Diet and Health: A Commentary on Current Dietary Recommendations and Their Use in Public Health

Adam Drewnowski

School of Public Health, Human Nutrition Program, University of Michigan, Ann Arbor, Michigan, USA

The typical diet of industrialized nations is rich in sugars and fat but low in complex carbohydrates and fiber. Such dietary patterns are associated with increased risk of chronic disease, including coronary heart disease, stroke, some types of cancer, and diabetes (1). These leading causes of death and disability in the USA (1) are regarded as largely preventable through improved health behaviors and better nutrition and diet. Diet-related factors have also been associated with high blood pressure, obesity, osteoporosis, and dental caries. Further adverse effects on health have been linked to excess alcohol use (1,2). Although some of the epidemiological evidence linking diet and chronic disease can be controversial, experts agree that appropriate nutrition is essential for optimal health.

The chief concerns of public health nutrition in the USA have changed sharply in recent years. Past efforts in nutrition have been directed at the prevention and treatment of nutrient deficiencies and nutrient deficiency diseases. However, with some exceptions, problems of malnutrition and nutrient deficiency in the USA have been largely replaced by those of nutrient overconsumption (1,2). Accordingly, the current emphasis in nutrition research and training is on the health consequences of nutrient excess and nutritional imbalance. For example, excessive fat content of the typical American diet has been linked to increased risk of cardiovascular disease, hypertension, obesity, and some forms of cancer (1,2). Reducing the consumption of fats, especially saturated fats, is therefore a top priority area in public health nutrition (1). Similarly, given that most Americans consume excess amounts of protein, current guidelines recommend reducing protein consumption, or keeping it at a moderate level (2).

Establishing causal links between foods, food groups, eating patterns, and the risk of chronic disease is a difficult process. While the classic nutrient deficiency syndromes could be traced to the absence of a single nutrient from the diet, the origin of chronic disease is likely to be multifactorial. The expression of illness can be influenced by genetic predisposition and is often modulated by diverse environmental
factors, including diet. The precise contribution of dietary factors is often unclear, and it is difficult to distinguish between dietary, genetic, behavioral, or other environmental causes. As a result, assigning a specific role to dietary variables alone can be an impossible task.

The postulated links between diet and chronic disease are based on a variety of preclinical, clinical, and epidemiological studies (1,2). However, causal relationships are not always firmly established, and there are frequent methodological problems in the assessment of habitual food intake, medical history, and current health status. Dietary recommendations are typically based on a consensus of expert opinion following a review of the available, if often incomplete and sometimes contradictory, evidence (1,2).

Although dietary recommendations serve to focus attention on diet, nutrition, and associated health problems, their usefulness has been criticized on the grounds that the anticipated health benefits cannot be estimated in a quantitative manner. Because the exact role of diet in the causation of disease is largely unknown, it is not possible to determine what proportion of chronic disease would be reduced by dietary modifications alone. It has also been argued that dietary guidelines should be selectively directed only at high-risk individuals for whom dietary modification might be a preferable alternative to drug therapy. It is sometimes unclear what health benefits might be derived from population-wide dietary intervention designed to modify eating patterns of low-risk healthy people. Diet modification may prove ineffective even for some high-risk groups: individuals with essential hypertension or familial dyslipidemia will not be helped by low sodium or low fat diets.

Most of the published dietary guidelines are intended for healthy people. The recent Nutrition and Health (1) and the Diet and Health (2) reports, which provide general dietary advice in regard to health promotion and disease prevention, are intended for the general public. More specialized reports issued by the National Cancer Institute (3) and the American Heart Association (4) address dietary practices specifically intended to reduce the risk of heart disease and cancer. This chapter will outline the nature of the evidence behind the guidelines, their changing focus over the years, and their applications to public health.

**DIET AND CHRONIC DISEASE**

Causal links between diet and chronic disease are generally inferred from evidence gathered from a variety of sources (1,2). These include data from animal and laboratory studies, clinical trials, epidemiological surveys, and ecological comparisons. Animal studies generally involve dietary manipulations and prolonged exposure to specific diets or disease-promoting agents. However, their value is sometimes limited by questions regarding their relevance to the origins of chronic disease in humans. Clinical investigations address the effects of selected diets or dietary supplements on patient samples and on appropriate controls. Such studies are often limited both in sample size and in the usual duration of diet exposure.
Information on dietary patterns and health status of populations is generally provided by large-scale surveys in nutritional epidemiology (5–9). Such surveys may suffer from inadequacies in dietary intake assessment, being based most often on a single measure of 24 h food recall. Although such surveys provide useful indications of the nutritional status of populations, they tend to be cross-sectional in nature and usually fail to document a causal relationship between diet and disease. Furthermore, a single 24 h recall does not provide a true picture of the dietary intake patterns of the individual.

The technique of 24 h food recall may also suffer from the respondents’ inability to remember and describe to the interviewer what was consumed (8). Reliance on memory may lead to selective omissions, inaccuracies in portion size, or underestimates of the energy and nutrients that were consumed. Self-administered food frequency instruments (FFQs) rely on the respondents’ estimates of how often a given food was consumed over a period of several months or even a year (9). Obtaining accurate frequency estimates is a problem, as many respondents tend to minimize the consumption of unhealthy foods and exaggerate the consumption of foods they view as nutritious. Concerns with health issues, body weight, or dieting appear to be major sources of misrepresentation and bias.

Ecological comparisons involve correlations between diet composition and the prevalence of disease that are made between different countries. Such studies critically depend on the accuracy of food consumption measures and the completeness of medical statistics collected from various nations. Needless to say, morbidity and mortality statistics are not always kept with the same accuracy, and the data may be confounded by demographic, ethnic, sociocultural, and other variables. For example, increased meat consumption—and increased fat content of the diet—are almost invariably associated with higher per capita income. In fact, meat consumption has been used as a proxy measure of economic progress in many industrializing nations. At the same time, higher income and improved standard of living may be associated with better education and improved access to public health amenities and medical care.

For the establishment of causality, scientific evidence must conform to several rules. Ideally, the relationship between diet and disease should be consistent, graded, and strong (10). Second, there should be a plausible biological mechanism mediating the connection between diet and the expression of illness. For example, the risk of coronary heart disease has been linked to high blood cholesterol, high blood pressure, and cigarette smoking. Habitual diet plays a major role in regulating cholesterol levels, which in turn promote the formation of arterial plaque and the development of atherosclerosis (1). The association between high blood cholesterol and increased risk of coronary heart disease is continuous and strong, and is apparent even in the “normal” range at cholesterol levels in the range of 180 mg/dl (4.7 mmol/liter) (11). A level of 240 mg/dl cholesterol (6.2 mmol/liter) indicates high risk (1).

However, while some epidemiological studies have demonstrated such a relationship between dietary fats, plasma cholesterol, and coronary heart disease, other studies of individuals within populations—notably Framingham and Tecumseh
samples—have failed to find such a relationship (12). Even in some of the best-documented cases, links between diet and diseases are far from firm.

The relationship between diet and hypertension is even less clear, and a number of alternative biological mechanisms have been proposed (1,2). High blood pressure (defined as 140/90 mm Hg) is generally treated through weight control and restriction of sodium and alcohol. Similarly, obesity—itself a risk factor for hypertension, diabetes, and cardiovascular disease—has never been linked to diet alone. Rather, the expression of obesity appears to be the combined outcome of genetic predisposition and dietary variables. Although there is incontrovertible evidence that excessive energy intakes promote obesity in both animals and man, epidemiological studies tend to show a puzzling but consistent inverse correlation between overeating and overweight. According to some analyses of the NHANES data, obese women consumed significantly less energy than did lean women (13). Similarly many clinical studies have failed to document sustained overeating among obese patients as compared to lean controls.

Even though individual studies are often inconclusive, numerous expert panels have attempted to formulate a consensus regarding causal links between diet and chronic disease. Published reviews generally suggest that a diet characterized by excess energy, fat (especially saturated fat), cholesterol, and sodium, but low in complex carbohydrates and fiber is not conducive to optimal health (1,2). It is a problem for global public health that this diet, characteristic of Western societies, is currently gaining acceptance among the newly industrialized nations (14).

CHANGING DIETARY RECOMMENDATIONS

Successive sets of dietary recommendations intended for the American public during the period 1977–1989 reflect both new scientific evidence and changing health priorities and concerns. Summarized in Table 1 are some key sets of recommendations and guidelines, including those issued by the US government.

The first set of dietary recommendations aimed at the prevention of chronic disease was the 1977 report Dietary Goals for the United States issued by the Senate Select

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Committee on Nutrition and Human Needs (15). Selected as priority goals were maintenance of desirable body weight, increase in the consumption of complex carbohydrates, and a reduction in the consumption of sugar. Additional goals included a reduction in the consumption of fat, saturated fat, cholesterol, and sodium. The 1979 Surgeon General's Report Healthy People (16) listed a slightly different set of priorities. These were reissued as the 1980 USDA/DHHS Dietary Guidelines for Americans (17,18) and are summarized in Table 2. The priority emphasis was on eating a variety of foods and on maintaining desirable body weight.

The 1988 Surgeon General's Report on Nutrition and Health (1) listed as priority areas for public health a reduction in the consumption of fats and cholesterol and the maintenance of desirable body weight. The main recommendations of the 1988 report are summarized in Table 3.

The most recent report on Diet and Health (2) was issued in 1989 by the Food and Nutrition Board of the National Academy of Sciences. This thorough review of the scientific evidence linking diet and chronic disease gave priority to a number of

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### TABLE 2. Dietary guidelines for Americans (USDA/DHHS 1980)

**Summary of recommendations**

- Eat a variety of foods
- Maintain desirable weight
- Avoid too much fat, saturated fat, and cholesterol
- Eat foods with adequate starch and fiber
- Avoid too much sugar
- Avoid too much sodium
- If you drink alcoholic beverages, do so in moderation

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- Fats and cholesterol. Reduce consumption of fat (especially saturated fat) and cholesterol.
- Energy and weight control. Achieve and maintain a desirable body weight. To do so, choose a dietary pattern in which energy (calorie) intake is consistent with energy expenditure.
- Complex carbohydrates and fiber. Increase consumption of whole grain foods and cereal products, vegetables and fruits.
- Sodium. Reduce intake of sodium by choosing foods relatively low in sodium and limiting the amount of salt added in food preparation and at the table.
- Alcohol. To reduce the risk for chronic disease, take alcohol only in moderation (no more than two drinks per day) if at all.

Other issues for some people:

- Fluoride. Community water systems should contain fluoride at optimal levels for prevention of tooth decay.
- Sugars. Those who are particularly vulnerable to dental caries, especially children, should limit their consumption and frequency of use of foods high in sugars.
- Calcium. Adolescent girls and adult women should increase consumption of foods high in calcium.
- Iron. Children, adolescents, and women of childbearing age should be sure to consume foods that are good sources of iron.
areas for dietary change, as summarized in Table 4. Chief emphasis was placed on reducing dietary fat intake and increasing the carbohydrate-to-fat ratio. The recommendation was to reduce fat consumption and increase intake of complex carbohydrates in the form of grains, vegetables, and fruit.

Table 5 illustrates the changing nature of priority areas between 1977 and 1989. It is clear, for example, that concerns with excess sugar consumption, so prominent during the 1970s, have been replaced by concerns regarding dietary fat. Increasing attention given to fat is clearly based on progressively more convincing evidence linking dietary fat with plasma cholesterol levels and risk for cardiovascular disease. Other studies suggest that while excess carbohydrate energy tends to be metabolized by the organism, excess fat energy tends to be deposited as body fat (19). The current dietary advice is to increase the carbohydrate-to-fat ratio in the habitual diet.

The removal of sugar from the list of key dietary concerns is partly due to the absence of any damming scientific evidence. Many studies tried and failed to link sugar consumption with increased risk of chronic disease (see reference 20 for review). However, it should be noted that dietary guidelines are not entirely immune from social pressures and secular trends.

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DIETARY RECOMMENDATIONS

The popular press and the weight-loss industry have been influential in shaping our attitudes toward sugar and fat. During the 1970s, popular books addressed at the general public outlined the dangers of sugar consumption in persuasive detail (21,22). Sugar was called "pure, white and deadly" (21), and all carbohydrate-rich foods were viewed as intensely fattening. Accordingly, best-selling diet books recommended high protein diets for weight reduction (23,24). Such diets tended to be relatively rich in fat, with fat accounting for up to 72% of dietary energy (23). Carbohydrates, whether starches or sugars, were to be scrupulously avoided by dieters intent on weight control.

Some ten years later the pendulum swung the other way as most health professionals came to believe that high carbohydrate diets are essential for optimum health. Again, best-selling diet books published during the 1980s illustrate this changing trend. Following the initial success of the high carbohydrate Pritikin Diet (25), most weight reduction diets switched to high carbohydrate, moderate protein formulations (26). The combination of a high carbohydrate diet and exercise proved especially popular with athletes and was found to provide some benefits for cardiovascular health. At the present time, the standard weight reduction diet for moderate obesity adopted by most weight loss programs and clinics in the USA derives 60% of energy from carbohydrate, 20% from protein, and 20% from fat. Excess fat, rather than excess carbohydrate consumption, is now viewed as the chief danger to health.

Dietary recommendations issued by experts are intended to guide the public toward better nutrition and optimum health. However, the selection of priority areas may not be based solely on scientific evidence but may reflect prevailing attitudes and social trends. The gradual replacement of sugar by fat as the key priority area (see Table 5) is a case in point. Popular attitudes toward the health value of carbohydrates, sugars, and fat have also changed dramatically over the past 20 years, as attested by the changing composition of diets for weight reduction. It is sometimes difficult to say whether dietary recommendations shape the public perception of the health value of selected foods or the other way around.

POLICY IMPLICATIONS

What are the chief policy implications of dietary guidelines directed at healthy people? First, it is important to decide whether a population at low risk for chronic disease would benefit from dietary advice. A population-wide change in dietary patterns may result in significant health benefits for the population, but may not be personally advantageous to the low-risk consumer. To put it another way, why should people deprive themselves of unhealthy but good-tasting foods so that their neighbors might live longer? Arguably, it may be a more appropriate strategy to target dietary recommendations at individuals or populations at risk.

Second, chronic disease risk is due only in part to nutrition and diet. The expression of obesity, for example, is the combined outcome of familial predisposition and environmental variables, including diet. Consequently, it is unclear whether obesity
can be successfully treated by dietary intervention alone. Data from obesity clinics tend to suggest that crash diets do not work in the long term and that the majority of obese clients eventually regain their former body weight (27). Dietary modification is important but it is not the only factor in health promotion and disease prevention.

Third, recommendations based around ideal nutrient composition of the diet are often difficult to interpret. Dietary recommendations should be translated into actual food choices that can be easily understood and followed by the consumer. All too often, complex dietary recommendations are rejected by the consumer. The lack of adequate nutritional information is not necessarily the cause. For example, although increased consumption of complex carbohydrates and fiber has been advocated by nutritionists over the past several years, nutritional surveys conducted by the USDA indicate that the consumption of vegetables and fruit by women actually declined between 1977 and 1985 (28). A reversal of this trend is a challenge for the food industry and for the health professional.

Although dietary guidelines can be a powerful tool of preventive medicine, they should not serve as a substitute for nutrition education. Improved nutrition training of physicians, dietitians, nutritionists, and other health professionals will help define the role of diet in health promotion and disease prevention. Educators and behavioral scientists should also become involved in the study of behavioral aspects of dietary compliance. Only then will the results of current studies on diet and disease have a wide-ranging impact on public health nutrition.

CONCLUSION

Dietary habits of industrialized nations are characterized not by nutrient deficiency but by nutrient excess and nutritional imbalance. Excessive consumption of fats, especially saturated fats, at the expense of complex carbohydrates and fiber has been associated with elevated risk of chronic disease, including cardiovascular disease, hypertension, obesity, and diabetes. Diet-related factors have also been associated with high blood pressure, obesity, osteoporosis, and some forms of cancer. Further adverse effects on health have been linked to excess alcohol use (1,2).

The causal nature of the relationship between diet and chronic disease has been inferred from a variety of laboratory, clinical, epidemiological, and ecological studies. However, evidence linking diet and disease is far from solid. While the classic nutrient deficiency syndromes could be traced to the absence of a single nutrient, the origin of chronic disease is likely to involve genetic, dietary, behavioral, and other environmental causes. The expression of illness can be influenced by genetic predisposition and is often modulated by environmental variables including diet. Sociocultural and behavioral factors including dietary compliance are also thought to play a major role. The precise role of foods, food groups, and dietary habits in the etiology of disease is thus difficult to determine. Accordingly, dietary recommendations and guidelines are typically based on a consensus of expert opinion
following a review of the available, if often incomplete and sometimes contradictory, evidence.

It may be useful to think of dietary recommendations as a powerful tool of preventive medicine. The guidelines focus attention on priority areas of public health and offer a viable dietary strategy for health promotion and disease prevention. However, it is a valid criticism of dietary recommendations that the health benefits of modified diets cannot be calculated in a quantitative manner. First, given the proliferation of conflicting opinion, the nutritional message is sometimes inconsistent and dietary compliance is a problem. Second, it is not always clear whether dietary guidelines should apply only to high-risk individuals or groups or to the population at large. Third, most guidelines are based around nutrients rather than specific foods. There is a clear need to translate dietary recommendations into effective food choice strategies that can be more easily adopted by the consumers.

Most of the published dietary recommendations are intended primarily for healthy people. Among the most recent U.S. reports on diet, health, and chronic disease are The Surgeon General’s Report on Nutrition and Health (1988) and the Diet and Health Report (1989) issued by the Food and Nutrition Board of the National Academy of Sciences. Both reports confirm that a diet characterized by excess calories and high content of fat, cholesterol, and sodium is detrimental to health (1,2). It should be noted that this habitual diet of Western societies is currently gaining acceptance among other industrialized nations.

Although useful in focusing attention on nutrition and health, dietary guidelines should not take the place of nutrition education. Improved nutrition training of physicians, nurses, and other health professionals will help define the role of diet in disease prevention and should have a wide-ranging impact on public health.

REFERENCES


DISCUSSION

Dr. Harper: The guidelines that were proposed for preventing chronic and degenerative diseases in the 1970s were based on hearings in the US Senate. They were designed for middle-aged men. Not for anyone else. They say nothing about infants, children, pregnant women, or old people. The latest US Surgeon General’s report does not even include a guideline for variety in food consumption. The objective seems only to be disease prevention. The original report from the Senate committee recommended only 3 g of sodium per day and included no recommendation for weight control. The nutritional community pointed out these oversights and a second edition with modifications was out in about two months. The Diet and Health Report of the Food and Nutrition Board and the Surgeon General’s report are influenced by people with a major interest in establishing policy, not evaluating scientific knowledge.

Dr. Drewnowski: This reinforces my argument that recommendations are formulated after much discussion between various groups with conflicting interests and points of view. Thus they are likely to reflect social trends.

Dr. Olson: I am a supporter of dietary guidelines that consist of general advice to individuals directed toward decreasing or increasing certain foods in the hope of preventing the onset of given chronic diseases. However, I should like to distinguish between dietary goals which are quantitative targets for institutions or countries to modify the average intake of macro-nutrients from existing levels to achieve protection from chronic diseases, and those which
consist of nonquantitative advice to individuals. The McGovern Select Committee report from the US Senate in 1977 recommended a set of quantitative dietary goals for the country, whereas the 1985 USDA-DHHS Committee on "Dietary Guidelines" for Americans", of which I was a member, urged individuals to practice variety and moderation in choosing their diet, but also warned against excessive intakes of fat, saturated fat, cholesterol, salt, sugar, and alcohol in general terms. No quantitative goals were set for individuals since we thought them inappropriate. I consider the US Surgeon General's report of 1988 reasonable since it talks about dietary advice for high-risk persons in nonquantitative terms. On the contrary, I take issue with the recent NRC report on Diet and Health (1989) because it sets dietary goals for individuals in quantitative terms and extends the advice for adults to children over two years of age. This move toward inflexibility and universality is undesirable.

Dr. Drewnowski: I agree that dietary recommendations should be targeted at specific groups and should not be rigid.

Dr. Mauron: I should like to ask about the secular trend linking affluence with increased intake of dietary fat, meat, and sugar, and reduced cereals, potatoes, and so on. The trend is reversing in the USA and in the United Kingdom and has been since the early 1980s. Do you think this reversal will continue and can we extrapolate from the trend? In other words, can we say that consumption is likely to return to the 1960s levels as a result of the new lifestyles?

Dr. Drewnowski: In the United States there has been a decline in the consumption of fat but the reduction in energy intakes has been rather small so there has been compensation. For example, while the consumption of red meat has declined the consumption of cheese—which also contains saturated fat—has gone up. It is difficult to predict where the fat intakes will stabilize. The American Heart Association hopes they will stabilize at about 30% of energy intake. It will be interesting to see if the consumption of fat in Japan, which is now 20% of energy, will increase to 30% or higher in future years.

Dr. Ashwell: Can you look into the 21st century and tell us what you think the dietary guidelines might be 20 years from now? Do you really see a place for guidelines, particularly quantitative ones?

Dr. Drewnowski: I definitely see a place for nutrition education. Dietary guidelines too often take the place of nutrition education since they serve to inform and alert the public to certain types of diets that are not healthy. I should like to see a replacement of the guidelines by more comprehensive nutrition education at all levels, starting with the teaching of nutrition and medical school and extending to the general population as well.