

The Relationship Between Food Deserts, Farmers' Markets, and Food Assistance Programs in Hawai'i Census Tracts

Andrea M. Brace PhD, CHES; Todd W. Moore PhD; and Todd L. Matthews PhD

Abstract

Due to inadequate resources and limited access to healthy foods, residents who live in food deserts struggle to maintain a healthful diet. Living in a food desert increases the risk of developing diet-related chronic diseases such as obesity. Local farmers' markets serve as community-level interventions, bringing healthy food options to food deserts. This study explores the relationship between food deserts, placement of farmers' markets, and availability of food assistance programs in the state of Hawai'i. Data are from the 2017 United States Department of Agriculture (USDA) Food Access Research Atlas and the USDA Farmers' Market Directory. Farmers' market addresses were geocoded in ArcGIS 10.3. Descriptive statistics and spatial visualization were used to explore census tract level relationships. Of the Hawai'i census tracts, 10% are food deserts. Sixteen of the 101 registered farmers markets are located within a food desert. Of these markets, 28.7% accept Farmers' Market Nutrition Program coupons, 0% accept Women, Infants, and Children Fruit and Vegetable Checks, and 39.6% accept Supplemental Nutrition Assistance Program benefits. Fewer than 20% of farmers' markets in Hawai'i are located in food deserts, and few accept food assistance programs. Fresh food is less accessible to low-income residents in these areas and lack of access to fresh food is associated with diet-related chronic diseases. To reduce food insecurity, farmers' markets could accept food assistance program funds. Additional farmers' markets could be established in food deserts to increase availability of healthy food, thereby reducing the population's risk of developing obesity and diet-related chronic diseases.

Keywords

food desert, farmers' markets, food assistance programs, Hawai'i, healthy food

Abbreviations/Acronyms

EBT = Electronic Benefits Transfer
FMC = Farmers Market Coalition
FMNP = Farmers Market Nutrition Program
FNS = Food and Nutrition Service
FVC = Fruit and Vegetable Checks
LILA = low-income, low-access
SFMNP = Seniors Farmers' Market Nutrition Program
SNAP = Supplemental Nutrition Assistance Programs
US = United States
USDA = United States Department of Agriculture
WIC = Women, Infants and Children

Introduction

Limited access to healthy foods makes it difficult for residents in many low-income communities to maintain a well-balanced, nutritious diet. The United States Department of Agriculture (USDA) defines limited access to healthy foods as food insecurity.¹ Therefore, a food desert is a geographic area that

meets the USDA's definition of food insecurity (low access and low-income).² Food deserts are locations where residents live more than 1 mile in urban neighborhoods, and 10 miles or more in rural settings from a grocery store. Food deserts have become a prevalent problem in the United States (US),³ as approximately 54.4 million people (17.7%) are estimated to live within them.^{1,3}

The health of residents in food deserts is affected by the structure of the local food environment.⁴⁻⁷ Because residents lack access to fresh foods, they tend to purchase food from nearby locations—fast food restaurants, convenience stores, drugstores, and gas stations.⁴ Foods from these locations are often processed, pre-packaged, and high in calories, fat, sugar, sodium, and preservatives.⁸ The lack of access to fresh and nutritious foods fosters unhealthy eating habits, and therefore has the potential to increase the risk of overweight and obesity, diabetes, and other diet-related diseases such as hypertension and high cholesterol.^{6,7,9-12}

This issue is particularly concerning as the prevalence of obesity was 40% among US adults between 2015 and 2016¹¹ and the prevalence of diabetes was approximately 9% in 2016.¹⁴ In Hawai'i, the prevalence of obesity was lower (approximated between 2012 and 2014), at 23% among adults.¹³ The self-reported prevalence of diabetes was approximately 9% in 2017.¹⁴ Overweight and obesity are preventable health conditions through diet modifications.⁹ A diet rich in fruits and vegetables, for example, can reduce the risk of overweight and obesity, as well as various other chronic diseases such as cardiovascular risk and certain cancers.^{15,16} Such a diet is difficult to afford and access for residents in food deserts.^{8,17} Studies have shown that living closer to a grocery store has the potential to increase intake of fruit and vegetables.¹⁷ Additionally, the prevalence of obesity is reduced in communities by 0.73 with a grocery store nearby.^{7,18,19}

Four of five counties in Hawai'i are rural. However, 90% of Hawai'i residents live in urban areas.²⁰ Residents of urban food deserts, where grocery stores are more than one mile away, often need to walk to stores, or rely on friends, family, or public transportation to obtain fresh food.²¹⁻²³ This problem is amplified for residents in rural food deserts, who often must travel ten to twenty miles to access fresh food.²³ Distance-of-travel for fresh foods is a financial strain on many who live in food deserts.^{15,24} The lack of local food retailers is another factor that compounds the financial burden on the residents of food deserts.^{19,25}

Link Between Farmers' Markets and Food Deserts

Between 1994 and 2014, the number of farmers' markets in the US has grown at a compounded annual rate of 8.4%.²¹ Their growing popularity is due in part to an increased interest in fresh, local foods, as well as to the opportunity to interact directly with farmers.²⁶ Farmers' markets can provide communities with fresh fruits and vegetables, including recipients of food assistance.^{21,27} Farmers' markets can also provide nutritional education and information on how to shop, preserve, and prepare food.¹⁰ As a result, the USDA recommends farmers' markets as a community-level intervention to address food accessibility in food deserts.²¹ The USDA specifically notes farmers' markets are "less expensive, require less space, and can be quicker to implement than programs that encourage new store development."²³

However, farmers' markets face obstacles when trying to succeed in low-income communities. They operate on a small budget making it difficult to advertise beyond social media.²¹ They also sell higher-priced food items in some locations, which can be a challenge for low-income residents. To help with the higher-priced items and support the development, improvement, and expansion of farmers' markets, the USDA created the Farmers' Market Promotion Program which advertises local farmers' markets and promotes access to locally and regionally produced agricultural products.²⁸ In addition, there are programs which aid low-income families. These programs include the Supplemental Nutrition Assistance Program (SNAP, formerly known as food stamps); the Farmers' Market Nutrition Program (FMNP), which is associated with the Supplemental Nutrition Program for Women, Infants, and Children (WIC); and the Senior Farmers' Market Nutrition Program (SFMNP).^{28,29} While food assistance programs are accepted at many farmers' markets, they often are not accepted by those in rural food deserts, perhaps because of a lack of funding and/or electricity to equip Electronic Benefits Transfer (EBT) machines.^{23,27} The USDA covers the cost of EBT technology when it is used in retail stores such as grocery stores and mini marts. The USDA Food and Nutrition Service (FNS) and the Farmers Market Coalition (FMC) provide eligible farmers markets (ie, those that do not already have functioning EBT equipment or that received EBT equipment before May 2012) with free EBT equipment.³⁰ The program is limited by the availability of funds, and is distributed on a first-come, first-serve basis.³⁰ Other administrative costs that present obstacles include developing the process needed to successfully accept food assistance benefits at farmers' markets; training market managers and farmers; hiring staff to work the EBT booths; promoting the food assistance programs; and reporting financial information responsibilities.

Eliminating food deserts has become a top priority in national-level food and nutrition policies.³¹ In particular, researchers have prioritized examining spatial inequalities to access healthy foods, along with changes in dietary habits.¹⁵ In line with this

priority, this report explores the relationship between locations of farmers' markets, participation in food assistance programs, and food desert status in Hawai'i. Hawai'i is a suitable state for analysis because approximately 370,000 residents of Hawai'i, including 127,000 children, live in food deserts.³² In 2014, over 193,000 residents of Hawai'i received SNAP benefits.³³ The following research questions guide this report: (1) What is the relationship between location of farmers' markets and food desert census tracts within Hawai'i; (2) What proportion of farmers' markets in Hawai'i participate in food assistance programs; and (3) What is the average time farmers' markets in Hawai'i are open, allowing residents to access their goods? By addressing these questions, this report provides a thorough understanding of the availability and effectiveness of food assistance programs through farmers' markets.

Methods

Data sources include the 2017 USDA Food Access Research Atlas and the 2017 USDA Farmers Market Directory.^{32,34} The Food Access Research Atlas provides the following data: (1) census tract food desert designation across the US; (2) population data from the 2010 Census; (3) income data from the 2010 American Community Survey; and (4) food access data drawn from two 2010 lists of food stores selling all major categories of food.^{34,35} The linked datasets provide information to identify US residents who have low access to healthy food and are designated as low-income by the US Census Bureau (LILA). Low access for those in urban settings includes individuals who live more than one-half mile or 1 mile from a grocery store. Residents in rural settings who are low access live more than 10 miles or 20 miles from a grocery store. The maps display LILA data as LILA .05 & 10 for more conservative analysis (fewer people qualify), and LILA 1 & 20 for more inclusive analysis.³⁶

The USDA Farmers' Market Directory is a self-reported registry of markets that provides a list of agricultural products for sale in physical locations at registered times.³² For each registered market, the USDA Farmers' Market Directory provides the address, days and hours of operation, products, and the degree to which each market participates in food assistance programs.

Addresses of farmers' markets were geocoded in ArcGIS 10.3.³⁷ Quantitative data were analyzed using descriptive statistics in IBM SPSS Statistics version 21.0.³⁸ Access to food programs, including the Farmers' Market Nutrition Program (FMNP), WIC Fruit and Vegetable Checks (FVC), and Supplemental Nutrition Assistance Program (SNAP) were linked to farmers' markets. These data were analyzed with the USDA Food Access Research Atlas tract data. Descriptive statistics and spatial visualization were used to analyze the relationship between locations of farmers' markets, participation in food assistance programs, and food desert status by census tract in Hawai'i.

Results

Figure 1 shows locations of farmers' markets in relation to food desert census tracts in Hawai'i. There are 321 census tracts in Hawai'i, and 10% of tracts were classified as food deserts. Food deserts were found scattered across the islands of Hawai'i, Maui, and O'ahu, and covering the entire islands of Lana'i and Moloka'i. There were 101 farmer's markets registered in 2017, and 16% were located within a food desert tract. The 101 markets were located on the islands of Honolulu (44%), Hawai'i (33%), Kaua'i (14%), Maui (9%), and Moloka'i (1%). The densest cluster of markets is on the island of O'ahu in the Honolulu metropolitan area. Comparatively few appear in other areas with dense populations such as Hilo, Kailua, and Captain Cook on the Island of Hawai'i. In rural areas, farmers' markets are sparse.

Farmers' markets were coded based on the availability of food assistance programs at each market (Figure 1). Within the state of Hawai'i, 28 (28%) accept more than one type of food assistance program, 29 markets (29%) accept FMNP, zero (0%)

accept FVC, 40 (40%) accept SNAP benefits, and 58 markets (57%) do not participate in any food assistance programs. Most of the markets that do not participate in any food assistance programs are located on Hawai'i, Maui, and Kaua'i Islands. On Hawai'i Island, for example, none of the markets in Waimea-Pu'u Anahulu, which is the food desert tract in the northwestern portion of the island, participate in food assistance programs. Similarly, none of the markets in and near the Spreckelsville and Hali'imaile food desert tracts on Maui participate in any food assistance programs. Zero markets on Kaua'i participate in food assistance programs. There are no food desert tracts on the Kaua'i. In contrast to the markets on the other islands, most of the markets on O'ahu participate, and many participate in two programs.

Approximately half (50 of the 101) of the farmers' markets provide data on their months of operation, and all of these were open 12 months a year. Roughly 50% (49 of 101) also provide data on their hours of weekly operation. These markets operated between 1 and 65 hours per week, yielding a mean of 4.7 hours per week (median is 5 hours per week) and standard deviation

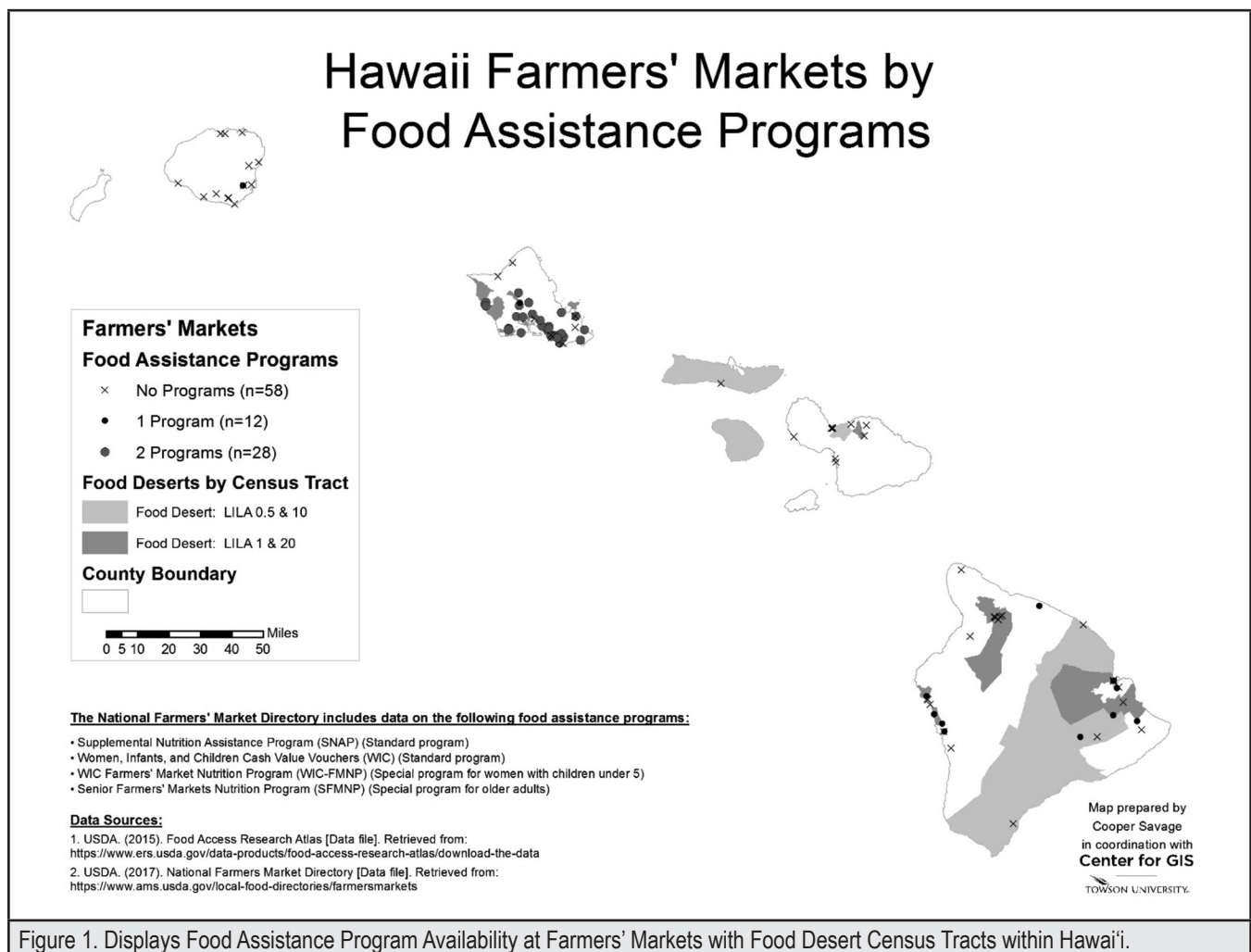


Figure 1. Displays Food Assistance Program Availability at Farmers' Markets with Food Desert Census Tracts within Hawai'i.

of 10.62 hours per week. Figure 2 indicates that most of the markets that were open more than 4 hours per week were located on Hawai‘i Island. Furthermore, most of these were within or proximate to tracts classified as food deserts. For example, multiple markets that are open 4.5–6 hours per week are located in the Waimea-Pu‘u Anahulu food desert tract on Hawai‘i Island. There are, similarly, multiple other markets open more than 4 hours per week within and near the food desert tracts on the northeastern portion of Hawai‘i Island. Most of the markets in Honolulu County on O‘ahu open 4 or fewer hours.

Discussion

This study integrated multiple datasets and used spatial analysis to examine essential community resources (ie, farmers’ markets) that can be used to improve access to fresh and healthy food, thus mitigating obesity in food deserts in the state of Hawai‘i. Food deserts are locations lacking traditional grocery stores,

which offer constant, and affordable access to healthy foods. When grocery stores are absent, farmer’s markets can meet the needs of making fresh fruits and vegetables available. Fewer than 16% of farmers’ markets in Hawai‘i were found to be located in food deserts. Additionally, few of the markets on the islands of Hawai‘i, Maui, and Kaua‘i participate in any food assistance programs. Most of the markets on O‘ahu, however, participate in one or more food assistance programs. Accessing fresh food sold by farmers’ markets can present a major challenge for residents in food deserts. Another barrier to fresh food from farmers’ markets includes the limited hours of operations of many farmers’ markets throughout Hawai‘i. The mean hours-of-operation per week is only 4.7 hours, which could make it difficult to visit the markets. More than 80% of farmers’ markets that reported their hours of operation were open only one day a week. All of the markets were open 12 months a year.

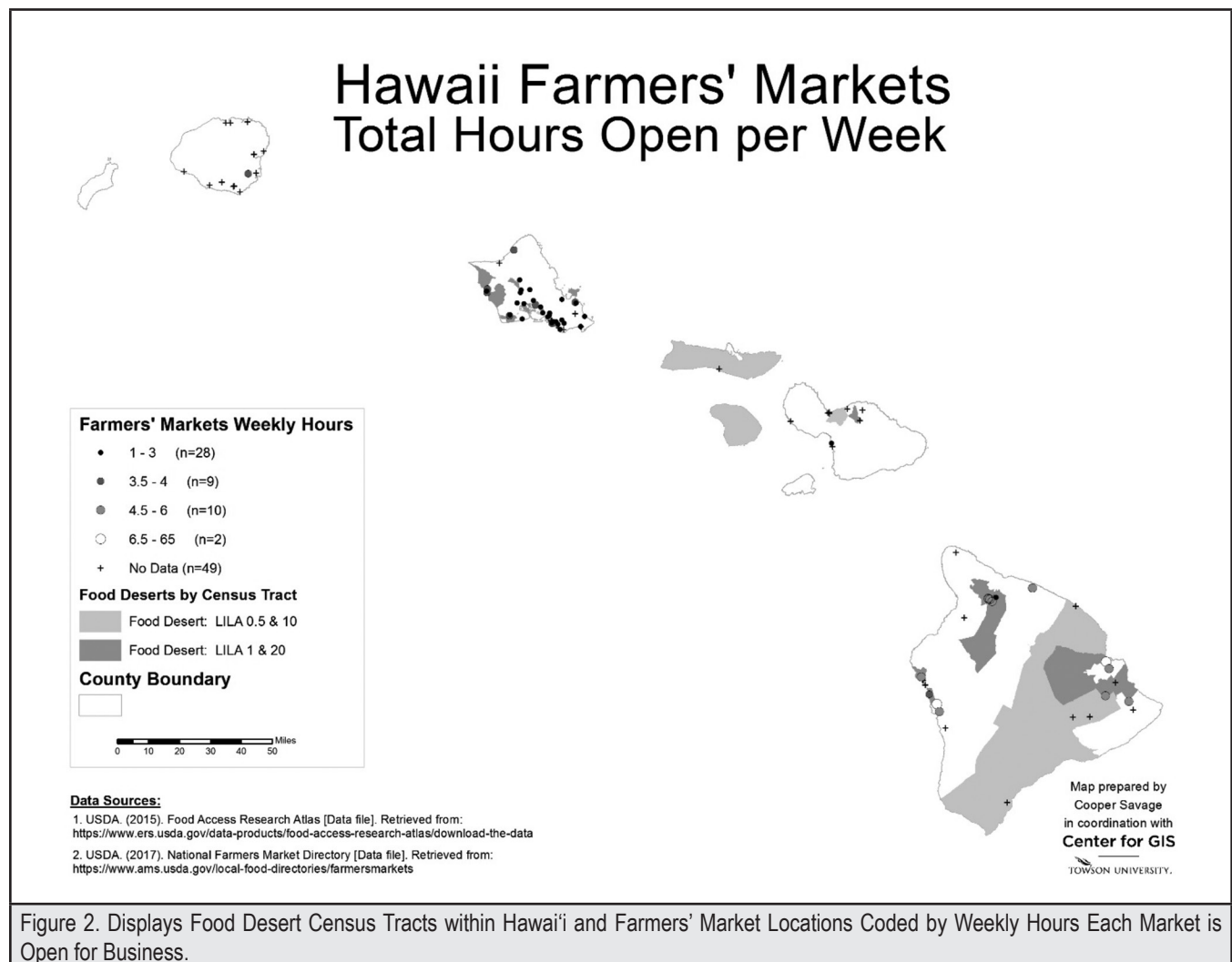


Figure 2. Displays Food Desert Census Tracts within Hawai‘i and Farmers’ Market Locations Coded by Weekly Hours Each Market is Open for Business.

Residents of Hawai‘i, especially those on the islands of Hawai‘i, Maui, and Kaua‘i, who live in food deserts and depend on food assistance programs, have little access to fresh produce at farmers’ markets. Most of the markets on these islands do not participate in food assistance programs and their hours-of-operation are limited. This lack of fresh, healthy food is known to increase the risk of obesity and other diet-related chronic conditions.^{6,7} In Hawai‘i, lack of fresh and healthy food could be a contributor to overweight and obesity rate of 56.9% in 2017.³⁹ In 2017, the national prevalence of overweight (35.3%) and obesity (31.6%) was 66.9%.⁴⁰ In 2017, prevalence of diabetes in Hawai‘i was 9.2%.³⁹

Additional research is needed to extend the period of record of this analysis. Causation cannot be established from this study because the data included is cross-sectional and therefore may not be exhaustive. In addition, future efforts might consider sources other than the USDA Farmers’ Market data to remedy these limitations. Information gathered by interviewing farmers and community leaders would likely provide additional insight to the approach taken here. Such an approach might identify barriers faced by farmers’ markets in food deserts. The identification of these barriers could enable community leaders to develop policies to reduce them. Other considerations that would complement the approach taken here are socioeconomic status and cultural factors, including race and ethnicity, which influence how people utilize transportation to obtain food.¹⁹ Additional study should also expand this effort to include other states. A longer period of record and wider geographic area might identify trends and variabilities not captured here. In addition, future research could look at the availability and access of community gardens, mobile farmers’ markets, small stores that provide fresh fruits and vegetables within a community.

Another important consideration involves a broader critique that has emerged in the social science literature regarding the potential efficacy of farmers markets themselves as a means of addressing issues of food deserts.⁴¹⁻⁴⁴ This critique has two primary dimensions. First, food deserts are not the primary causal factor, but instead result from concentrated poverty. This could indicate that access to nutritious food in a high poverty area will not necessarily result in the population being able to afford access these new offerings.^{43,44} Thus, the emergence of new farmers markets should not be seen as a panacea to overcoming the broader issues of poverty plaguing census tracts, counties, or entire regions. Second, farmers markets have been criticized as being largely white, middle to upper class spaces.^{41,42,45,46} As such, non-whites or people of more modest socioeconomic background may feel unwelcome at farmers markets, which might result in the unintended intensification of the divide in access to, and consumption of, healthier foods. To overcome this issue, conscious efforts at inclusion of potentially marginalized populations should be undertaken through advertising and direct engagement with important voices in all communities near the farmers market.

Healthy, affordable food must become accessible to reduce food insecurity in food deserts. Providing access via brick and mortar food retailers that offer fresh food and participate in food assistance programs would be ideal.⁴⁷ However, due to a myriad of barriers, traditional grocery stores are not always a feasible solution to food accessibility.⁴⁸ These barriers may include lack of supermarket interest in being in urban environments, economics, and availability of land.⁴⁸

Farmers’ markets can provide fresh food to residents of food deserts. The authors recommend that more farmers’ markets should be established in low income areas with low access to fresh food. To ensure the barrier of increased cost of fresh, healthy food is reduced, increased acceptance of food assistance programs across the state could also be a positive factor in reducing food insecurity, particularly by utilizing EBT technologies. Additionally, emulation of partnerships such as those formed between farmers markets and the GreenWheel Food Hub in Honolulu could dramatically expand the overall health impact of the healthy foods sold at farmers markets.⁴⁹ GreenWheel is building “micro markets” to expand the farmers markets to those who are unable to reach them, including residents of senior living facilities who lack mobility and low-income individuals who live in more remote rural locations.⁴⁹ These socially entrepreneurial activities that involve public-private partnerships are a critical component of what is needed to promote sustainable change in this space, particularly as public investment in health promotion and prevention is significantly lagging. For a state like Hawai‘i, in which upwards of 90% of food is imported from thousands of miles away at a great cost,⁵⁰ such local initiatives are critical if a serious reduction in food insecurity is to be attained.

Conflict of Interest

None of the authors identify any conflict of interest.

Acknowledgements

We would like to thank the Towson University Center for GIS and the College of Health Professions for supporting this project.

Authors’ Affiliations:

- Department of Health Sciences, Towson University, Towson, MD (AMB)
- Department of Geography and Environmental Planning, Towson University, Towson, MD (TWM)
- Department of Leadership and Organizational Development, Cabrini University, Radnor, PA (TLM)

Correspondence to:

Andrea M. Brace PhD; Department of Health Science, Towson University, 8000 York Road, Towson, MD 21252; Email: abrace@towson.edu

References

- Economic Research Service. Food security in the U.S. 2017.
- Ver Ploeg M. Access to affordable, nutritious food is limited in "Food Deserts". 2010; <https://www.ers.usda.gov/amber-waves/2010/march/access-to-affordable-nutritious-food-is-limited-in-food-deserts/>.
- USDA USDA. Food deserts. 2017; <https://www.ers.usda.gov/data-products/food-access-research-atlas/documentation>, 2018.
- Blanchard TC, Matthews TL. Retail concentration, food deserts, and food-disadvantaged communities. In: Hinrichs CC, Lyson TA, eds. *Remaking the North American food system*. Lincoln, NE: University of Nebraska Press; 2007:201-215.
- Jilcott S, Wade S, McGuirt J, Wu Q, Lazoric S, Moore J. The association between the food environment and weight status among eastern North Carolina youth. *Public Health Nutrition*. 2011;14(9):1610-1617.
- Morland K, Diez Roux A, Wing S. Supermarkets, other food stores, and obesity: The atherosclerosis risk in communities study. *Am J Prev Med*. 2006;30(4):333-339.
- Morland K, Evenson K. Obesity prevalence and the local food environment. *Health Place*. 2009;15(2):491-495.
- Herforth A, Ahmed A. The food environment, its effects on dietary consumptions, and potential for measurement within agriculture-nutrition interventions. *Food Security*. 2015;7(3):505-520.
- Mokdad AH, Ford ES, Bowman BA, et al. Prevalence of obesity, diabetes, and obesity-related health risk factors, 2001. *Journal of the American Medical Association*. 2003;289(1):76-79.
- Prince George's County Health Department (PGHEAL). *Recommendations to increase the accessibility, availability, and affordability of existing farmers' markets for 10 communities in Prince George's County, MD*. 2014.
- CDC CfDcaP. Adult Obesity Facts. 2017; <https://www.cdc.gov/obesity/data/adult.html>.
- NIH NIOH. Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults: The evidence report. *Obesity Research*. 1998;6(2):52S-209S.
- Warehouse HHD. Weight - BMI status, for the State of Hawaii, for the Aggregated Year(s) - 2011-2013, 2012-2014. *Hawaii State Department of Health, Behavioral Risk Factor Surveillance System*. 2016.
- CDC CfDcaP. *National Diabetes Statistics Report, 2017*. Atlanta, GA: Centers for Disease Control and Prevention, US Department of Health and Human Services;2017.
- Cummins S, Maclntyre S. Food environments and obesity – Neighborhood or nation? *International Journal of Epidemiology*. 2006;35:100-104.
- Guillaumie L, Godin G, Vézina-Im L-A. Psychosocial determinants of fruit and vegetable intake in adult population: A systematic review. *International Journal of Behavioral Nutrition and Physical Activity*. 2010;7:1-12.
- Giang T, Karpyn A, Laurison HB, Hillier A, Perry RD. Closing the grocery gap in underserved communities: The creation of the Pennsylvania Fresh Food Financing Initiative. *Journal of Public Health Management and Practice*. 2008;14(3):272-279.
- Inagami S, Cohen DA, Finch BK, Asch SM. You are where you shop: Grocery store locations, weight, and neighborhoods. *American Journal of Preventive Medicine*. 2006;31(1):8.
- Morland L, Wing S, Diez Roux A, Poole C. Neighborhood characteristics associated with the location of food stores and food services places. *American Journal of Preventive Medicine*. 2002;22(1):23-29.
- Hawaii State Data Center. *Urban and rural areas in the State of Hawaii, by County: 2010*. State of Hawaii;2013.
- Ahn S, Johnson K, Lutton M, Otudor I, Pino J, Yu C. *Examining disparities in food access and enhancing the food security of underserved populations in Michigan*. Ann Arbor, MI: School of Natural Resources and Environment, University of Michigan; 2014.
- Bitto EA, Morton LW, Oakland MJ, Sand M. Grocery store access patterns in rural food deserts. *Journal for the Study of Food and Society*. 2003;6(2):35-48.
- United States Department of Agriculture. Access to affordable and nutritious food: Measuring and understanding food deserts and their consequences. 2009; http://www.ers.usda.gov/media/242675/ap036_1_.pdf.
- Ghosh-Dastidar B, Cohen DA, Hunter G, Dubowitz T. Distance to store, food prices, and obesity in urban food deserts. *American Journal of Preventive Medicine*. 2014;47(5):9.
- Blanchard TC, Lyson TA. Retail concentration, food deserts, and food disadvantaged communities in rural America 2002:27, Mississippi State, MS.
- Bullock S. *The economic benefits of farmers' markets*. United States;2011.
- McCracken VA, Sage JL, Sage RA. Do farmers' markets ameliorate food deserts? *Focus*. 2012;29(1):21-26.
- USDA USDA. WIC farmers' market nutrition program (FMNP). 2017; <https://www.fns.usda.gov/fmnp/overview>, 2017.
- United States Department of Agriculture. Supplemental nutrition assistance program (SNAP). 2017; <https://www.fns.usda.gov/snap/supplemental-nutrition-assistance-program-snap>.
- Farmers Market Coalition. WIC Farmers Market Nutrition Program. 2016; <https://farmersmarketcoalition.org/advocacy/wic-farmers-market-nutrition-program/>.
- Jiao J, Moudon A, Ulmer J, Hurvitz P, Drewnowski A. How to identify food deserts: Measuring physical and economic access to supermarkets in King County, Washington. *American Journal of Public Health*. 2012;102(10):e32-e39.
- USDA USDA. Local food directories: National Farmers Market Directory. 2017; <https://www.ams.usda.gov/local-food-directories/farmersmarkets>.
- Department of Human Services. Supplemental Nutrition Assistance Program (SNAP). 2019; <http://humanservices.hawaii.gov/bessd/snap/>.
- USDA-ERS USDAERS. Food Access Research Atlas. 2017; <https://www.ers.usda.gov/data-products/food-access-research-atlas/> 2017.
- Ver Ploeg M, Breneman V, Dutko P, et al. Access to affordable and nutritious food: Updated estimates of distance to supermarkets using 2010 data. United States Department of Agriculture;2012.
- Bureau USC. 2010 census urban and rural classification and urban area criteria. 2015; <https://www.census.gov/geo/reference/ua/urban-rural-2010.html>.
- ArcGIS Desktop [computer program]. Version 10.3. Redlands, CA: Environmental Systems Research Institute; 2015.
- Version 21. Chicago: SPSS Inc.; 2012.
- Health HiSDo. Behavioral Risk Factor Surveillance System, 2017. In: Health HiSDo, ed2019.
- CDC CfDcaP. BRFSS Prevalence & Trends Data [online], 2017. In: National Center for Chronic Disease Prevention and Health Promotion DoPH, ed2019.
- Alkon AH, McCullen CG. Whiteness and farmers markets: Performances, perpetuations... contestations? *Antipode*. 2010;43(4):937-959.
- Kato Y. Not just the price of food: Challenges of an urban agriculture organization in engaging local residents. *Sociological Inquiry*. 2013;83(3):369-391.
- Lee Y. The role of local food availability in explaining obesity risk among young school-aged children. *Social Science and Medicine*. 2013;74(8):1193-1203.
- Slack T, Myers CA, Martin CK, Heymsfield SB. The geographic concentration of U.S. adult obesity prevalence and associated social, economic, and environmental factors. *Obesity*. 2014;22(3):868-874.
- Guptill A, Larsen DA, Welsh R, Kelly E. Do affluent urban consumers drive direct food sales in the Northeast United States? A three-part analysis. *Journal of Agriculture, Food Systems, and Community Development*. 2018;8(2):73-86.
- Lyson MC. The class politics of alternative food: Informing public health policy and remedying health inequality. *Sociology Compass*. 2014;8(10):1216-1228.
- Richardson AS, Ghosh-Dastidar M, Beckman R, et al. Can the introduction of a full-service supermarket in a food desert improve residents' economic status and health? *Annals of Epidemiology*. 2017;27(12):771-776.
- Polthukuchi K. Attracting supermarkets to inner-city neighborhoods: Economic development outside the box *Economic Development Quarterly*. 2005;19(3).
- GreenWheel Food Hub. 2018; <http://www.greenwheelfoodhub.org/>. Accessed March 25, 2018.
- Halperin D. Feeding the needy in paradise: Hawaii brings farmers' markets right to their door. 2014; <http://nationswell.com/say-aloha-food-insecurity-honolulu-video/>. Accessed March 25, 2018.