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How Should the Recommended Dietary Allowances Be Revised? A Concept Paper from the Food and Nutrition Board

The science of human nutrition stands at a pivotal point in its development. We now understand not only that nutrients are essential for growth and development and health maintenance, but also that some play a role in the reduction of risk of chronic disease. We have also come to understand that some nutrients function as hormones and others as gene regulators. A time may come when recommendations about what constitutes a health-promoting diet could be tailored to an individual's genetic predisposition to disease. However, until we have more complete knowledge of genetic variability in nutrient needs for health promotion and disease prevention, we must continue to rely on population-based approaches. One such approach is to develop recommendations for nutrient intakes that are designed to cover individual variations in requirements and that also provide a margin of safety above minimal requirements to prevent deficiency diseases. This is the approach traditionally taken in establishing Recommended Dietary Allowances (RDAs).

The Food and Nutrition Board (FNB) was established in 1940 to address issues of critical importance pertaining to the safety and adequacy of the nation's food supply, to establish principles and guidelines for adequate nutrition, and .to render authoritative judgment on the relationships among food intake, nutrition, and health. The FNB is a cistinguished, multidisciplinary group comprising scientists and leaders with expertise in various areas of nutrition, nutritional biochemistry, food science and technology, epidemiology, food toxicology, food safety, public health, and food and nutrition policy. Since its inception, the FNB has examined the science and made recommendations to improve food quality and safety, thereby promoting public health and preventing diet-related diseases. The emphasis of the FNB's activities has, over the past few years, shifted from nutritional deficiencies to excesses or imbalances in food components. The FNB additionally has become increasingly concerned with the translation of available scientific knowledge of food composition and human nutrition to die improvement of public health.

Since the time the FNB first published the RDAs in 1941, their application has expanded markedly. They serve important functions in a variety of nutrition-related activities that professionals in government, industry, academia, and the health services have undertaken.

Although some nutrition professionals question the need for RDAs, most would agree that some type of nutrient-based standard is necessary. The RDAs have become so integral to food and nutrition policy in the United States that it is difficult to conceive of planning a food program or changing a nutrition policy without considering how either would affect the population's dietary intakes expressed in relation to the RDAs.

Successive editions of the *Recommended Dietary Allowances* provided intakes of specific levels of several essential nutrients by age group, sex, and as appropriate, physiological state. These levels are judged on the basis of available scientific evidence to meet the known nutritional needs of practically all healthy persons in the United States. Concurrent with the expansion of knowledge of the biochemical function of specific nutrients, knowledge of how diet influences the risk of chronic diseases has also increased. The FNB now faces the challenge of whether to bring together the concepts of a health-

The members of the Food and Nutrition Board are Janet C. King, Ph.D., Chair; Edwin L. Bierman, M.D., Vice-Chair; John W. Erdman, Jr., Ph.D., Vice-Chair; Cutberto Garza, M.D., Ph.D., Vice-Chair; Perry L. Adkisson, Ph.D.; Lindsay H. Allen, Ph.D.; Dennis *M.* Bier, M.D.; Fergus M. Clydesdale, Ph.D.; Hector F: DeLuca, Ph.D.; D.Sc.; Michael P. Doyle, Ph.D.; Johanna T. Dwyer, D.Sc, R.D.; Scott M. Grundy, M.D., Ph.D.; K. Michael Hambidge, F.R.C.P., Sc.D.; Laurence N. Kolonel, M.D.;Ph.D.; Sanford Miller, Ph.D.; Alfred Sommer, M.D., M.H.S.; Vernon R. Young, Ph.D., D.Sc.; Steve L. Taylor, Ph.D., Ex-Officio; and Arthur H. Rubenstein, M.D., IOM Council Liasion. The FNB wishes to acknowledge the special contributions of Bernadette M. Marriott, Ph.D.; Catherine E. Wotecki, Ph.D.; Paul R. Thomas, Ed.D.; M. R. C. Greenwood, Ph.D.; Margaret P. Applewhite, M.S.; and Marcia S. Lewis, B.A., in the preparation of this paper.

promoting diet to reduce the risk of chronic disease and the nutrient-specific concepts underlying the RDAs.

In June 1993 the FNB held a national conference consisting of a symposium and a public hearing to explore several key issues related to the future of the RDAs. Before the symposium, the FNB members and staff developed five questions that formed the framework for the presentations and testimony. These questions were intended to stimulate discussion and commentary about the issues needed to advance the RDA process:

- What has been the experience in applying the RDAs in various settings, and what factors limit their use?
- What new evidence has arisen since publication of the 10th edition of the RDAs that would argue for a change from the present values or a reexamination of the evidence?
- Should concepts of chronic disease prevention be included in the development of allowances, and for which nutrients and other food components?
- How should recommended levels of intake be ex pressed? Should single numbers be given for dif ferent age and sex categories, or should ranges of recommended intake be provided? How should the ranges be defined? Should toxic levels be in cluded where data are sufficient to establish an upper acceptable limit?
- Is knowledge of relationships among nutrients sufficient to consider when establishing RDAs?

Members of regulatory and other federal agencies discussed their experiences in applying the RDAs in different policy situations and identified factors limiting their usefulness. Nutrition and medical experts described new evidence attained since publication of the tenth edition that would support a change from the present values or a reexaminatiqn of the data base. Also discussed was incorporating concepts related to reducing the risk of chronic disease in the development of nutrient-specific allowances. Some speakers offered alternative formats for presenting RDAs.

Following the conference, the FNB concluded that further discussion of these issues was needed. Although there is substantial support for the revision of the current RDAs, the approach to be taken in this revision needs; further development. The FNB members believe that they must develop, discuss, and disseminate new concepts of the RDAs with the scientific and professional communities to gain widespread support and agreement on an approach before a new RDA committee is convened.

To continue its collaboration with the larger nutrition community on the future of the RDAs, the FNB decided not to form an RDA committee at this time. Instead, it has prepared a concept paper summarizing the symposium, public hearing, and FNB discussions. The paper also proposes an initial approach for revising the RDAs. There are three chapters: Chapter 1 presents a basic introduction to the RDAs. Chapter 2 includes a history of the RDAs and the conceptual changes that have taken place since the first edition in 1941. Chapter 3 outlines a new approach to the RDAs developed by the FNB. The text from Chapter 3 is excerpted in its entirety below. At the end of Chapter 3 there is an address to which Comments may be sent. Later this year, the FNB will review the comments received in response to the concept paper and will continue the process of revising the RDAs through activities that will involve the nutrition community.

Future Directions for the Recommended Dietary Allowances Under Discussion by the Food and Nutrition Board

A Conceptual Approach for the RDAs

When the FNB began considering whether the RDAs should be revised, it recognized the need to increase the participatory process. The FNB is gathering information and opinions about the need for revising the RDAs through four mechanisms: (1) prepared talks from researchers invited to participate in a symposium held in Washington, DC, June 28-29, 1993; (2) oral testimony delivered during the subsequent open hearing; (3) written testimony; and (4) participation in meetings sponsored by other organizations. The opportunity to comment at the symposium and hearing was advertised, and 25 individuals and organizations provided oral testimony and 19 submitted written testimony. This testimony is organized according to the five questions posed that formed the basis for the symposium. The FNB has reviewed all written and oral comments. These will remain as part of the database that the FNB is developing to include in further deliberations.

Last June's symposium and public hearing provided a forum for scientists, advocates, and involved professionals to present the FNB with their viewpoints on issues pertaining to the future of the RDAs. The FNB reviewed the information and developed three general conclusions from it:

1. Sufficient new knowledge has accumulated for selected nutrients, especially energy and several vitamins and minerals, that supports a review of the current RDAs.
2. Reduction in the risk of chronic disease is a con cept that should be included in the formulation of future RDAs where sufficient data for efficacy and safety exist.

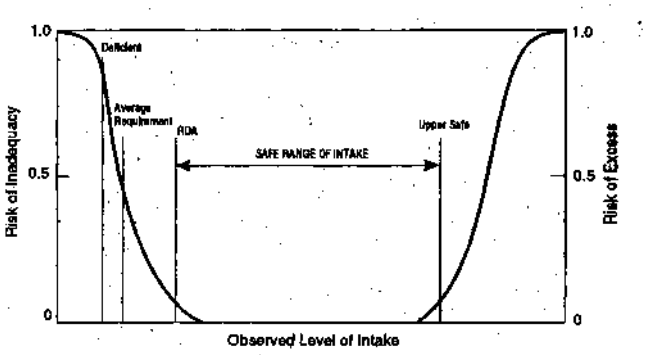

Figure 1. The concept of a safe intake range. The safe intake range is associated with a very low probability of either inadequacy or excess for an individual selected at random from the population. Adapted from Health and Welfare, Canada, 1983.[3]

3. Serious consideration must be given to developing a new format for future RDAs.

The FNB believes that the basic purpose of the RDAs remains valid, that is, "to provide standards to serve as a goal for good nutrition"[1]. Given the research on which RDAs are based, RDAs are meant to be applied to groups of healthy people and not individuals. They are therefore set at levels that exceed the needs of most people to encompass the individual variability in nutrient requirements. In practice, however, most nutritionists would translate the purpose of the RDAs to be the levels of essential nutrients that *healthy individuals* should consume on average over a period of time to *ensure adequate and safe nutrient intakes.* One task of a new RDA committee will be to provide practitioners and interested laypersons with guidance on the appropriate ways in which RDAs might be used to evaluate the nutrient needs of individuals.

If no change were to be made in the basic purpose of the RDAs, the FNB would plan to revise RDAs for individual nutrients as the body of scientific evidence accumulates. In this way, specific chapters could be revised and widely disseminated along with an updated table, but the entire text would be revised less frequently than has been the case in the past.

The FNB members feel strongly that future RDA documents need to provide more detail about the derivation of the recommendations and more explicit guidance in using the values for policy and other uses. Specific approaches need to be developed and tested for using available data to derive several reference points for intake of essential and other important food components that influence the risk of chronic disease. In addition, it would be critical to identify where data were insufficient for judgments to be made about the reference points and to make recommendations for research to fill these gaps. These reference points could provide a systematic way of organizing the scientific literature and identifying the strengths and weaknesses of existing data. In the judgment of the FNB, possible reference points (as illustrated in Figure 1) could be defined as follows:

- Deficient-—Level of intake of a nutrient below which *almost all healthy people* can be expected, over time, to experience deficiency symptoms of a clinical, physical, or functional nature.
- Average Requirement—Mean level of intake of a nutrient or food component that appears, on the basis of experimental evidence, sufficient to maintain the desired biochemical/physiological function *in a population.* It is also importan to know the variation in the mean requirement.
- Recommended Dietary Allowance—Level of intake of an essential nutrient or food component considered on the basis of available scientific knowledge, to be adequate to meet the known nutritional needs of practically *all healthy per sons.* There will be a continuing need to redefine numerical recommendations. For some nutrients, other functional endpoints might be defined and included as criteria for the definition of recom mended intakes.
- Upper Safe—Level of intake of a nutrient or food component that appears to be safe for *most healthy people* and beyond which there is con cern that some people will experience symptoms of toxicity over time.

These multiple reference points would incorporate some aspects of the approach adopted by the Committee on Medical Aspects of Food Policy (COMA) of the United Kingdom in its 1991 report on Dietary Reference Values (DRVs).[2] The DRVs consist of three values. The first is the Estimated Average Requirement (EAR), which is the average requirement of a nutrient as shown in various study populations. The two other values are based on an assumption of normal distribution of nutrient requirements in a population, with the understanding that information is usually inadequate to calculate the precise distribution of requirements. The Lower Reference Nutrient Intake is a value two standard deviations below the mean requirement and represents the lowest intake that will meet the needs of some individuals. In contrast, the Reference Nutrient Intake (RNI) is the value two standard deviations above the mean requirement. The RNI, whidi represents the amount of a nutrient sufficient or more than sufficient to meet the needs of most healthy people, is essentially equivalent in concept to the current RDAs of this country. In addition to DRVs for vitamins and minerals, the COMA report recommends intakes for several other dietary conm-

ponents—such as starches, sugars, fats, and fatty acids—where no precise requirement (or EAR) can be defined. The recommended intakes for these components are derived by a different process than that used for vitamins and essential minerals, described by COMA as "pragmatic judgments" that represent intakes "consistent with good health, given the prevailing socio-cultural environment."

The FNB faces many challenges in developing its proposed approach. A future committee charged with this task and reviewing the literature would need to deal with suggestive, but incomplete, information on the potential for nutrients to reduce the risk of chronic disease and the amounts required to provide these effects; on the effective dose (analogous in concept to the average requirement); on the variability in the effective dose; on the chronic toxicity of large doses of nutrients; and on potential nutrient interactions. Of particular concern is the general lack of information on children, youths, and young adults. This information is required to develop recommendations that may affect longevity, health, and chronic disease. Most of the research to date on the reduction of risk of chronic disease is based on studies of middle-aged and older adults.

A Plan for the Next RDAs

The FNB believes that future RDAs will need to have more flexibility to address multiple uses. The FNB recognizes that the present RDAs are not well suited for some applications. For example, using RDAs for the nutritional labeling of foods requires that a single value for each nutrient be established as a standard. To meet the broad range of needs of users of the RDAs, the FNB proposes to develop a series of three publications.

One publication, an llth edition of the RDAs, would review what is known about essential nutrients and important food components with respect to the four proposed reference points: deficient, average requirement, recommended dietary allowance, and upper safe levels. In addition, a new RDA committee would address, in the text of the report, issues of nutrient-nutrient interactions and the potential roles of nutrients and other food constituents in reducing chronic disease risk. The committee would review the literature in these areas for each nutrient or relevant constituent and give guidance on when and under what conditions it might be appropriate for certain individuals or population groups to strive for intakes that deviate from the RDAs.

A second publication would describe how the new RDAs could be used for the variety of purposes to which they are put. The traditional uses of the RDAs would be covered in this document. A third publication, intended for the public, would explain the principles and scientific evidence underlying the RDAs and present them in terms of dietary patterns for persons of specific age and physiologic states. It would also include recommended dietary patterns for population subgroups based on considerations of age, race, and ethnic dietary preferences. To contain costs, these three reports would be developed sequentially using a series of small committees overseen by a committee of FNB members.

The FNB would maintain this open process for developing future RDAs by implementing new mechanisms to obtain wider participation. In addition to reviewing the literature, holding invitational workshops, and corresponding with experts, FNB members are considering new ways to obtain comments on the conceptual development of the RDAs and to evaluate the adequacy of the literature. Public meetings structured around the findings of the committee with respect to different controversial nutrients, symposia held in conjunction with professional society meetings, and research review monographs published for public comment will be planned to increase the involvement of the nutrition community.

With this concept paper, the FNB presents its initial ideas for a new approach to the RDAs. The FNB seeks constructive criticism, suggestions, and substantiated rebuttal so that our approach can be reviewed and modified. To advance this process, symposia are scheduled at nutrition-focused scientific meetings through 1994 to debate several of the outstanding issues discussed in this paper. The FNB urges readers of this report to submit written remarks to the address below. Please include full literature citations and supporting documentation wherever appropriate.

The FNB looks forward to working with the interested nutrition community in determining the future of the RDAs. Send comments to: RDA Comments, Food and Nutrition Board, Institute of Medicine/NAS, 2101 Constitution Avenue, N.W., Washington, DC 20418.

1. NRC (National Research Council). *Recommended dietary allowances.* Washington, DC: National Research Council, 1941
2. COMA (Committee on Medical Aspects of Food Policy). Dietary reference values for food energy and nutrients for the United Kingdom. Report of the Panel on Dietary Reference Values of the Committee on Medical Aspects of Food Policy. Department of Health, Report oh Health and Social Subjects, No. 41. London: HMSO, 1991
3. Health and Welfare, Canada. Recommended nutrient intakes for Canadians. Compiled by the Committee for the Revision of the Dietary Standard for Canada. Bureau of Nutritional Sciences, Food Directorate, Health Protection Branch, Department of National Health and Welfare/Ottawa: Canadian Government Publishing Centre, 1983