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How Does Food Security Impact Residents of a Food Desert and a Food Oasis?

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This study explored how factors that influence food buying practices make it harder for food secure and food insecure households to eat healthy. Twenty-five men and women participated in the concept mapping process, a mixed methods approach that allows participants to identify, sort, and rate ideas according to their perceptions. Participants identified 121 unique statements and sorted them into 12 clusters that represented their perceptions. Cluster ratings were higher among food-insecure participants compared to food-secure participants. A secondary aim was to explore how food security and food desert statuses are perceived to hinder healthy eating. Food secure participants in a food desert perceived clusters as more important to hindering healthy eating than food-secure participants in a food oasis. Similar perceptions were noted among food-insecure residents in either a food desert or a food oasis. Findings contribute to our understanding of how perceptions differ by food desert and food security statuses.

First and foremost, we want to thank the participants for their time and perspectives. We want to thank the staff at the Hazelwood Young Men's Christian Association (YMCA) and the Lawrenceville Public Library for accommodating us during the concept mapping sessions.

At the time the study was conducted, Renee E. Walker was affiliated with the University of Pittsburgh, Department of Behavioral and Community Health Sciences.

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INTRODUCTION

Rates of poverty, food insecurity and hunger are increasing in the United States.¹ Within the last 2 decades, “food insecurity” has been developed as a measure of hunger in the United States.² *Food insecurity* is defined by national experts as “limited or uncertain availability of nutritionally adequate and safe foods or the limited or uncertain ability to acquire acceptable foods in socially acceptable ways (p. 2330).”³ A common misperception of food security is that having any type of food constitutes food security. However, food security pertains to a sufficient quantity of a variety of nutritious foods of a good quality that is obtained in ways that are not intended to be extremely destructive to one’s dignity. A major cause of food insecurity is the lack of financial resources. Families with low financial resources often go hungry, are malnourished, and experience changes in psychological, physical, or developmental states or diminished productivity, which results from inadequate food intake due to limited access to food as a result of store locations or financial constraints.^{2,4}

The United States Department of Agriculture (USDA) developed an instrument to measure food insecurity, the US Food Security Scale (FSS), which has been used in research to measure the adequacy and stability of a household’s food supply.⁵ It is used to estimate the number of people in the United States who are hungry. Food security is calculated from 18 questions for households with children (10 questions for households without children). These questions ask about conditions, experiences, and behaviors surrounding food quantity, quality, and variety.⁶ Studies that focus on food security pertain to understanding the prevalence, experience, and adverse consequences of food insecurity among the nation’s families, adults, and children.⁷ These studies identify risk factors that can contribute to food insecurity. These risk factors include financial hardships, educational attainment, race/ethnicity, family composition, time, employment skills, health insurance status, social support, abuse, and the availability of affordable and nutritious foods within the local food environment.^{8–15} These studies help conceptualize food insecurity in the United States and offer information about the prevalence and burden of food insecurity and programs available to counter the consequences of a poor diet. However, they fail to explore food insecurity in the greater context in which people live, specifically the food environment from which people are required to obtain food. Beyond financial constraints, there exist a myriad of factors that play a role in healthy eating for both food-secure and food-insecure households.

Though these factors have been speculated on in the literature, additional research is needed to explore these factors in-depth to understand how they affect healthy eating for food-secure and food-insecure households. It has been shown that given the financial obligations that low-income families have with a limited source of income, food is oftentimes the first necessity to be compromised.^{11,13} Understanding the factors that are involved in the decision-making processes involved in purchasing food and healthy eating could offer insight into the best programs and policies needed to provide affordable, healthy, and nutritious foods to food-insecure households. The primary research question addressed in this study was “How do residents’ perceptions of factors influencing food buying practices differ by food security status?” A secondary aim of this research was to explore how perceptions of factors influencing food buying practices differ by food desert status.

METHODS

The first step in completing this research study was to identify two ZIP codes in Pittsburgh, Pennsylvania, one categorized as a food desert, the other as a food oasis. Residential ZIP codes in Pittsburgh were categorized by food desert status. This involved utilizing the online Yellow Pages located at <http://www.yellowpages.com> to identify distance to the nearest supermarket. This method has been used in the literature as an accurate means of identifying addresses based on latitudinal and longitudinal coordinates.¹⁶ For this study, a food desert is defined as a geographic area that does not have a large chain supermarket within 0.5 miles from the ZIP code centroid, the center of the defined area identified by latitude and longitude coordinates. A distance of 0.5 miles is consistent with the literature that defines food deserts in terms of time required to walk a distance to the nearest supermarket. It is suggested that an approximate one-way walking time in excess of 15 minutes for an adult in an urban area is a proxy for a food desert.¹⁷ On the other hand, a food oasis will be used to describe a geographic area that contains a supermarket within 0.5 miles of the center of the ZIP code.

Percentage of families below the federal poverty line, as determined by the US Census Bureau, was determined and used as a proxy for neighborhood poverty status. The use of families living below the federal poverty line as a proxy for neighborhood poverty status is consistent with previous studies focusing on neighborhood poverty status.¹⁸ Based on distance to the nearest supermarket from the center of the ZIP code (food desert status) and families living below the federal poverty line (neighborhood poverty status), the two ZIP codes were identified. The two ZIP codes included in the studied were 15207 (food desert) and 15201 (food oasis).

Recruitment

Recruitment of study participants took place over a 4-week period in January 2009 and continued until 15 participants in each ZIP code had enrolled. Recruitment involved a modified convenience sampling technique that produced a sample based on referrals from people who knew others who met the inclusion criteria.¹⁹ The referrals were made from staff from social service agencies, such as neighborhood clinics, senior centers, and food banks, and from participants who had already been recruited to participate in the study. A study recruitment flyer was developed and included information about the study and a contact number to call for further information.

Concept Mapping Methodology

Concept mapping is a systematic process that incorporates group processes including brainstorming, sorting and rating of generated ideas, and the use of multivariate statistical methods (eg, multidimensional scaling and hierarchical cluster analysis) to graphically represent the results of the stakeholders.²⁰ The generated maps depict relationships of ideas in the form of clusters or unique concepts. The intended use of concept mapping was in program planning and evaluation. However, more recently, researchers have utilized concept mapping innovatively to explore health-related topics.^{21–23} For this study, the concept mapping process was conducted over a period of 3 non-consecutive days and lasted approximately 8 hours in duration. Each session was conducted in a private room at a community agency located within each ZIP code. This study was approved by the University of Pittsburgh Institutional Review Board.

Day 1: Generation of statements: During this 2-hour session, participants were asked to generate words and short phrases in response to the focus prompt: “What things, good or bad, influence your food buying practices?” The phrase *food buying practices* was defined as “where you buy food, the types of food you buy, and when you buy food.”

Day 2: Structuring of statements and representation: During this 4-hour session, participants were required to complete 3 tasks. First, participants received a stack of note cards with each of the unique items generated during the first session written on each card. Participants were asked independently to sort the cards into piles with similar items sorted together. Second, participants were asked to rate, on a scale of 1 (*not at all*) to 5 (*extremely*), how strongly each of the generated statements hinders healthy eating. Third, participants were asked to complete the USDA Food Security Scale.⁶ Once the sorting and rating steps and the Food Security Scale items were completed, data were entered

into the Concept Systems software²⁴ for immediate representation of the participants' ideas.

Day 3: Interpretation of the map: The last session, which lasted 2 hours, involved the participants interpreting the concept map. Participants were asked to elaborate on the role that specific items have in hindering healthy eating.

DATA ANALYSIS

Data analysis begins with individual sort and rate data and ends with a variety of tools (maps, lists of statements, reports, etc) to be utilized during the interpretation step.²⁰ Data analysis involves 3 core steps, which will be described in more detail below: (1) managing sort and rate data, (2) multi-dimensional scaling, and (3) hierarchical cluster analysis. For these analyses, the sample was stratified by food security status in order to answer the primary research question. The sample was stratified by both food security and food desert status to answer the secondary aim of this research. The analysis involved using quantitative techniques that yield a group product based on individual data. From this process one type of concept map, a point map, was generated to illustrate how the group, as a whole, sorted statements generated during the brainstorming session. From the point map, distinct clusters or ideas were formed that represented unique concepts that pertain to the original focus prompt.

Data from individual rating sheets were entered into the software to illustrate how important each statement and overall cluster was to hindering healthy eating. Rating data is also crucial when performing subgroup analyses to illustrate how important the clusters are to different groups. From average group ratings, data were analyzed using a *pattern match*, a display that allows average cluster ratings to be compared between 2 variables. For this analysis, the 2 variables were food-secure and food-insecure households. The "ladder graph" representation of the data illustrated how strongly correlated the 2 variables were. A Pearson's product moment correlation was calculated to represent the relationship between the 2 variables.

RESULTS

Participant Characteristics

Twenty-five participants were included in this analysis. Based on results of the Food Security Scale, 9 participants were classified as being food secure and 16 participants were classified as food insecure. The median age of the sample was 44.8 years. Nearly half (48%) of the sample was African American and another 48% was Caucasian. Among African American

TABLE 1 Participant Characteristics by Food Security Status

ZIP code characteristic	Food secure	Food insecure	Total
Total number of participants	9 (36%)	16 (64%)	25 (100%)
Age			
Median age (years)	45.3	44	44.8
Sex			
Male	1 (11.1%)	2 (12.5%)	3 (12.0%)
Female	8 (88.9%)	14 (87.5%)	22 (88.0%)
Race/ethnicity			
African American	5 (55.6%)	7 (43.8%)	12 (48.0%)
Caucasian	4 (44.4%)	8 (50.0%)	12 (48.0%)
Other	0 (0%)	1 (6.2%)	1 (4.0%)
Employment status			
Disabled	1 (11.1%)	2 (12.5%)	3 (12.0%)
Employed part-time	4 (44.4%)	9 (56.2%)	13 (52.0%)
Unemployed	4 (44.4%)	5 (31.2%)	9 (36.0%)
Car ownership			
Do not own car and hard to find a ride	2 (22.2%)	6 (37.5%)	8 (32.0%)
Do not own car and able to find a ride	4 (44.4%)	5 (31.2%)	9 (36.0%)
Own car	3 (33.3%)	5 (31.2%)	8 (32.0%)

participants, 55.6% were food secure. Among Caucasian participants, 44.4% were food secure. Additional demographic characteristics for the sample are displayed in Table 1.

Cluster Ratings

A list of 121 unique statements was generated by participants. Examples of statements include “fixed income,” “convenience,” “help from organizations,” and “season.” Quantitative techniques were used to partition the map into a 12-cluster map that was identified by participants as the appropriate number of clusters for best depicting their perceptions of factors that influence food buying practices (results not shown). Each of the 12 clusters contained statements ranging in number from 6 to 15, depending on how participants sorted the statements generated during the brainstorming process. After reviewing the statements within each cluster, participants agreed upon a cluster name that represented the statements within the cluster. The rating process was used to further explore how perceptions of clusters generated hinder healthy eating. Participants were asked to rate on a scale of 1 (*not at all strong*) to 5 (*extremely strong*) how strongly each statement within the 12 clusters hinders healthy eating. To qualify the degree to which each cluster hinders healthy eating, cluster ratings were divided into tertiles and designated as low, moderate, and high. A low value indicates a rating value between 2.44 and 2.86, whereas a moderate value indicates a rating value between 2.87 and 3.29. High indicates a rating value between 3.30

TABLE 2 Average Cluster Ratings by Food Security Status^a

Cluster name	Cluster ratings	
	Food secure	Food insecure
High risk	Low	Moderate
Information I depend on	Moderate	High
Lifestyles	Low	Moderate
Areas for improvement	Moderate	High
Making choices	Low	High
Making ends meet	Low	High
Neighborhood issues	Moderate	High
Transportation	Low	High
Access issues	Low	High
Quality healthy foods	Low	High
Budgeting	Low	High
Concerns about the stores	Low	High

^aRatings represent how strongly each statement hinders healthy eating. Ratings between 2.44 and 2.86 are designated low; ratings between 2.87 and 3.29 are moderate; and ratings between 3.30 and 3.73 are high.

and 3.73. Table 2 lists the cluster name and cluster importance for each of the 12 clusters for food-secure and food-insecure participants.

For each cluster, food-insecure participants rated clusters higher than food-secure participants. For example, the cluster “areas for improvement,” which includes statements such as “bad attitudes from store employees,” “need to eat to live,” and “stress” received an average cluster rating of 2.88 (designated low) from food-secure participants. Among food-insecure participants, this same cluster was given an average rating of 3.48 (designated high). This suggests that food-insecure participants perceive each cluster as more important in its role in hindering healthy eating than food-secure participants.

To illustrate the differences in average cluster ratings, Figure 1 presents a pattern match, which compares average cluster ratings for how strongly each cluster is perceived to hinder healthy eating for food-secure and food-insecure participants. The pattern match uses a ladder graph representation where a perfect correlation would be a horizontal straight line. The bolded numbers 3.73 at the top of the display and 2.44 at the bottom represent the maximum and minimum average cluster ratings given to a cluster. The rating scale ranged from 1 (*not at all strong*) to 5 (*extremely strong*). For example, the cluster “neighborhood issues,” which includes statements such as “store closing,” “war increases prices,” and “need more neighborhood stores,” was the highest rated cluster for food-secure participants with an average cluster rating of 3.06 (designated moderate). This same cluster was ranked third highest for food-insecure participants with an average cluster rating of 3.54 (designated high). This suggests that the cluster

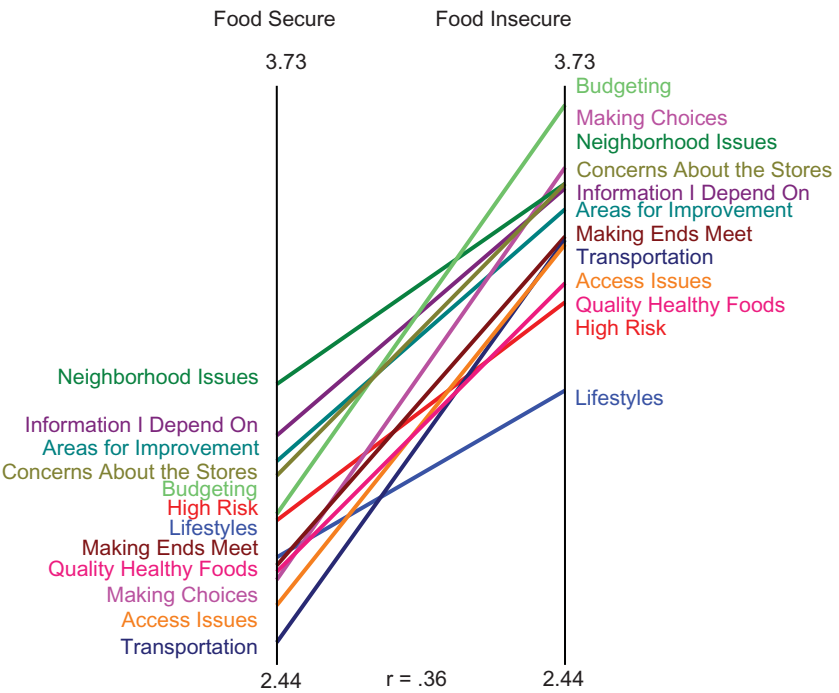


FIGURE 1 Pattern match comparing factors that hinder healthy eating for food-secure and food-insecure participants. The two vertical lines represent average cluster ratings with results for food-secure participants on the left and food-insecure participants on the right.

neighborhood issues is perceived as the most important factor for hindering healthy eating for food-secure participants but not for food-insecure participants. The $r = 0.36$ value located at the bottom of the display is the Pearson's product moment correlation, which represents the correlation between average cluster ratings between food-secure and food-insecure participants.

It is worthwhile to note that though 5 of the 6 highest rating clusters are the same for both groups (neighborhood issues, information I depend on, areas for improvement, concerns about the stores and budgeting), the average ratings are quite different. For example, among food-secure participants, budgeting received a rating of 2.75 (designated low). This same cluster was the highest rated cluster among food-insecure participants and received a rating of 3.73 (designated high). This ranking suggests that, overall, the same clusters are important for hindering healthy eating among food-secure and food-insecure participants. However, the degree to which the cluster is perceived to hinder healthy eating is greater among food-insecure participants. Additional differences in cluster ratings between food-secure and food-insecure participants were noted.

TABLE 3 Average Statement Ratings for the Cluster Concerns About the Stores^a

Statement	Food secure	Food insecure
Hours	High	Moderate
Clean and organized store	Moderate	High
Convenience	Moderate	High
Food expiration date	Moderate	High
Variety	Moderate	High
Gas discount perks	Moderate	High
Season	Moderate	Moderate
Well-stocked shelves	Moderate	High
Consolidate trips	Moderate	High
Treatment of store employees	Low	Low
Co-op shopping	Low	Moderate
Local foods	Low	High

^aRatings reflect how strongly each statement is perceived to hinder healthy eating. Ratings between 2.44 and 2.86 are designated low; ratings between 2.87 and 3.29 are moderate; and ratings between 3.30 and 3.73 are high.

Differences in Cluster Ratings

One of the differences between food-secure and food-insecure participants was in the ratings for the cluster “concerns about the stores.” Table 3 outlines the statements and statement ratings for the cluster concerns about the stores. The ratings in this table present how strongly each statement within the cluster is perceived to hinder healthy eating. The ratings range from 1 (*not at all strong*) to 5 (*extremely strong*). To qualify the degree to which each cluster hinders healthy eating, cluster ratings were divided into tertiles and designated as low, moderate, and high. A low value indicates a rating value between 2.00 and 2.68, whereas a moderate value indicates a rating value between 2.69 and 3.37. High indicates a rating value between 3.38 and 4.06. These differences were explored in-depth during the interpretation step.

Cluster Interpretation

During the interpretation step of the concept mapping process, participants were assigned to small groups where they collectively diagrammed how the statements within the cluster concerns about the stores hinder healthy eating. Based on each group’s interpretation of this cluster, differences were noted between food-secure and food-insecure participants in terms of how each group perceived the relationship of the statements within the cluster and the role in hindering healthy eating. Additionally, discrepancies were observed between how participants rated the statements and what was mentioned during the interpretation step of the concept mapping process.

During the interpretation step, food-secure participants identified “convenience” and “treatment of store employees” as being the most important factors for hindering healthy eating among the statements that comprise the cluster concerns about the stores. Among food-insecure participants, “convenience,” “variety,” “cost,” and “customer service” were identified during the interpretation step as being the most important factors for hindering healthy eating. Examples of how participants explained how the statements within the high-risk cluster are related to influence food buying practices are

Employee treatment is the most important thing. Employees are not treated right and they are gonna quit and the store is going to go out of business. (Food-secure participant)

There is no convenience here. It hinders [healthy eating] because the stores that are in Hazelwood, the prices are so high you can't afford to buy things there. (Food-insecure participant)

The secondary aim of this study was to identify whether the factors that hinder healthy eating for either food-secure or food-insecure households differ by whether the household is in a food desert or food oasis. The goal of this analysis was to explore how perceptions of factors that hinder healthy eating are influenced by an individual-level measure of hunger within the larger neighborhood context.

Figure 2 presents a pattern match comparing average cluster ratings for food-secure participants in a food desert to food-secure participants in a food oasis. The pattern match uses a ladder graph representation where a perfect correlation would be a horizontal straight line. The bolded numbers 3.45 at the top of the display and 1.71 at the bottom represent the maximum and minimum average cluster ratings given to a cluster. The rating scale ranged from 1 (*not at all strong*) to 5 (*extremely strong*). The $r = 0.15$ value located at the bottom of the display is the Pearson's product moment correlation, which represents the correlation between average cluster ratings between food desert and food oasis participants. From this illustration, it is clear that the overall rankings were similar for both groups of participants with the clusters areas for improvement, information I depend on, and neighborhood issues being some of the most important clusters for hindering healthy eating. It is worthwhile to note that although the overall rankings were similar, participants in the food desert rated all of the clusters higher than participants in the food oasis. For example, both groups ranked the cluster information I depend on as the second most important cluster for hindering healthy eating. Food-secure participants in the food desert considered this cluster of high importance for hindering healthy eating compared to food-secure participants in the food oasis, who considered this cluster of low importance for hindering healthy eating. The degree of importance to

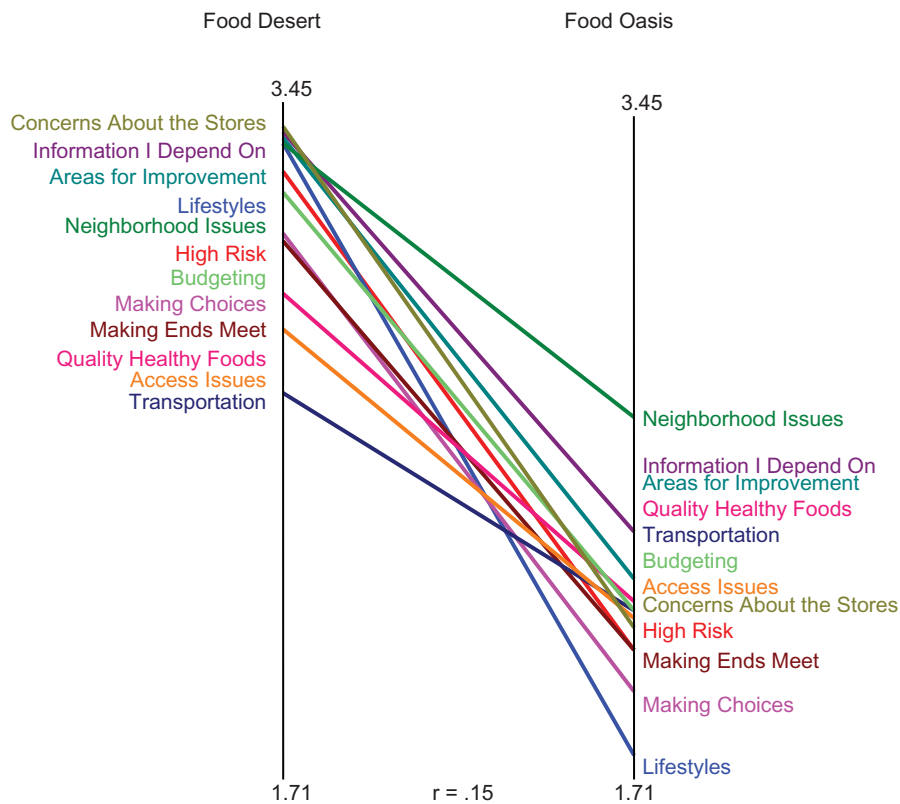


FIGURE 2 Pattern match for factors that hinder healthy eating comparing food-secure participants in a food desert to a food oasis. The two vertical lines represent average cluster ratings with results for food desert participants on the left and food oasis participants on the right.

which each cluster hinders healthy eating for food-secure participants residing in a food desert and food-secure participants residing in a food oasis is listed in Table 4.

When exploring perceptions of factors that hinder healthy eating among food-insecure participants in the food desert and the food oasis, the results were not as clear. Figure 3 presents a pattern match, which compares average cluster ratings for how strongly each cluster is perceived to hinder healthy eating for food-insecure participants residing in a food desert and food-insecure participants residing in a food oasis. The bolded numbers 4.1 at the top of the display and 2.97 at the bottom represent the maximum and minimum average cluster ratings given to a cluster. The rating scale ranged from 1 (*not at all strong*) to 5 (*extremely strong*). The $r = 0.12$ value located at the bottom of the display is the Pearson's product moment correlation, which represents the correlation between average cluster ratings between food desert and food oasis participants. At first glance, it would appear that

TABLE 4 Average Cluster Ratings and Importance for Hindering Healthy Eating^a

Cluster	Food secure		Food insecure	
	Food desert	Food oasis	Food desert	Food oasis
Budgeting	Moderate	Low	High	High
Making choices	Moderate	Low	High	High
Neighborhood issues	High	Moderate	High	High
High risk	High	Low	High	Moderate
Areas for improvement	High	Low	High	High
Information I depend on	High	Low	High	High
Concerns about the stores	High	Low	High	High
Quality healthy foods	Moderate	Low	High	Moderate
Making ends meet	Moderate	Low	High	High
Access issues	Moderate	Low	Moderate	High
Transportation	Moderate	Low	Moderate	High
Lifestyles	High	Low	Moderate	Moderate

^aRatings reflect how strongly each statement is perceived to hinder healthy eating. Ratings between 1.71 and 2.50 are designated low; ratings between 2.51 and 3.30 are moderate; and ratings between 3.31 and 4.10 are high.

there were major differences between food-insecure participants in a food desert compared to food-insecure participants in a food oasis. For instance, the overall rankings of the clusters were quite different, with the cluster transportation being ranked nearly last for the food desert but ranked first for the food oasis.

Upon closer inspection, it became clear that although the rankings were different, the average cluster ratings were similar, suggesting that the importance of each cluster in hindering healthy eating was similar for food-insecure participants regardless of neighborhood-level access to a supermarket. For example, consider the cluster making choices. This cluster ranked second among food-insecure participants residing in a food desert and eighth among food-insecure participants residing in a food oasis. Though these rankings are different, the average cluster ratings suggest that food-insecure participants residing in the food desert and food-insecure participants residing in the food oasis perceive this cluster of high importance for hindering healthy eating. Overall, the average cluster ratings were slightly higher for participants in the food desert compared to the food oasis. In other words, the difference in magnitude of the average cluster ratings was greater among food-secure households compared to food-insecure households. The exceptions are in the clusters transportation, making ends meet, and access issues. Examples of statements that comprise the cluster transportation are “need a car,” “distance to shops,” and “weather.” Examples of statements that make up the cluster making ends meet are “food stamps,” “making choices between buying food and paying bills,” and “got a raise and lost food stamps.” Examples of statements that make up the cluster access

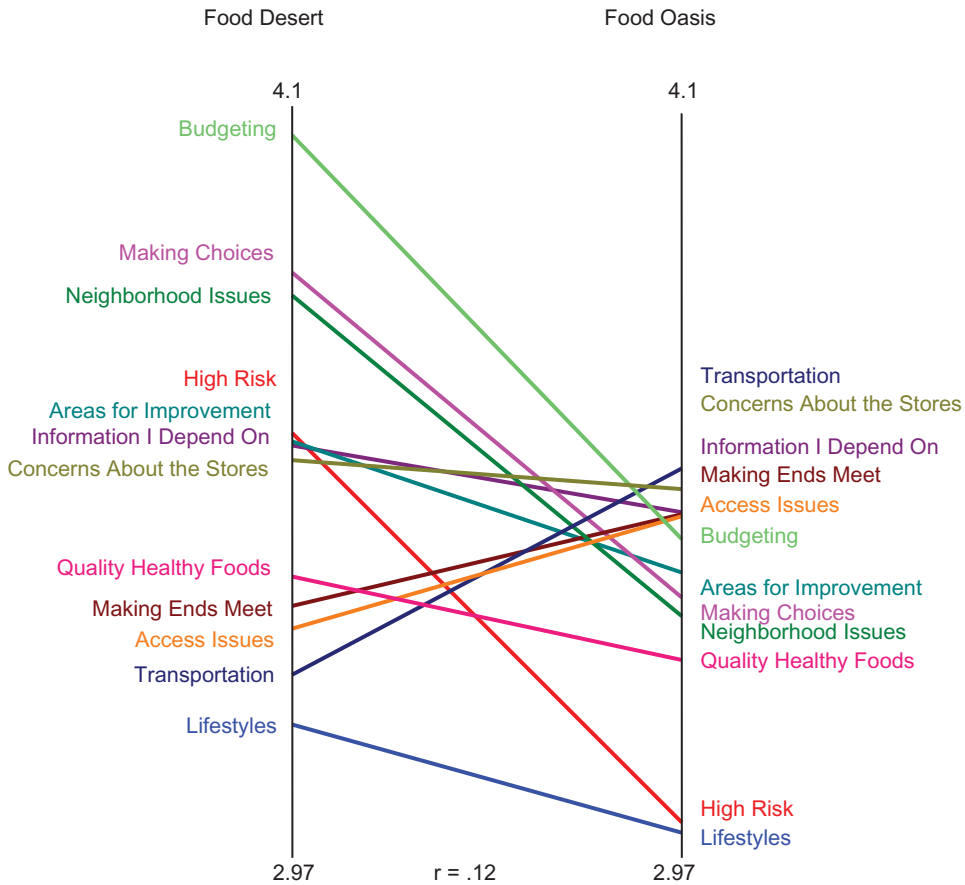


FIGURE 3 Pattern match for factors that hinder healthy eating comparing food-insecure participants in a food desert to a food oasis. The two vertical lines represent average cluster ratings with results for food desert participants on the left and food oasis participants on the right.

issues include “high gas prices,” “lack of transportation,” “high bus fare,” and “depend on the bus lines.”

Table 4 summarizes cluster importance for each of the 12 clusters for the sample stratified by both food security and food desert status. To qualify the degree to which each cluster hinders healthy eating, cluster ratings were divided into tertiles and designated as low, moderate, and high. A low value indicates a rating between 1.71 and 2.50, whereas a moderate value indicates a rating value between 2.51 and 3.30. High indicates a rating value between 3.31 and 4.10. For example, the cluster information I depend on is perceived by food-secure participants in a food desert and all food-insecure participants as rating high in terms of importance for hindering healthy eating. Food-secure participants in a food oasis were the exception in this example and perceived this cluster of low importance for hindering healthy eating.

DISCUSSION

This study represents one of the first studies seeking to explore the relationship between an individual-level measure of hunger and a neighborhood-level measure of supermarket access on hindering healthy eating in an urban area. Though caution must be taken when interpreting the results and comparing findings to existing studies due to the small sample size, these findings provide novel insight into an area of research that is poorly explored. Key findings from this study show that factors that hinder healthy eating are the same for food-secure and food-insecure participants. The difference is in the degree of importance or the cluster ratings. Compared to food-secure participants, food-insecure participants viewed each cluster as being more important to hindering healthy eating. This is not surprising given that food insecurity pertains to the inability to obtain affordable, safe, and nutritious foods.²⁵ Each cluster, comprised of statements related to concerns regarding access, affordability, neighborhood characteristics, and individual factors, is impacted by income.

The in-depth explanation of the cluster concerns about the stores highlighted convenience as a concern for both food-secure and food-insecure participants. It was noted in the Results section that the statement convenience was rated third (after “hours” and “clean and organized store”) in terms of perceived importance in hindering healthy eating among food-secure participants. It is reasonable and appropriate for participants to perceive convenience as the most important factor for hindering healthy eating when the other statements included in this cluster are closely related to convenience. For instance, one participant was concerned about the impact of store employees being treated unfairly. The concern was that employees will quit and stores will close, thereby making food shopping inconvenient. Additionally, store hours, variety of foods offered, and well-stocked shelves all play a role in convenience. If the store hours are not conducive to the consumer, if there is a lack of variety and poorly stocked shelves, it is likely that residents would have to shop at another store, potentially in another neighborhood. This can be an inconvenience to a low-income individual who has to rely on public transportation to obtain food.

When comparing food-secure residents within a food desert to a food oasis, the data suggest that living in a food desert heightens the degree to which residents perceive the range of factors as hindering healthy eating. This has major public health significance because it highlights the need for additional research to explore the impact of living in a food desert. Findings from this study suggest that perceptions of factors that hinder healthy eating do not vary by location (food desert or food oasis), but the mere fact that living in a food desert and not having access to a supermarket is a key component in hindering healthy eating despite the household's ability to afford healthy and nutritious foods.

Food-insecure participants from the food desert and the food oasis had similar ratings for each of the clusters. Each of the clusters was rated high or moderate in terms of hindering healthy eating. This suggests that for food-insecure households, location (food desert or food oasis) does not play a major role in determining factors that hinder healthy eating. Rather, this relationship is associated with being food insecure. In other words, among households that are food insecure, the degree of importance for each cluster in hindering healthy eating is heightened regardless of neighborhood food desert status. This has major health and community development implications. An improvement in diet comprised of healthy and nutritious foods cannot be achieved alone by increasing access to a supermarket. Underlying issues of poverty and related food insecurity must also be addressed.

Two of the clusters that were rated higher among food-insecure participants in a food oasis compared to food-insecure participants in a food desert were access issues and transportation. One explanation for this finding is that nearly half (44.4%) of food-insecure participants residing in a food oasis own their cars (results not shown). This is in comparison to food-insecure participants residing in a food desert, where 14.3% own a car (results not shown). Food-insecure participants in the food oasis may view these clusters as more important for hindering healthy eating because a greater percentage, compared to food-insecure participants in the food desert, has to maintain the upkeep of their personal cars including paying high gas prices. Similarly, a greater percentage of food-insecure participants in the food oasis find it difficult to obtain transportation. As a result, these participants may have rated statements pertaining to the public transportation system as more important because they tend to rely mostly on this mode of transportation.

Strengths and Limitations

A strength of the study is its focus on household food security status and food desert status. This allowed for associations between these 2 measures to be studied. These analyses offer new insight into the intersection of food security and food desert statuses and can prove beneficial in offering recommendations to improve diet and nutrition among low-income food-secure and food-insecure residents with different levels of supermarket access.

Additionally, this study includes the use of concept mapping as the methodology to answer the research questions. Unlike qualitative methods such as focus groups, concept mapping offers the participants the unique opportunity to rate items according to individual importance and note how items are related to each other. Furthermore, this participant-driven methodology involves the participants in each phase of the concept mapping process. This is especially salient for exploring and understanding perspectives and viewpoints through the interpretation and analyses of the constructed maps. Quantitatively, concept mapping uses multidimensional

scaling and hierarchical cluster analysis to examine similarities of ideas among participants and identify the degree of similarity. These analyses, in conjunction with the rich qualitative data collected during the early stages of the process, highlight additional strengths of this methodology.

Similar to other qualitative studies, this study is limited in its generalizability. This study represents the views of 9 food-secure and 16 food-insecure participants. For the secondary aim, the sample size was even smaller. As a result, our findings are not generalizable to other food-secure and food-insecure households or to non low-income ZIP codes. However, the purpose of this study was not to make generalizations but to generate hypotheses. The goal was to explore perceptions of the participants regarding factors that hinder healthy eating. This study can serve as pilot data for a supplemental study with a larger sample size. It would be beneficial to replicate this study to verify the results and contribute new findings.

Recommendations

Findings from this study uncovered potential areas for future research and intervention. These areas include increasing access to food assistance programs for low-income urban residents, which have proven beneficial in reducing food insecurity.²⁶ Second, additional research is needed to explore the impact of existing food assistance programs (ie, soup kitchens, food banks, community gardens, etc) on reducing food insecurity. Lastly, exploring pathways between food security status and barriers to healthy eating is warranted. Further research is required to better understand the mechanism whereby food security status intensifies the relative importance of factors involved in hindering healthy eating.

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