

The 2015 Dietary Guidelines Advisory Committee Scientific Report: Development and Major Conclusions^{1–3}

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ABSTRACT

The Dietary Guidelines for Americans (DGA) is published every 5 y jointly by the Department of Health and Human Services (HHS) and the USDA and provides a framework for US-based food and nutrition programs, health promotion and disease prevention initiatives, and research priorities. Summarized in this report are the methods, major conclusions, and recommendations of the Scientific Report of the 2015 US Dietary Guidelines Advisory Committee (DGAC). Early in the process, the DGAC developed a conceptual model and formulated questions to examine nutritional risk and determinants and impact of dietary patterns in relation to numerous health outcomes among individuals aged ≥ 2 y. As detailed in the report, an expansive, transparent, and comprehensive process was used to address each question, with multiple opportunities for public input included. Consensus was reached on all DGAC's findings, including each conclusion and recommendation, and the entire report. When research questions were answered by original systematic literature reviews and/or with existing, high-quality expert reports, the quality and strength of the evidence was formally graded. The report was organized around the following 5 themes: 1) food and nutrient intakes and health: current status and trends; 2) dietary patterns, foods and nutrients, and health outcomes; 3) diet and physical activity behavior change; 4) food and physical activity environments; and 5) food sustainability and food safety. The following 3 cross-cutting topics were addressed: 1) sodium, 2) saturated fat, and 3) added sugars. Physical activity recommendations from recent expert reports were endorsed. The overall quality of the American diet was assessed to identify overconsumed and underconsumed nutrients of public health concern. Common food characteristics of healthy dietary patterns were determined. Features of effective interventions to change individual and population diet and physical activity behaviors in clinical, public health, and community settings were identified. The report was used by the HHS and the USDA to develop the 2015 DGA. *Adv Nutr* 2016;7:438–44.

Keywords: Dietary Guidelines, nutrition, conceptual model, physical activity, dietary patterns

Introduction

The 1990 National Nutrition Monitoring and Related Research Act (Section 301) enacted after the 3rd edition of the Dietary Guidelines was released states that the Guidelines “be based on the preponderance of the scientific and

medical knowledge which is current at the time the report is prepared.” The law does not specify use of a federal advisory committee to accomplish this requirement. However, beginning with the 1985 edition, the USDA and the Department of Health and Human Services (HHS)¹⁸ have appointed a Dietary Guidelines Advisory Committee (DGAC) composed of nationally recognized experts in the field of nutrition and

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¹⁸ Abbreviations used: CVD, cardiovascular disease; DGA, 2015 Dietary Guidelines for Americans; DGAC, Dietary Guidelines for Americans Committee; HHS, Department of Health and Human Services; NEL, Nutrition Evidence Library; SRSC, Scientific Review Subcommittee.

health to provide independent, science-based advice and recommendations for development of the Guidelines. The charges to the 2015 DGAC were to examine the Dietary Guidelines for Americans, 2010, and to determine topics for which new scientific evidence is likely to be available that may inform revisions to current guidance or suggest new guidance; place its primary focus on the systematic review and analysis of the evidence published since the last DGAC deliberations; place its primary emphasis on the development of food-based recommendations that are of public health importance for Americans aged ≥ 2 y; and prepare and submit to the Secretaries of the HHS and the USDA a report of scientific recommendations, with rationales, to inform the development of the 2015 Dietary Guidelines for Americans (DGA). DGAC responsibilities did not include translation of the recommendations into the 2015 DGA. The work of the DGAC was to be completed within a 2-y period and to culminate in the submission of the DGAC's recommendations in a scientific report to the secretaries.

The DGA provides a critical framework for food and nutrition programs, health promotion and disease prevention initiatives, and research priorities at local, state, regional, and national levels. The potential reach of the DGA is substantial, given the broad scope and impact of the HHS's and the USDA's federal policies, programs, and activities related to food, agriculture, nutrition, and health. Given this, the DGA is in the position to contribute to policies, services, and products across public and private sectors, including the federal food and nutrition programs and the public health and health care systems and related industries, education, agriculture, and food producers and retailers.

The 2015 DGAC was a 14-member committee of scientists nominated by a public process and appointed by the secretaries of the HHS and the USDA. DGAC members are recognized as experts in a broad range of domains, including food and nutritional sciences, medicine, epidemiology, nutrition and health policy, public health, and related areas. All DGAC members served without compensation and were fully vetted according to strict federal guidelines for potential conflicts of interest that pertained to their committee responsibilities. In February 2015, the Scientific Report of the 2015 DGAC was submitted to the secretaries of the HHS and the USDA, and the DGAC disbanded. The Scientific Report of the 2015 DGAC can be found online (1). The purpose of this article is to summarize the DGAC process, present the DGAC's major conclusions and recommendations, and provide certain insights learned from the development and publication of the 2015 DGAC Scientific Report.

Methods and Procedures

The broad charge to the committee as presented by the secretaries of the HHS and the USDA was to "Examine the Dietary Guidelines for Americans, 2010, and determine topics for which new scientific evidence is likely to be available that may inform revisions to the current guidance or suggest new guidance." The areas addressed by 2015 DGAC fell within this charge.

To define and guide its scope of work, the 2015 DGAC created a conceptual model that drew on the socioecologic framework [Figure 1 (2)]. The DGAC identified multiple levels of influence on dietary patterns and physical activity behaviors and, in turn, the relations between modifiable lifestyle behaviors and health outcomes across the life span (Figure 1).

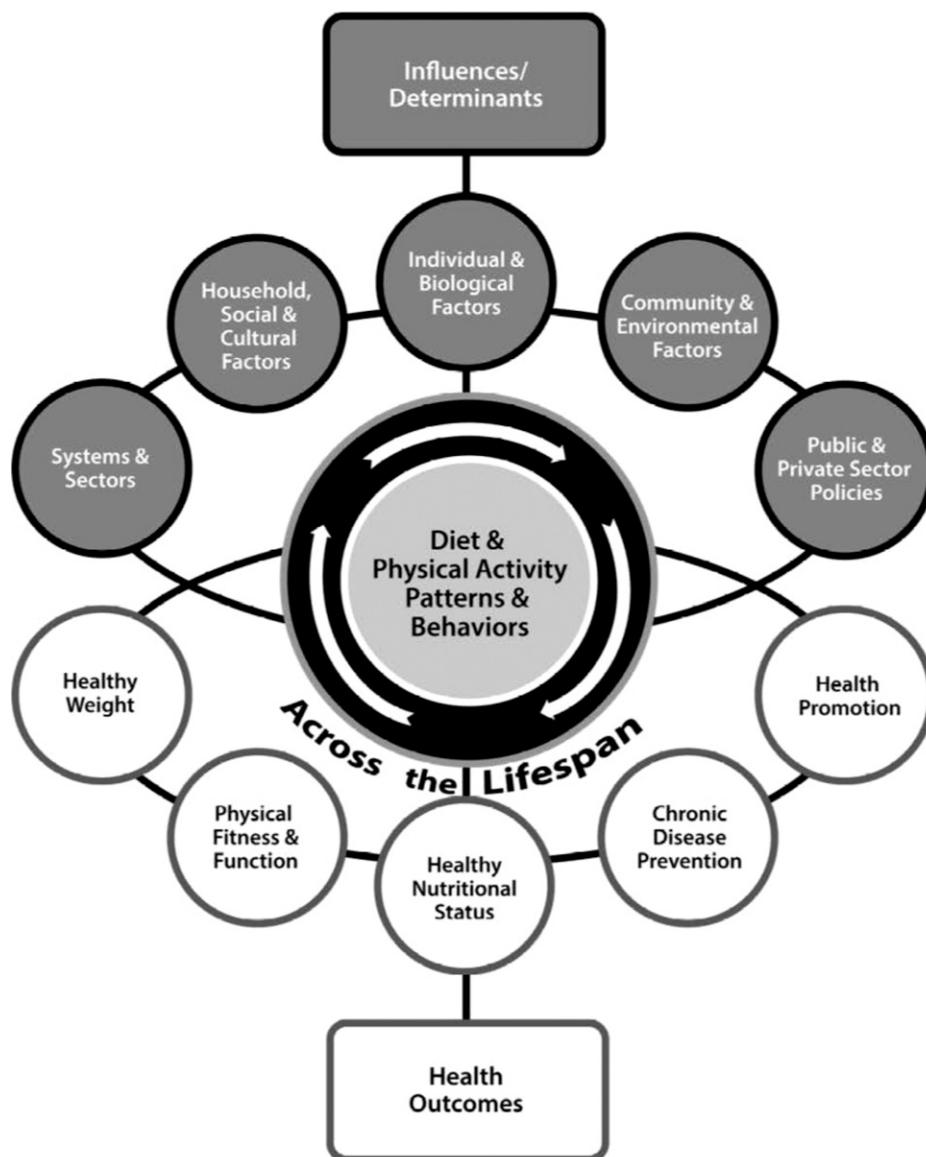
The 2015 DGAC initially formed 3 work groups that identified the following 5 major research themes: 1) food and nutrient intakes and health: current status and trends; 2) dietary patterns, foods and nutrients, and health outcomes; 3) diet and physical activity behavior change; 4) food and physical activity environments; and 5) food sustainability and food safety. Five subcommittees were then established to address these themes. In addition, 3 cross-cutting working groups were formed to address the following issues that transcended the subcommittee themes: 1) sodium, 2) saturated fat, and 3) added sugars. Each 2015 DGAC member served on ≥ 2 of the subcommittees and 1 of the cross-cutting working groups. An oversight Science Review Subcommittee (SRSC) was formed, composed of the DGAC chair, DGAC vice-chair, 2 DGAC members who participated on the 2010 DGAC, and subcommittee chairs. Each subcommittee and cross-cutting workgroup defined and prioritized their research questions.

One of the first tasks undertaken by each subcommittee and cross-cutting workgroup was to identify and prioritize questions the members deemed important to the nutritional status and health of the US population and that were consistent with their congressional charge. Each member of the subcommittees submitted questions of importance to their thematic area, and after an internal review and discussion the group then recommended a tiered and rank-ordered priority list of questions. The SRSC provided additional review and comment to clarify the scope of the DGAC's research and to achieve nonoverlapping questions across subcommittees. After SRSC review, the subcommittee members reached consensus on their final lists of tiered, rank-ordered questions and determined the methods to be used to address each question.

The procedures used to prepare the 2015 DGAC Scientific Report were expansive, transparent, and thorough with multiple opportunities for public input through oral testimony and website submissions. Rigorous and strict rules for DGAC meetings and communications were established and followed and were in keeping with requirements of the Federal Advisory Committee Act (3). All meetings of the DGAC were announced in advance in the *Federal Register*. At least 1 federal staff member who represented the designated federal officer was part of all subcommittee and working group meetings, conference calls, and e-mails. All meetings of the 2015 DGAC were made available by real-time broadcasts and, along with public comments, are archived online (4).

The 2015 DGAC used the following 4 approaches to address each scientific question or subquestion: 1) original systematic reviews conducted by the USDA's Nutrition Evidence Library (NEL); 2) existing, peer-reviewed high-quality expert

FIGURE 1 Diet and physical activity, health promotion, and disease prevention at individual and population levels across the life span.



reports and systematic reviews; 3) analyses of US population food and health data sets; and 4) original analytical modeling of USDA food patterns. Part C Methodology of the 2015 Scientific Report of the DGAC (5) describes the complete process used by the DGAC to identify and prioritize research questions, including when to use existing peer-reviewed systematic reviews or expert reports, when to commission NEL systematic reviews, and when to perform research analyses or analytical food pattern modeling. Each subcommittee selected the approach deemed most appropriate and resource efficient for each question addressed. For questions that pertained to the nature and scope of food, nutrient, and health-related problems in the population, analyses were requested from existing population-based data, including the national nutrition monitoring system, What We Eat in America, and NHANES. Analytical food pattern modeling was used to determine how to achieve the nutrient-dense, healthy dietary patterns, consistent with the report's recommendations. All

original analyses were performed for the 2015 DGAC by experts within the collaborating federal agencies, including the USDA, National Cancer Institute, and CDC, and were guided, reviewed, and summarized by the 2015 DGAC. When systematic reviews and authoritative statements were deemed sufficiently robust, up to date, and high quality, they were used to answer some questions. In their absence, NEL reviews were commissioned. The 2015 DGAC emphasized in its report that the scientific community and expert advisory groups, including those of the NIH and Institute of Medicine, routinely use systematic review methods to summarize the body of available research evidence that forms the basis of their expert guidelines and recommendations. Therefore, the availability of robust, systematic reviews, and published expert guideline reports allowed the 2015 DGAC to expand its scope of work and number of questions considerably.

The 2015 DGAC report fully describes the committee's methods for approaching each research question, including

literature inclusion and exclusion criteria, grading the quality of individual research papers, and rating the overall body of evidence for each question. As part of this process, the DGAC reached consensus on the overall quality of evidence and, based on this, formally graded its conclusions and recommendations, and, when appropriate, used published protocols [2015 DGAC Scientific Report Table C.1 Nutrition Evidence Library (NEL) Bias Assessment Tool; Table C.2 NEL Grading Rubric and USDA Nutrition Evidence Library Conclusion Statement Evaluation; Table C.3 Assessment of Multiple Systematic Reviews Tool; and Table C.4 Strength of Evidence terminology to support a conclusion statement when a question is answered with existing reports] (5). The 2015 DGAC's deliberations were supplemented with public comments that are archived online (6). Each systematic review question is discussed further in 2015 DGAC NEL Systematic Reviews (7).

Most of the 2015 DGAC's final conclusions and recommendations were rated strong or of moderate quality. For conclusions and recommendations that received a 2015 DGAC grade of strong, the evidence came from many studies of strong design free from design flaws, bias, and execution problems; several good-quality studies, in which large numbers of subjects were studied; studies with sufficiently large sample sizes for adequate statistical power; findings generally consistent in direction and size of effect or degree of association and statistical significance with minor exceptions; studied outcome related directly to the question, size of effect was clinically meaningful; and studied population, intervention, and outcomes were free from serious doubts about generalizability. For conclusions and recommendations that received a 2015 DGAC grade of moderate, the DGAC found the studies of strong design with minor methodologic concerns or only studies of weaker study design but relating to the research question being addressed; several studies by independent investigators; some doubt about adequacy of sample size to avoid type I and type II errors; some inconsistency in results across studies in direction and size of effect, degree of association, or statistical significance; some study outcomes related to the question indirectly; some doubt about the clinical significance of the effect; and/or minor doubts about the research generalizability. For questions in which the data were limited, inconsistent, or emerging, the DGAC graded conclusions or recommendations as either limited or grade not assignable according to its published criteria as noted above [Table C.2 NEL Grading Rubric (5)]. All subcommittees and cross-cutting working group conclusions, recommendations, and evidence grades were presented in public meetings and voted on by the full 2015 DGAC. Each subcommittee and cross-cutting working group question and the related conclusions, recommendations, and implications statements are summarized and referenced in the 2015 DGAC Scientific Report. Furthermore, the entire 2015 DGAC Scientific Report was reviewed and approved formally by the entire DGAC before submission to the secretaries of the HHS and the USDA.

Major Conclusions

First, the 2015 DGAC addressed the current status and recent trends in food and nutrient intake and the prevalence of major health conditions of the US population across the life span. The 2015 DGAC concluded that the dietary patterns of the US population, regardless of where the diets are prepared or eaten, deviate from recommended healthy dietary patterns and overall nutrient quality criteria. Consumption of vegetables, fruits, whole grains, and dairy tend to be low, and consumption of refined grains and added sugars are high. Underconsumed nutrients, as determined by national standards (Estimated Average Requirements, Adequate Intakes, or Upper Tolerable Intake Levels, as appropriate), were characterized as shortfall nutrients. These included vitamin A, vitamin D, vitamin C, vitamin E, folate, calcium, magnesium, fiber, potassium, and iron (in adolescents and premenopausal women). When nutrient underconsumption was linked to biomarkers or health outcomes, then these were classified as nutrients of public health concern and included calcium, vitamin D, fiber, potassium, and iron (in premenopausal women and female adolescents). Overconsumed nutrients of public health concern were saturated fat and sodium. In the absence of predetermined standards, population intakes of refined grains and added sugars were also identified as too high. In addition to findings on dietary intake, it was recognized that 117 million American adults had ≥ 1 preventable diet-related chronic diseases, two-thirds were overweight or obese, and most of these adults were at increased risk of chronic diseases. One in 3 children and youth were overweight or obese.

Second, the 2015 DGAC examined relations between dietary patterns and disease prevention and health promotion across the life span (excluding infants and children aged ≤ 2 y). The review of evidence indicated that there were common characteristics of healthy dietary patterns associated with wide-ranging positive health outcomes that included the following: higher intakes of vegetables, fruits, whole grains, low-fat and nonfat dairy, seafood, legumes, and nuts; moderate intake of alcohol (if consumed and among adults only); lower consumption of red and processed meats; and low intake of sugar-sweetened foods and drinks and refined grains. In its conclusions and recommendations that were related to specific outcomes, the 2015 DGAC recommended consumption within healthy dietary patterns to lower the risk of cardiovascular disease [(CVD) DGAC grade strong] and diabetes (DGAC grade moderate), to prevent overweight and obesity and to maintain healthy body weight (DGAC grade moderate), and to lower risk of colon/rectal cancer (DGAC grade moderate) and breast cancer in postmenopausal women (DGAC grade moderate).

Food pattern modeling was performed by using national population food intake data sets. These analyses identified several options to achieve healthy dietary patterns that are consistent with favorable health outcomes and reduced risks of chronic diseases, including heart disease, hypertension, stroke, diabetes, diet-related cancers, and overweight and

obesity. These modeled options were based on the USDA eating pattern and included the following 3 alternatives: a healthy US pattern, a Mediterranean-style dietary pattern, and a vegetarian-style pattern (Tables 1 and 2) (1). At most calorie levels, the modeled patterns are nutrient dense and achieve not only the 2015 DGAC food-based dietary pattern recommendations but also those for essential nutrients and underconsumed and overconsumed nutrients of public health concern. These data analyses were not graded consistent with methodologic procedures described above.

Third, the 2015 DGAC extended its evidence review to include research on the antecedents of deleterious dietary and physical activity behaviors in children, youth, and adults and on behavioral techniques that complement effective strategies for changing individuals' dietary patterns and physical activity behaviors. Frequent eating away from home in adults aged ≥ 40 y and prolonged television viewing in youth were associated with obesity risk (both DGAC grade moderate). Behavioral interventions were found to be effective in reducing recreational screen time in children aged ≤ 13 y (DGAC grade strong). Self-monitoring of diet and weight or both in the context of behavioral weight management interventions that incorporate goal setting and feedback was found to improve weight loss, particularly in adult women (DGAC grade moderate).

Fourth, the 2015 DGAC examined what modes and methods work to promote dietary behavior change at individual and population levels, including the characteristics of environmental changes needed to achieve these goals, and settings in which population-based interventions are effective. At the individual level, the DGAC concurred with the 2013 American Heart Association/American College of Cardiology/The Obesity Society Guideline for the Management of Overweight and Obesity in Adults (8) and the 2013 American Heart Association/American College of Cardiology Guideline on Lifestyle Management to Reduce Cardiovascular Risk (9). They emphasized the effectiveness

TABLE 1 Composition of 3 USDA food patterns (healthy US-style, healthy vegetarian, and healthy Mediterranean-style) at the 2000-kcal level¹

Food group	Healthy US-style pattern	Healthy vegetarian pattern	Healthy Mediterranean-style pattern
Fruit	2 c/d	2 c/d	2.5 c/d
Vegetables	2.5 c/d	2.5 c/d	2.5 c/d
Legumes	1.5 c/wk	3 c/wk	1.5 c/wk
Whole grains	3 oz eq/d	3 oz eq/d	3 oz eq/d
Dairy	3 c/d	3 c/d	2 c/d
Protein foods	5.5 oz eq/d	3.5 oz eq/d	6.5 oz eq/d
Meat	12.5 oz eq/wk	—	12.5 oz eq/wk
Poultry	10.5 oz eq/wk	—	10.5 oz eq/wk
Seafood	8 oz eq/wk	—	15 oz eq/wk
Eggs	3 oz eq/wk	3 oz eq/wk	3 oz eq/wk
Nuts/seeds	4 oz eq/wk	7 oz eq/wk	4 oz eq/wk
Processed soy	0.5 oz eq/wk	8 oz eq/wk	0.5 oz eq/wk
Oils	27 g/d	27 g/d	27 g/d

¹ 1 c = 240 mL; 1 oz = 28 g. c, cup; eq, equivalent; oz, ounce. Adapted from reference 1 with permission.

TABLE 2 Nutrients in the 3 USDA food patterns (healthy US-style, healthy vegetarian, and healthy Mediterranean-style) at the 2000-kcal level as a percent of the goal or limit for a 19- to 30-y-old woman¹

Nutrient	Healthy US-style pattern, % goal/limit	Healthy vegetarian pattern, % goal/limit	Healthy Mediterranean-style pattern, % goal/limit
Protein, % RDA	198	155	194
Protein, % energy	18	14	18
Fat, % energy	33	34	32
Saturated fat, ² % energy	8	8	8
CHO, % RDA	197	211	199
CHO, % energy	51	55	52
Fiber, % goal	109	126	112
Calcium, % RDA	127	133	100
Iron, % RDA	93	96	95
Vitamin D, % RDA	46	37	42
Potassium, % AI	71	70	71
Sodium, ² % UL	76	61	72

¹ AI, Adequate Intake; CHO, carbohydrate; UL, upper limit. Adapted from reference 4 with permission.

² Overconsumed nutrient.

of nutrition and lifestyle interventions performed by multidisciplinary teams of professionals or nutrition professionals and the importance of tailoring behavioral interventions to the biological needs and sociocultural preferences of the individual.

Community settings found to be effective for improving food-purchasing behaviors, dietary patterns, overall nutritional quality of foods and beverages consumed, and for preventing obesity or managing weight outcomes at population levels include child care programs (DGAC grade moderate), primary and secondary schools (DGAC grade moderate to strong, depending on the outcome studied), and corporate worksites (DGAC grade moderate). The 2015 DGAC noted that the most effective strategies for population level dietary and physical activity behavior changes were multifaceted such as policies that affect the type and quality of foods and beverages offered, educational and/or counseling initiatives, parental and family involvement (as appropriate), and increased opportunities for physical activity and healthy foods.

Fifth, the 2015 DGAC examined food sustainability and food safety within a food security framework. Sustainable diets reflect a pattern of eating that promotes health and well-being and provides food security for the current population while sustaining food supplies and natural resources for future generations. The DGAC concluded that its recommended healthy dietary patterns are sustainable, given their beneficial environmental impact (lower greenhouse gas emissions and lower land, energy, and water use) and conservation of land, water, and energy resources (DGAC grade moderate). The 2015 DGAC interpreted these findings as creating new opportunities for education and public health communications on healthy dietary patterns and offering potential new ways for motivating consumers on the importance of healthy dietary patterns and lifestyle.

For food safety, the DGAC concluded that the health benefits outweigh concerns about safety and contamination of wild and farmed seafood (DGAC grade moderate) but cautioned that the productivity of capture fisheries is fully exploited and needs to be carefully managed (DGAC grade strong). Caffeine intake up to the equivalent of 5 cups of caffeinated coffee/d in adults was found to be safe (DGAC grade strong) and, in moderate amounts, is associated with reduced risk of CVD, type 2 diabetes, and Parkinson disease in healthy adults (DGAC grade moderate). The 2015 DGAC also concluded that aspartame as currently consumed is safe and does not pose health risks in healthy individuals without phenylketonuria (DGAC grade moderate).

Sixth, the 2015 DGAC considered the cross-cutting topics of sodium, saturated fat, and added sugars. The DGAC concluded that the body of evidence indicates that higher intakes of sodium increases the risk of CVD (DGAC grade moderate); that replacing saturated fat with polyunsaturated fats (but not carbohydrates of undefined quality) lowers the risk of CVD (DGAC grade strong); that higher consumption of added sugars, particularly sugar-sweetened beverages, increases the risk of type 2 diabetes (DGAC grade strong), coronary heart disease, hypertension, elevated blood pressure, and stroke (DGAC grade moderate); and that higher intakes of free sugars are linked to the development of dental caries in children and adults (DGAC grade moderate).

Seventh, the 2015 DGAC brought forward and endorsed the HHS recommendations from the policy document 2008 Physical Activity Guidelines for Americans (10). Physical activity recommendations, part of the DGA since 2000, were included in the 2015 DGAC report because structured exercise accompanies and complements dietary behavior change and can act synergistically with diet to promote health and to reduce disease risks. The 2015 DGAC advocated regular physical activity by the US population at all ages, including older adults and those with cognitive disabilities (DGAC grade strong). The DGAC noted the benefits of regular physical activity for wide-ranging health outcomes, including CVD, type 2 diabetes, overweight and obesity, bone health, cardiorespiratory and muscular fitness, colon and breast cancers, metabolic syndrome, functional health, cognition, and mental health (DGAC grade strong). The DGAC emphasized that every effort should be made to encourage and facilitate programs at multiple levels so that children, adults, and older adults meet the 2008 Physical Activity Guidelines for Americans and encouraged that environments in wide-ranging community settings be modified through policies and programs to create cultures of health that support regular physical activity and a healthy diet.

Post-DGAC Report Release

Throughout the 2015 DGAC process, wide public discourse was encouraged by an open and transparent process. After publication of the DGAC Scientific Report, formal public comment continued, and the public comment period was extended because of high levels of interest. There were lobbying efforts to add riders to the House and Senate Appropriations

bills that would limit the translation of the 2015 DGAC report into the DGA and federal policy. In response, preeminent medical and nutrition organizations, including the American Medical Association, the American Academy of Pediatrics, the American Society for Nutrition, the Academy of Nutrition and Dietetics, and the American Institute for Cancer Research, issued strong statements in support of the 2015 DGAC report. The secretaries of the HHS and the USDA issued a formal public statement in response to the public discourse that emphasized the deliberative and evidence-based process used by the 2015 DGAC. They further stated that "One of our government's most important responsibilities is protecting the health of the American public, and that includes empowering them with the tools they need to make educated decisions. Since 1980, families, nutrition, and health professionals across the nation have looked to the Departments of Health and Human Services and Agriculture for science-based dietary guidelines to serve as a framework for nutritious eating. The guidelines help our citizens make their own informed choices about their diets and create a roadmap for preventing diet-related health conditions, like obesity, diabetes, and heart disease. They also provide guidance to public and private programs and support efforts to help our nation reach its highest standard of health. Diet is one of the most powerful tools we have to reduce the onset of disease and the amount of money we spend on health care. The HHS and the USDA required the 2015 DGAC to conduct a rigorous, systematic, and transparent review of the current body of nutrition science. Following an open process over 19 mo, documented for the public (5), the external expert committee submitted its report to the Secretaries of the HHS and the USDA." The HHS and the USDA considered the Scientific Report of the 2015 DGAC, along with comments from the public and input from federal agencies, to develop the 2015 DGA that was recently released (11).

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