A Research Analysis
By

Gregory J. McKee, PhD-Economics
and
Shawn C. Kaskie, PhD Candidate-Human Sciences: Leadership

Food Deserts in Nebraska:

A revised methodology and analysis

September, 2024

Funding for this study was provided by the Center for Rural Affairs and the Nebraska Grocery Industry Association. All opinions, conclusions or recommendations expressed are those of the author(s) and do not necessarily reflect the views of the CFRA or NGIA.

Introduction

Food deserts present a significant obstacle to healthy lifestyles and health outcomes for Nebraska residents. They are designated based on whether residents in a geographic region can access affordable, healthy foods. This study assesses the extent of limited access areas in Nebraska to affordable and nutritious food and describes how changes in food markets affect the ease with which Nebraska households can access food at retail outlets.

Nebraska Food Deserts Using USDA Definition

A food desert definition used by the United States Department of Agriculture (USDA) designates healthy food as unaffordable when more than 20% of the population in a Census tract is classified as below the poverty rate or when the median family income in the tract is less than 80% of the state median. The definition designates healthy food as inaccessible when at least 33% of the population in a region resides more than 10 miles from the nearest supermarket.

Figure 1 shows locations of rural Nebraska food retail outlets and food deserts when the USDA definition is applied. Figure 1 includes grocery store locations as of 2023 (CFRA), which are indicated by a shopping cart icon. The number of food retail outlets in a community is designated by a red circle containing a white number. Income data, used to indicate affordability, are based on 2024 estimates. Farmers market locations (2022 UNL BFBL) are also displayed, designated by eating utensil icons. Pink areas in Figure 1 are Census tracts designated Low Income and Low Access "Food Deserts" per the USDA (2019) definition using 2024 ESRI income estimate data. These Census tracts are found in eleven Nebraska counties (Blaine, Custer, Duel, Dundy, Grant, Hitchcock, Hooker, Jefferson, Keya Paha, Morrill, and Sioux).

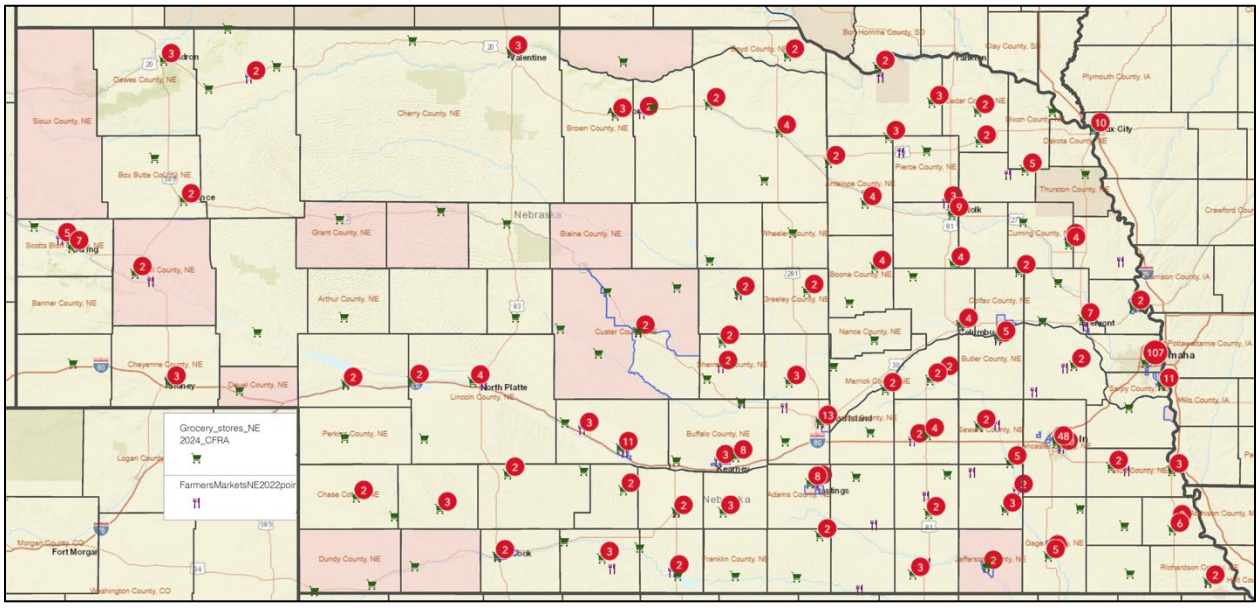

Figure 1. Nebraska Food Deserts, as Designated by USDA Food Desert Definition

Nebraska Food Deserts Using a Modified Definition

Financial management practices, including asset ownership and income deferral, used by rural Nebraska residents can increase spending potential beyond income. These practices call for modifications to the Low-Income criterion of the USDA food desert definition. We use net worth to measure additional spending potential. Net worth could be invested in creating retail food outlets or liquidated to purchase food at existing retail food outlets. Net worth data are available by zip code. We consider any zip code with an average net worth per person of less than $1,000,000 to also qualify as a region where healthy food may be unaffordable. We use data based on projected net worth in 2028 (ESRI). We consider investments in food retail businesses by most population members to be unlikely at this level of net worth.

Figure 2 shows the combined regions designated as food deserts when considering the Low Income and Low Access USDA definition and accounting for potential spending power by Nebraska residents via their net worth. Using our expanded definition, it shows the Census tracts (in pink) and the zip code regions (in tan/brown fade) that can be described as food deserts.

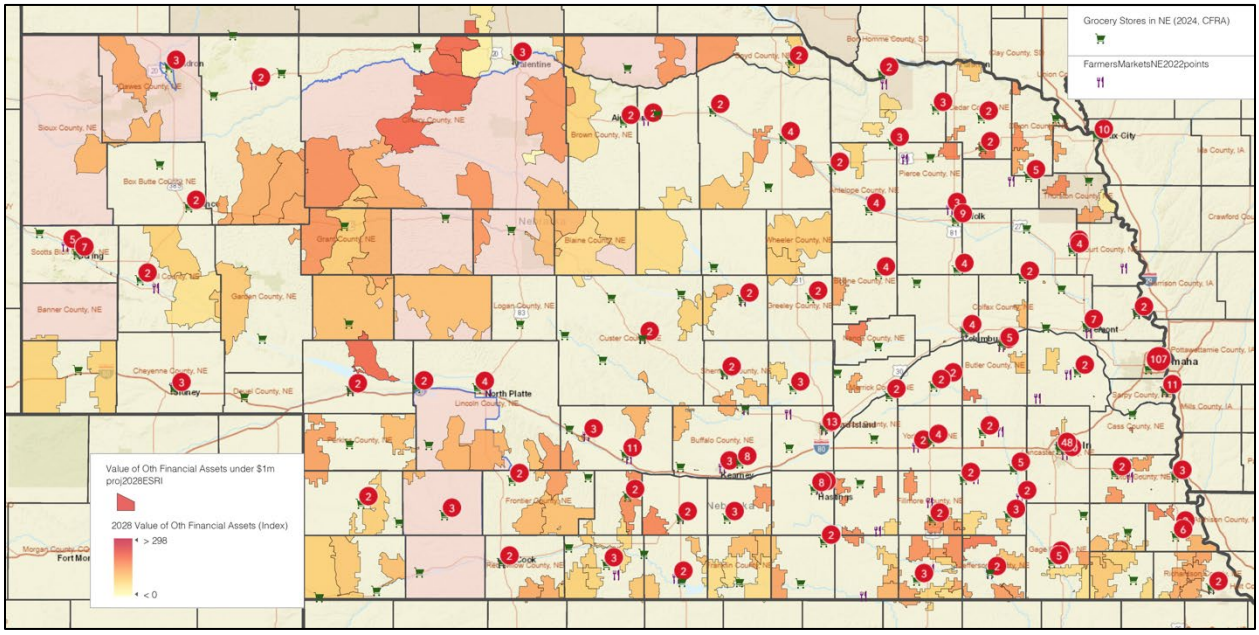

Figure 2. Projected Nebraska Food Deserts in 2028, as Designated by Modified Food Desert Criteria

Applying the USDA definition of Low Access for 20 miles and accounting for low net worth indicates Census tracts in twelve counties can be designated food deserts. In addition, several zip codes have an average of less than $1,000,000 in household spending on goods and services each year. Table 1 lists Census tracts designated as food deserts in Nebraska using the 20 miles to nearest grocery store threshold. Table 2 lists zip codes designated as food deserts where inadequate spending potential, as measured by net worth, is also present. In our analysis, all areas listed in Tables 1 and 2 can be designated food deserts.

Census Tract	County
31005958300	Arthur
31009972400	Blaine
31031955900	Cherry
31045950600	Dawes
31085961500	Hayes
31087962700	Hitchcok
31091956700	Hooker
31103975400	Keya Paha
31111960600	Lincoln
31117957900	McPherson
31165950100	Sioux
31171957100	Thomas

Table 1. Nebraska Census Tracts Designated as Food Deserts Based on Estimated Spending Potential through 2028

Zip Code	County	Zip Code	County	Zip Code	County	Zip Code	County
68773 (Royal)	Antelope	68929 (Bloomington)	Franklin	68438 (Sprague)	Lancaster	69144 (Keystone)	Perkins
68821 (Brewster)	Blaine	68960 (Naponee)	Franklin	69132 (Dickens)	Lincoln	69161 (Seneca)	Perkins
68833 (Dunning)	Blaine	68972 (Riverton)	Franklin	68816 (Archer)	Merrick	69167 (Tryon)	Perkins
68655 (Primrose)	Boone	69039 (Moorefield)	Frontier	69125 (Broadwater)	Morrill	69216 (Kilgore)	Perkins
68719 (Bristow)	Boyd	69042 (Stockville)	Frontier	68943 (Hardy)	Nuckolls	69221 (Wood Lake)	Perkins
68858 (Miller)	Buffalo	68936 (Edison)	Furnas	68964 (Oak)	Nuckolls	69366 (Whitman)	Perkins
68861 (Odessa)	Buffalo	68946 (Hendley)	Furnas	68974 (Ruskin)	Nuckolls	69367 (Whitney)	Perkins
68001 (Abie)	Butler	68948 (Holbrook)	Furnas	68324 (Burr)	Otoe	68923 (Atlanta)	Phelps
68014 (Bruno)	Butler	69046 (Wilsonville)	Furnas	68323 (Burchard)	Pawnee	68738 (Hadar)	Pierce
68667 (Surprise)	Butler	68309 (Barneston)	Gage	68380 (Lewiston)	Pawnee	68747 (Mclean)	Pierce
68749 (Magnet)	Cedar	68381 (Liberty)	Gage	68441 (Steinauer)	Pawnee	69026 (Danbury)	Red Willow
69027 (Enders)	Chase	68458 (Virginia)	Gage	69135 (Elsmere)	Perkins	69036 (Lebanon)	Red Willow
68452 (Ong)	Clay	68969 (Ragan)	Harlan	69142 (Halsey)	Perkins	68445 (Swanton)	Saline
68934 (Deweese)	Clay	68977 (Stamford)	Harlan	69148 (Lisco)	Perkins	68453 (Tobias)	Saline
68954 (Inland)	Clay	68711 (Amelia)	Holt	69157 (Purdum)	Perkins	68055 (Rosalie)	Sarpy
68975 (Saronville)	Clay	68734 (Emmet)	Holt	69171 (Willow Island)	Perkins	68042 (Memphis)	Saunders
68659 (Rogers)	Colfax	68742 (Inman)	Holt	69212 (Crookston)	Perkins	68330 (Cordova)	Seward
68828 (Comstock)	Custer	68838 (Farwell)	Howard	69214 (Johnstown)	Perkins	68364 (Goehner)	Seward
68881 (Westerville)	Custer	68350 (Endicott)	Jefferson	69219 (Nenzel)	Perkins	68844 (Hazard)	Sherman
68834 (Eddyville)	Dawson	68377 (Jansen)	Jefferson	69220 (Sparks)	Perkins	68871 (Rockville)	Sherman

68732 (Dixon)	Dixon	68440 (Steele City)	Jefferson	69331 (Angora)	Perkins	68315 (Belvidere)	Thayer
68751 (Maskell)	Dixon	68332 (Crab Orchard)	Johnson	69335 (Bingham)	Perkins	68326 (Carleton)	Thayer
68072 (Winslow)	Dodge	68945 (Heartwell)	Kearney	69340 (Ellsworth)	Perkins	68362 (Gilead)	Thayer
69030 (Haigler)	Dundy	68753 (Mills)	Keya Paha	69351 (Lakeside)	Perkins	68375 (Hubbell)	Thayer
69037 (Max)	Dundy	69128 (Bushnell)	Kimball	69353 (Mcgrew)	Perkins	68429 (Reynolds)	Thayer
69041 (Parks)	Dundy	68724 (Center)	Knox	69354 (Marsland)	Perkins	68837 (Elyria)	Valley
68365 (Grafton)	Fillmore	68789 (Winnetoon)	Knox	69355 (Melbeta)	Perkins	68952 (Inavale)	Webster
68416 (Ohiowa)	Fillmore			69365 (Whiteclay)	Perkins		
68444 (Strang)	Fillmore						

Table 2. Nebraska Zip Codes Designated as Food Deserts Based on Estimated Spending Potential through 2028

This expanded region, relative to USDA's Low Income and Low Access definition, is due to retail food outlets potentially being present within the driving radius of a typical rural Nebraska drive but insufficient spending potential to affordably purchase quality food.

Trends in Nebraska Food Deserts

Trends in household spending potential affect the persistence of Nebraska food deserts. Zip codes listed in Table 2 are assigned their food desert status based on trends in household spending potential between 2024 and 2028. Zip codes with households whose spending potential increases over time will become steadily less likely to remain food deserts if current economic trends continue. For these, the strain on households to affordably access nutritious food will decrease. Figure 3 shows the areas at greatest risk of store closure through 2028. Spending potential will change the increase between 2025 and 2028 in counties whose spending potential grows by 3 percent or more each year. This includes zip codes in 11 counties (Table 3) (Blaine, Boone, Buffalo, Cedar, Clay, Dixon, Dodge, Dundy, Frontier, Keya Paha, Knox, Lancaster, Lincoln, Perkins, Saline, Saunders, and Thayer) and counties. It should be remembered, however, that none of the zip codes designated food deserts through 2028 (Table 2) will emerge from this designation before that time. Zip codes in counties whose spending potential grows by less than 1.66% (Table 3) will have grocery stores at the greatest risk of closing and may need economic remedies to improve their viability. This includes zip codes in 19 counties (Antelope, Clay, Colfax, Custer, Dundy, Fillmore, Franklin, Fumas, Gage, Harlan, Jefferson, Merrick, Nuckolls, Pawnee, Perkins, Sarpy, Thayer, Valley, and Webster). Of the areas we expect to remain as food deserts through 2028 that currently have stores, we expect the stores in Hendley (68946) and Haigler (69030) are most likely to close.

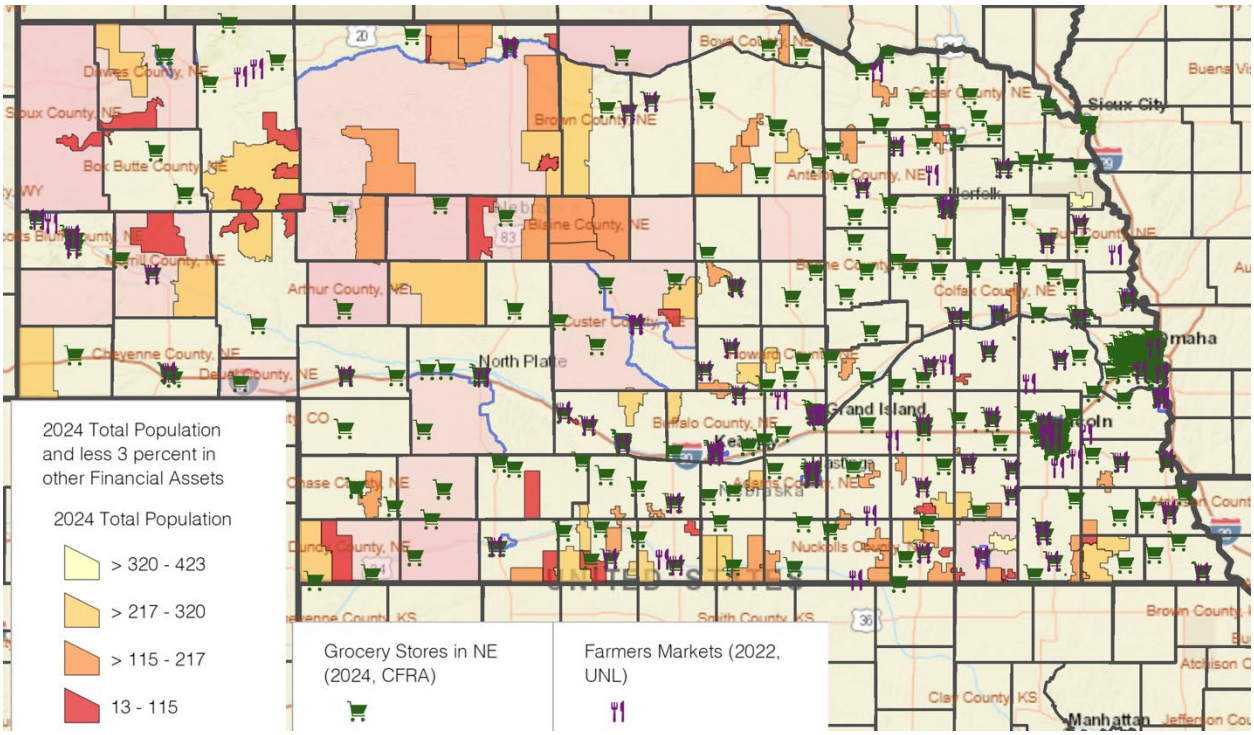

Figure 3. Nebraska Regions of Greatest Financial Risk to Food Retailers, Counties Designated Food Deserts through 2028

ZIP Code	Compound Annual Growth Rate	ZIP Code	Compound Annual Growth Rate	ZIP Code	Compound Annual Growth Rate	ZIP Code	Compound Annual Growth Rate
69219 (Nenzel)	-0.90%	68719 (Bristow)	1.68%	68747 (McLean)	2.14%	69042 (Stockville)	2.96%
69135 (Elsmere)	-0.63%	68667 (Surprise)	1.72%	68821 (Brewster)	2.17%	68453 (Tobias)	2.96%
68934 (Deweese)	-0.23%	69027 (Enders)	1.74%	69340 (Ellsworth)	2.21%	68749 (Magnet)	2.98%
68881 (Westerville)	0.10%	68323 (Burchard)	1.74%	68751 (Maskell)	2.25%	68375 (Hubbell)	2.99%
69167 (Tryon)	0.51%	68001 (Abie)	1.77%	68834 (Eddyville)	2.26%	69039 (Moorefield)	3.04%
68816 (Archer)	0.66%	68326 (Carleton)	1.78%	68711 (Amelia)	2.26%	68789 (Winnetoon)	3.04%
69171 (Willow Island)	0.71%	69026 (Danbury)	1.79%	69142 (Halsey)	2.28%	68014 (Bruno)	3.10%
69366 (Whitman)	0.87%	68936 (Edison)	1.80%	69046 (Wilsonville)	2.31%	68861 (Odessa)	3.12%
68773 (Royal)	1.00%	69157 (Purdum)	1.81%	69161 (Seneca)	2.34%	68954 (Inland)	3.15%
68943 (Hardy)	1.08%	69221 (Wood Lake)	1.83%	69331 (Angora)	2.40%	69148 (Lisco)	3.20%
69030 (Haigler)	1.24%	68330 (Cordova)	1.87%	68858 (Miller)	2.44%	68452 (Ong)	3.28%
68972 (Riverton)	1.26%	68960 (Naponee)	1.88%	68828 (Comstock)	2.44%	68753 (Mills)	3.33%
68659 (Rogers)	1.28%	68948 (Holbrook)	1.90%	69214 (Johnstown)	2.44%	69132 (Dickens)	3.38%

68952 (Inavale)	1.30%	69354 (Marsland)	1.90%	68364 (Goehner)	2.50%	69144 (Keystone)	3.40%
68969 (Ragan)	1.33%	68871 (Rockville)	1.90%	68429 (Reynolds)	2.50%	68732 (Dixon)	3.48%
68929 (Bloomington)	1.35%	68974 (Ruskin)	1.91%	68838 (Farwell)	2.51%	69037 (Max)	3.66%
68365 (Grafton)	1.37%	69335 (Bingham)	1.92%	68444 (Strang)	2.55%	68655 (Primrose)	3.91%
69220 (Sparks)	1.37%	68381 (Liberty)	1.93%	69212 (Crookston)	2.58%	68438 (Sprague)	3.96%
68458 (Virginia)	1.39%	69125 (Broadwater)	1.94%	68844 (Hazard)	2.62%	69355 (Melbeta)	4.74%
68946 (Hendley)	1.42%	68964 (Oak)	1.97%	68309 (Barneston)	2.68%	68042 (Memphis)	4.86%
68380 (Lewiston)	1.46%	69041 (Parks)	1.98%	69128 (Bushnell)	2.70%	68072 (Winslow)	5.19%
68837 (Elyria)	1.47%	68977 (Stamford)	2.02%	68350 (Endicott)	2.78%	69353 (McGrew)	5.63%
68975 (Saronville)	1.49%	68734 (Emmet)	2.05%	68315 (Belvidere)	2.79%		
68441 (Steinauer)	1.58%	68332 (Crab Orchard)	2.10%	68324 (Burr)	2.82%		
68362 (Gilead)	1.58%	68445 (Swanton)	2.10%	69036 (Lebanon)	2.86%		
68377 (Jansen)	1.59%	68440 (Steele City)	2.12%	68923 (Atlanta)	2.89%		
68055 (Rosalie)	1.60%	68724 (Center)	2.12%	69351 (Lakeside)	2.91%		
68416 (Ohiowa)	1.62%	68742 (Inman)	2.14%	69367 (Whitney)	2.91%		
68945 (Heartwell)	1.67%	69216 (Kilgore)	2.14%	68833 (Dunning)	2.95%		

Table 3. Annual Growth of Nebraska Zip Code Spending Potential in Counties Designated Food Deserts through 2028

Understanding Market Conditions Contributing to Nebraska Food Deserts

Access to affordable and nutritious food depends on factors that affect consumer demand for it and food retailers' willingness to supply it. If consumer demand factors, such as the number of consumers or their spending potential to purchase affordable and nutritious food, are present, then we can understand whether patterns in consumer behavior will affect food deserts. Similarly, food retailer ownership turnover may explain why some areas are underserved. We explore Nebraska's food market conditions below and describe their consequences for food desert persistence or development.

Total Population

Food demand must be large enough for retailers to market food profitably. The average population of the 48 counties with census tracts or zip codes designated as food deserts was 17,000 in 2022. The food desert zip code had the smallest population of 200; the largest population was 251,000 for zip codes in Lancaster County. The median county had a population of 6,000; the 75th percentile population was 10,000. Counties with census tracts or zip codes that were not designated food deserts tended to have smaller populations. The median county had a population of 4,000; the 75th percentile population was 9,000.

These comparisons indicate that population is not the only factor affecting affordable and nutritious food access. Counties with smaller populations can support grocery stores within an accessible distance. This suggests spending potential, together with population, contributes to food deserts. Figure 4 shows this combination of factors is likely to be present in some food desert regions, such as Adams, Buffalo, Dawson, Hall, and Lincoln counties. These have relatively larger populations and still contain designated food desert census tracts or zip codes. On the other hand, some food deserts exist in low-population areas, such as Sioux, Cherry, Grant, Hooker, Thomas, and McPherson counties.

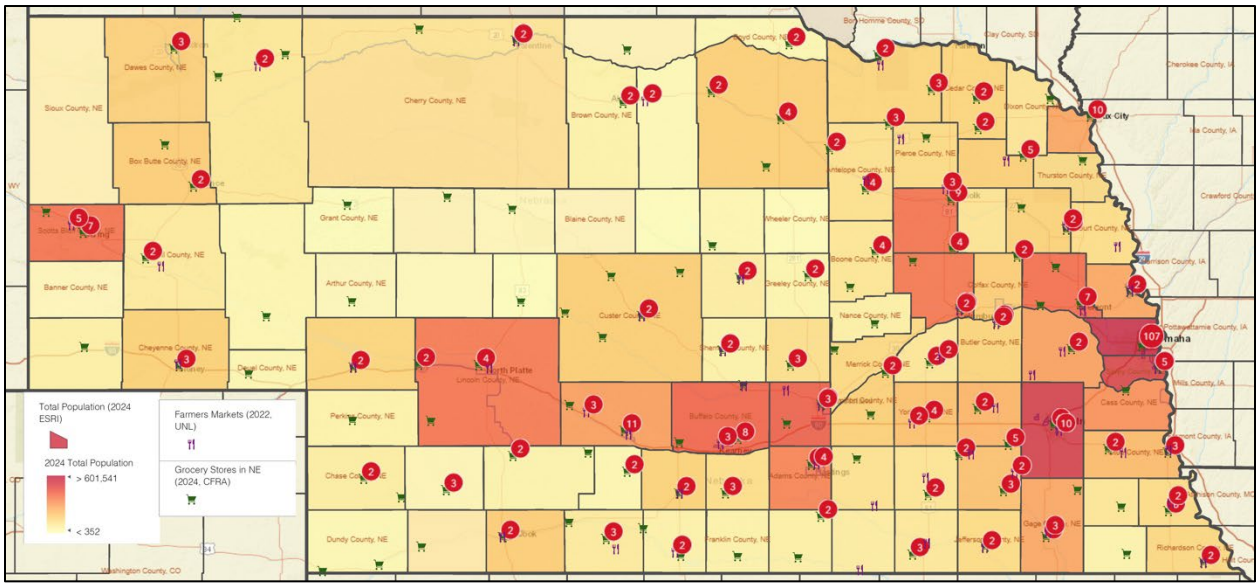

Figure 4. Total County Population and Rural Nebraska Grocery Store Location

Comparing the counties that have food desert regions with those that have no food desert designation indicates that, in more recent years, food desert regions tend to have less population, at the median, than those without. The median county population of counties without a food desert designation is 67%, as large as those that do. This suggests that relatively populated rural counties make do with food purchases by shopping outside the county or by shopping in regions within the county without a food desert designation. In other words, residents of Blaine County tend to shop in the non-food desert zip codes of Custer County. Similarly, residents of food desert zip codes in Keya Paha County travel to non-designated zip codes within the county or to non-food desert designated zip codes of Cherry County. These patterns reinforce the importance of considering the net worth characteristics within each census tract.

Population Change

Food demand must be large enough for retailers to market food profitably, and the size of this demand changes over time. 48 of 93 Nebraska counties have census tracts or zip codes meeting our food desert criteria. 46 of these 48 counties experienced an average population decline of 2.9% between 2020 and 2022. If these population growth trends continue, none of the 46 counties is likely to emerge from its food desert status by population change. Population

dynamics in Nebraska are likely to encourage persistent food deserts in the zip codes, or census tracts, of the 48 counties we designated as food deserts.

The average population of the two counties with growing populations is 1200 in 2022. They grew at an average of 18% over the 2020-2022. Only two counties with a food desert designation have a 2022 population smaller than 1200, but 11 counties with no food desert designation have smaller populations. Factors other than population are important for these two counties' access to affordable and nutritious food despite their population growth.

Consumer Age

Food demand is distinct across age groups, and USDA Food Guide recommendations for nutritious diets change with age. Current Food Guide Pyramid recommendations indicate children between 9 and 18 and adults over 50 need 150% as many daily servings of low-fat or fat-free dairy consumption as adults 19-49. The 2020-2025 dietary guidelines for Americans indicate older adults need reduced calories and increased nutrition intake to maintain health. As the Nebraska population ages, aging patterns reinforce the presence of food deserts since regions with aging populations will need to provide increased nutrition intake.

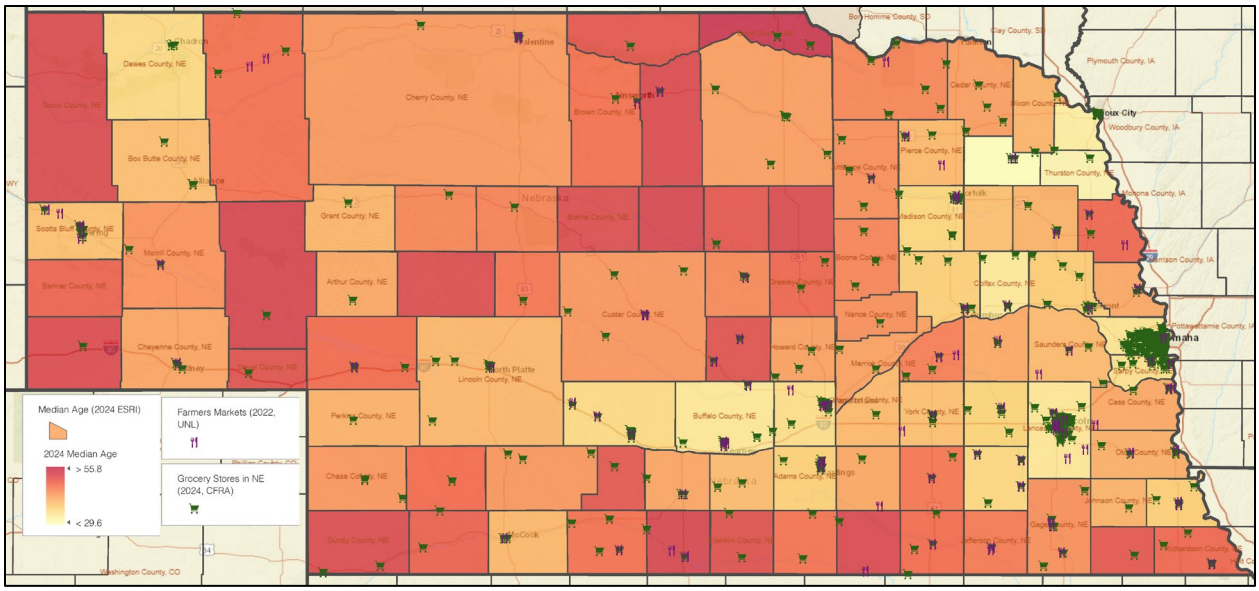

Figure 5. Median Age of Head of Household and Rural Nebraska Grocery Store Location

Using county-level population estimates, with age information, from 2010 and 2020, we examine the change in the population of adults over 65. In 2010, counties designated food deserts had a median population over 65 of 2000 persons. In 2020, these counties had a median population over 65 of 3000 persons.

Since populations over 65 need greater nutrition access than those between 19 and 49, trends in Nebraska county population aging suggest counties with food desert designations in Figure 2 will remain so. Figure 5 shows that the higher-population food desert counties like Lincoln, Dawson, Buffalo and Hall tend to have younger populations. The low-population food desert regions like Sioux, Cherry, Grant, Hooker, Thomas, and McPherson counties tend to have

relatively higher median ages than the higher-population areas. The nutrition requirements of these populations is increasing by virtue of age.

Aging trends in areas not currently designated as food deserts may also strain existing access to affordable and nutritious food. Between 2010 and 2020, the population over 65 in counties with a food desert designation increased by 914%, while the population over 65 in those without a food desert designation increased by 318% during the same period. Demand for nutrition has increased in these counties among the aging population.

Household Size

Demand for access to affordable and nutritious food is affected by household size. Single-person households have distinct dietary behaviors compared to larger households. Single-person households cannot take advantage of scale economies when purchasing food and often spend more per capita. They also buy a different mix of foods than larger households and spend a larger portion of their income away from home on food. They must also purchase and prepare food alone, limiting their time on food-related activities. Research also shows they are less likely to choose a diet described as "healthy" than larger households.

In 2010, 29% of all Nebraska households were single-person households. Among counties with food desert designations, 29% were single households. By 2020, 30% of Nebraska households were single households, and 30% of counties with food desert designations were also single households. A stable fraction of single households indicates that areas currently designated food deserts will likely continue to be so.

Between 2010 and 2020, 5.3% more households in counties with no food desert designation became single households. These are less likely to demand nutritious foods, making it more difficult for existing retailers to meet minimum wholesale orders and to operate profitably. This trend in household food demand may cause regions with increasing numbers of single households to become food deserts.

Figure 6 shows higher-population food desert counties like Buffalo, Dawson, Hall, and Lincoln counties tend to have larger household sizes. Their food desert status is less attributable to household size. Low-population food desert regions like Cherry, Grant, Hooker, McPherson, Sioux, and Thomas counties tend to have relatively smaller household sizes than the higher-population areas. Their food desert designation is relatively more attributable to household size.

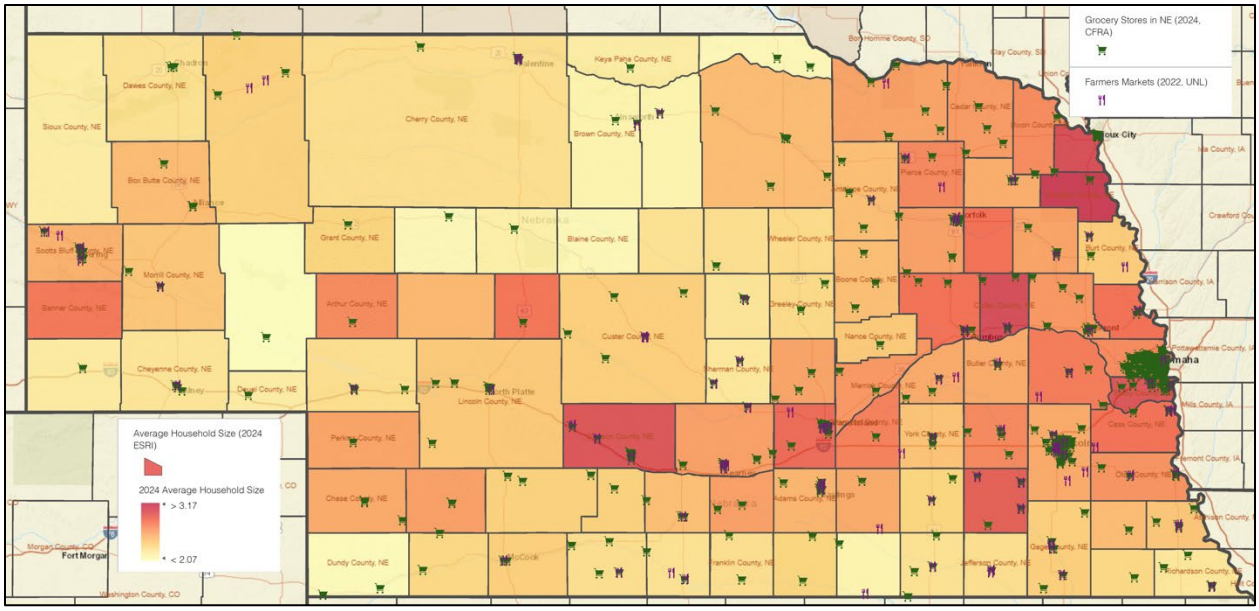

Figure 6. Average Nebraska Household Size, and Rural Nebraska Grocery Store Location

Education

Several studies indicate educational attainment affects food desert trends. The percentage of people with a college education, for example, is correlated with the demand for grocery stores, fitness facilities, and public parks. Nebraska counties, in the year 2000, without a food desert designation, had 17.6% of their population with at least some college; those with a food desert designation had 16.2% with at some college. In the year 2024, these had increased to 22.9% and 21.2%, respectively. Increasing levels of at least some college education suggest counties with existing food desert designations could emerge from this status through increased awareness of the benefits of access to nutritious food.

Figure 7 shows higher-population food desert counties like Buffalo, Dawson, Hall, and Lincoln tend to have extremes in the share of the population with bachelor's degrees, with relatively low and relatively high fractions of the county with these degrees. The low-population food desert regions like Cherry, Grant, Hooker, McPherson, Sioux, and Thomas counties tend to be more uniform in education, with a larger fraction of the population having degrees in comparison with the state average. This suggests that reasons other than education reinforce food desert trends in low-population food desert areas.

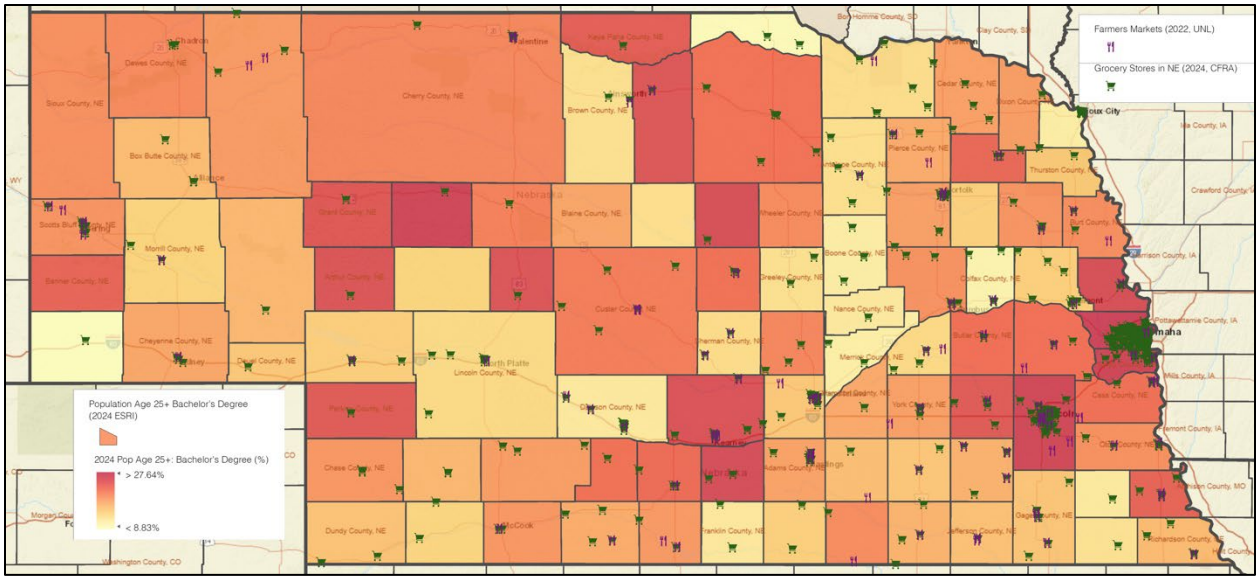

Figure 7. Percent of Population over 25 with A Bachelor's Degree, and Rural Nebraska Grocery Store Location

Household Income

Affordability is influenced by household income. We use estimated 2024 disposable income to display spending potential to detect the likely future designation of food desert regions in rural Nebraska (Figure 8). The average household disposable income of counties with food desert designations was $62,000 in 2022; the average in counties without a food desert designation was $59,000. Since Figure 2 shows only some zip codes in these counties are food deserts, pockets of relatively high and relatively low income must be present in these counties. The low-population food desert regions like Cherry, Grant, Hooker, McPherson, Sioux, and Thomas counties tend to have the lowest levels of disposable income in the state. Concerns with income-related spending potential dominate areas in these counties where a food desert designation occurs.

Affordability changes as household income changes. The average compound annual growth rate of disposable income in Nebraska between 2010 and 2022 in counties with a food desert designation was 3.9%; it was 3.6% in counties with no food desert designation. This is evidence that there are trends in affordability that may tend to diminish the prevalence of food deserts in Nebraska. On the other hand, demand for affordable and nutritious food is unlikely to increase. National data indicate a 1% increase in income results in a 0 to 0.02% increase in unprocessed meat expenditures, a 0.04% increase in milk expenditures, a 0.17% increase in fruit expenditures, and a decrease in vegetable expenditures. Increases in nutritious food expenditures of a few percent will only happen with substantial changes in household spending power.

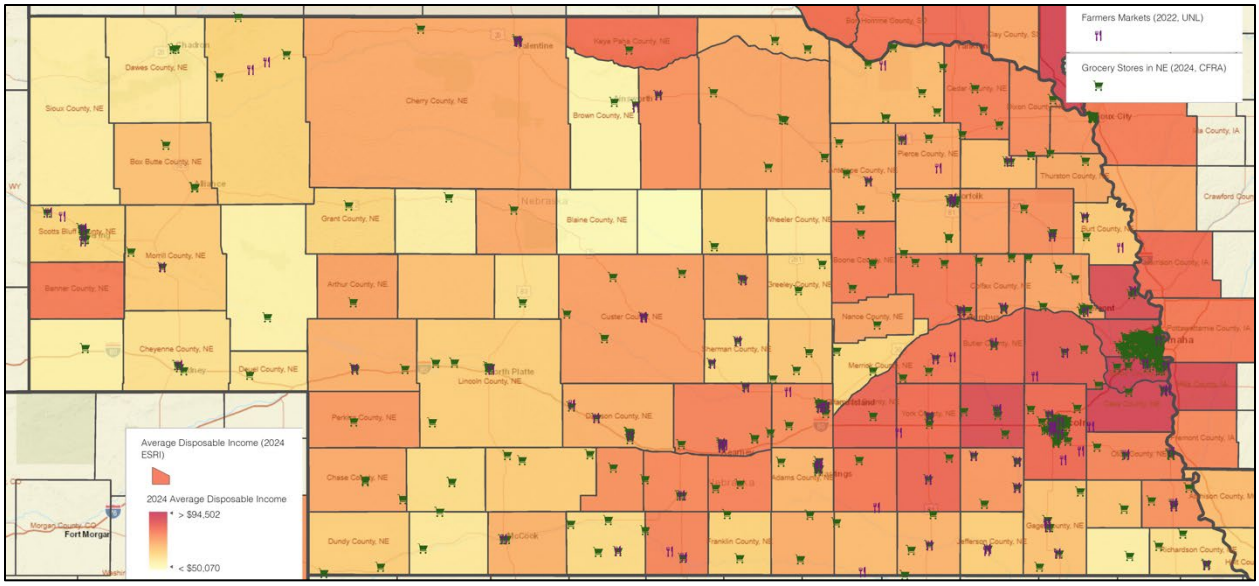

Figure 8. Average Disposable Income and Rural Nebraska Grocery Store Location

Changes in employment can potentially change spending power. Regions with relatively high unemployment can increase their spending power if employment increases. In 2023, 2.15% of the workforce in Nebraska counties with a food desert designation were unemployed (Figure 9). Furthermore, in 2023, Nebraska counties with a food desert designation had lower unemployment than counties without food desert designations. These trends indicate that unemployed populations in food desert counties will likely migrate into regions with better food access.

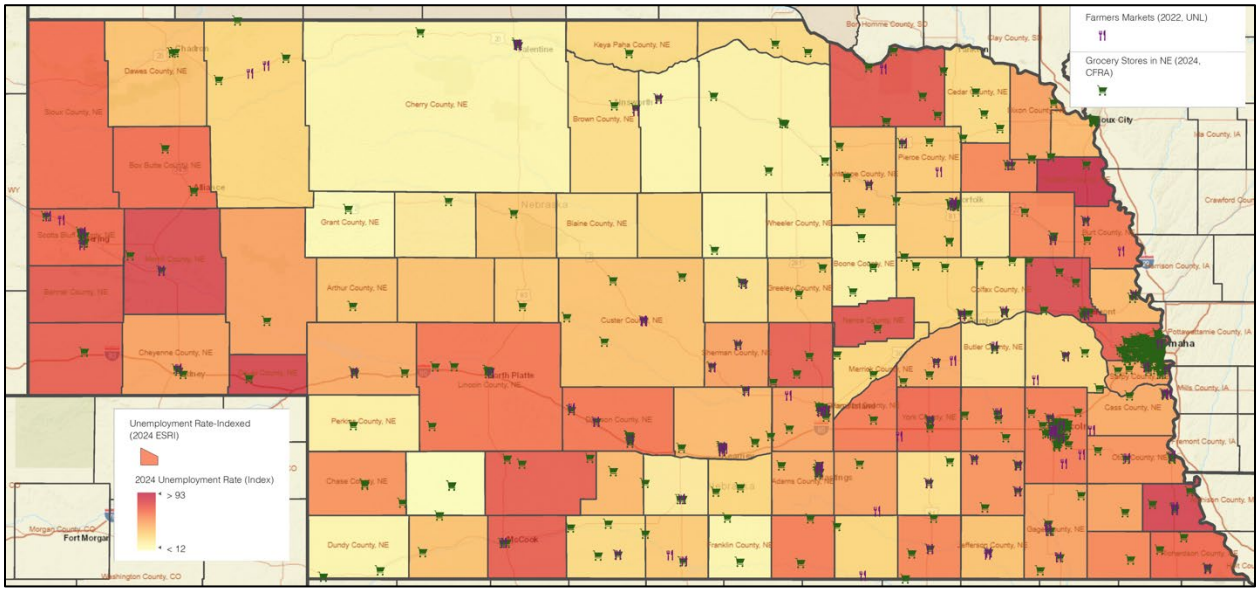

Figure 9. Nebraska County Unemployment Rate and Rural Nebraska Grocery Store Location

Poverty and food desert designation (Figure 9) correlate in Nebraska. The percentage of the population living in poverty in counties with any region in food desert designation was 12.2% in 2010 and 11.3% in 2020. This is less than the 13.4% (2010) and (12.3%) in counties with no food desert designation. These counties are losing population, and it may be that residents living in poverty are leaving these counties. Figure 10 shows low-population food desert regions like Cherry, Grant, Hooker, McPherson, Sioux, and Thomas counties tend to have extreme differences in poverty levels relative to each other. In higher population counties with food desert areas like Lincoln, Dawson, Buffalo, and Hall counties, it is typical for larger percentages of the population to be at the poverty level. Again, disposable income is absent among an unemployed group with insufficient spending potential in food desert-designated zip codes (Figure 2).

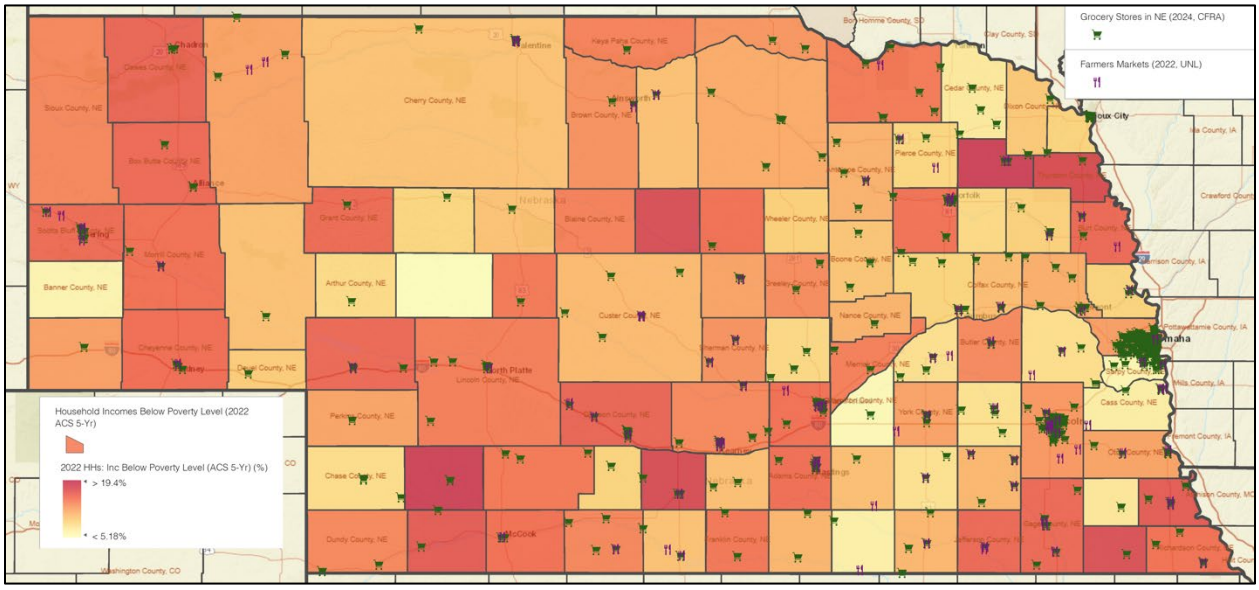

Figure 10. Share of Nebraska Households Below Poverty Level, and Rural Nebraska Grocery Store Locations.

Per capita food expenditures emerge from demand and supply factors in food markets. Annual food expenditures for food eaten at home increased by 3.02% annually between 2010 and 2023 in the United States. This is less than the growth in per capita income of 3.9% in counties with a food desert designation. Income is growing faster than food expenditures. Figure 11 shows counties with higher-than-average per capita spending on food and the food desert areas [pink (USDA,2019)]. Food desert areas, except southern Cherry County, tend to have relatively low food expenses per capita. Counties with food desert designations are unlikely to change their food desert status since their food expenses are unlikely to increase or in areas with low changes in spending potential.

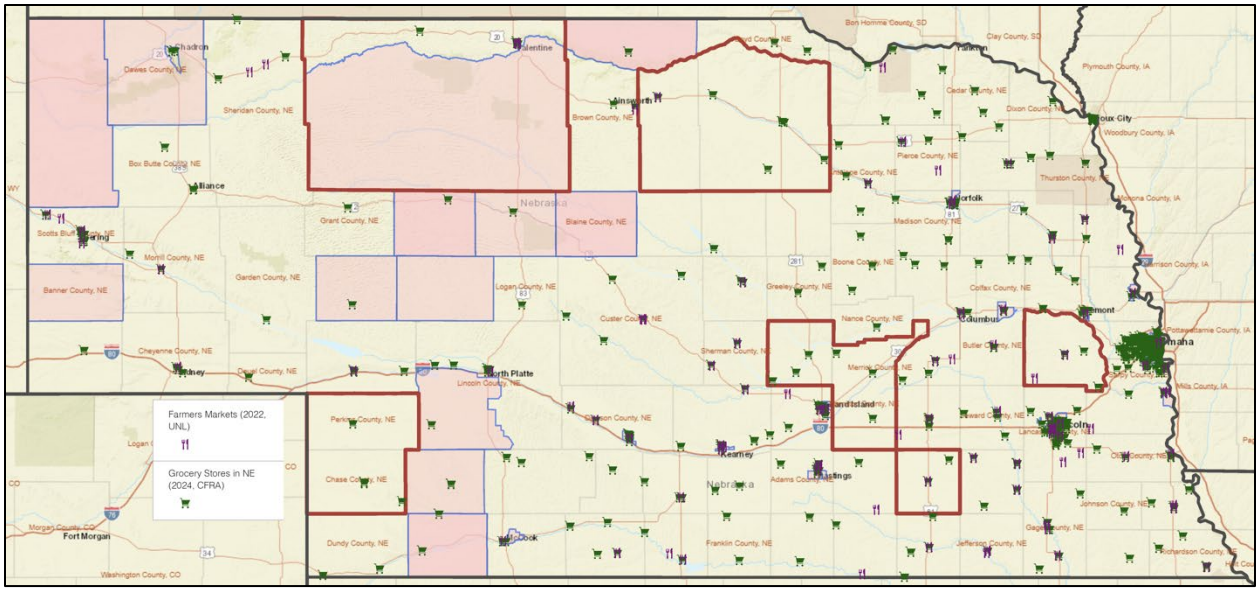

Figure 11. High Food Expenditures per Capita [red outline] and Rural Nebraska Grocery Store Locations

Number of Retail Grocery Outlets

The first supply trend in Nebraska food retail markets is the number of rural Nebraska grocery stores. These declined from 290 in 2016 to 204 in 2021 (US Bureau of Census), reinforcing the current pattern of rural Nebraska food deserts.

The decline in the number of retail food outlets is attributed, in part, to the closure of independent stores, which individuals or small groups often own. Closure is often caused by store owners looking to divest the store and retire. Finding qualified, motivated owners to purchase and operate independent grocery stores presents pressing challenges for many rural communities.

A 2020 survey of independent, rural grocery store owners and employees asked about their willingness to oversee successful ownership transitions to new owners, whether proprietors or other groups. Responses to several questions in this survey indicate how willing incumbent owners would be to oversee these transitions. We asked respondents to rank the importance of customer convenience, saving and creating local jobs, and attracting new residents. We asked why respondents believed customers shop at their store, and we considered respondents more likely to oversee a successful transition when they ranked food availability, convenient business hours, low travel time, and highly supported local businesses. When respondents were asked to indicate whether they believed their community supports a grocery store, they considered respondents more likely to oversee a successful transition when they agreed with that statement for multiple reasons.

The figure below shows the overlap between the store locations where respondents answered favorably to store transition questions and regions designated food deserts.

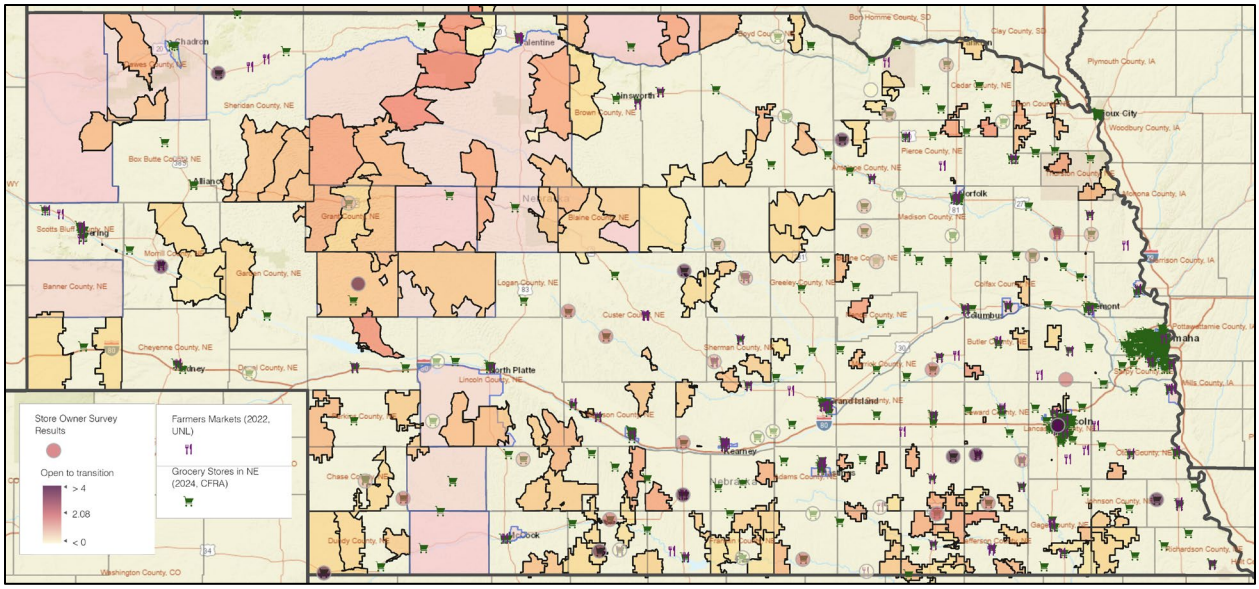

Figure 12. Grocery Store Openness to Ownership Transition and Rural Grocery Store Location

Figure 12 shows store locations in Arthur, Dundy, and Lincoln appear to have the strongest indication the incumbent owner would be motivated to oversee a successful ownership transition. Other store locations with motivated incumbent owners are outside food desert regions. Store locations bordering food desert regions often indicate a willingness to oversee successful transitions. These trends suggest two points. First, willing incumbent owners will most likely be found outside food desert regions. Residents traveling to these locations may continue to find a viable retail location after the ownership transition. A successful ownership transition will prevent these areas from becoming designated a food desert. Second, not all incumbent owners and employees who responded expressed the same " openness " level to oversee a transition. Areas featuring a respondent with somewhat less openness can increase this by clearly communicating the store's value to the area and the willingness of residents to engage in ownership transition planning with the incumbent owner in various ways.

Alternative Food Retail Outlets

Another method of making nutritious food available is direct sales by farmers to rural residents. These can happen as farm producers and residents exchange directly or as producers sell in farmers' markets.

Figure 13 shows the location of farmers' markets in Nebraska. Zip codes containing farmers markets almost always overlap with zip codes containing retail food markets. Zip codes in Knox, Antelope, Pierce, Wayne, Morrill, Butler, Custer, Keith, Dawson, Seward, Adams, Red Willow, Harlan, and Jefferson counties appear to have farmers markets without any retail outlets. In some cases, these zip codes can be designated food deserts. Although the farmers' market may make nutritious food available to residents, this likely only happens seasonally. Hence the food desert designation remains for at least part of the year.

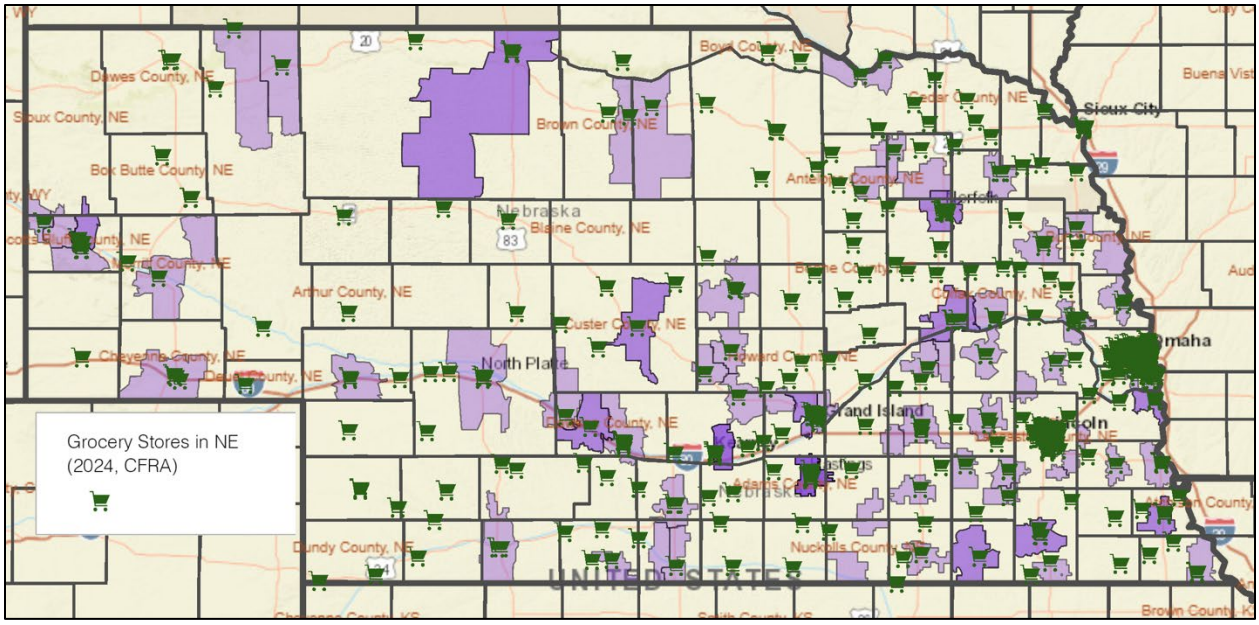

Figure 13. Nebraska Zip Codes Served by a Farmers Market[purple], and Rural Grocery Store Locations

In addition, several counties served by farmers' markets, but not retail grocery stores, have direct sales from producers to consumers. The USDA Agricultural Census records the value of direct sales made by agricultural producers in Nebraska counties. Of the 14 counties listed above with farmers markets but not retail outlets, 12 have positive compound annual growth rates in sales between 2007 and 2022, with 14 averaging 5% annual growth rates in sales. The annual growth rate is 3% among the five counties with a food desert designation.

Potential Remedies

The changes in Nebraska food retail market conditions indicated by trends in supply and demand-related factors, as well as changes in household wealth, suggest public policy, corporate, and community-based solutions. Targeted solutions that could enhance positive changes in market conditions or potentially remedy these conditions are short-term solutions that may sustain existing food access or expand it.

Public Policy Remedies

The USDA has developed a goal to improve food access for rural food desert dwellers. The USDA Rural Food Transformation framework includes goals for more and better food market options, makes nutritious food more accessible and affordable, and makes investments (USDA 2024) to improve food purchasing equity. Mobile grocery stores could serve food deserts in a similar fashion as bookmobiles. This type of solution has been tried in urban food deserts, such as Indiana University's Garden-on-the-go initiative (Gura, 2014). This program delivers fresh produce to urban food deserts on a set schedule. There are similar efforts in New York, Michigan, and New Mexico. This type of solution may prove effective in high population density

areas, but it would likely face significant challenges in areas where consumers are few and widely dispersed, like communities in the Nebraska Sandhills region.

A more effective public policy may be to subsidize grocery stores serving rural food deserts. For example, stakeholders in California have recently introduced a $200 million fund called the California Fresh Works Fund (Yoshida, 2016). This program will incentivize the development of grocery stores and other solutions to increase accessibility to healthy food for consumers in food deserts. Perhaps the USDA could allocate funding to encourage the development and retention of grocery stores in rural areas. There is clearly an adequate precedent for governmental subsidy of critical industries, including agriculture, defense, and healthcare. Access to nutritional food for rural consumers is of similar importance.

Consumer demand for nutritious food can be affected by education. Supermarket-based interventions can help. These include stocking, labeling, and advertising nutritious foods, conducting taste test sessions, holding community outreach events, and training supermarket employees to help with healthy purchasing. Gardening, as a form of experiential learning, has also been shown to affect food choices and access to nutritious foods (Cardarelli et al 2020).

Corporate Remedies

To address increasing operational costs, food distributors serving rural areas continue to raise prices, delivery charges, and minimum order sizes for smaller, more dispersed retailers. Grocers can retain their distributors by volume purchases. In some cases, retailers have responded by joining together to meet minimum requirements. For example, a convenience store in Scribner, unable to meet minimum order requirements on its own, cooperates with a local grocery store. The two stores share the added logistical and transportation costs to distribute the shared order among themselves. Incentives from the government could be implemented to encourage distributors to continue to provide access to retailers serving areas in danger of becoming food deserts (Dailey et al 2022) or to mitigate the challenge of forming cooperatives. Other solutions include optimizing food supply chain node locations, improving food distribution routes, and collaboration between food suppliers and distributors (Paciarotti and Torregiani, 2021) or suppliers and targeted producers (Norton County RFSA, 2022) or customer groups (McCann, 2024).

Community-based Remedies

A variety of projects have been started at the community level in areas that struggle to maintain local grocery retail service. These include innovations in food distribution or targeted food retail services for underserved groups, all to increase the number of suppliers in the food retail market. These include unstaffed, self-service grocery stores (Langeley, 2023); improvements in market development for local food distribution (Capouch et al, 2019), and targeted extensions in food value chains via technology (Shute, 2024) or formal retailer relationships with underserved groups (Martin, 2020).

Food cooperatives have been started in Nebraska. As recently as 2019, residents of Lynch were threatened with the loss of a grocery store because of floods on Whiskey Creek. Residents would

need to drive to Spencer, O'Neill, or Niobrara to reach the nearest grocery store. The Valley Foods Co-op operates as a cooperative, started by local residents. The store carries a variety of nutritious food products.

Community-based remedies can increase the number of suppliers via careful planning to oversee the transition of grocery store ownership from one group to the next. The Kauffman Foundation funded a grant to research grocery stores and ownership transitions. The resulting booklet breaks down various options for transitions, including making successful transitions to ownership within the community.

Farmers markets offer an opportunity to increase the number of food suppliers by giving producers the opportunity to sell produce, including fresh fruit and vegetables, directly to consumers. These markets have grown in popularity in recent years, but they are not likely to be a complete remedy for food deserts because of low sales volume in rural areas and seasonal food availability.

Summary

The USDA provides a definition for food deserts based on accessibility and affordability. The USDA definition measures affordability based on income alone. We modify the affordability criterion to include a measure of spending potential relevant to rural Nebraska consumers. This definition indicates portions of several Nebraska counties can be designated as food deserts in 2028. Changes in spending potential between 2024 and 2028 will allow zip codes in 11 counties to ease financial strain on existing food retailers, but these will remain food deserts through 2028. Most zip codes meeting the 2028 food desert designation are unlikely to change their designation and food retailers will need economic remedies to reduce financial strain.

Food market conditions beyond spending potential affect the presence of food deserts. Population size and dynamics, population age, household size, education, and spending potential all indicate trends that reinforce food deserts in several zip codes designated as food deserts in 2028 in rural Nebraska. Supply-side conditions can also contribute to the range of rural Nebraska designated as a food desert. Declining numbers of stores indicate a pattern of food desert persistence. Willingness to work with communities to oversee successful ownership transitions suggests no expansion in food deserts by sudden store closures. In contrast, farmers' markets and direct sales can help offset, in selected locations and for only short periods of the year, the accessibility segment of diets by temporarily making available limited selections of nutritious foods produced in the area.

Many remedies exist that can influence food retail markets. Among these are public policy, corporate-based, and those pursued by communities. The most effective solutions seem to be local solutions. Examples include community awareness about grocery store ownership transition plans or forming grocery cooperatives or public-private partnerships for food retail.

Bibliography

Capouch, L., M. Stumpf, N. Doty. 2019. Food Distribution Pilot Project In Northeastern North Dakota. https://www.ndarec.com/sites/ndarec/files/Rural_Grocers/111919FinalReport.pdf. Accessed August 1, 2024.

Dailey, A., K. Davidson, K. Gaskin, L. Cooper, B. Schell, Y. Gagliardi, K. Glahn. 2022. Responding to Food Insecurity and Community Crises through Food Policy Council Partnerships in a Rural Setting. https://muse.jhu.edu/pub/1/article/861584/pdf. Accessed August 1, 2024

Gura, L. 2014. Garden on the Go, Indiana University Health https://stakeholderhealth.org/garden-on-the-go-indiana-u-health/. Accessed August 1, 2024

Langley, M. 2023. Investments In Rural Food Sustainability Are Investments In States Future. https://northdakotamonitor.com/2023/12/12/investments-in-rural-food-sustainability-are-investments-in-states-future/. Accessed August 1, 2024.

Martin, L. 2020. Major Market Makes Triumphant Return to Zuni Pueblo. https://www.rcac.org/success-stories/major-market-makes-triumphant-return-to-zuni-pueblo/. Accessed August 1, 2024.

McCann, J. 2024. Junction City, Main Street and Live Well Geary County Receive Grant for Incubator Kitchen Feasibility Study. https://jcpost.com/posts/a82bc925-e981-421d-923f-f51996ac643d. Accessed August 1, 2024.

Norton County. 2022. Norton County Regional Food System Assessment. https://www.newventureadvisors.net/wp-content/uploads/2022/10/Norton-Cnty-Exec-Summ_2022_FINAL-Digital.pdf. Accessed August 1, 2024.

Paciarotti, C., F. Torregiani. 2021. The logistics of the short food supply chain: A literature review. https://www.sciencedirect.com/science/article/pii/S2352550920302876. Accessed August 1, 2024.

Shute, L. Menus of Change, Farm Generative Cooperative. https://www.menusofchange.org/lindsey-lusher-shute. Accessed August 1, 2024.

United States Department of Agriculture, www.usda.gov/media/press-releases/2024/04/17/usda-partners-reinvestment-fund-increase-equitable-access-healthy. Accessed August 1, 2024

Yoshida, S. 2016. California FreshWorks Food Access Report. https://www.gih.org/files/AudioConf/Freshworks-Food-Access-Report_WEB2_FINAL.pdf. Accessed August 1, 2024