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Defining and Analyzing a Food Desert

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INTRODUCTION

A food desert is a term to describe areas that are separated from food venues where the residents experience physical and economic barriers to accessing healthy food (Reisig and Hobbiss, 2000, as referenced in Sparks et al., 2009). The term "food desert" was first used when a resident in public housing expressed their view of what it was like to live in an area where food was costly and geographically not tangible (McEntee 2010). The topic of food deserts has been the talk of researchers in the GIS world very recently. Many aspects of this topic have been touched upon, such as, what are the health effects of a food desert, what is a reasonable walking distance considering the weight of the groceries and the physical capability of the person, and comparing methods of evaluating a food desert.

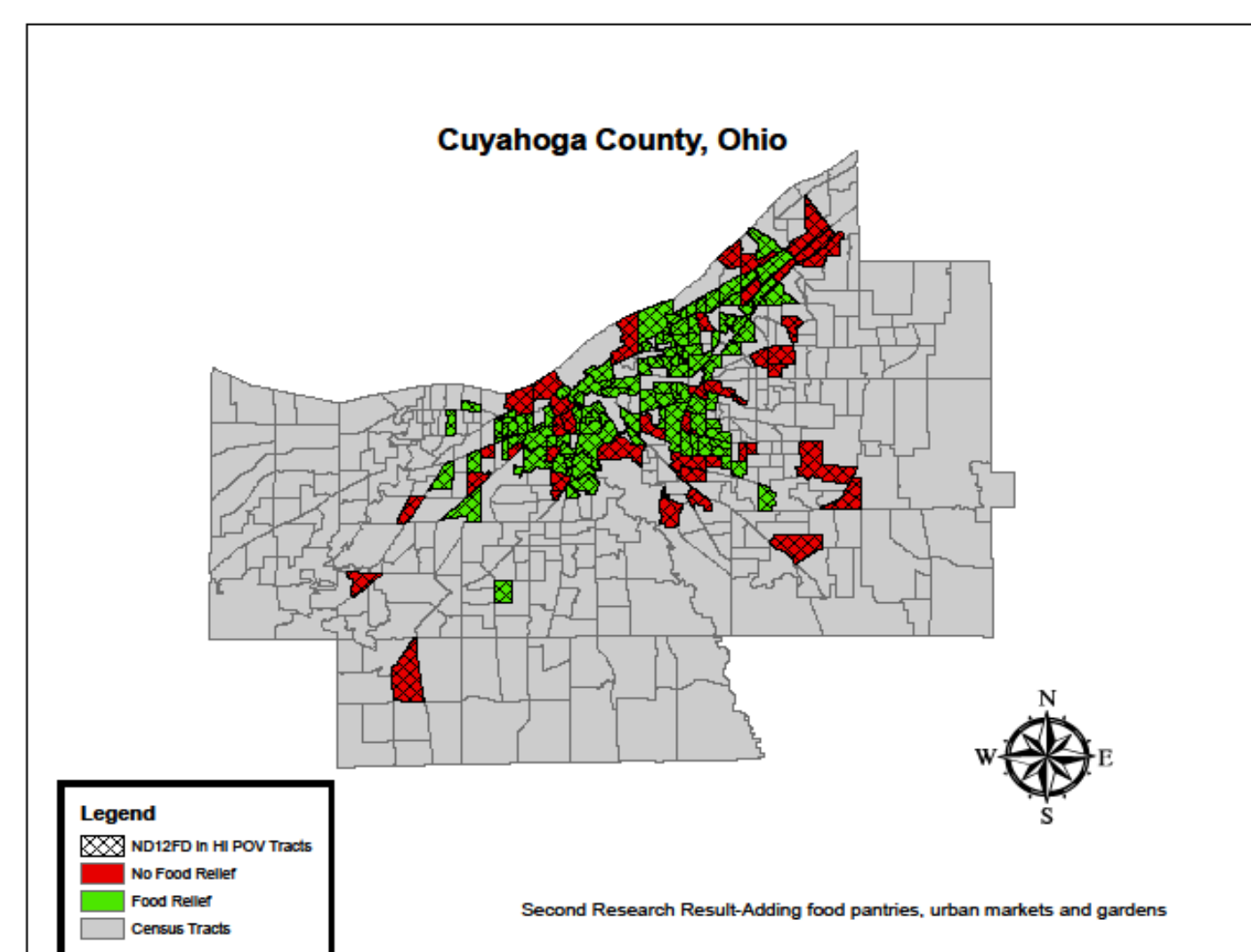
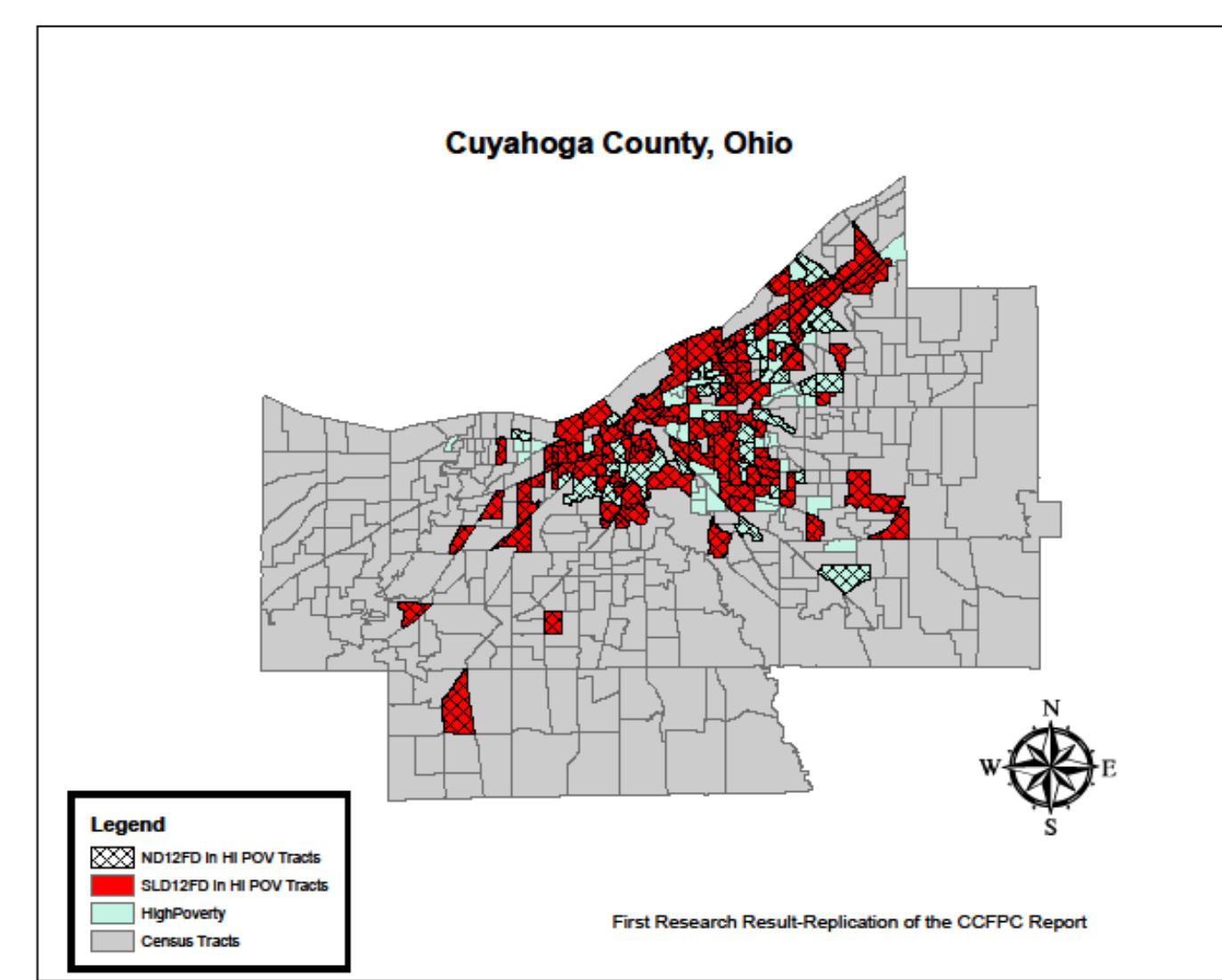
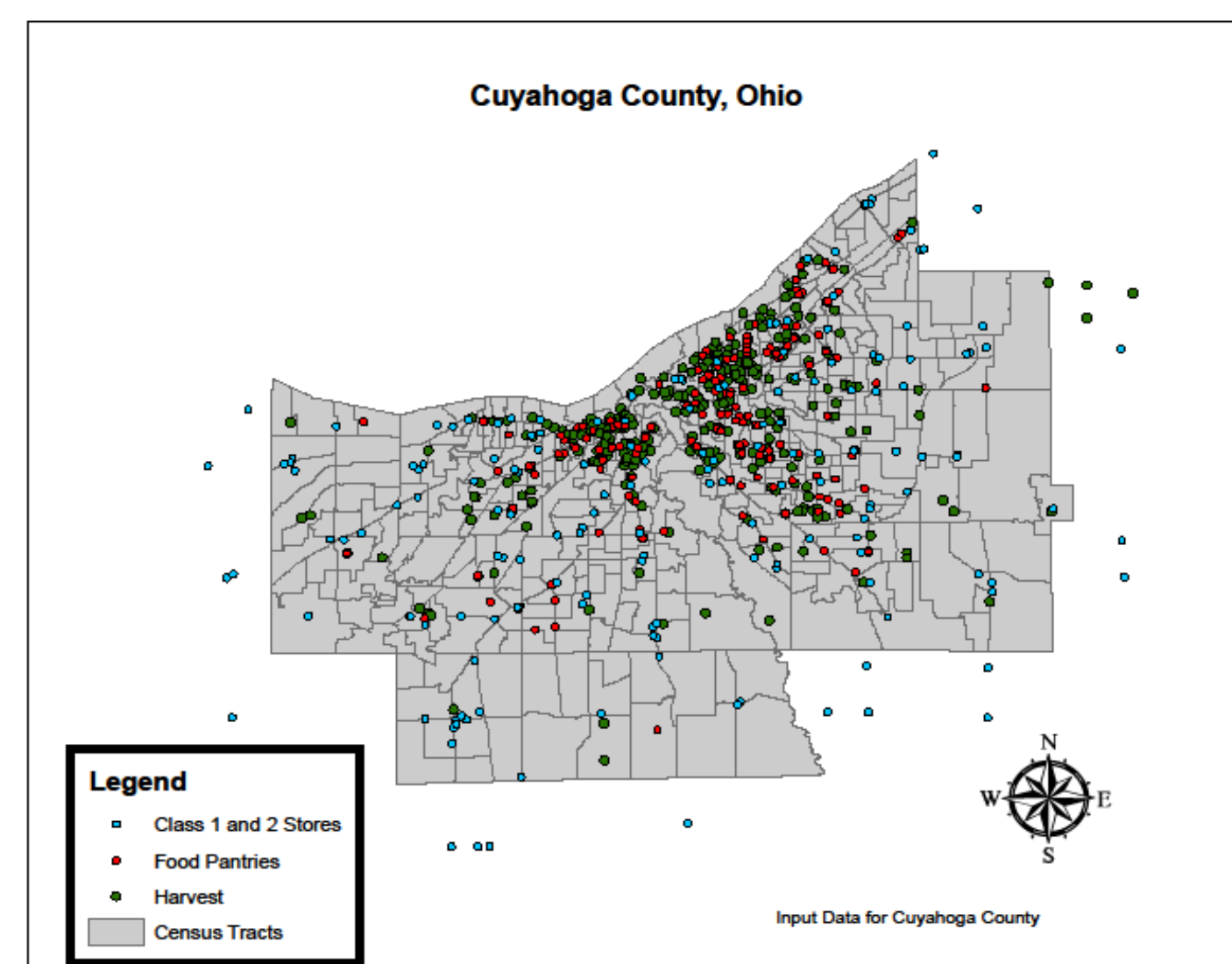
While researchers have looked at a comparison of network analysis and straight-line distance using a grocery store or a fast food restaurant as a reference point, no research known to the author has considered food pantries, urban gardens, and farmers markets to see if a classification of a food desert or non-food desert varies based on these additional, but periodic food sources. In addition to this, no one has explored if this trend is true for the area of Cuyahoga County in Ohio. In the process of reviewing the literature, comparisons in certain guidelines for an urban food desert were examined, such as, what was the walking distance used in all the studies, what level did they measure this (census tracts, census blocks or 1 Kilometer grids), to which food venue did they measure (supermarkets, class 1 and 2 stores, etc), and what were the characteristics of the results (vehicle availability, demographics, etc.).

METHODS

In ARC GIS, there are various methods for mapping and finding the distance between different locations. The most common methods are network analysis and straight-line (Euclidean) distance. Network analysis is a method of ARC GIS mapping that takes the address of a particular location and travels along the street network to get to a certain destination. Straight-line or Euclidean distance is a method of ARC GIS mapping where the length of the straight distance between the initial and ending location is measured, without the consideration of the street network. Comparing these two methods, network analysis seems to be the best method for mapping because it is more realistic. Straight-line distance uses a radius and does not take into consideration the constructed or natural barriers that get in the way of a pedestrian getting to a food venue. Those barriers could be lakes, rivers, buildings, highways, etc.

The first step in this process was to replicate the methods used by the Cuyahoga County Food Policy Coalition. This was done by calculating the straight-line distances from the centroid of each Cuyahoga County census tract to Class 1 and Class 2 food venues. Census tracts were used for consistency, since the CCFPC used them. One should note that when comparing data from performing the network analysis, including the Class 1 and Class 2 food stores, food pantries, markets, and gardens, we are not using the values to declare the census tracts as a food desert or non-food desert, we are simply describing whether or not those areas are provided with relief when adding those food additional food venues.

RESULTS AND DISCUSSION



Type of Tract	Number of Tracts	Poverty Rate	% of HH with no Veh Avail
Straight-line distance food deserts	101	0.351	0.259
Food deserts added by using network distance	34	0.338	0.249
All network distance food deserts	135		
Network distance food deserts with relief	94		
Network distance food deserts without relief	41		
High poverty non-food desert tracts	40		
Tracts with poverty rates less than 20%	264	0.08	0.07
Tracts with no poverty data reported	7		

TABLE 1

The data presented in Table 1 compare straight-line and network analysis methods and categorizes the results based on the characteristics of the tracts. When performing the straight-line distance analysis, only Class 1 and Class 2 stores were used because this was replicating the methods used by the CCFPC. The results that were obtained from doing the straight-line analysis in this project showed that 101 census tracts were food deserts, out of the 446 census tracts in the county. In doing the network analysis, the results showed that 135 census tracts were food deserts; 34 more census tracts than the straight-line analysis. Simply changing the methodology of the distance calculation increased the number of Cuyahoga County food deserts by roughly one third. Since the network analysis seems a more appropriate method for urban settings, this method and its results were used throughout the rest of the project.

Network analysis was performed again, but this time adding food pantries, markets, and urban gardens. The results showed that 94 census tracts out of the original 135 census tracts that were deemed a food desert were provided with some relief from one or more of these food venues. This finding is one of the highlights of our analysis – food pantries and harvest locations are collectively providing food relief in nearly 70% of the county's food desert neighborhoods.

CONCLUSION

In conclusion to this study, network analysis is a better way to map out areas that are food deserts. Network analysis uses streets to find the closest facility from a certain location. With this in mind, this is the most logical way to present data that will help the general population. Adding food pantries, markets, and urban gardens suggests that with the effort of providing these additional food venues, there is some food relief in desert areas. These data can also help in figuring out where more food venues need to be located in areas that still need food relief.

Although the results were not complete for the poverty rate and percent of households that have no vehicle, there is a reasonable cause to say that food deserts are located in areas that have a higher poverty rate and higher rate of homes that have no vehicle available.

FUTURE RESEARCH

Other characteristics of food desert areas are of interest for future research. These might include crime, and condition/availability of the sidewalks. These variables are thought to affect the availability of food venue options for where citizens shop. Other variables that might affect our findings are the seasons. Although it was found that there is food relief in markets and urban gardens, these food venues are on a seasonal basis. Additionally, there might be eligibility and/or timing issues relating to food pantry access. A focus on these issues would paint a clearer year-round picture of food access for Cuyahoga County neighborhoods.

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