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FOOD DESERTS AND MIGRANT FARMWORKERS: ASSESSING FOOD ACCESS IN OREGON'S WILLAMETTE VALLEY

Katie Grauel[1] and Kimberlee J. Chambers[2]

Food insecurity, often correlated with ''food deserts,'' affects migrant and seasonal farmworkers (MSFW) at greater rates than other populations. Our research evaluates the food desert experiences of MSFW communities in Oregon's Willamette Valley. Through GIS mapping, interviews with MSFW, and food retailer inventories, our research helps elucidate the degree to which the geographical distribution of food retailers and the products they carry affects MSFW. Access to food retailers was assessed for distances of 0.25, 1.5, 5, and 10 miles. Mapping locations of registered MSFW labor camps (n=62) and food retailers (n=215) in the Willamette Valley revealed access to a food retailer within 0.25 mile for one labor camp and 1.5 miles for 46% of camps. All MSFW camps had access to a food retailer within 5 miles. Our research further suggests that using distance alone to determine food deserts may be deceptive as these numbers do not show the types of food retailers and challenges that MSFW in rural labor camps, who often lack access to personal vehicles and public transit, encounter when shopping for nutritionally and culturally appropriate foods. Migrant and seasonal farmworkers in the Willamette Valley experience significant physical and economic barriers to food access, especially culturally appropriate foods.

Keywords: *food security, food deserts, traditional foods, migrant and seasonal farmworkers, Willamette Valley*

Introduction

Food Security and Migrant and Seasonal Farmworkers

Food insecurity, and its associated risk factors, is an increasingly prevalent issue in developed countries such as the United States and the United Kingdom (Cummins and MacIntyre 2006; Reeder 2000). Food security is defined as all persons obtaining at all times a nutritionally adequate and culturally acceptable diet through local non-emergency sources for an active, healthy life (Allen 1999; Gottlieb and Fisher 1996; Reeder 2000; USDA 2012a). Communities, households, or individuals that experience food insecurity do not necessarily experience hunger, which is defined as a reduced or inadequate intake of food (Opfer 2010; Reeder 2000; USDA 2012b). Instead, food insecurity is a lack of access to sufficient quantity and quality of food to maintain health and culture. Food insecurity is often increased by easier access to obesity-causing foods (Dietz 1995; Drewnowski and Specter 2004; Nord et al. 2010).

Food insecurity disproportionately affects low-income, homeless, minority, and rural populations (Morton and Blanchard 2007; Richards and Smith 2006; Schafft et al. 2009; Sharkey et al. 2011; Slocum 2006). Income is frequently cited as

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the primary barrier to achieving food security and poverty rates generally are positively correlated to rates of food insecurity (Cason et al. 2003; Nord et al. 2010; Radimer et al. 1990). Food access issues such as transportation, the geographic distribution of food retailers, language barriers, lack of culturally appropriate foods and minimal participation in federal assistance programs also all contribute to household food insecurity (Cason et al. 2003; Gottlieb and Fisher 1996; Reeder 2000; Richards and Smith 2006). Our research evaluates how food access issues affect minority communities of migrant and seasonal farmworkers in Oregon's Willamette Valley. To assess food access we use spatial analysis of proximity through GIS mapping of food retailers and migrant and seasonal farmworkers (MSFW) housing developments and labor camp locations, case study interviews in a migrant farmworker community, and food retailer surveys of prices, selection, and quality.

Food security research that factors in race finds that low-income minority neighborhoods have fewer healthy food options in restaurants, a limited number of full-service grocery stores, a higher prevalence of fast-food outlets, and higher rates of food insecurity than wealthier, predominately white neighborhoods (Blair-Lewis et al. 2007; Cummins and MacIntyre 2006; Morland et al. 2002; Zenk et al. 2006). Additionally, studies have found that African American and Hispanic households experience food insecurity at rates double the national average (Quandt et al. 2006; Sharkey et al. 2011; Shields 1995 as cited in Slocum 2006; Weil 2004). People identifying as Hispanic or Latino are the fastest growing and largest minority population in the United States, especially in rural areas (Guzman 2001; Lichter and Johnson 2006). While these communities garner considerable attention in food security studies (Cason et al. 2003; McClure et al. 2010; Pérez-Escamilla and Putnik 2007; Reeder 2000; Sharkey et al. 2011; Weigel et al. 2007), they are underrepresented in literature examining the root causes of that food insecurity.

Migrant and seasonal farmworkers, defined as individuals who travel more than 75 miles to find work (Weigel et al. 2007), are particularly subject to food insecurity. Despite their contribution to food production these communities experience extremely high rates of food insecurity in comparison with the general public (Cason et al. 2003; McClure et al. 2010; Pérez-Escamilla and Putnik 2007; Reeder 2000; Weigel et al. 2007). For example, Reeder (2000) found that in Newport, Oregon 72.7% of MSFW households experience food insecurity, in contrast to the 12.7% of households statewide. About 70% of MSFW in Oregon are foreign-born, a statistic consistent across ten years (McClure et al. 2010; Reeder 2000), and up to 97% of foreign-born workers come from Mexico (Weigel et al. 2007), which may present unique food security challenges such as overcoming language barriers and attaining culturally appropriate foods.

The availability of traditional foods is vital for the cultural maintenance and health of immigrant and MSFW communities. In Mexican culture, food preparation and consumption is an integral part of many religious celebrations and family gatherings (Christie 2004). Food can be seen as both the embodiment and maintenance of culture. Acculturation, the adoption of a new culture by immigrants evidenced by new values, attitudes, customs and behaviors, has been associated with increasing problems of obesity and diabetes in immigrant

populations as they abandon traditional foods (Anderson 2008; Grigsby-Toussaint et al. 2010; Pérez-Escamilla and Putnik 2007; Reeder 2000). Many people are intimidated to try unfamiliar foods due to a lack of knowledge of how to prepare them, limiting food choices to prepackaged meals with less nutritional value (Engler-Stringer 2010; Pérez-Escamilla and Putnik 2007). Due to language barriers, immigrants may also experience difficulties in attaining healthier food options, such as requesting leaner cuts of meat from the butcher, or taking advantage of sales (Cason et al. 2003). Access to culturally appropriate food is especially problematic for MSFW due to factors including transitory residence, geographical isolation, language barriers, availability, quality, and price, all of which increase the likelihood of food insecurity (Cason et al. 2003; Fishman et al. 1999; Reeder 2000). For MSFW the risk of food insecurity and associated negative health implications may be increased by low levels of participation in federal food-assistance programs due to language barriers and discrimination (Cason et al. 2003; McClure et al. 2010; Minkoff-Zern 2014; Pérez-Escamilla and Putnik 2007).

Measuring Food Deserts

Food security research has begun to examine specifically how the physical and built environment may affect food access. Several studies have found that disparities in geographic distribution of full-service food retailers correlate with socio-economic conditions (Guy and David 2004; Richards and Smith 2006; Schafft et al. 2009). Richards and Smith (2006) found that distance to nearest grocery stores, selection and quality varied greatly across urban socio-economic landscapes. Low-income areas tend to have one-third less grocery stores, with less selection, less nutritionally dense and more calorically dense foods (Richards and Smith 2006). This situation is conceptualized by the term *food desert*, characterized by an area with a population that has limited food access, limited mobility, low income, a more calorie-dense diet, and a reliance on smaller food stores that have poor quality and selection at high prices (Guy and David 2004).

The prevalence of food deserts can be partially attributed to the consolidation of supermarkets that cater to middle-class and wealthy suburban areas, driving smaller independent grocers located in the city centers out of business (Morland et al. 2002; Morton and Blanchard 2007; Opfer 2010; Schafft et al. 2009). These supermarkets are often located near highways, which discourages alternative forms of transportation such as walking, biking, or public transit because of distance from residential areas and lack of sidewalks, bike lanes, and bus routes. Low-income populations frequently do not have access to personal vehicles, and depend on rides from family and friends, or alternative modes of transportation for grocery trips, making these supermarkets less accessible (Opfer 2010).

A review of the literature fails to provide a clear or consistent quantitative definition for what qualifies as a food desert. Measurements for food deserts vary depending on application to rural or urban areas and the mobility of residents. Some studies use distance to the nearest grocery store from a defined community, which can differ drastically between rural and urban areas, varying from 0.25 mile to ten miles (Guy and David 2004; Morton and Blanchard 2007; Opfer 2010; Richards and Smith 2006; Schafft et al. 2009). Others use census tracts (Morland et

al. 2002), school districts (Schafft et al. 2009) or counties (Hendrickson et al. 2006) to denote communities, and measure density or distance to food retailers. The United States Department of Agriculture (USDA 2011) measured a food desert as a low-income census tract (with a poverty rate of 20% or more) with low access to a large grocery store (defined as one-third of the census tract population residing more than one mile away for urban areas or ten miles away for rural). This standardization could serve as a potential tool for food desert research. However, measuring poverty and distances is not enough to understand the obstacles that communities face in accessing nutritionally and culturally appropriate foods.

Our research examines issues of food insecurity in MSFW communities in Oregon's Willamette Valley, through the lens of the food desert concept on two levels. First, we mapped all registered MSFW labor camps in the designated study area and the proximity of food retailers to test the predominate method for defining a food desert. We then conducted a more in-depth evaluation of a particular MSFW housing development to explore the potential barriers to food access, such as proximity, transportation, price, selection, quality, availability of culturally appropriate foods, storage and cooking facilities, and language barriers. While there has been increasing discussion regarding health status and food insecurity in migrant farmworker populations (Cason et al. 2003; Pérez-Escamilla and Putnik 2007; Reeder 2000; Weigel et al. 2007), there has been little discussion as to the structural barriers at the root of these problems.

Study Area

The Willamette Valley is an 11,500 square mile area located in western Oregon and includes parts of Benton, Clackamas, Columbia, Lane, Linn, Marion, Multnomah, Polk, Washington and Yamhill counties (Giombolini et al. 2010). This site was chosen for our analysis because of the large agricultural presence and the dependency on migrant farmworkers (Nelson 2007; Reeder 2000).

Marion County, which includes the cities of Salem and Woodburn, has the highest concentration of MSFW in the Willamette Valley: 18,090 as of 2002 (Larson 2002). While Morton and Blanchard (2007) did not identify Marion County as a low food-access county in their nationwide study, this finding does not preclude that food deserts occur on a more local scale (see McEntee and Agyeman 2010; Vermont-based research for similar discrepancies in findings). We chose this county because of the high concentration of MSFW who likely experience high rates of food insecurity for the diverse reasons discussed above. For the fiscal year 2009–2010, the Marion-Polk Food Share distributed almost 7 million pounds of food throughout Marion County (McCorkle 2010), suggesting that many households in this region depend on assistance to meet food needs. The use of these emergency food sources suggests that there is a large population that would qualify as food insecure (see definitions by Allen 1999; Gottlieb and Fisher 1996; Reeder 2000; USDA 2012a).

The case study interviews for this research were conducted with residents of Colonia Libertad (CL), a migrant farmworker housing complex in Salem, Oregon. Colonia Libertad falls just within the urban boundary of Salem in a census tract with a population density of greater than 500 persons per square mile, fitting the

US Census Bureau's definition of ''urban'' (U.S. Census Bureau 2000). Colonia Libertad is a 48-unit housing project of the local non-profit organization Farmworker Housing Development Corporation (FHDC), which provides housing for 190 farmworker families in the mid-Willamette Valley. At CL, the average annual income is $15,586 with at least 55% coming from farm work (F. Camacho, pers. comm., Oct. 2010; McClure et al. 2010; Nelson 2007). Ninety-seven percent of residents are foreign-born with 85% coming from Mexico, compared with 75% born in Mexico, reported in the National Agriculture Workers Survey (NAWS 2010), making this a fairly consistent cross-section of the MSFW population (Cason et al. 2003; McClure et al. 2010; Reeder 2000). Given that over 54% of CL households report food insecurity (McClure et al. 2010), it seems possible that this community may be situated in a food desert. Part of the mission statement of FHDC is to provide affordable housing within urban boundaries and to provide social services to residents, both of which could help to alleviate food insecurity issues (Nelson 2007). However, J. Arredondo, fund development director of FHDC states that the organization is also limited in its site locations by zoning restrictions, politics, funding, existing populations of farmworkers, and community pushback (J. Arredondo, pers. comm., Mar. 1, 2011). Given the reportedly high levels of food insecurity at CL, we suspected that other forms of structural (for example: language and cultural barriers, poverty) or physical barriers (for example: access to vehicles, distance to grocery stores) to food access may exist.

Methodology

For this study we utilized a mixed-methods approach, similar to other food desert studies (see Child and Lewis 2012; Hendrickson et al. 2006), to gather data regarding food retailer distribution relative to MSFW communities in the Willamette Valley and a case study community, Colonia Libertad. We mapped all registered labor camps (ODCBS 2010) and food retailer locations relative to each camp. Mapping alone, however, neglects to examine other factors that restrict food access such as economic, mobility, and cultural constraints. Additionally, store presence does not guarantee availability of healthy and culturally appropriate food options. Combining methods provides opportunities to apply first person insights to the numbers and visualizations acquired through GIS analysis. In order to better understand the food security challenges of MSFW, we conducted interviews with residents of CL and the fund development director of FHDC, J. Arredondo, to gather information concerning shopping habits and perceived barriers to food access. These interviews were followed by food retailer inventories to collect data on price, selection, and observations of food quality at the stores identified by residents as their primary shopping locations.

GIS Mapping

Spatial representation of data is beneficial for recognizing patterns in the distribution of food retailers and identifying food deserts (Guy and David 2004; Hackett et al. 2008; Opfer 2010; Schafft et al. 2009). Through the Oregon Department of Consumer and Business Services website, we obtained a database

containing information for all of the 289 registered farmworker labor camps in the state of Oregon in 2010. Using geographic information systems (GIS) technology (ESRI Inc. 2008), we mapped the locations of all registered labor camps that fall within the ten counties of the Willamette Valley (n=62). We then used Google Earth to search and map the locations of food retailers nearest the labor camps (n=215). Using Google Earth, we entered the address of the labor camps (ODCBS 2010) to obtain the coordinates and used the ''find business'' tab to search for ''grocery store.'' We also tested other keywords such as ''supermarket,'' ''food retailer,'' and ''convenience store'' and found that ''grocery store'' captured all of these results.

Many MSFW lack United States driver's licenses or access to personal vehicles (J. Arredondo, pers. comm. Mar. 1, 2011; NORC 2011), limiting access to food, thus we defined the distance for assessing food deserts based on an urban definition as any community further than 0.25 mile from the nearest food retailer. This distance has been defined as easily walkable (Cerin et al. 2006; Walkscore 2010) and used in another food desert study (Guy and David 2004). We also included a 1.5-mile buffer radius, defined as the ''maximum walkable distance'' (Walkscore 2010), and five- and ten-mile buffers, based on rural food desert studies (Opfer 2010; Schafft et al. 2009). In our study we did not address bicycle use or access as an alternative transportation method.[1]

We classified food retailers by store type, based on the North American Industry Classification System (NAICS) (U.S. Census Bureau 2007). Other classification systems by Cassady et al. (2009), Guptill and Wilkins (2001), and Schafft et al. (2009) and self-identification were incorporated to further distinguish food retailers and used for the inventory section of the methods. Basic categories in order of decreasing selection included international-chain superstore, club-membership wholesaler, regional-chain superstore, ethnic warehouse, grocery store, specialty-food market, convenience store, and gas station with food-mart. To clarify spatial analysis, these classifications were consolidated into three broad categories: *grocery store, specialty store,* and *convenience store*. *Grocery store* includes superstores, wholesalers, warehouses, and grocery stores. *Specialty store* includes farm stands, meat markets, fruit and vegetable markets, and small-independent grocers with four or fewer employees. *Convenience store* includes gas stations with food-marts and convenience stores. Figure 1 displays an example of our methodology, for the 0.25-mile and 1.5-mile buffers for a select number of farmworker housing camps.

Interviews

The goal of the interviews was to better understand the food security challenges of MSFW in the Willamette Valley, which would not be evident in the GIS visualizations and results. To meet this goal we conducted interviews with residents of CL and the fund development director of FHDC. This community was chosen because of its past connections with local researchers, which increased our ability to gain permission to interview residents who represent a generally vulnerable population.

Questions for the semi-structured interviews with CL residents were organized around the following categories: 1) basic demographic data; 2) food

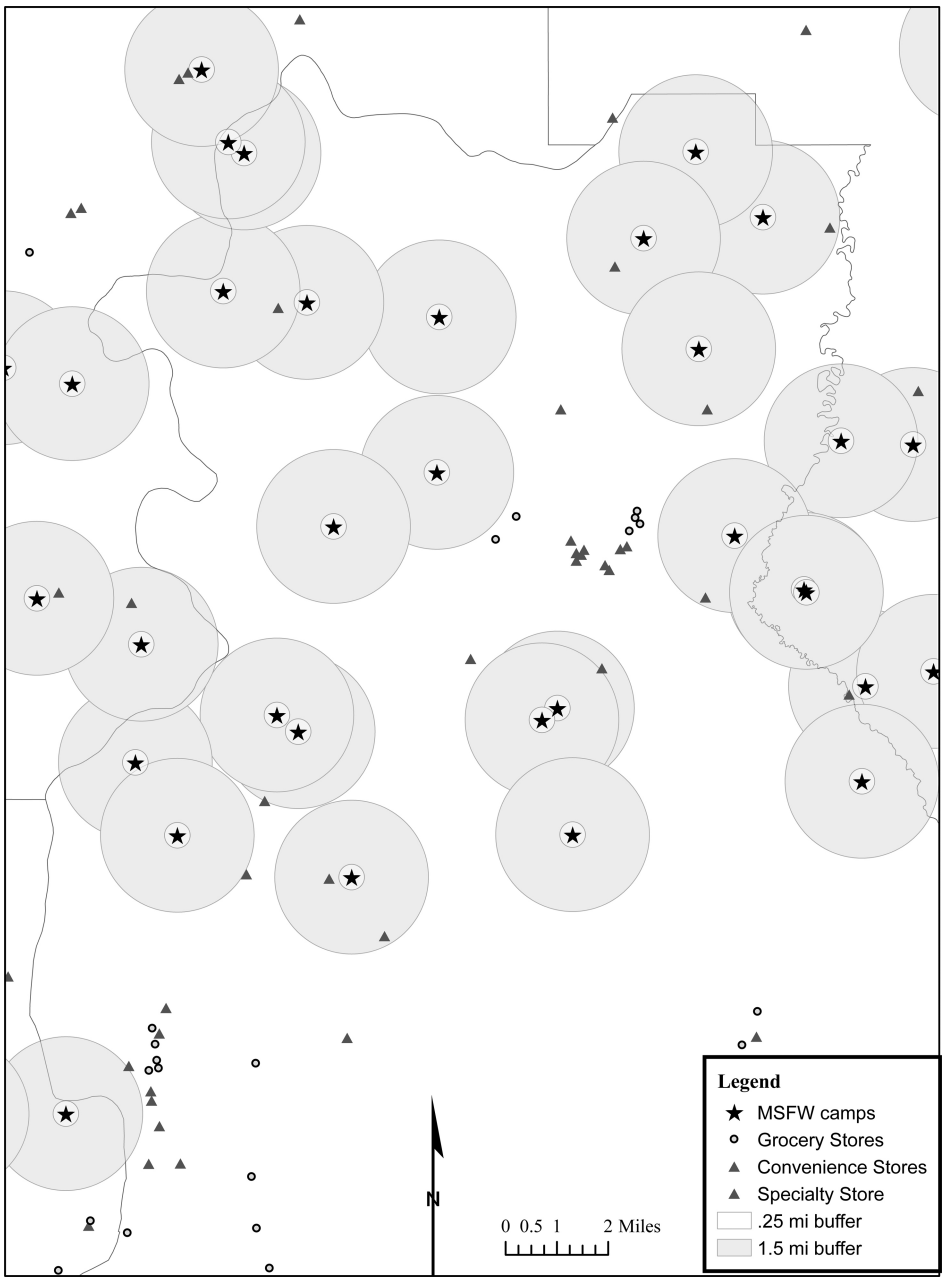

Figure 1. A close-up from the map created to identify MSFW labor camps in Oregon's Willamette Valley and access to food retailers. Convenience stores and specialty stores are displayed with the same symbol because of their similar characteristics: limited selection, higher prices and seasonality or restricted hours of operation.

shopping habits; 3) food consumption habits; 4) transportation methods; and 5) access to cooking and storage facilities. These categories were chosen based on studies conducted by Cason et al. (2003) and Richards and Smith (2006). The format of questions was a mixture of open-ended, multiple choice, and closed questions. For example, we asked participants: *''Where do you shop most often?''* *''Which statement best describes how you feel? I (always, frequently, occasionally, never) have enough to eat''* and *''Are you able to buy the foods you would like to?''* The interviews lasted about 30 minutes and were conducted orally in Spanish to overcome language or literacy barriers, and took place in residents' homes or in one of the offices of the CL community center. The number of people in the room and the number of respondents were not controlled for during the interview process, due to the difficulty in scheduling interviews, and varying comfort levels of participants. The CL community organizer (a native Spanish speaker) reviewed the questions to ensure clarity and cultural sensitivity.

Thirteen interview participants were recruited through voluntary sign-ups at community meetings, word-of-mouth, and with the help of staff at CL to achieve a convenience-based sample population. These non-probability sampling methods are appropriate for this population, given the difficulty of recruitment as experienced by other researchers (Cason et al. 2003; McClure et al. 2010) and because this portion of our research was qualitative in nature rather than quantitative (Bickman and Rog 1998; Patton 1990). All participants were at least 18 years old, a current CL resident, and the primary food shopper for their household. We also interviewed the fund development director for FHDC, J. Arredondo, as a key informant.

Food Retailer Inventories

The purpose of the food retailer inventory was to collect information about the price, selection and quality of food available at the stores frequented by CL residents. We conducted inventories at the food retail locations that were identified by CL residents as their primary source of food. These food retailers were classified according to the same methods set forth in the GIS mapping section above. For the food retailer inventories, we made use of self-identification to further distinguish food retailers, such as ''ethnic warehouse.''

We inventoried selection as categorized by dietary guidelines set forth in the food guide pyramid by the USDA (2010a). The prices were recorded and compared to the market-basket prices (MBP) for ''West urban'' gathered from the Consumer Price Index (CPI), available through the Bureau of Labor Statistics (2010), and to the national average retail prices recorded by the USDA (2010b) to determine relative price (Cassady et al. 2009; Richards and Smith 2006). The Bureau of Labor Statistics (2010) gathers information regarding seasonal and annual changes in the CPI and defines the categories of U.S. city average, Northeast urban, Midwest urban, South urban, and West urban, as well as selected local areas. ''West urban,'' which includes all states west of the Rocky Mountains, was the most regionally specific data found, and therefore used in this study. The national average retail prices (USDA 2010b) were used to fill gaps in CPI data when possible. Quality of food was determined qualitatively by noting expiration dates and perceived freshness of produce. We determined

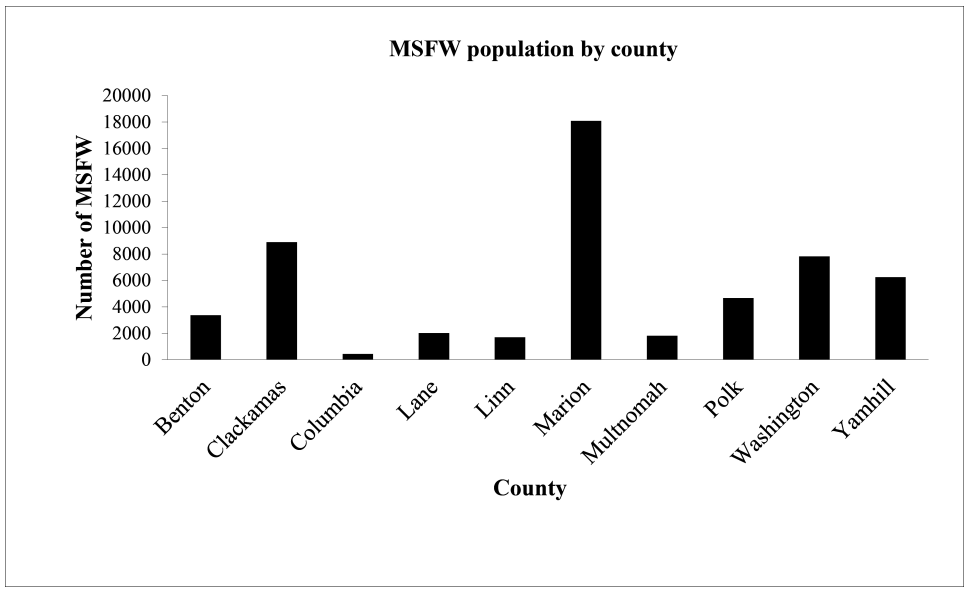

Figure 2. The 2010 labor camp populations of MSFWs by county in Oregon's Willamette Valley (ODCBS 2010).

culturally specific foods through the interview process and included all that were mentioned. Availability of culturally specific foods such as corn tortillas, beans, chile varieties, tomatillos, roma tomatoes, nopales, and tropical fruits, such as mangos and papaya was noted. A few additional chiles were also inventoried that were not specifically mentioned by interviewees because of their common availability, in order to provide another price comparison.

Results and Discussion

GIS Mapping

As noted in the methodology section, 289 MSFW labor camps were registered in Oregon in 2010 (ODCBS 2010), dropping from 341 in 2006 (Farquhar et al. 2008). Out of the total number of camps in Oregon, 62 were located in the Willamette Valley, a 30% decrease from 2006 (ODCBS 2010). Marion County had almost double the number of labor camp occupants than any other county and about twice as many MSFW live in Marion County than any other county in the Willamette Valley (see Figure 2 for the 2010 labor camp population of MSFW by county in Oregon's Willamette Valley).

The NAWS (2010) reported that 68% of farmworkers lived off the farm in non-employer housing, and 40% lived greater than nine miles from work. This is a shift in settlement patterns from MSFW living primarily in farmer-owned labor camps. However, the drop in registered labor camps in the Willamette Valley may indicate an underreporting of labor camps by the owners. One expert estimated that there are probably as many unregistered labor camps as there are registered ones, due to understaffing and under-enforcement from the regulatory

agency (J. Arredondo pers. comm., Mar. 1, 2011). The low percentage of MSFW living in labor camps may also be attributed to the trend of farmworkers becoming less migratory due to government policies that make border crossings and travel more dangerous and costly, thereby encouraging MSFW to establish more permanent residences in towns or cities in order to be closer to services (J. Arredondo pers. comm., Mar. 1, 2011; Nelson 2007). By investigating the proximity of food retailers to registered labor camps, we are able to compare this living situation to the housing developments overseen by FHDC, which reflect historical trends of residence.

The food retailers that we mapped were defined by the three broad categories of grocery store, specialty store, and convenience store because of similar characteristics that govern price, selection, and quality at a basic level. Within the largest of the buffers we analyzed, a ten-mile radius from the registered Willamette Valley labor camps, there were 81 grocery stores, 78 convenience stores, and 56 specialty stores. Convenience stores and specialty stores are displayed in Figures 1 and 3 with the same symbol to enhance readability and because of their similar characteristics, such as limited selection, higher prices, and seasonality or restricted hours of operation, which limit their potential as sources of a variety of healthy food options (Guy and David 2004; McEntee and Agyeman 2010; Schafft et al. 2009). Our categorization makes assumptions based on the scholarship of others regarding the price, quality, and selection differences at convenience stores (Cummins and MacIntyre 2006; Hendrickson et al. 2006; Opfer 2010).

Only one MSFW labor camp had a food retailer within a 0.25-mile walkable radius. The food retailer near this labor camp was a farm stand, which does not carry many staple foods, and is only open seasonally. This means that essentially, for MSFW labor camp residents without personal transportation, the entire Willamette Valley is functionally equivalent to an urban food desert. The rural locations of many of the camps and the reportedly low mobility of the population (J. Arredondo, pers. comm., Mar. 1, 2011) effectively constrains the distance easily traveled to that accessible by foot. Even if this distance is expanded to 1.5 miles, the maximum reasonable walkable distance (Walkscore 2010), only 46% of MSFW camps have access to a food retailer. Of these, 10% have access to a grocery store, 59% to specialty stores, and 45% to convenience stores (Note: these do not sum to 100% because some locations had access to multiple types of stores). Thus 95.4% of all labor camps in the Willamette Valley do not have access to a grocery store less than 1.5 miles away as a reliable source of produce and healthy food options (see Figure 3 which illustrates the registered MSFW camps, including CL, and food retailers in the Willamette Valley).

If we define the MSFW camps as rural, and use a ten-mile buffer common in rural food desert studies (Morton and Blanchard 2007; Opfer 2010; Schafft et al. 2009) all 62 locations have access to a grocery store. In fact, all MSFW labor camps still have access to a food retailer within five miles. However, within this five-mile buffer, only 71% of MSFW camps have access to a grocery store, whereas 90% have access to a convenience store, and 92% have access to a specialty store. If specialty stores and convenience stores are combined, together they represent 62% of food retailers within ten miles of MSFW camps in the Willamette Valley (see Table 1 for selected data from the GIS analysis). These results may represent

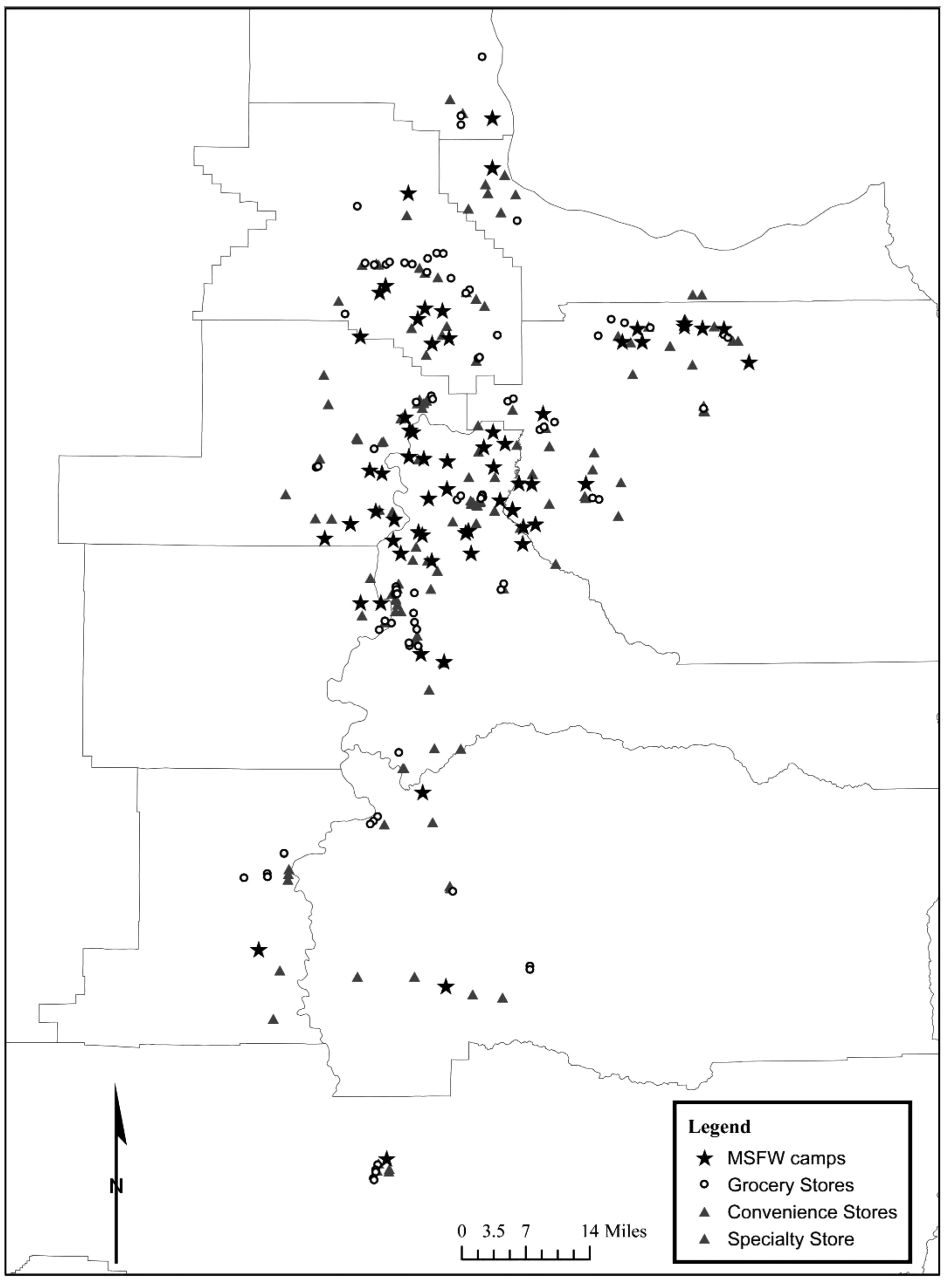

Figure 3. Locations of registered MSFW camps and food retailers in Oregon's Willamette Valley. Convenience stores and specialty stores are displayed with the same symbol because of their similar characteristics: limited selection, higher prices and seasonality or restricted hours of operation.

Table 1. Selected data from the GIS analysis showing the percentage of MSFW labor camps in Oregon's Willamette Valley with access to different types of food retailers within the specified distance.

Distance	Grocery store (%)	Convenience store (%)	Specialty store (%)	Total (%)[1]
0.25 mile	0.0	0.0	1.5	1.5
1.5 miles	4.6	27.1	20.7	46.0
5.0 miles	71.0	100.0	100.0	100.0
10.0 miles	100.0	100.0	100.0	100.0

[1] Row sums are the percentage of locations with access to stores within the specified distance, regardless of store type.

a more optimistic estimation of food retailer access for those with motorized transportation options as the buffers are based on linear distances. The addition of roads necessary for access to the food retailers as well as physical barriers to access, such as freeways, rivers, and the grid of farmers' fields would likely result in even fewer MSFW camps having access to food retailers, based on previous rural food desert studies (McEntee and Agyeman 2010; Morton and Blanchard 2007; Opfer 2010; Schafft et al. 2009). We feel that when the transportation challenges of MSFW are taken into consideration these rural communities are more appropriately assessed using urban food desert distances of measurement.

Interviews

Colonia Libertad was chosen for the interview portion of our research because of its past contact with university community members and our ability to gain permission to interview residents. Our ability to gain access to and interview residents in other parts of the Willamette Valley was limited due to the circumstances of MSFW housing being located on private land and the probability of large numbers of residents being undocumented and unwilling to speak to us. Much of our information regarding the conditions on other MSFW sites came from our key informant and others' scholarship (J. Arredondo pers. comm., Mar. 1, 2011; Nelson 2007). Due to the difficulty of accessing other MSFW sites, we are uncertain how far our results can be generalized, given the urban location, support staff and resources available to residents of CL that are inaccessible to many other MSFW. However, the interviews provide insights into the unique food security issues of MSFW.

The results of the semi-structured interviews are categorized by the themes outlined in the methodology section: *demographics, shopping habits, food consumption habits, transportation methods, access to cooking and storage facilities*. Of these, *shopping habits* and *food consumption habits* revealed the greatest food access issues for the interviewees. Out of the 48 households at Colonia Libertad, 13 participated in the study, representing 27% of the households. Low recruitment partially reflects low community attendance at the residents' meetings where we recruited the majority of the participants.

Demographics

The results for the demographic questions revealed that the majority of participants were relatively young, ten respondents were between the ages of 18

and 39. All identified themselves as Mexican, and 12 of 13 have lived in the U.S. for over six years, and seven for more than ten years. The majority of the interviewees were women (10 out of 13). This may reflect that at CL most of the housing units are designed for single families and there are a number of services for residents with young children, encouraging a young family atmosphere. Participants had lived at CL ranging from less than one year to almost six, which at the time of the research was the age of the establishment. Nine of the 13 interviewees had worked as a farmworker for over ten years, with some doing this form of labor for 26 years. The majority of respondents had six or fewer years of schooling, and while all except one felt very comfortable speaking, reading, and writing in Spanish, none of the participants felt comfortable speaking, reading, or writing in English. This suggests that the participants must cope with a language barrier, which may present difficulties for residents in attaining services, due to a lack of bilingual signage, information, and service personnel, which Cason et al. (2003) noted as obstacles to food security.

Shopping Habits

The questions that structured discussions of shopping habits included the frequency and locations that people shopped, average grocery expenses per week, availability of cultural foods in the locations where they shopped, participation in government sponsored food-assistance programs, limitations on purchasing, and what they would purchase if those limitations were removed. Eight respondents bought groceries once every week, and five indicated buying groceries every 15 days, corresponding with pay periods. Respondents spend between $75 and $200 (U.S.) dollars per week on groceries, depending on how many family members are living with them, and how frequently they shop. Ten indicated that an employee-owned superstore was their primary food shopping location. The top reasons cited for shopping at this store included price, proximity, and convenience. Other stores mentioned included an ethnic warehouse, an international chain superstore, a club-membership wholesaler, and another ethnic warehouse in Woodburn, OR, which was far outside the distance interviewees normally traveled for groceries, but was close to the individual interviewee's employment site.

In addition to grocery superstores, participants indicated acquiring food from alternative sources. Participants mentioned borrowing food from neighbors, receiving food from the food bank at CL, and planting in the community garden on site or at their employer's property. While these sources diversified food access, their reliability was limited in the types and amount of food available, making grocery stores still the major food source. Nine of the 13 respondents participated in some form of government-sponsored food-assistance program. This is a much higher proportion than reported in other studies (Cason et al. 2003; Pérez-Escamilla and Putnik 2007), and may reflect that living at CL provides greater opportunities to connect residents with services. All of these are invaluable alternative food sources when budgets are tight and most would be considered ''emergency'' sources, an indication of food insecurity (Allen 1999; Gottlieb and Fisher 1996; Reeder 2000; USDA 2012a).

The locations where respondents attained food varied strikingly from where they previously acquired food in Mexico. Respondents mentioned *mercados* (markets), *puestos* (small street vendors), *tiendas de abarrotes* (small corner stores), and foraging as their usual means for purchasing or attaining food before coming to the United States. However since coming to the United States participants largely prefer shopping at larger grocery stores. This is consistent with findings from Guy and David (2004), who cited the assumption of lower prices and better selection as a reason for this preference. The changes in locations where respondents acquired food may result in not only changes in purchasing habits but challenges when facing new systems and languages.

Participants were also asked to respond to questions regarding culturally and regionally specific foods, their perceived availability, and barriers to purchasing preferred and healthy foods. All respondents replied that it was easy to find fruits and vegetables where they shopped but that the produce was not always affordable. Respondents identified red meat, chicken, fish, fruits and vegetables as foods that they would like to purchase more of if they cost less. All of these foods are essential parts of a healthy diet according to the USDA (2010a). Eleven of the 13 participants responded affirmatively to the question, ''*Do you worry about your ability to buy enough food to feed your family?*'' Eight responded affirmatively to the question, ''*Are you able to buy all the food you need or want?*'' This may indicate food insecurity without hunger, as they do not have to restrict food intake, however the number of respondents who indicated that they participate in some form of food-assistance program may suggest that ideas of food insecurity are relative and complex.

Nine participants thought that it was easy to find cultural foods where they shopped. However, one participant mentioned that while cultural foods were available, she would not buy them because of their poor quality. The cultural foods listed by respondents were quite extensive and varied, and a full list is included in Table 2 as part of the food retailer inventory. Examples include beans, rice, 11 different varieties of chiles, nopales, tomatillos, guayaba, mango, salsa, and queso fresco. The variation in responses reflects the participants' hometowns, located in eight different Mexican states, and the relationship between cultural diversity and food preferences regionally in Mexico.

Food Consumption Habits

In this section, respondents answered questions about food consumption habits such as eating out, and dietary and food consumption changes since coming to the United States. Our findings indicate differences from the previous published literature on food studies and culturally relevant additions specific to immigrant MSFW populations. Eight of the 13 respondents reported ''eating out'' less than once a month, some as little as once a year. Four ate out only two to three times per month, mostly at sit-down restaurants like Denny's or China Buffet, suggesting that ''fast-food'' is not necessarily an important or regular source of calories, as is frequently the case in food desert studies (Blair-Lewis et al. 2007; Engler-Stringer 2010). Only two respondents expressed eating habits similar to previously published studies, such as going to corner food stands two to three times a week because it was easy and cheap (one male) and not having

Table 2. Cultural foods listed by respondents and price inventories of respondents' preferred food retailers.

Food guide pyramid food groups	Food prices ($US)			Market basket price West urban ($US)
	International chain superstore	Employee-owned superstore	Ethnic warehouse	
Bread, cereal, rice, pasta				
Flour, white, all-purpose (per lb)	0.46	0.53	0.50	0.53
Rice, white, long grain, uncooked (per lb)	0.99	0.69	0.98	0.69
Spaghetti and macaroni (per lb)	1.00	1.03	0.88	1.03
Bread, white, pan (per lb)	0.88	1.36	0.98	1.36
Bread, whole wheat, pan (per lb)	0.98	1.50	0.98	1.50
Fruit				
Apples, red delicious (per lb)	0.77	1.04	0.98	1.04
Bananas (per lb)	0.46	0.65	0.46	0.65
Oranges, navel (per lb)	0.66	1.23	0.40	1.23
Oranges, Valencia (per lb)	-	0.86	-	0.86
Grapefruit (per lb)	0.44	0.86	0.44	0.86
Lemons (per lb)	1.25	1.82	1.75	1.82
Peaches (per lb)	0.68	1.30	2.48	1.30
Strawberries (per 12 oz)	4.98	1.72	-	1.72
Orange juice, from concentrate (per 12 oz)	1.28	1.93	-	1.93
Grapes, Thompson seedless (per lb)	2.56	1.47	2.48	1.47
Cantaloupe (each)	2.28	2.12	2.98	2.12
Honeydew melon (each)	2.98	2.15	3.88	3.21
Watermelon (each)	3.28	6.40	5.98	4.49
Vegetable				
Potatoes, white (per lb)	0.44	0.38	0.68	0.50
Lettuce, iceberg (per lb)	0.75	0.75	0.78	0.68
Lettuce, romaine (per lb)	1.69	2.48	1.98	1.54
Tomatoes, field grown (per lb)	1.24	2.28	1.48	1.06
Grape tomatoes (per lb)	3.02	2.05	-	2.12[1]
Broccoli (per lb)	1.78	1.28	0.68	1.54
Green beans (per lb)	1.24	2.98	2.88	1.81[1]
Carrots, baby (per lb)	1.18	1.38	1.98	1.31[1]
Celery (per lb)	0.92	0.98	1.32	1.27[1]
Sweet corn (per lb)	1.84	0.68 ea	0.50 ea	0.47[1]
Cucumbers (each)	0.54	0.68	0.50	0.66[1]
Zucchini squash (per lb)	0.92	2.28	2.48	1.24[1]
Mushrooms, white (per 8 oz)	1.68	2.68	-	1.69[1]
Sweet onions (per lb)	0.46	0.58	1.28	1.13[1]
Sweet red peppers (per lb)	3.00	1.36	2.36	2.31[1]
Sweet potatoes (per lb)	0.78	0.78	0.98	0.91[1]
Beans, dried, any type (per lb)	0.75	0.56	0.98	1.27
Meat, poultry, fish, eggs, and nuts				
Ground beef, lean and extra lean (per lb)	3.46	2.88	2.98	3.56
Chuck roast, graded and ungraded excluding USDA prime and choice (per lb)	4.08	3.78	3.28	3.72
Chuck roast, USDA choice, boneless (per lb)	3.98	3.58	3.38	4.02
Steak, round, graded and ungraded, excluding USDA prime and choice (per lb)	5.28	3.98	4.38	3.88
Steak, sirloin, USDA choice, boneless (per lb)	4.98	3.98	4.88	5.98
Bacon, sliced (per lb)	3.18	4.30	3.97	5.23
Chops, boneless (per lb)	4.28	2.48	2.98	3.94
Ham, boneless, excluding canned (per lb)	1.20	2.78	2.20	3.56
Chicken, fresh, whole (per lb)	0.98	1.18	0.99	1.34

Table 2. Continued.

Food guide pyramid food groups	Food prices ($US)			Market basket price West urban ($US)
	International chain superstore	Employee-owned superstore	Ethnic warehouse	
Chicken breast, boneless (per lb)	1.78	2.68	1.78	2.99
Chicken legs, bone-in (per lb)	1.22	1.09	1.98	1.42
Fish, tilapia (per lb)	4.48	1.98	1.98	-
Milk, yogurt, and cheese				
Milk, fresh, 2%, fortified (per gal)	2.04	2.18	2.79	2.94
Cheddar cheese, natural (per lb)	3.98	3.18	4.48	3.42
Yogurt (per quart)	1.98	1.68	2.98	-
Eggs, large (per dozen)	1.33	1.43	1.77	-
Fats, oils, and sweets				
Sugar, white, all sizes (per lb)	0.456	0.50	1.00	0.59
Margarine, soft, tubs (per lb)	1.30	0.65	0.99	1.46
Canola oil (per quart)	1.504		2.62	3.15
Cultural foods				
Nopales, fresh (per lb)	-	1.48	1.98	-
Tunas, fresh (each)	-	0.88	0.33	-
Nopalitos (canned)	1.58	1.85	1.98	-
Tomatillos (per lb)	1.24	1.28	1.88	-
Jalapenos (per lb)	0.88	0.88	1.48	-
Chilepullas	-	-	-	-
Chile ancho (California) (dried, per lb)	5.97	-	6.48	-
Guajillo, dried (per lb)	5.97	7.55	6.48	-
Morita	-	-	-	-
Serrano, fresh (per lb)	-	1.58	1.98	-
Pasilla dried (per lb)	-	1.58	2.98	-
Arbol dried (per lb)	-	3.98	4.48	-
Japones (dried, per lb)	5.97	7.55	4.48	-
Poblano	1.48	-	-	-
Anaheim, fresh (per lb)	1.48	1.48	2.98	-
New Mexico, dried (per lb)	-	3.98	4.98	-
Pasilla Negra dried (per lb)	-	-	6.48	-
Habanero, fresh (per lb)	-	6.98	6.98	-
Yellow/ red fresh (per lb)	3.98	2.98	2.98	-
Queso fresco (per lb)	-	4.68	3.98	-
Guayaba fresh (per lb)	-	5.78	-	-
Mango (per lb)	1.18	1.17	1.17	-
Papaya (per lb)	1.18	1.28	1.98	-
Lime (each)	0.25	0.48	0.25	-
Avocado (each)	0.74	0.74	0.74	-
Nanches	-	-	-	-
Plum (per lb)	0.64	1.98	2.48	-
Camarones secos (per oz)	-	0.90	-	-
Maseca	0.56	0.53	0.61	-
Tortillas	0.59	0.75	0.40	-

[1] USDA (2010b) quarterly average advertised retail prices used because prices were not available from the CPI (BLS 2010).

time to cook because of work and family obligations (one female). Because the interviewees indicated that fast-food retailers were not a significant contribution to their daily diet we did not map the proximity of these to the MSFW camps, however, it is possible that the members of other communities may rely more heavily on these caloric sources.

When asked about dietary changes since coming to the United States, eleven people said that they ate more processed food, and six said that they ate fewer fruits and vegetables. Availability and price were cited as the two most common reasons. Many interviewees noted that, ''*Toda está enlatada o congelada. La carne no es fresca.*'' (''Everything is canned or frozen. Meat is not fresh.'') One woman said she would not buy meat from the supermarket, but rather went to a *carnicería* farther away when she bought meat, a finding corroborated by the results of Park et al. (2011). This finding is also supported by Cason et al. (2003), who noted that people compensated for poor flavor by preparing the food in different, often less healthy, ways. Eleven respondents reported that they had gained weight since moving to the United States, which may be attributed to many potential factors including acculturation, stress, discrimination, and food insecurity (Cason et al. 2003; McClure et al. 2010; Pérez-Escamilla and Putnik 2007). Six respondents also noted other health changes since moving to the United States, such as diabetes, obesity, high blood-pressure, asthma, allergies, getting sick more, stress and depression, which may also be correlated with changes in diet and environment, as well as the factors listed above.

Transportation Methods

As has been illustrated in the discussion of the results for the GIS analysis, access to transportation may play a significant part in defining food deserts for MSFW. In contrast to Arredondo's comments that farmworkers living in labor camps rarely have access to personal vehicles (J. Arredondo, pers. comm., Mar. 1, 2011), all respondents living at CL reported having regular access to a car, and nine personally owned a vehicle. This high percentage of car ownership at CL may reflect the more permanent nature of the family-based residence and available parking space as well as immigration status in the United States. This, in addition to the access to government programs at CL, is indication of how this community may be a best-case scenario for MSFW in the Willamette Valley. Undocumented workers are not eligible to acquire a driver's license in Oregon, potentially limiting the number of personal vehicles among the MSFW community. While the lack of a driver's license does not necessarily prohibit the ownership or operation of a personal vehicle, it does provide another obstacle in acquiring a car and presents the risk of deportation if caught. Those that did not own a car depended on others for transportation to and from the grocery store. Of those that did not have regular access to a car, three out of four said that not owning a car affected their schedule and made it more difficult to go shopping. Nine of the 13 respondents said that they do not like to walk to the nearest grocery store for safety reasons. They noted that there is no sidewalk for a portion of the walk, no streetlights and a dangerous blind curve with high traffic volume. All of these factors would also affect bicycle safety. Given that this case study community is considered to be in an urban area (U.S. Census Bureau 2000), these safety concerns may be even greater for MSFW walking from labor camps in rural areas of the Willamette Valley to buy groceries due to lack of pedestrian infrastructure, public transit, and higher speed limits.

Access to Cooking and Storage Facilities

Residents in MSFW labor camps frequently lack cooking appliances and food storage space (Farquhar et al. 2008; J. Arredondo, pers. comm., Mar. 1, 2011).

However, all apartments in CL are furnished with a stove, oven, freezer and refrigerator. Only two residents with five or more family members sharing their apartment reported not having adequate food storage space. This is another way that we expect the residents of CL to be in a situation unique from other labor camps in the Willamette Valley.

Food Retailer Inventories

Our inventory of the three food retailers that were identified by three or more CL residents as their primary shopping location revealed that all stores carried the majority of items surveyed, of mostly good quality food at relatively low and comparable prices. All of these were classified as grocery stores based on the NAICS coding (U.S Census Bureau 2007). These stores were previously referred to in this paper as the international-chain superstore, the employee-owned superstore, and the ethnic warehouse. None of the food retailers that were inventoried fell within 0.25 mile of CL, reported as the ideal walkable distance (Cerin et al. 2006). However they all fell within 5 miles of CL, which was the maximum distance to a food retailer for any registered labor camp in the Willamette Valley.

A comparison of prices among the three grocery stores, as well as the market basket prices (MBP) for western states, revealed these stores had comparable and relatively low prices, while selection and quality of cultural foods varied. This inventory supported the interviewees' claims of good availability of produce and relatively low prices (as compared with the MBP). It also supported the respondents' observation of poor or variable quality and selection of cultural foods. The ethnic warehouse had comparable or higher prices than either the international-chain superstore or the employee-owned superstore, however, qualitatively it did compare favorably to the other stores. The ethnic warehouse appeared to cater to the local Mexican population based on its greater selection of cultural foods, stocking 27 of 32 cultural items inventoried (see Table 2). It also carried Mexican specialty items such as pigs' feet and chili-spiced candies, and had bilingual signs and announcements. Most of its produce was also ripe, or borderline overripe, which might actually be more familiar to Mexican consumers. While the employee-owned superstore offered almost as many cultural foods (25 of 32 listed in Table 2), and had greater selection and quality of produce at lower prices, it did not have bilingual signage, as the other two stores did. However, due to its proximity to CL, the majority of respondents bought groceries there. Overall, the prices from all three stores were more or less comparable to each other, and less than or comparable to the MBP for West urban. For a complete inventory with prices noted for each of the stores, and comparisons with the MBP for West urban (BLS 2010), see Table 2. The results from the food inventory supported findings from the interviews, as well as previous studies indicating that grocery stores are reliable and less expensive sources of healthy and good quality foods (Cassady et al. 2007; Morland et al. 2002; Morton and Blanchard 2007; Opfer 2010; Schafft et al. 2009).

Conclusion

We investigated the relationship between the distribution of food retailers and registered MSFW labor camps in Oregon's Willamette Valley, to determine whether

or not this population experiences food deserts. Through GIS mapping, interviews, and food retailer inventories we determined that MSFW experience economic and physical barriers to food access, with possible cultural and language barriers as well.

The GIS analysis highlighted that all except one MSFW camp qualified as being part of an urban food desert (Guy and David 2004), and closer analysis revealed that the food retailer in close proximity to this one camp was a seasonal farm stand with limited food types. Defining MSFW labor camps as urban in this context is valid because of the low mobility of the population due to a lack of personal and public transport (J. Arredondo pers. comm., Mar. 1, 2011), which constrains the distance of easily accessible services. Even when the distance was expanded to the maximum walkable distance of 1.5 miles (Walkscore 2010), less than half of the labor camps had access to a food retailer and less than 5% to a grocery store. This analysis did not account for physical barriers obstructing linear distance to these sources such as rivers, private property, and the interstate freeway, which may result in even lower numbers of MSFW having access to appropriate food retailers from labor camps.

The semi-structured interviews at Colonia Libertad revealed that 84% of participants worry about their ability to buy food for themselves and their family, and most cited financial constraints as a barrier to healthier eating habits, indicating a low level of food security, also found by McClure et al. (2010). The CL population is increasingly representative of MSFW who are residing in the periphery of an urban area in overcrowded apartments (J. Arredondo, pers. comm., Mar. 1, 2011). However, based on its urban location, support staff, access to government programs, and resources available to residents, this population may represent a best-case scenario for potential farmworker housing sites. Despite these additional resources, CL's location only marginally improves access to a food retailer, as compared to the rural locations of most labor camps.

Our goal with this research was to contribute meaningfully to the body of literature on food deserts. We defined CL as an urban food desert, however using the definition of the USDA's food desert locator (2010), this community does not qualify. This highlights the inconsistencies in definitions throughout food desert literature as well as challenges to food access beyond financial means and geographic distances from food retailers. In addition, this research begins to address a unique situation within the food desert literature by examining not only nutritional inequalities, but also cultural inequalities in the availability of food. Despite their contribution to food production, MSFW in the Willamette Valley may experience limited access to nutritional and cultural foods that are vital for maintaining the health and culture of these communities (Anderson 2008; Pérez-Escamilla and Putnik 2007; Reeder 2000). Our research contributes to a broader conversation of food deserts and food insecurity through investigating inequities in food access for a marginalized, minority population underrepresented in the relevant literature. Though some limitations exist with our study, such as the uniqueness of the interview population and the exclusion of physical barriers in the GIS analysis, we hope that our findings will be used in collaboration with other food desert studies to highlight the particular food security challenges for MSFW.

As scholars, planners, nongovernmental and community organizations continue to create and experiment with new frameworks to meet the food

security needs of their communities our research provides insights into several important policy challenges. These include developing flexible measurements of food deserts to accommodate diverse populations, and providing accommodations in food security policies for MSFW who face additional challenges such as: lack of personal transportation, residing in rural areas, language barriers, and limited access to government programs for a variety of factors, including location of residence and immigration status. For example, Oregon's Urban Growth Boundary policy should be examined for the restrictions it places on development of rural areas, which could contribute to limited food access (Oates 2008). Additionally, our research highlights that policies to alleviate food insecurity need to go beyond nutrition to consider culturally appropriate foods. Addressing these policy concerns will require interdisciplinary research that combines quantitative and qualitative methods and includes the voices of the local participants. Combining methods such as spatial representation of data with interview data and grocer surveys will be useful to community organizers and food-system planners in gaining a holistic understanding of the food security challenges faced by particular populations.

Notes

[1] While bicycles are becoming increasingly prevalent as an alternative mode of transportation, their use has not been investigated in any of the food desert literature reviewed in this study and could be a relevant dimension to include in future research. The 1.5- and 5-mile buffers could be used to approximate easily bikeable and maximum bikeable distances, however further examination of bicycle infrastructure such as bike lanes and bike paths, and traffic speeds and rates should also be taken into account.

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