealed that in the unadjusted model, all weight categories (with normal weight as the reference) exhibit statistically significant associations with the physiological distress (Kessler K6), excluding overweight. Following adjustments for age, sex, race, comorbidities, and SDoH, the associations remain significantly elevated for all higher obesity classes. Notably, individuals with class III obesity are 1.4 times more likely to experience psychological distress, demonstrating the strongest association with the outcome across all adjustment levels, as indicated by an adjusted ORs of 1.393 (95% CI: 1.181-1.644,  $P < 0.001$ ). In subgroup analyses, similar results were observed in the non-Hispanic White 1.615 (95% CI: 1.283-2.032,  $P < 0.001$ ) and female 1.408 (95% CI: 1.408-2.096,  $P < 0.001$ ), but significance was not observed in the Hispanic, non-Hispanic Black, and male subgroups (Central Illustration).

In fully-adjusted linear regression analyses (Figure 1), where the outcome was defined as the Kessler K6 continuous scale ranging from 0 to 24, the predicted Kessler K6 scale exhibits a gradual increase corresponding to higher weight categories. The mean beta coefficient was 0.191 (0.140-0.232),  $P < 0.001$ , highlighting the positive association between weight category and the predicted Kessler K6 scale. The mean for the predicted Kessler K6 scale was  $2.8 \pm 0.7$  for normal weight and  $3.6 \pm 1.0$  for class III obesity ( $P < 0.001$ ). In subgroup analyses (Figure 2), the mean for the predicted Kessler K6 scale varied:  $3.0 \pm 0.8$  in non-Hispanic White,  $2.8 \pm 0.9$  in non-Hispanic Black, and  $2.6 \pm 0.8$  in Hispanic individuals ( $P < 0.001$ ). Additionally, the scale was  $2.6 \pm 0.7$  for males and  $3.2 \pm 0.7$  for females ( $P < 0.001$ ). After adjustment for age, sex, race or ethnicity, comorbidities, and SDoH,

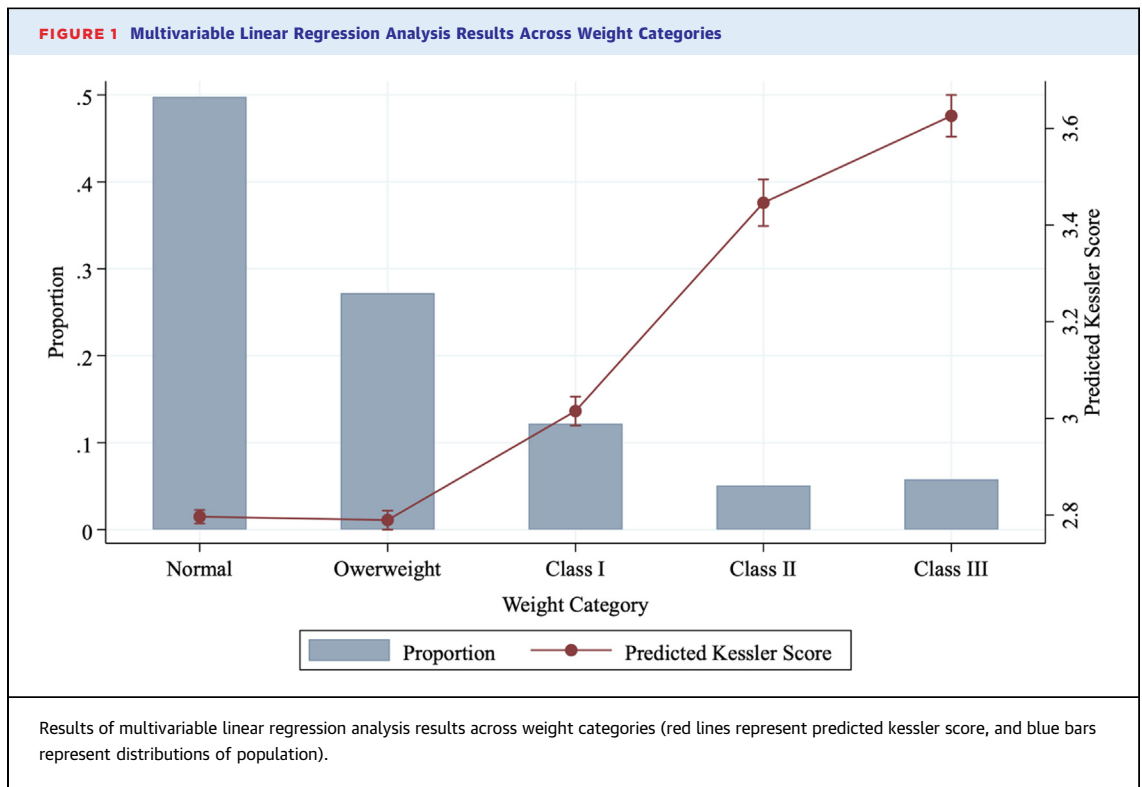


the risk of psychological distress, as assessed by Kessler K6, is elevated at both low and particularly high BMI values (reference for BMI was 24 kg/m<sup>2</sup>) (Figure 3).

### DISCUSSION

Our study addresses a notable knowledge gap in the relationship between obesity and psychological distress, making significant contributions to the existing literature. Specifically, it stands out as one of the few large-scale, community-level studies that

comprehensively assesses the obesity-psychological distress relationship in a national sample of young adults in the United States. This approach allows for a more robust and representative understanding of the relationship between obesity and psychological distress on a broader scale. Furthermore, our study goes beyond a general examination by delving into the intricacies of sociodemographic variability, offering a nuanced investigation into how factors such as age, gender, and race intersect with the obesity-psychological distress relationship. This adds a layer of complexity and depth to the current understanding



of the subject, providing valuable insights for both research and practical applications.

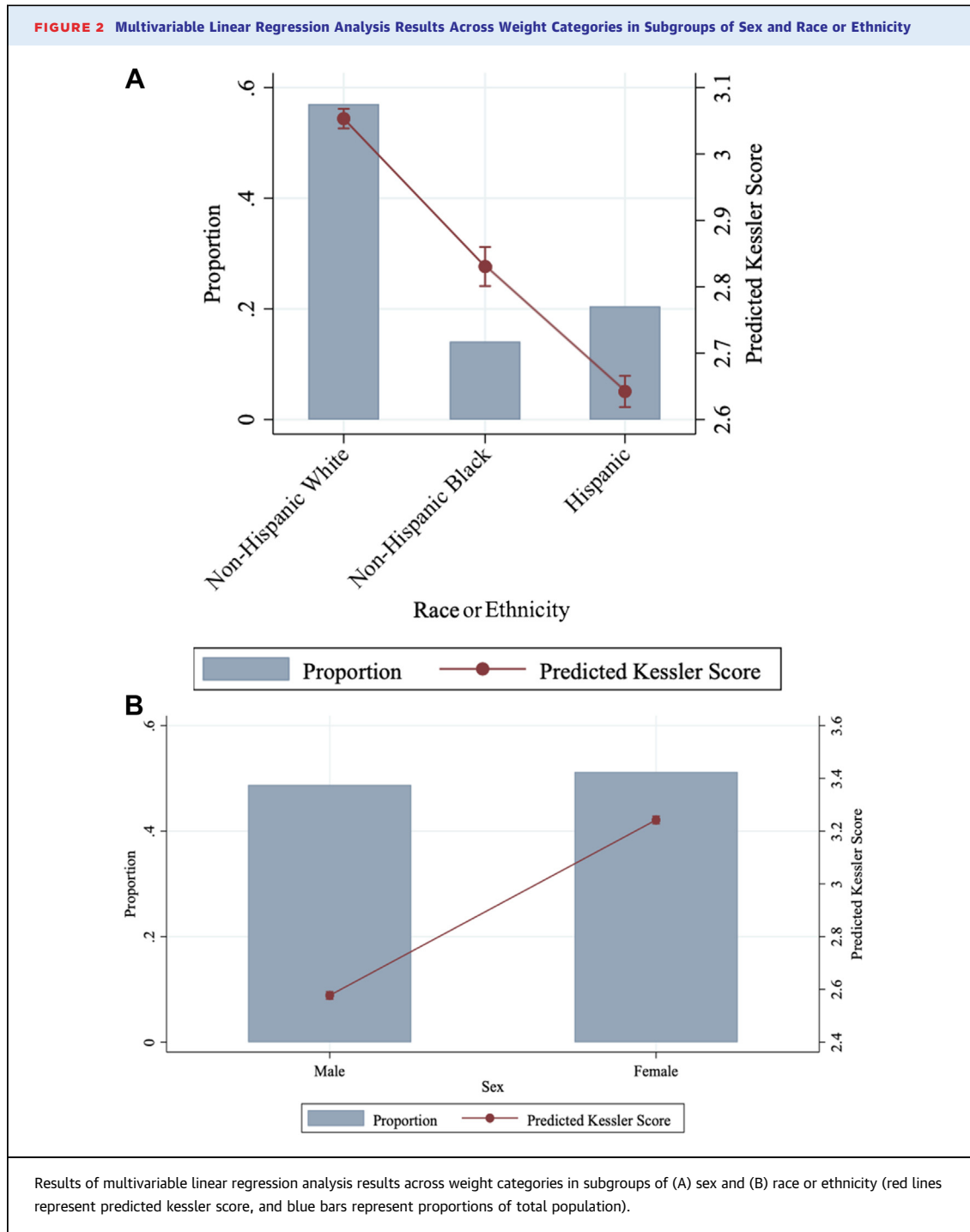
Young adults are at a pivotal stage of development in which they experience a unique subset of stressors and SDoH that contribute to an elevated risk of experiencing psychological distress. Obese individuals, especially young adults, are more likely to experience weight-based stigmatization and bullying, contributing to elevated levels of psychological distress.<sup>4,6</sup> This stigmatization can result in a cycle of maladaptive behavior including binge eating, resulting in an increased risk of developing future comorbidities and elevated psychological distress.<sup>4,14</sup> Our findings underscore the robustness of the observed associations between weight categories and the psychological distress, highlighting the importance of accounting for diverse demographic and health factors in comprehending the relationships within the young adults. In this study, it was determined that heightened levels of psychological distress are positively associated with obesity risk and that this relationship is the strongest for class II and III obese young adults.

Females are especially vulnerable to negative self-perceptions of body image, which is amplified by beauty standards frequently displayed in western media.<sup>15</sup> While studies have indicated that the

frequency of weight-related stigma may be similar among men and women, female adolescents exhibit greater psychological distress when experiencing stigmatization.<sup>16</sup> The results of this study confirm that females with obesity experience higher levels of psychological distress compared to males (2.6 for males and 3.2 for females).

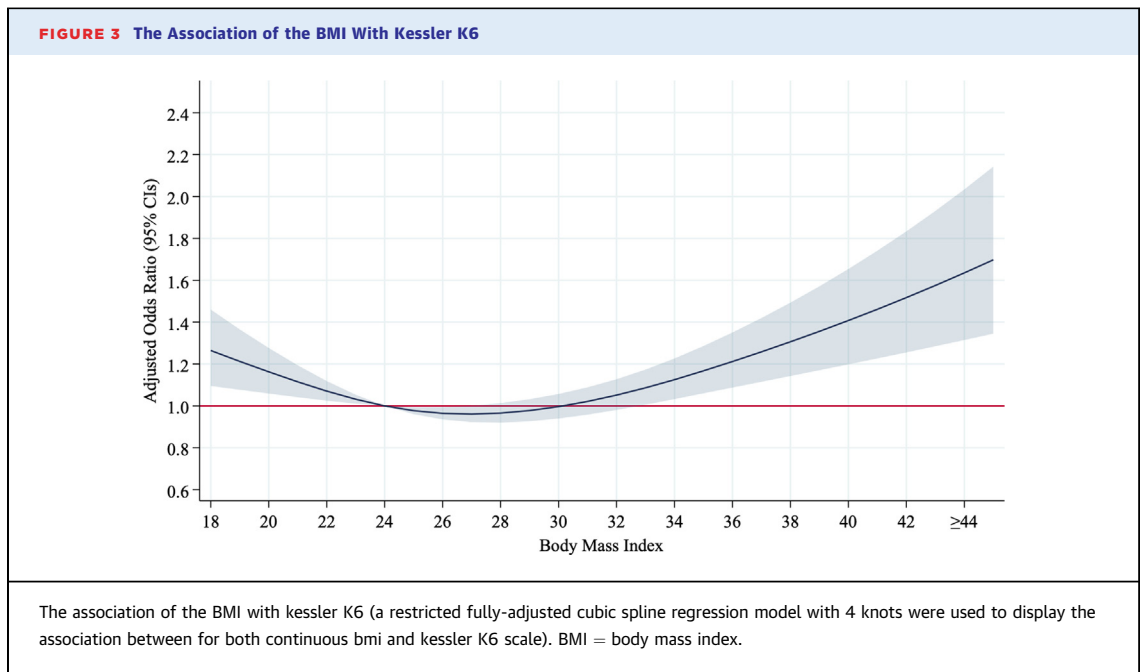
On top of sociocultural factors influencing the relationship between psychological distress and obesity, the biological connection between psychological distress and obesity is additionally well-characterized. Obesity can lead to dysfunction of the hypothalamic-pituitary-adrenal axis, resulting in elevated cortisol levels and feelings of psychological distress.<sup>6</sup> In one study, for example, it was determined that obese individuals had significantly higher hair cortisol concentrations than nonobese and overweight participants.<sup>17</sup> The results of this study indicate that the risk of this psychological distress-obesity relationship may be further characterized by class of obesity, meaning that individuals with class II or III obesity are more likely to experience this connection than overweight and class I obese individuals.

The interplay between overnutrition and SDoH, such as socioeconomic status, access to healthy food, and educational attainment, plays a crucial role in the development and perpetuation of obesity.<sup>18</sup> These



social determinants contribute to both the prevalence of obesity and the associated psychological distress, creating a feedback loop that exacerbates health disparities. Understanding these factors is essential for developing targeted interventions that address not only the biological aspects of obesity but also the underlying social drivers.

The findings of this study may have noteworthy implications for the pharmacotherapeutic options available to patients experiencing both obesity and psychological distress. It has been demonstrated that improved fitness levels contribute to better overall mental health by enhancing self-esteem and reducing anxiety. These psychological benefits of physical



activity and fitness underscore the importance of incorporating regular physical activity into interventions aimed at mitigating psychological distress, particularly in individuals with obesity.<sup>19-22</sup> These observations hint at the broader therapeutic potential of weight-lowering therapies, offering a multifaceted approach to address both the physical and psychological aspects associated with obesity.<sup>23-25</sup>

**STUDY LIMITATIONS.** There are several limitations to consider for this study. First, all the study data in the NHIS, including BMI, were self-reported, which could potentially result in misclassification.<sup>26</sup> However, previous studies have utilized self-reported data and have shown high correlations between results obtained from measured vs self-reported BMI.<sup>27</sup> We were unable to determine the directionality of the relationship. It is likely that this relationship is bidirectional in nature, meaning that obesity contributes to elevated levels of psychological distress, and heightened levels of psychological distress additionally contribute to further obesity. However, the strength of this relationship in each of these directions is yet to be determined and should be considered in future studies. Further, the temporal nature of these results was not explored in this study. This study does not explore whether young adults experiencing obesity are at higher risk of developing mental health complications later in life or whether these symptoms are alleviated over one's lifespan. Additionally, since there is no information on physical activity and fitness in the dataset, we were unable

to address this aspect. Lastly, since there is no information about American Indians and Alaska Native population, our findings may not be generalizable to this population. Future studies should additionally explore whether the psychological distress-obesity relationship is mitigated following periods of natural weight loss, bariatric surgery, or the use of weight-lowering medications.

## CONCLUSIONS

This study indicates that obesity contributes to higher levels of psychological distress in young adults, which is further magnified in non-Hispanic White and females. These findings have important implications for guiding future health policy initiatives focused on addressing the mental health crisis and the elevating incidence of obesity in younger populations within the United States.

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## PERSPECTIVES

### COMPETENCY IN MENTAL HEALTH SCREENING AND INTERVENTION:

Young adults, especially those classified as class 3 obese, exhibit a 1.4 times higher likelihood of experiencing psychological distress. Clinicians should integrate routine mental health screenings into obesity management protocols to facilitate early intervention and tailored therapeutic strategies. Given the observed variations based on race or ethnicity and gender, clinicians must adopt demographic-tailored approaches. Specifically, non-Hispanic White individuals and females

show a relatively stronger impact, necessitating nuanced screening and intervention strategies to address their specific mental health needs.

**TRANSLATIONAL OUTLOOK:** Recognizing the association between obesity and psychological distress highlights the need for preventive measures. Health care professionals should focus on promoting healthy lifestyle choices from adolescence to mitigate the long-term impact on mental health outcomes.

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**KEY WORDS** obesity, psychological distress, social determinants of health, young adults

**APPENDIX** For a supplemental table, please see the online version of this paper.