

UNIVERSITY OF WISCONSIN-LA CROSSE

Graduate Studies

FOOD INSECURITY AND HEALTH OUTCOMES IN A USDA IDENTIFIED FOOD
DESERT

A Manuscript Style Thesis Submitted in Partial Fulfillment of the Requirements for the
Degree of Master of Public Health in Community Health Education

Karlana M. Brailey

College of Science and Health
Health Education and Health Promotion

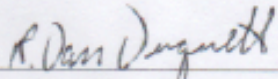
December, 2013

FOOD INSECURITY AND HEALTH OUTCOMES IN A USDA IDENTIFIED FOOD
DESERT

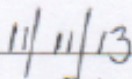
By Karlana M. Brailey

We recommend acceptance of this thesis in partial fulfillment of the candidate's requirements for the degree of Master of Public Health in Community Health Education.

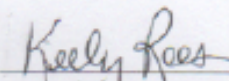
The candidate has completed the oral defense of the thesis.



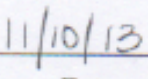
R. Dan Duquette, Ed.D.
Thesis Committee Chairperson



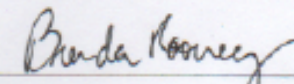
Date



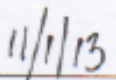
Keely Rees, Ph.D.
Thesis Committee Member



Date

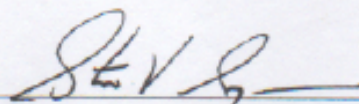


Brenda Rooney, Ph.D., MPH
Thesis Committee Member

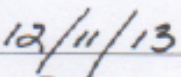


Date

Thesis accepted



Steven Simpson, Ph.D.
Graduate Studies Director



Date

ABSTRACT

Brailey, K. Food insecurity and health outcomes in a USDA identified food desert.
Master of Public Health, December 2013, 38pp. (R.D. Duquette)

Food security is the ability of people to access enough food at all times for an active healthy life. Prior research has found numerous correlations between food insecurity and poor health including increased risk of heart disease, hypertension, depression and poor or fair health status. The purpose of this research is to measure rates of food security among food desert residents in a USDA identified food desert in La Crosse, WI and determine if food insecure residents are at an increased risk of having poor health outcomes than food secure residents. This was a cross-sectional descriptive study, (N=2,068) with a final sample size of 575 respondents. The data was analyzed using chi-square and logistic regression. Results indicated a significant correlation between individuals who are food insecure and someone in their household with depression, poor or fair general health status, and a higher mean Body Mass Index (BMI). Food Insecure residents were 3.5 times more likely than food secure residents to have fair or poor health when controlled for other factors. There was not a statistically significant correlation between food insecurity and diabetes, hypertension, general BMI classification, and chronic disease.

ACKNOWLEDGEMENTS

I would like to thank the following individuals and organizations for their support throughout my education and their contributions that have made this research possible:

- The Gundersen Lutheran Medical Foundation for the generous funds to cover the cost of participant incentives, the La Crosse County Health Department for their donation of office supplies, and the Gundersen Health System for covering the cost of postage and printing.
- My committee chair Dr. Dan Duquette and committee members Dr. Keely Rees and Dr. Brenda Rooney for their support and flexibility throughout this process as my original timeline was extended so that I could take time to begin the journey of motherhood.
- Dr. Brenda Rooney for the endless hours she spent in all stages of this research helping in the preparation of surveys, IRB reports, address lists, data analysis, and for her incredibly prompt and patient responses to all my questions.
- My husband Sven for all the incredibly long hours he spent at work to make tuition possible and for his continual love and support.
- And to my daughter Olianna, who helps me to keep things in perspective.

TABLE OF CONTENTS

	PAGE
ABSTRACT	III
ACKNOWLEDGEMENTS	IV
LIST OF TABLES	VII
INTRODUCTION	1
Background	1
Purpose of the Study	5
Need for the Study	5
Research Questions	6
Definition of Terms	6
MATERIALS AND METHODS	8
Participants	8
Instrument	9
Procedures	9
Statistical Analysis	11
RESULTS	12
DISCUSSION	18
RECOMMENDATIONS	20
REFERENCES	21
APPENDICES	23

Appendix A. Survey Cover Letter	23
Appendix B. Food Desert Survey.....	25

LIST OF TABLES

TABLE	PAGE
1. Census Block Demographics and Response Rate	13
2. Rates of Food Security	13
3. Demographic Characteristics by Food Security Status	14
4. Risk Factors by Food Security Status	15
5. Health Status by Food Security Status	16
6. Odds Ratio of Demographic, Risk Factors, and Health Status Variables to Predict Fair or Poor Health	17

INTRODUCTION

Background

Food deserts are neighborhoods and communities that have limited access to affordable and nutritious foods. The term first referred to a public sector housing area in Scotland in the 1990's that had poor availability to affordable, nutritious foods (Shaw, 2006; Walker, Keane, & Burke, 2010). Since then, researchers have used multiple definitions for this metaphor in an attempt to describe and define these areas of poor food access. While there is still no universally recognized definition of food desert, it is widely accepted that food deserts are geographic areas where the population has poor access to a wide range of healthy foods. Consensus has not been reached on whether low access refers to physical access, economic access, or both (Leete, Bania, & Sparks-Ibanga, 2012).

Walker et al. (2010) offers several theories as to how neighborhood food environments have changed in the U.S. to cause areas of poor food access, now labeled as food deserts. One theory of how food deserts formed is from the growth of large suburban supermarkets in affluent areas. These supermarkets offer better quality, variety, and prices of food, with more parking and longer hours. The expansion of these stores has forced smaller, independent neighborhood grocers to close, creating areas where affordable food is only available to those who have a car or means to access public transportation. A second theory speculates that in the 1970's and 80's, more affluent households immigrated from inner cities to suburban areas. This shift in income forced

nearly one-half of inner-city supermarkets to close. Additionally, large supermarkets are often less inclined to open new stores in inner-city areas due to declining demand for low-skilled workers and zoning laws (Walker et al., 2010).

The continuing rise of obesity and other chronic health conditions has prompted more attention to be given to how food deserts and the lack of affordable healthy food options contribute to food insecurity, increased adverse health conditions, and health disparities among vulnerable populations. Researchers found that African-American populations had half as much access to chain supermarkets as Caucasians, and Hispanic populations had one-third the access to chain supermarkets as non-Hispanics when controlling for other factors (Institute of Medicine (IOM) & National Research Council (NRC), 2009). Groceries are significantly more expensive at non-chain stores than at chain supermarkets and chain supermarkets are less common in poor urban areas than in affluent suburban areas (Chung & Myers, 1999).

While food security is the ability of people to access enough food at all times for an active healthy life (Coleman-Jensen, Nord, & Singh, 2013), and food deserts are geographic areas with poor access to a variety of affordable foods, little research explores the connection between food deserts and food insecurity. Walker et al. (2010) found that the perception of factors that hinder healthy eating do not vary from a food desert to food oasis. More importantly, food secure residents living in a food desert reported that the factors that hinder healthy eating have greater significance in hindering healthy eating than food secure residents in a food oasis. Despite having enough money to purchase food, research suggests that merely living in a food desert is a key component in hindering healthy eating. Results also found that location does not play a role in

determining factors that affect healthy eating for food insecure residents (Walker, Butler, Kriska, Keane, Fryer, & Burke, 2010).

The goal of improving access to healthy food options is to increase consumption of healthy foods such as whole grains, low-fat dairy, fruits and vegetables, thereby improving health outcomes. However, research does not consistently show that improved access leads to increased consumption and improved health outcomes. While an increase in the consumption of healthy foods does not necessarily reduce body weight, there is a more substantial link with reducing the incidence and severity of cardiovascular disease and cancer (IOM & NRC, 2009).

Research has found that individuals in food insecure households are significantly more likely to report having a variety of chronic conditions including heart disease, diabetes, hypertension, depression, and hyperlipidemia (Vozoris & Tarasuk, 2003; Seligman, Bindman, Vittinghoff, Kanaya, & Kushel, 2007; Seligman, Laraia, & Kushel, 2010). In addition, a nationally representative sample of students from kindergarten through eighth grade, the Early Childhood Longitudinal–Kindergarten Cohort Study, found a substantial link between parental reported health status in eighth grade students and persistent food insecurity. Among children with no household food insecurity during the study period, over 84% had very good or excellent health at the start of kindergarten, while 70% of students found to be persistently food insecure had very good or excellent health. Health differences became more pronounced by eighth grade where 88% of children with no food insecurity had very good or excellent health and only 58% of food insecure children. These results suggest that persistent household food insecurity is detrimental to health status in children (Ryu & Bartfeld, 2012).

Another national study of over 2,000 low-income Americans found that food insecure families were 1.4 times more likely to have a head of household who smoked cigarettes than those families who are food secure. Additionally, cigarette packs smoked per week were greater in food insecure than food secure families. These findings are significant, as the link between smoking and health is well established. Alcohol consumption was not associated with food insecurity (Armour, Pitts, & Lee, 2008).

Despite the numerous studies that have found an association between food deserts and poor health, a 2005 study of 1,000 urban households in South Yorkshire, England, found that supermarket fruit and vegetable price, distance to supermarkets, and socio-economic factors were not significantly associated with fruit or vegetable consumption. Results show that poverty and distance to supermarkets, the key elements of food deserts, were not predictors of fruit or vegetable intake, rather cultural influences such as gender and age were more likely to be linked with decreased consumption (Pearson, Russell, Campbell, & Barker, 2005).

Another study points out a concern of focusing food and health interventions on only those individuals living in food deserts. A study of food deserts and food access in Portland, OR found that food deserts only account for 12.1% of the entire poor population, 3.7% of the elderly population and 8.9% of those without access to an automobile. This leaves 85 to 95 percent of the poor, elderly and those without a car living outside of identified food deserts because of the lack of a concentrated low socioeconomic population. Depending upon how low access is defined, these low food access areas not labeled as food deserts, are home to 5 to 6 times as many poor persons,

15 to 25 times as many elderly, and 4 to 5 times as many individuals without access to a car than are in food deserts (Leete, Bania, & Sparks-Ibanga, 2012).

Similarly, results from a September 2013 Gallup study found that low-income, not low-access to grocery stores predicts higher obesity rates. This nation-wide study used food desert data from the U.S. Department of Agriculture's Food Access Research Atlas and obesity data from over 300,000 phone interviews. Gallup found a 30% obesity rate among Americans who are both low-income and low-access, while rates among those who are low-income only to be 28%, and low-access 25%. Of all factors examined, (gender, age, education, region, race/ethnicity, and marital status), income remained the strongest predictor of obesity (McGeeney & Mendes, 2013). These results suggest that addressing food affordability and increasing knowledge about what constitutes healthy foods are more likely to be effective efforts in decreasing obesity in Americans.

Purpose of the Study

The purpose of this study was to measure rates of food security and health outcomes in a La Crosse, WI census tract identified by the USDA as a food desert. This study determined 1) rates of food security among food desert residents and 2) if food insecure residents within the USDA identified La Crosse, WI food desert are at an increased risk of having poor health outcomes than food secure residents within the food desert.

Need for the Study

While research shows that residents living within a food desert are at an increased risk of food insecurity and negative health outcomes (Vozoris & Tarasuk, 2003; Seligman, et al., 2007; Seligman, et al., 2010; Armour, et al., 2008; Ryu & Bartfeld,

2012), not all food deserts necessarily have a disproportionate number of residents experiencing these negative outcomes (Leete, et al., 2012; Pearson, et al., 2005; McGeeney & Mendes, 2013). This study determined rates of food insecurity and any change of health status associated with food insecurity among residents in a La Crosse, WI food desert.

Research Questions

- 1) What is/are the rate(s) of poor health outcomes reported by food insecure residents in a USDA identified food desert?
- 2) What is/are the rate(s) of poor health outcomes reported by food secure residents in a USDA identified food desert?
- 3) What is the difference in health status between food secure and food insecure residents in a USDA identified food desert?

Definition of Terms

Food Security – “Access by all people at all times to enough food for an active, healthy life. Food security includes at a minimum: (1) the ready availability of nutritionally adequate and safe foods, and (2) an assured ability to acquire acceptable foods in socially acceptable ways (e.g., without resorting to emergency food supplies, scavenging, stealing, or other coping strategies)” (Bickel, Nord, Price, Hamilton & Cook, 2000, p. 6).

Food Insecurity – “Limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways” (Bickel et al., 2000, p. 6).

Hunger – “The uneasy or painful sensation caused by a lack of food. The recurrent and involuntary lack of access to food. Hunger may produce malnutrition over time ...

Hunger ... is a potential, although not necessary, consequence of food insecurity” (Bickel et al., 2000, p. 6)

Food Desert – The Healthy Food Financing Initiative (HFFI) considers a food desert a “*low-income [census] tracts* in which a substantial number or proportion of the population has *low access* to a supermarkets or large grocery stores (Dutko, Ver Ploeg, & Farrigan, 2012, p. 5).” Low-income is defined as an area having a poverty rate of 20% or greater. In addition, to qualify as an urban food desert tract, at least 33% or a minimum of 500 people must live more than 1 mile from a supermarket or grocery store which has at least \$2 million in sales and contains all major food departments found in traditional supermarkets.

MATERIALS AND METHODS

Participants

The population of this cross-sectional study all reside in an area labeled as a food desert in the city of La Crosse, Wisconsin by the United States Department of Agriculture (USDA) in the fall of 2012. The USDA identified the boundaries of the food desert based upon US census tract data from the year 2000. Five census group blocks received the identification, currently listed as 9-1, 9-2, 9-3, 9-4, and 3-2. Census block 3-2 was included in the study even though it no longer resides in the same census tract because the USDA determined food desert status based upon census data from the year 2000 when 3-2 did belong to the same tract. All households (n=2068) residing within this area were eligible to participate and received a survey.

According to census data, a majority (82%) of the La Crosse, WI food desert population (n=5109) has low access to a grocery store and 18.2% have both low income and low access to a grocery store. A significant percentage of children (17.8%) and individuals age 65+ (10.7%) have low access to a grocery store and over 13% of households have both low access to a grocery store and no access to a vehicle (Breneman, Ver Ploeg, & Dutko, 2013).

According to 2010 census data, a majority (1,886) of occupants rent, compared to those who own their homes (502). The average household size is around two persons. The highest proportion of households fall under the lowest income bracket, meaning annual household income is less than \$15,000. Median household incomes of each

census block all fall below \$32,000. The median age is around 30 years. The top three races represented are white, Asian, and black, at approximately 82%, 8%, and 5%, respectively. The ratio of males to females is close to 1:1 (Census 2000 summary profile esri).

Instrument

Questions used to measure health status were taken from the 2011 Behavioral Risk Factor Surveillance System survey (BRFSS) and a regional community needs assessment, the 2012 COMPASS NOW. Food security was measured with the USDA's "Guide to Measuring Household Security" (2000). No pilot was done, however the survey used validated and reliable questions. It was revised and edited by the researchers before it was distributed.

Procedures

This research was a collaboration between the University of Wisconsin-La Crosse (UWL), Gundersen Health System's Community and Preventive Care Services department, and the La Crosse County Health Department. Approval for this study was first obtained from the Gundersen Health System's Institutional Review Board (IRB) in October 2012 and then from UWL's IRB in October 2012.

A list of household addresses within the current United States Department of Agriculture's (USDA) Economic Research Service's (ERS) identified food desert in La Crosse, WI was obtained from the City of La Crosse Planning Department. The list of addresses was edited to remove any commercial businesses, duplicate addresses, and assisted living and skilled nursing facilities that provided all meals to residents. The survey was sent out in English only because previous county surveys determined that

there was a negligible difference in response rate when a survey was offered in both English and Hmong.

A postcard informing the heads of households of the upcoming survey and participant incentive was mailed on October 31st, one week prior to the survey, which was mailed on November 7th. This date was chosen to mail surveys so as to not interfere with presidential election mail in an attempt to get a better response rate. A postcard reminding participants of the survey and the opportunity to receive an incentive if completed by December 15th, 2012 was sent out on November 21st, 2012. The survey was closed on December 15th and incentives were subsequently mailed to survey participants. Participants were given the option of completing the survey online or filling out a paper copy and returning in a postage-paid envelope. Incentive addresses were matched to remove any duplicate survey responses.

If participants wanted to receive the incentive, a \$5.00 gift card to their choice of one of four local grocery stores, they were asked to fill out a separate card with their address, which was used only for incentive purposes and then mailed back to them. This process, along with informed consent information was described in detail in the cover letter to the survey (see Appendix A).

After the survey was closed, all data was entered into the online survey collection system and then downloaded into a spreadsheet file and uploaded into SAS for statistical analysis. Addresses were checked to remove any duplicate completed surveys from both the paper and online databases.

Statistical Analysis

First data went through an initial process to recode and correct illogical responses. For instance, if a respondent chose two answers when one was requested, a coin was flipped to randomly select one of the two requested variables. Additional examples include, changing a value to 30 if a respondent put a number greater than 30 for “days during the past 30 days in which physical health NOT good,” or changing response to ‘yes’ they had to cut the size of a meal because there was not enough money for food if they specified the frequency to be greater than ‘never’.

To determine if a correlation exists between various health, demographic, and food security variables both univariate and multivariate analyses were done using Chi Square and Logistical Regression with a P value of $< .05$ indicating statistical significance.

RESULTS

In the five census blocks within the food desert, there were 575 responses from the 2068 valid addresses. According to the 2010 census, the percentage of rental property by census block ranged from 56% to 92.3%, and median income from \$19,281 to \$31,646 (Table 1). A majority of respondents were female and the response rate was not statistically different by census block. Food insecurity did not differ significantly by census block, so responses were analyzed together. The varying levels of food insecurity were grouped together for analysis, resulting in two categories; food secure and food insecure (Table 2).

While level of food security did not differ by gender, there were numerous other demographic characteristics that describe food insecure residents. Food insecure residents were more likely to be young, low-income, non-white, renters, with either no health insurance or on Medicaid, have not graduated high school and do not work for pay outside the home (Table 3). Binge drinking and eating meals prepared at restaurants were not significant risk factors associated with food insecurity, however household smoking status, individual smoking status and frequency of fruit and vegetable consumption were (Table 4).

Food insecure individuals are more likely to have poor or fair self-rated overall health, an individual in their household with depression and a higher mean body mass index (BMI). However, obese, overweight and normal weight BMI categories were not significantly associated with food insecurity (Table 5). People with food insecurity were

3.5 times more likely to have fair or poor health than those who were food secure after adjusting for employment status, smoking, frequency of eating out and obesity. Obese people were 9.7 times more likely to have fair or poor health after adjusting for food security and other factors (see table 6).

Table 1. Census Block Demographics and Response Rate

Census Block	Median income of census block¹	% rental property¹	# valid addresses	Response rate
3-2	\$19,281	84.2%	532	136 (25.6%)
9-1	\$28,965	74.4%	405	112 (27.7%)
9-2	\$25,094	92.3%	558	151 (27.1%)
9-3	\$31,646	56.0%	228	77 (33.8%)
9-4	\$29,826	67.9%	345	99 (28.7%)
Total			2068	575 (27.8%)

¹ According to the 2010 Census

Table 2. Rates of Food Security

Food Security Status	Percent (%)
Food Secure	66.1 (n=380)
Food Insecure No Hunger	19.3 (n=111)
Food Insecure Moderate Hunger	13.4 (n=77)
Food Insecure Severe Hunger	1.2 (n=7)

Table 3. Demographic Characteristics by Food Security Status			
Characteristic	Insecure (N=195)	Secure (N=380)	p-value
Gender			0.4435
% Female	73.6%	70.5%	
Age			0.0001
18-39	52.1%	43.5%	
40-64	43.6%	32.4%	
65+	4.3%	24.1%	
Income			0.0001
<10k	30.2%	13.3%	
10-25K	50.5%	39.3%	
25-50K	17.2%	29.3%	
50K+	2.1%	18.1%	
Race			0.0127
Non-white	15.9%	8.9%	
Health Insurance			0.0001
Private insurance	30.0%	58.2%	
Medicare	3.7%	16.3%	
Medicaid	41.1%	14.4%	
No insurance	25.3%	11.1%	
Education			0.0001
No HS grad	13.0%	4.3%	
HS grad	31.1%	29.0%	
Voc/some college	35.2%	27.2%	
College or advanced degree	20.7%	39.5%	
Rent/own home			0.0001
Rent	84.0%	60.9%	
Own	16.0%	39.1%	
Work for pay			0.0001
Yes	66.7%	65.0%	
No (<65 y)	29.7%	16.7%	
No (65+)	3.7%	18.3%	

Table 4. Risk Factors by Food Security Status			
Risk Factor	Insecure (N=195)	Secure (N=380)	p-value
Binge drinking			0.0459
% any	51.6%	42.7%	
Smoking status (respondent)			0.0001
% yes	56.0%	28.6%	
Household smoking status			0.0001
2+ smokers	23.6%	8.2%	
1 smoker	22.1%	12.1%	
0	54.4%	79.7%	
Fruit/Vegetable consumption			0.0218
0-2 servings/day	70.3%	58.7%	
3-4	27.0%	35.5%	
5+	2.7%	5.8%	
Frequency of eating out			0.0904
Never	28.4%	22.2%	
1-2/week	55.8%	55.3%	
3+/week	15.8%	22.5%	

Table 5. Health Status by Food Security Status			
Health Status	Insecure (N=195)	Secure (N=380)	p-value
Overall Self-rated health			0.0001
Fair/poor	30.6%	14.3%	
Good	42.5%	41.4%	
Excellent/very good	26.9%	44.3%	
Body Mass Index			
Mean	28.94	27.63	0.0348
Median	27.47	26.58	0.0841
Body Mass Classification			0.2458
Obese	34.1%	27.2%	
Overweight	31.4%	34.6%	
Normal/under wt	34.6%	38.2%	
Household hypertension			0.9054
Yes	20.0%	24.6%	
No	70.3%	68.7%	
Don't know	9.7%	9.7%	
Household Diabetes			0.3984
Yes	13.3%	9.7%	
No	77.4%	81.6%	
Don't know	9.2%	8.7%	
Chronic (Diabetes or Hypertension or Morbidly obese)			0.7063
% yes	42.6%	44.2%	
Household Depression			0.0001
Yes	35.4%	18.2%	
No	49.2%	69.7%	
Don't know	15.4%	12.1%	

Table 6. Odds Ratio of demographic, risk factors, and health status variables to predict fair or poor health

Predictor of Fair or Poor Health	Odds Ratio	95% CI
Food insecure vs. food secure	3.48	1.75, 6.93
Age 65+: Retired vs. work	3.85	1.23, 11.99
Age <65: Unemployed vs. work	1.63	0.75, 3.52
Smoker vs. nonsmoker	2.76	1.38, 5.52
Eat out 1-2/week vs. never eat out	0.39	0.17, 0.87
Eat out 3+/week vs. never eat out	0.82	0.31, 2.18
Overweight vs. underweight/normal weight	1.93	0.78, 4.78
Obese vs. underweight/normal weight	9.70	4.01, 23.46

DISCUSSION

Our results are consistent with other research in that those who are food insecure are more likely to have negative health outcomes (Vozoris & Tarasuk, 2003; Seligman, et al., 2007; Seligman, et al., 2010; Armour, et al., 2008; Ryu & Bartfeld, 2012). Specifically what these negative health outcomes are continue to vary by study. While we found that food insecurity predicts a higher mean body mass index, it does not significantly predict obesity or overweight. These results are consistent with the recent GALLUP study, finding a poor correlation between BMI and food security (McGeeney & Mendes, 2013). Additionally, our results are consistent with the Armour et al. study that found a correlation between smoking status and food insecurity, but not alcohol (2008). We found food insecurity in La Crosse to be significantly higher at 34%, compared to 11.8% in Wisconsin and 14.3% nationally in 2012 (Wisconsin Department of Health Services, 2012).

Due to the nature of this cross-sectional study, assumptions regarding causation cannot be made between health and food insecurity. While food insecurity was a strong predictor of poor health when controlled for other factors, it is unknown what the primary cause of poor health is in the food insecure population. While this study did elicit a sample size large enough for statistical significance ($n=575$), it is possible that the people who did not participate in this survey are more transient, lower income, and suffer from poorer health than those who did respond. In fact, the census tract with the lowest response rate also had the lowest median income.

Additionally, we found that food insecure individuals are more likely to be uninsured, which further increases the likelihood that health conditions are under reported in this population. All health status questions were self reported and asked in the following format: “has a health professional ever told you that you have ____.” Again, since food insecure individuals were more likely to be uninsured or on Medicaid, it is possible that health conditions went under reported due to lack of awareness of the health condition. Finally, asking respondents if they are pregnant or full-time college students could also have influenced BMI, income, and food security status results.

RECOMMENDATIONS

Recommendations include developing a study design that would prompt a larger response rate. Given the significant amount of rental property in this neighborhood, it is possible that the most transient members could also be the most likely to be food insecure, have poor health, and also least likely to answer a mailed survey. Determining the demographics of who did not participate in the survey could be important in developing a stratified sample in future research. Furthermore, this study was limited in comparing outcomes of only those individuals within the USDA identified food desert and did not determine if food insecure individuals in the food desert are more likely to have increased poor health outcomes than the food insecure individuals outside of the food desert.

While clearly the food desert has a disproportionate percentage of food insecure individuals, as Leete et. al (2012) illustrate, it is quite possible that a significant portion of the food insecure population in La Crosse reside outside of the study area. While income remains the strongest predictor of food insecurity, further research would need to determine where else in La Crosse, WI food insecure individuals are. This could prove important in determining the placement of health care, food resources and other interventions designed to decrease the prevalence of poor health and food insecurity. Perhaps the most important question remaining and the topic of further research is determining the best interventions to achieve sustainable long-term food security and improve health outcomes in at-risk populations.

REFERENCES

1. Armour, B., Pitts, M., & Lee, C. (2008). Cigarette smoking and food insecurity among low-income families in the United States, 2001. *American Journal of Health Promotion*, 22(6) 386-390.
2. Bickel, G., Nord, M., Price, C., Hamilton, W., & Cook, J. (2000). *Guide to Measuring Household Food security, Revised 2000*. U.S. Department of Agriculture, Food and Nutrition Service, Alexandria VA.
3. Breneman, V., Ver Ploeg, M., & Dutko, P. (2013). *Archived food desert document*. Retrieved from <http://www.ers.usda.gov/data-products/food-access-research-atlas/download-the-data.aspx#.UcocyRZe>
4. Chung, C., & Myers, S., (1999). Do the poor pay more for food? An analysis of grocery store availability and food price disparities. *The Journal of Consumer Affairs* 33(2), 276-296.
5. Coleman-Jensen, A., Nord, M., & Singh, A. (2013). *Household food security in the United States in 2012*, U.S. Department of Agriculture, Economic Research Service (Publication number ERR-155).
6. Dutko, P., Ver Ploeg, M., & Farrigan, T. (2012). *Characteristics and influential factors of food deserts*, U.S. Department of Agriculture, Economic Research Service (Publication number ERR-140).
7. Institute of Medicine (IOM) & National Research Council (NRC). (2009). *The public health effects of food deserts: Workshop Summary*. Washington, DC: The National Academies Press.
8. Leete, L., Bania, N., & Sparks-Ibanga, A. (2012). Congruence and coverage: Alternative approaches to identifying urban food deserts and food hinterlands. *Journal of Planning Education and Research*, 32(2), 204-218.
9. McGeeney, K., & Mendes, E. (2013). Income, not “food deserts,” more to blame for U.S. obesity: Nationwide study assessing link between adult obesity and food deserts. *Gallup Wellbeing*. Retrieved from <http://www.gallup.com/poll/164513/income-not-food-deserts-blame-obesity.aspx#1>

10. Pearson, T., Russell, J., Campbell, M., & Barker, M. (2005). Do 'food deserts' influence fruit and vegetable consumption? A cross-sectional study. *Appetite*, 45, 195-197.
11. Ryu, J., & Bartfeld, J. (2012). Household food insecurity during childhood and subsequent health status: The early childhood longitudinal study-kindergarten cohort. *American Journal of Public Health*, 102(11), e50-e55.
12. Seligman, H., Bindman, A., Vittinghoff, E., Kanaya, A., & Kushel, M. (2007). Food insecurity is associated with diabetes mellitus: Results from the national health examination and nutrition examination survey (NHANES) 1999-2002. *Journal of General Internal Medicine*, 22(7), 1018-1023.
13. Seligman, H., Laraia, B., & Kushel, M. (2010). Food insecurity is associated with chronic disease among low-income NHANES participants. *The Journal of Nutrition*, 140(2), 304-310.
14. Shaw, H. (2006). Food deserts: Towards the development of a classification. *Geografiska Annaler*, 88B(2), 231-247.
15. Vozoris, N., & Tarasuk, V. (2003). Household food insufficiency is associated with poorer health. *American Society for Nutritional Sciences*, 133(1), 120-126.
16. Walker, R., Keane, C., & Burke, J. (2010). Disparities and access to healthy food in the United States: A review of food literature. *Health & Place*, 16, 876-884.
17. Walker, R., Butler, J., Kriska, A., Keane, C., Fryer, C., & Burke, J. (2010). How does food security impact residents of a food desert and a food oasis? *Journal of Hunger & Environmental Nutrition*, 5, 454-470.
18. Wisconsin Department of Health Services. (2012). *Food insecurity in the Wisconsin WIC population: January 2012*. Retrieved from <http://www.dhs.wisconsin.gov/wic/WICPRO/data/foodsecurity.pdf>

APPENDIX A

SURVEY COVER LETTER

Dear Head of Household,

Some neighborhoods in the United States and even in La Crosse have been identified as places where residents have limited access to healthy foods. We are doing a survey of people living in some neighborhoods in the City of La Crosse to determine ability to purchase and eat healthy foods. Everyone within your neighborhood was sent this survey. It is being done by Gundersen Lutheran, the University of Wisconsin-La Crosse, and the La Crosse County Health Department.

- Filling out the survey is voluntary.
- The survey should take you about 10 to 15 minutes to do.
- If you do not want to answer a question for any reason, you do not have to. We are interested in your opinions. There are no right or wrong answers.
- Please don't put your name on the survey.
- By sending us the completed survey, you are giving us consent to use your answers along with everyone else's to help us determine if your neighborhood has limited access to food. The results from this study may be reported in local papers, or scientific journals.
- When finished, please put the survey in the enclosed postage paid return envelope and put it in the mail (or mail to: Gundersen Lutheran Health System, 1900 South Avenue -NCA1-04, La Crosse, WI 54601).
- As a thank you for your time, we are offering you a \$5 gift card to one of four locations in La Crosse. Complete the enclosed purple card with your name and address on it, and say where you would like a gift card, and return it with your completed survey. When we receive your completed survey and this card, we will separate the card and survey, and we will mail the purple card and gift card back to you.
- If you want to complete this survey electronically, you may do so at:
<http://www.surveymonkey.com/s/XXXXXXblockspecificaddress>. If you complete the survey electronically, you will be asked to enter your name and address and you will be sent a gift card. Your name will then be removed from your answers.
- Please complete the survey by **December 15, 2012**.

If this survey causes you any discomfort or if you are looking for additional community resources, we encourage you to call Great Rivers 211 (**Dial 211**). For more information regarding this study, please contact the Principal Investigator of this survey: Brenda Rooney, PhD, Gundersen Lutheran Health System, at 608-782-7300. For more information about your rights as a research participant, contact Bernard J Hammes, PhD, Chair of the Gundersen Lutheran Institutional Review Board.

Thank you for helping us study the needs of our community!

Sincerely,

Brenda Rooney, PhD, Epidemiologist
Gundersen Lutheran Health System



APPENDIX B

FOOD DESERT SURVEY

1. Thinking of the area in which you live and work, how would you rate the area as a place to live? (*check one*)

☐ Excellent ☐ Very good ☐ Good ☐ Fair ☐ Poor

2. Would you say that in general your health is: (*check one*)

☐ Excellent ☐ Very good ☐ Good ☐ Fair ☐ Poor

3. Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health *NOT* good?

_____ Number of days

4. Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health *NOT* good?

_____ Number of days

5. During the past 30 days, for about how many days did poor physical or mental health keep you from doing your usual activities, such as self-care, work, or recreation?

_____ Number of days

6. Have you *EVER* been told by a doctor, nurse, or other health professional that you have high blood pressure?

☐ Yes →

Was this only when you were pregnant? ☐ Yes ☐ No

☐ No

7. Has a doctor, nurse, or other health professional *EVER* told you that you have diabetes (high blood sugar)?

☐ Yes →

Was this only when you were pregnant? ☐ Yes ☐ No

☐ No

8. Has a doctor, nurse, or other health professional *EVER* told you that you have depression?

☐ Yes

☐ No

9. Is there anyone else in your household that has had:

High blood pressure?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't know
Diabetes?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't know
Depression?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't know

10. Have you smoked at least 100 cigarettes in your entire life? (*NOTE: 5 packs = 100 cigarettes*)

☐ Yes →

Do you now smoke cigarettes every day, some days, or not at all?
☐ Every day ☐ Some days ☐ Not at all

☐ No

11. Does anyone else in your household smoke cigarettes? ☐ Yes ☐ No
12. About how much do you weigh without shoes? _____ pounds
13. About how tall are you without shoes? _____ feet and inches
14. How many servings of fruits and vegetables do you consume in a typical day?
_____ Servings per day
15. On average, how many times per week do you eat meals that were prepared in a restaurant (including sit down, fast food and carry-out)?
☐ Never ☐ 1-2 times/week ☐ 3-4 times/week ☐ 5+ times/week
16. Considering all types of alcoholic beverages, how many times during the past month did you have:
Males: 5 or more drinks on an occasion _____ number of times last month
Females: 4 or more drinks on an occasion _____ number of times last month
17. Where do you most often get medical care? (*check one*)
☐ At a physician's office in a medical clinic ☐ In the emergency room of a hospital
☐ At a free clinic (like Saint Clare Health Mission) ☐ At a "quick clinic" in a retail store
☐ I don't get medical care ☐ Other: _____
18. Do you have access to a working vehicle that you can drive? ☐ Yes ☐ No
19. What is your primary mode of transportation? (*check one*)
☐ Personal vehicle ☐ Passenger in vehicle ☐ Public transportation
☐ Bike ☐ Walk ☐ Other: _____
20. Where do you get most of your groceries? (*check one*)
☐ Festival Foods ☐ Woodman's ☐ Our Town Fresh Market ☐ Quillin's
☐ People's Food Co-op ☐ Kwik Trip ☐ Walmart ☐ Sam's Club
☐ Menards ☐ Aldi's ☐ Asian Food Markets ☐ Food Pantry
☐ Walgreens ☐ Target ☐ Other: _____
21. Have you or anyone in your household ever gotten food from any of the following:
- | | | |
|--|------------------------------|-----------------------------|
| Food pantries/soup kitchens | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Food stamps (Supplemental Nutrition Assistance Program or SNAP) | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Free or reduced school lunch or breakfast | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| WIC (Special Supplemental Nutrition Program for Women, Infants and Children) | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
22. When you think about the way you usually eat, would you say that your eating habits are: (*Check one.*)
☐ much healthier than most ☐ somewhat healthier than most ☐ about the same as most
☐ somewhat less healthy than most ☐ much less healthy than most

23. Which of these statements best describes the food eaten in your household in the past 12 months? “We had...”

- ☐ Enough of the kinds of food we wanted to eat ☐ Enough but not always the kinds of food we wanted
☐ Sometimes not enough to eat ☐ Often not enough to eat
☐ Don't know

24. Please rate the following as potential difficulties in getting enough healthy foods:

The cost of healthy food	<input type="checkbox"/> A significant barrier	<input type="checkbox"/> Somewhat of a barrier	<input type="checkbox"/> Not a barrier
I'm not sure how to cook healthy foods	<input type="checkbox"/> A significant barrier	<input type="checkbox"/> Somewhat of a barrier	<input type="checkbox"/> Not a barrier
I don't know very much about nutrition	<input type="checkbox"/> A significant barrier	<input type="checkbox"/> Somewhat of a barrier	<input type="checkbox"/> Not a barrier
I'm too busy to shop and/or cook	<input type="checkbox"/> A significant barrier	<input type="checkbox"/> Somewhat of a barrier	<input type="checkbox"/> Not a barrier
My household doesn't like to eat healthy foods	<input type="checkbox"/> A significant barrier	<input type="checkbox"/> Somewhat of a barrier	<input type="checkbox"/> Not a barrier

25. The following are some reasons why people don't always have enough or the kinds of the foods they want to eat. Please indicate whether the statement was *often* true, *sometimes* true, or *never* true for YOU in the past 12 months.

There's not enough money for food	<input type="checkbox"/> Often true	<input type="checkbox"/> Sometimes true	<input type="checkbox"/> Never true	<input type="checkbox"/> Don't know
The kinds of food I want are not available	<input type="checkbox"/> Often true	<input type="checkbox"/> Sometimes true	<input type="checkbox"/> Never true	<input type="checkbox"/> Don't know
There's not enough time for shopping or cooking	<input type="checkbox"/> Often true	<input type="checkbox"/> Sometimes true	<input type="checkbox"/> Never true	<input type="checkbox"/> Don't know
It is too hard to get to the store	<input type="checkbox"/> Often true	<input type="checkbox"/> Sometimes true	<input type="checkbox"/> Never true	<input type="checkbox"/> Don't know
I'm on a diet	<input type="checkbox"/> Often true	<input type="checkbox"/> Sometimes true	<input type="checkbox"/> Never true	<input type="checkbox"/> Don't know
I don't have access to a working stove	<input type="checkbox"/> Often true	<input type="checkbox"/> Sometimes true	<input type="checkbox"/> Never true	<input type="checkbox"/> Don't know
I'm not able to cook or eat because of health problems	<input type="checkbox"/> Often true	<input type="checkbox"/> Sometimes true	<input type="checkbox"/> Never true	<input type="checkbox"/> Don't know
I don't have a way to get to a store to buy food	<input type="checkbox"/> Often true	<input type="checkbox"/> Sometimes true	<input type="checkbox"/> Never true	<input type="checkbox"/> Don't know

26. In the past 12 months, did you or other adults in your household ever cut the size of your meals or skip meals because there wasn't enough money for food?

☐ Yes →

Or

☐ No

☐ Don't know

How often did this happen—almost every month, some months but not every month, or only 1 or 2 months?

- ☐ Almost every month ☐ Some months but not every month
☐ Only 1 or 2 months ☐ Never
☐ Don't know or not applicable

27. People have made several statements about their food situation. For these statements, please indicate whether the statement was *often* true, *sometimes* true, or *never* true for YOUR HOUSEHOLD in the past 12 months.

"I worried whether our food would run out before we got money to buy more."	<input type="checkbox"/> Often true	<input type="checkbox"/> Sometimes true	<input type="checkbox"/> Never true	<input type="checkbox"/> Don't know
"The food that we bought just didn't last, and we didn't have money to get more."	<input type="checkbox"/> Often true	<input type="checkbox"/> Sometimes true	<input type="checkbox"/> Never true	<input type="checkbox"/> Don't know
"We couldn't afford to eat balanced meals."	<input type="checkbox"/> Often true	<input type="checkbox"/> Sometimes true	<input type="checkbox"/> Never true	<input type="checkbox"/> Don't know

28. In the past 12 months, did you ever eat less than you felt you should because there wasn't enough money to buy food? ☐ Yes ☐ No ☐ Don't know

29. In the past 12 months, were you ever hungry but didn't eat because you couldn't afford enough food? ☐ Yes ☐ No ☐ Don't know

30. In the past 12 months, did you lose weight because you didn't have enough money for food? ☐ Yes ☐ No ☐ Don't know

31. In the past 12 months, did you or other adults in your household ever not eat for a whole day because there wasn't enough money for food?

☐ Yes →

How often did this happen— almost every month, some months but not every month, or only 1 or 2 months?

Or

☐ Almost every month

☐ Some months but not every month

☐ Only 1 or 2 months

☐ Never

☐ Don't know or not applicable

☐ No

☐ Don't know

32. The next questions are about children living in the household who are younger than 18 years old. If there are no children in your household, answer "no children".

"We relied on only a few kinds of low-cost food to feed the children because we were running out of money to buy food."	<input type="checkbox"/> Often true	<input type="checkbox"/> Sometimes true	<input type="checkbox"/> Never true	<input type="checkbox"/> Don't know	<input type="checkbox"/> No children
"We couldn't feed the children a balanced meal because we couldn't afford that."	<input type="checkbox"/> Often true	<input type="checkbox"/> Sometimes true	<input type="checkbox"/> Never true	<input type="checkbox"/> Don't know	<input type="checkbox"/> No children
"The children were not eating enough because we just couldn't afford enough food."	<input type="checkbox"/> Often true	<input type="checkbox"/> Sometimes true	<input type="checkbox"/> Never true	<input type="checkbox"/> Don't know	<input type="checkbox"/> No children
"We cut the size of the children's meals because there wasn't enough money for food."	<input type="checkbox"/> Often true	<input type="checkbox"/> Sometimes true	<input type="checkbox"/> Never true	<input type="checkbox"/> Don't know	<input type="checkbox"/> No children

33. In the past 12 months, did any of the children ever skip meals because there wasn't enough money for food?

☐ Yes →

How often did this happen—almost every month, some months but not every month, or only 1 or 2 months?

Or

☐ No

☐ Don't know

☐ Almost every month

☐ Only 1 or 2 months

☐ Don't know or not applicable

☐ Some months but not every month

☐ Never

34. In the past 12 months, were the children ever hungry but you just couldn't afford more food?

☐ Yes

☐ No

☐ Don't know

☐ No children

35. In the past 12 months, did any of the children ever not eat for a whole day because there wasn't enough money for food?

☐ Yes

☐ No

☐ Don't know

☐ No children

36. What do you think is the biggest concern you have for your *household*? (*check one*)

☐ Quality nutrition

☐ Personal debt

☐ Having enough money

☐ Transportation

☐ Our health

☐ Hunger

☐ Crime

☐ No concerns

☐ Health insurance

☐ Medical care

☐ Education

☐ Other: _____

☐ Having/keeping a job

☐ Drug use

☐ Housing

37. What do you think is the biggest concern you have for your *neighborhood*? (*check one*)

☐ Quality nutrition

☐ Personal debt

☐ Having enough money

☐ Transportation

☐ Our health

☐ Hunger

☐ Crime

☐ No concerns

☐ Health insurance

☐ Medical care

☐ Education

☐ Other: _____

☐ Having/keeping a job

☐ Drug use

☐ Housing

To help us better understand the results, please answer a few questions about you and your family.

1. Are you male or female? ☐ Male ☐ Female

2. Are you Hispanic, Latino, or of Spanish origin? ☐ Yes ☐ No

3. What do you consider to be your primary race? (*check one*)

☐ White

☐ Other Asian

☐ Other (please specify) _____

☐ African American, Black

☐ Pacific Islander/Hawaiian

☐ Native American

☐ Hmong

☐ Two or More

4. What year were you born? _____

5. How many children (under the age of 19) do you have living at home? _____ children

6. Including yourself, how many total people are living in your household? _____

7. What is your primary source of medical insurance? (*check one*)
☐ Private insurance (e.g. Blue Cross) ☐ Medicaid/Medicare (e.g. Badger care) ☐ No insurance/Self-pay
8. What is the highest level of education you have completed? (*check one*)
☐ Did not graduate from high school ☐ High school diploma
☐ Vocational school or some college ☐ College graduate
☐ Post graduate/professional degree
9. How long have you lived in your current residence?
☐ Less than 1 year ☐ 1-2 years ☐ 3-5 years ☐ More than 5 years
10. Do you own or rent your current home? ☐ Rent ☐ Own
11. Do you work for pay outside the home? ☐ Yes ☐ No
12. Counting income from all sources (including earnings from jobs, unemployment insurance, pensions, welfare, etc.) and counting income from everyone living in your home, which of the following ranges did your household income fall into last year? (*check one*)
☐ Less than \$10,000 ☐ \$10,000-\$25,000 ☐ \$25,001-\$50,000
☐ \$50,001-\$75,000 ☐ \$75,001-\$100,000 ☐ Over \$100,000