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Traffic and Our Health

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Population Health and Public Health

Scholarship in Medicine Final Report

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

Abstract

Objective: The intent of this study is to find a correlation between long commute times, physical health, and mental health. *Methods:* Data was collected from a publicly available dataset on countyhealthrecords.org. *Results:* Increased percentage of lone drivers with long commutes and obese adults, positive correlation between long commuters and access to exercise opportunities, and negative correlation between long commuters and poor mental health days.

Key Words: commute times, physical health, obesity, mental health, Ohio, public health

Introduction/Literature Review

As traffic construction seems to be ever continuing, it seems that commute times are also ever increasing¹. As commute times increase, one wonders if this influences health of the population, especially with the knowledge that obesity and mental health issues have become more prevalent in the United States^{2,3}. As such, it's important to know if there is a correlation between commute times and physical and mental health.

Previous research is conflicting about the benefits of commuting on mental health. For example, one study suggests that those with longer commutes have less access to social support due to such commutes being unrelated to social activity¹. Another purports that, "long-time commuters were more likely to sleep less, exercise less and work less long," whereas "long-hour workers were more likely to commute shorter, work on holidays more frequently, smoke more and their stress coping potentials were higher"⁴. This implies that long-time commuters would have better mental health than shorter commuters.

Regarding physical health, long-term exposure to traffic noise has been shown to be correlated to an increased risk of obesity and cardiometabolic issues⁵. These health effects have been thought to be mediated, at least partially, by the loss of overall time, and thus, the loss of time to sleep and exercise that comes with long commute times^{4,6,7}.

The studies up to this point were typically not performed in the United States, much less Ohio, so the current study seeks to fill this gap by examining long commute times, obesity and exercise, and mental health over the last 5 years in Ohio as well as any correlations there might be.

Research Questions

RQ1: Has the percent of people with long commutes who drive alone changed in Ohio from 2016-2020?

RQ2: Has the percent of obese adults, physical inactivity, and access to exercise opportunities in Ohio changed from 2016-2020?

RQ3: Is there a correlation between long commutes and driving alone and adult obesity, physical inactivity, and/or access to exercise opportunities?

RQ4: Is there a correlation between long commute times and driving alone and poor mental health days?

Methods

Context/Protocol

Data were collected by County Health Rankings for all Ohio counties, a website with data on almost every county of the United States. A long commute was defined as a road commute driven alone for more than 30 minutes, and data were obtained from the nationwide survey American Community Survey (ACS). 2020 data were estimated from 2014-2018 data. Traffic collection data were estimated from 2018 Environmental Justice Screening and Mapping Tool (EJSCREEN) data and is defined as average traffic volume per meter of major roadways in the county. Adult obesity and physical inactivity were defined as the percentage of adults 20 and older that reports a BMI greater or equal to 30 kg/m² and no leisure-time physical activity, respectively, and data came from the United States Diabetes Surveillance System estimated from 2016 for the 2020 datapoints. Access to exercise opportunities was defined as the percentage of

the population with adequate access to locations for physical activity and the 2020 measure is estimated from 2010 and 2019 data from Business Analyst, Delorme map data, ESRI, and US Census Tigerline Files. Poor mental health days was defined as the average number of mentally unhealthy days reported in the past 30 days and was age-adjusted. 2020 data came from 2017 Behavioral Risk Factor Surveillance System, and 2016 data came from 2014 of the same system.

Data Collection

The percent of drivers with long commute times who drive alone was used as an independent variable. Traffic volume for each county was used to match counties' long commute times. Adult obesity, physical inactivity, and access to exercise opportunities served as dependent variables to examine the correlation between the long commute times variable and physical health. Poor mental health days performed a similar function, but for mental health. Each variable will be for 2016, 2019 and 2020, and each analysis contains 88 datapoints representing the 88 Ohio counties.

Data Analysis

RQ1: Compare percent with long-commute and drive alone in Ohio from 2016-2020 using paired t-test.

RQ2: Compare percent of adult obesity, physical inactivity, and access to exercise opportunities in Ohio from 2016-2020 using paired t test.

RQ3: Correlate percent with long-commute and drive alone with percent of adult obesity, physical inactivity, and access to exercise opportunities in Ohio from 2019 using Pearson/Spearman correlation.

RQ4: Correlate percent with long-commute and drive alone with poor mental health days in Ohio in 2019 using Pearson/Spearman correlation.

Results

RQ1: Has the percent of people with long commutes who drive alone changed in Ohio from 2016-2020?

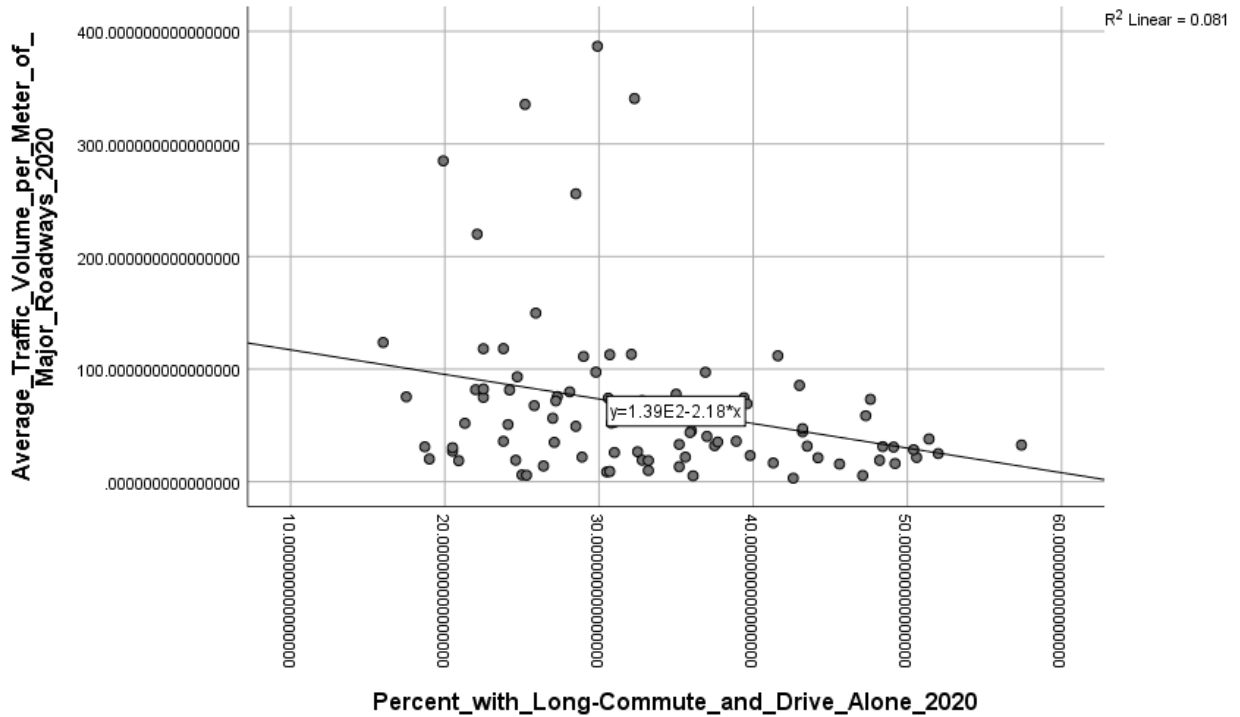
According to the data found in Table 1, the mean number of drivers who have long commutes and drive alone significantly increased from 32.01 to 32.12 ($p < .001$) between 2016 and 2020. Furthermore, the correlation shown in Figure 1 shows a slight negative correlation between traffic volume and drivers with long commutes who drive alone.

Table 1: Paired T test of percent of drivers who have long commutes and drive alone

	<i>n</i>	<i>Mean</i>	<i>Standard Deviation</i>	<i>Sig.</i>
2016	88	32.01	9.12	.000*
2020	88	32.12	9.64	

* denotes a statistically significant value

Figure 1: Correlation between traffic volume and percent of drivers with long commutes who drive alone



* denotes a statistically significant value

RQ2: Has the percent of obese adults, physical inactivity, and access to exercise opportunities in Ohio changed from 2016-2020?

Table 2 shows that the percent of obese adults in Ohio has increased significantly between 2016 and 2020 (32.07 and 34.32, respectively, $p < .001$). The rest of the variables for RQ2 did not change significantly.

Table 2: Paired T test of several variables

	<i>n</i>	<i>Mean</i>	<i>SD</i>	<i>Sig.</i>
<i>Obese Adults</i> <i>2016 (%)</i>	88	32.07	2.77	.000*

<i>Obese Adults</i>	88	34.32	3.69	
<i>2020 (%)</i>				
<i>Physically</i>	88	28.75	3.61	.556
<i>inactive 2016</i>				
<i>(%)</i>				
<i>Physically</i>	88	28.96	43.00	
<i>inactive 2020</i>				
<i>(%)</i>				
<i>Access to</i>	88	68.19	17.43	.703
<i>Exercise</i>				
<i>Opportunities</i>				
<i>2016 (%)</i>				
<i>Access to</i>	88	67.76	19.08	
<i>Exercise</i>				
<i>Opportunities</i>				
<i>2020 (%)</i>				

* denotes a statistically significant value

RQ3: Is there a correlation between long commutes and driving alone and adult obesity, physical inactivity, and/or access to exercise opportunities?

Figure 2 and 3 show no correlation between the percent of drivers with long commutes who drive alone and the percent of obese adults and the percent of physically inactive people. However, Figure 4 shows a negative correlation between drivers with long commutes who drive alone and the percent of people with access to exercise opportunities.

Figure 2: Correlation between percent of obese adults and drivers with long commute times who drive alone

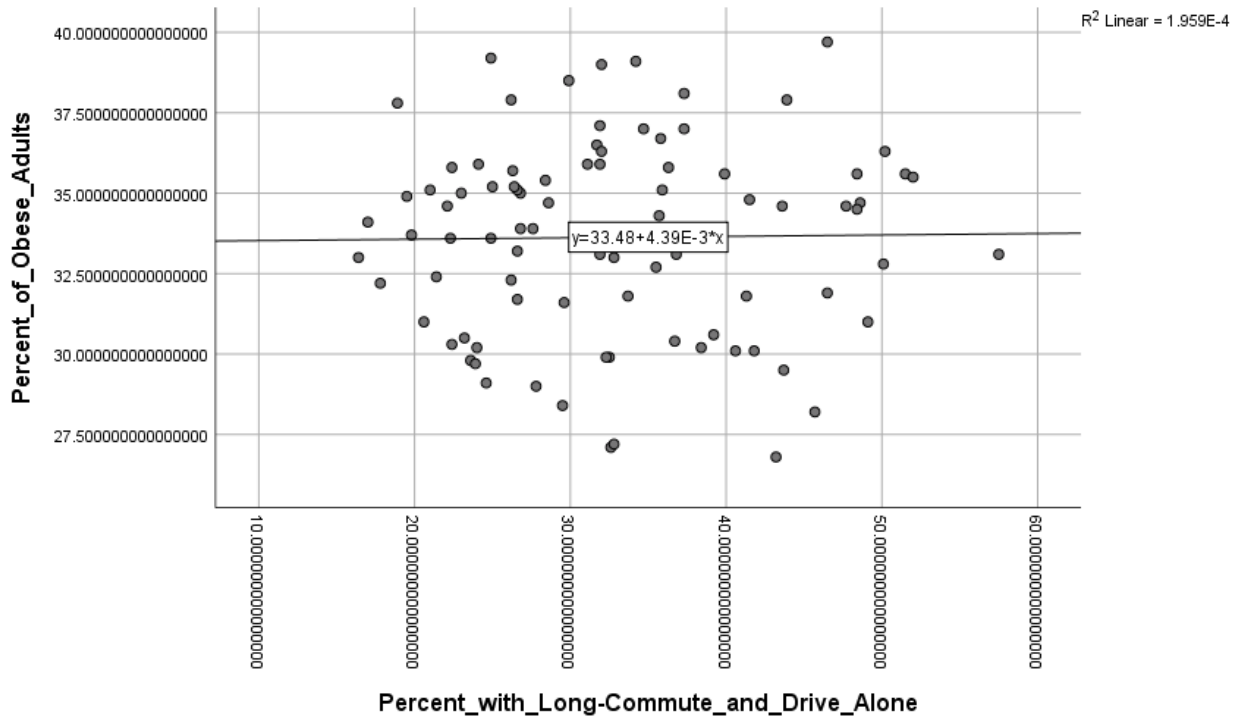


Figure 3: Correlation between percent of physically inactive population and drivers with long commute times who drive alone

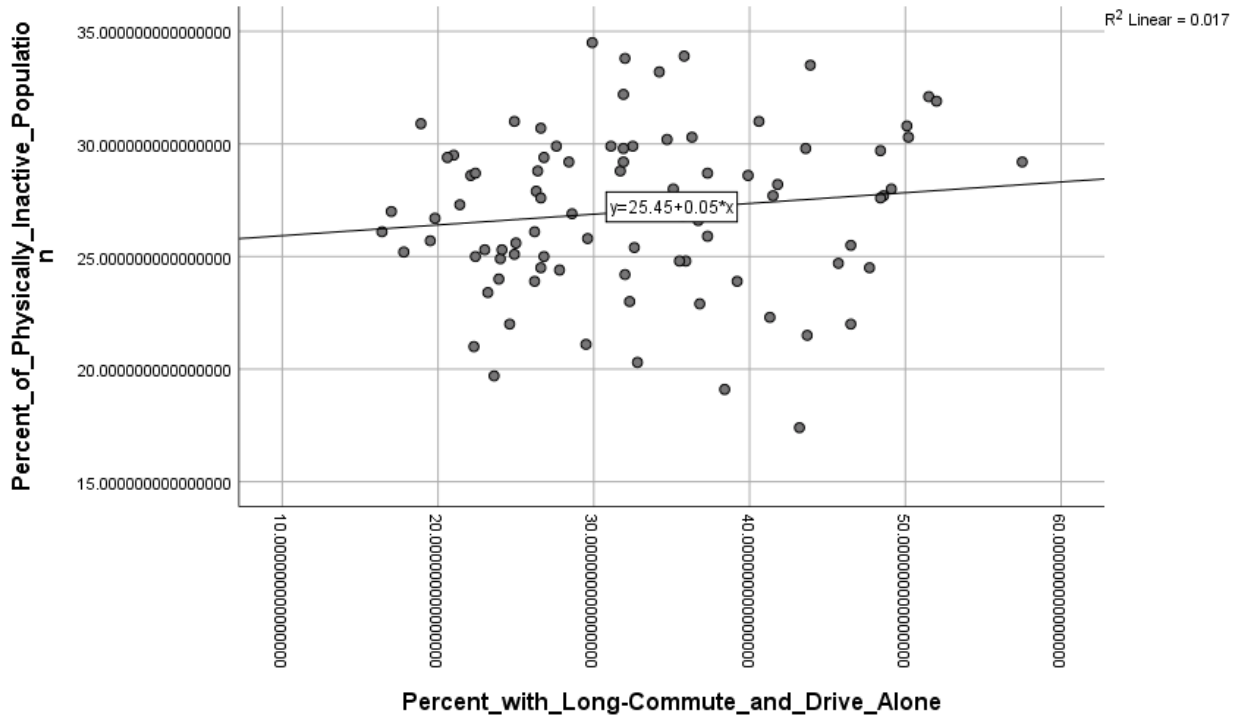
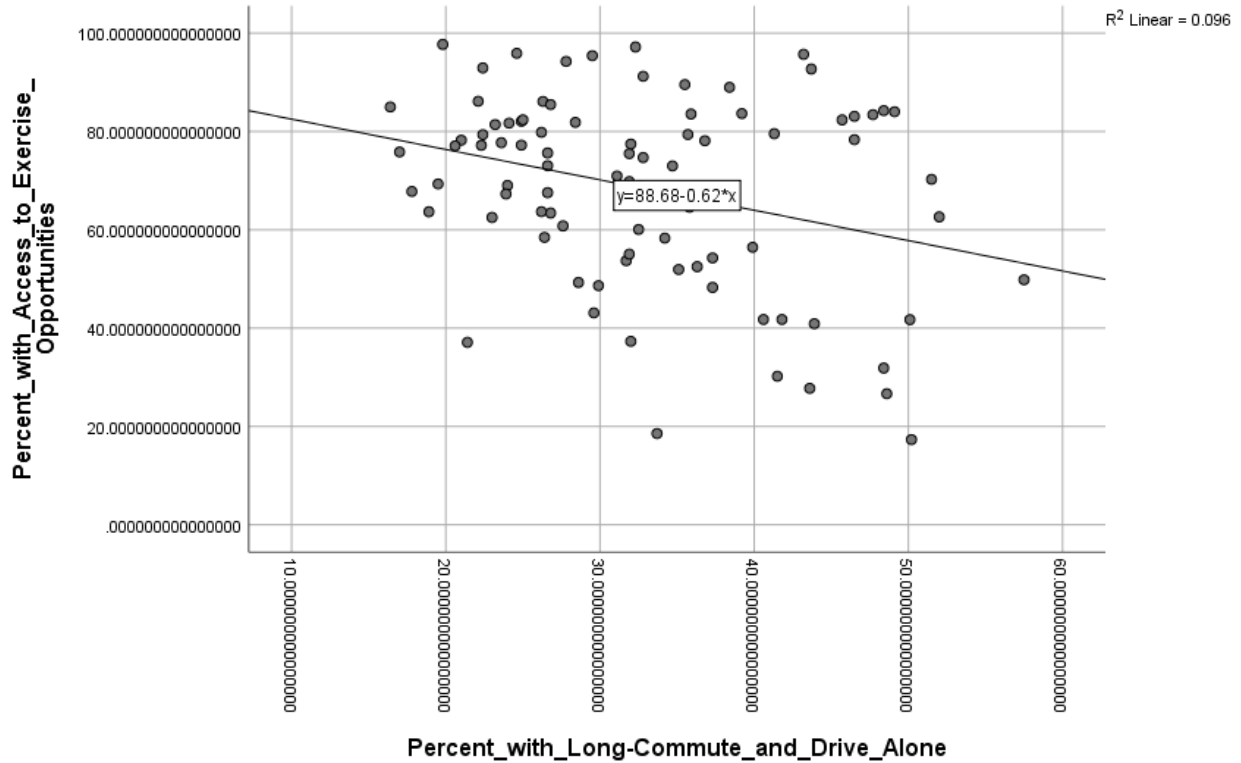


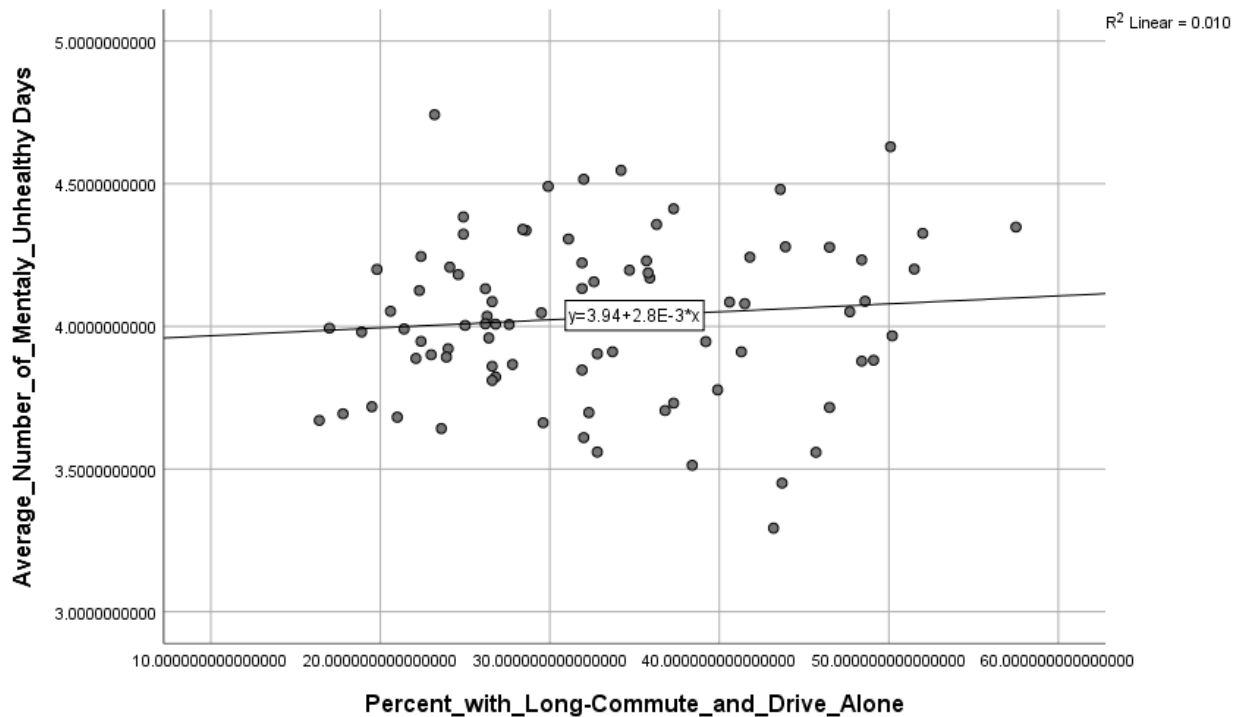
Figure 4: Correlation between percent of adults with access to exercise opportunities and drivers with long commute times who drive alone



RQ4: Is there a correlation between long commute times and driving alone and poor mental health days?

Figure 5 shows no correlation between average number of mentally unhealthy days and drivers with long commute times who drive alone.

Figure 5: Correlation between average number of mentally unhealthy days and drivers with long commute times who drive alone



Discussion

RQ1: Has the percent of people with long commutes who drive alone changed in Ohio from 2016-2020?

The results suggest that, as expected by the hypothesis, the percent of people with long commutes who drive alone has increased from 2016 to 2020. The slight negative correlation between the average traffic volume and commuters who drive alone for over 30 minutes shows that, at least in 2020, an increase in traffic volume does not explain the increased commute time. Unfortunately, data for 2016 could not be found to determine if the trend existed before or if traffic volume also increased like long commutes did or if this means that there are less drivers on the road overall. Potential explanations for the increased percentage of long commutes alone could include more or less people carpooling and using public

transport. Meaning that, potentially, there are less drivers, but those who do drive, do so alone. The time it takes would likely be an issue of distance rather than traffic, like someone who drives from one suburb to the city or between suburbs for work. Again, due to limited data, especially given the small but significant increase, this is speculative and more data including traffic and public transportation in these counties would be needed. Further research between counties with cities and counties without them could also potentially provide substantive data.

RQ2: Has the percent of obese adults, physical inactivity, and access to exercise opportunities in Ohio changed from 2016-2020?

Results suggest that obesity has increased significantly throughout Ohio in the last five years as expected. However, physical inactivity and access to exercise opportunities did not show any significant change. Previous studies suggested physical inactivity to increase and access to exercise opportunities to not change^{4,5}. That obesity increased so significantly while physical inactivity didn't change implies that the increase seems to be more an issue of food intake. Perhaps highly calorically dense foods like junk foods have been consumed more in the last five years despite people exercising at the same frequency. To be sure, further study in food intake and nutrition during the same period must be investigated.

RQ3: Is there a correlation between long commutes and driving alone and adult obesity, physical inactivity, and/or access to exercise opportunities?

There was no correlation between those with long commutes who drive alone and obesity or physical inactivity, and a slight negative correlation with access to exercise

opportunities in Ohio counties in 2019. All of this was unexpected and inconsistent with previous research, so a bit difficult to explain. The lack of correlation shows that the long commute times while driving alone ultimately has little, if any, effect on physical health. As discussed previously, physical health could be more related to food intake than physical activity. Otherwise, this population, unlike in previous studies can more adequately balance sleep and physical activity with their commutes. The negative correlation between the former and access to exercise opportunities could represent a population who must live far from work and don't live near a park or recreational facility, such as those who live in rural areas but work in the city or another suburb. Of course, there are limitations to how this access was defined by CHR such that some opportunities could exist that weren't accounted for. This could erase the correlation. Regardless, traffic noise and lack of time didn't appear to mediate the results as in previous studies due to the lack of correlation^{4,6,7}.

RQ4: Is there a correlation between long commute times and driving alone and poor mental health days?

A positive correlation was expected between poor mental health days and percent of people with long commute times who drive alone, but the 2019 Ohio county data instead reflects no correlation between the two. Unfortunately, without demographic data, it's unknown if these results refute the results found in previous studies, i.e., the suggestion that those who commute longer have less social support or work less and thus experience better mental health^{1,4}. More data is necessary to determine whether traffic noise, being alone for extended periods, higher stress, working longer or more frequently, or some other unknown factor could help to elucidate similar results.

Conclusion

As discussed above, the data shows a significant increase in the percent of long commuters who drive alone and obese adults, but only a negative correlation between the commuter variable and access to exercise opportunities. Limitations to each specific research question were discussed above, but speaking generally, the nature of this study makes it difficult to draw definitive conclusions about the reasoning behind the results. As the data was collected from a database, the considerations for the data were made by a third party, so errors in data collection or definitions of the data are possible. Also, because the analyses were correlations, nothing can be said about the causality of these variables. In the future, prospective experiments involving cohorts from the same population rather than many different counties would help to rectify this. Ultimately, the current study shows that in Ohio, or perhaps anywhere with long-commuters, health is just another concern to be cognizant of while sitting in traffic.

References

1. Besser LM, Marcus M, Frumkin H. Commute Time and Social Capital in the U.S. *AMEPRE*. 2008;34(3):207-211. doi:10.1016/j.amepre.2007.12.004
2. Schaefer JD, Caspi A, Belsky DW, et al. Enduring mental health: Prevalence and prediction. *J Abnorm Psychol*. 2017;126(2):212-224. doi:10.1037/abn0000232
3. Hales CM, Carroll MD, Fryar CD, Ogden CL. *Prevalence of Obesity Among Adults and Youth: United States, 2015-2016 Key Findings Data from the National Health and Nutrition Examination Survey.*; 2015.
https://www.cdc.gov/nchs/data/databriefs/db288_table.pdf#1. Accessed April 14, 2020.
4. Nomoto M, Hara A, Kikuchi K. EFFECTS OF LONG-TIME COMMUTING AND LONG-HOUR WORKING ON LIFESTYLE AND MENTAL HEALTH AMONG SCHOOL TEACHERS IN TOKYO, JAPAN. *J Hum Ergol (Tokyo)*. 2015;44(1):1-9. doi:10.11183/jhe.44.1_1
5. Foraster M, Eze IC, Vienneau D, et al. Long-term exposure to transportation noise and its association with adiposity markers and development of obesity. 2018. doi:10.1016/j.envint.2018.09.057
6. Bayon V, Leger D, Gomez-Merino D, Vecchierini MF, Chennaoui M. Sleep debt and obesity. *Ann Med*. 2014;46(5):264-272. doi:10.3109/07853890.2014.931103
7. Milner A, Badland H, Kavanagh A, Lamontagne AD. Time Spent Commuting to Work and Mental Health: Evidence from 13 Waves of an Australian Cohort Study. *Am J Epidemiol*. 2017;186(6):659-667. doi:10.1093/aje/kww243

