Food Sources, Dietary Behavior, and the Saturated Fat Intake of Latino Children

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ABSTRACT

Background. Recent recommendations for Americans aged 2 and older call for a reduction in the average saturated fat intake to less than 10% of calories.

Methods. Using 24-hour dietary recalls collected from mothers of 4- to 7-year-old urban Latino children, we identified foods and dietary behavior patterns that distinguish children with higher and lower mean daily percentages of calories from saturated fat.

Results. Compared with children in the lowest quintile of intake, children in the highest quintile consumed more than twice as much saturated fat per day from high-fat milk products (18.5 g vs 7.8 g), mostly from whole milk. They did not consume different kinds of milk or different amounts of milk per eating occasion, but on average they consumed milk more frequently (2.8 vs 1.6 eating occasions per day). Even children in the lowest quintile, on average, exceeded the 10% of calories from saturated fat currently recommended. If low-fat (1% fat) milk had been substituted without other dietary changes, all but the highest two quintiles would have been within the recommended level.

Conclusions. The substitution of low-fat for whole milk appears to be a key strategy for preschool children for achieving recommended levels of saturated fat intake. (*Am J Public Health.* 1992;82:810–815)

Introduction

Numerous studies in adults link diet to risk of cardiovascular disease, some types of cancer, and other illness.[1–3] Dietary saturated fat in particular has been found to be associated with atherosclerosis.[2] Studies in young children[4–7] have found that total and saturated fat intakes are higher than recommended levels,[8–10] that saturated fat is associated with serum total and low-density lipoprotein cholesterol levels,[11] and that there is tracking of serum lipid[12] and nutrient intake levels.[6,13,14] One risk reduction objective for the year 2000, specified by the US Public Health Service (PHS)[10] and supported by the National Cholesterol Education Program (NCEP),[9] is to reduce average saturated fat intake among children aged 2 years and older from more than 13% to less than 10% of total calories.

We identified only two studies that examined the contributions of specific foods and food groups to young children's saturated fat intake.[4,15] The Nationwide Food Consumption Survey is a continuing national survey of food intakes by individuals that uses probability sampling and repeated dietary recall interviews of parents to provide surrogate reports of children's dietary intake. (For 1985, this survey included 222 children aged 1 to 3 and 149 children aged 4 to 5)[4] In this survey, milk products contributed almost 40% of children's saturated fat intake. In the Bogalusa study,[15] which used a single surrogate dietary recall interview per year, milk alone contributed more than 20% of saturated fat intake for children aged 3 (n = 106) and 4 (n = 219).

Conceptualization and measurement of diet can be addressed from multiple perspectives. Most nutritional epidemiology has examined the relationship between nutrient intake levels and disease or risk factors.[1–3] Several recent reports demonstrate the value of analyzing diet in terms of dietary behavior patterns, such as the amount and type of food eaten[16] and the frequency of eating throughout the day.[17] According to Willett,[18] educational interventions to assist the public in making healthful food choices should focus on specific foods and dietary patterns rather than on nutrients. To our knowledge, no published research has described the dietary patterns that determine children's saturated fat intake.

We sought to determine whether children with higher and lower saturated fat intakes eat different foods, or eat the same foods but have different dietary behavior patterns (i.e., do they eat different amounts per serving or eat the same serving sizes but eat more frequently). To do this, we collected 24-hour dietary recalls for young Latino children on seven occasions over 3 years. These data were used to determine the relative contributions of food sources to children's saturated fat intake, and to identify foods and dietary behavior patterns that distinguish children with higher and lower saturated fat intakes.

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Methods

Study Sample

Subjects were 4- to 7-year-old Latino children and their mothers living in northern Manhattan or the Bronx, New York City, and participating in the Columbia University Study of Childhood Activity and Nutrition. Ten percent of the mothers and more than 90% of the children for whom we had birthplace data (n = 204 mothers and n = 184 children) were born in the United States. Children were generally healthy, with no dietary prescriptions or restrictions. Recruitment, which was mainly from a pediatric practice of a large hospital in a disadvantaged urban community, is described in greater detail elsewhere.[11] All mother/child pairs who completed four 24-hour recalls from the first year of the study were included in the baseline analysis (n = 205 pairs; 103 male children). Of these pairs, 168 completed three 24-hour dietary recalls in the third year of the study as well. At the time of first recall, the children's mean age was 4.4 years (SD = 0.34) and the mother's mean age was 31.8 years (SD = 5.2). At the time of the fifth recall, the children's mean age was 6.3 years (SD = 0.42).

Data were elicited orally by trained interviewers from 1986 to 1989. Because Spanish was the language spoken at home by 95% (n = 195) of these families most of interviews were conducted in Spanish.

Measurements

During four fairly evenly spaced visits to our community field site in the first year and three visits in the third year of the study, each mother recalled her child's dietary intake during the previous 24 hours. After listing the foods eaten by her child during each eating occasion, she was then asked to describe portion sizes. A variety of probing techniques and adjuncts, such as three-dimensional food models, were used to enhance the completeness and accuracy of the mothers' reports. Dietary data were cleaned, coded, and edited by nutritionists prior to data entry and verification. Nutrient values were computed using the Georgetown University Study of Childhood Activity and Nutrition dietary analysis program.[19] Nutrient values for commonly eaten foods that were not included in the original database were added.[20-22] Previously reported data provide support for the reliability[6] and validity[11,23,24] of the mothers' reports of their children's diet.

Statistical Analysis

Typical nutrient intakes at two points in time were derived by averaging results from the four 24-hour recalls collected in year 1 (n = 205) and from the three recalls collected in year 3 (n = 168). Mean number of eating occasions, quantity, and grams of saturated fat from each food were calculated for each child. Foods were collapsed into 33 food groups (Appendix 1) based on a typology adapted from the US Department of Agriculture.[21]

Using data from year 1, a stepwise multiple regression analysis was used to select those foods that contributed the most to variance in percentage of calories from saturated fat. The possible independent variables were grams of saturated fat consumed per day from each of the 33 food groups. Grams of saturated fat for selected specific foods, most notably whole milk, were also examined.

Children were classified according to percentage of caloric intake from saturated fat and divided into quintiles. Joint classification analysis determined the stability of the quintile classification from year 1 to year 3.[25] More than 60% of the children who were classified in the highest (or lowest) quintile in year 1 remained in the highest (or lowest) two quintiles in year 3. Seasonal variation was not associated with saturated fat intake.

Stepwise discriminant analyses were used to select (1) those food groups whose grams of saturated fat per day and (2) those food groups whose number of servings per day most accurately distinguished children in the lowest and highest quintiles. The analysis by servings allowed us to identify foods both with and without fat that were associated with saturated fat intake. Prespecified serving sizes for each food were taken from the nutrient database (e.g., one cup of whole milk or one ounce of cheese = one serving). Multivariate analysis of variance was used to assess the overall significance of differences in the selected food groups across all five quintiles. Mean number of servings and mean number of grams of saturated fat per day were tested for univariate linear trends across the quintiles. The selected food groups were examined more closely to identify dietary behavior patterns, including specific foods mentioned, average amount consumed per eating occasion, number of eating occasions per day, and type of eating occasion (i.e., whether foods were consumed as part of snacks or main meals).

Data from year 3 were then used to verify the results. Mean percentage of calories from saturated fat was predicted using the food groups selected by the stepwise regression on year 1 data. The discriminant function generated from year 1 data was calculated using year 3 intakes and was used to classify subjects into extreme quintiles of percentage of calories from saturated fat in year 3.

All the analyses were replicated using calorie-adjusted saturated fat instead of percentage of calories from saturated fat. By using residuals from a regression with caloric intake as the independent variable and with saturated fat intake as the dependent variable, inferences can be drawn about saturated fat intake independent of total caloric intake.[3,25,26] Results were the same for calorie-adjusted saturated fat and nutrient densities. Only data for percentage of calories from saturated fat are reported because current recommendations are expressed in this way.[8-10]

Results

Data in Table 1 show that the reported mean percentage of calories from saturated fat in year 1 was 13.3% (SD = 2.2), approximately 30% higher than the amount of calories (less than 10%) recommended by the PHS.[9,10] Even children in the lowest quintile had an average reported consumption of more than 10% of total calories from saturated fat. High-fat milk products accounted for more than half and whole milk alone contributed 44% of the total reported saturated fat consumption across the sample.

Reported grams of saturated fat consumed per day from the following five food groups made the greatest successive incremental contributions to explained variance in the children's percentage of calories from saturated fat: high-fat milk products (R^2 = .56), beef/veal (R^2 = .60), enriched bread (R^2 = .62), animal fats/oils for cooking and table (R^2 = .65), and pork/lamb/sausage (R^2 = .67). Whole milk alone accounted for 41% of the variance.

Compared with children in the lowest quintile, children in the highest quintile consumed more than twice as much saturated fat per day from high-fat milk products (18.5g versus 7.8g), including more than twice as much from whole milk (13.2g vs 6.4g) and more than six times as much from hard cheese (3.4 vs 0.5g). The amounts of saturated fat from cheese were much smaller than those from whole milk.

TABLE 1—Daily Saturated Fat Intake from Selected Food Groups and All Foods, Calories from Saturated Fat, and Total Energy Intake by Quintile of Children's Percentage of Calories from Saturated Fat

	Lowest Quintile (n = 41)		Second Lowest Quintile (n = 41)		Middle Quintile (n = 41)		Second Highest Quintile (n = 41)		Highest Quintile (n = 41)		Total Sample (n = 205)	
	Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)
High-fat milk products (g)	7.8	(3.2)	10.3	(2.7)	12.2	(3.0)	14.7	(2.7)	18.5	(5.1)***	12.7	(5.1)
Whole milk	6.4	(3.0)	8.4	(3.0)	10.0	(2.7)	12.2	(2.6)	13.2	(4.3)***	10.0	(4.0)
Hard cheese	0.5	(0.9)	1.1	(1.5)	1.7	(1.7)	1.7	(1.7)	3.4	(3.0)***	1.7	(2.1)
Other high-fat milk products	0.9	(1.0)	0.8	(1.2)	0.5	(0.7)	0.7	(1.0)	2.0	(4.3)*	1.0	(2.2)
Beef/veal (g)	0.8	(1.0)	1.5	(2.3)	1.4	(1.5)	1.8	(1.8)	1.9	(2.1)**	1.5	(1.8)
Enriched bread, etc. (g)	0.4	(0.2)	0.4	(0.2)	0.4	(0.2)	0.4	(0.3)	0.4	(0.2)	0.4	(0.2)
Animal fats/oils for cooking and table (g)	0.4	(0.8)	0.4	(0.7)	0.4	(0.6)	0.5	(0.9)	0.6	(1.4)	0.4	(0.9)
Pork/lamb/sausage (g)	0.1	(0.5)	0.4	(0.9)	0.6	(1.5)	0.5	(0.9)	0.4	(1.0)	0.4	(1.0)
Saturated fat (all foods) (g)	17.0	(4.0)	21.4	(6.1)	22.0	(5.0)	24.7	(3.7)	29.9	(8.4)***	23.0	(7.1)
Calories saturated fat (%)	10.3	(1.0)	12.1	(0.4)	13.2	(0.3)	14.5	(0.3)	16.5	(1.1)***	13.3	(2.2)
Total energy intake (calories)	1481.8	(290.8)	1588.4	(438.1)	1495.6	(327.3)	1539.7	(227.3)	1636.3	(466.9)	1548.4	(362.5)

*$P < .05$ linear trend.
**$P < .01$ linear trend.
***$P < .001$ linear trend.

Parents of only four children in year 1 reported the consumption of low-fat or skim milk.

A discriminant function using grams of saturated fat per day from high-fat milk products and from beef/veal correctly classified 95% of the children in the two most extreme quintiles. A discriminant function using only grams of fat from whole milk correctly classified 84%. The multivariate analysis of variance showed significant overall differences among the five quintiles ($\Lambda = .43$, $P < .001$). Univariate tests for linear trends in grams of saturated fat from high-fat milk products and from beef/veal were both significant ($P < .001$ and $P < .01$, respectively).

A discriminant function using reported mean servings per day of high-fat milk products and of soda/punch/fruit drinks correctly classified 90% of the children in the two most extreme quintiles of percentage of calories from saturated fat. More reported servings per day of high-fat milk products and fewer servings per day of soda/punch/fruit drinks were associated with a high percentage of calories from saturated fat (Table 2). A discriminant function using only servings of whole milk correctly classified 84% of the children. The multivariate analysis of variance on number of servings per day indicated significant overall differences among the five quintiles ($\Lambda = .56$, $P < .001$). Univariate tests for linear trends in servings of high-fat milk products and of soda/punch/fruit drinks were both significant ($P < .001$) (Table 2).

Specific dietary behavior patterns involving whole milk were examined. In year 1, the mean number of servings per day ranged from 1.3 cups in the lowest quintile to 2.6 cups in the highest quintile (Table 2). The children in the lowest quintile did not consume smaller amounts of whole milk per eating occasion than those in the highest quintile (0.8 cups vs 0.9 cups) but consumed whole milk less frequently (1.6 vs 2.8 times per day). Overall, 56% of whole milk was consumed as part of snacks: 48% for children in the lowest quintile and 62% for children in the highest quintile. Thus, a substantial portion of whole milk was consumed daily as snacks, regardless of quintile membership.

Data from year 3 confirm the patterns observed in year 1. Grams of saturated fat consumed in year 3 from the five food groups selected using data from year 1 accounted for 58% of the variance in percentage of calories from saturated fat for year 3 data. The discriminant function from year 1 calculated using grams of saturated fat from year 3 correctly classified 79% of the children in the two most extreme quintiles in year 3. The multivariate analysis of variance on grams of saturated fat across quintiles was significant ($\Lambda = .58$, $P < .001$), but only the univariate trend for grams of saturated fat from high-fat milk products remained significant ($P < .001$). The discriminant function generated from year 1 data calculated with daily servings of high-fat milk products and soda/punch/fruit drinks in year 3 correctly classified 74% of the children in the two most extreme quintiles of percentage of calories from saturated fat in year 3 (Table 2). The multivariate analysis of variance on servings across quintiles was significant ($\Lambda = .74$, $P < .001$), but only the univariate linear trend for servings of high-fat milk products remained significant ($P < .001$). Although reported consumption of whole milk was lower in year 3 for all quintiles, children in the lowest quintile still consumed approximately half the number of cups per day as children in the highest quintile.

Discussion

The PHS[10] and the NCEP[9] recommend that children aged 2 years and older should consume less than 10% of their total calories as saturated fat. In our study, mean saturated fat consumption was 13.3% of total calories, and even children in our lowest quintile of saturated fat intake had reported an average consumption of more than 10%. Consistent with other studies,[4,15] we found that milk and milk products were the foods that made the greatest contribution to young children's saturated fat intake. Our data show that frequent consumption of whole milk was the single most important dietary be-

TABLE 2—Mean Number of Servings per Day of Selected Food Groups from Four Year 1 Recalls and from Three Year 3 Recalls by Quintile of Children's Percentage of Calories from Saturated Fat

	Year 1[a]									
	Lowest Quintile (n = 41)		Second Lowest Quintile (n = 41)		Middle Quintile (n = 41)		Second Highest Quintile (n = 41)		Highest Quintile (n = 41)	
	Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)
High-fat dairy	1.6	(0.9)	2.0	(0.6)	2.4	(0.7)	2.8	(0.5)	3.4	(1.0)*
Whole milk	1.3	(0.6)	1.6	(0.6)	2.0	(0.5)	2.4	(0.5)	2.6	(0.8)*
Soda/punch/fruit drinks	0.8	(0.8)	0.7	(0.6)	0.7	(0.6)	0.5	(0.3)	0.5	(0.4)*
	Year 3[b]									
	Lowest Quintile (n = 33)		Second Lowest Quintile (n = 34)		Middle Quintile (n = 34)		Second Highest Quintile (n = 34)		Highest Quintile (n = 33)	
	Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)
High-fat dairy	1.2	(1.1)	1.5	(0.9)	1.9	(1.0)	2.2	(0.7)	2.7	(1.0)*
Whole milk	0.9	(0.6)	1.2	(0.5)	1.6	(0.7)	1.6	(0.7)	2.0	(0.7)*
Soda/punch/fruit drinks	0.6	(0.5)	0.7	(0.7)	0.5	(0.5)	0.7	(0.7)	0.5	(0.5)

[a]Overall $\Lambda = .56$; $df = 8,398$; $P < .001$.
[b]Overall $\Lambda = .74$; $df = 8,324$; $P < .001$.
*Univariate linear trend $P < .001$.

havior pattern that distinguished children with low and high saturated fat intake.

Substitution of 1% milk-fat milk for whole milk, without changing any other dietary behaviors, would have reduced the percentage of calories from saturated fat by 25% for the whole sample (from 13.3% to just under 10.0%) and by no less than 20% in any of the five quintiles. This single dietary substitution would have brought average intakes of all children but those in the two highest quintiles within the level recommended by the PHS[10] and the NCEP.[9]

Concerns have been raised about adverse effects of interventions to reduce children's fat intake,[27–29] but there are few data that empirically address how a moderately reduced fat diet affects growth or development. One study, based on a small sample of children (n = 40), reported growth failure in eight children associated with reduced caloric and zinc intake resulting from unsupervised dietary treatment of hypercholesterolemia.[29] Most research on the role of caloric intake in children's growth and development has been conducted in developing countries.[30–32] We did not identify any published population-based studies documenting adverse effects on growth or development resulting from a moderately reduced fat diet such as that recommended by the NCEP[9] or the PHS.[10] In our data, children in the lowest quintile of percentage of calories from saturated fat did not differ on average from children in any other quintile on measures of height, weight, body mass index, or sum of skinfolds.[33] (Methods for these measures are reported elsewhere).[34] A related issue is that selectively limiting foods that are high in fat, such as dairy products, may also restrict intake of protein and micronutrients.[27] However, given that low-fat, skim, and whole milk are equivalent sources of protein, carbohydrate, calcium, and most other micronutrients (Table 3), substituting low-fat for whole milk affects only intake of calories and fat. Moreover, balancing these concerns about possible unintended adverse effects of reducing children's calorie and fat intakes are national data showing that prevalence rates of obesity among children are increasing[35] and that many children eat too much saturated fat.[4–7]

Several limitations of this study must be considered. First, data in Table 2 show that the average number of servings of milk and milk products was lower in year 3 than in year 1. We have reported elsewhere that this decline is most likely an artifact of children entering school and mothers thus being unaware of their children's food consumption during lunch.[6] Because this change occurred in all five quintiles, it did not bias the results. Second, we defined saturated fat generically, but some reports indicate that different kinds of saturated fat affect serum cholesterol differently.[36,37] Although further research may lead to more specific recommendations, current dietary recommendations for children by the PHS[10] and the NCEP[9] are specified in these terms.

The generalizability of our findings may be limited because this study included a single sample of 4- to 7-year-old Latino children from low socioeconomic families in one disadvantaged urban community. The Latino population in disadvantaged urban settings is of particular interest for public health because it is growing rapidly[38] and because, compared with non-Hispanic Whites, Latinos have been shown to have increased prevalence of some cardiovascular disease risk factors,[39–44] to have lower levels of knowledge about cardiovascular disease risk factors,[39,44] and to consume more saturated fat and less low-fat and non-fat milk than other ethnic groups.[45,46] Generalizability may also be limited because our data were collected from 1986 to 1989. Over the last two decades, national per capita consumption of whole milk has declined while consumption of low-fat milk has increased,[47] yet less than 4% of the

TABLE 3—Nutrition Information for One Cup Serving of Grade A Pasteurized, Homogenized Whole Milk, 2% Milk-fat Milk, 1% Milk-fat Milk, and Skim Milk

	Whole Milk Vitamin D Added	2% Milk-fat Milk Vitamin A and D Added	1% Milk-fat Milk Vitamin A and D Added	Skim Milk Vitamin A and D Added
Calories	150	120	100	85
Protein (g)	8	8	8	8
Protein[a]	20	20	20	20
Carbohydrate (g)	11	12	12	12
Fat (g)	8	5	3	0
Sodium (mg)	120	122	123	126
Potassium (mg)	370	377	381	406
Vitamin A[a]	4	10	10	10
Vitamin C[a]	4	4	4	4
Vitamin D[a]	25	25	25	25
Vitamin B4[a]	0	0	0	4
Vitamin B6[a]	4	4	4	0
Vitamin B12[a]	15	15	15	15
Calcium[a]	30	30	30	30
Iron[b]				
Thiamine[a]	6	6	6	6
Riboflavin[a]	25	25	25	25
Niacin[b]				
Phosphorus[a]	20	20	20	20
Magnesium[a]	8	8	8	8
Zinc[a]	4	4	4	4
Pantothenic acid[a]	6	6	6	6

[a]Percentage of US daily allowances of these nutrients.
[b]Less than 2% of US recommended daily allowance for these nutrients.

parents of the children in our sample reported consumption of low-fat or skim milk. While our data suggest no substantial shift to low-fat milk, we cannot be sure that this change has not occurred since 1989.

The gap between national estimates showing that 4- to 5-year-old children consume an average of 14.7% of calories from saturated fat[4] and recommendations by the PHS[10] and the NCEP[9] that children aged 2 years and older should consume less than 10% of calories from saturated fat indicates a need for many young children to modify their typical diet. We conclude that, for those young children who consume more than 10% of calories from saturated fat and whose family and pediatrician have decided to pursue dietary change to reach national dietary recommendations,[9,10] an important strategy is for parents to substitute low-fat milk for high-fat milk.[48] Maintenance of sufficient caloric intake should be part of any dietary recommendation. □

Acknowledgments

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References

1. US Department of Health and Human Services. *The Surgeon General's Report on Nutrition and Health.* Washington, DC: US Govt Printing Office; 1988. DHHS PHS publication 88–50210.
2. Committee on Diet and Health, National Research Council. *Diet and Health: Implications for Reducing Chronic Disease Risk.* Washington, DC: National Academy Press; 1989.
3. Willett WC. *Nutritional Epidemiology.* New York, NY: Oxford University Press; 1990.
4. US Department of Agriculture. *Nationwide Food Consumption Survey.* Hyattsville, Md: US Dept of Agriculture; 1987. Human Nutrition Information Service NFCS, CSFII, Report No. 85–4.
5. Kimm SYS, Gergen PJ, Malloy M, Dresser C, Carroll M. Dietary patterns of US children: implications for disease prevention. *Prev Med.* 1990;19:432–434.
6. Stein AD, Shea S, Basch CE, Contento IR, Zybert P. Variability and tracking of nutrient intakes of preschool children based on multiple administrations of the 24-hour dietary recall. *Am J Epidemiol.* 1991;134: 1427–1437.
7. Nicklas TA, Farris RP, Major C, et al. Dietary intakes. *Pediatrics* 1987;80(suppl): 797–806.
8. Task Force of the Nutrition Committee and the Cardiovascular Disease in the Young Council of the American Heart Association. Diet in the healthy child. *Circulation* 1983;67:411A–4A.
9. US Public Health Service. *National Cholesterol Education Program: Report of the Expert Panel on Population Strategies for Blood Cholesterol Reduction Executive Summary.* Washington, DC: US Govt Printing Office; 1990. National Institutes of Health publication 90–3047.
10. US Public Health Service. *Healthy People 2000: National Health Promotion and Disease Prevention Objectives.* Washington, DC: US Govt Printing Office; 1991. US Dept of Health and Human Services publication PHS 91–50212.
11. Shea S, Basch CE, Irigoyen M, et al. Relationships of dietary fat consumption to serum total and low-density lipoprotein cholesterol in Hispanic preschool children. *Prev Med.* 1991;20:237–249.
12. Webber LS, Srinivasan SR, Wattigney WA, Berenson GS. Tracking of serum lipids and lipoproteins from childhood to adulthood. *Am J Epidemiol.* 1991;133:884–899.
13. Nicklas TA, Farris RP, Smoak CG, et al. Dietary factors relate to cardiovascular risk factors in early life. *Arteriosclerosis.* 1988; 8:193–199.
14. Basch CE, Shea S, Contento I, Zybert P. Stability of diet measured by a semiquantitative food frequency questionnaire in 4- to 7-year-old Latino children. Unpublished manuscript.
15. Nicklas TA, Farris RP, Johnson CC, Webber LS, Berenson GS. *Food Sources of Nutrients: A Tool for Dietary Management and Health.* New Orleans, La: National Center for Cardiovascular Health, Louisiana State University Medical Center; 1990.
16. Willett WC, Stampfer MJ, Colditz GA, et al. Relation of meat, fat, and fiber intake to the risk of colon cancer in a prospective study among women. *N Engl J Med.* 1990; 323:1664–1672.
17. Jenkins DJA, Wolever TMS, Vuksan V, et al. Nibbling versus gorging: metabolic advantages of increased meal frequency. *N Engl J Med.* 1989;321:929–934.
18. Willett WC. Challenges for public health nutrition in the 1990s. *Am J Public Health.* 1990;80:1295–1297.
19. Zuckerman AE. *Dietary Recall Nutrient Analysis Software.* Washington, DC: Alan E. Zuckerman; 1987.
20. Adams CF, Richardson M. *Nutritive Value of Foods.* Washington, DC: US Govt Printing Office; 1981. US Dept of Agriculture, Home and Garden Bulletin 72.
21. Gebhardt SE, Matthews RH. *Nutritive Value of Foods.* Washington, DC: US Govt Printing Office; 1986. US Dept of Agriculture, Home and Garden Bulletin 72.
22. De Reguero LC, de Santiago SMR. *Tabla de composicion de alimentos de uso corriente en Puerto Rico.* Hato Rey, Puerto Rico: Universidad de Puerto Rico; 1978.
23. Basch CE, Shea S, Arliss A, et al. Validation of mothers' reports of dietary intake by four to seven year-old children. *Am J Public Health.* 1990;80:1314–1317.
24. Eck LH, Klesges RC, Hanson CL. Recall of a child's intake from one meal: are parents accurate? *J Am Diet Assoc.* 1989;89: 784–789.
25. Willett WC, Sampson L, Stampfer MJ, et al. Reproducibility and validity of a semiquantitative food frequency questionnaire. *Am J Epidemiol.* 1985;122:51–65.
26. Willett W, Stampfer MJ. Total energy intake: implications for epidemiologic analysis. *Am J Epidemiol.* 1986;124:17–27.
27. Committee on Nutrition, American Acad-

emy of Pediatrics. Prudent lifestyle for children: dietary fat and cholesterol. *Pediatrics.* 1986;78:521–525.
28. Pugliese M, Weyman-Daum M, Moses N, et al. Parental health beliefs as cause of non-organic failure to thrive. *Pediatrics.* 1987;80:175–182.
29. Lifshitz F, Moses N. Growth failure: a complication of dietary treatment of hypercholesterolemia. *Am J Dis Child.* 1989; 143:537–542.
30. Sigman M, Neuman C, Jansen AAJ, Bwibo N. Cognitive abilities of Kenyan children in relation to nutrition, family characteristics, and education. *Child Dev.* 1989;60:1463–1474.
31. Sigman M, Neuman C, Baksh M, Bwibo N, McDonald A. Relationship between nutrition and development in Kenyan toddlers. *J Pediatr.* 1989;115:357–364.
32. Allen LH, Black AK, Backstrand JR, et al. An analytical approach for exploring the importance of dietary quality vs quantity to the growth of Mexican children. *Food Nutr Bull.* 1991. In press.
33. Shea S, Basch CE, Zybert P. Relationships between 4- to 7-year-old children's dietary fat intake and growth. Unpublished manuscript.
34. Gutin B, Basch CE, Shea S, et al. Blood pressure, fitness, and fatness in 5- and 6-year-old children. *JAMA.* 1990;264:1123–1127.
35. Gortmaker S, Dietz W, Sobol A, Wehler C. Increasing pediatric obesity in the United States. *Am J Dis Child.* 1987;141:535–540.
36. Hegstead DM, McGandy RB, Myers ML, Stare FJ. Quantitative effects of dietary fat on serum cholesterol in man. *Am J Clin Nutr.* 1965;17:281–295.
37. Bonanome A, Grundy SM. Effect of dietary steric acid on plasma cholesterol and lipoprotein levels. *N Engl J Med.* 1986; 318:1244–1248.
38. US Department of Commerce, Bureau of the Census. The Hispanic population in the United States: March 1988 advance report. *Current Population Reports.* Series P-20, no. 431. Washington, DC: US Govt Printing Office; 1988. USGPO publication 1988–201–478:80117.
39. Hazuda HP, Stern MP, Gaskill SP, Haffner SM, Gardner LI. Ethnic differences in health knowledge and behaviors related to the prevention and treatment of coronary heart disease: the San Antonio Heart Study. *Am J Epidemiol.* 1983;117:717–728.
40. Samet JM, Coultas DB, Howard CA, et al. Diabetes, gallbladder disease, obesity and hypertension among Hispanics in New Mexico. *Am J Epidemiol.* 1988;128:1302–1311.
41. Hamman RF, Marshall JA, Baxter J, et al. Methods and prevalence of non-insulin dependent diabetes mellitus in a biethnic population: the San Luis Valley Diabetes Study. *Am J Epidemiol.* 1989;129:295–311.
42. Mitchell BD, Stern MP, Haffner SM, Hazuda HP, Patterson JK. Risk factors for cardiovascular mortality in Mexican Americans and non-Hispanic Whites: the San Antonio Heart Study. *Am J Epidemiol.* 1990;131:423–433.
43. Stern MP, Haffner SM. Type II diabetes and its complications in Mexican Americans. *Diabetes Metab Rev.* 1990;6:29–45.
44. Shea S, Stein AD, Basch CE, et al. Independent associations of educational attainment and ethnicity with behavioral risk factors for cardiovascular disease. *Am J Epidemiol.* 1991;134:567–583.
45. Knapp, JA, Hazuda HP, Haffner SM, et al. A saturated fat/cholesterol avoidance scale: sex and ethnic differences in a biethnic population. *J Am Diet Assoc.* 1988;88:172–177.
46. Delapa RM, Mayer JA, Candelaria J, et al. Food purchase patterns in a Latino community: Project Salsa. *J Nutr Educ.* 1990; 22:133–136.
47. Miller JJ, Short SD, Neff SA. *Dairy: situation and outlook yearbook.* Rockville, Md: US Dept of Agriculture, Economic Research Service, Commodity Economics Division; 1991. Publication DS–431.
48. Wechsler H, Wernick SM. A social marketing campaign to promote the consumption of low-fat milk in an inner-city Latino community. *Public Health Rep.* In press.

APPENDIX—Thirty-three Groups Derived from a US Department of Agriculture Typology

1	Low-fat milk products (<10% of calories from fat)
2	Medium-fat milk products (10–40% of calories from fat)
3	High-fat milk products (40% of calories from fat)
4	Beef/veal
5	Pork/lamb/sausage (not smoked)
6	Poultry, not fried
7	Poultry, fried
8	Fish/shellfish, not fried
9	Fish/shellfish, fried
10	Cured and processed meats/organ meats/franks/lunchmeat/bacon/ham
11	Meat mixtures/sandwiches
12	Eggs/egg mixtures
13	Legumes/nuts/seeds
14	Enriched bread/rolls/muffins/rice/noodles/pasta/biscuits/flour
15	100% whole grain bread/rolls/muffins/rice/noodles/pasta/biscuits/flour
16	Cakes/cookies/pies/pastries/doughnuts/graham crackers
17	Crackers/chips/salty snacks from grains
18	Breakfast cereals
19	Pancakes/waffles/french toast
20	Grain mixtures, mostly grain
21	Fresh fruit
22	Other fruit
23	Fruit juice
24	Dark green leafy and nonleafy vegetables/deep yellow vegetables
25	Other vegetables/vegetable mixtures
26	Vegetables, fried
27	Fats and oils used in cooking and at the table from vegetable sources
28	Salad dressing/gravy
29	Fats and oils used in cooking and at the table from animal sources
30	Sugars/jellies/syrups/gelatin/desserts/popsicles/ices/candies/gum/puddings/icing
31	Soda/punch/fruit drinks
32	Alcoholic beverages
33	Condiments

Source. Data from the US Department of Agriculture.[21]