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Access to exercise opportunities and physical inactivity's relationship to obesity in Ohio 2020

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Scholarship in Medicine Proposal

By checking this box, I indicate that my mentor has read and reviewed my draft proposal prior to submission (I am in the May super short course)

Abstract

Objective: Determine whether access to exercise opportunities correlate to obesity in Ohio 2020, physical inactivity correlates to obesity in Ohio 2020, access to exercise opportunities correlates to physical inactivity in Ohio 2020, and whether access to exercise opportunities and physical inactivity can predict obesity in Ohio 2020. *Methods:* The data for this study was all gathered from counyhealthrankings.org and analyzed using a Pearson correlation for the correlation and a step wise linear regression analysis for assessing predictability. *Results:* While investigating how percent of population with access to exercise opportunities correlates to percent of obese adults in Ohio 2020 (RQ1), a Pearson correlation showed a small and significant negative correlation ($r = -.334$, $p = .001$). As percentage of access to exercise opportunities increased, percentage of obese adults decreased in Ohio 2020. While investigating how the percent of the population that is physically inactive correlates to percentage of obese adults in Ohio 2020 (RQ2), a Pearson correlation showed a moderate

and significant correlation ($r = -.602$, $p = .001$). As the percentage of the population that is physically inactive increased, percentage of obese adults increased in Ohio 2020. While investigating how percent of population with access to exercise opportunities correlates to the percent of the population that is physically inactive in Ohio 2020 (RQ3), a Pearson correlation showed a moderate and significant negative correlation ($r = -.464$, $p = .001$). As percentage of access to exercise opportunities increased, percentage of obese adults decreased in Ohio 2020. The final research question investigated how access to exercise opportunities and physical inactivity could predict obesity in adults in Ohio 2020 (RQ4). A step wise linear regression indicated the best fitting model was significant (F change = 48.833, $p < .001$), accounting for 36.2% of the variance in obesity in adults in Ohio 2020. Percent of physically inactive was the only variable that contributed to the model ($B = .555$, $t = 6.992$, $p < .001$). Access to exercise opportunities did not contribute to the model.

Key Words: Ohio, obesity, exercise, physical activity, opportunity

Introduction/Literature Review

According to the CDC, 42.4% of the United States population is obese as of 2017/2018¹. The prevalence of obesity in The United States population has gone up 11.9% since 1999¹. Obesity related conditions, including heart disease, diabetes, stroke and cancer, make up the largest percentage of premature deaths in the United States¹. Due to it's prevalence and adverse affects, obesity and it's contributing factors have become an increasing topic of interest within the medical and public health community over the past decades. The negative health outcomes have been widely taught to medical professionals through their schooling and has made their way into common knowledge among the public. Obesity negatively affects multi organ systems, as well as economical stability within the patient, contributing to the state becoming a pandemic². Many factors contribute to obesity in populations, and have become of increasing interest within the medical community. Of these, modifiable factors have become popular due to their ability to be changed on a personal and population level. Exercise and physical activity has always been thought to be a modifiable contributor to obesity, and many studies have been conducted showing this relationship. The odds ratio for obesity was .52 with a confidence interval of 95% when compared to the most physically inactive quartile in the European union, according to a study in 1999, showing a relationship between the most physically inactive people and obesity³. The idea that physical inactivity correlates to obesity was further explored in 2006 when a twin study compared physical activity to visceral fat composition. The study found that the physically inactive co-twins had 50% greater visceral fat area compared with the active co-twins (mean difference 55.5 cm², 95% confidence interval (CI) 7.0-104.1, P0.010). The liver fat score was 170% higher (13.2, 95% CI 3.5-22.8, P0.030) and the intramuscular fat area 54% higher (4.9 cm², 95%

CI 1.9-7.9, P0.002) among the inactive co-twins⁴. A more recent study investigated the viability of exercise as a treatment to obesity within a population. Their findings showed exercise as a real treatment to the obesity epidemic⁵. While these studies have proven that exercise and physical activity have been correlated to decreased rates of obesity on a world and national level, no such studies have looked at a smaller population, more specifically Ohio.

A variable to the obesity epidemic is access to exercise opportunities. If the population had a decreased opportunity to exercise, it could be hypothesized they would as a whole be more obese, given the findings in previously cited studies. A study in 2015 found the average American population with access to exercise opportunities was 52% (range, 0%-100%) with large regional variation. Access to exercise opportunities was most notably associated with no leisure-time physical activity ($r = -0.47$), premature death ($r = -0.38$), and obesity ($r = -0.36$)⁶. This study shows the correlation between access to exercise opportunities and obesity on a national level, but no study has been completed on an Ohio state level. As a future medical professional in the state of Ohio, the state's current obesity epidemic and its contributing factors are extremely interesting to me. While many studies have correlated obesity to exercise opportunities and physical activity, there has been no recent study looking at Ohio's population. I will be studying whether access to exercise opportunities correlate to percentage of obese adults in Ohio 2020, percentage of physically inactive individuals correlate to percentage of obese adults in Ohio 2020, access to exercise opportunities correlate to percentage of physically inactive individuals in Ohio 2020, and how can access to exercise opportunities and percentage of physically inactive individuals predict percentage of obese adults in Ohio 2020.

Hypothesis/Specific Aims/Research Questions

RQ1 - Does access to exercise opportunities correlate to percentage of obese adults in Ohio 2020?

RQ2 - Does percentage of physically inactive individuals correlate to percentage of obese adults in Ohio 2020?

RQ3 - Does access to exercise opportunities correlate to percentage of physically inactive individuals in Ohio 2020?

RQ4 - How can access to exercise opportunities and percentage of physically inactive individuals predict percentage of obese adults in Ohio 2020?

Methods

Context/Protocol

For access to exercise opportunities Ohio 2020, I used countyhealthrankings.org to gather my data. They used data from 2010 and 2019 for this measure. The data is a percentage of individuals in a given county that live within reasonable distance to locations for physical activity, defined as parks or recreational facilities. Reasonable distance was defined as within a half mile of a park, within one mile of a recreational facility an urban area, and within three miles of a recreational facility in a rural area.

For adult obesity in Ohio 2020, I used countyhealthrankings.org to gather my data. They used data from 2016 for this measure. The data was compiled from Behavioral Risk Factor Surveillance Survey and is a percentage of adult population in Ohio, 20 years or older, that reports a body mass index (BMI) of greater than or equal to 30 kg/m². Participants reported height and weight and BMI was calculated.

For physical inactivity in Ohio 2020, I used countyhealthrankings.com to gather my data. They used data from 2016 for this measure. The data was compiled from Behavioral Risk Factor Surveillance Survey and is a percentage of adult population in Ohio, 20 years or older, that self reported no leisure time physical activity in the past month.

Data Collection

All data that was provided on countyhealthrankings.org was included in data collection. There were no exclusion criteria in my data collection

Data Analysis

For RQ1-3, I will run a Pearson test to correlate access to exercise opportunities to percentage obese adults Ohio 2020, percentage physically inactive adults to percentage obese adults Ohio 2020, and access to exercise opportunities to percentage of physically inactive adults in Ohio 2020, respectively. Finally, for RQ4, I will run a step wise linear regression test to assess whether access to exercise opportunities and percentage physically inactive adults predict percentage obese adults in Ohio 2020.

Results

While investigating how percent of population with access to exercise opportunities correlates to percent of obese adults in Ohio 2020 (RQ1), a Pearson correlation showed a small and significant negative correlation ($r = -.334$, $p = .001$). As percentage of access to exercise opportunities increased, percentage of obese adults decreased in Ohio 2020.

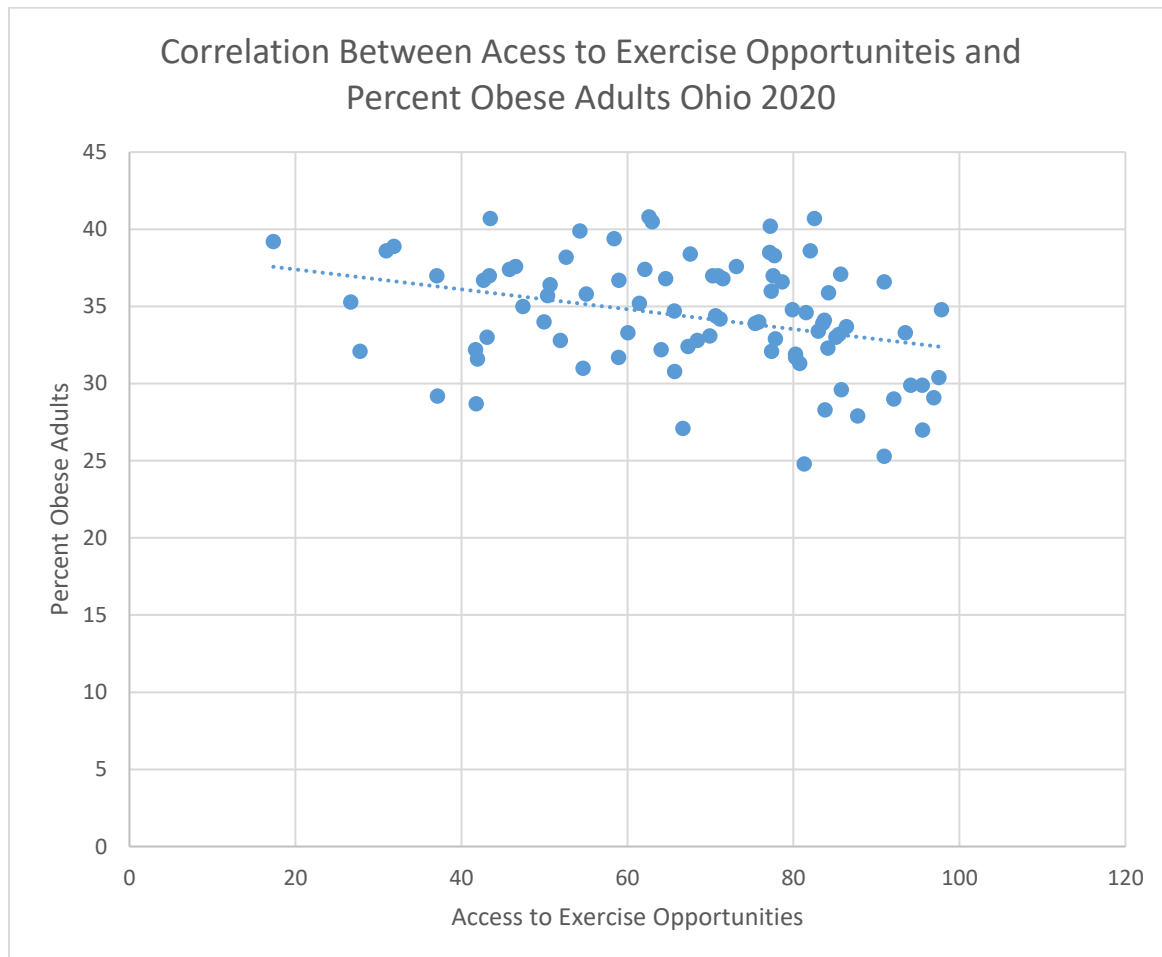


Figure 1

While investigating how the percent of the population that is physically inactive correlates to percentage of obese adults in Ohio 2020 (RQ2), a Pearson correlation showed a

moderate and significant correlation ($r = -.602$, $p = .001$). As the percentage of the population that is physically inactive increased, percentage of obese adults increased in Ohio 2020.

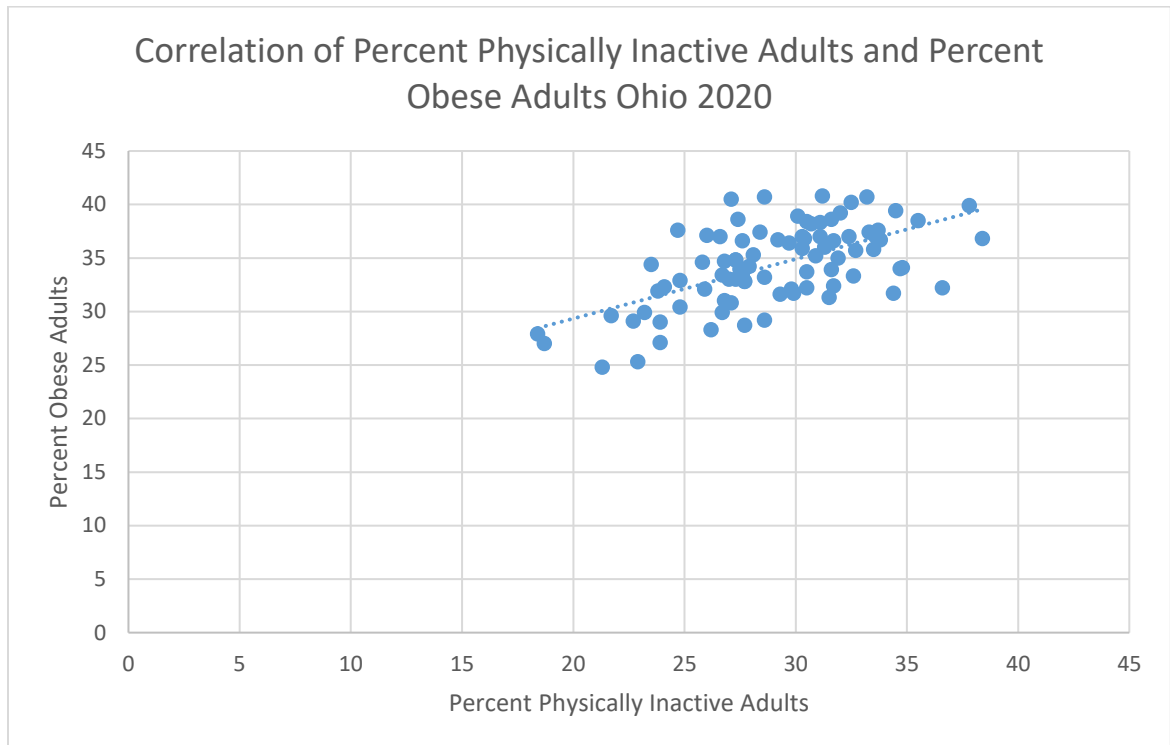


Figure 2

While investigating how percent of population with access to exercise opportunities correlates to the percent of the population that is physically inactive in Ohio 2020 (RQ3), a Pearson correlation showed a moderate and significant negative correlation ($r = -.464$, $p = .001$). As percentage of access to exercise opportunities increased, percentage of obese adults decreased in Ohio 2020.

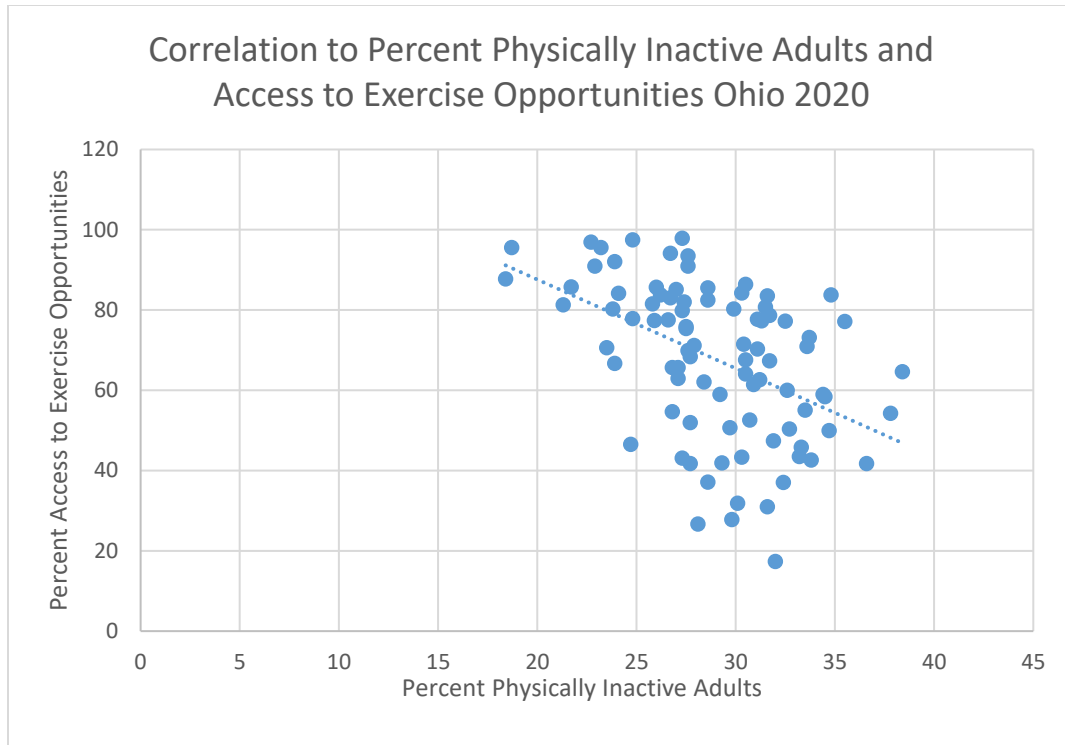


Figure 3

The final research question investigated how access to exercise opportunities and physically inactivity could predict obesity in adults in Ohio 2020 (RQ4). A step wise linear regression indicated the best fitting model was significant (F change= 48.833, $p < .001$), accounting for 36.2% of the variance in obesity in adults in Ohio 2020. Percent of physically inactive was the only variable that contributed to the model ($B = .555$, $t = 6.992$, $p < .001$). Access to exercise opportunities did not contribute to the model.

Discussion

The results of this study supported the hypotheses that access to exercise opportunities and physical inactivity are correlated to obesity in Ohio 2020 and that access exercise opportunities and physical inactivity are correlated to each other in Ohio 2020. The results show a significant negative correlation between access to exercise opportunities and obesity and access to exercise opportunities and physical inactivity in Ohio 2020. The study also showed a significant positive correlation between physical inactivity and obesity in Ohio 2020, supporting the hypotheses of the first three research questions. However, the hypothesis of research question four that access to exercise opportunities and physical inactivity are predictive of obesity in Ohio 2020 was not supported by this study. The results show that only physical activity is predictive of obesity in Ohio 2020.

These study results are supported by previous studies done on similar subject matter. The study done in 2015 showed a correlation between access to exercise opportunities and obesity in the United states as a country⁶. Our results of research question 1, whether access to exercise opportunities correlates to obesity in Ohio 2020 showed similar results, proving there is a correlation. The European Union study done in 1999 showed an odds ratio of .52 with a confidence interval of 95% between physical inactivity and obesity³. The results of the correlation between physical inactivity and obesity in Ohio 2020 in our study coincide with this previous study. They both show a relationship between obesity and physical inactivity within a population. This studies results were also supported by the previous twin study which showed increased visceral fat in the twin with more physical inactivity⁴. These previous studies support the findings of both research question's results; - Does percentage of physically inactive individuals correlate to percentage of obese adults in

Ohio 2020 and how can access to exercise opportunities and percentage of physically inactive individuals predict percentage of obese adults in Ohio 2020. Our results showed correlation between physical inactivity and obesity in Ohio 2020 and that physical inactivity predicts obesity in Ohio 2020, which follows the same findings of previous studies.

The outcomes of this study can be applied to the Ohio population as a whole. The results show that there is correlation between access to exercise opportunities and physical inactivity with obesity. Obesity has been shown to negatively impact health on a multi-organ system level². With 42% of American's obese, we can use the results of this study to show the lifestyle choice of physical inactivity and the environmental factor of access to exercise opportunities correlates to obesity and may be negatively impacting our populations health¹. We can apply these results on a population level and make environmental and lifestyle changes to better set up citizens for success in combating the obesity epidemic that plagues the United States of America.

Conclusion

The limitations for this study can be categorized into either data collection or applicability of the results. For obesity, the data was collected by self reported height and weight and a BMI was calculated. As anything self reported, results may not be entirely accurate. BMI is a way to roughly measure obesity, but has its limitation with body composition and build. For instance, a body builder may have a higher BMI, but not considered obese. For access to exercise opportunities, not all exercise opportunities were used in the study. Home gyms, sidewalks and many other exercise opportunities were not used to calculate the data. This may

under predict the access to exercise opportunities in Ohio 2020. There is also a limitation in defining access. A set distance was defined for the study, but in some areas within that distance, the exercise may still be non accessible. For physical inactivity, the data was self reported, giving similar limitations to obesity self reporting. People are not always honest in self reporting how active they are.

This study also has limitations in how it can be applied to the population. The data was only collected for Ohio 2020. While this is a large population, it will have limitations in applying to the nation and a larger population. This study also only showed correlations and predictability of the variables, which limits application to causation.

The future directive of the study will be applying these results on a bigger scale. The results show there is correlation between physical inactivity, access to exercise and obesity in Ohio 2020. These results can be used in future studies to show correlation on a larger scale and larger population. Also, if the study upholds on a larger scale, the study can be used to provide patients information on how their lifestyle and environment affects their weight and health. Obesity is an epidemic and needs to be controlled. This study shows there are variable that are correlated to obesity and predict obesity in a population. This should help future studies prove causation and then provide support for treatment and prevention of obesity in a population.

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