SPATIAL ANALYSIS OF FARMER’S MARKETS IN CALIFORNIA

I. INTRODUCTION

In the spring of 2009 the first lady, Michelle Obama, installed a food garden on the front lawn of the White House to demonstrate the benefits of healthy, local food on personal health and community development. She involved the help of 23 fifth graders from a local elementary school in the hopes of exposing them to food production, empowering them to lead healthy lives and creating connections in their community. In the face of growing rates of obesity and heart disease and the prevalence of food deserts in urban and rural areas policy makers and government officials are looking at farmer’s markets as alternatives for making fresh, healthy food accessible and affordable to those suffering from food insecurity. The effects of food insecurity however are not evenly distributed among the population and disproportionately affects poor communities and communities of color. Understanding the distribution of farmers markets in relationship to income and race of residents is a necessary step in ensuring equitable access to food resources and addressing health concerns of food insecure individuals.

Client
PolicyLink is a research and policy institute promoting social equity in community and economic development. As client for this project PolicyLink is interested in mapping and analyzing the proximity of farmer’s markets to low-income communities and communities of color. They are also interested in whether the markets accept supplemental forms of payment such as the Supplemental Nutrition Program for Women, Infants and Children (WIC), the Electronic Benefits Transfer (EBT) (formerly food stamps), or the Senior Farmer’s Market Nutrition Program (SFMNP) benefits. Although PolicyLink is interested in a larger nationwide analysis of this issue, for the purpose of this project I will focus my attention on the state of California.

Review of Literature
In 2008, instances of food insecurity in the United States were at an all time high with 14.6 percent of households experiencing food insecurity in the previous 12 months. Included in this number are the 5.7 percent or 6.7 million households that have experienced severe insecurity where, “food intake of one or more members [of a household] was reduced and eating patterns disrupted because of insufficient money

and other resources for food. Although food insecurity increased among all segments of the population, it was well above national average for poor households (42.2%), those with children and headed by single women (37.2%) and among black and Hispanic households (25.7% and 26.9% respectively). The USDA also reports that on average those that live in city centers tend to have higher rates of food insecurity than those residing in suburban areas.

Clearly then, food insecurity is not an isolated phenomenon, but is closely interrelated with demographics and location. The hollowing out of food infrastructure in the urban centers has led to concentration of factors resulting in insecurity and lack of access to healthy food. Characterized by absence of supermarkets, overabundance of fast food establishments, high concentrations of low-income and poor people lacking personal transportation and lack of land and capacity for food production, ‘food deserts’ are prevalent in inner-city areas of major metropolitan regions. The impacts of food insecurity are therefore disproportionately concentrated in communities located within central cities that are often home to low-income and poor residents and to communities of color.

Farmer’s markets provide a wonderful opportunity to supply fresh and healthy food to consumers, increase awareness and build community connections. In fact, the number of farmer’s markets had been growing rapidly in the past decade with over 4,000 markets nationwide in 2006. However, in order to improve access for those most affected by food insecurity, markets must be properly cited (within physical proximity to communities of color and poor communities), accept supplemental forms of payment, and be supported through policy incentives. For the purpose of this project I will be focusing on analyzing the proximity of markets to census tracts with high concentrations of poverty and those with concentration of people of color. The analysis of whether the markets accept supplemental forms of payment was attempted, but not possible for reasons discussed later in the paper.

**Research questions**

The analysis will focus on the following research questions:

- How many farmers markets are located in tracts with a large percentage of people of color?
  - Show distribution of Latino, Black, Asian, white, and multiracial communities.
- How many farmers markets are located in high poverty census tracts (>30% poverty rate)?
- How many are located within a .5 mile radius of a high poverty census tract?

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3 Ibid.
4 Ibid.
6 Ibid.
8 Ibid.
• How many are located within a cluster of low-income communities?
  o Analyze classification of poverty to better understand the distribution beyond the high poverty tracts (>40%, 30-40%, 20-30%, 10-20%, and under 10%).
• How many markets accept EBT, WIC, and SFMNP?
  o What is their proximity to low-income communities and communities of color?

II. METHODS

Data Sources
The data on farmer’s markets location was obtained from, the USDA Food and Nutrition Service and the California Department of Food and Agriculture. Data on race and poverty level were obtained from the Census 2000 at the census tract level.

Methods
Farmer’s Markets Data
I downloaded data about farmer’s markets locations from the USDA and the CDFA. The USDA data came in better shape with much more detail about location as well as information about whether or not the markets accept supplemental forms of payment. The CDFA site had many more sites – some of them duplicates of the USDA data – but the quality of the data was rather poor with many incorrect addresses and missing zip codes. I first attempted to clean up the data in Excel merging the two lists into one and fixing as many obvious errors as possible. I then geocoded the markets information to StreetMap USA using the existing Address Locator that StreetMap comes with. The geocoding was rather unsuccessful (with about 20% of points matching) because of the quality of the data and the fact that there remained many duplicated in the data. I then manually geocoded as many addresses as I could looking up each location and making my best judgment when the match was not exact. This got the match rate up to about 80% with the rest of the markets simply not coming up in the Address Locator. I exported the 115 or so of these unmatched data points to excel and mapped them manually through the edit function. Since these points did not have any attributes associated with them I joined the existing Excel file with attributes to the data points using a unique identifier. I then merged the two files (one with geocoded markets, the other with manually mapped markets) to create one file with all the farmer’s markets in California.

Census Data
I downloaded shapefiles for census tracts in each county for CA from the ESRI site, merged all the counties together into one shapefile and defined the coordinate system using GCS North America 1983. I
then downloaded Census information on race and poverty status for all census tracts by county in CA and cleaned up the categories in Excel. Once I had the race and poverty status categories I joined the Excel attribute table to the shapefile of census tracts.

For the analysis involving race I made categories of:

- White
- Black
- Latino/Hispanic
- Asian
- Multiracial
- Non-white (this category consists of total population – non-Hispanic whites)

For the analysis of poverty rate I made the category:

Percent of People below poverty level (people below poverty level / total population)

At this point I projected both the census tracts shapefile and the farmer’s markets shapefile using the NAD 1983 California Teale Albers projection since I will be displaying the whole state in many of the maps.

**Analysis**

For analysis of race: I mapped each category normalizing it by total population and classified it using Natural Breaks. I then calculated the number farmer’s markets in each class by using the Spatial Join function which gave me the number of markets in each tract. I exported the attribute table of the spatial join and manipulated the data further in Excel in order to make tables that summarize the data.

For analysis of poverty level: I compiled one map similarly to the ones above classifying the percent of people in poverty by categories provided by PolicyLink, performing a spatial join and creating a table in Excel. For analysis of involving high poverty tracts, I performed similar analysis using only two classes (‘high’ poverty tracts with over 30% of people in poverty, and the rest). I then created .5 mile buffers around the markets and performed another spatial join of the buffer layer to census tracts in order to analyze how many tracts are located within walking distance of a farmer’s market. I also created a number of maps displaying clusters of high poverty tracts in order to perform visual analysis of whether farmer’s markets were located in such areas.

Analysis of which markets accepted supplemental forms of payment and whether they were located in proximity to high poverty tracts or tracts with concentration of people of color proved impossible because most of the data points (those that came from CDFA) did not include data on acceptance of WIC, SNAP or SFMNP as forms of payment.
III. SPATIAL ANALYSIS

Basemap of Farmer’s Markets in California

This map is included to show the overall distribution of markets in CA. I included major highways and cities for orientation. It is clear that the greater Bay Area and the Los Angeles region (the two largest population centers) show the heaviest concentration of markets in the state. These two areas will be shown on inserts in some of the following maps.
The above map shows where census tracts with higher proportions of people of color are concentrated. The full length map shows concentration of people of color in the Central Valley as well as in the south and south east of the state. The inserts demonstrate that in the Bay Area higher proportions of people of color live in the East Bay and South Bay, while in Los Angeles the only tract with few people of color are those adjacent to the coast. The table below illustrates that out of the total 519 markets located in 382 census tracts, the majority are located in tracts with low concentrations of people of color.

<table>
<thead>
<tr>
<th>Percent of People of Color</th>
<th>Number of Census Tracts</th>
<th>Number of Markets</th>
<th>% of Markets in Tracts of Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-25%</td>
<td>179</td>
<td>199</td>
<td>38.3%</td>
</tr>
<tr>
<td>26-40%</td>
<td>101</td>
<td>104</td>
<td>20.0%</td>
</tr>
<tr>
<td>41-60%</td>
<td>86</td>
<td>91</td>
<td>17.5%</td>
</tr>
<tr>
<td>61-80%</td>
<td>58</td>
<td>64</td>
<td>12.3%</td>
</tr>
<tr>
<td>81-100%</td>
<td>58</td>
<td>61</td>
<td>11.8%</td>
</tr>
<tr>
<td>Total</td>
<td>482</td>
<td>519</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
Farmer’s Markets in Census Tracts by Race

Legend

Percent Asian
- 0% - 4%
- 5% - 21%
- 22% - 41%
- 42% - 65%
- Farmer’s Markets

Legend

Percent Black
- 0% - 1%
- 1% - 3%
- 3% - 14%
- 15% - 24%
- 25% - 40%
- 41% - 60%
- 61% - 100%
- Farmer’s Markets

Source: Census 2000, USDA, CDFA
Projection: NAD 1983 California State Albers
The above maps demonstrate concentration of different races by census tracts. The first four provide greater detail to the people of color map demonstrating a concentration of black and Asian populations in the Bay and Los Angeles regions, with a Latino population more prevalent in the Central Valley as well as in the East Bay and central Los Angeles areas. The map of multi-racial tracts does not present clear patterns, but it is representative of a very small percentage of the population – those that only identified themselves as multi-racial. The map representing the white population contrasts with the people of color map, in essence representing the inverse information.

The table summarizes the percent of markets located in tracts with majority population of various races / ethnicities. Almost 80% of markets are located in tracts where the majority of the population is white, while less than 2% are located in tracts where the majority of population is either black or Asian. This is largely reflective of the fact that whites are a greater portion of the population and therefore are a majority in most tracts. In addition people of color certainly reside in tracts where whites are the majority and therefore are not necessarily denied access to 80% of farmers markets.

<table>
<thead>
<tr>
<th>Tracts with Majority (over 50%)</th>
<th>Black</th>
<th>Asian</th>
<th>Latino</th>
<th>Multi-race*</th>
<th>White</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Markets</td>
<td>7</td>
<td>8</td>
<td>66</td>
<td>0</td>
<td>408</td>
</tr>
<tr>
<td>Percent of Markets</td>
<td>1.3%</td>
<td>1.5%</td>
<td>10.7%</td>
<td>0.0%</td>
<td>78.6%</td>
</tr>
</tbody>
</table>

* There were not census tracts where the multi-racial population exceeded 20%
Farmer’s Markets in Census Tracts by Poverty Level

In the above map it is evident that higher poverty census tracts are concentrated in areas where people of color tend to reside. Tracts with higher poverty rates are prevalent in the East Bay and the central part of Los Angeles, as well as in the Central Valley and the southeast of the state. In addition areas of medium poverty dominate in northern California where the majority of tracts are predominantly white. The table illustrates that nearly 50% of markets are located in tracts with less than 10% of people in poverty, while only 1.2% are located in tracts where rates of poverty exceed 40%. Thus access to farmer’s markets is restricted for those residing in areas of higher poverty.

<table>
<thead>
<tr>
<th>Percent in Poverty</th>
<th>Number of Tracts</th>
<th>Number of Markets</th>
<th>Percent of Markets</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10%</td>
<td>235</td>
<td>244</td>
<td>47.0%</td>
</tr>
<tr>
<td>11-20%</td>
<td>148</td>
<td>168</td>
<td>32.4%</td>
</tr>
<tr>
<td>21-30%</td>
<td>65</td>
<td>67</td>
<td>12.9%</td>
</tr>
<tr>
<td>31-40%</td>
<td>28</td>
<td>34</td>
<td>6.6%</td>
</tr>
<tr>
<td>41-100%</td>
<td>6</td>
<td>6</td>
<td>1.2%</td>
</tr>
<tr>
<td>Total</td>
<td>482</td>
<td>519</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

In order to explore this further the following maps present information on tracts of concentrated poverty.
Farmer’s Markets in High Poverty Census Tracts

Although there are only 35 tracts with high poverty (over 30% of population), they are once again concentrated in East Bay, central Los Angeles and the Central Valley. As the table below demonstrates only about 8% of the markets are located in high poverty tracts. When the analysis was done to include census tracts within .5 miles from farmer’s markets, the number of markets increased to 10% , still a very small percent.

<table>
<thead>
<tr>
<th></th>
<th>Number of Tracts</th>
<th>Number of Markets</th>
<th>Percent of Markets</th>
<th>Tracts within .5 miles of Market</th>
<th>% of Tracts within .5 miles of Market</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Poverty Tracts (&gt; 30%)</td>
<td>35</td>
<td>41</td>
<td>7.9%</td>
<td>182</td>
<td>10.1%</td>
</tr>
<tr>
<td>Total</td>
<td>482</td>
<td>519</td>
<td>100.0%</td>
<td>1807</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

The following four images provide a visual analysis of the distribution of markets in areas where high poverty tracts cluster together. It is evident that although markets are present in the general vicinity of high poverty clusters, they tend not to be located in the high poverty tracts themselves.
Distribution of Farmer’s Markets in Cluster of High Poverty Tract
IV. DISCUSSION

The analysis clearly demonstrates the correlation between race / ethnicity and poverty level and proximity to farmer’s markets. Farmer’s markets tend not to be located in census tracts with majority people of color – especially blacks and Asians – or poor people. The very populations that suffer disproportionately from food insecurity and negative health consequences associated with it are therefore systemically underserved by farmer’s markets. The uneven distribution of markets diminished the ability of people of color and poor people to access fresh produce reinforcing the negative effects on the individual and community level.

Exploring the underlying state and local policy initiatives which either promote or thwart development of farmer’s markets is a key area for further research. Without understanding the policy context in which such uneven distribution of markets has developed it is difficult to comment on its causes and particular spatial distribution. Further research should also be undertaken to examine the national trends in locations of farmer’s markets. This way comparisons between states or regions can be undertaken which demonstrate either success or failure of particular policies in equitably distributing the location of farmer’s markets.

Lastly, the very important aspect of affordability was absent from this analysis due to limitations in the data. This piece is key to getting the full picture of access. If markets are located within physical proximity, but remain unaffordable to low-income consumers the market does not truly provide access for low-income people. Thus a complementary analysis of whether the markets accept supplementary forms of payment is key to getting a complete understanding of access issues.
V. REFERENCES


