

Review

Nutrient Profiling: The New Environment

Theresa A. Nicklas, DrPH

USDA/ARS Children's Nutrition Research Center, Department of Pediatrics, Baylor College of Medicine, Houston, Texas

Key words: nutrient density, nutrient profiling, dietary guidelines, consumer research, standardized definition

The 2005 Dietary Guidelines for Americans (DGA) recommends that individuals choose nutrient-dense foods to help meet nutrient needs without consuming excess calories, a concept that is supported by health professionals and nutrition organizations. With an increased emphasis on nutrient density, the 2005 Dietary Guidelines Advisory Committee, in their Technical Report, called for more research to develop a valid and scientific method for defining the nutrient density of foods that can ultimately be useful on labels to help people build healthier diets [1]. Nutrient profiling is the science of ranking foods based on nutrient composition. Over the past years, numerous nutrient-profiling systems have emerged to provide guidance on improving diet quality, resulting in a heightened awareness of a need for a standardized definition of nutrient density. While nutrient-profiling systems are meant to help individuals make healthier food choices, their introduction to the marketplace leaves many unanswered questions regarding both the development of a scientific definition of nutrient density and its consumer application. The goal of this article is to review the roles of nutrient density and nutrient profiling in providing consumer guidance. Specifically, this review will summarize the current nutrition environment and address the need for future research around nutrient-profiling systems as a means to define nutrient density.

Key teaching points:

- Most Americans remain physically inactive and consume excessive calories without meeting the recommended intakes for a number of nutrients.
- The 2005 DGA, health professionals, and nutrition organizations support the concept of consuming nutrient-dense foods to help meet nutrient needs without exceeding caloric needs.
- Establishing a standardized definition of nutrient density that is relevant to consumers and practical for making better food choices may help Americans build healthier diets.
- The introduction of numerous profiling systems raises new research questions and considerations and further supports the need for a unified definition of nutrient density.
- Consumer research is needed to determine the best way to communicate to consumers about how to use the nutrient density profiling systems in making food choices.

INTRODUCTION

Overweight Yet Undernourished: Making Each Calorie Count

Two thirds of adults and one fifth of children are overweight or obese in the United States [2]. An estimated

86% of adults and nearly 30% of children will continue to be so by 2030 if the current rate of increase continues [3]. Obesity is a risk factor linked to many health conditions including cardiovascular disease, type 2 diabetes, and certain cancers, such as colorectal cancer and ovarian cancer [4]. Overweight and obesity are associated with negative social stigmas and can

Address correspondence and reprint requests to: Theresa A. Nicklas, DrPH, USDA/ARS Children's Nutrition Research Center, Department of Pediatrics, 1100 Bates Avenue, Baylor College of Medicine, Houston, TX 77030. E-mail: tnicklas@bcm.tmc.edu

Presented in part at "Nutrient Rich Foods: An Approach to Defining Nutrient Density," a Symposium held at the 49th Annual Meeting of the American College of Nutrition, Arlington, VA, October 4, 2008.

Financial interests: The symposium was supported by the National Dairy Council. This work was supported by the U.S. Department of Agriculture (USDA) Agricultural Research Service (ARS) through specific cooperative agreement 58-6250-6-003. This work is a publication of the USDA/ARS Children's Nutrition Research Center, Department of Pediatrics, Baylor College of Medicine, Houston, TX. The contents of this publication do not necessarily reflect the views or policies of the USDA, nor does mention of trade names, commercial products, or organizations imply endorsements from the U.S. government.

Journal of the American College of Nutrition, Vol. 28, No. 4, 416S–420S (2009)

Published by the American College of Nutrition

decrease quality of life [5,6]. In the midst of this obesity epidemic, most Americans remain physically inactive and consume excessive calories without meeting the recommended intakes for a number of nutrients [7]. For example, based on NHANES 2001–2002 data, a significant percentage of Americans older than 1 year have inadequate intakes of vitamin E (93%), magnesium (56%), vitamin A (44%), vitamin C (31%), vitamin B6 (14%), and zinc (12%) based on the Institute of Medicine's estimated average requirements [8]. In addition, on average, 70% or more of all Americans older than 1 year do not meet recommendations for calcium, potassium, or fiber intake [8,9]. The 2005 Dietary Guidelines Advisory Committee (DGAC) collectively identified several nutrients of concern that most Americans do not meet recommended intakes for, including potassium, calcium, magnesium, fiber, and vitamins A, C, and E [1,7]. In addition, a widespread concern over the past decade has been that some foods containing low amounts of nutrients may be eaten at the expense of other foods that are, by comparison, better sources of essential nutrients. As such, the 2005 DGAC called for the need to develop a scientifically valid method for defining the nutrient density of foods that can ultimately be useful on labels to help the consumer build a healthier diet [1].

The goal of this article is to review the roles of nutrient density and nutrient profiling in providing consumer guidance. Specifically, this article will summarize the current nutrition environment and address the need for future research around nutrient-profiling systems as a means to define nutrient density.

BACKGROUND

Nutrient Density as Part of Building a Healthier Diet

An emphasis on choosing nutrient-dense foods, also known as nutrient-rich foods, is essential for planning and consuming a healthier diet and will likely continue to be a foundation of future public health guidance. The 2005 Dietary Guidelines for Americans (DGA) defines nutrient-dense foods as “those foods that provide substantial amounts of vitamins and minerals and relatively few calories” and stresses the importance of choosing foods rich in nutrients as a means to obtain adequate nutrient intake within calorie recommendations [7]. As opposed to nutrient-dense foods, energy-dense foods (calories/100 g) provide a larger amount of energy in a given amount of food [1]. Consuming too many energy-dense foods and not enough nutrient-dense foods can lead to weight gain and poor health outcomes and potentially increase the risk of disease [1].

The 2005 DGA and MyPyramid, the tool that helps people put the DGA into practice, promote eating a healthy, balanced diet, which includes consuming a variety of nutrient-dense

foods from the food groups each day with attention to portion control and serving size [7,10]. The basic food groups include fruit, vegetables, grains, dairy, and meat and beans, with each of these groups contributing a unique nutrient package to the total diet. For instance, the fruit group provides potassium, fiber, vitamin C, and folic acid; the vegetable group provides potassium, fiber, and vitamins A, C, and E; the grain group provides fiber, B vitamins, iron, magnesium, and selenium; the dairy group provides calcium, potassium, vitamin D, and protein; and the meat and beans group provides protein, B vitamins, vitamin E, iron, zinc, and magnesium [10]. Choosing foods from all of the food groups each day helps ensure the necessary supply of essential nutrients. Eliminating whole food groups from the diet can compromise nutrient adequacy and may lead to adverse nutritional consequences and thus adverse health outcomes [1,10]. The 2005 DGAC determined that many Americans would need to make substantial changes in their food consumption habits to meet the current DGA (Fig. 1) [1]. Based on this, the DGA specifically encourages the consumption of select food groups because they provide key nutrients lacking in the U.S. diet [7]. The “food groups to encourage” are fruits, vegetables, whole grains, and low-fat and fat-free dairy foods [7]. Among the vegetable group, specific subcategories including green leafy vegetables, orange vegetables, and legumes are emphasized (Fig. 2) [7].

While increased intakes of foods from these select food groups are encouraged, consumption of other foods, such as solid fats and enriched grains, will need to be decreased in the overall diet (Figs. 1, 2) [1,7]. In addition, individuals generally consume more sodium than needed so this nutrient may also be considered a nutrient to limit [7]. Balancing increased intakes of valuable nutrients with decreased intakes of nutrients to limit, all within a given caloric allotment, are critical parts of a healthier diet. Moreover, choosing appropriate serving sizes of foods and beverages helps individuals to consume a variety of foods and stay within their daily caloric allotment [7,10]. In summary, choosing nutrient-dense foods daily from all food groups is essential to building a healthier diet, as is consuming a variety of these foods in moderation with attention to serving sizes and portion control.

Support for a Definition for Nutrient Density

Nutrient density is an integral component of a healthy, balanced eating plan, and this concept is supported not only by the 2005 DGA but also by health professionals and nutrition organizations. Health and nutrition organizations including the American Academy of Family Physicians, American Academy of Pediatrics, American Dietetic Association, National Hispanic Medical Association, National Medical Association, School Nutrition Association, and Action for Healthy Kids all support the nutrient-rich foods approach, which considers the total nutrient package of a food or beverage, as a way for

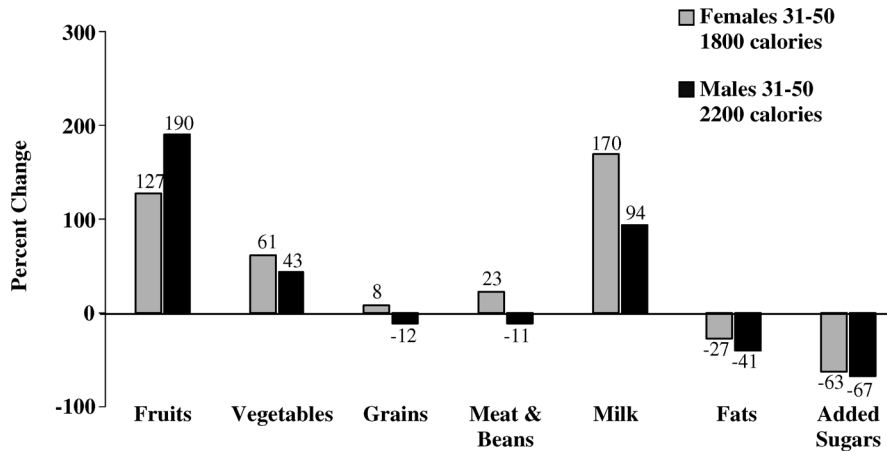


Fig. 1. Recommended percentage changes in intake for the vegetable, fruits, grains, meat and beans, and milk food groups, fat and added sugar for men and women aged 31–50 years following a 2200- and 1800-calorie diet, respectively. Figure adapted from the 2005 Dietary Advisory Committee Report [1].

Americans to build and enjoy a healthier diet by getting more nutrients from their calories [11–13].

In the Technical Report of the 2005 DGAC, the committee called for the development of a scientifically valid definition for *nutrient density* that consumers could use to help make wise food choices, and they charged the scientific community to create this definition [1]. The American Dietetic Association, the world’s largest organization of food and nutrition professionals, released a practice paper in 2007 supporting the 2005 DGA’s call for a definition of nutrient density and nutrient-dense foods [11]. The paper focuses on some of the factors that need to be addressed when developing the definition [11]. The paper also states that the American Dietetic Association endorses a total diet approach to eating

well along with providing Americans with guidance on nutrient density so individuals can make nutritious food choices [11].

The Food and Drug Administration, the U.S. governmental agency responsible for overseeing food labeling and ensuring the safety of many food products, previously reported that using a nutrient-density approach may be a viable option for health claims by placing an emphasis on the valuable nutrients in a food in relation to its caloric contribution for a given serving size [14]. With an increasing emphasis on the importance of nutrient density as part of a healthier diet and the support for a standardized definition that will help consumers make wise food choices, nutrition-profiling systems have recently emerged in an effort to meet some of these challenges.

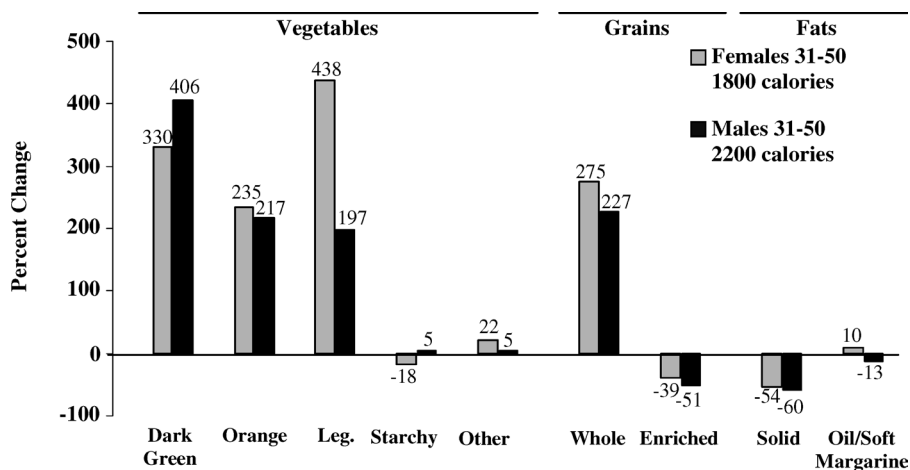


Fig. 2. Recommended percentage changes in intake for the select vegetable, grain, and fat categories for men and women aged 31–50 years following a 2200- and 1800-calorie diet, respectively. The vegetable food group categories include dark green, orange, legumes (leg.), starchy, and other. The grains food group categories include whole grains and enriched grains. The fat categories include solid fats and fats from oils or soft margarine sources. Figure adapted from the 2005 Dietary Advisory Committee Report [1].

DESCRIPTION OF SUBJECT

Nutrient-Profiling Systems

Nutrient profiling is the science of ranking foods based on nutrient composition [15,16]. Nutrient-profiling systems are meant to help individuals identify and select certain foods based on a preselected set of criteria [16]. This can help consumers understand the nutrient contribution of the food to help them make healthier choices when buying and consuming foods and may also motivate food manufacturers to develop more healthful food products [16]. The criteria used in nutrient-profiling systems are not currently regulated. A standardized approach to developing nutrient density criteria along with future standards governing their use is greatly needed [17].

Nutrient-profiling systems may fall under one of the following categories: systems using beneficial or positive nutrients, systems using only nutrients to limit, or systems using some combination of both [18]. Profiling systems ranking foods based only on their content of beneficial nutrients, such as calcium or vitamin C, consider only the valuable nutrients that a food item has to offer [18]. Profiling systems ranking foods based only on their content of nutrients to limit, which may include nutrients such as total fat, added sugars, or sodium, consider only the nutrients that individuals are typically encouraged to reduce the consumption of in their diets. A combination or mixed profiling system considers both the beneficial nutrients and the nutrients to limit in a given food item and may be a more holistic approach [18]. In addition, the nutrient-profiling system can be either a threshold or continuous profiling system [19]. Threshold systems consider whether a food item has a nutrient content higher or lower than a specified threshold; nutrition claims such as “low fat” use a threshold concept [19]. Continuous systems calculate and assign a score to each food item, which can then be used to rank and compare foods [19]. While a variety of systems already exist, each with its own attributes, a mixed profiling system may provide a more balanced nutrient profile of the food item than focusing solely on nutrients to encourage or nutrients to limit.

Areas of Future Research

The introduction of numerous nutrient-profiling systems that attempt to provide guidance on nutrient density has resulted in a lack of consensus in its characterization and heightened the need for a standardized definition of this concept [11,20]. As a result, many unanswered questions and topics of concern remain that pertain to both the development of a scientific definition of nutrient density as well as its consumer application [11,20]. In the development of a scientifically valid definition of nutrient density, the selection criteria for nutrients need to be determined [16]. For example, should the nutrients being used to determine nutrient density

be based on the 2005 DGA’s “nutrients of concern,” a select group of nutrients to limit, or both? Should other nutrients be considered in the definition as well? For example, should the nutrients to encourage be based on key nutrients representative of each of the food groups since each food group provides a unique nutrient package? The best method for food quantification will also need to be characterized. For example, should the nutrient profiling be based on serving sizes, grams, or calories [21]? In addition, should the system used to define nutrient density be food group specific or rank foods across all food groups? Should this system include other criteria in its ranking of foods such as bioactive components including antioxidants or flavonoids and other bioactives that may provide additional health benefits to individuals [16]? Additional questions have been raised about how a unified definition of nutrient density can address fortification as well as both energy-dense and nutrient-dense foods [11,20]. Certain energy-dense foods are also rich in essential nutrients, including amino acids and essential fatty acids [22]. Lastly, in creating a definition, the system needs to address whether ranking foods using a continuum or thresholds is preferred and ensure that the designated definition is transparent and validated against objective measures of health-related outcomes and diet quality [11,20]. Some scientists have proposed that a scientifically valid definition of nutrient density needs to take into account a food’s total energy content and a balanced nutrient package including nutrients to encourage and nutrients to limit. Furthermore, some scientists believe that nutrient density should be instituted as a nutrition platform in the DGA and as the guiding principle for planning healthier diets [20].

In the DGAC’s call for the development of a scientifically valid definition for *nutrient density*, the committee recommended that it also be useful on the food label so consumers can use it to make educated decisions about buying and consuming healthier foods [1]. As a result, in addition to the outstanding scientifically relevant questions that need to be addressed in developing such a definition, it is imperative to address whether consumers will understand and apply the concept of the nutrient density approach. Essentially, will the system be feasible, economical, and relevant to consumers, and will it help consumers change behavior that translates into making wise food choices and consuming a healthier diet? Both the scientific development of a nutrient density definition and the consumer relevance will need to be considered equally for such an approach to translate into relevant dietary changes that will result in a healthier eating pattern. It may be time for a shift in the emphasis in consumer nutrition education. Rather than focusing on foods to avoid, dietary guidance needs to focus on foods to encourage. A consumer-driven eating system that helps people get more nutrition from their calories within the context of the total diet may prove to be more effective in helping Americans build a healthier diet.

CONCLUSION

This article provides an overview of the current nutrition environment and addresses future nutrition and consumer research needs related to nutrient-profiling systems as a means to define nutrient density. This topic is critical because most Americans are physically inactive and consume excessive calories without meeting the recommended intakes for many nutrients. The concept of selecting foods that are nutrient dense to help meet nutrient needs within calorie limits is supported by the 2005 DGA, health professionals, and nutrition organizations. Establishing a standardized definition of nutrient density that is relevant to consumers and practical for making better food choices would help Americans build healthier diets. Many new research questions and considerations have been raised since the introduction of a number of nutrient-profiling systems, further supporting the need for a unified definition of nutrient density. Even after a unified definition is identified, the importance of ensuring proper communication to the consumer should be emphasized. Consumer research is needed to determine the best way to communicate about nutrient density to help make food choices.

ACKNOWLEDGMENTS

Special thanks to Pamela Harris for help in preparing the manuscript and Bee Wong for obtaining scientific articles.

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Received December 8, 2009.