

# The Study of Public-School Location Associated with Fast-Food Restaurant in Baltimore City, Maryland State

## Introduction

The increasing prevalence of overweight and obesity in school-aged children is potentially linked to contextual influences such as the food environment around schools. Recent researches find that the proximity of fast-food restaurants to public-schools may enhance access to unhealthy foods and have a negative impact on diet and some research found most school are characterized by a high density of fast-food outlets.

The hypothesis of this project is that school context, which effect by distance to restaurants and population density, may be a factor in student eating habits and health. In the high population density area, students are more likely to walk to school and walk home, so they are more likely to stop at fast food restaurants and buy some unhealthy food. For this reason, this project aims to explore the possibility of using geographic information system to discover specific public schools that were provide candidates school that are in "Good" location or schools that are in "Bad" location in Baltimore City for the next stage in the study which is to visit "Good" and "Bad" schools to measure the data may use in the future research.

## Methodology

This research plan to find the target schools which can be the candidate school in Baltimore City, Maryland State. To find these areas in Baltimore City, this project use the spatial analysis and raster overlay analysis to create the vulnerability scores by using 2 factors: the distribution condition of fast-food restaurant, and population density.

**Distance to restaurants:** The 500 meters is less than 10 minutes walking for school students, so the area within 500 meters will be in the bad area and over 1000 meters will be in the good area, so this project using the spatial analysis tool to show and reclassify the score of restaurants distance.

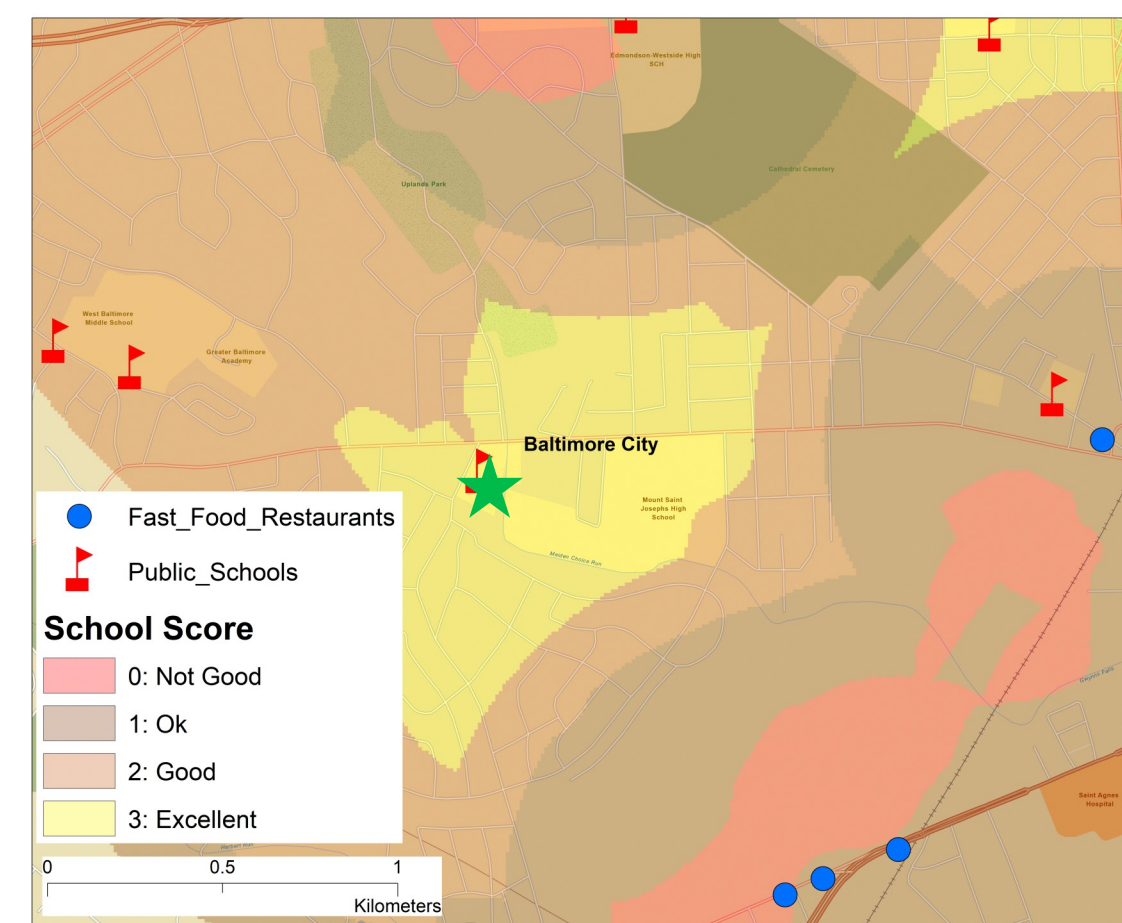
**Population density:** the area has over 3000 people within the 500 meters will be considered as high population density area. This project using the spatial analysis tool to show the score of population density by polygon raster.

## Evaluation

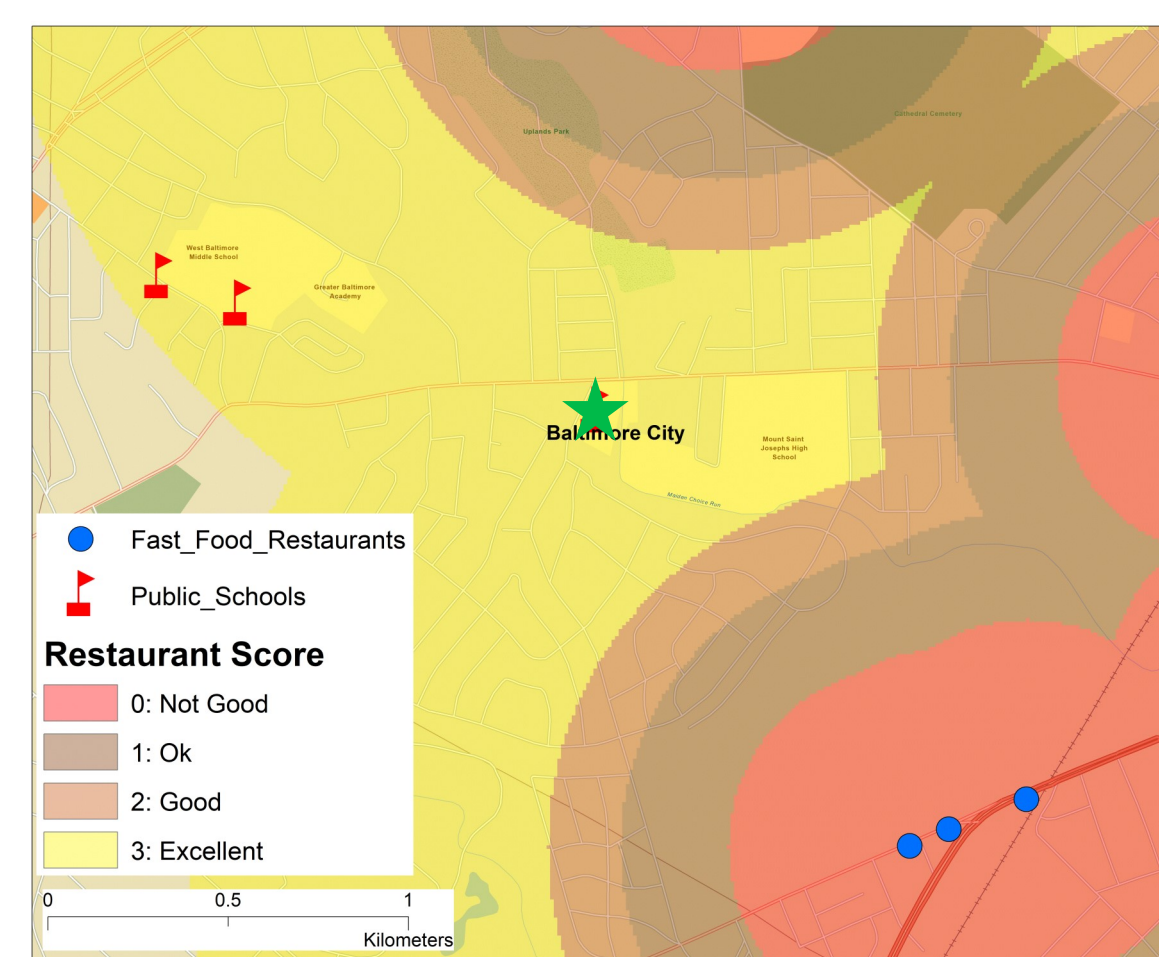
- The distribution of fast food restaurants also related to the commercial land, because some school are located to a commercial area and there will be lots of fast food restaurants. But in this project, this factor is not include in the model, so this may cause bias.
- The school data is a public-school data, so that include the elementary, middle, and high school. Most elementary school have school lunch program, and elementary school students will not go to the fast-food restaurant by their own and walking, so that may influence the accuracy of research results.

## "Good" School

Mount Saint Josephs high school is the target school which is a "good" location. The school score shows on the map is excellent. This school is in a very good area with both two factors (distance of restaurant and population density) in an excellent score. This means that target school is far from the fast-food restaurant and located in the area with over 3000 people within 500 meters. Students in this area are more likely to walk to school and home, but they are less likely to buy unhealthy food.

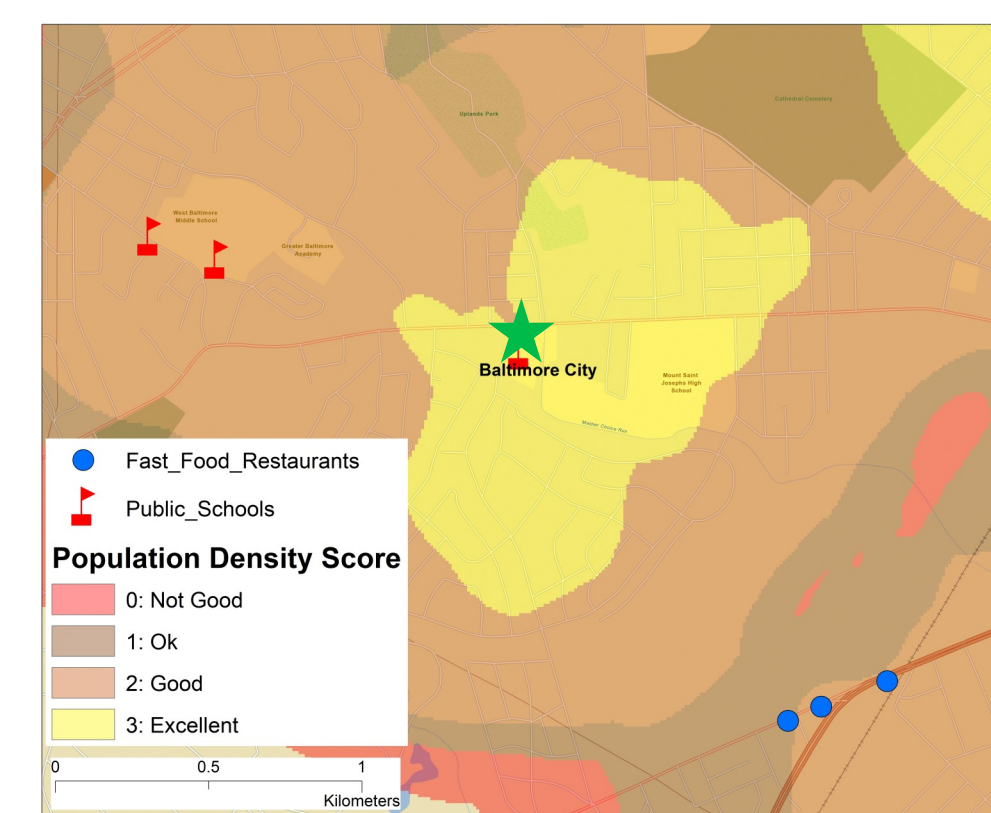


Map1. The School Score for "Good" School



Map2: The Distance of Restaurant factor

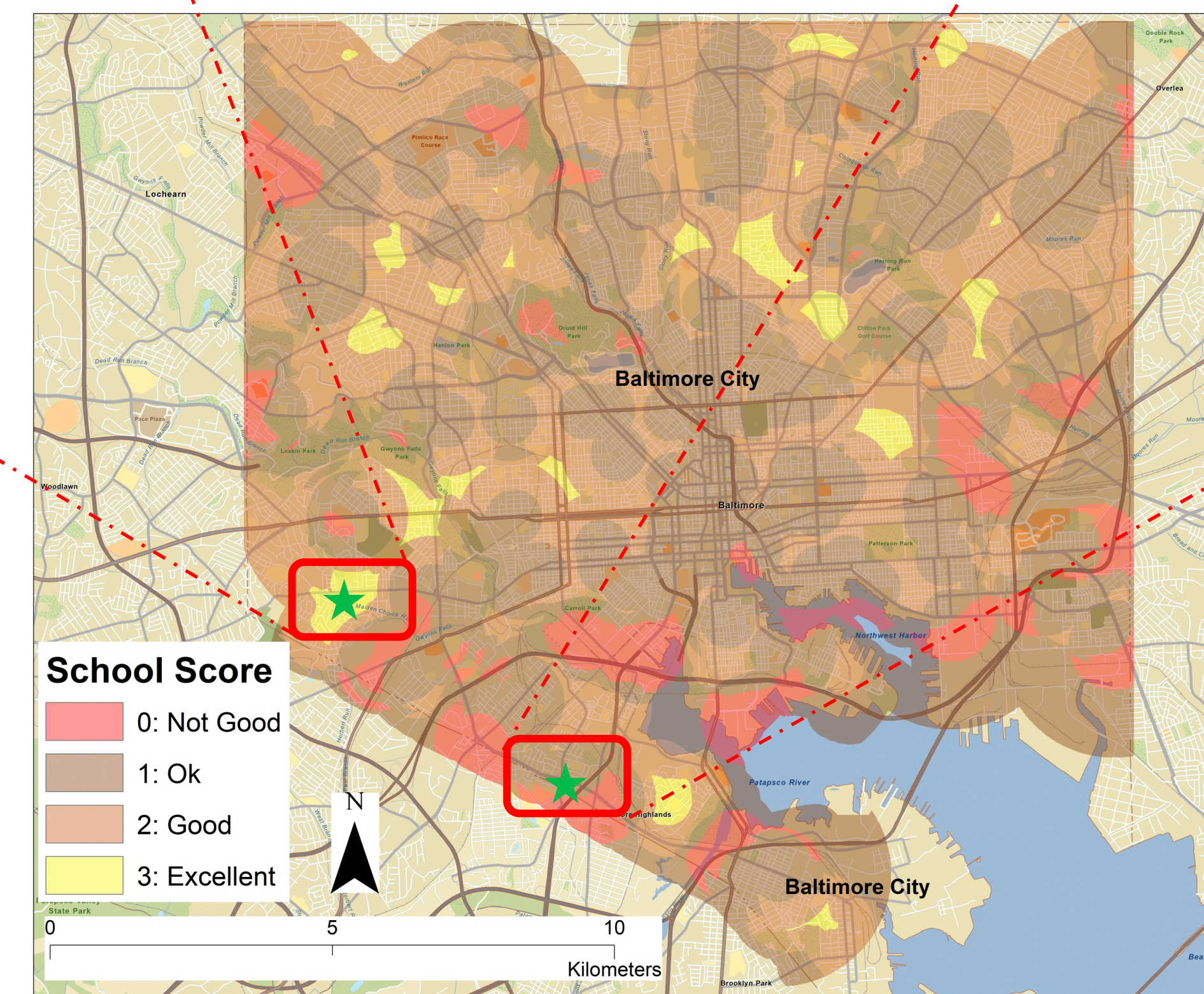
The map shows on the right is the population density score. The target school is in excellent area which include over 3000 people with in 500 meters.



Map3. The Population Density Factor

## Discussion

This project, the study of public-school location associated with fast-food restaurant in Baltimore city, can be used as a tool to determine the target or candidates location for the next stage of study about childhood obesity and environmental factors. By using the spatial analysis tool in geographic information system, we found two candidates school in Baltimore city which one is "Good" with both excellent score of distance to fast-food restaurant and excellent score of population density and another is "Bad" with not good score of distance to fast-food restaurant and excellent score of population density.



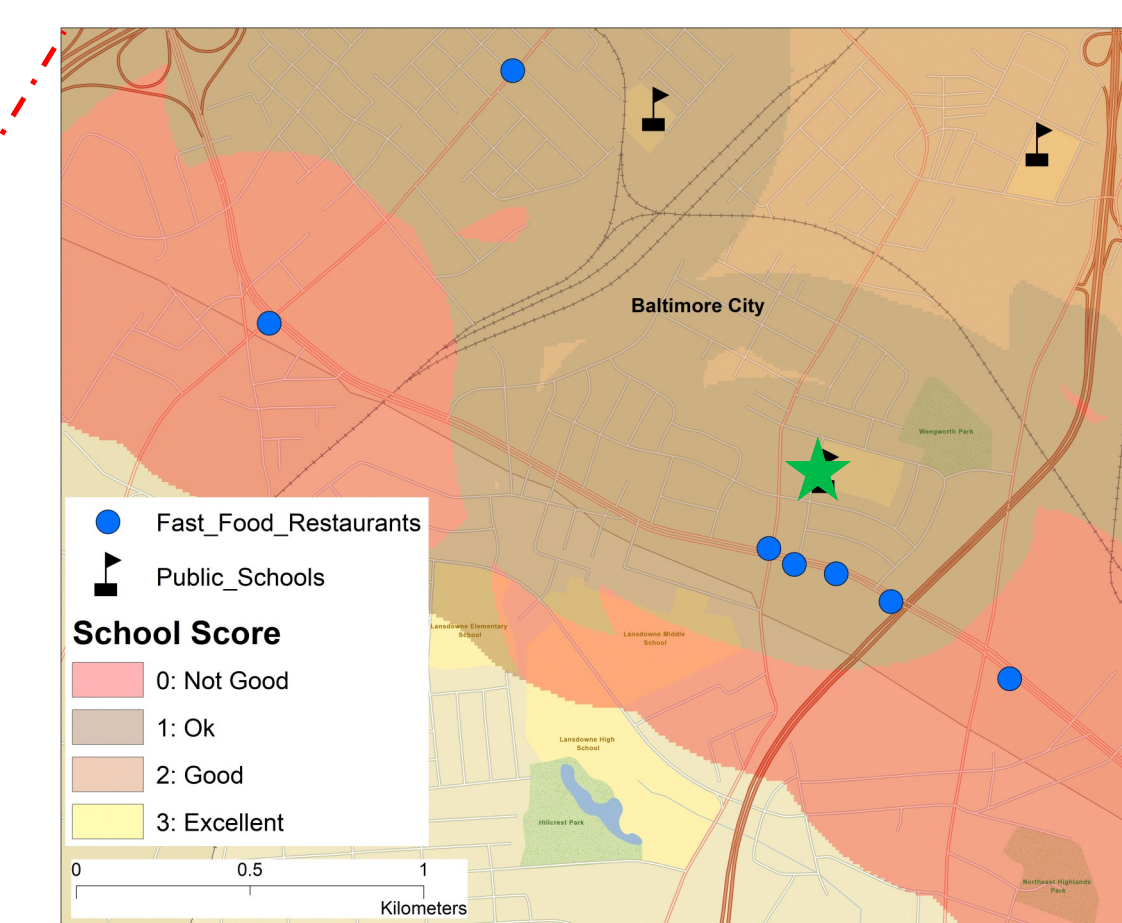
Map4. The School Score for Baltimore City, Maryland State

After using the measurements tool in ArcMap to measure the specific distance between the target school and nearest restaurant, we found that Lakeland middle school has five fast-food restaurant around about 250 meters distance to 400 meters distance, and the distance to the nearest restaurant of Mount Saint Joseph's High School is 1300 meters. In conclusion, those two target school is very good for next stage study.

Name	Lakeland middle school	Mount Saint Joseph's High School
Number of restaurants	5	0
Distance to the nearest restaurant	269 meters	1300 meters
Population density	Over 3000 within 500 meters	Over 3000 within 500 meters
Evaluation	OK	Excellent

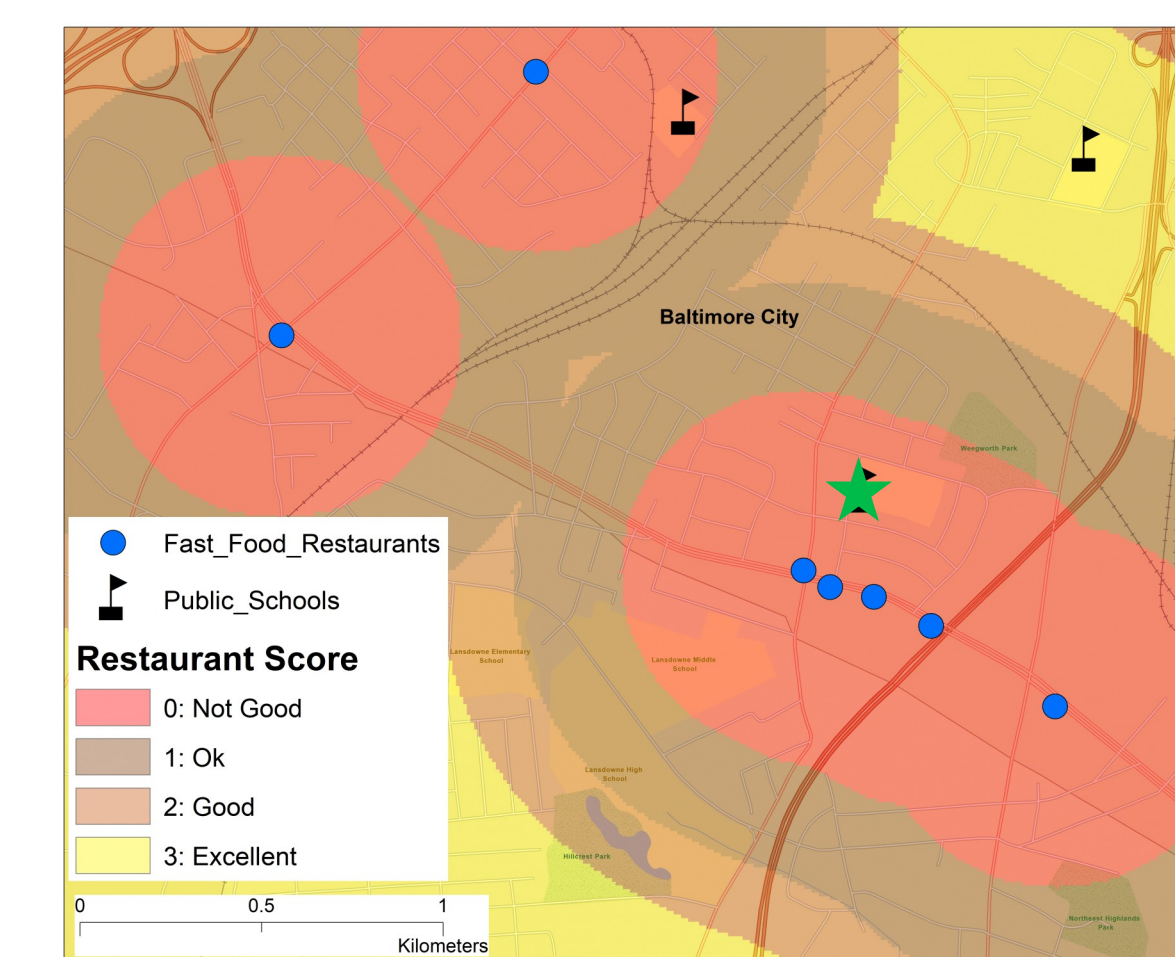
## "Bad" School

Lakeland middle school is the target school which is a "bad" location. The school score shows on the map is Ok. This school is in a not good area with distance of restaurant factor in a not good score and population density in an excellent score. This means that Lakeland middle school is very near to the fast-food restaurant and located in the area with over 3000 people within 500 meters. Students in this area are more likely to walk to school and home, and they are more likely to buy unhealthy food, so they have higher risk of disease.

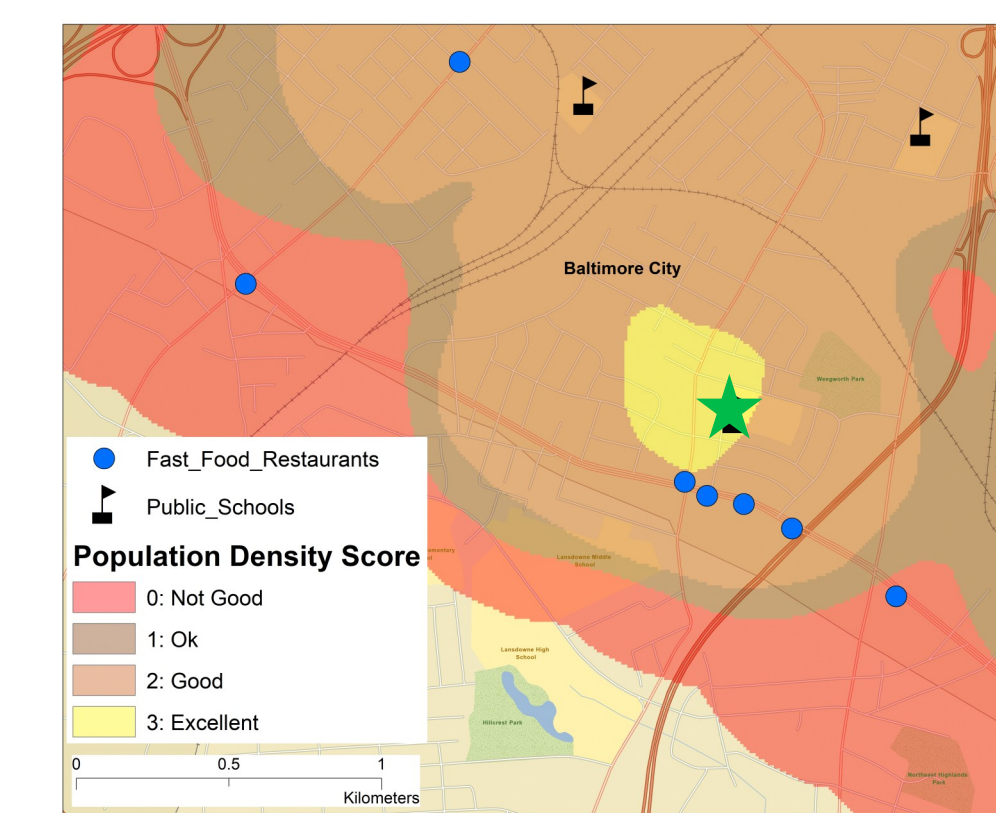


Map5. The School Score for "Bad" School

This is in "not good" area which is less than 500 meters away from restaurant. The nearest restaurant is 269 meters away, and we also can found 5 fast-food restaurant are very near from the target school.



Map6. The Distance of Restaurant Factor



Map7. The Population Density Factor

The map shows on the right is the population density score. The target school is in excellent area which include over 3000 people with in 500 meters.

### Dara Source:

- Fast Food Chain Restaurants, Feb 2017, Johns Hopkins Center for a Livable Future online research published by Johns Hopkins Center for A Livable Future, accessed April 02, 2019.
- Maryland Land Use Land Cover - Land Use Land Cover 2010, Jan 2010, published by Maryland GIS Data Catalog, accessed April 02, 2019
- Block group Population Density: US Bureau of the Census, 2010, U.S Department of Commerce; Published by U.S Census Bureau, accessed April 09, 2019.

### Literature Source:

- Day and Pearce, 2011, P.L. Day, J. Pearce, Obesity-promoting food environments and the spatial clustering of food outlets around schools, *Am. J. Prev. Med.*, 40 (2011), pp. 113-121.
- S. Bryn Austin, et.al, "Clustering of Fast-Food Restaurants Around Schools: A Novel Application of Spatial Statistics to the Study of Food Environments", *American Journal of Public Health* 95, no. 9 (September 1, 2005): pp. 1575-1581.

### Xinrui Ren

Tufts Friedman School of Nutrition Science and Policy  
NUTR 231: Fundamentals of GIS  
May 04th, 2019  
State Plane Maryland FIPS 1900 (Meters) (NAD 1983)  
was used for all maps which are constructed in Arc Map.