

# A Pricing Strategy to Promote Low-Fat Snack Choices through Vending Machines

## ABSTRACT

**Objectives.** This study examined the role of price on purchases of low-fat snacks from vending machines.

**Methods.** Sales of low-fat and regular snacks were monitored in nine vending machines during a 4-week baseline, a 3-week intervention in which prices of low-fat snacks were reduced 50%, and 3 weeks postintervention.

**Results.** The proportion of low-fat snacks purchased was 25.7%, 45.8%, and 22.8% in the three periods, respectively. Total snack purchases did not vary by period.

**Conclusions.** Reducing relative prices may be effective in promoting lower-fat food choices in the population. Vending machines may be a feasible method for implementing such nutrition interventions. (*Am J Public Health*. 1997;87:849-851)

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## Introduction

There is general agreement that measures that would reduce the fat content of the diet in the population as a whole would be helpful in preventing or delaying the development of several chronic diseases.<sup>1-4</sup> An important question for public health policy, therefore, is how to encourage the population as a whole to make lower-fat food choices. To date, environmental intervention strategies to reduce the population prevalence of high-fat food consumption have focused primarily on improving consumer knowledge through mass media, school-based, and point-of-purchase education.<sup>5-11</sup> Such interventions have shown positive effects on nutrition knowledge, but changes in food-choice behaviors have been modest in magnitude, variable, and often short lived.

Environmental strategies designed to influence food choice through mechanisms of availability and cost rather than nutrition education have received less research attention.<sup>5-14</sup> Perhaps the most impressive of these studies in magnitude of effect was a recent cafeteria-based study that examined pricing and availability influences on food choice.<sup>14</sup> Prices of fruit and salad were reduced by 50%, and the number of fruit and salad items available was increased. Purchase of fruit and salad increased threefold during the 3-week intervention period. Given the magnitude of these effects, further exploration of the feasibility and efficacy of environmental interventions seems warranted. The present study examined the role of price on the purchase of low-fat snacks from vending machines. It was hypothesized that sales of low-fat snack foods would increase if prices were reduced relative to regular snack food prices.

## Methods

The present study was conducted in a university setting over a 10-week period in collaboration with the university food

and vending services. Nine vending machines at four locations were targeted for intervention. The study used a within-machine design with three time periods (baseline, low-price intervention, postintervention). The initial baseline period was 4 weeks; the low-price intervention, 3 weeks; and the postintervention, 3 weeks. Low-fat snacks were defined as those that contained 3 or fewer fat grams per package.<sup>15</sup> The proportion of low-fat products available averaged 24% of the total products sold in the machines, but varied by machine, ranging from 9% to 37%. Throughout the study, low-fat snacks were clearly identified for patrons by the placement of a bright orange price label beneath each low-fat item. In addition, a 5-by-7-inch bright orange sign placed on the panel glass of the vending machine indicated that orange-labeled products contained 3 grams of fat or less. The usual prices of the low-fat items were similar to those of comparable regular snacks. During the intervention, prices of the low-fat, orange-labeled items were reduced by 50%. Prices were labeled under each item. However, no promotional signage was used to call attention to the reduced prices. After the 3-week intervention period, prices were raised to preintervention baseline levels.

All analyses were conducted using SAS statistical software programs.<sup>16</sup> Sums were calculated for low-fat, regular, and total snacks for each week and each machine. SAS PROC MIXED was used to examine differences in the proportion of low-fat snacks purchased by experimental period. Location, machine, and weeks were treated as hierarchically nested random effects. In this study with four locations and three periods, there are 6 *df*

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**TABLE 1—Mean Number of Snacks (SE) Sold from Vending Machines at a University, by Experimental Period and Snack Type**

Snack Category	Experimental Period					
	Baseline <sup>a</sup>		Low Price <sup>b</sup>		Postintervention <sup>c</sup>	
	Mean	(SE)	Mean	(SE)	Mean	(SE)
Low-fat snacks, no.	106.6	(20.1)	241.8	(41.6)	74.7	(13.3)
Regular snacks, no.	354.8	(68.0)	266.1	(41.9)	339.9	(78.5)
Total snacks, no.	461.4	(80.7)	507.9	(79.1)	414.6	(85.1)
Low-fat snacks, %	25.7	(.51)	45.8	(.6)	22.8	(.71)

Note. Mean sum of products sold over four locations, nine machines and 10 weeks, by experimental period.

<sup>a</sup>Low-fat snacks were sold at usual price.

<sup>b</sup>Low-fat snacks were sold at 50% reduced price.

<sup>c</sup>Low-fat snacks were sold at usual price.

for estimating the appropriate error variance against which to assess period effects. A contrast was used to examine differences between the two baseline conditions combined and the low-price intervention.

## Results

Table 1 shows the average number of items purchased summed over machines and weeks by snack category and experimental period. Across the entire 10-week period, the average number of snacks sold per machine per week was 142.6 (SD = 157.2) for low-fat snacks and 321.0 (SD = 319.7) for regular snacks. Low-fat snacks represented 31.6% and regular snacks 68.3% of total sales. At baseline, 106.6 low-fat items on average were sold per machine per week. During the intervention period, sales increased 150% to a mean of 241.8, and fell to 74.7 in the postintervention period. The percentage of low-fat snacks sold increased about 80% during the low-price intervention, from 25.7% to 45.8% of total sales. The percentage of low-fat snacks purchased returned to baseline levels (i.e., 22%) during the postintervention period. Results of the PROC MIXED analysis of the percentage of low-fat snacks showed a significant effect for experimental period ( $F[2, 6] = 18.46; P < .002$ ). The contrast between the two baseline periods and the intervention period was also significant ( $F[1, 6] = 10.82; P < .01$ ). Sales of regular snacks declined modestly during the low-price intervention period (from 74.3% to 54.2%) and increased during the postintervention period (to 77.2%). The total number of snacks sold did not differ by experimental period. Although some

between-location variability was present in the percentage of low-fat snack sales, the pattern of intervention effects was similar across the four locations.

## Discussion

The results of the present study showed that without affecting overall sales volume, sales of low-fat snacks from vending machines increased significantly when prices were lowered and in the absence of a concurrent nutrition education intervention. These findings suggest that environmental approaches to promoting low-fat food choices, such as reducing their relative price, may hold promise for promoting lower-fat food purchase and consumption in the population as a whole.

Despite the lack of public health initiatives in this area, public health policies that promote lower-fat food choices may be favorably received by the public. For example, a community-based survey of 821 men and women found that requiring low-fat foods to be available in school cafeterias and eliminating high-fat food snacks from vending machines were among the most favorably evaluated public health policies.<sup>17</sup>

Future research is needed to address several issues related to the present research, including (1) cost-effectiveness, (2) target populations, (3) concurrent nutrition education programs, (4) definitions of healthy snacks, (5) impact on total dietary intake, and (6) duration of effects. The cost-effectiveness issue has implications for the feasibility of implementing pricing strategies to promote low-fat food choices in diverse settings, such as schools and work sites. In the present study, low-fat items were reduced in price

by 50% and the price of high-fat items was not increased. While the sales volume of low-fat items increased, it was not enough to offset the reduced profit margin and resulted in a net revenue loss. However, smaller price reductions for low-fat items and simultaneous price increases for high-fat items could result in net revenue gains and a net profit for vendors. For example, if an identical shift in purchase patterns of 50-cent items were observed with a 50% price change achieved by reducing the prices of low-fat items to 35 cents and raising the prices of high fat items to 70 cents, the net profit per machine would be \$156. (Pricing in the present study resulted in a decrease in profit per machine from \$116 per week to \$66 per week.)

Target population is a second issue regarding intervention effectiveness. Pricing strategies may be most effective with groups that have less disposable income, such as lower socioeconomic groups or adolescent populations. Third, the incremental effect of an educational point-of-purchase intervention is worth exploration in future research. Actively promoting low-fat choices with educational messages may enhance low-fat food choices in conjunction with price reductions. Fourth, additional research is warranted into the specific foods defined as healthy. In the present study, healthy foods were defined solely in terms of fat content. Thus, healthy choices included candy that was high in sugar, low in nutrients, and already selling at a high volume. Future research should examine whether pricing strategies are effective in increasing sales of less popular foods (e.g., fruits, vegetables, low-fat milk, or yogurt).

The impact on total dietary intake of environmental interventions such as the one described in the present study should be further evaluated through prospective tracking of individual dietary intake. A related issue is the duration of intervention effects. In the present study, food choices rapidly returned to preintervention levels after the usual prices were reinstated. Additional research is needed to explore the conditions under which changes in food choices are maintained for a longer duration.

In conclusion, environmental strategies may be useful in promoting low-fat eating patterns in the general population. Pricing strategies that make low-fat foods much less expensive are clearly effective in increasing choices of low-fat foods. The parameters and boundary conditions of these effects, such as subject popula-

tion, magnitude of pricing differential, and food types targeted, warrant further empirical evaluation. Such strategies have policy implications with respect to taxation and price supports for foods of differing fat content. □

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## ABSTRACT

**Objectives.** The purpose of the study was to analyze overall and cause-specific mortality among injection drug users in Rome.

**Methods.** A cohort of 4200 injection drug users was enrolled in drug treatment centers from 1980 through 1988 and followed up until December 1992.

**Results.** The age-adjusted mortality rate from all causes increased from 7.8/1000 person-years in 1985/86 to 27.7/1000 in 1991/92. The rise was mainly attributable to acquired immunodeficiency syndrome (AIDS), but mortality from overdose and other causes increased as well. The cumulative risk of death by the age of 40 was 29.3%.

**Conclusions.** The impact of AIDS deaths appears to be additional to a persistent increase of mortality for all other causes. (*Am J Public Health*. 1997;87:851-853)

# A Persistent Rise in Mortality among Injection Drug Users in Rome, 1980 through 1992

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## Introduction

There is established evidence that injection drug users are at increased risk of death from several causes.<sup>1</sup> In a cohort study of injection drug users in Rome, we documented a large excess in mortality for all causes in the period 1980 through 1988, with a decrease in total mortality from 1980 to 1985 and a rise afterward.<sup>2</sup> The main cause of death was overdose. Acquired immunodeficiency syndrome (AIDS) accounted for 7.1% of all deaths, whereas in a cohort of drug injectors enrolled and followed up from 1984 to 1987 in New York City, AIDS accounted for 40% of all deaths.<sup>3</sup> Since the highest incidence of human immunodeficiency virus (HIV) infection among injection drug users occurred in Italy in 1986 and 1987,<sup>4-6</sup> we extended the follow-up of the same cohort to investigate whether the

rise in mortality observed since 1985 was continuing and whether such an increase could be attributed to AIDS or to other causes as well.

## Methods

The population under study and the methods have been described in detail previously.<sup>2</sup> Briefly, all injection drug users attending, from 1980 to 1988, the three largest drug treatment centers in Rome were enrolled and followed up as of December 31, 1992. Vital status was ascertained through the registry office of

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