AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Journal of Food Distribution Research
Volume 48, Issue 3

Supply Chain Barriers to Healthy, Affordable Produce in Phoenix-Area Food Deserts

Gina Lacagnina,[a] Renee Hughner,[b] Cristina Barroso,[c]
Richard Hall,[d] and Christopher Wharton[e]Ⓟ

[a]*Community Dietitian, Maricopa County Department of Public Health, 4041 N. Central Ave., Phoenix, AZ 85012 USA*

[b]*Associate Professor, Morrison School of Agribusiness and Resource Management, Arizona State University, 7271 E. Sonoran Arroyo Mall, Mesa, AZ 85212 USA*

[c]*Associate Professor, Department of Public Health, University of Tennessee, Knoxville, 386 HPER, 1914 Andy Holt Ave., Knoxville, TN 37996 USA*

[d]*Clinical Professor, College of Nursing and Health Innovation, Arizona State University, 500 N. 3rd Street, Phoenix, AZ 85004 USA*

[e]*Associate Professor and Interim Director, School of Nutrition and Health Promotion, Arizona State University, 500 N. 3rd Street, Phoenix, AZ 85004 USA*

Abstract

Considerable research has demonstrated the connections between food deserts, dietary outcomes, and chronic diseases. Less research exists on upstream challenges that could play a role in the creation and perpetuation of food deserts. This study examines barriers to supplying affordable produce to food deserts. We conducted expert interviews with channel members of a regional produce supply chain to reveal perceived supply chain barriers, which included high distribution costs, lack of perceived consumer demand, and failure to achieve scale economies. Opportunities identified included providing strategic economic incentives, improving retail infrastructure, and working with novel distribution mechanisms such as food hubs.

Keywords: community food security, food access, food deserts, food distribution, food security, local food systems, supply chain

Ⓟ Corresponding author: Tel: 602-827-2773
Email: cwharton@asu.edu

Introduction

According to data from the U.S. Department of Agriculture's Economic Research Service (2017), roughly 19 million people in the United States live in food deserts, low-income urban and rural areas where residents have limited access to healthy, affordable food options (U.S. Department of Agriculture, 2017). People who live in urban food deserts are often required to travel more than one mile to shop at a supermarket or large grocery store, and those in rural food deserts must travel more than 10 miles (U.S. Department of Agriculture, 2017). Residents of food deserts—disproportionately low-income and racial and ethnic minority groups—are also more likely to experience food insecurity and contend with higher rates of overweight, obesity, and their comorbidities, contributing to health disparities in the United States (Morland, Diez Roux, and Wing, 2006; Drewnowski, 2009; Coleman-Jensen, Gregory, and Singh, 2014). This is a particular concern in Arizona, where poverty and food insecurity rates exceed national averages (U.S. Census Bureau, 2015; Wolfersteig et al., 2011).

The potential coexistence of food insecurity and obesity is likely the result of considerable barriers to healthy food access coupled with easy access to low-cost, unhealthy fast and convenience foods, among other factors (Larson, Story, and Nelson, 2009; Hilmers, Hilmers, and Dave, 2012). Environmental considerations that limit access to healthy foods include relative distance to supermarkets; access to public or private transportation; and the higher prices, lower variety, and poor quality of fresh fruits and vegetables generally found in smaller neighborhood stores (Chung and Myers, 1999; Hendrickson, Smith, and Eikenberry, 2006; Freedman, 2009; U.S. Department of Agriculture, 2009; Odoms-Young et al., 2012; Larson et al., 2013).

Although public health officials and researchers alike have investigated the issue of food deserts since the early 1990s, the variety of problems that contribute to them has not been fully described (Gittelsohn et al., 2008; Hawkes, 2009). In part, it has been difficult to compare studies and draw definitive conclusions on the relationship between physical accessibility to food sources and dietary intake and health consequences due to variations in research methodologies (Larson, Story, and Nelson, 2009). For example, researchers have interpreted the phrase "food desert" in various ways, with some focusing on distance to retail stores alone and others including income level (Gittelsohn et al., 2008). However, studies examining the relationship between the local food environment and health have found that the connection between the two differs by social context. Access to certain food stores by location depends largely on the socioeconomic status and race or ethnicity of a community, raising social and environmental justice concerns (Chung and Myers, 1999; Hendrickson, Smith, and Eikenberry, 2006; Freedman, 2009; Larson, Story, and Nelson, 2009; Hilmers, Hilmers, and Dave, 2012).

Many experts have used supermarkets as an indicator of healthy food access because of the variety of fresh foods available at relatively low prices (U.S. Department of Agriculture, 2009). Several studies have found that supermarkets are more common in predominately white and affluent neighborhoods (Morland, Diez Roux, and Wing, 2006; Larson, Story, and Nelson, 2009; Hilmers, Hilmers, and Dave, 2012), while low-income and minority neighborhoods have greater access to convenience stores and fast-food restaurants. On a national level, low-income zip codes are reported to have 30% more convenience stores than higher income areas (Hendrickson, Smith, and Eikenberry, 2006; Hilmers, Hilmers, and Dave, 2012). These stores generally offer

relatively inexpensive refined and highly processed foods and very little, if any, fresh fruits, vegetables, or whole grains. Researchers have emphasized the potential importance of working with existing small stores and alternative outlets to improve their fresh food selection, and healthy corner store programs have been implemented across the country to support existing stores to stock and sell healthier options. However, questions remain regarding the long-term sustainability of these fresh food initiatives.

A small number of studies have examined the limitations of supplying corner stores with fresh food from the perspective of store owners (Gittelsohn et al., 2008; Larson et al., 2013). These limitations include lack of physical space and equipment needed to store perishable items, the perception of low demand for healthier options, the inability to return unsold perishable items, neighborhood crime, and difficulties negotiating small purchase volumes from suppliers (Gittelsohn et al., 2008; Larson et al., 2013). Some studies have also recognized the potential importance of leveraging the entire supply chain in efforts to improve healthy food access (Gittelsohn et al., 2008; Hawkes, 2009). For example, researchers have suggested including not only retailer perspectives but also food producers and distributors in healthy corner store interventions, as each supply chain entity is interconnected (Gittelsohn et al., 2008).

Most food desert research to date has focused on individuals' perceived barriers to healthy food access as well as characterizations and mapping of food environments (Hill, 1998; Gittelsohn et al., 2008; Freedman, 2009; Larson, Story, and Nelson, 2009). Little research, however, has explored issues further upstream in the supply chain (Hawkes, 2009). Specifically, few studies describe the constraints that representatives of the fresh produce supply chain face in providing healthy food to low-income and food desert areas. A better understanding of how these entities work together may provide valuable insights as to how best to supply communities with fresh, affordable food (Hawkes, 2009). These insights could be potentially important in the Phoenix area, which has considerable urban sprawl and related widespread food deserts as well as particularly high rates of poverty and food insecurity. The objectives of this study were to (1) identify barriers to supplying fresh, affordable produce to Phoenix-area food deserts, and (2) explore current success stories or potential strategies for effectively supplying fresh, affordable produce to Phoenix-area food deserts. These objectives were addressed through in-depth interviews with expert members of the local produce supply chain. Though unique to the Phoenix area, these results may provide insights useful for exploring other urban areas.

Methods

Participants and Recruitment Procedure

In 2015, researchers partnered with experts and representatives of the Arizona food supply chain, who provided the team with contacts for potential interviewees involved in food retail, distribution, and farming in Phoenix, Arizona. This partnership aided in identifying cases for study (the selection of individuals and/or organizations) who were considered "information rich," offering useful insights related to the objectives of the study. Sampling targeted the local produce supply chain in a geographically confined context, and as a qualitative study the focus remained on identifying emergent themes that may be critical for future investigation rather than

generalizable conclusions from a representative sample (Strauss and Corbin, 1990). Potential participants (n=15) all noted Phoenix, AZ, as their primary service area.

With their permission, an introductory letter was sent to potential interview participants via email to gauge interest in participation. The letter expressed the research team's interest in conducting an interview to gain their perspectives on healthy food access issues in food deserts. The potential participants were told they would receive a $50 incentive as compensation for their time and were asked to contact the research team with any questions or concerns or to express interest in participation. Potential participants were given a week to respond, after which a reminder email was sent. All those who responded were enrolled in the study, and an interview date and time was scheduled with each participant. Due to low response rates, researchers also utilized snowball sampling, a purposeful approach in which enrolled study participants identify other potential participants for recruitment in order to gain targeted access to additional supply chain representatives (Patton, 1990). Following each interview, participants were asked whether they could provide information that would connect the research team with other members of the same population, a method primarily used in exploratory research. The Institutional Review Board of Arizona State University approved this study.

Interview Design

The research team developed a brief demographic survey and semi-structured questionnaire for each interview group. The demographic survey was created to quickly gather data to classify participants within groups. The semi-structured questionnaire was used as the interview guide. As few studies exist regarding perceived supply chain issues in supplying healthy foods in food deserts, we developed a novel questionnaire, which was created using input from experts in agribusiness and food systems and was pilot-tested for clarity among graduate students studying qualitative methods in a research-intensive program. Following this review, supply chain experts at two universities examined the questionnaire for face validity. The interview guide consisted of a series of questions about business operations, perceived distribution challenges, and opinions regarding potential barriers and solutions to supplying produce to underserved areas in Phoenix.

The interview moderator was trained prior to conducting fieldwork. Upon arriving at the interview, participants read and signed an informed consent letter that assured participants that their participation would be voluntary and that they could discontinue the interview at any point with no penalty. It also informed participants that the interview would be audio-recorded with their permission and that their responses could be used in future publications. However, their name and their business's name would not be identified to maintain confidentiality. The interviews were conducted in English and were primarily scheduled to take place at participants' worksites to facilitate higher recruitment rates. The same researcher was responsible for moderating and audio-recording all interviews. Although interviews were guided by the semi-structured questionnaire, questions were adapted to follow the flow of the conversation. Participants were encouraged to share their honest thoughts and opinions in an attempt to evoke a greater understanding of the topics. Immediately following the interview, the researcher summarized major themes discussed as part of the note-taking process. Interviews averaged one hour in length.

Data Analysis

Interviews were transcribed verbatim and proofread for accuracy. Data were organized using a general inductive approach based on the grounded theory method, which has been previously published in similar qualitative research (Thomas, 2006; Freedman, 2009). This inductive approach allows insights to emerge directly from the data as opposed to confirming or denying previously defined hypotheses (Glaser and Strauss, 1967). Data coding was an iterative and collaborative process. Two researchers independently coded six pages of the interview transcripts, each developing a codebook that comprised the code name, abbreviation, definition/explanation, and examples. Researchers then met to compare their coding schemes, discussing agreements and discrepancies of assigned codes to ultimately merge their codebooks. This process was repeated two more times with four new pages of transcripts compared at each meeting. A crude assessment of inter-rater reliability was determined by calculating percentage agreement of the most frequently coded sections. A coding was considered an agreement if both researchers assigned the main idea of a text segment to the same code (Burla et al., 2008). Overall, inter-coder reliability of the transcripts was 90.9%.

After establishing reliability, the remaining transcripts were organized using the qualitative data analysis software NVIVO. Similar to the initial coding process, a thematic content analysis was conducted from actual phrases used in the text to identify emerging ideas, patterns, and themes from the dataset based on volume of codes (Glaser and Strauss, 1967). Subtopics were identified for certain categories, and appropriate quotes that conveyed fundamental themes were noted (Thomas, 2006). The process resulted in categories that represented the most important themes from the data.

Results

Sample Demographics

Table 1 displays data from the brief demographics survey, revealing characteristics of the six supply chain representatives who participated in the study. While two participants described their businesses as only one type within the produce supply chain (such as farm operation or distributor), the other four participants selected multiple descriptors. Results from this sample indicate there is not necessarily a clear distinction between supply chain entities. Participants included small, midsize, and large-scale family farms with distribution ranging from local to international. However, all participants described Phoenix-area markets as their primary distribution focus.

The small and midsize family farms conducted their own distribution and delivery to outlets such as farmers' markets, farm stands, community supported agriculture programs, and independent restaurants. The two large-scale family farms hired less-than-truckload shipping, distributed directly, or allowed customers to pick up product from their docks. Primary customers included retail chain supermarkets, small-format grocery stores, and downtown produce brokers or wholesalers who then disseminated some of that product to food service and smaller retailers. One of these participants also sold slightly older produce that would not meet chain store

Table 1. Participant Characteristics.

	Participants					
	1	**2**	**3**	**4**	**5**	**6**
Business description	-Farm operation	-Farm operation -Distributor -Retailer (Direct marketing farm operation)	-Farm operation -Distributor -Retailer	-Farm operation -Distributor	-Distributor -Processor	-Distributor
Business size	Large-scale family farm ($1,000,000 or more)	Midsize family farm ($350,000 - $999,999)	Moderate-sales, small family farm ($150,000 - $349,000)	Large-scale family farm ($1,000,000 or more)	Annual sales: $37,000,000	Annual sales: $50,000,000
Where the business distributes produce	-Locally -Regionally -Nationally -Internationally	-Locally	-Locally	-Locally -Regionally -Nationally	-Locally -Regionally -Nationally	-Locally -Regionally
Multistate operation? (yes or no)	Yes (2 states)	No	No	No	Yes (2 states)	No

standards to secondary markets in Phoenix and Los Angeles. The distributor/processor delivered product to grocery stores, warehouse clubs, and other major distributors. The customer base of the final distributor included Phoenix-area schools, restaurants, "mom and pop" stores, and other retail markets. In the sections following, direct quotes from participants are followed by fabricated initials to ensure anonymity.

Barriers

Transportation costs

Transportation costs were brought up by nearly all of the participants when asked about produce distribution challenges (noted by 5/6 participants; 28 references total). Several participants specifically mentioned logistical costs as a barrier to servicing smaller retailers or secondary outlets. Respondents noted the cost of the truck, the driver, insurance, fuel, maintenance, and minimum delivery costs as current and potential barriers.

> "If it's trying to schedule freight and trucks and all of that, in the end it almost becomes more trouble than it's worth from a business sense." [L.T.]

> "What are the challenges…um fuel costs, um, expensive delivery equipment, you know, do you need refrigerated trucks and that sort of thing. We don't have that now but those would be helpful." [D.R.]

Production Costs

Local growers felt that staying in business and thriving as a farm was itself a challenge and described how the costs involved impacted their practices, pricing, and with whom they conducted business (5/6; 18 references). Production costs mentioned included field, labor, and storage prices. These production costs varied in relation to market variability. One grower explained that if a particular item saturated the market, the production costs associated with harvest and storage were often greater than revenue from sales. Hence, several growers opted to leave produce in the field (food waste) or donate produce to charity to minimize production costs and loss of revenue. Several growers described having limited profit margins within the produce supply chain as a result.

> "Sometimes it's actually more expensive for us to sell it than it is for us to just leave it in the field or donate it…It becomes harder and harder to be a farmer because it's really cost prohibitive." [L.T.]

Lack of Control

Participants described several variables in the produce industry beyond their power of influence, including produce distribution challenges (4/6; 22 references). Respondents expressed this theme in relation to shorter shelf life, variation in produce appearance, weather fluctuations, a variable produce market, and retail stores accepting product. Participants specifically emphasized the diminishing quality of a perishable product and the resulting limits on where produce can be

distributed depending on storage space, transportation, and retail standards. Several participants also mentioned how weather impacted growing capabilities and subsequent pricing. Especially on a small scale, production and volume vary to a greater extent than larger-scale production; as such, growers described a limitation on meeting demand for a larger volume of single items because they could not guarantee that level of production, nor did they generally have the capacity to store larger volumes and distribute it efficiently. This issue has been noted in previous work as well (Bloom and Hinrichs, 2011).

> "The thing with produce is it's not widgets. It's different every day. The product you get in is different every day. Um, one day it could be perfect and the next day you could have bug damage. Um, some vegetables hold up better than others, you know, there's all kinds of moving parts that affect what you do that you have zero control over…As a farmer you have no control over the weather, you have no control over the market, and you have no control over what the chain stores are gonna buy from you." [L.T.]

Purchasing Power of the End Customer

Participants identified retail customers' purchasing power as a potential barrier to distributing to underserved areas in the Phoenix Valley (4/6; 15 references). One respondent noted that distribution depends on potential customers' ability to buy enough product to make it worthwhile for the distributor to stop at the retail location. Several participants mentioned that they preferred to work with large-volume customers, and one participant expressed that their minimum order requirements and inability to break cases made them inaccessible to small food retailers. These findings mirror challenges identified in a previous report about providing fresh produce to small food stores (Laurison, 2014).

> "I mean, it would behoove us to work with someone who orders a lot of volume because margins are so low, it is, there are volume items and you do better with volume. But even more than that it's just the logistics of, 'hey, we can only sell you two dozen of this, and if you can't take two dozen, it's zero or two dozen.' We have no means to break it up." [L.T.]

> "…if they don't purchase at least 250 dollars' worth of product, it becomes a loss to us." [S.J.]

Financial Security

Financial security emerged as a subtheme of end customers' purchasing power (2/6; 7 references). This code represented statements several participants made about preferring to work with customers who provide financial security when it comes to getting paid for their product. One participant also commented that they only worked with business partners who have certain ratings in the "blue book," which she described as an encyclopedia of company information and business statistics for all areas of farming business, including pay trends, trade practices, and credit scores. This allowed their business to minimize the potential of "getting burned" financially from not being paid for the perishable product they provide.

> "…with perishable product it's not like you can take it back. And if that company can't pay, you have the potential to take a huge loss and possibly never recoup expenses." [L.T.]

> "When we're looking for new business we're generally looking for really steady opportunities, um, so we're not necessarily looking for every individual small store." [L.T.]

Affordability of Produce

When asked about potential barriers to selling in underserved areas of Phoenix, five participants brought up the price point of produce (5/6; 11 references). This subtheme emerged as a barrier for both retail stores and customers purchasing fruits and vegetables. Some participants expressed that fresh produce tends to carry a higher price than energy-dense, low-nutrient foods such as potato chips. Several respondents specifically said that their produce prices were higher than processed foods derived from subsidized commodities such as wheat, corn, rice, and soybeans. In addition, small and midsize growers described having a higher pricing structure for their produce because of their smaller size, greater labor inputs, and higher land prices, potentially making them unaffordable for sale in low-income areas.

> "What I know of, you know, trouble with the low-income food problems, has to do with limited resources for buying food, so buying the cheapest calories possible…I think it's gonna take a shift in how we think of food and the value of food and value associated with the cost of food, when you can get a lot more Doritos, you know, for your money than fresh produce…" [D.R.]

> "…a lot of those places won't purchase from us, because they can't afford to purchase that. They need something much more reasonable to give to that customer." [S.J.]

Strategies

Alternative Distribution Channels

Alternative distribution channels were identified as important strategies for increasing fresh fruit and vegetable access in low-income Phoenix neighborhoods (5/6; 18 references). Several participants identified the help of a third-party program such as a food hub or non-profit organization to assist with distribution and logistics. Two participants suggested the establishment of mobile markets that carry fresh, affordable produce to food desert neighborhoods. One distributor proposed redirecting food that is safe but would otherwise be wasted to be sold in these areas.

> "If there was a non-profit involved that helped facilitate, you know, transporting produce to these areas. Or, um, partnered stores with farms, you know, then yeah, absolutely, but I think it would take something like a third-party to kind of facilitate that…" [L.T.]

> "…we really need to pull back in and look at some of these smaller format distribution models like food hubs." [A.H.]

Incentive/Profit

Participants identified the need for tax or economic incentives that would lessen the financial risk involved with distributing to low-volume stores (4/6; 14 references). Several participants noted that they would be interested in distributing to small food retailers in food deserts if there were funding to provide them with more efficient storage or transportation equipment, a tax incentive, or a "break-even" opportunity. These types of incentives have been identified in previous studies as important strategies for addressing barriers such as minimum order requirements and delivery fees from the retail perspective but not from perspectives further upstream in the supply chain. For example, many healthy corner store programs across the country offer store owners small stipends to reduce the risk associated with stocking new products such as fresh fruits and vegetables (Laurison, 2014; U.S. Department of Agriculture, 2016).

> "…as a company too, you're out there to be profitable. Um, so if there's a break even, even to do something like that, that helps the community, then yeah, it's something that we could do." [S.J.]

Utilize Existing Infrastructure

Two participants suggested utilizing and improving existing distribution systems and retail infrastructure as a strategy for increasing access to fresh, affordable food in low-income neighborhoods (2/6; 6 references). One participant suggested working with existing small food retailers in food desert areas to increase the availability of healthy items, a common public health approach for improving healthy food access (U.S. Department of Agriculture, 2016). Another participant suggested finding out who is already distributing to these areas and whether they would be interested in supplying produce to existing stores to maximize delivery efficiency. Other reports have explored more nuanced strategies for improving existing distribution systems to better serve small food retailers, such as establishing cooperative purchasing agreements among multiple small stores in a community and working with larger institutions such as hospitals and schools to add onto existing fresh produce orders (Laurison, 2014).

> "From a distribution standpoint, I'd have to look at the model and see where those deserts are in conjunction with our customer base, and find out who would be willing to look into this as an opportunity to sell more product." [P.L.]

> "…you know corner store and convenience stores, the 'C' store concepts. I think that's a great idea because you're using an existing system and you're just changing it." [A.H.]

Additional Insights

Food Safety Regulations

Many participants discussed food safety regulations, the costs associated with enforcing such regulations, and their impact on business partnerships (4/6; 22 references). While participants acknowledged the importance of food safety, several growers emphasized concerns over the added expense of implementing food safety programs and third-party audits such as Hazard Analysis and Critical Control Points (HACCP), Good Handling Practices (GHP), and Good Agricultural Practices (GAP) (Martinez, 2016). These certifications improve market access opportunities for growers as many distributors, retailers, and foodservice buyers require them as a condition of purchase. However, the documentation and infrastructure required for these certifications can be cost-prohibitive for small produce growers, preventing them from entering new markets. One large-scale grower felt that farmers were most impacted by potential financial implications of food safety issues. This caused them to work with vendors or distributors that could ensure safe transport and storage of their product. Two distributors expressed the need for total accountability from the growers they do business with and acknowledged that this prevented them from working with some small-scale local farmers.

> "…it increases costs by a lot and it increases wariness from a farmer to, you know, even grow certain things or work with certain things because of concern." [L.T.]

> "Unless the local farmers can, can get us a third-party audit certificate and show that they're HACCP certified, uh, we stay away from that." [S.J.]

Donations

Nearly all respondents donate excess produce to a network of food banks and saw this as an effective strategy to get produce into low-income areas (5/6; 17 references). Two respondents explained that excess product is typically a result of produce appearance not meeting chain store specifications or greater than expected yields.

> "We have always focused on getting our produce into low-income areas by donating and participating in the Statewide Gleaning project…Our gleaning program has allowed us to donate 1.5 – 2 million pounds of produce annually to food banks to distribute out and get into the hands of people who need access to fresh produce." [A.H.]

> "If I don't know where to go with it, it goes to the food bank." [P.L.]

Discussion

To date, little research exists focusing on potential barriers and strategies of the supply chain in relation to food deserts. This study provided novel insight into this important aspect of the issue. In particular, the relations between supply chain entities represented a variety of potential barriers that could contribute to the perpetual lack of healthy, affordable fresh food in food desert areas.

Participants perceived numerous obstacles in servicing Phoenix-area food deserts. Several local growers described the lack of control inherent in working with a perishable product, production costs, and market volatility as challenges to simply remaining financially sustainable as a farm.

Participants also mentioned several distribution barriers: minimum delivery requirements greater than the needs of the typical small store, an inability to break up case sizes for low-volume orders, transportation costs, and the higher price point of their produce relative to other food options. In addition, many participants expressed how new food safety regulations introduce added costs and uncertainties within farmer-distributor-retailer business partnerships. These results reflect those from similar work conducted by the Food Trust among small store operators (Bentzel et al., 2015).

Participants also suggested multiple strategies for overcoming these barriers and other related issues. As financial viability was a common concern among participants, they commonly suggested the need for financial incentives or a "good break-even" to interest them in new business in these areas. Participants also discussed alternative distribution/retail channels such as mobile markets and food hubs as potential strategies for alleviating logistical and transportation costs and improving healthy food accessibility for residents of low-income, low-access areas, among other benefits. As an additional insight, nearly all participants described currently donating excess produce to local food banks as their primary means of distributing fresh fruits and vegetables to low-income communities.

These insights may be useful to practitioners and advocates interested in exploring systems solutions to the problem of healthy food access. Examples exist around the United States of local foods initiatives that simultaneously target the dual goals of improved food security and community development (Phillips and Wharton, 2015). Programs include successful food hubs, processing centers, and other novel models of fresh food aggregation and delivery. Further, researchers have explored innovations in local food social entrepreneurship that provide insights into how best to plan the implementation of these types of programs and organizations (Horst et al., 2011).

While greater insight and understanding of the issues in the fresh produce supply chain was obtained, this study does have some limitations that provide opportunities for future research. Due to the qualitative, exploratory nature of the study, the results reveal thematic findings but do not intend to offer conclusive answers to the research questions. Also, because of the recruitment methodology and small sample size, the sample is not representative of the larger population. Instead, these findings provide insights into one supply chain stream in order to identify emergent and critical issues that could be explored in future research regarding how pervasive, or generalized, they might be. As such, next steps would be to follow up with a survey informed by these results, in which data obtained could be quantified and extrapolated to a larger population.

Conclusion

This research provides important insights into the challenges faced by fresh produce supply chain members in servicing food desert areas. Findings from this qualitative, exploratory study also shed light on potential strategies for overcoming such barriers from the supply chain perspective. Although some of the findings are consistent with previous research, such as concerns about cost of operations and lack of control over multiple factors of small-farm operations, other insights have a degree of novelty as the grower and distributor perspective has not been fully represented in the literature. For example, concerns about food safety regulations

represent an important concern, and novel opportunity for intervention, from the grower and distributor perspective. Similarly, interest among these groups in alternative distribution strategies, such as food hubs, suggests an openness to new ways of coordinating production to improve access. These data serve to guide further research, which may ultimately better inform policies and programs addressing healthy food access and working toward a more equitable food system.

Acknowledgments

This study was supported by a USDA Higher Education Grant (#026885-001). The contents of this article are the responsibility of the authors and do not necessarily represent the views of the funding source.

References

Bentzel, D., S. Weiss, M. Bucknum, and K. Shore. 2015. *Healthy Food and Small Stores: Strategies to Close the Distribution Gap.* Philadelphia, PA: The Food Trust.

Bloom, J.D., and C. Hinrichs. 2011. "Moving Local Food through Conventional Food System Infrastructure: Value Chain Framework Comparisons and Insights." *Renewable Agriculture and Food Systems* 26(1):13–23.

Burla, L., B. Knierim, J. Barth, K. Liewald, M. Duetz, and T. Abel. 2008. "From Text to Codings: Intercoder Reliability Assessment in Qualitative Content Analysis." *Nursing Research* 57(2):113–117.

Coleman-Jensen, A., C. Gregory, and A. Singh. 2014. *Household Food Security in the United States in 2013*. Washington, DC: U.S. Department of Agriculture, Eeconomic Research Service, Economic Research Report 173, September.

Chung, C., and S.L. Myers. 1999. "Do the Poor Pay More for Food? An Analysis of Grocery Store Availability and Food Price Disparities." *Journal of Consumer Affairs* 33(2):276–296.

Drewnowski, A. 2009. "Obesity, Diets, and Social Inequalities." *Nutrition Reviews* 67 (Suppl 1):S36–39.

Freedman, D.A. 2009. "Local Food Environments: They're All Stocked Differently." *American Journal of Community Psychology* 44(3–4):382–393.

Gittelsohn, J., M. Franceschini, I. Rasooly, A. Ries, L. Ho, W. Pavlovich, V. Santos, S. Jennings, and K. Frick. 2008. "Understanding the Food Environment in a Low-Income Urban Setting: Implications for Food Store Interventions." *Journal of Hunger & Environmental Nutrition* 2(2–3):33–50.

Glaser, B.G., and A.L. Strauss. 1967. *Discovery of Grounded Theory: Strategies for Qualitative Research*. Chicago: Aldine.

Hawkes, C. 2009. "Identifying Innovative Interventions to Promote Healthy Eating Using Consumption-Oriented Food Supply Chain Analysis." *Journal of Hunger & Environmental Nutrition* 4(3–4):336–356.

Hendrickson, D., C. Smith, and N. Eikenberry. 2006. "Fruit and Vegetable Access in Four Low-Income Food Deserts Communities in Minnesota." *Agriculture and Human Values* 23(3):371–383.

Hill, J. 1998. "Environmental Contributions to the Obesity Epidemic." *Science* 280(5368):1371–1374.

Hilmers, A., D.C. Hilmers, and J. Dave. 2012. "Neighborhood Disparities in Access to Healthy Foods and their Effects on Environmental Justice." *American Journal of Public Health* 102(9):1644–1654.

Horst, M., E. Ringstrom, S. Tyman, M. Ward, V. Werner, and B. Born. 2011. "Toward a More Expansive Understanding of Food Hubs." *Journal of Agriculture, Food Systems, and Community Development* 2(1):209–225.

Larson, C., A. Haushalter, T. Buck, D. Campbell, T. Henderson, and D. Schlundt. 2013. "Development of a Community-Sensitive Strategy to Increase Availability of Fresh Fruits and Vegetables in Nashville's Urban Food Deserts, 2010–2012." *Preventing Chronic Disease* 10:E125.

Larson, N.I., M.T. Story, and M.C. Nelson. 2009. "Neighborhood Environments: Disparities in Access to Healthy Foods in the U.S." *American Journal of Preventive Medicine* 36(1):74–81.

Laurison, H.B. 2014. *Providing Fresh Produce in Small Food Stores.* Oakland, CA: ChangeLab Solutions.

Martinez, S.W. 2016. "Policies Supporting Local Food in the United States." *Agriculture* 6(3):43.

Morland, K., A.V. Diez Roux, and S. Wing. 2006. "Supermarkets, Other Food Stores, and Obesity." *American Journal of Preventive Medicine* 30(4):333–339.

Odoms-Young, A.M., S.N. Zenk, A. Karpyn, G.X. Ayala, and J. Gittelsohn. 2012. "Obesity and the Food Environment Among Minority Groups." *Current Obesity Reports* 1(3):141–151.

Patton, M.Q. 1990. *Qualitative Evaluation and Research Methods*, 2nd ed. Newbury Park, CA: Sage.

Phillips, R., and C. Wharton. 2015. *Local Food Systems and Community Well Being*. New York: Taylor & Francis.

Strauss, A., and J. Corbin. 1990. *Basics of Qualitative Research: Grounded Theory Procedures and Techniques*. Newbury Park, CA: Sage.

Thomas, D.R. 2006. "A General Inductive Approach for Analyzing Qualitative Evaluation Data." *American Journal of Evaluation* 27(2):237–246.

U.S. Census Bureau. 2015. *Arizona: US Census Bureau State City QuickFacts*. Washington DC, April.

U.S. Department of Agriculture. 2016. *Healthy Corner Stores: Making Corner Stores Healthier Places to Shop.* Washington, DC: U.S. Department of Agriculture, Food and Nutrition Service, Report FNS-621, June.

U.S. Department of Agriculture. 2017. *Food Access Research Atlas.* Washington, DC: U.S. Department of Agriculture, Economic Research Service. Available online: https://www.ers.usda.gov/data-products/food-access-research-atlas/

Wolfersteig, W.L., H. Lewis, T. Musgrave, T. Johnson, T. Wolven, and F.F. Marsiglia. 2011. *2010 Arizona Health Survey: Food, Housing Insecurity and Health*. Phoenix: Arizona Health Survey, November.