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PPD 631

Analyzing the Association of Low-Income States and Obesity

Executive Summary:

Obesity is more prevalent among lower income people in the United States. Considering fast food is cheap and widely available in the United States, it was examined whether lower income states have more fast food restaurants and if these states have higher obesity rates. Consequently, it was examined whether the prevalence of fast food and obesity rates where associated with higher health care expenditures. If health care expenditures weren't associated, it was determined if political spending had something to do with it. The research determined that there was no association between obesity rates and restaurant density in low income states. Nor was there a relationship between political affiliation and healthcare spending. Factors other than fast food have caused people in low income states to have high obesity rates.

Problem Statement:

Being obese has many ills that come with that status label. Obesity is associated with deadly diseases such as diabetes, heart disease, and some forms of cancer (Kopelman, 2000). Obesity is measured by body mass index (BMI), which seeks to measure the body fat present in an individual based on that persons weight and height. According to the Center for Disease Control, any person with a BMI over 30 is considered obese (Division of Nutrition, n.d.). As of 2012, in the United States, one-third of adults who were 20 years of age or older had a BMI over 30 and were considered obese. These numbers have remained fairly constant since 2004 (Ogden, Margaret, Kit, & Flegal, 2014). Obesity significantly decreases life expectancy and considering the poor are more likely to be obese, this disproportionately affects them. (Fontaine, Redden, Wang, Westfall, & Allison, 2003)

In the United States, there is an association between the prevalence of obesity and wages earned. Individuals with lower wages have an increased chance at elevated BMI, and obesity, in comparison to those with greater earning power. (Kim, 2010) Thus, it is germane to ask what types of foods or eating habits these individuals with low wages have that results in them having greater obesity rates.

Furthermore, the amount of income earned has an effect on the nutritional value of food an individual consume. People with lower incomes tend to consume their daily calories from less healthy foods than their high income counterparts. (Andreyava, Tripp, & Schwartz, 2015) Thus, these low income people are able to meet their caloric needs, but are unable to meet the advised United States Department of Agriculture's dietary guidelines that dictate proper nutrition. There is also a known association between increases in body fat with the consumption of fast food. (McCrory, et al., 1999).

Considering that fast food establishments are physical assets, the role that fast food restaurants play in obesity will be examined through the use of Geographic Information Systems (GIS).

Taking into account that the low income population has a greater prevalence of obesity, the examination of the magnitude of the role of the density of fast food restaurants in these lower income states will be examined. It will also be examined whether these associations have any impact on state health care costs. There is an expected association with higher obesity rates and higher healthcare spending considering the obesity is second only to smoking in preventable causes of death. (Flegal, Willimson, Pamuk, & Rosenberg, 2004)

Data:

This project was realized utilizing 6 types of data sets from a total of 5 different sources. All data is United States state level data. Data examined is only for 48 Contiguous States. Data specifics are as follows. :

- Healthcare Spending per Capita: This data was retrieved from the Kaiser Family Foundation in the form of an excel document. The data was gathered in 2009. In order to make the data usable, I had to reduce the monetary value of the spending 3 decimal places to get a whole number. Additionally, I had to add a new column with a state specific code so I would be able to join it to the States shapefile. The code unique to each State was determined by looking at the existing ArcGIS state shapefile that had a predetermined field labeled STATEFP. Since the state code column on the healthcare spending variable was a long type, I had to add a new field to the State shapefile before I joined them. The variable includes spending for public and private funded personal health care services by state. The total net revenue of Hospital spending is also included. As previously stated, people of lower wages have higher obesity rates and are prone to more illness/death. This variable allows us to see if the United States takes an equitable approach to healthcare spending and gives more to those individuals in need.
- Obesity rate per state: This data was retrieved from the Kaiser Family Foundation in the form of an excel document. The data was gathered in 2013. Obesity rate was measured by examining all adults with a body mass index over 30. The data was gathered using a state-based telephone survey of adults over the age of 18. This data parallels what the federal government deems a very unhealthy person to be using a quantitative measure. This quantitative measure allows me to use numerical data to compare to other quantifiable data. I created a State specific code on the excel document to be able to join this data with the States shapefile. Since it was a long type, I joined it with the long type State code I had previous used to join a previous variable.
- Median Household Income: This data was retrieved from the United States Census Bureau. The data was gathered in 2014. The data is presented in 2014 current dollars. I also created a state specific code column for this variable in order to be able to link it to the States shapefile. This code was a long type and when I combined it with the States shapefile I used the field that I had previously created when joining the healthcare variable. Since I am distinguishing low-income and high-income states as two separate entities, I took the median income for that year ($53,657) and labeled all the States that fell below that threshold as low-income using the selection tool. In total, there were 23 states that fell into that category. Leaving that selected field on, I then exported that map layer of

only selected attributes using the source data. This gave me a layer which I could toggle on and off in collaboration with all other layers to only get low income specific data.

- Political Affiliation: This data was retrieved from the Daily Kos. The Daily Kos is a liberal American political blog. The party affiliation is based on the 2012 Presidential Election Electoral College results. A state was either deemed to be Democrat or Republican. This variable was chosen to see the effect that politics play on healthcare spending. If the lower income states with more needs don't receive more money, it allows us to see if there is an association of party politics factored into the decision of healthcare spending. In order to be able to distinguish between the Democrat and Republican states, I added a new field that created a dummy variable (0, 1) where 0=Republican States and 1=Democrat. In order to make that difference visual, I went to the "symbology" tab and under "categories" I created unique values for republicans and democrats using my dummy variable column. I also created a States specific column with a state specific code that matched the States shapefile. I then matched it to the long type field I had created to match the rest of the variables.
- Fast Food Restaurants per 10,000 Residents: Restaurant per state data was calculated by findthehome.com. The restaurant data was proved by Dun & Bradstreet. Dun & Bradstreet provides access to data on corporations and claims to be the largest single source of business information available. (About Us, n.d.). Pizza is not classified as a fast food restaurant. This data was created by an unidentified third party on google sheets who used these sources. I had to download the data and add a state code to it to join it with the States shapefile. This data would not add to the States shapefile on ArcGIS so I had to get it converted into a .dbf file with the help of Bonnie. This data was the basis of finding if unhealthy foods, in the shape of fast food restaurants, were associated with obesity rates in low income states, as was predicted.
- US States shapefile: The US states shapefile was retrieved from ESRI data and Maps. The Shapefile included US 50 states + DC shapefile. I had to use the States shapefile to express the content of all of my data because it is all State specific. I initially made 5 different State shapefile layers so each of the variables could use the shapefile to express the data. I then created an additional low income state layer which I could toggle on with any layer to only get the desired low income states to show their data. I also created an additional layer with just the names of those low income states so I could toggle on and off with each layer. Having these two additional layers made getting the state specific data much easier as this was utilized in every map I will display.

Data Combination/Analysis:

In order to answer my first question of which of the 48 Contiguous States being examined where to be considered low income, I turned on three layers to get a State visual representation of only the low income states in question. The layers I turned on where the state income layer, the transparent states layer, and the transparent states naming layer. The transparent states layers allowed me to only visually map the low income states, while the naming layer added the other component. The low income states turned out to be composed of 23 states (Appendix 1). Most of these states were centered on the Mideast and Southeast portion of the United States. Next, the magnitude of obesity in these low income states was examined. This was done by turning on the obesity rate layer along with the low income states layer and the naming layer. By moving the obesity rate layer above the low income states layer, the low income data presented itself visually. From this, it was noted that a good portion of the low income states in the Mideast and southeast were among the most obese in the nation (Appendix 2).

Next, I wanted to find out how the low income variable interacted with the fast food restaurant variable. Thus I turned on the low income states layer, the low income naming layer, and the fast food restaurant layer. From this, I discovered that the states in the Mideast and Southeast were all similar in that they were mostly in the upper quantile of restaurant per 10,000 residents' rate (Appendix 3). In order to find out if there was an association between the variables of obesity and restaurant density in a per state basis, in relation to the low income states, a score was made for each quantile of these variables. Each variable is split into 4 quartiles and each variable got assigned a score between 0-3. The quantiles are presented in the legends of each of the 2 original maps produced. The scores were then combined onto one single layer and a new column was created where the two scores would be added up using the field calculator option. The scores created worked on scale of 0-5. The Score map tended to mimic the obesity map as seen by the southeast states being relatively the same quantile color in both maps. This showed me that there was little restaurant density influence on obesity. (Appendix 5). The vast majority of these low income states where on the lower quantile of healthcare expenditure, which is the opposite of what was expected.

In the event that there was no association between the aforementioned variable, different hypothesis were examined. The presence of politically charged spending might have some association with healthcare funding considering that being a low income state didn't. Of the 23 low income states examined, only 4 were democratic states. Of those 4 states, there was no spending trend that signaled a favorable spending approach to them as opposed to the other Republican States (Appendix 6). Thus, it was deemed that political affiliation was not a factor in healthcare spending per state. Although, it was a pleasant surprise to see that 19 of these low income states voted Republican in the 2012 election.

Conclusion:

In conclusion, no such visual relation was found between restaurant prevalence and obesity in low-income states. Even though restaurants provide cheap, unhealthy food, the people in these low income states could be getting their BMI increasing foods from other places, such as grocery stores. After further research, new studies linking fast food consumption to the low-income population have been deemed as myths. Furthermore, new studies claim that there aren't notable differences in caloric intake from fast food by poverty status. (Vikraman, Fryaer, & Ogden, 2015) Thus, even though it is known that low income people tend to be more obese than their counterparts, it is other factors not touched on by this analysis that drive that obesity.

Limitations:

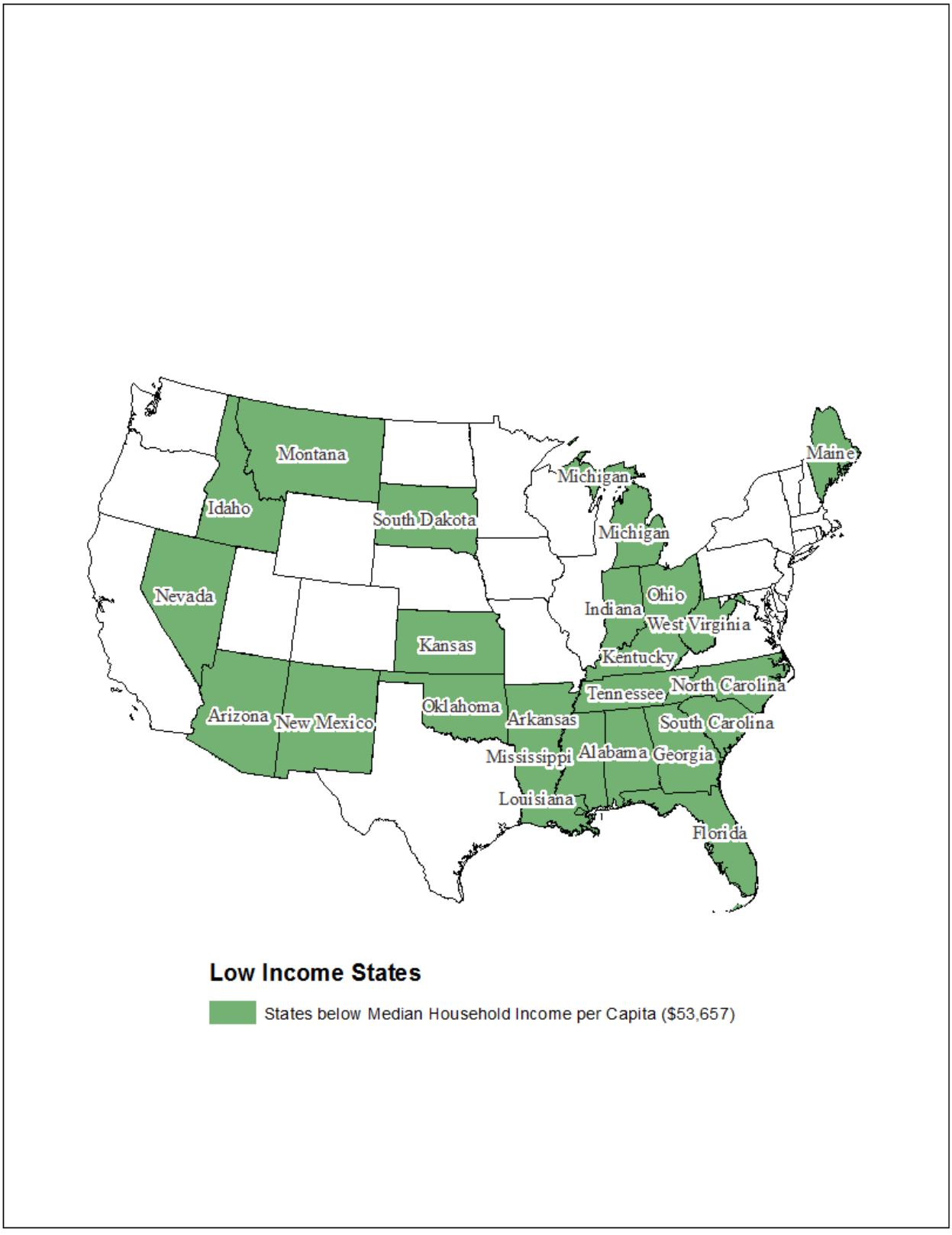
Some of the data didn't contain information for Alaska or Hawaii, thus only the Contiguous US states were examined to create a uniform set of data. Most of the data sets contained margin of error in their estimates of the desired variable but they were not accounted for in this project. The data sets also are not matching in terms of the year which the data was examined. Thus, this project assumes that the data sets being examined have remained fairly constant and that all findings are indicative of actual conditions.

In relation to obesity, a high BMI doesn't necessarily mean a person is unhealthy. Thus, the data classifying obesity by state might not be truly indicative of the facts that they were trying to present. The healthcare spending includes public and private spending. Thus, when looking at the association between political affiliation and spending, it is not known the percentage of private funds in that spending number. The importance of healthcare spending and political affiliation might not be indicative of the strength of the relationship between party affiliation and spending.

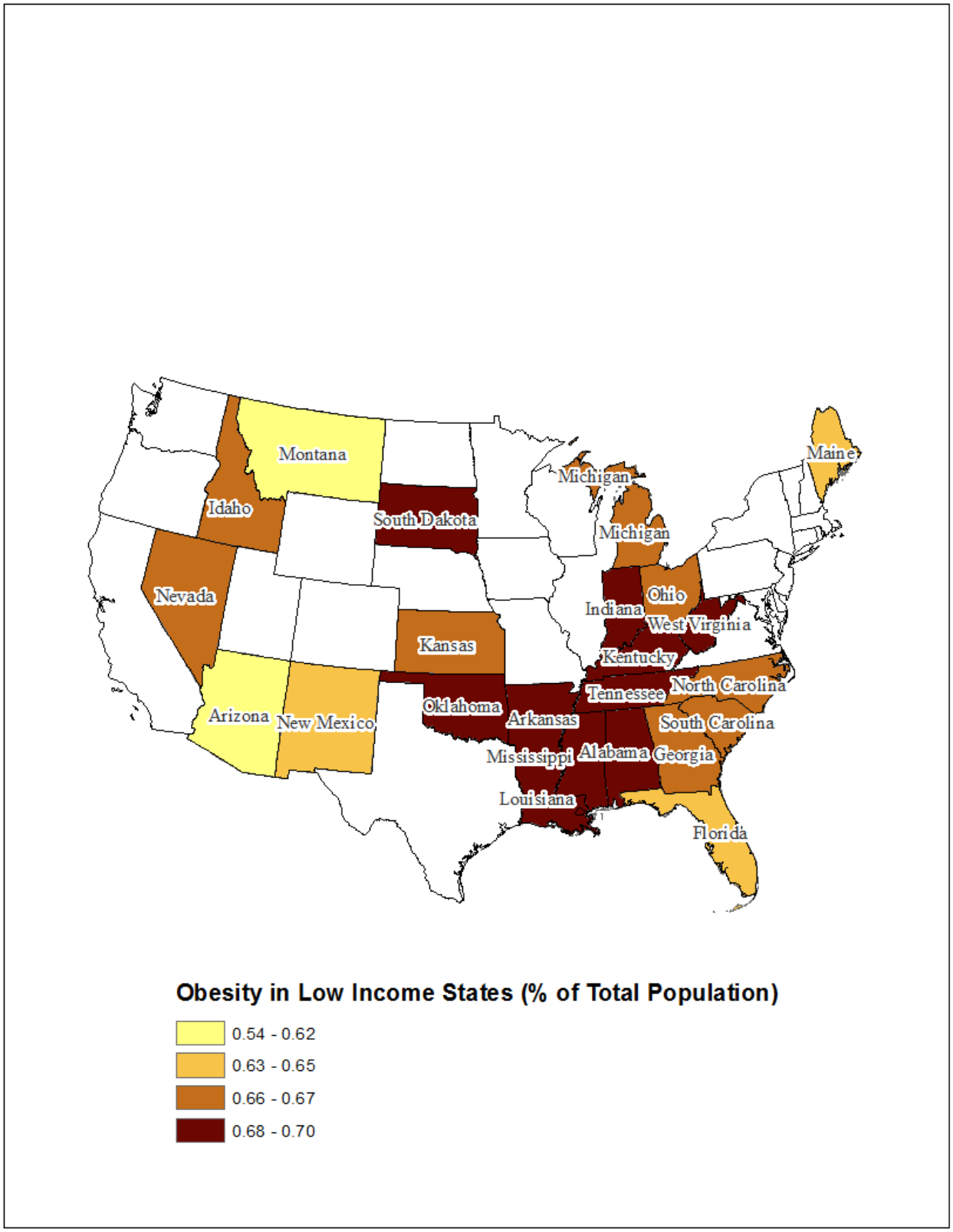
Retrospectively, I should have probably used 2008 electoral data to be able to more accurately interact with my 2009 healthcare expenditure data. The healthcare data would have been 1 year after the election and would have taken into account the political climate in Congress at that time. This would have given me a fairer representation of party politics influence on spending if any. Furthermore, in order to get a truer representation of the association, it would create a stronger argument if a regression analysis of the association between these variables was performed to accompany the data.

Appendix:

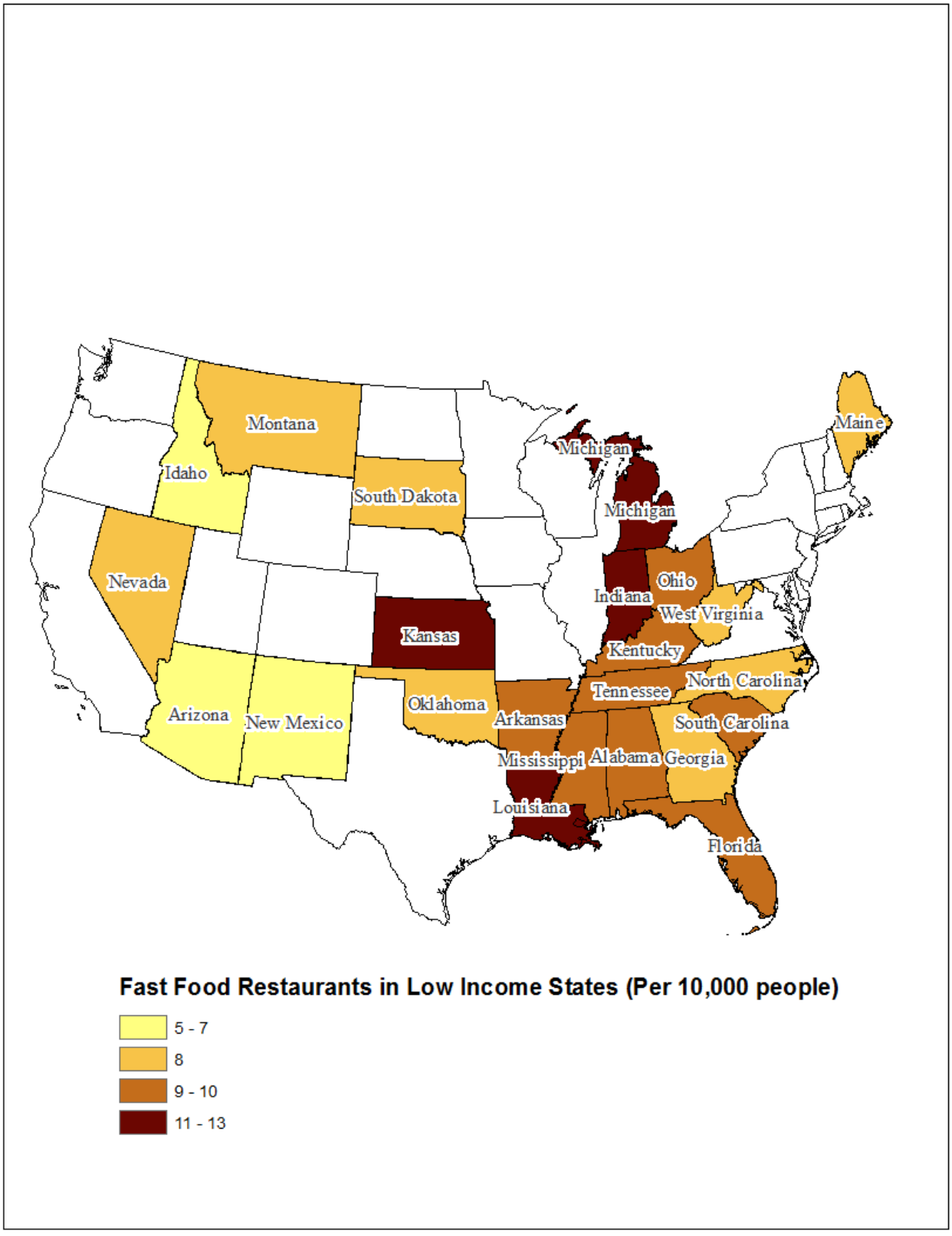
Map 1.



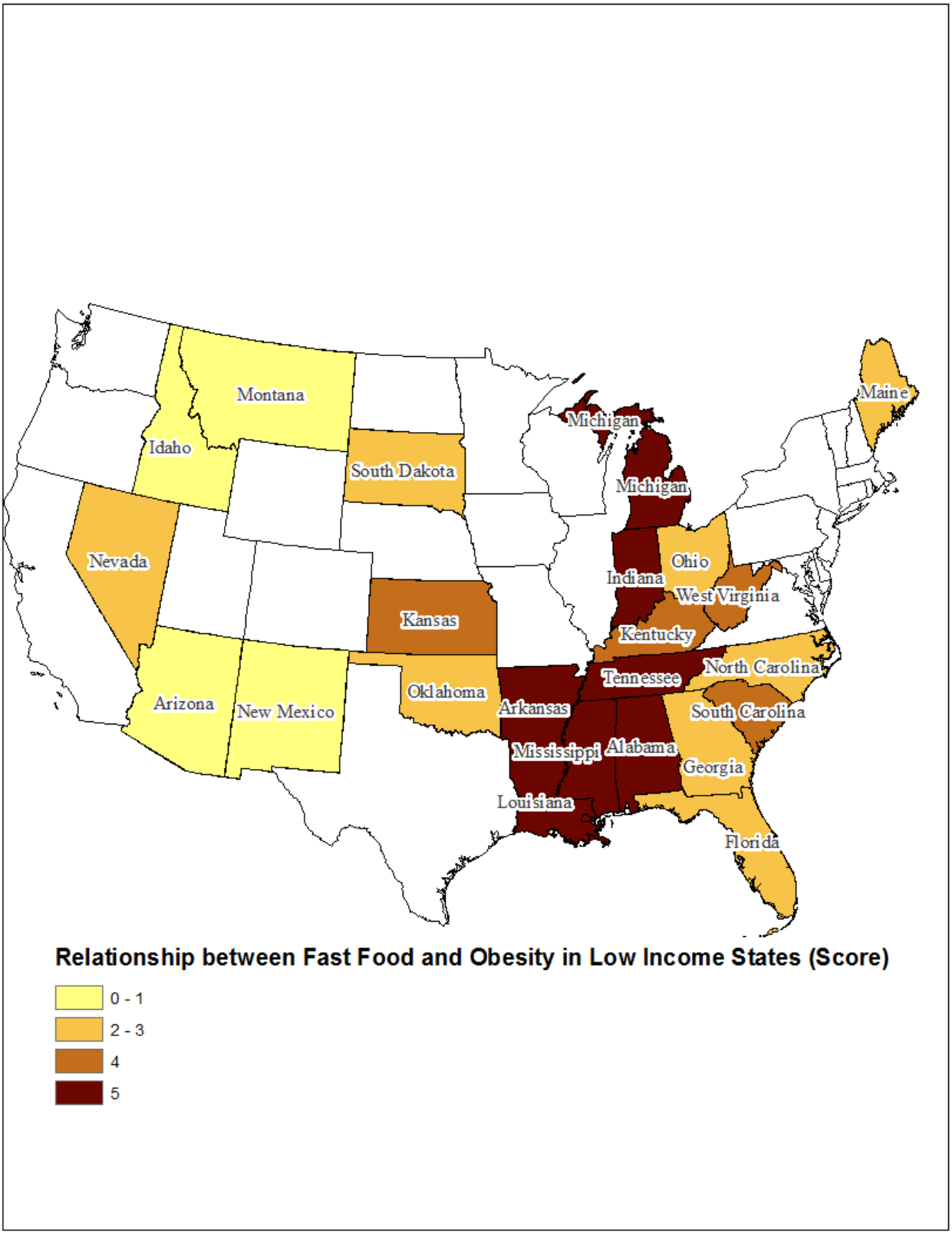
Map 2.


Montana
Idaho
South Dakota
Nevada
Kansas
Arizona
New Mexico
Oklahoma
Arkansas
Mississippi
Alabama
Georgia
Louisiana
Florida
South Carolina
North Carolina
Tennessee
Kentucky
West Virginia
Indiana
Ohio
Michigan
Michigan
Maine
Obesity in Low Income States (% of Total Population)
0.54 - 0.62
0.63 - 0.65
0.66 - 0.67
0.68 - 0.70

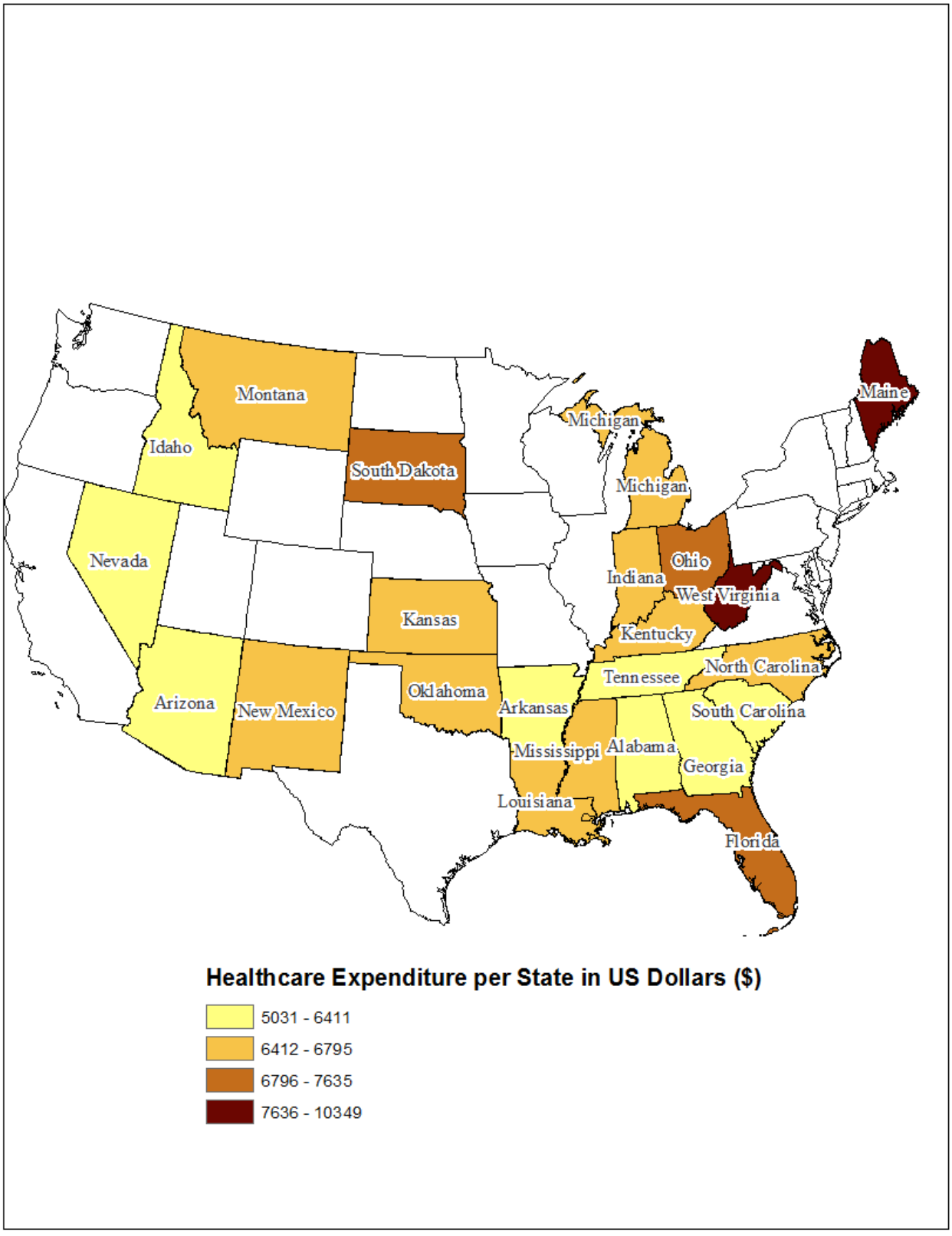
Map 3.


Montana
Idaho
South Dakota
Michigan
Michigan
Maine
Nevada
Ohio
Indiana
West Virginia
Kansas
Kentucky
North Carolina
Tennessee
Oklahoma
Arkansas
South Carolina
Arizona
New Mexico
Mississippi
Alabama
Georgia
Louisiana
Florida
Fast Food Restaurants in Low Income States (Per 10,000 people)
5 - 7
8
9 - 10
11 - 13

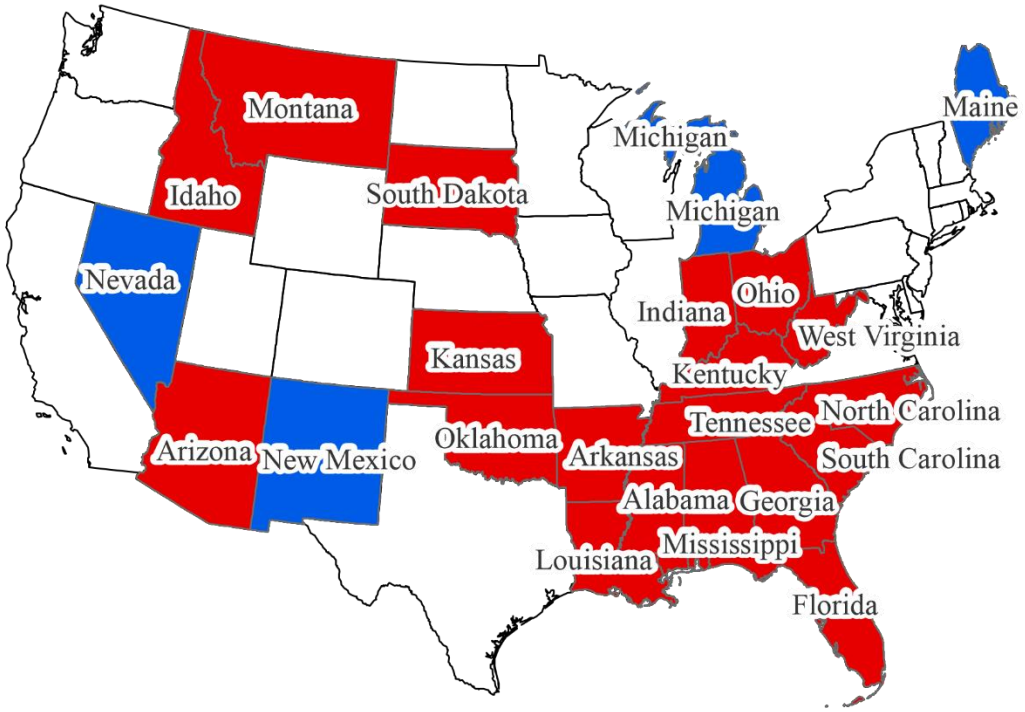
Map 4.


Montana
Idaho
South Dakota
Nevada
Kansas
Arizona
New Mexico
Oklahoma
Michigan
Michigan
Indiana
Ohio
West Virginia
Kentucky
Tennessee
North Carolina
Arkansas
South Carolina
Mississippi
Alabama
Georgia
Louisiana
Florida
Maine
Relationship between Fast Food and Obesity in Low Income States (Score)
0 - 1
2 - 3
4
5

Map 5.


Montana
Idaho
South Dakota
Nevada
Kansas
Arizona
New Mexico
Oklahoma
Michigan
Michigan
Indiana
Ohio
West Virginia
Kentucky
Tennessee
North Carolina
Arkansas
South Carolina
Mississippi
Alabama
Georgia
Louisiana
Florida
Maine
Healthcare Expenditure per State in US Dollars ($)
5031 - 6411
6412 - 6795
6796 - 7635
7636 - 10349

Map 6.



Political Affiliation of Low Income States

Republican

Democrat

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