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Cultivating Sustainability: A Quantitative Study Identifying N.J. Urban Ag. Barriers in Food Deserts

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ABSTRACT

Food deserts are a public health phenomenon where the lack of supermarkets, inadequate public transportation, and high poverty rates impede consistent access to healthy food. Across the U.S., various strategies seek to alleviate these challenges, focusing on government relief programs and aid. Urban food deserts are equally essential to consider in light of urbanization trends. In N.J. (New Jersey), 50 food desert areas face the most severe food insecurity across rural and urban contexts. Decreases in food insecurity in urban food deserts are often accompanied by urban agricultural practices that have enhanced food variety, promoted sustainability, and localized food systems. However, this study identified nine barriers to implementing urban agriculture initiatives in N.J.'s urban food deserts. Through a sequential quantitative analysis of a survey of food systems professionals and a spatial analysis using Geographical Information Systems (GIS), this study attempts to identify the most prevalent barrier to effective urban agricultural operations across N.J. urban food deserts. In partnership with N.J. urban agricultural organizations and representatives, lack of funding was the most commonly cited barrier to the expansion of urban agriculture initiatives. Furthermore, a GIS-based spatial analysis identified whether the high-priority barriers to urban agriculture varied by region and revealed that all organizations identified funding or lack of access to funding as a significant barrier, regardless of whether they operated in a low- or high-income neighborhood. Thus, policymakers must reevaluate urban agricultural organizations' valuable role in N.J.'s urban food deserts.

Foreword

The urbanization of human societies has been accompanied by several implications for the environment and accelerated demand for critical amenities, infrastructure, land, occupations, and affordable housing (United Nations, 2023). One direct implication is an increased demand for an urban food supply to support an expanding urban population, which poses significant obstacles to ensuring economic, environmental, and social sustainability (Ritchie & Roser, 2018). According to projections, by the year 2050, around 89% of the U.S. population and 68% of the world population will live in urban areas (University of Michigan, 2023). Equally important, cities and urban areas account for 70% of the total food consumed. Thus, it becomes essential to view urban areas' sustainability as a critical cornerstone to advancing the United Nations Sustainable Development Goals (SDGs), particularly UN SDG #11, which is to make cities and human settlements inclusive, safe, resilient, and sustainable (United Nations, 2023). Significant factors such as food prices and accessibility to fresh and nutritious food impede achieving food security in urban settings (FAO, 2023). Urban residents in the United States continue to face the threats of food insecurity, with urban food access uncertainty increasing by 15% in recent years (Djan, 2023).

Literature Review

Food insecurity is a significant challenge that disproportionately affects low-income communities in both urban and rural contexts, and it occurs when there is a lack of financial resources to purchase food (Coleman-Jensen et al., 2011). However, some studies suggest that 'food desert' is a more accurate term to refer to a specific geographical region that fulfills the U.S. Department of Agriculture's (USDA) criteria for food insecurity and is categorized as having limited availability of healthy food and low-income levels (Brace et al., 2020). The precise definition of a food desert varies depending on internal factors such as geographical area, mobility, distance, distribution, and food prices, as well as external factors such as socioeconomic status, political state, and historical events. Nevertheless, the USDA defines food desert areas as residents living more than one mile (urban food deserts) or ten miles (rural food deserts) from a grocery store or supermarket. This phenomenon affects 17.7% of Americans (Dutko et al., 2012; Ver Ploeg, 2009).

Experts have developed theories to explain the factors that cause food deserts, which can be applied to urban and rural food desert contexts. Notwithstanding the various factors that heighten the disparities of food deserts, the supermarket industry is the primary contributor to this issue (Schafft et al., 2009). Supermarkets are a central part of the food industry and serve as a source of nutritious food items and produce. However, the "standard theory" highlighted that there are more supermarkets in high-income areas than in low-income areas, as the ability to pay for healthy food will increase with income (Bitler & Haider, 2010). Furthermore, the "entry threshold crossing" model explains that when entering a market, fixed costs are needed for businesses to enter and exit (Bresnahan & Reiss, 1991). In other words, a decreasing number of businesses and supermarkets operate in these low-income areas, as they believe there will be less profit or return on investment (Bonanno, 2012), thus contributing to the lack of accessibility.

While Schafft et al. (2009) highlighted that the presence of supermarkets contributes to the diverse and plentiful selection of fresh produce and nutritious food, Castillo et al. (2013) argued that given the disinclination of supermarkets to operate in poor urban areas, which is due to the "entry-threshold model," it may be more efficient and equitable to partner with other entities: local food systems.

GIS in Food Deserts

Spatial analysis, specifically Geographic Information Systems (GIS), is an analytical tool that provides useful information in the development planning, resource management, and public health field (Davenhall & Kinabrew, 2012). Furthermore, it can store, visualize, analyze, and interpret geographic data from open-source contexts or census tracts available online and create maps (CDC, 2020).

GIS is beneficial in analyzing food desert contexts as it can identify factors that affect food availability by mapping trends and patterns in a community, such as the variables of transportation and supermarkets (Bradley & Vitous, 2019). Both Shannon (2015) and Colson-Fearon and Versey (2022) acknowledged that previous research on food access disparities has mainly concentrated on documenting the existence of food deserts through GIS and spatial analysis tools. However, Shannon (2015) argued that relying on spatial data indicators alone does not capture the significant qualitative data, participatory group perspectives, and the complex factors influencing food access. Similarly, Eckert and Shetty (2011) concluded that although GIS provides a broad overview of the "health" of a population, it does not recognize local food environments and the variety of factors within them that could disrupt the accuracy of research findings. Consequently, a comprehensive approach encompassing the community-centric perspective is required for greater efficacy in alleviating food deserts, unlike prior research that addresses conventional food system solutions, such as focusing on supermarkets in communities.

Urban Food Desert Recognition

Urban food systems have not been acknowledged thoroughly in the food desert movement and literature due to the misconception that urban areas have abundant food to support increasing populations (Bellian, 2019). Nonetheless, food deserts concentrate on the type of access to the quality and nutritional value of food, and thus, in light of urbanization factors and the continued displacement of minority communities, urban food deserts must be equally acknowledged (Richardson et al., 2019). A new focus on the emerging field and practice of urban agriculture can be applied to achieve a community-centric solution in urban food deserts.

Urban Agricultural Initiatives

In the last decade, a plethora of research fields have demonstrated the growing interest in urban agriculture, as it embodies the aspects of urban planning, zoning regulations, public health, and social welfare programs. Specifically, 'urban agriculture' is a practice that uses horticulture, animal husbandry, aquaculture, and/or other methods to produce fresh food and other agricultural goods in cities. It also employs ground-level, rooftop, hydroponic, and greenhouse garden practices, producing perishables and high-value horticultural commodities for local consumption (Siegner et al., 2018). It has been touted as being a predictor of whether a city's economic development has reached an advanced level, and it is regarded as a local community food system that improves social, economic, and environmental sustainability conditions in urban areas (Alves & De Oliveira, 2022; Kafle et al., 2023). Accordingly, urban agriculture is becoming a significant provider of fresh food in disadvantaged neighborhoods that lack access to grocery stores (Colson-Fearon & Versey, 2022).

Grassroots organizations have used urban agriculture to address various social and economic challenges in disadvantaged areas (Kato, 2013). Although urban agriculture has the potential to be a community-centric solution, some efforts have achieved social cohesion and sustainability (Kirby et al., 2021), while others have seen barriers to securing finances, regulations, and access to essential programming resources such as education, outreach, and essential input resources. For example, through interviews with urban planners and farmers, Castillo et al. (2013) identified seven perceived barriers to urban and peri-urban agriculture in the greater Chicago metropolitan region. Similarly, while Castillo et al. (2013) revealed the impact of urban agriculture implementation barriers on farmers and urban planners, Whittinghill and Sarr (2021) focused on urban grower (farmers and gardeners) challenges in Louisville, Kentucky, analyzing management practices, funding, and availability of land. In their case study, the researchers assessed improvement in urban agriculture practices for further operational effectiveness and sustainability.

Current Study

As one of the nation's most urbanized and densely-populated states, N.J. is a prime example of a region with a growing population and demand for food (Global Edge, 2024). Currently, more than 1.3 million New Jerseyans live in "food deserts," and a report identified fifty food desert areas in N.J.'s urban and rural areas (Hurdle, 2022; NJDEA, 2022).

Additionally, N.J. faces several obstacles in formulating a comprehensive strategy to fulfill citizens' demand for more significant space to 'green' their urban environment and grow local agricultural products. This is despite ranking among the top ten states in the United States for a wide range of fruit and vegetable crops (State of N.J. Department of Agriculture, 2024). Nonetheless, urban agriculture represents an ideal target for N.J. to bridge the gap between social change, local produce, and communities in urban regions of the state.

To date, particular case studies have analyzed the environmental advantages of urban agriculture as a local production system and its role in food security. However, there is a lack of research on operational, social,

and economic sustainability assessments and integrated methods for evaluating urban agriculture (Sanyé-Mengual, 2018). Despite the ongoing pursuit of urban agriculture, there appears to be a gap regarding the barriers surrounding the effective implementation of urban agricultural solutions, especially in N.J. urban food deserts. International studies have explored barriers and opportunities for urban agriculture in the United Kingdom, and they have utilized surveys, interviews, and observation to collect data (Hetherington, 2017). In the United States, others have reflected on urban agriculture and its barriers in various locations for specific urban agriculture sectors, such as farming and gardening (Castillo et al., 2013; Whittinghill & Sarr, 2021). While these studies aimed to identify barriers to urban agriculture through mixed methods, an extensive search revealed there is a lack of syncretism and effective implementation of the urban agricultural field and urban food desert field. Additionally, these studies did not assess urban agricultural sectors expanding beyond outdoor vegetable gardening, such as vertical farming, hydroponics, or urban beekeeping.

One report released by Rutgers University addressed various difficulties in involving, educating, and funding agriculture in the densely populated regions along N.J.'s rural-to-urban farming spectrum (Rutgers Cooperative Extension, OUEE, 2022). This report accompanied a mixed methods approach of GIS, surveys, and engagement with diverse urban agricultural stakeholders. Regardless, the report did not identify one prevalent barrier that impedes operational productivity in the specific context of N.J. urban food deserts. Thus, the distinctive relationship between urban agriculture and N.J.'s urban food deserts must be highlighted as it is crucial to achieve UN SDG Goal #11. Hence, the integration of these two fields is important to address to obtain the perceptions of all urban agriculture sectors and progress in the movement for a sustainable framework, starting with N.J.

This poses a significant question: What is the most prevalent barrier to sustainable urban agricultural operations in N.J.'s urban food deserts? Answering this question and addressing the knowledge gap in current literature will enable scholars and policymakers to reevaluate the focus of current urban food system research and practice.

Methods

Overview

This study used a sequential quantitative data approach, which entailed combining Survey Research and GIS Mapping Analysis in selected urban food desert communities in Central, South, and North N.J., as recognized by the New Jersey Economic Development Authority or NJEDA (2022).

The research identified gaps in urban agricultural initiatives regarding the most prevalent barrier to sustainable operations in two phases. Phase One: Survey Research. It is accompanied by a descriptive statistical analysis to identify the most prevalent barrier, and achieve participatory group perspective.
Phase Two: GIS Mapping Analysis. It aimed to spatially map three variables: food deserts, organizations, and the selected “most prevalent” barrier to find relationships between the variables and present a cohesive conclusion. Phase Two is entirely conducted in the ESRI ArcGIS Pro Suite; a platform with access to the GIS software tools.

Defined Terms

For this study’s research question, sustainable is defined as a nonprofit's ability to sustain itself and execute its mission goals over the long term (National Council of Nonprofits, 2019). Prevalent barriers are the variables that will be identified by community input or urban agriculture organizations existing within the designated food desert areas. However, one barrier will be determined through the process of this study. Urban agricultural

organizations are organizations or initiatives within an urban agricultural operation, such as a site with a community-based urban farming or urban gardening center.

As Shaw (2006) suggested, food deserts are not solely a geographical issue, as they are influenced by economic, urban, social, and political factors. With this understanding, there are a multitude of barriers that affect urban agriculture organizations located in such areas. Thus, prior to data collection, nine pre-selected barriers were identified based on previous literature that analyzed urban agriculture barriers (Castillo et al., 2013; Rutgers Cooperative Extension, OUEE, 2022; Whittinghill & Sarr, 2021). The barriers in this study extended to funding, socioeconomics, available space or land, zoning regulations, transportation accessibility, time availability, education, the designation of the term food desert, and environmental and public health stressors.

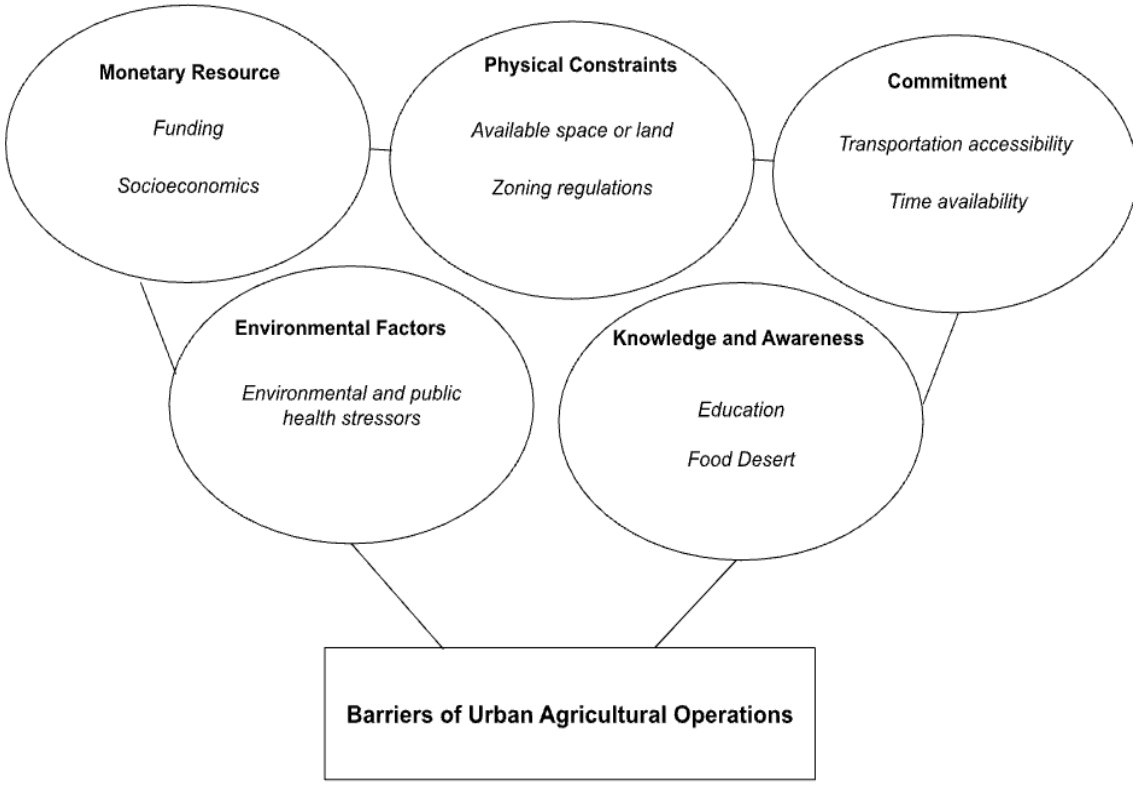

Figure 1. Barriers of Urban Agricultural Operations. The figure categorizes nine barriers analyzed in Phase 1.

The barriers were placed into six categories. The categorization aimed to accurately transfer the survey results to GIS, as each variable corresponds to spatial data available at the census tract level set for public use online.

Phase One: Survey Research

Firstly, the prevalence of each barrier was examined at an organizational level through survey research. As surveys are used in social and psychological research to characterize and study human behavior, they are a pragmatic method for collecting targeted information, having the ability to focus efforts on a particular demographic, such as the specific population of N.J. urban agricultural stakeholders (Singleton & Straits, 2018). The

specific population of this study had two main requirements to be a point of outreach when searching for survey participants and representatives from urban agricultural organizations. The organization must first categorize itself as within the urban agricultural sector, and, secondly, be located in the same county as one of N.J.'s 50 food deserts.

Fifty urban agricultural organizations were identified and contacted in North, South, and Central Jersey to capture perceptions from "across NJ" and provide a community-centric perspective. The survey was a Google Form sent out electronically to identify urban agricultural organizations' contact information. This process was conducted over a month-long period from mid-January to mid-February.

The organizational representatives or survey participants answered various questions. Firstly, multiple-choice questions about participant demographics were asked. Secondly, Likert scales were featured regarding the preferences and ranking of the preselected barriers to achieving sustainable urban agricultural operations. Lastly, participants were asked to fill out open-ended questions to provide context to the identified barriers in the Likert scales. The results of the open-ended questions were coded to determine patterns and themes of future directions and potential solutions.

The Likert scale portion of the survey was the most significant in answering the question posed by the study. The Likert scale contained a five-point scale, with 1 (strongly disagree) and 5 (strongly agree) regarding whether one of the nine barriers impacted operational sustainability. The ‘most prevalent’ barrier was determined by descriptive statistics in the survey research. Specifically, the barrier from the Likert scale with the highest median central tendency value was intended to be further analyzed in Phase Two. The full contents of the survey are located in Appendix A.

Phase Two: GIS Mapping Analysis

At the end of the survey response collection, Phase Two was introduced. Phase Two entailed a GIS Mapping Analysis to validate the survey results and spatially analyze the correlations between variables. A valuable feature of GIS software is its capacity to overlay many layers of data, which enables the observation of spatial correlations between the multiple variables present in research, namely food deserts and non-food desert areas, the selected barrier variable, and urban agriculture organizational locations. Specifically, this research used a Spatial Join with the result of the identified barrier from Phase One to further analyze the correlations between the surveyed organization location. A Spatial Join allows transferring attributes from one map layer to another based on spatial and attribute relationships through the table join technique available on the Esri ArcGIS platform (ArcGIS, n.d.).

Results

Of the 50 urban agricultural organizations that met the population sample requirements and were identified, 14 organizations participated with 27 stakeholder responses. 23 valid responses were only used for analysis, as four did not meet the study’s population requirement (not affiliated with any urban agricultural initiative, as noted in the survey response).

Demographics and Contextual Survey Information

Although the study aimed to survey urban agriculture organizations located in urban food deserts, 61% of organizations were located more than a mile from a supermarket or coded as located in an urban food desert. More than half (61%) of survey participants were Caucasian, while 35% identified as part of a racial minority. 44% of the survey participants were 40-50 years old or middle-aged individuals, and there were no records of

participants categorized as young adults from 18 - 20 years old. The majority of the participants were highly involved as stakeholders in the organization's operations, and 57% classified themselves under staff and leadership. The staff and leadership perspective is crucial in understanding their organizations' daily operational challenges.

Additionally, over half (52%) of participants have been involved in the urban agriculture sector for more than five years. Lastly, the definition of urban agriculture was encapsulated in the survey results, as there were different types of urban agriculture operations that participated, with no dominating operations primarily assessed in previous literature. Table A1 provides the full context for demographics.

Effectiveness Rankings

An essential facet of the survey was understanding the prevalence of operational barriers. The first way to investigate this was through rankings of initiative effectiveness. Interpretation of effectiveness was based on the survey respondent's perspective. Various respondents stated that urban agriculture's operational effectiveness is neutral at best, with less than half saying it was effective or very effective (Figure 2).

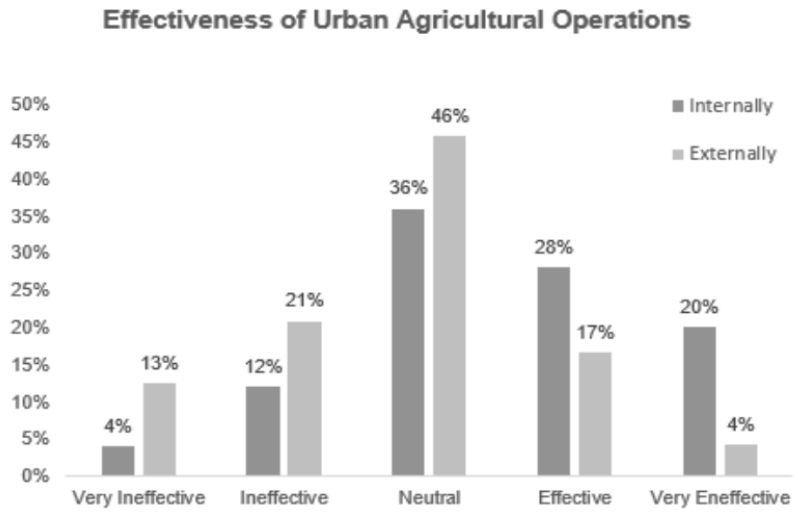

Figure 2. Effectiveness of Urban Agricultural Operations. This figure shows the Likert scale ranking results of the perceived effectiveness of urban agricultural operations internally (inside the organization) and externally (outside the organization or community).

Furthermore, 34% of participants believed urban agricultural operations are ineffective (ineffective and very ineffective) externally or in the community, and local municipality (Figure 2), and 16% of participants believed that operations are ineffective (ineffective and very ineffective) internally or within their own organization (Figure 2).

Despite the small percentages reported for ineffectiveness, this finding suggests that urban agriculture currently faces limitations and barriers and must be further analyzed.

Barrier Calculations

To further understand what fostered such percentages of ineffectiveness, participants were asked to rank the nine barriers in the survey. Experts have argued that the median should be used to measure the central tendency for Likert scale data. With the median not being a suitable fit for answering the research question, experts have contended that frequencies (percentages of responses in each category) can be utilized for such Likert scales (Sullivan & Artino, 2013). The frequency was calculated for each Likert scale barrier to distinguish between the two results and answer the prevalence of one barrier affecting operations (Table 1).

Table 1. Barrier Frequency and Median Value Distribution.

Barrier	% Value					
	SD	*D*	*N*	*A*	SA	MD
Funding	13	0	9	26	52	5
Socioeconomic status	13	4	17	26	39	4
Available space or land	9	13	9	17	52	5
Transportation access	9	13	13	26	39	4
Education	17	4	26	22	30	4
Zoning regulations	13	4	17	26	39	4
Environmental and public health stressors	13	13	13	22	39	4

Food desert classification	18	5	18	14	45	4

Note. SD= Strongly disagree; D=Disagree, N=Neutral; A=Agree; SA=Strongly agree; MD = Median Value Distribution.

Given the nature of urban areas and the associated lack of space, the researcher of this study hypothesized that available space or land would be the highest-ranked barrier. This hypothesis was strongly supported by studies demonstrating that urbanization leads to a reduction in productive urban land used for agriculture due to infrastructure development and housing (Beckers et al., 2020; Giyarsih et al., 2024; Nuissl & Siedentop, 2021).

Significantly, the calculations revealed that funding and available space or land were the two highest corresponding barriers, both scoring 5 (strongly agree) for the median central tendency. This underscores the substantial impact of these barriers on organizations.

While the initial aim was to identify a single barrier, the result of two barriers necessitated an alternative approach. Thus, frequency distribution was employed to provide a comprehensive understanding of the barriers affecting operations.

As demonstrated in Table 1, frequency distribution proved to be a suitable fit, providing further information on a precise ranking compared to the median central tendency. It is shown that 78% of participants agreed that funding is a barrier to effective operations in terms of 4 (agree) and 5 (strongly agree) on the Likert scale. In comparison, only 69% of participants agreed that available space or land is a barrier to effective operations.

The close correlations between funding and land availability can be attributed to the finding that lack of funds can limit access to resources such as land. This has been proven by various case studies, such as one in South Africa (Bisaga et al., 2019), Southern Australia (Pollard & Booth, 2019), and Niger (Graefe et al., 2008).

Barrier Variable Coding

The most approximate open-source data set that represented the funding barrier was median household income. Thus, when proceeding with this study's second phase, median household income represented the organization's funding perception barrier. The full context of the open-source data sets used in this study is located in Appendix B.

GIS Mapping Analysis

Files based on the corresponding variables were first imported into the Esri ArcGIS Pro Suite to conduct the GIS Mapping Analysis. Then, a Spatial Join was conducted between the food desert and N.J. census tracts that contained data regarding the selected barrier. In the original census tract dataset (with the food deserts), this study categorized them as "not null." Conversely, in the data set without food deserts, the value in this column was categorized as "null" or empty, as there was no surrounding food desert that the tract was joined to upon doing the Spatial Join. As such, this created two distinct categories of N.J. polygon areas: food deserts (black) and non-food deserts (white). The database created was filtered using the definition query feature based on whether the desert name column has non-null or null entries. The median household income variable was also inputted into the platform for each region in N.J. Lastly, the platform utilized a point feature to input organizational locations. After obtaining longitude/latitude coordinates for each organization surveyed, this was used to create an xy table to map the locations of organizations to be inputted into the main N.J. map layer.

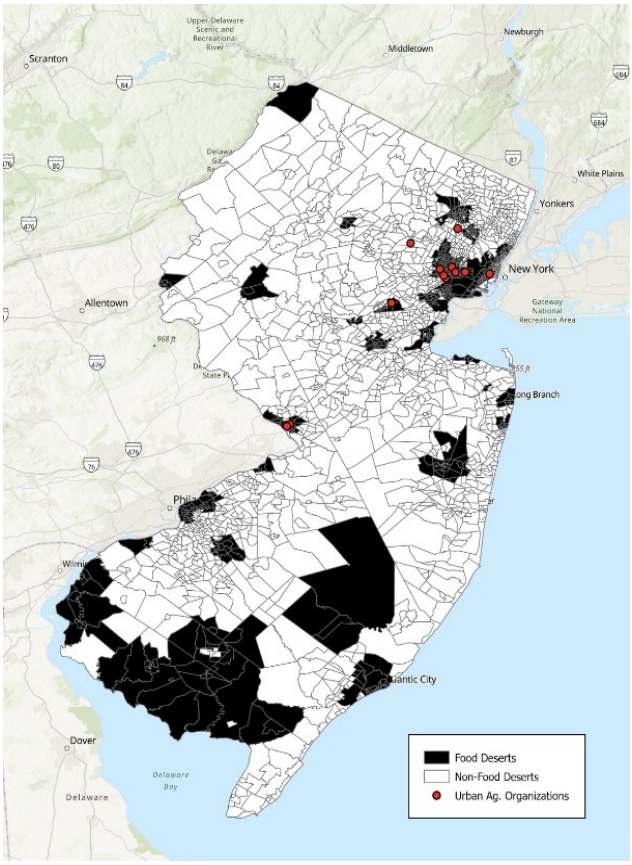

Figure 3. ArcGIS Map. This figure shows the product of the GIS Mapping Analysis and Spatial Join created in Esri ArcGIS Pro platform.

As the database was filtered to separate food desert areas and nonfood desert areas in NJ, the median household income was calculated using GIS descriptive statistics, which produced a histogram. Further analysis showed that compared to all N.J. census tracts, the mean median household income for N.J.non- food desert areas is $110,000 (Figure 4), and compared to N.J. food deserts, the mean median household income is $63,000 (Figure 5).

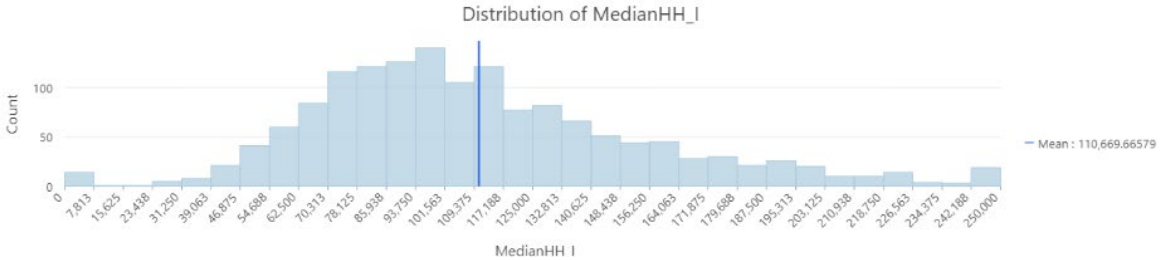

Figure 4. Distribution of Median Household Income in Non-Food Desert Regions. Calculated as a function of ArcGIS Pro.

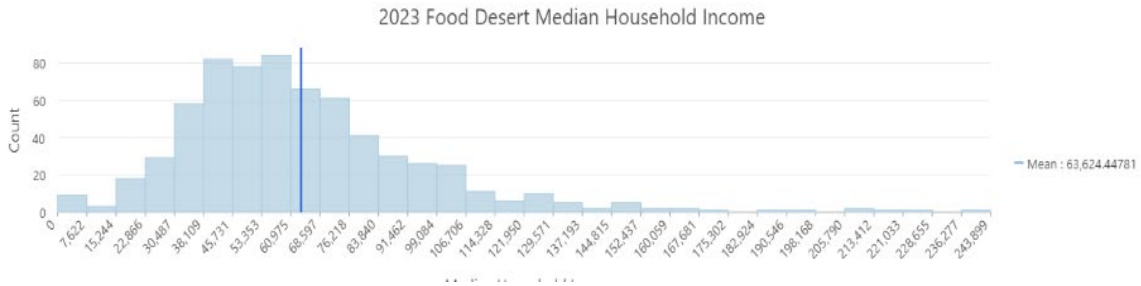

Figure 5. Distribution of Median Household Income Across NJ Food Deserts. Calculated as a function of ArcGIS Pro.

At this point of the research, to further investigate the prevalence of this barrier and the comparative difference between the median household income, a second question emerged in this study, adding validity to the prevalence of the funding barrier:

1. How much variation in perception exists for the funding barrier across the organizations dispersed in NJ?

In further analysis, the surveyed organizations included on the map were categorized into two tiers of high and low-income areas based on the open-source median household income in the GIS map. The classification of the tiers was based on a report that categorized N.J. into six regions and recognized the income brackets of each region (Affordable Housing Professionals of New Jersey, 2023). This analysis aimed to compare if survey responses for the funding barrier differed in the median household income associated with the locations or areas of the organizations surveyed. Naturally, a second hypothesis accompanied the question: Organizations in low-income areas will agree/strongly agree that funding is a barrier more than organizations in non-low-income areas.

For the purposes of this study, a percentage above 50% is considered an agreed-upon barrier. As a result, 100% of representatives from organizational areas categorized as located in high-income areas agreed/strongly agreed that funding was a barrier. On the other hand, 64.2% of respondents of organizational regions categorized as located in low-income areas agreed/strongly agreed that funding was a barrier. Thus, the initial hypothesis was rejected. However, regardless of whether the area is low-income or high-income in food deserts, it is revealed that lack of access to funding is a barrier.

Discussion

Key Findings

This study demonstrated key facets to answer the most prevalent barrier to effective urban agricultural operations across NJ's urban food desert. In the quantitative, sequential approach, the survey research reveals that funding and available space or land were the two highest median values through median central tendency, while funding was ranked higher with the frequency distribution approach.

When analyzing the funding barrier in further contexts, federal government agencies have attempted to alleviate monetary problems. In 2022, the USDA invested $14.2 Million in over fifty urban agriculture and innovative production efforts, which stemmed from $26.3 million in grant projects since 2020 as part of the USDA's extensive urban agriculture assistance program (USDA Press, 2022). Nonetheless, the monetary funds from this grant program have been considered highly competitive, and those urban agricultural organizations that have a large donor and volunteer base and many years within the industry are most likely to receive the

reward rather than local grassroots that are starting up and those who require the monetary support to a greater extent.

Secondly, Phase Two of the research, or GIS Mapping Analysis, revealed the discrepancy in median household income, with food desert areas containing a significantly lower mean of median household income than non-food desert area tracts. This finding supports the USDA's findings in their foundational report in "Characteristics and Influential Factors of Food Deserts," in which "economic disparities between food desert tracts and other tracts are prevalent and noted in differences in median family income" (Dutko et al., 2012, p. 11). For this reason, it was crucial to identify the income variable regarding the organizations surveyed and their location. This identification answered the second question that arose in the study of how much variation in perception there is of lack of access to funding across the organizations in N.J. The results proved unexpected as the hypothesis that lower-income areas agreed funding would be more of a barrier than higher-income areas was rejected. However, this can be attributed to a limitation discussed further in this section regarding various responses that could not be used in Phase Two.

Applications

As this research demonstrated, it has become clear that urban agricultural operations and practices in highly populated urban areas receive relatively little financing and attention. Nonetheless, urban agricultural initiatives are a valuable resource for locals who lack convenient access to reasonably priced, wholesome, and culturally appropriate food, and the prosperity and success of the organizations depend on operational effectiveness internally and externally.

This result of funding as a barrier has also been proven in a report by Rutgers Cooperative Extension, OUEE (2022), where urban agriculture participants identified as "Must Have" consisted of resources related to funding and high priorities or "Dare to Dream" included funding dedicated to preserving urban agriculture land. Similarly, Whittinghill and Sarr (2021) stated that land and lack of tenure on land for urban farming and funding were identified as challenges and noted barriers for urban farmers and growers.

However, in contrast with Castillo et al. (2013), the highest corresponding barrier was the lack of clear, agriculture-inclusive ordinances, which this study did not include in the survey. Furthermore, land availability was ranked third. High costs and funding were ranked fourth by urban farmers. This discrepancy can be attributed to the population gap or the lack of consistent barriers for surveyed participants.

Limitations

Various limitations arose within the study. Firstly, there was no proportional representation of areas in South N.J. as there was no representation from Regions 5 or 6, which consist of the Southern areas of N.J. Although organizations were contacted from both regions, there was a lack of follow-through, and this was a significant limitation in representation as Atlantic City is ranked as the second largest challenged food desert in N.J. and is located within these regions (NJDEA, 2022).

Nonetheless, a majority of the organizational areas were located in North N.J., although the study aimed to represent the North, Central, and South regions of N.J. This can be attributed to internal difficulties in outreach.

Regarding technical difficulties, when transitioning to Phase Two of the research, or the GIS Mapping Analysis, the funding barrier was challenging to represent spatially as it needed to be coded onto a census tract level that justified and corresponded to a relation in funding. However, based on prior literature and the relevance of low-income communities when identifying food desert areas, median household income was an appropriate corresponding variable in relation to monetary value.

In addition, when aggregating the GIS map, there was an organizational location not specified in the survey. The organizational location was various sites around N.J., and only one survey respondent belonging to the organization identified their location in the survey. Thus, four participants who were valid respondents in Phase One were not used in Phase Two, yet their answers from the survey were still utilized for barrier identification.

Lastly, 61% of the organizations stated they are located more than a mile from a grocery store, defined as an urban food desert (USDA Food Access Research Atlas, n.d.). Unfortunately, this percentage was not 100%, as this study intended to capture urban agricultural organizations in urban food deserts.

Despite these limitations, a new understanding emerged. Regardless of low-income or high-income areas in N.J. food deserts, these areas agreed that funding is a barrier and must be prioritized despite the perceived federal efforts and grants.

Conclusion

Future Recommendations from the Community Perspective

Practical applications of this study can be shared with policymakers regarding more funding allocated towards urban agricultural initiatives to become successful and aid urban food desert communities. Specifically, the 'farm bill' provides an opportunity for the intersection of urban food desert and urban agriculture as the bill is a multiyear legislation that oversees several food and agriculture initiatives (Congressional Research Service, 2022). It allows policymakers to address issues related to agriculture and food through its multi-year execution. As implied by this study, the aspect of funding as a barrier can be further advocated for in this bill and supported by community leaders.

Organizations identified various courses of action through open-ended responses in Phase One. Specifically, the question asks, 'How can your community shape and support urban agricultural initiatives or projects?' The responses were categorized and coded into themes based on keywords. The emerging categories included Resources: Funding/Land Availability, Partnerships, Government/Policy Support, Community Engagement, Education, and New Initiatives. The full content of the open-ended responses and categorization is located in Appendix C.

As a result, future recommendations by organizations vary and are not limited to addressing funding as a whole; they are multifaceted, with space for partnerships, educational and community empowerment, and governmental and policy support. Thus, future researchers must consider the nine barriers selected in Phase One of this study and further identify correlations on the GIS platform instead of focusing on one barrier, such as funding.

Additionally, to further understand the effect of the barriers on urban agricultural areas, future researchers should aim to conduct a study that assesses all urban agricultural organizations in N.J. and not just those limited to urban food desert areas. This would allow for a comparison of survey responses in non-food and food desert areas and assess varying community group needs.

Thus, policymakers, government stakeholders, and community leaders must consider the research results, namely, the continued pursuit of urban agriculture in urban food deserts and the need to mitigate the barriers present for organizations focused on achieving UN Sustainable Development Goals. This, in turn, will develop the framework for making cities sustainable, starting with food security and community cohesion.

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