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# Mental Health and Obesity: Are They Related in Young Adult, Middle-aged, and Older Adult Females in the General Population?

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## Abstract

**Purpose:** Although the relationship between mental health disorders and obesity has been established, limited research addresses the relation between overall mental health and obesity status, especially by gender and age groups. The purpose of this study is to examine whether current general mental health differs by obesity status among young adult, middle-aged, and older adult females in the general population.

**Methods:** The cross-sectional analysis used 2016 data from the Behavioral Risk Factor Surveillance System (BRFSS) for young adult females (N=1.535), middle-aged females (N=6.198), and older adult females (N=5.567) from Arkansas, Louisiana, Mississippi, and Tennessee. Multiple logistic regression analyses by age group and state were used to assess the relationship between obesity and current mental health while controlling for health status, health behaviors, demographic factors, and socioeconomic status.

**Results:** Less than half of participants in all age groups reported current mental health issues (young: 44%-51%; middle-aged: 41%-43%, older: 18%-29%) or obese status (young: 29%-41%; middle-aged: 38%-49%; older: 27%-35%). The results of adjusted analyses showed that current mental health did not differ by weight status within any age groups across states. However, in at least 3 of 4 states, current mental health was highly-related to number of health conditions in all age groups, and moderately-related to general health and substance use in middle-aged and older adult females.

**Conclusion:** The results of this study indicate that current mental health is not related to obesity in females of different age groups, but that current mental health is consistently and moderately to highly-related to number of health conditions in all age groups and to substance use in middle-aged and older adult females. Practitioners should screen for all of these in adult female patients who present with any, regardless of age and educate and treat as comorbid conditions.

**Keywords:** Mental health; Mental illness; Weight status; Obesity; Health conditions

## Introduction

Poor mental health status, which includes depression, daily stress, and emotional problems is becoming increasingly prevalent in the United States [1,2]. In fact, mental illness will affect over half of the U.S. population in their lifetime [2]. From 1993 to 2010, the number of reported “mentally unhealthy days” in the working-age population in the U.S. population increased by 20% [1], with the most common health conditions reported by women being depression and anxiety [3]. Of mental health issues, anxiety has the highest prevalence in developed countries [4] and depression has one of the highest rates observed in patients acquiring outpatient care [5]. Furthermore, mental illness is a huge economic burden, costing the U.S. an estimated \$300 billion annually [2].

Research has shown that mental illness is linked to lifestyle factors such as tobacco use, alcohol abuse [2] and lack of exercise [6]. Mental illness has also been related to poor overall health and presence of chronic disease [6,7]. Other research indicates that poor mental health differs by demographic factors such as increased age, ethnic/racial groups, and lower income and education [7,8].

Existing research has also established an association between mental health and obesity [9]. Obesity is another major public health concern with more than one third of Americans categorized as obese [10], which is defined as having a BMI of 30 kg/m<sup>2</sup> or greater [4]. Obesity has been linked to cardiovascular disease, diabetes, and some cancers [10,11] as well as to psychological and mental health issues including depression and anxiety [12,13]. However, research indicates that the relationship between obesity and mental health may be stronger in women and weak or non-existent in men [1,3,5,7,8]. In addition, little research exists for the relationship between general mental health and obesity for females of different age groups [3-5,13]. This information would be beneficial to general practitioners in order to better treat their female patients. Thus, the purpose of this study is to examine whether current general

mental health differs by obesity status among young adult, middle-aged, and older adult females in the general population.

## Methods

### Design

This cross-sectional analysis used data from the 2016 Behavioral Risk Factor Surveillance System (BRFSS) conducted by the Centers for Disease Control and Prevention [14]. BRFSS is a nationwide survey system that collects data annually utilizing random digit dialing (RDD) techniques for landline and mobile phones. BRFSS gathers data from participants 18 years or older in all 50 states, the District of Columbia, and three U.S territories about their chronic health conditions, health-related risk behaviors, and use of preventative services. State health departments directly interview or contract with call centers and universities to administer the BRFSS interviews (roughly 400,000 interviews per year). The CDC compiles all BRFSS data and allows researchers access to de-identified data to conduct secondary data analyses. This study was given exempt status by the Institutional Review Board (IRB) of The University of North Texas Health Science Center.

### Sample

The samples for this study included females ages 18 and older in Arkansas (N=3300), Louisiana (N=3284), Mississippi (N=3161), and Tennessee (N=3555) that were categorized into three age groups: young adults (ages 18 to 44; N=1.535), middle-aged adults (ages 45 to 64; N=6.198), and older adults (ages 65 and older; N=5.567). These states were chosen because of their higher crude prevalence of obesity and poor mental health in females according to BRFSS 2016 prevalence survey data maps [15].

### Data

The outcome, mental health, was originally measured in BRFSS as the number of "not good" mental health days in the past 30 days "which includes stress, depression, and problems with emotions." In all four states, the means for days of mental health were severely skewed as the mode in each state was 0 days of "not good" mental health. We reversed this variable to reflect "good current mental health" and categorized it as "yes" for reporting no days of mental health issues in the past month and "no" for reporting one or more days of mental health issues in the past month. The factor of interest, weight status, was originally categorized in BRFSS as the BMI categories "underweight," "normal," "overweight," and "obese" derived from self-reported height and weight. Few participants were in the underweight category so we excluded them from the study and used "normal," "overweight," and "obese" categories.

Control variables included number of health conditions, general health status, tobacco use, alcohol use, physical activity, ethnicity/race, marital status, education level, income level, and employment status. Number of health conditions was defined as the number of "yes" responses to having a diagnosis for heart attack, coronary heart disease, stroke, skin cancer, cancer, COPD,

arthritis, depression, kidney disease, diabetes, and asthma. That number was then categorized as either "0 or 1" or "2 or more." General health was categorized as "good or better" or "fair or poor." Tobacco use was categorized as "never," "former," or "current". Alcohol use was categorized as "yes" or "no" for alcohol consumption in the past 30 days. Physical activity was measured as "yes" or "no" for performing physical activity in the past 30 days. Due to small percentages in various categories across states, race/ethnicity was categorized as "white, non-Hispanic" vs "other". Education level was dichotomized as "graduated college or technical school" or "did not graduate college or technical school". Income was categorized as "\$0 to less than \$25,000", "\$25,000 to less than \$50,000" or "\$50,000 or more". Employment status was categorized as "employed" or "not employed".

### Analysis

Frequency distributions by age group and state were used to assess sample characteristics and identify any issues with the distribution of variables. Multiple logistic regression analyses by age group and state were used to assess the relationship between current mental health and obesity after controlling for health status, health behaviors, demographic factors, and socioeconomic status. Data from multiple states was assessed separately in order to determine patterns among variable relations across similar samples. A similar result in 3 or 4 states out of 4 states was considered reliable findings for a relationship. We chose to conduct all analyses separately by age group, rather than to include interaction terms in the adjusted analysis, to better assess any patterns or differences in variable relations related to age. Any observations with missing data for any variable were removed from the multivariable models. All analyses were conducted in STATA 15.1 (Copyright 1985-2017 StataCorp LLC).

## Results

### Young adult females

For young adult females, almost half of the participants across 4 states reported having current mental health issues in past 30 days (44%-51%) and about one-third were obese (29%-40%). For health status, few reported having 2 or more health conditions (12%-16%) or fair or poor health (11%-17%). For health behaviors, most reported never smoking (63%-70%), about half reported not consuming alcohol in the past 30 days (42%-56%), and most reported performing physical activity in the past 30 days (75%-79%). For demographic factors, half or more reported white race (54%-73%) and more than half were not married (59%-68%). For socioeconomic status, most did not graduate college or technical school (65%-75%), about one-fourth reported an income between \$25,000 and \$50,000 (24%-30%), and the majority reported being employed (56%-63%).

As shown in **Table 1**, the results of multiple logistic regression analysis for young adult females in Arkansas, Louisiana, Mississippi and Tennessee indicated that after controlling for all other variables in the model, current mental health was not

significantly related to weight status across states. However, in three out of four states, participants who reported having 2 or more health conditions were about 3 to 4 times less likely to report good current mental health.

**Table 1:** Results of adjusted analysis by age group and state.

Young Adult Females: Predicting Good Current Mental Health (yes vs. no)*	Arkansas		Louisiana		Mississippi		Tennessee	
	AOR	95% CI	AOR	95% CI	AOR	95% CI	AOR	95% CI
Weight Status								
Overweight vs. normal	1.08	0.44,2.66	1.18	0.60,2.31	0.88	0.47,1.65	0.76	0.41,1.41
Obese vs. normal	1.23	0.55,2.76	0.61	0.30, 1.23	0.67	0.36,1.25	0.57	0.31,1.04
Health Conditions								
2 or more vs. 0 or 1	0.89	0.30,2.63	0.33	0.12,0.89	0.25	0.10,0.58	0.24	0.11,0.53
Middle-Aged Females: Predicting Good Current Mental Health (yes vs. no)*	Arkansas		Louisiana		Mississippi		Tennessee	
	AOR	95% CI	AOR	95% CI	AOR	95% CI	AOR	95% CI
Weight Status								
Overweight vs. normal	1	0.68,1.46	1.15	0.82,1.61	0.8	0.55,1.16	1.04	0.76,1.44
Obese vs. normal	0.76	0.53,1.08	1.15	0.83,1.60	0.7	0.49,0.99	0.91	0.69,1.30
Health Conditions								
2 or more vs. 0 or 1	0.5	0.36,0.68	0.5	0.37,0.66	0.4	0.30,0.54	0.49	0.37,0.66
General Health Status								
Fair/poor vs. good/better	2.07	1.43,3.00	2.16	1.52,3.06	2.02	1.43,2.86	3.17	2.21,4.55
Alcohol Use								
Yes vs. no	0.77	0.57,1.03	0.66	0.51,0.87	0.71	0.53,0.95	0.56	0.43,0.74
Older Adult Females	Arkansas		Louisiana		Mississippi		Tennessee	
	AOR	95% CI	AOR	95% CI	AOR	95% CI	AOR	95% CI
Weight Status								
Overweight vs. normal	1.27	0.86,1.87	1.11	0.75,1.64	0.64	0.38,1.08	0.88	0.59,1.31
Obese vs. normal	1.17	0.80, 1.73	0.9	0.61, 1.33	0.56	0.33, 0.96	0.74	0.49, 1.13
Health Conditions								
2 or more vs. 0 or 1	0.48	0.34,0.69	0.47	0.33,0.66	0.48	0.30,0.77	0.6	0.42,0.86
General Health Status								
Fair/poor vs. good/better	1.81	1.26,2.59	1.77	1.25,2.52	2.77	1.76,4.36	1.46	0.99,2.15
Tobacco Use								
Former vs. never	1.03	0.73,1.46	0.9	0.64,1.25	1.19	0.74,1.93	0.75	0.52,1.09
Current vs. never	0.53	0.32,0.88	0.5	0.30,0.84	1.06	0.53,2.15	0.52	0.31,0.88
<b>Note:</b> AOR=Adjusted odds ratio; 95% CI=95% confidence intervals; boldface indicates significance (AORs with 95% CI that do not include 1.00 are significant)								
*Only shows results for weight status and significant results across 3 or more states. All models included weight status, general health and number of health conditions, tobacco use, alcohol use, and physical activity and controlled for ethnicity/race, marital status, educational level and income level and employment status.								

### Middle-aged females

For middle-aged females, less than half reported having current mental health issues in the past 30 days (41%-43%) or being obese (38%-49%). For health status, over one-third reported having 2 or more health conditions (36%-43%) and fewer reported fair or poor general health (23%-30%). For health behaviors, over half reported never smoking (54%-63%), not consuming alcohol in the past 30 days (56%-69%), and performing physical activity in the past 30 days (64%-68%). For demographic factors, half or more reported white race (53%-81%) and were married (49%-59%). For socioeconomic status, two-thirds did not graduate from college or technical school (66%-69%), about one-fourth reported an income between \$25,000 and \$50,000 (21%-26%) and about half reported being employed (54%-56%).

As shown in **Table 1**, the results of multiple logistic regressions for middle-aged females in Arkansas, Louisiana, Mississippi, and Tennessee indicated that after controlling for all other variables in the model, current mental health was not significantly related to weight status across states. However, across all four states, participants who reported 2 or more health conditions were about 2 to 2.5 times less likely to report good current mental health. In addition, participants who reported good or better general health status were about 2 to 3 times more likely to report good current mental health. Lastly, in three out of four states, those who reported drinking in the past 30 days were about 1.5 to 2 times less likely to report good current mental health.

### Older adult females

For older adult females, less than one-third reported having current mental health issues in the past 30 days (18%-29%) and about one-third reported being obese (27%-35%). For health status, more than half reported 2 or more health conditions (54%-57%) and about one-third reported having fair poor general health (30%-33%). For health behaviors, over half reported never smoking (58%-67%), most did not consume alcohol in the past 30 days (73%-86%), and the majority performed physical activity in the past 30 days (56%-61%). For demographic factors, most of the participants reported white race (70%-86%) and the majority were not married (63%-64%). For socioeconomic status, most did not graduate from college or technical school (76%-78%), about one-third reported an income between \$25,000 and \$50,000 (27%-32%), and most were not employed (88%-91%).

As shown in **Table 1**, the results of multiple logistic regression analysis for older adult females in Arkansas, Louisiana, Mississippi, and Tennessee indicated that after controlling for all other variables in the model, current mental health was not significantly related to weight status across states. However, across all four states, participants who reported 2 or more health conditions were about 2 times less likely to report good current mental health. In addition, in three out of four states, participants who reported good or better general health were about 2 to 3 times more likely to report good current mental

health. Lastly, in three out of four states, current smokers were about 2 times less likely to report good current mental health.

## Discussion

The purpose of this study was to examine whether current general mental health differs by obesity status among young adult, middle-aged, and older adult females in the general population. The results of the adjusted analyses indicated that current mental health did not differ by weight status across states for any age group of adult females. This is contradictory to prior research that has established relationships between mental health and weight status [9,13]. This contradiction may be due to differences in measures and target populations. Other studies assessed obesity and DSM-IV health disorders in all ages [9,13] and we assessed obesity and current general mental health status in females only and separately by age group. Thus, overall mental health and well-being may be less related to actual weight and more related to negative effects of weight such as stigma or health complications.

The findings of this study did, however, indicate that across all states and age groups, participants that reported two or more health conditions were about 2 to 4 times more likely to report current mental health issues, and middle-aged and older adult females that reported good or better general health were about 2 to 3 times more likely to report good current mental health. Numerous diseases such as cardiovascular disease, diabetes, obesity, asthma, epilepsy, and cancer have been related to mental health status [2], but the findings of this study extend knowledge by indicating that the number of comorbid health conditions may impact mental health. Future studies should assess burden related to comorbid health conditions as it relates to mental health in female adults in the general population.

Mental health was also related to substance use in the older age groups. Middle-aged females that reported alcohol use in the past 30 days and older adult females that reported tobacco use were up to 2 times more likely to report current mental health issues. Previous research links mental health and alcohol and tobacco use [16,17], and such findings are concerning as substance may prolong, complicate, or advance mental health issues.

## Limitations

Using BRFSS data allowed large sample sizes in multiple samples to conduct analyses by age group. However, data for mental health, health conditions, and substance use did not include information for severity, management of any issues, or medication use. Future studies should include such information as related to mental health in females. In addition, because this was a cross-sectional study, temporal or causal relations cannot be determined. Future studies should focus on the mechanisms underlying the relations among number of health conditions and mental health in all age groups and to substance use and mental health in middle-aged and older adult females. Furthermore, because the majority of participants were white, the results may not generalize to other ethnic/racial groups. Future studies should be conducted within various ethnic/racial groups to

observe the relationship between mental health, obesity and multiple health conditions in young adult, middle-aged and older adult females in the general population.

## Conclusion

Because this was a population-based study, the results may generalize to women ages 18 and older in primary care settings. For young adult, middle-aged, and older adult females, practitioners may expect about one-third to one-half of patients to report recent general mental health issues and to be obese, but that these are not related. Providers should screen all adult females for mental health [18] and weight issues, but educate, treat, and make referrals as separate conditions. In addition, practitioners may expect that about one-third to one-half of their adult female patients, especially in the older age groups, to report two more health conditions, and that having multiple health conditions is highly-related to current mental health. Thus, providers should screen all patients in this target population for both, educate patients on the importance of managing comorbid conditions, coordinate treatment plans, and make referrals to specialists as needed. In addition, practitioners may expect about one-third to one-half of middle-aged and older adult females to report fair to poor general health and up to one-third to report alcohol or tobacco use, and that these are moderately-related to current mental health. Thus, providers should screen for all of these if patients present with symptoms of any, coordinate treatment plans for comorbid conditions, provide information and resources for smoking cessation and alcohol misuse and make referrals for substance misuse services as needed.

## Disclaimer

No author has any conflict of interest.

## Sources of Support

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