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*DIVISION
OF HEALTH
PROMOTION*

**JACKSON
COUNTY**
HEALTH
DEPARTMENT



REPORT

PROXIMITY *of* FAST FOOD RESTAURANTS *to* SCHOOLS

in Eastern Jackson County (EJC)



BACKGROUND

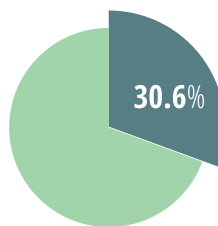
Obesity by the Numbers

Obesity in the United States has become an epidemic. It is a leading factor of chronic disease and health issues and, according to the National Center for Health Statistics, the prevalence of adults with obesity in the U.S. is 39.8%.¹ Jackson County is not immune to overweight and obesity rates either. According to the Missouri County Level Study, 30.58% of Jackson County residents are obese.² Obesity not only impacts adults; the rate of youth with obesity is 18.5% nationally.¹ Adolescents in Missouri (10 - 17 year olds) are obese at a rate of 12.7%. When considering high school students alone (9th – 12th grade), obesity rates increase to 16.6%. Interestingly, obesity rates for youth aged 10 – 17 year olds have slightly decreased over the last year, but the rate in high school students has nearly doubled since 1999 and increased by nearly 3% from 2015 – 2017.³

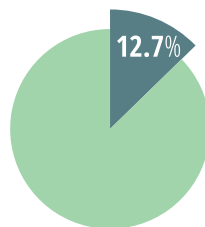
Childhood Obesity and Health

Children with obesity are at an increased risk for a number of health issues including: high blood pressure and high cholesterol, increased risk of impaired glucose tolerance, insulin resistance, type 2 diabetes, breathing problems (such as asthma and sleep apnea) joint problems and fatty liver disease, gallstones, and heartburn.⁴ Children with obesity also face social and emotional stress as they are often targets of bullying, experience social isolation, and feel an overburden of stress.⁵ Additionally, childhood obesity sets the trajectory for lifelong health conditions including adult obe-

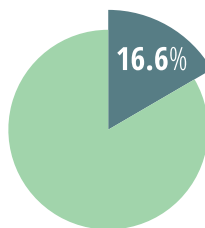
JACKSON COUNTY RESIDENTS WHO ARE OBESE



MISSOURI ADOLESCENTS (10-17 year olds) WHO ARE OBESE



MISSOURI HIGH SCHOOLERS (9th-12th grade) WHO ARE OBESE



sity. If an individual is overweight or obese as an adolescent, there is a 70% chance they will remain overweight or obese as an adult.⁶ Adults who have experienced lifelong obesity also tend to have more serious health problems than those who become obese later in life.

Low Income Children at Higher Risk

Childhood obesity disproportionately affects children in low income families. While the rate of childhood obesity increased by 10% from 2003 to 2007, it increased somewhere between 23-33% for children in low-education, low-income, and higher-unemployment households in that same time period. A recent study on school districts in Massachusetts found that for every 1 percent increase in low-income status, school districts saw a 1.17% increase in overweight/obesity rates.⁶ Studies have shown that low-income communities often face more barriers to improving their overweight/obesity status than their higher income neighbors. For example, low-income communities may lack full-service grocery stores, exercise facilities, and recreational programs and parks, but have an increased access to fast food outlets and convenience stores.



Fast Food and “Dining Out” on the Rise

While there is often an excess of availability of fast food within low income communities, all Americans are impacted by the inundation of fast food. The proportion of meals Americans eat away from their homes has significantly increased. The technological advances of the food industry have allowed restaurants to mass produce their meals, leading to the expansion of the fast-food industry.⁷ The number of fast food outlets in the United States has increased from about 30,000 locations in 1970 to more than 233,000 locations in 2004. Additionally, fast food outlets have been classified as the most rapidly expanding sector of US food distribution.⁸

In 2016, 91% of parents reported purchasing lunch or dinner for their child in the past week at one of the four largest chains (McDonald’s, Burger King, Wendy’s, and Subway). This was an increase from 2010, where 79% of parents reported purchasing a meal from one of these chains once in the past week.⁹ Results from the 2012 NHANES survey showed that children and adolescents received an average of 12.4% of their daily calories from fast food. Adolescents ages 12 – 19 ate twice as many calories from fast food than children ages 2 – 11. Combined, one third of children ages 2 – 19 eat fast food on any given day.¹⁰ On days where they do eat fast food, children consume about 126 more calories and adolescents consume about 310 more calories than days where they do not eat fast food. They also consume more sugar sweetened beverages, more

91%

of parents reported purchasing lunch or dinner for their child in the past week at one of the four largest chains.



1/3 of children ages 2 – 19 eat fast food on any given day.

overall sugar, more fat, more saturated fat, and more sodium, while consuming less fiber, less fruits and vegetables, and less milk.^{11,12}

Regular consumption of fast food can lead to weight gain and insulin resistance. In a 15 year study of young adults in the U.S., those who ate fast food two or more times a week gained approximately 10 more pounds and had double the increase of insulin resistance over the 15 year period than those who consumed fast food less than once per week.¹³ Weight gain and insulin resistance increase the risk of developing obesity and type 2 diabetes.

Fast Food Outlets and Proximity to Schools

As fast food consumption contributes to obesity in children, it is worth considering the relationship between fast food outlets and schools. A 2014 study in Arkansas found that fast food restaurants within one mile of a school do impact school-level weight outcomes and that an addition of a fast-food restaurant within one mile radius increases school obesity rates by 1.23%.⁷ Another study found that

students who attend schools within one half mile of fast food restaurants are more likely to be overweight or obese.¹⁴

In major metro cities throughout the country, including New York City, Chicago, and Los Angeles, studies have consistently shown fast food clustering near schools. Nearly 80% of schools in Chicago have at least one fast food restaurant within 800 m (or about 1/2 mile).¹⁵ This is especially true for high schools. For instance, researchers in Los Angeles County have found a greater proximity of fast food restaurants to high schools than middle or elementary schools.¹⁶ And across the United States, 67% of high schools in major cities are within 800 meters of a fast food outlet.¹⁷ The proximity of fast food locations near high schools could be for various reasons including the tendency for both to locate near major thoroughfares, or major commercial zones serving larger populations. Conversely, middle and elementary schools are often located in residential neighborhoods serving a smaller number of students and further from commercial zones and thoroughfares.

The location of fast food near high schools is important because the rate of teenage obesity has steadily increased in recent years. Among adolescents aged 12 - 18 years old, the percentage of total energy intake from restaurant and fast foods consumption increased by nearly 300% from 1977 to 1996.¹⁸ This may be due to various reasons including that high school students have more choice in

SOCIAL DETERMINANTS OF HEALTH AFFECTED

ECONOMIC STABILITY



EDUCATION



HEALTH AND HEALTH CARE



NEIGHBORHOOD AND BUILT ENVIRONMENT



SOCIAL AND COMMUNITY CONTEXT



the foods they eat because of their disposable incomes, their ability to drive or walk themselves to food options, their flexible schedules, and open campus policies that allow them to leave school for lunch.¹⁹ In a 2011 study, researchers surveyed adolescents at fast food restaurants on what influenced them to eat there; 57% responded that ease mattered ‘some’ or ‘a lot’ and 48% responded that location was the most important factor. In that same study, researchers found that adolescents who purchased fast food without a caregiver present tended to order meals with higher calorie content.²⁰

In recognizing the rate of obesity in Jackson County, and acknowledging the fact that fast food consumption contributes to childhood obesity, the aim of this study was to examine the proximity of fast food restaurants to Eastern Jackson County schools. Specifically, this study addressed two questions: 1) Is there a difference in proximity of fast food restaurants among elementary, middle, and high schools? 2) Is there an association between proximity of fast food restaurants to schools and neighborhood income level?

METHODS

A total of 106 public schools and 451 fast food restaurants were included in this analysis. Information on fast food restaurants was gathered using Google. Restaurants labeled as fast food or fast casual and convenience locations were labeled as fast food restaurants (McDonald’s, Burger King, Wendy, Subway, etc.).²¹ Full service grocery stores and department stores with grocery sections were labeled as healthy food vendors. Information on public schools was gathered using Missouri Spatial Data Information. Data on census tract-level median household income was obtained from the U.S. Census. Schools were categorized by elementary school (n= 71), middle school (n= 19), and high school (n=16). Schools were also classified by the median household income of the census tract in which the school was located and then divided into four quartiles. Schools and fast food restaurants were geocoded using longitudinal and latitudinal coordinates. From the geocoded schools, layers were created representing buffered areas around each school at ½ mile and 1 mile radius.

The mean number of fast food restaurants, and the percentage of schools with one or more fast food restaurants within the two buffers were calculated and examined by school type and neighborhood income quartile. Differences in percentages were assessed for statistical significance with the Chi-Square test. Single-factor analysis of variance (ANOVA) models were run to examine whether the mean number of fast food restaurants with ½ and 1 mile of schools varied significantly by school type and neighborhood income.



RESULTS



This study found a high concentration of unhealthy fast food restaurants surrounding Eastern Jackson County public schools. Out of all food vendors within one mile of high schools, 90.48% were labeled as unhealthy. Similarly, 89.13% of food vendors within one mile of middle schools were unhealthy, and 88.22% of food vendors within one mile of elementary schools were unhealthy.

Overall, 48.1% and 78.3% of public schools had one or more fast food restaurants located within ½ mile and 1 mile, respectively (as seen in Table 1). The percentage of schools with one or more fast food restaurants within ½ mile was highest for high schools (62.5%), intermediate for elementary schools (46.5%), and lowest for middle schools (36.8%). The same trend was seen with the 1 mile buffer.

In assessing the relationship between mean number of fast food outlets and neighborhood income, a single-factor analysis of covariance (ANCOVA) was applied using population density as a covariate. This helped to account for differences in population density across neighborhood income levels.²²

Geographic analysis was performed using ArcGIS 10.6.1 and subsequent statistical analyses were performed using IBM SPSS 25. Post-hoc comparisons were performed using the Games Howell adjustment for multiple comparisons because the test of homogeneity of variances failed, and a significance level of $\alpha = 0.05$ was used throughout.

When the ½ mile buffer was implemented, the estimated mean number of fast food restaurants in close proximity to high schools was significantly higher than the estimated mean for middle schools ($p = 0.015$). The estimated mean for high schools was not significantly different than the estimated means for elementary schools (see Figures 1-3 for reference). When the 1 mile buffer was implemented, the estimated mean number of fast food restaurants in close proximity to high schools was not significantly higher than the means for middle or elementary schools.

When the ½ mile buffer was implemented, the estimated mean number of fast food restaurants in close proximity to schools in the highest income

quartile was not significantly lower than the estimated means for all other quartiles. When the 1 mile buffer was implemented, the estimated mean number of fast food restaurants in close proximity to schools in the highest income quartile was significantly lower than the estimated means for schools in the lowest ($p = 0.002$) and second highest quartile ($p = 0.049$).

When controlling for population density, the effect of neighborhood income was significant when estimating the mean number of fast food restaurants within 1 mile. However, only the lowest income quartile was significant when compared to the highest income quartile (see Figures 4 & 5 for reference).



UNHEALTHY FOOD VENDORS WITHIN 1/2 MILE OF EJC HIGH SCHOOLS

FIGURE 1

90.48%
of food vendors within one mile of high schools were unhealthy

62.5%
of high schools have one or more fast food restaurants within half a mile

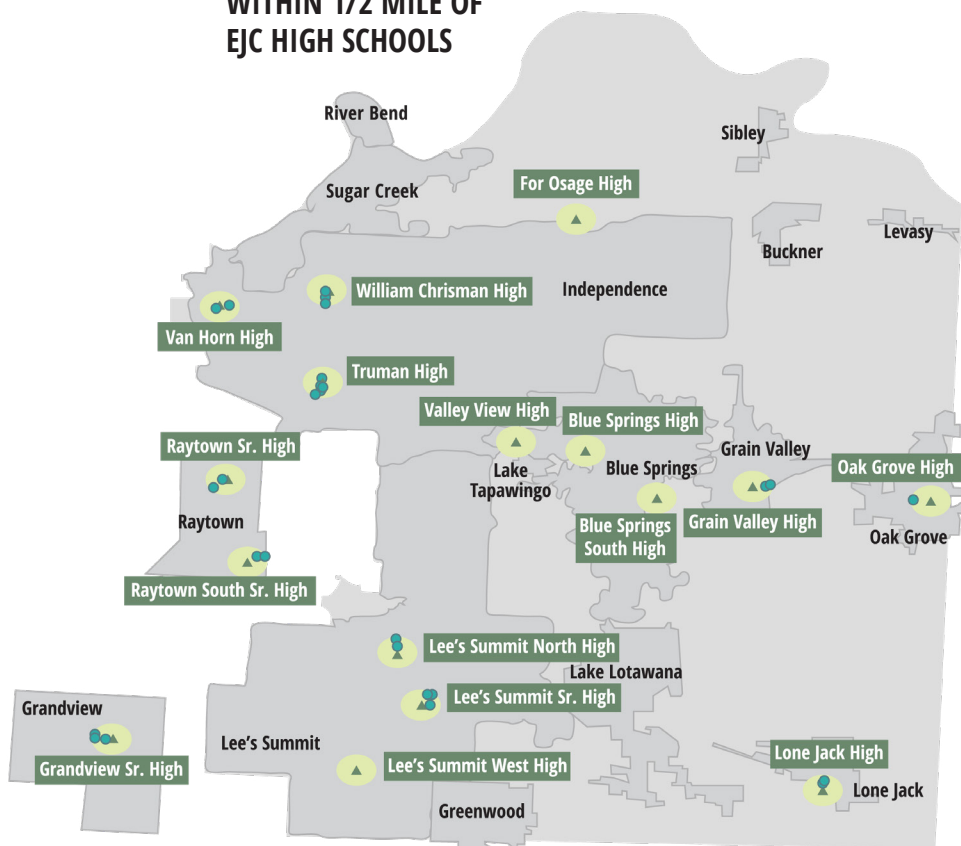


TABLE 1

	Number of Schools	Mean Number of Unhealthy Food Restaurants within 1/2 Mile	Range (min, max)	Percent of Schools with 1 or more Unhealthy Food Vendors within 1/2 Mile	Mean Number of Unhealthy Food Vendors within 1 Mile	Range (min, max)	Percent of Schools with 1 or more Unhealthy Food Vendors within 1 Mile
Overall	106	1.27	(0, 7)	48.1	6.19	(0, 24)	78.3
SCHOOL TYPE							
High School	16	2.19 ^a	(0, 6)	62.5 [*]	6.75 ^a	(0, 18)	87.5
Middle School	19	0.58 [*]	(0, 3)	36.8	4.11	(0, 10)	73.7
Elementary School	71	1.25	(0, 7)	46.5	6.62	(0, 24)	76.1
NEIGHBORHOOD INCOME QUARTILE							
Q1 (< \$46,471.00)	25	1.88	(0, 6)	56.0	9.24 [*]	(0, 24)	92.0 ^{**}
Q2 (\$46,471.00 - \$61,050.49)	28	1.46	(0, 7)	53.6	6.43	(0, 21)	82.1
Q3 (\$61,050.50 - \$74,571.24)	27	1.11	(0, 5)	48.2	6.04 [*]	(0, 18)	81.5
Q4 (> \$74,571.25)	26	0.65 ^b	(0, 5)	30.8 [*]	3.15 ^b	(0, 24)	78.3 ^{**}

*p < 0.05

**p < 0.001

^a School Type: high school vs. middle or elementary school

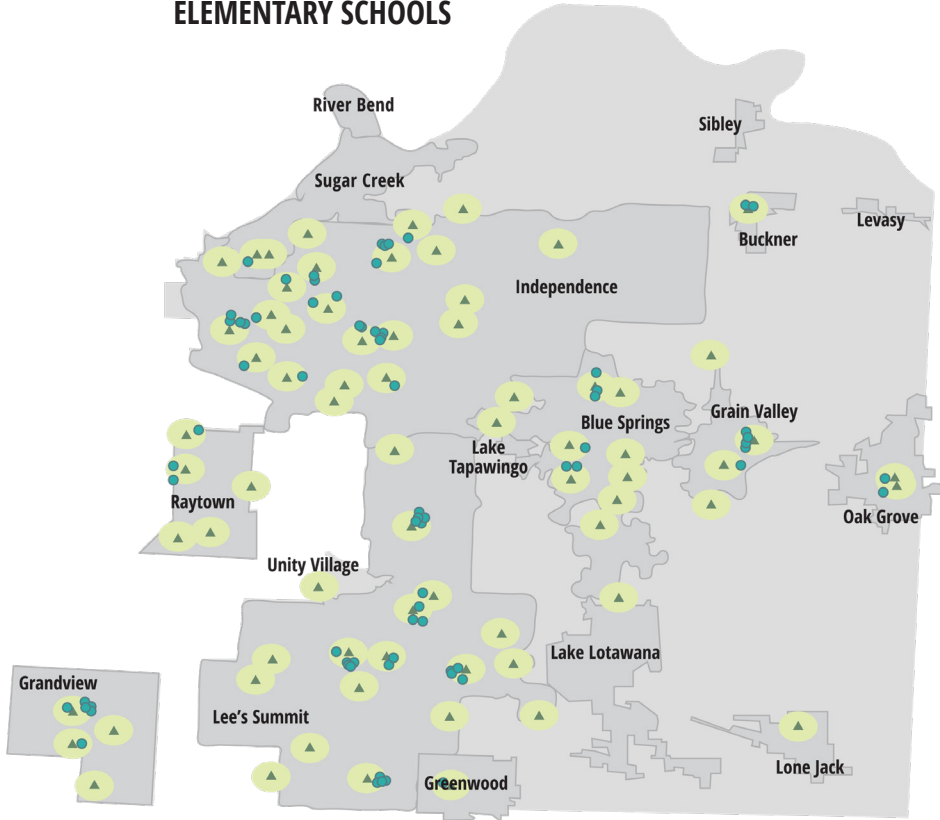
^b Neighborhood Income: 4th quartile vs. other quartiles

UNHEALTHY FOOD VENDORS WITHIN 1/2 MILE OF EJC ELEMENTARY SCHOOLS

FIGURE 2

88.22%
of food vendors
within one mile of
elementary schools
were unhealthy

46.5%
of elementary
schools have one
or more fast food
restaurants within
half a mile



UNHEALTHY FOOD VENDORS WITHIN 1/2 MILE OF EJC MIDDLE SCHOOLS

FIGURE 3

89.13%
of food vendors
within one mile
of middle schools
were unhealthy

36.8%
of middle schools
have one or more
fast food restau-
rants within half
a mile

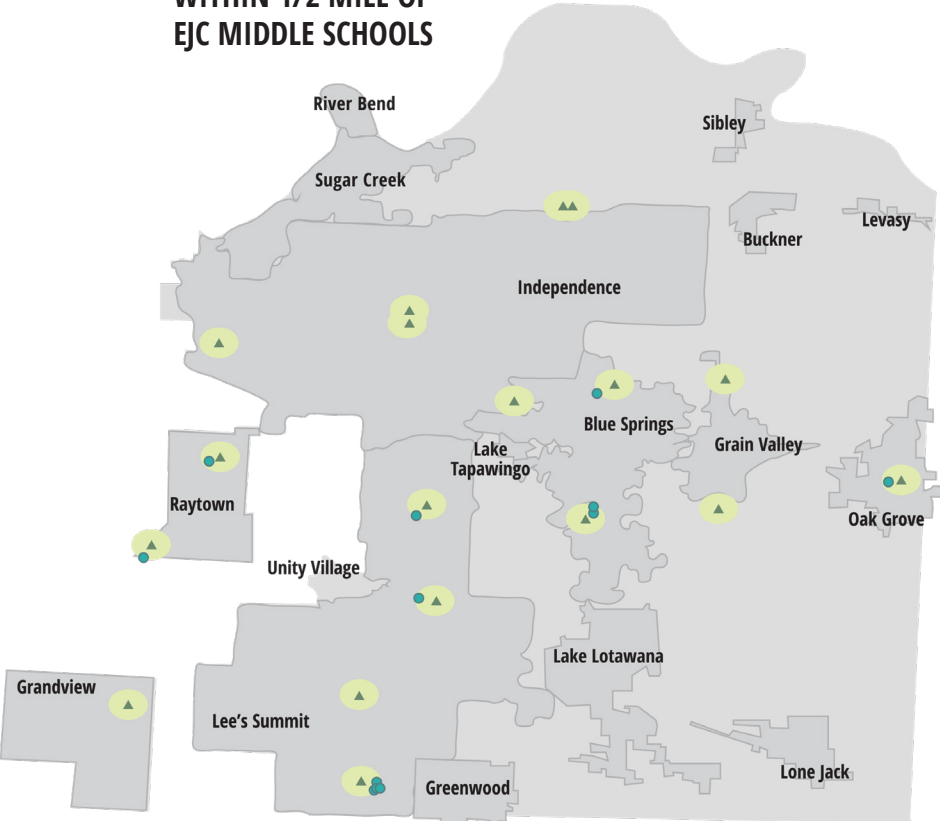


FIGURE 4

**UNHEALTHY FOOD VENDORS
BY INCOME QUARTILES IN EJC**

LEGEND

- Unhealthy Food Vendor
- Quartile 1 (Lowest)
- Quartile 2
- Quartile 3
- Quartile 4 (Highest)

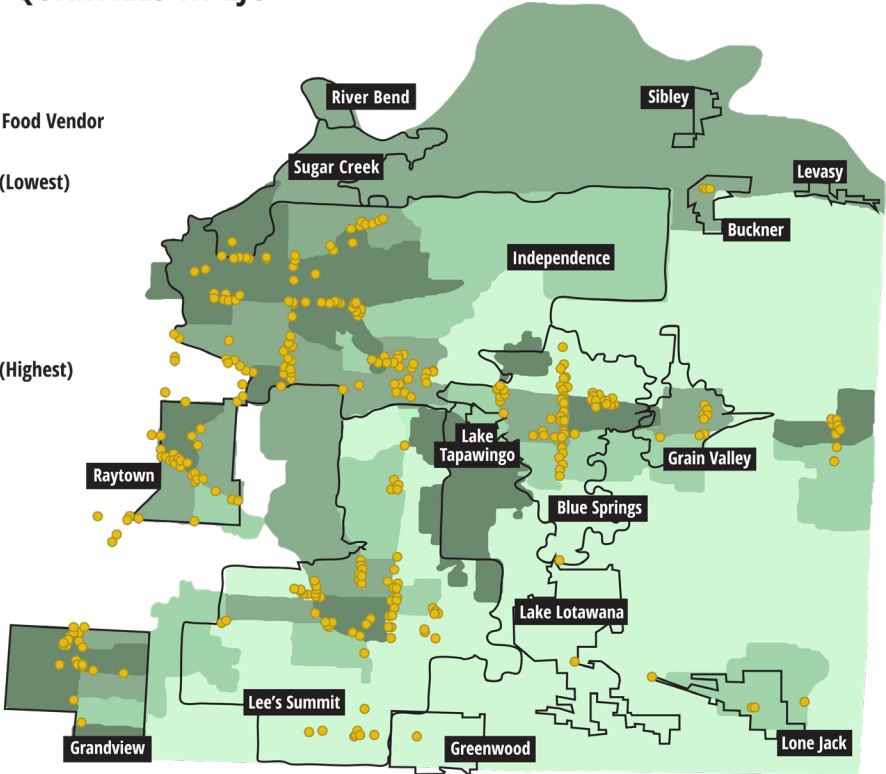
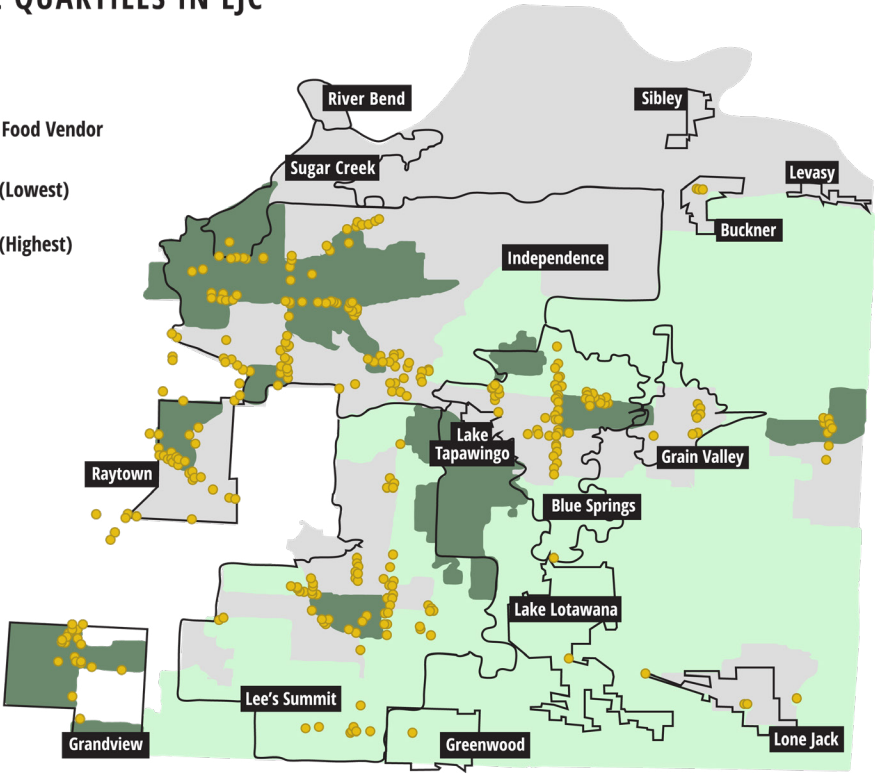


FIGURE 5

**UNHEALTHY FOOD VENDORS
BY INCOME QUARTILES IN EJC**

LEGEND

- Unhealthy Food Vendor
- Quartile 1 (Lowest)
- Quartile 4 (Highest)



DISCUSSION

High schools in Eastern Jackson County have a significantly higher number of fast food restaurants within ½ a mile than middle schools in the area. Additionally, schools in the lowest income quartile had a significantly higher number of fast food restaurants within 1 mile than schools in the highest income quartile, even after controlling for population density. These results are consistent with similar studies from across the U.S.¹⁷

As discussed previously, there is a connection between proximity of fast food to schools and school level obesity rates. The results of this study, therefore, may shed light on why the obesity rate among Missouri high schoolers increased by 3% from 2015 to 2017. Additionally, the fact that schools in lower income census tracts in Eastern Jackson County have a higher number of fast food restaurants confirms the observation that other studies have shown: that low income individuals are disproportionately affected by unhealthy food environments and are at greater risk of obesity and obesity-related diseases.



Fighting the Obesity Epidemic with Schools

Schools have the ability to influence fast food intake for their students. Schools throughout Missouri have enacted policies reducing impact of nearby fast food restaurants. In St. Louis, a Richmond School District elementary school banned fast food from being brought into the cafeteria at the beginning of the 2018-2019 school year.²³ In Eastern Jackson County, some school districts' student handbooks restrict students from leaving campus at lunch unless written notice is provided. The Grandview High School student handbook takes further actions and prohibits bringing catered foods and fast food into the school cafeteria.²⁴ By creating policies that limit bringing fast foods into school buildings, school districts can curb the intake of fast food during the school day.

Eastern Jackson County can take further action to prevent the negative effects of fast food availability from becoming a problem. One option is to make sure all students are receiving comprehensive nutrition education that includes information about fast food. Specifically, students should learn about the high fat, sugar, and sodium content in many fast food meals, the health risks of consuming foods high in fat, sugar, and sodium, and how to choose healthier options at these establishments.

Schools should also provide healthy alternatives to the fast food options nearby. After undergoing much scrutiny in recent years, school lunch options are more nutritious and healthy.

They could also go a step further by offering healthier after school snacks. Another option is to start a school garden, where students can learn how to grow fresh produce. School gardens have been shown to increase student knowledge of different vegetables and increase students' vegetable consumption.²⁵

Fighting the Obesity Epidemic through City Policy and Environment

On a broader level, communities across the U.S. and around the world have noticed these same patterns and taken action. Local municipalities control ordinances, zoning regulations, and land use policies within their jurisdictions that can be used to increase healthy food consumption while decreasing fast food intake. For instance, major cities, such as London, have committed to this kind of policy change.

Beginning in January 2019, London will no longer allow unhealthy foods including burgers, candy and salted food and sugary drinks to be advertised in their major public transit system, The London Underground. Fast food restaurants will be able to advertise only if they promote their healthy food items and sugar free drinks. Beyond the advertising ban, the city is taking further action by no longer allowing any new fast food restaurants, including corner stores that sell hot food, and street vendors to open and operate within one quarter of a mile near primary and secondary schools.²⁶ This makes London one of the first major cities in the world to take extensive policy action to reduce the risk of obesity.



LIMITATIONS

Some U.S. cities have taken a variety of zoning actions as well. To reduce the impact fast food has on children, Detroit, Michigan and Monterey, California both implemented zoning ordinances near schools. In 2017, Detroit enacted a policy that restricts fast food restaurants from opening within 500 feet of an elementary, middle or high school while Monterey prohibited future development of fast food restaurants within 500 feet of public and private elementary schools, public parks or recreation facilities.^{27,28}

Eastern Jackson County cities can join these efforts to serve as leaders among U.S. cities and pass healthy food zoning ordinances. These ordinances would prohibit new fast food restaurants from opening within half a mile (walking distance) of a school. This could prevent the concentration of fast food around existing schools from becoming even higher. However, these ordinances would have the greatest impact on future schools that have not yet been built, as it could completely prevent fast food restaurants from opening up around them. Other policy options include encouraging healthy food vendors to locate near schools through permit or tax incentives, prohibiting students and

families from bringing fast food onto school campus, and restricting advertising for unhealthy food and beverages in and around schools.

Whether through school policies or broader city ordinances, the need for action is clear. Neglecting to intervene now could lead to an even higher rate of obesity in tomorrow's generation. Jackson County in particular has seen an increase in obesity rates among both high schoolers and adults in recent years. Therefore, the more high schoolers that graduate at an unhealthy weight today, the more diabetes, heart disease, and other health issues our community will have to face in the future.



This study had some limitations. Fast food locations were identified using Google Maps; while this provided over 450 fast food establishments there is risk of inaccurate counts based on an outdated map. This has likely caused an underestimation of the number of fast food locations. As mentioned previously, high schools are often located near major thoroughfares or commercial zones. It was not possible to calculate commercialization for Eastern Jackson County schools with the data available to determine if this affected the high number of fast food restaurants near high schools. However, population density was accounted for in the income analysis. Additionally, the half mile and one mile buffer zones do not factor in roadways or paths, so while a location may be within half a mile of a school it does not necessarily mean that a route available for a person to walk or drive is within a 1/2 mile or 1 mile. Due to this reason, there is a possibility of some overestimation of fast food proximity to schools. In addition, this study was a broad analysis from a community level measure. Because students were not surveyed they were unable to self-report their consumption of fast food. Individual students' or school-level BMIs were not available either. School food policies for large districts including Blue Springs, Grandview, Independence and Lee's Summit were available, but smaller districts within the county were not accessed.

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