

Overcoming the Challenges of Translating the US Dietary Guidelines Into Healthier Grain-Based Foods

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How can we translate the *2010 US Dietary Guidelines for Americans* recommendations into grain-based foods that are more nutrient-rich, less calorie-dense, and more widely available to consumers? Grain-based foods are highly consumed and have the opportunity to be modified to provide healthier attributes. All segments of the food delivery system, from science (theory) to consumers (practice), need to work together in an integrated and multifaceted process that delivers grain-based foods richer in whole grain and fiber with smaller portion sizes and less solid fat, added sugars, and sodium, while still having a desirable taste profile and being accessible to the end consumer. A gradual shift in the amount of these ingredient/nutrient categories could be achieved by setting incremental goals through collective knowledge, targeted research, policy recommendations, and a supportive regulatory environment. A greater abundance of accessible, healthier foods in targeted food environments, in unison with nutrition education, may be a more realistic approach for helping consumers come closer to meeting dietary guidance.¹
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The *2010 Dietary Guidelines for Americans*¹ and predecessors to this highly regarded report provide information and advice for choosing a healthy eating pattern. Yet, Americans continue to fall short of meeting most recommendations. As pointed out in the *2010 Dietary Guidelines*, Americans consume too many calories (energy)—nearly three-fourths of men and two-thirds of women are overweight or obese²—along with excess amounts of sodium, solid fats, added sugar, and processed grains and not enough vegetables and fruits, whole grains, fiber, and key nutrients (Figure). Much emphasis is placed on establishing the scientific basis for dietary guidance, but less effort focuses on aligning the food industry (food manufacturers and ingredient companies), trade associations, food service and culinary professionals, the medical community, policy makers, and other interested parties to direct food formulation and product development to help make it easier for consumers to eat in a way that supports this guidance. The need to address collaboration is urgent, as not doing so has implications for national security, public healthcare costs, and the well-being of our future generations.³ This article addresses the challenges within the current US food system, along with a suggested framework for supporting US dietary guidance with collective solutions that create food environments

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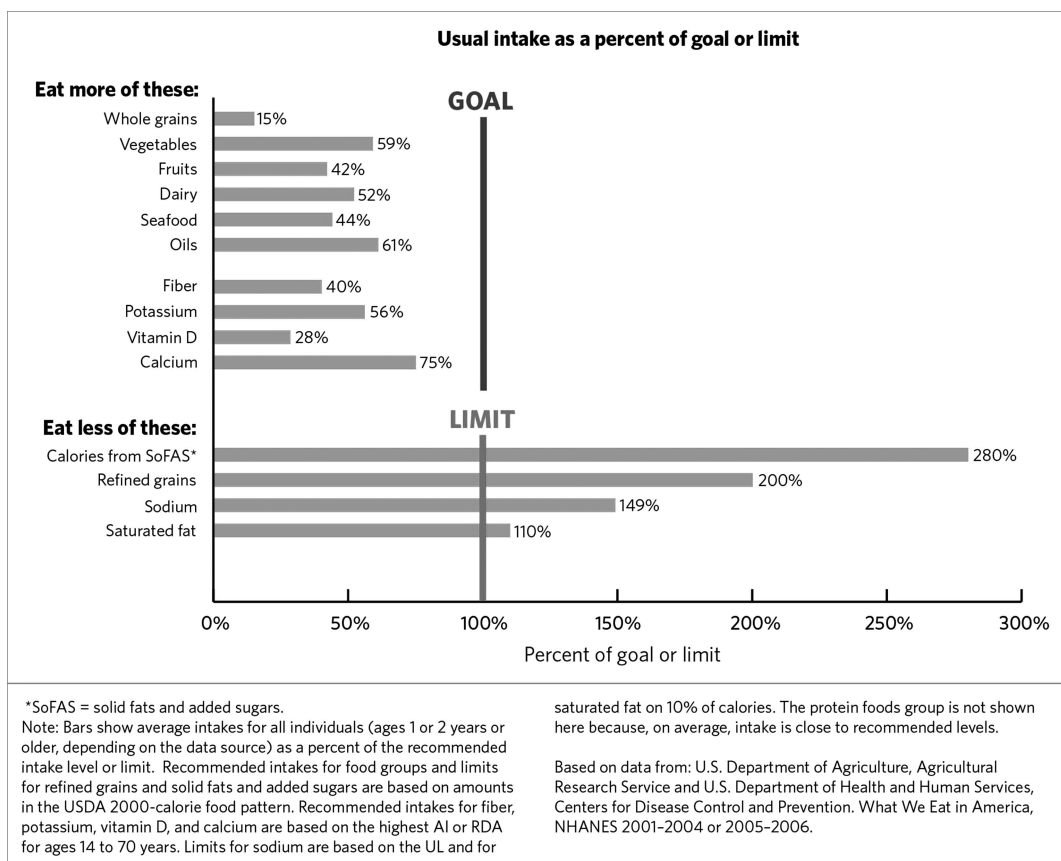


FIGURE. Dietary intakes in comparison to recommended intake levels or limits.¹

with practical, healthier, affordable, and desirable foods in supermarkets, restaurants, homes, and other venues.

CHALLENGES

Current Food Environment

The US food system has slowly evolved to include a high percentage of high-calorie, low-nutrient, highly palatable foods.⁴ With longer working hours, fewer stay-at-home parents, and less time to prepare meals at home, the demand for and production of convenient processed foods have dramatically increased.⁵ Larger portion sizes, greater availability and variety of snack foods, and expanding fast-food venues have created an unhealthy environment of calorie-rich and nutrient-poor foods that distract Americans from healthful foods such as whole grains, legumes, fruits and vegetables, and low-fat dairy products.⁶ Convenience foods containing higher levels of sodium, fat, and sugar and are low in whole grain and dietary fiber are typically more accessible and lower cost than alternatives with more nutritional value, making them more appealing and easier to incorporate as everyday foods.⁷ Proximity to fast-food outlets and limited access to supermarkets in “food deserts” may also adversely influence food choices, particularly in low-income areas.⁸

Food cost is critical for people living in poor neighborhoods as compared with those living in areas of affluence.⁹ Those with lower incomes are less likely to meet the *Dietary Guidelines* for healthful foods such as vegetables and milk.¹⁰ Following the *Dietary Guidelines* can be more expensive; in contrast, getting more calories from saturated fat and sugar reduces costs.¹¹ Despite education’s best effort, this population may not have the opportunity to choose foods that meet the *Dietary Guidelines* because of barriers such as access or cost constraints.¹²

Nutrition Education/Labeling of Foods Has Not Consistently Changed Eating Behavior

Health-related professionals continue to search for successful strategies for changing food behavior. Unfortunately, most Americans say that they do not use the food package label, and only a small percentage of shoppers report using all the information on the label.¹³ Results are similar in restaurants, where calorie labeling has not had the desired effect of reducing calories purchased or consumed.¹⁴ Although diets appear to be more healthful among label users, the food label alone is unlikely to modify food-purchasing behavior.¹⁵ A greater abundance of accessible healthful foods in targeted food environments, in unison with nutrition education, may be a more realistic

approach for helping consumers come closer to meeting dietary guidance.¹

Calls for Change Are Being Made by Numerous Parties

Government agencies,¹⁶ health-related organizations,¹⁷ advocacy groups,¹⁸ and scientists¹⁹ are exerting considerable pressure for change in the food supply to promote human health. The *2010 Dietary Guidelines* ask for new food introductions and reformulation of prepared foods that more closely meet *Dietary Guidelines* while delivering good taste and convenience within cost constraints.¹ *Healthy People 2020*²⁰ calls for incentivizing retail outlets to provide foods that are consistent with the *Dietary Guidelines* and increasing access to such retail outlets. Consumer advocacy organizations such as the Center for Science in the Public Interest are championing increased taxes on “unhealthy” foods such as beer, soft drinks, and others, while calling for drastic reductions to sodium content of the food supply.^{21,22}

RISING TO THE CHALLENGE FROM THE 2010 DIETARY GUIDELINES ADVISORY COMMITTEE

The Dietary Guidelines Advisory Committee (DGAC) notes that “A coordinated strategic plan that includes all sectors of society, including individuals, families, educators, communities, physicians and allied health professionals, public health advocates, policy makers, scientists, and small and large businesses (eg, farmers, agricultural producers, food scientists, food manufacturers, and food retailers of all kinds), should be engaged in the development and ultimate implementation of a plan to help all Americans eat well, be physically active, and maintain good health and function.”²³ More than in past reports, the 2010 DGAC emphasized the importance of creating a healthier food environment. Improving the nutritional profile of the food supply could support these consumer education efforts to sustain long-term behavioral change.

Industry Is Best Positioned to Translate Policy Into Products

Currently, the healthy choice may not be the first or easiest choice for many Americans—availability and access to the healthier choice may be limited by economic constraints and perceived lack of convenience. Ideally, the food supply chain could reduce (and absorb) this complexity, allowing consumers to make healthier choices with less effort and required knowledge of health and nutrition.³ Food and ingredient industries are uniquely positioned with the technical expertise to gradually make changes that improve the nutritional profile of their products, moving toward dietary recommendations while main-

taining or even improving their consumer acceptance.²⁴ This removes the burden from the consumer. Positive changes by industry must be concomitantly supported by the other factions within the supply chain and food environment (infrastructure). Policy and regulatory agencies will need to support and even reward these efforts and allow them time to be implemented. In addition to food manufacturers gradually introducing healthier foods into the food environment, success will be predicated on an integrated and multifaceted approach focusing on holistic health. It will be imperative that the built environment, physical activity, and economic and sociocultural influences are all moving in a positive, reinforcing, and synchronous manner to support consumer well-being.

A successful example of product change is whole-grain-rich, lower-sodium, lower-fat pizza, which is available for school meals and has limited availability in the food service and retail market.²⁵ Because pizza is widely consumed and accepted and is made up of several different food groups, it has the potential to be a healthier staple that targets acceptable levels of whole grain, vegetables, and dairy with lower fat and sodium. Modifications to the crust to include whole-grain flour have been made without affecting acceptance among school children.²⁶ Making these healthier pizza products more accessible to consumers will require targeting acceptable levels of whole grain and fiber and ensuring the right supply chain sectors work together to build the proper infrastructure. This meaningful collaboration will allow for continuity between sectors and lead to collective solutions for other healthy grain foods.

Pizza may serve as a model for other foods that could be modified to more closely meet *Dietary Guidelines* recommendations while satisfying consumer expectations for cost, taste, and convenience. A gradual shift in the amount of whole grain incorporated into other grain-based foods could provide an organized process for increasing the availability of desirable, tasty, affordable, and healthful foods for consumers, particularly for underserved populations.

Manufacturers of grain-based foods can consider the “stealth” addition of whole-grain ingredients.²⁷ Small and gradual modifications to the types of grain food staples eaten by millions of Americans every day, combined with aggressive consumer education and awareness building of the health benefits of whole grain, can help create and sustain a grain food industry that better supports dietary guidance. This was demonstrated in a study of elementary school children when up to 91% whole red-and-white wheat flour was gradually introduced in buns and rolls over the course of 1 school year. The results showed that consumption of whole grains increased significantly, and acceptability did not differ until the 72% level for red and 67.5% level for white whole wheat.²⁸

Finding a Level Playing Field for Introducing Healthier Food Options in the Marketplace

Without a coordinated and comprehensive effort supported by all sectors that influence the food supply, companies may be hesitant to initiate widespread change for fear of being alone in their efforts. Although product change poses risk, creation of an industry-wide infrastructure providing clear guidelines and incentives for healthier food products would allow for shared risk across the food system. This will require expertise from each sector (academia, government, industry and scientific/trade organizations, activist groups) and discipline (plant geneticists, research scientists, product development experts), along with consumer groups, for a democratic, systematic, and collective solution within the context of the overall food supply and specific eating environments.

What support does the food industry need to remain profitable? Considerable resources, including time, are involved with the introduction and reformulation of food to enhance health attributes, and industry members who voluntarily modify their product lines may be punished in the marketplace if consumers continue to prefer less healthful products that are widely available and have a better cost and taste profile. For example, Frito-Lay Sun Chips required 10 years of research and development at a considerable cost to create a healthier alternative with a similar taste experience similar to a full-fat potato chip. Cost-benefit ratio is a major barrier because of costs associated with capital investment in new equipment, labor, effective ingredients for health, functionality and quality, new technologies, storage, shelf life, and subsequent product price, combined with the uncertainty of consumer acceptance and marketplace success.

Industry-wide guidelines for product formulation and development can direct the increase of healthful components such as whole grain and fiber; reduce fat, added sugars, and sodium; and manage portion size and lower-calorie density, all in products with taste profiles that are appealing to consumers and profitable to food suppliers, manufacturers, and retailers. At the same time, consumers may prefer the taste of whole grain with incremental changes in sodium, fat, and sugar favoring dietary guidance.²⁸

ACHIEVING COLLECTIVE SOLUTIONS

Understanding how the food supply chain can be leveraged to improve health would be achieved when representatives from each sector come together to agree on aligned goals. New research should be prioritized and support system-wide changes by addressing gaps in the food supply chain, food environment, and food product attributes. The desired outcome is to translate the science into food through targeted development and delivery of healthier foods that are affordable, desirable, and practical for con-

sumers. In order to get to this point, the following questions should be answered:

- How can we align food supply stakeholders to guide food formulation and product development to make it easier for consumers to eat in a way that supports dietary guidance?
- Is there an approach that simultaneously encourages new ingredient and innovative technology development, supports a profitable industry business model, and delivers products with enhanced nutritional value that appeal to consumers?

Success will depend on our ability to integrate the food system in developing healthier products with the appealing taste that the public demands while in concert with new ingredients, innovative technologies, and business models to support this effort.^{19,29,30}

Develop Collaborative Partnerships Across the Sectors and Disciplines

As a first step, a collaborative multidisciplinary committee is necessary to solidify the project scope and the overall approach. This would result in an expanded network of working partnerships from across the food supply chain that could identify and prioritize real issues and gaps. With meaningful collaboration and the application of collective knowledge, targeted research, policy recommendations, and a supportive regulatory environment will result. Ultimately, partnerships can positively influence health through healthier foods.

Change Is Gradual and Unified and Transverses Across the Food Industry

Product development guidelines would be best implemented with gradual change over a 10- to 15-year period and would permit specific incremental targets to develop products and gradually introduce them in a way that would allow for consumer adaptation. Change would be in unison with 5-year incremental changes that parallel the *Dietary Guidelines*. Any modifications in sodium, fat, sugar, whole grain, and fiber content must be slow and deliberate and must never exceed the threshold whereby consumers find products to be unacceptable. The health attributes of foods would improve over time, with decreased solid fats and added sugars and increased whole grain and dietary fiber, as a consumer driver. Action by the consumer to move away from 1-step processed cooking toward more scratch cooking or multistep food production would also alleviate some of the pressure on industry alone to meet these food attributes.

Can Incentives Improve the Availability of Healthier Foods in the Marketplace?

Incentives typically drive priorities and behavior within a supply chain.³¹ Without collaboration, each entity tends to have its own priorities and goals and might not be focused on the needs of other supply chain members, or the entire

system. This can result from lack of alignment toward common goals, making assumptions about the other participants and their motivations, or lack of cross-organizational information sharing.^{31,32} If health-driven objectives are aligned with incentives and rewards for outcome-based behaviors, the supply chain has the potential to deliver products with an improved nutritional profile to positively influence public health.

WHAT DOES SUCCESS LOOK LIKE IN TRANSLATING US DIETARY GUIDELINES INTO HEALTHIER EATING?

- The sectors, disciplines, and consumer come together with the purpose of working toward more, healthier foods available in the marketplace. The healthy choice becomes the easier choice for consumers.
- The food environment is aligned with *Dietary Guidelines* recommendations.
- Industry-wide guidelines are defined, accepted, and implemented to introduce healthier foods through direct participation and open dialogue of all sectors, representative disciplines, stakeholders, and citizens.

CONCLUSION

It is anticipated that the *2015 Dietary Guidelines for Americans* will echo the *2010 Dietary Guidelines*, which provided a call to action to increase the “opportunities for Americans to purchase and consume healthy foods.”¹ This suggests that all involved parties—government, food industry, restaurant professionals, researchers, the medical community, advocacy groups, and, importantly, consumers—need to work together to guide policy and create food products that make it easier for consumers to eat for health. In pursuit of achieving better health, food companies, government agencies, and nonprofit/trade organizations can collectively create a vision and strategic plan that will translate dietary guidance into healthful foods that are accessible, affordable, and desirable. The 2015 DGAC could take the first step in translating the *Dietary Guidelines* into recommendations by product category that could guide food industry product formulation, recipe development in restaurants, and ultimately help consumers more closely meet dietary guidance.

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REFERENCES

1. US Department of Agriculture and US Department of Health and Human Services. *Dietary Guidelines for Americans*. 7th ed, Washington, DC: US Government Printing Office; 2010.
2. Flegal KM, Carroll MD, Ogden CL, Curtin LR. Prevalence and trends in obesity among US adults, 1999–2008. *JAMA*. 2010; 303(3):235–241.
3. Mission: Readiness Military Leadership for Kids. Too Fat to Fight. <http://www.missionreadiness.org/2010/too-fat-to-fight/>. Accessed July 10, 2012.
4. Lin B-H, Guthrie J. *Nutritional Quality of Food Prepared at Home and Away From Home, 1977–2008, EIB-105*. Washington, DC: US Department of Agriculture, Economic Research Service; 2012.
5. Popkin BM, Gordon-Larson P. The nutrition transition: worldwide obesity dynamics and their determinants. *Int J Obes Relat Metab Disord*. 2004;28:S2–S9.
6. Duffey KJ, Popkin BM. Energy density, portion size, and eating occasions: contribution to increased energy intake in the United States, 1977–2006. *PLoS Med*. 2011;8(6):e1001050.
7. Aggarwal A, Monsivais P, Drewnowski A. Nutrient intakes linked to better health outcomes are associated with higher diet costs in the US [published online ahead of print May 25, 2012]. *PLoS One*. 2012;7(5):e37533.
8. Boone-Heinonen J, Gordon-Larsen P, Kiefe CI, Shikany JM, Lewis CE, Popkin BM. Fast food restaurants and food stores: longitudinal associations with diet in young to middle-aged adults: the CARDIA study. *Arch Intern Med*. 2011;171(13):1162–1170.
9. Papas MA, Alberg AJ, Ewing R, et al. The built environment and obesity. *Epidemiol Rev*. 2007;29:129–143.
10. Kirkpatrick SI, Dodd KW, Reedy J, Krebs-Smith SM. Income and race/ethnicity are associated with adherence to food-based dietary guidance among US adults and children [published online ahead of print April 25, 2012]. *J Acad Nutr Diet*. 2012; 112(5):624.e6–635.e6.
11. Monsivais P, Aggarwal A, Drewnowski A. Following federal guidelines to increase nutrient consumption may lead to higher food costs for consumers [published online ahead of print August 3, 2011]. *Health Aff (Millwood)*. 2011;30(8):1471–1477.
12. Webber CB, Dollahite JS, Sobal J. Food access by low-income households dependent on hierarchy of resources. *J Am Diet Assoc*. 2008;108:9(A109).
13. Chen X, Jahns L, Gittelsohn J, Wang Y. Who is missing the message? Targeting strategies to increase food label use among US adults [published online ahead of print September 7, 2011]. *Public Health Nutr*. 2012;15(5):760–772.
14. Swartz JJ, Braxton D, Viera AJ. Calorie menu labeling on quick-service restaurant menus: an updated systematic review of the literature. *Int J Behav Nutr Phys Act*. 2011;8:135.
15. Ollberding NJ, Wolf RL, Contento I. Food label use and its relation to dietary intake among US adults. *J Am Diet Assoc*. 2010;110(8):1233–1237.
16. Pray L, Pillsbury L. *Building Public-Private Partnerships in Food and Nutrition: Workshop Summary*. Washington, DC: Institute of Medicine National Academy of Sciences; 2012.
17. McKeown NM, Jacques PF, Seal CJ, et al. Whole grains and health: from theory to practice—highlights of the Grains for Health Foundation’s Whole Grains Summit 2012. *J Nutr*. 2013; supplement: 1–15.
18. Centers for Science in the Public Interest. Following new IOM report, CSPI urges consumers, industry, and government to reduce sodium. <http://www.cspinet.org/new/201305141.html>. Accessed June 11, 2013.
19. Marquart L, Hauge D. Food technology innovations: formulating grain-based foods that support dietary guidance. *Cereal Foods World*. 2012;57(1):10–12.
20. *Healthy People 2020*—Improving the health of Americans. <http://www.healthypeople.gov/>. Accessed July 14, 2012.
21. Center for Science in the Public Interest. Salt: the forgotten killer. <http://www.cspinet.org/salt/>. Accessed March 27, 2013.
22. Center for Science in the Public Interest. Sugary Drink Taxes. <http://www.cspinet.org/liquidcandy/sugarydrinktaxes.html>. Accessed March 27, 2013.
23. Dietary Guidelines Advisory Committee. *Report of the Dietary Guidelines Advisory Committee on the Dietary Guidelines for Americans, 2010, to the Secretary of Agriculture and the*

Secretary of Health and Human Services. Washington, DC: US Department of Agriculture, Agricultural Research Service; 2010.

24. Pray L, Pillsbury L. *Leveraging Food Technology for Obesity Prevention and Reduced Effort: Workshop Summary*. Washington, DC: Institute of Medicine National Academy of Sciences; 2011.
25. Schwan's BIG DADDY'S® Bold 16" Rolled Edge Cheese Pizza and SPECIAL RECIPE™ Four Cheese Pizza. <http://www.schwans.com>. Accessed June 16, 2013.
26. Chan HW, Burgess Champoux T, Reicks M, et al. White whole-wheat flour can be partially substituted for refined-wheat flour in pizza crust in school meals without affecting consumption. *J Child Nutr Mgmt*. 2008;32(1).
27. Mancino L, Kuchler F, Leibtag E. Getting consumers to eat more whole-grains: the role of policy, information, and food manufacturers. *Food Policy*. 2008;33:489–496.
28. Rosen RA, Sadeghi L, Schroeder N, et al. Gradual incorporation of whole wheat flour into bread products for elementary school children improves whole grain intake. *J Child Nutr Manag*. 2008;32(2).
29. Rosen RA, Hauge D, Maschoff B, Haymond A, McCurry S, Marquart L. Developing and delivering healthier grain-based foods. *Nutrition Today*. 2011;46(2):68–74.
30. Hauge D, McCurry S, Engleson S, Fulcher G, Hesse D, Marquart L. Grains for health: a look to the past and insights into the future. *Cereal Chem*. 2010;87:155–158.
31. Narayanan VG, Raman A. Aligning incentives in supply chains. *Harvard Bus Rev*. 2004;82:94–102.
32. Cohen SA, Kulp S, Randall T. Motivating supply chain behavior: the right incentives can make all the difference. *Supply Chain Manage Rev*. 2007;11:18–24.

CALENDAR

2nd International Conference on Nutrition and Growth

January 30–February 1, 2014

Barcelona, Spain

<http://www2.kenes.com/nutrition-growth/pages/home.aspx>

The 3rd International Conference on Food Digestion

March 11–13, 2014

Wageningen, the Netherlands

<http://www.cost-infogest.eu/Home/News/3rd-ICFD>

Society of Behavioral Medicine Annual Meeting

April 23–26, 2014

Philadelphia, Pennsylvania

<http://www.sbm.org/meetings/2014>

DOI: 10.1097/NT.0000000000000007

Experimental Biology

April 26–30, 2014

San Diego, California

<http://www.experimentalbiology.org/2014/Home.aspx>

The 6th Asian Congress of Dietetics-6th ACD2014

Taipei, Taiwan

August 21–24, 2014

<http://www.acd2014.org/registration.html>