

Food Security and Food Desertification: A West-Central Minnesota Case Study

Edwin Brands^{1,*}, Argie Manolis², Danny Kenyon³, Lily Sugimura⁴, Allison Koos⁵

¹Environmental Studies, University of Minnesota Morris, Morris USA

²Benson Center for Community Partnerships, University of Minnesota Morris, Morris USA

³Anthropology & Archaeology Department, Augustana University, Sioux Falls USA

⁴Humphrey School of Public Affairs, University of Minnesota, Minneapolis USA

⁵Environmental Studies & Studio Art, University of Minnesota Morris, Morris USA

*Corresponding author: ebrands@morris.umn.edu

Received February 09, 2024; Revised March 10, 2024; Accepted March 17, 2024

Abstract This article reports the approach and main findings of a yearlong effort (2021-2022) to characterize food security within the context of Stevens County, MN (population 9,700), a rural county in West-Central Minnesota, USA. We used the USDA ERS Community Food Security Assessment Toolkit (with some modifications) for this assessment. In addition to collecting information about household food security, we deployed a survey for gathering information about food availability and accessibility as well as barriers to food access that residents may have been experiencing. Residents identified economic issues, mobility issues, and issues related to land access and seasonal gardening as barriers to food access. Approximately 9% of county residents' incomes were below the federal poverty line; about 1/3 of respondents indicated at least some tendency toward experiencing food insecurity. More than half of the population lives over 1 mile (1.6 km) from the nearest grocery store, and approximately 30% of the population lives more than 2 miles (3km) from the nearest grocery store. In addition to the household survey, we also conducted a market basket survey focused on USDA Thrifty Food Plan item availability and cost at local grocery stores in spring 2022 and gathered information about local food production and availability. Based on this assessment, which also included local trends in grocery store closures and significant increases in visits to and food distributed by the local food pantry (or food shelf), county residents appear to have been experiencing food desertification: food was becoming more difficult for many county residents to access.

Keywords: food security, community assessment, food desertification, rural, minnesota

Cite This Article: Edwin Brands, Argie Manolis, Danny Kenyon, Lily Sugimura, and Allison Koos, "Food Security and Food Desertification: A West-Central Minnesota Case Study." *Journal of Food Security*, vol. 12, no. 1 (2024): 1-12. doi: 10.12691/jfs-12-1-1.

1. Introduction

1.1. Food Assessments and Food Security

With the goal of providing baseline information about the 'food situation' in a given community, food assessments have been conducted at a variety of geographies (e.g., campus, city, county, region) and even within the same geography (e.g., cities) at widely different scales. But unlike watershed assessments which have a clear physical delineation, there is no single apparent optimal scale or geography for food assessments because especially in the most developed nations, the present global food supply chain often connects sites of production and processing with extremely distant sites of distribution and consumption. Although the scales and geographies of food assessments vary significantly, most assessments focus on common themes within the larger umbrella concept of food security (individual and

community): 1) barriers to food access, 2) how residents access food, 3) community characteristics including demographics and local food production.

Hamm and Bellows (2003) define **community food security** in a way that is socially and culturally inclusive, public health-focused, and which emphasizes the importance of local or regional food production [1]:

"...a situation in which all community residents obtain a safe, culturally acceptable, nutritionally adequate diet through a sustainable food system that maximizes community self-reliance and social justice." (37)

Our research team, based on definitions in the literature and our own discussions developed a specific definition of individual food security to acknowledge that food security may be chronic or sporadic (or both), barriers are not only economic in nature, and that consistent access to facilities are also necessary:

A situation in which an individual or household always has access to sufficient nutritious and culturally acceptable foods that enable a healthy, active lifestyle. This means considering dietary requirements and restrictions, physical

as well as economic access to food, and adequate facilities for food storage, preparation, and cooking.

1.2. Food insecurity Drivers and Prevalence

In general, the globally significant drivers of food insecurity include rising food prices and disproportionate impact on low income individuals and households, rising demand for food (population growth and consumption changes), climate change, availability of natural resources (e.g., water, soil), markets and global trade, declining investments in the agricultural sector, and biofuel production [2]. Food insecurity in the most developed countries can be related to two overarching (and interrelated) causes: economic inequality and neoliberalism, which have led to a rapid increase in food security-related programming in charitable and non-profit organizations [3].

Compared to the United States national average of 10.2% [4], households with incomes less than 185% of the poverty threshold and female headed households with children experienced food insecurity at the highest rates (26.5% and 24.3% respectively). Food insecurity rates were also significantly higher than the average in households with black non-Hispanic (19.8%) and households with Hispanic persons (16.2%). Although on average, food insecurity in rural areas was less prevalent (10.8%) than in major cities (12.2%), there are still significant challenges for rural residents. For example, distance to or lack of variety in local grocery stores can be a challenge for many rural residents [5].

Food insecurity is likely more prevalent and significant among American Indian (AI) and Alaska Native (AN) households than in any of the groups identified in the USDA annual household food security report. A recent review of the literature on food insecurity in AI/AN communities found a weighted average of 45.7% of households experienced food insecurity, with a range of 16%-80%. The choice not to specifically identify AI/AN households in the USDA annual food security report or in US Census Household Pulse surveys significantly limits the availability of information about food insecurity in AI/AN communities and seems to perpetuate the challenging conditions many such communities currently face as a consequence of historical dispossession of land and subsequent reliance on low-quality government-provided food products [6].

1.3. Addressing Food Insecurity

The US federal government has created, funded, and with the assistance of state governments and non-profit organizations implemented a patchwork quilt of food assistance programs for individuals and households including the Supplemental Nutritional Assistance Program (SNAP), the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), the Nutritional Assistance Program for Seniors (NAPS), and The Emergency Food Assistance Program (TFAP)--which supports food banks, food pantries, soup kitchens, and other regional and local emergency food programs.

In recent decades, the concept of 'food desert' emerged in an effort to identify and target specific areas for food assistance. Food deserts are defined as census tracts that

are home to a large number or high percentage of low-income residents who have low access to food outlets [7]. Because public transit is underdeveloped and often largely absent in much of the United States, distance to the nearest grocery store is one of the most important measures of food access, especially for households without the use of a motor vehicle. Between 2015-2019, approximately 30 percent of the US population lived within ½ mile of a grocery store, and another 30 percent lived between ½ and 1 mile from a grocery store. More than half of households without vehicle access were near (within ½ mile of) a grocery store; however, more than 2 million such households were more than 1 mile from the nearest grocery store [8].

While the food desert concept describes food access at a specific time, the related concept of food desertification is concerned with whether food access is becoming more difficult over time. Common causes of reduced food access include closure of a local supermarket, or major upheaval in local, regional, or national food supply as occurred during the recent Covid-19 pandemic [9]. Some examples of efforts to address food access issues include additional funding and flexibility for emergency food programs such as was the case during the Covid-19 public health emergency, attracting new supermarkets to areas in which they are lacking, establishing more local production of fresh produce via urban farming, or expanding allowed uses of SNAP funds to include fresh local produce from farmers markets [10,11,12,13].

This article reports the main findings¹ of a yearlong attempt to characterize household and community food security within the context of Stevens County, MN (population 9,700), a rural county in West-Central Minnesota in 2021-2022. The need for an assessment was identified as part of a longstanding local effort to address the needs of people experiencing poverty and food insecurity and to reinvigorate local food production. To our knowledge, no previous food assessments had been completed for Stevens County or in West-Central Minnesota except for the 2010 report from the Morris Healthy Eating initiative², which focused on the city of Morris (population approximately 5,000) and on the UMN Morris campus.

The goals of the assessment were to determine what food is grown in the county, what food is available, where food can be obtained in various forms, accessibility and affordability of food, as well as county residents' experiences with and thoughts and suggestions about food. Was food becoming more or less available or difficult for Stevens County residents to access?

2. Study Area/County Profile

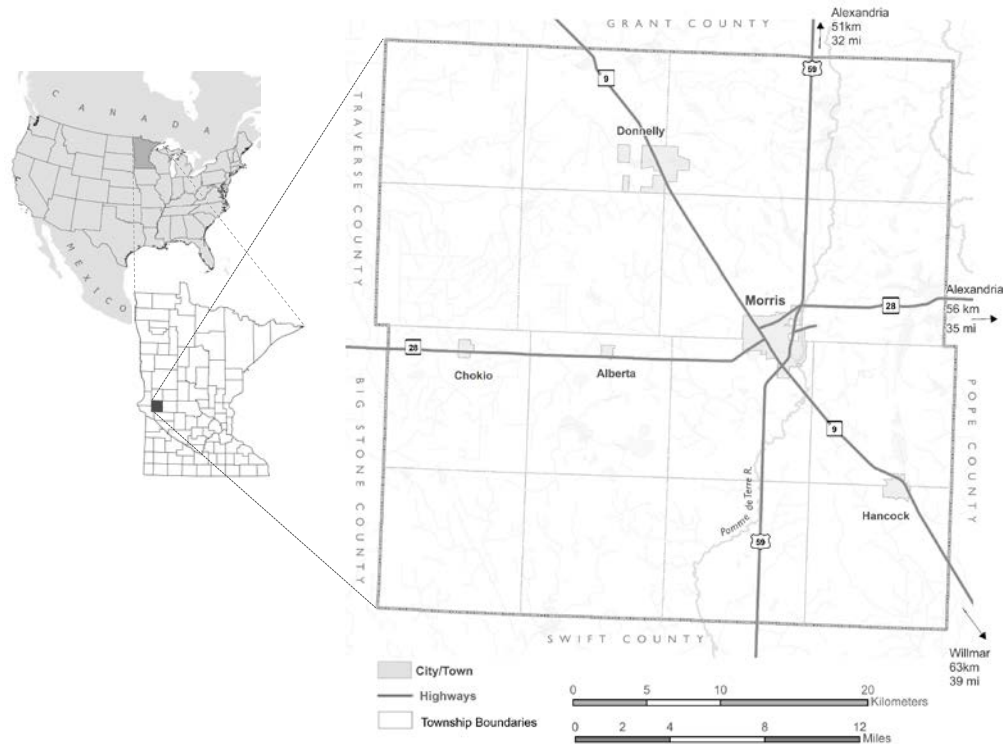
2.1. Human and Physical Characteristics

¹ The complete final report (including executive summary and graphical summary) for this project is available on the UMN Morris Center for Small Towns website <https://morris.umn.edu/center-small-towns/stevens-county-food-assessment>

² The Morris Healthy Eating Community Assessment <https://morris.umn.edu/health-and-wellness/healthy-eating/community-food-assessment>

Stevens County (Figure 1) covers an area of approximately 560 mi² (1,450 km²) and the average population density in the county was 17 people per mi² (or 7 per km²). Seventy percent (or 6,800) of county residents lived

in the five cities or towns in Stevens County; 54% of the population (5,280) resided in Morris, and 8%, 4%, 2%, and 1% of the population respectively lived in Hancock (765), Chokio (400), Donnelly (241), and Alberta (103) [14].



Data Sources: ESRI, Minnesota Department of Transportation

Figure 1. Stevens County, Minnesota, USA

According to the 2020 US Census, the vast majority (85.3%) of Stevens County residents identified as white, while 1.8% identified as Native American or Alaska Native, 0.9% Black or African American, and 0.7% Asian³. 6.2% identified with some other race and 5.1% identified with two or more races. More than 10% of county residents identified as Hispanic or Latino; this proportion has increased significantly from the 2000 Census in which only 0.8% of the population identified as Hispanic or Latino [15]; there are many indications that Hispanic or Latino populations were underestimated in the 2020 Census.

According to the 2016-2020 American Community Survey (US Census Bureau) Stevens County estimated median household and per-capita incomes were \$65,503 and \$35,551 respectively; approximately 870 (9% of) county residents had incomes below the federal poverty guideline. The federal poverty guideline is defined as below \$13,590 for people living alone and increases by \$4,720 per person for each additional person in the household [16,17].

Nearly 70% of the population 16 or older was employed in 2022. The top (non-agricultural) employment categories in Stevens County were manufacturing (15%) and retail trade (8.6%). In previous years, educational services and health care and social assistance each comprised 13-15% of employment; it is unknown why data for these categories was not reported in 2022 [18]. Stevens County is home to several major employers

including manufacturing companies such as Superior Industries (parent company to Westmor Industries among others), Riverview LLC (dairy and beef) headquarters, the University of Minnesota Morris⁴, and Stevens Community Medical Center.

Land use and land cover in Stevens County was dominated by cultivated land (86%), followed by grassland (4%) and water (3%); all other land use/land cover categories represented less than 2% of the county's land area [19]. Stevens County is mainly drained by the Pomme de Terre River, although the extreme eastern part of the county is part of the Chippewa River watershed, both of which are tributaries to the Minnesota River. Lakes in Stevens County are mainly shallow prairie pothole lakes. Almost all the original previously dominant wet and dry prairie has been removed, and most wetlands have been drained to make way for agricultural land uses.

2.2. Agricultural Production and Availability of Locally Grown Foods

⁴ The University of Minnesota Morris (UMN Morris) is a public liberal arts campus that has been operating in Morris since September 1960. From 1887-1909, the site was home to American Indian Boarding Schools operated first by the Sisters of Mercy and subsequently by the US Government. Per federal and state law, American Indian students attended the West Central School of Agriculture (1910-1963) tuition-free and still attend UMN Morris tuition-free. Approximately 1/3 of current UMN Morris students qualify for this tuition waiver. Prior to European settlement, both Anishinaabe and Dakota/Lakota peoples inhabited and stewarded the land now occupied by UMN Morris and Stevens County.

³ Percentages provided here are from the 2020 US Census Table DP1.

Table 1. Percentage of Harvested Cropland by Crop in Stevens and Neighboring Counties (2017) [20]

	Stevens	Grant	Douglas	Pope	Swift	Big Stone	Traverse
Vegetables	0.0%	0.0%	0.1%	2.0%	0.2%	0.0%	0.0%
Dry Edible Beans	3.1%	0.9%	0.1%	17.5%	1.4%	0.4%	0.0%
Soybeans	40.6%	45.0%	46.3%	38.0%	38.8%	50.8%	50.4%
Corn (grain)	43.0%	43.8%	35.3%	47.1%	51.8%	41.6%	41.8%
Wheat (grain)	3.5%	4.6%	5.9%	2.2%	14.9%	5.2%	3.1%
Sugar Beets	1.9%	4.2%	0.0%	0.8%	1.8%	0.0%	0.0%

Most land in Stevens and surrounding counties was devoted to commodity crops including corn (grain), soybeans, wheat, and sugar beets, none of which are directly edible by humans (Table 1) [20]. Dry edible beans were the most grown directly edible food crop, occupying about 3% of harvested cropland in Stevens County and about 18% of harvested cropland in Douglas County. Much less than one percent of land in Stevens County was used to grow vegetables, fruits, or nuts. Of the surrounding counties, Pope County had by far the most land (about 2% of total harvested cropland) devoted to vegetable production. Although many people in Stevens and surrounding counties grew vegetables and fruits in home gardens, it is likely that most people in this area relied on produce shipped from elsewhere in the state, in the United States, or elsewhere. No data on gardening in the county were available or collected for this assessment.

Stevens County's human population was outnumbered by beef cattle (nearly 15,000 as of 2017) and especially by hogs and pigs (nearly 170,000). Although sheep and goats were also raised in the county, their numbers were much more modest. Despite the number of animals raised for meat in Stevens County, there was only one remaining small meat processing facility (Hancock Quality Meats in Hancock) in the county.

As of 2022, there were no community supported agriculture (CSA) operations in Stevens County, MN. Two CSA operations in bordering counties (Grant and Swift) have closed in recent years, while others have opened in neighboring Douglas County. The Morris Area Farmers Market (which accepts SNAP/EBT for food products) features local small producers/vendors and operates June through September each year on Thursday afternoons and is located just north of the Morris Public Library. In 2022 there were eleven vendors selling a wide variety of items including vegetables, fruits, beef, chickens, homemade breads, and jams. Some produce sold at the market was certified organic, and some products were gluten-free [21].

At the time of this assessment, there were two large processors of locally grown edible produce: Bonanza Bean (est. 2008) and Fresha Carrots (est. 2019), which as their names suggest process edible beans (dark and light red kidney beans) and carrots. Fresha carrots are marketed to many communities and sold in at least one local grocery store when in-season or as supplies in storage allow.

Headquartered just south of Morris, Riverview LLC is one of the top five dairy producers in the world. Four of Riverview's dairy production sites (Darnen Dairy, District 54 Dairy, Riverview Dairy, and West River Dairy) are in Stevens County. Because there were only a few dairy operations in the county, the USDA Census of Agriculture did not provide data on either the number of farms or the

number of dairy cows in the county for 2017. In 2012, however, there were 8 dairy farms and 21,428 dairy cows in the county. The vast majority of milk from dairies in Stevens County was processed into cheese at Valley Queen Cheese in Millbank, SD. Organic milk produced in the county was collected and processed by Organic Valley Cooperative.

3. Methods

In addition to conducting a literature review, we gathered primary data via 1) household food security survey, and 2) market basket survey of local grocery stores. We collected secondary data from several sources including demographic data from the US Census Bureau American Community Survey (2021), economic and employment data from the Minnesota Department of Employment and Economic Development, agricultural production data from the US Department of Agriculture's Census of Agriculture (2017), free and reduced lunch eligibility data from the Minnesota Department of Health [22], and data about eligibility for or usage of supplemental or emergency food programs from local organizations including Horizon Public Health, Stevens County Food Shelf, and Stevens County Human Services.

3.1. Household Food Security Survey

3.1.1. Survey Development and Comparison to Other Published Studies

Members of the research team collaboratively created the household food security survey, which included 1) the USDA Economic Research Service's (ERS) 10-item household food security survey (part A-food security), 2) questions developed based on a literature review of recent community food security assessments done in small communities in the United States (part B-food access, availability, affordability, and barriers), and 3) standard demographic questions (part C-demographics) [23,24].

Several recent studies of food (in)security utilized one or more items from the USDA's Food Security Assessment Toolkit, including a version of or selected questions from the USDA ERS household food security assessment survey [23,24,25,26]. We selected the 10-item food security assessment instrument for this study because it provides more detailed information (than the 6-question version) about respondents and does not directly ask questions about children (as is the case in the 18-question version), which we decided might increase the risk of elevating emotions such as shame among respondents.

We developed Part B of the survey to better understand

what and how often community members were eating, where they were accessing food, their perceptions of food available in or near Stevens County, and what barriers may exist to accessing food for Stevens County residents. Our review of the literature found a variety of approaches taken to understanding food access and barriers in communities that have undertaken food security assessments including interviews and focus groups to obtain more in-depth information about sub-populations of interest [27,28]. A study that analyzed corner store locations and other characteristics in Atlanta [29] provided important insights for an urban area but were not easily adaptable to a more rural setting with sparser population and comparatively fewer retail food outlets. Whereas many studies focused strictly on economic factors (e.g., income level) as the main barrier to food access, some also discussed barriers that are either often adjacent (e.g., access to transportation) or not necessarily related to (e.g., attitudes toward or knowledge about food or food choices, or personal safety) an individual's economic situation [26,29].

3.1.2. Survey Distribution and Recruitment Strategies

Beginning in mid-March 2022, we made the survey available for 6 weeks both electronically (via Qualtrics) and in hard copy, in both English and Spanish. Windy Roberts, Teaching Specialist in Spanish at the University of Minnesota Morris, prepared the Spanish translation. We recruited survey respondents through use of email listservs and Facebook advertisements, flyers posted throughout the community, and via traditional media (radio and print).

3.2. Market Basket Survey

The purposes of the market basket survey were to determine 1) food item availability and 2) food item cost at local grocery stores. We adapted this survey from the USDA's Community Food Security Assessment Toolkit; we derived the list of foods on the survey from the USDA's Thrifty Food Plan⁵ (TFP), one of four model food plans that also include the low-cost, moderate-cost, and liberal food plans. Our focus on the TFP was due to our desire to collect information that would be most useful in the context of community members with the least resources. As the lowest cost food plan, the TFP is the basis for calculating SNAP benefits and is modeled on a standard nutritious diet for a family of four that consists of two adults (one male and one female) between the ages 20 and 50 and two children ages 6-8 and 9-11 [30].

After an initial reconnaissance visit to determine any adjustments (in products or available product sizes) that would need to be made to find options that fit within each of the TFP categories, we visited each grocery store location three times (February, March, and April 2022). Team members recorded 1) whether an item (or similar) was available as well as 2) the price of the cheapest available option for each of the designated foods. The survey included the two largest grocery stores in Stevens County (both located in Morris): Willie's SuperValu, a

local supermarket, and Meadowland Market, a discount grocery that sells salvaged packaged food, some fresh produce, and is more varied and inconsistent in its offerings than a traditional supermarket. Because many Stevens County residents often travel to Alexandria (45 minutes northeast of Morris) for groceries, we also included two of the several grocery stores in that city: Walmart, an American multinational retail corporation that combines a grocery store with a retail store and specializes in low-cost wholesale items, and Aldi, a discount grocery chain which has a varied but inconsistent stock of items.

4. Results

4.1. Household Food Security Survey Responses and Respondent Characteristics

We received a total of 237 completed survey responses (English and Spanish versions of both electronic and hard copy surveys). The number of completed survey sections decreased with progress through the survey (Part A: 253, Part B: 246, Part C: 237), and the total number of survey responses was less than the target of 370, the minimum required for a statistically representative sample of the Stevens County population. Survey results must therefore be interpreted within the context of the group of respondents rather than of the county population as a whole.

The most significant demographic differences between survey respondents and US Census figures for Stevens County were in the categories of education attainment, urban vs. rural residents⁶, and Hispanic or Latino population. Compared to US Census data, twelve percent fewer survey respondents had earned a high school diploma, and thirty-six percent more survey respondents had earned a bachelor's degree or higher [31]. Whereas the 2020 US Census indicates over 10% of county population identify as Hispanic or Latino, only 5% of survey respondents identified as such. The percentage of county residents who completed the survey and live outside a town or city was 17% lower than estimated by the US Census, while the percentage of residents living in a town or city was 17% higher than indicated by the US Census data for Stevens County [15].

4.2. Household Food Security Results/Classification

We classified food insecurity status according to the number of total affirmative responses to six of the questions in the household food insecurity instruments [23]. Zero or one affirmative response equated to food secure, whereas 2, 3, or 4 affirmative responses were classified as food insecure without hunger and 5 or 6 affirmative responses were categorized as food insecure with hunger. According to this classification method,

⁵ Comparisons of grocery store prices in the context of the TFP are not necessarily reflective of how the stores may compare in the context of the other three USDA model food plans or of actual individual shopping habits or choices.

⁶ Stevens County has only one city that qualifies as an urban cluster; the rest are classified as rural towns. To learn more about survey respondents and representation in this survey we used an in town/out of town distinction rather than urban/rural.

nearly 78% (197) of respondents fell into the food secure category, while 13% (33) were categorized as food insecure without hunger and 9% (23) were categorized as food insecure with hunger (Table 2).

Table 2. Food Security/Insecurity classification [23]

Number of Affirmatives	Food Security Classification	Survey Responses
0	Food Secure	174
1	Food Secure	23
2	Food insecure without hunger	15
3	Food insecure without hunger	9
4	Food insecure without hunger	9
5	Food insecure with hunger	10
6	Food insecure with hunger	13

Because food insecurity is a multi-dimensional condition that was exacerbated by the Covid-19 pandemic, food supply chain interruptions, and rapid recent inflation, we used a lower threshold was in this study to identify people who tended toward food insecurity. We identified a single affirmative answer (yes, often true, or sometimes true) to questions 2, 3, or 4 in Part A for the purposes of our study to describe a respondent as tending toward experiencing food insecurity. Responses of “often true” or “sometimes true” to the following questions were coded as affirmative responses.

2. “I/we worried whether food would run out before (I/we) got money to buy more.” Was that often true, sometimes true, or never true for (you/your household) in the last 12 months?

3. “The food that (I/we) bought just didn’t last, and (I/we) didn’t have money to get more.” Was that often, sometimes, or never true for (you/your household) in the last 12 months?

4. “(I/we) couldn’t afford to eat balanced meals.” Was that often, sometimes, or never true for (you/your household) in the last 12 months?

Approximately one-third (84 of 253) of survey respondents as a whole and nearly two-thirds (43 of 69) who identified as UMN Morris students⁷ answered at least one of Part A questions 2, 3, or 4 in the affirmative are for the remainder of this article termed “food insecure.” Students made up approximately half of the respondents in this category.

4.3. Food Access

4.3.1. Shopping Habits

As recently as the 1990s, grocery stores were in all but one of the cities or towns in Stevens County (Table 3). In 2022 there were four grocery stores⁸, all located in Morris. One of the grocery stores (Willie’s SuperValu⁹) is a

supermarket¹⁰. Six of the eight convenience and other stores (e.g., dollar stores) that sell groceries in Stevens County were also located in Morris. Similarly, only two restaurants in Stevens County were located outside of Morris.

Table 3. Grocery Stores by Community, 1990-2020

	1990	2000	2010	2020
Alberta				
Chokio	2			
Donnelly	1	1	1	
Hancock	1	1	1	
Morris	4	3	3	4
Total	8	5	4	4

Data Source: local phone books

Willie’s SuperValu was by far the most common (62% of responses) location where survey respondents purchased groceries, followed by Aldi (Alexandria, 11.5%), WalMart (Alexandria, 10%), and Meadowland Market (8%). Additional locations where respondents purchased groceries included Pomme de Terre Foods (natural foods store in Morris), Mi San Juan Market (Mexican grocery store in Morris), WalMart (Willmar), Casey’s (Morris), Shell gas station (Morris), Cenex (Chokio), Target (Alexandria), Cub Foods (Alexandria), Costco (St. Cloud), Elden’s Fresh Foods (Alexandria), and Dollar Tree (Morris). Student and food insecure respondents were less likely (-14% and -19% respectively) to purchase most of their groceries at Willie’s and slightly more likely (8% and 5% respectively) to purchase most of their groceries at Meadowland Market compared to survey respondents as a whole.

4.3.2. Eating Habits

Sixty-three percent of household food security survey respondents reported that all or almost all of their meals were prepared at their home. Another 22% reported that more than half their meals were prepared at home. Four respondents indicated that none of their meals were prepared at home, and the remaining 13% indicated less than half or a few meals were prepared at home. Compared to survey respondents as a whole, student and food insecure respondents were about 10% less likely to report that all or almost all of their meals were prepared at home; students eating at the campus dining hall would of course be less likely to report consuming meals prepared at home.

Only three percent of respondents indicated that they ate less than half, more than half, or all their meals at a friend or relative’s home, whereas 28% reported eating a few meals at a friend or relative’s home. More than 60% of respondents reported eating a few meals at gas stations, stores, or restaurants, while 13% reported eating less than half and 5% reported eating more than half their meals at these locations. Very few respondents (8%) indicated that they ate more than a few meals at a location other than home, a friend or family member’s home, or restaurants, gas stations, or stores.

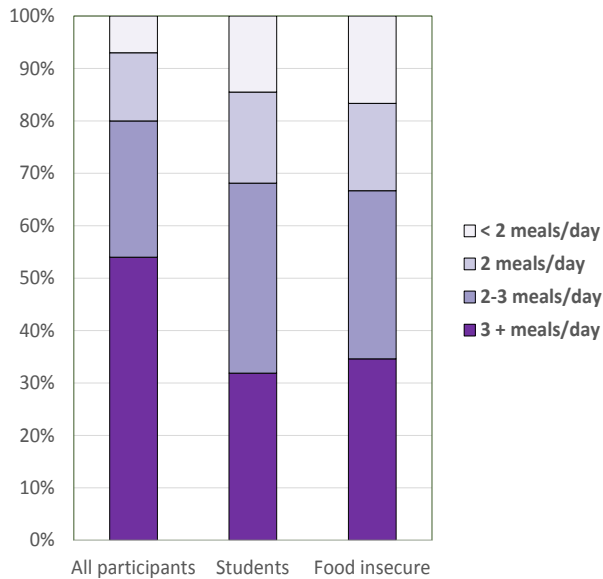
⁷ The term ‘students’ will be used to refer to UMN Morris (college) students hereafter.

⁸ Grocery stores for the purposes of this article are defined as establishments that derive most of their income from food products including prepackaged and fresh foods.

⁹ SuperValu Inc. is headquartered in Eden Prairie, MN and has since 2018 been a wholly owned subsidiary of United Natural Foods Inc.

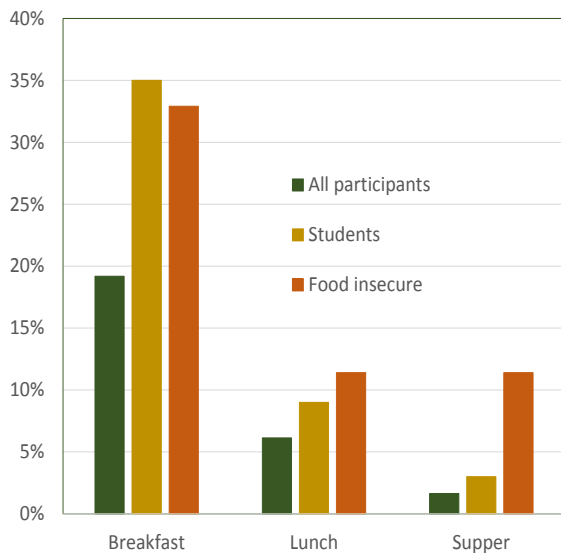
¹⁰ A supermarket can be thought of as a scaled-up grocery store, usually with a butcher and other specialized sections, expanded fresh produce options, as well as many non-food items such as utensils, toiletries, and cleaning supplies.

Most respondents (54%) indicated they usually ate three or more meals per day. (Figure 2). One quarter of respondents reported eating between 2-3 meals per day, and 13% of respondents ate two meals per day. About 7% (13) reported eating fewer than two meals per day; this proportion was at least doubled among student (14%) and food insecure respondents (17%). Almost all respondents reported usually eating lunch (94%) and supper ((98%), whereas nearly 20% of respondents indicated they did not eat a morning meal (Figure 3). 35% of student respondents and 33% of food insecure respondents reported usually not eating breakfast, 9% and 11% usually did not eat lunch, and 3% and 10% usually did not eat supper.



Data Source: Household Food Security Survey

Figure 2. Number of (daily) meals eaten by respondents



Data Source: Household Food Security Survey

Figure 3. Meals not eaten by respondents

Respondents indicated that at breakfast they most frequently consumed grains (69%), dairy (54%), protein (53%), and fruit (47%), with fewer than 10% of respondents indicating they ate vegetables for breakfast.

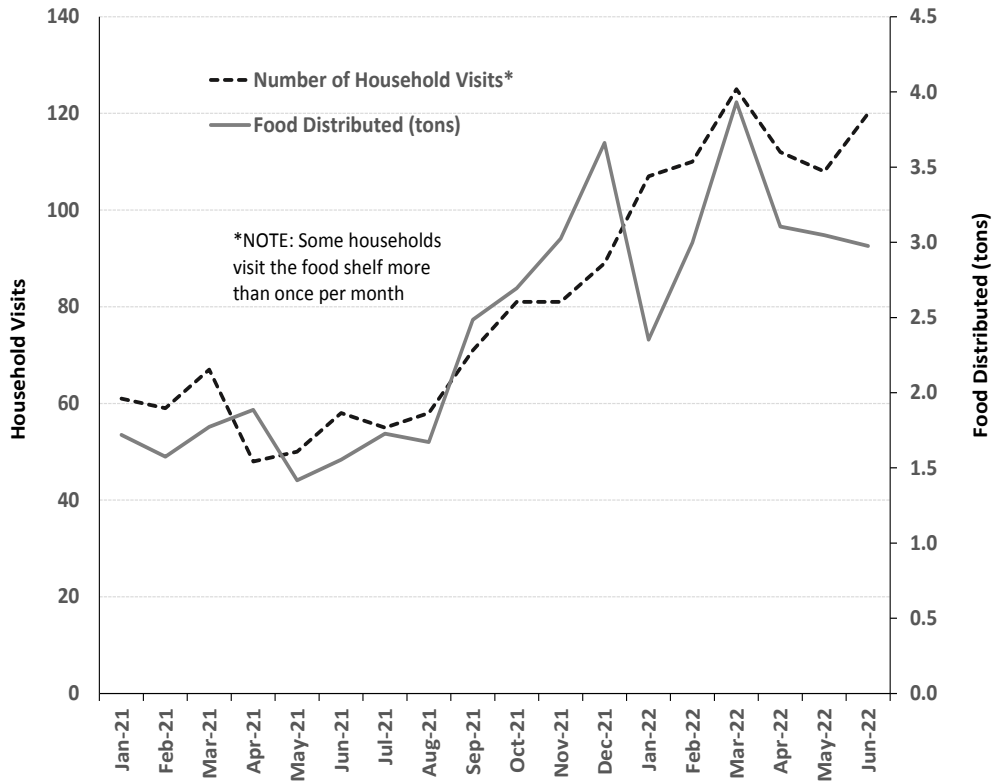
Nearly 80% of respondents indicated they ate a protein for lunch, followed by grains (73%), and vegetables (61%); about 40% of respondents indicated they ate fruit or dairy products for lunch. For dinner, over 90% of respondents indicated they ate protein, 84% ate grains, 82% ate vegetables. Nearly 60% consumed a dairy product, while only about 30% of respondents ate fruit. Compared to survey respondents as a whole, student and food insecure respondents were 12-15% less likely to consume dairy, grains, fruit, or protein at breakfast. At supper, food insecure respondents were much less likely to consume vegetables (-28%), dairy products (-27%), and protein (-24%), and less likely to consume grains (-12%) but slightly more likely to consume fruit (+6%).

4.3.3. Supplemental and Emergency Food Resource Usage

Stevens County residents have access to the same federal (SNAP, WIC, NAPS, TEFAP as noted in the introduction) and state supplemental and emergency food resources as other Minnesota residents. However, very few of the supplemental or emergency food resources are co-located. Stevens County residents may use SNAP/EBT at local grocery stores or at the local farmers market, visit the local food shelf (food pantry), obtain food at one of three summer food distributions (no income requirements), and families with children may access additional food through the backpack program at the local public school. Seniors are eligible to participate in congregate dining and/or home delivered meals. As of July 1, 2023, breakfast and lunch at Minnesota primary and secondary schools became free to all students attending schools that participate in the National School Lunch Program¹¹.

Of the supplemental or emergency food sources, respondents most commonly used the Stevens County Food Shelf (12), followed by SNAP (7), WIC (5) and church (2). It is likely that at least some supplemental or emergency food sources or programs are underutilized in Stevens County. For example, in 2019 an estimated 254 households received SNAP benefits. However, in the same year, there were an estimated 445 households below the federal poverty level in the county (American Community Survey, US Census Bureau). According to Stevens County Human Services, 266 households participated in SNAP in December 2021. Because gross income eligibility threshold for SNAP benefits was 130% of the federal poverty level, it is likely that even more than 445 households were eligible for SNAP benefits.

¹¹ Minnesota was the fourth U.S. state to adopt a free school meals program. All Minnesota schools participating in the National School Lunch Plan are mandated to participate in the state-funded Free School Meals Program <https://education.mn.gov/MDE/dse/FNS/SNP/free/>. Percentage of primary and secondary school students qualified for free and reduced school lunches has often been used as a community food security indicator. However, in response to the Covid-19 pandemic, the USDA food and nutrition service granted a nationwide waiver that allowed all students to receive free lunch for the 2020-2021 and 2021-2022 school years. This likely led to a reduced number of families filling out the free and reduced lunch applications during those school years.



Data Source: Stevens County Food Shelf

Figure 4. Number of Stevens County Food Shelf Household Visits and Pounds of Food Distributed January 2021-June 2022.

Stevens County residents’ usage of the Stevens County Food Shelf doubled or nearly doubled in most categories between the first half of 2021 and the same period in 2022. The only measures that increased less than twofold were total food distributed (85%) and number of people served who were 65 or older (33% increase). The largest increase in any category was the number of individuals who were 18 or younger (+153%). A monthly plot of household visit data indicates a marked increase in visits between April 2021 (50 visits) and March 2022 (>120 visits) (Figure 4). Total food (by weight) distributed followed a similar pattern through the end of 2021 but was disrupted by supply chain issues that impacted food availability (particularly in January and February 2022) at North Country Food Bank, the main supplier of items to the Stevens County Food Shelf.

4.4. Quality, Availability, and Affordability Of Food

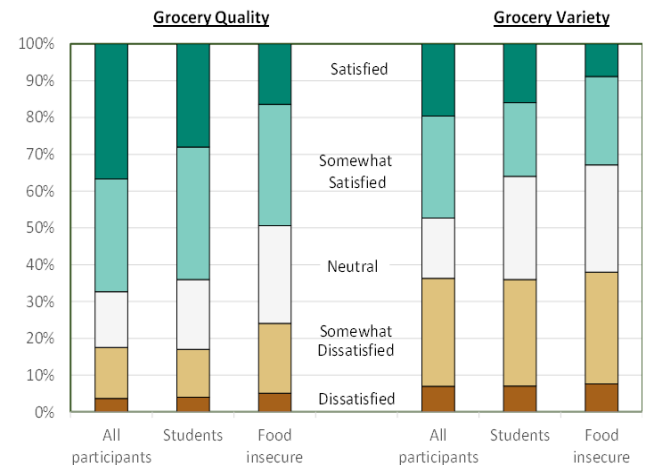
4.4.1. Household Food Security Survey Results

Survey respondents as a whole were mostly satisfied (37%) or somewhat satisfied (31%) with the quality of groceries that they purchase (Figure 5). Fifteen percent were neutral, 14% were somewhat dissatisfied, and 4% were dissatisfied. Only 16% of food insecure respondents and 28% of students were satisfied with the quality of groceries they purchased.

With regard to the variety of groceries available (Figure 5), slightly more than half of respondents responded neutral (16%), somewhat dissatisfied (29%) or dissatisfied (7%), and slightly less than half indicated they were

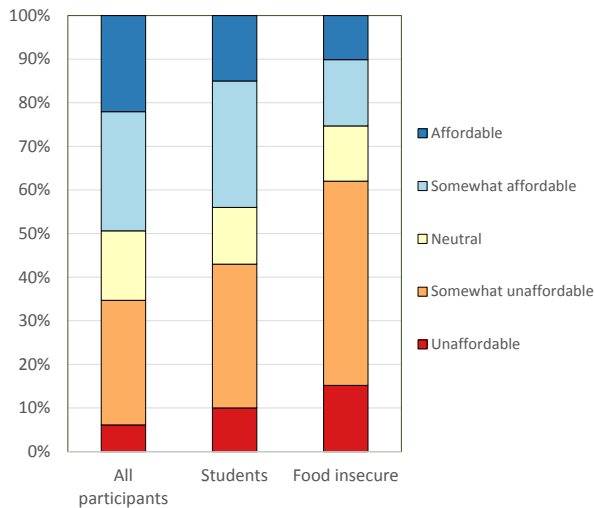
somewhat satisfied (28%) or satisfied (20%). Student and food insecure respondents were more likely to respond neutral (+12% and +13% respectively) and less likely to respond somewhat satisfied (-8% and -4%) or satisfied (-4% and -11%).

Approximately half of respondents (Figure 6) felt that groceries were affordable (22%) or somewhat affordable (27%), with 16% neutral, 29% indicating their groceries were somewhat unaffordable, and 6% indicating their groceries were unaffordable. Sixty-two percent of food insecure respondents and 43% of student respondents indicated they found groceries to be unaffordable or somewhat unaffordable.



Data Source: Household Food Security Survey

Figure 5. Survey respondents’ satisfaction with grocery quality and variety



Data Source: Household Food Security Survey

Figure 6. Survey respondents' opinions of grocery affordability

4.4.2. Thrifty Food Plan (TFP) Market Basket Survey Results

We collected grocery price and availability data in February, March, and April of 2022. As might be expected, item availability was most consistent at Walmart and Willie's SuperValu; no more than two items on our TFP food list were absent from these locations. Between 7 -8 items were unavailable at Aldi each visit, while 14-17 items were unavailable at Meadowland Market. Due to item unavailability at Meadowland Market and Aldi, we could only construct a full TFP basket comparison between Willie's (Morris) and Walmart (Alexandria), with the cost approximately 50% higher at Willie's (Table 4).

Table 4. Weekly TFP Cost at Willie's vs. Walmart

Month	Willie's SuperValu	Walmart
February	\$222.07	\$144.45
March	\$223.92	\$148.88
April	\$222.95	\$150.55

Data Source: Market basket survey

Differences in prices were much more significant and consistent in some categories (e.g. frozen and condiments and spices) and items (e.g. 1% milk cost at least 1/3 more per gallon at Willie's than at Walmart) than in other categories (e.g. fruits and vegetables were 15% or less different) and items (e.g. 1 dozen large eggs were 64% more expensive at Willie's than Walmart in February and 16% cheaper at Willie's than Walmart in April). Though it is beyond the scope of this report to delve into explanations of why such price differences existed, it is important to note that these retail outlets differ significantly in many ways (e.g., location, warehouse space, purchasing power, and availability of distributors), as well as the timing of data collection during a period of significant food supply chain disruptions.

As would be expected in a time of rapid inflation, many individual item costs increased over the three-month period at all four stores that were surveyed. The cost of the TFP at Willies was higher compared to the national average weekly cost of the TFP. However, the cost of the TFP at Willie's during the survey period (Feb-April) did not increase, in contrast to the national average cost. The

TFP cost at Walmart (Alexandria location) did increase, though less rapidly than the national average.

4.5. Barriers to Food Access

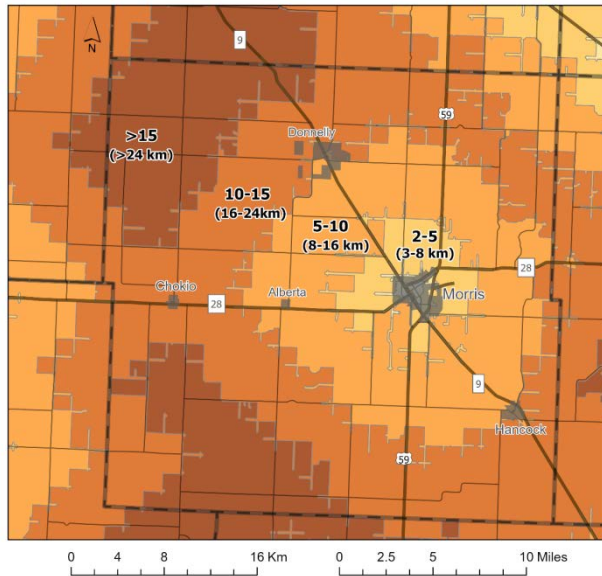
Survey respondents most frequently identified time of year (availability of garden produce, 27%), distance to food sources (22%), economic issues (21%), and transportation (11%) as barriers to food access. Approximately 9% of respondents also identified knowledge about food preparation, cooking, or storage and access to land for gardening as barriers. Approximately 1/3 (82) of respondents reported that they experience no barriers to food access in Stevens County.

Compared to survey respondents as a whole, student and food insecure respondents were more likely to identify barriers to food access, with economic issues (+21% and +36% respectively), transportation (+17% and +12%), and access to land for gardening (+10% and +11%) as the top three barriers identified. Student and food insecure respondents were also much more likely to identify access to a kitchen or food storage (+13% each), and information about supplemental food sources (+7% and +10%) as barriers. Food insecure respondents were much more likely (+10%) to note personal mobility issues as a barrier. Student and food insecure respondents were much less likely (-16% and -28%) to indicate they did not experience barriers to food access. In addition to barriers prepopulated in the survey question, respondents also reported other barriers including the lack of access to an Asian or other ethnic food stores, lack of time for canning and freezing foods, lack of mask wearing at the local supermarket (during the Covid pandemic), and lack of availability of food for specialized diets (e.g., gluten free, diabetic, various allergies).

Because respondents identified distance to food sources and transportation as two of the top barriers to food access, we conducted additional analysis of distance to grocery stores. Public transit options in the City of Morris and in Stevens County operate on regular but somewhat limited schedules. Morris Transit operates 6-10pm on weekdays and on Saturday afternoons and Sunday mornings; Rainbow Rider serves county residents with some regular routes and appointment-based service 7am-5pm on weekdays. Whether via public transit or personal vehicle, motor vehicle is the primary mode of transportation in Stevens County. Our analysis therefore focused on driving distance to the nearest grocery store. We determined driving distance from the nearest supermarket to all locations in Stevens County using the spatial analyst network analysis tool and the ESRI online road network solver available in ArcGIS Pro (Figure 7).

Stevens County residents in the northwest and southwest reaches of the county were located furthest (>15 miles or >24 km) from the nearest grocery store. 94% of the land area in Stevens County was more than 5 miles (8 km) from a supermarket; however, because most (54% of) people in Stevens County lived in Morris, most were located within 2 miles (3 km) of a supermarket. However, all residents of Alberta (6 miles), Donnelly, and Hancock (9 miles each) were further than 5 miles (8km) from a grocery store. Chokio residents (4% of the population) were about 14 miles (22 km) from the nearest

grocery store. Approximately 2,900 people (30% of the county's population) lived more than 2 miles (3km) from a grocery store. More than half of the county's population lived more than 1 mile (1.6 km) one way to the nearest supermarket or grocery store, or at least 10% more of the population than the national average of approximately 40% living more than 1 mile from the nearest grocery store [8].



Data Sources: ESRI, Minnesota Department of Natural Resources, Minnesota Department of Transportation
Map created using ESRI ArcGIS Pro 2.5, network area analysis (service area analysis)

Figure 7. Driving distance in miles (km) to grocery stores for Stevens County, MN residents

4.6. Residents' Suggestions for Improvement

Survey respondents' most common suggestions for improving their or their family's food situation included: lower food prices or a better financial situation (31), more grocery stores (23), and more food variety (17). Respondents also frequently mentioned more local foods (9), an access to tools or preparation spaces (4), more education or knowledge on food topics (5), more assistance from government programs (5), and gardening (5). A small number of other responses (3) included wanting access to food subscription services and better public transport to Alexandria.

Suggestions from students included lower costs (16), more grocery stores (6), more variety (4), more local foods (2) and more food education (2). Students also brought up campus-specific comments including wanting different food offerings at the dining hall, finding it difficult to stock up on and prepare food while living on campus, and being unable to afford the dining hall. Suggestions from food insecure respondents emphasized lower costs or a better financial situation (27); comments also included more grocery stores (9), more variety (9), better assistance programs (5), more local foods (3), access to tools or preparation spaces (2), and more food education opportunities (1).

5. Discussion and Conclusions

Challenges with community food security are in no way unique to Stevens County, MN as they are at least in part a product of the present function and status of our regional, national, and global food supply chains, transportation systems, and social safety nets. Rapid increases in emergency food usage and closures of grocery stores in smaller communities and the fact that only about half of household food security survey respondents and only ¼ of food insecure respondents found groceries to be affordable suggest that the county was experiencing food desertification (i.e., food was becoming more difficult for many county residents to access). Based on the results of this community food assessment, it is clear that in Stevens County there is a good deal of work required even to approach the standards of community food security:

- It is likely that significantly more than 10% of county residents or households were experiencing food insecurity.
- Supplemental and emergency food programs were likely underutilized (only ¼ of households below poverty level were utilizing SNAP benefits, for example)
- County residents experiencing food insecurity were more likely to be non-white, low income, or have a disability.
- At least 10% more county residents than the national average lived more than 1 mile from the nearest grocery store.
- Those experiencing food insecurity were less likely to consume a balanced diet.
- Especially for those without the use of a vehicle, significant barriers to food access included distance and transportation to grocery stores.
- There were many excellent gardeners in Stevens County; however, access to land for gardening and/or produce from others' gardens (only seasonally) was identified as a problem for many residents.
- It is likely that very little of the food consumed in Stevens County was produced and/or processed in Stevens County.

In response to the COVID-19 pandemic and related disruptions, before, during, and after the process of this assessment, several changes were made to the local food shelf including expanding the volunteer corps, obtaining commercial cooling equipment, reorienting messaging and providing more public information about the food shelf, and remodeling the facility to allow more efficient food storage and distribution. These developments have likely in many cases helped address residents' short term need for food, but in no way address the underlying or structural causes of food insecurity.

To address food security issues in the longer term, it is important to consider that community food security overlaps strongly with several other important areas of basic needs including housing, transportation, and income. Finding ways to address access to basic needs requires a

holistic, cohesive, and coherent process that considers which approaches are locally feasible, acceptable, and effective. Information and findings from this assessment are being used as a starting point for improving community and individual food security in Stevens County.

6. Limitations

As with any assessment effort, there are several areas in which more information gathering could potentially have improved knowledge of county residents' food situations. For example, we would ideally have convened focus groups to learn more about selected individuals' or households' experiences and suggestions. However, our ability to conduct focus groups was limited by funding, staffing and the timing of this assessment at the tail-end of Covid-19 restrictions. An expanded assessment team has secured funding in 2023-2024 to conduct a five-county regional food assessment in Stevens and surrounding counties during which we plan to deploy several qualitative data collection methods.

ACKNOWLEDGEMENTS

The University of Minnesota Morris Benson Center for Community Partnerships, Morris Academic Partners, and the Volunteers in Service to America (VISTA) program provided funding for this project. Community partners including Brenda Boever (coordinator of the Stevens County Food Shelf) and Maggie Johnson (Horizon Public Health) provided valuable input.

Author Contributions

Ed Brands (lead author) analyzed all data, prepared all tables and figures, and completed all the writing in this manuscript. Contributing author Argie Manolis provided structure, direction, and feedback on the overall assessment project trajectory. Danny Kenyon, Allison Koos, and Lily Sugimura assisted with literature review and survey design and distribution. Danny Kenyon and Allison Koos gathered data for the market basket survey; Lily Sugimura gathered information about historical food retail outlets in the study area. All contributing authors reviewed, commented on, and approved the manuscript.

Statement of Competing Interests

The authors declare no competing or conflicting interests.

References

- [1] Hamm, M.W., and Bellows, A.C. "Community Food Security and Nutrition Educators." *Journal of Nutrition Education and Behavior*. 35:37-43. Jan-Feb 2003.
- [2] Fyles, H., and Madromootoo, C. "Key Drivers of Food Insecurity." In: Madromootoo Ed. *Emerging Technologies for Promoting Food Security*. Cambridge, UK: Woodhead Publishing (Elsevier). 2016.
- [3] Long, M.A., Gonçalves, L., Stretesky, P.B., and Defeyter, M.A. "Food Insecurity in Advanced Capitalist Nations: A Review." *Sustainability*. 12: 3654. 2020.
- [4] Coleman-Jensen, A., Rabbitt, M.P., Gregory, C.A., and Singh, A. "Household Food Security in the United States in 2021." USDA Economic Research Report # 309. 2022. [online] Available: <https://www.ers.usda.gov/webdocs/publications/104656/err-309.pdf>. [Accessed March 6, 2024].
- [5] Haynes-Maslow, L., Hardison-Moody, A., Patton-Lopez, M., Prewitt, T.E., Shanks, C.B., Andress, L., Osborne, I., and Pitts, S.J. "Examining Rural Food-Insecure Families' Perceptions of the Supplemental Nutrition Assistance Program: A Qualitative Study." *International Journal of Environmental Research and Public Health*. 17: 6390. 2020.
- [6] Nikolaus, C.J., Johnson, S., Benally, T., Maudrie, T., Henderson, A., Nelson, K., Lane, T., Segrest, V., Ferguson, G.L., Buchwald, D., Jerrigan, V.B.B., and Sinclair, K. "Food Insecurity among American Indian and Alaska Native People: A Scoping Review to Inform Future Research and Policy Needs." *Advances in Nutrition*. 13(5): 1566-1583. March 2022.
- [7] Ver Ploeg, M., Nulph, D., and Williams, R. "Mapping Food Deserts in the United States." 2011. [online] Available: <https://www.ers.usda.gov/amber-waves/2011/december/data-feature-mapping-food-deserts-in-the-us/>. [Accessed March 6, 2024].
- [8] Rhone, A., Williams, R., and Dickens, C. "Low-Income and Low-Supermarket-Access Census Tracts, 2015-2019." Economic Information Bulletin No. 236. Washington, DC, United States Department of Agriculture Economic Research Service. 2022. [online] Available: <https://www.ers.usda.gov/webdocs/publications/104158/eib-236.pdf>. [Accessed March 6, 2024].
- [9] Russell, S., and Heidkamp, C.P. "Food desertification": The loss of a major supermarket in New Haven, Connecticut." *Applied Geography*. 31(4): 1197-1209. 2011.
- [10] US Department of Agriculture Food and Nutrition Service. FNS Covid-19 Response. <https://www.fns.usda.gov/coronavirus-response>. [Accessed March 6, 2024].
- [11] Cantor, J., Beckman, R., Collins, R.L., Dastidar, M.G., Richardson, A.S., and Dubowitz, T. "SNAP Participants Improved Food Security and Diet After a Full-Service Supermarket Opened in An Urban Food Desert." *Health Affairs*. 39(8): 1386-1394. 2020.
- [12] Hashim, N. "Reversing food desertification: examining urban farming in Louisville, Chicago and Detroit." *The International Journal of Justice and Sustainability*. 20(6): 611-636. 2015.
- [13] Karpyn, A.E., Riser, D., Tracy, T., Wang, R., and Shen, Y. "The changing landscape of food deserts." *UNSCN Nutr*. 44: 46-53. 2019.
- [14] Stevens County. Cities in Stevens County, MN [online] Available: <https://www.co.stevens.mn.us/1007/Cities>. [Accessed March 6, 2024].
- [15] US Census Bureau. 2020 Census Results. [online] Available: <https://www.census.gov/programs-surveys/decennial-census/decade/2020/2020-census-results.html>. [Accessed March 6, 2024].
- [16] US Census Bureau. American Community Survey. [online] Available: <https://www.census.gov/programs-surveys/acs>. [Accessed March 6, 2024].
- [17] US Department of Health and Human Services. Poverty Guidelines 2022. [online] Available: <https://aspe.hhs.gov/topics/poverty-economic-mobility/poverty-guidelines>. [Accessed March 6, 2024].
- [18] Minnesota Department of Employment and Economic Development. 2022. County Profile: Stevens County. [online] Available: https://mn.gov/deed/assets/021224_stevens_tcm1045-407505.pdf. [Accessed March 6, 2024].
- [19] Minnesota Geospatial Information Office. 1988-1990. Stevens County Land Use and Cover. [online] Available: https://www.mngeo.state.mn.us/maps/LandUse/lu_stev.pdf. [Accessed March 6, 2024].
- [20] USDA Census of Agriculture, 2017. Vol 1. Chapter 2. Minnesota County Level Data, Tables 11, 12, 13, 17, 19, 24, 25, 28. [online] Available: https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_2_County_Level/Minnesota/. [Accessed March 6, 2024].
- [21] Morris Area Farmers Market. [online] Available: <https://morrisareafarmersmarket.org/>. [Accessed March 6, 2024].
- [22] Minnesota Department of Health. Free and reduced-price lunch eligibility. [online] Available: <https://data.web.health.state.mn.us/free-reduced-lunch>. [Accessed March 6, 2024].

- [23] Bickel, G., Nord, M., Price, C., Hamilton, W., and Cook, J. "Guide to Measuring Household Food Security." USDA Food and Nutrition Service, Office of Analysis, Nutrition, and Evaluation. 2000. [online] Available: <https://www.fns.usda.gov/guide-measuring-household-food-security-revised-2000>. [Accessed March 6, 2024].
- [24] Cohen, B., Andrews, M., and Kantor, L.S. "Community Food Security Assessment Toolkit." USDA Economic Research Service. EFAN-02-013. 2002. [online] Available: <https://www.ers.usda.gov/publications/pub-details/?pubid=43179>. [Accessed March 6, 2024].
- [25] Nevarez, L., Tobin, K., and Waltermaurer, E. "Food Acquisition in Poughkeepsie, NY." *Food, Culture, & Society*. 19(1): 19–44. 2016.
- [26] Dolstad, H.A., Woodward, A.R., Green, C.L., and Mcspirit, S.J. "Interest in Nutrition and Local Food Systems among Food-Insecure Households in an Appalachian Community." *Journal of Hunger & Environmental Nutrition*. 11(3): 340–353. 2016.
- [27] Brasseur, K., Ozier, A., McBride, R., Powell, A., Ratliff, E., Yao, P., Leong, C.M.H., and Umoren, J. "Resources Enabled to Assist the Community and Hunger (REACH): A Community Food Security Needs Assessment." *Journal of Food Security*. 3(4): 99–106. 2015.
- [28] Ko, L., Enzler, C., Perry, C.K., Rodriguez, E., Mariscal, N., Linde, S., and Duggan, C. "Food Availability and Food Access in Rural Agricultural Communities: Use of Mixed Methods." *BMC Public Health*. 18(1): 634. 2018.
- [29] Rollins, P., Carey, T., Proeller, A., Adams, M.A., Hooker, M., Lyn, R., Taylor, O., Holden, K., and Akintobi, T.H. Community-Based Participatory Approach to Increase African Americans' Access to Healthy Foods in Atlanta, GA. *Journal of Community Health*. 46(1): 41–50. 2021.
- [30] US Department of Agriculture. 2022. USDA Cost of Food Reports. [online] Available: <https://www.fns.usda.gov/cnpp/usda-food-plans-cost-food-monthly-reports>. [Accessed March 6, 2024].
- [31] US Census Bureau. Educational Attainment. [online] Available: <https://www.census.gov/topics/education/educational-attainment.html>. [Accessed March 6, 2024].



© The Author(s) 2024. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).