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Nutrient Content of the U.S. Food Supply

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There have been some marked changes in the American food supply over the last two decades. We're using less red meat and eggs and more poultry and fish. We've also cut back on whole milk but are using more cheese, lowfat milks, and creams. Animal fats—butter, lard, and beef fat—have declined in use, while vegetable fats—oils and shortening—have increased. Use of many plant-based foods has risen steadily over the past 20 years, particularly grain products, fresh fruits, fruit juices (especially citrus), fresh and frozen vegetables, and caloric sweeteners. These changes have affected nutrient levels of the food supply.

Changes in the quantity of nutrients available are affected by more than changing diets. Technological advances, such as the introduction of new crop varieties, and specific events, such as revised Federal enrichment standards, affect nutrient levels as well.

Nutrient levels reported in this article are based on food disappearance data—that is, all food available for consumption from the U.S. food supply—and are reported on a daily per capita basis. Estimates of food available are referred to as food "use" rather than consumption because the data represent disappearance of foods into food marketing channels and have presumably been used up for consumption. Disappearance data presented here do not show ingestion of foods because they do not account for losses that occur after the food is measured at the wholesale/retail level. Nonetheless, these data are useful for indicating trends in food and nutrient levels in the American diet over time. The data presented here are based on food use data through 1988.

The author is a nutritionist with the Human Nutrition Information Service, USDA.

Grains Increase Carbohydrate and Other Nutrients

One of the most significant changes in food use affecting nutrient levels has been an increased use of grain products. Between 1968 and 1984, annual per capita use of grains increased by a modest 8 pounds, from 146 to 154 pounds. However, increased use of wheat flour and rice raised that figure by another 18 pounds between 1984 and 1988 (see April-June, 1991 *FoodReview*, "U.S. Flour Milling on the Rise").

This large increase was primarily responsible for a 26-gram gain in carbohydrate from 1984 to 1988 (399 to 425 grams). Greater use of grain products, which provide complex carbohydrate, slightly raised the share of total calories provided by complex carbohydrate from 22 to 23 percent.

Grains played less of a role in the increase in carbohydrate between 1968 and 1984, from 379 grams to 399 grams. Most of this increase can be attributed to corn syrups. Annual per capita use of corn syrups rose from 13 to 66 pounds between 1968 and 1988, primarily because

Table 1.
Levels for Most Nutrients in the U.S. Food Supply Have Increased

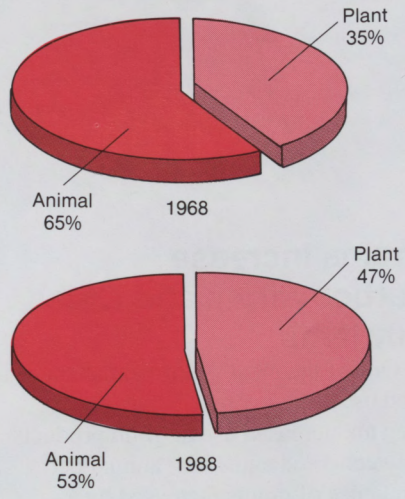
Nutrient (unit)	1968	1978	1988
	Per person per day		
Food energy (kcal)	3,300	3,300	3,600
Carbohydrate (g)	379	387	425
Protein (g)	98	99	105
Fat (g)	158	157	168
Saturated fatty acids (g)	63	58	60
Monounsaturated fatty acids (g)	64	63	67
Polyunsaturated fatty acids (g)	24	30	34
Cholesterol (mg)	500	450	440
Vitamin A (RE)	1,430	1,500	1,630
Carotenes (RE)	470	580	770
Vitamin E (mg)	12.7	14.6	16.7
Vitamin C (mg)	100	108	118
Thiamin (mg)	2.0	2.1	2.2
Riboflavin (mg)	2.3	2.3	2.4
Niacin (mg)	22	24	26
Vitamin B6 (mg)	2.0	2.0	2.2
Folate (mcg)	270	267	284
Vitamin B12 (mcg)	10.2	9.8	9.1
Calcium (mg)	850	850	890
Phosphorus (mg)	1,470	1,460	1,540
Magnesium (mg)	320	310	330
Iron (mg)	14.7	14.8	17.1
Zinc (mg)	12.5	12.3	12.7
Copper (mg)	1.6	1.5	1.7

Source: Human Nutrition Information Service, USDA.
Contact: Nancy Raper (301) 436-5625.

of the development of high-fructose corn syrup as a sugar substitute. High-fructose corn syrup replaced much of the sugar used in soft drinks, canned fruits, ice cream, and many other foods. With growing use of corn syrups, annual sugar use fell from 99 pounds in 1968 to 62 pounds in 1988, which offset some of the increase in carbohydrate from corn syrups.

Grain products were also responsible for almost all of the increase in thiamin, riboflavin, and iron and a major portion of the gain in niacin (tables 1 and 2). Federal standards for enriching white flour with thiamin, riboflavin, and niacin were raised in 1975 and with iron in 1983. These higher nutrient standards and a 16.5-pound increase in annual per capita use of wheat flour were major factors behind the higher nutrient levels. The increase in poultry use also contributed to the higher niacin level.

Figure 1
Animal Sources of Fat Have Declined Relative to Plant Sources



Contact: Nancy Raper (301) 436-5625.

Grain products have been the primary source of thiamin and iron over the past two decades, accounting for about one-third of the total of each in 1968 and 43 percent in 1988. Lower use of red meat reduced the share of iron from the meat, poultry, and fish group from 27 percent in 1968 to 22 percent in 1988. The decrease in iron from red meat more than outweighed the increase from higher poultry use.

Dairy products have been the largest contributor of riboflavin, accounting for about one-third during those years. The meat, poultry, and fish group ranked second as a source in 1968. But by 1988, grain products ranked second. The meat, poultry, and fish group has been the primary source of niacin during the past two decades.

Sources of Fat Shift

The level and the sources of fat have also changed. The level of fat available for consumption has risen about 6 percent over the last two decades to 168 grams. Most of this gain was due to increasing use of vegetable fats—salad and cooking oils and shortening. Use of oils almost doubled and use of shortening increased by about one-third. In contrast, use of animal fats—butter and lard—decreased.

Even though vegetable sources of fat increased over the past 20 years, animal sources still accounted for a greater share of fat in the American food supply in 1988 (figure 1). However, the proportion from animal sources declined markedly from 65 to 53 percent between 1968 and 1988, primarily due to less use of butter and lard. Using less whole milk and red meats also contributed to the decline.

Americans are increasing their use of animal foods which are lower in fat—lean cuts of red meat, poultry, fish and shellfish, and lowfat milks. However, use of creams and cheese, items which are generally higher in fat, is also increasing.

The increased use of vegetable fats and the shift of animal fats has meant changes in the mix of fatty acids (table 1). Fat is comprised of saturated, monounsaturated, and polyunsaturated fatty acids. Total saturated fatty acids declined slightly from 63 grams in 1968 to 60 grams in 1988. The level of monounsaturated fatty acids rose slightly from 64 to 67 grams. Polyunsaturated fatty acids showed the biggest change, increasing from 24 to 34 grams.

Data on fats and oils available for consumption may overestimate trends in actual consumption. Some of the increase in fat use is associated with the growth of away-from-home eating places, which discard significant amounts of fats used in frying foods.

Food Energy Increases

Higher levels of fat and carbohydrate, as well as protein, increased the level of food energy in the food supply from 3,300 calories in 1968 to 3,600 in 1988. The proportion of calories provided by fat decreased slightly from 43 to 42 percent, while the share from carbohydrate rose from 46 to 47 percent. Food energy from protein remained constant at 11 percent.

Most Other Nutrients Increase

Levels for most nutrients in the food supply increased over the past two decades. However, levels of vitamin B12 and cholesterol declined. Although major sources of most nutrients were the same

in 1968 and 1988, changes occurred in the relative nutrient contributions of some foods.

● Calcium. Levels of calcium closely followed trends in the use of dairy products, which accounted for about three-fourths of the calcium between 1968 and 1988. Significant gains in use of lowfat milks and cheese were mostly responsible for the increase in calcium from 850 to 890 milligrams. Grain products and dark green vegetables also added to the higher level, but to a lesser extent.

Among dairy products, whole milk was the leading source of calcium in 1968, but use was halved by 1988. In contrast, use of lowfat milks almost tripled, while cheese increased by more than 80 percent. Consequently, cheese was the leading source by 1988, with lowfat milks a close second.

● Zinc. The small increase in zinc, from 12.5 to 12.7 milligrams, reflects gains from grain products, lowfat milks, and cheese. Although the meat, poultry, and fish group was the primary source of zinc over the last two decades, its share declined slightly from 51 to 47 percent as Americans used less red meat. The share of zinc supplied by dairy products increased from 17 to 19 percent and the share from grain products rose from 12 to 14 percent.

● Magnesium. Greater use of lowfat milks, cheese, poultry, nuts, and fruits accounted for the rise in magnesium, from 320 to 330 milligrams. Foods of plant origin provided the largest share of magnesium in the food supply, about two-thirds between 1968 and 1988.

● Phosphorus. Increased use of poultry, grains, cheese, and lowfat milks spurred the gain in phosphorus from 1,470 to 1,540 milligrams. Three food groups—dairy products; meat, poultry, and fish; and grain products—provided about three-fourths of the phosphorus in the food supply. Of these, dairy products constituted the largest share. The meat, poultry, and fish group ranked second.

How Nutrient Levels Are Estimated

Each year, USDA's Human Nutrition Information Service estimates the daily per capita levels of food energy and 24 nutrients and food components in the U.S. food supply. Estimates are derived from data on quantities of foods available for consumption per capita per year and from data on the nutrient composition of foods. Nutrient levels of the food supply are determined by multiplying the annual pounds used per capita of each food by the nutrient value of the edible portion per pound of food.

Estimates include nutrients from all foods in the commercial system, as well as nutrients from foods produced at home. Some sources of nutrients are excluded: consumer purchases of vitamin and mineral supplements; alcoholic beverages and the sugars and grains used in their manufacture; and baking powder, baking soda, yeast, and certain vitamins and minerals added to foods for their functional or flavoring properties. Nutrients added commercially through enrichment of flour and cereal products and through fortification of other foods are included.

Estimates exclude nutrients from the inedible parts of foods, such as bones, rinds, and seeds, but include nutrients from parts of foods that are edible but not always eaten, such as the separable fat on meat. Estimates also include nutrients that may be lost after food is measured at the wholesale/retail level—during processing, marketing, or cooking.

Estimates also reflect changes in the composition of foods due to technological developments and marketing practices. For example, the vitamin values applied to fresh potatoes consumed in recent years are higher than vitamin values applied to potatoes produced at the beginning of the century because of better storage conditions and use of different varieties.

The nutrient content of most foods has not changed over time. For these foods, the same set of composition data has been used for all years in the series. The estimates reported here are based on the most up-to-date food composition data.

● Copper. The level of copper was about the same in 1988, 1.7 milligrams, as in 1968, 1.6 milligrams. The slight increase reflects greater use of nuts and grain products. Foods of plant origin accounted for the largest share of copper, providing about 75 percent between 1968 and 1988.

● B6. Gains in poultry, fruit, and grain products use increased vitamin B6, from 2.0 to 2.2 milligrams. The meat, poultry, and fish group was the primary source of vitamin B6, accounting for about 40 percent over the last two decades.

● Folate. Greater use of citrus fruits and juices (mainly frozen orange juice), grain products, and deep-yellow and dark-green vegetables (mainly broccoli) was largely responsible for the small increase in folate, from 270 to 284 micrograms. Foods of plant origin were the primary source of folate, accounting for about three-fourths between 1968 and 1988.

● Vitamin A, carotenes. Vitamin A occurs in different forms. Retinol, the active form of vitamin A, is found in animal foods. Plants contain carotenes, which are converted to vitamin A in the body. Retinol and carotenes together constitute total vitamin A.

Total vitamin A increased from 1,430 retinol equivalents (RE) in 1968 to 1,630 RE in 1988. Carotenes also rose from 470 RE per person per day in 1968 to 770 RE in 1988.

The higher vitamin A level reflects increased use of vegetables high in carotenes—dark-green and deep-yellow types (particularly carrots and broccoli)—and the development of new varieties of deep-yellow vegetables, such as carrots, which have a higher carotene content. Vegetables accounted for 80 percent or more of the carotenes over the past 20 years.

Table 2.
Food Nutrients Come From Varied Sources, Which Have Shifted Over Time [1]

Food group	Food energy	Protein	Total fat	Fat			Cholesterol	Carbohydrate
				Saturated	Monounsaturated	Polyunsaturated		
	Percent							
1968								
Dairy products, excluding butter	10	20	12	19	9	3	14	6
Meat, poultry, fish	22	43	37	43	41	24	42	—
Eggs	2	6	3	2	3	2	38	—
Legumes and nuts	3	5	3	2	4	7	0	2
Grain products	20	19	1	1	—	4	0	36
Fruits	3	1	—	—	—	—	0	6
Vegetables	5	5	—	—	—	1	0	10
Fats and oils, including butter	17	—	40	31	42	58	6	—
Sugar and sweeteners	17	—	0	0	0	0	0	39
Miscellaneous [2]	1	1	2	2	1	1	0	1
1988								
Dairy products, excluding butter	10	20	12	20	8	2	15	5
Meat, poultry, fish	19	43	32	40	35	17	47	—
Eggs	1	4	2	2	2	1	33	—
Legumes and nuts	3	5	4	2	5	6	0	2
Grain products	21	20	1	1	—	3	0	38
Fruits	3	1	—	—	—	—	0	7
Vegetables	5	5	—	—	—	1	0	9
Fats and oils, including butter	20	—	47	32	48	69	5	—
Sugar and sweeteners	17	—	0	0	0	0	0	39
Miscellaneous [2]	1	1	2	3	2	1	0	1

	Vitamin A	Carotenes	Vitamin E	Vitamin C	Thiamin	Riboflavin	Niacin	Vitamin B6
	Percent							
1968								
Dairy products, excluding butter	17	3	4	4	9	35	2	10
Meat, poultry, fish	31	0	7	3	31	26	48	42
Eggs	6	0	3	0	1	10	—	3
Legumes and nuts	—	—	6	—	6	2	5	4
Grain products	—	1	5	0	36	18	25	9
Fruits	3	9	4	39	4	3	3	9
Vegetables	26	80	10	52	11	6	12	22
Fats and oils, including butter	14	4	60	0	—	—	—	—
Sugar and sweeteners	0	0	—	—	—	—	—	—
Miscellaneous [2]	3	2	1	3	1	1	5	1
1988								
Dairy products, excluding butter	16	2	3	3	8	33	2	10
Meat, poultry, fish	21	0	6	2	25	22	45	41
Eggs	4	0	2	0	1	7	—	2
Legumes and nuts	—	—	6	—	6	2	5	4
Grain products	—	1	4	0	43	25	31	9
Fruits	3	6	4	42	5	3	2	10
Vegetables	42	88	8	48	11	6	12	22
Fats and oils, including butter	11	2	67	0	—	—	—	—
Sugar and sweeteners	0	0	—	—	—	1	—	—
Miscellaneous [2]	1	1	1	4	1	1	3	1

Continued—

Table 2.
Food Nutrients Come From Varied Sources, Which Have Shifted Over Time *(continued)* [1]

Food group	Folate	Vitamin B12	Calcium	Phos-phorus	Mag-nesium	Iron	Zinc	Copper
				Percent				
1968								
Dairy products, excluding butter	9	17	76	34	20	2	17	4
Meat, poultry, fish	11	77	4	30	15	27	51	21
Eggs	8	4	3	5	1	4	4	—
Legumes and nuts	20	0	3	6	12	7	5	15
Grain products	13	1	4	13	17	34	12	19
Fruits	10	0	2	2	6	3	1	7
Vegetables	27	0	6	8	16	14	7	23
Fats & oils, including butter	—	—	—	—	—	—	—	—
Sugar and sweeteners	0	0	—	—	—	2	—	2
Miscellaneous [2]	2	0	2	2	12	5	2	9
1988								
Dairy products, excluding butter	8	18	75	34	19	2	19	4
Meat, poultry, fish	10	76	4	29	15	22	47	16
Eggs	6	4	2	4	1	3	3	—
Legumes and nuts	20	0	3	6	13	6	5	18
Grain products	14	2	4	14	19	43	14	20
Fruits	13	0	3	2	7	3	1	7
Vegetables	27	0	7	8	16	13	7	22
Fats & oils, including butter	—	—	—	—	—	—	—	—
Sugar and sweeteners	0	0	—	—	—	2	1	3
Miscellaneous [2]	2	0	2	2	11	5	3	9

— = Contributes less than 0.5 percent. [1]Food components may not total 100 percent due to rounding. [2]Coffee, tea, chocolate-liquor equivalent of cocoa beans, spices, and fortification of foods not assigned to a specific group.

Source: Human Nutrition Information Service, USDA.
Contact: Nancy Raper (301) 436-5625.

● Vitamin E. The vitamin E level of the food supply increased to 16.7 milligrams in 1988, up 4 milligrams from 1968. This large increase is attributed mostly to greater use of salad and cooking oils and shortening. The fats and oils group has always been the primary source of vitamin E, accounting for 60 percent or more over the past two decades. Within the fats and oils group, oils provided the largest proportion. Moreover, their share increased from 30 to 38 percent.

● Vitamin C. Higher use of fruits and vegetables accounted for the rise in vitamin C from 100 to 118 milligrams. These two food groups provided about 90 percent of the vitamin C between 1968 and 1988. More processed citrus juices, mostly frozen orange juice, were behind the higher level. Use of frozen orange juice, for example, jumped from 20 pounds per capita per year in 1968 to 37 pounds in 1988. Vegetables, primarily dark-green types and tomatoes, also contributed to the increase, but to a lesser degree.

● Protein. With Americans using more poultry, protein rose from 98 to 105 grams. Between 1968 and 1988, use of poultry increased from 45 to 80 pounds per capita per year. Increased use of grain products, cheese, and lowfat milks also contributed to the higher level.

● Cholesterol. Cholesterol declined from 500 to 440 milligrams over the past two decades. Most of the decrease was due to a drop in use from 316 eggs per person per year in 1968 to 244 eggs in 1988.

● B12. Lower use of meat (mostly offals) and eggs was responsible for the decline in vitamin B12, from 10.2 to 9.1 micrograms. Offals, which include liver and other organ meats, are particularly good sources of vitamin B12. The meat, poultry, and fish group provided about 75 percent of the vitamin B12 between 1968 and 1988. ■