Research suggests that obesity may be related to sleep duration. This research examined the relationship among several demographic variables and obesity in 3474 patients. Specifically, we were interested in whither age, race, sleep duration, and sleep quality (bad, ok, or good) were associated with obesity status. When cleaning the data we discovered that 29 data points were missing from the sleep duration variable and the same 16 subjects were missing from each of the three sleep quality variables for a total sample. There were no data entry issues apparent in the data set. Descriptive statistics were conducted using frequencies and percentages for categorical data. Continuous data were summarized using means and standard deviations and medians with minimum and maximum values. All statistical analyses were performed using JMP Pro 16 and were performed at a=0.05 significance level. The overall sample (see table 1) consisted of more White; Non-Hispanic participants (53.54%) than Black; Non-Hispanic participants (46.45%) The average age of the study was 40.199 +- 3.61 with a range from 32 to 49. The average sleep duration was 6.52 +- 1.26 hours with a range of 1 hour to 15 hours. Obese patients made up 32.52% of participants and not obese patients made up 67.47%. 15.76% of participants reported bad sleep quality while 84.23% reported not having bad sleep quality. 31.63% of participants reported Ok sleep quality with 68.36% reported having bad/good sleep quality. Finally, 52.60% of participants reported good sleep quality with 47.39% reporting bad/ok sleep quality.

The data in table 1 are also summarized by Obesity (Obese or Not Obese) to assess differences among age, race, sleep quality, and sleep duration on obesity status. The Bivariate analyses consisted of the Likelihood Ratio chi square for categorical variables (race, sleep quality) and independent t-test for the continues variables (sleep duration, age). Assumptions for both statistical tests were evaluated The chi squares' expected frequencies were met for all categorical variables. For the independent t tests, normality assumptions were tested with a histogram, normal quantile plot, and the Shapiro Wilkes W test. All three tests showed normality for both Obese and Not Obese patients. For the equal variance assumption, the Obrien, Brown-Forsythe, Levene, and Bartlett tests were used. Equal variance was not met for age or sleep duration thus we used the t-test. Patients who were obese were more likely to be Black (43.37%, $X2 = 161.06$, $p < 0.0001$). Age had little effect on Obesity with Obese patients averaging 40,15 +- 3.74 years and Not Obese patients averaging 40.22 +- 3.54 years $p = 0.5948$. We next examined whether this bivariate relationship held up under multivariate analysis.

For the multivariate analyses, we were interested in a research question of association with multiple independent variables. In addition, dependent variable was a categorical variable with two levels; thus, a binary logistic regression analysis was performed to predict the obesity status (Obese or Not Obese), using age, race, sleep duration, and sleep quality. A test of the full model compared with a constant or null model was statistically significant ($X2 = 176.54$, $p<0.0001$). The Lack of Fit test was significant ($p<0.0001$) and 67.43% of cases were correctly

identified indicating poor model fit. The strength of the association between the predictors and obesity was weak [R2(U) = .0406]. There was no evidence of multicollinearity, and the split was acceptable 67.47% Not Obese and 32.52% Obese. As shown in table 2, only sleep duration and race were significant predictors of Obesity. White patients were 59.6% less likely to be obese than black patients controlling for age, sleep quality, and sleep duration (AOR = 0.404; p<0.0001). For every hour increase in sleep duration, the odds for obesity decreases 9.3% controlling for race, sleep quality, and age (AOR = 0.907, p=0.0031). Age was not a significant indicator for obesity (p=0.1470) nor were good sleep quality (zeroed), bad sleep quality (p=0.6475) or Ok sleep quality (p=0.3583). The analysis examined only main effects. Further research may need to be conducted for example the relationship between race (p<0.0001) and sleep duration (p<0.0001) were statistically significant.

Table 1. Descriptive Statistics by Obesity Status (N=3474)

Variable	Obese (N = 2344)	Not Obese (N = 1130)	p-Value	95% CI on Mean Difference	Total (N=3474)
Age (years)			0.5948	-0.33 to 0.19	
Mean +- SD	40.15 +- 3.74	40.22 +- 3.54			40.19 +- 3.61
Median, Min-Max	40, 32 - 46	41, 32 - 49			41, 32 - 49
Race			<0.0001		
White	38.05 (430)	61.00 (1430)			53.54 (1860)
Black	61.94 (700)	38.99 (914)			46.45 (1614)
Sleep Duration			<0.0001	-.36 to -0.17	
Mean +- SD	6.34 +- 1.33	6.61 +- 1.21			6.52 +- 1.26
Median, Min - Max	6, 1 - 12	7, 1 - 15			7, 1 - 15
Sleep Quality (Bad)			0.0514		
Bad	17.51 (197)	14.91 (348)			15.76 (545)
Good/Ok	82.48 (928)	85.08 (1985)			84.23 (2913
Sleep Quality (Good)			0.0093		
Good	49.42 (556)	54.13 (1263)			52.60 (1819)
Bad/Ok	50.57 (569)	45.86 (1070)			47.39 (1639)
Sleep Quality (Ok)			0.2102		
Ok	33.06 (372)	30.94 (722)			31.63 (1094)
Bad/good	66.93 (753)	69.05 (1611)			68.36 (2364)

Table 2 Summary of Multivariate Logistic Regression Analysis Predicting Obesity (N=3445)

Variable	AOR	p-value	AOR 95% Confidence Interval
Age (yrs)	1.015	0.1470	0.994 to 1.036
Race (1 = White)	0.404	<0.0001	0.347 to 0.470
Sleep Duration (hours)	0.907	0.0031	0.851 to 0.968
Bad (1 = Bad)	1.055	0.6475	.0837 to 1.330
Ok (1 = Ok)	1.081	0.3583	0.915 to 1.276

Note: Obesity Status is Obese (1) versus Not Obese (0); AOR=Adjusted Odds Ratio