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An Analysis of Obesity and Associated Health Implications in Colorado and Mississippi States in U.S.A.

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Abstract

The study tries to investigate the obesity and obesity related health implications of Colorado and Mississippi States to see the significant factors affecting obesity in each state to propose effective and doable policy suggestions to the states, especially to Mississippi state. The study follows logit analysis using Behavior Risk Factor Surveillance Systems (BRFSS) survey data of 2018. The individual data reported for the states were used for the analysis. The statistical package of STATA was used for the analysis. The analytical results show that physical exercise (EXER), number of sleeping hours (SLEP), and education (EDUC) play a major role in combatting obesity. Also, the impact of smoking (SMOK), alcohol consumption (DRNK), and obesity -related diseases ((DISE). The large differences in value between Colorado and Mississippi indicate the significance of these variables and how they could be used in Mississippi. Thus, Mississippi needs to go for efficient and effective policy implications to facilitate more for physical exercises, and education. Both states report that obesity-related illnesses have a significant impact on obesity. Thus, health programs on these diseases would be required to reduce obesity.

Keywords: obesity, Colorado, Mississippi, health implications

1. Introduction

Obesity is an abnormal or excessive accumulation of fat in the body that presents a risk to health. It is measured using Body Mass Index (BMI). The BMI is calculated by dividing the body weight of the individual by the square of his height and yields a unit measure of kg/m^2. Based on the BMI value, obesity level is classified as shown in Table 1. Thus, the BMI value more than 30 are classified as obese in general.

Table 1. Obesity Classifications

BMI	Classification
< 18.5	underweight
18.5–24.9	normal weight
25.0–29.9	overweight
30.0–34.9	class I obesity
35.0–39.9	class II obesity
≥ 40.0	class III obesity

Source: US National Institute of Health (NIH).

According to World Health Organization (WHO, 2021) worldwide obesity has tripled since 1975. The increasing rate of obesity for all ages is reported around the world (James, 2008; Finucane et al., 2011; Shekar & Popkin, 2020). For example, the prevalence of overweight or obesity among children and adolescents aged 5 to 19 years increased from 4 percent to 18 percent globally since 1975 to 2016 (Shekar & Popkin, 2020). More importantly, obesity and excess weight are important risk factors for non-communicable diseases (NCDs). According to World

Population Review, the total number of obese people in the world is approximately 2.1 billion which is 30 percent of the total population, and over 3 million people each year die from obesity. Every year, 3 to 4 million people die from obesity or overweight around the world (Shekar & Popkin, 2020). In addition to deaths, it results in reduced productivity, increased disabilities, increased health care costs, early retirement, and a reduction in free healthy living throughout the life cycle. All these threatens on human capital production outcomes and economic growth of the world.

The obesity epidemic continues in the United States and the rate is rising as far as estimates are concerned. The age-adjusted prevalence of obesity among adults was 42.4 percent in 2017-18 in the United States (Hales et al., 2020), and it appears that the rate has increased significantly compared to 1999-2000. Studies show that almost 34 per cent of adults and 15-20 per cent of children and adolescents in the United States are obese, and 67 percent of adults are overweight (Flegal et al., 2010; Ogden et al., 2010; Sabate & Wien, 2010; Shekar & Popkin, 2020). Obesity is a threat to public health in the United States, and it is associated with cardiovascular disease (CVD), stroke, hypertension, cancer, type 2 diabetes, asthma, musculoskeletal diseases, arthritis, and sleep apnea (NIH ; 1998; Ogden et al., 2002; Morimoto et al., 2002; Flegel et al., 2002; Schmid et al., 2005; Gregg et al., 2005; kinbami, 2006; Beuther et al., 2006; Kumanyika et al., 2008; Wolin et al , 2010; Herath Bandara & Brown, 2013; Bhupathiraju & Hu, 2016; Aronow, 2017; CDC, 2019). Obesity leads to higher mortality rates compared to people of normal weight (Strum, 2002; Mokdad et al., 2003; Flegal et al., 2010). According to Fontaine et al. (2003) life expectancy is decreased due to being overweight across the life span of an adult.

Obesity depends on biological, social, cultural, education, behavioral and economic factors as well (Smith & Tasnadi, 2003; Drewnowski & Specter, 2004; Classen & Hokayem, 2005; Lee et al., 2019). Obesity is caused by a high calorie content in the body (Cawley, 1999; Richards et al., 2004; Rosin, 2008) and is backed by sedentary lifestyles, and high-fat and energy-rich food intake (Becker & Murphy, 1988; Cawley et al., 2005; Anderson & Butcher, 2006). Genetic factors also account for obesity (Classen & Hokayem, 2005). Changes in food prices, types of food establishments like fast food centers and supermarkets, effect on obesity (French et al., 2001; Chou et al., 2004; Rashad et al., 2006; Morland et al., 2006; Currie et al., 2010). Higher education supports reducing obesity rates as health promotion is driven by knowledge; (Drewnowski & Specter, 2004; Cawley et al. 2005). According to Ewing et al. (2003) and Nayga (2006) urban development could be associated with increased weight. High poverty leads to high rates of obesity (Khan et al., 1998; Kumanyika et al., 2008). Neighborhood patterns impact on obesity (Frank et al., 2004; Boardman et al., 2005; Inagmi et al., 2006; Wang et al., 2007; Amarasinghe et al., 2009). Reduced overall physical activity can have led to excess weight (Lakdawalla & Philipson, 2002; Rosin, 2008). Wang et al. (2010) reveal that alcohol consumption increases the consumption of meat and high-fat foods and reduces the consumption of low-fat grains and meals that can affect overweight and obesity. Smoking is linked to obesity-related illnesses (Manson et al., 1990; Sun et al., 2019). Sleep deprivation can play an important role in obesity in some persons (Gangwisch et al., 2005; Beccuti & Pannain, 2011).

1.1 Cost of Obesity

Obesity has a high economic weight worldwide. It has far-reaching implications in all countries, regardless of economic or geographical context (Okunogbe et al., 20201). Obesity represents between 2 percent and 9 percent of the total health budget in high-income countries, excluding the cost of all obesity-related conditions. The United States Department of Health and Social Services (2010) reports that the annual cost of obesity in 2008 was $147 billion. The annual medical cost for obese individuals was $1,429 higher than for those with normal body weight. The total annual cost of obesity is $2,646 for an overweight man and $4,879 for an overweight woman (Dor et al., 2010). The National League of Cities (NLC) reveals that the estimated annual health cost related to obesity was 190.2 billion. This is 21 percent of annual medical spending in the United States (NLC, n.d.). Further, it highlights that the medical expenditures would be $549.5 billion for the next 20 years if the obesity is remained at the rate of 2010. According to Lehnert et al. (2015), Germany's estimated direct costs of overweight and obesity were $8,647 million in 2008. It was nearly 3.27 percent of total German heath care expenditures excluding the additional indirect costs of 8,150 million (Lehnert et al., 2015). The cost estimations for China show that national health care costs associated with overweight, and obesity have increased from 0.56 percent from 2000 to 3.13 percent in 2009 (Qin & Pan, 2016). Kosen (2018) reveals that 3 percent of GDP loss, about USD 28.4 billion due to obesity and related problems in Indonesia. In Brazil, health care costs related to overweight, and obesity are estimated to almost double from US$5.8 billion in 2010 to US$10.1 billion in 2050 (Rtveladze et al., 2013). Interestingly, obesity impacts the labor market. Averett and Korenman (1996) indicate that obese women have family incomes below their normal weight, even if family differences are taken into account. Moreover, the lower economic status of obese women is largely due to differences in the marriage market and in part to discrimination in the labor market. Cawley and Danziger (2005) and Zagorsky (2004, 2005) report discrimination based on the proportion of

women's earnings and employment.

1.2 Objectives and Research Questions

Compared to adults who are not obese, obese adults are more likely to have decreased quality of life and an increased risk of health problems. It affects obese adults and society in many ways. The high cost of obesity may significantly reduce an individual's productivity and the economic growth of a country beyond health impacts. Numerous studies have demonstrated the impact of obesity with relates to drinking and eating habits, physical activity, and the social and physical environment. In addition, the importance of promoting healthy food policies, improved physical environment and other regulations that help reduce obesity.

This study attempts to identify the answer to the following question by comparing factors affecting obesity and health implications of Colorado State which reports the lowest obesity with Mississippi State that reports the highest rate of obesity.

- What are the most efficient and effective ways of controlling obesity and costs of obesity.

With significance to the above research question, this study is attained following objectives:

- To understand the factors affecting obesity and costs of obesity in Colorado and Mississippi states
- To estimate binary regressions (logit) for obesity for the states
- To evaluate the major factors behind obesity for the states
- To propose effective and practical policy suggestions to Mississippi in controlling obesity

2. Materials and Methods

2.1 Background of the Study Area

Colorado is the number 12 richest state in the United States. There are 64 counties and 18 of them are urban counties, while others are rural. Agriculture, manufacturing, mining, and tourism are the industries that generate the most income in Colorado. Manufacturing is the largest among the industries which account for 6.4 percent of total output and 5.8 percent of jobs. The average household income is $96,970 with a per capita income of $38,226 (Census & Statistics, n.d.). Colorado has its lowest obesity rate since 1990. According to a report from the Trust for America's Health and the Robert Wood Johnson Foundation, about 23 per cent of adults were obese in 2017. Most adults between 45 and 64 years old are obese in Colorado. Among obese adults, around 20 percent are white, 27 percent are Latino, and 29 percent are black.

Mississippi is classified as the poorest state of the United States. Its total poverty rate is 19.6 percent, and far above the national average rate of 10.5 percent (Census & Statistics, n.d.). Mississippi is home to 82 counties, 36 of which are urban, while others are rural. The major industries are agriculture, textile production, electronic production, transportation and utilities, manufacturing, trade, education and health care, and fishing. The agriculture sector is the largest industrial sector, and agricultural production is in cotton, corn, soybeans and rice. Mississippi is a major producer of farmed catfish, sweet potatoes, cotton and pulpwood in the country. Agriculture employs about 17.4 percent of the state's workforce either directly or indirectly and agriculture is about 7.35 billion dollars from industry. There are around 34,700 farms in the state spanning 10.4 million acres (source?). According to the census and statistics (n.d.) the median household income for Mississippi is 45,081 for 2018. In 2019, obesity rate in Mississippi is 40.8 percent and it is the highest reported in the United States (CDC, 2019). It reported 37.3 percent on 2016 and was the second highest rate of adult obesity in the nation (CDC, 2019). Mississippi also has the highest rate of childhood obesity and close to half of Mississippi's children are overweight and obese (Mendy et al., 2017). In 2008, the direct health care cost of obesity was $925 million and was expected to increase with increasing obesity.

2.2 Data Collection

Behavior Risk Factor Surveillance Systems (BRFSS) survey data for year 2018 was the main sources of data. BRFSS is a survey of health-risk behaviors in non-institutionalized civilian adults, age 18 years and over. These data were collected from a stratified random sample through computer-assisted telephone interviewing by state health departments with the collaboration of the Center for Disease Control and Prevention (CDC). Individual data for obesity (BMI), presence of obesity-related diseases, socioeconomic factors (age, gender, race, marital status, education,), behavioral factors (smoking, alcohol consumption, engage in physical activities, sleeping hours), and environmental factors are collected from BRFSS (CDC, 2018). Missing data reported on BMI, calorie intake, physical exercise, income, and any of the variables were dropped from the sample. The final sample used for Colorado and Mississippi states were 8279 and 5508 respectively. Econometric analysis was done using the

statistical package of STATA.

2.3 Analytical Framework

2.3.1 Theoretical Framework: The Binary Logit Model

An individual decision-making process for a commodity is usually guided by already formed preferences (Moorthy et al., 1997), In the case of a commodity 'good health status" an individual's choice is a bundle of attributes, which were created from behavioral and socioeconomic functions, based on maximizing satisfaction subject to his budget and time constraints. The choice depends on whether the individual is satisfied or dissatisfied with the commodity purchased. Thus, the individual may either purchase or not purchase a product, resulting in two mutually exclusive alternatives which is a binary choice. Investments in "good health status" can be described by a household's production function. The time of the consumer and market goods such as medical care, diet, exercise, recreation, and housing as well as exogenous or given socioeconomic and demographic characteristics are combined (Grossman, 1972) to create "good health status".

Thus, the individual's good health status' faces a choice, which yields a binary dependent variable y_i that takes on the value of zero (0) if the individual does not have the intention to 'good health status" and one (1) if the individual has the intention to 'good health status' and is influenced by several factors x_i.

The probability of observing the (1) is given as:

$$P_t\left(y_t = \frac{1}{x_t}B_t\right) = F(-x_t B_t) \tag{1}$$

Where F is a continuous cumulative distribution function, an increasing function that takes a real value and returns, a value which ranges from 0 and 1.

The probability of observing the zeros is given as:

$$P_t\left(y_t = \frac{0}{x_t}B_t\right) = 1 - F(-x_t B_t) \tag{2}$$

In such specification, a maximum likelihood estimation can be followed to estimate the parameters of the model. The dependent variable is unobserved latent variable that is linearly related to y_i by the equation:

$$y_t = B_t x_t + u_t \tag{3}$$

Where u_i is a random error term. The observed dependent variable is determined by whether y_i exceeds a given value or otherwise.

This can be given as:

$$y_t = \begin{cases} 1 \;\; if \;\; y_t^* < 0 \\ 0 \;\; if \;\; y_t^* \geq 0 \end{cases} \tag{4}$$

where y_i* is the threshold value for y and is assumed to be normally distributed.

The binary logit model assures that the estimated probabilities remain in the 0–1 range and that it is nonlinearly related to the explanatory variables (Gujarati, 2003). Also, by taking the logarithm of the odds ratio, what appears to be a highly nonlinear model becomes linear in the parameters.

The logit model is given as:

$$L_t = ln\left(\frac{P_i}{1-p_i}\right) = \beta_7 + \sum B_1 x_\pi \tag{5}$$

Where P_i is the probability of an individual getting commodity of 'good health status' and $(1–P_i)$ is the probability of not getting it. L is the log of the odds ratio and is not only linear in X, but also linear in the estimated parameters. The βs are the estimated parameters. The relative effect of each explanatory variable (X_{ji}) on the probability of individual's decision is measured by differentiating with respect to X_{ji}.

That is:

$$\frac{dp_t}{dx_{f_i}} = B_g P(1-p) \tag{6}$$

This shows that the rate of change in probability with respect to X involves not only βs, but also the level of probability from which the change is measured. The βs measures the change in L for a unit change in X. It tells how the log-odds in favor of a change in the decision as the explanatory variables change by a unit.

2.3.2 Empirical Model

The paper used the binary logit regression model to analyze the factors affecting obesity in Colorado and Mississippi states. Individual level data were used for the analysis. The presence of obesity is the dependent variable. For each individual, obesity related diseases (DISE), marital status (MARY), education level (EDUC), employment status (EMPL), household income (HINC), and gender (GEND) were the socioeconomic variables considered. Among behavioral factors, sleepless hours in a day (SLEP), if the individual consumes alcohol (DRNK)), if the individual smokes (SMOK), if an individual engaged in exercise in the previous month (EXER) and if living in Urban (URBN) were used. The logit analysis with obesity -related factors as exogeneous variables would give the coefficients for the marginal impact on obesity for each state.

The following empirical model is used for the analysis.

$$L_t = ln\left(\frac{p_i}{1-p_i}\right) = B_0 + B_1 xSLEP_1 + B_2 EXER_2 + B_3 DISE_3 + B_4 xGEND_4 + B_5 MARY_5 + B_6 EDUC_6 + B_7 x_3 +$$

$$B_8 EMP_8 + B_9 HINC_9 + B_{10} SMOK_{10} + B_{11} DRNK_{11} + B_{12} URBN_{12} + U_i \quad (7)$$

Where the dependent variable, obesity is measured by dichotomous variable. SLEP denotes the number of sleeping hours of an individual in a day. EXER is a dummy variable indicating whether or not engage in physical exercises in last 30 days. More the physical exercises lead towards weight control of an individual. DISE is the number of any of the obesity related diseases of Asthma, Arthritis, Cancer, Diabetes, Heart attacks, or heart diseases that the individual has currently. Individuals show more association between obesity and obesity related diseases and is hypothesized to have a positive coefficient. GEND is a dummy indicating whether the induvial is male or otherwise. MARY is a dummy indicating whether or not the individual is married or otherwise. EDUC is a dummy indicating whether the individual is leaned up to some college or more or otherwise. As education impact on better food and health management, it is therefore hypothesized to have a positive coefficient. EMP is also a dummy variable used in two dummies as EMPD1 employed or otherwise, and EMPD2 retied or otherwise. HINC is also a dummy variable used in two dummies of HINCD1 and HINCD2. HINCD1 is whether household income is in between 25,000–50,000 dollars or otherwise, and HINCD2 is whether household income is more than 50,000 dollars or otherwise. SMOK is a dummy indicating whether the individual smokes or not. DRNK denotes the consumption of alcohol (no of drinks) per a month. Finally, URBN is also a dummy indicating whether the individual lives in an urban area or a rural area.

The considered variables and the expected theoretical signs of the associated parameters are presented in Table 2.

Table 2. Definitions of variables considered for the analysis

Variable	Description	Expected Effect
OBESE (DV)	1 if obese; 0 otherwise	N/A
SLEP	Number of sleeping hours in a day	undetermined
EXER	1 if engage physical exercise in last 30days; 0 otherwise	-
DISE	Presence of any of the obesity -related diseases	+
GEND	1 if male; 0 otherwise	undetermined
MARY	1 if married; 0 otherwise	undetermined
EDUC	1 I learned up to some college or more; 0 otherwise	-
EMPD1	1 of employed; 0 otherwise	+
EMPD2	1 if retired; 0 otherwise	undetermined
HINCD1	1 if income between 25,000-50,000, 0 otherwise	undetermined
HINCD2	1 if income is more than 50,00, 0 otherwise	+
SMOK	1 if smoke; 0 otherwise	undetermined
DRNK	Alcohol consumption (no of drinks)/ month	undetermined
URBN	I if living in Urban; 0 otherwise	undetermined

Source: Author's construction from the literature review.

3. Results and Discussion

3.1 Descriptive Analysis

The summary statistics of the variables for both Sates are presented in Table 3. Table 3 shows the mean values for the obesity related variables for both states. It shows that the average values for obesity (OBESE) for Colorado is 22 percent while it is 45 percent for Mississippi. The average sleeping hours (SLEP) per day is 7 hours for Colorado and 6.8 hours for Mississippi. The mean value of engaging in exercises in the previous month (EXER) is 83 percent for Colorado while it is 65 percent for Mississippi State. The average number of obesity related diseases reported (DISE) shows low numbers for Colorado compared to Mississippi. The average value for education (EDUC); learned up to some college or more is 72 percent for Colorado while it is 56 percent for Mississippi. The average values for employed including self-employed (EMPD1) is 55 percent for Colorado and 44 percent for Mississippi. The number of retired (EMPD2) or both States seems to the same average of 28 percent. The mean value for the annual household income in between 25,000 and 50, 000 (HINCD1) for Colorado is lower (26 percent) than the Mississippi (32 percent) but the mean value for the annual household income more than 50, 000 (HINCD2) is higher for Colorado (51 percent) compared to Mississippi (27 percent). The mean value for smoking (SMOK) is 12 percent for Colorado while it is 18 percent for Mississippi. Average value for alcohol consumption (DRNK) is high for Colorado (5.8 drinks per week), compared with Mississippi (2.8 drinks per week). The average percentage live in urban area (URBN) is 92 percent for Colorado and it is 71 percent for Mississippi. The percentages are seemed to be high in the samples when it is considered the number of urban counties in both States.

Table 3. Descriptive statistics of variables at State level for 2018

Variable	**Colorado**		**Mississippi**	
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**
OBESE	0.2287	0.4200	0.4055	0.4910
SLEP	7.0686	1.4243	6.8602	2.1637
EXER	0.8350	0.3711	0.6574	0.4746
DISE	0.6605	0.9599	0.9680	1.1933
GEND	0.4970	0.5000	0.4128	0.4923
MARY	0.5486	0.4976	0.4655	0.4988
EDUC	0.7266	0.4457	0.5677	0.4954
EMPD1	0.5585	0.4969	0.4493	0.4974
EMPD2	0.2801	0.4490	0.2871	0.4524
HINCD1	0.2627	0.4401	0.3275	0.4693
HINCD2	0.5126	0.4987	0.2746	0.4463
SMOK	0.1217	0.3270	0.1891	0.3916
DRNK	5.8334	8.6930	2.8485	6.6387
URBN	0.9246	0.2640	0.7106	0.4535

Source: Author's calculation based on data.

Table 4 and Figure 1 show the obesity and weight status both in Colorado and Mississippi states. Colorado reports low percentage for Obesity, but high percentages for Health weight and overweight. It seems healthy weight percentage is really low for Mississippi which 25 percent of the population.

Table 4. Obesity levels in States, 2018

	Colorado State		Mississippi State	
	Number	**Percentage**	**Number**	**Percentage**
Obese	1894	22.88	2234	40.56
Overweight	3025	36.54	1871	33.97
Healthy weight	3360	40.58	1403	25.47

Source: Author's calculation based on data

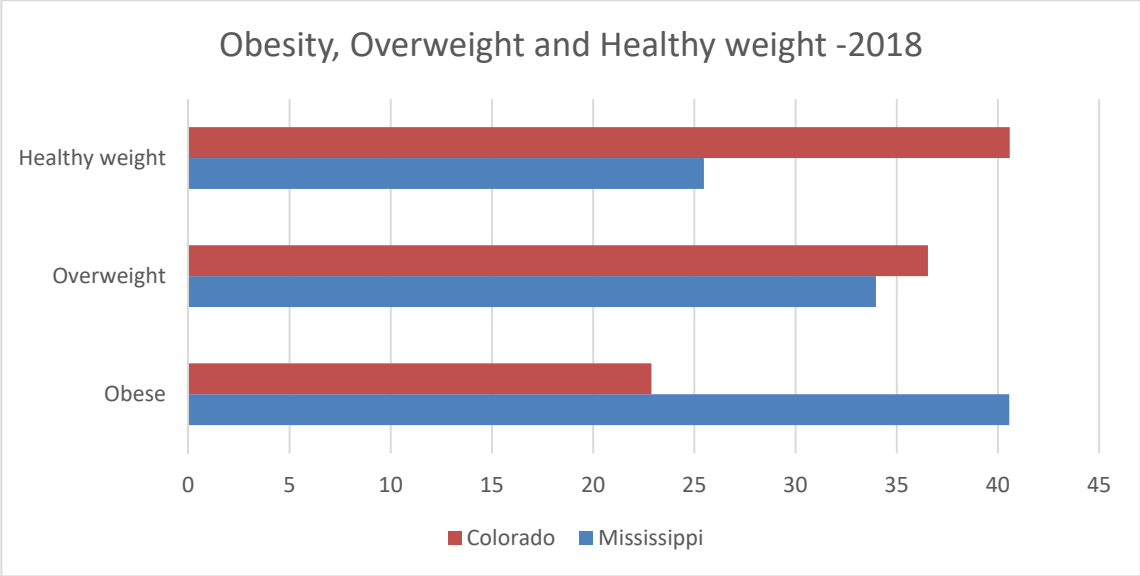

Figure 1. Obesity, overweight and healthy weight, 2018

Table 5 and Figure 2 show the presence of obesity-related diseases both in Colorado and Mississippi. According to table 5, the prevalence of asthma, arthritis, diabetes, heart attacks, and heart diseases are high in the Mississippi state compared with Colorado. However, presence of any cancer (skin, cervical, breast, etc.) reports a bit high number for Colorado state.

Table 5. Obesity related diseases, 2018

Disease	**Colorado State**		**Mississippi State**	
	Number	**Percentage**	**Number**	**Percentage**
Asthma	1152	13.91	797	14.47
Arthritis	2483	29.99	2223	40.36
Any Cancer	1458	17.61	842	15.29
Diabetes	740	08.94	1060	19.24
Heart Diseases	344	04.16	398	07.23
Heart Attacks	750	09.06	854	15.51

Source: Author's calculation based on data.

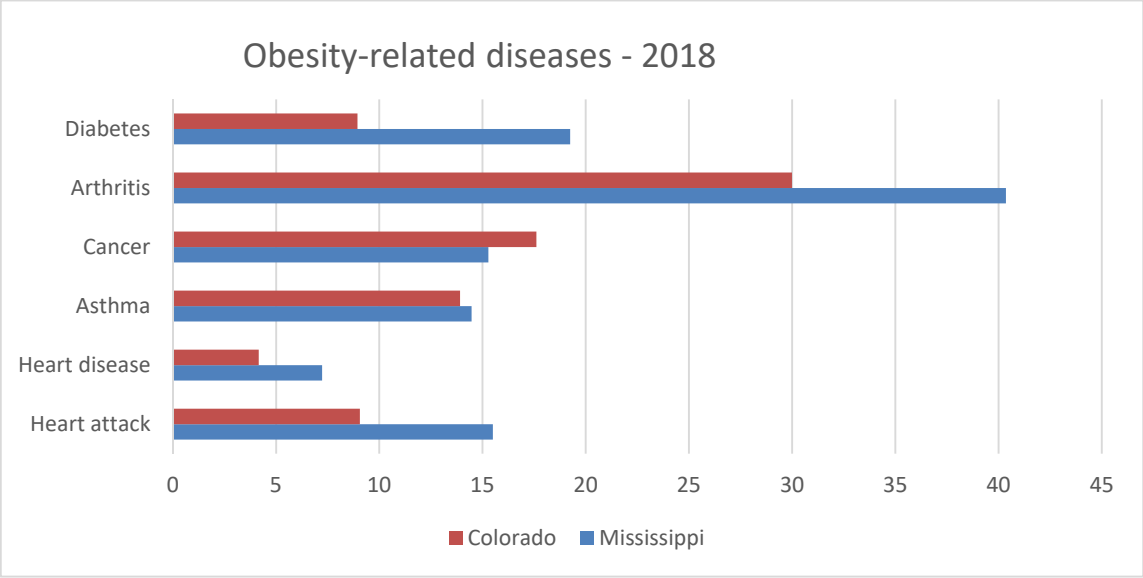

Figure 2. Obesity related diseases, 2018

3.2 Econometric Analysis

Table 6 presents the Logit analysis for obesity for both States. It shows that most of the variables are significant for both states. For the Colorado state, the significant and negative sign for SLEP indicates that individuals who sleep more hours are less likely to be obese. Further, the significant and negative sign for EXER indicates that individuals who are more likely to engage in physical exercise are less likely to be obese. Importantly, the DISE demonstrate strong positive relationship with obesity. This means that the higher presence of obesity related diseases leads increasing obesity in Colorado as it generally seen in other states. Results show significant and positive relationship with MARY and Obesity, indicating that marred individuals are more like to be obese compared to the unmarried individuals as shown by some other studies (Sobal et al., 2012; Teachman, 2016). The negative and significant relationship between EDUC and obesity (0.2417) shows that the higher the education in some college or more leads towards bringing down obesity in Colorado. The HINCD2 indicates a positive relationship with obesity for Colorado. This implies that the households with more than 50,000 incomes are more likely to be obese compared to the households with less than 25,000 annual incomes in Colorado. The result is not with the expected sign of income and obesity. However, recent research studies show that the relationship between income and obesity are not clear and sometimes find positive causality as well (Kim & Knesebeck, 2018; Bentley et al., 2018). Both smoking (SMOK) and drinking alcohol (DRNK) show significant and negative relationships with obesity. This indicates that smokers and alcohol consumers are less likely to be obese. However, the literature gives mixed results. Certain studies find that group of current smokers are less likely to be obese in comparison with never smokers (Shadrach, et al 2015; Ginawi et al., 2016). Traversy and Chaput (2015) find that individuals who frequently drink moderate amounts of alcohol may enjoy a healthier lifestyle in general that may protect them from weight gain while Wang et al. (2010) find the alcohol consumption reduces weight gain.

The analysis for Mississippi in Table 6 brings important results. The significant and negative sign for EXER indicates that individuals who are more likely to engage in physical exercise are less likely to be obese. The DISE shows the significant and positive relationship with obesity. This means that the higher the having obesity related diseases more the chance to be obese in Mississippi. The negative and significant sign for GEND indicates the male are more likely to be obese compared with female in the state. The positive and significant sign for EMPD1 indicates that the employed are more likely to be obese while, the negative and significant sign for EMPD2 indicates the retired are less likely to be obese. To get a better understanding of this outcome, it may need to check the types of jobs the employed are engaged and other associated facilities there. Interestingly, most available jobs at Mississippi are sedentary type of jobs and that could be highly linked to this positive relationship. The HINCD1 indicates a positive relationship with obesity and income in between 25,00–50,000. It implies that that the households with annual income in between 25, 000 to 50,000 are more likely to be obese compared to the households with less than 25, 000 annual income. This could be associated with food consumption patterns with the limited income of the households. The idea is supported by the lower average household income of the state ($42,781). Both smoking (SMOK) and drinking alcohol (DRNK) show significant and negative relationships with

obesity for Mississippi. Most interestingly, the significant and negative sign for URBN indicates that the urban residents are less likely to be obese compared with rural residents in Mississippi. This could be associated with the more opportunities for physical activities.

Table 6. Logit analysis for Colorado and Mississippi, 2018

	Colorado			**Mississippi**		
Variable	Coefficient	Std. Err.	P> Z	Coefficient	Std. Err.	P> Z
SLEP	-0.0509***	0.0184	0.006	-0.0002	0.0131	0.987
EXER	-0.7609***	0.0680	0.000	-0.3591***	0.0614	0.000
DISE	0.2893***	0.0273	0.000	0.2860***	0.0259	0.000
GEND	-.01634	0.0552	0.767	-0.2248***	0.0598	0.000
MARY	0.1200**	0.0588	0.041	-0.0174	0.0612	0.775
EDUC	-0.2417***	0.0628	0.000	-0.0263	0.0621	0.671
EMPD1	0.1052	0.0810	0.194	0.2700***	0.0772	0.000
EMPD2	-0.1117	0.0866	0.197	-0.5380***	0.0802	0.000
HINCD1	0.1131	0.0787	0.151	0.1376**	0.0702	0.050
HINCD2	0.2211***	0.0796	0.006	-0.0836	0.0855	0.328
SMOK	-0.5055***	0.0926	0.000	-0.4254***	0.0766	0.000
DRNK	-0.0289***	0.0036	0.000	-0.0196***	0.0047	0.000
URBN	0.0304	0.1020	0.765	-0.1210**	0.0626	0.053
Con	-0.3344	0.1859	0.072	-0.0949	.12837	0.460
	N = 8279; Prob > chi2 = 0.0000; Log likelihood = -4242.82; LR chi2(13) = 419.04; Pseudo R2 = 0.047			N = 5508; Prob > chi2 = 0.0000; Log likelihood = -3549.96; LR chi2(13) = 338.23; Pseudo R2 = 0.045		

***, **, * are significant @ 1%, 5% and 10% respectively.

4. Conclusions, Policy Suggestions, and Limitations

The study attempted to investigate the obesity related health implications of Colorado and Mississippi States in order to see the significant factors affecting obesity in each state to propose effective and doable policy suggestions. The findings strongly suggest the need to increase awareness of the societal impacts of obesity and to take strategic steps to address the systemic roots of obesity. The analytical results show that physical exercise (EXER), number of sleeping hours (SLEP), and education (EDUC) play a major role in combatting obesity. The large differences in value between Colorado and Mississippi indicate the significance of these variables and how they could be used in Mississippi. Thus, Mississippi needs to go for efficient and effective policy implications to facilitate more for physical exercises, and education. As education significantly improves the desire on engaging physical exercise, programs to enhance knowledge on obesity, obesity-related diseases, and healthcare would be more benefited. Further, more employment opportunities with minimized sedentary styles would help to decrease obesity in long run. Both states show the significant impact of obesity related diseases on obesity. Thus, health programs on these diseases would be needed to minimize obesity.

The study outcomes and conclusions could be improved for better policy actions if environmental factor related data like recreational facilities, supermarkets, fast food facilities, sidewalks etc. could be considered in the analysis.

Competing Interests Statement

The authors declare that there are no competing or potential conflicts of interest.

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