

BRIDGING THE GAP: DO FARMERS' MARKETS HELP ALLEVIATE IMPACTS OF FOOD DESERTS?

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As evidence mounts regarding the relationship between diet and various health indicators such as cardiovascular disease, obesity, and other chronic diseases, the promotion of farmers' markets has been proffered as a means to increase consumption of nutritious foods (Larsen, Story, and Nelson 2009). However, disparities in participation by low-income individuals and communities have also been noted, as many of the beneficiaries of the relocalization movement are of the metropolitan middle class (Jarosz 2008; Kremer and DeLiberty 2011). The suggestion of a spatial and socioeconomic disparity in access to these types of healthy food choices is reminiscent of arguments made in regard to food and amenity access in general. It has been posed as an effect of the reduction or elimination of urban amenities that reached a low point in the 1980s with net losses of supermarkets in cities while net gains were experienced nationwide (Eisenhauer 2001), mostly in the suburban metropolitan areas. However, in the case of farmers' markets, it may be the failure of thriving markets to arise in such communities, not necessarily an exodus. Briggs et al. (2010) suggest low-income communities provide unique opportunities for direct marketing as well as economic, social, and even cultural barriers to successful operation. Schmit and Gomez (2011) found that vendors in upstate New York prefer to sell in a limited number

of markets, thus supporting efforts to centrally locate markets that provide more convenient locations with ample customer base.

It is within conclusions such as those of Schmit and Gomez (2011) in which concerns arise over the ability of a relocalized food system to balance food and farm security (Hinrichs and Kremer 2002; Guthman, Morris, and Allen 2006). Seeking the possibility of "win-win" scenarios, Guthman, Morris, and Allen (2006) explicitly ask whether it is possible to simultaneously provide fresh, nutritious food that is affordable to low-income consumers while providing adequate returns to small-scale farmers via farmers' markets. Centralizing farmers' markets to high-traffic areas undoubtedly provides increased opportunity for market and vendor success and thus positive community outcomes in terms of increased access to fruits and vegetables as well as increased retention of food dollars in the local community. However, its ability to address food security for those most in need of improved access remains to be seen.

Largely driven by a push for economies of scale (Kaufman 1998), the effects of a consolidating and centralizing food system (Hendrickson et al. 2001) are already felt throughout many low-income communities, both in urban (Eisenhauer 2001; Larsen and Gilliland 2008; Sparks, Bania, and Leete 2009) and rural settings (Morton and Blanchard 2007; Schafft, Jensen, and Hinrichs 2009; Sharkey 2009). The evolution of the phenomenon now commonly known as "food deserts" is the result (Wrigley, Warm, and Margetts 2003; Smoyer-Tomic, Spence, and Amrhein 2006; Sparks, Bania, and Leete 2009). Exact and consistent definitions of a food desert across studies are uncommon. For example, Morton and Blanchard (2007) identified food deserts as counties in which all residents must drive

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more than 10 miles to the nearest supermarket chain. In contrast, [Larsen and Gilliland \(2008\)](#) estimated the prevalence of food deserts through multiple means, including within walking distance (500 or 1,000 meters) and public transit availability. Despite efforts to provide quality representations of food deserts in many locales, the majority of these studies minimally address or even fail to include access to farmers' markets. Most studies generally utilize grocery store and supercenter locations as the source of fresh produce. However, the omission of food venues other than supermarkets may overlook the servicing of areas by independent and smaller stores as well as other alternative venues ([Bader et al. 2010](#)).

Our objective is to uncover the presence of traditionally conceived food deserts in Washington State. Traditionally conceived food deserts are those high-poverty areas with restricted access to healthy food; first considered here to be access to a large grocery store. We then move beyond the traditional consideration to further evaluate whether the present distribution of farmers' markets aids in minimizing the effects of food deserts or, alternatively, whether they reproduce the same locational disparities as already observed. Identification of food deserts and gaps in access to farmers' markets are only half of the equation. Several studies have demonstrated the remarkably low, less than 25%, participation rates in farmers' markets by those receiving food stamps (e.g., [Kantor 2001](#)). Similarly, [Conrey et al. \(2003\)](#) observed Women, Infants, and Children (WIC) Farmers' Market Nutrition Program (FMNP) redemption rates of less than 70% over the span of 1996–2001. [Alexander \(1996\)](#) suggests that the three keys to improving the success of FMNPs are education, access to markets, and market quality. To get at the heart of the food insecurity issue in this study, we conclude with an examination of the effects of market location and their relationship to low-income communities on redemption of food assistance program benefits, namely, the FMNP.

Data and Methods

A spatially referenced database of all supermarkets in the state of Washington was created consistent with much of the existing literature on food deserts. Similar to the restrictions used by [Sparks, Bania, and Leete \(2009\)](#), these

supermarkets are assumed to sell a full suite of food products, though the requirement that they be a part of a large distribution system supplying multiple stores or a chain is relaxed in order to maintain those grocers that remain independent entities of significant size. We begin from the premise that supermarkets with at least 50 employees will likely be able to supply the full host of products. The supermarket locations are populated using a 2010 dataset from Reference USA. The complete set includes 3,812 retail food sources ranging in size from supermarkets to convenience stores. From this original set, all retailers whose primary or secondary designation aligned with what could reasonably be considered a major food retailer was designated a "grocer." All designations not meeting the established requirements were designated "nongrocers." The grocer designees were further segmented by number of employees, with the creation of three categories: >50 employees, >20 employees, and >10 employees. Spot checks of the data and consultation with the data-generating firm were done to verify the reliability of the data. The remainder of the study is conducted using the subset of grocers that meet the 50-employee cutoff.

Washington's collection of farmers' markets is increasing yearly, with a large portion centered in the greater Seattle area: 57 out of 169 markets in 2010. An accurate database of market locations has been created and maintained; it includes operating times for these markets and is continually updated as new markets come on, move, or fail. Using this dataset of markets, the sites were geocoded in ArcGIS to the most accurate level feasible. Unlike supermarkets and other permanent sites of retail activity, a farmers' market may move from year to year. This is especially true for the lesser or nonestablished markets as they seek out the most suitable site to locate. With such uncertainty and variability in market locations, all attempts were made to geocode the sites to the most recent market location that corresponds to the location of the market during the time period for which data on food assistance redemption figures were estimated. Distance measures are created in the same manner as for supermarkets.

Food deserts are generally conceived as a function of a population's ability to traverse a specified distance to a source of nutritious food. Given the highly diverse geographic setting of Washington, one metric for this assessment does not capture a reliable measure of access

limitations for all residents of the state. As such, two metrics are used: the first is based on walkable distances and used for the denser, urban tracts, and the second uses a driving distance for the sparser tracts. To make a logical separation of which tracts to consider under which metric, the 2000 US Census Tracts and the urbanized areas (UAs) of Washington are used to designate those areas to be considered urban and thus warranting consideration via walkable distances.

Hewko, Smoyer-Tomic, and Hodgen (2002) suggest that access to amenities under the assumption that the population may likely walk can be estimated using a Euclidean distance given the propensity of walkers to use a combination of network sidewalks and “short-cuts.” A reasonable walking distance of 0.62 mile is used as the estimated breakpoint between high and low access. This measurement maintains general consistency with other food desert studies with a walking distance for urban areas in the range of 0.31 miles (Wrigley, Warm, and Margetts 2003) to 1 mile (Ver Ploeg et al. 2009). However, the same is not true for driving trips in which the path is, almost without exception, linked to the road network. As such, the road network will be the basis for measuring access for the remaining tracts of the state. By using travel distance over a Euclidean distance, we more reliably estimate the time constraints that impact consumer decisions or inabilities to navigate required distances. Identification of what constitutes high versus low access has typically been done using a 10-mile estimate. All areas within this distance will be considered high-access areas, while those areas beyond this distance will be considered low access. Those tracts, urban or rural, considered low access and having greater than 20% of its population living under the poverty line, according to the 2000 Census, are deemed to be food deserts.

Results

The retail food landscape for the purposes of purchases for “food at home” (FAH) is readily observed to have two distinct components: that of the urban foodscape and that of the rural foodscape. As such, it is not surprising that there is a high density of grocers in the greater Seattle area, as well as other smaller clusters in the other UAs of the state. Farmers’ markets form rather similar clusterings in the UAs and throughout the state as do the grocers. There are, however, observations of farmers’

markets in several rural areas not served by what is considered to be a full-service grocer.

The food desert notion is a twofold phenomenon. It is the manifestation of not only the distance needed to travel to obtain healthy and affordable food but also the ability to traverse that distance in a reliable and consistent manner without undue hardship. Figure 1 provides a depiction of poverty rates at the census-tract level throughout the state. The figure suggests a spatial pattern as to where high poverty occurs, both in urban and rural contexts. Figure 1 additionally reveals the occurrences of rural food deserts. The Moran’s I statistic is a test of the occurrence of spatial autocorrelation in a variable. Spatial autocorrelation of poverty rates becomes important when considering amenity access inequalities. Indication of spatial autocorrelation is confirmed (Moran’s $I = 0.4794$; $P < 0.001$) for tract level poverty rates, thus indicating a very significant degree of clustering. Similarly, an even higher degree of clustering is indicated when considering vehicle ownership rates ($I = 0.5332$; $P < 0.001$). The owning or accessibility of a vehicle is an important determinant in traversing the necessary distance between residence and food retailer. Finally, a bivariate depiction of Moran’s I measuring correlation between variables reveals that not only should tracts be considered to be clustered by poverty rate and by vehicle ownership rates but that these two variables are mutually clustered ($I = 0.3383$; $P < 0.001$).

The Urban Food Desert

Washington has 13 UAs, of which three contain no tracts that meet the food desert criteria set forth in this paper, either because there are no tracts with greater than 20% poverty or because those high-poverty tracts that may be present do not demonstrate low-access conditions. Within the 13 UAs, 737 of 1,004 tracts could be considered low-access tracts, meaning their population-weighted distance to a full-service grocer is more than a 1 km walk. Relaxing the 50-employee cutoff to one of 20 employees would only bring 63 tracts out of the low-access designation, leaving 674 tracts remaining at a distance greater than 1 km and indicating a lack of sensitivity to store size thresholds. In addition, 345 of the 737 low-access tracts, 47%, are at distances less than 1 km from a nongrocer. Recall that nongrocers are those establishments, such as convenience stores, that are considered to not be a full-service food retail outlet

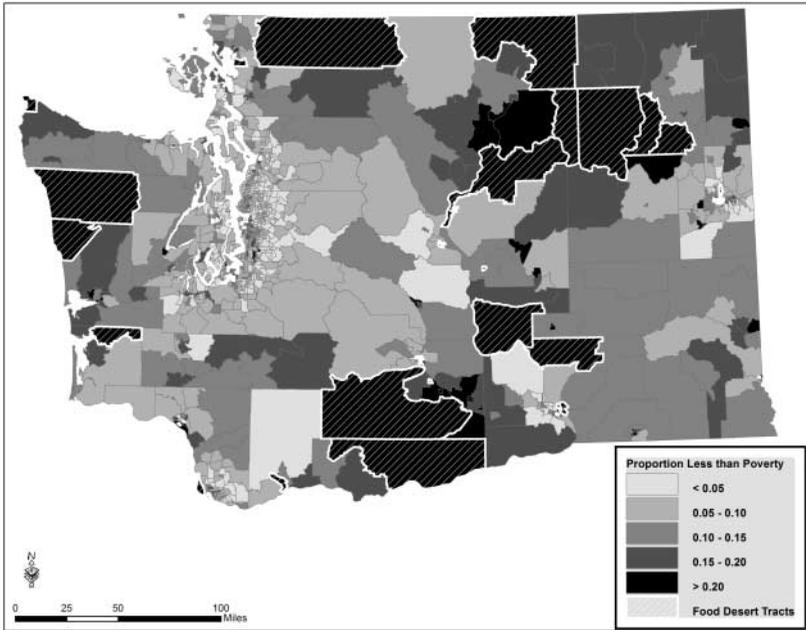


Figure 1. Statewide, tract-level poverty rates

and are often associated with less healthy food. Of the 1,004 tracts, 10% qualify as high poverty by standards established. Considering only these high-poverty tracts, 64 of the 104 are found to be low access. This observation, compounded with the previously described relationship between poverty and vehicle ownership in urban areas, leads us to identify these 64 tracts as urban food deserts. Additionally, 59 of these 64 tracts, 92%, are found to be at distances of less than 1 km from a nongrocer.

On average, urban tracts are found to be 2.06 km from a full-service grocer, 1.23 km from a nongrocer, and 4.24 km from the nearest farmers' market. Narrowing the focus to just those tracts with a high poverty rate, we observe a reduced distance for each category, that is, 1.36 km, 0.57 km, and 2.40 km, respectively. At first, these averages may seem counterintuitive given that our premise is centered on the lack of access for high-poverty tracts; however, these results are consistent with those previously observed in the Portland area (Sparks, Bania, and Leete 2009). They suggest the distribution may be attributable to the spatial history of the region, the recent and steady population growth, and land-use planning laws that result in less concentrated residential poverty and thus less defined access issues. That being said, 62% of the high-poverty

urban tracts have observed food access constraints. Additionally, Sparks and colleagues (2009) point out that the food desert classification used here and in their work only identifies the access limitations of those poorer residents who live in tracts of high poverty concentration and omits those who live in less-concentrated tracts. Subsequently, they suggest the potential for food access problems outside of food desert considerations. The urbanized areas of Washington State support this concern. Nearly 3.5 million residents reside in low-access tracts, of which almost 300,000 live below the poverty threshold. Fewer than 70,000 of these residents live in high-poverty tracts. Thus, consideration of only high-poverty tracts omits 77% of the urban population living below the poverty line.

Turning to the location of farmers' markets in relation to the observed food deserts in urban areas, we observe that of the 64 food desert tracts, 16 are within 1 km of a farmers' market. Of the nearly 70,000 food desert residents living below the poverty line, 23% are less than 1 km from a farmers' market. The 16 tracts are spread throughout the state, with 8 of the 10 UAs having food desert tracts possessing at least one farmers' market within walking distance. Fifteen of the state's 94 UA farmers' markets are located in what are traditionally considered food deserts.

The Rural Food Desert

Within Washington State, 82 tracts are identified as meeting the defined requirements of a food desert; 18 of these tracts are rural. These tracts can be seen in Figure 1. The tracts identified as rural food deserts have a population weighted average distance from a grocer of almost 30 miles, which is considerably higher than the threshold distance for the designation. Additionally, it could be argued and is a valid consideration that grocers in rural areas may still provide a large selection of food options though at smaller sizes, thus they would also have fewer employees. Dropping the required employee size to 20 reduces the average distance to 17 miles, and 7 of the 18 tracts would no longer come under the food desert identification, thus indicating a fair amount of sensitivity of food desert assumptions to the store size threshold chosen. Interestingly, all of these tracts are considerably closer to nongrocer sources of food, 16 km on average.

Access to farmers' markets is improved over grocers in 13 of the 18 tracts, resulting in an average distance of 19 miles, an average that trends high because 3 tracts are in excess of 80 km from a market. Rural farmers' markets, that is, those outside of a 0.5-km buffer around a UA or urban cluster (UC), constitute 38 of the 169 markets statewide. Three of these 38 markets are located in food deserts. Markets that have yet to be discussed are those that do not exactly fit the definition of rural and yet are not found in association with an urbanized area. These markets are found in UCs. Thirty-Seven markets make up this group. Three of these UC markets are located in rural food deserts.

Utilizing the WIC FMNP

The above urban and rural sections unfold the locational aspects of both grocers and farmers' markets throughout the state. However, the picture is not complete until a discussion of their implications for usage of the WIC program is thought through. In 2010 123 farmers' markets collected nearly \$700,000 in WIC FMNP vouchers. Table 1 highlights the basic elements of the differences between markets in UAs, UCs, and rural areas. From this table, it becomes evident that urban markets tend to be larger in both the number of farmers participating and the volume of WIC usage. Additionally, higher percentages of both UA

Table 1. 2009 WIC FMNP Redemptions by Market Type

WIC FMNP Redemption	Urban Areas	Urban Clusters	Rural
Total number of markets	94	37	38
Number of markets accepting WIC FMNP	76	28	19
Average number of vendors accepting WIC FMNP	15	11	6
Average WIC (\$) per market	\$7,577	\$3,781	\$729
Total WIC (\$)	\$575,892	\$105,872	\$13,852

and UC markets are able to accept the WIC vouchers.

Further variation can be observed when considering markets located in food deserts as compared to those not in food deserts. The markets within food deserts, 11 of them accepting WIC vouchers, on average saw double the amount of vouchers redeemed, nearly \$11,000 in 2010, as compared to those markets outside of the food deserts, which redeemed just over \$5,000. These distinctions are evident even when considering the size of the market in terms of the number of farmer vendors present. As encouraging as these redemptions are, an unsettling notion takes shape in that of the 21 identified markets in food deserts, 6 are either rural or found in UCs, as opposed to an urban area, and only 2 of the 6 were set up to accept WIC vouchers in 2010. However, 9 of the 15 markets found in urban food deserts do accept the WIC vouchers and collect them at rather impressive levels. While farmers' markets in food deserts make up only 8% of the markets statewide, they collect more than 17% of the WIC vouchers.

Discussion and Conclusion

The primary objective of this research is to implement spatially informed methodologies in order to aid in the determination of whether potential food deserts throughout Washington State, both in urban and rural settings, are systematically alleviated or exacerbated by farmers' markets. Additionally, we sought to understand how this relationship relates to

the effectiveness of food assistance programs aimed at reducing food poverty and insecurity at community levels. Results suggest distinct differences in current abilities of markets to significantly alter the healthy food landscapes of low-income areas of Washington, depending on whether the market is in a rural or urban setting. One quarter of urban food deserts were found to have the effects of their low access to food reduced, even with the heavy tendency of farmers' markets to locate close to the supermarkets whose locations were used to determine the presence of food deserts.

In larger urbanized areas such as Seattle, 29 of the 57 markets are found to be within the 1-km buffer of a grocer, and many others are not far away from them. These observations, should they continue to unfold, have several potential implications. Schmit and Gomez (2011) found that farmers' market vendors find positive value in locating near other retail activity, an effect of agglomeration in a sense. Thus it should be of little surprise that we see so many of these markets locating close to established grocers, which are generally in areas of more retail activity. Despite this trend, 15 farmers' markets, 9 of which accept WIC, are found in urban food deserts. These observations suggest that nearly a quarter of the high-poverty residents of food deserts can be considered to have high access to a healthy food source when considering farmers' markets in conjunction with supermarkets.

The generally positive results for food access witnessed in the urban food deserts do not carry over as well to those of the smaller UCs or rural areas of the state. Here, we find that of the 18 rural tracts identified as food deserts, 13 have distances reduced with access to a farmers' market but not to a large enough degree to take them out of a food desert category. Additionally, a combined six markets between the rural and UC areas of the state are found in food deserts, though none accepted WIC. These markets also tend to be very small, with only a few vendors at each.

Time and location considerations suggest that market vendors receive higher satisfaction from selling in a limited number of larger markets that possess more amenities and varied vendors (Schmit and Gomez 2011). The rapid proliferation of markets in the greater Seattle area is evidence of this observation. With the exception of a handful of vendors, most farmers participating in markets do so at five or fewer markets. Of the 688 farmers who accepted WIC vouchers in 2009, 659 were at

five or fewer markets and 460 attended only one. It is thus not surprising that rural markets are considerably smaller than their UA or even UC counterparts, with only an average of six farmers attending the rural markets and accepting WIC vouchers, while 15 farmers on average do so in UA markets. These early observations support the concerns raised over whether it is possible to simultaneously provide fresh, nutritious food that is affordable to low-income consumers while providing adequate returns to small-scale farmers at farmers' markets.

We demonstrate here that central to all potential food security solutions is the necessary consideration of access and thus cost of access. Further, access is not simply a manifestation of a certain distance to be travelled. The relationship between poverty rate and vehicle ownership makes the ability to traverse any given distance an important consideration in addition to that of simply the actual distance. This interaction suggests that as the poverty level of a given geographic region increases, the effect of a needed distance to travel to utilize a food assistance benefit is heightened. These relationships place added value on collaboration between markets in or near high-poverty areas and food assistance programs to ensure the prevention of a spatial mismatch.

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