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# EVOLUTION OF RECOMMENDED DIETARY ALLOWANCES— New Directions?

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## *Introduction*

"Recommended dietary allowances (RDA) are the levels of intake of essential nutrients considered, in the judgement of the Committee on Dietary Allowances of the Food and



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Nutrition Board on the basis of available scientific knowledge, to be adequate to meet the known nutritional needs of practically all healthy persons" (28).

The RDA are a set of dietary standards. The nature of dietary standards has changed over time as knowledge of nutrition has accrued; the reasons for establishing such standards have changed as understanding of relationships between essential nutrient needs and health has increased; also, as these changes have occurred, the uses of dietary standards have expanded. Awareness of this evolution is helpful for an understanding of the controversies that have arisen over the concept of RDA.

The RDA were designed to serve as dietary standards for the planning of food supplies for population groups. They are estimates of the daily average amounts of essential nutrients that individuals in a population group should consume over time in order to ensure that the physiological needs of all will be met. RDA were not intended for use by the general public nor were they proposed as part of nutrition policy. They were formulated as scientifically based, reference standards for use by qualified individuals who had responsibility for assuring that the food served to large groups of people would be nutritionally adequate (27, 28).

There have been scientific differences of opinion over some of the values selected for RDA ever since these standards were first established. These are largely attributable to technical problems and differences in scientific judgement in selecting the most appropriate values for average nutrient requirements and for allowances that exceed average requirements by an amount that will ensure adequate tissue reserves. As the uses of the RDA have expanded, and particularly since RDA have been adapted for use in certain types of health, regulatory, and social policy, misunderstanding of the concept of RDA and misuse, either inadvertantly or purposefully, of these standards have brought the RDA into contention.

My objectives are to outline the evolution of dietary standards in general and of the RDA in particular; discuss the original reason for developing RDA and the adequacy of the scientific bases of RDA for this purpose; and identify additional uses to which RDA have been put and assess some of their limitations. I conclude with some thoughts about reasons for contention over RDA, relationships between RDA and dietary guidelines, and future directions for both.

## *Evolution of Dietary Standards*

DIETARY RECOMMENDATIONS 1835–1940 The evolution of dietary standards prior to 1941 has been described by Leitch (53). Her review has provided the starting point for most other discussions of this subject (17, 39, 71, 87). The first formal action to institute a dietary recommendation, she notes, was passage of the British Merchant Seaman's Act in Britain in 1835 by which provision of "lime" or lemon juice to prevent scurvy was made compulsory in the rations of the mercantile service.

Probably the first true dietary standard was proposed by Dr. Edward Smith in 1862 in response to a request from the British Privy Council. The council wanted to determine the least cost for which enough food could be purchased to prevent starvation and the diseases associated with it among the population that was unemployed as the result of the economic depression of the time. Smith's recommendation was based on experimental observations on energy and protein metabolism as well as on the food habits of factory workers. It was expressed in terms of carbon and nitrogen but would appear to represent about 3000 kcal of energy from food sources and 80 g of protein/day (39). It was a quantitative standard developed on scientific principles.

Several other dietary recommendations were proposed, mainly by individual scientists or physicians, during the succeeding 50 years. Most were based on observed protein and energy intakes of working people (17, 39, 53, 71, 87), not on scientific knowledge of nutrient needs. Also, all of the recommendations proposed prior to the early part of the twentieth century, except that for citrus juice for sailors, dealt only with energy sources and protein. The nutritional essentiality of other components of foods for maintenance of health was recognized only between 1910 and 1920 through the investigations of Grijns, Hopkins, Funk, McCollum, Osborne, and Mendel and their colleagues. Also, prior to and during this period, energy requirements were being quantified accurately through calorimetry, and protein requirements through nitrogen balance studies (57, 58). The results of this research provided the basis for dietary recommendations, not just for ensuring survival and maintenance of work capacity, but for improving health.

Toward the end of World War I, the Food Committee of the British Royal Society prepared a report on the food requirements of man based on the available scientific knowledge of nutritional needs (17, 53, 71). The Committee accepted the estimates of energy requirements of 3000 kcal for a 66-kg man, with scaling downward for women and children, which had been used earlier by Lusk to calculate the amounts of food Western European countries would need from North America to replace deficits resulting from wartime disruption of agriculture. The Committee concluded that the diet should provide not less than 70–80 g of protein/day and not less than 25% of the energy as fat. It proposed that diets of infants and children contain a considerable proportion of milk, and that all diets contain a certain proportion of fresh fruits and green vegetables and not too large a proportion of processed foods. Although these proposals were not quantitative, they represented recognition of the importance for health of including sources of "protective" foods (foods rich in various essential nutrients) in diets and were a step toward development of dietary recommendations specifically for maintenance of health.

*Standards for vitamin and mineral intakes* Between 1925 and 1935, the League of Nations Health Organization established committees and commissions and held conferences to examine many aspects of problems relating to food and nutrition, especially those resulting from the economic crisis of 1929. Among the reports of the Health Organization was one by Burnet & Aykroyd (11) that provided an assessment of nutrition and public health and emphasized the need for scientific knowledge of nutritional requirements. This stimulated extensive discussion of nutrition by the League of Nations Assembly and its Health Organization (50–52) and culminated in formation of a Technical Commission to review and revise the report. Information on nutrition compiled by the Health Organization was transmitted to appropriate agencies of member nations, in an effort to encourage them to establish national councils on nutrition and health. The Secretary General of the League called attention to the need for dietary standards; for improved diets for mothers, infants, school children, and various groups in the population with special needs; and for methods of evaluating nutritional status.

During this time, in 1933, two sets of dietary standards were proposed (17, 39, 53, 71, 87) in connection with efforts to alleviate the deprivation caused by the economic depression of the 1930s; one by a committee of the British Medical Association (BMA) (9), and the other by Stiebling (78) as a standard for food programs of the US Department of Agriculture (USDA). The BMA Committee followed the approach of the Food Committee of the Royal Society. It recommended 3000 kcal of energy for men, scaled down appropriately for women and children, with 12% of the energy to be derived from protein, half of it from animal sources. The Committee made no quantitative estimates of needs for vitamins and minerals but recommended inclusion of protective foods in diets to meet these needs and included examples of desirable diets in the report.

The standard proposed by Stiebling (Table 1) as a guide to ensure nutritional adequacy of diets used in USDA food programs was the first to include quantitative values for specific vitamins and minerals and separate values for different age groups. The values were based on current knowledge of human requirements for nutrients (59, 75, 83).

The Technical Commission of the League of Nations Health Organization presented its report on estimated requirements for vitamins and minerals in 1937 (52). The standards proposed by Stiebling were revised and expanded by Stiebling & Phipard (79) in 1939. In 1939 also, the Canadian Council on Nutrition proposed a Canadian Dietary Standard (13) for various age-sex groups for calories, fat, protein, calcium, iron, ascorbic acid, and vitamin D. To compare these proposals in detail would require a lengthy discussion; however, Leitch (53) calculated from the reports the allowances per head of population. These, displayed in Table 2, indicate the range of values for

**Table 1** Quantities of nutrients for individuals per day, used in comparing the adequacy of suggested diets[a]

| | Dietary allowance in | | | | | | |
|---|---|---|---|---|---|---|---|
| Individuals by age, sex, and activity groups | Energy value (cal) | Protein (g) | Calcium (g) | Phosphorus (g) | Iron (g) | Vitamin A (I.U.) | Vitamin C (I.U.) |
| Child under 4 years | 1200 | 45 | 1.00 | 1.00 | 0.006–0.009 | 3000 | 75 |
| Boy 4–6; girl 4–7 years | 1500 | 55 | 1.00 | 1.00 | 0.008–0.011 | 3000 | 80 |
| Boy 7–8; girl 8–10 years | 2100 | 65 | 1.00 | 1.00 | 0.011–0.015 | 3500 | 85 |
| Boy 9–10; girl 11–13 years | 2400 | 75 | 1.00 | 1.20 | 0.012–0.015 | 3500 | 90 |
| Moderately active woman; boy 11–12; girl over 13 years | 2500 | 75 | 1.00 | 1.20 | 0.013–0.015 | 4000 | 95 |
| Very active woman; active boy 13–15 years | 3000 | 75 | 0.88 | 1.32 | 0.015 | 4000 | 100 |
| Active boy over 15 years | 3000–4000 | 75 | 0.88 | 1.32 | 0.015 | 4000 | 100 |
| Moderately active man | 3000 | 67 | 0.68 | 1.32 | 0.015 | 4000 | 100 |
| Very active man | 4500 | 67 | 0.68 | 1.32 | 0.015 | 4000 | 100 |

[a] Stiebling (78).

**Table 2** Requirements per head of population: theoretical allowances[a]

| | Stiebling, 1933, 1939 | League of Nations, 1935, 1936, 1937 | US National Research Council Standard, 1941 |
|---|---|---|---|
| Energy requirement, net calories | 2810 | 2980 | 2775 |
| Percentage of total calories from protein | 9.7 | (12) | 9.5 |
| Protein (g) | 68 | (89) | 66 |
| Calcium (g) | 0.90 | 0.83 (1937) | 0.91 |
| Phosphorus (g) | 1.223 | — | — |
| Iron (mg) | 13 to 14 | — | 12 |
| Vitamin A (I.U.) | 5800 | 2000–4000 (1937) (or more) | 4696 |
| Vitamin $B_1$ (I.U.) | 460 | 300 (1937) | 516 |
| Vitamin C, ascorbic acid (mg) | 71 | 30 (1937) | 71 |
| Riboflavin (mg) | 1.74 | — | 2.3 |
| Nicotinic acid (mg) | — | — | 15.5 |
| Vitamin D (I.U.) | — | — | approx. 210 |

[a] Leitch (53).



intakes of nutrients being proposed just prior to World War II. The Canadian values fell generally within this range.

*Transitions in dietary standards* Two transitions in the evolution of dietary standards had thus occurred between 1920 and 1940; one in the purpose for which such standards were developed, and the other in the approach used to develop them. First, from being recommendations for programs to relieve starvation and illness resulting from economic and wartime crises, they became standards for programs to maintain and improve the health of the population as a whole, with increasing emphasis on meeting nutritional needs of infants, children, and pregnant women. Second, from being observational standards based on information about usual patterns of food consumption, they became technical standards based on scientific knowledge of human needs for essential nutrients and energy sources.

Some of the problems that have led to contention over RDA were identified before RDA were established. The difficulty in selecting the most appropriate values for human requirements for nutrients was recognized by the League of Nations Health Organization in the comment: "Answers given by scientists—have been both numerous and varied." Also, the improbability of being able to determine nutrient requirements for more than a small number of individuals and the inadequacy of average requirements as a standard for public health programs were recognized by Stiebling & Phipard, who proposed that average requirements be increased by 50% to allow for individual variability (79).

This is a brief summary of the progress toward dietary standards when, in 1940, a Committee on Food and Nutrition was set up under the National Research Council (NRC) of the US National Academy of Sciences (NAS) to advise the government on problems concerned with national defense. The name of this Committee was changed the following year to the Food and Nutrition Board (FNB).

RECOMMENDED DIETARY ALLOWANCES One of the first tasks that was undertaken by the FNB was to prepare a set of dietary standards. Dr. Lydia Roberts, who was chairman of the Committee that was given this responsibility, described the process by which it was accomplished (72, 73). First, the Committee evaluated the literature pertaining to dietary requirements and formulated a tentative set of values. This was sent to about 50 individuals who were active in research on nutrient requirements. After receiving their responses, the values were revised and resubmitted to the same group together with a summary of the various suggestions. Further comments were received, the report was revised and was accepted by the FNB after some additional modifications had been made. It was then presented to the members of the American Institute of Nutrition during their annual meeting in 1941 and was accepted without serious disagreement. Finally, this set of values, now termed Recommended Dietary Allowances, was accepted at a National Nutrition Conference called by President Franklin Roosevelt in May of 1941. The values, as averaged by Leitch (53), are included in Table 2. The agreement between the RDA and the standard proposed by Stiebling & Phipard (Column 1) is striking.

*RDA 1943–1986* The RDA report was released originally just as a typescript but was published shortly after in the *Journal of the American Dietetic Association* (3). The first printed version did not appear until 1943 (26). The RDA report has been revised eight times, in 1945, 1948, 1953, 1958, 1964, 1968, 1974, and 1980 (28). A ninth revision was prepared for publication in 1985. The Committee for this edition was given the assignment by the FNB of reevaluating previous RDA values, searching out discrepancies and inconsistencies, correcting them, and producing as cohesive and consistent a report as was possible for the tenth edition. The report was submitted, reviewed, and revised. Some of the values retained by the Committee were considered unacceptable by the FNB (the membership of which had been altered considerably in the interim), the NRC, and the NAS. These organizations have not provided specific scientific reasons for their dissatisfaction; nonetheless, the President of the Academy withheld approval of the revised report (49, 66). Failure of the NAS either to release the report or to provide information about the scientific basis for withholding it is difficult to understand. This is not the type of action expected of a leading scientific body in dealing with a scientific report. The manuscript has since been reviewed by officials of the National Institutes of Health who are reported to have found it acceptable (16).

The changes made in the RDA during the first eight revisions have been summarized elsewhere (20, 60) and so are not reproduced here. For the most part they represent changes to bring the allowances into line with new knowledge or reinterpretations of earlier findings. For several nutrients included in the table of RDA (thiamin, riboflavin, ascorbic acid, and protein) values for adults have declined as confidence in knowledge of requirements has increased. This has also occurred with energy recommendations. Values for calcium, iron for males, vitamin A, and niacin have changed very little, but iron allowances for women have risen in recent years. Many changes, mostly minor, have occurred in values for other age groups. Many of these result from decisions by each succeeding Committee to modify the age-sex groups. Recommendations for lower values for vitamins A and C by the tenth RDA Committee are reported to be the basis for rejection of the current report by the Academy (65).

The table of allowances has been expanded considerably since the sixth edition in 1964. Allowances for vitamin E, folacin, vitamin $B_6$, vitamin $B_{12}$, phosphorus, iodine, and magnesium were added in the seventh edition. This was done largely in response to informal requests from the Food and Drug Administration for guidelines that could be used for regulatory purposes and partly because of the need for standards to evaluate the validity of concerns about the adequacy of folacin and vitamin $B_6$ intakes. In 1974 values for zinc were added for the same reasons. An innovation in the ninth edition in 1980 was inclusion of tables of safe and adequate intakes for vitamin K, biotin, and pantothenate and for six trace minerals, not because of concern over the adequacy of intakes of these but, because some of them were being touted commercially as supplements for improving health. It therefore seemed important to establish guidelines for safe intakes in the hope of discouraging self-dosing with quantities that might lead to toxicity.

Over the years the RDA report has grown in size as more information about the scientific bases for establishing allowances has been requested for educational programs in nutrition. In 1974, the introductory section of the report was greatly expanded to provide general background information about the RDA and, in particular, about their appropriate uses. The stimulus for this was the frequency of observations about misuse of the RDA, a problem that seems to be universal: The introduction to the report for the United Kingdom (UK) (19) notes "More difficulties have been encountered about the use of the figures than about their validity."

OTHER DIETARY STANDARDS Since the end of World War II, recommended dietary intakes have been proposed by many national and international organizations. The work on international dietary standards begun by the League of Nations was taken up by the Food and Agriculture Organization of the United Nations (FAO) after it was established in 1945 (56) and subsequently in collaboration with the World Health Organization (WHO). FAO and WHO have elaborated on the bases for their recommended intakes of energy and protein and several other nutrients in more detail than is usual in RDA reports (21–24). The FAO/WHO reports and the RDA of the US have been used by many countries, either in whole or in part, for establishing their own national standards. Many of the national standards, however, have been developed independently.

Recently the Committee on RDA of the International Union of Nutritional Sciences (IUNS) published a compilation of Recommended Dietary Intakes (81, 82). The introduction by Truswell (81), chairman of the IUNS Committee, provides an overview of the approaches used by the different national committees, and of the similarities and differences in their reports.

*Definitions of dietary standards* Among the terms used to describe these standards are safe intakes of nutrients; recommended nutrient intakes; recommended dietary allowances; recommended dietary intakes; and simply, dietary standard.

Safe Intakes or Recommended Intakes of Nutrients are defined by FAO/WHO as the amounts of essential nutrients considered necessary to meet the physiological needs and maintain health in nearly all persons in a specified group (22). The Nutrition Advisory Committee of the Indian Council of Medical Research "was guided by the safe allowance of nutrients as proposed by FAO/WHO" (48).

In the UK, the Recommended Intakes of Nutrients (18) are defined as "the amounts of essential nutrients and energy sufficient or more than sufficient for the nutritional needs of practically all healthy persons in a population." In the 1979 revision (19) a more practical definition was included, "the average amount of the nutrient which should be provided per head in a group of people if the needs of practically all members of the group are to be met."

The Canadian Dietary Standard (41) was defined as "the daily amounts of energy and essential nutrients considered adequate on the basis of scientific data, to meet the physiological needs of practically all healthy persons in the population." In 1983, however, the term Recommended Nutrient Intakes was adopted (43) and defined as "the level of dietary intake thought to be sufficiently high to meet the requirements of almost all individuals in a group with specified characteristics."

Despite the differences in the names and definitions used for these recommendations, the aims in establishing them are essentially the same—to provide a reference standard for essential nutrient intakes, based on scientific knowledge, that will maintain health in healthy individuals. The estimates are higher than amounts needed to prevent clinical deficiency disease. They are amounts considered adequate to establish and maintain reasonable levels (or stores) of the nutrients in body tissues.

## *RDA Are Dietary Standards Based on Scientific Principles*

PRIMARY USE OF RDA Although the Committee on Food and Nutrition was established "to advise on nutrition problems in connection with National Defense" (26), "the allowances for specific nutrients" according to the Committee and subsequently the FNB "are intended to serve as a guide for planning adequate nutrition for the civilian population of the United States" (3). This simple, clear statement of purpose should be reiterated at the beginning of each edition of the RDA report. The RDA were *not* intended, as some authors (53, 81) have stated, "to maintain perfect health," nor to attain any other idealistic and ill-defined, most likely unachievable goal; the aim "was to develop a table of allowances which would represent the best available evidence on the amounts of the various nutritive essentials desirable to include in practical diets"—a realistic, down-to-earth, achievable objective. They were "standards to serve as a goal for good nutrition," not in the vague and idealistic sense in which this statement is often used, but in the very practical sense indicated by the quotations above.

Interestingly, no precise definition of RDA was included in the first five editions of the RDA report. At the outset (3, 26), however, the RDA were stated to be not just "minima sufficient to protect against actual deficiency disease" but sufficient "to insure good nutrition and protection of all body tissues," and in the 1953 edition they are stated to be "nutrient allowances suitable for the maintenance of good nutrition in essentially the total population."

The RDA have been adopted and adapted by various organizations for many purposes but they were devised for the planning and procurement of food supplies that would be nutritionally adequate for population groups. Therefore, any assessment of the adequacy, accuracy, and reliability of the RDA will be meaningful only if it is done in relation to their use for this primary purpose. To base such an assessment on their adequacy for other purposes would be like judging the adequacy of the design of the family car for use as a snowplow.

SCIENTIFIC BASES FOR RDA The scientific bases for RDA were described by Roberts (73) shortly after the first report was published. Although some modifications in the approach to estimating RDA have been introduced over the years, the essence of the procedure remains the same. The first step is, as Roberts (72, 73) states, critical examination and appraisal of the scientific literature on human requirements for the different nutrients.

*The committee process* RDA Committees are appointed by the NRC from among recognized scientists who have a broad background of experience in nutrition, each with special knowledge of some aspect of the subject. Each member is given responsibility for preparing a paper on one or more nutrients. The entire Committee reviews these as they become available and meets at intervals over a period of three years or more to discuss them. On some of the more difficult or controversial problems, a subcommittee may be formed, workshops may be held, and the paper may be circulated for comment to others knowledgeable in the field. After appropriate revision and acceptance by the Committee, the report is reviewed by the FNB and may be revised further. The final document is then submitted by the NRC to additional reviewers for comments, revised once more, and the final version (except that for the tenth edition) is then published.

The process used and the problems encountered in selecting values for the RDA have been discussed in recent RDA reports (27, 28) and by various investigators (12, 34, 36, 61, 65, 74, 81, 87). The background papers are rarely published, but the recent reports include much more information than was customary. Although this is helpful for educators and scientists, it defeats one of the purposes of the report, i.e. to provide clear and easily understood guidance for practical applications. The usual user does not want a textbook on nutrition nor to be told to read 180 pages before using the table. A logical solution would be to publish the background papers separately. The National Health and Medical Research Council of Australia is doing just this (68); thus, papers providing the scientific bases for their RDA values will be available for critical evaluation by scientists and for use by educators; the text of the report itself can then focus mainly on uses. A report on "Uses of the RDA" prepared in connection with the tenth edition also was not released for publication.

*Estimation of requirements* The scientific bases for establishing RDA cannot be described in detail here, but the process, which is often subjected to criticism, and some of the reasons for this, deserve attention. For the initial step, estimating the average human requirement for each nutrient, criteria are needed for establishing when the requirement has been met. Secondly, requirements of individuals differ; therefore, some measure of individual variability is needed. Thirdly, for some nutrients other factors must be considered: e.g. differences in requirements between the sexes; differences in efficiency of utilization of different forms or precursors of the nutrient; and information about biological availability of the nutrient from foods. Fourthly, as requirements of only a few age-sex groups have been studied, allowances for other groups must be estimated through interpolation or extrapolation from a limited body of information. The process involves both scientific knowledge and critical judgement.

There is not always agreement on the appropriate criteria for deciding when a requirement has been met, especially when the objective is not merely to prevent deficiency but to assure that the quantity of nutrient present in tissues is sufficient to reduce (essentially to zero) the probability of any inadequacy occurring over a given time. The quantities required to prevent or cure deficiency have been established within narrow limits for nutrients that have posed public health problems, e.g. thiamin, niacin, ascorbic acid, vitamins A and D, iron, and iodine. For several this information has been obtained both in experimental studies and from observations on intakes of populations in relation to occurrence of deficiency. For riboflavin, vitamin $B_6$, folic acid, and vitamin E, estimates of requirements have been obtained from depletion and repletion studies. For protein, calcium, magnesium, copper, and zinc, estimates of requirements have been obtained using the balance technique. For most of these nutrients additional information about the size of the body pool is available. For several of the water-soluble vitamins, for example, relationships between intake and blood concentrations or urinary excretion of the nutrient or one of its metabolites have been reported. Measurements of some metabolic function in relation to intake serve as indicators of body stores, e.g. for vitamins A, E, and K, for thiamin, and for iron. For vitamin $B_{12}$ and ascorbic acid, body pools and their characteristics have been measured directly. Neither the total amount of information nor the total number of subjects studied is as great as is desirable, but for many nutrients requirements have been estimated by two or more methods and overall knowledge is not insubstantial.



*Problems in setting RDA* A major reason for differences in estimates of requirements and allowances is that different investigators or committees have used different criteria for deciding when the reserve in tissues is adequate. Biological responses to increasing intakes of nutrients are curvilinear; they do not have sharp inflection points. Thus, selection of the appropriate point along a urinary excretion curve or a pool depletion curve that is indicative of adequate body reserves involves scientific judgement. Note well that this is not an arbitrary judgement as is sometimes implied (31); it is a judgement based on a response curve constructed from quantitative measurements. The type of question that must be answered might be, "is excretion in urine of 15% of the amount of riboflavin consumed evidence of adequate retention by tissues or should the value be 25%?" Different answers to such questions lead to differences in the values selected for requirements but, on the whole, what is most impressive is how similar the values in the various standards, both national and international, are for most nutrients. There is little convincing evidence that the values selected for RDA are too low; Committees tend to select the higher of alternative values when in doubt because there is no evidence that a small surplus will pose a health risk, whereas a small deficit over a long time will lead to depletion. Differences among standards in the values for a few nutrients, e.g. vitamins A and C, calcium, and iron, are larger than would be expected. The RDA of the FNB for these tend to be high; the reasons for this should be examined carefully (65).

The next question to be answered in establishing RDA is, "how much must the average requirement be increased in order to meet the needs of individuals with the highest requirements?" Stiebling (78) proposed that the average requirement should be increased by 50%. Pett and associates (70, 71) suggested that, as requirements probably follow a Gaussian distribution, the appropriate increase would be more than three times the standard deviation above the average amount required to prevent deficiency. FAO/WHO committees (24) have concluded that the average requirement plus two standard deviations, a value that should meet the requirements of 97.5% of the population, is an appropriate practical RDA value. As the standard deviation is about 15% of the mean for many biological variables, any of these approaches could be justified. In view of the ability of individuals to adapt to intakes somewhat below usual recommended intakes (24, 69), and in view of the propensity of RDA Committees to use criteria that lead to overestimation rather than underestimation of average requirements, the FAO/WHO approach seems sound. Unfortunately, estimates of individual variability of requirements based on an adequate number of subjects have been obtained for only a few nutrients; therefore, increases above average requirements to cover allowances must be made for many nutrients by extrapolation from knowledge of the variability of nutrient requirements generally. The adequacy of proposed RDA values is checked by examining the published individual requirement values to see if any exceed the allowance. Also, dietary survey results are examined to determine if there is any evidence of inadequacy among populations with intakes equal to the proposed value.

Finally, for certain nutrients, the various factors mentioned at the beginning of this discussion must be considered. Iron is the only nutrient for which significant differences in requirements between the sexes (except for those due to differences in body weight) have been established. The iron requirement of mature females is high because of menstrual losses. The unusually high RDA value for women of child-bearing age is set in the desire to cover as nearly as is possible the needs of the small proportion with the highest losses (6, 12, 62). If these women were considered to have a clinical problem for which supplements are required, the RDA for iron would be lower. Efficiency of utilization of precursors of vitamins A and relative values for the different forms of vitamin E have been established from results of many animal experiments; efficiency of conversion of tryptophan to niacin has been estimated from the results of at least three human trials; efficiency of protein utilization has been estimated in many human trials. Values for biological availability of folic acid and vitamin $B_6$ and of several minerals are less well established than is desirable, but information on iron and calcium absorption is quite extensive (27, 28). Here again critical judgement is required in selecting the appropriate correction factor, but it is not a judgement made in a vacuum.

Adequacy of the quantitative estimates of human requirements and allowances can be obtained by comparing the incidence of low values for biochemical indicators of nutritional status in population surveys with the proportion of the population surveyed having intakes that fall below the RDA. Low serum vitamin C levels occur in only about 3% of the population, although over 40% of mature males and females consume less than the RDA. Impaired iron status is observed in about 5% of mature females, even though 80% of them consume less than the RDA for iron (85). Such observations suggest that the RDA are more likely to be overestimates than underestimates.

The accumulated evidence, both experimental and practical, indicates that the RDA provide a satisfactory, but not necessarily the most accurate, standard for the basic purpose for which they were designed, i.e. planning and procuring food supplies that meet physiologic needs of healthy persons for essential nutrients (86). A few of the values may be unnecessarily high; this can make it difficult to meet the standard for some nutrients from the usual selection of foods (14, 32). If the RDA for some nutrients exceed the amounts readily obtainable from the usual selection of foods and there is no convincing evidence of nutritional inadequacy in the population, the basis for selection of these values should be carefully reexamined.



## *Purposes for Which RDA Have Been Used*

RDA and RDA reports are used for many purposes other than the primary one for which they were intended. They are used for (*a*) developing food and nutrition information and education programs; (*b*) establishing standards for food and nutrition regulations; (*c*) formulating new products and special dietary foods; (*d*) providing baseline information for designing special or therapeutic diets; (*e*) setting standards for food assistance programs; and (*f*) evaluating information obtained in dietary surveys. Some of these are extensions of the primary purpose for which RDA were proposed and for them the RDA are sound guides; others represent uses for which the RDA were not originally intended and, for these, the RDA have limitations or require modification.

INFORMATION AND EDUCATION The RDA report is an appropriate source of information for education programs in nutrition but, like an advanced textbook on nutrition, it is designed for specialists and must be interpreted carefully when it is used for general nutrition education. As Ruth Leverton (54) has said "RDA are not for amateurs." RDA cannot be used by the public as guides for meeting nutritional needs, even though the report can be used effectively for developing materials for general education in nutrition.

When foods are grouped on the basis of the essential nutrients of which they are major sources, the RDA can be used to estimate the numbers of servings needed from each food group to meet the needs of individuals of different ages for essential nutrients (47, 86). Food guides developed on this basis (42, 67) are widely used in nutrition education programs. Comprehensive information and education programs provide other information about diets besides that required for meeting essential nutrient needs.

*Nutrient density concept* RDA also serve as the basis for developing materials for guidance in food selection using the nutrient density concept, i.e. the amount of a nutrient contained in an amount of a food or diet that provides a specified amount of energy (e.g. 100 or 1000 kcal). If the nutrient content of a given weight of food is expressed as a percentage of the RDA for that nutrient, and the number of kilocalories provided by the same amount of the food is expressed as a percentage of the energy requirement, the ratio of the percentage of the RDA provided to the percentage of the energy requirement provided represents the proportion of the RDA that would be met if the energy need were to be met exclusively from that food. If, for example, the ratio for ascorbic acid in a food were 10, the RDA for ascorbic acid could be met by consuming an amount of that food equal to 10% of the energy requirement. These ratios are termed "indices of nutritional quality" (33). By calculating the ratio for each nutrient in a food or diet, and displaying the ratios graphically, a profile of the nutrient contributions of the food per unit of energy can be obtained. The profiles can be used to compare foods or diets as sources of essential nutrients in relation to their contributions to energy needs.

The index of nutritional quality is based on assumptions about RDA that differ from the principles on which RDA are developed. A major assumption used to calculate this index is that essential nutrients are required in proportion to calories. Although this holds for thiamin and may apply for riboflavin and niacin, requirements for some, if not all, minerals and fat-soluble vitamins are a function of body weight and growth rate. Vitamin $B_6$ requirements are related more closely to protein intake. Thus, for nutrients that are not required in proportion to energy, the ratios can be inaccurate. Also, the RDA are designed to cover the essential nutrient needs of individuals with the highest requirements, but RDA for energy are averages for the group. The index will, therefore, differ considerably from the standard if individual energy needs are used in place of the average.

The nutrient density or index of nutritional quality concept permits direct comparision of nutrient contributions of foods that provide about the same amounts of calories per serving. However, as the procedure does not take into account portion size, it can create a false perception of the nutrient contributions of foods with high indices that contribute only small amounts of energy to the total diet. For example, fresh oranges provide 2 mg thiamin/1000 kcal, cooked ham provides 1.6 mg/1000 kcal; to obtain 1 mg of thiamin one would have to eat 1 kg of oranges but only 200 g of ham. Also, use of this type of guide is not appropriate when energy intake is low, e.g. during weight reduction or illness, because essential nutrient needs, even those that are related to energy intake, have not been shown to decline with decreasing energy intake below the maintenance requirement. Also, there is no evidence that essential nutrient requirements decline during aging even though energy requirements decline (28). The limitations that result from adaptation of the RDA for this use should be explained when the nutrient density concept is used for nutrition education.



FOOD AND NUTRITION REGULATIONS For food and nutrition regulations such as nutrition labeling of foods and guidelines for food fortification, a standard of reference is required. As the standard for regulatory purposes, the Food and Drug Administration (FDA) selected from the table of RDA the highest values for 20 nutrients and called these US RDA (Recommended *Daily* Allowance). These are not dietary standards; they are standards for the nutrition information provided on food labels for adults and children over four years of age (to label special foods for infants, for young children, and for pregnant and lactating women, the FDA has three other comparable sets of standards). This use of the RDA was judged to be appropriate in a court decision after lengthy hearings (35).

The US RDA, which consist of a single set of values are not, however, useful as guides to the nutrient needs of various age-sex groups (63). The US RDA were designed only to permit comparisons of the nutritional quality of different sources of a specified food and of the quantities of particular nutrients provided by different types of foods. Because each value on the label is given as a percentage of the US RDA in a serving, comparisons of this type can be related to usual food usage.

DEVELOPMENT OF NEW AND SPECIAL FOODS The RDA, or the US RDA derived from them, can be used appropriately as standards for designing products for special dietary purposes, such as vitamin and mineral supplements or fortified foods, to ensure that they contain useful (50% of the US RDA) but not excessive (150% of the US RDA) amounts of nutrients (25). RDA can be used similarly for formulating fabricated products, such as total diets for weight reduction, in order to ensure that the essential nutrient needs of the consumer will be met despite the low caloric content of such products. For foods that are substitutes for traditional products, on the other hand, the composition of the traditional food is a more appropriate guide.

THERAPEUTIC NUTRITION The RDA are obviously as appropriate standards for hospital patients receiving "normal" diets as they are for healthy population groups. RDA are not intended as guides for therapeutic diets but can serve as the starting point for such diets with modifications, either reductions or increases, being made in the content of individual nutrients to meet the unique nutritional needs of specific patients.



STANDARDS FOR FOOD PROGRAMS The RDA have been used in two distinctly different ways as standards for economic assistance programs undertaken by government agencies to comply with legislative actions (76). RDA are used as standards for ensuring that foods or meals supplied through food distribution programs (such as the School Lunch Program, the Nutrition Program for the Elderly, food packages distributed to Native Americans, and the Supplemental Food Program for Women, Infants, and Children) will be of satisfactory nutritional quality. The RDA are also used as the basis for the Thrifty Food Plan of the USDA, which is, in turn, the standard for allotment of coupons in the Food Stamp Program. This food plan has also been used by the Office of Management and Budget in establishing the poverty level of income.

As the RDA are standards for ensuring that diets for population groups will meet the needs of virtually all individuals in the group for essential nutrients, they are appropriate standards for ensuring that food supplies used in economic assistance programs will meet a specified portion of basic nutritional needs. The RDA are not guides for total diet planning; many aspects of diet besides meeting needs for essential nutrients must be taken into account in planning diets. Some of these are considered in establishing the Thrifty Food Plan.

RDA were not intended to serve as standards for economic assistance programs; they were merely adopted by government agencies as an expedient. This has resulted in many economic assistance programs being viewed as nutrition programs or health programs and, although this use of RDA may help to increase acceptance of economic assistance programs by Congress and to ensure that the food provided in such programs is nutritionally adequate, it has reduced the incentive for establishing a comprehensive standard for the poverty level of income and for dealing more directly with the basic problem of economic assistance. It has also created the impression that the economic implications of this use of RDA should be taken into consideration in setting RDA values (*The New York Times,* Sept. 23, 1985). To do this would result in inconsistent, unscientific standards and would preclude the use of RDA for the purpose for which they were developed. Meaningful standards for economic assistance programs must consider many needs besides simple nutritional needs. Use of RDA as a surrogate for an appropriate economic assistance standard leads to confusion about both the concept of RDA and their purpose.

## *Evaluating the Adequacy of Nutrient Intakes*



RDA were not intended to serve as standards for assessing either the adequacy of nutrient intakes or nutritional status; their widespread and inappropriate use for these purposes, has led to unjustifiable criticisms of the RDA. Problems in obtaining accurate measures of food consumption in dietary surveys and limitations of using food composition tables for estimating intakes of individual nutrients have been discussed extensively (8, 45, 62, 80). Problems encountered in using RDA values as standards for assessing the adequacy of nutrient intakes have also been discussed extensively (7, 45, 55, 62, 69, 70).

RDA are not standards for identifying the point at which the level of intake of a nutrient by an individual becomes inadequate or poses a health risk. Individuals with high requirements cannot be distinguished from those with low requirements except through elaborate, costly, and time-consuming metabolic studies. Also, nutritional status of an individual can be evaluated only through biochemical and clinical assessments. This means that for an individual with an intake of a nutrient that is below the RDA, neither the adequacy of that nutrient intake nor the nutritional status of the individual can be assessed by comparing the intake directly with the RDA or with any other dietary standard.

For individuals, if the intake of a nutrient is equal to or greater than the RDA, the risk of nutritional inadequacy is remote. If it is less than 50% of the RDA, the risk of inadequacy is high. However, when intake falls between these extremes all that can be said is that the farther intake falls below the RDA the greater is the risk of deficiency. The precise nutritional status of such a subject can be determined only by a clinical examination and appropriate laboratory studies. In evaluating the adequacy of intakes of population groups, the limitations are still greater because variability of intake as well as of requirements must be taken into account. Thus, even if the average intake of a population exceeds the RDA, intakes of a portion of the population may be below the average (34) because of cultural practices, poverty, neglect, illness, social instability, or addiction to alcohol or drugs. Again all that can be said is that the probability of deficiency among the population is greater the farther average intake falls below the RDA.

These shortcomings of the RDA have prompted proposals for using a lower set of values, e.g. average requirements, as the standard for assessing the adequacy of nutrient intakes (44, 81). Such proposals result from misunderstanding of the nature of the problem. The difficulties would be the same with any other standard; the only difference would be that the relationship between intake and probability of risk would be altered. The solution for the problem depends upon improving the consistency and reliability of the values that comprise the standard and in applying probability statistics to assess the degree of risk.

THE PROBABILITY APPROACH Pett et al (70, 71) discussed problems of evaluating the adequacy of nutrient intakes in 1945, including the idea of having a standard that differed from the RDA for this purpose. They emphasized the need for a probability approach in order to estimate (*a*) the risk of a particular intake of a nutrient by an individual being inadequate; and (*b*) the proportion of a population that might be at risk of inadequacy. This approach received only limited attention at the time, but has been dealt with more recently in considerable detail (5–7, 55, 62, 69). It is based on the assumptions that (*a*) requirements of individuals for nutrients do not deviate greatly from a Gaussian distribution; (*b*) the dietary standards used are derived from accurate estimates of requirements; and (*c*) the values for intakes of essential nutrients are reliable estimates of usual intakes. If values for average requirements and the variability of individual requirements are reliable, the probability or risk of a particular intake of a nutrient being inadequate, as a function of either the requirement to prevent deficiency signs or the RDA, can be estimated as shown by the scales below the horizontal axis of Figure 1 (5).

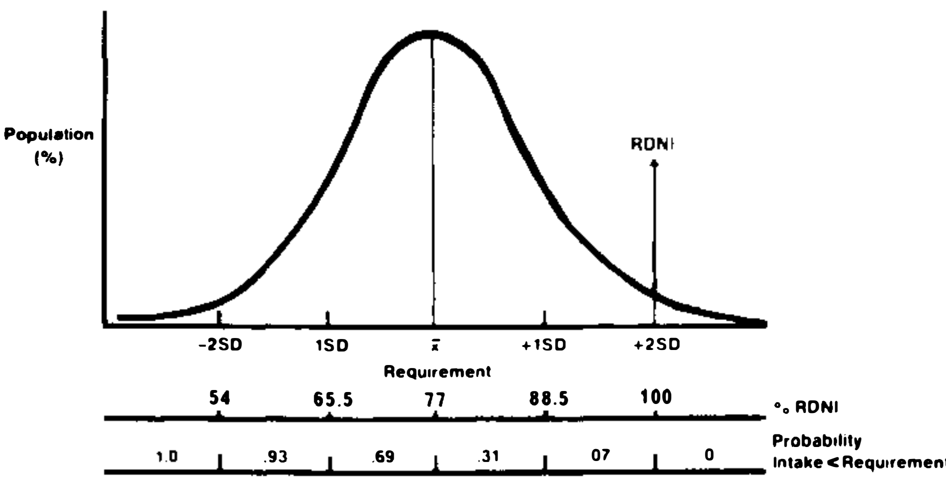


*Figure 1* Distribution of nutrient requirements for a homogeneous population and the probability of intake being less than the requirement within given intervals below the recommended daily nutrient intake (5).

A similar approach can be taken in estimating the proportion of a population likely to be at risk of having inadequate intakes. From a curve for the cumulative distribution of a nutrient requirement (Figure 2), the risk of a particular intake being inadequate for an individual can be estimated. Also, from knowledge of the distribution of intakes in a population, the proportion of the population at risk of having inadequate intakes can be estimated.

Even with this approach, it cannot be assumed that the estimated risk from having a particular intake below the RDA applies to a specific individual; it merely means that, on the average, individuals with that nutrient intake will have that level of risk. Also, the reliability of the estimate of risk will depend upon the accuracy of the standard and of the reported intake. If the estimate of the requirement or RDA used for the standard is high, the risk will be overestimated; if it is low, the risk will be underestimated; if the values for different nutrients have not been established in a consistent manner, the estimates of relative risk from low intakes of different nutrients will be unreliable.

The need for a consistent and reliable standard was a major reason for having the tenth RDA Committee review the scientific basis for the entire RDA table. The Committee concluded that estimates of physiological needs for vitamins A and C in particular were high and proposed that they be



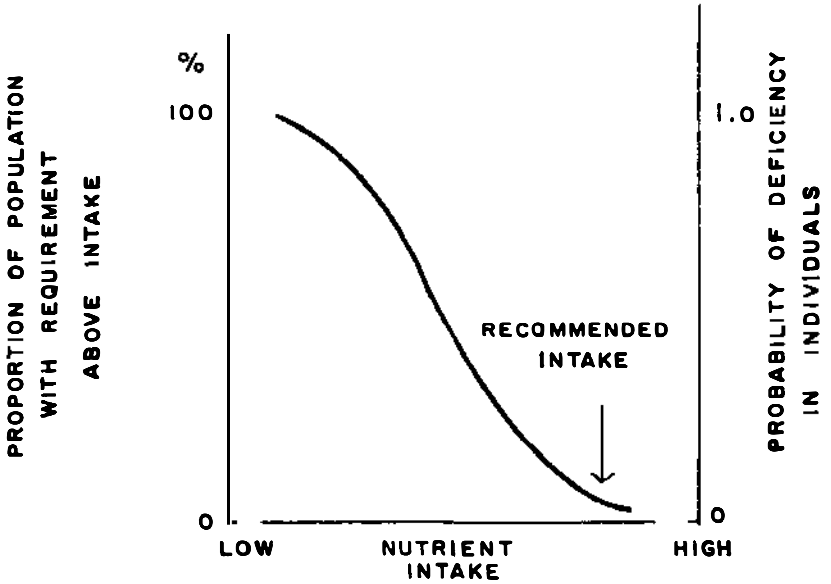


*Figure 2* Cumulative plot of the distribution of nutrient requirements for a homogeneous population and the probability of deficiency being associated with particular intakes. (Courtesy of G. H. Beaton, unpublished.)

lowered (65). Resistance to this proposal is reported to have developed within the NRC (49, 66) because another NRC Committee (15) had previously recommended increased intakes of these nutrients as cancer prevention measures. Withholding of the RDA report over this issue is particularly unfortunate at a time when a third NRC Committee has been attempting to improve methods for assessing the risk of inadequacy of nutrient intakes (7, 62) and an improved set of standards might provide the impetus for renewed effort in this direction.

## *Dietary Standards and Guidelines for Healthful Diets*



MISUNDERSTANDING OF RDA The RDA are criticized frequently because they do not serve well for a number of public health purposes for which they were not intended. They do not provide guidelines for appropriate intakes of fat, carbohydrate, cholesterol, and fiber; they do not deal with associations between diet and chronic and degenerative diseases; they do not provide guidance for food selection or preventing obesity. Why should standards of reference for human physiological needs for essential nutrients be expected to serve for so many unrelated and unintended purposes?

Use of the name "Recommended Dietary Allowances" for these standards has undoubtedly contributed to confusion, even among scientists, about their uses and purposes. With the term "recommendation" being used so widely today to imply the "amount that should be consumed," the original concept of RDA as a "goal" or "floor" for intake below which risk of inadequacy begins to increase, has been neglected or forgotten. Also, as Truswell has pointed out, the term "allowance" carries a paternalistic connotation, again implying the "appropriate" or "desirable" intake. Although the RDA for adults for protein is 0.8 g/kg body weight/day, the "desirable" intake is considered to be 10 to 15% of energy (kcal) as protein. The latter figure is a guideline. The term "adequate intakes of essential nutrients" in place of RDA might help to avoid the implication that RDA are recommendations for general dietary guidance, reduce the misuse and unrealistic expectations of the RDA, and curtail efforts to modify them for policy purposes in ways that would make them inappropriate for the main purpose for which they were intended. Payne (69) criticized the notion that requirements should be set at levels assumed to promote some undefinable "optimum" state of health. He suggested that the efforts of those with this view "should be directed more toward objecting to the misapplication of requirements than toward distorting the figures themselves."

Semantics, as such, is not the crux of the problem. The problem arises from failure to understand that RDA are not policy recommendations per se, but a set of reference standards developed by scientists that may be used in certain types of nutrition programs to implement a sound public health policy. They have been used expediently by administrators as standards for ecomonic assistance programs. When the RDA do not serve this purpose well, the reaction is to propose modification of the RDA to fit the program or policy for which they were not intended rather than to create an appropriate independent standard for social welfare or economic assistance programs.

A similar problem has arisen in relation to health policy. The RDA have been adopted as a standard for one component of health policy, i.e. planning nutritionally adequate diets. This has led to nutrition policy being used as a synonym for health policy. In this case, too, when the RDA, which are an appropriate standard for one facet of health policy, are found to be inappropriate for other facets of that policy, the reaction is to propose modification of the RDA to make them fit the policy rather than to develop an appropriate independent standard. From the statements issued by the NAS/NRC in connection with its refusal to release the tenth RDA report (4, 49, 65, 66), it seems evident that this is at the heart of the impasse over publication of the tenth edition of RDA (49, 65, 66).



GUIDELINES FOR HEALTHFUL DIETS It should be evident from the foregoing discussion that RDA are reference standards for levels of essential nutrients needed in diets to ensure nutritional adequacy, and, as such, cannot serve as a set of general dietary guidelines; also, that a standard of this type cannot be in conflict with dietary guidelines because the purposes of the two are distinctly different. Guidelines are recommendations for appropriate or desirable intakes of foods and nutrients generally designed, as part of health policy, to provide the public with information about various aspects of the selection of nutritious, appetizing, and healthful diets. The recommendations may be given in terms of ranges or alternatives. It is virtually impossible to combine a quantitative dietary standard for appropriate intakes of essential nutrients with a set of qualitative dietary guidelines for appropriate selection of foods without frustrating the purposes of both (7, 40, 44, 66). The two should be kept completely separate and their entirely different purposes should be distinguished clearly.

*Distinction between RDA and guidelines* It would require another essay to discuss the development, uses, and limitations of dietary guidelines adequately (37, 38), but a few points deserve mention to illustrate further how dietary guidelines differ from RDA and how they are related.

Among the various dietary guidelines that have been proposed as a component of health policy by different agencies and nations (38), two stand out as being universally accepted because their scientific bases are indisputable. The first is to consume a nutritionally adequate diet composed of a wide variety of foods. This guideline for maintaining nutritional health is derived from the body of knowledge on which the RDA are based. The RDA and this guideline are thus complementary, but serve distinctly different purposes. The second universally accepted guideline is to maintain appropriate body weight or to consume food sources of energy in moderation. Here again the RDA report provides a crucial part of the basic information for development of this guideline and again the two—the RDA report and the guideline for weight control—are complementary.

The accumulation of information about associations between dietary patterns and the incidence of chronic and degenerative diseases has directed attention to the possibility of using diet modification as a measure for "preventing" or, more accurately, "delaying the onset" of such diseases (77). This has led to a proliferation of guidelines (15, 37, 64, 84) for this purpose. In view of statements, some from the NAS/NRC, implying that the concept of RDA should be modified to be compatible with such guidelines (30, 40, 46, 49, 66), it is important to compare these two distinctly different types of dietary recommendations.

First, dietary guidelines (84) deal primarily with foods; with macronutrients, such as carbohydrates and fats, that do not have unique and specific metabolic or physiological functions; with nonnutrients such as cholesterol and fiber; with components of foods, such as potentially protective or detrimental substances that often have not been identified or characterized; and with a few essential nutrients that may have beneficial (e.g. calcium) or detrimental (e.g. sodium) effects when they are consumed in amounts exceeding those needed for normal physiological function. These topics have only a peripheral relationship to dietary standards for essential nutients.

Secondly, associations between diet and chronic and degenerative diseases are complex. In no instance do these diseases result simply from a deficit or surplus of a single dietary component; they are multifactorial diseases with diet as only one of several potential contributing factors, and for none of them is it clear that inappropriate diet is the primary underlying cause. As a result, even for the few essential nutrients, imbalances of which are thought to be involved in a chronic disease process, it is not possible to provide a sound basis for quantitative recommendations. There is little relationship between these topics and RDA.

Thirdly, and perhaps most importantly, individuals are not uniformly at risk of developing chronic and degenerative diseases. Even for diseases such as heart disease and cancer, which are responsible for roughly 40% and 20%, respectively, of total deaths in the United States, the ability to predict susceptibility or resistance of an individual from a knowledge of all risk factors is limited (1, 64), and from knowledge only of diet is negligible. For a proportion of people, metabolic impairments of genetic origin increase susceptibility greatly; another proportion seem to be constitutionally resistant to all of them (10). These types of relationships are distinctly different from those dealt with in the RDA report.

There is no common biological basis for the various recommendations included in dietary guidelines as disease prevention measures. For an individual who follows such guidelines, the outcome is not predictable. Predictions of beneficial or detrimental effects are based on statistical probabilities derived from the results of large-scale intervention studies and epidemiologic observations on associations between disease incidence and food consumption patterns; thus, even the variables with which differences in disease incidence are associated may be only indicators of effects of other environmental factors. Relationships between nutrient intake and disease response cannot be quantified for these dietary components and, with few exceptions, the food components of concern are not essential nutrients.

In contrast, for the essential nutrients for which RDA are set, the consequences of depletion have been characterized, and for most of them specific metabolic or physiological functions that are impaired as the result of deficits can be identified. The entire population is predictably susceptible to specific impairments from depletion of essential nutrients, and such impairments can be completely prevented by provision of the nutrient. Intakes at which impairments will occur, and those at which they can be completely prevented, have been quantified within reasonably narrow limits. It is thus possible to develop a quantitative reference standard for essential nutrient intakes, RDA, on the basis of scientific knowledge, and to use it to develop a health policy that will predictably prevent nutritional deficiency diseases in the entire population.

To modify RDA on the basis of uncertain associations between unquantifiable variables would advance understanding neither of the RDA nor of dietary guidelines nor diet-disease relationships.

### *Directions in Dietary Standards and Guidelines*

There is a need for both dietary standards and guidelines, and for research that will improve the utility of both. The RDA and dietary guidelines serve distinctly different functions. The former are scientific standards that are essential for the development of certain types of food and health policies; the latter are largely deductions from indirect evidence, with much less adequate scientific underpinning and are proposed as part of health policy to provide guidance for maintenance and improvement of health.

DIRECTIONS IN RDA Perhaps the first need is to change the name of the RDA to "adequate intakes of essential nutrients." This should make clear that the values represent a set of dietary standards, not a set of recommendations for "desirable" intakes. It should also make clear that they are not dietary guidelines and have been established independently of health policy.

There is a continuing need for review and revision of RDA in order to ensure that the values are as accurate and consistent as possible. This was the objective set for the tenth RDA Committee. Critical evaluation of information on requirements, and especially on variability of requirements and on appropriate body pool sizes or reserves, is needed to improve the accuracy and reliability of RDA. An accurate standard is important as the basis for developing food guides for education about meeting essential nutrient needs. It is even more important when RDA are used for assessing the adequacy of nutrient intakes from dietary survey data.

The RDA report has become overly elaborate, so much so that it is difficult to select out the critical information that is needed for using RDA practically from the extensive discussion of the scientific basis for RDA. Publishing the background papers on requirements and factors affecting requirements as critical reviews in scientific journals would reduce the need for much of this material in the RDA report. The report could then focus more directly on appropriate uses of the RDA and on their limitations when they are used for purposes for which they were not intended.

DIETARY GUIDELINES It would be helpful for the development of dietary guidelines to have detailed background papers on fats, carbohydrates, fiber, and related topics prepared independently of policy considerations. In these, information about the nutritional and metabolic significance of different types of fats, carbohydrates, and fibers at different stages throughout life could be provided without placing major emphasis on associations between diet and disease. Basic information about weight control might also be included in a publication of this type. The American Society of Clinical Nutrition publication on diet and health (2) and the NRC publication *Toward Healthful Diets* (29) were efforts in this direction.

In the present Dietary Guidelines publication (84), despite the recent revision, the focus is still on the role of nutrition in protecting the middle-aged male from chronic and degenerative diseases. This shifts the focus away from the central role of nutrition for maintenance of health at each of the stages of life, and toward the narrow issue of how nutrition may influence the outcome of diseases that are associated with aging, diseases that are not primarily nutritional. Although the subject of associations between diet and disease is important, to focus on it so strongly in a set of general dietary guidelines is comparable to using therapeutic nutrition as the vehicle for teaching general nutritional principles—it results in loss of perspective.

A basic scientific report on the nutritional roles of the major dietary constituents would provide the basic scientific background for developing appropriate dietary guidelines for infants; young children; adolescents; pregnant women, particularly the young pregnant woman; the elderly; for maintenance of desirable body weight; and for the highly physically active individual.

DIET AND DISEASE These guidelines do not provide general nutrition information but, like the therapeutic guidance offered to those suffering from specific diseases, they focus on individual disease entities. Nevertheless, they are often proposed as dietary guidelines for the general public. Here more than elsewhere, there is a need for a report (or perhaps it would require a series of reports) comparable to the RDA report, developed independently of policy considerations, that provides a critical evaluation of the potential role of diet modification as a disease prevention measure. Such a report should focus on the disease entities, not on specific nutrients. It should include accurate information about health statistics, including the incidence of death from each of the major diseases at different ages, in order to provide perspective rather than create apprehension about the risks. It should include information about what is known of the causes of these diseases, what is known about various risk factors, and above all, it should place the role of diet or diet modification in appropriate perspective in relation to knowledge of other risk factors.

This type of publication is needed particularly for several reasons. First, because knowledge of relationships between diet and chronic and degenerative diseases is tenuous; second, because cause-effect relationships are not established, only implied; and third, because advocacy of diet as a disease prevention measure is highly emotional. The advocacy approach would make it difficult to achieve objectivity in preparing a publication on this subject, but an attempt would be well worth the effort, even if the report must be done in two sections by two different groups whose conclusions might be quite different. For such a report to be useful it would be necessary to have the authors of each section evaluate the same literature and for the report to consist only of scientific evaluations without policy recommendations, as in the RDA report.

One or more publications of this type, providing critical and objective assessments of current knowledge of diet-disease associations, could then be used for developing accurate and objective information for the public on this subject and for making appropriate health policy recommendations. Separation of the assessment of information needed for health policy from the development of policy as such might also help to reduce the antagonistic relationship between the ardent advocates of diet modification and their critics, a situation that arises in large measure from selection of supportive evidence for policy proposals and neglect of contrary evidence.

Separation of the science from the policy in developing background information and use of the background papers objectively for developing policy and guidelines would represent a substantial step toward providing the public with appropriate perspective on issues relating to diet and health. The RDA provide the scientific base for policies in which RDA are used in a variety of ways. It is essential in order to maintain the credibility of both the science and the policy that this separation be retained. A comparable approach in developing dietary guidelines for both the major nutrients and diet-disease relationships would reduce the confusion that results when the science and policy objectives are intertwined.

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