Examining the Influence of the Food Environment on Household Food Security

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Introduction:

Having sufficient resources to access enough food for an active healthy lifestyle is a basic human need, yet almost 50 million Americans have been classified in 2013 as not having met this need (Coleman-Jensen, Nord, and Singh 2013). The extent of food insecure households in the United States has largely been unchanged in recent years, even as funding for food assistance programs has grown in an attempt to address this problem. As such, the role of the food environment on alleviating food insecurity is an important area of research as public initiatives are developed to increase food access with the expectation of improving household food security.

Previous research has examined the determinants of food insecurity (see Gundersen, Kreider and Pepper 2011), yet there has been little focus on the effect of the local food environment on household food security. Using data from the Current Population Survey-Food Security Supplement (CPS-FSS), Bonanno and Li (2015) show mixed evidence on the impact of different food store types on food security. The authors show that small grocery stores/convenience stores have a large effect on reducing food insecurity, however, large grocery stores have significantly less impact on reducing food insecurity and Walmart Supercenters have no impact on reducing food insecurity of low-income households. The policy recommendation from their work is to facilitate expansion of smaller food stores, however, evidence exists that smaller food stores present issues of higher costs and poorer quality/variety of food. The major caveat of the research is that MSA-level data is used and it raises questions as to the validity of the results at a local level. Measures of food access over a large geographic area may not accurately reflect the relevant food environment for households. At the very least, the impact of the local food environment on food security remains a valid empirical questions.

Kirkpatrick and Tarasuk (2010) examine the association between neighborhood characteristics and household food security in Toronto, Canada. Focusing only on low-income households this research finds that proximity to food retail outlets or community food programs do not mitigate the effects of food insecurity. Thus the authors raise questions about the focus on local level intervention to alleviate household food security by improving food access. The focus on only low-income households, however, leaves questions about slightly higher income households that also experience low levels of food security for reasons unrelated to income. Furthermore, the study took place in high-poverty neighborhoods in Toronto, Canada, yielding case study results that while of significant interest are not transferable to a broader population and interpretation.

The contribution of this research is to examine the effect of the local food environment, measured at the zip code level in the State of Connecticut, across a wider array of income groups. Further, this analysis controls for a large number of household shopping characteristics and utilizes a more detailed description of the local food environment than previous studies.

Data:

This study uses a unique online survey that was conducted during the fall of 2013 to investigate a number of issues around food purchasing behavior. In addition to the primary objectives of this survey we also asked questions about household food security. The advantage of online surveys are they are less expensive, faster to administer and more accurate while allowing for a large amount of responses in a shorter period of time (McCullough, 1998; Cobanoglu, Warde and Moreo, 2001; Dillman, Smyth and Christian, 2008). Online surveys also have some

disadvantages, however, including the lack of respondents who do not have internet access which could be an issue for low-income or food insecure households.

To recruit participants, we used a panel from Global Market Insight, Inc. (GMI). Respondents needed to be at least 18 years of age or older and a resident of Connecticut to participate. A total of 1,820 panelists were invited, however, not all agreed to participate and others did not answer all questions used for this analysis. After elimination of incomplete responses, a total of 1,135 panelists completed the necessary questions for this study.

Each participant was asked to complete the U.S. Household Food Security Survey Module: Six-Item Short Form developed by the Economic Research Service, USDA. Food security scores are then calculated based on their responses to these questions. In addition, demographic characteristics, zip code, and questions about household shopping behaviors were provided by respondents.

Demographic questions consisted of age, gender, race, household income, number of children, and number of adults. As noted in Table 1, our sample was on average 51 years old, about 11 years older than the U.S. Census average of 40. Our sample also had a higher income compared to the U.S. Census at $89,780 vs $69,461. Thus generalizations to the population as a whole needs to keep in mind this deviation.

About 23 percent of the sample responded with low or very low food security, while 11 percent of the sample indicated very low food security. Participants also provided their zip code of residence which allows us to combine the survey data with data on the food environment obtained from Nielsen Trade Dimensions. In particular, we calculate the number of supermarkets per square mile in each zip code, which on average in the sample is 0.33. We also

calculated the number of farmers markets per square mile in each zip code as a further measure of the local food environment.

In addition to demographic and food environment variables, respondents were also asked various questions about their eating, healthy lifestyle, and shopping behaviors. A healthy eating index was calculated from questions developed by Teratanavat and Hooker (2006) and Verbeke and López (2005). A food neophobia score, a measurement of a person's aversion to new foods, was calculated in the format provided by Pliner and Hobden (1992). Both of these variables are included in this model as lifestyle choices and eating habits may impact the level of food security. We also included the average number of minutes survey respondents traveled to do grocery shopping, another indicator of food access that is a direct measure of an individual's shopping behavior as opposed to supply of potential retailers.

The last variable of interest depicted in Table 1 is the Gini Index for the zip code of the respondent, obtained from the 2013 American Community Survey. The Gini Index is a measure of income inequality, in this case for a particular zip code. We include this variable as a component of the food environment, hypothesizing that increased income inequality within a community is associated with a lower likelihood of food security levels for the household.

Estimation:

We estimate the relationship of the food environment on household food security with a logit model as presented in Table 2. Of the demographic variables, age is consistently associated with lower levels of food insecurity. Female respondents were less likely to indicate very low food security, but when low or very low is combined they are no different than male respondents.

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Caucasians are less likely to be food insecure, but this variable is not robust when just focused on very low levels of food security.

Focusing on various food assistance programs, SNAP recipients are more likely to be food insecure, as well as those that visit a food pantry. Thus while these private and public benefit programs are intended to alleviate food security issues, their limited funding relative to overall food costs do not completely eliminate the problem.

One interesting result is the food neophobia index which is associated with a greater likelihood of low or very low food security. This may be a result driven by food insecure households preference for processed less expensive foods. Thus food neophobic individuals may benefit from programs that can address issues of aversion to new foods and broaden the scope of variety to address issues of food insecurity.

With respect to the food environment variables, we find an increase in the number of supermarkets per square mile decreases the odds of low or very low food security, however, this finding is not robust when focused on just the very low food secure population. The number of farmers markets per square mile is not associated with lower levels of food security. We do find, however, zip code areas with increasing income inequality (Gini Index) as having a greater association with lower levels of food security.

Conclusion:

This research has significant policy implications related to issues of food security and the food environment including food access and the continuation of publicly funded programs that encourage retail development. The limited literature that exists in this area has identified the need for further research. We show that in fact an increase in supermarkets has a mitigating

effect on low and very low food secure households, however, no such benefit exists when focused on just very low food secure households. Furthermore, farmers markets are not associated with household levels of food security. This latter finding begs the question as to the motivation behind increasing access to farmers markets in areas with significant food security issues. While there may be benefits to providing access to fresh fruits and vegetables, it is doing little to ensure adequate access to food on a regular basis.

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Table 1. Descriptive statistics

Variable	Mean	Std. Dev.
Low or Very Low Food Security	0.23	0.42
Very Low Food Security	0.11	0.31
Age	51.01	14.60
Female	0.62	0.49
Caucasian	0.89	0.31
SNAP	0.07	0.26
WIC	0.02	0.15
Visit a pantry	0.04	0.21
Health-diet habit index	4.55	0.79
Food neophobia index	3.37	1.05
Education Bachelor	0.31	0.46
Education Master's or higher	0.27	0.44
Housing in apartment	0.14	0.35
Housing in other (non-single family/apartment)	0.03	0.18
No. of children	0.44	0.84
No. of adults	2.11	0.87
Household income in 2012 ($1,000)	89.78	56.23
Number of supermarkets per square mile	0.33	0.53
Number of minutes to grocery shopping	9.92	8.02
Number of farmers markets per square mile	0.05	0.12
Gini Index	0.42	0.05
Number of observations	1135	

Table 2. Logit Model Estimated Coefficients

Variable	Low or Very Low Food Security			Very Low Food Security		
	Coefficient	P Value	Odds Ratio	Coefficient	P Value	Odds Ratio
Age	**-0.04**	0.00	0.96	**-0.04**	0.00	0.96
Female	-0.25	0.16	0.78	**-0.41**	0.07	0.66
Caucasian	**-0.42**	0.10	0.66	-0.02	0.96	0.98
SNAP	**1.29**	0.00	3.64	**1.09**	0.00	2.98
WIC	-0.54	0.33	0.59	-0.52	0.35	0.59
Visit a pantry	**1.82**	0.00	6.16	**1.24**	0.00	3.46
Health-diet habit index	-0.08	0.44	0.92	0.14	0.31	1.15
Food neophobia index	**0.25**	0.00	1.28	0.06	0.58	1.06
Education Bachelor	**-0.90**	0.00	0.41	**-0.56**	0.04	0.57
Education Master's or higher	**-0.72**	0.00	0.49	-0.27	0.36	0.77
Housing in apartment	**0.49**	0.04	1.64	-0.24	0.41	0.79
Housing in other (non-single family/apartment)	-0.21	0.64	0.81	-0.54	0.40	0.58
No. of children	-0.13	0.23	0.88	-0.05	0.71	0.95
No. of adults	0.04	0.66	1.04	-0.07	0.53	0.93
Household income in 2012 ($1,000)	**-0.01**	0.00	0.99	**-0.01**	0.00	0.99
Number of supermarkets per square mile	**-0.41**	0.04	0.67	-0.38	0.12	0.68
Number of minutes to grocery shopping	**0.03**	0.00	1.03	0.01	0.24	1.01
Number of farmers markets per square mile	-0.72	0.44	0.48	-1.40	0.30	0.25
Gini Index	**4.01**	0.04	54.96	**6.82**	0.00	913.40
Constant	-0.33	0.76	0.72	**-2.78**	0.03	0.06
Pseudo R2	0.24			0.16		
Number of observations	1135			1135		

Bold values denote significance at 0.10 level or less.