

An Empirical Exploration of U.S Healthcare Discrimination and Obesity Prevalence

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Abstract:

This paper offers an empirical exploration of the discriminatory nature of the US healthcare system using obesity prevalence as a primary lens. The study involves an analysis of time series data sets to examine the impact of an array of both economic and lifestyle factors on obesity rates across a statewide level. In addition to discussing the current realm of literature surrounding obesity, this paper expounds upon existing empirical models. Results show that inequality and race are significant influencers of anti-black discrimination that is ever present within society.

JEL Classification: I18, I15.

Keywords: Obesity, United States, Empirical Analysis

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INTRODUCTION

Amongst all the public health epidemics facing our nation, obesity has become one of the most detrimental. Little surprise should be found within the statement that its prevalence has only worsened as years have gone on and society has advanced. Since the 1990s, U.S obesity rates have increased drastically; obesity rates within most adult age and racial groups are now exceeding 30% (Kim & Basu, 2016). Obesity is classified as a condition where an individual reports a body mass index- or BMI- of over 30 (WHO). Body mass index is calculated by taking an individual's weight in either kilograms or pounds and dividing it by the square of their height in meters or feet.

The condition of course can result in a plethora of further health complications, including heart disease, cancer, diabetes, and blindness (WHO). A 2017 study found that over 4 million people die annually resulting from complications associated with obesity (WHO). What is interesting about the condition is that globally, there are now more overweight individuals than underweight individuals in virtually every region (WHO). This means that a concern that was previously mainly perceived to be a problem associated with higher income regions, is truly a pandemic of sorts that does not discriminate based on things like income, socioeconomic status, or race (WHO).

This being the case, however, great interest can be found in a fixated deep dive on obesity trends within specific areas of the world; the reason being that the data can suggest that for various potential reasons, it is in fact discriminatory. In the United States, healthcare discrimination has been just another item on a long list of deep-rooted societal issues. A 2015 study found that of the 39 US states reporting alarming obesity rates, those with the highest rates were commonly found among states with inhabitants of lower socio-

economic status (Broady & Meeks, 2015). The same study further expounds upon this phenomenon by discussing Mississippi where-at the time of said study-the state reported both the highest percentage of Black residents with the highest obesity rate “Mississippi is the state with the highest percentage of African American residents, 37.5%; the highest obesity; and the fifth lowest median household income...” (Broady & Meeks, 2015) Other supporting literature discusses the disparities in obesity prevalence between Black women and their white counterparts within the states; An analysis of obesity data from 1976-80 shows that the discrepancies within obesity rates for Black and white women was at a level of 15.6% (Burke & Heiland, 2008). An analysis of the differences from 1999-2004 shows that the level increased to more than 20% (Burke & Heiland, 2008).

While there are a fair amount of existing studies-the aforementioned included- that examine the dynamic between race and healthcare, few attempt to make a deep enough dive detailing the truly significant areas where marginalized groups experience the most detrimental effects. Most either fixate on determining only the explanatory impacts-behavioral tendencies, sociological impacts-or the more economic; relating to metrics describing income, regional inequalities, education and similar concepts. The purpose of this study is to make that deep dive. It is believed that an analysis combining both the most significant explanatory variables and prominent economic indicators pertaining to obesity prevalence will help add a breadth of fresh air to the current realm of literature surrounding US healthcare discrimination.

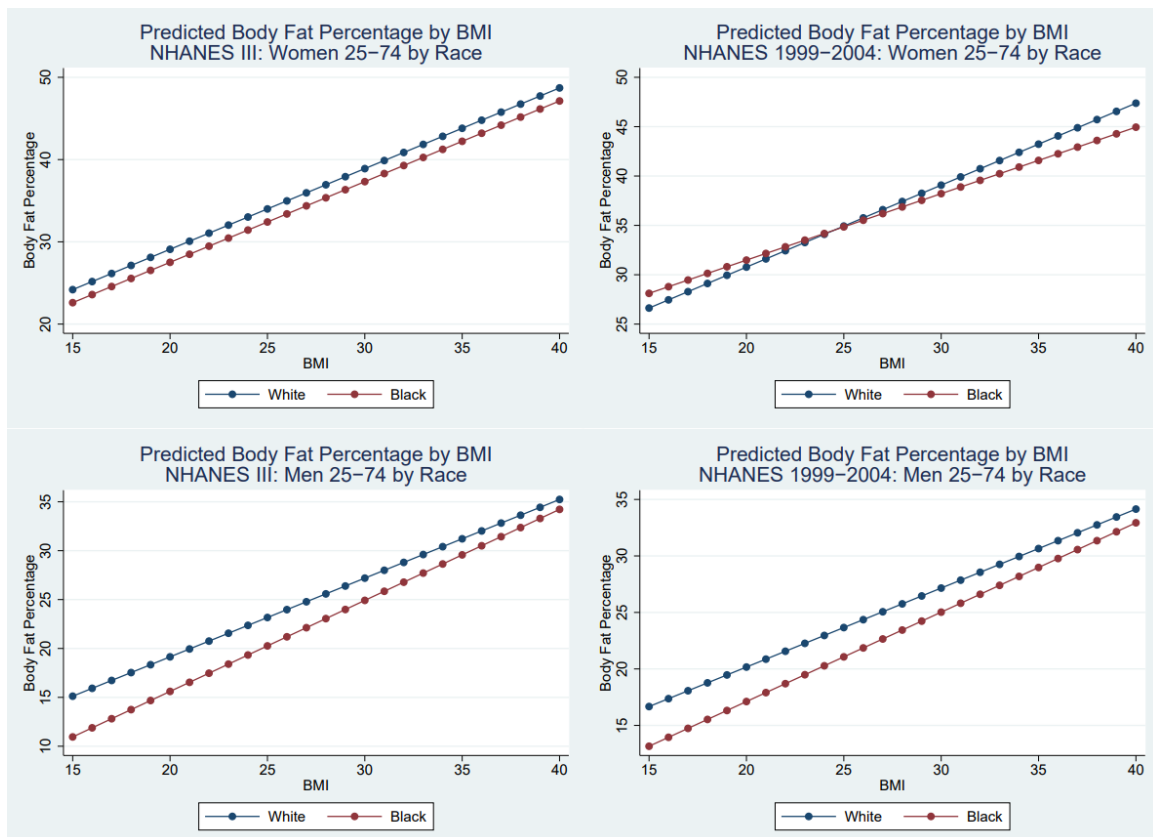
The rest of the paper is organized as follows: Section 2 gives a brief literature review. Section 3 outlines the empirical model. Data and estimation methodology are

discussed in section 4. Finally, section 5 presents and discusses the empirical results. This is followed by a conclusion in section 6.

OBESITY TRENDS

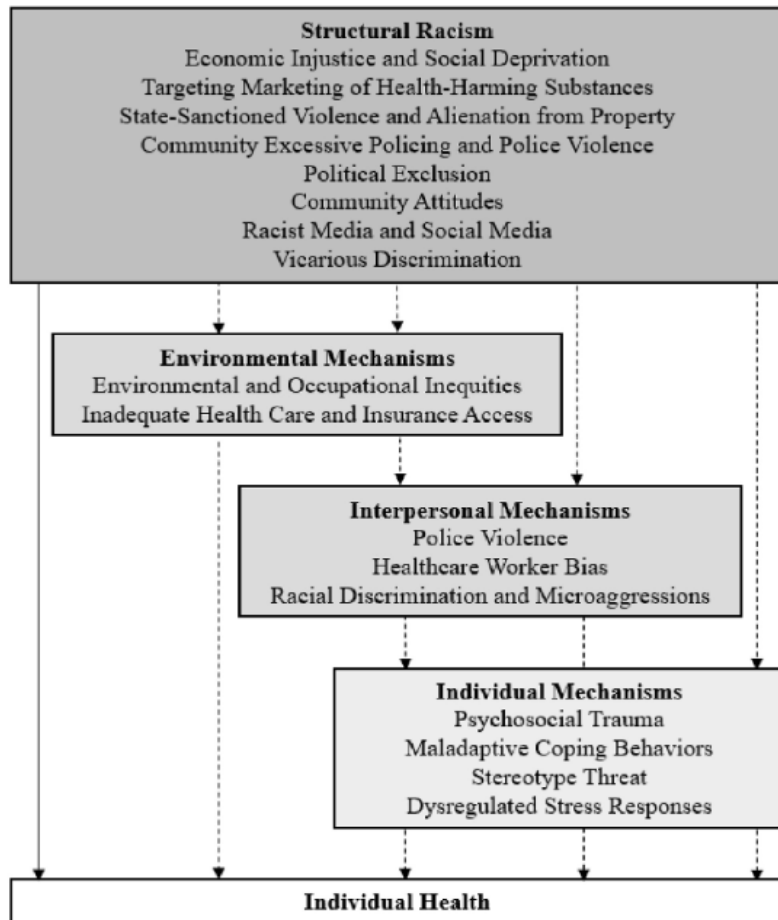
Figure 1, sourced from a 2008 study shows body fat plotted against BMI measurements categorized by both race and gender. The charts categorized as NHANES III present survey data from 1988-1994. The NHANES is the National Health and Nutritional Examination survey, which is a collection of cross-sectional studies performed by the CDC (Burke & Heiland, 2008).

Observing the chart on the top right, we see an intersection between the lines. This shows that for females with BMI values below around 24, Blacks are expected to report a higher percentage of body fat than their white counterparts (Burke & Heiland, 2008). This being the case, the opposite can be said when BMI levels surpass this amount (Burke & Heiland, 2008). In all the other supporting charts, we see that Whites are often predicted to report higher levels of body fat regardless of the level of BMI when compared to their black counterparts.



Source: NHANES III, NHANES 1999-2004 (Burke & Heiland, 2008)

Figure 2, sourced from a 2023 implications report presents a theoretical framework outlining the way in which structural racism links itself to physical and mental health complications within Black Americans. The theoretical model is included in this article to further stress the existence of an anti-Black sentiment surrounding the current systems controlling US healthcare. Within the original implications report, the current realm of empirical literature is discussed and critiqued (Reid & Earnshaw, 2023). The solid line within the model suggests a more concrete connection between two elements; in this case there is without a doubt a clear perceived relationship between the advent of structural racism and the onset of individual health issues in Black Americans. The dotted lines represent the less clear relationships; this is not to say that they are weak or non-existent. Rather, literature and empirical studies need to evolve in order to more concretely describe the dynamics.



Source: Reid & Earnshaw, 2023 (adapted from Bailey et al., 2017)

LITERATURE REVIEW

The primary shortcoming of the existing research in this field is that it does not dive deep enough into both the economic factors and sociological/behavioral mechanics that work together to impact obesity rates. This being the case, several studies exist that offer luminous insights into both sides of the equation.

The aforementioned 2023 implications report offers a concise yet plenteous discussion on the current discriminatory sentiment disseminating across the US Healthcare system. Additionally, it also offers criticism that is intended to urge researchers to build upon longstanding limitations. The concept of structural stigma is introduced, and it is defined as a devaluating social process that works to “constrain the opportunities, resources, and well-being of the stigmatized” (Reid & Earnshaw, 2023). It is devaluating and socially demoralizing because it offers a lens towards how social phenomena can bleed into the values of institutions and cause concrete damage. The authors touch upon a 2001 study that attempted to identify the potential catalysts that resulted in segregated communities having worse levels of general health. The study found alarmingly intuitive results; exposure to toxins and inequities amongst access to quality health care were a few of the potential mechanisms found (Reid & Earnshaw, 2023).

The crux of the report is the inclusion of a model adapted from a 2017 study that attempts to find the pathways through which structural stigma can be linked to impacts on individual health. This is an essential model to understand because it offers visual evidence of the ways in which society’s mechanisms work to keep Black and other non-white individuals in a suppressed and demoralized state. It shows that everything is connected; the toolbox utilized by government officials during the redlining era is still being employed today. The only difference is that more and more tactics have been added to distort the reality that the primary way this system benefits is via the control of the non-white body, mind, and economic livelihood.

Using this theoretical framework as a foundation of sorts, attention can now be turned towards empirical studies that quantitatively attempt to highlight issues facing Black individuals regarding healthcare. A 2015 study analyzing statewide obesity prevalence offers an empirical model that attempts to identify what economic factors are most correlated to Black health issues (Broady & Meeks, 2015). The authors address the impact of the capitalist market on the obesity epidemic “fast food restaurant franchises are becoming more prevalent, consumers are buying more...obesity rates are increasing” (Broady & Meeks, 2015). Their criticism is paramount; they argue that population detriments created as a result of support of the free market need to be checked by state and federal level policy changes (Broady & Meeks, 2015). National fitness initiatives, food accessibility programs, and general nutritional education. These are some areas that the authors feel a nation needs to place more of an emphasis, especially within the context of Blacks and their reported levels of health as a result of this lack of emphasis.

The model used within this report mixes a key number of lifestyle indicators and economic programs; SNAP benefit, physical exercise tendencies, and MRFEI (Modified Retail Food Environment Index) to name a few.

A 2008 study looked to address the discrepancies in obesity prevalence rates between Whites and non-whites using self reported survey data from the National Health and Nutrition Examination Surveys (Burke & Heiland, 2008). Within the data the study observed gaps in mean BMI and obesity prevalence between Black and white women (Burke & Heiland, 2008). This being the case, the gaps weren't found to narrow significantly once things like education, income, and occupation were controlled for. The study concluded that black women face much weaker incentives to avoid becoming obese, and this is explained by a combination of both health related incentives and behavioral (Burke & Heiland, 2008).

A 2016 empirical work aimed to address the heightening level of public concern regarding health care costs by performing an analysis of the costs associated with obesity in the US. The study found that the annual level of spending on obesity related complications in 2014 was just under \$150 million (Kim & Basu, 2016). 12 additional studies were gathered and observed within this report. Positive correlations were observed

between lifetime healthcare costs and rising BMI, which further suggests the reality that the condition leads to both financial and physical burdens (Kim & Basu 2016).

In 2019, researchers at FIU dove into an interesting potential relationship. They wanted to answer the question: is there any sort of correlation between violent crime and obesity rates? (Stolzenberg, D'Alessio, & Flexon, 2019). It is suggested that residing in a violent/unsafe neighborhood could potentially exacerbate obesity by pushing individuals to stay inside in order to avoid the dangers of their environment. The study observed data describing 12,645 residents living in 34 different NYC neighborhoods. It found that the probability of both a black and hispanic resident being obese increase additionally (Stolzenberg et al., 2019). Obesity and crime do not have a clear correlation; this study even noted that while increased probability of one led to an increase in the other, there wasn't a direct link (Stolzenberg et al., 2019). The dynamic can be related to a plethora of factors; those who reside in poverty stricken areas probably will not have fair access to healthy food options. The study expounds upon this interesting dynamic and offers valuable insight into a correlation that is not often discussed in other literature.

A 2020 study within the *Journal of Social Economics Research* offers an empirical analysis of the differences in obesity trends between the East and Westt Coasts of the US (Adrangi, Hoppe, & Raffiee, 2020). To perform this analysis, the researcers built a model that captured food access and household income for both regions. To address food access, the model included metrics capturing the amount of grocery stores per country, fast food restaurants, and convenience stores. Recreational facilities per county was also included. The study concluded that policy recommendations stressing fast food corporations offering healthy options should be emphasized (Adrangi et al., 2020). Additionally, as the data showed a negative correlation with grocery stores and obesity, it is suggested that increasing access to these healthier food options would be a strong point for policies to fixate on (Adrangi et al., 2020). Of course these implementations are easier said than done. This being the case however, this study serves as further justification that the capitalist drives of the franchise need to be examined if true public health reform it so be achieved.

DATA AND EMPIRICAL METHODOLOGY

Data

The study uses cross-sectional statewide data from the year 2021. Data was obtained from a wide array of organizations and web databases. Data for the dependent variables of OBESITY_TOTAL, OBESITY_WHITE, and OBESITY_BLACK were sourced from the 2021 CDC web publication of statewide obesity prevalence. Data for the independent variable VIOLENT_CRIME was obtained from an online World Population Review database. Data for the remaining independent variables was sourced from Statista. Summary statistics for the data are provided in Table 1.

Table 1 Summary Statistics

Variable	Obs	Mean	Std. dev.	Min	Max
BLACK PERC	51	0.1227451	0.1054908	0.01	0.47
FAST FOOD	51	4894.078	5665.853	356	30867
HEALTH	50	8.6602	0.5562869	7.5	9.8
HOSPITAL	51	8.37E+07	1.06E+08	3444658	5.02E+08
INCOME	51	71532.88	11825.76	46637	97332
SNAP	51	799.7055	906.4409	29.83	4396.99
OBESITY TOTAL	51	0.3193529	0.0400753	0.238	0.408
VIOLENT CRIME	51	396.1042	175.9051	108.581	999.837
SMOKING	51	0.1294118	0.0294219	0.06	0.2
ALCOHOL	51	2.560196	0.5943955	1.36	4.83
GINITHEILINDEX	51	0.472549	0.0210564	0.43	0.54

Empirical Model

Following (Broady & Meeks, 2015) this study adapted and modified a model that was originally developed to determine the impact Supplemental Nutrition Assistance Program benefits (SNAP) and other lifestyle factors had on statewide obesity prevalence rates.

The original model is as follows:

$$O = \beta_0 + \beta_1 SNAP + \beta_2 LTPA + \beta_3 INCOME + \beta_4 AFRICAN + \beta_5 HEALTHY_FOOD + \beta_6 MFREI + \epsilon_{it}$$

This report adapts the model from the 2015 study and creates 2 separate models that attempt to capture the multifaceted indicators that have significant impacts on obesity rates for both Blacks and Whites. The first model attempts to recreate the findings of the first, while using some variables as a proxy. The variables SNAP and INCOME were pulled from the original model. As a proxy for LTPA, HEALTH was used. This was a self-reported score assessing the average level of physical well-being for the inhabitants of a given state. As a proxy for AFRICAN, BLACK_PERC was utilized. This variable captured the statewide percentage of Black inhabitants. In the original model, HEALTHY_FOOD was a quantitative variable that captured the percentage of census tracts that did not have at least one healthy food retailer (Broady & Meeks, 2015) MFREI was also utilized in the original model; it was the Modified Retail Food Environment Food Index. It measures the count of healthy and less healthy food retailers within a given census track. As a proxy for these variables, FAST_FOOD was utilized. This variable captured the total amount of fast-food restaurants in each state. The model adds in a measurement of inequality through GINITHEILINDEX. This measurement captured the average Gini coefficient estimate for each state.

The second model expounds upon the first by adding more explanatory models. The key variables appended to the model were ALCOHOL, HOSPITAL, SMOKING, and VIOLENT_CRIME. Both models set OBESITY_TOTAL as the key dependent variable. This was an estimate of the average levels of obesity prevalence for each state.

The models can be written as follows:

- 1) $OBESITY_TOTAL = \beta_0 + \beta_1 SNAP + \beta_2 HEALTH + \beta_3 INCOME + \beta_4 BLACK_PERC + \beta_5 FAST_FOOD + \beta_6 GINITHEILINDEX + \epsilon_{it}$

$$2) \text{ OBESITY_TOTAL} = \beta_0 + \beta_1 \text{ALCOHOL} + \beta_2 \text{BLACK_PERC} + \beta_3 \text{FAST_FOOD} + \beta_4 \text{GINITHEILINDEX} + \beta_5 \text{HEALTH} + \beta_6 \text{HOSPITAL} + \beta_7 \text{INCOME} + \beta_8 \text{ASMOKING} + \beta_9 \text{SNAP} + \beta_{10} \text{VIOLENT_CRIME} + \epsilon_{it}$$

5.0 EMPIRICAL RESULTS

The empirical estimation results are presented in Table 2. The empirical estimation for the first model initially presents the negative relationship with SNAP and OBESITY_TOTAL. While the signage is appropriate, it is not a statistically significant finding. BLACK_PERC and FAST_FOOD both had a positive sign. This is appropriate, as the signage suggests that the higher the Black population in a state, the higher the prevalence of obesity is. This follows the findings of (Broady & Meeks, 2015). This was found to be statistically significant at a 5% level. INCOME and its relationship was found to be statistically significant at a 1% level. HEALTH, INCOME, and GINITHEILINDEX all had a negative sign. This follows the common perception most works of literature have surrounding these concepts; the more physically active someone is the less likely they are to succumb to a sedentary lifestyle/obesity. The more income an individual or household can acquire, the better quality of food they can purchase and the greater avoidance they have of obesity and its related ailments. The negative signage of the Gini coefficient variable suggests that as economic inequality increases, the prevalence of obesity seems to decrease. An increase in the Gini coefficient would suggest that the dispersion of income in each state has become more uneven. States with higher Gini coefficients are likely to have higher wealth and overall wellbeing. In regions with higher Gini coefficients, the disparity between affluent individuals and impoverished individuals is greater. This being the case, individuals with greater individual wealth can afford cleaner food, finance expensive exercise habits, and generally foster a lifestyle that extravagantly avoids a sedentary lifestyle. In both models, this coefficient is statistically significant at a 1% level. The R-squared for this model was 0.5232, which showed that the model was a good fit.

Table 2: Regression results OBESITY_TOTAL

	I	II
CONSTANT	.9154873***	.8320247***
SNAP	-.0000128	-.0000147
HEALTH	-.0217902***	-.0154657
INCOME	-1.58e-06***	-1.22e-06
BLACK_P ERC	.091163**	.1026248**
FAST_F OOD	1.22e-06	1.17e-06
GINITHE ILINDEX	-.6366939***	-.636181***
ALCOHOL		-.0100603
HOSPITAL		8.10e-12
SMOKING		.232816
VIOLENT CRIME		-5.16e-06
R ²	0.5232	0.5173
F-statistics	9.96	6.25
Number of obs.	50	50

Note: ***, **, and * denotes significance at the 1%, 5%, and 10% respectively.

In the second model, none of the key additional variables appended to the first were significant. The signages of the variables were appropriate. HOSPITAL represented the amount of revenue hospitals collected from patients statewide as a result of obesity related concerns. The positive sign supported the findings of (Kim & Basu, 2016) regarding rising healthcare costs and their impacts on obesity prevalence. The positive sign of smoking suggested that the more someone partakes in smoking, the more likely they were to find themselves susceptible to obesity and its related ailments. The adjusted R-squared for the second model was 0.5173.

CONCLUSION

In summary, the regression analyses included in this study suggest that there exists a significant level of anti-black discrimination within the U.S healthcare system. Additionally, it can be concluded that inequality - which was captured via the GINITHEILINDEX variable – serves as another significant influencer of the aforementioned healthcare discrimination. In terms of policy implications, legislation should place emphasis on improving the access that low SES census tracts have to clean and affordable food options.

Reflection on this study has led to the unearthing of key limitations that should be addressed if further replication is to be pursued. The first pertains to the data utilized within this study; the manual combination of multiple separate datasets to create one holistic data source could have resulted in some unwanted manipulation. If this study were to be revisited, it may be worthwhile to utilize more complete datasets, as the removal of the manual step of combining data - using programs like excel- could eliminate a certain level of human error. Another limitation was the fact that the study generalized statewide activity using data from an aggregate level. If the study utilized survey data, assessments could have been more individually focused. More individually focused assessments could have resulted in more variables being found significant. All things considered, this study expounds upon current literature within the field, and adds a fresh perspective that highlights key behavioral and economic factors that pertain to U.S healthcare discrimination.

Appendix A: Variable Description and Data Source

Acronym	Description	Data source
OBESITY_TOTAL	Statewide obesity prevalence in percentage.	CDC
SNAP	Supplemental Nutritional Assistance Program benefits allotted per person for each state	STATISTA
HEALTH	10 pt. score capturing individual well-being based on self-reported survey responses	STATISTA
INCOME	Median household income for each state.	STATISTA
BLACK_PERC	Percentage of Black population for each state	STATISTA
FAST_FOOD	Number of fast-food retailers in given state	STATISTA
GINITHEILINDEX	Gini Coefficient for a given state.	STATISTA
ALCOHOL	Average consumption of alcoholic beverage in liters for a given state	STATISTA
HOSPITAL	Amount of revenue collected by hospitals resulting from obesity related ailments/treatments	STATISTA
SMOKING	Average consumption of cigarettes in packs per person for a given state	STATISTA
VIOLENT_CRIME	Violent crime rate for a given state.	World Population Review

Appendix B- Variables and Expected Signs

Acronym	Variable Description	Expected sign
SNAP	Supplemental Nutritional Assistance Program benefits allotted per person for each state	-
HEALTH	10 pt. score capturing individual well-being based on self-reported survey responses.	-
INCOME	Median household income for each state.	-
BLACK_PERC	Percentage of Black population for each state	+
FAST_FOOD	Number of fast-food retailers in given state	+-
GINITHEILINDEX	Gini Coefficient for a given state.	+
ALCOHOL	Average consumption of alcoholic beverage in liters for a given state	+
HOSPITAL	Amount of revenue collected by hospitals resulting from obesity related ailments/treatments	-
SMOKING	Average consumption of cigarettes in packs per person for a given state	+

VIOLENT_CRIME	Violent crime rate for a given state.	+
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