

COURSERA_CAPSTONE COURSE REPORT: DISCOVERING “FOOD DESERTS” OPPORTUNITIES IN CHICAGO BY ALDI

2/16/2020

1. Introduction (a): Project Background and Description

This Food Desert project demonstrates that there is an economic opportunity for a major supermarket food chain to profitably invest in the economically poorer neighborhoods of Chicago and reduce the negative impacts of Food Deserts in Chicago.

I have chosen ALDI as example of a supermarket chain that has placed supermarkets in the food deserts of Chicago. With their low-cost profitable business model, ALDI's possibly could profitably expand by opening new stores in additional Chicago food deserts.

2. Introduction (b): Project Scope and Audience

Scope:

1. *Using Spatial Libraries such as GeoDataFrame, Point, Polygon and Mapping Libraries such as Folium, this project lays out the geography and census tracts of the city of Chicago and ALDI current locations.*
2. *Using Folium this project displays where the current ALDI's are and where the future ALDI's could be opened in the food deserts.*
3. *The 'Hardship Index' of each community will be referenced as well as the associated average income of the residents of these communities.*
4. *Using Folium, it can then be shown which food desert communities are being served by ALDI and which food deserts present opportunity for further ALDI investment.*
5. *Using Foursquare, I future investigate the "TIPS" of the ALDI's in the Chicago food deserts.*

Audience:

1. *The **Audience** for this project is the strategy planning executives of the ALDI Supermarket Chain. Of course, the model can be used for other cities and other supermarket chains. The resulting information will act as a guide to picking the potentially profitable locations of supermarkets in additional food deserts.*

3. Data: Getting the shape files of Chicago

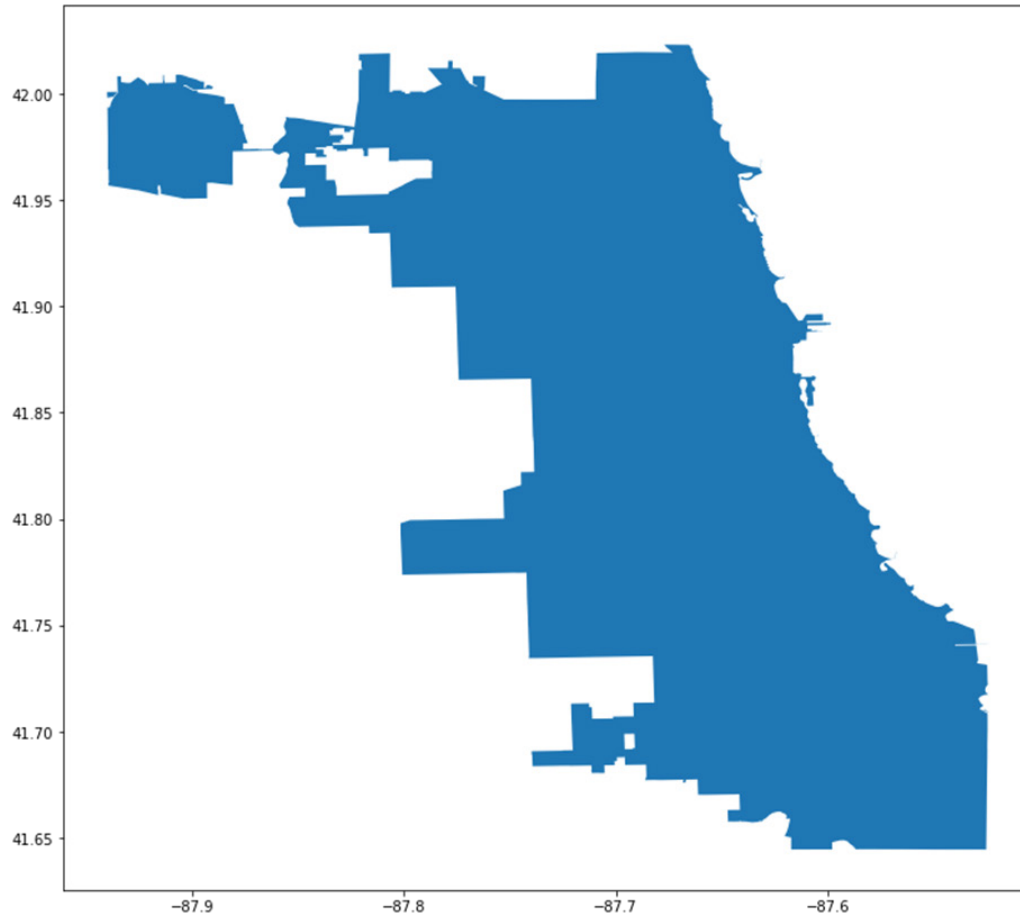
In this project we will explore ALDI's expansion into "Food Deserts" in the City of Chicago. The food deserts are based on the 2010 census. *Here is a reference for learning more about [Census Tracts](#).* Since that census ALDI's has placed supermarkets in Chicago neighborhoods that contained food deserts. When an ALDI supermarket is introduced in a food deserts the area is no longer a food desert. By definition, a food desert does not contain a supermarket.

The food desert definition that we will use in this project is from <https://www.ers.usda.gov/data-products/food-access-research-atlas/documentation> "A low-income census tract with at least 500 people, or 33 percent of the population, living more than ½ mile (urban areas) or more than 10 miles (rural areas) from the nearest supermarket, supercenter, or large grocery store". We are concerned only with the urban areas, and I have extended the distance to .75 of a mile.

The Chicago data that is needed is on the Chicago website: <https://data.cityofchicago.org>. This website has the shape files that are used throughout the project. The first map "shapefile" that we have in the program flow is of Chicago itself. This shapefile gives us the geometry of the city of Chicago.

<https://data.cityofchicago.org/Facilities-Geographic-Boundaries/Boundaries-City/ewy2-6yfk>

CHICAGO



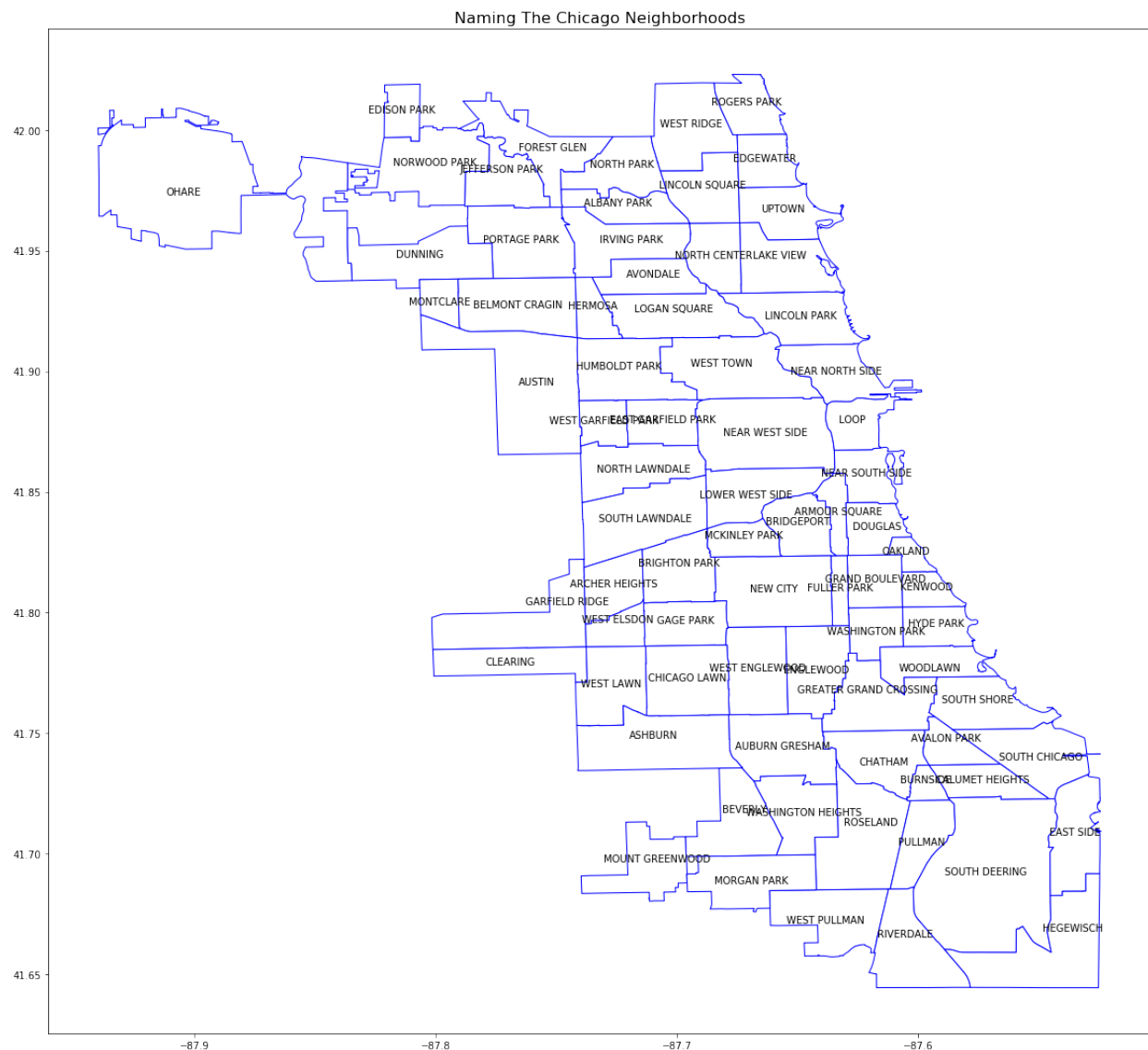
Next, we download a key shape for the project, namely, what I call the Neighborhood Map in the program and project but is technically a Community Area in the Chicago Data Portal:

<https://data.cityofchicago.org/Facilities-Geographic-Boundaries/Boundaries-Community-Areas-current-/cauq-8yn6> This Neighborhood Map provides the geometry for each Chicago neighborhood.

I also provide the neighborhood names using `representative_point`; crediting: Labeling Technique from <https://stackoverflow.com/questions/38899190/geopandas-label-polygons>

Next, define the centroid of each neighborhood.

4. Data: A picture of Chicago Neighborhoods/Community Areas



5. Methodology: Why ALDI, Why Chicago

- The ALDI Supermarket Chain was chosen by me for the following reasons
 1. Globally, ALDI's has significant net profits due to their strategic economic choices
 2. They have innovative, low cost technology for offering quality groceries economically
 3. ALDI pays good wages, which the neighborhood residents could take advantage of.
- The City of Chicago provides the following

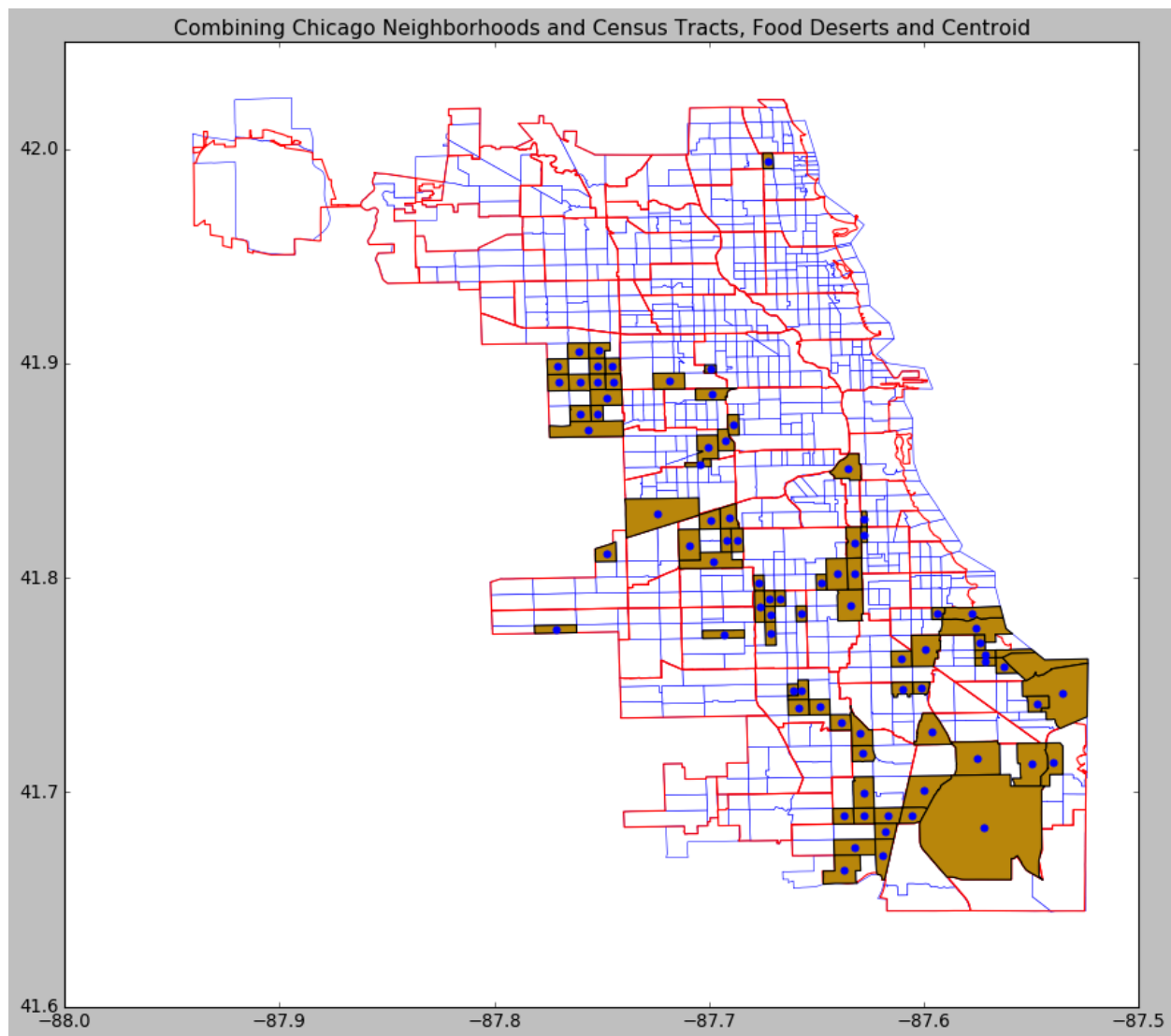
1. *A website with large supply of timely accessible dataframe and spatial data about urban social aspects and geography*
 2. *Concentrations of wealth and poverty providing calibration of food desert*
- **Process**
 1. *Develop a Food Desert census map for the city of Chicago*
 2. *Find the proximity of a recently built ALDI supermarket to a Food Desert*
 3. *Develop map showing where the Food Deserts and where the ALDI's are.*
 4. *Develop a map showing where possible new ALDI's can be built.*

6. Methodology: Bring in the Food Access Data

Our next step is to get the food desert census tracts that exist in Chicago neighborhoods. National Food Access Information can be found here: [food-access-research-atlas](https://www.ers.usda.gov/webdocs/DataFiles/80591/DataDownload2015.xlsx?v=0). From there download the food access file:

<https://www.ers.usda.gov/webdocs/DataFiles/80591/DataDownload2015.xlsx?v=0> This file contains the low income/low food access census tracts for the entire United States by state, 72865 entries. Therefore, I extracted the state of Illinois and then extracted Cook County, where Chicago is. Cook County has 1315 entries. This excel file is part of the repository.

First, intersect (inner join) the geospatial map of Chicago neighborhoods with Cook County census food access file in that there are additional cities in Cook County. This identifies only Chicago neighborhoods. Then further identify the neighborhoods that have food deserts; next, find the centroid of the neighborhood's food deserts. This will give us one location to find distance from in each neighborhood food desert.



7. Methodology: Where are the ALDI's: (Let us find Chicago's ALDI)

Many neighborhoods have several food desert census tracts. The data would be overwhelming if we considered all the food desert census track's centroids. This would cloud the main point. Therefore, we will only consider the centroid of the collective census tracts in a neighborhood. This will reduce the number of geocodes to the number of neighborhoods with food deserts.

Next, add in the ALDI's:

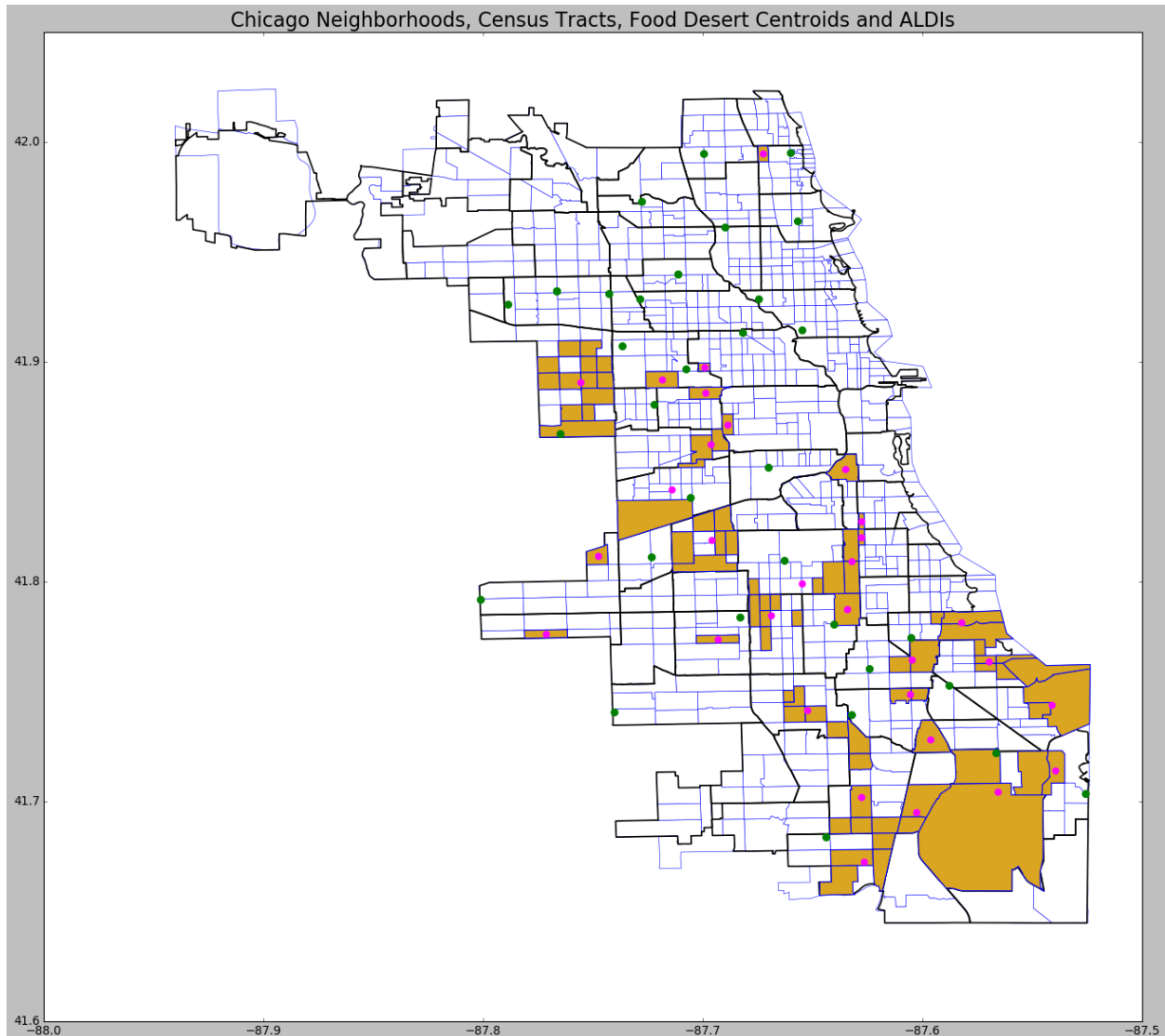
I researched the individual ALDI's in Chicago. I looked up each individual ALDI and obtained it's geocodes from Google. With this information I built the Chicago_ALDI_geocodes2.csv file that is part of this github.

There are 34 ALDI's. These are located on the plotted map as green dots. There is a concentration of green dots in the non-food desert neighborhoods, the wealthier sections of Chicago.

Putting it all together Chicago Neighborhoods (red lines), census tracts (blue lines), food deserts (sand color blocks), Census tracts centroids (magenta dots), and ALDI's (green dots).

A summary follows:

1. The map plot shows the location of all the ALDI's.
 - a. Most of which are not in the sand color food deserts.
 - b. Seven ALDI's are in or within $\frac{3}{4}$ mile of food desert centroid. Note the green dots either in or touching the sandy colored food deserts.
2. The distance from each ALDI to the centroid of the food desert in each neighborhood
 - a. ALDI's within a $\frac{3}{4}$ mile of the centroid of what was formerly a food desert (7)
 - b. There are 24 sites (food desert census centroids) outside of a $\frac{3}{4}$ mile range which are possible locations for other ALDI's, which we will see later



3. Inferential Statistics:

- a. The six ALDI's in the Food Desert is a test sample demonstrating that an ALDI can be successful in the food desert where there is a household income between \$26,000 to \$44,000. This **test sample infers** that 14 to 20 ALDIS can be located in other comparable Chicago food deserts to relieve the food desert status.

8. Results: Foursquare and Folium

There are two folium maps shown here. The two maps have annotations. The first map shown is of the existing ALDI's in the food desert, these annotations in the Folium Markers gives the formatted address and associated TIPS for the ALDI. Foursquare is used to display the "TIPS". All the TIPS can be seen in the code or in the notebookviewer, (try this) [Notebook for Determining Food Deserts Using Foursquare](#) by clicking the Folium Markers. Unfortunately, one of the sites is a duplicate.

Foursquare presented positive tips for the ALDI's in the food desert. Here are two:

1. Security guard knows where everything is and isn't busy ringing up customers. If you need help finding something just ask him where stuff is. He was very helpful.
2. Their prices are great

The map shown below has in the annotation the suggested addresses of the proposed ALDI [Notebook for Determining Food Deserts Using Foursquare](#). The Folium Markers show the candidates of the statistical inference: These 24 sites (shown in as a png file) are:

1. Spread out across low income areas of Chicago
2. Food desert census tracks centroid addresses
3. Greater than $\frac{3}{4}$ of a mile from an existing ALDI's
4. The residents have a household income of 24,000 to 44,000

The statistical inference is: Using a sample of 6 ALDI's out of a population of 31 comparable sites and affirming that the stated characteristics of the 6 are consistent with those of total 31 then there is a high probability that 14 to 20 can be considered viable sites for new ALDI's in other food deserts. The Maps in the Notebook,([Notebook for Determining Food Deserts Using Foursquare](#)) provides the addresses of the centroids.

Possible ALDI's location in Chicago's Food Desert

