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Solving the Problems of Iowa Food Deserts: Food Insecurity and Civic Structure*

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ABSTRACT Rural regions include places where food sources are not evenly distributed, leading to areas of concentration and food deserts—places where few or no grocery stores exist. Individuals are hypothesized to depend on personal connections and the civic structure of where they live to help them solve the problem of food insecurity. We find that residents living in poor rural counties with few grocery stores and perceptions of high civic structure are significantly less likely to be food insecure. A great deal of food giving and receiving is reported, but these personal connections do not decrease the odds of being food insecure. Lower incomes and being younger increase the odds of food insecurity. Our findings suggest that investments in strengthening the social structure of rural communities along with strategies that increase incomes can help households solve the problem of food insecurity.

> "I live in Southern Iowa . . . [We] had a small town grocery store that supplied the area needs until it closed 16 months ago. The only food sources in the town and surrounding area are two convenience stores and three restaurants. The population must travel 15 to 30 miles to do any serious grocery shopping. This is a great inconvenience for the elderly and those who do not work in a town with a store."
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> Letter from random sample participant included with the returned mail questionnaire, January 13, 2003

A disproportionate number of low-income people live in areas that

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have been abandoned by retailing (Leland 1987; Lang and Rayner 2002). Consolidation in the retail food industry has led to fewer but larger food stores (Kaufman 2000; Pollack Associates 2002) and in many rural areas higher food prices, less variety, and lower quality fresh produce and meat compared to suburban and urban stores (Morris et al. 1992; Kaufman 1998). For most of the rural population, changes in the supermarket industry simply mean acquiring new patterns of travel to obtain the family's weekly groceries. However, for elderly and low-income households the loss of rural grocery stores has implications for how they access food and their food security. There is this "... perverse irony that the poorest have to pay more for a basic necessity of life" (Leland 1987:3). Low-income households often do not have a reliable personal vehicle and depend on family, friends, or neighbors (USDA 2003) for getting groceries on a regular basis. Many rural elderly, compared to the general population, have less independent access to a vehicle to shop for food. When they do shop, they are likely to shop one, rather than multiple, grocery stores (Bitto et al. 2004). Food insufficiency in older men and women has been predicted by shopping for food once a month or less and getting most of their food from one store (Wooden 2002; Wooden and Oakland 2003).

When access to the retail food environment is limited by income or functional disabilities, households devise a variety of coping strategies to solve their food problems. One set of strategies includes utilizing a personal network of friends and family (Olson et al. 1997; USDA 2003; Martin et al. in press). However, individual personal connections to people and safety net services are often insufficient. A local community social structure that addresses food problems is also necessary if long-term solutions to increasing food access and reducing food insecurity are to be achieved. In this paper we examine how personal connections to family, friends, and safety net institutions and perceptions of a civic structure that addresses food issues affect the food insecurity of those who live in places with no or few grocery stores.

Food security is the ready availability of nutritious and safe food and the assured ability to obtain it through normal sources (Anderson 1990; Morris et al. 1992). Although most households in the United States are food secure, 11.6 percent of nonmetropolitan households in 2002 were food insecure (Nord et al. 2003). Campbell (1991) conceptualizes three major categories of food sources: the normal food system (grocery stores and food service operations), government food assistance (WIC, school lunch, nutrition programs for elderly), and alternative food sources (private food assistance, gifts from family and friends). When the normal food system is unevenly distributed, areas of concentration and food deserts are created. Food deserts are places where few or no consumer

food stores are available (Lang and Caraher 1998; Whitehead 1998; Furey et al. 2001; Lang and Rayner 2002). While food deserts may not be the source of food insecurity, they frame the conditions under which disadvantaged communities and households must expend greater resources to obtain food through normal sources. Households with financial constraints and elderly with income and physical limitations of activities of daily living are affected by the spatial distribution of their food supply and the social organization of the places where they live. Lobao's (2003) research shows that spatial inequality leads to stratification when the economic and social infrastructure of rural regions is inadequate. This suggests that rural food deserts will perpetuate the inequality cycle unless individuals and communities proactively devise ways to solve the problem of food access. Couto (1999) finds that the most vulnerable communities have working poor where work is not tied to maintaining or sustaining communities. Under these conditions, the personal social connections of individuals become resources in solving household food insecurity (Martin et al. in press). Households with insufficient personal income utilize both government and private food program assistance (Molnar et al. 2001; Gogue et al. 2001).

Much of the food security literature focuses on assessing household food insecurity and recommending policies that solve individual food problems. However, in rural places where access to affordable foods for purchase is limited, individual-focused policies and strategies may be insufficient. We posit that the social organization of rural areas is a critical factor in the capacity of at-risk households to obtain healthy, affordable foods to meet food sufficiency needs. Thus, we propose that personal connections and perceptions of civic structure will decrease the odds of being food insecure.

Personal Connections and Food Security

The connections and relationships of mutuality that individuals have with each other are resources for meeting personal needs (Bourdieu 1986; Coleman 1988). Coleman (1988:S101) writes that this resource, known as social capital, constitutes an "... aid in accounting for different outcomes at the level of individual actors ..." Thus, these relationships of trust and obligation have the potential to help low income and elderly individuals solve their food sufficiency problems. Friends, family, and neighbors can be direct sources of food as well as money and transportation resources to obtain food. The United States Department of Agriculture (USDA) (2003) National Food Stamp Program Survey of 1996 reports that less than half of U.S. low income households are able to use a car they own and have to rely on friends,

family, and neighbors for transportation, including food shopping. Olson et al. (1997) interviewed 193 women in rural upstate New York and report that being a single parent, lack of savings, larger household size, and unexpected expenses significantly contribute to food insecurity. They further find significant differences between food secure and food insecure households and the frequency of family/friends bringing them food, frequency of borrowing money for food from family/friends, and frequency in using a food pantry.

Hofferth and Iceland (1998) report that families living in rural regions have high levels of interpersonal exchange among kin; almost 60 percent of their sample had given or received time or money help. Further, low-income families are more likely to receive help than give it; and families with more education were more likely to give help to and receive money from kin compared to those with less education (Hofferth and Iceland 1998). They also find reciprocal giving among rural generations, not just one way giving from older to younger persons.

In recent work on food security in Iowa, focus group interviews by Greder et al. (2002) and Morton et al. (2002) also reveal that family, friends, and neighbors are important resources for low-income young parents and elderly. One focus group member says, "I put in a garden, way too much fruit for the two of us, and I share. I give it to people . . . that don't have gardens or are older and not able to get out. That's done quite a bit in this town" (Morton et al. 2002:12). Greder et al. (2002:39) report similar findings: ". . . my in-laws go and they work on a farm. . . . In lieu of pay we can raise hogs and cattle out there . . . that is how we get our meat." Other young mothers talked about the importance of family and neighbors, "I call my Dad" or "My Mom will bring us if I don't have the gas." Another agreed, ". . . if I needed to go somewhere bad enough my family would take me." One young woman summed up the importance of social connections, ". . . unless they got good neighbors or something . . . or someone to help maybe, . . . they go without" (Greder et al. 2002:44).

Martin et al. (in press) examine household and community social capital and report that both decrease the odds of household hunger in urban households that are food insecure. However, they find that none of their social capital variables significantly predict the odds of being food secure. This lack of significance may be related to using measures of social capital that focus on generalized norms of trust and reciprocity rather than measuring food related relationships. Further, Martin et al. (in press) mix personal behaviors with perceptions of the neighborhood. We hypothesize that the personal connections people have with family, friends, and neighbors will increase the odds of reporting food security. Further, personal interactions with family, friends, and others are conceptually separated from overall perceptions of community

social structure. We test personal connections using indicators of food exchange between individuals and connectivity to local safety net services. Personal networks of food exchange, and giving and receiving food are resources that are expected to help households solve the problem of food access and shortages.

Food Security and Civic Structure

There are theoretical reasons for expecting that the social organization of the community in specific food environments—such as food deserts—could make a difference in the food insecurity outcomes low income and elderly rural residents experience. Rural areas with high levels of poverty and limited or no food sources place burdens of food availability, access, and quality on low-income populations. Morris et al. (1992) report that in small and medium grocery stores located in persistently poor areas of rural America, food prices for the thrifty food plan market basket specified by USDA are 36 percent higher than the national average. Many solutions to limited supplies of affordable, healthy foods are community rather than individual based. Traditional community solutions include food pantries, senior meal programs, and farmer markets. However, community strategies can also encompass efforts to make locally produced foods available for retail purchase, to build and support local food stores and food production facilities, to develop better transportation networks, and to invest in livable wage industries.

These community solutions require partnerships among multiple groups with norms of civic responsibility. Molnar et al. (2001) note the rural church plays a central role in developing local food banks and organizing outreach efforts. Senior meal sites utilize public (community centers) and private (churches) space and volunteers as well as tax supported financial matches. The creation and maintenance of farmer markets takes local leadership and the cooperation of many. In one study, 7 out of 10 such markets are located on public property, and 45 percent of market managers report they are part of another organization or local government (Hinrichs 2001). These are examples of collective community efforts to change the local food infrastructure.

Not all places experience similar levels of collective actions around food issues. The quality of a community's social structure affects whether problems are identified and attempts made to solve them (Flora and Flora 1993; Putnam 1993; Young and Lyson 2001; Morton 2003). A community's civic structure consists of multiple interacting groups with community benefit norms and activities in response to identified issues (Morton 2003). This structure gives communities the capacity to solve problems such as inadequate food resources.

Food security focus groups conducted with rural low-income Iowa individuals provide multiple references to community groups and organizations that help households meet food needs (Morton et al. 2002; Greder et al. 2002). Focus groups held prior to the survey reported in this paper offer a variety of experiences that link community institutions to food. In one town, a retired man spoke of his involvement "... in a lot of potluck suppers and so forth at the church and I'm a member of the VFW [Veterans of Foreign Wars]." Another older person identified her favorite place to eat out as "the church potluck." In a different rural town, an older resident who uses the local senior center also talked about the VFW, "At the VFW we donate to it [the local food pantry]. ..." In this same community, another older resident commented on the activities of a local group: "The Rotary Club has a massive [field of sweet corn] ... out there, and they pick it and then make it up and have a roadside stand and sell it. The price is reasonable, and it's excellent corn, wonderful corn." Senior citizens in this town acknowledged that any senior who says, "... hey, help me here ... can even eat here [senior meal site] for free if they have no money. ..."

In a different town, a young parent commented on the school feeding program: "I think it's pretty good. If you don't eat breakfast at home, you get it at school or go without." Other focus group members from other communities also commented on their school feeding programs. A young unemployed male said: "... on Mondays ... I go over there and eat with the little kids. They want adults around to kind of supervise a little bit. ..." A young mother responded to his comment by saying that, "... children know its okay to be able to eat there, and it's nothing ... bad that they're doing. Sometimes they get put down by other kids, but it helps ... It's okay because grownups are doing it too."

One low-income focus group member acknowledged the competing needs of government to balance social services support and public safety and thought public safety financial needs were given more priority. "[W]e were trying to get help with our rent, and they told us that rental assistance had been shut off until the end of the year because they were out of funds. But they just bought a brand new truck for the sheriff for $29,000." Another concludes, "I think basically if the problem (not enough food) is known, the community will work it out."

The multiple connections among groups within an area are important indicators of social functioning and regional economic viability (Flora 1998; Putnam 1993). Putnam (1993:87) offers evidence that the emphasis on civic community and the obligations of citizenship are positively related to "... the ability of liberal societies to function successfully. ..." Civic structure has been used to explain variations in rural core public services as well as private public partnership services

(Morton 2003) and variations in rural housing adequacy (Morton et al. 2004). USDA identifies community food insecurity as a function of inadequate resources from which people can purchase foods in sufficient quantity or variety at affordable prices (Cohen 2002). Further, community food security is affected when there are no local food production resources available to community members and there is inadequate food assistance to help low-income people purchase foods at retail markets. This suggests social, institutional, and economic factors within a community affect the quality and quantity of available foods and their affordability. If civic structure affects housing adequacy and other rural services, it is likely to also affect the food supply of rural places and offer an explanation of the variations in rural food security. We do not have a direct measure of civic structure but use rural residents' perceptions of the civic structure where they live. While perceptions may not reflect objective reality, they do reflect indigenous knowledge and level of engagement the individual has regarding his or her community (Innes 1994). We hypothesize that perceptions of multiple public and private groups and firms in the community working towards solving food problems will reduce the odds of individual food insecurity.

Methods

Iowa lost more than half (52.6 percent) of its grocery stores from 1976 to 2000 (Stone and Artz 2001). This decline included the loss of 310 grocery stores in the last ten years (Stone and Artz 2001), many of which were main street businesses in small rural towns across Iowa. Two rural high-poverty counties in Iowa were purposively selected for study because they had four or fewer grocery stores, were not adjacent to a metropolitan county, and had high poverty levels.[1] When the 2003

[1] First, the number of grocery stores in each of Iowa's 99 counties was identified. The average rural county in the United States has 3.8 grocery stores (Morris et al. 1992). This threshold was used in defining an Iowa food desert. It is recognized that county land mass, population density, and topography can also affect food desert classifications. The research team found that Iowa county sizes are fairly uniform as is the topography and decided that a four grocery store rule of thumb offered a useful threshold to identify a universe of counties with relatively few retail food stores. The 1997 Standard Industrial Classification (SIC) code for retail grocery stores and supermarkets (54) was used to find Iowa counties with four or fewer stores. Thirteen counties fit our Iowa food desert definition. These 13 were screened for urban influence based on proximity to a county with a large or small metropolitan designation using a 1993 urban influence code (Ghelfi and Parker 1997). Next, 1997 estimates of poverty rates for people of all ages were obtained for the list of 13 counties. The four with the highest rates (13.1 to 19.1) were located in Iowa's southern tier, contiguous in pairs, and had similar rural topography and agriculturally based economies. A comparison of county demographic data from 2000 revealed similar age, ethnicity, and other patterns. From the list of four high poverty counties, we selected the highest poverty county (19.1 percent) and a second county that was not contiguous but with the same number of grocery stores (2).

Table 1. Demographic and Social Description of Iowa Community Food Assessment Study Sites

Characteristic	County A		County B	
	Number	Percent	Number	Percent
Total Population (2000)	8,689		8,016	
Median Age (years)	36.4		39.7	
65 and over	1,535	17.7	1,566	19.5
Under 18 years	2,002	23	2,032	25.3
High School Education		81.7		82.2
Race/Ethnicity (alone and combination)				
White	8,468	97.5	7,925	98.9
Black/African American	101	1.2	33	.4
Asian	89	1.0	41	.5
Hispanic/Latino	148	1.7	40	.5
Native American Indian	65	.7	48	.6
Number of Households				
Female house with children under 18 years	173	5.2	178	5.5
Householder living alone	1,010	30.3	903	28.0
Average family size	2.96		2.97	
Number of Grocery Stores	2		2	
Poverty rate 1997 (State of Iowa 9.9 percent)		19.5	13.9	
Per Capita Income 1997 (State of Iowa $25,598)	$16,436		$22,739	
Food Stamps (2002)				
Number of households	310		221	
Percent of all residents		7.1		6.0
School Lunches—Percent Free/Reduced		47.9		37.4
Registered Voters	5,127		4,977	
Percent voted 2000 (November, Presidential election) *(State of Iowa percent voted 71.6%)*		72.2		73.6
Percent voted 1998 (November, state & local elections)		58.3		53.8

Sources: Goudy et al. 2000; U.S. Census Bureau 2003.

survey was conducted, both selected counties had only two grocery stores. Comparisons of the two counties show similar population sizes (8,689 and 8,016), percent 65 years and over (17.7 percent and 19.5 percent), and a predominantly white population (97.5 percent; 98.9 percent) in 2000 (See Table 1). Poverty rates for both counties (19.5 and 13.9 percent) are considerably above the state poverty rate (9.9 percent). A little more than 7 percent of County A residents receive food stamps compared with 6 percent in County B. County A has 10 small, incorporated towns. Two small towns (populations 2,047 and

2,319) in this county are about 16 miles apart and each has one grocery store. County B has two grocery stores and six small towns. Both grocery stores are located in one town (population 3,870) close to the center of the county.

This project was funded by the Iowa Department of Health with the intent to assess the food environment of rural places with limited grocery stores. In the first year of this project we conducted focus groups with Iowa State University Extension support. Data from these focus groups were used to construct the mail survey in year two. Addresses for each of the two study counties were purchased and a random sample was drawn from each county. A total of 1,468 surveys were mailed to the stratified random sample, 720 surveys were returned, 3 were returned void, and 272 were undeliverable or refused. The 3-stage Dillman (2000) mail survey method was used followed by a telephone call six weeks later to those who had not returned their surveys. The return rate was 60.1 percent.

Data from the two counties are combined for analyses. The rationale for combining these two data sets is the similarity of demographic profiles and population size. Food insecure/food secure is used as the dependent variable. Four independent variables represent personal connections and civic structure. Age, income, and education are used as control variables. A number of literatures have established these three variables as highly related to food insecurity (Olson et al. 1997, Nord and Andrews 2002; Food Security Institute 2002, 2003). A fourth variable, live in town vs. open country, was added to control for proximity to community services and facilities.

Results

Food Insecurity Indicators

Almost 10 percent of Iowa's 3 million people are estimated to be in poverty. USDA 2000-02 prevalence rates for the State of Iowa are 9.1 percent food insecure and 2.8 percent food insecure with hunger (Nord et al. 2003). Food insecurity occurs when there is limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways. Food insecurity with hunger is "... the uneasy or painful sensation caused by the lack of or recurrent and involuntary lack of access to food" (Anderson 1990:1560).

More than 12 percent of our sample is classified as food insecure and 6.7 percent is food insecure with hunger using the USDA six item food insecurity scale (Table 2) (Nord and Andrews 1999). Respondents who answered "yes" to one or none of the items are considered food secure

Table 2. USDA Core Food Insecurity Variables (Rural Random Sample)

	Percent
1. The food that I/we bought just didn't last, and I/we didn't have money to get more (often true, sometimes true = 1; never true = 0) $N = 712$	18
2. I/we couldn't afford to eat balanced meals. (often true, sometimes true = 1; never true = 0) $N = 711$	16
3. In the last 12 months did you and/or other adults in your household ever cut the size of your meals or skip meals because there wasn't enough money for food? (yes = 1; no = 0) $N = 675$	8
4. If yes, how often did this happen? (Almost every month, some months but not every month = 1; for only 1 or 2 months = 0) $N = 712$	5
5. If yes, in the last 12 months, did you ever eat less than you felt you should have because there wasn't enough money to buy food? (yes = 1; no = 0) $N = 712$	7
6. If yes, in the last 12 months, were you ever hungry but didn't eat because you couldn't afford enough food? (yes = 1; no = 0) $N = 712$	7
USDA food security scale (0–6)[a] $N = 669$	
Food secure ("yes" to 0–1 items)	87.6
Food insecure ("yes" to 2–6 items)	12.4
Food insecure with hunger ("yes" to 5–6 items)	6.7

[a] 0–1 items, household is food secure.
2, 3, 4 items food insecure with no hunger evident.
5, 6 items food insecure with hunger.
Short Form of the 12 Month Food Security Scale prepared by Nord and Andrews, 1999.

households. Those who marked "yes" to 2–4 items are classified as food insecure but without evidence of hunger. Respondents who said "yes" to 5–6 items are food insecure with hunger. The first three questions are answered by all respondents, the last three are dependent upon the answer given to question 3, "In the last 12 months did you and/or other adults in your household ever cut the size of your meals or skip meals because there wasn't enough money for food?" In our sample, 18 percent reported that the food they bought didn't last and they didn't have money to buy more. Sixteen percent said they couldn't afford to eat balanced meals. Eight percent reported cutting the size of meals or skipping meals because there wasn't enough money for food. Five percent said they cut meal sizes or skipped meals almost every month or some months but not every month. Seven percent reported eating less than they felt they should because there wasn't enough money to buy food; and another 7 percent reported being hungry but not eating because they couldn't afford enough food. These items are combined to measure the degree of food insecurity experienced by the sample. In this analysis, a binary dependent variable is constructed with food insecure (those answering "yes" to 2 or more items) = 1 and food secure ("yes" to 0 or 1 item) = 0.

Personal Connections: Giving and Getting Food

Food exchanges among individuals and the use of safety net institutions represent personal connections as resources to solve food shortages. Constructed variables for analysis were derived from the question, "In the past 12 months, have you given food (garden produce, meat, fish, milk, etc.) to others in your community: family, friends, neighbors, people you don't know, food pantry/bank, food drive, senior meal program." A giving food to family and friends summated index was created using three items: family, friends, neighbors (reliability alpha = .826; index mean 1.86, SD 1.23).[2] Over 74 percent reported giving food to family; 68 percent gave food to friends; and 51 percent gave food to neighbors. A second summated index consisting of giving food to people I don't know, food bank, food drive, and senior meal program (reliability alpha = .574; index mean .93, SD 1.06) was examined but not used in the logistic regression model due to statistically unstable sample numbers.

Three questions were chosen to represent receiving food, "In the past 12 months, how have you acquired food? Please check all that apply: food pantry/shelf, senior meal program, and family/friends." These indicators of acquiring food were selected to represent personal relations (acquiring food from friends and family) and personal connections to community institutions (acquiring food from senior meal site and acquiring food from food pantry). Seven percent of the sample reported using the senior meal site; three percent obtained food from a local food pantry; and 30 percent acquired food from friends and family. Local food pantry use is not included in the logistic regression because of insufficient numbers for statistical analysis.

Civic Structure

The civic structure index measures the extent to which respondents perceive that local institutions and leaders are working to solve food problems in the community (Table 3). The map of Iowa lists a total of 16 small towns in these two counties. One-third of our respondents do not live in a town, but report being either a farm or rural nonfarm resident. Rural residents who live outside of town orient socially toward one or several of these towns based on school districts, fire districts, main street businesses, political districts, and/or employment. Thus, both small town residents and those living in their outskirts are

[2] Principal component factor analysis was used to identify two dimensions of giving food. Giving food to family, friends, and neighbors summated index values entered into the logistic regression model are the summed score divided by three to retain the original metric of this variable.

Table 3. Rural Civic Structure (Random Sample)

	Mean (SD)
1. There are group meal sites and home delivered meals available for elderly persons where I live (not available = 1; available 1–4 days per week = 2; available Monday through Friday only = 3; available 6–7 days per weeks = 4) $N = 548$	2.77 (.68)
2. My community has a number of active groups that work at solving food problems of community members (no active groups = 1; somewhat active groups = 2; many active groups = 3; a lot of active groups = 4) $N = 447$	1.87 (.62)
3. Local farmers and food manufacturers and distributors donate foods through food banks, food pantries, and other groups in our community (never = 1; sometimes = 2; often = 3; very often = 4) $N = 445$	2.16 (.71)
4. Churches in our community offer meals, food pantries, and emergency food supplies (never = 1; sometimes = 2; often = 3; very often = 4) $N = 541$	2.31 (.81)
5. Government food programs like Food Stamps and WIC work together with churches and nonprofit organizations to coordinate efforts to meet food needs of people (don't seem to work together = 1; work together a little = 2; work together = 3; work together a lot = 4) $N = 369$	2.50 (.86)
6. Group meal sites and food pantries/shelves usually have an active and large numbers of volunteers (no volunteers = 1; a few volunteers = 2; adequate number of volunteers = 3; many volunteers = 4) $N = 436$	2.38 (.60)
7. Elected officials are aware of food access and affordability problems in your community/neighborhood (not at all aware = 1; a little aware = 2; aware, but aren't doing anything to help = 3; aware and trying to do something to help = 4) $N = 319$	2.72 (.99)
Summated index of these items has a reliability for internal consistency $\propto = .79$. The index mean is 16.46; SD is 3.66.	

expected to be able to assess the quality of their civic structure based on their knowledge of the institutions and activities of local leaders.

The civic structure index consists of seven items each containing a 1–4 response arranged from low to high and has a mean of 16.46 (Table 3). Questions were designed to represent perceptions of community cooperation and coordination in three areas: 1) voluntary groups' and organizations' activities related to food; 2) private business, farmer contributions, and cooperation in solving community food concerns; and 3) partnerships or coordination of public, private non-profit, and private for profit business related to community food issues. The coefficient alpha reliability score is .79, well above the accepted level for internal consistency (Nunnally 1978). Summated index scores entered into the logistic regression model are divided by 7 to retain the original metrics.

Our measures of civic structure offer subjective assessments of how respondents view the social organization of their community. These

assessments are derived from personal experiences, shared knowledge, myths, and facts. Perceptions provide the framework in which respondents attempt to devise strategies for solving community issues of food insecurity and hunger. Respondents, on average, said that elderly meal sites and home delivered meals were available Monday through Friday but not on weekends. On average, they thought that their community had somewhat active groups working at solving food problems. Local farmers, food manufacturers and distributors were reported as donating food a little more than sometimes. Churches were perceived as offering meals, food pantries, and emergency food supplies about midway between sometimes and often. Group meal sites and food pantries were thought to have more than a few but a little less than an adequate number of volunteers. Respondents believed that government food programs worked together with churches and nonprofit groups more than a little. Lastly, they perceived that their elected officials were aware of food access and affordability issues in their community but weren't doing anything to help.

Individual Characteristics

Age, income, and education are known predictors of food insecurity (Olson et al. 1997; Nord and Andrews 2002; Food Security Institute 2002, 2003). In order to identify the effects of personal connections and civic structure, we control for these variables to discover if relationships and perceptions of community structure matter. The average age of our adult sample is 56 years old. Respondents reported income in nine categories. The center of each income range was taken yielding an average annual income of $35,639. The log transformation was used in logistic regression models. Eighty-nine percent of the respondents have a high school diploma and the median education level is technical education beyond high school. To capture the spatial relations of these rural counties a little more finely, place of residence was dichotomized as live in rural town or live in the open country. The open country variable included farm and rural nonfarm residents. Sixty-two percent of our sample lived in a rural town.

Models of Food Security, Patterns of Personal Connections, and Civic Structure

Food insecurity is frequently considered an individual problem of not enough income and not enough education. We hypothesize it is also affected by personal connections and the social organization of the community. Three logistic regression models are estimated to determine the contribution of respondents' individual demographic

characteristics, personal connection patterns, and perceptions of civic structure (Table 4). The first model consists of four demographic variables (age, income, education, and live in town) and yields modest R^2 values (Cox and Snell R^2 = .145 and Nagelkerke R^2 = .263). These summary measures estimate the strength of association between the dependent variable and independent variables in predicting the observed value (Menard 1995) and are analogous to the OLS R^2. The second model adds personal connections of giving and acquiring food; and the last model combines civic structure with demographic and personal connections variables. While the increase from Model 1 to Model 2 is small, the measures of R^2 show a 50 percent increase from Model 2 to Model 3 (Cox & Snell R^2 56.8 percent increase and Nagelkerke R^2 = 48.9 percent increase) offering strong support for our civic structure theory.

In Model 1, the coefficients on age and income are negative and highly significant. The coefficient −.054 associated with age implies older respondents have lower odds of being food insecure than younger respondents. Income is centered and then logged to better represent the functional relationship between income and food insecurity (Nord and Andrews 2002). Thus, those with lower incomes and younger have higher probabilities of being food insecure. Neither education nor living in town is significantly associated with food insecurity. Education is entered as a dichotomous variable, high school education or less = 1 and more than high school = 0.[3] Education may not be significant because its effects are largely mediated through the income variable.

Three personal connections variables are added in Model 2; a giving food to family, friends and neighbors index and two single indicators, acquiring food at a senior meal site and acquiring food from family and friends. None of the personal connection variables in Model 2 are significant; age and income continue to be negative and significant.

The civic structure index is added in Model 3. This variable improves the fit of the model; its coefficient is negative and significant ($p > .021$) with an odds ratio of .200. Thus, perceptions of high civic structure decrease the odds of being food insecure. Model 3 supports the civic structure hypothesis but not the personal connections one. Giving to or receiving food from family and friends does not decrease the odds of being food insecure.

[3] The 2000 US Census and our descriptive data reveal high rates of high school education. The median education level is technical training beyond high school. High school diploma/GED and less than high school categories are combined due to the small cell numbers revealed in cross tabulation of less than high school and food insecure.

Table 4. Logistic Regression Models of Food Insecurity,[1] Patterns of Personal Connections, and Civic Structure (Food secure $N = 564$; food insecure $N = 92$)

	Model 1			Model 2			Model 3		
	(β)	Odds ratio	Significance	(β)	Odds ratio	Significance	(β)	Odds ratio	Significance
Constant	13.077			16.641			57.188		
Individual characteristics									
Age	−.054	.947	.000	−.048	.953	.000	−.062	.940	.016
Income[a]	−2.807	.060	.000	−3.412	.033	.000	−3.297	.037	.009
High school education or less[b]	.437	1.548	.145	.337	1.401	.315	.973	2.647	.194
Live in town[c]	−.138	.871	.635	.197	1.218	.547	.230	1.258	.762
Personal connections									
Give food to family and friends index[d]				.032	1.033	.934	−.012	.988	.990
Acquire food from senior meal site[e]				−6.655	.001	.570	−6.359	.002	.863
Acquire food from family and friends[e]				.134	1.144	.689	−.784	.457	.360
Civic structure index[f]							−1.610	.200	.021
Cox & Snell R^2		.145			.167			.262	
Nagelkerke R^2		.263			.299			.444	

[1] The dependent variable is food insecure = 1.
[a] Income log10. Income categories are centered in the following ranges (yearly).
Under $5,000; $5,000–$9,999; $10,000–$14,999; $15,000–$24,000; $25,000–$34,999; $35,000–$49,999; $50,000–$74,999; $75,000–$99,999; $100,000–150,000.
[b] High school diploma/GED, 8th grade or less and 9th–11th grade combined = 1; Technical, some college, college graduate = 0.
[c] Live in small town = 1; Rural nonfarm and farm = 0.
[d] Giving food to family, friends, and neighbors summated index divided by 3 items to retain original metric.
[e] Acquiring food: "In the past 12 months, how have you acquired food? Please check all that apply: senior meal program, family/friends."
[f] Civic structure summated index divided by 7 items to retain original metric.

Discussion

The logistic regression analysis shows a strong relationship between food insecurity and perceptions of civic structure. This suggests that the multiple efforts of groups and organizations in rural regions addressing food problems are important in reducing food insecurity. These organizations work directly and indirectly by responding to changes in individual circumstance and the food environment. Some groups have specific safety net missions to aid households who financially or physically can't access the normal food system. Senior home meal deliveries and congregate meals, transport vans for disabled and elderly, and food drives are programs undertaken by local agencies, churches, and civic groups.

A great deal of food sharing is revealed by our study, however, the "... durable network of more or less institutionalized relationships of mutual acquaintance and recognition ..." theorized by Bourdieu (1986:248) does not serve as a predictor of food security. Personal connections used to acquire food from family, friends, and others may serve as food resources, but they do not explain why some are food secure and others not. Hofferth and Iceland's (1998) findings on rural giving and receiving support the idea that some rural communities have normative expectations of reciprocal giving among family members. While this cultural norm may explain why food giving doesn't differentiate between food secure and food insecure, additional qualitative research on these relationships could shed more light on why differences are not apparent.

We find in these two high poverty rural places, where the numbers of grocery stores are few, perceptions of high civic structure are associated with lower odds of being food insecure. However, there are many more unanswered questions. The term food desert is used as a setting in which food insecurity takes place. But when is a place really a food desert and does that have any effect on food insecurity? We don't know. The concept of food desert needs to be refined and tested. Future research can then compare food deserts to those places with a sufficient normal food supply. Comparative studies between places with few or no food stores and adjacent rural hub towns where superstores and larger grocery stores are locating is needed to understand the effects of retail food consolidation on rural food insecurity, diets, and health.

This study has a number of limitations. First, while our random sample findings are generalizable to the population of the two study counties, they can't be generalized to other rural counties in Iowa or the Midwest. Second, our food insecurity index measures adult food insecurity only. To identify the extent of food insecurity in the children of these counties, future research should include additional indicators. Lastly, civic

structure is measured as perceptions of individuals rather than at the community level. This is due to the limited number of communities in the sample. Future research should include at least 30 rural places/areas. Then community structure could be evaluated in a multi-level model to separate individual and community level effects. There are other possible indicators of civic structure. Lyson (2001) posits that civic agriculture groups (cooperatives, farmer market groups, nutrition councils, buy local initiatives, and community supported agriculture groups) increase the overall capacity of rural problem solving. In addition, other community groups have economic development and transportation as goals and can be sources of civic structure that could contribute to solving the problem of food insecurity. Future research should incorporate these indicators as measures of civic structure.

If consolidation in the food system continues, it is likely to further desertify rural areas while concentrating retail food stores in regional hub towns. Small town stores, due to limited floor space, economies of scale, and distance from distribution centers, will likely continue to have a limited food selection at higher prices and be challenged to stay profitable (Leland 1987). While all households must solve the problem of feeding their families, low-income and younger households in our two high poverty rural Iowa food deserts were less successful than others in avoiding food insecurity. They are the at-risk group in greatest need of a civic infrastructure. Strong civic structure can offer more than food safety net assistance. The loss of a local grocery store or the inadequate quality and variety of fresh foods in an existing store are problems for the whole community, not just those with resource limitations. Community groups are sources of mobilization to encourage local shopping, to increase the quality of foods available, to create farmer markets, to support existing or recruit new grocery stores, and to develop better transportation systems and livable wage employment.

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