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Suitability Analysis for Vacant lots as Future Urban Farms in Chicago

Abstract

Food deserts are defined as areas lacking access to healthy foods like fresh fruits and vegetables. Individuals living in communities that are considered food deserts often suffer from higher rates of health-related illnesses as a consequence of poor diet. The project is designed to locate communities with both the highest quantile of hardship index and highest obesity rates in adults and then find vacant lots located within these specific neighborhoods with the aim to develop urban farms. The datasets used in this project included the socioeconomic indicator labeled as hardship Index, adult obesity rates, list of grocery stores with more than 10,000 squares feet, city-owned vacant lots, and Chicago community areas. The final results demonstrate that there were three communities within Chicago that fit into the category of fitting within the highest quantile of both hardship index and obesity rates. These communities are as follows: West Garfield Park, West Englewood, and North Lawndale. Within these communities, there were 1292 vacant lots that were located outside of .5 miles from the nearest grocery stores. It is these vacant lots that provide the opportunity for further analysis in determining their overall suitability as being developed into urban farms in the future.

Introduction

According to the Dutko, P. et. al. (2012), 6,500 food desert tracts were identified within the United States based on 2000 Census and 2006 data pertaining to access to supermarkets, large grocery stores, and Supercenters. Since then this number has increased significantly. Based on Nutrition Digest publication provided by Gallagher M. (2011) defines food deserts as follows. *"Food deserts are defined as parts of the country vapid of fresh fruit, vegetables, and other healthful whole foods, usually found in impoverished areas. This is largely due to a lack of grocery stores, farmers; markets, and healthy food providers."*

Formerly known as the Food Desert Locator, the Food Access Research Atlas presented by the USDA (2017) serves as a platform where maps are created representing a spatial overview of food access indicators for low-income, health-related issues such as diabetes and obesity along with the hardship index for specified populations suffering from such food deserts. Narrowing down the scope of the research, analysis, and findings of this project will be concentrated on the City of Chicago and its neighborhoods that are most affected by food deserts.

The key variables of this research will consist of vacant lots that are .125 acres equating to roughly 5,500 ft. Hardship index is determined using a composite score based on socioeconomic indicators such as percent of crowded housing, unemployment rate for age 16 and older, percent of households below poverty level, percent of adults 25, and older without a high school diploma, percent of population under 18 or over 65 and per capita income are all considered socioeconomic indicators that comprise what is considered the "hardship Index" described by Moser, W. (2012). Obesity in adults will be the focus point of the research which reflects how lack of nutritious and healthy foods directly coincides with food deserts and such variables as previously mentioned. Grocery store data will include those stores which are 10,000 ft or larger which is the standard on how food deserts are measured in the City of Chicago, as Ruthhart, B. (2016) wrote in his article. The distance used to define a food desert is any area outside of .5 miles from one of these grocery stores as this is a metric utilized by the USDA in determining food deserts (USDA, 2017).

The aim of this project is to locate vacant lots in the greater Chicago area that might be suitable locations for the development of urban farms. The criteria we are looking at to determine suitability includes vacant land located within food deserts, percentage of population suffering from health issues as a consequence of poor diet e.g. obesity or diabetes, and finally looking at socioeconomic factors such as income, unemployment rates, and education levels that are grouped together as the hardship index. The final results will illustrate vacant lots located outside .5 miles from the nearest grocery store and also existing within communities that suffer from the highest quantile rates of both hardship index and obesity levels in the city of Chicago.

Data & Methods

The datasets used in this project include the socioeconomic indicator named as hardship index, list of grocery stores, city-owned land inventory, the adult obesity rates, and the map of community areas in Chicago. The list of grocery stores, hardship index, and city-owned land inventory were collected from the Chicago Data Portal (https://data.cityofchicago.org/). The obesity rates data was collected from the Chicago Health Atlas (https://www.chicagohealthatlas.org.).

The hardship index census data is from 2008-2012, and is a score derived from six socioeconomic indicators of public health which include unemployment rates (labor force over the age of 16 years), education (percent of people over the age of 25 years without a high school diploma), per capita income level, poverty rate (percent of households living below the federal poverty level), crowded housing (percent of occupied housing units with more than one person per room), and dependency (percent of the population under 18 or over 64 years of age). The score is represented on a scale from 0 to 100. This field corresponding to the community area that were utilized in this study.

The list of grocery stores represents the total number of grocery stores that were open in each community area in Chicago in 2013. To gain a better representation of grocery stores that might offer fresh produce, any grocery stores smaller than 10,000 square feet were deleted from the list. This figure aligns with the current square footage utilized by the city of Chicago in its own studies of determining food deserts. Additionally, grocery store chains that have closed since 2013 such as Dominic's and Treasure Island Foods were deleted as well. The grocery store list fields relevant to the scope of this study included the square footage, longitude, and latitude of each grocery store. The city-owned land inventory fields utilized by this study included the latitude and longitude of vacant lots in Chicago in 2018. Finally, the adult obesity data represented the obesity percentage of adults in each community area in Chicago between the years of 2014-2016. The weight percentage field as well as the community area were used in this study.

A light gray canvas map was utilized as the basemap for the study and the projected coordinate system NAD 1983 StatePlane Illinois East in order to minimize distortion based on the placement of the prime meridians. Chicago community boundaries data was uploaded in order to be able to isolate the geographic area of Chicago and its corresponding community areas. The grocery store data was uploaded and displayed in the geographic coordinate system in order to accurately place the grocery stores on the map (see appendix map 1A). A buffer of .5 miles was created around the grocery stores to delineate food desert and non-food desert areas in Chicago (see appendix map 2A). City-owned vacant lot data was first refined to delete all properties that had already been sold and then uploaded and displayed in the geographic coordinate system (see appendix map 3A).

The next step was to create a .5 mile buffer around all grocery stores to find all vacant lots outside of this perimeter (see appendix map 3B). In other words, this query was able to restrict results to vacant lots that are located within food deserts.

The final two data sources to be uploaded were both socioeconomic indicators and adult obesity rates. These data sources were joined to Chicago communities in order to have all the information in one data table using the community name. The community boundary fields were saved as type string whereas the data in the other sets were type long so another field was added to the community boundary data set and saved as type long so that all the datasets could be joined. Choropleth maps were created using the field values hardship index and weight percentage and the equal interval method with 5 classes (see appendix map 4A & 4B). Once these quantiles were created, a definition query was utilized to isolate the communities that fit into the highest quantile for both hardship index and adult obesity rates. The last step included creating a definition query within the city-owned vacant lot data that named the communities in the highest quantile of hardship index and obesity rates (see Appendix map 5A). Additionally, one vacant lot had to be deleted because it existed outside the communities yet was listed in the data set as existing within them. This sums up the data and methods used during this study.

Results

The final results demonstrate that there were three communities within Chicago that fit into the category of fitting within the highest quantile of both hardship index and obesity rates. These communities are as follows: West Garfield Park, West Englewood, and North Lawndale. Within these communities, there were 1292 vacant lots that were located outside of .5 miles from the nearest grocery stores. It is these results that provide opportunities for future research to better determine the suitability of these sites as urban farms.

Conclusion

The findings within this study demonstrate that there's a direct correlation amongst communities that suffer from a high hardship index, limited and or restricted access to healthy food options and high levels of obesity. It also demonstrates that opportunity exists within these communities to develop urban farms based on the sheer quantity of vacant lots. Developing these vacant lots into urban farms would provide populations within these communities with increased access to fresh and healthy produce options which has the potential to positively impact health standards such as lowered obesity rates. It would also offer employment opportunities to individuals within the communities boosting the quality of life and socioeconomic index of these individuals to help lower the overall hardship index score.

It should be noted that there were some limitations found in the data. City-owned land inventory only listed square footage for 21 out of 1292 lots from the three communities. Future research would be needed in order to find vacant lots that fit within the criteria of .125 acres or greater. There was also no data for four communities for obesity rates in the Chicago area and the grocery store list is from 2013 so these data sources would also need to be updated.

Future research could include field research to update the grocery store list within these communities as well as determine the square footage of vacant lots in order to determine their suitability as an urban farm. This would allow a more targeted approach in being able to determine appropriate sites for the placement of urban farms within these communities before the actual development of these sites. It would also be beneficial to get updated socioeconomic indicator data as well as obesity data if possible. This would be critical in helping compare before and after data once urban farms are able to begin operations and be able to determine the effectiveness of urban farms in improving quality of life standards such as income level or obesity rates.

References

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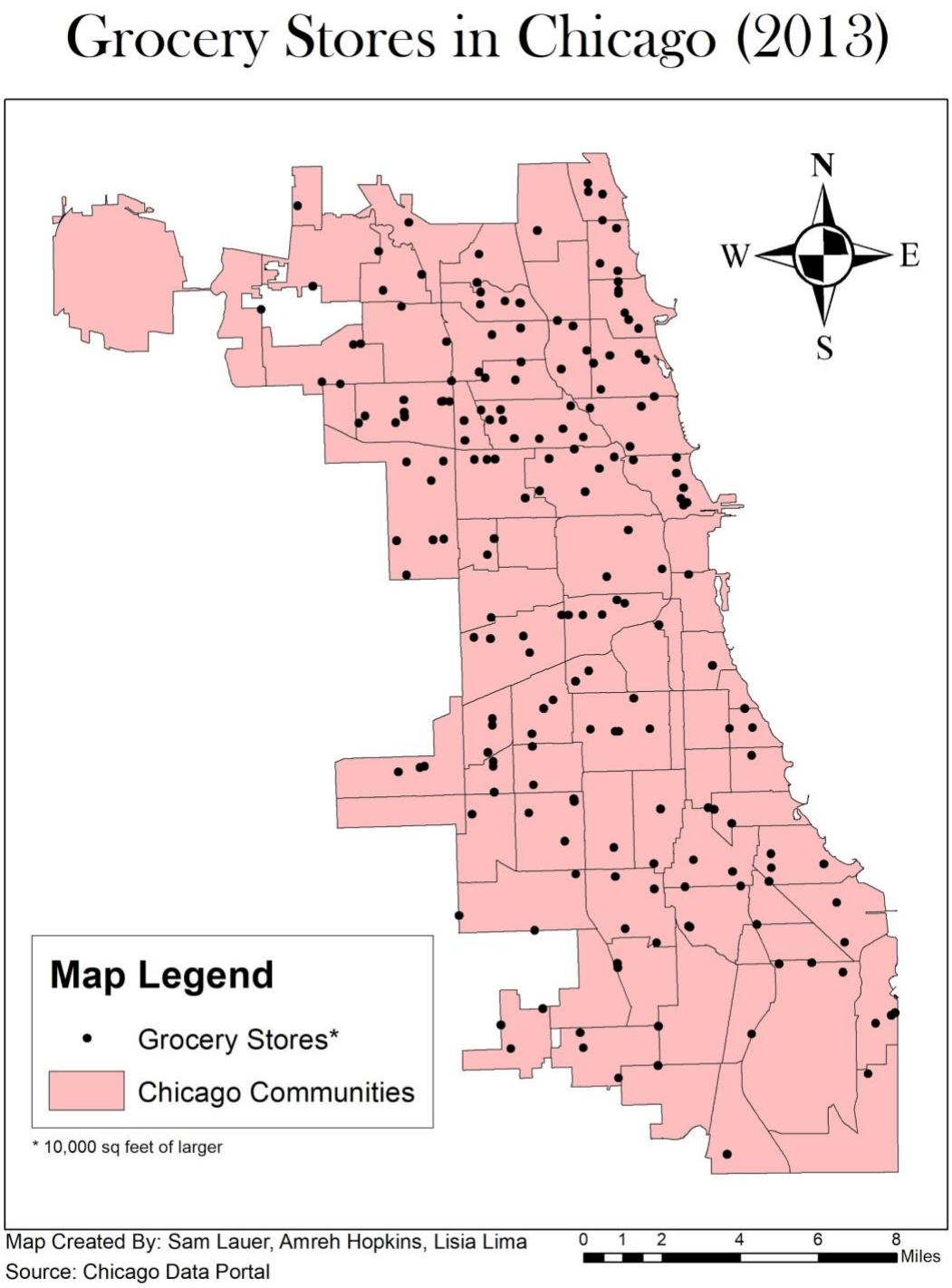
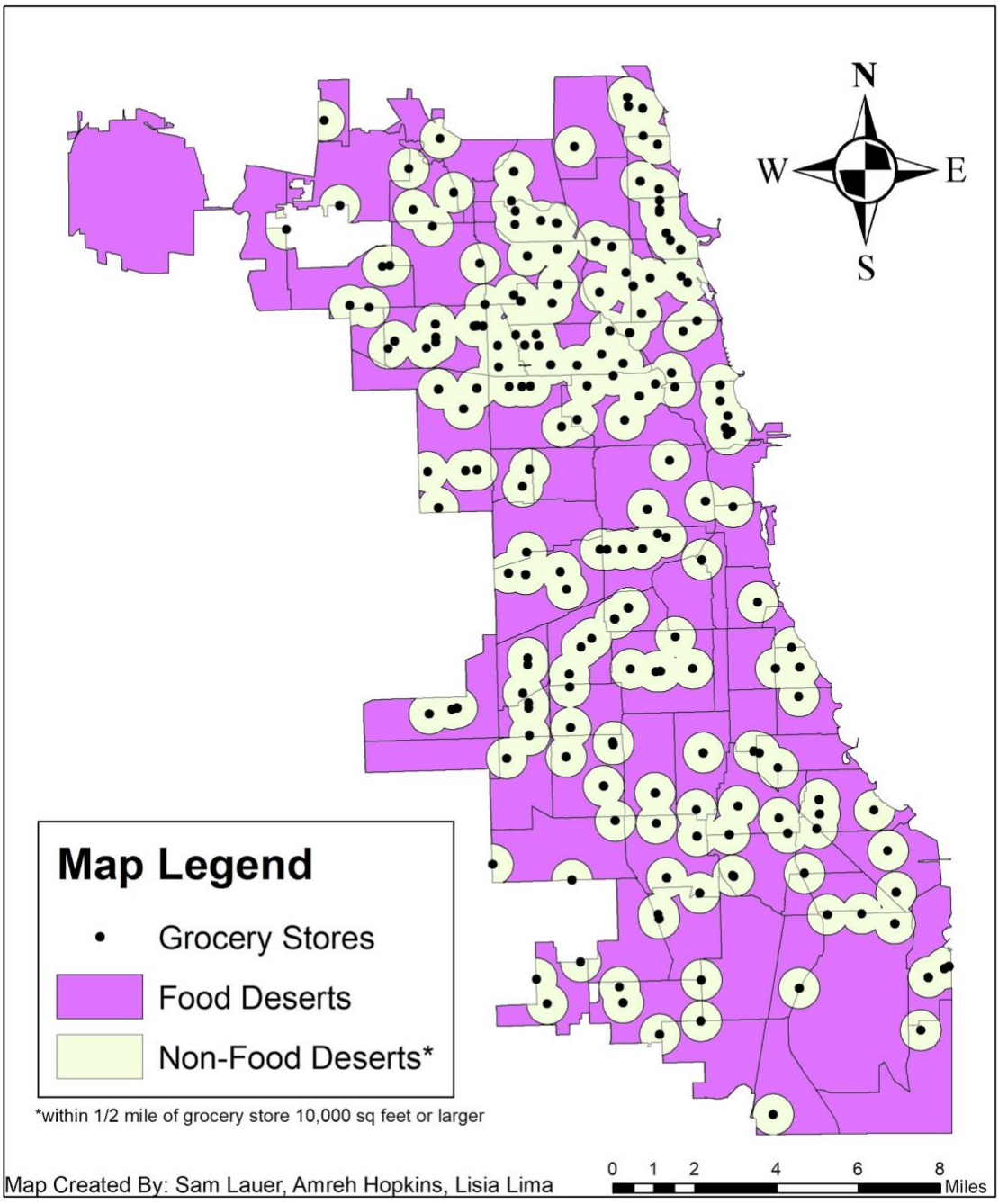
Appendix

Map 1A



Map 2A

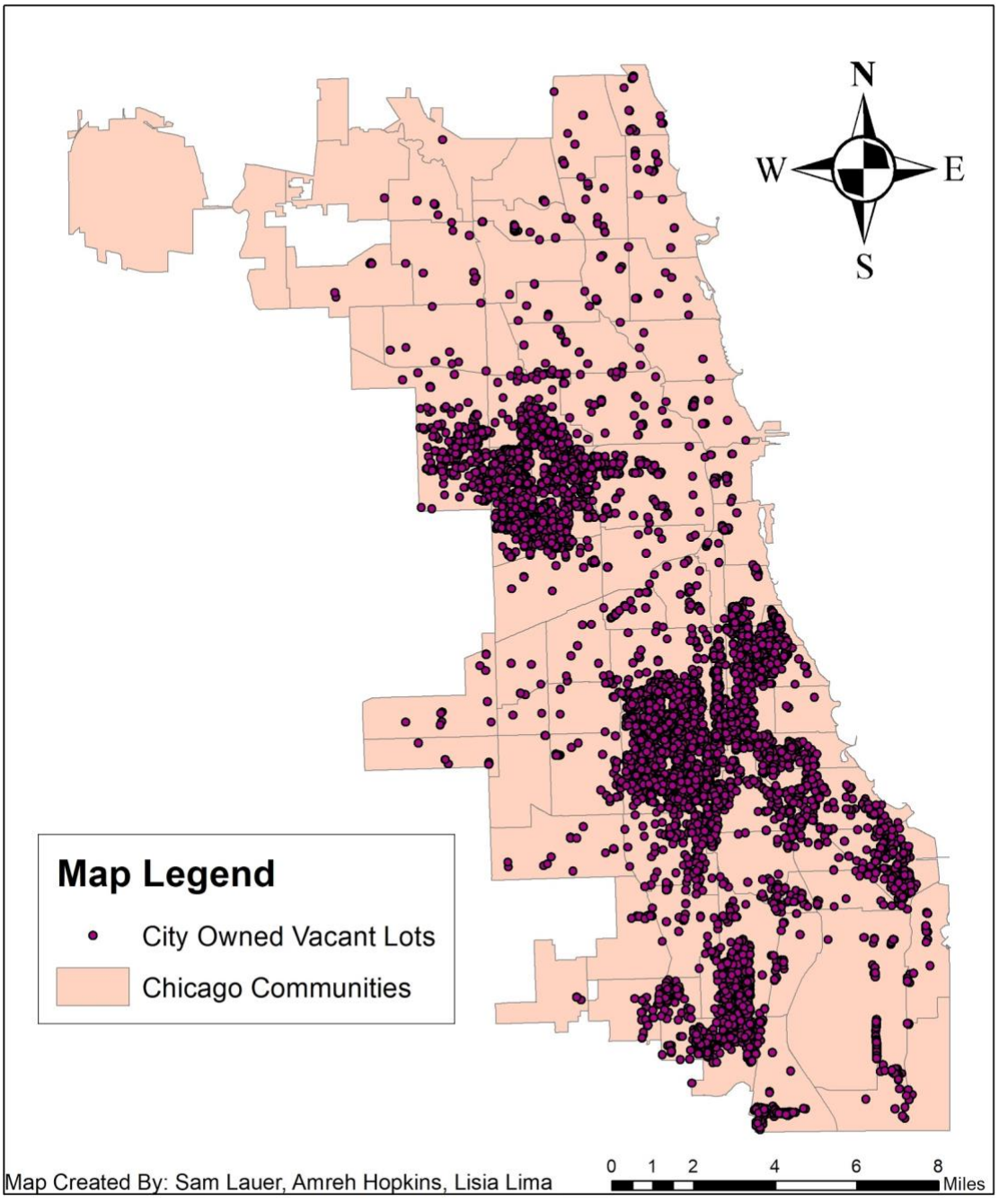
Food Deserts in Chicago Communities



Source: Chicago Data Portal

Map 3A

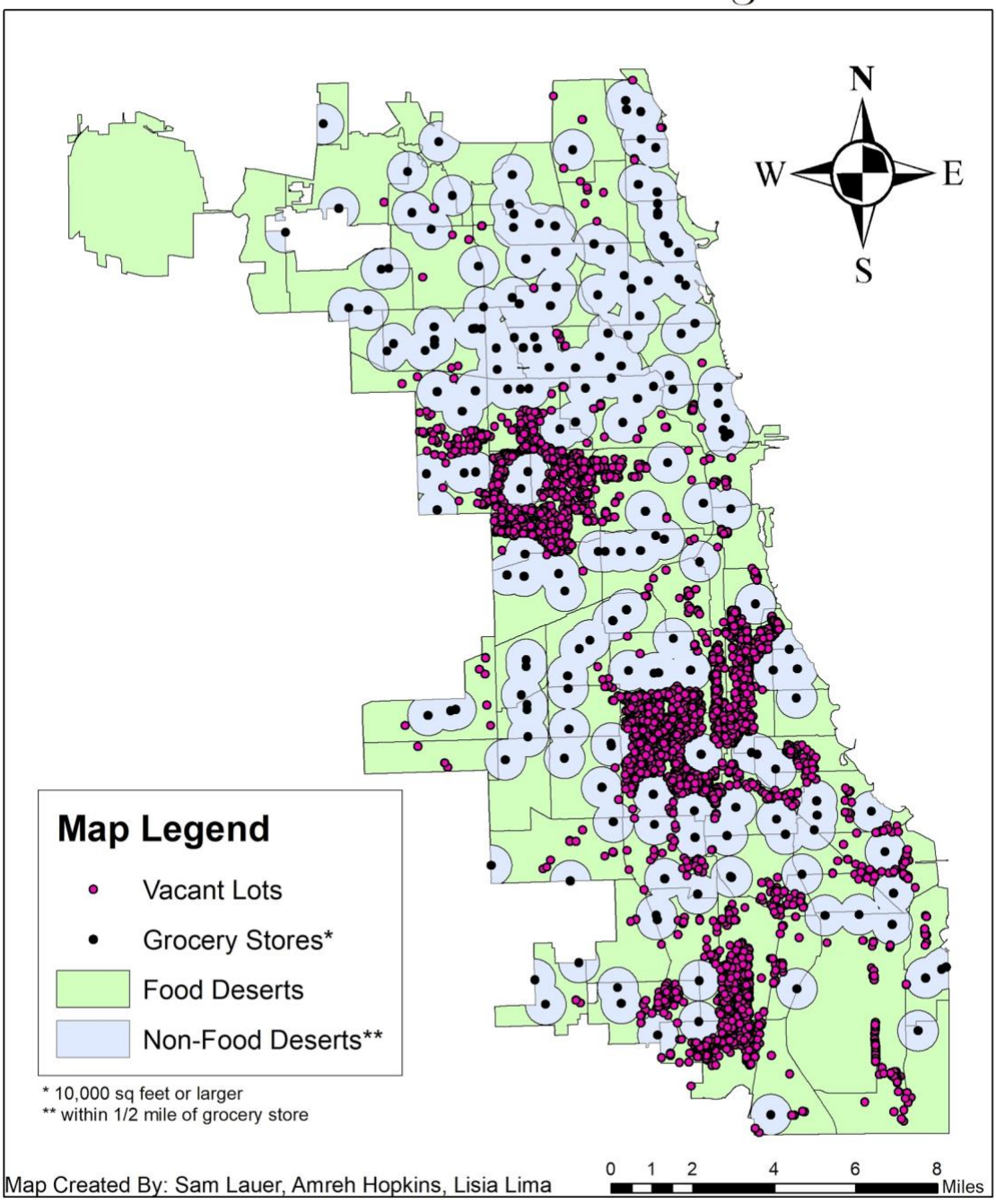
City-Owned Vacant Lots in City of Chicago



Source: Chicago Data Portal

Map 3B

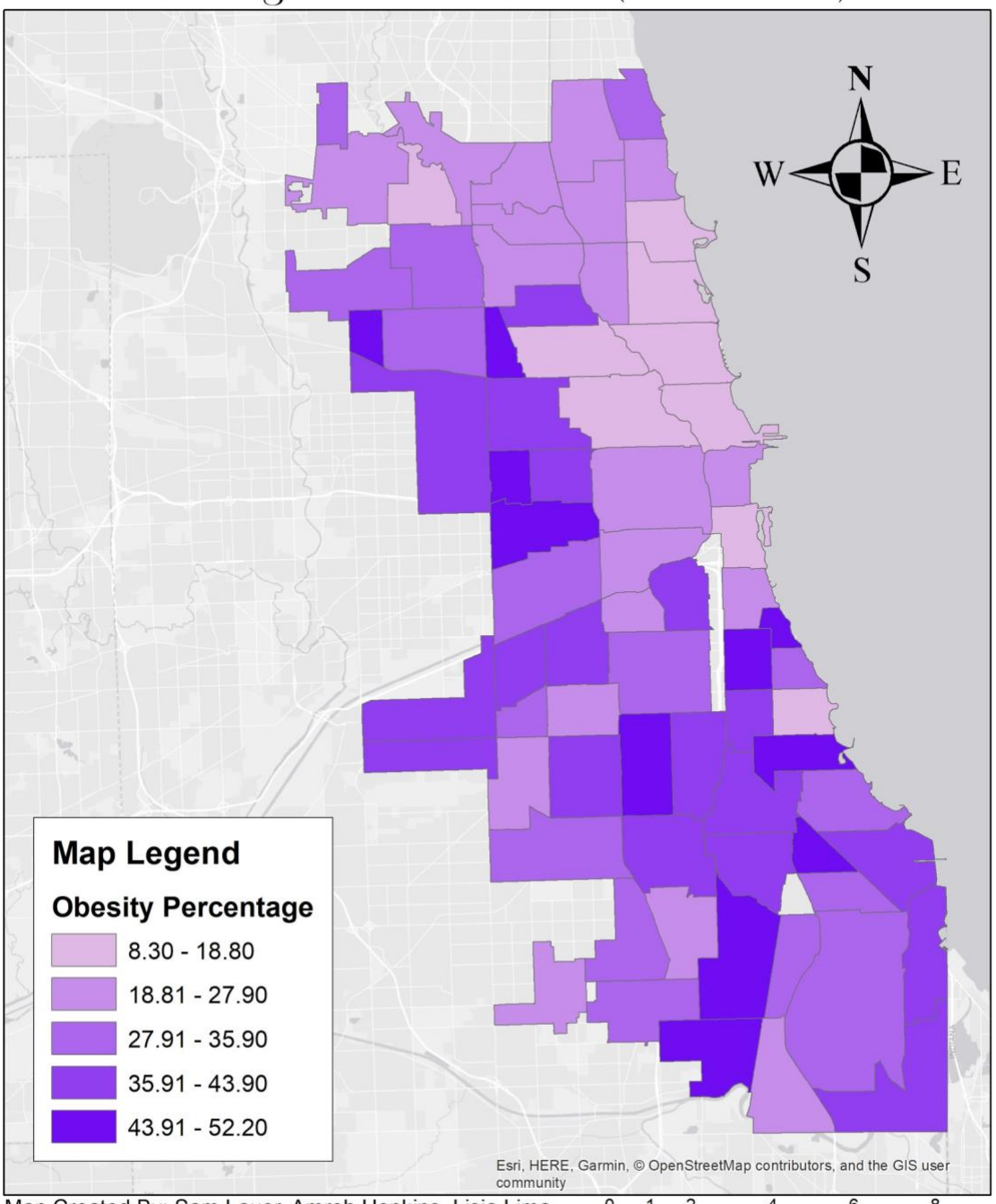
City-Owned Vacant Lots Within Food Deserts in Chicago



Source: Chicago Data Portal

Map 4A

Obesity Rates in Adult Population (18+) in Chicago Communities (2014-2016)

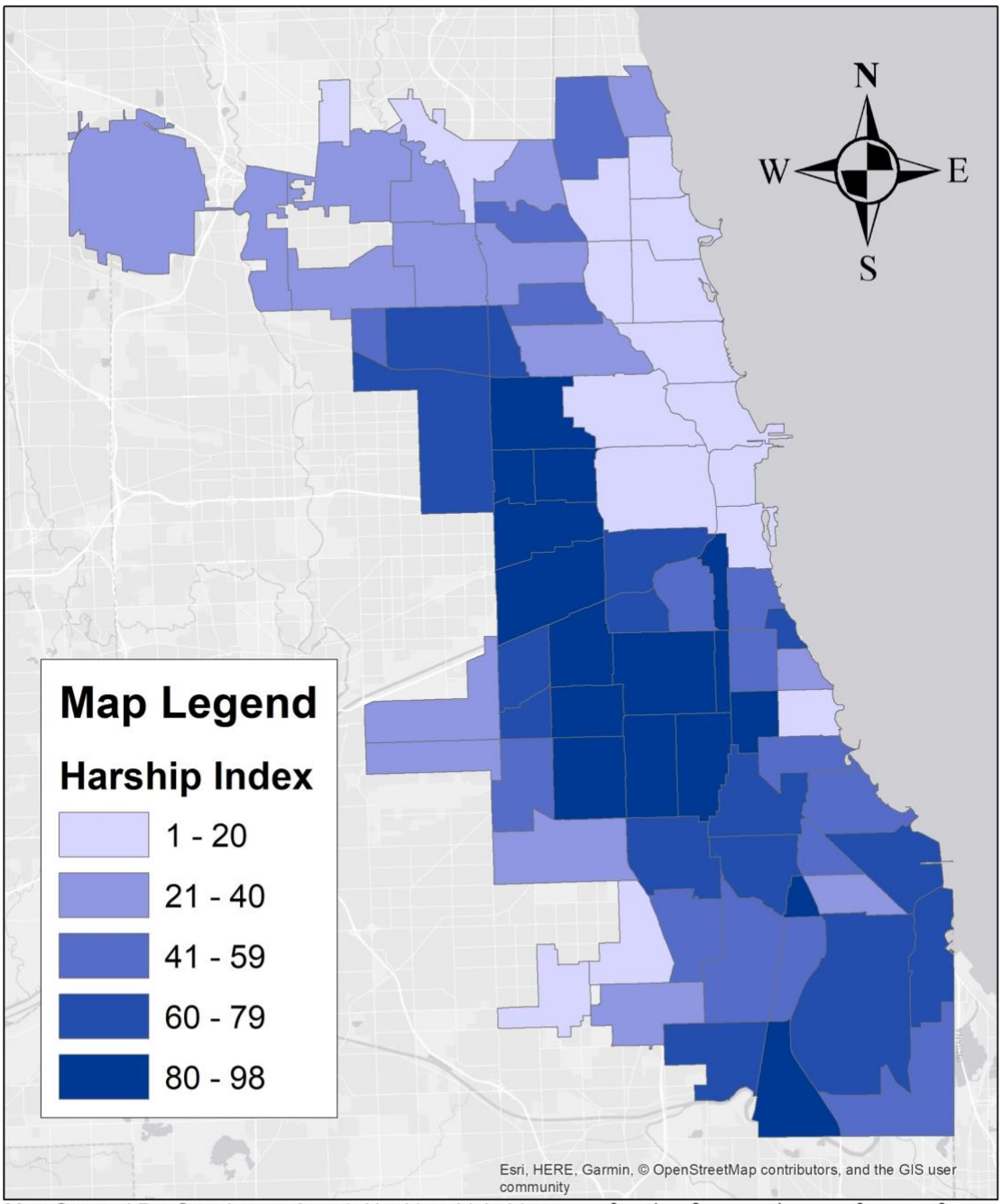


Map Created By: Sam Lauer, Amreh Hopkins, Lisia Lima

Source: Chicago Health Atlas

Map 4B

Hardship Index in Chicago Communities (2008-2012)

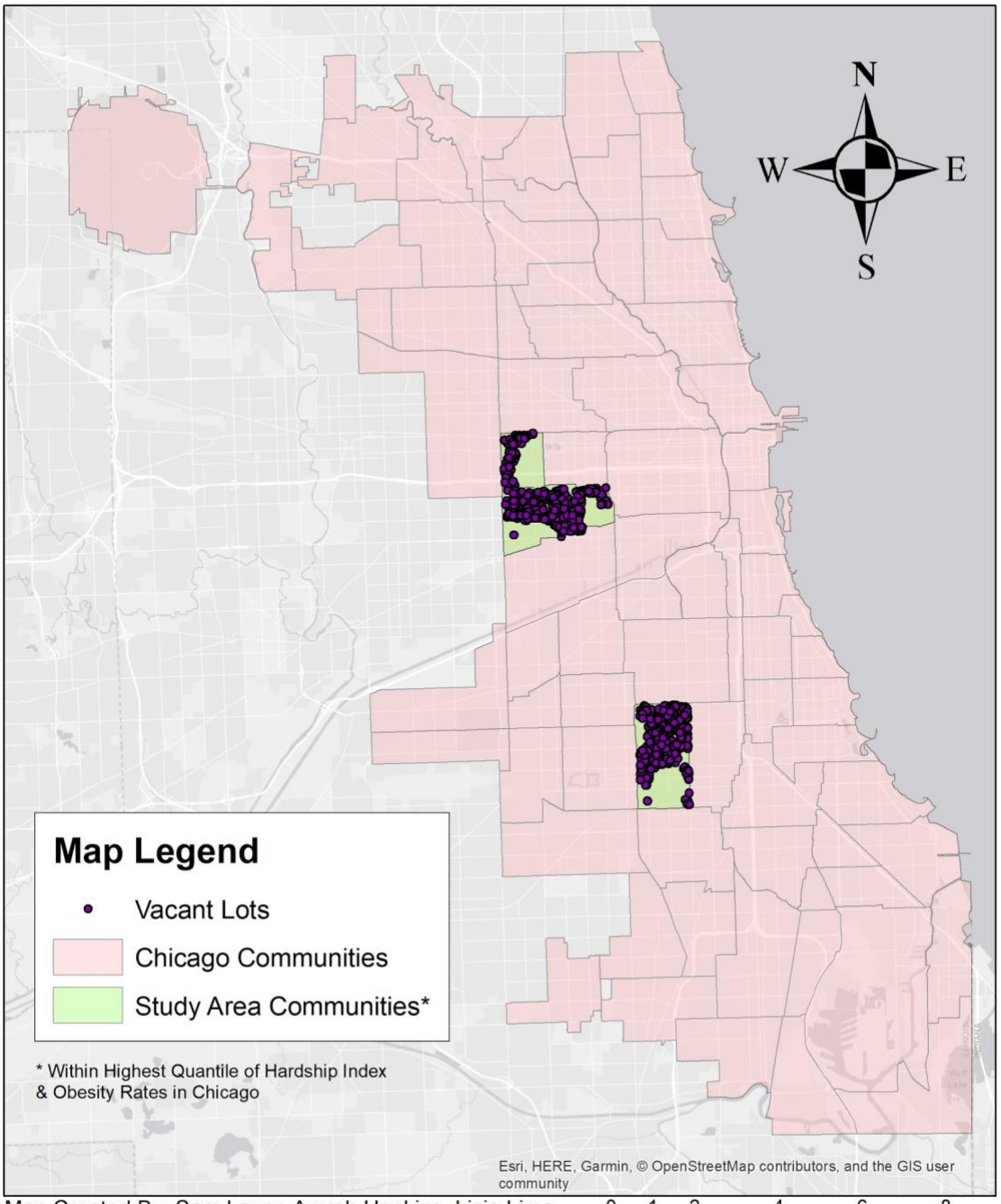


Map Created By: Sam Lauer, Amreh Hopkins, Lisia Lima

Source: Chicago Data Portal

Map 5A

Suitability Analysis for Urban Farming in Chicago: Vacant Lots in Food Deserts



Map Created By: Sam Lauer, Amreh Hopkins, Lisia Lima

Sources: Chicago Data Portal & Chicago Health Atlas