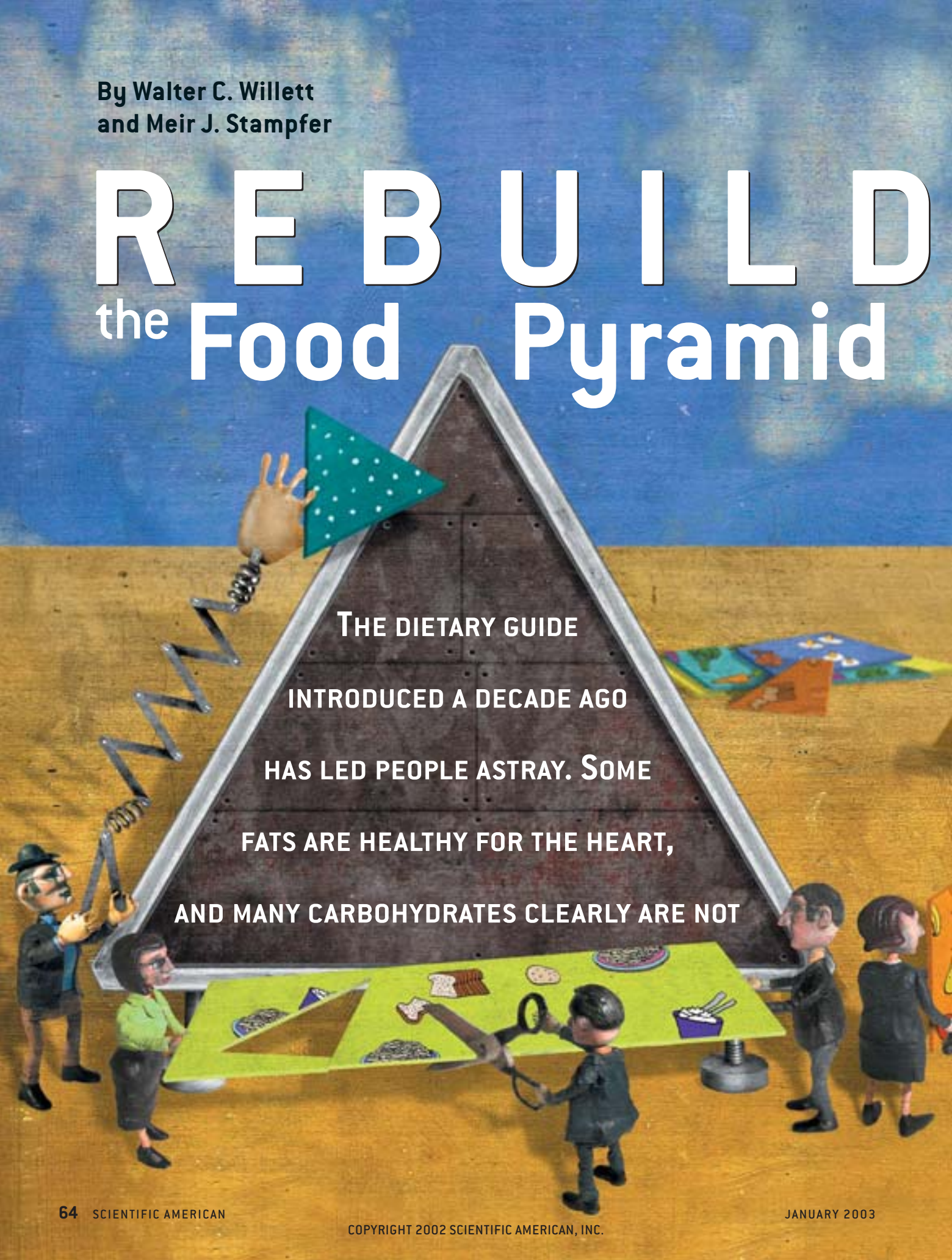
By Walter C. Willett and Meir J. Stampfer

REBUILD the Food Pyramid



THE DIETARY GUIDE INTRODUCED A DECADE AGO HAS LED PEOPLE ASTRAY. SOME FATS ARE HEALTHY FOR THE HEART, AND MANY CARBOHYDRATES CLEARLY ARE NOT

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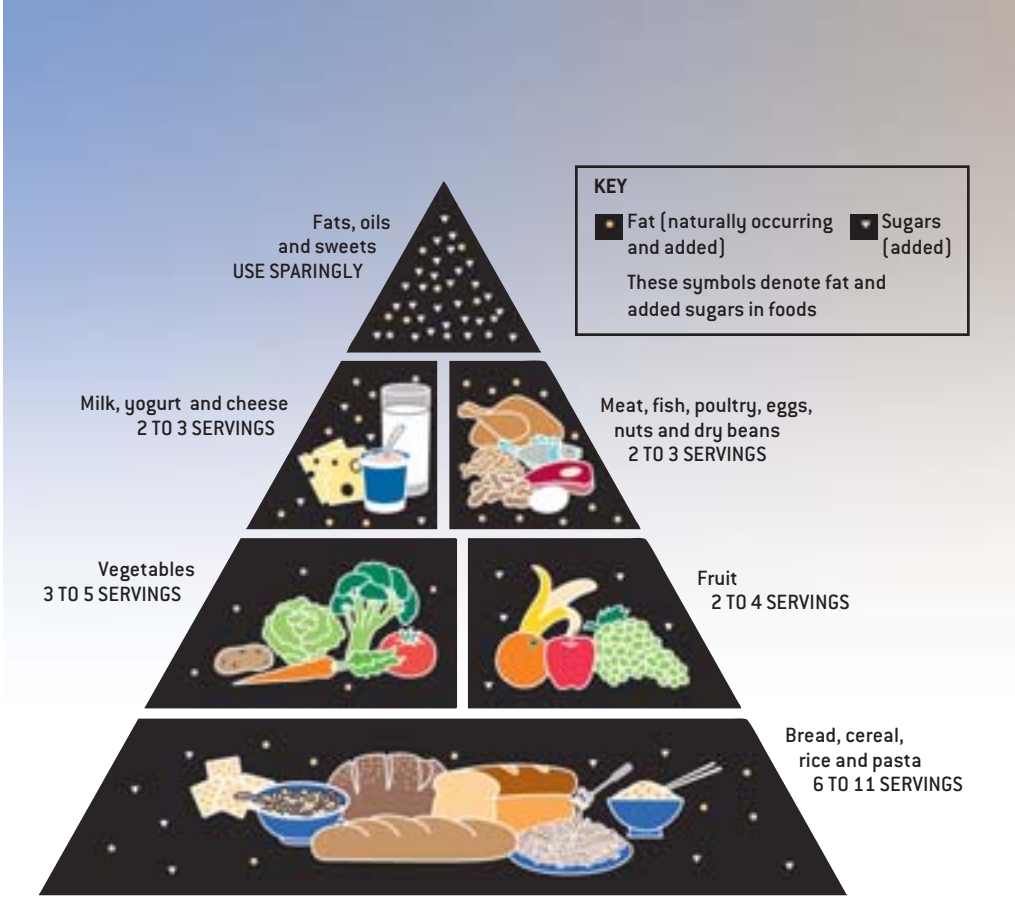
In 1992

the U.S. Department of Agriculture officially released the Food Guide Pyramid, which was intended to help the American public make dietary choices that would maintain good health and reduce the risk of chronic disease. The recommendations embodied in the pyramid soon became well known: people should minimize their consumption of fats and oils but should eat six to 11 servings a day of foods rich in complex carbohydrates—bread, cereal, rice, pasta and so on. The food pyramid also recommended generous amounts of vegetables (including potatoes, another plentiful source of complex carbohydrates), fruit and dairy products, and at least two servings a day from the meat and beans group, which lumped together red meat with poultry, fish, nuts, legumes and eggs.

Even when the pyramid was being developed, though, nutritionists had long known that some types of fat are essential to health and can reduce the risk of cardiovascular disease. Furthermore, scientists had found little evidence that a high intake of carbohydrates is beneficial. Since 1992 more and more research has shown that the USDA pyramid is grossly flawed. By promoting the consumption of all complex carbohydrates and eschewing all fats and oils, the pyramid provides misleading guidance. In short, not all fats are bad for you, and by no means are all complex carbohydrates good for you. The USDA's Center for Nutrition Policy and Promotion is now reassessing the pyramid, but this effort is not expected to be completed until 2004. In the meantime, we have drawn up a new pyramid that better reflects the current understanding of the relation between diet and health. Studies indicate that adherence to the recommendations in the revised pyramid can significantly reduce the risk of cardiovascular disease for both men and women.

How did the original USDA pyramid go so wrong? In part, nutritionists fell victim to a desire to simplify their dietary recommendations. Researchers had known for decades that saturated fat—found in abundance in red meat and dairy products—raises cholesterol levels in the blood. High cholesterol levels, in turn, are associated with a high risk of coronary heart disease (heart attacks and other ailments caused by the blockage of the arteries to the heart). In the 1960s controlled feeding studies, in which the participants eat carefully prescribed diets for several weeks, substantiated that saturated fat increases cholesterol levels. But the studies also showed that polyunsaturated fat—found in vegetable oils and fish—reduces cholesterol. Thus, dietary advice during the 1960s and 1970s emphasized the replacement of saturated fat with polyunsaturated fat, not total fat reduction. (The subsequent doubling of polyunsaturated fat consumption among Americans probably contributed greatly to the halving of coronary heart disease rates in the U.S. during the 1970s and 1980s.)



OLD FOOD PYRAMID

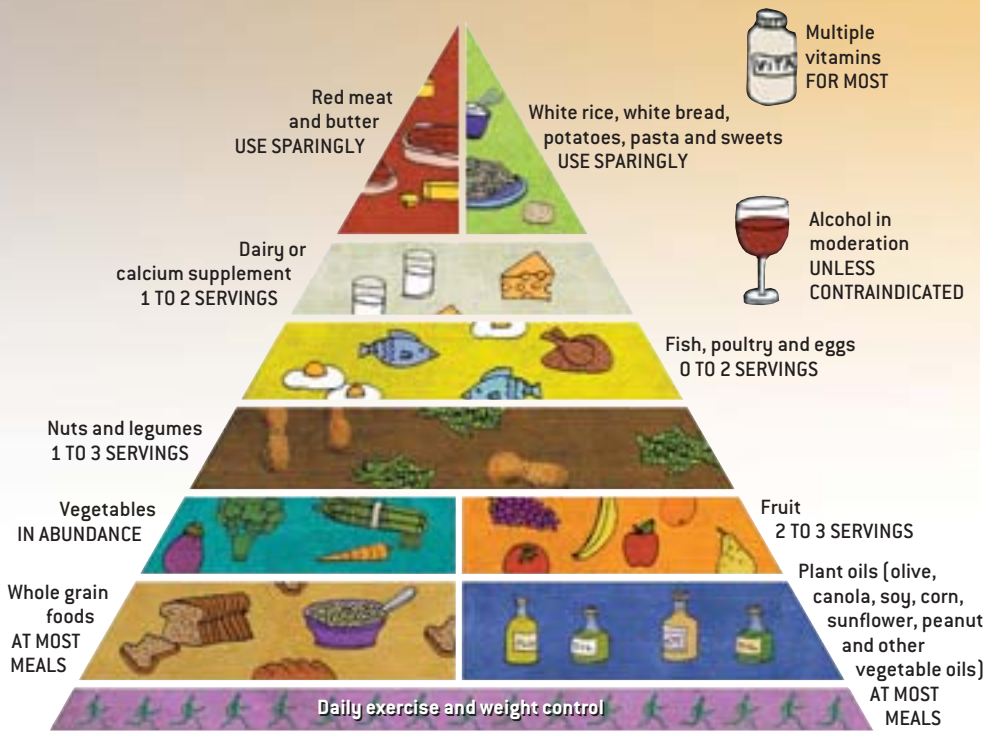
conceived by the U.S. Department of Agriculture was intended to convey the message "Fat is bad" and its corollary "Carbs are good." These sweeping statements are now being questioned.

For information on the amount of food that counts as one serving, visit www.nal.usda.gov:8001/py/pmap.htm

Overview/*The Food Guide Pyramid*

- The U.S. Department of Agriculture's Food Guide Pyramid, introduced in 1992, recommended that people avoid fats but eat plenty of carbohydrate-rich foods such as bread, cereal, rice and pasta. The goal was to reduce the consumption of saturated fat, which raises cholesterol levels.
- Researchers have found that a high intake of refined carbohydrates such as white bread and white rice can wreak havoc on the body's glucose and insulin levels. Replacing these carbohydrates with healthy fats—monounsaturated or polyunsaturated—actually lowers one's risk of heart disease.
- Nutritionists are now proposing a new food pyramid that encourages the consumption of healthy fats and whole grain foods but recommends avoiding refined carbohydrates, butter and red meat.

RICHARD BORGE (*preceding pages*); USDA/DHHS (*old pyramid*)



NEW FOOD PYRAMID

outlined by the authors distinguishes between healthy and unhealthy types of fat and carbohydrates. Fruits and vegetables are still recommended, but the consumption of dairy products should be limited.

The notion that fat in general is to be avoided stems mainly from observations that affluent Western countries have both high intakes of fat and high rates of coronary heart disease. This correlation, however, is limited to saturated fat. Societies in which people eat relatively large portions of monounsaturated and polyunsaturated fat tend to have lower rates of heart disease [*see illustration on next page*]. On the Greek island of Crete, for example, the traditional diet contained much olive oil (a rich source of monounsaturated fat) and fish (a source of polyunsaturated fat). Although fat constituted 40 percent of the calories in this diet, the rate of heart disease for those who followed it was lower than the rate for those who followed the traditional diets of Japan, in which fat made up only 8 to 10 percent of the calories. Furthermore, international comparisons can be misleading: many negative influences on health, such as smoking, physical inactivity and high amounts of body fat, are also correlated with Western affluence.

Unfortunately, many nutritionists decided it would be too difficult to educate the public about these subtleties. Instead they put out a clear, simple message: "Fat is bad." Because saturated fat represents about 40 percent of all fat consumed in the U.S., the rationale of the USDA was that advocating a low-fat diet would naturally reduce the intake of saturated fat. This recommendation was soon reinforced by the food industry, which began selling cookies, chips and other products that were low in fat but often high in sweeteners such as high-fructose corn syrup.

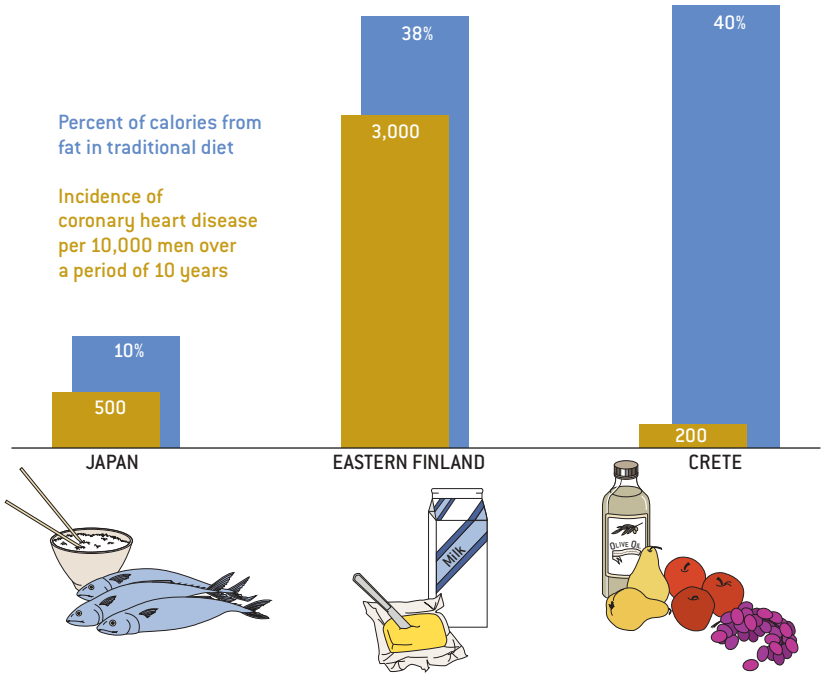
When the food pyramid was being developed, the typical American got about 40 percent of his or her calories from fat, about 15 percent from protein and about 45 percent from carbohydrates. Nutritionists did not want to suggest eating more protein, because many sources of protein (red meat, for example) are also heavy in saturated fat. So the "Fat is bad" mantra led to the corollary "Carbs are good." Dietary guidelines from the American Heart Association and other groups recommended that people get at least half their calories from carbohydrates and no more than 30 percent from fat. This 30 percent limit has become so entrenched among nutritionists that even the sophisticated observer could be forgiven for thinking that many studies must show that individuals with that level of fat intake enjoyed better health than those with higher levels. But no study has demonstrated long-term health benefits that can be directly attributed to a low-fat diet. The 30 percent limit on fat was essentially drawn from thin air.

The wisdom of this direction became even more questionable after researchers found that the two main cholesterol-carrying chemicals—low-density lipoprotein (LDL), popularly known as "bad cholesterol," and high-density lipoprotein (HDL), known as "good cholesterol"—have very different effects on the risk of coronary heart disease. Increasing the ratio of LDL to HDL in the blood raises the risk, whereas decreasing the ratio lowers it. By the early 1990s controlled feeding studies had shown that when a person replaces calories from saturated fat with an equal amount of calories from carbohydrates the levels of LDL and total cholesterol fall, but the level of HDL also falls. Because the ratio of LDL to HDL does not change, there is only a small reduction in the person's risk of heart disease. Moreover, the switch to carbohydrates boosts the blood levels of triglycerides, the component molecules of fat, probably because of effects on the body's endocrine system. High triglyceride levels are also associated with a high risk of heart disease.

The effects are more grievous when a person switches from either monounsaturated or polyunsaturated fat to carbohydrates. LDL levels rise and HDL levels drop, making the cholesterol ratio worse. In contrast, replacing saturated fat with either monounsaturated or polyunsaturated fat improves this ratio and would be expected to reduce heart disease. The only fats that are significantly more deleterious than carbohydrates are the trans-unsaturated fatty acids; these are produced by the partial hydrogenation of liquid vegetable oil, which causes it to solidify.

RICHARD BORGE

Fat and Heart Disease



INTERNATIONAL COMPARISONS reveal that total fat intake is a poor indicator of heart disease risk. What is important is the type of fat consumed. In regions where saturated fats traditionally made up much of the diet (for example, eastern Finland), rates of heart disease were much higher than in areas where monounsaturated fats were prevalent (such as the Greek island of Crete). Crete's Mediterranean diet, based on olive oil, was even better for the heart than the low-fat traditional diet of Japan.

Found in many margarines, baked goods and fried foods, trans fats are uniquely bad for you because they raise LDL and triglycerides while reducing HDL.

The Big Picture

TO EVALUATE FULLY the health effects of diet, though, one must look beyond cholesterol ratios and triglyceride levels. The foods we eat can cause heart disease through many other pathways, including raising blood pressure or boosting the tendency of blood to clot. And other foods can prevent heart disease in surprising ways; for instance, omega-3 fatty acids (found in fish and some plant oils) can reduce the likelihood of ventricular fibrillation, a heart rhythm disturbance that causes sudden death.

The ideal method for assessing all these adverse and beneficial effects would be to conduct large-scale trials in which individuals are randomly assigned to one diet or another and followed for many years. Because of practical constraints and cost, few such studies have been conducted, and most of these have focused on patients who already suffer from heart disease. Though limited, these studies have supported the benefits of replacing saturated fat with polyunsaturated fat, but not with carbohydrates.

The best alternative is to conduct large epidemiological studies in which the diets of many people are periodically assessed and the participants are monitored for the development of heart disease and other conditions. One of the best-known examples of this research is the Nurses' Health Study, which was begun in 1976 to evaluate the effects of oral contraceptives but was soon extended to nutrition as well. Our group at Harvard University has followed nearly 90,000 women in this study who first completed detailed questionnaires on diet in 1980, as well as more than 50,000 men who were enrolled in the Health Professionals Follow-Up Study in 1986.

After adjusting the analysis to account for smoking, physical activity and other recognized risk factors, we found that a participant's risk of heart disease was strongly influenced by the type of dietary fat consumed. Eating trans fat increased the risk substantially, and eating saturated fat increased it slightly. In contrast, eating monounsaturated and polyunsaturated fats decreased the risk—just as the controlled feeding studies predicted. Because these two effects counterbalanced each other, higher overall consumption of fat did not lead to higher rates of coronary heart disease. This finding reinforced a 1989 report by the National Academy of Sciences that concluded that total fat intake alone was not associated with heart disease risk.

But what about illnesses besides coronary heart disease? High rates of breast, colon and prostate cancers in affluent Western countries have led to the belief that the consumption of fat, particularly animal fat, may be a risk factor. But large epidemiological studies have shown little evidence that total fat consumption or intakes of specific types of fat during midlife affect the risks of breast or colon cancer. Some studies have indicated that prostate cancer and the consumption of animal fat may be associated, but reassuringly there is no suggestion that vegetable oils increase any cancer risk. Indeed, some studies have suggested that vegetable oils may slightly reduce such risks. Thus, it is reasonable to make decisions about dietary fat on the basis of its effects on cardiovascular disease, not cancer.

Finally, one must consider the impact of fat consumption on obesity, the most serious nutritional problem in the U.S. Obesity is a major risk factor for several diseases, including type 2 diabetes (also called adult-onset diabetes), coronary heart disease, and cancers of the breast, colon, kidney and esophagus. Many nutritionists believe that eating fat can contribute to weight gain because fat contains more calories per gram than protein or carbohydrates. Also, the process of storing dietary fat in the body may be more efficient than the conversion of carbohydrates to body fat. But recent controlled feeding studies have shown that these considerations are not practically important. The best way to avoid obesity is to limit your total calories, not just the fat calories. So the critical issue is whether the fat composition of a diet can influence one's ability to control caloric intake. In other words, does eating fat leave you

CORNELIA BLIK

more or less hungry than eating protein or carbohydrates? There are various theories about why one diet should be better than another, but few long-term studies have been done. In randomized trials, individuals assigned to low-fat diets tend to lose a few pounds during the first months but then regain the weight. In studies lasting a year or longer, low-fat diets have consistently not led to greater weight loss.

Carbo-Loading

NOW LET'S LOOK at the health effects of carbohydrates. Complex carbohydrates consist of long chains of sugar units such as glucose and fructose; sugars contain only one or two units. Because of concerns that sugars offer nothing but "empty calories"—that is, no vitamins, minerals or other nutrients—complex carbohydrates form the base of the USDA food pyramid. But refined carbohydrates, such as white bread and white rice, can be very quickly broken down to glucose, the primary fuel for the body. The refining process produces an easily absorbed form of starch—which is defined as glucose molecules bound together—and also removes many vitamins and minerals and fiber. Thus, these carbohydrates increase glucose levels in the blood more than whole grains do. (Whole grains have not been milled into fine flour.)

Or consider potatoes. Eating a boiled potato raises blood sugar levels higher than eating the same amount of calories from table sugar. Because potatoes are mostly starch, they can be rapidly metabolized to glucose. In contrast, table sugar (sucrose) is a disaccharide consisting of one molecule of glucose and one molecule of fructose. Fructose takes longer to convert to glucose, hence the slower rise in blood glucose levels.

A rapid increase in blood sugar stimulates a large release of insulin, the hormone that directs glucose to the muscles and liver. As a result, blood sugar plummets, sometimes even going below the baseline. High levels of glucose and insulin can have negative effects on cardiovascular health, raising triglycerides and lowering HDL (the good cholesterol). The precipitous decline in glucose can also lead to more hunger after a carbohydrate-rich meal and thus contribute to overeating and obesity.

In our epidemiological studies, we have found that a high intake of starch from refined grains and potatoes is associated with a high risk of type 2 diabetes and coronary heart disease. Conversely, a greater intake of fiber is related to a lower risk of these illnesses. Interestingly, though, the consumption of fiber did not lower the risk of colon cancer, as had been hypothesized earlier.

Overweight, inactive people can become resistant to insulin's effects and therefore require more of the hormone to regulate their blood sugar. Recent evidence indicates that the adverse metabolic response to carbohydrates is substantially worse among people who already have insulin resistance. This finding may account for the ability of peasant farmers in Asia and elsewhere, who are extremely lean and active, to consume large amounts of refined carbohydrates without experiencing diabetes or heart disease, whereas the same diet in a more sedentary population can have devastating effects.

The best way to avoid obesity is to LIMIT YOUR TOTAL CALORIES, not just the fat calories.

Eat Your Veggies

HIGH INTAKE OF FRUITS and vegetables is perhaps the least controversial aspect of the food pyramid. A reduction in cancer risk has been a widely promoted benefit. But most of the evidence for this benefit has come from case-control studies, in which patients with cancer and selected control subjects are asked about their earlier diets. These retrospective studies are susceptible to numerous biases, and recent findings from large prospective studies (including our own) have tended to show little relation between overall fruit and vegetable consumption and cancer incidence. (Specific nutrients in fruits and vegetables may offer benefits, though; for instance, the folic acid in green leafy vegetables may reduce the risk of colon cancer, and the lycopene found in tomatoes may lower the risk of prostate cancer.)

The real value of eating fruits and vegetable may be in reducing the risk of cardiovascular disease. Folic acid and potassium appear to contribute to this effect, which has been seen in several epidemiological studies. Inadequate consumption of folic acid is responsible for higher risks of serious birth defects as well, and low intake of lutein, a pigment in green leafy vegetables, has been associated with greater risks of cataracts and degeneration of the retina. Fruits and vegetables are also the primary source of many vitamins needed for good health. Thus, there are good reasons to consume the recommended five servings a day, even if doing so has little impact on cancer risk. The inclusion of potatoes as a vegetable in the USDA pyra-

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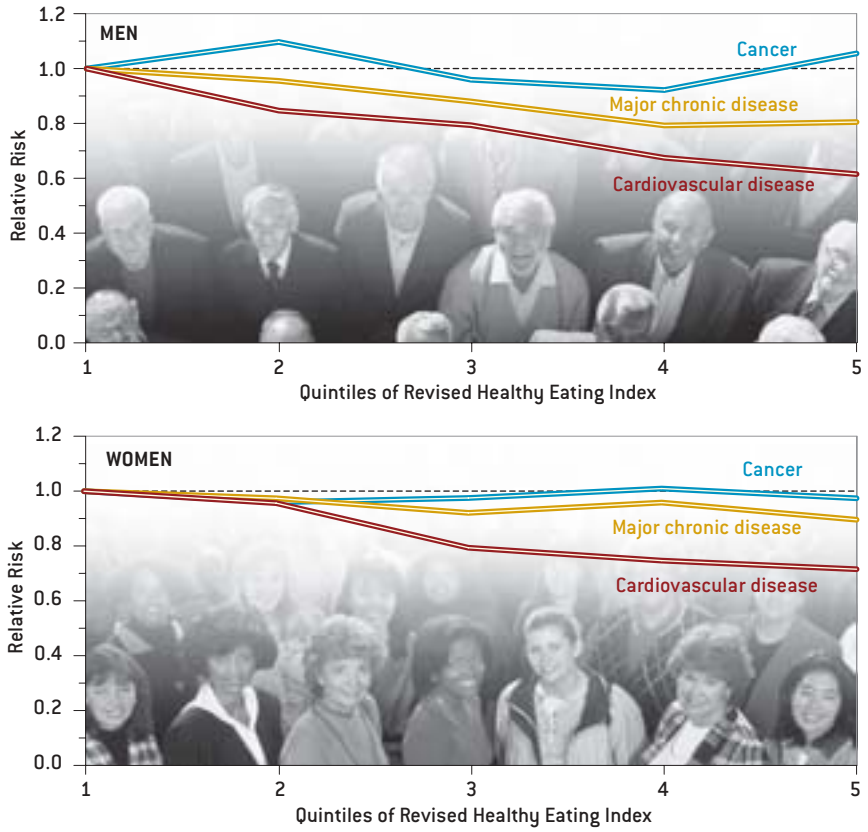
Benefits of the New Pyramid



HEALTH EFFECTS OF THE RECOMMENDATIONS in the revised food pyramid were gauged by studying disease rates among 67,271 women in the Nurses' Health Study and 38,615 men in the Health Professionals Follow-Up Study. Women and men in the fifth quintile (the 20 percent whose diets were closest to the pyramid's recommendations) had significantly lower rates of cardiovascular disease than those in the first quintile (the 20 percent who strayed the most from the pyramid). The dietary recommendations had no significant effect on cancer risk, however.

mid has little justification, however; being mainly starch, potatoes do not confer the benefits seen for other vegetables.

Another flaw in the USDA pyramid is its failure to recognize the important health differences between red meat (beef, pork and lamb) and the other foods in the meat and beans group (poultry, fish, legumes, nuts and eggs). High consumption of red meat has been associated with an increased risk of coronary heart disease, probably because of its high content of saturated fat and cholesterol. Red meat also raises the risk of type 2 diabetes and colon cancer. The elevated risk of colon cancer may be related in part to the carcinogens produced during cooking and the chemicals found in processed meats such as salami and bologna.

Poultry and fish, in contrast, contain less saturated fat and more unsaturated fat than red meat does. Fish is a rich source of the essential omega-3 fatty acids as well. Not surprisingly, studies have shown that people who replace red meat with chicken and fish have a lower risk of coronary heart disease and colon cancer. Eggs are high in cholesterol, but consumption of up to one a day does not appear to have adverse effects on heart disease risk (except among diabetics), probably because the effects of a slightly higher cholesterol level are counterbalanced by other nutritional benefits. Many people have avoided nuts because of their high fat content, but the fat in nuts, including peanuts, is mainly unsaturated, and walnuts in particular are a good source of omega-3 fatty acids. Controlled feeding studies show that nuts improve blood cholesterol ratios, and epidemiological studies indicate that they lower the risk of heart disease and diabetes. Also, people who eat nuts are actually less likely to be obese; perhaps because nuts are more satisfying to the appetite, eating them seems to have the effect of significantly reducing the intake of other foods.

Yet another concern regarding the USDA pyramid is that it promotes overconsumption of dairy products, recommending the equivalent of two or three glasses of milk a day. This advice is usually justified by dairy's calcium content, which is believed to prevent osteoporosis and bone fractures. But the highest rates of fractures are found in countries with high dairy consumption, and large prospective studies have not shown a lower risk of fractures among those who eat plenty of dairy products. Calcium is an essential nutrient, but the requirements for bone health have probably been overstated. What is more, we cannot assume that high dairy consumption is safe: in several studies, men who consumed large amounts of dairy products experienced an increased risk of prostate cancer, and in some studies, women with high intakes had elevated rates of ovarian cancer. Although fat was initially assumed to be the responsible factor, this has not been supported in more detailed analyses. High calcium intake itself seemed most clearly related to the risk of prostate cancer.

More research is needed to determine the health effects of dairy products, but at the moment it seems imprudent to recommend high consumption. Most adults who are following a good overall diet can get the necessary amount of calcium by consuming the equivalent of one glass of milk a day. Under certain circumstances, such as after menopause, people may need more calcium than usual, but it can be obtained at lower cost and without saturated fat or calories by taking a supplement.

A Healthier Pyramid

ALTHOUGH THE USDA'S food pyramid has become an icon of nutrition over the past decade, until recently no studies had evaluated the health of individuals who followed its guidelines. It very likely has some benefits, especially from a high intake of fruits and vegetables. And a de-

KEN FISHER (*men*) AND ED HONOWITZ (*women*) Getty Images; CORNELIA BLIK (*graph*)

crease in total fat intake would tend to reduce the consumption of harmful saturated and trans fats. But the pyramid could also lead people to eat fewer of the healthy unsaturated fats and more refined starches, so the benefits might be negated by the harm.

To evaluate the overall impact, we used the Healthy Eating Index (HEI), a score developed by the USDA to measure adherence to the pyramid and its accompanying dietary guidelines in federal nutrition programs. From the data collected in our large epidemiological studies, we calculated each participant's HEI score and then examined the relation of these scores to subsequent risk of major chronic disease (defined as heart attack, stroke, cancer or nontraumatic death from any cause). When we compared people in the same age groups, women and men with the highest HEI scores did have a lower risk of major chronic disease. But these individuals also smoked less, exercised more and had generally healthier lifestyles than the other participants. After adjusting for these variables, we found that participants with the highest HEI scores did not experience significantly better overall health outcomes. As predicted, the pyramid's harms counterbalanced its benefits.

Because the goal of the pyramid was a worthy one—to encourage healthy dietary choices—we have tried to develop an alternative derived from the best available knowledge. Our revised pyramid [*see illustration on page 67*] emphasizes weight control through exercising daily and avoiding an excessive total intake of calories. This pyramid recommends that the bulk of one's diet should consist of healthy fats (liquid vegetable oils such as olive, canola, soy, corn, sunflower and peanut) and healthy carbohydrates (whole grain foods such as whole wheat bread, oatmeal and brown rice). If both the fats and carbohydrates in your diet are healthy, you probably do not have to worry too much about the percentages of total calories coming from each. Vegetables and fruits should also be eaten in abundance. Moderate amounts of healthy sources of protein (nuts, legumes, fish, poultry and eggs) are encouraged, but dairy consumption should be limited to one to two servings a day. The revised pyramid recommends minimizing the consumption of red meat, butter, refined grains (including white bread, white rice and white pasta), potatoes and sugar.

Trans fat does not appear at all in the pyramid, because it has no place in a healthy diet. A multiple vitamin is suggested for most people, and moderate alcohol consumption can be a worthwhile option (if not contraindicated by specific health conditions or medications). This last recommendation comes with a caveat: drinking no alcohol is clearly better than drinking too much. But more and more studies are showing the benefits of moderate alcohol consumption (in any form: wine, beer or spirits) to the cardiovascular system.

Men and women eating in accordance with THE NEW PYRAMID had a lower risk of major chronic disease.

Can we show that our pyramid is healthier than the USDA's? We created a new Healthy Eating Index that measured how closely a person's diet followed our recommendations. Applying this revised index to our epidemiological studies, we found that men and women who were eating in accordance with the new pyramid had a lower risk of major chronic disease [*see illustration on opposite page*]. This benefit resulted almost entirely from significant reductions in the risk of cardiovascular disease—up to 30 percent for women and 40 percent for men. Following the new pyramid's guidelines did not, however, lower the risk of cancer. Weight control and physical activity, rather than specific food choices, are associated with a reduced risk of many cancers.

Of course, uncertainties still cloud our understanding of the relation between diet and health. More research is needed to examine the role of dairy products, the health effects of specific fruits and vegetables, the risks and benefits of vitamin supplements, and the long-term effects of diet during childhood and early adult life. The interaction of dietary factors with genetic predisposition should also be investigated, although its importance remains to be determined.

Another challenge will be to ensure that the information about nutrition given to the public is based strictly on scientific evidence. The USDA may not be the best government agency to develop objective nutritional guidelines, because it may be too closely linked to the agricultural industry. The food pyramid should be rebuilt in a setting that is well insulated from political and economic interests. SA

MORE TO EXPLORE

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