

U.S. Diets and Enrichment

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Between 1955 and 1965, amounts of calcium, ascorbic acid, and vitamin A in U.S. diets decreased somewhat. These were the nutrients in which family diets were most likely to fall below recommendations. Enrichment of bread and cereals, margarine, and fruit beverages have added appreciable amounts of B-vitamins, iron, and vitamins A and C to the average diet. Adoption of standards under consideration by the Food and Drug Administration for low-fat milks, fruit beverages, and breakfast cereals would add more vitamins A and C and would distribute more evenly the added B-

vitamins and iron in breakfast cereals. However, if consumption of enriched flour, cornmeal, and bread continues to decrease, and unenriched sweet baked goods to increase, and breakfast cereals remain the same, the contribution from grain enrichment would drop. This could be arrested by enrichment of mixes and sweet bakery products. Calcium, the nutrient in which most diets failed, would not be affected by any of the proposals. Dietary problems that cannot be corrected by enrichment still remain.

Diets in the United States are evaluated by specialists in the U.S. Department of Agriculture from two types of data. Commodity specialists provide nutritionists with yearly per capita estimates of the number of pounds of various foods available at the retail level. These estimates, often referred to as "disappearance" data, are obtained by adding together quantities of foods produced and imported during the year and stocks on hand at the beginning of the year. From this total, deductions are made for exports, inventories at the end of the year, foods taken by the Armed Forces, and foods used for feed, seed, and nonfood purposes. The remaining food is considered to approximate what is used by the civilian population.

The other type of data is obtained from nationwide surveys of food consumption of households, five of which have been made in the past three decades. These surveys are made by questioning homemakers in a statistically selected sample of households on foods used during the previous seven days. Data presented here are from nationwide household food consumption surveys conducted in 1955 and 1965 and from the disappearance or food supply estimates (U.S. Dept. Agr., 1956, 1957, 1967, and in press; Friend, 1966).

IN WHICH NUTRIENTS DO DIETS NEED IMPROVEMENT?

Food supplies available to families in the United States are abundant, varied, and of high quality. If they were distributed according to nutritional needs every individual could be well fed. However, in each food consumption

survey some households have been found to have diets that failed to meet the dietary allowances recommended by the National Research Council. In 1955 nearly half of the household diets failed to meet the allowances in one or more nutrients. About one fourth of the families used food that furnished less than recommended amounts of calcium; one fifth were below the full allowance in ascorbic acid. About one sixth had diets below recommended levels in vitamin A and iron. Few were short in protein, thiamine, or riboflavin (U.S. Dept. Agr., 1957; LeBovit *et al.*, 1961). Data on per cent of households not meeting allowances have been adjusted for changes in NRC allowances between 1953 and 1963. Published reports containing 1955 Household Food Consumption Survey data present diets evaluated by an adaptation of the 1953 allowances. Evaluated according to the 1963 allowances, the per cent of diets not meeting recommended levels is smaller for most nutrients and greater for iron than published percentages.

This does not mean that large proportions of the population are suffering from malnutrition. The recommended allowances of the National Research Council provide a considerable margin of safety over average needs. The margin varies for the different nutrients. Few of the families had diets that were very low in any nutrient. The nutrient in which the largest proportion (10%) of household diets fell below two thirds of the allowance was ascorbic acid. Two thirds of the ascorbic acid allowance is about 50 mg.—a level not considered low by some authorities. (Ascorbic acid standards in England are 20 mg., in Canada, 30.)

As shown by Figure 1 the amounts of calcium, vitamin A value, and ascorbic acid in the food supply decreased slightly in the decade since 1955; thiamine was virtually unchanged. Preliminary estimates of the nutritive value of diets of households surveyed in 1965 indicate the same direction of changes in the average nutritive value of household diets as shown by the food supply data.

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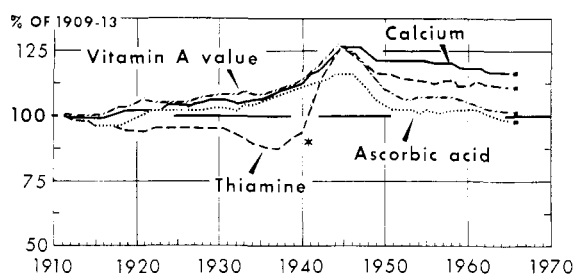


Figure 1. Per capita civilian consumption of calcium, vitamin A, thiamine, and ascorbic acid

5-year moving average
 * Enrichment initiated
 ■ 1966 preliminary

Household consumption of several groups of foods important for their nutrient contribution decreased between 1955 and 1965 (Table I). Average consumption of the milk, cream, and cheese group which contributes much of the calcium and appreciable amounts of riboflavin in family diets decreased about 10%. Use of vegetables and fruit in total, which contribute nearly all of the ascorbic acid, much of the vitamin A value, and important amounts of iron and B-vitamins, also decreased nearly 10%. However, use of citrus fruits and juices, which are a rich source of ascorbic acid, changed very little when totaled on a juice-equivalent basis. Grain products (flour, cereals, bakery products), important contributors of iron and B-vitamins, decreased in consumption a little less than 10%; the decreases were principally in products that were classified as not whole-grain, enriched, or fortified. The only major food group showing increased consumption between 1955 and 1965 was meat, poultry, and fish.

The net effect of changes in U.S. diets in the past decade indicates that the content of calcium and ascorbic acid, the nutrients in which diets were most likely to be in need of improvement in 1955, may be slightly lower.

Vitamin A, in which about 15% of the diets failed to meet allowances in 1955, may also be in a somewhat poorer position in 1965. Iron, in which about 15% of the 1955 diets were below allowances, is probably in an improved position, and thiamine, in which less than 10% were low, is probably little different.

VARIATION WITHIN POPULATION GROUPS, 1965

Among the values of large-scale food consumption surveys such as those made in 1955 and 1965 is the ability to separate the nation's households into smaller more homogeneous groups for examination of some of the differences in food consumption patterns. Thus it is possible to see which groups of households have diets most in need of improvement and in which nutrients.

City-Farm. In the spring of 1965 city families, in comparison to farm families, used less milk and grain products per person but more vegetables and fruit. Consumption of meat, poultry, and fish was about the same for both groups. City diets, consequently, are estimated to be lower in calcium, thiamine, and iron and higher in vitamin A and ascorbic acid than farm diets.

North-South. Families in the South used less milk products, vegetables and fruit, and meat, poultry, and fish but more grains than families in the North. Southern diets are estimated to be lower than northern in vitamin A and ascorbic acid, but a little higher in thiamine.

Income. Low-income families used less milk products, vegetables and fruit, and meat, poultry, and fish but more grain products than families with higher incomes. Diets of poorer families were probably lower in calcium, vitamin A, and ascorbic acid than the diets of families at higher income levels.

CONTRIBUTION OF ENRICHMENT AND FORTIFICATION

Grain Products. Since the 1940's, when enrichment of white bread and flour was introduced in this country significant amounts of iron and B-vitamins have been added to the average diet by such enrichment. Estimates based on the food supply indicate that all such cereal enrichment adds about one third more thiamine, one fifth more iron and niacin, and one tenth more riboflavin to the nation's diet than would be available if foods were not enriched (Friend, 1963).

Standards of enrichment now exist for cornmeal and grits, rice, macaroni and noodle products, and farina in addition to those for white bread, rolls, buns, and flour. Most manufacturers of breakfast cereals add iron and B-vitamins to their products. Of the thiamine added to grain products about seven tenths is in white bread and flour, nearly two tenths in cornmeal and grits, rice, and macaroni, and a little over one tenth in breakfast cereals.

Since 1955 the quantity of white flour and cornmeal and grits used by households has decreased considerably and that of purchased white bread slightly. Use of hot breakfast cereal and macaroni and noodle products has not changed, while use of rice and ready-to-eat cereal has in-

Table I. Foods Used at Home per Person per Week in U.S. Households

Food Group	Units	1955	1965
Milk, cream, cheese (fluid equivalent)	Quarts	4.45	4.08
Meat, poultry, fish	Pounds	4.14	4.58
Other protein foods (eggs, dry beans and peas, nuts, mixtures)	Pounds	1.22	1.24
Vegetables and fruit	Pounds	9.74	9.09
Dark green and deep yellow vegetables	Pounds	0.59	0.48
Citrus fruit (juice equivalent)	Pounds	1.24	1.22
Grain products (flour equivalent)	Pounds	2.84	2.65
Enriched, whole grain	Pounds	2.10	2.09
Not enriched or not whole grain	Pounds	0.71	0.51
Fats and oils	Pounds	0.89	0.83
Butter	Pounds	0.20	0.13
Margarine	Pounds	0.20	0.24
Sugars and sweets (sugar equivalent)	Pounds	1.38	1.37

U.S. Department of Agriculture Household Food Consumption Surveys, spring 1955 and 1965.

creased (Figure 2). The quantity of purchased sweet baked goods (cakes, pies, cookies, doughnuts) has increased about 65%. Few of these products are enriched or whole-grain. The net effect of the changes in consumption on the thiamine content of the average diet has been to keep the amount contributed by enrichment the same (Figure 3).

We have been discussing averages and families vary considerably from averages. Based on what homemakers reported in 1965, nearly all the white flour and bread (98%) used in the previous week was enriched. Since standards of enrichment exist for these products and most households used bread and flour we can assume that most households benefited from bread and flour enrichment. However, the quantitative effect varied with consumption of the products. Low-income families compared to those with higher incomes used the most flour and about the same amount of bread and therefore gained more from enrichment. For example, in 1955 enrichment of white bread and flour added 23% more thiamine to diets of city households in the lowest third of the income distribution and only 17% in the highest third.

Most of the cornmeal and grits (93%), macaroni products (94%), and rice (86%) were also reported enriched. Rice and cornmeal were used most by low-income families especially in the South where diets often are in need of improvement. Since enrichment standards exist for these products, we can assume that diets of many people benefited from such enrichment, especially those most in need of dietary improvement.

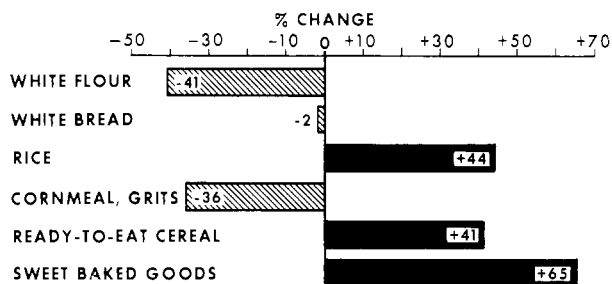


Figure 2. Changes in grain products, 1955-65

Household food consumption surveys, spring 1955 and 1965. All households in U.S.

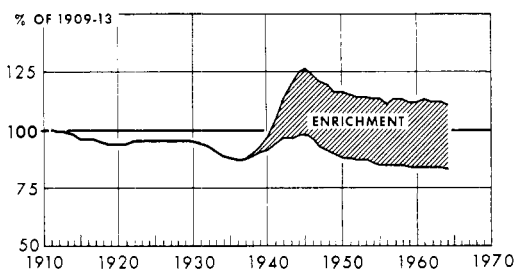


Figure 3. Per capita civilian consumption of thiamine
5-year moving average

Breakfast cereals present a different picture. No standards exist at present. While it is possible to compute average content from tables of food composition, it is impossible to say how much of each nutrient comes from the grain and how much from added ingredients. Since individual cereals vary greatly as to which nutrients are added and in what quantity, households using the same quantity of cereal but different varieties may be ingesting vastly different amounts of iron and B-vitamins in their cereal.

Margarine. For nearly two decades margarine has been fortified by the addition of 15,000 U.S.P. units of vitamin A per pound, the average for butter. More households reported using margarine at the time of the 1965 survey (72% in a week) than in 1955 (58%) which resulted in a higher average consumption—one-fourth pound per person per week in 1965, one-fifth pound in 1955. As a consequence the proportion of the vitamin A contributed to the average diet by margarine has increased from 5% in 1955 to 7% in 1965. Quantities of margarine used vary little with income or between city and farm families. However, use does vary somewhat geographically with the lowest quantities reported in the Northeast.

Fruit Juices and Drinks. In 1955 there were just a few frozen concentrated and canned fruit drinks on the U.S. market and some beverage powders. Less than 10% of the households reported using any of these products in a week. Now the freezer cases and grocery shelves contain cans, packages, and jars of a bewildering variety of drinks, punches, ades, nectars, some containing fruit juice and some completely synthetic. Some contain sugar, some need the addition of sugar, and some contain artificial sweeteners. Even more bewildering than the variety of flavors and sweeteners are the vitamin contents of these products. Some labels state in bold print that the product is "vitamin-enriched." The fine print list of ingredients on the back of the label may then include ascorbic acid or, surprisingly, it may include thiamine, riboflavin, or niacin. Similar products from the same manufacturer may contain no vitamin or any vitamin. The quantities added also vary immensely. In 1965 nearly half of the households reported using some fruit drink, punch, or ade during the week covered by the interview.

Estimates based on a 1963 survey of manufacturers and distributors of synthetic vitamins indicated that the ascorbic acid added to commercial fruit juices and drinks adds about 5% of this vitamin to the average diet (Friend, 1963). According to the 1965 household survey these products are used in all parts of the country and at all income levels although somewhat more in the North than the South, in cities than on farms, and at higher than lower income levels. As with the breakfast cereals it is impossible to know who is getting what vitamins in drinks. There are no standards and contents vary and keep changing.

IMPLICATIONS FOR THE FUTURE

The Food and Nutrition Board of the National Research Council and the Council on Foods and Nutrition of the American Medical Association adopted a joint statement of policy in 1961 on addition of nutrients to

foods. Among the points covered were the following:

The purpose of such additions is to maintain good nutrition in all segments of the population at all economic levels.

The requirements for adding a given nutrient to a given food include evidence that the supplemented food would be physiologically or economically advantageous for a significant segment of the population and that the food would be an effective vehicle of distribution for the nutrient to be added.

Foods suitable for enrichment or fortification are those in which nutrients are lost in refining or other processing or those which are widely and regularly consumed. The nutrients added should generally be the kinds and quantities associated with the class of foods involved.

Supplementation needs to be considered when technologic or economic changes lead to a nutritionally significant reduction in the intake of an essential nutrient. Such reduction might result either from a marked decrease in the consumption of an important food or from a considerable increase in the consumption of foods of diminished nutritive quality (National Academy of Sciences, National Research Council and American Medical Association, 1961).

In line with this policy the Food and Drug Administration in December 1966 issued proposed new standards which include addition of vitamin A to fluid and powdered low-fat milk products and fluid skimmed milk (but not powdered skimmed milk), addition of ascorbic acid to fruit or vegetable juices and drinks and imitations of such articles, and addition of iron and B-vitamins to breakfast cereals (U.S. Food and Drug Admin., 1966). As discussed earlier, enrichment of these products is in practice to some extent but is far from standardized. The proposals are, of course, tentative and will be reviewed and debated as were earlier proposals for enrichment. Their adoption is not assured. If they are adopted it is not certain when this will be or with what modifications. But let us see what effect the present proposals would have on household diets.

Vitamin A in Skimmed and Low-Fat Milk. The standard proposed is for the addition of 500 U.S.P. units of vitamin A to each 8-fluid ounce serving of the product prepared for beverage purposes as directed on the label. The foods to which this addition are to be made are "fluid skimmed milk, fluid skimmed milk product, fluid or powdered low-fat milk, fluid or powdered low-fat milk product (whenever they purport to be or are represented for beverage purposes)." If vitamin A were added as proposed to the average quantities of fluid skimmed and partly skimmed milk and chocolate milk drink reported in the 1965 Household Food Consumption Survey, about 50 units per person per day would be added to the average content in the diets, an increase of about 1%. Consumption of fluid skimmed and partly skimmed milk has doubled in the past decade. These products are used principally by high-income households. However, at present some of the fluid skimmed milk is being fortified with vitamin A. Dry skimmed milk is not being fortified and is not covered by the proposed standards. It is used much more by low- than high-income households. Therefore,

low-income households would benefit little from the adoption of the proposal as now written.

Ascorbic Acid in Juices and Drinks. The standard proposed is for the addition of a minimum of 30 mg. and a maximum of 60 mg. of ascorbic acid to each 4- to 6-fluid ounce serving of "juices, drinks, nectars, drink bases, or imitations of such articles." In our estimates we have assumed that a serving of juice, nectar, and synthetic orange juice substitute is 4 fluid ounces and of cider, drink, ade, punch, and imitation of these is 6 fluid ounces. If ascorbic acid were to be added to bring those products that are now below the 30 mg. per serving to the proposed minimum and the few products now above 60 mg. per serving were limited to the proposed maximum, about 8% more ascorbic acid would be added to the average diet.

It is estimated that such beverages are already contributing about 4% more ascorbic acid to household diets than would be in the unfortified foods. If the new proposals go into effect they would contribute another 8% or a total of about 12%. The consumption of commercial juice has increased only slightly in the past decade. That of drinks has increased 10-fold. If this trend were to continue the proportion of ascorbic acid added by the adoption of this proposal would be considerably greater than the estimates based on 1965 consumption.

Iron and B-Vitamins in Breakfast Cereals. The standard proposed is for the addition of the following amounts (in milligrams) to a 1-ounce serving of processed breakfast cereals (excluding infant and junior cereal products):

	Minimum	Maximum
Thiamine	0.12	0.25
Riboflavin	0.03	0.06
Niacin	1.1	2.2
Iron	0.7	1.5

If the cereals containing less than the proposed minimum amounts would have nutrients added to bring them up to the minimum and those over the proposed maximum would be limited to the maximum, the net effect on the average diet would be a slight reduction in iron and no change in the B-vitamins. A greater number of cereals would have nutrients added than subtracted but those exceeding the maximum levels would be changed more per serving. The proposals would bring about more similarity from brand to brand and less variation in the nutrients that different households are getting from cereals.

The Food and Drug proposals would add important nutrients to some diets but a number of problems remain. Increased consumption of breakfast cereals and rice has offset the effect of the decrease in use of flour, cornmeal, and bread over the past decade. However, the consumption of sweet bakery products and crackers has also increased and few of these are enriched. If the decreases in flour, cornmeal, and bread (all enriched) and the increase in other baked goods (few enriched) were to continue—a possibility—and the use of breakfast cereals remained the same as it was in 1965, the contribution from enrichment of grains would drop. Such a drop could be arrested by enrichment standards for mixes, cakes, cookies, and other bakery products.

Iron may be even more of a problem for women and girls than in the average household diet. Women and girls have a higher requirement than men and are not

likely to consume as much cereal or bread. Excess iron may also be a problem for some individuals if the present high levels in some breakfast cereals continue.

Calcium, which was mentioned earlier as the nutrient in which the most diets failed to meet allowances, is likely to continue to be short in household food supplies.

Dietary problems that cannot be corrected by enrichment and fortification of foods still remain. The following from the joint NRC-AMA statement of policy of addition of nutrients to foods issued in 1961 is likely to continue to be important: "The desirability of meeting nutritional needs by the use of an adequate variety of foods as far as practicable is emphasized strongly. To that end, research and education are encouraged to ensure the proper choice and preparation of foods and to improve food production, processing, storage, and distribution so as to retain their essential nutrients" (National Academy of Sciences, National Research Council-American Medical Association, 1961).

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