

Use of Fat-Modified Food Products to Change Dietary Fat Intake of Young People

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Abstract: Food purchasing and preparation practices were modified in two boarding high schools to increase the polyunsaturated-to-saturated fat ratio (P/S) of the diet of students by changing food products rather than attempting to change eating behaviors. During years when fat-modified products were served, the P/S of males increased by 75 percent, versus a decrease of 6 percent during control years. For females, P/S increased by 53 percent during intervention years, versus an increase of 6 percent during control years. (*Am J Public Health* 1990; 80:1374-1376.)

Introduction

In an effort primarily to decrease the risk of premature cardiovascular disease, many health promotion organizations currently advise that all Americans, including young people, modify the amount and type of fat in their diets.¹⁻³ However, the traditional, one-on-one counseling approach to changing eating behaviors is difficult and time-consuming and is an inefficient method for changing the dietary practices of an entire population. An alternate approach is to change the fat content of food products. This would appear to be particularly relevant today, since such a large proportion of foods consumed in the United States are manufactured, processed, or prepared by the industry, rather than prepared from scratch in the home. This limits the control that individuals have over the amount and type of fat that is contained in the foods they consume.

Studies were carried out at two boarding high schools in New England to determine the impact of modifying fats in food products served in the schools' dining halls on the polyunsaturated-to-saturated fat ratio (P/S) of the diets of students. The goal was to determine the effects on the total intake of nutrients of a "passive" intervention, i.e. an intervention at the level of food production and preparation only. Foods with a higher P/S ratio were purchased and changes were made in food preparation practices in the schools' kitchens, but students were not advised to modify their eating behaviors. This paper reports the effects on students' overall dietary fat intake when the fat-modified products were introduced into the dining halls of each of the two schools over a school year.

Methods

The project was carried out at Phillips Exeter Academy in Exeter, New Hampshire and Phillips Academy in An-

dover, Massachusetts during 1986-88. School food service workers at each institution were trained to procure and prepare food products in which some of the saturated fat content was replaced by polyunsaturated fat.^{4,5} It was sought to avoid alteration of the total fat content of food products. The general intent was to make only those modifications that were feasible in terms of product availability, acceptability, and cost, at the time of the study, for an institutional food service operation.

The study design was that of a longitudinal investigation with food product modification being carried out in each of two schools in alternate school years. After the first month of each school year, modifications of food purchasing and preparation practices were carried out in the school which was serving as the intervention school for the year, while the other school continued to serve usual food products. Some modification was carried out for almost two-thirds of fat-containing foods served. While students were aware that some foods were being prepared using different types of fat, they were not told and, in general, could not tell which items had been modified.

For each of the two years, all students at both schools who were taking selected courses in biology or chemistry (approximately 200 at each school each year) were trained and asked to furnish food diaries at specified times during the year to monitor the effects of the food service changes on their intakes of calories and specific nutrients. All foods ingested were recorded, including those foods that were obtained outside of the dining halls (which furnished 28 percent of calories).⁶ Comparisons were made between trends in fat intake in the two schools between a baseline period in the fall (when both schools were serving usual products) and a follow-up period in the spring, when the intervention school students were being served fat-modified products. Analysis of food diaries was performed by trained registered dietitians using the "Food Finder" program at the Center for Clinical Computing, Beth Israel Hospital, Boston, MA.⁷

A total of 6,436 food diaries were submitted during the control and intervention years at the two academies. Data provided by all students completing food diaries during a period were used to calculate mean values for that period.

Results

Baseline and follow-up dietary data for males and females are given in Tables 1 and 2, respectively. At baseline, all groups were consuming approximately 35 percent of their calories from fat. During intervention years, the P/S ratio of the students' diet increased by 75 percent (from 0.53 to 0.93) for males and by 53 percent (from 0.64 to 0.98) for females. During control years, the P/S ratio decreased by 6 percent for males and increased by 6 percent for females.

Discussion

The present study was designed to test the feasibility of changing the P/S ratio of the diet of boarding school students

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TABLE 1—Baseline and Follow-up Dietary Data among Males, by Intervention Status (Mean ± SD)

	Control			Intervention			Intervention Effect (Intervention-Control)	
	Baseline (n = 197)	Follow-up (n = 109)	Diff. (%)	Baseline (n = 198)	Follow-up (n = 98)	Diff. (%)	Effect (%)	(95% CI)
Calories	2831 ± 801	2603 ± 786	-8	2835 ± 802	2420 ± 688	-15	-7	(-14, +1)
Total Fat (%kcal)	35.5 ± 5.0	33.6 ± 5.6	-5	34.5 ± 5.4	31.9 ± 6.5	-8	-2	(-7, +3)
Total Fat (gm)	112.1 ± 37.7	98.7 ± 34.5	-12	110.9 ± 41.3	86.6 ± 30.3	-22	-10	(-19, -1)
Polyunsaturated fat (%kcal)	6.1 ± 1.8	5.5 ± 1.7	-10	5.7 ± 1.8	7.9 ± 3.4	+39	+48	(+34, +63)
Polyunsaturated fat (gm)	19.3 ± 7.6	16.2 ± 6.9	-16	17.8 ± 7.4	21.1 ± 9.2	+19	+35	(+21, +48)
Monounsaturated fat (%kcal)	12.5 ± 2.4	12.1 ± 2.4	-3	12.5 ± 2.4	10.9 ± 2.6	-13	-10	(-15, -4)
Monounsaturated fat (gm)	39.8 ± 14.4	35.6 ± 13.1	-11	40.5 ± 16.9	29.7 ± 11.5	-27	-16	(-25, -8)
Saturated fat (%kcal)	12.3 ± 2.6	12.0 ± 2.6	-2	12.2 ± 2.6	9.6 ± 2.8	-21	-19	(-25, -13)
Saturated fat (gm)	39.5 ± 14.9	35.1 ± 13.1	-11	37.8 ± 15.6	26.0 ± 11.5	-31	-20	(-29, -11)
P/S Ratio	0.54 ± 0.20	0.51 ± 0.22	-6	0.53 ± 0.21	0.93 ± 0.45	+75	+81	(+60, +102)

TABLE 2—Baseline and Follow-up Dietary Data among Females, by Intervention Status (Mean ± SD)

	Control			Intervention			Intervention Effect (Intervention-Control)	
	Baseline (n = 188)	Follow-up (n = 130)	Diff. (%)	Baseline (n = 191)	Follow-up (n = 130)	Diff. (%)	Effect (%)	(95% CI)
Calories	2040 ± 552	1898 ± 649	-7	2063 ± 519	1773 ± 581	-14	-7	(-14, -0)
Total Fat (% kcal)	34.9 ± 5.5	34.1 ± 6.0	-2	34.2 ± 5.9	30.7 ± 6.3	-10	-8	(-12, -3)
Total Fat (gm)	80.9 ± 27.2	73.7 ± 31.6	-9	81.1 ± 27.2	62.1 ± 26.9	-23	-15	(-23, -6)
Polyunsaturated fat (%kcal)	6.5 ± 2.3	6.5 ± 2.6	0	6.4 ± 2.0	7.8 ± 2.9	+22	+22	(+11, +33)
Polyunsaturated fat (gm)	14.5 ± 5.8	13.2 ± 5.1	-9	14.5 ± 5.9	15.7 ± 7.6	+8	+17	(+6, +29)
Monounsaturated fat (%kcal)	11.7 ± 2.5	11.3 ± 2.6	-3	11.6 ± 2.6	9.8 ± 2.5	-16	-12	(-18, -6)
Monounsaturated fat (gm)	27.2 ± 10.3	24.6 ± 11.8	-10	27.5 ± 10.3	20.1 ± 10.3	-27	-17	(-27, -8)
Saturated fat (% kcal)	12.1 ± 2.9	11.7 ± 3.3	-3	11.8 ± 2.8	9.2 ± 2.7	-22	-19	(-25, -12)
Saturated fat (gm)	28.0 ± 10.7	25.9 ± 13.4	-8	26.6 ± 10.2	18.6 ± 9.7	-30	-23	(-33, -13)
P/S Ratio	0.62 ± 0.28	0.66 ± 0.40	+6	0.64 ± 0.25	0.98 ± 0.42	+53	+47	(+31, +62)

by modifying the foods served rather than by changing student eating behaviors. The modified products were very well accepted by students. While the estimated effect of the intervention on the diets of students is based on their self-reports of intake, the students had not been told to change their dietary habits or fat intake and thus were unlikely to be trying to please the investigators by reporting what was believed to be desired. Also, in general, they did not know which products had been modified. The study demonstrated that the modification of approximately two-thirds of the fat-containing food products served in the schools' dining halls reduced total saturated fat intake by over 20 percent and resulted in a P/S ratio approaching 1.0, the level currently recommended by most health agencies.¹⁻³

The approaches tested in this study are commercially feasible and could be implemented in schools or other institutional food service operations elsewhere. Furthermore, the approaches are applicable to food manufacturers and processors in general. The development of margarines with higher P/S ratios and the replacement of highly saturated coconut, palm, or palm kernel oils with less saturated oils in

many food products are examples of such applications. The widespread adoption of such approaches by the food industry could result in healthier foods for Americans.

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Weekly Food Servings and Participation in Social Programs among Low Income Families

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Abstract: Low income families were interviewed to determine factors related to the number of family food servings per week. A multiple regression model indicated that participation in WIC (supplemental food program for women, infants and children), household size, and number of different income sources were associated with more family food servings per week. Number of food servings per week decreased the last week of the month most often in families with younger members. (*Am J Public Health* 1990; 80:1376-1378.)

Introduction

Several studies suggest that family food shortages have increased during the past decade. Populations in the United States that are at risk for these shortages include the elderly, single parent families, and children.¹⁻¹⁰ Other studies have shown that participants of government assistance programs also endure food shortages.¹¹⁻¹⁶ These food shortages follow monthly cycles with the greatest prevalence occurring the last week of the month.¹²

The purpose of this study was to determine if the number of food servings per week could be used to assess food shortages that occur at the end of the month, the number and types of food and income assistance programs used by low income families, and factors associated with the number of family food servings.

Methods

A random sample of 25 percent of family members from six food cooperatives for low income families was selected, with 109 of 114 responding. Fifty families from the Hillsborough County Florida Expanded Food and Nutrition Education Program (EFNEP) who were not participating in the food cooperative were randomly selected to participate in the study; 12 did not participate and 10 more were randomly

selected as substitutes. One home interview was conducted for each family.

The focus of the study was the household. Demographic data were collected with information on participation in 23 food and income assistance programs. The number of family food servings during the past week from a list of 27 food groups was collected. A serving was defined as the preparation and offering of a food group to family members; second and third offerings of the food during the same meal were not counted. A normally distributed additive score for 20 food groups was calculated (mean \pm 1 SD: 24.7 \pm 5.0; Cronbach's alpha of 0.76.)¹⁷ The excluded food groups were oils, salty snacks, candy, sweet baked goods, soda, soup, and coffee.

Frequency analysis using Chi-square and T-tests for means were used to determine the characteristics of the participants of the two programs. Multiple regression was used to determine factors related to the number of food servings. Potential independent variables for the final model were: participation in individual food and income assistance programs; the number of income or food assistance programs; the reference week of the month for the servings; the household size; sex of respondent; the age of the household respondent; participation in the food cooperatives or EFNEP; and an interaction term between program participation and reference week. However, when the final regression model was constructed several variables were not significant and dropped.

Results

The EFNEP households compared with the food cooperative families were younger: (31 vs 51 years); had more single parents (60 percent vs 40 percent); had more children less than 5 years of age (60 percent vs 44 percent); and had lived less time in their present location (42 vs 128 months).

The food and income sources used by these families are presented in Table 1. There was a wide variation in the combination of sources used among all families with no families using the same combination; 39 percent had four or more sources and 13 percent had six or seven sources of income.

The last week of the month was associated with a decrease in the number of food servings per week (mean \pm 1 SEM 22.9 \pm 0.8) compared with the second (26.4 \pm 1.0) and third (26.1 \pm 0.8) week of the month (Figure 1). The variables in the best model (Table 2) to predict the number of food

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