An analysis of food deserts in different geographic locations in the U.S

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Research questions

How do food deserts look in urban, suburban, and rural areas?

What are the similarities and difference among. different geographical areas?

What kinds of factors play into food insecurity?

Methods

Datasets from: USDA Food Environment Atlas 2018 and United States Census Bureau

Data from the USDA's Economic Research Service were very clean.
Null values dropped

US Census Json API and a public Github API were used initially to get county data
Intermittent lack of availability of server led to change to US Census shapefiles

Tools : Jupyter notebook, API, GeoPandas, SciPy, shapefiles, plotly, orca, and Pandas

Tests: linear regression, correlation, choropleth grouping using Jenks method

Literature review

Definitions

Food Desert: "An area in the United States with limited access to affordable and nutritious food, particularly such an area composed of predominantly lower income neighborhoods and communities" (Title VI, Sec. 7527).[1]

Food deserts disproportionately affect communities of color.

In the United States, food deserts are not the same thing as a lack of availability of any food. But inadequate nutrition in food consumed leads to health issues such as obesity and diabetes. In addition to social inequity, these two problems alone result in over $800 billion in health care costs annually.

Definitions (cont'd)

Food deserts differ in urban and rural areas. The National Center for Education Statistics (NCES) has created definitions of these areas based on broader U.S. Census definitions.

Urban: Territory inside an urbanized area and inside a principal city.

Suburban: Territory outside a principal city and inside an urbanized area

Rural: Territory that is miles outside an urbanized area

Principal city: The largest city in each metropolitan or micropolitan statistical area

Urban area: Must have at least 2,000 housing units or a population of at least 5,000

Definitions (cont'd)

- **Nutritious**: Definitions of what is a "nutritious" or "healthy" food differ widely among studies and many tools have been created to measure them. One frequently-used measurement is the USDA's "Healthy Eating Index," that scores foods on a scale from 1 to 100 based on the presence of 13 components that make up different food groups. The HEI follows general recommendations from the USDA's Dietary Guidelines for Americans. Key positive components include fruits, whole fruits, total vegetables, greens and beans, whole grains, dairy, total protein, seafood and plant protein, and fatty acids. Key negative components include refined grains, sodium, refined sugars, and saturated fats.

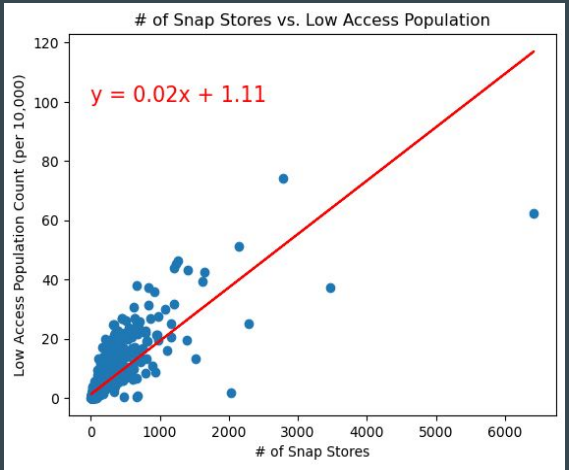
Definitions (cont'd)

Travel cost: A food desert in a rural area has been defined as an area where the nearest large grocery store is more than ten miles away (Ver Ploeg, 2009). Travel is a significant dollar cost of obtaining food in rural areas. In rural and suburban areas, people of all incomes travel miles to shop at grocery stores for over 85% of their food purchases, regardless whether they live in a food desert. The US Department of Transportation estimates that, overall, rural families spend $13,665 annually on transportation, 17.9% of their budgets, compared to $10,300, or 13.2% for urban families. People in the lowest income quartile spend 26.9% of their after-tax income on transportation, while the highest income quartile spends 10..4% (2021 data).

In Maryland, one state study showed the average distance to a grocery store with nutritious options for SNAP recipients was 1.8 miles, yet SNAP recipients who had stores in their neighborhoods reported traveling 4.9 miles to the store where they shopped most frequently, and those who did not have grocery stores in their neighborhoods travelled 9.2 miles.

Travel is also a cost in urban areas. "Walkable" is defined as approximately one half-mile. Yet residents of neighborhoods in New York are classified as living in food deserts based on census block reporting of one block. These residents may have access to several small stores with fewer healthy options on their own blocks, but do not tend to walk one block east to a wealthy neighborhood where the healthy food options available at small stores are much higher and there are more medium and large stores.

Results



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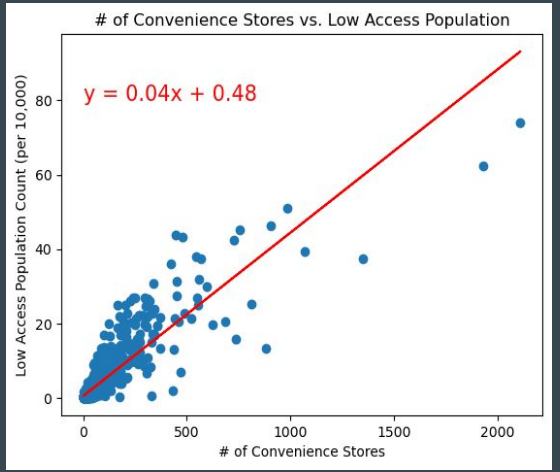

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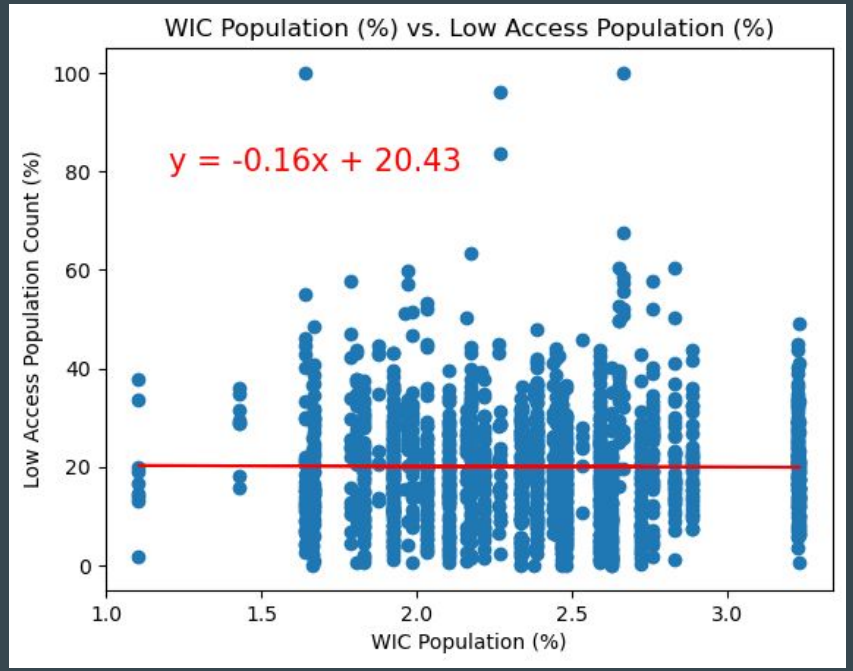
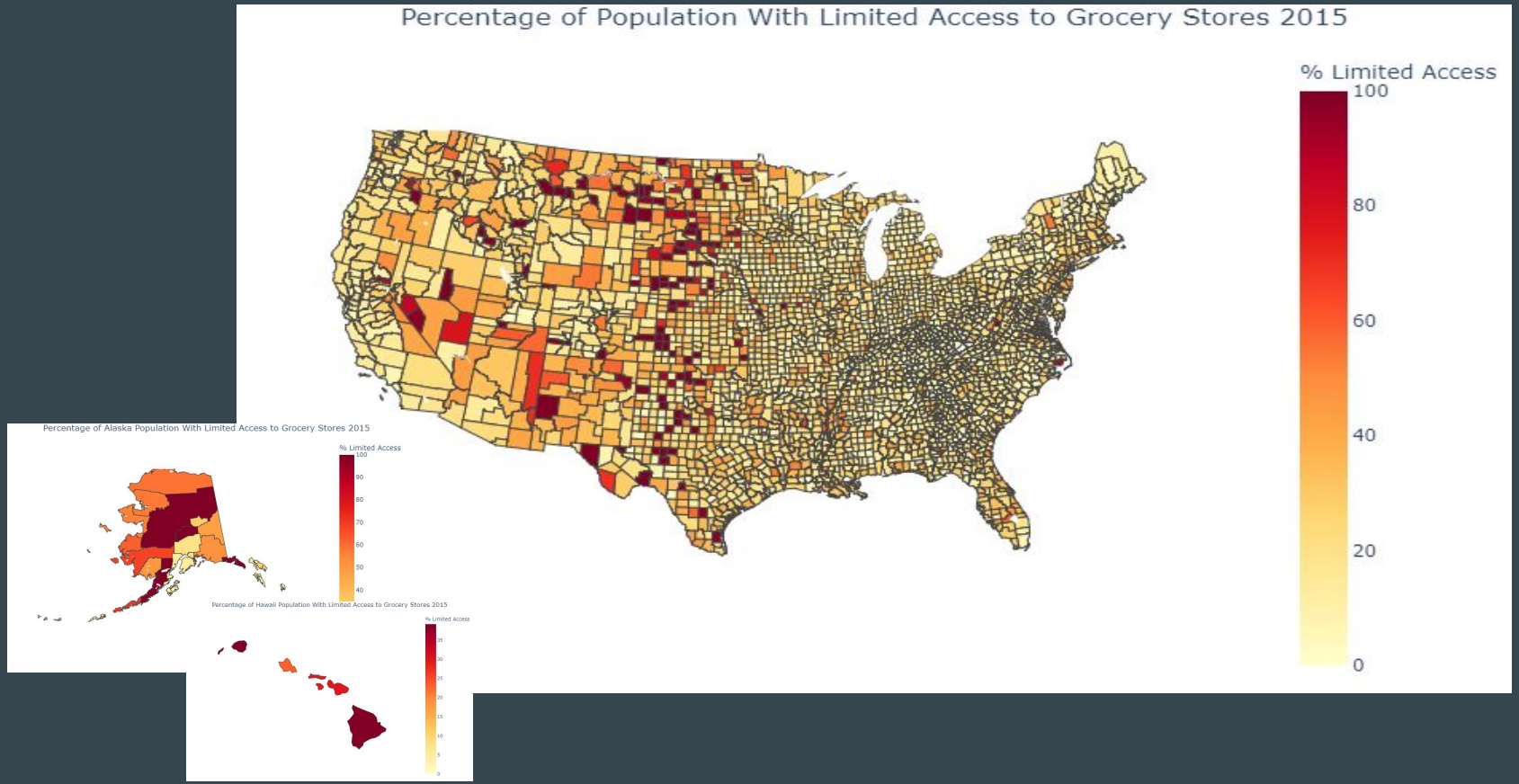
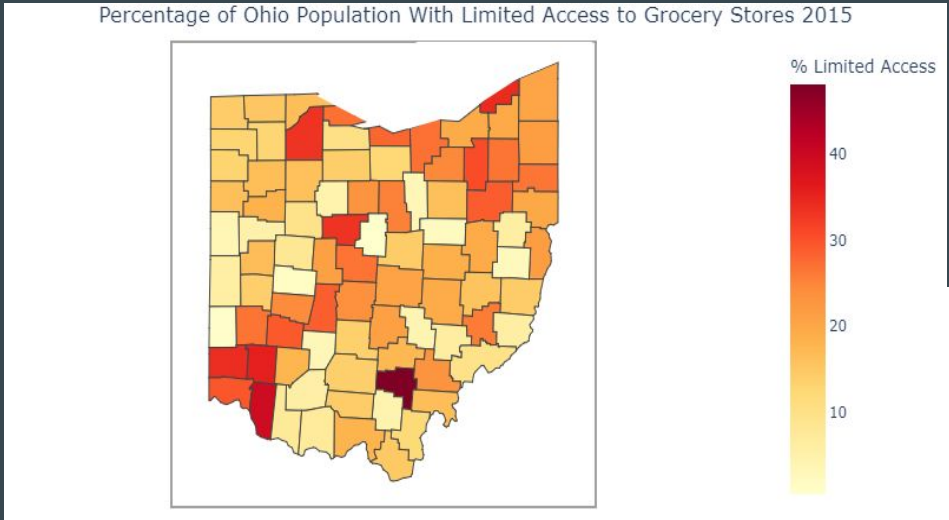
Results



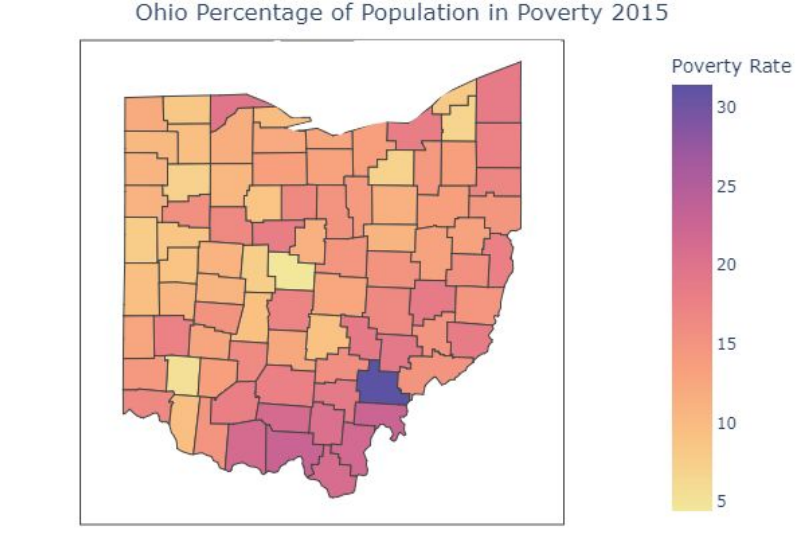
Limited by County Data Quality


Percentage of Population With Limited Access to Grocery Stores 2015
% Limited Access
100
80
60
40
20
0
Percentage of Alaska Population With Limited Access to Grocery Stores 2015
% Limited Access
100
90
80
70
60
50
40
Percentage of Hawaii Population With Limited Access to Grocery Stores 2015
% Limited Access

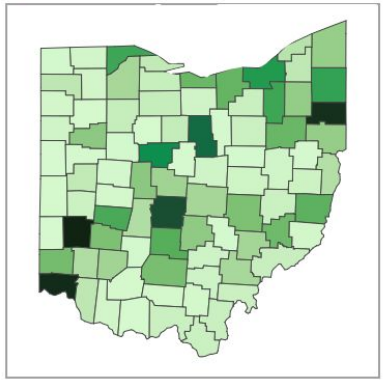


Limited Grocery Store Access

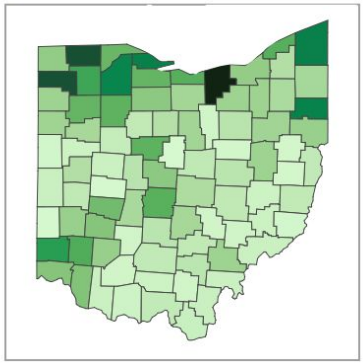
Poverty Rate



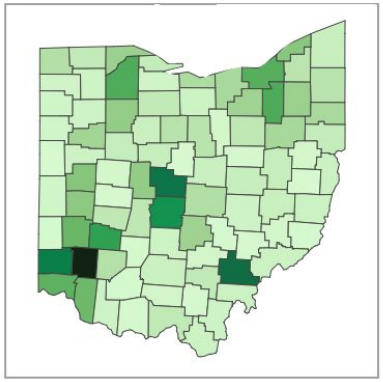
Percentage of Black Residents With Limited Access to Grocery Stores 2015



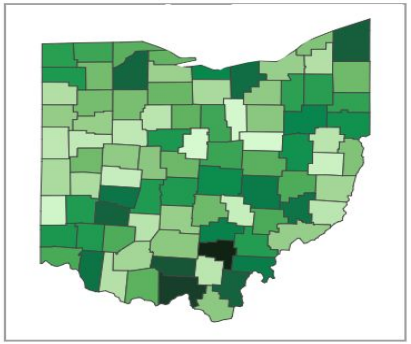
Percentage of Hispanic Residents With Limited Access to Gr



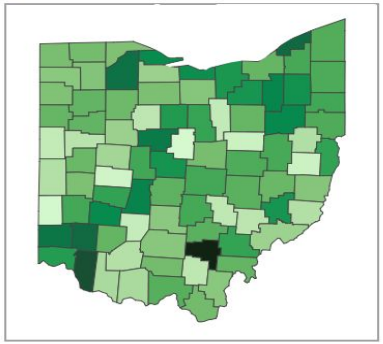
Percentage of Asian Residents With Limited Access to Grocery Stores 2015

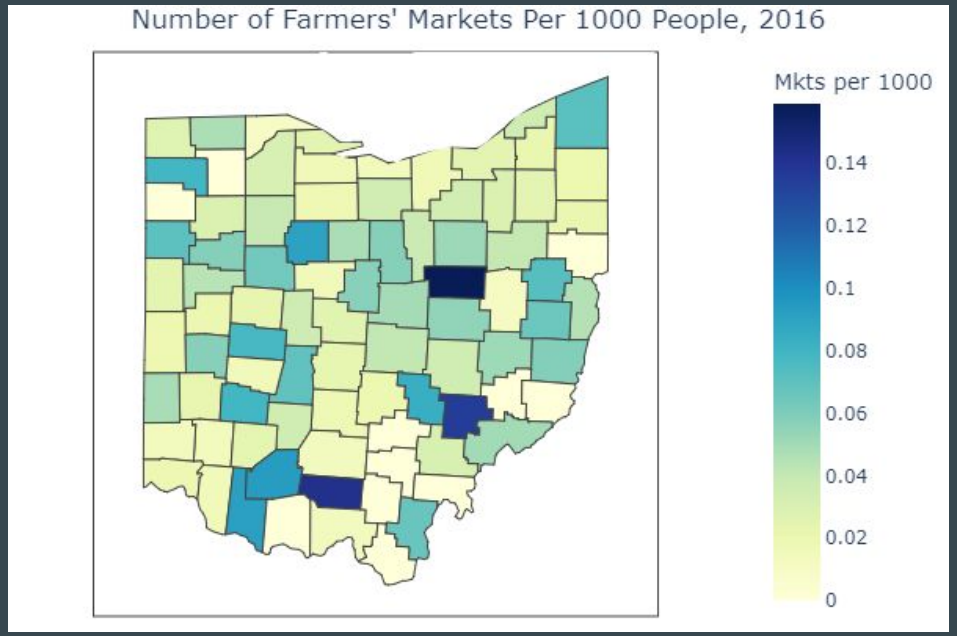


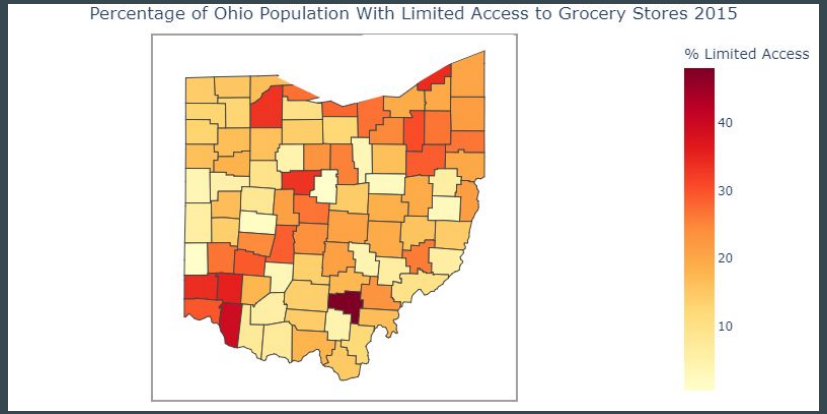
% of American Indians and Alaska Natives With Limited Access to Grocery Stores 2015



Percentage of White Residents With Limited Access to Grocery Stores 2015




Number of Farmers' Markets Per 1000 People, 2016
Mkts per 1000
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0


Percentage of Ohio Population With Limited Access to Grocery Stores 2015
% Limited Access
40
30
20
10

Limitations

- The food desert data is available at state and county levels. This may work well for rural areas, but it is not detailed enough for urban areas. It masks differences. To see differences in demographic groups in urban areas, data is needed at the census block or census block group level, depending on the size of the city.
- The years available are inconsistent among variables. For example, farm data compares 2009 and 2016, access to grocery stores compares 2010 and 2015.
- Placement of stores does not necessarily show where people shop and does not show what they buy.
- The data were collected immediately prior to the pandemic, and food insecurity likely has changed significantly since.
- The data may not be representative of all members of a community. Those who are undocumented or who are not U.S. citizens may not have been counted in Census reporting.

Research Studies Projected Results

Many programs designed to address food inequity and food deserts have focused on increasing access to stores that sell healthy food. Our observed results would support that approach.

Newer studies have suggested that many people without a large grocery store in their neighborhood travel to shop at one rather than buying at closer local stores, and both lower- and higher-income groups bought 85% of their food at large grocery stores which offer more healthy options.

One study of people who moved to an environment where healthy food was available showed they did not change to consuming more nutritious food over the several years of the study.

Education and knowledge about nutrition seem to play an important role in food choices.

Contrary to expected results, foot item costs, even for fresh produce, appear to be lower in urban food deserts than in areas with better access. But costs in travel time are much higher for those with limited income. Only 40% of SNAP recipients own vehicles.

Conclusion/Further Study

Much of the data on food deserts has been collected nationally at a county level. This may accurately reflect conditions in rural areas, but clearly does not in urban areas. Studies by census block in urban areas, as have been done for a few neighborhoods in specific cities, would much better demonstrate food inequity

Data collected on food purchases reflects those households who answered surveys or participated in studies. Households with undocumented residents, or limited English speakers, may not have been represented, yet may represent populations of significant food inequity. Work with community advocates might develop ways to collect data on these groups.

There may be significant differences in access and equity in geographic regions. The USDA 2009 report identifies a few trends such as proximity to a grocery store being higher in the northeast, and access to vegetables being higher in California. This is in part due to local production and supply chain issues. To develop programs that will successfully increase food equity, regional differences must be identified systematically, so the varying causes of these differences can be examined and ameliorated.

Conclusion/Further Study (cont'd)

The data shows correlation, not causation.

Much of the public funding to eliminate food deserts was intended to increase the supply of healthy food in areas with little access.

Newer research suggests that adding grocery stores to a food desert community does little to increase the healthfulness of what is eaten, or to change the 34% of meals that wealthy and lower-income households each eat outside the home.

A 25-year study showed entry of a new grocery store in a neighborhood without one improved nutritional equity by about 9% of the total difference in lower-income and higher-income household nutrition. People in former food deserts simply switched their grocery store spending from a more distant store to the new local one.

Unhealthy food choices seem to be correlated with education and knowledge about nutrition.

Directing funds at changing demand for healthy food through education and funding healthy choices may be more successful and more cost-effective.

Policy and Impact

The problem of food inequity in the United States is not one of lack of availability. The USDA estimates that 34% of food in the United States is wasted. Feeding America estimates that 40% is wasted.

119 billion pounds (54 million metric tons) of food, costing $408 billion, are wasted annually in the United States.

That is the highest food waste percentage in the world.

Japan, which has the second largest percentage food waste to population in the world, wasted 5.2 million metric tons in 2020.

SNAP's budget for 2022 was $119.5 billion.

Policy and Impact (cont'd)

Food deserts in the United States do not necessarily mean food insecurity as far as numbers of calories.

But the social justice and economic costs of preventable disease, disability, and early death from unhealthy consumption are enormous and disproportionately affect communities of color.

USDA Food Security Supplement surveys reported that 3.1% of U.S. households surveyed said they sometimes or often did not have enough to eat.

16% reported that they had enough to eat but not always the kinds of foods they wanted to eat, Of those who could not get the kinds of foods they wanted, half said it was too difficult to get to the store or the store did not have those foods.

81% reported that they always had access to the kinds of foods they wanted to eat. These reports did not consider the nutritional value of the foods.

Policy and Impact (cont'd)

Many studies have been conducted on food deserts in the United States over the last 25 years. Many programs have been developed to address the issue of food inequality by federal, state, and local governments, and by private organizations. Hundreds of billions of dollars have been spent on these programs. Yet despite these efforts, food inequity continues essentially unabated.

The problem may appear intractable because approaches have been developed at a national level, without adequate understanding of the reasons for the ongoing inequities, and without the involvement of local communities.

Specific grassroots and local efforts have been shown to be successful on that limited basis.

Community involvement and education will be key in changing demand for healthy food.

Policy and Impact (cont'd)

Federal and state programs are not enough, but they can have a huge impact on food inequity.

Per the USDA, 40% of babies in the United States are eligible for WIC benefits. About half of those receive them. SNAP supports 12.6% of United States residents.

One model of 25 years of food purchases by 60,000 households estimated that adding an additional 15% to SNAP's annual budget to subsidize healthy food purchases and make them more financially attractive would eliminate nutrition inequity in SNAP recipients. Of course, whether to do so raises many other ethical issues.

Children who received more healthy foods through school lunch programs were the only group in areas of food deserts whose consumption of healthy foods increased significantly.since 1994.

Universal lunch and breakfast programs in schools, such as Minnesota recently adopted, should be adopted nationally. Those programs can offer healthy foods, and providing children healthy foods, such as high fiber bread, has been shown to be successful in modifying diets, over several years. It is not necessary to study test scores and incidence of obesity in Minnesota school children who have participated in this program to decide that all school children need access to healthy food in order to grow, thrive, and succeed in school.

Policy and Impact (cont'd)

June 2022 USDA funding initiatives: A completely different approach.

Relatively small dollar amounts, but an enormous turn-around in what is supported. These initiatives support local production, making nutritious food more accessible, community involvement, distributed supply chains., and improving access to markets for consumers and small producers. They also would reduce food costs, create local jobs, and result in food distribution models that are less disruptive to the environment. Hundreds of millions to train mew food workers, support access to markets for independently-owned producers, and reduce food waste. Specifically, among others:

Farm to city ($300 million for Organic Transition Initiative) ($50 million for Senior Farmers Market program)

Farm to school ($60 million)

Community gardens and median gardening ($75 million)

Community-owned cooperative grocery stores ($400 million to create regional food business centers to support creation of small food and farm businesses)

Locally-owned and staffed restaurants selling local food ($166 million for Healthy Food Initiative Program)

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QUESTIONS?