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Impacts of Point-of-Sales Nutritional Labels and Nutrition Education on Healthful Food Purchase at Rural Grocery Stores: A Case Study

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Abstract: *According to the 2013 Food Environment Atlas, 37.6 million Americans live in low-income, low access tracts and about 13% of them live in rural food deserts. We extend the literature on access to and availability of healthy foods in rural food deserts by examining the change in food purchase behavior in response to interventions intended to promote healthful eating. Healthfulness of food purchases were examined as point-of-sale nutritional labels were introduced and patrons received nutrition education programming at two locally owned stores in rural Kansas using a difference-in-difference model. Results indicate that ***

Introduction

The obesity rate for adults in the United States stood at approximately 36% between 2011 and 2014 (Ogden *et al.,* 2015). This entailed a medical cost of $1901 per individual in 2014 amounting to $149.4 billion at the national level (Kim and Basu, 2016). Because food choices directly and indirectly impact health outcomes, promoting balanced and healthful food choices is an important policy objective at federal, state, and local levels. According to the Food Acquisition and Purchase Survey in 2012-13, the quality of food purchased by American households stood at 53 on the 100 point Healthy Eating Index 2010 (HEI) proposed by the United States Department of Agriculture (USDA) indicating that the food choices of Americans could be improved substantially (Mancino *et al.* 2018). While households did not meet the adequacy benchmark for any food groups except protein; the consumption of refined grain and empty calories was approximately 1.5 times higher than the recommended limits. The study also found that households in low-income low-access tracts scored about 4% lower than households who had better access.

According to the 2013 Food Environment Atlas, 37.6 million Americans live in low-income, low access tracts where at least 500 or 33% of the residents are located more than a mile from a supermarket for urban areas and ten miles for rural areas (USDA-ERS). About 13% of them live in rural food deserts. Besides, the expanding food deserts also have greater ill-effects on the elderly and poor, who make up high proportions of rural communities. Studies have documented the burden of low food access on healthful consumption and related health consequences among rural residents (Larson *et al.*, 2009). For instance, rural adults had lower intake of fiber and fruits and higher intake of sweetened beverages (Trivedi *et al.,* 2015). The prevalence of obesity is also higher in rural counties than in urban counties (Jackson *et al.*, 2005). In 2010, rural adult obesity rate stood at 39.6%, compared to 33.5% for urban adults (Trivedi *et al.,* 2015).

Policies that make available healthful foods and educate residents so that they can use the available nutritional information and other resources to the best of their ability are crucial to promote the well-being of rural residents particularly in small and poor communities. This paper examines the impact of interventions designed to promote healthful food purchase patterns among the patrons of two locally owned stores in rural Kansas. One of the interventions was extension programming designed to provide nutrition education while the other was the introduction of succinct point of sales nutrition scores that patrons could use to make more informed choices.

This paper is most closely related to a group of studies that examine the impact of nutritional awareness on food consumption. Most of these studies have demonstrated that consumers in fact do use the available nutritional information to the best of their ability to consume more healthful foods (Weaver and Finke, 2003; Roberto *et al.*, 2010; Hellyer *et al.*, 2012; Zhu *et al*., 2015). In fact, a small stream of more recent studies has also demonstrated that some groups of consumers are also willing to pay for customized nutritional information (Balcombe *et al.* 2016) or pay more for products that are healthier (Hellyer *et al.*, 2012). Most studies on the topic have established a positive relationship between the usage of nutritional labels and healthful food consumption or improved nutrient intake (Kreuter *et al*.,1997; Neuhouser *et al*., 1999; Kim *et al*., 2000; Satia *et al*, 2005; Lin *et al*., 2004). This study is closest in spirit to studies that examine impact of succinct point-of-sales (POS) nutrition labels on consumer purchase behavior such as Nikolova and Inman (2015) who examined the impact of a nutrition scoring system on eight food items among frequent shopper clients of a grocery store chain and found significant results.

The contribution of this paper is to expand our understanding of food purchase patterns among rural residents in a more holistic manner. Unlike the previous findings that are based on small experimental groups in urban areas, we focused solely on rural communities with a view to

take into account the unique constraints that rural residents face. We examined food purchases at small locally-owned grocery stores in the rural Midwest taking into account the food environment in both the control and treatment stores measured using the metrics recommended by the Nutritional Environment Measures Survey (NEMS), the impact of Extension education programs implemented to improve nutritional awareness among store patrons in the study stores, and consumer perceptions and attitudes toward food choices collected through surveys administered to store patrons. Besides, this study also contributes to behavioral economics literature by demonstrating how consumer food purchase patterns shift in response to specific information disclosures.

Our finding suggest that both the interventions are successful in promoting healthier food purchase patterns among the patrons of the study stores. However, the magnitude of the impact of the two interventions on different type of shoppers is different. The quick shoppers who pick up few items or spend less money are compared to the more intentional shoppers who buy more items and / spend more seem to benefit more from the interventions. The findings are thus relevant to food policy, rural and community development policy, and household, consumption and behavioral economics.

The rest of the paper is organized as follows. The next section presents a background and review of existing literature. We describe the scope of the study followed by the methods and results and finally conclude with the policy implications.

Background

Access, availability, utilization and stability are the four key dimensions of food security (FAO, 2008). Limited access to healthful foods is likely to hamper consumption of healthful foods in rural towns as compared to their urban counterparts (Liese *et al.*, 2007; Morton and Blanchard,

2007). This is illustrated by the low intake of nutrients and higher rates of obesity prevalent among rural Americans. (Trivedi *et al*., 2015). Geographical distance is the most cited barrier to access among rural residents. Hendrickson *et al.* (2006) used survey methods and focused group discussions to examine whether healthy foods were available and consumer perceptions of food availability in four communities- one each in North and South Minneapolis and two counties in rural Minnesota. They found that low–income rural residents appeared to have wider variety of foods to choose from compared to low-income urban residents, but the rural residents were affected by the high cost of food and transportation problems. Smith and Morton (2009) used qualitative methods to investigate 'how low-income rural residents living in food deserts accessed the normal food system and food safety net within their communities and explored how social, personal and environmental factors drove food access and food choice.' Through seven focused group discussions involving 57 adults in selected counties in Iowa and Minnesota they concluded that unlike personal factors that influenced the eating behavior of rural people, physical and environmental factors constrained peoples' ability to access food. Sharkey *et al.* (2010) found that increased distance to the store – both objective and perceived was negatively associated with consumption of fruits and vegetables in rural Texas. They estimated bivariate correlations using Perason's product-moment method and multivariate linear regression models on a sample of 582 seniors in the Brazos Valley Counties.

Another body of literature has examined how availability of healthful foods *i.e.* the food environment relates to healthful consumption. There is evidence to support positive food environments are associated with higher intake of fruits and vegetables (Moore *et al.*, 2008; Ver Plong, 2010). Morland *et al.* (2002) examined the association between the local food environment and residents' report of recommended dietary intake among 10,623 Atherosclerosis Risk in

Communities (ARIC) participants. Their sample included observations from 221 census tracts out of which 29 were located in Washington County, Maryland; 80 in Forsyth County, North Carolina; 58 in Jackson City, Mississippi; and 54 in the suburbs of Minneapolis, Minnesota. Random-effects log-linear models for each census tract were used to find that black Americans' fruit and vegetable intake increased by 32% for each additional supermarket in the census tract while white Americans' fruit and vegetable intake increased by 11% with the presence of one or more supermarket. Hanson *et al.* (2005) estimated Spearman's correlation between parent report of household fruit, vegetable, dairy foods and soft drink availability and adolescent intake of these foods among 4,746 participants of Project EAT (Eating Among Teens) who were adolescents from public middle schools and high schools in the Minneapolis, St. Paul and Osseo school districts in Minnesota. They concluded that median intake increased among adolescents as their parents reported these foods were more frequently available at home. Bodor *et al.* (2008) found that greater fresh vegetable availability within 100 meters of residence was positively associated with vegetable intake and each meter of additional shelf space in grocery stores was associated with 0.35 servings per day of increased intake. They used a liner regression model and controlled for household demographic factors to obtain their estimates for a random sample of 102 households in four contiguous census tracts in central New Orleans.

Several studies have illustrated that consumers use available resources to make more informed choices. Balcombe *et al.* (2016) found that people were willing to pay to use technology to customize food shopping and that people were willing to pay more for specific information versus for generic nutritional information. 791 British citizens participated in the discrete choice experiment and data was collected using a survey-instrument administered by an online polling company. Their findings complemented an earlier experiment by Hellyer *et al.* (2012) based on

183 individuals recruited at the University of Kent to participate in a Vickrey second price auction to examine consumer responses to the provision of nutritional information for a variety of bread products and found that the provision of both a specific or non-specific health claim along with nutritional information influenced the participants' willingness to pay.

Several studies have consistently observed an association between increased use of the food label and improved nutrient intake or healthier dietary patterns among study participants. (**Kreuter *et al*., 1997**; **Neuhouser *et al*., 1999**; Kim *et al*., 2000; **Satia *et al*, 2005**; **Lin *et al*., 2005**) For instance, Kim *et al*. (2000) used endogenous switching regression techniques and found that nutritional label use changed dietary intake in favor of dietary fiber and reduced the intake of cholesterol, sodium and saturated fat. Their findings were based on 5,203 complete observations from the Diet and Health Knowledge Survey. Olberding *et al*. (2011) used 4,454 responses from the National Health and Nutrition Examination Survey (NHANES) 2005-06 and found that the use of specific nutrient information found on the nutrition facts panel was associated with the largest difference in mean nutrient intake between label users and nonusers for energy, total fat, cholesterol, and sodium. Sato *et al.* (2013) also demonstrated a positive relationship between nutrient labeling and sales of healthy foods in the cafeteria of Kaiser Permanente San Francisco Medical Center. The cafeteria serves about 100 customers a day 70% of whom are employees at the Center. The findings *i.e.* descriptive statistics of trends during the study period were based on 131 anonymous surveys and sales data. Thorndike *et al*. (2012) found that a color coded labeling intervention improved sales of healthy items in five cafeterias in the Massachusetts General Hospital. They followed this up by another intervention to increase the visibility and convenience of some of the items labeled as healthy. The two phased intervention was analyzed using logistic regressions and difference in difference models for all items sold and for changes within the group

for beverages (diet soda, regular soda and bottled water). This analysis was based on big data with a sample size of over 100,000 for beverages and over 900,000 for all items.

More recent studies have investigated the environments in which nutrition labelling interventions are likely to be most effective. Barreiro-Hurle *et al.* (2010) conducted a choice experiment to identify the effects of multiple health and nutrition information labels for two products representing a healthy and unhealthy food choice and found that while consumers attached positive utility to most of the individual labels, the simultaneous presence of multiple labels impacted utility positively in only one out of nine possible cases. Their findings suggest that while consumers consult nutrition labels when making decisions, they are unlikely to use such information if presented in multiple and confusing forms. Their sample was drawn from 800 grocery shoppers randomly approached in grocery stores and supermarkets in two Spanish cities to participate in the study. They obtained estimates using both a random parameters logit and an error component mixed logit model. Visschers *et al.* (2013) investigated the kind of consumers who were likely to benefit from nutritional labels. They concluded that different strategies worked to promote healthful eating among different groups of people and hence nutritional awareness was not a substitute but a compliment to improving food environments. Their findings were based on the Swiss Food Panel Questionnaire that had a sample size of 6,061. They however, did not establish any causal inference. Zhu *et al.* (2015) extended consumer search theory to include healthfulness and examined whether decreasing the cost of nutritional information increased the probability of healthful consumption for ready-to-eat breakfast cereals. Their study spanned 5,844 households from Nielsen Homescan Panel over 152 weeks. They found that simplifying nutritional labeling did indeed increase the healthfulness of consumer choices. More detailed investigation

revealed that less-educated and smaller households with frequent purchases benefitted the most from reduction in information cost.

Study design

Geography

This study is based on patrons of two locally owned grocery stores in communities with population of less than 2,500 in rural Kansas. Four control stores located in rural communities with 2,500 people or less were selected. Two of the control stores (C1 and C4) were located in Iowa and the other two (C2 and C3) in Missouri. In order to participate in the study stores had to fulfil three requirements. The stores had to be located within or servicing an area designated as a food desert by the USDA and the storeowners had to be willing to participate in the project. The stores also had to be serviced by Affiliated Foods Midwest[1] (AFM), a cooperative wholesale grocery distributor that served over 800 rural grocery stores throughout the Midwest and over 70% of the rural grocery stores in Kansas.

According to the 2015 American Community Survey (5-year sample) both the treatment and control stores were located in counties where 94% of the total population was white and the average household size was just over 2.5. Store A was located in a relatively affluent county with median income of about $60,000 and unemployment rate of 3.7%. Approximately 6% of the households received Supplemental Nutrition Assistance Program (SNAP) benefits and about 65% were married couple households. The county with Store B on the other hand had a median income near $50,000 and the unemployment rate stood at 7%. 11% of households received food stamps

[1] In July 2016 AFM and Associated Wholesale Grocers (AWG) announced they had reached an agreement to combine the two businesses and this merger was completed in October 2016, with AWG retaining the brand name and Martin Atler, chief executive officer of AFM taking over as the senior vice president of the Northern region of AWG.

and 55% of the households were married couple households. For the control stores the median income ranged from $38,289 to $55,203; the unemployment rate ranged from 5.5% to 7.8% and the number of households receiving food stamps ranged from eight to 14%. The control and treatment stores also had similar proportion married households (about 55%), working age population (around 45%), and labor force participation rate (around 63%). The county level characteristics of each of the control and treatment stores are presented in Table 1.

Study intervention

The treatment included two interventions implemented in the study stores at different times in order to estimate the joint as well as the independent impact of the two interventions. The timeline of the interventions is summarized in Table 2. One intervention was the introduction of a new nutritional quality index called NuVal at the POS. The index simplified nutritional information for consumers by providing a succinct nutritional score to each food item as a single number from 1 to 100. Consumers could thus see the nutritional value of the food they bought at a glance and compare it with other food items within the same food category as also across categories. The NuVal scores were displayed on the left hand side of the shelf tag that lists the price and barcode of the item on shelf (Figure 1). This intervention was introduced in Store A in February 2015 and in Store B in June 2015.

The other intervention, an Extension outreach program was designed in conjunction with the nutritional quality index system to complement the SNAP Education and nutrition education materials that were already in use. The program was designed taking into account the typical and cultural shopping patterns, technology limitations, and other practical shopping considerations of customers in of the rural grocery stores. The material was also designed to connect with rural community audiences and included posters, fliers, short recorded lessons played at the store and

other innovative methods of nutritional education. For instance at Store A, the nutrition education program consisted of a workshop designed to cover components of a balanced meal based on *My Plate,* a healthy eating guide proposed by the USDA's Center for nutrition policy and promotion. This was followed by a review of how to read and use nutrition labels. The workshop ended with a discussion on different approaches to planning and cooking easy family meals. The second part of the program was a field trip to the grocery store to work through interactive smart shopping worksheets and exercises, shopping and nutrition tips and an overview of NuVal. The nutrition education program was hosted in Store B in February-March 2015 and in Store A in July-August 2015.

Data Collection

Data from several different sources was gathered to evaluate the impact of the interventions. The data collected included consumer purchase data and store inventory from all the six stores and customer intercept surveys and measures of the food environment from the study stores.

Consumer purchase data was gathered from both the treatment stores and the four control stores from October 2014 through March 2016. This data included the time stamp, transaction id, frequent shopper number of the purchasing household, price, product description, and the Universal Product Code (UPC) of all items purchased in the six stores during the study period. The dataset after it was stripped of all non-food purchases included observations for 338,305 purchase events of 24,405 unique UPCs by 11,599 households purchasing a total of 2,686,140 food items from the six grocery stores during the study period. The expenditure per purchase event was $39.45 for the control stores while it was $51.69 for the treatment stores during the study period. Patrons at the treatment stores however, paid $2.70 per food item on average compared to

$2.50 per food item at the control stores. Out of the total food items purchased, 20.1% of item sales were purchase events where shoppers ran in the store to pick up five or fewer items, while the remaining 79.9% were bulk purchase events where shoppers bought a more substantial number of items (5 or more). The mean expenditure per trip of "quick" shoppers was $8.89 while that of the intentional (planned) shoppers was $34.88. These statistics are listed in Table 3.

Customer intercept surveys were conducted in the treatment stores to gather the patrons' demographics and measure their awareness, attitude and preferences related to healthy foods. Data related to the store patrons' demographic and attitudinal information was obtained from surveys administered to store patrons when they signed up for the frequent shopper cards. This survey was administered in February-March 2015 at the time of enrollment and documents their age, occupation, income, gender race and such other time invariant characteristics. The sample size of this data is 643. Follow-up surveys to measure changes in their perception of food intake and nutritional awareness were administered by intercepting shoppers in May-June, and October-November of 2015. The total number of observations in the follow-up surveys is 246.

The Nutritional Environment Measures Survey (NEMS) provides a standardized metric to measure and compare the availability of nutritional foods across different stores. The method can be used to assign scores to grocery stores based on quality and price of products shelved in the stores. While stores are given points based on the assortment and availability of different products depending on their nutritional value they can also be penalized for higher prices on the healthier alternatives. The NEMS score for stores can range from zero to 50. The NEMS score for both the treatment stores was 26 in the follow up surveys done in March 2016. This is comparable to mean scores limited assortment /deep discount stores and big box stores. (Hillier *et al.*, 2015) The baseline NEMS was administered in the study stores in January 2015 and a follow-up was done in

March 2016. The NEMS compliments the store inventory data that documents product-level inventories of each of the store during the study period. The NEMS scores for the treatment stores are also listed in Table 3.

Methods and analysis

In this section we discuss the data and methods used to analyze the impact of the interventions to determine the extent to which the interventions modified the purchase patterns of the patrons.

Empirical model

The empirical model can be summed up in equation (1) below.

$$y_{pst} = \alpha + \delta_{nuval} * nuval_{pst} + \delta_{exed} * exed_{pst} + s_s + t_i + \epsilon_{pst} \quad (1)$$

y_{pst} is the outcome variable for purchase event *p* at store *s* at time *t.* It is measured as the aggregate nutritional score of all food items purchased during purchase event *p* in store *s* at time *t* normalized by the number of food items purchased. $nuval_{pst}$ is a dummy variable that takes the value 1 for all purchase events from the treatment stores after the intervention was put in place *i.e.* $nuval_{pst}$ = 1 for all observations from March 2015 onward at Store A and July 2015 onward at Store B. $exed_{pst}$ is a dummy variable that takes the value 1 for all purchase events from the treatment stores after the extension education programming was completed *i.e.* $exed_{pst}$ = 1 for all observations from September 2015 onward at Store A and April 2015 onward at Store B. In this model, δ_{nuval} and δ_{exed} capture the impact of the two interventions respectively.

s_s captures store level fixed effects. It is a series of dummy variables that takes the value one for each store *s* respectively with store C1 excluded as a reference category. This variable captures any trends specific to a store or the community that the store is located in that may be

confounded as the impact of the intervention. t_t flags the reference period which is month in this case. It captures any time trend that may confound the effects of the intervention. This series of dummy variables flags every purchase made in that particular month from October 2014 to March 2016 with the first month omitted as the reference period.

Data and descriptive statistics

The consumer food purchase data and interpolated nutrition score database of food items were combined to calculate the outcome variable. The outcome variable *i.e.* the nutritional score of each food purchase event is the aggregate score of all food items purchased during purchase event *p* in store *s* at time *t*. This score is normalized by the number of food items purchased during the purchase event.

Our primary data source is sales data from the two treatment stores and four control stores. This includes a list of all items purchased by shoppers during the study period and their universal product codes (UPC), product descriptions, frequent shopper card number, prices and discounts availed if any. The sales data included both food and non-food purchases. All the non-food purchases were flagged and excluded from the analysis. Discounts, alcohol and pharmacy products were also flagged and excluded from the analysis. The product department descriptions, group descriptions, module descriptions, and UPC descriptions used to identify non-food items, alcohol and pharmacy products are listed in Appendix B. The dataset was also stripped or error entries. If two entries within the same time stamp and transaction id had the same UPC but a positive price on one entry and negative price of the same amount on the consequent entry, then such entries were dropped.

The nutritional value of each purchase was interpolated using food scores published by the Environmental Working group's (EWG). They take into consideration more than 80,000 foods,

5,000 ingredients and 1,500 brands and rate each food item based on nutrients, ingredient concerns and processing (EWG food scores, 2014). Nutrition is weighted the highest, followed by ingredient concerns and then processing. Nutrition accounts for calories, saturated fat, trans fat, sugar, sodium, protein, fiber and fruit, vegetable and nut content. Ingredient concerns control for the likely presence of key contaminants, pesticides, hormones and antibiotics and health implications of certain food additives. The processing score reflects an estimate of the extent to which a particular food has been processed. Scoring also factors in modification of individual ingredients from whole foods, number of artificial ingredients and other factors.

Each food items' performance on the three scales is combined into a single overall product score on a scale of 1 to 10 such that the best (healthiest) foods score 1 and the worst (least healthy) foods score 10 (EWG food scores, 2014). For instance, fresh fruits and vegetables have the lowest scores (typically between one and two), candy ranged from five to ten with dark chocolate and fruit bars being at the lower end of the spectrum, breakfast cold cereal ranged from one to 10 with steel cut oats scoring one while frosted and sweetened cereal had a score of 10. Yogurts ranged from one to nine, with organic Greek yogurts at the lower end followed by non-organic, flavored and frozen yogurts.

To construct the outcome variable, the four and 11 digit UPCs were first converted into a 12 digit number using the formula defined to calculate the last check digit of the UPC. The complete 12 digit UPC was then used to match observations in the sales dataset with their foodscore from the EWG foodscore database. The EWG food score database assigned a score to about 27% of the total unique UPCs in our sample. Scores of products missing a score were interpolated based on the scores assigned to similar products in the EWG database. For those product modules, where the range was less than two, the group mode was assigned as the score for

all products in the module. For product modules with a greater range of scores, the keywords in the product description used to distinguish the healthier options were identified and scores were assigned based on these keywords. The list of keywords used to classify the products into healthier and less healthy options is presented in Appendix C.

The mean scores ranges between 4.9 and 5.4 for the control group. The mean score for the treatment group was 5.219 during the pre-intervention period and 5.147 after at least one of the interventions was introduced. Histograms of the score distribution for all the stores are presented in Figure 2 and the mean scores over time in the treatment and control stores during the study period are presented in Figure 3.

Results

In this section we discuss the findings of the study. Our findings suggest that the interventions had a limited effect on modifying people's food purchase choices. The estimation results of equation (1) for the whole sample and the different subsamples are presented in Table 4. The outcome variables in all the estimations is the aggregate nutrition score of the food purchases normalized by the number of food items purchased. Since the scores range from 1 to 10 with the healthiest foods scoring one and the least healthy ten, the inventions if effective would result in a negative co-efficients *i.e.* the nutrition scores of the food purchases will decrease. Panel A presents the results for the complete sample while the results for store A and store B independently are presented in Panel B and Panel C respectively. The different columns present estimations for different type of shoppers – quick buyers and intentional shoppers (planners). The estimations in column 1 are based on the whole sample while those in column 2 and 4 are for the quick shoppers *i.e.* those who purchase less than 5 items during the shopping event or their trip expenditure is less

than $25 respectively. Column 3 and 5 present the impact on the intentional shoppers (planners) *i.e.* those who more than 5 items during the purchase event or spend more than $25 respectively.

As seen in Panel A, the co-efficient on *nuval* is not significant in any of the columns while that on *exed* is significant at the 10% level for the whole sample and at the 5% level for quick shoppers buying less than five items and planners spending more than $25. More precisely, extension education resulted in a 0.10 unit shift in the nutrient score toward healthier food purchases for the whole sample and this shift was mainly driven by the quick shoppers for whom the effect was 0.16 unit shift.

At store A (Table 4: Panel B) where, POS nutrition labeling was the first intervention to be introduced, it achieved a significant shift in the purchase behavior in favor of more healthful purchases for all types of shoppers with the quick shoppers benefitting the most. NuVal decreased the food score of quick shoppers by 0.4 units indicating an improvement in their purchase choice as healthier foods are scored one while the least health 10. People buying less than 5 items experienced a 0.2 unit fall while those spending less than $25 saw a 0.1 unit shift toward healthier foods. At Store A, while the Extension Education program was successful in bringing down the nutrition score of the food purchases by 0.1 units for the whole sample, this effect was mainly driven by the two types of quick shoppers whose scored fell by 0.2 and 0.07 respectively.

At Store B (Table 4: Panel C), the first intervention to be introduced was the Extension education programming followed by the POS nutrition labels a few months down the road. Here the POS nutrition labels did not have significant effects on the food purchase choices of shoppers but extension education promoted healthier purchases across all types of shoppers with the quick shoppers improving the most. While the nutrition scores fell by 0.1 units for the whole sample and

the intentional shoppers (planners), for the quick shoppers it was 0.5 unit decrease in score and the results were significant at the 1% level.

Conclusion

In this paper we evaluated the impact of two interventions designed to promote healthful food purchase patterns among the patrons of locally owned grocery stores in small rural communities that are designated as food desserts. One of the interventions was extension programming designed to provide nutrition education while the other was the introduction of succinct point of sales nutrition scores that patrons could use to make more informed choices. Our study suggested that rural residents are interested in modifying food purchase behavior in favor of more healthful choices and are willing to use the available resources and information. However, different interventions have different impacts on different types of shoppers. Our analysis suggested that while the POS nutrition labelling intervention was successful primarily in Store A where it was the first intervention to be introduced, extension education programming was highly effective in Store B where it was the first intervention to be introduced but also had limited effects at store B where it was introduced a few months after the introduction on POS nutrition scores. Our findings also suggest that although all types of shoppers benefitted from the interventions, quick shoppers *i.e.* those purchasing fewer than five items of spending less than $25 during a purchase event benefited the most.

Several theories could explain the limited impact of the interventions. It is possible that while the first intervention was well received in both the treatment communities, by the time the second intervention was introduced the communities had reach a saturation point. It is also possible that the interventions were not publicized enough and hence patrons disregarded the resources

while they shopped for groceries. This is a preliminary analysis. It will be followed up with other models to test the sensitivity of the results to different specifications.

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Table 1: County characteristics of the treatment and control stores

Store	Store A	Store B	Store C1	Store C2	Store C3	Store C4
County	Pottawatomie	Sumner	Marshall	Shelby	Knox	Tama
State	Kansas	Kansas	Iowa	Missouri	Missouri	Iowa
Community size (total households)	312	474	539	696	545	715
Total county population as of 2015	22,625	23,638	40,962	6,179	4,035	17,479
Total households	8,192	9,091	15,297	2,499	1,689	6,790
Percentage of white population	94.09	94.38	84.41	97.93	96.60	88.68
Percentage of married-couple households	62.61	55.02	55.08	53.18	54.65	56.57
Average household size	2.72	2.55	2.72	2.37	2.34	2.51
Percentage of workering age population (age 16+)	48.19	44.94	46.37	46.48	41.69	46.58
Percentage of labor force participation rate (age 16+)	68.70	62.70	65.10	63.20	58.10	63.60
Unemployment rate; Population (age 16+)	3.70	7.00	6.30	5.80	7.40	5.60
Means of transportation to work (Car, truck, or van)	92.50	90.20	90.30	87.90	80.40	91.20
Median household income (dollars)	60,216	50,141	53,351	39,087	38,289	55,203
Percentage of households receiving SNAP benefits	6.58	11.71	14.13	11.80	13.38	8.35

Source: American Community Survey 2015 (5 year sample)

Table 2: Timeline of Interventions

Begin Date	End Date	Intervention
1-Oct-14		LLD enrollments began in the treatment stores
16-Jan-15	27-Jan-15	Baseline NEMS survey at the two treatment stores.
14-Feb-15	13-Mar-15	First customer intercept survey
23-Feb-15	27-Feb-15	Introduction of NuVal scores in Store A (First Intervention)
25-Feb-15	30-Mar-15	Provision of nutritional education training in Store B (First Intervention)
16-May-15	12-Jun-15	Second customer intercept survey
4-Jun-15	5-Jun-15	Introduction of NuVal scores in Store B (Second Intervention)
24-Jul-15	20-Aug-15	Provision of nutritional education training in Store A (Second Intervention)
30-Oct-15	14-Nov-15	Third customer intercept survey
10-Mar-16	24-Mar-16	Follow up NEMS survey at the two treatment stores.

Table 3: Store level summary statistics

Store	Store A	Store B	Store C1	Store C2	Store C3	Store C4
Number of households	174	319	1,490	4,430	3,387	1,799
Total number of food items sold	45,757	119,906	308,479	886,435	820,213	505,350
Number of unique shopping events	4,191	12,574	53,079	96,967	93,456	78,038
Number of unique UPCs	5,533	7,013	8,740	14,568	12,838	7,615
NEMS Score Availibility (2015)	22.00	20.00				
NEMS Score Price (2015)	5.00	-6.00				
NEMS Score Total (2015)	27.00	14.00				
NEMS Score Availibility (2016)	23.00	23.00				
NEMS Score Price (2016)	2.00	2.00				
NEMS Score Total (2016)	25.00	25.00				

Table 4: (Panel A: Store A & B) Impact of interventions on food purchase behavior

	(1)	(2)	(3)	(4)	(5)
Sample	Whole sample	Quick shoppers items < 5	Planners items > 5	Quick shoppers Spending < $25	Planners Spending > $25
Nuval	-0.085	-0.125	-0.0830	-0.133	-0.0557
	(0.0774)	(0.136)	(0.0748)	(0.183)	(0.0361)
Exed	-0.0954*	-0.164**	-0.0802	-0.105	-0.0783**
	(0.0510)	(0.0663)	(0.0537)	(0.101)	(0.0363)
Observations	2,451,772	444,171	2,007,601	1,098,064	1,353,292
R-squared	0.002	0.001	0.004	0.002	0.005
Households (n)	9,074	7,686	7,843	8,416	6,510

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4: (Panel B: Store A) Impact of interventions on food purchase behavior

	(1)	(2)	(3)	(4)	(5)
Sample	Whole sample	Quick shoppers items < 5	Planners items > 5	Quick shoppers Spending < $25	Planners Spending > $25
Nuval (first)	-0.218***	-0.435***	-0.205***	-0.477***	-0.109***
	(0.00952)	(0.0155)	(0.0108)	(0.0119)	(0.0143)
Exed (second)	-0.0553**	-0.190***	-0.0271	-0.0715*	-0.0235
	(0.0249)	(0.0434)	(0.0233)	(0.0366)	(0.0192)
Observations	2,341,320	427,938	1,913,382	1,057,469	1,283,465
R-squared	0.003	0.001	0.004	0.002	0.005
Households (n)	9,073	7,685	7,842	8,415	6,509

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4: (Panel C: Store B) Impact of interventions on food purchase behavior

Sample	(1) Whole sample	(2) Quick shoppers items < 5	(3) Planners items > 5	(4) Quick shoppers Spending < $25	(5) Planners Spending > $25
Nuval (second)	0.0225	0.0274	0.0254	0.0971***	-0.00112
	(0.0167)	(0.0285)	(0.0178)	(0.0239)	(0.0187)
Exed (first)	-0.175***	-0.251***	-0.166***	-0.257***	-0.131***
	(0.0164)	(0.0244)	(0.0169)	(0.0226)	(0.0204)
Observations	2,409,233	439,943	1,969,290	1,084,724	1,324,110
R-squared	0.003	0.001	0.004	0.002	0.005
Households (n)	9,073	7,685	7,842	8,415	6,509

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Appendix A: List of abbreviatons

AFM	Affiliated Foods Midwest
ARIC	Atherosclerosis Risk in Communities
ERS	Economic Reseach Service
EWG	Environmental Working Group
FAO	Food and Agriculture Organization
HEI	Healthy Eating Index
NEMS	Nutritional Environment Measures Survey
NHANES	National Health and Nutrition Examination Survey
POS	Point-of-sales
Project EAT	Project Eating among Teens
SNAP	Supplemental Nutrition Assisstance Program
UPC	Universal Product Codes
USDA	United States Department of Agriculture
ACS	American Community Survey

Appendix B: Keywords used to identify non food purchases

Product department used to identify alcohol

Toiletries, Non food merchandies, Beer, liquor, wine

Keywords in the product upc description used to identify alcohol

bacardi, smirnoff, adam puchta, wine

Product group descriptions used to identify non food items

Ice, Pet Food, Cookware, Laundry, Supplies, Table, Syrups, molasses, Medications/remedies/health Aids, Household cleaners, Stationery, school supplies, Kitchen gadgets, Household supplies, Charcoal, logs, accessories, Cough and Cold Remedies, Batteries and Flashlights, Fresheners and Deodorizers, Personal Soap and Bath Additives, Books and Magazines, Pet Care, Sanitary Protection, Canning, Freezing Supplies, Oral Hygiene, Glassware, Tableware, Insecticides/pesticides/rodenticides, Light Bulbs, Electric Goods, First Aid, Hair Care, Disposable Diapers, Electronics, Records, Tapes, Deodorant, Shaving Needs, Housewares, Appliances, Automotive, Soft Goods, Floral, Gardening, Grooming Aids, Baby Needs, Skin Care, Preparations, Grt Cards/party Needs/novelties, Cosmetics, Shoe Care, Sewing, Notions, Feminine Hygiene, Hardware, Tools, Ice, Men's Toiletries, Photographic Supplies

Product Module Descriptions used to identify non food items

food, Pet care - pet food, Pet care - wild bird food, Unclassified automotive, Unclassified babyneeds, Unclassified cookware, Unclassified cosmetics, Unclassified feminine hygiene, Unclassified floral gardening, Unclassified fresheners and deodorizers, Unclassified glassware, tablew, Unclassified grooming aids, Unclassified hair care, Unclassified hardware,tools, Unclassified household cleaners, Unclassified household supplies, Unclassified housewares, appliances, Unclassified kitchen gadgets, Unclassified laundry supplies, Unclassified medications/remedies/hea.., Unclassified mens toiletries, Unclassified oral hygiene, Unclassified personal soap and bath a.., Unclassified pet care, Unclassified shaving needs, Unclassified stationary, school suppl.., Unclassified tobacco & accessories, Unclassified toys & sporting goods, Cat food - dry type, Cat food - dry type, Cat food - wet type, Catsup, Dog & cat treats, Dog food - dry type, Dog food - moist type, Dog food - wet type, Gift package with candy or gum, Ice, Unclassified baby needs, Unclassified medications/remedies/health ai, Unclassified personal soap and bath additiv, Unclassified stationary, school supplies" "', Small ice, Video products prerecorded, Drinkware container set, Hair care and fashion accessory, Hair coloring - women's, Cosmetics-lipsticks, Kitchen utensil and gadget, Food storage containers, Pain remedies - headache, Children's cologne & gift sets, School and office basics, Shampoo-aerosol/ liquid/ lotion/ powder, Cold remedies - adult, Hand & body lotions, Pens & pencils, False nail and nail decoration, Antacids, Soap - specialty, Beverage storage container, Crème rinses & conditioners, Oral hygiene brushes, Face cleansers & creams & lotions, School and office paper and forms, Pet accessory, Candle and candle in holder, Cigarettes, Cosmetics-eye shadows, Women's gift sets & skin care packages, Artist and hobby paint and supply, Cosmetic kits, Cosmetic and nail grooming accessory, Video and computer games, Wave setting products, Personal planners, binders and folders, Cough syrups & tablets, Dog & cat treats, Cold remedies - children, Home school and office combinations, Tooth cleaners, Detergents - heavy duty - liquid, Baby accessory, Gloves, Hair spray - women's, Cookware product, Cough drops, Lip remedies - remaining, Suntan preparations - sunscreens & su.., Sponges - personal, First aid - treatments, Deodorants - personal, Baby bottles & nipples, Lamps - incandescent, Soap - bar, Pre-moistened towelettes, Vitamins-multiple, Markers, Baby pacfr/teethr & bottle/nipple bru.., Cat food - wet type, Baby care products-bath, Cosmetics-mascara, Cosmetics-eyebrow & eye liner, Correction fluid and erasers, Cigars, Cotton - swabs/balls/rolls/aplctrs etc., Pain remedies - children's liquid, Ir/specialty fresheners - aerosol spr.., Hair preparations - other than men's, Razors disposable,

Keywords in the product upc description used to identify non food items

Romance, Brake, Fluid, Rommance, Boquet, Pencil, Sentinel, Toy, Bonus, Coupon, Discount, Red mulch, Republican, Tattoos, Cable, Edina, Shelbina, Bows, Herald, Plastic, Charger, Ear phone, Alley cat, Candles, Book, Magic glow, Enterprise, Tissu, Fishing, Republic, Toothpick, Cutlery, Straw, Courier, Container, Hotwheels, Cosmopolitan, Register, Cling wrap, Tooth pk, Duct tape, Color book, Crossword, Strainer, Drain, Stopper, Silicone, Swatter, Basketball, Putty, Yo-yo, Jaru, Needles, Sewing, Thread, Basket, Teeth, Bag ice, Herald, Dvd sale, Discount, Fee, Deposit, Video, Redhawk, Rebate, Dep, Postage, Newspaper, Coupon, Gift card, Release, Fax, Copies, Copy, Releases, Releases, Potting, Bonus, Points, Pages, Card, Off, Trees, Christmas, Puzzle, Magazine, Magazines, Hangers, Calender, Tree, Card, Promo, Movie, Firewood, Firewood, Movie, Propane, Towels, Batteries, Coupo, Coup, Gift, Paper, Hanger, Towel, Cloth, Calender, Quilt, Pliers, Screwdrivers, Screwdriver, Knofe, Knife, Flashlight, Drywall, Hook, Baloon, Balloon, Stamps, Plate, Bowl, Rugdoctor, Rug doctor, Flowers, Safety pins, Bedding, Elf eye, Elf lip, Elf gloss, Tissue, Elf mascara, Elf shine, Elf blush, Eraser, Ritter's, Hanging basket, Softner salt, 20 lb ice, 6-lb cube ice

UPC codes used to flag non-food items

30000000000 to 38151900001	Phramaceutical products
60933200000	Elf beaty products
60933300000	Elf beaty products
67811300000	Eye and ear drops
67811200000	Eye and ear drops
38004100000	Sanitary pads
38137000000	J&J baby care products
60933200000	Elf beauty products
60933300000	Elf beauty products
75703700000	Oxiclean home cleaning products
75703800000	Oxiclean home cleaning products
76131800000	Revlon beauty products
79271600000	Shower gel
79285000000	Burtbees lip balm
88596700000	Spray starch
978037000000	Books & Magazines

978043000000	Books & Magazines
978148000000	Books & Magazines
608	Icebag purchases
607	Icebag purchases
606	Icebag purchases
609	Icebag purchases
850	Charcoal
876	Vegetable plants

Appendix C: Alogoritm to impute missing scores

Item	Score group	Keywords used to identify the group	Imputed score	Product module code	Product group code
Milk					
	low	skim, 1%, 2%	4.5	3625	2506
	high	whole, 2, 2%, red fat, vitamin d	5	3625	2506
	other	milk,	4.75	3625	2506
Bakery - Bread Fresh					
	low	mltigrn ,whole grain, multi grain, rubschlager, multigrai, light, 12 grain	3	4000	1501
	wheat	wheat ,whole, pmprnkle, ,rye, whlgrn, brown, 100%,	4.5	4000	1501
	high	ciabat, sourdo, loaf, baguet, bun, potat, potato, hny, rasin, honey, ,hawai, pizza, pza crst, brea, sand, white , texas toast, clsc wh, toast, sara lee, hone, country pot, cin raisin, white, pumper, english muffin, poto brd, natures harvest, honey 7 grain, whte bred glut, butter, sugar f, potat, bread, honey wheat, hawaiian , oatm, brd, king haw sliced,	6	4000	1501
	other	naa ,focca, bage, pza, bread, roll, sara, hartford, ital, bun, fluffy, mrs carv, bread ,roll, sara, hartford, ital, bun, brd, multigrain, toast,	6	4000	
Bakery-Buns-Fresh					
	wheat	wheat,	4.5	4001	1501
	other	hotdogbuns, buns, hamburber, hot d, hamb, brats, white, coney, classic, dog, bun, hmb bun,	5	4001	1501
Bulk ice cream					
	low	lf, no sugar, lt, rf , ff, lite, low fat, low, reduced,	6	2672	2005

	bb brc ,rocky, bunny, talenti, ice, banana, almond, B&j, cow, choc vanila ,pe, cdouble, str bellchocneapbutterkempsice crechocolatedeansneapolitancf prem ic tpice creamstrawberrycoffeechipcherrylactobreyerspnt btrmintrock rdtriplebord chryappletin roofsundaerocky roadcookiepecanmoose tracksfannie maebrownie,cook& crm, fudge almond fdge butter pecan banana bunny tracks chunky choc chip ,b& j, b&j, cow bell ,gelato ,ice crm,	Group		
all	crm, cream,	mean	2672	2005
Candy-chocolate				
low	dark, dr, kdk %,60 ,	8	1493	
Canned-soup				
low	org,brth ,nat,unslated,low ,broth, stock,	4	1290	
Dairy sourcream				
low	lite,	5	3604	
high	sour , cream, sr, crm,	6	3604	
Bottled water				
low	spring, , drink ,aquafina, , fiji, ,coconut, , mineral, ,	5	1487	
high	vitamin,flav ,punch, strawb, fruit, sobe,	7	1487	
Ground beef				
all	ground beef ,grnd beef, lean gr beef, groung chuck, ground chuck, grnd-bf,	8		
Chicken				
all	breast ,thigh, ,	6		
Soft- Drinks carbonated				
low	low calorie ,diet, decaf, tea, sugarfree, izze, zero, caf, italian,	6		
Canned green beans				
low	lite ,no salt,	3		
Bacon-refrigerated				
low	low ,sodium, lght, l/sod,	8		
regular	bacon ,bcn, smoked, bac, bacon ,bac, bcn, honey b,	10		

Dough Biscuit			
low	rfat ,	6	
dough	biscuit ,buttermilk, btrmilk, bisc, btrmlk, pil,	8	
Sauce mix- Taco			
tacosauce	taco ,mild, mrs,	4	
yogurt refrigerated			
very high		7	
high		6	
low	rfat ,nonfat, 100, plain, ff, grk, pla,	3	
other	chobani ,yogurt, pf, nostimo, noosa, yog, farms, chob,	6	
Snacks- potato chips			
low	kettle, lightly, lite, baked, veggie, vegetable, vegatable, straw,	5	
high	chip, lay, chp, wavy, potato, ruffles, mesquite, backers, rachel,	6	
very high	pring, stax,	9	
Cookies			
low	graham, grhm, lite, ff, belvita, cracker,		5
medium	oreo, waf, peanut, pnt, ginger, biscotti, pb, butter, butt, oat, rsin, mac, nut,	7	
high	sugar, icd, frost, easter, frst, iced, pink, sugr, blue, yellow,		10
		Group	
other	cookie, ck, loft, choc, snicker,	mean	
other	cookie, ck, loft, choc, snicker,	8.44	
Dry seasoning			
all	leaves, onion, sage, dill, cinnamon, spice, basil, mint, celery, italian, herb, seasoning, cloves, chili, curry, cajun, garlic, seed, oregano, mrs dash, mc , cv , sf ,	1.5	
Toma all			
all	tom, diced, crush,	3	
Vegetables-beans-chili-canned - the mode on the website is 3 for meatless canned chili beans			
all	bean, chil,	3	
Cottage cheese			
low	rfat, 2, 4, 1, %, skim, low, free, ff , lf , lite,	3.5	

high	cottage ,cheese, cot, chs,	4.5	
Cheese natural reminaing			
all	che, chs, jack, colby, strng, shred, shing, jk, chunk, stick, ,	7	
Cheese-slices-processed-american			
low	rfat, %, skim, low, free, ff , lf , lite, lt ,	7	
high	amer ,cheese, jack, chs, slice,	8	
Cheese-processed-cream cheese			
low	,rfat, %, skim, low, free, ff , lf , lite, lt ,	6	
high	crm ,cheese, chs, che, soft, sprd, ,	7	
Vegetables-mixed-frozen			
all	veg, calif, blnd, broc, fry, frzn, yellow, pea, stir, protein, oriental, country,	Group mode	
Mushrooms-shelf stable			
all	mushroom, mshrm, stem,	4	
Sugar			
		10	
		10	
		10	
		10	
		10	
Oils, butter, shortening, margerines and spreads- for justification refer to excel sheet			
oliveoil	,olive,xtra,vir,olv,	8.2	1193
butter			
		9.6	
		9.6	
Fruit drinks-other container			
		6	
Vegetable-frozen potatoes			
		Group mode	
Lunchmeat-refrigerated sliced			
low	,rfat, lean, lite, lt , ff , lf , lite,	8	

Fresh pies			
		Group mean	
Toppings- whipped frozen			
low	rfat, skinny, low, free, ff , lf , lite, lt ,	7	
Frankfurters			
low	rfat ,skinny, low, light, free, ff , lf , lite, lt , lean,	8	
Gravy mixes packaged			
		Group mean	
Vegetables - corn whole kernel canned			
		Group mean	
Cereal-ready to eat			
low	bran, rasin, cheerios, unfrost,	5	
		Group mean	
other			
Pasta- noodles and dumplings			
		Group mean	
all			
Bakery- bread frozen			
		Group mean	
all			
Olives-black			
		Group mean	
all			
Vegetables-beans kidney/red canned			
		Group mean	
all			
Frozen Novelties			
		Group mean	2675
all			

Candy non-chocolate				
			Group	
	all		mean	1498
Dry dinner- pasta				
			Group	
	all		mean	1340
Pasta - macaroni				
			Group	
	all		mean	1331
Vegetable juice - tomato				
			Group	
	all		mode	1054
BAKERY-BREAKFAST CAKES & SWEET ROLLS-FROZEN				
			Group	
	all		mean	2652
BAKERY-CAKES Fresh				
			Group	
	all		mean	4004
Nuts- Bagged				
	low	natural, ori, dry, raw, sliver, almon,	3	
	high	honey, salt, bbq, pecan, pea, nut, cash,	5	
	low	natural, ori, dry, raw, sliver, almon,	3	1508
	high	honey, salt, bbq, pecan, pea, nut, cash,	5	1508
Mexican - tortillas				
	low	corn, crn,	2.6	
			Group	
	high	tort, flour, baguet, bred, glut,	mode	
	low	corn, crn,	2.6	1257
			Group	
	high	tort, flour, baguet, bred, glut,	mode	1257
Canned-fruit peaches cling				
	low	100, lt, juice,	3	

high	peach, sl,	5	
Pasta-speghetti			
all	pasta, spag, penne, lasa, angel, noodle,	Group mode	
Peanut butter			
low	nat, orig,	4.5	
high	peanut butter, crmy, pnt, btr, but,	6	
Tuna- canned - shelf stable			
low	lt,	3	
high	tuna,	5	
Tea-bags (Stay high scores)			
all	blk, bag, green, tea, bige, lip, eng, chai,	Group mode	
all	blk, bag, green, tea, bige, lip, eng, chai,	Group mode	1458
Sausage dinner(Stray low observations)			
all		Group mean	3572
dairy cream refrigerated			
low	lt, light, half, 1/2,	6	
all		10	
Apple juice			
all		Group mean	1033
Pizza- frozen			
low	cheese, chs, 3 ch, 4 ch,	6	
high	piz, pza, palermo, cal, mich, bread, crust, frontera, jack, tony, sup, sausa, pepp, chick,	Group mode	
Vegetables frozen -Product group code			
low	broc, lim, yell, beans, frsh, frzn, harv,	Group mode	
high	french, crin, shoe, ,tater, hash, pot, tot,	5	

Lunchmeat -deli pouches refrigerated			
		Group	
all		mean	3618
Cannedfruit-oranges			
		Group	
all		mean	1014
Desserts-rtsingle serve canned			
low	app, sce, nat, buddy, ,	2.4	
medium	fruit, pear, peach, pine, ,	4.5	
all		7	
Frozen-waffles frenchtoast pancakes			
		Group	
all	tst, waff, pan, cke, french, frn,	mode	
Pickles-dill			
		Group	
all	dil, pic,	mean	1168
Pudding-sweetened mix			
		Group	
all		mode	
Frozen poultry			
		Group	
all		mode	
popcorn-unpopped			
low	but, lt, light, lite, ,	6	
Mexican sauce			
		Group	
all		mode	
Vinegar			
		Group	
all		mode	
Sausge- breakfast			
low	turkey, trky, tky, pork, prk, pk,	8	

Pie filling canned		
		Group mode
all		
Bakery-muffin fresh		
low	eng ,bag, light, bred, ,	6
medium	banana ,nut,	7
high	cake ,muffin, choc, blue, muf, pink, crm, dnt,	10
canned fruit - pineapple		
		Group mode
all		
canned milk		
low	f/f ,lf, light, lite, ,	6
Bread- rolls -fresh		
low	wheat, brown, grain, rye, brwn,	5
		Group mode
high	white, whte, roll, bread, bun, focc, dinn, bag, hawa, hart,	
Dairy-dip refrigerated		
		Group mode
all	dil, di, dp, ranch, gauc, taco, jal, guac, chs, sprd, che,	
Breading products		
		Group mode
low	andy ,crum, coat, louis, fry, ssnd, zatar,	
high	bk ,golden, pank, gld, seasoning, onion,	6
Snack- torilla		
low	tost ,tortil,	4.5
high	nach ,dorito, faji,	7
Candy- special chocolate		
		Group mode
all		

Figure 1

Figure 2

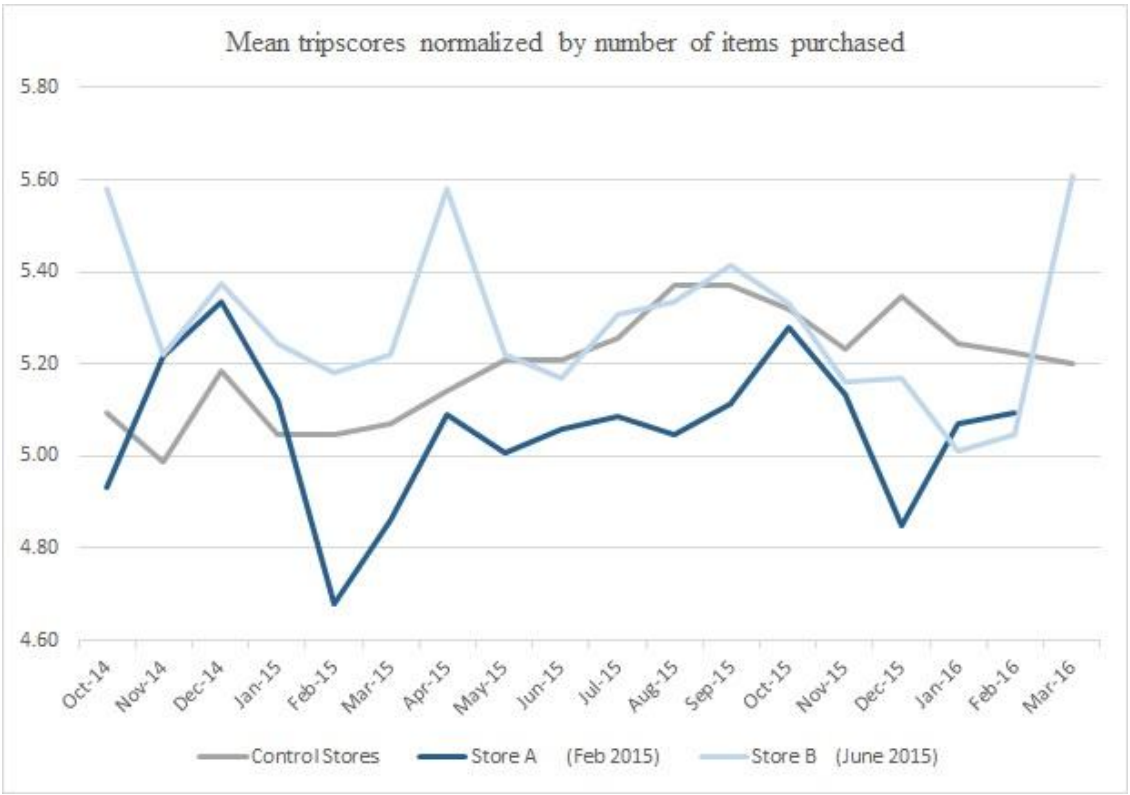
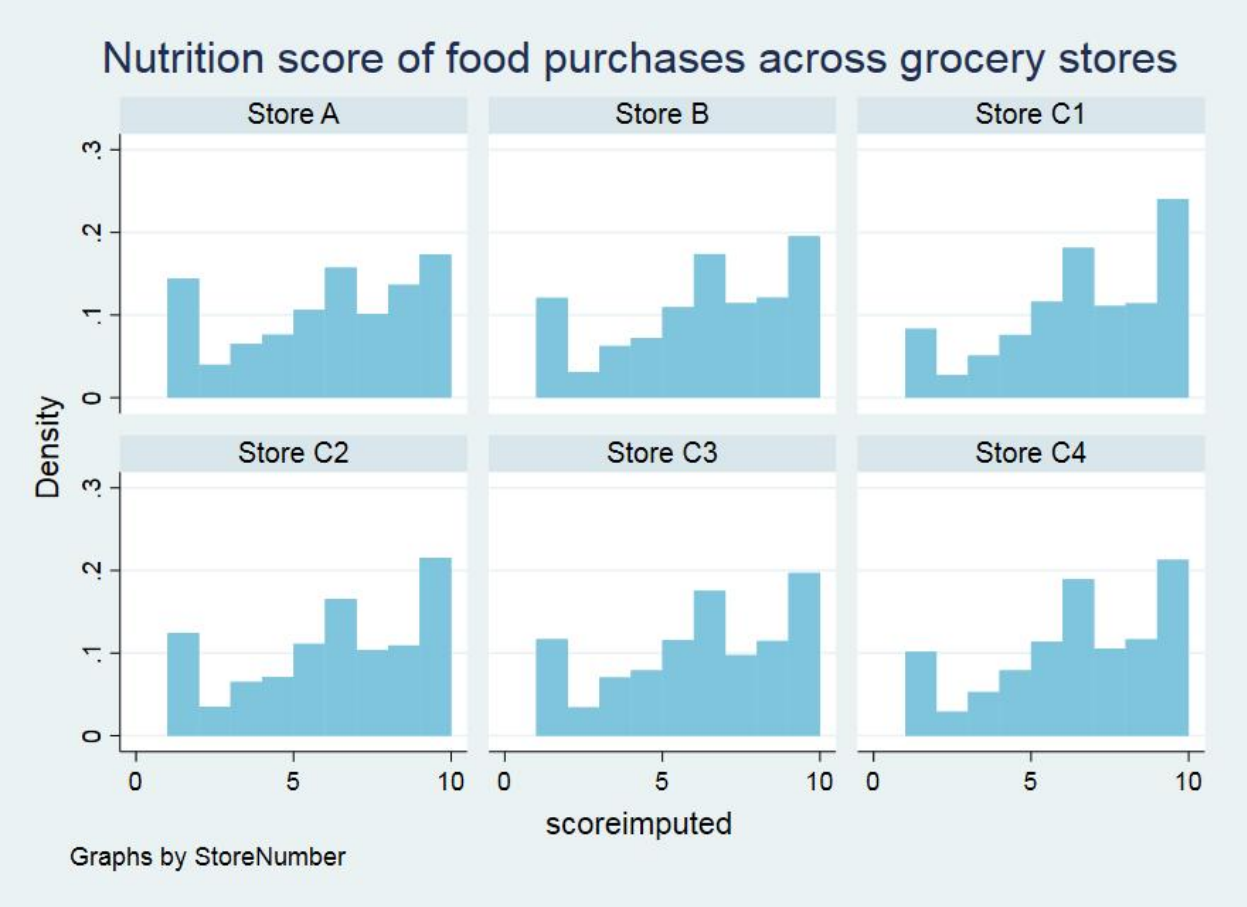


Figure 3


Nutrition score of food purchases across grocery stores
Store A
Store B
Store C1
Store C2
Store C3
Store C4
Density
0
.1
.2
.3
0
5
10
scoreimputed
Graphs by StoreNumber