Walkability and Obesity Trends across Geographical Regions in the United States

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Abstract

Obesity has become a major concern for health officials in the United States. Rates of obesity are higher than ever before and as a result, consequential medical conditions have arisen in those who suffer from obesity; while at the same time, medical expenses are skyrocketing for these same individuals. In this study, I analyze regional trends in the United States of both obesity rates and walkability in 74 cities in the United States. After analyzing the data and constructing visual representations, I found that the Northeast region of the US is most walkable, while the Southeast and Southwestern regions are the least walkable. In regards to obesity rates, I found that the West had the lowest obesity rates in both 2010 and 2013, while the Midwest and the Southeast had a high obesity rate in both 2010 and 2013. Additionally, the Northeastern US had a high obesity rate in 2013.

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Introduction

Because our nation is concerned about our high rate of obesity, I decided to consider obesity trends across geographical regions in the US and, at the same time, to compare the walkability of US cities within each of the regions. In the past few years, obesity has been termed an "epidemic" in the United States. It has become a major health concern in our nation, as American's rate of obesity is growing at an unprecedented level. Obesity is a threat to individuals' livelihood both physically and financially. According to State of Obesity (2016):

"Obesity remains one of the biggest threats to the health of our children and our country, putting millions on Americans at increased risk for a range of chronic diseases and contributing to more than $147 billion to $210 billion in preventable healthcare spending."

Individuals who suffer from obesity are at a much higher risk of falling ill to other diseases as a result of their weight. Such diseases include heart failure, diabetes, amongst a long list of other possibly life-threatening diseases. With more health concerns also come significantly higher medical bills for those suffering from obesity.

Several scholars have previously considered obesity in the context of multiple variables: public transportation, proximity to fast food outlets, among many others. Some of the literature has considered the walkability of a city in terms of the obesity rate of its residents, but only during a single time period. My study is dynamic in that it includes data in multiple years: 2010 and 2013. A very similar study was completed in Ontario, Canada in 2015; however, it has never been done in the US. Therefore, my contribution to the literature is a dynamic analysis of city walkability and obesity rates in US cities.

After analyzing the data and constructing visual representations, I found that the Northeast region of the US is most walkable, while the Southeast and Southwestern regions are the least walkable. In regards to obesity rates, I found that the West had the lowest obesity rates in both 2010 and 2013, while the Midwest and the Southeast had a high obesity rate in both 2010 and 2013. Additionally, the Northeastern US had a high obesity rate in 2013.

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Previous Literature

Obesity is a widely studied phenomenon that has been analyzed through the lens of several different concentrations. However, despite the vast amount of scholarly work dedicated to obesity, obesity in relation to city walkability has been a relatively minute area of research. Several scholars have analyzed at the relationship between fast food availability and obesity in a specific geographical area in the United States (Dunn, 2010), but very few have studied the relationship between walkability and obesity. In my study, I analyze both obesity and walkability trends across geographical regions in the United States, which has not been yet been explored in the existing literature.

Obesity rates and accessibility to fast food restaurants is a highly studied relationship in scholarly literature. Although my study did not account for fast food restaurants in the vicinity, my methodology is similar to that used in other fast food studies. For example, Dunn et al. (2010) studied how the prevalence of fast food restaurants in a residential area affected residents' weights. After analyzing the number of fast food outlets and residents' obesity rates in Canadian metropolitan areas, Dunn et al. found that the incidence of obesity is related to fast food restaurant accessibility. However, the authors were unable to determine the direction of causation between the two variables (Dunn et al., 2010).

Another study looked at both the walkability and the prevalence of fast food restaurants in relations to residents' obesity levels. Xu and Wang (2015) studied the physical geography of US cities. The authors found that poorer street connectivity, or lower walkability scores, in a city were correlated with a higher rate of obesity in the area. Additionally, they concluded that more fast food outlets are also linked with higher rates of obesity. Furthermore, Xu and Wang also discussed that implications that their findings may have on policy proposals. Due to the great geographic and demographic variability between cities, public policies cannot be "one size fits all." Instead, policies must be specifically tailored to an area in order to be most effective (Xu and Wang, 2015).

Few studies have specifically analyzed the relationship between Walkscore and obesity. Walkscore utilizes a specific methodology and data in order to assign major US cities with a score of its walkability. Ken Smith et al. analyzed the relationship between walkability and body mass index (BMI) in Salt Lake County, Utah (2008). Smith and colleagues created their own measurement of walkability, which included factors such as population density, pedestrian-friendly design, the proportion of residents who walk to work, and the median age of housing. Results concluded that increased levels of walkability decrease the risks of excess weight. Furthermore, they found that the two main predictors of BMI were the proportion of individuals who walked to work and the median age of housing in the area (Smith et al., 2008).

Chiu et al. (2015) used the same walkability measurement as in mine (Walkscore), but this study was focused on individuals in Ontario, Canada. Chiu and colleagues recorded the Walkscore for cities throughout Ontario and consequently categorized these cities based on their walkability. Those cities that were least walkable (with a score between 0 and 20) were in a category known as "car-dependent," meaning that much of the city is not accessible to pedestrians. On the other hand, the most walkable cities were in the "walker's paradise" category and they scored anywhere between 80 and 100 on the walkability ratings. The authors found that individuals who resided in the "car dependent" cities were at a higher risk of obesity compared to those who lived in more walkable cities. This is a reasonable finding assuming that those who lived in less walkable cities were less likely to walk in their neighborhoods and therefore had higher rates of obesity (Chiu et al., 2015).

Finally, Creatore et al. published a study most closely related to mine in 2015. She and her colleagues studied the relationship between walkability and obesity in cities in southern Ontario. After analyzing obesity and diabetes rates over a period of 12 years, Creatore et al. found that cities that were more walkable also had the lowest risk of contracting diabetes and being overweight (2015). I based my own research on the context of this study and also followed a similar methodology by comparing walkability and obesity rates over time.

Data

My study included a sample of 74 US cities that were located across the continental US. The regional divisions were based on a widely-accepted mapping system created by National Geographic (2017). The five regions in the US include: the West, the Southwest, the Midwest, the Northeast, and the Southeast. Furthermore, multiple cities from each of the five regions were included in the sample size. I chose those 74 cities based on the availability of

the data. Another central variable that was included in my study was a Walkscore measurement for each city that was measured in 2016. Walkscore is a validated measurement that is used to compare how pedestrian-friendly cities are compared to one another. According to Duncan et al. (2011), Walkscore is a reliable measurement for several locations and at various spatial scales. Walkscores can vary anywhere from 0 to 100, where 0 means that the city is not pedestrian friendly and a 100 is perfectly walkable. In order to produce a Walkscore, the measurement system considers hundreds of walking routes to amenities that are close by, and it awards points based on the distance to and accessibility of each amenity ("Walkscore Methodology", 2017). Charlotte, North Carolina had the lowest walkability with a Walkscore of 25.5, while San Francisco was the most walkable with a score of 85.7.

The other central variable in this study is obesity rates. Rates were recorded at a city-level for each of the 74 cities. The obesity variable varies anywhere from 0-100. In this case, the numerical values represent the percent of the population that is considered obese. In order to maintain consistency, the obesity variable only includes the percent of the population that is considered obese and does not include the proportion of residents who are considered "overweight." The two terms are considered separately in this paper and only obesity is accounted for in my data.

Obesity data for the year 2010 was collected from the Behavioral Risk Factor Surveillance System, which came from the United States Centers for Disease Control and Prevention (CDC). In 2010, San Francisco, Oakland, and Fremont, all cities in California, had the lowest obesity rate at 18.2, while Memphis, Tennessee had the highest rate of obesity at 35.8 Moreover, the 2013 obesity data was obtained from Gallup Analytics' US Community Well-Being Tracking System. San Diego, California, Denver, Colorado, and Aurora, Colorado were tied for the lowest obesity rate in 2013 at 19.3. On the other hand, Toledo, Ohio had the highest rate of obesity in 2013 at 34.2.

I also included several other demographic variables in order to control for the variability between the cities. The first variable that I included was the population, or the number of people who reside in each city. Population varied from 203,433 people in Des Moines, Iowa, to 3,792,621 in Los Angeles, California. I also included a gender variable that measured the ratio of males to females who resided in a city, all of the cities fell within a few percentage points from a 50/50 split. Another important control variable I considered was the median age of the residents in each city. This is an important variable because age can significantly impact one's risk of becoming obese. For similar reasons, I also included a measure of the median income of each city in the data.

I also included race variables that were recorded in terms of the percentage of residents who self-reported their race. Race categories included: Caucasian, African American, Asian, and Hispanic/Latino. Finally, I controlled for different education levels throughout the cities. There were 4 categories in which individuals could fall. The first category was "Some High School," indicating that this individual had attended school up to ninth grade, but did not receive a high school diploma. The next tier was "High School Grad," which includes individuals who graduated from high school or those who obtained a similar degree such as a GED. Similar categories are present for the collegiate level. "Some College" indicates that an individual began college, but did not obtain a degree. Those who fell in the category of "College Grad" received some type of college degree, anything from an Associate's Degree to a Doctor of Philosophy (PhD). All of the control variables discussed above were obtained from the 2010 Census. A summary of all variable statistics can be found in Table 1.

Statistic	N	Mean	St. Dev.	Min	Max
WalkabilityScore	74	48.476	15.393	25.500	85.700
Obesity2010	74	26.428	3.735	18.200	35.800
Obesity2013	74	25.450	3.336	19.300	34.200
Population	74	590,650.600	576,455.700	203,433	3,792,621
Male	74	48.923	1.073	46.800	51.800
Female	74	51.077	1.073	48.200	53.200
Age	74	34.400	2.569	28.900	46.300
Income	74	49.195	14.643	25.764	105.763
Caucasian.White	74	57.062	16.405	10.600	89.300
African.American	74	24.393	19.435	1.500	82.700
Asian	74	6.138	7.815	1.000	50.600
Hispanic.Latino	74	20.022	17.303	2.300	80.700
SomeHS	74	14.441	5.279	3.800	31.800
HSGrad	74	23.586	5.455	8.300	34.000
SomeColl	74	21.197	3.764	8.700	27.500
CollGrad	74	40.773	10.546	17.800	76.500
Obesitychange	74	−0.978	2.555	−6.800	9.500
West	74	0.270	0.447	0	1
Midwest	74	0.216	0.414	0	1
Southeast	74	0.257	0.440	0	1
Southwest	74	0.176	0.383	0	1
Northeast	74	0.081	0.275	0	1

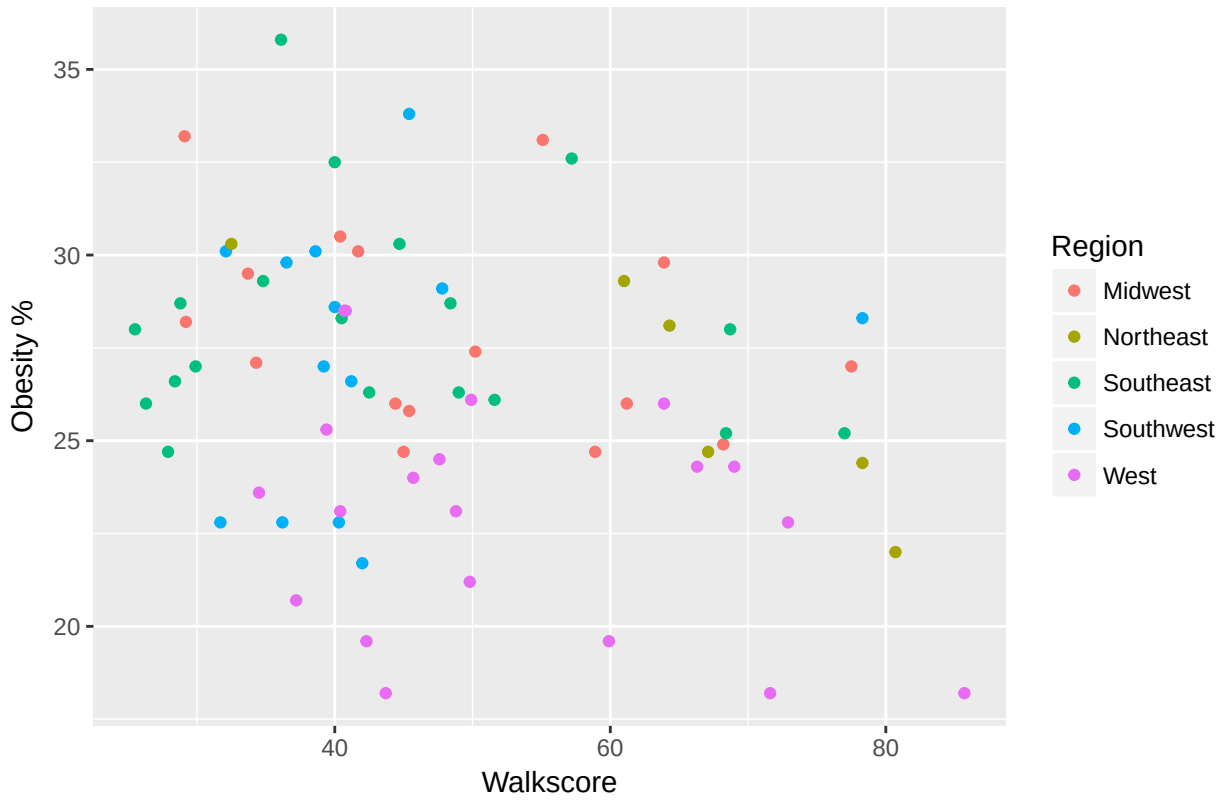
Results

After analyzing the data in a number of ways, I have come to conclude that there are regional trends in the US for both walkability of cities and obesity rates. Walkability was highest in the Northeastern region of the US, while cities in the Southeast and Southwestern US were deemed the least walkable. Additionally, the Western US had the lowest obesity rates in both 2010 and 2013, while the Midwest and the Southeast had the highest obesity rates in both years. Additionally, the Northeast also had a high obesity rate in 2013.

A scatterplot demonstrating the relationship between cities' walkability and their obesity rates is shown in Figure 1. The most striking observation was the divide between cities as being either low-walkability or high-walkability cities. Most of the cities with a low Walkscore fall somewhere between 20 and 50. On the other hand, most of the cities that were deemed more walkable, had a score that fell somewhere between 60 and 80. Given this information and by looking at the graph, one should note that there are few cities that have a Walkscore between 50 and 60. This result is an interesting observation, yet one that is not readily explained by available information.

In terms of walkability, the Northeastern region of the US is the most walkable compared to all other regions. The Southeast and the Southwestern regions, on the other hand, are the least walkable. One possible explanation for this regional difference is the date of establishment for different cities. For example, the Northeastern US was the first area to be occupied by settlers and this significantly influenced how Northeastern cities were designed. Those regions that were settled earlier were designed specifically with pedestrian demands in mind. However, those cities that were established in later years perhaps had other demand for its design. Some cities were established after cars were invented and therefore were designed more for public transportation, rather than pedestrian accessibility, in mind.

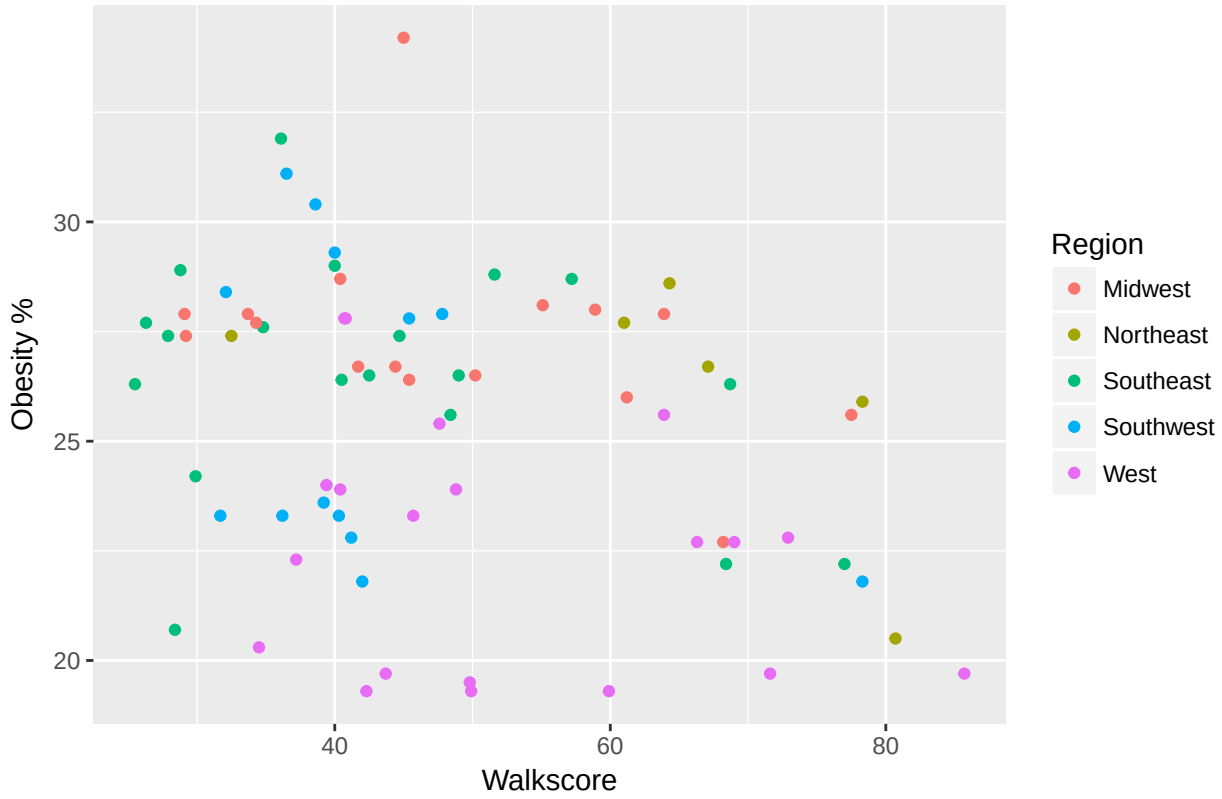
Figure 1. Walkability vs Obesity in 2010



There are also observable trends in regional obesity rates that arise from the 2010 obesity data. First, the Western region of the US seems to have an overall lower obesity rate than any other region. One possible explanation for this finding could be a difference in diet. Many Americans note that those who live in the West typically have a healthier diet than the rest of the country. For example, San Francisco is known to be one of the most vegan-friendly cities in the nation. On the contrary, Northeastern and Southeastern cities are known for less healthy food options, such as pizza (New York City, New York), King's cake (New Orleans, Louisiana), and Krispy Kreme (High Point, North Carolina). Opposite of the West, the Southeast and the Midwestern regions of the US have the highest rates of obesity in both 2010 and 2013. This may also be somewhat attributable to diets, as the Midwest is also known for unhealthy dishes, such as Chicago's deep-dish pizza.

Interestingly, the Northeast also showed to be one of the more obese regions in the US in 2013, but not in 2010. This is an interesting result because it is the only region that appeared in the obesity rate standings for one year (2013) and not the other (2010). An explanation for this phenomenon is not readily available. One may consider a more in-depth study of the Northeastern region of the US in order to uncover the reasoning behind its increased obesity from 2010 to 2013.

Figure 2. Walkability vs Obesity in 2013



Conclusion

Walkability and obesity are two related variables that play an important role in the health of individuals. My study analyzed the walkability scores (2016) and the obesity rates of 74 different US cities in 2010 and 2013. Overall, I conclude that the Northeastern region of the US is the most walkable, while the Southeast and the Southwestern US are relatively less walkable regions. Furthermore, I found that individuals in the Western US have the lowest obesity rates. Meanwhile, the Midwest and the Southwestern US have the highest obesity rates, and the Northeastern region also has a relatively high obesity in 2013 rate compared to other regions in the US during that year.

Overall, analyzing regional trends in obesity is an important tool for policymakers who are working to reduce obesity rates across the nation. XU and Wang (2015) emphasize the importance of policy flexibility. In other words, it is likely that a "one size fits all" type of policy will not be as effective in reducing obesity rates as a policy that is aimed at a specific region or a specific city. Of course, the demographical landscape is different in each city, as is the extent of the obesity problem. Therefore, a policy that is targeted to the specific needs of an area will likely have a more significant impact than a general policy that is implemented nationwide.

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