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A Study of the Importance of Education and Cost Incentives on Individual Food Choices at the Harvard School of Public Health Cafeteria

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Abstract

Objectives—To investigate the importance of cost and awareness of health- or disease-promoting properties of foods and meals for choices by customers of a cafeteria.

Design—A non-randomized intervention study.

Setting—A medium size cafeteria in the Harvard School of Public Health.

Participants—Customers of the cafeteria mainly consisting of public health students, faculty, and school staff and workers from the medical campus.

Intervention—The purchase of healthy foods and dishes was subsidized and their prices reduced by 20%. This promotion was accompanied by the distribution of educational material.

Main Outcome Measures—Change in consumption of healthy and less healthy foods.

Analysis—The geometric mean was used to calculate the change in consumption.

Results—During the intervention, we observed a 6% increase in the consumption of healthy foods (95% confidence interval [CI]; 5% to 8%), and a 2% decline in the consumption of less-healthy foods (95% CI; -1% to -4%). After the prices returned to their original levels, the consumption of healthy foods increased further to 17% (95% CI; 13% to 20%) and a 2% decline in the consumption of less-healthy foods (95% CI; % 1 to -5%) persisted.

Conclusions—Subsidizing healthful meals and educating consumers about the importance of a healthy diet can result in a modest increase in the selection of healthy foods and meals that can be maintained beyond the periods of subsidy and promotion.

Keywords

food choices; cost; point-of-purchase

INTRODUCTION

The frequency of regularly consuming meals prepared outside of the home is increasing. These meals have been found to be of lesser nutritional quality, which may have a negative impact on the population health [1]. This phenomenon of modern life makes it important to understand eating behavior and the determinants of food choices at the point-of-purchase (customer behavior at the point of the purchase decision).

Many public and private efforts have actively engaged at the individual, group, and population level to improve nutrition and reduce the risk of chronic diseases [2]. Nutrition education programs generally operate on a population level to promote a healthy diet. Interventions targeting individuals or specific population subgroups may be more efficient but are more expensive than interventions that have the potential to reach larger populations through workplace, communities, and schools [3]. Environmental and policy interventions are being advocated for their cost-effectiveness. Environmental nutrition interventions may target availability, access, incentives, and pricing, or information about foods at the point-of-purchase [4]. Previously, only few studies have employed strategies of availability, access, and incentives.

Individual food choices are influenced by a number of factors, including taste, availability, convenience, cost, health consciousness, and body-weight considerations [5,6]. The relevance of these factors to decision-making, however, may depend on the individual and the circumstances. For example, a busy person may choose the meal that is easiest to obtain, while another person's decision may be driven by the prices of the available choices. If availability and convenience are not issues in these decisions, the question remains how heavily cost, awareness of health effects, and personal taste weigh in the decision process. Can appropriate health education influence a person's choice between two equally priced items? How important a factor is the elasticity of demand? Can a change in the pricing structure induce individuals to change their usual eating patterns, i.e., does a price reduction promote the consumption of healthful meals?

We were able to investigate in a limited way the importance of cost and awareness of health- or disease-promoting properties of foods and meals for choices among customers of the Harvard School of Public Health (HSPH) cafeteria in Boston, Massachusetts. Specifically, we explored whether reducing the price of foods considered healthy in combination with the distribution of educational material about diet and health would increase the purchase of such health-promoting foods and decrease the purchase of foods considered less healthy and whether such behavior can be maintained beyond the intervention period.

MATERIALS AND METHODS

Setting

The HSPH cafeteria serves the community of faculty, staff, and students of the HSPH and attracts affiliated customers from other Harvard University institutions, such as the surrounding hospitals (Brigham and Women's Hospital, Beth Israel Deaconess Medical Center, Dana-Farber Cancer Center, Children's Hospital) and workers from the Harvard Medical School campus. The large majority of the customers are HSPH students with a limited budget and HSPH staff including administrators and other office workers. The cafeteria offers a variety of foods for breakfast and lunch, including a comprehensive salad bar, a healthy "Saluté" entrée (a daily special specifically developed according to principles defined by the Nutrition Department of HSPH); a stir-fry bar including a selection of vegetables and brown rice; whole-grain pizza; as well as regular entrées, pizza, hamburgers,

hot dogs, French fries, and a variety of desserts, cakes, cookies, brownies, yogurt, and assorted fruits.

Intervention

During the years 2001 and 2002, we conducted a study of consumer choice in the HSPH cafeteria. Following dietary guidelines [7] and results from large epidemiologic studies [8], we identified a list of healthy foods (salad bar, stir-fried dishes, Saluté entrée, whole-grain pizza, yogurt, and fruit) and less-healthy foods (regular entrée, regular pizza, hamburger, hot dogs, french fries, cookies, cakes, and desserts) that could easily be registered by the cashiers.

The intervention (named Nutrition Awareness weeks) consisted of

- a. reducing the price for the identified healthy foods and dishes by 20% (This 20% subsidy was chosen since the difference in price was absorbed by the Dean's office and hence had to be within limits). The subsidy was announced in the school-wide newsletter prior to the beginning of the intervention and advertised within the cafeteria throughout the intervention period. The prices for main dishes at HSPH or a medium serving from the salad bar vary between four and six dollars, thus a 20% reduction in price would result in an approximately one dollar saving for a main dish and less for individual food items.
- b. the distribution of educational material that described current knowledge about the relation between diet and health and disease. Handouts placed at the entrance to the cafeteria and table-top tents put on all tables in the cafeteria alerted consumers to the promotion and its purpose: namely, to increase consumption of health-promoting foods. The educational material included general information on healthy nutrition and lifestyle; it did not specifically promote the purchase of the healthy foods offered at the HSPH cafeteria. However, many of the foods discussed in the material were offered in the cafeteria, e.g. fruits and vegetables and whole grains, and the nutrients discussed were contained in the meals available, e.g. antioxidants, folate, fiber, and vegetable oils.
- c. free blood pressure readings by a nurse during lunch hours which were offered during the first two days of the promotion to raise awareness of the project.

Assessments

Data were collected by the cashiers of the HSPH cafeteria who register every transaction. The cash registry counts every dish and for the salad bar also counts the weight purchased per transaction. Since the cash registry counts dishes, not individual customers, we could not establish the number of individuals included in this study.

During three consecutive five-week periods, the following assessments were made:

1. Baseline assessment (first five-week period): During a five-week period in 2001, we counted the number of servings purchased for the food items included in this project.
2. Intervention period (second five-week period): During a subsequent five-week period, we conducted Nutrition Awareness weeks. Throughout this period, the purchase of the identified healthy foods and dishes was subsidized and their prices were reduced by 20%. During this intervention period, we again registered the purchase of the targeted foods and meals.

3. Follow-up period (third five-week period): After the five-week intervention, we eliminated the price subsidy and prices returned to their initial levels. During this follow-up period, we assessed all cashier transactions of the food items specified above.

Statistical Methods

We calculated the percentage change in purchases for each food item and then calculated an average percentage change over all healthy items, by weighting according to relative frequency of consumption. The same calculations were done for non-healthy items.

Specifically, overall changes in consumption of healthy and less-healthy foods were calculated on the natural logarithmic scale and weighted by the frequency of selection of the individual items. The mean change in consumption on the natural logarithmic scale was calculated as the sum of the weighted change divided by the sum of the weights. The geometric mean was obtained by exponentiating this log mean change. The standard error of the log mean change was calculated as the inverse of the square root of the sum of the weights. 95% confidence intervals were calculated on the natural log scale and then exponentiated.

IRB Approval

This study was approved by the Human Subjects Committee of the HSPH.

RESULTS

During the three five-week periods, the total caloric content of the purchases of patrons of the HSPH cafeteria did not change significantly, although it increased slightly during the intervention and follow-up periods compared with the baseline. Similarly, the number of servings purchased remained largely unchanged during the intervention but increased slightly in the follow-up period. The sales of the individual food items and meals during the three time periods are listed in Table 1.

Specifically, the consumption of stir-fried dishes increased 27% during the reduced-price period and the increase remained at 25% after prices returned to their original levels. The use of the salad bar increased by 15% during the reduced-price period and climbed to 53% after the Nutritional Awareness weeks were over. The consumption of regular entrées declined by 43% during the promotion, and the reduction remained at 41% thereafter. The consumption of hamburgers/cheeseburgers decreased by 58% during the Nutrition Awareness weeks, and the decreased consumption remained 12% lower thereafter. Consumption of French fries was reduced by 20% during the Nutrition Awareness weeks and remained 14% lower thereafter. There was, however, a 56% increase in the consumption of cakes and desserts during the nutrition promotion period; after the promotion ended, this increase remained at 59%.

Overall, the consumption of healthy foods increased by a significant 6% (95% confidence interval [CI]; 5% to 8%) during the Nutrition Awareness weeks (Table 1). During the same period, the consumption of less-healthy foods declined by 2% (95% CI; -4% to -1%). After the prices returned to their original levels, the consumption of healthy foods increased further to a statistically significant 17% (95% CI; 13% to 20%) and a 2% decline in the consumption of less healthy foods (95% CI; -5% to 1%) persisted (Table 1).

DISCUSSION

In our study, a reduction in price and a promotional campaign alerting consumers to the importance and implications of a healthful diet were associated with a modest overall increase in the consumption of health-promoting foods and meals and in a slight overall decrease in the consumption of less-healthy foods and meals. After the end of the cost-saving period and promotion, the increase in the consumption of healthy foods items increased further. Most notably, the consumption of salad-bar items increased even further beyond the increase observed during the Nutrition Awareness weeks. The reduction in consumption of regular entrées was maintained at a similar level beyond the promotion period.

Eating habits result from individual choices and behavior, but an environment, which may not support healthy choices, may be just as important. The social environment has established norms shaped by the abundant availability of food, leading to excessive consumption of convenient, relatively inexpensive, highly palatable, energy-dense food [9]. Environmental strategies have been studied for decades for commercial purposes and are powerful means to change consumer behavior. Environmental and policy actions seem to be of central importance to promote behavior changes leading to healthy food choice. Among the environmental strategies, education may be effective in changing eating behavior in small degrees, but may actually have an inconsistent effect among different groups of people [10], because the new information has to be integrated positively into the complexity of food choice. Other interventions, which directly affect behavior at the point-of-purchase, such as increasing availability, access, and pricing have more consistent positive effect, at least in the short term.

In a survey of a national sample of 2,967 adults taste was ranked as the most important predictor of food choices, followed by cost [5]. Participants responded that health concerns were less relevant to their choices than were taste and cost.

Some previous studies have examined the effect of an altered price structure on food choices. The effects of pricing and promotion strategies on purchases of low-fat snacks from vending machines was explored in one intervention [11]. Price reductions of 10%, 25%, and 50% on lower-fat snacks resulted in an increase in sales of 9%, 39%, and 93%, respectively, with average profits per machine remaining unaffected [11]. In a study in a Midwestern suburban high school cafeteria, prices of four low-fat foods were reduced about 25% and prices of three high-fat foods were increased about 10% [12]. Low-fat foods averaged about 13% of total sales, but total sales were not assessed before the intervention and were estimated to be only 9% without reduced price [12]. A 50% reduction in the price of fresh fruit and baby carrots in two secondary school cafeterias resulted in a fourfold increase in the sale of fresh fruit and in a twofold increase in the sale of baby carrots [13]. In an intervention in a Delicatessen style restaurant, prices for healthy foods were decreased by up to 20–30% and signs were posted indicating that the restaurant was offering a promotion [14]. A health message intervention followed during a subsequent time period. Sales during price reduction intervention were higher than those during the health message intervention [14].

An intervention similar to ours was conducted in the cafeteria of a university office building [15]. The intervention consisted of an increase in the selection of fruits and salad bar choices and a 50% reduction in the price of salad and fruit. The intervention was advertised by posting signs in the cafeteria and flyers in employee's mail-boxes. Three weeks of baseline observation were followed by three weeks of intervention and three weeks of follow-up. The

consumption of fruit and salad increased markedly during the intervention but dropped significantly after the intervention was completed, but remained slightly above baseline.

Overall, our study confirms previous observations that cost incentives are important determinants of food choices. Few studies provide data beyond the intervention period, thus a better understanding of factors influencing maintenance of a healthy diet is warranted.

The population included in our study comprised the customers of HSPH in Boston. This population consists mainly of public health students, faculty, HSPH staff, and some workers from the campus. Identification from HSPH or the surrounding hospitals is required to enter HSPH cafeteria. The clientele dining at HSPH cafeteria is very stable. HSPH cafeteria customers are likely to be sensitive to the cost of food. Our study indicates that subsidizing the purchase of healthy foods, in combination with a nutrition awareness program, can promote the consumption of healthful meals and reduce the consumption of less-healthful meals. Often, the selection of items from salad bars or of other healthy lunch items results in a more expensive meal than does the selection of pizza, hamburgers, or other items. Our observations suggest that subsidizing healthful meals in cafeterias can promote healthy eating and reduce the consumption of less-healthy foods. Overall, we observed an increase in the consumption of raw and cooked vegetables and a decrease in dishes rich in saturated fats.

Increased consumption of healthy foods was maintained beyond the period of a reduced pricing structure, at least for the interval studied. It is possible that consumers became more conscious of their choices as a consequence of the educational campaign, that the financial incentive made them try and appreciate healthier foods, and that their new-found habits were maintained beyond the subsidized period. This observation underlines the importance of nutritional education for the promotion of healthy diets as tasty and inexpensive.

A number of consumers seemed, however, to return to their original habits; their consumption of less-healthy foods, in particular, did not significantly change over the longer term. It is interesting that consumption of cakes and desserts increased during and after the promotion. Perhaps customers remained hungry or “made-up” for the choice of a healthier main dish by adding a dessert “treat.” Indeed, the caloric intake and the number of servings purchased remained largely the same during the Nutrition Awareness weeks. A similar observation was made in a study describing how price or income changes affect food purchases [16]. The author concluded that consumers respond to changes in food prices and income by adjusting their food choices to maximize their satisfaction.

It was not possible in this study to investigate whether increasing the prices for less-healthy foods might provide consumers with an additional incentive to select healthier food items. Changing the pricing structure to add the subsidy expense as an additional cost to the less-healthy foods to avoid a loss in profits may provide an additional incentive for choosing a healthful meal.

Since our intervention combined a price subsidy and education, we cannot separate the relative importance of the two factors. In the study examining the effects of pricing and promotion strategies on purchases of low-fat snacks from vending machines, price reductions were accompanied by a much stronger increase in the purchase of low-fat snacks than were promotional strategies [11].

Since this study was not a randomized controlled trial but a non-randomized intervention, other external factors may have contributed to the changes in food choices. The clientele of a cafeteria in a school of public health may be more health conscious than the clientele of other cafeterias. The cafeteria at the HSPH, however, is frequented by a fairly diverse group

of customers, including staff and workers from the surrounding institutions. Moreover, since the clientele of the HSPH cafeteria is very stable, it is likely that the changes observed occurred within the same group of customers. All interventions were carried out during the academic calendar further reducing external influences. Seasonal variation has limited impact on the offerings at HSPH cafeteria: the choices at the salad bar and of fruits are fairly homogenous throughout the year. Our study was conducted during the fall and winter months, thus changes in the products offered were minimal.

An important economic question is whether the increase in sales could overcome the decrease in profit incurred by the decreased price structure and thus whether the decreased prices are sustainable. The most important force in influencing sales may indeed be marketing: announcing and advertising a price reduction increase sales even in the absence of a price change [17].

Interventions at the workplace cafeteria may have more potential for success in improving patrons diet than interventions in restaurants or grocery stores. While cafeterias are used for convenience and cost is relevant, restaurants are mostly frequented for enjoyment and taste, prices are less important, and a wider choice of restaurants is available. Health considerations may already affect choices in grocery stores especially if purchases are made for other family member and children.

In conclusion, our study indicates that subsidizing healthful meals and educating consumers about the importance of a healthy diet can result in a modest increase in the selection of healthy foods and meals that can be maintained beyond the time periods of subsidy and promotion.

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Table 1
Food Consumption at the Harvard School of Public Health Cafeteria at Baseline, during the Intervention Period and during Follow-up

ITEM	Baseline			Intervention			Follow-up		
	Number of calories per serving	Number of transactions (servings)	Number of transactions	Number of transactions	Percent Change	Number of transactions	Percent Change	Number of transactions	Percent Change
Healthy Foods									
Salad bar (310 g)	25 per 31g	3,070	3,529	15%↑	4,686	53%↑			
Saluté entrée	400	771	625	19%↓	521	32%↓			
Bok choy stir-fried dish with vegetable or chicken	661	976	1,239	27%↑	1,121	15%↑			
Bok choy stir-fried dish with shrimp	533	214	278	30%↑	372	74%↑			
Whole-wheat pizza (slice)	209	846	862	2%↑	664	22%↓			
Yogurt	130	723	634	13%↓	738	2%↑			
Fruit cup, fresh	125	171	139	19%↓	139	19%↓			
Fruit, assorted	90	1,544	1,527	1%↓	1,471	5%↓			
Subtotal		8,315	8,832	6% (5%–8%) [†]	9,711	17% (13%–20%) [†]			
Less Healthy Foods									
Regular entrée	618	750	431	43%↓	443	41%↓			
Regular pizza	267	3,776	4,040	7%↑	3,128	17%↓			
Hamburger	360	19	8	58%↓	19	0%			
Cheeseburger	460	33	15	55%↓	27	18%↓			
Hot dog	302	15	8	47%↓	20	33%↑			
French fries/onion rings	458	225	168	25%↓	193	14%↓			
Cookies/brownies	200	1,549	1,393	10%↓	2,243	45%↑			
Cakes/desserts	250	268	419	56%↑	425	59%↑			
Subtotal		6,635	6,482	-2% (-4% to -1%) [†]	6,498	-2% (-5% to 1%) [†]			
Total		14,950	15,314		16,209				

[†] 95% Confidence Interval.