Mediterranean diet pyramid: a cultural model for healthy eating[1,2]

Walter C Willett, Frank Sacks, Antonia Trichopoulou, Greg Drescher, Anna Ferro-Luzzi, Elisabet Helsing, and Dimitrios Trichopoulos

ABSTRACT We present a food pyramid that reflects Mediterranean dietary traditions, which historically have been associated with good health. This Mediterranean diet pyramid is based on food patterns typical of Crete, much of the rest of Greece, and southern Italy in the early 1960s, where adult life expectancy was among the highest in the world and rates of coronary heart disease, certain cancers, and other diet-related chronic diseases were among the lowest. Work in the field or kitchen resulted in a lifestyle that included regular physical activity and was associated with low rates of obesity. The diet is characterized by abundant plant foods (fruit, vegetables, breads, other forms of cereals, potatoes, beans, nuts, and seeds), fresh fruit as the typical daily dessert, olive oil as the principal source of fat, dairy products (principally cheese and yogurt), and fish and poultry consumed in low to moderate amounts, zero to four eggs consumed weekly, red meat consumed in low amounts, and wine consumed in low to moderate amounts, normally with meals. This diet is low in saturated fat (≤7–8% of energy), with total fat ranging from <25% to >35% of energy throughout the region. The pyramid describes a dietary pattern that is attractive for its famous palatability as well as for its health benefits. *Am J Clin Nutr* 1995;61(suppl): 1402S–6S.

KEY WORDS Mediterranean diet, chronic disease, dietary patterns, dietary recommendations, food guide pyramid

INTRODUCTION

In January 1993, international experts on diet, nutrition, and health convened to review research on the composition and health implications of Mediterranean diets consumed during the past half century. This conference, 1993 International Conference on the Diets of the Mediterranean, was the first in a series jointly organized by Oldways Preservation & Exchange Trust and the World Health Organization (WHO)/Food and Agriculture Organization (FAO) Collaborating Center in Nutritional Epidemiology at Harvard School of Public Health to describe and evaluate the public health implications of traditional diets. This series of conferences is titled Public Health Implications of Traditional Diets.

One purpose of these conferences is to develop a series of food guide pyramids that reflect the diversity of worldwide dietary traditions that have historically been associated with good health. These cultural models for healthy eating will be presented graphically as pyramids in a manner similar to that used by the US Department of Agriculture (USDA) in its 1992 food guide pyramid, which is shown in **Figure 1** (1).

A principal objective of this initiative is to foster discussions among international scientists and government officials with expertise in public health, nutrition, agriculture, and the environment about culturally based dietary patterns likely to promote good health as suggested by current clinical and epidemiologic research. The graphic representation of these models as pyramids may be revised in response to new data from ongoing and future research. The first of these pyramids, developed jointly by the WHO/FAO Collaborating Center, the WHO Regional Office for Europe, and Oldways Preservation & Exchange Trust, is modeled according to the Mediterranean diet of the early 1960s. It is presented in **Figure 2.**

Mediterranean diet: definition

In the discussion here, the term "Mediterranean diet" has a specific meaning. It reflects food patterns typical of Crete, much of the rest of Greece, and southern Italy in the early 1960s. The selection of this specific time and these geographical areas is based on three lines of evidence:

1) Adult life expectancy for populations in these areas was among the highest in the world, and rates of coronary heart disease, certain cancers, and some other diet-related chronic diseases were among the lowest in the world in the early 1960s (2, 3), despite limitations of existing medical services.
2) Data on food availability and dietary intake in the Mediterranean region describe dietary patterns with many common characteristics.
3) Dietary patterns sharing many of these common characteristics have been associated with low rates of chronic diseases and high adult life expectancy in numerous

[1] From the Departments of Epidemiology and Nutrition, Harvard School of Public Health, Boston; Brigham and Women's Hospital, Boston; the Channing Laboratory, Department of Medicine, Harvard University School of Medicine, Boston; the Departments of Nutrition and Biochemistry, Athens School of Public Health, Greece; Oldways Preservation & Exchange Trust, Boston; the Unit of Human Nutrition, National Institute of Nutrition, Rome; and the Nutrition Unit, World Health Organization Regional Office for Europe, Copenhagen.

[2] Address reprint requests to WC Willett, Department of Nutrition, Harvard School of Public Health, 665 Huntington Avenue, Boston, MA 02115.

Am J Clin Nutr 1995;61(suppl):1402S–6S. Printed in USA.

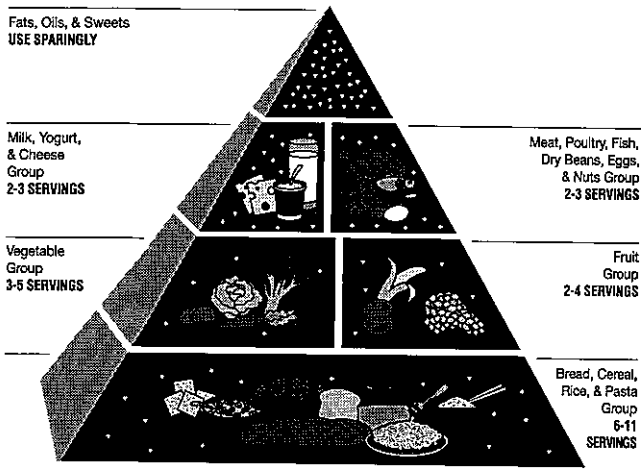

FIGURE 1. The 1992 US Department of Agriculture food guide pyramid: a guide to daily food choices. ○, fat (naturally occurring and added); ▽, sugars (added): these symbols show fats, oils, and added sugars in foods. From reference 1.

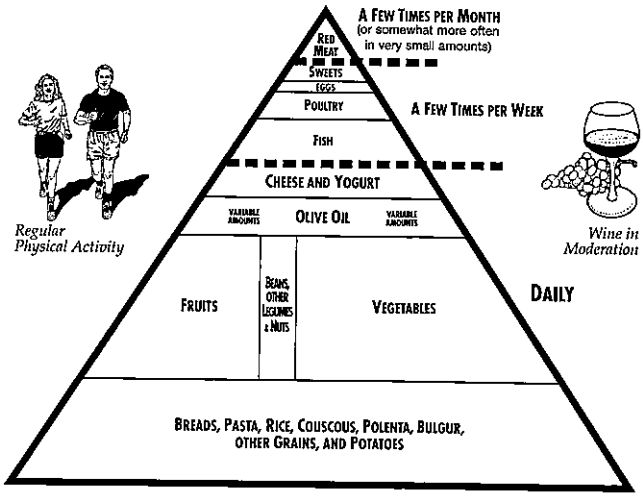

FIGURE 2. The Mediterranean diet pyramid: a cultural model for healthy eating. © Copyright 1994 Oldways Preservation & Exchange Trust.

epidemiologic studies conducted throughout the world (4).

Variations of the Mediterranean diet exist but have been less well described in other parts of Italy, and in parts of France, Lebanon, Morocco, Portugal, Spain, Syria, Tunisia, Turkey, and elsewhere in the Mediterranean region. As defined here, the diet is closely tied to traditional areas of olive cultivation in the Mediterranean region. Thus, the generic term "Mediterranean diet" particularly refers to dietary patterns found in olive-growing areas of the Mediterranean region ≥30 y ago.

Mediterranean diet: 1960s characteristics

The Mediterranean diet of the early 1960s can be described by the following broad characteristics (5, 6): an abundance of plant foods (fruit, vegetables, breads, other forms of cereals, potatoes, beans, nuts, and seeds); minimally processed, seasonally fresh, and locally grown foods; fresh fruit as the typical daily dessert, with sweets containing concentrated sugars or honey consumed a few times per week; olive oil as the principal source of fat; dairy products (principally cheese and yogurt) consumed daily in low to moderate amounts; fish and poultry consumed in low to moderate amounts; zero to four eggs consumed weekly; red meat consumed in low amounts; and wine consumed in low to moderate amounts, normally with meals.

As much as can be determined, this diet was low in saturated fat (≤7–8% of energy), with total fat ranging from <25% to >35% of energy from one area to another. Data also indicate that work in the field or kitchen resulted in a lifestyle that included regular physical activity and was associated with far less obesity than was observed in the United States (2).

Mediterranean diet pyramid

The Mediterranean diet pyramid (Figure 2) is designed to convey a general sense of the relative proportions and frequency of servings of foods and food groups that contribute to this overall dietary pattern, modified in light of contemporary research. The pyramid is meant to provide an overall impression of healthy food choices rather than to define recommended weights of certain foods or proportions of energy obtained from them. Where the pyramid does indicate relative frequencies, they are intentionally nonspecific because good health has been associated with considerable variation within the overall pattern. Similar to the USDA pyramid, it is designed as a dietary guide for the general adult population and may need to be modified to meet the needs of children, pregnant women, and other special population groups.

CONTEMPORARY PERSPECTIVES

The Mediterranean diet pyramid is distinct in several characteristics. The following discussion provides a rationale for the recommendation of these characteristics on the basis of current research on diet and health. This discussion is meant to highlight issues related to the effects of traditional dietary patterns on health, to promote further discussion, and to stimulate further research on those issues.

Abundance of plant foods

In the traditional Mediterranean diet, as in many traditional everyday diets, plant foods constituted the core of the daily intake, whereas foods from animals were more peripheral. Examples of traditional Mediterranean dietary patterns with foods from plants at the center of the plate include the use of couscous, vegetables, and legumes in North Africa; pasta, polenta, rice, or potatoes, along with vegetables and legumes in southern Europe; and bulgur and rice, along with vegetables, chickpeas, and other beans in eastern Mediterranean regions. Foods from plants also accompanied meals. Bread, for example, eaten without butter or margarine, was a fundamental component of virtually all meals. Fresh vegetables, salads, fruit, nuts, seeds, and olives were consumed frequently and garlic, onions, and herbs were used as condiments.

This diet, when consumed in sufficient amounts, provided all of the known essential micronutrients (ie, vitamins and minerals), fiber, and other plant food substances believed to promote health (5). Because these substances are numerous and complex, are found in differing proportions in foods, and interact in

ways that are incompletely understood, virtually all contemporary dietary guidelines around the world emphasize a large and varied intake of foods (7). Minimal processing, seasonal use, and freshness of foods would be expected to maximize contents of dietary fiber, antioxidants, other micronutrients, and nonnutritive substances found in foods from plants.

Note that the Mediterranean diet reflected in the pyramid is not a vegetarian diet; it includes modest amounts of foods from animal sources. This balance increases amounts of vitamin B-12 and iron available in the diet, yet keeps contents of saturated fat low. Thus, this dietary pattern would be expected to reduce risks for chronic diseases to a greater degree than patterns recommended by many contemporary dietary guidelines.

Olive oil as the principal fat

Olive oil was the region's principal source of fat and characteristically was used in place of animal fats typical of northern European diets. Olive oil contains a large proportion of monounsaturated fat, is relatively low in saturated fat, and is a source of the antioxidant vitamin E. From the standpoint of health, these features make it preferable to animal fats. Research has suggested several reasons why olive oil also might be preferable to other fats in general, to fats from other plant sources, and even, perhaps, to high amounts of carbohydrates in the diet. Among these reasons are the following:

1) Oleic acid is considered to be antithrombotic compared with saturated fatty acids (8).
2) Diets high in monounsaturated fat are less likely than those high in polyunsaturated fat to be involved in the oxidation of low-density lipoproteins (LDLs), a process thought to increase the risk of atherogenesis and coronary heart disease (9).
3) Substitution of olive oil for carbohydrates in certain short-term clinical studies has been shown to increase concentrations of high-density lipoproteins (HDLs) without increasing LDLs and should be expected, therefore, to reduce coronary risk (10, 11).
4) Mediterranean people have used olive oil as their major dietary fat for a few thousand years with no evidence of harm. The widespread increased use of polyunsaturated vegetable oils is more recent, and the long-term effects of such usage are unknown (4).
5) Olive oil facilitates the typical consumption of large amounts of vegetables and legumes throughout much of the Mediterranean region by enhancing taste and energy density.

What should the recommendation be for percent of total dietary energy from fat when olive oil is the principal source of fat? Evidence suggests that the proportion of energy from total fat in Mediterranean diets varied widely throughout the region in the early 1960s; it was reported to range from 28% in southern Italy and even less in other regions, to as much as 40% in Crete and other parts of Greece (2, 5, 6). Proportions of energy from fat across this range appear to have been compatible with excellent adult health with diets in which most of the fat was derived from olive oil.

In adult Greek men in 1960, for example, premature mortality from coronary heart disease was 90% lower than that for men in the United States, and the life expectancy of Greek men was the highest in the world reported at that time (2). In women, breast cancer rates were less than one-half of those in the United States. Overall rates of several other chronic diseases in Greece also were generally lower than those in other Mediterranean and northern and central European countries (3).

These observations suggest that Mediterranean dietary characteristics taken as a whole were compatible with excellent health, even when the proportion of energy from fat exceeded the 30% figure generally recommended as an upper level in the official dietary guidelines of many countries today (7).

These differences in total fat are also and more broadly associated with two Mediterranean dietary variants: the dietary pattern of southern Italy [relatively low total fat; moderate intake of olive oil, fruit, and vegetables; and high intake of cereals (12)] and that of Greece [higher total fat (mostly in the form of olive oil), high intakes of fruit and vegetables, but moderate intake of cereals (2, 6)].

This suggests that more than one model for healthy Mediterranean eating may exist and that further research is needed to determine whether these variants applied in a contemporary setting have equally favorable effects on health. For example, it is as yet uncertain whether a diet containing >35% of energy from fat, much of it olive oil, and the remaining energy mainly from fruit, legumes, vegetables, and bread, promotes obesity in a sedentary population any more than does a diet with an equivalent amount of energy but less fat (13, 14).

In applying these observations to today's diets, several points are especially relevant. Butter was rare in the Mediterranean region in 1960, and margarine unknown until quite recently. The use of both has increased in the past 30 y, as has substitution of other less-expensive vegetable oils for olive oil (15). Following Mediterranean tradition, however, butter should be used only in small amounts or on special occasions, and olive oil should replace—not be added to—other sources of dietary fat such as butter, margarine, or vegetable oils and shortenings. Another relevant point is that Mediterranean populations in the early 1960s were physically very active, and regular physical activity should be part of a healthy regimen (2, 5).

Dairy products, principally yogurt and cheese, in low to moderate amounts

Mediterranean diets typically included small amounts of dairy products from a variety of animals: goat, sheep, buffalo, cow, and camel (5, 6). Dairy products as a group were consumed in low to moderate amounts. Because refrigeration was lacking and the climate was often hot, milk in the Mediterranean region was frequently preserved and consumed as yogurt and cheese, and these foods represented a greater proportion of dairy food intake than is typical of modern diets in the United States or in northern Europe. Grating small amounts of high-fat, full-flavored cheese over pasta is an example of the Mediterranean approach to incorporating these foods in a healthful yet good-tasting manner, while keeping overall consumption of dairy products low to moderate (6). The more recent introduction of low- and nonfat dairy products on the global market suggests the possibility that consumption of dairy foods could be increased with little adverse health effects for a given individual. From a food supply and population-based perspec-

tive, however, it is less clear that increased consumption of low- and nonfat dairy products is positive, because the extracted fat from these products remains in the food supply. Full-fat cheeses can continue to be enjoyed in a Mediterranean-style diet on a daily basis when amounts remain modest.

Red meat, poultry, fish, and eggs in low to moderate amounts

Traditional Mediterranean diets included foods from animals in limited amounts (6). Evidence increasingly supports associations between Western diets that include high intakes of meats such as beef, pork, and lamb, for example, and the incidence of chronic diseases such as coronary heart disease and cancers of the colon, and, perhaps, of the prostate and other sites. Whether the fat in meat is the sole contributor to these relations is uncertain. Other factors may also be involved; research has suggested the possible involvement of the carcinogens formed during frying and cooking of meat, and the protein, cholesterol, or iron content of the meat. Meat contains no fiber and few antioxidant nutrients; its energy displaces that from plant foods that do contain these essential nutrients. The consumption of low amounts of red meat by traditional Mediterranean populations posed no evident risk to adult health and was consistent with better health profiles than those observed in industrialized countries where much higher amounts are consumed (4).

The amount of fish consumed varied widely between and within Mediterranean countries, with Crete and southern Italy at the lower end, and Corfu, Spain, and Portugal at the higher end. This fact, together with data from Japan and clinical evidence, indicates that weekly consumption of low to moderate amounts of fish would be compatible with excellent health (6, 13–17).

The consumption of zero to four whole eggs per capita per week was typical of Mediterranean diets of the early 1960s (6). This figure includes eggs used in baking and preparing foods.

Wine in moderation, and with meals

In contrast with Islamic populations in the Mediterranean region, populations in Greece, southern Italy, and other countries typically drank wine in low to moderate amounts with family meals. In some areas, wine was mixed with water, and women often did not drink alcohol at all (5). In the context of the Mediterranean diet pyramid, moderation in wine consumption is defined as one to two glasses per day for men. Consumption at this level appears to reduce the risk of coronary heart disease as well as that of overall mortality (18). For women, moderation in wine consumption is defined as one glass per day. Consumption at this level decreases coronary risk. However, recent research suggests that even a modest amount of alcohol may be associated with a small increase in the risk of breast cancer (19).

From a contemporary public health perspective, wine should be avoided whenever consumption would put an individual or others at risk, such as during pregnancy or before driving. Wine is considered optional in Mediterranean-style diets, and individuals should make personal decisions about wine drinking based on many factors, including family history and other health and social considerations.

Physical activity and other lifestyle factors

Physical activity and other diet-related lifestyle factors may also have contributed to the high adult life expectancy and low chronic disease rates found in specific Mediterranean areas in the early 1960s. Mediterranean populations in the early 1960s were highly active, and the groups observed in Crete and other areas of Greece were leaner than their Western counterparts (2, 5).

In addition, certain lifestyle factors are of particular interest: the social support and sense of community that accompanies sharing food with family and friends; lengthy meals that provide relaxation and relief from daily stress; delicious meals, carefully prepared, that stimulate enjoyment of healthy diets; and postlunch siestas (afternoon naps) that also provide an opportunity for rest and relaxation.

CONCLUSION

The Mediterranean diet constitutes a centuries-old tradition that contributes to excellent health, provides a sense of pleasure and well-being, and forms a vital part of the world's collective cultural heritage. For Mediterranean people, the pyramid describes a traditional diet that can be readily preserved and revitalized within a modern lifestyle. For Americans, northern and Eastern Europeans, and others who wish to improve their diets, the pyramid describes a dietary pattern that is attractive for its famous palatability as well as for its health benefits, and one that can be adopted in its entirety or in conjunction with meals inspired by other healthful dietary traditions from cultures throughout the world.

REFERENCES

1. US Department of Agriculture. The food guide pyramid. Hyattsville, MD: Human Nutrition Information Service, 1992. (Publication HG252.)
2. Keys A. Seven countries: a multivariate analysis of death and coronary heart disease. Cambridge, MA: Harvard University Press, 1980.
3. World Health Organization. Food and health indicators: computerized presentation. Copenhagen: WHO Regional Office for Europe, Nutrition Programme, 1993.
4. Willett WC. Diet and health. What should we eat? Science 1994;264: 532–7.
5. Allbaugh LG. Crete: a case study of an underdeveloped area. Princeton, NJ: Princeton University Press, 1953.
6. Kromhout D, Keys A, Aravanis C, et al. Food consumption patterns in the 1960s in seven countries. Am J Clin Nutr 1989;49:889–94.
7. Cannon G. Food and health: the experts agree. London: Consumers' Association, 1992.
8. Ulbricht TL, Southgate DA. Coronary heart disease: seven dietary factors. Lancet 1991;338:985–92.
9. Reaven P, Parthasarathy S, Grasse BJ, et al. Feasibility of using oleate-rich diet to reduce the susceptibility of LDL to oxidative modification in humans. Am J Clin Nutr 1991;54:701–6.
10. Mattson FH, Grundy SM. Comparison of effects of dietary saturated, monounsaturated, and polyunsaturated fatty acids on plasma lipids and lipoproteins in man. J Lipid Res 1985;26:194–202.
11. Mensink RP, Katan MB. Effect of monounsaturated fatty acids versus complex carbohydrates on high-density lipoproteins in healthy men and women. Lancet 1987;1:122–5.

12. Ferro-Luzzi A, Sette S. The Mediterranean diet: an attempt to define its present and past composition. Eur J Clin Nutr 1989;43(suppl 2):13–29.
13. National Diet Heart Study Research Group. National Diet Heart Study final report. Circulation 1968;37(S):1–428.
14. Kasim SE, Martino S, Kim PN, et al. Dietary and anthropometric determinants of plasma lipoproteins during a long-term, low fat diet in healthy women. Am J Clin Nutr 1993;123:221–34.
15. Organization for Economic Cooperation and Development. Food consumption statistics, 1979–1988. Paris: OECD Publications, 1991.
16. Taha FA. Japan adds western flavor to its traditional diet. Food Review 1993;16:30–7.
17. The Japan Dietetic Association. Nutrition and dietetics in Japan. 6th ed. Tokyo: The Japan Dietetic Association, 1992.
18. Klatsky AL, Armstrong MA, Friedman GD. Alcohol and mortality. Ann Intern Med 1992;117:646–54.
19. Howe G, Rohan T, Decarli A, et al. The association between alcohol and breast cancer risk: evidence from the combined analysis of six dietary case-control studies. Int J Cancer 1991;47:707–10.