

Original Research Article

## The Impact of the Sociodemographic Factors Associated with Higher Obesity Rates in the Central Gulf Coast

Hosik Min

Department of Sociology, Anthropology, and Social Work, University of South Alabama, AL, USA 36688.

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### ABSTRACT

**Aim:** This study examines the extent to which obesity has an association with sociodemographic factors in the Central Gulf Coast, namely, Alabama, Mississippi, and Louisiana. **Materials and Methods:** To achieve this end, this study uses data from the 2014 Behavioral Risk Factor Surveillance System and employs logistic regression analysis as its statistical method.

**Results:** The results show that socioeconomic status is not significant for males but is significant for females. The impact of being African American is significant only for females in the Central Gulf Coast. Surprisingly, rural residences are not significant for males or females in this area.

**Conclusion:** The results suggest that policies and programs should consider both income and education together for females. More lifestyle-oriented policies and programs would be effective for males in reducing obesity rates. The results also provide strong evidence that there is no reason to tailor policies and programs to rural or urban residences in this area.

**Keywords:** obesity, Central Gulf Coast, socioeconomic status, African American, gender, odds ratio, logistic regression.

### INTRODUCTION

Obesity is one of the most important public health concerns in the United States, and it is increasingly becoming a problem around the world. <sup>(1-3)</sup> Obesity is associated with several other serious chronic diseases, such as heart disease, diabetes, hypertension, cancer, and stroke. <sup>(2-6)</sup> Obese people are more likely than non-obese people to have problems with activities of daily living (ADL), lower scores on quality of life indices and higher mortality rates. <sup>(2,7-9)</sup> The cost of health problems, including hospitalization, is higher for obese people than for the non-obese. In 2008, the cost of obesity reached \$114 billion, comprising approximately 5-10% of total U.S. health care spending, and it is expected to increase continuously. <sup>(10)</sup> The trend of obesity prevalence is also increasing: according to data from the Behavioral Risk Factor

Surveillance System (BRFSS), the obesity prevalence increased from 15.9% in 1995 to 34.9% in 2014. <sup>(11)</sup>

Prior studies have associated several factors with obesity. For instance, aging increases the likelihood of obesity among adults, <sup>(12-14)</sup> and males are more likely to be obese than females. <sup>(12,13)</sup> Non-Asian minorities are more likely to be obese than whites. <sup>(3,12,13)</sup> Education and socioeconomic status (SES) demonstrate negative relationships with obesity; that is, higher educational attainment and SES are both correlated with lower obesity rates. <sup>(14,15)</sup> Analyses for marital status show that non-married people, including those who are divorced, widowed, and separated, have a lower likelihood of being obese compared to married people. <sup>(13)</sup> Adults who live in rural areas have shown a higher likelihood of being obese, <sup>(16)</sup> and exercise, as widely

acknowledged, lowers the likelihood of being obese. (12,17,18)

Although higher obesity rates than the national average have been recorded in Alabama, Louisiana, and Mississippi (in alphabetical order), only few studies have been conducted on this issue. For instance, Sen and Patel-Dovlatabadi found that these states had higher obesity rates; females compared to males had higher obesity rates; the impact of the males' SES including educational attainment and income on obesity were not significant, while that of females were significant: the higher the SES, the lower the obesity. Their study, however, did not include other contributing factors. (19) Akil and Ahmad used different measurements of SES such as income level, poverty level, food stamp reception, and unemployment and found similar results: lower SES people are more likely to be obese. (20) Min found that, except the highest SES in females, older adults in this region do not have significant associations between SES and obesity. African American and rural residences show mixed results: African American is significant only in females, whereas rural residences are significant only in males. However, his study addresses only older adults and does not include younger adults. (21) Thus, the main goal of this paper is to examine whether the impacts of sociodemographic factors on obesity in this region are similar to those in the national average. As explained in detail in the following section, this study employs a constructed SES variable to estimate obesity, (19,21) as opposed to models that base SES solely on education. This study expects to provide data that result in meaningful policy implications to address obesity in this area.

## **MATERIALS AND METHODS**

The data used in this study were obtained from the 2014 BRFSS. The BRFSS is a representative-sample survey sponsored by the Centers for Disease Control and Prevention (CDC) in which 500,000 random-digit-dialed telephone

interviews with adult residents are conducted each year. The principal objective of the survey is to monitor the state-level prevalence of the major behavioral risks among adults associated with premature morbidity and mortality by collecting data on actual behaviors, rather than on attitudes or knowledge, which is especially useful for planning, initiating, supporting, and evaluating health promotion and disease prevention programs. (22)

Due to the following characteristics, the geographic area of focus in this study comprises Alabama, Louisiana, and Mississippi, namely, the Central Gulf Coast. This area shares similar socio-demographic characteristics, such as higher poverty rates and a higher percentage of African Americans, (23-25) and it has shown higher obesity percentages over the years than the national average. (26)

## **Statistical Analyses**

This study employs a logistic regression model because the dependent variable, that is, whether a respondent is obese, is dichotomous (yes=1, no=0). Following the National Institutes of Health (NIH) criteria, obesity is defined as having a body mass index (BMI) of 30 or greater. (27) The STATA 13.1 statistical package is used for the analysis.

The independent variables used to estimate obesity include the respondent's age, sex, race/ethnicity, marital status, socioeconomic status, and rural residence, all of which have been identified as contributing factors to obesity. All of the variables except age are measured as "dummy" variables: "yes" is coded as "1" and "no" as "0". Age is measured in 5-year range from age group 1 to 13: 1 ranges from 18 to 24, 2 ranges from 25 to 29, 3 ranges from 30 to 34, 4 ranges from 35 to 39, 5 ranges from 40 to 44, 6 ranges from 45 to 49, 7 ranges from 50 to 54, 8 ranges from 55 to 59, 9 ranges from 60 to 64, 10 ranges from 65 to 69, 11 ranges from 70 to 74, 12 ranges from 75 to 79, and 13 is 80 years old and higher. In this study, exercise is defined

as having participated in any physical activities during the past month.

The study constructs four SES variables by combining education and household income to better gauge the complexity of SES. <sup>(21)</sup> Income is a widely used SES variable; however, income in the BRFSS is measured at the household level. Thus, it cannot be used as an individual variable. Hence, the two variables are combined into one grouping with four sub-categories: less than a college education with lower household income (under \$55,000, which is the average household income in the 2014 BRFSS data); less than a college education with higher household income (over \$55,000); a college education with lower household income; and a college education with higher household income. The lowest SES group, namely, those with less than a college education and a household income below \$55,000, is used as a reference group.

The study conducted a series of logistic regression models to examine the factors associated with obesity for adults nationally and for Central Gulf Coast adults specifically (note that the national average model does not exclude the Central Gulf Coast). Given that the CDC report has shown different results of obesity by gender, <sup>(11)</sup> this study conducts the logit regression models by gender, resulting in a total of four logit models that comprise the male and female national averages and figures for Central Gulf Coast males and females. However, the interpretations are focused on the adults of the Central Gulf Coast.

## RESULTS

Figure 1 presents the percentage distributions of obesity in the national average and the Central Gulf Coast by gender, confirming that the Central Gulf Coast has higher obesity percentages than those in the national average for both males and females.

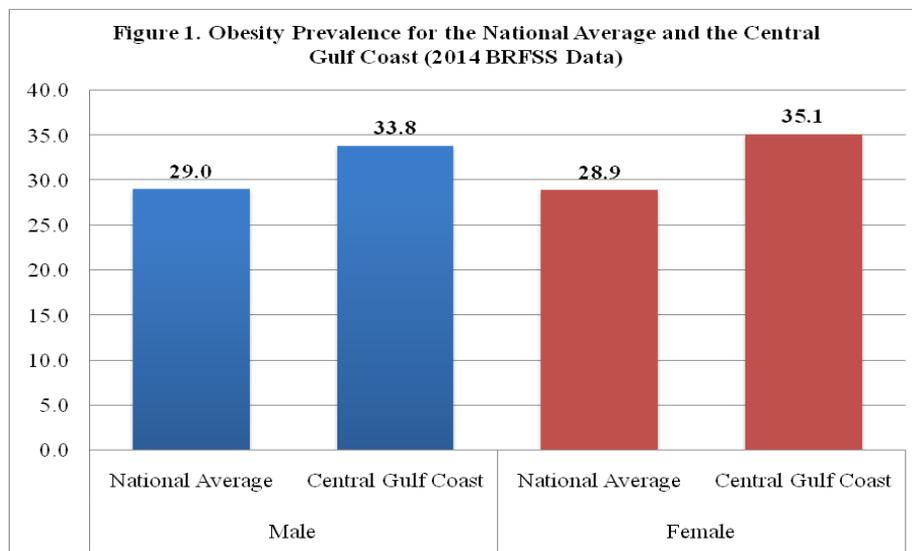


Figure 1

[Table 1](#) presents the frequency distributions of all of the independent variables for the national average and the Central Gulf Coast by gender from the 2014 BRFSS data. The average ages of males and females for both areas are similar, 7.4 to 7.5, respectively. Given that age group 7 ranges from 50 to 54, 7.4 and 7.5 can be transferred to 52.0 to 52.5 years old, and the average

ages for the Central Gulf Coast are slightly older than those of the national average. The percentage of whites is higher in the national average than in the Central Gulf Coast; however, the percentage of African Americans is higher in the Central Gulf Coast than in the national average. Other minority groups in the Central Gulf Coast are significantly smaller than those in the

national average. More than six out of ten males are married in both areas, but the percentage of married females compared to males is approximately 10% lower in both areas.

Central Gulf Coast males show higher percentages of lower SES and lower percentages of higher SES than those in the national average. Of the Central Gulf Coast males, 37% are of the lowest SES, having less than a college education with lower household income, compared to 29% in the national average, and 20% are of the highest

SES, a college education with higher household income, compared to 27% in the national average. Central Gulf Coast females show similar patterns; however, the gap between the national average and the Central Gulf Coast is greater. Both males and females in the Central Gulf Coast exercise less than the national average. The percentages of rural residents for males and females in the Central Gulf Coast are higher than those in the national average: 1.7 and 1.9 times for males and females, respectively.

**Table 1. Descriptive Statistics for the National Average and the Central Gulf Coast by Gender (2014 BRFSS data)**

Variable	Male				Female			
	National Average		Central Gulf Coast		National Average		Central Gulf Coast	
	%	S.E.	%	S.E.	%	S.E.	%	S.E.
Age	7.38	0.02	7.47	0.10	7.42	0.02	7.49	0.07
White	74.67	73.99	70.49	1.24	72.34	0.29	67.66	0.84
African-American	9.79	9.36	23.74	1.13	12.05	0.19	28.29	0.80
Hispanics	9.42	8.89	2.23	0.50	9.78	0.23	1.83	0.32
Asian	3.61	3.22	0.75	0.31	3.55	0.19	0.53	0.16
Other	2.51	2.33	2.80	0.47	2.29	0.07	1.69	0.20
Married	65.89	65.24	63.45	1.32	56.52	0.28	53.58	0.89
Lower Income with No College	29.06	28.43	36.96	1.28	36.99	0.28	47.37	0.90
Lower Income with College	3.16	2.97	2.41	0.27	3.67	0.08	3.92	0.31
Higher Income with No College	40.89	40.23	40.42	1.31	35.39	0.28	30.99	0.87
Higher Income with College	26.89	26.38	20.21	0.88	23.95	0.21	17.73	0.58
Exercise	77.53	76.98	72.68	1.18	73.65	0.25	66.18	0.83
Rural Residence	19.57	19.14	33.37	1.15	18.84	0.17	36.41	0.78

Note: \* Average in Age Categories

[Table 2](#) presents the results of the logistic regression analyses for the national average and the Central Gulf Coast adults by gender. Concerning the national average, most coefficients are statistically significant and show the expected associations with obesity for both males and females. To enable an easier understanding of the logistic coefficients, this paper converts all of the coefficients to odds ratios in percentage terms. (28,29) For instance, additional age decreases the likelihood of being obese by 2% for the male national average in the first column of [Table 2](#). Males in the national average show that African Americans are 19% more likely to be obese than their white counterparts and that Asians are 72% less likely to be obese. Married people are 25% more likely to be obese. A person with lower income and a college education is 20% less likely to be obese compared to a person with lower income and less than a college education; a

person with higher income and less than a college education is 13% more likely to be obese; and a person with higher income and a college education is 20% less likely to be obese. A person who exercises is 36% less likely to be obese compared to a person who does not exercise. A person who lives in a rural area is 10% more likely to be obese.

However, Central Gulf Coast males show somewhat different associations compared to the male national average model. Most variables are not significant. Only the age and married variables are significant. Unlike the male national average model, no SES variable shows a significant relationship with obesity. Race/ethnicity including African American, exercise, and rural residence are also not significant. The result for rural residences is the opposite of the expectation in this research. Age decreases the likelihood of being obese by 7%. Married males are 74% more likely to be obese.

Concerning the females in the national average, most coefficients show the same associations with obesity as the male model, but the magnitudes are different. The evident differences are in race/ethnicity and SES variables. For instance, African American females are 111% more likely to be obese than white females, Hispanics are 26% more likely, Asians are 76% less likely, and the “other” group is 33% more likely to be obese. Contrary to the male national average, all SES demonstrate significant relationships with obesity. Females with lower income and a college education are 22% less likely to be obese compared to females with lower income and less than a college education; higher-income females with less than a college education are 20% less likely to be obese; and higher-income females with a college education are 45% less likely to be obese.

Central Gulf Coast females show similar associations with obesity compared to females in the national average. African American females are 103% more likely to be obese than white females. Females with lower income and a college education are 39% less likely to be obese compared to females with lower income and less than a college education; higher-income females with less than a college education are 24% less likely to be obese; and higher-income females with a college education are 37% less likely to be obese. Unlike Central Gulf Coast males, females have significant association with obesity and are 50% less likely to be obese when they exercise. Rural residences are not significant, as in the Central Gulf Coast males. Being married is not significant, whereas it is significant in the national average mode.

**Table 2. The Results of Logistic Regression Models by Gender**

Variable	Male						Female					
	National Average		Central Gulf Coast		National Average		Central Gulf Coast		National Average		Central Gulf Coast	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Age	0.98*	0.97	0.99	0.93*	0.90	0.97	0.98*	0.97	0.99	0.96**	0.93	0.99
African-American	1.19**	1.06	1.33	1.21	0.92	1.59	2.11*	1.95	2.28	2.03*	1.69	2.45
Hispanics	1.11	0.97	1.27	1.58	0.63	3.95	1.26*	1.12	1.42	0.71	0.33	1.56
Asian	0.28*	0.20	0.40	0.20	0.04	1.14	0.24*	0.17	0.33	0.20	0.03	1.46
Other	0.96	0.82	1.12	0.61	0.31	1.21	1.33*	1.15	1.53	1.44	0.83	2.50
Married	1.25*	1.17	1.34	1.74*	1.35	2.25	1.08**	1.02	1.14	1.20	1.00	1.44
Lower Income with College	0.80**	0.70	0.91	0.95	0.60	1.52	0.78*	0.70	0.87	0.61**	0.43	0.86
Higher Income with No College	1.13**	1.04	1.22	1.00	0.76	1.32	0.80*	0.75	0.86	0.76***	0.61	0.94
Higher Income with College	0.80*	0.74	0.86	0.80	0.60	1.07	0.55*	0.51	0.59	0.63*	0.51	0.79
Exercise	0.64*	0.60	0.69	0.80	0.62	1.02	0.55*	0.52	0.58	0.50*	0.42	0.59
Rural Residence	1.10**	1.03	1.17	0.88	0.70	1.10	1.14*	1.08	1.20	1.09	0.93	1.28
Constant	0.65*	0.58	0.73	0.85	0.54	1.36	0.85**	0.77	0.94	1.08	0.74	1.58

Note: \* <.001; \*\* <.01; \*\*\* <.05

## DISCUSSION

This study attempted to examine the impact of sociodemographic factors on obesity in Central Gulf Coast adults by gender compared to those in the national average. The results of this study found different associations with the contributing factors and obesity between the national average and the Central Gulf Coast. Race/ethnicity, SES, exercise, and rural residences were not significant for males in the Central Gulf Coast, whereas these factors were significant in the national average. Exercise and rural residences, however, were significant, whereas being

married was not significant for older males in the Central Gulf Coast.

Being African American, SES, and exercise were significant in Central Gulf Coast females, whereas rural residences and being married were not significant. All SES variables in the female model had significant associations with obesity that were in line with expectations. African American females in the Central Gulf Coast showed a significant relationship with obesity, demonstrating that they were the group most vulnerable to obesity. Second, there was no significant relationship between SES and obesity in Central Gulf Coast males, whereas females had

significant relationships with all of the SES variables. The findings here were different from other studies that used education as the basis for SES, which found a linear relationship with obesity. (15,30) This result suggests that considering income and education together for policies and programs would be important for females in this area to reduce health disparities in obesity, improve the public health, and could curtail the impacts of SES on obesity. The fact that SES was not significant for males may suggest that lifestyle, including diet, has more profound effects on obesity than expected. More lifestyle-oriented policies and programs would be more effective for males in this area.

The health disadvantages associated with rural areas are well known, (12,31) and obesity is not an exception. (16,32,33) Remember that the Central Gulf Coast has a higher percentage of rural residents; this study finds different relationships between rural residences and obesity than the national average. Rural residences in the Central Gulf Coast do not have any a significant relationship with obesity for either males or females, which is another important finding of this study. However, this study does not interpret this result as the disappearance of the rural disadvantage because there is no clear evidence of the disappearance of the rural disadvantage. Instead, this study understands this result to be due to the higher obesity rate in both rural and urban areas compared to the national average. Thus, there is no reason to distinguish policies and programs based on rural/urban residences in this area.

In addition, this study identifies the potential importance of lifestyle, including diet, in this area, which also implies a limitation of this analysis. For instance, although physical activity is included in the model, the definition of said activity does not follow the national guideline of 150 minutes/week of moderate-to-vigorous exercise. This study does not fully examine other lifestyle factors, such as diet and smoking; hence, further research on lifestyle

is required. If other lifestyle factors are significant, then those factors should be estimated along with the sociodemographic factors to understand their relative effects on obesity. Finally, this study may identify some geographically based characteristics of lifestyle in this area, given that some argue that geographical proximity allows residents to share a similar culture and lifestyle, including diet. (16,34) Obtaining better knowledge on this relationship will provide a better understanding of obesity in this area, which can lead to more effective obesity prevention policies and programs.

## CONCLUSION

This study found interesting results on Central Gulf Coast compared to the national average. Males in this area have no significant relationships between obesity and SES, rural residence, and race/ethnicity, while females have strong relationships between obesity and SES and race/ethnicity, African American in particular. These results suggested that males were closely related to lifestyle, which this study did not investigate thoroughly. As this area has higher obesity prevalence, further analysis on lifestyle would be necessary.

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