



Workshop in Economic Research

ABSTRACT

Many families are affected by food insecurity every day and live inside of food deserts. A food desert for the purposes of this paper is defined as a tract where either 500 people or 33% of residents do not have access to a supermarket within one mile in urban areas or ten miles in rural areas. This lack of access can have a significant impact on resident's health and other key areas of their lives. Furthermore, food insecurity impacts lower income communities with a higher population of minorities more commonly. This paper sets out to examine the demographics of food deserts, why they exist, and possible solutions.

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Abstract

Many families are affected by food insecurity every day and live inside of food deserts. A food desert for the purposes of this paper is defined as a tract where either 500 people or 33% of residents do not have access to a supermarket within one mile in urban areas or ten miles in rural areas. This lack of access can have a significant on resident's health and impact other areas of their lives. Furthermore, food insecurity impacts lower income communities with a higher population of minorities more commonly. This paper sets out to examine the demographics of food deserts, why they exist, and possible solutions.

History and Context

While food insecurity is often attributed to economic factors, food insecurity can arise due to many other reasons. Many food deserts are often the result of low economic activity and investment in an area and as a result most can be found in lower income neighborhoods (Bitler, Marianne, Haider 20). Other factors include racial demographic, distance, and access to city business districts (CBD), crime rate, and educational level. Unfortunately, studies show and conclude that minorities and women are disproportionate residents of these areas. Welfare and other economic programs were put in place to assist the residents through many means such as tax breaks, wealth transfers, vouchers, etc. However, the results of these programs show the disparity growing since implementation, especially over recent years. Additionally, research results show that many times investments in the local businesses of these areas see the profits go to the landowners instead of the residents. The reason is due to a mixture of lack of investment in economic activity in the area, crime, property value, etc. There can also be many influences on the choices of foods people will consume such as dietary restrictions, cultural and individual preference, and cost. Other determining factors are a community's religious practices, use of pesticides and perspectives on organics, and even who is selling the food can sometimes play a

huge role. Notably, many of these communities do not have the options to find food even outside of their preference. Other studies have been done on the details of food deserts such as *An Economic View of Food Deserts* by Marianne Bitler and Steven Haider who end up advocating for some type of policy to help resolve all these factors. Food insecurity hit a two decade long high back in 2011 after the housing bubble and government bailouts happened, then, it steadily declined until 2019, when it stagnated until 2020. During this same period food insecurity disproportionately affected single parent mothers as well as Blacks and Hispanics.

Literature Review

Examining Food Deserts

Food deserts have a few different definitions according to the United States Department of Agriculture (USDA). They are defined as an area having a poverty rate greater than 20%, a median family income around 80% of a state's median income, or finally as 33% of an area's residents or 500 or more residents in an area having no access to a food market within one mile for urban areas or 10 miles in rural areas. For this paper, the metric used will be the 500 and 33% (USDA.gov).

The lack of access to supermarkets can have compounding issues related to health (CDC.gov 2017). Although sometimes markets are put into these places, they are met with mixed results and some fail. Other possible reasons for the lack of success of the markets are that the residents do not receive enough income and cannot afford to shop at these stores, individual preferences to other types of foods not provided by that store, or lack of access to transportation to get to the market.

Farm Bill

The US Farm Bill is one of the most economically historic and important bills that congress reviews on average every five years with massive implications for the day-to-day lives and trade of Americans. It deals with provisions such as titles, trade, subsidies, tariffs, protections, and rights domestically and internationally. For example, the 2014 Farm Bill reviews provisions under programs like SNAP, determining who qualifies for these benefits, compensation and price support to dairy farmers, reviewed crop insurance standards and other environmental conservation matters (sgp.fas.org).

The 2018 bill has notable provisions such as authorizing food distributions to Indigenous reservations, emergency food assistance program funding, and funds for promoting and researching organic and sustainable practices. It also includes the Hemp Farming Act which decriminalizes some products from Controlled Substance Act having massive economic, legal, and societal effects since being passed.

Most importantly were the provisions building on the farming bill of 2008 for urban farmers that authorizes the USDA to form more regulating bodies for urban agriculture and innovative production. It also created grants for research projects to modernize indoor farming practices known as the Urban, Indoor, and Other Emerging Agricultural Production, Research, Education, and Extension Initiative. Another provision in the bill creates grants for farmer's market programs, local food promotion (for co-ops and community gardens), and educational/support resources. With this level of support through the USDA, urban farmers have been given more of a federal platform to deal with local obstacles.

Food Suppliers & Farmers

Food suppliers are another part of the equation. While there used to be many farmers in the US, over the past few decades, the amount has declined with the increase in large scale farming by large food manufacturers. Technology and urbanization have contributed to these changes in population farming participation (Hardman 601). This also means that more of our food comes from larger farms as the number of farms continues to dwindle. This is due to the cap that agriculture has on contributing to GDP, as technological, manufactured, and IP goods are all more valuable. Other reasons include the rising costs for smaller farmers and the increased tax incentives for larger distributors. There are natural barriers to entry for farming related to larger returns to scale. Examples include expensive equipment needed for quicker, more efficient yields, causing a higher initial investment is required.

Other factors may affect the population directly such as renegotiating trade agreements (e.g. NAFTA -> USMCA), farm bill changes, and new regulating policies from ERS or USDA (USDA.gov). Even local ordinances can have an effect on farmers both positively and negatively. An example is how there is a limitation on what plants you are allowed to grow if you live in a city in the state of Florida (even when there are city ordinances that promote urban farming). There are also tax incentives for landowners who use their land to grow agricultural goods. It is notable that some portions of the population are incentivized to grow while others in areas more populated and have the capability to grow are punished. This can have a direct effect on creating distortions in food sourcing and security.

Urban Agriculture Programs

Urban agriculture programs (UAP) are defined as activities based within urban or intra-urban areas of a town, city, or metropolis that grows, raises, distributes, or processes food and non-food ag products. There are multiple types of urban agriculture practices: Urban farming which refers to intentionally placed educational or resource farms for commercial use; Urban gardening refers to agricultural activities in lower economic areas for individual production for households (backyard garden) production with community needs; and experimental urban projects which are practice-based and learning-oriented projects in real-life contexts with the aim of environmental sustainability and social justice. There are also vertical farms, which are essentially buildings with farms or gardens using hydroponics, implementing advanced technology for growing crops (Palanivelu pp. 2590 ; Gravalos pp. 198). For the goal of reducing the number of food deserts, the focus will be on urban gardens, coops, and small urban experiments as these are more directly related to small individual involvement from community residents (pittsburghfoodbank.org ; Spilkova pp12).

There exists a number of urban agriculture programs (UAP), urban farming initiatives (UFI), coop programs, and other vertical agriculture companies that start with the goal of increasing the amount of healthy food options available to urban communities through urban farming. A few examples include local startups that have grown in scale such as the Michigan Urban Farming Initiative, grassroots government authorized coops such as the Grow Pittsburgh & Co-op group, government run groups such as the New York City Urban Agriculture Program, and commercial vertical farming companies such as AeroFarms.

The USDA targets barriers to entry for new farmers, so by extension, most UAPs do the same. This is done by providing guidance for urban farmers, creating, and streamlining pathways for them to register and contribute to community gardens, and providing resources for them to succeed. Most UFIs have a strong community involvement making it easier for farmers to partner with local businesses. For UAPs, the scale of their operation allows for more resources to be utilized for the registered farmers. UAPs also typically have more tax incentives as well through

being registered and partnered with the city. This results with farmers partnering with organizations such as food banks to have more sourcing and firms having a more centralized place to network and move their goods.

UFIs generally result in a positive boost in morale for the residents, involvement and investments from private firms, and reduction in food insecurity in those locales. Results of UAPs are generally an increased number of urban farmers and community gardens, increased food security for city residents, a decrease in homeless population percentage, and increase in average income among residents of that district. Some of these results are abstract analysis taken from anecdotes in statements in interviews with residents, news articles, and statistics around government spending (Gustaven, Waehler, et al ; Leech, Strunk 2018 ; Corcoran 2017 pp. 305).

With the idea of sustainable farming and food sovereignty being a hot topic these days, one paper decided to look specifically at the attributes and factors behind the successful programs and the failed programs to examine more underlying and causal reasons. In London, Irene Hakansson (Hakansson) studied the geodemographic typology and qualitative data on more than 150 urban experimentation projects to illustrate how contextual differences in each area is significant. If the idea of urban farming is to be implemented, it will be necessary to understand how to properly implement them as all urban areas do not have the same attributes. Most examples used in other studies have what she calls "survivor bias" and do not study other factors affecting persistence and longevity such as social, economic, cultural, physical, and political differences in each area. Socio-economic backgrounds include education levels, amounts of diversity, and other urban characteristics. Other detailed examples include varying dynamics of power in political economy, existing physical means and infrastructure, other existing urban development projects, and uneven social-spatial distribution of the experiments within the city. This study takes place primarily in London and asks the question "How do the characteristics of varying urban contexts shape the distribution, objectives, and persistence of sustainability projects"?

Intrinsically, the differences in inequalities, access to common pool resources, and problems shape how each community implements the urban experiment. Examples include how urban areas face different levels of inequality (sometimes expanding) which shapes the focus and reason behind whether there is community buy in. Areas with more inequality showed more involvement and focus on the local scale, meaning they had more "buy-in" and focus on areas that are less visually appealing, food sovereignty, and health initiatives. She concluded that these areas would respond better to place-based initiatives. Areas with less inequality focused more on the global scale, that is they responded better to climate change factors (Lennon pp. 4). Both responded well and focused on education as a byproduct of the experiment. Areas that did not have good structural integrity (meaning higher exposure to hazards in environment, less access to transportation, and less social networks & family ties) tended to struggle more with these inequalities and had less success with the urban experiments. Community led experiments more commonly performed better as there tended to be more policy incentives and other means of sustainability put in place to ensure the long-term success of these programs alongside the community involvement. Places that had more access to technology also fared better with these experiments, though some areas did not perform as well if too much infrastructure was in place, noting there was less community involvement (Hakkanson ; Granzow, Jones 2020 pp. 381).

Data and Calculations

The data from this analysis comes from the USDA Economic Research Service (ERS) who partnered with the Department of Treasury and the Department of Health and Human Services to compile this data. The data shows communities across the U.S. of compiled demographic data

clarifying census tracts that have income, ethnicity, and age in relation to proximity to a supermarket. This is done on average every five years and this data is from the 2019 survey.

First step was to create a dummy variable accounting for the tracts that have low access to a supermarket with caveats of one mile in urban and ten miles in rural areas. For the 33% aspect, the residents who lived in areas far from a supermarket were listed as low access. This population was divided by proximity (both one mile and ten miles, if qualified it was given a positive for food desert).

Chart 1

Base Data

Variable	N	Mean	Std. Dev.	Min	Pctl. 25	Pctl. 50	Pctl. 75	Max
Total Population	72531	4256.74	1955.99	1	2899	4011	5330.5	37452
Low Access Pop 1 Mi.	72531	1693.43	1983.21	0	0	979	2903	37061
Low Access Pop 10 Mi.	72531	945.96	1576.67	0	0	59	1367	27227
Median Income	72531	76243.31	38152.63	0	50932.5	68472	93500	250001
Low Access White	72531	1379.93	1701.07	0	0	633	2366	28165
Low Access Black	72531	158.26	448.96	0	0	11	80	12112
Low Access Hispanic	72531	156.36	450.07	0	0	28	117	11502
Low Access Asian	72531	41.95	141.16	0	0	5	28	5809
Low Access Native American	72531	19.78	155.78	0	0	2	10	8444
Low Access Multiracial	72531	91.42	204.07	0	0	27	94	6146
Mean Median Income	72531	76243.31	0	76243.31	76243.31	76243.31	76243.31	76243.3
Urban	72531	0.76	0.43	0	1	1	1	1
PovertyRate	72531	15.18	11.92	0	6.5	12	20.6	100
Urban Count	72531	55169	0	55169	55169	55169	55169	55169
Rural Count	72531	17362	0	17362	17362	17362	17362	17362
Urban %	72531	0.76	0	0.76	0.76	0.76	0.76	0.76

Looking at the overall base data in chart 1, some quick takeaways are that by population counts, there are a lot more whites than other races who are considered to have limited access to food within the population. Also, the median income is very high around \$76k with a high standard deviation of about half the mean. Due to diverse populations being different, it is hard to truly extrapolate this data, so this next chart is the population weighted by population tract.

Chart 2

Weighted Data

Variable	N	Wt. Mean	Wt. SD	Min	Pctl. 25	Pctl. 50	Pctl. 75	Max
Total Population	72531	5155.51	2392.17	1	2899	4011	5330.5	37452
Low Access Pop 1 Mi.	72531	2117.46	2401.35	0	0	979	2903	37061
Low Access Pop 10 Mi.	72531	1231	1977.49	0	0	59	1367	27227
Median Income	72531	78464.12	37484.27	0	50932.5	68472	93500	250001
Low Access White	72531	1711.08	2022.57	0	0	633	2366	28165
Low Access Black	72531	198.6	543.44	0	0	11	80	12112
Low Access Hispanic	72531	218.32	602.3	0	0	28	117	11502
Low Access Asian	72531	60.28	186.43	0	0	5	28	5809
Low Access Native American	72531	22.16	168.49	0	0	2	10	8444
Low Access Multiracial	72531	122.47	266.33	0	0	27	94	6146
Mean Median Income	72531	76243.31	0	76243.31	76243.31	76243.31	76243.31	76243.31
Urban	72531	0.77	0.42	0	1	1	1	1
PovertyRate	72531	14.4	11.23	0	6.5	12	20.6	100
Urban Count	72531	55169	0	55169	55169	55169	55169	55169
Rural Count	72531	17362	0	17362	17362	17362	17362	17362
Urban %	72531	0.76	0	0.76	0.76	0.76	0.76	0.76

As 76% of areas are urban, it is natural that the urban population have a higher count on average than rural. What is interesting is that the low access count for 10 miles is much closer to that of urban areas than the actual count of population from almost 5:1 for population to 2:1 for low access respectively. More interestingly, we see a large jump from the Hispanic and black populations with Hispanic means surpassing that of blacks.

Chart 3

Weighted Percentage Data

Variable	N	Wt. Mean	Wt. SD	Min	Pctl. 25	Pctl. 50	Pctl. 75	Max
Low Access Pop 1 Mi. %	72531	0.4	0.39	0	0	0.26	0.8	1
Low Access Pop 10 Mi. %	72531	0.22	0.31	0	0	0.02	0.35	1
Low Access White %	72531	0.32	0.34	0	0	0.17	0.62	1
Low Access Black %	72531	0.04	0.1	0	0	0	0.02	1
Low Access Hispanic %	72531	0.04	0.09	0	0	0.01	0.03	1
Low Access Asian %	72531	0.01	0.03	0	0	0	0.01	1
Low Access Native American %	72531	0	0.04	0	0	0	0	1
Low Access Multiracial %	72531	0.02	0.04	0	0	0.01	0.02	1
Mean Median Income	72531	76243.31	0	76243.31	76243.31	76243.31	76243.31	76243.31
Urban %	72531	0.76	0	0.76	0.76	0.76	0.76	0.76

Putting the information from chart 3 into percentage form gives a clearer viewpoint of the actual population demographics make-up of food deserts. It became clear during this point that not much detailed information was recorded on non-food desert data, although some information still exists within the data set.

What was interesting was that the data set showed that about 32% of whites were considered to have low access to food, which was a much higher percentage than the rest of the races. Considering minorities of black, Hispanic, and Asian only have a weighted mean of 4%, 4%, and 1% respectively. This is not what was imagined when conducting research and after literature review. These percentages only go slightly higher when looking at weighed food desert percentage data as again, there is a much higher percentage of whites than all other races by a

significant margin. Chart 4

Weighted Desert % Data

Variable	N	Wt. Mean	Wt. SD	Min	Pctl. 25	Pctl. 50	Pctl. 75	Max
Low Access Pop 1 Mi. %	41494	0.64	0.3	0.04	0.41	0.72	0.99	1
Low Access Pop 10 Mi. %	41494	0.36	0.33	0	0	0.28	0.62	1
Low Access White %	41494	0.52	0.29	0	0.28	0.55	0.83	1
Low Access Black %	41494	0.06	0.12	0	0	0.01	0.06	1
Low Access Hispanic %	41494	0.06	0.1	0	0.01	0.02	0.05	1
Low Access Asian %	41494	0.02	0.03	0	0	0	0.01	1
Low Access Native American %	41494	0.01	0.05	0	0	0	0	1
Low Access Multiracial %	41494	0.03	0.05	0	0.01	0.02	0.04	1
Mean Median Income	41494	78172.02	0	78172.02	78172.02	78172.02	78172.02	78172.02
Urban %	41494	0.59	0	0.59	0.59	0.59	0.59	0.59

The weighted data shows us the percentage make up of who lives in these areas, but there seems to be some data points missing from this study. Working with what we have, we regress ethnicity population on urban areas in comparisons.

Table 1: Regression of Ethnicity on Urban Pop		Compared to Low Access White %
Low Access Hispanic %		-0.035 (0.027)
Low Access Asian %		0.896 *** (0.050)
Low Access Native American		0.013 (0.029)
Low Access Black %		-0.053*** (0.012)
Low Access Multiracial %		2.848 *** (0.059)
Constant		25.721 *** (0.143)
Observations		72,531

Upon running regression, the data shows in table 1 that the significance of urban areas on racial demographics. The data does not match what was shown in various studies. Further investigation must be done to determine as to why this is the case.

Table 2: Regression of Urban location on income		Median Family income
Urban		8,371.178 *** (330.545)
Constant		69,875.970 *** (288.281)
Observations		72.531

Income was also examined. It shows that urban location is significant with relation to income among most ethnicities. While we do not have specific ethnicity data, those living in urban areas seem to make more money on average than those in rural areas.

Table 3: Regression of Food Desert on Ethnicity	Food Desert Y/N
Low Access Hispanic %	0.002 *** (0.0002)
Low Access Asian %	0.023 *** (0.0004)
Low Access Native American	0.008 *** (0.0003)
Low Access Black %	0.011 *** (0.0001)
Low Access Multiracial %	0.010 *** (0.001)
Constant	0.166 *** (0.001)
Observations	72,531

In table 3, with regards to if a food desert was present, the correlation between Hispanics and Native Americans is significant versus those of other backgrounds. Whites and blacks are very similar at .01 and .011 respectively.

Analysis

According to the initial dataset, the number of food deserts was abnormally high. Taking that into consideration along with other factors such as average distance and population, a larger data set is required to provide more information about non-food desert areas. This is a limitation of this study. The data shows that certain white populations are much more likely to be living in food deserts by population than others by about a factor of four. Further analysis shows that the population percentages increase with other ethnicities when these areas are considered food deserts. The urban areas have a significant correlation with income, increasing anywhere between 6%-10% on average. We would like to have more specific information about income in relation to ethnicity to do further analysis. Calculations also show poverty percentages to be higher in areas with food deserts.

Conclusions.

While food insecurity continues to impact minority communities as shown in the data, further analysis needs to be done on why there are fewer supermarkets in these areas. We see that there is a much larger urban population, and that the make-up of that population largely lives in food deserts in most areas. We also see that location of being inside of these urban food deserts has a significant correlation with ethnicity and income. Further investigations would include information on urban farming programs for these communities to produce more healthy food for themselves and the sustainability aspects of programs like these. Also, looking into more suburban areas as well as comparing across more detailed income groups could also yield further detailed information.

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