Public Health Strategies for Dietary Change: Schools and Workplaces\textsuperscript{1,2}

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\textbf{ABSTRACT} Environmental intervention represents an effective strategy to promote the purchase and consumption of healthful foods in community-based settings. Three such studies promoted the consumption of healthier snacks and lower-fat foods at worksites and at schools. The first study examined lower prices and point-of-purchase promotion on sales of lower-fat snacks in vending machines in 12 worksites and 12 secondary schools. Price reductions of 10\%, 25\% and 50\% on lower-fat snacks resulted in an increase in sales of 9\%, 39\% and 93\%, respectively, as compared to usual-price conditions. The second study examined the impact of a 50\% price reduction on the consumption of fresh fruit and baby carrots in 2 secondary school cafeterias. In the third study, 20 secondary schools were randomly assigned to either an environmental intervention or a control group for a 2-y period. The intervention increased the availability of lower-fat foods and implemented student-based promotions. School-based environmental interventions to increase availability and promotion of lower-fat foods and healthier snacks can increase purchase of these foods among adolescents. J. Nutr. 135: 910–912, 2005.

\textbf{KEY WORDS:} • food pricing • food availability • food choices

The current obesity epidemic is caused by a food environment that promotes food intake and discourages physical activity (1–7). Among factors that may promote excessive eating are the changing nature of the food supply, pervasive food advertising and marketing, and the increased consumption of foods away from home (5,8). The school food environment can have a significant effect on adolescents’ food choices because a large proportion of total daily energy is consumed at school (7). Foods sold outside the national School Lunch Program (i.e., “competitive foods”) make up an increasing share of students’ purchases at school, especially at the secondary level (7). Available data indicate that these foods are higher in fat compared with foods sold as part of the federally reimbursable school lunch program (7). In addition, vending machines selling soft drinks are now available in 98\% of U.S. high schools (9). This presentation addresses the potential impact of environmental interventions, including pricing strategies and peer promotion, on the consumption of healthful foods in community-based settings.

\textbf{Foods away from home}

Away-from-home foods are defined based on where the foods are obtained, as opposed to where they are eaten. Foods at home are those purchased at a retail store, a grocery store, a convenience store, or a supermarket and prepared for home consumption (8). Foods away from home include those obtained from fast-food outlets, schools, restaurants, other public places, and vending machines. Away-from-home foods are typically ready-to-eat and consumed “as is,” and the consumer has less control over portion size and nutritional content (8).

Not only have portion sizes for foods purchased at fast-food places and restaurants increased sharply, but prepackaged foods purchased in grocery and convenience stores are also being marketed in larger sizes (5,10). Whereas in the 1950s, soft drinks were marketed in 6.5-oz single serving bottles, by the 1970s the standard serving size was 12 oz. In 2000 the 20-oz bottle was the typical single serving size, a 250\% increase from the 1950s. Fast food restaurants have been marketing supersized hamburgers (216 g; 570 kcal), supersized fries (198 g; 610 kcal), and 42-oz soft drinks (11). Candy bars and potato chips that used to be sold in 1 oz servings are now being marketed in 2–3 oz packages (10).

Larger portions encourage increased consumption through a variety of physiological or cognitive mechanisms (12). Larger-sized packages are priced less per unit weight as compared with smaller-sized packages, so this perception is, in fact, correct. For example, the cost per ounce for soft drinks pur-
chased at a convenience store is 5¢ per ounce for a 12 oz serving, but only 2.3¢ per ounce for a 42 oz serving. This research suggests that people will consume a greater quantity of food or beverage from a “supersize” serving size compared to a small size, especially if the unit price is lower (5,12).

**Individual food choices**

The 3 main dimensions related to food choices are taste, perceived value (which includes price and portion size), and perceived nutrition (13,14). The importance placed on each dimension may vary from one person to another (13–15). Persons of lower socioeconomic status may place greater importance on perceived value, while those who are concerned about health and nutrition may place greater importance on the nutritional quality of foods (15). In general, people may possess knowledge about healthful food choices, but when considered in tandem with the choice dimensions of price and taste, they may choose the tastier and cheaper, but less nutritious, food. An important question for public health promotion efforts in the area of healthful food choices is “can people be influenced to purchase and consume more healthful foods if the foods are increased in attractiveness through lowering prices?”

**Price intervention studies**

Price reduction intervention strategies to increase purchases of healthful foods have been examined in a series of studies by French and colleagues (16–20). CHIPS (Changing Individuals’ Purchase of Snacks) examined a range of price reductions and point-of-purchase promotions on sales of lower-fat vending machine snacks in 12 worksites and 12 secondary schools in Minnesota (16). All vending machines in each of the sites were stocked with lower fat snacks (about 17% of the machine inventory). Prices on lower-fat snacks were reduced relative to the stock price reduction was associated with a significant increase in percentage of lower-fat snack sales. When prices were reduced by 10%, 25%, and 50%, the percentage of lower-fat snack sales increased by 9%, 39%, and 93%, respectively. Promotion had a small but significant independent effect on percentage of lower-fat snack sales. Overall, snack sales volume also significantly increased in the 25% and 50% price reduction conditions. Average monthly profits per machine did not significantly differ by price reduction condition.

Reducing snack prices in vending machines showed that small price reductions can be an effective means to encourage the selection of lower-fat snacks by the consumer. The generalizability of this finding to food types other than prepackaged high-fat snacks was examined in a second study (18). This study examined the effects of price reductions on purchases of fresh fruit and vegetables in 2 secondary school cafeterias. An important question was whether the price reduction strategy would be effective among an adolescent population, a population that stereotypically perceives fresh fruits and vegetables as the least attractive food choices (21–22).

The price reduction targeting fruits and vegetables was implemented in 2 secondary school cafeterias. One school was located in a primarily Caucasian, middle-income suburban area, while the other school was located in an urban area with a mixed ethnic and socioeconomic population. Fresh fruit and baby carrots were targeted for 50% price reductions. Results showed that during the price reduction period, sales of fresh fruit increased 4-fold, from 14 items per week to about 63 items per week (Fig. 2), and sales of baby carrots increased 2-fold, from 37 packets per week to 77 packets per week. Sales returned to baseline levels with the reinstatement of usual prices.

The financial feasibility of lowering prices as a strategy to promote healthier food choices is a legitimate concern. In the absence of government or other subsidies, large increases in sales volume might be necessary to offset decreases in profits resulting from price reductions on targeted foods. One strategy that has been proposed is to raise prices of popular high-fat energy-dense foods to generate revenues that could then be used to subsidize price reductions on healthier foods. This strategy was recently pilot-tested in a single high school during an entire school year (19). Seven foods were targeted during the intervention: 3 popular high-fat foods (French fries, cookies, and cheese sauce) and 4 lower-fat foods (fresh fruit, low-fat cookies, low-fat chips, and cereal bars). Prices ranged from 35¢ to $1.00. Prices on the higher-fat foods were raised by about 10% and prices on the lower-fat foods were reduced by about 25%. Price changes were implemented at the start of the school year and continued through the end of the year. Sales data were collected from the school food service point-of-sale cash register data. Results showed that estimated pooled revenues from the 7 foods were within 5% of revenues estimated for usual-price conditions.

**Parental perspectives**

At this point, there are very limited data regarding parents’ opinions regarding the availability of soft drink vending ma-
machines in schools. In a recent study (9), based on 6 focus groups with 33 parents at 3 suburban high schools, parents viewed the issue of soft drink vending machines as a matter of their children’s personal choice more than as an issue of a healthy school environment. However, parents were unaware of many important details about the soft drink vending machines in their children’s school, such as the number and location of machines, hours of operation, types of beverages available, or whether the school had contracts with soft drink companies. Parents need more information about the number of soft drink vending machines at their children’s school, the beverages available, the revenue generated by soft drink vending machine sales, and the terms of any contracts between the school and soft drink companies (9).

School-based interventions

Foods sold outside the school meals program are widely available and comprise an increasing share of the foods students purchase and consume at school. Federal policies provide little regulation of foods sold outside the school meals program. State and district policies are also limited, and few specifically address fruit and vegetable availability. In the past, school-based interventions to promote consumption of fruit and vegetables among students in school settings have primarily consisted of multi-component interventions that sometimes included an environmental intervention component. The results of these interventions have been positive, especially in their effects on fruit intake. The results of shorter-term environmental interventions that used lower prices or increased availability as strategies to increase fruit and vegetable intake have been positive. Several new approaches currently being piloted in schools include school gardening programs, salad bars using fresh produce from local Farmer’s Markets, and in-school, free fruit and vegetable distribution programs. Better information is needed on the economics of competitive foods and the role that financial profitability plays in decisions about food availability and sales in the school setting.

School-based data suggest that small price increases on popular high-fat foods and modest price reductions on lower-fat foods are potentially financially feasible as a long-term strategy to promote healthful food choices. The success of this or other pricing strategies may be limited to controlled settings such as worksite and school cafeterias in which food choices are somewhat limited and the population is a “captive audience.” A recent school-based intervention (7) that was intended to increase the sales of lower fat foods in secondary school cafeterias was based on increasing the availability of lower-fat “competitive (or a la carte) foods and peer promotion of healthier options. A steeper rate of increase in sales of lower-fat foods in year 1 (10% intervention vs. −2.8% control, P = 0.002) and a higher percentage of sales of lower-fat foods in year 2 (33.6% intervention vs. 22.1% control, P = 0.04) were observed. There were no significant changes in student self-reported food choices.

SUMMARY

School-based environmental interventions to increase the availability and promotion of lower-fat foods can increase the purchase of these foods among adolescents. These studies have implications for the marketing of low nutrient-density foods as opposed to more healthful foods. Specifically, removing price incentives for “super-size” portions on high-fat, energy-dense foods might be an effective strategy to limit the purchase and consumption of low nutrient-density foods by the consumer. The effects of price increases and decreases of various magnitudes also merit further study. An important consideration is the effect of pricing strategies on food choices at the individual vs. the population level. Pricing effects could be quite different on individual food choices in a cafeteria setting vs. the population consumption level. Pricing strategies potentially could be used to encourage fruit and vegetable consumption through government price subsidization or to influence food choices among participants in government-sponsored food assistance programs. Clearly, more research is needed to better understand the potential effects of various pricing strategies on individual and population food choices.

LITERATURE CITED