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Factors Contributing to Adult Obesity: A Midwestern Analysis

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Abstract

Objective: To investigate the association between adult obesity and several health-related factors: access to healthy food, exercise opportunities, and physical inactivity in Ohio compared to other Midwestern regional states (Illinois and Iowa) in 2022 *Methods:* Data was obtained from a County Health Rankings Model using the Behavioral Risk Factor Surveillance System (BRFSS). Data were then weighted to reflect population distribution and then used to measure various health behaviors and health-related quality of life (RQoL) indicators. *Results:* We found significantly higher rates of adult obesity in Ohio compared to Illinois and Iowa. It was also determined that adult obesity in Ohio was most impacted by physical inactivity. *Conclusion:* It has been demonstrated that Ohio is worse off than other Midwestern states in terms of adult obesity and the most beneficial place to start would be to focus on physical inactivity.

Key Words: adult obesity, Midwest, physical inactivity, access to healthy food, and exercise opportunities

Introduction

Early detection of adult obesity can help improve patients' life span and quality of life, but screening tools are only available to those who are wealthy enough to afford them. Over the past five years, there has been an increase in obesity rates in the United States. This is a result of multiple variables including decreased access to healthy food, exercise opportunities, and physical inactivity.[1] However, it is still unknown how Ohio compares to other midwestern states in terms of these variables. As residents of Ohio and potential future Ohio physicians, it is important that our patients have access to the best care which will ultimately lead to better health outcomes.

We will be comparing three Midwest states, Illinois, Iowa, and Ohio to examine the differences in several health-related factors that contribute to adult obesity rates. This study was proposed due to the lack of knowledge of the outcomes of obesity between different states within the same geographical region. It is well known that the Midwest region fares much poorer than other regions in terms of health outcomes. Specifically, the Midwest had the highest percentage of metabolic syndrome, a concomitant of a plethora of poor health outcomes, in the country. Not only was the Midwest the worst for metabolic syndrome rates but it was also ranked a very close second to the South in terms of obesity rates.[2] Furthermore, it has been estimated that if the current trend of obesity continues, over half (59% of today's toddlers and 57% of children aged 2 to 19) will have obesity at age 35.[3]

A potential variable that may explain the increase in obesity rates is the neighborhood in which people reside. It has been shown that urban, low SES Black and Hispanic children living in poorer neighborhoods and those with increased access to corner/convenience stores had higher BMIs, while those living in neighborhoods with more vegetation had lower BMIs.[4] Furthermore,

it has been found that when assessing the potential association between both food insecurity and living in a food desert to a waist-to-height ratio (WHtR), living in a food desert has a positive association with WHtR among females (OR = 1.247, $p = .026$) and males (OR = 1.245, $p = .024$).[5] Addressing this trend in obesity could help in lowering this predicted trend for toddlers and children, which would have significant impacts on their lives in the future.

Additionally, it has been shown that in neighborhoods deemed "walkable", there was no increase in obesity and overweight as compared to less walkable neighborhoods, in which there was an increase.[1] Walkable neighborhoods promote their inhabitants to either walk or ride a bicycle to workplaces, parks, schools, and shopping centers, which in turn leads to less reliance on automobiles.[1] The idea that one's living environment predicts their health outcomes is further exemplified by evidence that living near public open space (POS) is associated with greater physical activity and improved health outcomes.[1] This could be useful for both physicians and patients, as both parties could have an open and meaningful conversation as to how either a move to or use of the walkways could improve physical activity.

Continuing with the trend of obesity, it has been shown that there has been an increase in child and adolescent obesity which may be linked to access to healthy food.[1] This was corroborated with another study which showed that unhealthy options (fried snacks, sugar-sweetened beverages) were more often found closer to schools as compared to healthy options.[1] Furthermore, it has been found that fast food outlets were closer to secondary schools in lower SES neighborhoods (28.6%) as compared to higher SES neighborhoods.[1] This again, could be a talking point for pediatric patients and adolescents (along with their parents) with their physician about the importance of building good food habits early on that will continue with them later in life.

This study will examine the effect of decreased access to healthy food, exercise opportunities, and physical inactivity on adult obesity rates in three states in the Midwest region: Illinois, Iowa, and Ohio. We will specifically focus on how our home state of Ohio compares to other states in the same geographical area.

Research Questions

RQ1. What is the difference between access to healthy food between Ohio and Illinois?

RQ2. What is the difference between adult obesity rates between Ohio, Illinois, and Iowa in 2022?

RQ3. What is the association between adult obesity and access to healthy food in Ohio in 2022?

RQ4. How does limited access to healthy food, access to exercise opportunities, and physical inactivity predict adult obesity in Ohio?

Methods

Data Collection

The data came from the County Health Rankings Model. The data was obtained using the Behavioral Risk Factor Surveillance System (BRFSS), which is a stated-based random digit dial (RDD) telephone survey. Data were weighted using iterative proportional fitting (called "raking") methods to reflect population distributions. The data was then used to measure various health behaviors and health-related quality of life (HRQoL) indicators. We included adult obesity rates in the counties in the Midwest, specifically Ohio, Illinois, and Iowa. We set the time period to be post-COVID-19 pandemic (2022). We defined adult obesity rates by the percentage of the adult population (> 18 years of age) who have a body mass index (BMI) greater than or equal to 32 kg/m2. We defined limited access to healthy food as the percentage of the population that is considered low-income and does not live close to a grocery store. Low income was defined as having an annual family income of less than or equal to 200 percent of the federal

poverty threshold for the family size. Living close to a grocery store was defined differently in rural and nonrural areas; in rural areas, it meant living less than 10 miles from a grocery store; in nonrural areas, less than one mile.

Data Analysis

To analyze the difference between access to healthy food in Ohio and Illinois (RQ1) we conducted an unpaired t-test. Our second query was to determine if there was a difference between adult obesity rates between Ohio, Illinois, and Iowa in 2022 (RQ2). To answer this question, we performed a one-way ANOVA. We also were interested in the association between adult obesity and access to healthy food in Ohio in 2022 (RQ3). This was elucidated by performing a Spearman correlation since our data were not normally distributed. Lastly, we wanted to understand how limited access to healthy food, access to exercise opportunities, and physical inactivity predicts adult obesity in Ohio (RQ4). To analyze this, we conducted a stepwise linear regression mode.

Results

When examining accessibility of health foods between Ohio counties and Illinois counties (RQ1), it was found that there was no significant difference between access to healthy food in Ohio counties (7.328%) versus Illinois counties (6.261%) in 2022 ($t = 1.598$, $p = .056$) (Table 1).

Table 1: Limited Access to Healthy Food in 2022 Among Ohio and Illinois

State	N	Mean	SD
Illinois	102	7.328%	5.2728
Ohio	88	6.261%	3.6374

Abbreviation: SD, Standard Deviation

The ANOVA ran showed there was a significant difference between adult obesity rates in Ohio, Illinois, and Iowa in 2022 (RQ2) ($F_{2,286} = 14.676$, $p < .001$) (Table 2). The post Hoc test showed that Illinois had a lower percentage of adults with obesity (35.868%) than Ohio (37.572%) at the $p < .001$ level. It was also shown that Iowa had a lower percentage of adults with obesity (36.239%) than Ohio (37.572%) at the $p < .001$ level. There was no significant difference in percentage of adults with obesity between Illinois and Iowa. Lastly, Ohio had a higher percentage of adults with obesity (37.572%) than both Illinois (35.868%) and Iowa (36.239%) at the $p < .001$ level.

Table 2: Percentage of Adults with Obesity in 2022 Between Three States

State	**N**	**Mean**	**SD**
Illinois	102	35.868%[a]	2.2017
Iowa	99	36.239%[a]	2.1453
Ohio	88	37.572%[b]	2.4126

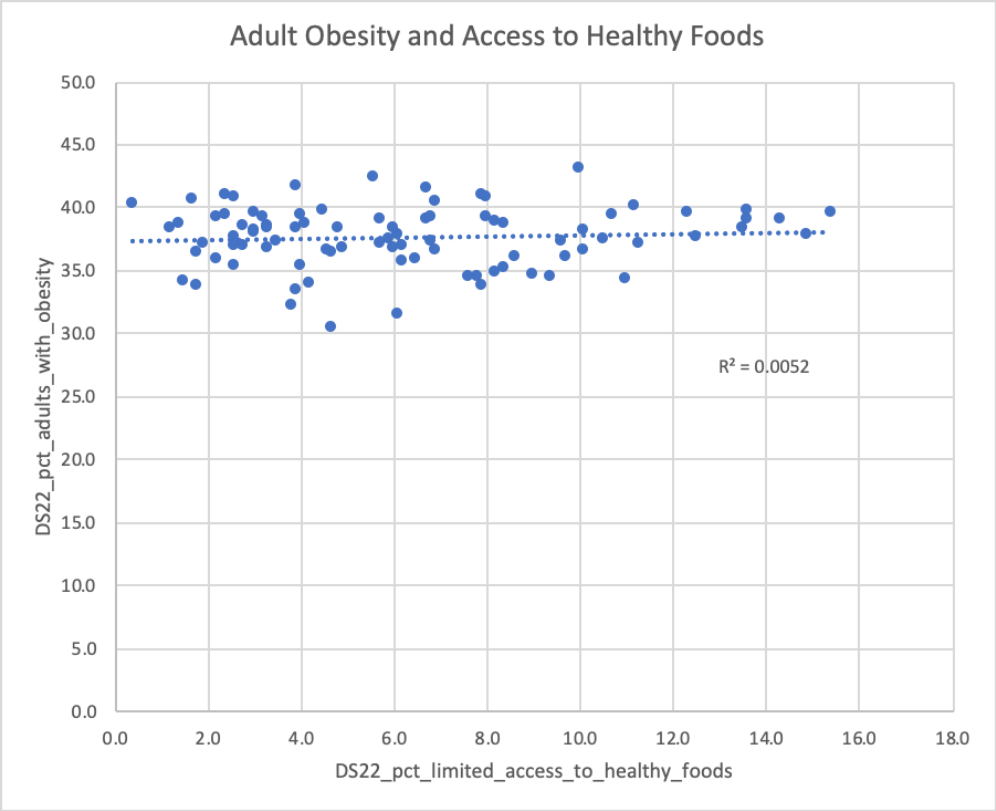
Abbreviation: SD, Standard Deviation

[a]statistically significant different from Ohio (p<.001)

[b]statistically significant different from Illinois and Iowa (p<.001)

When examining how access to healthy food correlates with adult obesity in Ohio in 2022 (RQ3), it was found that there was no significant association between the percentage of adults with obesity and access to healthy food in Ohio in 2022. A Spearman correlation indicated no significant difference between percentage of adults with obesity and access to healthy food in Ohio in 2022 (r= 0.028 p= 0.799).

Figure 1: Correlation Between Adult Obesity and Access to Healthy Food in Ohio



Our final research question (RQ4) investigated how limited access to healthy food, access to exercise opportunities, and physical inactivity predicted adult obesity in Ohio in 2022. A stepwise linear regression showed the best fitting model was significant ($F_{1,86}$= 56.844, p< .001), accounting for 39.8% of the deviation in the percent of adults that were obese in 2022. Percent of physically inactive contributed the most to the model (B = .492, t = 7.540, p <.001). Data showed that the variables of access to exercise opportunities and limited access to healthy food were not significant predictors of adult obesity in Ohio.

Discussion

It has been demonstrated that Ohio fares worse than other Midwestern states. As future Ohio physicians, this is concerning. In terms of improvement, it has been shown that the most

lucrative way to improve health outcomes is to focus on physical inactivity. There are many facets for approaching this issue, but one main avenue may be through increasing green space and the walkability of neighborhoods. The results from our study showed that adult obesity rates were correlated with high rates of physical inactivity, particularly in Ohio. The remaining results from our other research questions were not significant, and therefore no meaningful conclusions could be drawn from the data analysis.

The results showing that adult obesity rates were high in Ohio are supported by two studies. The first study showed that the obesity rates were increasing in Ohio from 2011 to 2016,[6] while the second study showed that residing in the Midwest was significantly associated with higher obesity rates for both black men and women and white men and women.[7] Additionally, it was shown that along with having higher rates of obesity, there was also a higher prevalence of Metabolic Syndrome (MetS) and Diabetes in the Midwest.[8] These findings together suggest that public health efforts toward monitoring and prevention of obesity in high-risk areas.

Some recommendations towards preventing obesity related morbidity and mortality in adults have been suggested, and considering this recent evidence, are worth re-examining. According to the recommendation suggested by the US Preventive Services Task Force, "an intensive multi-component behavioral intervention in adults with obesity can lead to clinically significant improvements in weight status and reduce the incidence of type 2 diabetes among adults with obesity and elevated plasma glucose levels".[9] In their analysis, the USPSTF found that participants in behavior-based weight loss intervention group showed greater weight lost and decreased waist circumference versus those in controls at 24 months follow-up.[9] This could be something that both a patient and their team of physicians could discuss in terms of formulating a

plan to help lower the patient's obesity, which in turn could have additional health benefits down the road.

Additionally, the increase in obesity rates in Ohio seen in our study and the increase in obesity rates in the Midwest are associated with a variety of other factors that include socio-economic status (SES), demographic disparities, and environmental factors, to name a few. This is corroborated by the fact that participants living in Midwest metropolitan and micropolitan statistical areas (MMSAs) were found to have a higher BMI and higher obesity rate.[10] It was also found that areas with a higher prevalence of obesity tended to have a higher proportion of individuals with a low SES; these individuals were associated with high obesity rates caused by inactive lifestyles, limited access to healthy food, and easy access to energy-laden food.[10] Physicians could take all this information together and work with both the public health community and legislators to enact policies and strategies that would lead to a reduction in obesity rates, while also appealing to the people being affected.

Conclusion

The limitations of our study were largely due to the amount of analysis that was carried out. For example, we only analyzed three different states in the Midwest region when there are twelve total states that are considered by the US census as being in the Midwest. Another limitation comes in the number of health factors that we analyzed. We only chose three variables to focus on: decreased access to healthy food, exercise opportunities, and physical inactivity which limited the number of conclusions we were able to draw. The final limitation concerns the way in which our data was collected. As stated previously, our data was obtained from County Health Rankings, which obtains their data collection through phone surveys. While this is

certainly an efficient way of collecting data it does not capture the nuisances and body language of in-person conversation.

As with any research design, there are always ways that we can improve. In the future, we would like to examine the additional nine states in the Midwestern region in comparison to Ohio. We also plan to examine other potential impactors of patient health like socioeconomic status, race, and access to green space. This will allow us to gain an even more comprehensive understanding of the potential factors that influence adult obesity. It may also be beneficial to examine another national database, besides County Health Rankings, that uses in person interviews and compare the results.

As future Ohio physicians, we are concerned about the general state of health of Ohio residents. If we as a population don't start to make some significant lifestyle changes the health outcomes of future generations will continue to be poor. We have found that focusing on physical inactivity is the most promising plan of action but that alone is not enough. We need to advocate for change that will allow our ideas to come to fruition. That means focusing on increasing neighborhood safety and walkability, increasing after-school programs that allow children to play outside, and increasing access to playgrounds and walking trails. We hope this study not only provided insight into factors that contribute to adult obesity but also a sense of urgency to make a conscious effort to improve health outcomes in Ohio.

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