Food Cariogenicity in Americans Aged from 9 to 29 Years Assessed in a National Cross-sectional Survey, 1971–74

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The purpose of this study was to investigate the association between the probability of having high DMFT scores and reported consumption of eight food groups. The sample included Americans (aged from 9 to 29 years) examined during the first National Health and Nutrition Examination Survey conducted between 1971 and 1974. Analysis was restricted to comparing those individuals having DMFT scores equal to or above the 80th percentile of the DMFT distribution with those having scores equal to or below the 20th percentile of the distribution.

The strongest discriminator between the low- and high-DMFT groups was the between-meal consumption of table sugars and syrups. The between-meal consumption of sugary desserts was also significantly associated with high DMFT scores. Foods to which table sugars are usually added before consumption, such as coffee, chocolate, and tea drinks, were associated with high DMFT scores in the bivariate analysis. When the same-day consumption of table sugars and syrups was accounted for, the associations became nonsignificant. The reported consumption of breakfast cereals, bread, fruit juices, ice cream, and nuts and crackers was not associated with high DMFT scores, perhaps because they were consumed only infrequently.

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Introduction.

Though the terms "cariogenicity", "cariogenic foods", "cariogenic impact", and "cariogenic potential" have been widely used in the dental literature, there are no agreed-upon definitions of these terms. During the Scientific Consensus Conference on Methods for Assessment of the Cariogenic Potential of Foods (Burt and Ismail, 1986), it was suggested that cariogenicity of foods be considered in two parts: "cariogenic potential", referring to the ability of foods to cause significant drop in plaque pH, demineralization of enamel, or more caries in animals under controlled experimental conditions; and "effective cariogenicity" or simply cariogenicity of foods, taking into account not only the cariogenic potential of a food but also the frequency and manner of its consumption. The effective cariogenicity of foods, therefore, can only be determined by longitudinal epidemiologic studies involving humans under free-living conditions, or by case-control studies correlating caries status and reported consumption of potentially cariogenic foods. The purpose of this study was to determine effective cariogenicity by studying the relation between the consumption of specific groups of foods and probability of having either low[1] or high[2] dental caries prevalence. In the analysis, I used a representative sample of white and black Americans (aged from nine to 29) who participated in the first National Health and Nutrition Examination Survey (NHANES I) conducted between 1971 and 1974.

Numerous epidemiological studies (Afonsky, 1951; Kleemola-Kujala and Rasanen, 1979 and 1982; Duany *et al.*, 1972; Russell, 1963; Marshall-Day, 1944; Sreebny, 1982a; Ismail *et al.*, 1984; Martinsson, 1972; Rugg-Gunn *et al.*, 1984) have concluded that diets of populations with low dental caries prevalence have more unprocessed foods and less refined carbohydrate than do the diets of populations with high dental caries prevalence. The frequently quoted Vipeholm dental caries study (Gustafsson *et al.*, 1954) demonstrated the strong association between the consumption of sugary confections and dental caries incidence. Observational epidemiologic studies have also demonstrated the association between caries experience and both the amount and frequency of between-meal consumption of sugary foods (Weiss and Trithart, 1960; Burt *et al.*, 1982; Centers for Disease Control, 1973; Ismail *et al.*, 1984).

There are few epidemiological studies that attempted to describe the dietary intake of individuals with high caries prevalence or incidence. Duany *et al.* (1972) compared the reported consumption of foods of caries-free and caries-active high school students in Miami, Florida. The caries-active group reported frequent consumption of soda pop, candy, and table sugars. A similar conclusion was reached by Kleemola-Kujala and Rasanen (1979) in Finland, where children with DMFT scores equal to or larger than the 67th percentile of the DMFT distribution reported frequent consumption of soft drinks and other cariogenic foods. In a study with children from Columbia (South Carolina) and Detroit (Michigan), Bagramian and Russell (1973), also using the 67th percentile as a cut-off point to define the high-caries group, failed to find a relationship between reported dietary intake and dental caries status.

Materials and methods.

Data sources. — The NHANES I survey collected extensive medical, biochemical, and dental information from a sample of over 20,000 persons representing the population of the continental United States. Dietary and nutritional information was obtained from each individual by means of a 24-hour dietary recall interview. As has previously been mentioned, analysis in this paper was restricted to white and black Americans, aged from nine to 29 years (n = 3194), who had low or high DMFT scores. This age group was selected in order to relate the food consumption patterns to dental caries prevalence at a caries-active age. Table 1 presents the sample size at each age included in this analysis, and the number of persons with low and high DMFT scores. Descriptions of the sampling design used in NHANES I, selection procedures, and data collected have been presented in detail elsewhere (United States Public Health Service, 1973) and have recently been summarized (Ismail *et al.*, 1983; Ismail *et al.*, 1984).

Dental data. — In the NHANES I survey, ten dental examiners recorded dental caries status (DMFT index) (Klein *et al.*, 1938). The examiners were trained prior to the survey and were calibrated throughout by two senior examiners.

Dietary data. — The amount and frequency of at- and between-meal consumption of defined food items were abstracted from the data gathered during the 24-hour dietary recall from each individual in the survey. In NHANES I, each individual

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[1]Equal to or below the 20th percentile of the decayed, missing, and filled teeth (DMFT) distribution.

[2]Equal to or above the 80th percentile of the DMFT distribution.

TABLE 1
THE NUMBER OF WHITE AND BLACK AMERICANS AGED FROM 9 TO 29 YEARS EXAMINED IN NHANES I, 1971-74, BY THE 20TH AND 80TH PERCENTILE OF THE DMFT DISTRIBUTION

	DMFT at or below the 20th percentile		DMFT equal to or above the 80th percentile	
Age	DMFT	n	DMFT	n
9	0	109	4	99
10	0	88	5	39
11	1	95	6	40
12	1	96	7	67
13	2	94	8	87
14	2	82	9	84
15	3	83	10	56
16	3	72	11	88
17	4	82	12	87
18	4	46	13	65
19	5	72	13	74
20	5	77	14	89
21	6	90	15	93
22	6	75	16	93
23	7	96	17	79
24	7	70	18	80
25	8	74	19	66
26	8	62	20	80
27	9	59	21	65
28	9	67	22	63
29	10	67	23	44
Total		1656		1538

was asked to classify the food item he or she reportedly had consumed into an at- or between-meal consumption. This method of classifying foods into a meal or a snack took into consideration the individual variations in food consumption.

Food groups were formulated specifically for this study and are different from those used in an earlier report given at the 4th Annual Conference on Foods, Nutrition and Dental Health (Burt and Eklund, 1981). The groups used in this analysis were (a) table sugars and syrups, (b) sugary desserts and snacks, (c) breakfast cereals, (d) coffee, chocolate, and tea drinks, (e) fruit juices, (f) ice cream, (g) bread, and (h) crackers and nuts. A summary list of foods included in each of the food groups is presented in Table 2, and a full list of the foods included can be obtained from the author.

Food groups were formed for this study after consultation with nutritionists, dentists, and oral epidemiologists, since there are no agreed-upon and published rules for grouping foods. A list of the foods and their codes reported by 20,749 Americans in NHANES I was provided by NCHS. A FORTRAN program was used to match the codes (supplied by NCHS) of foods consumed by each individual during the one-day preceding the interview with the foods included in each of the eight food groups described in Table 2. The at- and between-meal amount and frequency of consumption from each food group for each individual were then computed. The computed amounts and frequencies of consumption from the food groups were used to classify each individual into two or more consumption groups (for the amount and frequency, separately). Tables 3–6 present the lower and upper limits of each category (amount and frequency, separately) for the different foods included in this analysis. Nonconsumption information (zero amount or frequency of consumption from a food group) is not presented in the Tables.

Statistical analysis. — Analysis of the DMFT index in this study followed an approach that was previously used by others (Kleemola-Kujala and Rasanen, 1979 and 1982; Duany *et al.*, 1972; Ismail *et al.*, 1984). A case-control epidemiologic approach, using odds ratios, was used in analysis of the data. The odds ratio is a measure of the degree of association between a disease and the risk factor under study, and is commonly used in general epidemiology (Fleiss, 1981). An odds ratio is defined as the ratio of the probability of having a high DMFT score and consuming from a specific food group to the probability of having a low DMFT score and consuming from the same food group, divided by the ratio of the same probabilities given nonconsumption from the food group under study (Fleiss, 1981).

TABLE 2
A SUMMARY LIST OF FOODS INCLUDED IN EACH FOOD GROUP*

Food Group	Examples of Foods Included
Table sugars and syrups	white sugar, brown sugar, cane syrup, maple syrup
Sugary desserts and snacks	brownies, doughnuts, cakes, cookies, pies, candies
Breakfast cereals	corn cereals, cream of wheat, oat cereals, bran cereals
Coffee, chocolate, and tea drinks	coffee instant, caffeine-free coffee, tea, cocoa dry powder, chocolate drinks
Fruit juices	orange, pineapple, grapefruit, apple, cranberry
Ice cream	ice cream (all commercial flavors), ice milk, ice cream bar, ice cream cones
Bread	all types of bread reported by the interviewees including muffins, rolls and buns, waffles, croutons (In addition, macaroni and spaghetti were also included.)
Crackers and nuts	cashew nuts, chestnuts, peanuts, popcorn, crackers, tortillas

*A full list can be obtained from the author.

When no association exists between the disease and its risk factor(s), the odds ratio is equal to one. Odds ratios larger than one indicate the presence of a positive association between the risk factor and the disease under investigation. An odds ratio less than one indicates that exposure to the risk factor reduces the probability of having the disease (a negative association). In this study, only the null hypothesis that the odds ratio was larger than one was tested. Statistical significance of the increase in the odds ratio was tested using the chi-square test (Fleiss, 1981). In addition, 95% confidence intervals were computed for the odds ratios, by means of the Taylor series estimation (Kleinbaum *et al.*, 1982). When the confidence intervals did not include unity, it was concluded with 95% confidence that the odds ratio is larger than one.

In addition to estimating the odds ratios, I used a logistic regression model (Kleinbaum *et al.*, 1982) to account for differences between those with low and high DMFT scores with respect to age, gender, race, income, and education. In all analyses a Type I error equal to or less than 0.05 was used ($p < 0.05$).

Results.

(a) Table sugars and syrups. — A significant relation was detected between high DMFT scores and the amounts of table sugars and syrups consumed between meals (Table 3). The consumption of table sugars and syrups between meals in amounts greater than 20 g daily significantly increased the odds of having high DMFT scores by approximately 71%. The between-meal frequency of consumption from this food group

TABLE 3

THE ODDS RATIOS* OF THE ASSOCIATION BETWEEN HIGH DMFT SCORES AND THE ONE-DAY BETWEEN-MEAL AMOUNT AND FREQUENCY OF CONSUMPTION OF TABLE SUGARS AND SYRUPS, NHANES I, 1971-74

Amount of Between-meal Consumption			Frequency of Between-meal Consumption		
Amount (g)	Odds Ratios	95% Confidence Interval+	Frequency	Odds Ratios	95% Confidence Interval+
>0-<10	1.54++	1.03-2.28	1	1.43++	1.13-1.79
10-<10	1.34	0.95-1.87	2+	1.80++	1.29-2.49
20+	1.71++	1.27-2.30			

*See "Statistical analysis" for definition of odds ratios.
+95% confidence intervals were computed using the Taylor series confidence interval estimation (Kleinbaum *et al.*, 1982). See "Statistical analysis" for description.
++Odds ratio is larger than one with 95% confidence (chi-square test with one degree of freedom).

TABLE 4

THE ODDS RATIOS* OF THE ASSOCIATION BETWEEN HIGH DMFT SCORES AND THE ONE-DAY BETWEEN-MEAL AMOUNT AND FREQUENCY OF CONSUMPTION OF SUGARY DESSERTS AND SNACKS, NHANES I, 1971-74

Amount of Between-meal Consumption			Frequency of Between-meal Consumption		
Amount (g)	Odds Ratios	95% Confidence Interval+	Frequency	Odds Ratios	95% Confidence Interval+
>0-<34	0.87	0.77-1.11	1	1.15	0.97-1.35
34-<67	1.02	0.78-1.31	2	1.05	0.77-1.42
67-<100	0.64	0.42-0.90	3+	1.87++	1.04-3.35
100+	1.43++	1.10-1.84			

*See "Statistical analysis" for definition of odds ratios.
+95% confidence intervals were computed using the Taylor series confidence interval estimation (Kleinbaum *et al.*, 1982). See "Statistical analysis" for description.
++Odds ratio is larger than one with 95% confidence (chi-square test with one degree of freedom).

TABLE 5

THE ODDS RATIOS* OF THE ASSOCIATION BETWEEN HIGH DMFT SCORES AND THE ONE-DAY BETWEEN-MEAL AMOUNT AND FREQUENCY OF CONSUMPTION OF BREAKFAST CEREALS, NHANES I, 1971-74

Amount of Between-meal Consumption			Frequency of Between-meal Consumption		
Amount (g)	Odds Ratios	95% Confidence Interval+	Frequency	Odds Ratios	95% Confidence Interval+
0-<15	1.50	0.80-1.71	1	1.03	0.87-1.13
15-<30	0.75	0.77-1.29	2+	0.66	0.50-1.98
30-<45	1.03	0.72-1.37			
45+	1.18	0.81-1.22			

*See "Statistical analysis" for definition of odds ratios.
+95% confidence intervals were computed using the Taylor series confidence interval estimation (Kleinbaum *et al.*, 1982). See "Statistical analysis" for description.

TABLE 6

THE ODDS RATIOS* OF THE ASSOCIATION BETWEEN HIGH DMFT SCORES AND THE ONE-DAY BETWEEN-MEAL AMOUNT AND FREQUENCY OF CONSUMPTION OF COFFEE, CHOCOLATE, AND TEA DRINKS, NHANES I, 1971-74

Amount of Between-meal Consumption			Frequency of Between-meal Consumption		
Amount (g)	Odds Ratios	95% Confidence Interval+	Frequency	Odds Ratios	95% Confidence Interval+
>0-<240	1.21	0.92-1.58	1	1.46++	1.18-1.80
240-<480	1.58++	1.18-2.10	2	1.10	0.80-1.50
480+	1.54++	1.18-2.06	3	1.55	0.95-2.51
			4+	2.81++	1.81-4.35

*See "Statistical analysis" for definition of odds ratios.
+95% confidence intervals were computed using the Taylor series confidence interval estimation (Kleinbaum *et al.*, 1982). See "Statistical analysis" for description.
++Odds ratio is larger than one with 95% confidence (chi-square test with one degree of freedom).

was also significantly associated with high DMFT scores. Those who consumed from this food group two or more times daily between meals had an 80% increase in the odds of having high DMFT scores relative to those who did not consume table sugars and syrups between meals (Table 3). The frequency of between-meal consumption, but not the amounts, of table sugars and syrups remained a significant predictor of high DMFT scores when difference in age, gender, race, income, fluoride content of the enamel, and education were statistically accounted for using the logistic regression model. The distinction, however, between the separate effects of the amount and frequency of between-meal consumption cannot be made because of the high correlation between the two risk factors [Spearman rank correlation coefficient (r) equal to +0.99].

TABLE 7
LOGISTIC REGRESSION COEFFICIENTS OF THE PROBABILITY OF HAVING HIGH DMFT SCORES AND CONSUMING COFFEE, CHOCOLATE, AND TEA ACCOUNTING FOR THE CONSUMPTION OF TABLE SUGARS AND SYRUPS, NHANES I, 1971-74

Variable Name	Regression Coefficients	SE*	Z-Score
Table Sugars and Syrups			
Amount between meals	−0.08	0.10	0.81
Frequency between meals	0.33	0.14	2.28+
Coffee, Chocolate, and Tea			
Amount between meals	−0.09	0.93	0.95
Frequency between meals	−0.02	0.11	−0.17

*SE = Standard error of the regression coefficient.
+ $p<0.05$: Odds ratio is significantly larger than one (one-sided z test).

The amount and frequency of at-meal consumption from the table sugars and syrups food group were not associated with high DMFT scores, except for the at-meal frequency of three or more times which was associated with an 84% increase in the odds of having high caries scores (Tables not presented).

(b) Sugary desserts and snacks. — There was no significant association between high DMFT scores and the amount of consumption of sugary desserts and snacks at meals, in the bivariate analysis. Between meals, the consumption of 100 g or more daily from this food group was significantly associated with an estimated 43% increase in the odds of having high DMFT scores (Table 4). The estimated increase in the odds of having high DMFT scores for those who consumed sugary desserts and snacks three times or more, between meals, was approximately 87%, while the between-meal consumption of sugary desserts and snacks one or two times was not associated with high DMFT scores (Table 4).

When the amount and frequency of consumption at and between meals from this food group were correlated with status of dental caries after accounting for different potential confounding variables, the frequency of consumption between meals and the amount of consumption at meals were significant risk factors (data not tabulated). There was a high correlation between the amount and frequency of consumption, at and between meals, of sugary desserts and snacks. The Spearman correlation coefficients (r) were +0.96 and +0.98 between the amount and frequency of at and between meals, respectively; therefore, the distinction between the separate effect of amount or frequency cannot be made from the model because of the high correlation. When only consumers were compared to non-consumers, regardless of the amount and frequency of consumption (a dummy variable was coded a "0" when the individual reported nonconsumption, and "1" when the person reported that he or she had consumed sugary desserts and snacks), both the at- and between-meals consumptions were significant risk factors of high DMFT scores.

(c) Breakfast cereals. — No statistically significant association was detected between high DMFT scores and the different amounts or frequencies of at-meal consumption of breakfast cereals (Table 5). Because there were only 72 subjects aged from nine to 29 years in the NHANES I sample with low and high DMFT scores and who reportedly consumed breakfast cereals between meals, no categorization into different amounts or frequencies of between-meal consumption was carried out. No association was detected, in the bivariate analysis, between the status of dental caries and the between-meal consumption of breakfast cereals.

(d) Coffee, chocolate, and tea drinks. — A significant association was found, by the odds ratio analysis, between high DMFT scores and the between-meal consumption of coffee, chocolate, or tea drinks (referred to henceforth as "hot drinks") (Table 6). This apparent association between high DMFT scores and between-meal consumption of hot drinks, however, could be because of the high correlation between the amounts of between-meal consumption of hot drinks, and table sugars and syrups (r = +0.57), and also between the frequencies of between-meal consumption from both food groups (r = +0.57). When the same-day total consumption of table sugars and syrups and drinks was accounted for by means of the regression model, the relation between consumption of drinks and high DMFT scores became nonsignificant (Table 7).

(e) Other food groups. — No relation was found between high DMFT scores and the reported consumption of ice cream, fruit juices, and crackers and nuts.

Discussion.

The NHANES I was conducted from 1971 to 1974. Since then, the prevalence of dental caries in the United States has declined in children and adolescents aged from five to 17 years (Brunelle and Carlos, 1982). The NHANES I data, therefore, may present a picture of caries distribution in American children that is different from what may now be the case. Analyses of NHANES I dental data, similar to the one presented here, however, can provide information on the characteristics of individuals with high caries prevalence. Moreover, the findings can still be applied to populations where dental caries prevalence is increasing (Moller, 1978; Sardo-Infirri and Barmes, 1979), and may be applicable to those living in areas in the United States where dental caries is still higher than the national average — for example, in South Carolina (South Carolina Department of Health and Environmental Control, 1983).

Epidemiological studies, with limitations, help to shed light on the complex subject of the cariogenicity of foods by taking into consideration the human variations in the frequency and amount of consumption in the foods. By contrast, the other available models of measuring cariogenicity (Mühlemann, 1971; Imfeld, 1983; Jensen *et al.*, 1982; Bowen *et al.*, 1980; Rugg-Gunn *et al.*, 1975; Koulourides *et al.*, 1976) only provide information on the propensity of a food (cariogenic potential) to cause decay without testing the cariogenic impact of a food under the different dietary intake profiles of humans. Epidemiological research of food cariogenicity (effective cariogenicity), therefore, helps to augment the results of the different experimental models, such as the animal model, that assess the cariogenic potential of foods.

In conducting an epidemiological study to test for the cariogenicity of foods, researchers are faced with a number of methodological problems. One is the measurement of the consumption of foods, an inherently difficult task. A helpful factor in studies of diet-caries relations is that the disease predominantly affects young people, and hence the dietary intake needs to be estimated for only a relatively short period of time (in contrast to studies of coronary diseases). In this study, only those aged from nine to 29 years were included in order to minimize the problem of correlating a cumulative life-long measure of dental caries prevalence (DMFT index) and a one-day estimation of dietary intake.

The 24-hour dietary-recall questionnaire was used by NCHS to measure the nutritional status and dietary intake of Americans. The recall questionnaire was administered by trained dietitians who used three-dimensional food models and other aids to help the interviewees recall what they had consumed in the 24 hours preceding the interview. In the large and costly surveys conducted by NCHS, the one-day recall is perhaps the

only feasible method that can be used to measure dietary intake. There are limitations, however, on interpretation of data abstracted from the 24-hour dietary recall (Garn *et al.*, 1976; Beaton *et al.*, 1979). The instrument is an invalid estimator of the dietary intake of an individual because of the potential variation in the quantity and quality of foods eaten from day to day. For a group of individuals, it can be used to estimate the usual dietary consumption patterns with reasonable validity (Gersovitz *et al.*, 1978; Madden *et al.*, 1976).

Another caution associated with the use of the 24-hour dietary-recall questionnaire is the probable underestimation of the long-term intake of dietary intake, increasing the possibility of false-negative conclusions. For example, using the 24-hour dietary recall underestimates the usual consumption of carbohydrates (data on long-term consumption of sugars or sucrose are not available) by about ⅓ (Beaton *et al.*, 1979). Therefore, the probability of not finding a relation between carbohydrate intake and dental caries prevalence is higher than that expected by chance alone. Also, as a result, the strength of any association found between dental caries prevalence and carbohydrate intake may be underestimated. These problems associated with estimation of the dietary consumption of humans (estimated using 24-hour dietary recall, diet diary, or other methods) may be the reason why a number of epidemiologic studies have failed to find an association between dental caries prevalence and the consumption of sugary foods (Cleaton-Jones *et al.*, 1984; Sundin *et al.*, 1983). The weak correlations found in a recent longitudinal study between dental caries incidence and dietary habits (Rugg-Gunn *et al.*, 1984) may be because of the underestimation of the amount and frequency of consumption of the different foods. Also, the low frequency of consumption of sugary foods and the low incidence of dental caries may have contributed to the weak associations found (Rugg-Gunn *et al.*, 1984).

There are other problems associated with epidemiological research of food cariogenicity. Failure to account for the consumption of sugary foods other than those under study may mask the correlation between dental caries and the foods under study. In a previous analysis of NHANES I data (Ismail *et al.*, 1984), the joint consumption of soft drinks, table sugars and syrups, and sugary desserts and snacks was correlated with high DMFT scores. Even when the consumption of other sugary foods was accounted for, the association between consumption from the three food groups and high DMFT did not disappear.

Moreover, if the foods under study are usually consumed with an extra amount of table sugars or syrups added to them, then failure to account for the consumption of the added sugars in the analysis may lead to erroneous conclusions. In this analysis, for example, the consumption of coffee, chocolate, and tea drinks at and between meals was associated, in the regression model, with high DMFT scores. However, this association disappeared after accounting for the same-day consumption of table sugars and syrups.

Accounting for the exposure to sugars from food groups other than the food group under study is necessary in cross-sectional and longitudinal epidemiologic studies. Newbrun (1979) strongly advocates the presence of a threshold level between consumption of sugars and dental caries incidence. If such a threshold does indeed exist, then studying the bivariate relation between dental caries and the consumption of sugary foods may not show a significant correlation if the threshold point of sugar intake has been exceeded. In Western societies, all available evidence (Morgan and Zabik, 1981) indicates that the average consumption of sugars (mono- and disaccharides) is many times larger than the threshold values suggested by Newbrun *et al.* (1980), Sheiham (1983), and Sreebny (1982b).

The two cariogenic food groups that were identified in this analysis were table sugars and syrups, and sugary desserts and snacks. The consumption of table sugars and syrups even once a day between meals was associated with about a 43% increase in the odds of having high DMFT scores. No consistent correlation was found between the at-meal consumption of table sugars and snacks and high DMFT scores. The odds of having high DMFT scores increased to 80% when the between-meal consumption of table sugars increased to two times or more.

The discriminatory effect of the reported between-meal consumption of sugary desserts and snacks was less than that of table sugars. The NHANES I data indicate that the between-meal consumption of sugary desserts and snacks three times or more was associated with an 87% increase in the odds of having high DMFT scores. No association was found with lower frequencies of between-meal consumption and high DMFT scores. The reported consumption of breakfast cereals, fruit juices, bread, ice cream, nuts and crackers was not associated with high DMFT scores.

The results of this analysis and a previous one (Ismail *et al.*, 1984) of NHANES I data showed that individuals who had DMFT scores equal to or higher than the 80th percentile of the DMFT distribution at each age between nine and 29 years were frequent between-meal consumers of sugary foods. The two food groups identified in this analysis — table sugars and syrups, and sugary desserts and snacks — and the one identified in a previous study (soft drinks) were the only food groups that were significantly associated with high DMFT score. Restriction of these cariogenic foods from the diet of individuals with high DMFT scores, or those with either increased caries susceptibility, or those who in the future will be at a greater risk (patients who develop secondary xerostomia) will help to prevent and control dental caries.

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