Nudges in the Supermarket: Experience from Point of Sale Signs

Janani R. Thapa, Graduate Research Assistant
Department of Agricultural and Applied Economics
Texas Tech University

Conrad Lyford, Associate Professor
Department of Agricultural and Applied Economics
Texas Tech University

Eric Belasco, Assistant Professor
Department of Agricultural Economics and Economics
Montana State University

Barent McCool, Assistant Professor
Restaurant, Hotel and Institutional Management
Texas Tech University

Audrey McCool, Professor Emeritus
University of Nevada – Las Vegas

Barbara Pence, Professor
Pathology
Texas Tech University Health Sciences Center

Tyra Carter, Corporate Dietician
United Supermarkets, LLC

Selected paper prepared for presentation at the Agricultural & Applied Economics Association's 2014 AAEA Annual Meeting, Minneapolis, MN, July 27-29, 2014

Nudges in the Supermarket: Experience from Point of Sale Signs

Abstract

A project was designed with a supermarket in a small community to provide point of sale signs or nudges. These signs encouraged consumers to purchase healthier foods in main supermarket categories accompanied, in the intervention community and store, by overall healthy choice signs and messages to increase the sale of produce and other healthier food items. The community education reinforcement program included newspaper articles, public service announcements on television and in-person healthy eating classes. Relative to the control store, the program had a statistically significant impact on increasing purchases within the grain pasta and sauce category among the nudged item's categories; and a significant increase in the purchase of green leafy produce category. An overall increase in the purchase of several nudged item's categories and produce categories shows promise in supermarket based community interventions for behavior change. However, the lack of significant increase in purchases across all categories shows the challenges of changing food purchase behavior.

Key words: Supermarket, nudge, community reinforcement, obesity, food choice

Introduction

The Dietary Guidelines for Americans 2010 recommend stronger environmental strategies for improving the population's eating practices, including interventions to influence food purchasing behaviors in stores (USDA-USDHH, 2010). A number of research projects have been accomplished on accessibility to supermarket in relation to obesity and obesity related health problems (Spence et al., 2009). However, few researches have focused on using supermarkets to promote health despite the fact that supermarkets play an important role in food purchasing (Glanz and Mullis, 1988). An average consumer makes on an average 2.2 trips per week to the supermarket (FMI, 2011). Supermarket can play a vital role in community-based participatory obesity prevention efforts. Some of the recommendation to use supermarket in healthy diet promotion are to tie supermarket profits with healthy diets, and to make healthy foods more appealing and available (RWJF, 2011).

The use of supermarkets as a potential site for effective consumer education was researched substantially in the late 1980s and early 1990s (For e.g. Ernst et al., 1986 and Scott et al., 1991). Light et al. (1989) reported on a feasibility test of the supermarket as a site for consumer nutrition education program "Eat for Health"; which was a joint research study by the National Cancer Institute (NCI) and the Giant Food Inc., a regional supermarket chain in the Washington-Baltimore area. Despite the effectiveness of supermarket based programs like "Eat for Health" (For e.g. Scott et al., 1991 and Song et al., 2009) there is little use of supermarket interventions to prevent and reverse the trends in obesity. So there is value in ramping up work in using supermarket as an active health promotion site (RWJF, 2011). Also, a systematic review by Escaron et al. (2013), done to synthesize the evidence on supermarket and grocery store interventions to promote healthful food choices, reported effectiveness from grocery

interventions while needing more rigorous testing of interventions. Additionally, no other studies based on supermarket and grocery store intervention that specifically uses point of sales signs-*shelf talkers* can be found after Light et al. (1989) and Patterson et al. (1992).

While obesity is reaching epidemic levels, several studies on community based models have shown success in reversing the obesity trend and in disease prevention (for e.g. Brownson et al., 1996; Chou et al., 1998 and Allen et al., 2013). Other studies like Baker and Brownson (1998), Merzel and D'Afflitti (2003), and Corda et al. (2010) including the American Cancer Society emphasized community-based programs which encompass multiple interventions as the model with best potential to achieve behavior change that will reduce person's health risk (ACS, 2012).

One approach, less used in grocery stores, but also suggested by Gittelsohn and Lee (2013), is to coordinate the grocery store interventions with community reinforcement to encourage awareness and to hopefully shift purchase to healthier products. The design of the current program was to develop a community-based cancer risk reduction program. It was intended to develop an effective feasible program that could be adopted relatively easily by small communities but could also be applicable in a broader context. We have described the model in McCool et al. (2013). The project was implemented in a major supermarket in a small community. The store and the community was a good setting to implement the intervention due to high rates of obesity in the community and because the community was small the message over the media regarding healthy eating habit could be controlled.

The project model focused on incorporating obesity risk education in the local supermarket. The supermarket focus was designed with an objective to encourage the development of a community environment supportive of lifestyles that could reduce residents

risk for obesity and cancer. Since, the local supermarket is the largest source of daily food needs; the supermarket can be an excellent source of information and reinforcement for healthy behavior. The supermarket was used for following purposes:

- to conduct healthy food demonstrations,
- to put *shelf talkers* on comparatively healthy food product,
- as an active site of information flow by using posters regarding healthy eating were placed in the store, and
- to access food purchase data to evaluate the effect of the project on food purchase behavior.

The literature also suggests that there are few contemporary studies of strategies for obesity risk reduction that have focused in supermarket with community reinforcement. Community reinforcement is expected to be more effective than a business only approach because the motives from the community generally would not be profit oriented and can include business efforts. We found in the intervention that relying on a business only approach raised the visibility of purchased products by only 14% while a multi-tiered community effort increased awareness of desired awareness/use by 41% (McCool et al., 2013).

The goal of this essay is to conduct an outcome evaluation to measure the achievement of program objectives. The specific objective of the analysis is to see if the point of sale nudges and supermarket health promotion intervention could increase the consumption of relatively healthier items and fresh fruits and vegetables. The focus is on quantitative outcomes, on whether or not the supermarket intervention was effective in changing food purchase behavior. The objective was addressed by using supermarket sales data. The use of supermarket sales data have been

recommended also by Tin et al. (2007) from a review of twenty two studies that used supermarket sales data to supplement food and nutrition monitoring methods.

Review of literature

Risk factors for obesity

The causes of obesity are complex. There is also a disparity in obesity incidence rates among population groups. According to the American Cancer Society disparities predominantly arise from inequities in work, wealth, income, education, housing, and overall standard of living, as well as social barriers to high quality cancer prevention, early detection, and treatment services (ACS, 2012). There appears to be little difference in the cancer incidence and mortality rates of rural and urban populations in the United States. But, evidence suggests that cancer tends to be diagnosed at a more advanced stage among rural populations (Monroe et al., 1992; Gosschalk and Carozza, 2003; Philips et al., 2011 and Gong et al., 2012). The American Cancer Society also suggested that patients from ethnic minorities are substantially more likely to be diagnosed with cancer at a later stage, when treatment can be more extensive and more costly (ACS, 2012).

Access to food is another factor in being able to select healthy foods. Kumanyika et al. (2008), and Wang and Beydoun (2007) have pointed to income limitations as well as the accessibility of chain supermarkets to be limiting persons' ability to acquire foods of higher nutrition value. The relative costs of foods with high and low nutrient density and caloric values may be another factor contributing to the unhealthy choice. Several research studies (Drewnowski, 2003; Drewnowski and Specter, 2004; Drewnowski and Darmon, 2005; Ard et al., 2007 and Maillot et al., 2007) suggest that the current market prices encourage unhealthy eating. Products with high fat and sugar and low in other nutrients are relatively less expensive than

foods such as fruits and vegetables and whole grain products, foods lower in calories per unit weight as compared to less healthy foods.

Supermarket interventions

A recent report published by the Robert Wood Johnson Foundation (RWJF, 2011) has emphasized harnessing the power of supermarkets to help reverse childhood obesity. The report was developed on the following two guidelines:

1. "Marketing strategies to encourage healthy eating must improve the bottom line, or at least be revenue neutral, for food retailers, and manufacturers, and
2. Public health researchers and food retailers and manufacturers should work together to study how grocery store environments and marketing strategies affect shoppers' purchases and preferences."

Light et al. (1989) reported a feasibility test of supermarket as a site for consumer nutrition education program "Eat for Health". The reported supermarket nutrition intervention was built on previously successful collaborative experiences between Federal agencies and supermarket and on the experience of other researchers who had conducted point of purchase studies. The added component of "Eat for health" program was the scope of the project, its length, its extensive advertising, and the scale and depth of the evaluation. The details of the method and analysis of the impact of the NCI Giant Food Eat for Health Study can also be found in (Patterson et al., 1992). Other studies of health promotion through supermarket intervention have followed though no publicly reported efforts have used point of sale signs to promote healthy food habit since Light et al. (1989).

Escaron et al. (2013) excellently summarized the studies published from 1978 through 2012 on supermarket and grocery store interventions (N=33) to promote healthful eating. This

paper identified 58 articles and characterized 38 supermarket interventions. Some other studies that were not included in Escaron et al. (2013) also studied supermarket intervention. Two cross sectional time series models, estimated with a variance components procedure, showed the effectiveness of coupons, assuming habit and non-habit persistence along with consumer demographics (Ward and Davis, 1978). Similarly, Cummins et al. (2005) reported evidence for an improvement in psychological health of those directly engaged with the intervention although a net intervention effect on fruit and vegetable consumption was not found.

Use of scanner data

An evaluation of the feasibility and applicability of supermarket sales data in population food and nutrition monitoring has been done by Tin et al. (2007). In this study, eighteen studies that collected supermarket sales data for various population food and nutrition monitoring purposes and four feasibility studies were reviewed. The findings supported the feasibility of using supermarket sales data to monitor population food purchasing pattern. Further, the study showed that it is possible to use various kinds of sales data (directly collected check out scanner data, commercially available data sets, and grocery receipts) in population nutrition monitoring.

Using sales data have some advantage over traditional survey methods. Since sales data are objective, they are relatively free form recall bias or deliberate misinformation commonly encountered in traditional surveys. Use of supermarket sales data was recommended as an indirect measure of intervention effectiveness (Kristal and Ollberding, 2012). Similarly, Andreyeva and Luedicke (2013) used scanner sales data obtained from supermarket chain to assess how the Women Infant Children revisions affected purchases of bread and rice among WIC participating households in Connecticut and Massachusetts. In that study the main outcome

variables were total weight of bread, rice, and tortillas (in ounces) purchased by a household in a given month.

Influence of personal characteristics in food choice decisions

A trivariate probit model estimation of the effect of respondent's personal characteristics on decision to participate in attaining healthy weight was done by Chen and Huffman (2009). The personal characteristics included were education, reading food labels (signaling concern for good health), adjusted family income, opportunity cost of time, occupation, marital status, race and ethnicity. This study concluded men and women who read more food labels are more likely to participate in moderate or vigorous physical exercise, and women are less likely to be obese. In a previous study, Bender and Derby (1992) found that US label readers are more likely to be female, older, more educated and on restriction diets.

Research on the use of nutrition facts label in Honolulu reported that one half of the shoppers used nutrition facts label and an additional 18% reported using labels sometimes. The frequency of use did not differ by age, but Caucasians reported using labels more often than all of the others ethnic groups (Dooley et al., 1998). In a survey conducted by the Food Marketing Institute (FMI), 31% of the food shoppers interviewed either said they did not know what Percent Daily Values meant or defined it incorrectly (FMI, 2013).

Conceptual framework

The dictionary definition of persuasion is "cause someone to believe convince." Eysenck and Keane (2005) identified persuasion as an information processing activity, in which thoughts are actively manipulated to create new beliefs and attitudes. Heath and Fairchild (2007) defined persuasion as any activity which changes the attitudes of the recipient. Two different types of persuasion are defined by Heath (2006): rational and emotional. Performance claims, promotions, offers and the like are rational persuasion and what creates strong brand loyalty and repeated positive experience from consuming a product is emotional persuasion.

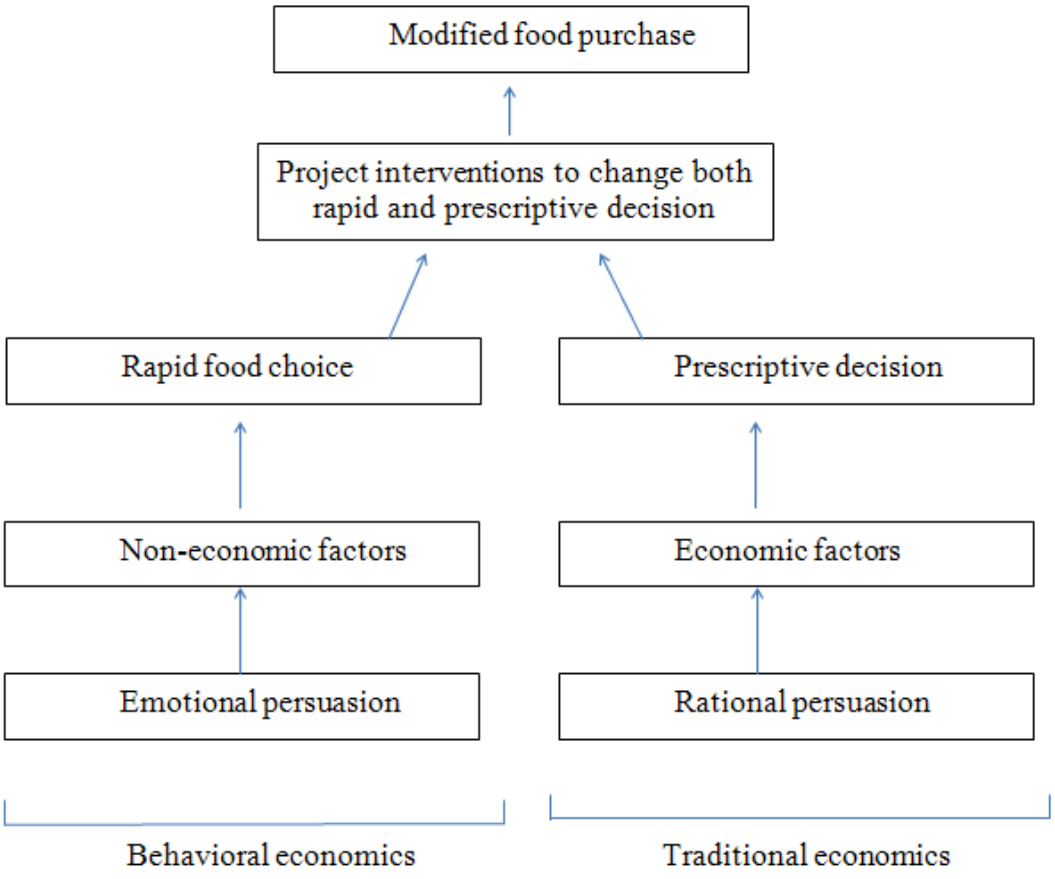

Figure 1 Conceptual Framework for the Supermarket Intervention

Figure 1 above shows the conceptual framework for the supermarket intervention. A previously held view was a rational choice view of human nature but the rational choice view is narrow (Cawley, 2004). Non-economic factors also affect decision explained by behavioral economics. Behavioral economics assumes that people depart from rationality in systematic ways (Kahneman, 2003). The role of emotions in decision making have been explained in Damasio (1994) as cited in Loewenstein (2000).

Success has been reported in applying behavior economics to increase healthy food choice and consumption. A growing body of research suggests that people respond to contextual cues without conscious thought or decision making. Distraction as an external cue is reported to have major effect on the food selected, the amount consumed and the eater's perception (Just et al., 2007). Self-attribution: when people feel that they have made their own decisions, has been recorded to provide greater satisfaction to the consumer (Just and Wansink, 2009). Choice architecture (where in choices are affected without letting the decision makers know that their decision have been influenced) has been shown to work (Just et al., 2007; Just and Wansink, 2009; Hanks et al., 2012a; Wansink et al., 2012 a, b and Van Kleef et al., 2013). Human's ability to act automatically (for e.g. if people touch something very hot, they will withdraw their hands before they have time to make conscious decision to do so) is a protective measure; however, it extends to eating and food choices (Cohen and Babey, 2012).

Consumer behavior in food choice decision can be of two extreme types: a) prescriptive that can be persuaded, and b) rapid decision based on heuristic devices (appearance, shapes, sizes, logos, brands etc.). The most important factor in a supermarket intervention success is how it influences the consumer. Persuasion and reinforcement mechanism during *post facto* choice behavior was identified also by Sheth (1974). Both prescriptive and rapid decision is based on

behavior. Behaviors exemplify this phenomenon; there are specific behaviors initiated automatically by contextual cues that were previously congruent with the performance of behaviors (Orbell and Verplanken, 2010).

This research applies both prescriptive and rapid food choice decision theories to change the behavior of consumers towards healthier food choice decision. The *shelf talkers* placed near relatively healthier items is proposed to help rapid decision makers by altering the heuristic device, providing healthy living visual cue. Providing *shelf talkers* has been listed under contextual influences in Cohen and Babey (2012). On the other hand, the overall multi-tiered health promotion approach supports prescriptive decision making based on persuasion.

Further, research on behavioral change in many different areas (e.g., smoking cessation, nutrition, and exercise) has focused on the multiple aspects involved in promoting behavioral change (e.g., an individual's readiness to change, economic factors, barriers to change). Drawing on literature across disciplines (economics, business, psychology, and marketing); it is clear that behavioral change is influenced by a multitude of factors (Fisher et al., 2002; Rose et al., 2009). Likewise, reinforcements for behavior change should come from many different aspects of the environment to be most effective. Economos et al. (2007) demonstrated how the community context can be modified and reinforcements can be offered to prevent weight gain. Embedding reinforcements within multiple levels of a person's environment provides a comprehensive effort towards addressing obesity risk factors.

Methods

Research setting

A small community of Muleshoe, TX was the setting to implement the project. The supermarket intervention was a part of a multi-tiered cancer prevention model with a substantial focus on obesity reduction. The activities in the supermarket were implemented in partnership with the management team of a local supermarket located in the intervention community. The selected supermarket was the United Supermarket. This supermarket is the largest supermarket of its size and sale volume in the city followed by small chain stores. The store intervention can be categorized into three types:

1. Point of sale signs or nudges to encourage consumers to purchase healthier foods in main supermarket categories,
2. Overall emphasis and communication to promote purchase and consumption of fresh fruits and vegetables (hereafter referred as produce) and other identified healthier food items, and
3. Community efforts to reduce obesity. The point of sale nudges and healthy eating messages were reinforced by a community education program including newspaper articles, food demonstrations, and public service announcements on television and in-person healthy eating classes.

The supermarket intervention to promote purchase and consumption of produce were carried out from January of 2012 to December of 2012 (hereafter referred as the trial period). Products were selected by their relatively higher NuVal score within each category targeted. The NuVal system places a single numeric score 1-100 based upon the nutritional characteristics of the product and allows us to compare foods using a single metric to establish the relative

healthfulness (Katz et al., 2010). The shelf talker nudges were checked once every month for placement accuracy. A total of 402 items were identified for placing *shelf talkers*. The data for this paper is the sales data of the 402 product with *shelf talkers* from the intervention store and the sales data of same products from the control store.

Data

The data set for this research was different for the produce and the identified healthier food items. Each data set has been explained separately under produce and point of sales nudges sections below. Further, the demographic data used to analyze the awareness and attitude towards healthy food promotion in supermarket are described under the demographics and project activities data in the sections below.

Produce

The data set includes monthly sales data (measured in units sold per product or in ounces per produce item) and their price, from January 2011 to December 2011 (hereafter referred to as the pre-trial period) and the trial period from the intervention and control store. There were a total of 2240 produce items being sold over the period of 24 months. However, many of the produce items were either discontinued or seasonal sales. The data set was cleaned to include items that were consistently sold over the 24 months (12 month of pre-implementation and 12 month of post-implementation) period with Universal Product Codes (UPC). Thus the analysis is done in following two parts:

1. Continued items: Includes sales data for only 10 categories of produce: apples, avocados, bananas, beans, bellpepper, berries, carrots, citrus, cucumber, and eggplant that were sold across the 24 months,

2. Continued and discontinued items: The dataset with or without continued sale of a unique UPC coded item categorized into the following fourteen categories: apples, avocados, bananas, beans, broccoli, citrus, corn, cucumber, grapes, green-leafy, other fruits, other vegetables, potatoes and salad. However, the categories bean and potato were dropped from the analysis. Category beans were dropped because it contained many dried bean items as well and the project promotion was on increasing sales of fresh fruits and vegetables and not other forms of vegetables including dry beans. Similarly potatoes was also dropped because there is an increasing debate among nutritionist that potato is biologically a vegetable but unlike other vegetable it is a starchy food like grains.

Point of sale nudges

The data for this paper is the monthly sales data of the 402 products with *shelf talkers*, from the intervened store and the control store. The control store was in a location with demographics similar to intervention store location. These stores were the largest supermarkets in these small communities. The data includes monthly sales data (measured in units sold per item) from January 2011 to December 2012 from both stores. The data were obtained from computerized cash registers, which record all individual purchases by UPC. None of the selected items were on promotion or discounted in price differently at any time during the analysis period. A similar comparison of sales data with two stores in matching geographic region and demography was accomplished by Sacks et al. (2010). The 402 selected items were categorized into 12 categories based on the Food Marketing Institute Product Category List, published in 2012 (FMI, 2012). The 12 categories with the number of items in each category in parenthesis are: Bakery and Bread (27), Baking (24), Beverages (29), Soda (4), Breakfast (48), Can foods (70), Dairy and Cheese (34), Frozen (41), Grain Pasta and Sauce (10), Meat and Seafood (39),

Pantry (41), Snacks (35). Monthly sales data has been reported to have the same variation compared to weekly data by Narhinen et al. (1998).

Community awareness and project activities data

Two small communities: Muleshoe and Dalhart in the state of Texas were selected, as project implementation and control sites respectively, based on their similar demographics. Muleshoe was selected as the intervention site as this small community met the criteria for implementing community-based research. The average poverty rate in these communities ranged from 9% to 23% and more than one third of the populations are Hispanic. The poverty rate of Dalhart is 9-15%. The population of Muleshoe is about 4,571 with 17-50% of the population estimated to be Hispanic. The poverty rate of Muleshoe is 17-23% (TTUHSC, 2010). The data were drawn from the data collected in two independent surveys among a total of three surveys undertaken during the project period. The demographic data used in this chapter were from the post-implementation survey (June of 2012) that was conducted at both control and intervention site; and from a follow-up (January of 2013) survey that was conducted only in the intervention site. The project activity data used in the analysis is from the intervention site from the post-implementation and follow-up survey.

There were a total of 550 respondents during 2012 survey: 335 from Muleshoe (Intervention) and 215 from Dalhart (Control). Of the total respondents in Muleshoe and Dalhart; 69 and 39 of them had participated in the baseline pre-intervention survey. Inclusion criteria for participation were for individuals who were at least 18 years of age, and self-identified as living in the communities of Muleshoe and Dalhart. They were invited to participate by mail sent out to a random sample of local population drawn from the local telephone book; the average show up rate was 22.3%; and this random sample was supplemented by participants invited through flyers

and pamphlets distributed in public areas and printed in local newspapers. Similar recruitment with mail survey was also done by Crawford et al. (2000). The demography of mail recruited respondents and the respondents recruited through flyers and pamphlets were not significantly different (Appendix 1 and 2) in both the comparison and intervention site. Appendix 3 also shows that the response on other indicator variables used in this analysis was not significantly different between the respondents recruited through flyers and pamphlets in the intervention site during the post-implementation survey.

Data analysis

The data analysis was done separately for the two data sets: 1) produce data, and 2) point of sale nudges data. Similarly, the data set included household characteristics of respondent who shopped from this supermarket. However the sales data was not available at individual level. Hence, the analysis is limited to comparing the change in sales by category in the intervention and control supermarket during the pre-trial and trial period. Similar tests to compare change in sales in units sold per item has been done to analyze supermarket intervention (Sacks et al., 2011). Further, the demographic data available from the questionnaire survey was used to compare the attitude toward project activities conducted in the supermarket and to find attitudes towards in-store healthy food choice messages and nudges by demographics.

The analysis of this data set however was limited due to lack of category sales data to compute proportional sale as done by Narhinen et al. (1998). Since the data available from the supermarket was a complete set of sales data in the produce aisle, computation of category sales data would have been possible. However, the lack of standard categories within the produce section would make the result inconsistent. Hence the category sales were not computed. Further, the interest of the research was to increase the sales of fresh fruits and vegetables overall

and not a particular item with a fruit or a vegetable category. The interest in putting *shelf talkers* on healthier items was to increase proportional sales of the nudged item within category; however lack of category sales data limited our analysis to looking at the sales difference with control store during the pre-trial and trial period.

All the analysis was done using SAS Enterprise Guide 5.1, SAS Institute Inc. The sales data in units sold per month was standardized to compute the units sold per unit dollar before analysis to account for the price differential between the pre- and post-implementation period, the price across all months was same in both the comparison and intervention store.

Produce data analysis

Paired comparison for pre- and post-implementation sales in intervention community

The difference between the monthly sales data on produce purchases during the pre-trial and trial period was tested using paired t-tests for the data set of items that were sold each month from January 2011 to December 2012 in the intervention store.

Change in produce sales an overall comparison

In the paired comparison if a brand of orange in citrus category with a specific UPC code would have been continued to be sold but if it was also substituted (not replaced) by a new brand of orange with a different UPC code. In cleaning the data for this analysis the item with the different UPC code would be deleted (as a discontinued item) and hence the deleted item would cause the total sale of citrus to decrease by including only the item with the specific UPC code in the analysis. This caused an unusual fluctuation in sales data. For this reason the analysis was done for all items in the category following the paired comparison. The sales data on produce purchases with or without continued sale of a particular item was used to test the mean difference of sales against a null hypothesis of zero difference by using independent t-test for the dataset.

The overall change in the sales of produce was computed by double difference method. The method of finding simple intervention effect is finding the difference between the changes in intervention mean minus the change in comparison mean. This is a typical way to measure the change and is a comprehensible method (Naresh, 2007 and Kristal and Ollberding, 2012):

$$(V_b - V_f)_i - (V_b - V_f)_c$$

where, V is the variable of interest; subscript b and f refer to pre-trial and trial respectively; and subscript i and c are for intervention and comparison.

Further, the percentage change in sum of units sold per month for each category was computed for both intervention and control store. The overall percentage change in produce sale as found from the formula above was computed from the pre-trial sale in the intervention community. The mean sales during the pre-trial and trial period were compared using independent t-test, separately for the intervention and control site.

Point of sale nudges data analysis

The change in sales data in units sold per month summed across each category of identified food items from pre-trial to trial period was computed. The percentage change in sum of units sold per month for each category was computed for both intervention and control store. However, the change in mean sales in units sold per month from the pre-trial to trial period was tested using independent t-test separately for the intervention and control store. Unlike for the produce data set no paired test were done for the point of sale nudges data.

The overall percentage change in produce sale was computed from the pre-trial sale in the intervention community. The overall effect of the project intervention in sales of point of sale nudges item was computed by double difference method. A method of finding simple

intervention effect by finding the difference between the changes in intervention and the change in comparison mean was used.

Community awareness and use of project activities

Intervention awareness and attitude towards intervention (*shelf talkers* and NuVal scores) of the respondents who self-reported regular shopping in the supermarket was also analyzed by demographics.

Results

Produce sales

Paired comparison in intervention community

The mean units of produce sold per month during the pre-trial and trial period in the intervention community, the change in unit sales per month and the corresponding p value from a paired t-test between sales during the pre-trial and trial period is shown in Table 1. A paired t-test was used because the comparison was done for the produce items that were consistently sold over the 24 months (12 month of pre implementation and 12 month of post implementation) period followed by UPC. Further if data for any month was missing in one of the year the data for concurrent month was deleted from the other year to make a paired observation. As shown in Table 1, the sales of bananas, carrots, cucumber and eggplant increased significantly, while there was a significant decrease in sales of citrus. For the reasons explained in the data and methods section the paired comparison in Table 1 shows large fluctuation in sale of stable fruits like citrus.

Table 1 Sales of produce during pre-trial and trial period

Category	Pre-trial		Trial			
	Mean	SD	Mean	SD	Change	p-value
Apples	288.39	781.33	337.68	860.25	49.29	0.166
Avocados	4395.39	4039.28	4143.43	3392.26	-251.96	0.567
Bananas	7702.25	7921.46	8056.30	8280.44	354.05	0.028**
Beans	13.97	22.24	21.97	44.78	8.00	0.181
Bell pepper	345.42	590.39	358.78	581.00	13.35	0.502
Berries	9.51	33.24	15.42	41.40	5.91	0.178
Carrots	66.40	113.09	73.64	131.51	7.23	0.055*
Citrus	4072.78	8411.63	3014.71	6452.85	-1058.07	0.014**
Cucumber	54.93	93.80	134.98	202.26	80.05	0.037**
Eggplant	11.82	2.87	17.15	6.08	5.33	0.026**

P value from paired t-test, * and ** significant at 10 and 5% level of significance respectively

Change in produce sales and overall comparison

The change in produce sales was computed by finding the change in sum of produce sales in units sold per month in pre-trial period and trial period in both the control and intervention store. The percentage change in the sum of produce sales in units sold per month and the overall change found by double difference method as explained in methods is shown in Table 2. The table reports the percentage change in sales (monthly units sold summed across each category) by category for all the fresh produce items sold in the supermarket. The change % for the intervention and control store is the change from pre-trial period. As shown in Table 2, the sale of avocados, citrus, and grapes decreased in both the intervention and control store. In addition, in the control store the sale of apples, broccoli, corn, and salad also decreased in the trial period from pre-trial period.

Table 2 also reports the overall change in units sold (%). The overall change is derived from change in intervention and control store. There was an overall growth in the sales of apples, bananas, broccoli, corn, green leafy, other fruits, and salad; and less decline in the sales of avocado, citrus, and grapes. The overall decrease in sales was observed in categories cucumbers and other vegetables. The decrease in the sales of cucumbers was very high (21%). The sharp decline in the overall sales of cucumber caused due to a 21% increase in sales in the control store could not be explained with the available data set.

Further, as shown in Table 2 the total number of units sold from pre-trial period to the trial period decreased in both the stores; by 12% in the intervention store and by 16% in the control store. Using the double difference method the overall change in the monthly units sold was an increase of 4% in the sales during the trial period in the intervention store. The overall sales increase was highest for the categories apples, broccoli and green leafy vegetables.

Table 2 Change in units sold from pre-trial period to trial period and overall change

	Change in units sold (%)		
Produce category	Intervention	Control	Overall
Apples	6	-13	19
Avocados	-6	-9	3
Bananas	5	2	3
Broccoli	9	-5	14
Citrus	-19	-25	6
Corn	7	-2	9
Cucumber	0	21	-21
Grapes	-34	-36	3
Green leafy	62	39	23
Other fruits	7	1	6
Other vegetables	0	3	-3
Salad	2	-3	5
Total	-12	-16	4

Independent t-test was used to compare the sales during the pre-trial period with the sales during the trial period in both intervention and control store. Table 3 shows the statistics from independent t-test for mean difference from pre-trial to trial period with a null hypothesis of no difference in sales in units sold per month between the pre-trial period and trial period separately in the intervention and control store. As shown in Table 3, mean sales in units sold per month was significant only for green leafy produce (at 10% level of significance in the control store and 5% level of significance in the intervention store).

The analysis reported in Tables 2 and 3 supports the inference that the project had a positive impact on purchase of fresh produce. The change in produce purchase in green leafy produce category was significant and the overall effect was positive.

Table 3 Change from pre-trial to trial period for produce (mean no. of units sold)

Produce category	Control		Intervention		Mean change	
	Mean (SD)		Mean (SD)			
	Pre-trial	Trial	Pre-trial	Trial	Control	Intervention
Apples	173.30	150.55	103.17	109.44	-22.75	6.27
	(995.86)	(827.37)	(569.42)	(575.57)		
Avocados	537.76	491.70	462.74	436.18	-46.06	-26.56
	(2038.89)	(1638.06)	(1865.65)	(1670.32)		
Bananas	1194.61	1213.24	770.26	805.70	18.63	35.44
	(5219.32)	(5263.09)	(3376.41)	(3530.45)		
Broccoli	17.82	16.62	9.27	9.99	-1.20	0.72
	(78.43)	(71.51)	(42.56)	(44.84)		
Citrus	1239.49	929.60	1126.16	907.45	-309.89	-218.71
	(6440.96)	(4249.20)	(5604.14)	(4364.26)		
Corn	299.20	293.04	200.50	215.27	-6.16	14.77
	(1611.94)	(1462.32)	(1047.24)	(1090.05)		
Cucumber	248.05	298.95	217.01	217.02	50.90	0.01
	(875.28)	(1042.21)	(830.63)	(712.06)		
Grapes	124.85	80.50	67.52	44.85	-44.35	-22.67
	(519.57)	(256.33)	(242.98)	(140.45)		
Green	2.28	3.14	2.19	3.53	0.86*	1.34**
	(7.04)	(8.17)	(8.89)	(11.78)		
Fruits	37.72	37.82	26.36	28.07	0.10	1.71
	(277.87)	(268.70)	(189.74)	(192.28)		
Vege.	57.55	58.94	36.77	36.73	1.39	-0.04
	(491.31)	(356.57)	(337.67)	(242.44)		
Salad	41.98	40.95	31.77	31.47	-1.03	-0.30
	(324.91)	(313.90)	(298.97)	(289.50)		

P-value from t-test, * and ** significant at 10 and 5% level of significance respectively

Point of sale nudges

Change in sales and overall comparison

The sum of sales in units sold per month was higher in the control store than in the intervention store for all categories during both the pre-trial and trial periods. The change in sales of nudged item (items with *shelf talkers*) was computed by finding the change in sum of sales of nudged item in units sold per month from pre-trial period to trial period in both comparison and intervention store. The overall change was found by double difference method as explained in methods. The results are shown in Table 4. The table reports the percentage change in sales (monthly units sold summed across each category) by category for all nudged item and the change %. The change % is the change from pre-trial period. The overall change in units sold (%) is the overall change from the units sold in the pre-trial period.

As shown in Table 4, the total units sold of the nudged items decreased from the pre-trial period to the trial period in both stores; by 4% and 5% respectively in the intervention and control store. The project expectation was for these items' sale to be increased within their respective category. Due to lack of category sales data it could not be clarified if the drop in sales was throughout the category or in the nudged items only. However, the availability of sales data and hence the comparison of sales with the control store provides some idea on the effect of intervention.

The change in monthly sales from pre-trial to trial period was not homogenous across the categories. The sale of nudged items in bakery and bread, can food, dairy, drinks excluding soda, soda, and meat and seafood category decreased in both the intervention and control store. The sale of nudged items in breakfast category decreased only in the control store. There was an overall growth in the sales of nudged items in categories breakfast, frozen, and grain and pasta;

and less decline in the sales of nudged items in categories can food, dairy, drinks excluding soda, meat and seafood, and soda. The overall decrease in sales was observed in the sales of nudged items in categories bakery and bread, baking, snacks and a higher decline in the intervention store in the category pantry. From this comparison of units sold, the category grain pasta and sauce followed by the categories of (a) canned food, (b) frozen, and (c) meat and seafood shows a potential positive nudging effect.

Table 4 Total percentage change (units sold) from the pre-trial to trial period

Point of sale shelf talker category	Change in units sold (%)		
	Intervention	Control	Overall
Bakery and bread	-14	-4	-10
Baking	25	29	-4
Breakfast	2	0	2
Can food	-3	-8	11
Dairy	-10	-14	4
Drinks excluding soda	-4	-5	1
Frozen	13	1	12
Grain and Pasta	44	15	29
Meat and seafood	-4	-10	6
Pantry	-11	-6	-5
Snacks	4	14	-10
Soda	-1	0	-1
Total	-4	-5	1

An independent t-test was used to compare the sales of nudged items during the pre-trial period with the sales of nudged items during the trial period, separately for the control and intervention stores. Table 5 shows the statistics from independent t-test for mean difference from pre-trial to trial period with a null hypothesis of no difference in sales in units sold per month between the pre-trial period and trial period separately in the intervention and control store. As shown in Table 5, mean sales in units sold per month was significantly higher in the intervention store only for nudged items in category grain and pasta (at 5% level of significance). From this t-test the category grain pasta and sauce shows a potential positive nudging effect.

Table 5 Change from pre-trial to trial period (mean units sold per month)

Category	Control		Intervention		Mean change	
	Mean (SD)		Mean (SD)			
	Pre-trial	Trial	Pre-trial	Trial	Control	Intervention
Bakery and bread	54.26 (86.56)	51.87 (88.84)	42.57 (65.61)	36.84 (57.79)	-2.39	-5.73
Baking	9.14 (17.42)	11.80 (22.85)	6.43 (12.72)	8.04 (16.41)	2.66	1.61
Breakfast	5.69 (7.41)	5.67 (7.33)	3.90 (4.80)	3.99 (4.61)	-0.02	0.09
Can food	48.47 (131.38)	44.80 (119.34)	27.06 (71.63)	26.26 (66.45)	-3.67	-0.80
Dairy	34.39 (108.91)	29.63 (83.54)	29.61 (93.42)	26.52 (84.22)	-4.76	-3.09
Drinks excluding soda	16.39 (44.47)	15.51 (38.24)	13.21 (45.45)	12.63 (43.16)	-0.88	-0.58
Frozen	9.18 (10.28)	9.31 (11)	5.42 (6.38)	6.11 (7.06)	0.13	0.69
Grain and Pasta	13.94 (12.45)	16.07 (16.84)	8.61 (7.74)	12.42 (17.40)	2.13	3.81**
Meat and seafood	8.11 (12.61)	7.27 (11.91)	5.72 (8.98)	5.46 (7.68)	-0.84	-0.26
Pantry	16.89 (24.18)	15.91 (25.37)	10.56 (15.30)	9.41 (17.07)	-0.98	-1.15
Snacks	9.23 (14.24)	10.51 (15.62)	8.50 (12.19)	8.88 (12.34)	1.28	0.38
Soda	11.95 (7.71)	11.91 (7.59)	7.48 (5.19)	7.44 (5.86)	-0.04	-0.04

P-value from t-test, * and ** significant at 10 and 5% level of significance respectively

Community awareness and use of project activities

Community's perception on project activities

In doing the analysis to find the effect of supermarket intervention in healthy food choice decision the current analysis was restricted by the unavailability of data to analyze the direct effect of intervention at an individual level. However, an important indicator of success and usefulness of the project is whether community members recognized and found project activities to be helpful. With this end in mind an analysis of respondent's attitude towards project activities was done by using the data available from the questionnaire survey done during the trial period and the follow up survey. From the survey during the trial period, 85% of the respondents in the intervention site had seen project health messages in the project period. This shows the overall awareness of health messages in the community to be 85%.

The results of respondents' attitude towards each project activities during the trial period are shown in Table 5. As shown in the table, community members were most aware of the *shelf talkers* in the supermarket (38%) followed by information from community education classes (25%) and nutrition education classes (5%). Fifty four percent of the respondents reported to have tasted the foods during the food tastings organized by the project in the supermarket. Project activities were viewed very positively by community members. Of the respondents' aware of information and programs provided to 4-H, boy and girl scouts, youth and other groups on cancer prevention 97% reported it to be helpful. Of the respondents' who had seen blue or green signs -cut your risk boost your health (*(shelf talkers)* in the supermarket, 80% reported it to be helpful. Similarly, 85% of the respondents' who had considered NuVal score before purchasing food item reported the score system to be helpful.

Table 6 Community views of the project during the trial period

	Value use of information provided (N=276)	yes	proportion
1.	Aware of information and programs provided to 4-H, boy and girl scouts, youth and other groups on cancer prevention	70	25%
	If yes, agree (strongly agree or agree) these programs have helped learn more about cancer risk reduction and healthy living	68	97%
2.	Participate in monthly education classes at County Electric Co-op	14	5%
	If yes, agree (strongly agree or agree) participation has helped to learn more about cancer	14	100%
3.	Taste foods at the food tasting at the Supermarket	148	54%
	Tried the recipes received at food tasting in the Supermarket	53	36%
4.	Seen Cut your risk boost your health *(shelf talkers)*	106	38%
	If yes, agree (strongly agree or agree) that the signs were helpful	85	80%
5.	Consider NuVal score before purchasing food item	39	14%
	If yes, higher NuVal score should be selected	28	62%
	If yes, NuVal score is helpful (very helpful or helpful)	33	85%

The results of respondents' attitude towards each project activities during the post-trial period from the follow up survey are shown in Table 7. As shown in the table, community members were most aware of the *shelf talkers* in the supermarket (48%) followed by information from community education classes (28%) and nutrition education classes (5%). Sixty percent of the respondents reported to have tasted the foods during the food tastings organized by the project in the supermarket. Of the respondents' aware of information and programs provided to 4-H, boy and girl scouts, youth and other groups on cancer prevention 54% reported it to be helpful. Of the respondents' who had seen blue or green signs that said cut your risk boost your health *(shelf talkers)* in the supermarket, 67% reported it to be helpful. Similarly, 54% of the respondents' who had considered NuVal score before purchasing food item reported the score system to be helpful. Hence all the project activities were viewed positively by the community members; yet less positively during the follow up period compared to during the trial period.

Table 7 Community views of the project from the follow-up survey

	Value use of information provided (N=200)	yes	proportion
1.	Aware of information and programs provided to 4-H, boy and girl scouts, youth and other groups on cancer prevention	57	28%
	If yes, agree (strongly agree or agree) these programs have helped learn more about cancer risk reduction and healthy living	31	54%
2.	Participate in monthly education classes at County Electric Co-op	11	5%
	If yes, agree (strongly agree or agree) participation has helped to learn more about cancer	8	73%
3.	Taste foods at the food tasting at United Supermarket	120	60%
	Tried the recipes received at food tasting in the Supermarket	64	53%
4.	Seen Cut your risk boost your health *(shelf talkers)*	96	48%
	If yes, agree (strongly agree or agree) that the signs were helpful	64	67%
5.	Consider NuVal score before purchasing food item	41	20%
	If yes, higher NuVal score should be selected	16	39%
	If yes, NuVal score is helpful (very helpful or helpful)	22	54%

Awareness by demographics

From the available data set it was also possible to analyze the intervention awareness and attitude towards intervention (*shelf talkers* and NuVal scores) of the respondents who self-reported regular shopping in the supermarket was also analyzed by demographics. This section explains the intervention awareness and attitude towards intervention by several demographic variables (education, income, race, age, gender, and language).

Education

Table 8a shows the awareness and use of NuVal score by level of education. The highest proportion of respondents who considered NuVal score system during purchase was high school graduate, 38% and 50% respectively in intervention and control community. The highest proportion of respondent who used NuVal score system during purchase and considered it helpful was also high school graduates, 29% and 38% respectively in intervention and control community.

Table 8a Use of NuVal score system by education level

NuVal score	Consider during purchase (%)		Consider helpful (%)	
	Intervention	Control	Intervention	Control
Elementary	12	7	24	7
High school graduate	38	50	29	38
Some college or technical school	25	27	22	34
College graduate	25	17	24	21

Table 8b shows the awareness and use of healthy eating signs placed by the project by the respondents' level of education in the intervention site. The highest proportion of respondents who considered healthy eating signs during purchase was high school graduate (39%). The highest proportion of respondent who used healthy eating signs during purchase and considered it helpful was also high school graduates (39%).

Table 8b Use of in-store signs by education level in the intervention community

Store signs	Consider during purchase (%)	Consider helpful (%)
Elementary	21%	24%
High school graduate	39%	39%
Some college or technical school	21%	21%
College graduate	19%	16%

Income

Table 9a shows the awareness and use of NuVal score system by income. The highest proportion of respondents who considered NuVal score system during purchase was in the income range of $20,000 to $35,000, 23% and 33% respectively in intervention and control community. The highest proportion of respondent who used NuVal score system during purchase and considered it helpful were in the income range less than $20,000 in intervention cite (34%) and in the range of $20,000 to $35,000 (38%) in the control community.

Table 9a Use of NuVal score system by income groups

	Consider during purchase (%)		Consider helpful (%)	
NuVal score	Intervention	Control	Intervention	Control
Less than $20,000	31%	27%	34%	24%
$20,000 - $35,000	23%	33%	21%	38%
$35,000 -$ 50,000	19%	10%	19%	3%
$50,000 - $75000	10%	20%	9%	17%
over $75000	17%	10%	17%	17%

Table 9b shows the awareness and use of healthy eating signs placed by the project by the respondents' level of income in the intervention community. The highest proportion of respondents who considered healthy eating signs during purchase in the intervention community were in the income level less than $20,000 (42%). The highest proportion of respondent who used healthy eating signs during purchase and considered it helpful was also in the income level less than $20,000 (45%).

Table 9b Use of in-store signs by income groups in the intervention community

Store signs	Consider during purchase (%)	Consider helpful (%)
Less than $20,000	42%	45%
$20,000 - $35,000	20%	22%
$35,000 -$ 50,000	14%	14%
$50,000 - $75000	13%	10%
over $75000	10%	9%

Gender

Table 10a shows the awareness and use of NuVal score system by gender. The highest proportion of respondents who considered NuVal score system during purchase were female, 75% and 63% respectively in intervention and control community. The highest proportion of respondent who used NuVal score system during purchase and considered it helpful were also female; 76% and 59% in the intervention and control community respectively.

Table 10a Use of NuVal score system by gender

NuVal Score	Consider during purchase (%)		Consider helpful (%)	
	Intervention	Control	Intervention	Control
Male	25%	37%	24%	41%
Female	75%	63%	76%	59%

Table 10b shows the awareness and use of healthy eating signs placed by gender in the intervention community. The highest proportion of respondents who considered healthy eating signs during purchase in the intervention community were female (70%). The highest proportions of respondent who used healthy eating signs during purchase and considered it helpful were also female (73%).

Table 10b Use of in-store signs by gender in the intervention community

Store signs	Consider during purchase (%)	Consider helpful (%)
Male	30%	27%
Female	70%	73%

Race

Table 11a shows the awareness and use of NuVal score system by race. The highest proportion of respondents who considered NuVal score system during purchase were white, 56% and 50% respectively in intervention and control community. The highest proportion of respondent who used NuVal score system during purchase and considered it helpful were also white; 52% and 48% in the intervention and control community respectively.

Table 11a Use of NuVal score system by race

NuVal score	Consider during purchase (%)		Consider helpful (%)	
	Intervention	Control	Intervention	Control
White	56%	50%	52%	48%
Hispanic	44%	43%	48%	45%
Other	0%	7%	0%	7%

Table 11b shows the awareness and use of healthy eating signs placed by race in the intervention community. The highest proportion of respondents who considered healthy eating signs during purchase in the intervention community were white (53%). The highest proportions of respondent who used healthy eating signs during purchase and considered it helpful was very close, 49% Whites and 50% Hispanics.

Table 11b Use of in-store signs by race in the intervention community

Store signs	Consider during purchase (%)	Consider helpful (%)
White	53%	49%
Hispanic	45%	50%
Other	1%	2%

Language

Table 12a shows the awareness and use of NuVal score system by language. The highest proportion of respondents who considered NuVal score system during purchase spoke English language, 92% and 80% respectively in intervention and control community. The highest proportion of respondent who used NuVal score system during purchase and considered it helpful also spoke English; 86% and 83% in the intervention and control community respectively.

Table 12a Use of NuVal score system by language

NuVal score	Consider during purchase (%)		Consider helpful (%)	
	Intervention	Control	Intervention	Control
English	92%	80%	86%	83%
Spanish	8%	20%	14%	17%

Table 12b shows the awareness and use of healthy eating signs placed by language in the intervention community. The highest proportion of respondents who considered healthy eating signs during purchase in the intervention community spoke English (93%). The highest proportions of respondent who used healthy eating signs during purchase and considered it helpful were also spoke English (92%).

Table 12b Use of in-store healthy eating signs by race

Store signs	Consider during purchase (%)	Consider helpful (%)
English	93%	92%
Spanish	7%	8%

Age

Table 13a shows the awareness and use of NuVal score system by age group. The highest proportion of respondents who considered NuVal score system during purchase were aged more than 30; 92% and 86% respectively in intervention and control community. The highest proportion of respondent who used NuVal score system during purchase and considered it helpful were also in the age group more than 30; 86% and 72% in the intervention and control community respectively.

Table 13a Use of NuVal score system by age group

NuVal score	Consider during purchase (%)		Consider helpful (%)	
	Intervention	Control	Intervention	Control
Less than or equal to 30	8%	23%	14%	28%
More than 30	92%	77%	86%	72%

Table 13b shows the awareness and use of healthy eating signs placed by age in the intervention community. The highest proportion of respondents who considered healthy eating signs during purchase in the intervention community was more than 30 years old (86%). The highest proportions of respondent who used healthy eating signs during purchase and considered it helpful were also in the age group more than 30 years old (85%).

Table 13b Use of in-store signs by age group

Store signs	Consider during purchase (%)	Consider helpful (%)
Less than or equal to 30	14%	15%
More than 30	86%	85%

Conclusions

Community-based models that incorporate supermarket in program activities are rare despite its potential effectiveness. A community-based cancer risk reduction program was implemented with a major supermarket in a small community. The small community setting allowed control over the media and a supermarket based intervention provided an excellent source of information and reinforcement for healthy behavior. In the project model, the supermarket was used a) to conduct healthy food demonstration, b) to put *shelf talkers* with healthy eating message in comparatively healthy food products, c) to provide healthy eating information, and d) to access food purchase data to evaluate the effect of the project on food purchase behavior. This research paper reports the project effect on food purchase behavior based on monthly sales in units sold per month for produce items and healthier items identified with *shelf talkers*.

The overall change analysis by double difference method and comparative analysis suggest that the project had a positive impact on purchase of fresh produce. The overall increase (or less decrease) was positive. On looking at the change by category the change in produce purchase in green leafy produce category was significant. Similarly, the overall change was positive in the sales of healthier items identified with *shelf talkers*. On looking at the change by categories the change was positive and significant for the category grain pasta and sauce. Thus the findings suggest that supermarket interventions have potential in changing food behavior. However, the lack of positive change across all categories also suggests the challenges associated with changing food behavior. Another analysis of attitude towards project activities showed that that the general awareness was 85% and majority either strongly agreed or agreed that the project activities were helpful.

The analysis reported in this paper was restricted by the lack of household level data on food and produce items' purchase. The data also lacked category level sales to compute change in the market share of identified items with *shelf talkers*. However, the demographic data available from the associated survey undertaken by the project was used to analyze the supermarket intervention awareness and attitude towards awareness by demographics. The results suggest that high school graduate in less than $20,000 income per year, English language speaking female over the age of 30 were most aware of the interventions and had positive attitude towards the interventions. The data also did not allow isolation of *shelf talkers* effect from the community-based healthy message reinforcement effect.

Appendix

Appendix 1 Response comparison in intervention site from post-implementation survey

Response item	Invitee	Volunteer	p-value
What is your marital status?			
Married	69%	62%	0.249
Divorced	8%	14%	0.205
Widowed	15%	4%	0.002
Separated	1%	6%	0.103
Never Married	6%	14%	0.067
What is the highest grade or year of school you completed?			
Elementary	18%	25%	0.259
High school graduate	33%	36%	0.673
Some college or technical school	19%	23%	0.531
College graduate	29%	16%	0.019
What is your annual household income from all sources?			
Less than $20,000	21%	35%	0.026
$20,000 to $35,000	19%	30%	0.090
$35,000 -$ 50,000	25%	14%	0.027
$50,000 - $75000	10%	14%	0.341
over $75000	25%	7%	0.000
Gender			
Male	40%	35%	0.389
Female	60%	65%	0.389
Race			
White	79%	40%	0.000
Hispanic	19%	58%	0.000

P-value from independent t-test

Appendix 2 Response comparison from control site during post-implementation survey

Response item	Invitees	Volunteers	p-value
What is your marital status?			
Married	39%	78%	0.000
Divorced	14%	7%	0.177
Widowed	18%	1%	0.000
Separated	7%	4%	0.472
Never Married	21%	9%	0.067
What is the highest grade or year of school you completed?			
Elementary	29%	23%	0.524
High school graduate	32%	36%	0.709
Some college or technical school	29%	27%	0.866
College graduate	11%	14%	0.623
What is your annual household income from all sources?			
Less than $20,000	39%	23%	0.070
$20,000 to $35,000	29%	36%	0.460
$35,000 -$ 50,000	7%	14%	0.350
$50,000 - $75000	18%	13%	0.478
over $75000	7%	15%	0.275
Gender			
Male	29%	36%	0.460
Female	71%	64%	0.460
Race			
White	61%	41%	0.048
Hispanic	32%	55%	0.028

P-value from independent t-test

Appendix 3 Comparing response in intervention site during post-implementation survey

Aware of information and programs provided to 4-H, boy and girl scouts, youth and other groups on cancer prevention.			
Yes	21%	26%	0.448
No	79%	74%	0.448
If yes, these programs have helped you or your families learn more about cancer prevention and healthy living.			
Strongly agree	13%	30%	0.205
Agree	73%	62%	0.412
Neutral	13%	9%	0.582
Disagree	0%	0%	NA
Strongly disagree	0%	0%	NA
Participate in monthly education classes at Bailey County Electric Co-op			
Yes	7%	3%	0.173
No	93%	97%	0.173
If yes, participation has helped to learn more about cancer			
Strongly agree	40%	33%	0.819
Agree	60%	67%	0.819
Neutral	0%	0%	
Disagree	0%	0%	
Strongly disagree	0%	0%	
Do you shop at united supermarket?			
Yes	94%	89%	0.211
No	6%	10%	0.254
Don’t know	0%	1%	0.537
Have you participated in food tastings?			
Yes	52%	51%	0.851
No	48%	48%	0.972
Don’t know	0%	1%	0.382
Have you tried the recipes?			
Yes	52%	51%	0.913
No	48%	49%	0.913
Have you seen the signs “cut your risk boost your health” in United Supermarket?			
Yes	30%	40%	0.137
No	30%	32%	0.760
Have seen	24%	20%	0.526
Don’t know	17%	9%	0.054
If yes, have you found them helpful in making healthy food choice			
Strongly agree	10%	28%	0.075
Agree	67%	53%	0.255
Neutral	24%	19%	0.621
Disagree	0%	0%	NA
Strongly disagree	0%	0%	NA

Do you consider a food item's NuVal score before purchasing an item?			
Yes	18%	14%	0.443
No	37%	44%	0.293
Don't know	45%	42%	0.626
Do you select items with higher or lower Vu-Val score to select the best nutritional value?			
Higher	37%	42%	0.507
Lower	39%	30%	0.218
Don't consider NuVal	16%	20%	0.456
Don't know	9%	8%	0.886
Do you find NuVal score helpful in making healthy food choices?			
Strongly agree	11%	17%	0.468
Agree	42%	32%	0.404
Neutral	47%	46%	0.918
Disagree	0%	2%	0.581
Strongly disagree	0%	3%	0.432

P-value from independent t-test

REFERENCES

Allen, M. L., Hurtado, G. A., Yon, K. J., Okuyemi, K. S., Davey, Cynthia S., Marczak, M. S., Stoppa, P., and Svetaz, V. M. (2013). Feasibility of a Parenting Program to Prevent Substance Use Among Latino Youth: A Community Based Participatory Research Study. *American Journal of Health Promotion*, *27*(4), 240–244.

Andreyeva, T., and Luedicke, J. (2013). Federal Food Package Revisions Effects on Purchases of Whole-Grain Products. *American Journal of Preventive Medicine*, *45*(4), 422–429.

Ard, J. D., Fitzpatrick, S., Desmond, R. A., Sutton, B. S., Pisu, M., Allison, D. B., … Baskin, M. L. (2007). The Impact of Cost on the Availability of Fruits and Vegetables in the Homes of Schoolchildren in Birmingham, Alabama. *American Journal of Public Health*, *97*(2), 367–372. Retrieved from http://search.ebscohost.com/login.aspx?direct=trueanddb=rzhandAN=2009517076andsite=ehost-live

Baker, E. A., and Brownson, C. A. (1998). Defining characteristics of community-based health promotion programs. *Journal of Public Health Management and Practice JPHMP*, *4*(2), 1–9. Retrieved from http://getit.libraries.psu.edu:9003/sfx_local?sid=Entrez:PubMedandid=pmid:10186729

Bender, M., and Derby, B. (1992). Prevalence of reading nutrition and ingredient information on food labels among adult Americans. *Journal of Nutrition Education*, *24*, 292–297.

Cawley, J. (2004). An economic framework for understanding physical activity and eating behaviors. *American Journal of Preventive Medicine*.

Chen, Y., and Huffman, W. (2009). An Economic Analysis of the Impact of Food Prices and Other Factors on Adult Lifestyles:Choices of Physical Activity and Healthy Weight. *Abstract: Agriculture and Applied Economics Association*.

Chou, C. P., Montgomery, S., Pentz, M. A., Rohrbach, L. A., Johnson, C. A., Flay, B. R., and MacKinnon, D. P. (1998). Effects of a community-based prevention program on decreasing drug use in high-risk adolescents. *American Journal of Public Health*, *88*(6), 944–948. Retrieved from http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1508235andtool=pmcentrezandrendertype=abstract

Cohen, D. A., and Babey, S. H. (2012). Contextual influences on eating behaviours: heuristic processing and dietary choices. *Obesity Reviews an Official Journal of the International Association for the Study of Obesity*, 1–14. doi:10.1111/j.1467-789X.2012.01001.x

Corda, K. W., Quick, V., Schefske, S., DeCandia, J., and Byrd-Bredbenner, C. (2010). TOWARD A POLYTHEORETICAL FRAMEWORK FOR HEALTH BEHAVIOR CHANGE. *American Journal of Health Studies*, *25*(4), 211–230. Retrieved from https://paloaltou.idm.oclc.org/login?url=http://search.ebscohost.com/login.aspx?direct=trueanddb=aphandAN=67311170andsite=ehost-live

Crawford, D., Jeffery, R. W., and French, S. A. (2000). *Can anyone successfully control their weight? Findings of a three year community-based study of men and women. International journal of obesity and related metabolic disorders : journal of the International Association for the Study of Obesity* (Vol. 24, pp. 1107–1110).

Cummins, S., Petticrew, M., Higgins, C., Findlay, A., and Sparks, L. (2005). Large scale food retailing as an intervention for diet and health: quasi-experimental evaluation of a natural experiment. *Journal of Epidemiology and Community Health*, *59*(12), 1035–1040. Retrieved from http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1732985andtool=pmcentrezandrendertype=abstract

Dooley, D. A., Novotny, R., and Britten, P. (1998). Integrating research into the undergraduate nutrition curriculum: Improving shoppers' awareness and understanding of nutrition facts labels. [References]. *Journal of Nutrition Education*, *Vol.30*(4), 225–231.

Drewnowski, A. (2003). Fat and sugar: an economic analysis. *The Journal of Nutrition*, *133*(3), 838S–840S. Retrieved from http://jn.nutrition.org/cgi/content/abstract/133/3/838S

Drewnowski, A., and Darmon, N. (2005). The economics of obesity: dietary energy density and energy cost. *The American Journal of Clinical Nutrition*, *82*(1 Suppl), 265S–273S. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/16002835

Drewnowski, A., and Specter, S. E. (2004). Poverty and obesity: the role of energy density and energy costs. *The American Journal of Clinical Nutrition*, *79*(1), 6–16. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/14684391

Ernst, N. D., Wu, M., Frommer, P., Katz, E., Matthews, O., Moskowitz, J., … Sondik, E. (1986). Nutrition education at the point of purchase: the foods for health project evaluated. *Preventive Medicine*, *15*(1), 60–73. doi:10.1016/0091-7435(86)90036-8

Escaron, A. L., Meinen, A. M., Nitzke, S. A., and Martinez-Donate, A. P. (2013). Supermarket and Grocery Store–Based Interventions to Promote Healthful Food Choices and Eating Practices: A Systematic Review. *Preventing Chronic Disease*. doi:10.5888/pcd10.120156

Eysenck, M. W., and Keane, M. T. (2005). *Cognitive Psychology: A Student's Handbook. Cognitive Psychology* (Vol. 5, p. 979). Psychology Press. Retrieved from http://books.google.com/books?id=_pBETDiOfmgCandpgis=1

Gittelsohn, J., and Lee, K. (2013). Integrating Educational, Environmental, and Behavioral Economic Strategies May Improve the Effectiveness of Obesity Interventions. *Applied Economic Perspective and Policy*, *35*(1), 52–68.

Glanz, K., and Mullis, R. M. (1988). Environmental interventions to promote healthy eating: a review of models, programs, and evidence. *Health Education Quarterly*, *15*(4), 395–415. Retrieved from http://heb.sagepub.com/cgi/doi/10.1177/109019818801500403

Gong, G., Belasco, E., Hargrave, K., Lyford, C., and Philips, B. (2012). Determinants of Delayed Detection of Cancers in the Texas Counties in the United States of America. *International Journal of Equity in Health*, *11*(1), 29. Retrieved from http://www.equityhealthj.com/content/pdf/1475-9276-11-29.pdf

Gosschalk, A., and Carozza, S. (2010). Rural Healthy People 2010: A companion document to Healthy People 2010. *College Station: The Texas AandM University System Health Science Center, School of Rural Public Health, Southwest Rural Health Research Center; 2003, Cancer in Rural Areas: A Literature Review*.

Heath, R. (2006). Emotional persuasion. *Advertising Research*, (5), 47–48.

Kahneman, D. (2003). Maps of Bounded Rationality: Psychology for Behavioral Economics. *The American Economic Review*, *93*(5), 1449–1475.

Kristal, A. R., and Ollberding, N. J. (2012). Evaluation of Nutrition Interventions. In A. M. Coulston, C. J. Boushey, and M. G. Ferruzzi (Eds.), *Nutrition in the Prevention and Treatmentof Disease* (3rd ed., pp. 191–208). Elsevier.

Kumanyika, S. K., Obarzanek, E., Stettler, N., Bell, R., Field, A. E., Fortmann, S. P., … Hong, Y. (2008). Population-Based Prevention of Obesity. *Circulation*, *118*(4), 428 –464. doi:10.1161/CIRCULATIONAHA.108.189702

Light, L., Tenney, J., Portnoy, B., Kessler, L., Rodgers, A. B., Patterson, B., … Tuckermanty, E. (1989). Eat for health: a nutrition and cancer control supermarket intervention. *Public Health Reports Washington DC 1974*, *104*(5), 443–450.

Loewenstein, G. (2000). Emotions in economic theory and economic behavior. *The American Economic Review*, *90*(2), 426–432. doi:10.2307/117263

Maillot, M., Darmon, N., Darmon, M., Lafay, L., and Drewnowski, A. (2007). Nutrient-dense food groups have high energy costs: an econometric approach to nutrient profiling. *The Journal of Nutrition*, *137*(7), 1815–1820. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/17585036

McCool, B., Lyford, C. P., Hensarling, N., Pence, B., McCool, A., Thapa, J., … Carte, T. M. (2013). Reducing Cancer Risk in Rural Communities Through Supermarket Interventions. *Journal of Cancer Education*, *28*, 597–600.

Merzel, C., and D'Afflitti, J. (2003). Reconsidering Community-Based Health Promotion: Promise, Performance, and Potential. *American Journal of Public Health*, *93*(4), 557–574. Retrieved from http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1447790andtool=pmcentrezandrendertype=abstract

Naresh, M. K. (2007). *Marketing Research an Applied Orientation*. Prentice Hall.

Orbell, S., and Verplanken, B. (2010). The automatic component of habit in health behavior: habit as cue-contingent automaticity. *Health Psychology Official Journal of the Division of Health Psychology American Psychological Association*, *29*(4), 374–383. Retrieved from http://dx.doi.org/10.1037/a0019596

Patterson, B. H., Kessler, L. G., Wax, Y., Bernstein, A., Light, L., Midthune, D. N., … Tuskermanty, E. (1992). Evaluation of a Supermarket Intervention: The NCI-Giant Food Eat for Health Study. *Evaluation Review*, *16*(5), 464.

Philips, B., Gong, G., Hargrave, K., Belasco, E., and Lyford, C. (2011). Correlation of the ratio of metastatic to nonmetastatic cancer cases with the degree of socioeconomic deprivation among Texas counties. *International Journal of Health Geographics*, 10–12.

RWJF. (2011). *Harnessing the Power of Supermarkets to Help Reverse Childhood Obesity*.

Sacks, G., Tikellis, K., Millar, L., and Swinburn, B. (2011). Impact of "traffic-light" nutrition information on online food purchases in Australia. *Australian and New Zealand Journal of Public Health*, *35*(2), 122–126. doi:10.1111/j.1753-6405.2011.00684.x

Scott, J. A., Begley, A. M., Miller, M. R., and Binns, C. W. (1991). Nutrition education in supermarkets: the Lifestyle 2000 experience. *Australian Journal of Public Health*, *15*(1), 49–55. doi:10.1111/j.1753-6405.1991.tb00010.x

Song, H.-J., Gittelsohn, J., Kim, M., Suratkar, S., Sharma, S., and Anliker, J. (2009). A corner store intervention in a low-income urban community is associated with increased availability and sales of some healthy foods. *Public Health Nutrition*, *12*(11), 2060–2067. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/19402943

Spence, J. C., Cutumisu, N., Edwards, J., Raine, K. D., and Smoyer-Tomic, K. (2009). Relation between local food environments and obesity among adults. *BMC Public Health*, *9*(192), 192. Retrieved from http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2708156andtool=pmcentrezandrendertype=abstract

Tin, S. T., Mhurchu, C. N., and Bullen, C. (2007). Supermarket sales data: feasibility and applicability in population food and nutrition monitoring. *Nutrition Reviews*, *65*(1), 20–30. Retrieved from http://onlinelibrary.wiley.com/doi/10.1111/j.1753-4887.2007.tb00264.x/abstract

Wang, Y., and Beydoun, M. (2007). The obesity rpidemic in the United States-gender, age, socioeconomic, racial/ethnic, and geographic characteristics: A systematic review and meta-regression analysis. *Epidemiologic Reviews, 29*(1), 6–28.

Ward, R. W., and Davis, J. E. (1978). A pooled cross-section time series model of coupon promotions. *American Journal of Agricultural Economics, 60*(3), 393–401.