The U.S. Food Supply Provides More of Most Nutrients

Claire Zizza and Shirley Gerrior
(202) 208-2331

A greater variety of foods, advances in food production and technology, changing consumer preferences, and revised Federal standards for enrichment are affecting the type and amounts of nutrients available in the U.S. food supply.

Americans have available to them more carbohydrates, protein, and fat—and this means more calories. Sources of fat are shifting from animal products to plant sources. Levels of most vitamins in the food supply increased—especially thiamin, niacin, folate, and vitamin E (although two vitamins, A and B12, had lower levels)—from 1970 to 1990. The amount of most minerals also rose, especially calcium, phosphorus, magnesium, iron, and potassium.

For most individuals, the nutrient levels present in the food supply are adequate in preventing deficiency diseases.

These findings are taken from the most recent estimates of nutrients available from the U.S. food supply.

Changes in foods and nutrients are monitored with disappearance data and reported on a per capita basis (see box for more details). These data measure U.S. supplies available for human consumption—not what Americans actually eat. Nonetheless, food and nutrient per capita values are useful for tracking the relative magnitude of changes in the American diet over time.

More Calories in the Food Supply

The level of food energy available for consumption increased from 3,300 calories per capita per day in 1970 to 3,700 calories in 1990 (table 1). There are more of all three of the energy-yielding nutrients—fat, car-

All but two nutrients in the food supply increased between 1970 and 1990. Values for vitamins A and B12 were lower than earlier levels, but they still exceeded the recommended allowances for a healthful diet by a generous margin.

Zizza and Gerrior are nutritionists with the Center for Nutrition Policy and Promotion, Food and Consumer Service, USDA.

Table 1
The U.S. Food Supply Contains More Nutrients

Nutrient	Unit	1970	1990
Food energy	Kcal	3,300	3,700
Carbohydrates	g	383	452
Protein	g	99	105
Total fat	g	159	165
Saturated fatty acids	g	61	59
Monounsaturated fatty acids	g	66	67
Polyunsaturated fatty acids	g	27	32
Cholesterol	mg	490	410
Vitamin A	RE	1,500	1,420
Carotenes	RE	500	620
Vitamin E	mg	13.4	15.7
Vitamin C	mg	108	110
Thiamin	mg	2.0	2.5
Riboflavin	mg	2.4	2.6
Niacin	mg	23	28
Vitamin B6	mg	2.1	2.2
Folate	mcg	280	296
Vitamin B12	mcg	10.4	8.7
Calcium	mg	870	920
Phosphorus	mg	1,470	1,600
Magnesium	mg	320	350
Iron	mg	15.5	19.3
Zinc	mg	12.6	12.7
Copper	mg	1.6	1.7
Potassium	mg	3,510	3,540

Note: Per capita, per day basis.

bohydrates, and protein—in the food supply, although carbohydrates showed the biggest jump.

Carbohydrates increased considerably from 383 grams per capita per day in 1970 to 452 grams in 1990, reflecting greater consumption of corn-syrup sweeteners and grain products—particularly wheat, corn, and rice.

Protein and fat levels each rose 6 grams per capita per day between 1970 and 1990. The increase in protein was due mostly to higher consumption of poultry and, to a lesser extent, grain products, cheeses, and lowfat milks. However, the increase in fat provided more energy than the increase in protein, since fat contributes more calories per gram than any other nutrient (1 gram of fat provides 9 calories, while 1 gram of protein and carbohydrates each provides 4 calories).

Animal products contributed the largest proportion of fat, but their share declined from 63 percent in 1970 to 52 percent in 1990. Offsetting the lower animal sources was a higher proportion of fat from vegetable sources—rising from 37 to 48 percent—due to the increased use of vegetable oils and shortening.

The switch from animal to vegetable sources of fat is reflected in changes in levels of fatty acids. Fats are a large group of compounds made up primarily of fatty acids. There are three basic types of fatty acids—saturated fatty acids found mostly in animal fats, such as lard and butter, and monounsaturated and polyunsaturated fatty acids found mostly in plant sources.

The fatty acid levels in the food supply include those from foods which are almost pure fat, such as shortening and cooking oils, and from other foods which contain fat, such as chocolate and whole milk.

Polyunsaturated fats in the food supply increased 19 percent, while saturated and monounsaturated fats decreased 3 and 2 percent, respectively.

Cholesterol (found only in animal products) declined 16 percent from 490 to 410 milligrams per person per day because of lower consumption of eggs, red meat, and fluid whole milk. Cholesterol is a member of the lipid family but it is not related to fatty acids. It is chemically a sterol.

Getting More of Most Vitamins

Levels of thiamin, niacin, folate, and vitamin E were higher in 1990 than in 1970. Thiamin and niacin levels rose primarily because of an increase in the amounts added to flour called for by revised Federal enrichment standards. Greater consumption of grain products pushed up folate levels, and greater use of vegetable oils generated higher levels of vitamin E. Riboflavin and vitamins C and B6 remained about the same in 1970 and 1990.

Vitamins A and B12 dropped by 5 and 16 percent, respectively, because of lower red meat (particularly organ meat) and egg consumption. However, the drop in vitamin A masks some changes in the compounds providing it. A person can get vitamin A from two families of compounds: retinoids and carotenoids. Only foods of animal origin, such as liver and milk, contain retinoids—supplies of which decreased with the lower consumption of red meats and eggs. Carotenoids, found in vegetables, fruits, and to a lesser

extent in animal products, can be changed by the body into retinoids, but this "conversion" is not a one-for-one deal. It is generally recognized that 6 micrograms of beta-carotene is nutritionally equivalent to 1 microgram of retinol, a type of retinoid. Beta-carotene is a carotene, which is a member of the carotenoid family. Carotenes increased in the food supply because of the development of varieties of deep-yellow vegetables, which contain more carotene than previous varieties. But since the increase in carotenes did not offset the drop in retinol, there was a net decrease in total vitamin A.

While 1990 values for vitamins A and B12 were lower than earlier levels, they still exceeded the recommended allowances for a healthful diet by a generous margin. To meet the nutritional needs of the U.S. population, nutrient levels in the food supply should exceed the recommended allowances because the estimates reflect the amount available before losses from trimming, cooking, waste, and spoilage (see box). In addition, per capita values are calculated as averages, which do not account for the higher nutritional needs of some people. Pregnant and lactating women, for example, generally have difficulty meeting their nutritional requirements because their requirements are so high. Teenagers also may not meet their nutritional requirements, because their needs are high and changing to support their growth spurt. Dieting by restricting food intake further pressures nutrient use, especially for teenagers. The elderly also have difficulty meeting their requirements because they tend to eat less than they used to.

About the Data

USDA's Center for Nutrition Policy and Promotion uses data on the amount of food available for consumption from USDA's Economic Research Service (ERS) and information on the nutrient composition of foods from USDA's Agricultural Research Service (ARS) to calculate the nutrients available in the food supply.

The amount of food available for consumption is measured by subtracting quantities of food reported for exports, yearend inventories, and nonfood uses from production, imports, and beginning-of-the-year inventories.

The estimates reflect amounts available prior to moving through marketing channels—not the amounts actually consumed. Therefore, the supplies include amounts that may be discarded during processing or marketing, lost in spoilage, or thrown away at home. For example, the food estimates may overstate fats and oils, since large amounts are used for frying by fast food restaurants and are later discarded.

The data on foods available for consumption are converted into nutrients available, using nutrient composition data from USDA's National Nutrient Data Bank System.

Basically, the nutrient estimates are calculated by multiplying the per capita amount of each food by the nutrient composition of that food. The results from all the foods are then totaled for each nutrient and presented on a per day basis.

As with the food supply estimates, the resulting nutrient estimates do not account for losses during processing, marketing, or home use. For example, vegetables generally lose nutrients, particularly water-soluble nutrients like vitamin C and thiamin, when cooked in water.

Nutrients not included in these values are those from vitamin and mineral supplements, alcoholic beverages (or the grains and sugar used to make alcoholic beverages), baking powder, yeast, and certain vitamins and minerals used for functional or flavoring agents in foods. Nutrients added through enrichment of flour and cereal products and through fortification of other foods are included in the nutrient values.

For more information on the nutrients available in the food supply, see *Nutrient Content of the U.S. Food Supply, 1909-90*, Home Economics Research Report No. 52, by Shirley Gerrior and Claire Zizza, U.S. Department of Agriculture, Agricultural Research Service, 1994.

More Minerals Available

Minerals are essential for adequate body structure, functioning, and maintenance. The amount needed depends on the mineral. Some are required in large amounts, such as calcium, phosphorus, and magnesium—known as macrominerals. Others are needed in small amounts, such as iron, potassium, copper, and zinc—called trace elements.

The U.S. food supply furnished more calcium, phosphorus, magnesium, iron, and potassium in 1990 than in 1970. The amount of dietary copper and zinc remained about the same.

Calcium

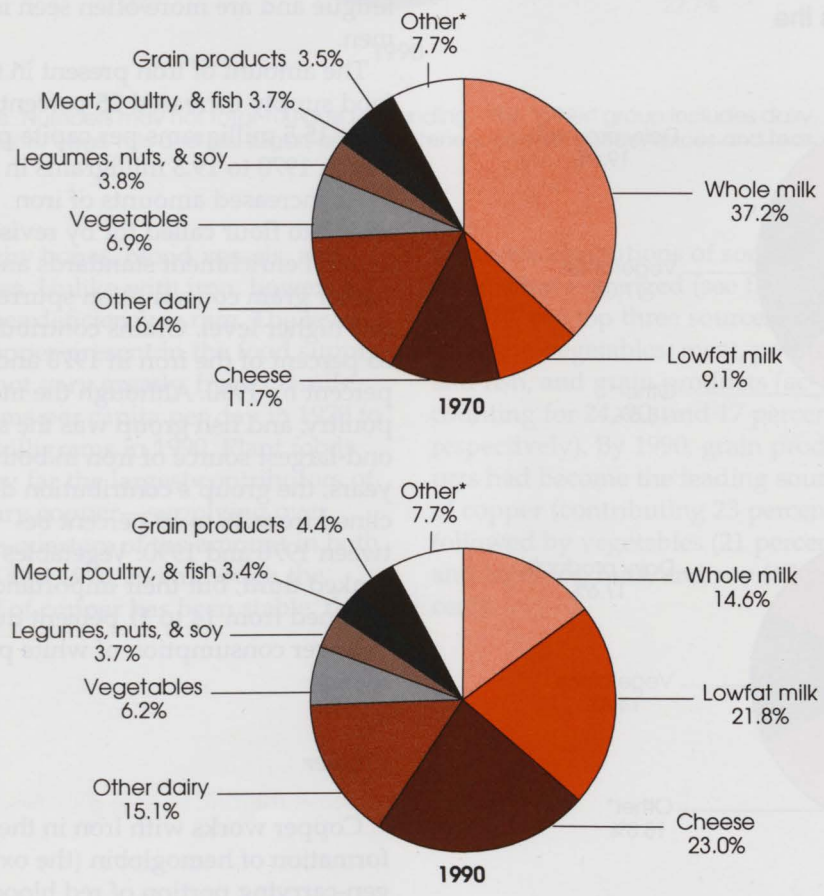
As the most abundant mineral in the human body, calcium is used to build bones and teeth and to maintain bone strength. Calcium is also necessary for muscle contraction, blood clotting, and the maintenance of cell membranes.

Inadequate intake of calcium may increase the risk of osteoporosis, a condition in which decreased bone mass weakens bones (although sev-

eral other factors, including age, sex, body weight, estrogen status, and physical activity, also influence its development). Sufferers are more susceptible to bone fractures, low backaches, and shortening of stature. The National Osteoporosis Foundation estimates that some 25 million Americans suffer from osteoporosis-related fractures each year, at an annual cost of between $10 billion and $18 billion in medical charges. Using data from the third National Health and Nutrition Examination Survey, the National Center for Health Statistics estimates that 6 million to 7 million women over the age of 50 are afflicted with osteoporosis of the hip.

The amount of calcium available in the food supply increased from 870 milligrams per capita per day in 1970 to 920 milligrams in 1990. Dairy products have always been the dominant source, contributing three-quarters of the calcium in the food supply. But the types of dairy foods providing calcium have shifted somewhat (fig. 1). With declining consumption of whole milk, the share of calcium contributed by whole milk had fallen to 15 percent in 1990 from 37 percent in 1970. An increase in lowfat milk and cheese consumption offset this drop, however. The share of calcium from cheese products rose from 12 percent to 23 percent and that from lowfat milks increased from 9 percent to 22 percent.

Figure 1
Calcium Sources Shift Among the Dairy Group



Notes: Numbers may not total 100 due to rounding. *The "other" group includes eggs, fruits, sugars and sweeteners, cocoa, coffees, spices, and teas.

Phosphorus

Phosphorus aids calcium in building bones and teeth. It is also involved in the release of energy from fat, protein, and carbohydrates in the body and it aids in the formation of genetic materials and cell membranes. Because practically all foods contain phosphorus, dietary deficiencies of this nutrient generally do not develop.

Phosphorus levels increased from 1,470 to 1,600 milligrams per capita per day between 1970 and 1990. Dairy products have been the leading source of phosphorus, contributing around 35 percent in both periods. Meat, poultry, and fish together contributed 30 percent of the phosphorus to the food supply in 1970 and 27 percent in 1990. Grain products are the third largest—and fastest growing—source, providing 13 percent in 1970 and 19 percent in 1990.

Magnesium

More than half the magnesium present in the human body is found in bones, and most of the rest is found in muscles. The body uses magnesium to build bones, synthesize protein, and release energy from muscles, as well as to regulate body temperature and blood pressure. While Americans do not experience magnesium deficiency caused by an inadequate diet, particular diseases may deplete magnesium for some people.

Magnesium in the food supply increased slightly from 320 milligrams per capita per day in 1970 to 350 milligrams in 1990. With increasing consumption of grain

products, grains have replaced dairy products as the leading source of magnesium (see figure 2). Vegetables are another important source.

Potassium

Potassium aids in muscle contraction and in maintaining fluid and electrolyte balance in body cells. Potassium is also used in sending nerve impulses, as well as in releasing energy from protein, fat, and carbohydrates in the body. People do not normally develop a potassium deficiency. But with recent reported beneficial effects on hypertension and a protective effect against vascular damage and stroke, the National Academy of Sciences has recommended increasing fruit and vegetable consumption in order to increase potassium intakes.

The level of potassium in the food supply increased from 3,510 to 3,540 milligrams per capita per day between 1970 and 1990. Increased consumption of grain products and noncitrus fruits pushed up the level of potassium enough to offset lower amounts from lower consumption of fluid milk, red meat, and eggs.

Iron

Iron is found in all body cells. As part of hemoglobin in the blood and of myoglobin in the muscles, iron carries oxygen. Iron-deficiency anemia, a condition in which the oxygen-carrying function of the blood is impaired due to reduced size and number of red blood cells, is the most common problem resulting from poor iron status. In fact, iron-deficiency anemia is the most common nutritional deficiency in the United States. Infants, adolescents, and women of childbearing years are the most at risk of developing anemia. Their greater needs, due to rapid growth or excessive blood loss during menstruation, usually cannot be compensated by dietary intake alone. Anemia impairs body-temperature regulation, impedes behavioral and intellectual performance, and increases susceptibility to infections and lead poisoning.

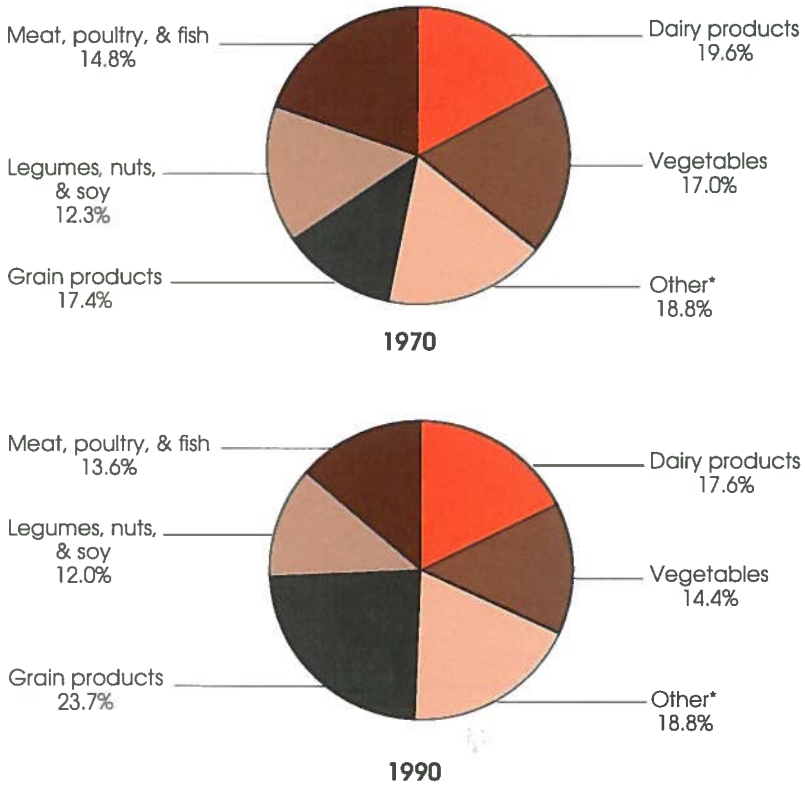
Even though many more people experience iron deficiency, there are some people with a genetic defect that increases the iron they absorb from food. This increase in iron absorption can lead to toxic amounts of iron in the body. The symptoms of excessive iron are weakness and fatigue and are more often seen in men.

The amount of iron present in the food supply increased 25 percent, from 15.5 milligrams per capita per day in 1970 to 19.3 milligrams in 1990. Increased amounts of iron added to flour called for by revised Federal enrichment standards and higher grain consumption spurred this higher level. Grains contributed 35 percent of the iron in 1970 and 49 percent by 1990. Although the meat, poultry, and fish group was the second-largest source of iron in both years, the group's contribution declined from 26 to 19 percent between 1970 and 1990. Vegetables ranked third, but their importance declined from 14 to 11 percent due to lower consumption of white potatoes.

Copper

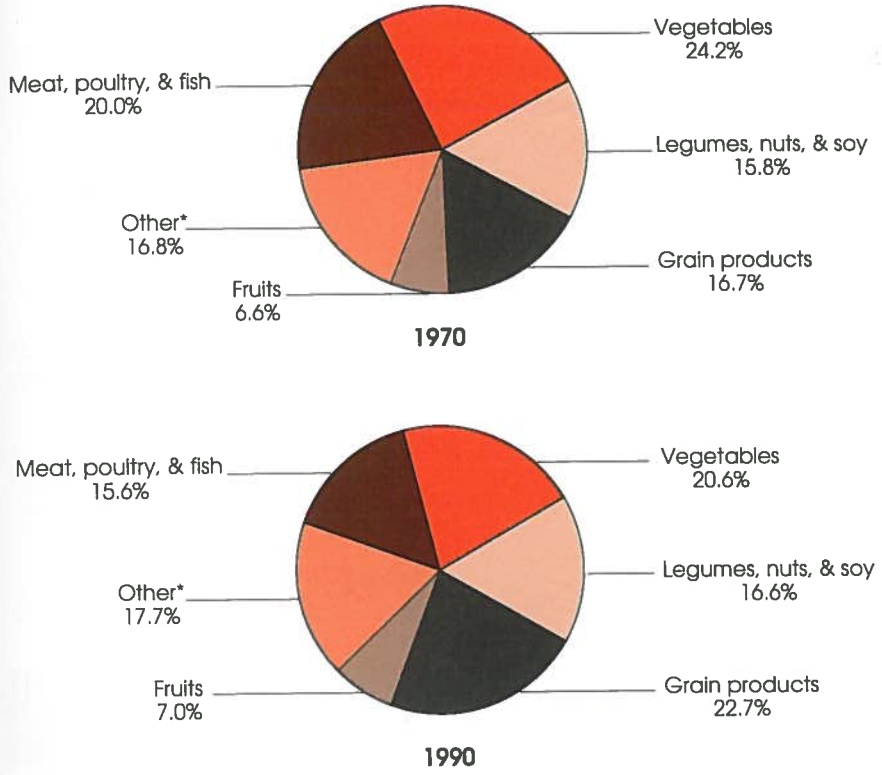
Copper works with iron in the formation of hemoglobin (the oxygen-carrying portion of red blood cells). Copper also helps maintain

Figure 2
Grain Products Replace the Dairy Group as the Major Source of Magnesium



Notes: Numbers may not total 100 due to rounding. *The "other" group includes eggs, fruits, sugars and sweeteners, cocoa, coffees, spices, and teas.

Figure 3
Leading Sources of Copper Change



Notes: Numbers may not total 100 due to rounding. *The "other" group includes dairy products, eggs, fats and oils, sugars and sweeteners, cocoa, coffee, spices and teas.

healthy bones, blood vessels, and nerves. Unlike with iron, however, copper deficiency is rare. The level of copper present in the food supply did not vary greatly, from 1.6 milligrams per capita per day in 1970 to 1.7 milligrams in 1990. Plant foods are by far the largest contributors of dietary copper—supplying over three-quarters of the amount in both 1970 and 1990. Even though the level of copper has been stable, the relative contributions of some food groups have changed (see figure 3). In 1970, the top three sources of copper were vegetables; meat, poultry, and fish; and grain products (accounting for 24, 20, and 17 percent, respectively). By 1990, grain products had become the leading source of copper (contributing 23 percent), followed by vegetables (21 percent), and legumes, nuts, and soy (17 percent).

Zinc

Zinc plays an important role in the formation of protein in the body, assisting in wound healing, blood formation, and general growth and maintenance of all tissues. Severe zinc deficiency is uncommon in the United States. However, mild or moderate deficiency has been found in older adults, the physically active, and some people afflicted with certain diseases. The level of zinc was roughly the same in 1970 as in 1990, and the sources have also remained rather stable. Animal products provided the bulk of the zinc, 66 percent in 1970 and 72 percent in 1990. Even though consumption of red meat has dropped, these foods were still the dominant sources of zinc in both 1970 and 1990. Dairy and grain products followed in contributions of zinc.

More Changes Expected

Between 1970 and 1990, most nutrients in the food supply increased. The exceptions were vitamins A and B12, lower levels of which followed decreased consumption of red meat. These lower vitamin A and B12 levels, however, are still adequate for most Americans.

Americans can expect food and nutrient availability to continue changing in the future as producers and manufacturers respond to changing food preferences, new Federal regulations, and new technologies. ■