Applied Research Briefs: Nutrition

Evaluation of a Supermarket Intervention to Increase Consumption of Fruits and Vegetables

Alan R. Kristal, Linda Goldenhar, Joann Muldoon, Roscoe F. Morton

Abstract

Purpose. *The purpose of this study was to evaluate whether a supermarket point-of-purchase intervention could increase shoppers' consumption of fruits and vegetables.*

Methods. *Eight supermarkets in rural Iowa were randomized to receive either an 8-month intervention or no intervention. The intervention consisted of: (1) one-page supermarket flyers that identified fruits and vegetables on sale, gave recipes and menu ideas for using sale foods, and gave a store coupon worth 50 cents toward the purchase of any fruit or vegetable; (2) store signage to identify fruits and vegetables featured on the flyer; and (3) consciousness raising activities such as food demonstrations and nutrition related signage. Evaluation was based on exit interviews and take-home surveys, completed by random samples of 120 shoppers from each store at baseline and approximately 1-year post randomization.*

Results. *At follow-up, 42.9% of intervention store shoppers and 6.5% of control shoppers recalled seeing the intervention flyer. Thirty-six percent of intervention shoppers had used a 50-cent coupon and 18% had used a recipe. Approximately 70% of all shoppers had purchased fruits or vegetables on the day they were interviewed, which did not differ between intervention and control stores. Compared to change in control shoppers, there was a borderline statistically significant 8.4 percentage point increase ($p < .07$) in the percentage of intervention store shoppers in the action or maintenance stages of dietary change, but there was no corresponding increase in fruit and vegetable consumption.*

Discussion. *Studies to test point-of-purchase interventions are difficult to design, implement, and evaluate. More powerful interventions are probably necessary to induce shoppers to purchase and consume more fruits and vegetables. (Am J Health Promot 1997;11[6]: 422–425.)*

Key Words: Food habits, Health promotion, Intervention studies, Fruit, Vegetables.

INTRODUCTION

Diets rich in vegetables and fruits are associated with reduced risks for many cancers.[1] Many public health nutrition programs, most notably the National Cancer Institute's "5-a-day" program,[2] have focused on promoting increased consumption of fruits and vegetables. However, results from several large and well-designed nutrition intervention studies have failed to demonstrate meaningful increases in fruit and vegetable use (as in Beresford et al.[3]). Supermarket point-of-purchase interventions, using devices that include shelf labels, posters, audiovisual media, and taste-testings,[4] are appealing because they can reach large numbers of persons at low cost. No studies have shown supermarket interventions effective in increasing total purchases of fruits and vegetables.

This report gives the results of a supermarket intervention to increase fruit and vegetable intake in rural Iowa. The goals of this research were to develop and test a theory-based point-of-purchase intervention and to evaluate alternative approaches for supermarket intervention evaluation.

METHODS

Design and Sample

This study was part of the Demonstration Cancer Control Project for Iowa Farmers, a 5-year program beginning in 1990 and funded by the National Institute for Occupational Safety and Health. The supermarket intervention began in September 1993 and continued for approximately 8 months. Participating stores were eight Hy-Vee supermarkets, all in

Alan R. Kristal, DrPH, is at the Fred Hutchinson Cancer Research Center and the University of Washington, Seattle, Washington. Linda Goldenhar, PhD, is at the National Institute for Occupational Safety and Health, Cincinnati, Ohio. Joann Muldoon, MS, and Roscoe F. Morton, MD, are at Mercy Foundation, Des Moines, Iowa.

Send reprint requests to Alan R. Kristal, DrPH, Cancer Prevention Research Program, Fred Hutchinson Cancer Research Center, 1124 Columbia, MP-702, Seattle, WA 98104.

This manuscript was submitted for publication December 27, 1995; revisions were requested April, 16, 1996; the manuscript was accepted for publication July 30, 1996.

Am J Health Promot 1997;11(6):422–425.

0890-1171/97/$5.00 + 0

small towns separated by at least 35 miles, similar in size, and with only modest amounts of ongoing health promotion activity. After baseline data collection, four stores were randomized to receive the intervention and four served as controls.

Intervention evaluation was based on monitoring sales of fruits and vegetables and by administering shopper interviews. The primary outcome was to be based on the comparison across intervention and control supermarkets of the total weight (fresh, frozen, and dried) or volume (canned) of fruits and vegetables sold each month. The protocol for collecting these data (available from the authors) was not successfully implemented in all stores, so it is not described further. Secondary outcomes were customer recall of and use of intervention materials and behavior changes associated with shopping in intervention stores.

Measures

At each store, 120 shoppers completed exit interviews at baseline and at 1-year postrandomization. This repeated cross-section evaluation design is statistically less powerful than following a cohort over time; however, it is simpler to implement and it avoids the biases inherent in recruiting and following a cohort. Interview periods were balanced across time of day and day of week. Using tables of random numbers, participants were systematically selected from cash register lines for the 5-minute interview, and those completing the exit interview received a take-home survey to mail back to study investigators.

Measurement

The exit interview collected data on demographics, shopping habits, recall of store signage, and purchase of fruits and vegetables. The take-home survey assessed intake of fruits and vegetables, diet habits, and stages of change in adopting diets high in fruits and vegetables. Intake of fruits and vegetables was assessed using a modified food frequency questionnaire,[2] based on the sum of usual frequencies of eating fruit juice, green salad, fried potatoes, other potatoes, vegetables (not including salad or potatoes), and fruits (not including juice). Fruit- and vegetable-related diet habits were a subscale of a previously validated instrument.[5] This scale score was the mean of six items (e.g., "When you ate snacks, how often did you eat raw vegetables?"), with options of "usually/always," "often," "sometimes," and "rarely/never" coded 1 to 4. Its Cronbach's alpha was .75 and its correlation with daily servings of fruits and vegetables was .59. Stage of change in adopting a diet high in fruits and vegetables was based on a previously validated algorithm,[6] which classified respondents on a continuum from precontemplation through contemplation, decision, and action to maintenance.

Intervention

The intervention was based on the Consumer Information Processing model,[4] which posits that consumers make decisions as a multistage process involving acquiring information, making a choice, and evaluating the outcome. The usual focus of intervention based on this model is to increase the salience of nutrition information, which for this study was expanded to include consideration of food costs.

The principal intervention components consisted of informational flyers and linked supermarket signage. The front side of the flyer listed fruits and vegetables on sale (including fresh, frozen, and canned foods) with a message to eat more fruits and vegetables and save money. The other side gave recipes and menus using sale items. Initially, new flyers were distributed weekly, and midway through the project flyers became biweekly and included a store coupon for 50 cents off any fruit or vegetable. Store signage consisted of highly visible labels that linked the sale fruit and vegetable items listed on the flyer to their shelf location. Additional intervention components included store signage, awareness raising activities (e.g., study personnel dressed as large vegetables handing out flyers to shoppers), and food demonstrations twice each month.

Analysis

Because randomization was by store and not individual, all statistical tests were adjusted for clustering by store. Contingency tables used the Rao-Scott correction,[7] and tests for changes between baseline and follow-up used linear or logistic models. These models included variables for time, treatment arm, and covariates (specified below), with the interaction of time by treatment as a test of the intervention effect, and were completed using the Statistical Analysis System's Proc Mixed procedure and GLIMMIX macro.[8]

RESULTS

Overall response rates to exit interviews were 59.8% in intervention and 67.2% in control stores, and were similar at baseline and follow-up. There were no significant differences in demographic characteristics between respondents from intervention and control stores. Approximately 84% of respondents were women, 68% lived in two-adult households, 60% had no children living in the household, and 28% considered themselves "farm families." Respondent age was distributed evenly across four categories: 18–33, 34–49, 50–64 and 65+.

Table 1 gives survey results on food purchases and recall of seeing or using intervention materials. Roughly 70% of respondents at baseline and 80% at follow-up purchased some type of fruit or vegetable. Intervention effects (intervention minus control) were 17.7% for recalling "a flyer with prices and recipes for fruits and vegetables" and 27.2% for picking one up. When interviewers held up a sample of the intervention flyer and asked if this was the flyer they remembered, the intervention effect increased to 36.4% (all $p < .001$). Among intervention respondents, almost 36% had used a 50-cent coupon and 18% had used a recipe. There were no significant intervention effects on the purchases of fruits and vegetables or recall of signage.

Response rates to the take-home survey at baseline were 74.5% in intervention and 72.3% in control markets, and at follow-up were 77.5% in

Table 1

Purchase of Fruits and Vegetables and Recall of Sales Promotion Materials of Respondents to Supermarket Exit Interview, at Baseline and One-Year Follow-up, by Treatment Group

		Baseline		Follow-up	
		Intervention	Control	Intervention	Control
(n)		476	479	478	480
Walk through produce section today					
%		81.0	79.0	93.7	82.1*
Purchase fruits and vegetables					
%	Fresh	65.9	65.3	72.8	68.7
	Frozen	14.6	14.2	18.3	24.0*
	Canned	41.3	58.7	34.0	34.0
	Any	71.6	70.4	80.3	78.7
Recall price signage					
%	Fresh	25.6	34.8	39.9	32.4
	Frozen	6.9	14.6	17.7	18.4
	Canned	10.7	16.9	27.9	21.3*
Recall health promotion signage					
%		29.4	15.3	23.7	18.7
Recall seeing flyers					
%	Fruit and vegetable flyer with prices and recipes, last 6 months			44.8	27.1†
	Intervention flyer, last 6 months			42.9	6.5†
	Intervention flyer, today			5.5	0.8†
Picked up intervention flyer					
%	Ever			38.5	11.3†
	Today			2.9	0.0†
Used a coupon					
%	Ever			35.9	
Used a recipe					
%	Ever			17.7	

* $p < 0.05$, intervention vs. control.
† $p < 0.001$, intervention vs. control.

both. There were no significant differences in demographic characteristics between intervention and control respondents at either baseline or follow-up.

Table 2 gives dietary characteristics of respondents to take-home surveys. Almost 50% of survey respondents reported eating a diet that was "very high" or "high" in fruits and vegetables for greater than 6 months (maintenance stage), and an additional 25% reported eating a diet "very high" or "high" in fruits and vegetables for less than 6 months (action stage). Comparing baseline to follow-up, the percentage respondents in action or maintenance among intervention respondents increased by 7.7 percentage points and decreased .7 percentage points among controls. The intervention effect, controlled for age, gender, income, and education, was borderline statistically significant ($p < .07$). For both intervention and control respondents, mean scores on the fruit and vegetable diet habits scale were 2.4 (slightly below the scale midpoint), and did not change. Consumption of fruits and vegetables was approximately 3.2 servings per day at baseline and 3.5 at follow-up, and was slightly higher among intervention respondents at both timepoints. The increases in fruit and vegetable intake, adjusted for age, gender, income, and education, were .27 servings per day in control respondents ($p < .03$) and .21 in intervention respondents ($p < .09$), and the intervention effect was not significant.

DISCUSSION

Summary

This study found no evidence that the supermarket-based, point-of-purchase intervention implemented in this study increased shoppers' consumption of fruits and vegetables. Neither purchase of fruits and vegetables on the day of the interview, usual consumption of fruits and vegetables, nor fruit- and vegetable-related dietary habits changed as a result of the intervention. There was some evidence that intervention increased the proportion of shoppers in the action or maintenance stages of dietary change, but this association was weak.

Limitations

It was not possible to evaluate whether the intervention affected total sales of fruits and vegetables, because only two stores ran the necessary monthly sales reports. This evaluation, based on monitoring Universal Product Codes for foods grouped by categories and package sizes, appeared to be feasible, but it took over 4 hours to generate reports in stores with less sophisticated computer systems. New cash register systems that allow researchers direct access to sales data would eliminate the need for special management of sales data at each store.

One reason for lack of intervention effects could be that the intervention was not sufficiently intense or of sufficient duration to reach the majority of supermarket shoppers. Only 43% of shoppers in intervention markets recalled having seen a flyer in the past 6 months, although most of these had picked up the flyer and used a 50-cent-off coupon at least once. Perhaps a better indication of the use of these flyers was that slightly less than 20% of shoppers had used one of the recipes printed on the back. These rates are high, however, compared to other studies. Achabal et al.[9] found that only 5.8% recalled signs and only

Table 2

Dietary Characteristics of Respondents to Take-Home Survey, at Baseline and 1-Year Follow-Up

	Baseline		Follow-up	
	Intervention	Control	Intervention	Control
(n)	356	347	369	371
Stage of change				
% Precontemplation	4.8	5.5	5.1	6.6
Contemplation	12.6	14.1	9.6	13.8
Decision	12.0	8.7	6.9	8.5
Action	21.5	22.8	27.1	23.3
Maintenance	49.2	49.0	51.3	47.8
Fruit- and vegetable-related diet habits scale				
$\bar{x} \pm sd$*	2.34 ± 0.71	2.35 ± 0.66	2.35 ± 0.60	2.32 ± 0.64
Fruit and vegetable intake (servings/day)				
$\bar{x} \pm sd$*				
Fruits	1.13 ± 0.84	1.11 ± 0.82	1.23 ± 0.83	1.18 ± 0.86
Vegetables	2.07 ± 1.08	2.01 ± 1.01	2.30 ± 1.17	2.24 ± 1.18
Fruits and vegetables	3.21 ± 1.75	3.14 ± 1.74	3.54 ± 1.79	3.44 ± 1.83

* Mean ± standard deviation.

3.6% read them, and Friend et al.[10] found that only 2.4% of shoppers who passed a display actually looked at it. In part, the low use of intervention flyers was probably due to the high level of sales and nutrition signage routinely displayed in the supermarkets. It was difficult to design and maintain intervention signage and flyer distribution that was sufficiently distinct from other signage and general sales advertisements. Another reason for the lack of observed effects could be that evaluation was based on shoppers who were already eating diets high in fruits and vegetables. Almost 75% of respondents reported "high" or "very high" intakes of fruits and vegetables.

Implications

Although point-of-purchase interventions may have considerable potential to change shoppers' food purchasing and consumption habits, demonstrating the efficacy of point-of-purchase interventions to increase fruit and vegetable consumption is difficult. These experiments are complex to design and evaluate, and during their implementation there is much that is outside of researchers' control. More powerful point-of-purchase interventions, longer duration of intervention programs, and better access to store sales data will be important for the success of future research.

Acknowledgments

Supported by Cooperative Agreements from the National Institute of Occupational Safety and Health CCU506139-0302 and CCU706142-04.

References

1. Steinmetz KA, Potter JD. Vegetables, fruit and cancer. I. Epidemiology. Cancer Causes Control 1991;2:325–57.
2. Subar AF, Heimendinger J, Paterson BH, et al. Fruit and vegetable intake in the United States: the baseline survey of the Five a Day for Better Health program. Am J Health Promot 1995;9:352–60.
3. Beresford SAA, Curry SJ, Kristal AR, et al. A dietary intervention in primary care practice: the Eating Patterns Study. Am J Public Health 1996. In press.
4. Glanz K, Hewitt AM, Rudd J. Consumer behavior and nutrition education: an integrative review. J Nutr Educ 1992;24:267–77.
5. Kristal AR, White E, Shattuck AL, et al. Long-term maintenance of low fat diets: durability of fat-related dietary habits in the Women's Health Trial. J Am Diet Assoc 1992;92:553–9.
6. Glanz K, Patterson RE, Kristal AR, et al. Stages of change in adopting healthy diets: fat, fiber and correlates of nutrient intake. Health Educ Q 1994;21:499–519.
7. Rao JNK, Scott AJ. On simple adjustments to chi-square tests with sample survey data. Annals Stat 1987;15:385–97.
8. SAS Technical Report P-229. SAS/STAT Software: Changes and Enhancements, Release 6.07. Cary, North Carolina: SAS Institute, 1993.
9. Achabal DD, Bell CH, McIntyre SH, et al. The effect of nutrition P-O-P signs on consumer attitudes and behavior. J Retal 1987;63: 9–24.
10. Friend TH, Dellmeir GR, Cross HR, et al. Time lapse videos of a "nutri-facts" display. J Nutr Educ 1990;22:56D.