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## POTENTIAL IMPACTS OF 2010 DIETARY GUIDELINES FOR AMERICANS

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**W**ill the Dietary Guidelines for Americans (DGA) 2010 (USDA, FDA 2011a) be any more effective at changing food consumption patterns and reducing obesity than the previous guidelines? If so, what impacts would there be on the U.S. agriculture sector, on trade, and on food processing and retailing? Beyond the issuance of guidelines and related promotional/educational activities, what changes in policies have the propensity to make a difference? A series of four theme papers can only begin to scratch the surface in providing answers to these, often politically charged, questions. The papers can, however, provide insight into the complexity of the issues and the role that applied economists might play in dealing with issues related to the dietary guidelines. While leaving the economic content to the authors of the papers, my objective in the overview is to provide perspective on why these particular topics were selected, what central conclusions might be drawn from them, and their implications for research, teaching, and extension.

### DGA History

The history of the dietary guidelines is well documented in the literature. Davis and Saltos (1999) chronicle the history of guidelines that date back to 1894. Nestle's *Food Politics* (2007) adds an important political perspective to the development and implementation of the guidelines through the food pyramid era. The contemporary, science-based era of the guidelines began in 1968 with the deliberations of Senator McGovern's Senate Select Committee on Nutrition and Human Needs. These deliberations were science-based in that the committee staff utilized the expertise of nationally-recognized dietary and medical experts in crafting their recommendations. The issuance of its *Dietary Goals for the United States* in 1977, which recommended substantially reduced consumption of saturated fats, sugar, and salt, set off a firestorm of concerns among beef, pork, meat packers, milk, and caloric-sweetener interest groups. Utilizing the work of McGovern's Select Committee, USDA's Assistant Secretary for Food and Consumer Services, Carol Foreman, in 1979 had *Food: A Hassle Free Guide to a Better Diet* published. In many respects, the rest is history. Now required by law to be issued every five years, with each iteration, the DGAs become more objectively focused to solve diet and health-related problems, more science-based, and more prescriptive in terms of needed public- and private-sector action. While the guidelines issued subsequent to the work of McGovern's Select Committee and Carol Foreman have changed in detail, the basic nutrition and dietary message has not changed—eat right and exercise.

Carol Foreman (December 17, 1977) had the notion that consumers should first be educated to eat right; then government should provide the incentives to produce the recommended commodities. Some concluded that such government incentives would be overly invasive and reasoned that market forces could perform this production allocation function. However, they ignored the fact that government had already invaded agricultural production through a myriad of subsidy programs, which continue to the present.

Policymakers treated fruits and vegetables as an orphan sector. At times, fruits and vegetables were discriminated against overtly by denying subsidies to farmers who desired to use farm program flexibility provisions to produce fruits and vegetables. Arguably, fruit and vegetable producers asked that subsidized program farmers be denied the "right" to use program land to produce fruits and vegetables. But, in the process, consumers were denied access to U.S. produced products, to the benefit of foreign-produced products.

The organization of this set of articles reflects a desire that, to the extent possible, the profession's analyses and models consider the full scope of products consumed and produced by the agriculture sector. This DGA impacts theme begins with an interdisciplinary summary analysis of the obesity challenges faced by an increasing share of the population, written by Duffy, Yamazaki, and Zizza. This is followed by two articles that encompass the impacts of

the DGA 2010, initially on consumer decisions and then on production decisions. The first of these articles, by Palma and Jetter, recognizes that the DGA mission is to create balanced diets from a consumer perspective that cuts across all foods. The second of these articles, by Ribera, Yue, and Holcomb, recognizes that increases in the consumption of fruits, vegetables, and fish, with corresponding reductions in the consumption of red meat and butter, would have implications that cut across the entire agriculture sector. The final article by Thilmany and Low addresses the need to keep the food supply chain open to U.S. produced local foods, which are primarily fruits and vegetables.

### **DGA 2010 and the Obesity Epidemic**

Duffy, Yamazaki, and Zizza note that the DGA 2010 reflects greatly increased national concern about the rise in obesity that has occurred over the past two decades. Palma and Jetter note that, at first glance, the DGA 2010 guidelines may not appear to be a whole lot different in food group recommendations than the DGA 2005. The differences are in the detail within the food groups. Consistent with the obesogenic DGA 2010 theme, Palma and Jetter make the key point that there is a need to reduce caloric intake from the current average 2,600 calories. This translates to a need to substantially reduce consumption of foods containing large quantities of fats, oils, sugar, and high fructose corn sweeteners. In particular, this means less consumption of sweetened drinks—not just soft drinks, fried foods, and fatty meats, which are typical components of fast food. Nevertheless, the specific recommendations on these predominant food ingredients are difficult to follow.

Ribera, Yue, and Holcomb point out that substituting fish for beef, pork, and poultry for two meals per week has important implications for the livestock subsector, as does the DGA 2010 recommendation that meat consumed needs to be lean. The recommendations that beans are a substitute protein source and soymilk is a substitute for lowfat milk also have important implications for both animal and plant production agriculture. In addition, they emphasize the need to increase consumption of whole grains, while reducing consumption of enriched, refined grains. The DGA 2010 winners would be the fruit and vegetable subsectors. However, the Ribera, Yue, and Holcomb analysis indicated that a substantial share of this increased consumption could come from imports. In sum, these are significant changes which, *if they occur*, would have important implications for the agriculture sector.

### **Perspective on Behavioral Economics**

Palma and Jetter conclude that past guidelines do not appear to have had much impact on consumption patterns, which is borne out by trends in obesity as documented by Duffy, Yamazaki, and Zizza. Is there any hope that DGA 2010 will be different? Duffy, Yamazaki, and Zizza conclude that understanding dietary choices requires multidisciplinary behavioral analysis. This conclusion is an important message for economists and for policymakers, who see economic incentives embodied in various forms of fat taxes as a solution to obesity and dietary change. It may be that nutritionists operating in cooperation with medical professionals prescribing solutions to health problems would have greater impacts. Wansink (2010) points out that nutrition must be marketed to change behavior. People must “reengineer” themselves to think differently about foods, exercise, and weight.

### **Perspective on Changes in the Marketing System**

One of the reviewers suggested that the paper on local foods by Thilmany and Low does not fit with the DGA theme. It is a fact that local foods place a heavy emphasis on the fruits and vegetables historically recommended by the DGA. From a strategic perspective, agricultural, food processing, food service, and food marketing interest groups need to be very careful in designing strategies for dealing with the dietary guidelines. Continuing to ignore the science-based nature of the guidelines and the related lifestyle changes may be a mistake at a time when obesity and its adverse health consequences are a focal point of attention. During these times, there may be much greater opportunities to profitably market nutrition. The complexities of the behavioral issues are clearly indicated in the work by Wansink (2010), Kessler (2009), and Nestle (2007). While still a small share of sales, organic foods have been turned into a positive development by all components of the food supply chain. That is, much to the chagrin of smaller farmers, the organic market is becoming co-opted by commercial segments of the food value chain from farm-to-table. An implication of the Thilmany and Low paper is that local foods may represent a significant challenge to food retailers and food service operators that typically have placed more emphasis on imports than on accessing and marketing local foods.

### **Implications for the DGA 2010 Implementation**

The contemporary center of controversy regarding the DGA 2010 is not so much in their content as in how they are to be implemented. Disputes between school administrators and parents over the nutritional value of school lunch versus bag lunches could spill over into the SNAP, WIC, and related programs. Insights into the FDA and USDA strategies are contained in the questions and answers segment of the DGA 2010. They appear to be considerably

more aggressive than for previous DGA implementation strategies (USDA, FDA 2011b). They are discussed in the Palma and Jetter paper.

Research, historically, appears to have ignored the complexity of DGA issues relating to grains, fats and oils, and the livestock and dairy sectors. These complexities are but one signal indicating an expanded need for multidisciplinary research, teaching, and extension approaches to dealing with the food consumption, production, and marketing issues raised by the DGA 2010. Major behavioral changes in consumption patterns must take place to effectively deal with diet-health issues such as obesity. These changes have important multidisciplinary dimensions. In addition, applied economists have an important role in identifying policy options that can facilitate the structural and behavioral changes needed to address the evolving USDA and FDA issues.

#### **For More Information**

Davis, C. and Saltos, E. (1999). How They Have Changed Over Time. In: *America's Eating Habits: Changes and Consequences*. Washington, D.C.: USDA, Economic Research Service AIB 750. Available online: <http://www.ers.usda.gov/publications/aib750/aib750.pdf> (accessed February 13, 2012).

Foreman, C.T. (December 17, 1977). Toward a U.S. Food Policy. In: *1978 Food and Agricultural Outlook*. Washington, D.C.: U.S. Senate Committee on Agriculture, Nutrition, and Forestry.

Kessler, D.A. (2009). *The End of Overeating: Taking Control of the Insatiable American Appetite*. New York, NY: Rodale, Inc.

Nestle, M. (2007). *Food Politics: How the Food Industry Influences Nutrition and Health*. Berkeley, CA: University of California Press.

U.S. Department of Agriculture (USDA) Science and Education Administration. (1979). *Food: A Hassle Free Guide to a Better Diet*. (Home and Garden Bulletin No. 228).

U.S. Department of Agriculture and U.S. Food and Drug Administration (USDA, FDA). (2011a). *Dietary Guidelines for Americans, 2010*. Available at: <http://www.cnpp.usda.gov/dietaryguidelines.htm> (accessed February 16, 2012).

U.S. Department of Agriculture and U.S. Food and Drug Administration (USDA, FDA). (2011b). Questions and Answers on the 2010 Dietary Guidelines for Americans. *Dietary Guidelines for Americans, 2010*. Available at: <http://www.cnpp.usda.gov/Publications/DietaryGuidelines/2010/PolicyDoc/QandA.pdf> (accessed February 16, 2012).

U.S. Senate Select Committee on Nutrition and Human Needs. (1977). *Dietary Goals for the United States* (2nd ed.).

Wansink, B. (2010). *Mindless Eating: Why we eat more than we think*. New York, NY: Bantam Books.

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## CAN THE DIETARY GUIDELINES FOR AMERICANS 2010 HELP TRIM AMERICA'S WAISTLINE?

**Patricia Duffy, Fumiko Yamazaki, and Claire A. Zizza**

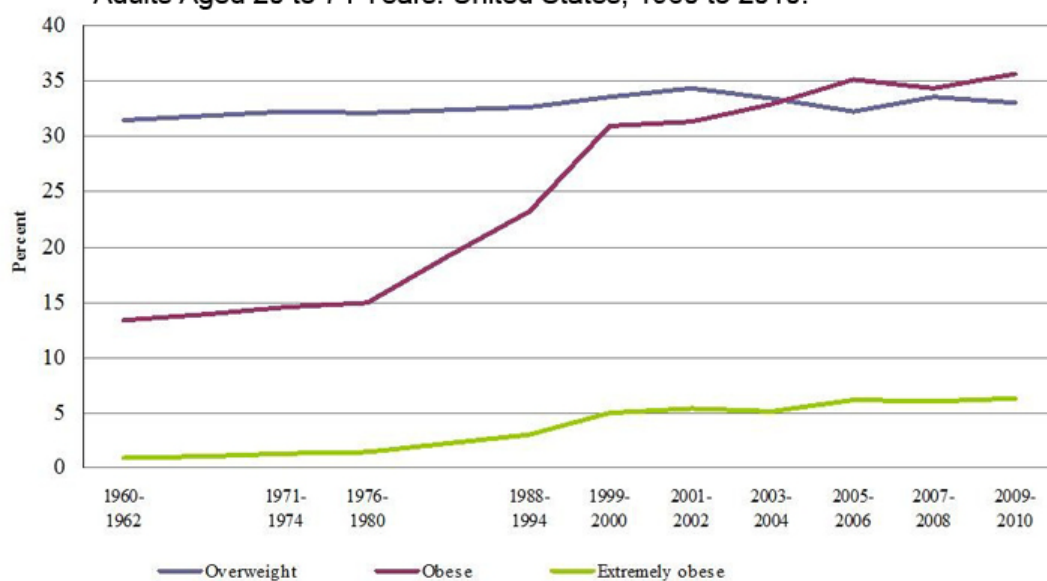
JEL Codes: I18, Q18

Keywords: Dietary Guidelines, Obesity

**F**or the first time since the series began in 1980, the Dietary Guidelines for America 2010 (DGA 2010) call for coordinated efforts from all sectors to improve the U.S. food environment to promote healthful choices that could lead to a decrease in rates of obesity and overweight. This article discusses the rise in numbers of overweight and obese people in the United States and reasons for concern about the increase in average body weight. It presents an overview of scientific literature on the likely causes for the rapid increase in obesity in the past 30 years. Finally, it examines the possible steps that could make the DGA 2010 more effective at managing the national waistline.

### The “Obesity Epidemic”

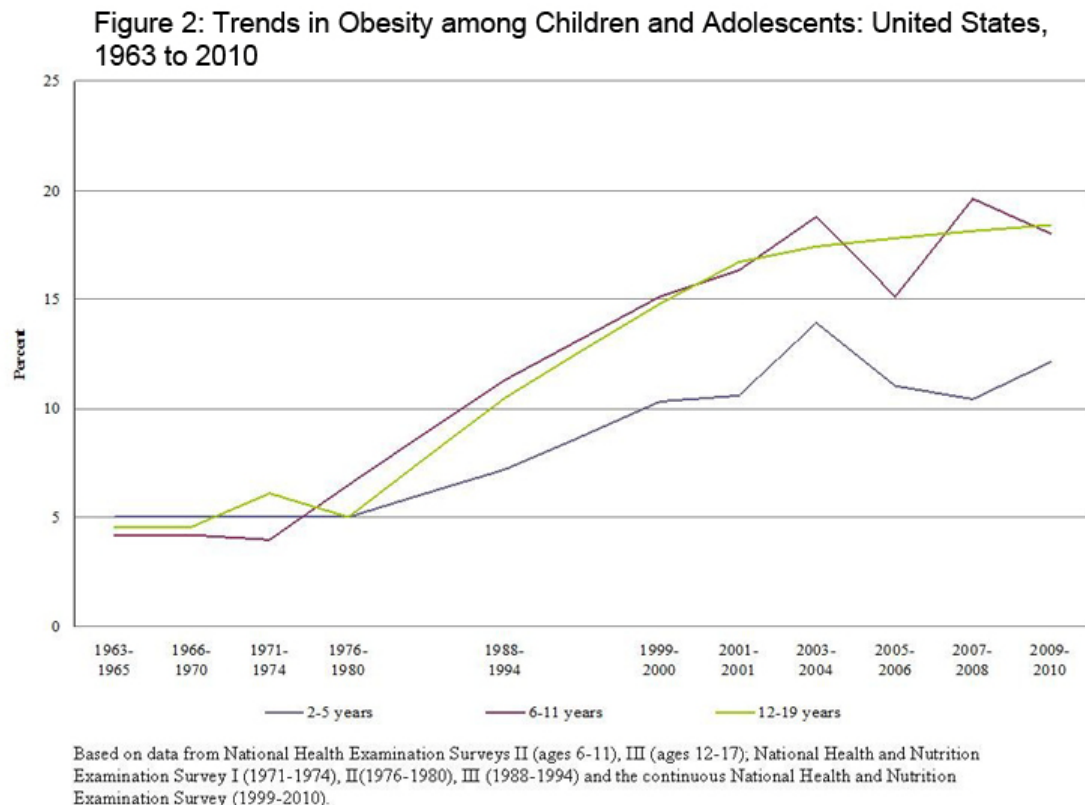
**Figure 1: Trends in Overweight, Obesity, and Extreme Obesity among Adults Aged 20 to 74 Years: United States, 1960 to 2010.**



Based on data from National Health Examination Survey cycle I (1960-1962); National Health and Nutrition Examination Survey I (1971-1974), II (1976-1980), III (1988-1994) and the continuous National Health and Nutrition Examination Survey (1999-2010).

Although early versions of the guidelines directly targeted consumers, since 2005 the guidelines have been a policy document, intended for policymakers to use to design and carry out nutrition-related programs and for nutrition educators and health professionals who directly interact with consumers. The increased focus on overweight and

obesity in the DGA 2010 comes as a response to dramatic increases in rates of obesity in the United States over the past decades. The popular media abound with stories about the "obesity epidemic," and it is broadly understood that Americans have grown fatter. Figure 1 shows U.S. adult overweight and obesity rates from the 1960s to the present. Figure 2 shows obesity rates for children and adolescents. Obesity rates for all three age groups remained relatively stable until the late 1970s, but increased sharply after that time. Currently, two out of three adult Americans are overweight or obese (Flegal et al., 2012). For children, since the 1970s, the prevalence of obesity has tripled, rising from around 5% to almost 17% (Ogden et al., 2012).



Obesity, especially at higher levels, is linked to premature death (Flegal et al., 2005; Engeland et al., 2004). It is linked to cardiovascular disease, type 2 diabetes, fatty liver disease, gallstones, breathing and joint problems, gastro-esophageal reflux, and poor mental health (NIH, 1998; Strine et al., 2008). Total national healthcare costs from obesity were recently estimated at \$147 billion, with the costs paid by third-party payers, including Medicare, over \$1,400 higher per year for people who are obese (Finkelstein et al., 2009). Indirect costs from income lost due to health conditions and the opportunity cost of future earnings are also part of the economic toll of obesity (Wolf and Colditz, 1998; Wellman and Friedberg, 2002). Adding to the economic burden of obesity, adults, especially white women, may face discrimination in the job market because of their weight (Cawley, 2004; Puhl and Brownell, 2001). Hence, concern over the national obesity rates, discussed at length in the DGA 2010, appears well justified from both medical and economic perspectives.

It seems clear, given the rapid rise in obesity rates, that Americans have not followed recommendations of maintaining a healthy weight, which have been included in the DGA since the series began. A related question involves how well we have complied with the recommendations targeting diet quality, which have also been highly consistent through the years. The Healthy Eating Index, or HEI, measures the quality of Americans' diets relative to the DGA. The current version, HEI-2005, has 12 components: total fruit; whole fruit; total vegetables; dark green and orange vegetables; total grains; whole grains; milk products and soy beverages; meat and beans; oils; saturated fat; sodium; and calories from solid fats, alcoholic beverages, and added sugars (SoFAAS) (Guenther, Reedy, and Krebs-Smith, 2008). Index values can range from 0 to 100, with higher scores associated with a higher-quality diet.

Researchers evaluated the diet quality of lower- and higher-income Americans, ages two and older, using dietary data from the 2003-04 rounds of a national survey (USDA, CNPP, 2008). The average score, across all income levels, was 57.5 out of the possible 100 points. Respondents did especially poorly on dark green and orange vegetables, whole grains, sodium, and calories from SoFAAS. Surprisingly, total HEI-2005 scores were about the



same for lower- and higher-income respondents. There were, however, differences in the ways in which low- and high-income respondents failed to meet the targets. (See the article by Palma and Jetter elsewhere in this issue for details on the differences across income groups.)

The DGA series has included explicit recommendations on physical activity levels since 2000. The DGA 2010

### When is someone considered overweight or obese?

To classify people as overweight or obese, body mass index (BMI) is the most common measure. For adults, BMI is calculated using weight in relation to height, specifically the adult's weight in kilograms divided by the square of his or her height in meters. BMI does not measure body fat directly, but for most people, BMI is closely related to percentage body fat. BMI does not accurately assess body fat for pregnant women, athletes with significant muscle mass, or adults over age 65. For children and adolescents (aged 2-19 years), a different category of BMI is used because their composition of body fat varies as they age and varies between boys and girls. A child's weight status is determined using an age and sex specific percentile.

Source: DGA 2010 (USDA and USDHHS, 2010)

Weight Category	Adults (BMI)	Children and Adolescents, ages 2-19 (BMI for Age Percentile Range)
Underweight	< 18.5	< the 5th percentile
Healthy Weight	18.5 to 24.9	5th percentile to the < 85th percentile
Overweight	25.0 to 29.9	85th percentile to < the 95th percentile
Obese	> 30.0	> the 95th percentile

physical activity recommendations are based on the "Physical Activity Guidelines for Americans," released in 2008 by the U.S. Department of Health and Human Services. For adults, the DGA 2010 encourages a minimum of 150 minutes per week of moderate-intensity aerobic activity or 75 minutes of high-intensity aerobic activity. For children six and older, an hour a day of physical activity is recommended. Many Americans fail to meet these targets. According to the Healthy People website, more than 80% of adults and adolescents do not meet the guidelines for both aerobic and muscle-strengthening activities (USDHHS, Healthy People 2020, 2012a).

Evidence indicates that most Americans have not followed recommendations in previous editions of the DGA in terms of maintaining a healthy weight, eating a high quality diet, and getting sufficient exercise. Given the costs to our society of obesity, poor diet quality, and lack of exercise, an important question is what can be done to make the 2010 DGA more effective in altering people's behaviors to reduce their risk of obesity? To answer that question, it is first important to understand the factors believed to be associated with rising rates of obesity.

### An "Obesogenic" Environment

The DGA 2010 calls our current environment "obesogenic," meaning that it promotes over-consumption of energy and discourages physical activity. With such striking changes in rates of obesity since the 1970s, significant changes affecting food intake or energy expenditure must have occurred in a short span of time. From a physiological standpoint, the cause of obesity is well understood: An individual incurs a persistent energy imbalance, consuming more energy through food and drink than is expended by physical activities. The excess energy is stored as body fat. However, the complex economic causes and consequences of obesity are yet to

be understood (Finkelstein et al., 2005). No paper of this size can do much justice to the extensive range of investigations that have been made by economists, nutrition and health researchers, and other scientists concerning the factors that may be linked to rising obesity rates; however, some of the major theories and findings are briefly discussed here.

Evidence concerning changes in activity levels over time is mixed, with some studies (Church et al., 2011; Lakdawalla and Philipson, 2002) suggesting a decrease, while others finding no significant changes since the mid-1970s that would account for the surge in obesity rates (Westertorp and Speakman, 2008). There is, however, very strong evidence that average daily energy intake, in the form of kcal—or "calories"—has increased substantially since the 1970s, although estimates of the magnitude of the increase have varied from around 200 calories per day (Leonard, 2010) to over 550 calories per day (Duffey and Popkin, 2011). The increased energy intake has been attributed to changes in dietary patterns, such as an increase in consumption of high-calorie and low-nutrition snacks including sugary beverages, larger portion sizes, and more food consumed away from home (Popkin, Duffey, and Gordon-Larsen, 2005; Duffey and Popkin, 2011; Zizza, Siega-Riz, and Popkin, 2001).

One of the first rules of economics is that price matters. As a percentage of income, food, especially highly caloric food, has become cheaper. But while food prices overall have declined since the 1970s, fruit and vegetable prices have increased (Christian and Rashad, 2009). The low relative cost of "energy-dense" foods has been hypothesized to be a factor in obesity (Drewnowski, 2004). The difference in relative prices for different types of food may also

explain some of the differences in rates of obesity found among different economic groups (Drewnowski and Specter, 2004). The time-cost of food has also fallen. For most Americans, food is now readily available and highly convenient (Cutler, Glaeser, and Shapiro, 2003).

The "built environment," or the human-made environment that provides the setting for our day-to-day activities, has been extensively studied in terms of dietary intake and physical activity (Papas et al., 2007). Long commutes; highways without crosswalks, sidewalks or bicycle lanes; and high speed limits on crowded roads discourage pedestrian traffic and bicycle-riding. Additionally, we have more access to prepared food. According to the DGA 2010, the number of fast-food restaurants in the United States has doubled since the 1970s, and people of all ages who eat out regularly, particularly at fast-food restaurants, increase their risk for overweight or obesity (USDA and USDHHS, 2010, page 11).

A study from the Economic Research Service of the U.S. Department of Agriculture (USDA) shows that foods eaten away from home are more energy-dense than foods prepared at home (Guthrie, Lin, and Frazao, 2002), and some economists have linked higher restaurant availability to higher obesity rates (Chou, Grossman, and Saffer, 2004). However, other research has found that while there is a link between food eaten away from home and obesity, the effect is small (Cai et al., 2008). For fast-food restaurants, the effect may be concentrated on females and minorities living in medium-density population areas, rather than broadly affecting the population (Dunn, 2010). Absence of full-service grocery stores, especially in areas with high rates of poverty, has also been posited as a problem that contributes to poor nutrition and health, but the current state of research on the issue of "food deserts" may not be sufficient for economists to draw conclusions about the impact of this possible problem (Bitler and Haider, 2010).

The effect of portion sizes on food consumption has been studied, and experiments have shown that people will consume more total calories when the amount served to them increases (Rolls, Morris, and Roe, 2002; Orlet Fisher, Rolls, and Birch, 2003). Portion sizes in the United States began to increase in the 1970s and then rose sharply in the 1980s. In fast food restaurants, portions of French fries, hamburgers, and soda are now two to five times larger than when first introduced to consumers (Young and Nestle, 2002). In many U.S. fast-food restaurants, the dramatic increase in portion size has led to situations where consumers can take in almost a day's worth of energy and more than the recommended daily amount of sodium with one low-cost, fast-food meal, a fact that can be easily verified by checking the online nutritional information provided by the restaurant chains. The increase in portion size is not limited to restaurants. Portions at home have also increased (Nielsen and Popkin, 2003).

While the food environment in America can be characterized as one in which a wide variety of convenient food is readily available for consumption, a substantial percentage of the population also faces a condition known as "food insecurity," meaning such people have limited or uncertain abilities to acquire sufficient, nutritionally adequate, and safe foods in socially acceptable ways (Andersen, 1990). In 2010, 14.5 percent of U.S. households were food insecure at least some time during that year, with a little over a third of that number experiencing more severe forms of food insecurity (Coleman-Jensen et al., 2011). Food insecurity is highly related to poverty, but not all poor households are food insecure. Food insecurity is linked to a variety of health problems and also to obesity, although not all researchers have found that food insecurity, independent of poverty, is linked to poor health. (See Gundersen, Kreider, and Pepper, 2011, for a thorough review of the literature on food insecurity.)

Federal nutrition programs, which are designed to alleviate food insecurity and improve dietary choices, have also been implicated by some people in the rise of obesity among the poor. Some research links the Supplemental Nutrition Assistance Program (SNAP, formerly called "food stamps") to higher rates of obesity (Gibson, 2003) and the increased consumption of added sugars and fats (Wilde, McNamara, and Ranney 2009). Other research, however, indicates that the effect of food stamps on obesity rates is small (Baum, 2011; Fan, 2010) and, at least for children, the impact on obesity rates may occur primarily in areas with high food costs (Kimbrow and Rigby, 2010). Further, researchers have found that other forms of federal food aid that subsidize children's meals at schools or daycare centers may be protective against childhood obesity (Kimbrow and Rigby, 2010).

The relative prices of fruits and vegetables compared to foods high in added fats and sugars, the quest for convenience, and an environment saturated with high-fat, high-sugar snacks and drinks may have more consequences than over-consumption of energy. Poor diets lead to increased risk of chronic diseases, such as type 2 diabetes, hypertension, and certain cancers, as well as micronutrient deficiencies (CDC, 2012). Lack of exercise is similarly linked to heightened risk for diseases, apart from its effect on body weight.

### **Can The Obesity Trend Be Reversed?**

The consensus is clear that the current rates of obesity and overweight, with the contributory problems of poor diet quality and lack of exercise, are linked to a number of medical, social, and financial problems. There is less agreement on what, if anything, should be done about America's waistline. The DGA 2010 provides advice for

individuals, such as focusing on the total number of calories consumed; monitoring food intake; choosing smaller portions or lower-calorie options when dining out; preparing, serving, and consuming smaller portions at home; eating a nutrient-dense breakfast; getting sufficient exercise; and limiting screen time. Unlike past editions, which recommended specific quantities, the 2010 key recommendations for dietary choices indicate increasing consumption of some foods and decreasing consumption of others, which may be easier for most people to understand. All told, these recommendations are sensible and, if undertaken, would likely lower an individual's risk of obesity and otherwise contribute to his or her health. However, we have seen that many Americans are clearly not following these recommendations.

The first step in making the DGA 2010 more effective in combating obesity is ensuring that everyone understands the message. Estimating the energy content of foods is an area of difficulty for many Americans, and research has shown that larger portion sizes add to the difficulty of accurate estimation (Geier and Rozin, 2009). Another area of information distortion is that people either may not understand what is meant by a "healthy" weight or they may reject the medical community's standards. A Harris poll found high rates of body size misperception, with 30% of overweight people thinking they were normal size, 70 percent of obese people viewing themselves as overweight, and 39% of morbidly obese people saying they were overweight but not obese (Harris Interactive, 2012).

Nutritional information for packaged food is already widely available, certainly far more available than it was 30 years ago when obesity rates were much lower. Under the 1990 Nutrition Labeling and Education Act (NLEA), all packaged food must bear nutrition labeling in a standard format, including calories per serving. Economic evaluation of the 1990 NLEA in terms of impact on obesity has been limited; however, one study shows these nutrition labels had a beneficial impact on reducing body weight, but only among non-Hispanic, white females (Variyam and Cawley, 2006). The 1990 NLEA may also have encouraged food processors to develop a wider range of low-fat products available to consumers (Arsenault, 2010).

As a provision of the 2010 health care reform legislation, restaurant chains with 20 or more stores will be required to post nutrition information on their standard menu items. Many such chains already provide this information voluntarily. Currently, four states (California, Maine, New Jersey, and Oregon) have menu labeling laws (TFAH and RWJF, 2011). Again, research on the impact of this type of labeling is limited, but one study indicates posting calories leads to a decrease of 6% in the number of calories per transaction (Bollinger, Leslie, and Sorensen, 2011).

Segmenting the consumer market may be a beneficial approach to making the DGA 2010 more relevant. Previous research on dietary behavior has identified three types of women consumers, "better eaters," "fair eaters," and "poor eaters" (Loughrey et al., 2001). Both the "better eaters" and the "fair eaters" were concerned about making healthful food choices, while the "poor eaters" were less likely than the "better eaters" to believe in the importance of eating a healthy diet. Finding a means to provide these different groups with different messages could be a helpful approach. While the "better eaters" may need only simple tips and encouragement to maintain or improve their current diet, the "fair eaters" may need more extensive messages appealing to their interests in taste and convenience. Finally, reaching the "poor eaters" will require the most intensive effort. Cultural relevance of the nutrition message is also important. Finding the budget to ensure that targeted and culturally relevant messages are delivered frequently may be difficult in our current economic environment, however.

The DGA 2010 goes beyond providing individual recommendations that could be translated into a nutrition education campaign; they advocate a society-wide, coordinated approach to the problem of obesity, involving families, communities, policy-makers, and educators. A Social-Economic Model in the DGA 2010 includes individual factors; the environmental settings; sectors of influence, which include government, public health and health care systems, agriculture, community design, industry, and media; and social and cultural norms and values. The publication states: "Interventions should extend well beyond providing traditional education to individuals and families about healthy choices, and should help build skills, reshape the environment, and re-establish social norms to facilitate individuals' healthy choices" (page 57). Suggested strategies include expanding access to healthy foods for all segments of the population, partnering with producers and food suppliers to promote appropriate portions of nutritious food, implementing the U.S. National Physical Activity Plan (USDHSS, 2008), ensuring that education on nutrition and physical activity is provided to young people and that school meals and snacks are consistent with the dietary guidelines, limiting food and beverage marketing to children, and promoting physical activity for children year-round.

In considering any sort of policy intervention, analysts will generally want answers to three questions: Will the policy be effective? Will it be equitable? Will it be politically and socially acceptable? Rashad (2005), in discussing the possible causes of the obesity epidemic, notes that government intervention to change adult behavior can be controversial, and that the government "should get involved only in one of three cases: there is imperfect information, there are externalities, or people do not behave rationally" (page 35). What constitutes "rational" behavior in respect to diet, exercise, and obesity may be a matter for debate, however.



A pair of articles in a recent issue of the Australian Economic Review provides an illustration of two distinct approaches to obesity, the "rational-choice" economic model (Mavromaras, 2008) and the "public health" model (Moodie, 2008). The rational-choice economic model starts with the notion that our current obesity levels may not be optimal from a medical standpoint, but that these levels may be chosen freely by consumers as a willing trade-off in terms of their enjoyment of convenient and palatable food. If such is the case, no government intervention to change behavior is justified, at least for adults, although mechanisms, such as increased health insurance premiums, could possibly be explored to shift some or all of the excess medical costs to the consumers who "choose" obesity. As Philipson and Posner (2003) state, "... in a model of human behavior in which people are assumed to be rational actors, there is no such thing as being 'overweight.'"

By contrast, the public health model views obesity as a problem to be corrected because it is affecting so many people and its consequences are severe. Under a public health model, where the goal is to protect and promote the public's health and well-being, policy intervention to counter the rise of obesity may be viewed as justified if consumers are not seen as behaving "rationally" when it comes to satisfying short-term choices for food and exercise at the expense of their long-term health. Proponents of the public health model may point to the anti-smoking campaign as a successful intervention that helped reduce disease and mortality. The anti-smoking campaign had several components. Information about the risks of smoking was prominently displayed on tobacco product packages and similar messages were conveyed through the mass media. Hefty taxes were levied on cigarettes and other tobacco products. Advertising of cigarettes and other products was severely curtailed. Finally, physicians were enlisted to bring the message to their tobacco-using patients that these products were harmful to their health. In more recent years, bans on smoking in public places have made smoking inconvenient.

A recent article in "Lancet" provides an overview, based on available literature, of various strategies that could potentially reduce obesity rates (Gortmaker et al., 2011). Although diet and exercise, low-fat diets, family counseling for obese children, and gastric banding were among the reported strategies with the strongest scientific evidence of effectiveness, these individual interventions were not judged the most cost effective in terms of overall societal benefits, as measured by disability-adjusted life years saved. The three most cost-effective strategies, according to this article, might instead be environmental interventions similar to those used in the anti-tobacco campaign: taxing "unhealthy" foods and beverages, using front-of-pack "traffic light" labeling, and reducing "junk food" advertising to children. Scientific evidence for the effectiveness of these strategies is not always strong, however (Gortmaker et al., 2011; Avenell and Goode, 2008).

According to the DGA 2010, solid fats and added sugars make up a little over one-third of the typical American's daily energy intake, without otherwise contributing importantly to the nutrient quality of the diet. The goal of so-called "junk food" taxes would be to increase the prices of products high in solid fats and added sugars so that consumers would purchase fewer of them. Thirty states already tax soda more than other foods, but the tax rates are modest, averaging around 6% (Bridging the Gap Program, 2011) and demand for sugar-sweetened beverages is generally agreed to be inelastic, meaning it takes a relatively large hike in price to affect consumption to an appreciable degree (Zhen et al., 2010; Lin et al., 2011). The potential costs and benefits of a "soda tax" have been discussed thoroughly in a recent issue of this journal (*Choices*, Issue 14, 2011) and thus will not be discussed in detail here. However, economists have pointed out the importance of considering substitutes for the taxed beverages and that the long-run and short-run effects of the tax may differ (Dharmasena and Capps, 2011; Zhen et al., 2010).

By nature, any consumption tax is highly regressive, meaning it falls more heavily on those with lower incomes, especially if lower-income individuals are less willing or able to switch to other, non-taxed items. As such, consumption taxes may fail the "equity" test for interventions unless the revenue generated benefits the low-income consumers enough to off-set their cost. Because low-income people are especially vulnerable to increased risk of obesity, using the money generated by the tax to fund public health programs may make these policies more equitable. Indeed, public support for soda taxes has been shown to be high when the money raised from the tax has gone to such purposes (Chaloupka, Powell, and Chiqui, 2011). However, no research is yet available to show that taxes on soda, or other "junk food" such as salty snacks, would be economically efficient in terms of benefits and costs (Lusk and Schroeter, 2011; Kuchler, Tegene, and Harris, 2005.)

"Traffic light" labeling involves a "green light," "yellow light," or "red light" symbol prominently displayed on the front of the food package, with "green light" foods being those considered most healthful, and "red light" foods the least healthful. Overseas, where traffic light labeling is being pioneered, the symbols appear for total fats, saturated fats, sodium, and sugars. On the surface, the "traffic light" symbols would appear to provide a simple visual cue, which might help some individuals make dietary choices more in line with the DGA 2010. However, while little research is yet available on the impact of this type of labeling on consumer choices, the existing evidence does not show this labeling scheme to be effective in changing purchasing patterns (Sacks et al., 2011; Sacks, Rayner, and Swinburn, 2009).

The U.S. Institute of Medicine was recently charged with reviewing front-of-pack nutrition labeling and has issued two reports. These reports indicate that there is some limited evidence that simple and clear front-of-pack labeling may encourage the selection of healthier products; however, research to date has not targeted children or other vulnerable population groups (Institute of Medicine, 2010 and 2011). The second report included the recommendation that the Food and Drug Administration and the USDA should develop, test, and implement a standard front-of-pack labeling system for all food and beverage products, along with deploying a promotional and awareness campaign (Institute of Medicine, 2011).

Every year, billions of dollars are spent on food and beverage advertising in the United States. Limiting advertising of low-nutrient, high-calorie foods and beverages to children may seem a reasonable step, given that children are more impressionable than adults. However, protections on free speech may make a U.S. advertising ban infeasible or, at the least, unpopular. An alternative would be to eliminate the tax deductibility of such advertisements. Economists have estimated that elimination of tax deductibility for fast food ads would reduce their viewing by 40% for children and 33% for adolescents. In turn, this move would reduce the number of overweight children by 7% and the number of overweight adolescents by 5% (Chou, Rashad, and Grossman, 2008). Such a policy would have the added advantage of increasing tax revenues.

In a public health model, physicians would be important players in the goal of reducing obesity. However, research shows that there are important barriers to their participation in this effort, including inadequate training in diet and weight-loss counseling (Forman-Hoffman, Little, and Wahls, 2006). Further, physicians, like the rest of the public, are not immune to being overweight and obese, and doctors who do not maintain a healthy weight are less likely to counsel their obese patients about weight loss (Bleich et al., 2012). Obesity counseling by primary care physicians, even when offered, is not always found to be effective (Noël et al., 2011).

Thus, based on available research evidence, the type of public health tools that proved effective for reducing tobacco use may not work as well at reversing the obesity epidemic. Unlike tobacco use, obesity springs from a complex interaction of genetics and behavior, influenced by multiple factors in the environment. Further, many foods include a combination of healthful and less healthful ingredients—for example, fruit pies—or healthy ingredients prepared in less healthful ways—for example, fried chicken—making the parallel to tobacco uncertain and the targeted products for taxation or advertising restrictions far less clear.

A bridge between the "rational choice" economic model and the "public health" model may possibly be found in the field of behavioral economics. Behavioral economics addresses the problem of self-control in an economic framework that views long-run decisions as sometimes running contrary to short-run behavior. People may desire to save more for retirement or, in the context of this article, to eat better, exercise more, and achieve or maintain a healthy weight. However, short-term temptations thwart these long-run plans, leaving the consumer worse off than if he or she could muster more self-control. If such a model accurately describes human behavior, then "soft paternalism" or a form of presenting choices in such a way as to lead to better outcomes may be justified. An example of "nudging" people into making choices more consistent with their long-term goals is arranging food in a cafeteria line so that healthier choices are more prominently displayed (Thaler and Sunstein, 2008). Modifying the built environment so that people have more opportunities to walk or bicycle would be another way of presenting people with more choices, rather than constraining their options. However, bike lanes, pedestrian crossings, and green spaces all come at a cost, and either higher local taxes or other items of potential benefit to taxpayers—for example, better highway maintenance—may be the trade-offs. (See Cash and Schroeter (2010)) for more discussion on how behavioral economics might help frame choices that affect obesity rates.)

Finally, changes in certain government nutrition programs may be seen as a way to affect obesity rates, at least for targeted groups. The Healthy, Hunger-Free Kids Act of 2010 provides the USDA with the ability to make significant changes in the school lunch and breakfast programs, including improvements to the nutritional quality of the meals. This Act also gives the USDA authority to set nutritional standards for all foods sold in schools, including in vending machines, the "a la carte" lunch lines, and school stores. Some have advocated limiting purchases with SNAP benefits to healthful foods (Townsend, 2006). However, only Congress can decide what constitutes eligible food under SNAP, and there are currently no standards on what constitutes "healthy" or "unhealthy" food. Further, limiting food choices would be likely to increase the complexity and cost of administering the program (USDA, FNS, 2012). The article by Palma and Jetter, elsewhere in this issue, provides an extended discussion of the array of federal nutrition programs and how these programs may be affected by the DGA 2010.

The White House Task Force on Childhood Obesity recently issued a report to the President, advocating a multi-disciplinary, multi-pronged approach to reduce childhood obesity. Among other strategies, the report calls for improved labels on food and menu items, reduced marketing of some food products considered unhealthy to children, and improved health care services, including body mass index (BMI) measurement for all children (White House Task Force on Childhood Obesity, 2010). These recommendations specifically target children and do not

address the problem of adult obesity, which may be more intractable. However, if childhood obesity can be curtailed in the current generation, in the long-run adult obesity could also be reduced.

### Some Concluding Thoughts

Despite decades of consistent dietary recommendations from the U.S. government, many Americans eat a diet that considerably misses the nutritional targets. Poor diet quality is linked to higher body weight and poor health. As seen in the shift of the DGA target audience from individual consumers to policymakers, the federal government has realized that obesity is more than an individual-level problem. If we are to significantly reduce the levels of overweight and obesity in this country, more aggressive measures may be necessary beyond the periodic updating of healthy eating guidelines. The difficulty lies in determining the path such efforts should follow.

To inform the policy debate, it is necessary to expand our research on plausible policy alternatives and their consequences. How do we expand access to healthy foods for all segments of the population, partner with producers and food suppliers to promote appropriate portions of nutritious food choices, ensure that education on nutrition and physical activity is provided to young people, and that school meals and snacks fit the dietary guidelines? At the national level we have few tools available beyond tax incentives or penalties, along with measures such as control of purchasing choices of SNAP recipients and related government food assistance programs. But even these choices are wrought with potential problems and concerns. Only through an expanded and focused research agenda can each alternative be vetted and a responsible plan developed. However, in today's budgetary environment, finding public money to support such an effort may be more difficult than curbing the obesity epidemic itself.

### For More Information

Andersen S.A., ed. (1990). Core indicators of nutritional state for difficult-to-sample populations. *Journal of Nutrition*, 120, (Suppl 11):1559S–1600S.

Arsenault, J. E. (2010). Can nutrition labeling affect obesity? *Choices*, 25, (3). Available online: <http://www.choicesmagazine.org/magazine/article.php?article=140>.

Avenell, A., and Goode, A. (2008). Assessing the evidence base for interventions to prevent the further increase in obesity. *Australian Economic Review*, 41, (1), 97-104.

Baum, C.L. (2011). The effects of food stamps on obesity. *Southern Economic Journal*, 77 (3), 623-651.

Bitler, M. and Haider, S. J. (2010). An economic view of food deserts in the United States. *Journal of Policy Analysis and Management*, 30, (1), 153-176.

Bleich, S.N. Bennett, W.L., Gudzone, K.A., and Cooper, L.A. (2012). Impact of physician BMI on obesity care and beliefs. *Obesity*. Available online: <http://www.nature.com/doifinder/10.1038/oby.2011.402>.

Bollinger B., Leslie, P., and Sorensen, A. (2011). Calorie posting in chain restaurants. *American Economic Journal: Economic Policy*, 3 (1), 91-128.

Bridging the Gap Program. (2011). University of Illinois at Chicago. State Sales Tax on Regular, Sugar-Sweetened Soda (as of July 1, 2011). Available online: <http://www.bridgingthegapresearch.org>.

Cai, Y., Alviola, P.A., IV, Nayga, R.M., Jr., and Wu, X. (2008). The effect of food-away-from-home and food-at-home expenditures on obesity rates: A state-level analysis. *Journal of Agricultural and Applied Economics*, 40 (2): 507-521.

Cash, S.B., and Schroeter, C. (2010). Behavioral economics: A new heavyweight in Washington? *Choices*, 25 (3). Available online: <http://www.choicesmagazine.org/magazine/article.php?article=142>.

Cawley, J. (2004). The impact of obesity on wages. *Journal of Human Resources*, 39 (2), 451–74.

Center for Disease Control and Prevention (CDC). (2012). Nutrition resources for health professionals. Available online: <http://www.cdc.gov/nutrition/professionals/>

- Chaloupka, F.J., Powell, L.M., and Chiqui, J.F. (2011). Sugar-sweetened beverages and obesity: The potential impact of public policies. *Journal of Policy Analysis and Management*, 30 (3), 645-655.
- Christian, T., and Rashad, I. (2009). Trends in U.S. food prices, 1950–2007. *Economics and Human Biology*, 7 (1), 113–120.
- Chou, S.Y., Grossman, M., and Saffer, H. (2004). An economic analysis of adult obesity: Results from the behavioral risk factor surveillance system. *Journal of Health Economics*, 23 (3), 565-587.
- Chou, S.Y., Rashad, I., and Grossman, M. (2008). Fast-food restaurant advertising on television and its influence on childhood obesity. *Journal of Law and Economics*, 51 (4), 599-618.
- Church, T.S., Thomas, D.M., Tudor-Locke, C., Katzmarzyk, P.T., Earnest, C.P., Rodarte, R.Q., Martin, C.K., Blair, S.N., and Bouchard, C. (2011). Trends over 5 decades in U.S. occupation-related physical activity and their associations with obesity. *PLoS ONE* 6, (5), e19657. doi:10.1371/journal.pone.0019657.
- Coleman-Jensen, A., Nord, M., Andrews, M. and Carlson, S. (2011). *Household Food Security in the United States in 2010*. Economic Research Report No. (ERR-125). Available online: <http://www.ers.usda.gov/Publications/ERR125/>.
- Cutler, D.M., Glaeser, E.L., and Shapiro, J.M. (2003). Why have Americans become more obese? *Journal of Economic Perspectives*, 17 (3), 93–118.
- Dharmasena, S., and Capps, O. Jr. (2011). Intended and unintended consequences of a proposed national tax on sugar-sweetened beverages to combat the U.S. obesity problem. *Health Economics*. Available online: [http://onlinelibrary.wiley.com/journal/10.1002/\(ISSN\)1099-1050/earlyview](http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)1099-1050/earlyview).
- Dunn, R. (2010). The effect of fast-food availability on obesity: An analysis by gender, race, and residential location. *American Journal of Agricultural Economics*, 92 (4), 1149-1164.
- Drewnowski, A. (2004). Obesity and the food environment: Dietary energy density and diet costs. *American Journal of Preventive Medicine*, 27 (3 Suppl), 154–162.
- Drewnowski, A., and Specter, S.E. (2004). Poverty and obesity: The role of energy density and energy costs. *American Journal of Clinical Nutrition*, 79 (1), 6-16.
- Duffey, K.J., and Popkin, B.M. (2011). Energy density, portion size, and eating occasions: Contributions to increased energy intake in the United States, 1977–2006. *PLoS Medicine*, 8 (6), e1001050. doi:10.1371/journal.pmed.1001050.
- Engeland, A., Bjørge, T., Tverdal, A., and Sjøgaard, A.J. (2004). Obesity in adolescence and adulthood and the risk of adult mortality. *Epidemiology*, 15 (1), 79-85.
- Fan, M. (2010). Do food stamps contribute to obesity in low-income women? Evidence from the National Longitudinal Survey of Youth 1979. *American Journal of Agricultural Economics*, 92 (4): 1165–1180.
- Finkelstein, E.A., Ruhm, C.J., and Kosa, K.M. (2005). Economic causes and consequences of obesity. *Annual Review of Public Health*, 26, 239-257.
- Finkelstein, E.A., Trogdon, J.G., Cohen, J.W., and Dietz, W. (2009). Annual medical spending attributable to obesity: Payer- and service-specific estimates. *Health Affairs*, 28, (5), w822-w831.
- Flegal, K.M., Graubard, B.I., Williamson, D.F., and Gail, M.H. (2005). Excess deaths associated with underweight, overweight, and obesity. *Journal of The American Medical Association [JAMA]*, 293 (15), 1861-1867.
- Flegal, K.M., Carroll, M.D., Kit, B.K., and Ogden, C.L. (2012). Prevalence of obesity and trends in the distribution of body mass index among US adults, 1999-2010. *Journal of The American Medical Association [JAMA]*, 307 (5): doi:10.1001/jama.2012.39. Available online: <http://jama.ama-assn.org>.
- Forman-Hoffman, V., Little, A., and Wahls, T. (2006). Barriers to obesity management: a pilot study of primary care clinicians. *BMC Family Practice*, 7, 35.

- Geier, A.B. and Rozin, P. (2009). Univariate and default standard unit biases in estimation of body weight and caloric content. *Journal of Experimental Psychology: Applied*, 15 (2), 153–162.
- Gibson, D. (2003). Food stamp program participation is positively related to obesity in low income women. *Journal of Nutrition*, 133, 2225–2231.
- Gortmaker, S. L., Swinburn, B.A., Levy, D., Carter, R., Mabry, P.L., Finegood, D.T., Huang, T., Marsh, T., and Moodie, M.L. (2011). Obesity 4. Changing the future of obesity: Science, policy, and action. *Lancet*, 378 (9793), 838–847.
- Guenther, P.M., Reedy, J., and Krebs-Smith, S.M. (2008). Development of the healthy eating index-2005. *Journal of the American Dietetic Association*, 108 (11), 1896–1901.
- Gundersen, C., Kreider, B., and Pepper, J. (2011). The economics of food insecurity in the United States. *Applied Economic Perspectives and Policy*, 33 (3), 281–303.
- Guthrie, J.F., Lin, B.H., and Frazao, E. (2002). Role of food prepared away from home in the American diet, 1977–78 versus 1994–96: Changes and consequences. *Journal of Nutrition Education and Behavior*, 34 (3), 140–150.
- Harris Interactive. (2012). "Overweight? Obese? Or Normal Weight? Americans Have Hard Time Gauging Their Weight." Available online: <http://www.harrisinteractive.com/NewsRoom/HarrisPolls/tabid/447/mid/1508/articlele/558/ctl/ReadCustom%20Default/Default.aspx>.
- Institute of Medicine. (2010). *Front of Pack Nutrition Rating Systems and Symbols, Phase I Report*. Wartella, E.A., Lichtenstein, A.H., and Boon, C.S., Editors. Washington, D.C.: The National Academies Press.
- Institute of Medicine. (2011). *Front of Pack Nutrition Rating Systems and Symbols: Promoting Healthier Choices*. Wartella, E.A., Lichtenstein, A.H., Yatkine, A., and Nathan, R., Editors. Washington, D.C.: The National Academies Press.
- Kimbro, R.T., and Rigby, E. (2010). Federal food policy and childhood obesity: A solution or part of the problem? *Health Affairs*, 29 (3), 411–418.
- Kuchler, F., Tegene, A., and Harris, J.M. (2005). Taxing snack foods: Manipulating diet quality or financing information programs? *Review of Agricultural Economics*, 27, (1), 4–20.
- Lakdawalla, D., and Philipson, T. (2002). The growth of obesity and technological change: A theoretical and empirical examination. National Bureau of Economic Research Working Paper Series No. 8946.
- Leonard, W. R. (2010). Size counts: Evolutionary perspectives on physical activity and body size from early hominids to modern humans. *Journal of Physical Activity and Health*, 7 (Suppl 3), S284–S298.
- Lin, B.H., Smith, T.A., Lee, J.Y., and Hall, K.D. (2011). Measuring weight outcomes for obesity intervention strategies: The case of a sugar-sweetened beverage tax. *Economics and Human Biology*, 9, 329–341.
- Loughrey K., Basiotis, P., Zizza, C., and Dinkins, J.M. (2001). Profiles of selected target audiences: promoting the Dietary Guidelines for Americans. *Family Economics and Nutrition Review*, 13 (1): 3–14.
- Lusk, J., and Schroeter, C. (2011). When do fat taxes increase consumer welfare? *Health Economics*. Available online: <http://onlinelibrary.wiley.com/doi/10.1002/hec.1789/pdf>.
- Mavromaras, K. (2008). Economics and obesity. *Australian Economic Review*, 41, (1), 78–84.
- Moodie, R. (2008). Fat is good for business. *Australian Economic Review*, 41, (1), 85–89.
- National Institutes of Health (NIH). (1998). Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults – The evidence report. NIH Publication 98-4083. Available online: <http://www.nhlbi.nih.gov/>

Nielsen, S.J., and Popkin, B.M. (2003). Patterns and trends in food portion sizes, 1977-1998. *The Journal of The American Medical Association [JAMA]*, 289 (4), 450-453.

Noël, P.H., Wang, C.P., Bollinger, M.J., Pugh, M.J., Copeland, L. A., Tsevat, J., Nelson, K.M., Dundon, M.M., and Hazuda, H.P. (2011). Intensity and duration of obesity-related counseling: Association with 5-year BMI trends among obese primary care patients. *Obesity*. Available online: doi:10.1038/oby.2011.335.

Ogden, C.L., Carroll, M.D., Kit, B.K., and Flegal, K.M. (2012). Prevalence of obesity and trends in body mass index among U.S. children and adolescents, 1999-2010. *Journal of The American Medical Association [JAMA]*, 307 (5), doi:10.1001/jama.2012.40. Available online: <http://jama.ama-assn.org>.

Orlet Fisher, J., Rolls, B.J., and Birch, L.L. (2003). Children's bite size and intake of an entrée are greater with large portions than with age-appropriate or self-selected portions. *American Journal of Clinical Nutrition*, 77 (5), 1164–1170.

Papas, M.A., Alberg, A.J., Ewing, R., Helzlsouer, K.J., Gary, T.L., and Klassen, A.C. (2007). The built environment and obesity. *Epidemiologic Reviews*, 29, 129–143.

Philipson, T.J., and Posner, R.A. (2003). The long-run growth in obesity as a function of technological change. *Perspectives in Biology and Medicine*, 46, (3 Suppl), S87-S107.

Popkin, B.M., Duffey, K., and Gordon-Larsen, P. (2005). Environmental influences on food choice, physical activity and energy balance. *Physiology & Behavior*, 86 (5), 603-613.

Puhl, R., and Brownell, K.D. (2001). Bias, discrimination, and obesity. *Obesity Research*, 9 (12), 788–805.

Rashad, I. (2005). Whose fault is it we're getting fat? Obesity in the United States. *Public Policy Research*, 12 (1), 30-36.

Rolls, B. J., Morris, E. L., and Roe, L.S. (2002). Portion size of food affects energy intake in normal-weight and overweight men and women. *American Journal of Clinical Nutrition*, 76 (6), 1207–1213.

Sacks, G., Rayner, M., and Swinburn, B. (2009). Impact of front-of-pack "traffic-light" nutrition labeling on consumer food purchases in the UK. *Health Promotion International*, 24 (4), 344-352.

Sacks, G., Tikellis, K., Millar, L., and Swinburn, B. (2011). Impact of 'traffic-light' nutrition information on online food purchases in Australia. *Australian and New Zealand Journal of Public Health*, 35 (2), 122-126.

Strine, T.W., Mokdad, A.H., Dube, S.R., Balluz, L.S., Gonzalez, O., Berry, J.T., Manderscheid, R., and Kroenke, K. (2008). The association of depression and anxiety with obesity and unhealthy behaviors among community-dwelling US adults. *General Hospital Psychiatry*, 30 (2), 127-137.

Thaler, R. H. and Sunstein, C. R. (2008). *Nudge: Improving Decisions About Health, Wealth, and Happiness*. New Haven, CT: Yale University Press.

Townsend, M.S. (2006). Obesity in low-income communities: Prevalence, effects, a place to begin. *Journal of the American Dietetic Association*, 106, (1), 34-37.

Trust for America's Health and Robert Wood Johnson Foundation (TFAH and RWJF). (2011). *F as in Fat: How Obesity Threatens America's Future, 2011 Issue Report*. Available online: <http://www.healthamericans.org/report/88/>

U.S. Department of Agriculture, Center for Nutrition Policy and Promotion (USDA, CNPP). (2008). Diet quality of low-income and higher income Americans in 2003-04 as measured by the Healthy Eating Index-2005 Nutrition Insight 42. Available online: <http://www.cnpp.usda.gov/Publications/NutritionInsights/Insight42.pdf>.

U.S. Department of Agriculture, Food and Nutrition Service (USDA, FNS). (2012). Implications of restricting the use of food stamp benefits -- Summary. Available online: <http://www.fns.usda.gov/ora/menu/Published/snap/FILES/ProgramOperations/FSPFoodRestrictions.pdf>.



U.S. Department of Agriculture and U.S. Department of Health and Human Services (USDA and USDHHS). (2010). *Dietary Guidelines for Americans 2010*. 7<sup>th</sup> Edition, Washington, DC: U.S. Government Printing Office.

U.S. Department of Health and Human Services (USDHHS). (2008). *2008 Physical Activity Guidelines for Americans*. Washington (DC): U.S. Department of Health and Human Services. Office of Disease Prevention and Health Promotion Publication No. U0036. Available online: <http://www.health.gov/paguidelines/>

U.S. Department of Health and Human Services (USDHHS), Healthy People 2020. (2012a). Physical Activity: Overview. Available online: <http://www.healthypeople.gov/2020/topicsobjectives2020/overview.aspx?topicid=33>.

U.S. Department of Health and Human Services (USDHHS), Healthy People 2020. (2012b). Nutrition and Weight Status. Available online: <http://www.healthypeople.gov/2020/topicsobjectives2020/overview.aspx?topicid=29>.

Variyam, J. N., and Cawley, J. (2006). Nutrition labels and obesity. National Bureau of Economic Research, Inc., NBER Working Papers: 11956.

Wellman, N.S., and Friedberg, B. (2002). Causes and consequences of adult obesity: Health, social and economic impacts in the United States. *AsiaPacific Journal of Clinical Nutrition*, 11 (Suppl 8), S705-S709.

Westerterp, K.R., and Speakman, J.R. (2008). Physical activity energy expenditure has not declined since the 1980s and matches energy expenditures of wild mammals. *International Journal of Obesity*, 32 (8), 1256-1263.

White House Task Force on Childhood Obesity. (2010). *Report to the President -- Solving the Problem of Childhood Obesity within a Generation*. Available online: [http://www.letsmove.gov/sites/letsmove.gov/files/TaskForce\\_on\\_Childhood\\_Obesity\\_May2010\\_FullReport.pdf](http://www.letsmove.gov/sites/letsmove.gov/files/TaskForce_on_Childhood_Obesity_May2010_FullReport.pdf).

Wilde, P.E., McNamara, P.E., and Ranney, C.K. (1999). The effect of income and food programs on dietary quality: A Seemingly Unrelated Regression analysis with error components. *American Journal of Agricultural Economics*, 81, (4), 959-971.

Wolf, A.M., and Colditz, G.A. (1998). Current estimates of the economic cost of obesity in the United States. *Obesity Research*, 6, (2), 97-106.

Young, L.R. and Nestle, M. (2002). The contribution of expanding portion sizes to the US obesity epidemic. *American Journal of Public Health*, 92 (2) 246-249.

Zhen, C., Wohlgenant, M.K., Karns, S., and Kaufman, P. (2010). Habit formation and demand for sugar-sweetened beverages. *American Journal of Agricultural Economics*, 93 (1), 175–193.

Zizza, C., Siega-Riz, A.M., and Popkin, B.M. (2001). Significant increase in young adults' snacking between 1977-1978 and 1994-1996 represents a cause for concern. *Preventive Medicine*, 32 (4), 303-10.

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## WILL THE 2010 DIETARY GUIDELINES FOR AMERICANS BE ANY MORE EFFECTIVE FOR CONSUMERS?

**Marco A. Palma and Karen M. Jetter**

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**T**he Dietary Guidelines for Americans 2010 (DGA 2010) form the basis for federal nutrition policy for the next five years. The goal of the DGA 2010 is to promote wellness, and decrease the risk of dietary and obesity related diseases such as diabetes, some cancers, and heart disease. This analysis emphasizes the potential consumption impacts of the DGA 2010, which sets the stage for subsequent analysis by Ribera, Yue and Holcomb (2012) of the potential geographic impacts in this issue. The DGA 2010 recommendations for each food group total are very similar and consistent with the previous DGA 2005. That is, they both promote the consumption of fruits and vegetables, fish and seafood products and emphasize the need to exercise to prevent or reduce the risk of chronic diseases. There are, however, some important differences in the DGA 2010 within each food group.

Table 1 provides a side-by-side comparison of the 2010 and 2005 DGAs based on the recommended diet for 2,000 calories per day intake. The 2,000 calorie per day equivalent has been the standard level of intake used by researchers to be consistent across the DGAs and also with all Nutrition Facts Labels on packaged foods (Buzby, Wells, and Vocke, 2006). However, since the DGAs are weight, age, and physical activity specific, analysts need to be careful in interpreting both the DGAs and food labels.

The 2010 total recommendations for fruits and vegetables remained the same at two cups per day for fruits and 2.5 cups per day for vegetables. However, vegetable sub-categories were broken down into sub-groups and minimum recommendations were adjusted within each group. The DGA 2010 vegetables were adjusted to include dark green vegetables, red and orange vegetables, legumes, starchy vegetables and other vegetables with weekly recommendations designed to maintain a dietary balanced vegetable consumption. The largest recommended change was moving red vegetables from the "other" category and combining it with orange to form one single sub-category. This explains, at least in part, the reduction in the other category of 2.5 cups per week with the red and orange vegetables now being 5.5 cups per week. Dark green vegetables and legumes recommendations were each reduced by 1.5 cups per week. Starchy vegetable consumption recommendations were reduced by two cups per week.

The largest overall recommended DGA 2010 change was in the protein group. The DGA 2005 made no specific subgroup recommendations for seafood; meat, poultry, and eggs; or nuts, seeds, and beans. The effect of adding specific recommendations of eight ounces per week of fish and four ounces per week of nuts, seeds, and beans was to materially reduce the recommendation for the meat, poultry and egg protein sub-category. The term discretionary calorie allowance used in the 2005 DGA was changed to maximum solid fats and added sugars (SoFAS) and it was decreased from 267 calories to 258 calories per day. The recommendations for fruit, grains, dairy, and oils remained the same as the 2005 DGA recommendations.

The DGA 2010 compares the typical American diet with the recommended intake levels or limits. This comparison is shown in Figure 1. The bars show average intake levels, for all individuals ages one or two and older, as a percent of the recommended intake level or limit. In summary, for the current American average 2,594 calorie intake, the DGA 2010 recommend large increases in consumption of fruit; vegetables; whole grains; fat-free or low fat milk (1%); fish; and nuts, seeds, or beans. They recommend substantial reductions in consumption of refined grains; meat, poultry and eggs; oils, fats and sugars; sodium; and sugary drinks. The percentage levels of food available for consumption versus recommended intake indicate the following food groups are below the recommended levels by the following percentages: fruit (42%), vegetable (59%), whole grains (15%), dairy (52%), seafood (44%), and oils (61%). The following foods exceed the recommended intake levels by the following percentages: meat, poultry and eggs (110%), calories from SoFAS (280%), refined grains (200%), and saturated fat (110%).

**Table 1**

**Side by Side Comparison of the 2005 and 2010 Dietary Guidelines for Americans, 2,000 Calorie Intake Level.**

Food Group	Units	DGA 2010	DGA 2005	Difference
<i>Fruits</i>	Cups/wk	14.0	14.0	0.0
<i>Vegetables</i>	Cups/wk	17.5	17.5	0.0
Dark Green	cups/wk	1.5	3.0	-1.5
Beans and Peas (legumes)	cups/wk	1.5	3.0	-1.5
Red and Orange	cups/wk	5.5	2.0	3.5
Starchy Vegetables	cups/wk	5.0	3.0	2.0
Other	cups/wk	4.0	6.5	-2.5
<i>Grains</i>	oz-eq/wk	42.0	42.0	0.0
Whole Grains	oz-eq/wk	21.0	21.0	0.0
Enriched Grains	oz-eq/wk	21.0	21.0	0.0
<i>Protein Foods</i>	oz-eq/wk	38.0	38.0	0.0
Seafood	oz/wk	8.0	n.s	n.s
Meat, Poultry and Eggs	oz/wk	26.0	n.s	n.s
Nuts, Seeds, Soy Products	oz/wk	4.0	n.s	n.s
<i>Dairy</i>	cups/wk	21.0	21.0	0.0
<i>Oils</i>	grams/wk	189.0	189.0	0.0
<i>Maximum SoFAS</i>	calories/day	258.0	267.0	-9.0

Source: Dietary Guidelines for Americans, 2005 and 2010. 1 Red vegetables were in the "other" category in the 2005 DGA and were moved to "red and orange" in the DGA 2010. 2 Protein foods were called lean meat and beans in the 2005 DGA. The sum of protein sub-categories were used as total protein recommendations; in the DGA 2010 they do not add up due to rounding. 3 Soy products include beans and peas, which are also part of the vegetable group, but they should only be counted in one group. 4 Maximum solid fats and added sugars (SoFAS) were called discretionary calorie allowance in the 2005 DGA. n.s. is not-specified.

Analysis of fats, oil, and sugar recommendations and their potential implications present some unique challenges. The DGA 2010 recommend a 27 gram daily limit of oil consumption and a maximum of 258 calories or 13% of caloric intake derived from solid fats and added sugars for the 2,000 caloric intake level. Oils include soft margarines and vegetable and nut oils that have no trans-fats. It is worth noting that the solid fats and added sugars are grouped into one category with a recommendation for a maximum amount of calories derived from it. The major sources of solid fats for Americans are cakes, cookies, other desserts, pizza, cheese, processed and fatty meats, and ice cream. Because oils, fats, and added sugars are usually consumed in conjunction with other food groups—for example, meat, poultry, whole milk, cheese—the implications of reducing the caloric intake from these groups needs to be taken into account. Therefore, the likely impact of the reduction can be expected to be higher for animal sources of fat than for vegetable sources. This is an area that merits further research, with significant implications for the pricing of food components such as butterfat, which will be discussed subsequently.

If Americans were to change their food consumption habits and adopt, at least in part, the recommendations of the DGA, there would be significant impacts for U.S. agriculture. However, to date, very little research has been conducted about the potential impacts of the DGA for agriculture and policy implications. More information is needed to answer relevant questions that are important for making policy decisions, such as: Will there be any changes in consumption as a response to the DGA? How much more food would be needed to satisfy the recommended levels of consumption? Where is the food going to come from? Are there any policies that will motivate changes in consumption? What is the likely impact by commodity groups and regions? Which commodities will be impacted positively and negatively? This paper and the following one by Ribera et al. only begin to scratch the surface in answering these questions.

### Changes in Consumption in Response to Past DGAs

Figure 2 shows per capita consumption, adjusted for loss, from 2000-2009, for selected food groups. Based on the ERS food consumption data system, there have only been very minor changes in consumption levels for the general population following the release of the 2000 and 2005 DGA. As Buzby, Wells, and Vocke (2006) point out, it is unrealistic to assume a full adoption of the dietary recommendations.

While Americans, in general, are not meeting the dietary guidelines, people who live in low-income households are less likely to meet dietary recommendations for fruit, vegetable, and fiber than higher income consumers (Satia 2009; Casagrande et

al. 2007). For example, 10% of upper income adults eat three or more servings of whole grains each day compared to 5% for low-income adults (Cleveland et al. 2000). Adults in households with incomes above the 1.25 poverty ratio eat 36% more vegetables than Supplemental Nutrition Assistance Program (SNAP) households and 15% more than households below the 1.25 poverty ratio who do not participate in the SNAP program (Table 2). SNAP, formerly known as the Food Stamp Program, is the largest federal food assistance program. It provides participants with a monthly supplement that can be used to purchase a variety of foods from authorized retailers including supermarkets, grocery stores, convenience stores—provided they stock certain foods, and many farmers' markets. In 2011, average monthly participation was 45 million persons and program costs exceeded \$75 billion (USDA 2012a).

Figure 1: Comparison of a Typical American Diet to Recommended Intake Levels or Limits of the DGA 2010. Source: DGA, 2010.

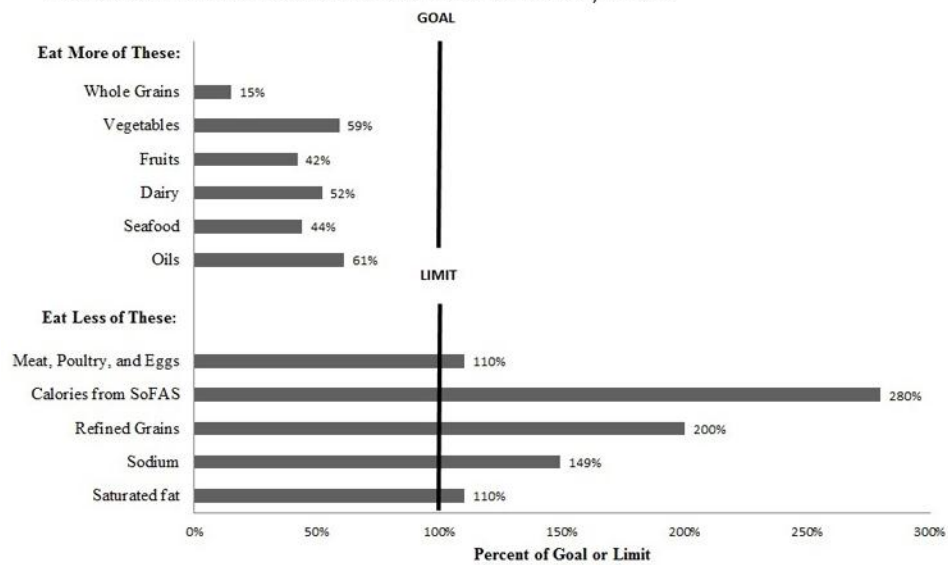
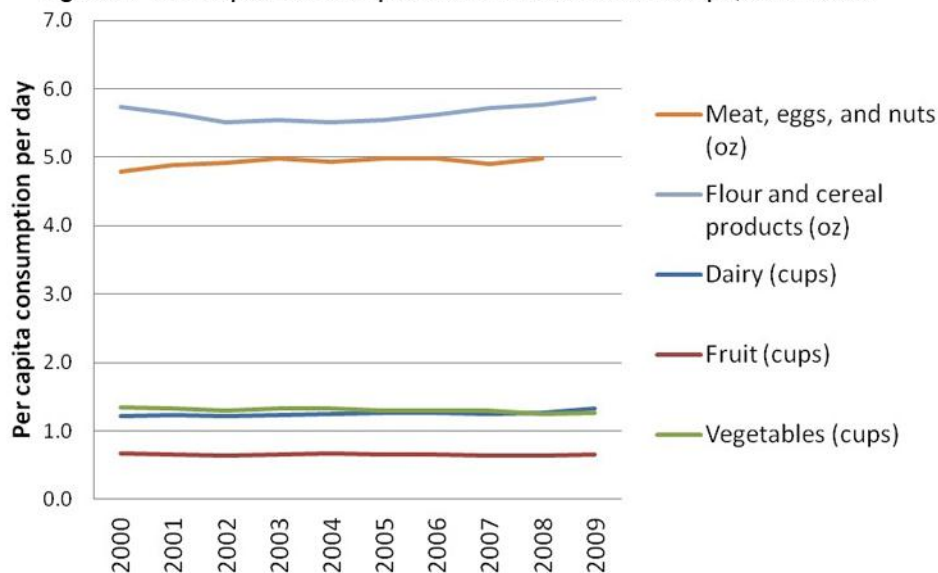


Figure 2: Per Capita Consumption of Selected Food Groups, 2000-2009



Adults in households above the 1.25 poverty ratio eat 1.69 servings of vegetables while adults in SNAP households eat only 1.25 servings a day. Adults in households below the 1.25 poverty ratio but not receiving SNAP benefits consume 1.47 servings of vegetables a day. The results are similar for the remaining vegetable categories except dark green vegetables. Adults living in households over the 1.25 poverty ratio consume almost three times the amount of dark green vegetables as adults living in households that receive SNAP benefits.

This same pattern is duplicated with respect to fruit consumption. Adults in SNAP households have the lowest fruit consumption at 0.88 servings a day. Adults living in households below the 1.25 poverty ratio consume 0.95 fruit servings per day while adults who live in households with income greater than the 1.25 poverty ratio consume over 1.11 servings of fruit per day.

An analysis of the National Health and Nutrition Examination Survey 2003-2004 data (USDHH 2005) also shows that adults who live in lower-income households are less likely to consume any fruits and vegetables, and have fewer



**Table 2**

**Total Consumption of Fruits and Vegetables by Category, SNAP Participation and Income Level for Adults, 2003-2004.**

All Adults	All	SNAP	Less than 1.25 poverty level/not on food stamps	Over 1.25 poverty level
(observations)	5266	222	1581	3463
Total vegetable, excl legumes	1.63	1.25	1.47	1.69
Dark Green	0.11	0.04	0.08	0.12
Deep yellow and red	0.45	0.34	0.42	0.46
Starchy	0.49	0.42	0.48	0.49
Other	0.59	0.45	0.49	0.62
Total Fruit	1.07	0.88	0.95	1.11

Source: National Health and Nutrition Examination Survey, 2003-2004. USDHHS (2005).

people who meet minimum recommendations for adults. Almost 10% of adults who live in SNAP households do not consume any vegetables and 36% do not consume any fruit. When vegetable categories are broken down further, over 88% of adults living in SNAP households do not consume any dark green vegetables. Almost 62% do not consume any dark yellow or red vegetables, 51% do not consume starchy vegetables, and 24% do not consume other vegetables. In contrast, less than 5% of adults in households with income above the 1.25 poverty ratio do not consume any vegetables and 23% do not consume any fruit.

Even though many households receiving SNAP benefits do not eat any fruits and vegetables, a larger percentage do meet the minimum dietary recommendations (Table 3). Just over 16% of adults in households receiving SNAP benefits meet the recommendations for vegetables and about 20% meet the recommendations for fruit. For adults in households below the 1.25 poverty ratio, but not participating in SNAP, 21% meet the dietary recommendation for vegetables and over 17% meet the recommendations for fruit. The figures continue to improve for adults living in households above the 1.25 poverty ratio compared to adults in lower-income households. Over 25% of adults in the above 1.25 poverty ratio group meet the recommendations for vegetable consumption and about one in five meet the fruit recommendations.

**Table 3**

**Percentage of Adults who Meet the Minimum Recommendations by Food Group, Income and SNAP Participation Status, 2003-2004.**

	All Adults	SNAP	Not currently on SNAP but under 1.25	Over 1.25 poverty ratio
	%	%	%	%
Total Vegetables	23.81	16.22	21.06	25.56
Dark Green	12.70	7.21	9.11	14.70
Dark yellow and red	7.70	5.86	7.31	8.00
Starchy	26.97	23.42	26.00	27.63
Other vegetables	34.62	22.52	28.91	38.00

Source: National Health and Nutrition Examination Survey, 2003-2004. USDHHS (2005).

### Effects of Full DGA 2010 Implementation

Very few studies have looked at the potential impacts of the DGA for U.S. agriculture. Buzby, Wells and Vocke (2006) are a notable exception. They looked at the potential impacts to agriculture from full adoption of the 2005 DGA using a linear extrapolation of the data. They concluded that in order for Americans to meet the fruit, vegetable, total grain, and whole grain recommendations, domestic crop acreage would have to increase by an estimated 7.4 million harvested acres or 1.7% of total U.S. crop land in 2002. They also found that U.S. dairy producers would need to increase annual production of milk and milk products by 108 billion pounds. They assumed the same ratio of share in domestic production and imported foods and hence the additional food amounts required to fill the gap will come from both domestic and foreign sources.

When looking at the potential impacts to agriculture and the increase in agricultural output required to fully satisfy the dietary recommendations of the DGA 2010, the use of a 2,000 calorie per day intake level makes the interpretation of the findings less intuitive and adds more complexity. In 2009, the average American consumed 2,594 calories. Our analysis uses a different approach, by interpolating the DGA recommendations to the actual average per capita food intake level of 2,594 calories per day in 2009. The actual levels of consumption by food

group are obtained from the Economic Research Service food consumption data system. This data series records per



**Table 4****Changes Needed to Meet the Full Recommendation Levels for the Average American Intake Level, 2,594 Calories Per Day.**

Food Group	Units	DGA Recommendation	Food Available for Consumption	Change needed to meet Guidelines	
					percent
<i>Fruits</i>	cups/wk	14.0	6.0	8.0	134.1
<i>Vegetables</i>	cups/wk	24.4	11.4	12.9	113.2
Dark Green	cups/wk	2.5	1.0	1.5	151.1
Beans and Peas	cups/wk	2.5	0.7	1.8	266.6
Red and Orange	cups/wk	7.0	2.1	.9	
Starchy Vegetables	cups/wk	7.0	3.9	3.1	79.2
Other	cups/wk	5.5	3.8	1.7	45.2
<i>Grains</i>	oz-eq/wk	62.8	57.5	5.3	9.2
<i>Seafood</i>	oz/wk	10.0	3.2	6.8	208.3
<i>Meat, Poultry and Eggs</i>	oz/wk	31.0	39.6	-8.6	-21.7
<i>Dairy</i>	cups/wk	21.0	12.1	8.9	73.7
<i>Oils</i>	grams/wk	237.3	285.6	-48.3	-16.9
<i>Max SoFAS</i>	cal/day	361.0	668.8	-307.8	-46.0

1 Units were converted to weekly equivalents for comparison across food groups except for maximum SoFAS where the recommendation is a percentage of total calorie intakes. 2 The amounts recommended represent the average American intake level of 2,594 calories per day in 2009, and they were interpolated from the DGA recommendations for 2,400 and 2,600 calories. 3 Food available for consumption obtained from the ERS food consumption data. 4 Grain available includes 7.6 ounce equivalent per day from ERS and 0.6 oz eq missing whole grain per day estimated by Putnam, Allshouse, and Kantor (2002) and used by Buzby, Wells and Vocke (2006). 5 Maximum SoFAS are daily calorie intake from solid fats and added sugars.

capita food availability adjusted for nonedible parts and loss or spoilage and converts that information to servings as specified in the DGA 2010. Even though these data do not measure actual food intake, they provide information about food availability for human consumption in the United States (ERS 2012; Buzby, Wells, and Vocke 2006). The recommended weekly amounts by food group for a 2,594 calorie per day intake level are then compared with food available for consumption, and the change in food availability needed to meet the recommendations for the average American are calculated.

This analysis keeps the level of calorie intake at the current consumption level of 2,594. The DGA 2010, however, also recommends a reduction in the amount of food intake. Hence these results represent minimum adjustment levels for a balanced diet with the current intake levels for the average American. As shown in Table 4, most food groups require substantial increases in consumption levels to satisfy the DGA 2010 recommendations. An increase in consumption of fruits (134.1%), vegetables (113.2%), grains (9.2%), seafood (208.3%) and dairy (73.7%) are required. Meat, poultry, and eggs consumption requires a reduction of 21.7%. Oil consumption needs to be reduced by 16.9%, while solid fats and added sugars need to be reduced 46%. This analysis does not account for any tradeoffs consumers may make to offset an increase for certain food categories by reducing others. The analysis also shows a need for reduction in the amount of food consumed by the average American. The magnitude of the reduction should be of at least 307 calories, which corresponds to the number of calories over the suggested limit for solid fats and added sugars, suggesting at least a reduction in the total calorie intake for the average American to 2,286 calories per day.

**Nutrition Policy Incentives Role in Adopting the DGA 2010**

With small changes in dietary behaviors from previous DGA, and income and prices being a determining factor in healthy eating behaviors, public policies may play a mediating role in improving the dietary quality of Americans. For

those food groups where a reduction in consumption is required—including meat, poultry, and eggs; fats and oils; and added sugars—price may play a bigger role in the consumers' decision making. Fluid milk is a good example, with the same current retail prices for whole milk and low-fat milk. While it is true that processing whole milk may pose additional costs for the processor, the cream obtained as a sub-product is used in the elaboration of other higher-valued dairy products with higher content of fat. From the consumer standpoint there are no price incentives to switch to a lower level of fat content in fluid milk. A pricing system similar to the producer level pricing, where price is a function of the fat content of the milk, could result in a greater consumer response. However, if consumers demanded more low-fat dairy products, it would likely increase the amount of butterfat available and hence the supply of higher fat content dairy products at potentially lower prices.

In addition to price, income also plays a role in consumer's adoption of the DGA recommendations. There are some potential DGA 2010 adoption impacts for low-income consumers who participate in food assistance programs. In 2008, in response to the 2005 DGA, the Food, Nutrition and Conservation Act authorized funding to evaluate a pilot program on the effects of providing a 30% cash bonus on purchases of fruits and vegetables. Under this policy participants would receive a credit of 30% of the total cost of fruits and vegetables on their Electronic Benefit Transfer Card. Previous studies have estimated the potential effects of financial incentives on healthy eating for SNAP participants. Jetter (2011) estimated that a price discount of 25% for SNAP participants would increase the consumption of fruits and vegetables by 6.9%. Dong and Lin (2009) estimated that a price discount of 10% could increase fruit and vegetable consumption by 2.1% to 5.2% and program costs could increase by \$310 million for fruits and \$270 million for vegetables.

The SNAP program provides a stipend that allows people to pick and choose the variety of foods they want to consume. In contrast, several other food assistance programs such as the Supplemental Food Assistance Program for Women, Infants and Children (WIC) and the Food Distribution Program on Indian Reservations (FDPIR) provides vouchers for only certain types of foods (WIC) or delivery of specific foods (FDPIR). The WIC program provides supplemental foods designed to meet the specific nutritional needs of low-income pregnant, breast feeding, non-breast feeding post-partum women, infants and children up to five years of age who are at nutritional risk. Participants use vouchers, or increasingly an electronic benefit card, to make purchases of authorized foods at authorized centers—supermarkets, local food outlets, WIC stores. In 2011, the average monthly participation was 9 million people and budget costs were about \$7 billion (USDA 2012b). Until recently, WIC foods included whole milk, cheese, eggs, peanut butter, baby cereals, formula, iron fortified cereals for mothers, dried peas and beans, and canned fruits, vegetables, and juices. Starting in 2006, following the publication of the 2005 DGA, a policy change to the content of the WIC food package was made to include fresh fruits and vegetables, brown rice, whole grains, tofu, soy milk, low-fat or non-fat milk, and baby food. Participants could also purchase fresh produce at farmers markets that accepted the WIC vouchers. In a pilot study on the effectiveness of using a fresh produce voucher at farmers' markets for six months, the results showed that six months after the voucher program ended, study participants still had significant increases in their fruit and vegetable consumption (Herman et al. 2008).

The National School Lunch Program is a federally assisted program that provides nutritionally balanced low-cost or free lunches to over 101,000 public and nonprofit private schools. Children from families with incomes at or below 130% of the poverty level (\$29,055 in 2012) are eligible for free meals, and those with income between 130%-185% of the poverty level (\$41,348 in 2012) are eligible for reduced-price meals. Participation levels in 2010 were over 31.7 million children for a total cost of \$10.8 billion (USDA 2012c). The objective of the program is to reduce obesity rates among children and to promote healthier eating habits. Under this program, school districts must increase the health content of the products they offer. Just and Wansick (2009) used behavioral economics to offer low-cost options for school districts to encourage children to buy more of the nutritional items and less of the less nutritional items. Some of these options include rearranging items to make it easier for children to purchase healthier items, and more difficult to purchase undesirable items. However, mandating the implementation of DGA 2010 recommendations has become a politically charged issue.

The Food Distribution Program on Indian Reservations provides a USDA commodity package of foods to 275 Indian Reservations, pueblos, Rancherias, and Alaska Native villages. The program has a monthly average enrollment of about 84,000 people and a budget of \$97 million in 2011 (USDA 2012c). This program is an alternative to the SNAP program for eligible households living in rural areas with limited access to stores that sell a variety of foods. The package provides a selection of about 100 commodities of mostly dried, canned or frozen goods, with some fresh produce available through the Department of Defense. Participants may either pick up their commodity package once a month from the distribution center, or have it delivered if they live at a tailgate site. Whole grain products in the form of whole grain rotini—starting in 2008—and whole wheat flour are also available, though not always at tailgate sites. The current allocation of canned or fresh produce is equal to about 1.25 servings a day for fruit and 1.5 servings of vegetables (USDA 2011). Prior to the 2005 DGA the commodity package provided about half the recommended amounts of fruits and vegetables. No significant policy recommendations were made for changes in the composition of the FDPIR commodity package in response to the 2005 DGA.

The programs discussed above provide food, electronic funds, or vouchers to purchase food and have successfully improved food security and the nutritional quality of foods consumed for participants. However, continuing income disparities may indicate the need for further policy change to improve dietary quality in response to the DGA 2010. One policy change could be to improve the ability of SNAP and WIC beneficiaries to purchase foods on-line for home delivery. Low-income households prefer to shop at supermarkets and grocery stores rather than other neighborhood stores such as specialty and convenience stores due to generally lower prices (Ohls et al. 1999). Often these stores are located outside the core neighborhoods where the family lives. Food stamp participants also tend to do most of their food shopping at the beginning of the month whether the purchases are paid with an EBT card or some other means (Hastings and Washington 2008; Wilde and Ranney 2000). Expenditures decrease over time during the month though, mostly due to a decrease in quantity purchased, rather than substitutions from generic items. The participants also tend to make only one or two major shopping trips, if living in a neighborhood located far from large supermarkets and bulk food stores.

As a result of these shopping patterns, it is difficult to stock up on perishables such as fresh produce and milk. Traditionally, however, neighborhood convenience stores have offered milk, bread, cheese and eggs. Due to the perishability of most fresh produce however, these stores seldom stock it. By developing the means to use EBT cards, make on-line purchases from stores that deliver, or increase the availability of local foods, purchases may be able to be made frequently enough to encourage greater consumption of healthier, though more perishable, food. This may be especially important for those people who are homebound—such as some seniors and disabled persons—and rely on food assistance programs.

Change may be overdue to the FDIIR commodity package to bring it more into compliance with the DGA 2010. The number of servings of fresh produce and whole grain provided in the package would need to be increased. Because FDIIR participants can only pick up commodities once month, they face the same constraints in buying and storing fresh produce over a month as SNAP participants living far from supermarkets. Thus, they are unable to have sufficient fresh produce to consume throughout the month. Some policy alternatives may be to provide seeds in the commodity package for those interested in gardening. Vouchers to be used for fresh produce purchases may also be provided in commodity packages.

## **In Summary**

The DGA 2010 recommendations are designed to promote wellness and decrease the risk of chronic diseases through a balanced diet and exercise. However, when looking at consumption trends for the main food groups, no significant changes in consumption or shifts from one food group to another have been observed in the last few years. If policies were implemented as an incentive for Americans to change their diets and adopt the recommendations from the DGA, there would likely be some impacts on agriculture. The magnitude of the impacts to U.S. agriculture, for every food group, will depend on any changes in demand and the amount of food produced domestically, as well as the share of consumption derived from imports. If a *status quo* of the current policies is maintained for the DGA 2010, then it is reasonable to expect similar results to those from previous DGA released in 2005 and 2000. With only very minor changes in consumption and no significant shifts from one food group to another, the impacts on agriculture in terms of increased acreage, trade effects, and changes in prices are expected to be minimal. Food policies need to consider the positive effects in consumption of promoting certain desirable food groups, and also the potential negative effects of discouraging the consumption of less desirable foods.

## **For More Information**

Buzby, J.C., Wells, H.F., and Vocke, G. (2006). Possible Implications for U.S. Agriculture From Adoption of Select Dietary Guidelines. Economic Research Service, Report No. 31.

Casagrande, S.S., Wang, Y., Anderson, C., and Gary, T.L. (2007). Have Americans Increased Their Fruit and Vegetable Intake? The Trends between 1988 and 2002. *American Journal of Preventive Medicine*, 32(4), 257-63.

Cleveland, L.E., Moshfegh, A.J., Albertson, A.M., and Goldman, J.D. (2000). Dietary Intake of Whole Grains. *Journal of the American College of Nutrition*, 19(3), 331S-338S.

Dietary Guidelines for Americans. (2010). U.S. Department of Agriculture. U.S. Department of Health and Human Services. Available at: <http://www.dietaryguidelines.gov>.

Dietary Guidelines for Americans. (2005). U.S. Department of Agriculture. U.S. Department of Health and Human Services. Available at: <http://www.dietaryguidelines.gov>.

Dong, D. and Biing-Hwan, L. (2009). *Fruit and Vegetable Consumption by Low-Income Americans: Would a Price Reduction Make a Difference?* Economic Research Report Economic Research Service, United States Department of Agriculture.

Economic Research Service (ERS), U.S. Department of Agriculture (USDA). (2012). Food Availability (Per Capita) Data System. Available at: <http://www.ers.usda.gov/Data/FoodConsumption/>

Hastings, J. F. and Ebonya L.W. (2008). The first of the month effect: Consumer Behavior and Store Responses. National Bureau of Economic Research. Working Paper 14578. Available at: <http://www.nber.org/papers/w14578>.

Herman, D.R., Harrison, G.G., Afifi, A.A., and Jenks, E. (2008). Effect of a targeted subsidy on Intake of Fruits and Vegetables Among Low-Income Women in the Special Supplemental Nutrition Program for Women, Infants and Children. *American Journal of Public Health*, 98, 98-105.

Jetter, K.M. (2011). Using Price Incentives to Increase the Consumption of Fruits and Vegetables among a Low-Income Population. Chapter 9 in *Nutrients, Dietary Supplements, and Nutraceuticals: Cost Analysis Versus Clinical Benefits*. Ronald Ross Watson, Joe K. Gerald and victor R. Preedy, Eds. Humana Press. New York.

Jetter, K.M., Chalfant, J.A., and Sumner, D.A. (2006). Linkages between Greater Fruit and Vegetable Consumption and Agriculture. Selected paper presented at the American Agricultural Economics Association. Long Beach, CA.

Just, D.R. and Wansik, B. (2009). Smarter Lunchrooms: Using Behavioral Economics to Improve Meal Selection. *Choices*, 24(3).

Ohls, J.C., Ponza, M., Morena, L., Zambrowski, A., and Cohen, R. (1999). Food Stamp Participants' Access to Food Retailers. Princeton, NJ: Mathematica Policy Research, Inc.

Putnam, J., Allshouse, J., and Kantor, L.S. (2002). US Per Capita Food Supply Trends: More Calories, Refined Carbohydrates, and Fats. *Food Review*, 25(3), 2-15.

Satia, J.A. (2009). Diet-Related Disparities: Understanding the Problem and Accelerating Solutions. *Journal of the American Dietetic Association*, 109(4): 610-15.

United States Department of Agriculture, Food and Nutrition Service. (2011). Monthly Distribution Guide Rates by Household Size. Available at: <http://www.fns.usda.gov/fdd/programs/fdpi/>. Access 1/31/12.

United States Department of Agriculture, Food and Nutrition Service. (2012a). *Supplemental Nutrition Assistance Program Participation and Costs*. Available at: <http://www.fns.usda.gov/pd/SNAPsummary.htm> Accessed 1/31/12

United States Department of Agriculture, Food and Nutrition Service. (2012b). WIC Program Participation and Costs. Available at: <http://www.fns.usda.gov/pd/wisummary.htm> Accessed 1/31/12

United States Department of Agriculture, Food and Nutrition Service. (2012c). National School Lunch Program. Frequently Asked Questions. Available at: <http://www.fns.usda.gov/cnd/lunch> Accessed 1/31/12

United States Department of Agriculture, Food and Nutrition Service. (2012d). Food Distribution Program on Indian Reservations. Frequently Asked Questions. Available at: [http://www.fns.usda.gov/fdd/programs/fdpi/fdpi\\_faqs.htm#5](http://www.fns.usda.gov/fdd/programs/fdpi/fdpi_faqs.htm#5) Accessed 1/31/12

United States Department of Health and Human Services. (2005). Centers for Disease Control, National Center for Health Statistics. National Health and Examination Survey. 2003-2004 data sets. Available at: [http://www.cdc.gov/nchs/nhanes/nhanes2003-2004/nhanes03\\_04.htm](http://www.cdc.gov/nchs/nhanes/nhanes2003-2004/nhanes03_04.htm) Accessed 1/31/12

Wilde, P.E., and Ranney, C.K. (2000). The Monthly Food Stamp Cycle: Shopping Frequency and Food Intake Decisions in an Endogenous Switching Regression Framework. *American Journal of Agricultural Economics*, 82(1), 200-213.

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## **GEOGRAPHIC IMPACTS ON U.S. AGRICULTURE OF THE 2010 DIETARY NUTRITION GUIDELINES**

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JEL Classification Codes: I18, Q18

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**T**he thrust of the 2010 Dietary Guidelines for Americans (DGA 2010) is to substantially reduce the intake of calories and fats as part of the fight against obesity and related diseases. This goal is to be accomplished by: (1) increasing vegetable and fruit consumption; (2) increasing whole grain consumption; (3) substituting fish and nuts for red meats; and (4) substituting skim milk, soymilk, yogurt, and cottage cheese for higher fat/calorie dairy products, including full-fat milk, chocolate milk, cheese, butter, etc. To the authors' knowledge, there has been little or no quantitative analysis of potential impacts of the DGA 2010 on the geographic distribution of agricultural production or dependence on imports, which is the objective of this paper.

Analyses of the agriculture sector impacts of the 2005 Food Pyramid Guidelines were limited in scope. The first study by Jetter, Chalfant, and Sumner (2004) initially analyzed the health, consumption, trade, production, and input demand implications of the DGA 1999. Subsequently, they analyzed the implications of the DGA 2005 for six adoption scenarios (Jetter, Chalfant, and Sumner 2006). They found that even 10% increases in consumption yielded large benefits to consumers and producers. Not quantitatively analyzed were the regional implications for fruits and vegetables or the implications for other commodities. Buzby, Wells, and Vocke (2006) analyzed the agricultural implications of full adoption of the DGA 2005. They found the need for a 132% daily increase in fruit consumption, a 31% daily increase in vegetable consumption, a 66% increase in milk consumption, and a 248% increase in whole grain consumption. The 35% extrapolated decrease in consumption of starchy vegetables was much larger than that found by Jetter, Chalfant, and Sumner.

This article will evaluate the sets of commodities most directly affected by the DGA 2010. The authors realize the need for a more comprehensive macroeconomic agriculture sector model to adequately evaluate these issues. Such a model that endogenously includes the specialty crop sector does not currently exist. Yet, the publicity surrounding the DGA 2010 raises many questions regarding the nature of the potential agriculture sector impacts and their geographic distribution. Despite analytical weaknesses, this study will utilize the methodology used by Buzby, Wells, and Vocke (2006), except for meat and dairy. The complexity of the meat—including fish, and dairy issues will be explained separately. In addition, this study will assess the geographic areas most directly affected by the guidelines as deviations from baseline production patterns. Finally, it will suggest steps that could be taken to facilitate geographic and structural adjustment.

A side-by-side comparison of the DGA 2005 and 2010 are presented in Palma and Jetter in an accompanying article. The recommended portions of each food group might differ from other publications because they assume a daily calorie level of 2,594 instead of a commonly used 2,000 level. The reason for the 2,594 caloric intake assumption is that it represents the average calorie intake by an American. In addition, the calorie level used in this analysis will more accurately indicate the potential impact on acreage, production, and trade for each food group in the United States.

### **Potential Impacts on Agriculture**

Because the impacts are likely to differ for various classes of agricultural products, the following sections address the product sectors individually.

#### ***Fruits***



**Table 1**

**The actual and simulation results of fruit and vegetable production, imports and exports to meet the DGA's 2010 recommended amount.**

Fruits				
	Total Domestic Production	Total Imports	Total Exports	Change in acreage of domestic production
	(million MT)	(million MT)	(million MT)	(acres)
Actual (average 2005-2010)	26.5	9.9	3.4	-----
<b>Simulation results</b>				
Scenario 1: (Holding exports, the share of imports constant)	34.6	12.8	3.4	891,400
Scenario 2: (Exports decrease by 10%; Share of imports increases by 10%)	29.5	17.5	3.06	334,500
Scenario 3: (Exports decrease by 20%; Share of imports increases by 20%)	27	19.7	2.72	54,800
Vegetables				
Actual (average 2005-2010)	56	5	7.6	-----
<b>Simulation results</b>				
Scenario 4: (Holding exports, the share of imports constant)	63.8	5.6	7.6	824,000
Scenario 5: (Exports decrease by 10%; Share of imports increases by 10%)	55.4	12.3	6.8	-72,800
Scenario 6: (Exports decrease by 20%; Share of imports increases by 20%)	58.1	8.8	6.1	254,800

Because there is no actual fruit consumption data available, we used the ERS loss-adjusted food availability for the average Americans with an intake level of 2,594 as an approximation. The total availability of fruit (domestic production + imports - exports) will need to increase by 133% to meet the DGA's 2010 recommended amount. From 2005 to 2010, the average domestic utilized production of fruit was 26.5 million metric tons (MMT) a year, imports averaged 9.9 MMT, and exports averaged 3.4 MMT (Economic Research Service 2011a; Foreign Agriculture Service 2011). When this increase is allocated proportionately between domestic production and imports by holding exports constant (Scenario 1 in Table 1), we estimate that the domestic production would need to increase by 131% to 34.6 MMT. Imports would need to increase by 129% to 12.8 MMT. We estimate the fruit industry must increase its acreage by 891,400 acres to total fruit production acreage of 3.8 million acres. In addition to domestic production, fruit imports are likely to increase to meet the increase in the fruit consumption recommended by the DGA 2010. Therefore, our estimates of the increase in domestic fruit production are believed to represent an upper-bound (Buzby, Wells, and Vocke2006). We simulated another two scenarios where exports and import shares also change (Table 1). When exports decrease by 10% and the share of imports increases by 10%, the increase in the acreage of domestic production is about 334,500 acres (Scenario 2 in Table 1); when exports decrease by 20% and the share of imports increases by 15%, the increase in acreage of domestic production is very small—only about 54,800 acres (Scenario 3

in Table 1). Scenario 3 shows the case when the United States does not expand domestic production in the short run and the increase in fruit consumption would be sourced from imports and by cutting exports simultaneously.

Different states in the United States would be affected to different degrees. According to the 2007 U.S. Census of Agriculture, California accounted for approximately 60% of the non-citrus fruit acreage, followed by Washington (about 14%) and Michigan (about 5%). For citrus fruit, Florida accounted for approximately 65% of the total acreage, California ranked second (about 30%) and Texas third (about 3%). To meet the increase in consumption, these top producing states are more likely to be affected due to their favorable climate, arable land, and other favorable production characteristics. The states that mainly produce tree fruits (apples, pears, etc.) and citrus fruits would be unlikely to increase production in the short run due to the time required for these trees to bear fruit. To meet the production increase, the inputs to produce fruit such as labor, land, water, and fertilizer will likely be in greater demand, leading to higher costs in these inputs. This is especially true for labor because most fruit production is labor intensive. Increased demand, resulting in higher prices, would bring higher cost areas into production.

The United States has been a net fruit importer despite the growth in exports. Between 2005 and 2010, excluding bananas, fresh fruit imports have increased by approximately 15%. During this period, fresh fruit imports—excluding bananas—accounted for about 30% of domestic fruit consumption, which represents a slight increase compared to 2004 when it was about 25%. Increases in imports were experienced by both fruits produced domestically and nontraditional fruits, especially tropical fruits. Mexico is the largest supplier of fresh and frozen fruit to the United States, accounting for over 30% each of the volume and value of fresh and frozen fruit imports—excluding bananas. This reflects the close geographic proximity, the low transportation costs, and low tariffs on Mexican imports. Other leading fruit suppliers are Chile, Brazil, China, and Argentina (Economic Research Service 2011b).

## **Vegetables**

The total availability of vegetables (domestic production + imports - exports) would need to increase by 114% to meet the DGA's 2010 recommended amount. But, this increase is not allocated evenly across the five subgroups. The consumption of beans and peas (legumes) and red and orange colored vegetables must increase substantially, by 257% and 233%, respectively. The consumption of dark green vegetables would have to increase by 150%, followed by starchy vegetables (80%), and other vegetables (45%).

During the 2005 to 2010 period, the average domestic production of vegetables was 56 MMT/year. Imports and exports averaged 5 MMT and 7.6 MMT, respectively (Economic Research Services 2011c; Foreign Agriculture Service 2011). When allocating the percentage increase (114%) proportionately between domestic production and imports, holding exports constant, we estimate that the domestic production and imports would both need to increase by 112%. Total acreage would have to increase by 824,000 acres to a total acreage of 7.6 million acres (Scenario 4 in Table 1). In addition to domestic production, vegetable imports are also likely to increase to meet the increase in the vegetable consumption recommended by the DGA 2010. Therefore, our estimates of the increase in domestic vegetable production represents an upper-bound. Similar to fruit, we simulated another two scenarios when exports and imports share also change (Table 1). When exports decrease by 10% and the share of imports increases by 10%, the change in the acreage of domestic production would be small—only about 72,800 acres (Scenario 5 in Table 1). When exports decrease by 20% and the share of imports increases by 5%, the acreage of domestic production would increase by about 254,800 acres (Scenario 6). Scenario 5 shows the case when the United States does not expand domestic production in the short run, so the increase in vegetable consumption would be sourced from imports and by cutting exports simultaneously.

California ranked first in terms of harvested area of vegetables, accounting for 43% of total harvested area, followed by Florida (10%), and Arizona (6.6%) (Economic Research Service 2011c). The growing conditions of vegetables are not as constrained by weather conditions as certain fruits. We expect that vegetable production would be expanded in other states, in addition to these top producing states. The price of vegetables will increase as a result of the demand increase. In contrast with fruit, many of the vegetables are not as labor intensive, so the demand for labor might not change as dramatically as that for the fruit industry and may vary across vegetable crops.

In addition to domestic production, vegetable imports are also likely to increase to meet the increase in the vegetable consumption recommended by the DGA 2010. From 2005 to 2010, vegetable imports have increased by approximately 16%. In terms of import value, Mexico and Canada have historically been the top suppliers of vegetables to the United States due to transportation and tariff advantages, followed by China, Peru, and Spain (Economic Research Service 2011d).

## **Grains**

Crops included in the study are wheat flour, corn products, rice, oat products, rye flour, barley products, and others (Table 2). The DGA 2010 recommendations indicate that the average American is not eating enough grain-based food, particularly whole grain as opposed to refined grain. Our estimates indicate that there are 57.5 grain servings per week per person available for consumption, compared to the recommended 62.8 servings per week per person, a 9.2% deficit (For more information see Palma and Jetter in the accompanying article). However, the guidelines suggest reducing enriched or refined grains consumption by 29 % and increasing whole grain consumption by 423.3%. Due to data gaps for whole grain consumption, wheat is the commodity used for our grain analysis. Wheat accounts for 68% of total grain available for consumption (Economic Research Service 2011a).

**Table 2****Weakly per capita availability of select grains in the United States, 2009.**

Grain	1-ounce equivalent servings	Share of total grain servings
Wheat flour	36.00	62.6%
Corn products*	11.74	20.4%
Rice	4.58	8.0%
Oat products	0.75	1.3%
Rye flour	0.13	0.2%
Barley products	0.11	0.2%
Other**	4.20	7.3%
Total	57.51	100.0%

\*Included here are corn flour, meal, and grits from field corn for human consumption. Not included is sweet corn as it is a vegetable.

\*\* Whole grain foods missing from the ERS Loss-Adjusted Food Availability Servings, i.e. popcorn, quinoa, etc. Putnam, Allhouse, and Kantor (2002) estimated that Americans were eating at least 4.2 whole grain servings per capita per week in 2000.

During the 2005 to 2010 period U.S. wheat harvested acreage averaged 50.2 million and on average 44.5% of those acres were available for food use, mainly flour, while the rest went into exports, seed, feed, and residual. In addition, during the same period, average domestic wheat flour production, both whole and refined, was 18.6 MMT, while imports and exports were 0.3 MMT and 0.2 MMT, respectively for 2005 and 2010. The total wheat flour and flour products available in the United States (domestic production + imports – exports) averaged 18.7 MMT/year. Industry estimates indicate that annual U.S. production of whole wheat flour is about 5% of total U.S. wheat milled, while the remainder goes into refined flour and products. Therefore, in order to reach the DGA 2010 recommended levels, whole wheat production needs to increase tenfold, from 5% to 50% so that half of the available wheat flour is consumed as whole wheat. Full adoption of the DGA 2010 standard would require, essentially, a reallocation of the processing of wheat from refined to whole wheat. Our study did not use the estimated 423.3% increase in whole grain consumption because that estimate is for all grains and we are only considering wheat.

The result of full compliance with the DGA 2010 would be a decrease in wheat production by around 1.8 MMT available for consumption, from 26 to 24.2 MMT. This result seems counterintuitive given that consumption of total grains should increase by 9.2% under the DGA 2010. However, given that one pound of wheat makes 0.98 pounds of whole wheat flour but only 0.74 pounds of refined flour, the net effect is a 7% decrease in total wheat available for consumption. These results vary significantly from the Buzby, Wells, and Vocke (2006) report, but the main difference is the daily calorie level used. They assumed 2,000 calories, while we assumed the average of 2,594 calories.

A decrease in wheat demand could trigger a drop in wheat prices and land allocation. The 1.8 MMT reduction due to compliance to the DGA 2010 equates to a 1.6 million fewer harvested acres needed, from 50.2 to 48.6 million acres. This drop only accounts to 3.2% of total harvested acres during the 2005-10 period, which is not large given that during the same period harvested acres ranged from 46.8 to 55.7 million acres. Nevertheless, some wheat farmers affected by this drop will likely shift acreage to other crops or other wheat varieties. An increasingly popular choice would be hard-white winter wheat for the production of whole wheat products due to some of its desirable properties similar to refined wheat products. Finally, the switch to produce more whole wheat products could affect the feed market because less wheat byproducts would be available to be used in livestock rations.

### ***Dairy and Meat Production***

In the past decade, several studies have attempted to identify land use and livestock industry impacts resulting from changes in farm and bioenergy policies, but the available literature is much less prevalent for the DGA impacts. O'Brien (1995) examined the relationship between increased adherence to the Food Pyramid and the output from production agriculture. He concluded that adherence to the Pyramid guidelines would result in increased poultry and pork production and less red meat production, with resulting declines in feed grain production because of higher feed conversions for poultry and hogs compared to sheep and cattle. Dairy production would increase under his assumptions.

Buzby, Wells, and Vocke (2006) pointed out the challenges of assessing dietary guideline impacts for the U.S. livestock/meat industry. These challenges are due mainly to the whole-animal system that includes both lean and non-lean meat production. That is, animal carcasses include both lean and higher-fat cuts of meat, and changes in consumption patterns could have corresponding impacts on the grain sector. Likewise, they discussed the challenges of differentiating "low-fat" and "non-fat" dairy products from other dairy products in their assessment of dairy consumption impacts. They concluded that total dairy production would increase, assumed that increased dairy

production would occur in current top dairy-producing states, and did not analyze what would happen to the excess butterfat.

Young and Kantor (1999) briefly discussed the pressures on grain and oilseed markets and the expected impact on pastureland values from increasing dairy activity near population centers. They also discussed the trends in meat and dairy consumption and production, taking into account the increased role of chicken in U.S. diets in the 1990s and gains made in milk production per dairy cow over time. Yet, like Buzby, Wells, and Vocke (2006), they did not address how large changes in dietary intake may impact regional livestock or dairy production.

**Table 3**

**ERS Loss-Adjusted Red Meat\*, Poultry, and Egg Availability (oz/wk), 1990-2009.**

Year	Red Meat*	Poultry	Eggs	Total**
1990	21.4	10.3	3.6	35.2
1991	21.2	10.6	3.5	35.4
1992	21.5	11	3.6	36.1
1993	21.1	11.3	3.6	36
1994	21.6	11.4	3.6	36.6
1995	21.6	11.3	3.5	36.5
1996	21.2	11.5	3.6	36.2
1997	20.8	11.6	3.6	35.9
1998	21.6	11.7	3.6	36.9
1999	21.9	12.3	3.8	38
2000	21.7	12.3	3.8	37.8
2001	21.2	12.3	3.8	37.4
2002	21.7	12.9	3.9	38.5
2003	21.3	12.9	3.9	38.1
2004	21.4	13.2	3.9	38.5
2005	21	13.4	3.9	38.2
2006	21	13.4	3.8	38.2
2007	21	13.4	3.7	38.1
2008	20.3	13.2	3.7	37.1
2009	20.1	12.6	3.7	36.4

\*Beef, veal, pork, and lamb.

\*\*Total of red meat, poultry, and eggs, but not including fish, shellfish, nuts, or dry beans.

Arnoult et al. (2010) made the most recent and significant attempt to address livestock industry and land-use impacts due to greater adherence to dietary guidelines, examining the impacts of following the U.K. Department of Health's healthy eating guidelines on agricultural production and land use in England and Wales. Although not identical to the DGA, the authors note that "[t]here is no fundamental difference between the recommendations on healthy eating given by different national and international agencies." The authors found that agricultural regions with the greatest dependency on beef and sheep production would be most negatively affected by adherence to the dietary guidelines. Their model predicted that dairy production and grain crops would supplant a share of sheep and beef production in areas where the land was suitable for such alternatives. They also concluded that remote pasture-dominated regions, being less suitable for alternatives such as grain or horticultural production, would experience the greatest negative impacts due to declining demand for beef and mutton.

Compared to Arnoult et al. (2010), an examination of dietary guideline impacts on the U.S. meat and dairy industries must consider the greater geographic diversity of the U.S. livestock sector, in addition to the crossover impacts to the larger grain and oilseed markets. As pointed out by MacDonald and McBride (2009), even highly integrated and geographically-concentrated livestock systems such as hogs and poultry involve multi-location production systems including hatcheries or farrowing operations, grow-out farms, and processing facilities. For cattle the system is even more geographically dispersed. A weaned calf from a Florida cow-calf operation might end up on Oklahoma winter wheat pasture as part of a stocker cattle program before heading to a feedlot and packing plant in Texas or Kansas. Thus, the geographic impacts of changes are broader and more difficult to estimate than the England/Wales example provided by Arnoult et al. (2010).

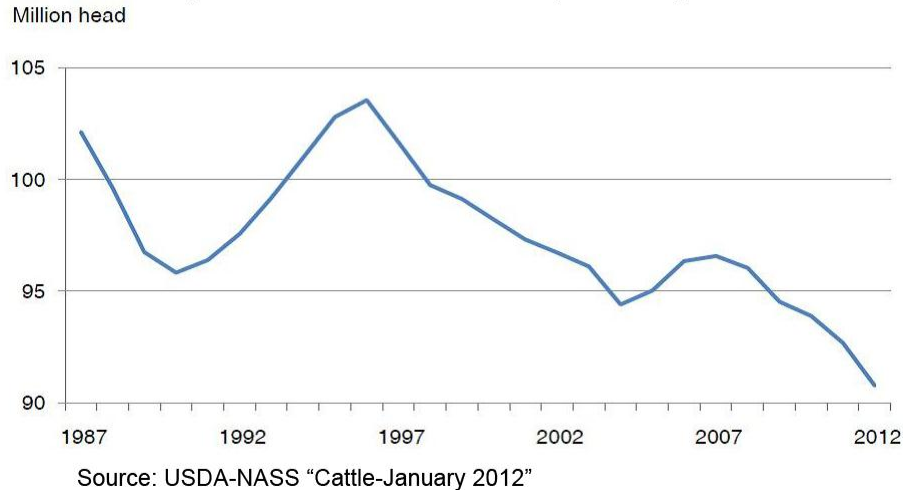
A study of geographically-identifiable agricultural impacts must account for ongoing structural change in the livestock/meat sector, so that trends noticed prior to the DGA 2010 are distinguished from additional changes required to meet the Guidelines. The DGA 2010 recommends a 21.7% decrease in the consumption of meat, poultry, and eggs. But as pointed out by Young and Kantor (1999) and by Buzby, Wells, and Vocke (2006), long-term trends show a gradual decline in per capita red meat consumption (Table 3). However, increased export demand could mitigate some of the industry impacts resulting from adherence to the DGA 2010.

U.S. livestock numbers, especially cattle inventories (beef and dairy), show a long-term decline, even after accounting for the impacts of the 2011 drought (Figure 1). However, beef and milk production per head have improved. MacDonald and McBride (2009) and Wirsenius, Azar, and Berndes (2010) suggest that factors such as scale economies, technological advancements, complementarities among stages, and

environmental regulations have been driving these changes in both livestock industry production methods and geographic locations on a national and global scale. The complementary nature of dairy and beef must also be considered, as an increase in milk production—and dairy herd levels—to meet DGA 2010 goals would necessitate an increase in beef production. In other words, spent dairy cows and most dairy bull calves are destined to become beef. Consistent with the DGA 2010, the more lean dairy animals, typically, would be leaner than beef breeds. Impacts will also be realized in both feed grain and forage production.

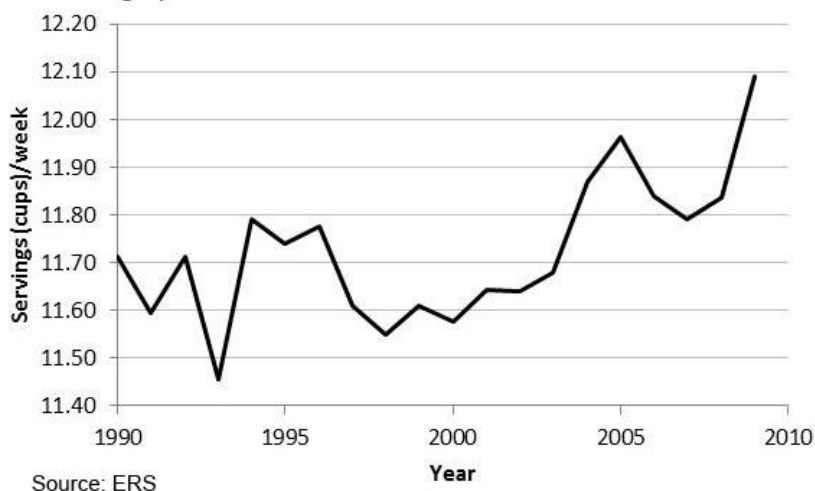


Figure 1: U.S. Cattle Inventory, January 1



Increasing milk production, while decreasing butter production, would be a challenge for meeting the DGA 2010. According to the Guidelines, the increase in milk production would have to be 73.6%—without the added effort of distinguishing fat content. This would require a heroic increase over historical dairy product availability (Figure 2). As noted in previous studies, the bulk and/or water content of dairy products—primarily milk—practically eliminate the feasibility of increased dairy imports to meet this increased demand and may negatively impact exports of U.S. dairy products such as cheese and whey to other countries. The option of substantially changing the pricing relationships of the fat and nonfat components of milk may have longer-run potential for dealing with this issue. Specifically, this would involve administratively increasing the price of the nonfat milk components while decreasing the price of butterfat. The geographic impacts of increasing milk production present a challenge for economists because of the movement of dairy operations in the first decade of the 21<sup>st</sup> century. Historically, dairy production has been concentrated relatively close to population centers to diminish transportation costs of the final fluid and bulk products. However, demands for land and water and environmental regulations have shifted the scale of dairy production and the locations in which dairy operations have concentrated (MacDonald et al. 2007). States such as Idaho and New Mexico, with comparably sparse populations and feed grain production capabilities, were not “Top 10” dairy states prior to 2000 (Blayney 2002). Yet according to ERS these two states now rank fourth and eighth, respectively, in dairy production. Meeting the 2010 guidelines would require increased dairy production in these or future “hot spot” dairy areas.

Figure 2: U.S. Total Dairy Products Availability, Servings per Week.



## ***Fish/Seafood and the DGA 2010***

Like the livestock sector, analyzing the DGA 2010 recommendations for increased fish consumption is a challenge for economists. It is further complicated by the distinction between edible and industrial—for example, fish meal—seafood production. Domestic production changes could come from freshwater production, U.S. territorial seas, the U.S. Exclusive Economic Zone (EEZ), or the high seas. During the 2005 -2010 period, U.S. supply and industrial fishery averaged 5.9 MMT, ranging from 15.8 to 16.5 pounds of edible meat per capita. Domestic production averaged 4.0 MMT while imports and exports averaged 5.0 and 3.1 MMT, respectively (NOAA 2011). The DGA 2010 recommends per capita consumption of 10 oz/week, while the available quantity for consumption in 2009 was 3.2 oz/week; therefore, an increase of 6.8 oz/week or 212.5% would be needed if the DGA 2010 were to be met.

The major fish/seafood producing states, by value of sales, are Washington, California, Louisiana and Mississippi. These states could benefit most from the potential increase in demand and prices. However, 85% of U.S. consumed edible and industrial fishery products are imported. Ironically, 75% of the U.S. domestic production is exported (NOAA 2011). As a consequence, the potential increase in demand due to the DGA 2010 will probably benefit imported products rather than domestic production. Clearly, the interactions between the fish and livestock sectors deserve substantially expanded attention, given the broad-based dietary recommendations to increase fish consumption, which implies reduced consumption of livestock products, and the concerns about over-fishing.

### **Concluding Remarks**

If the DGA 2010 were successfully implemented, it would raise the consumption of products preferred by the DGA 2010, such as fruits, vegetables, and fish, while reducing the consumption of products not preferred, such as enriched refined grains and red meats, among others. These changes in demand would be expected to have the short-run effects of raising the prices of products preferred by the DGA 2010 and reducing the prices of products not preferred. The effects on food costs are less clear. These price signals would also be transmitted to producers and change production patterns. Likewise, the long-run effects on national and regional agricultural production patterns, on land utilization, and on farm structure require further analysis. It is also hypothesized that imports of commodities favored by the DGA 2010 would increase, at least in the short run, although the long-run effects are unclear. Fruits and vegetable imports are more likely to increase, as countries with lower cost of production and/or more suitable climate will take advantage of the increase in demand and prices.

### **For More Information**

Arnoult, M.H., Jones, P.J., Tranter, R.B., Tiffin, R., Traill, W.B., and Tzanopoulos, J. (2010). Modeling the likely impact of healthy eating guidelines on agricultural production and land use in England and Wales. *Land Use Policy*, 27:1046-1055.

Blayney, D.P. (2002). *The Changing Landscape of U.S. Milk Production*.

Washington, D.C.: Economic Research Service SB-978, USDA. Available online: <http://www.ers.usda.gov/publications/sb978/sb978.pdf>. Accessed January 27, 2012.

Busby, J. C., Wells, H.F. and Vocke, G. (2006). *Possible Implications for U.S. Agriculture from Adoption of Select Dietary Guidelines*. Washington, D.C.: Economic Research Service ERR-31, USDA. Available online: <http://www.ers.usda.gov/publications/err31/err31.pdf>. Accessed November 17, 2011.

Economic Research Service, USDA. (2011a). Available online: <http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1377>. Accessed February 2, 2012.

Economic Research Service, USDA. (2011b). Available online: <http://www.ers.usda.gov/Briefing/FruitandTreeNuts/trade.htm>. Accessed February 2, 2012.

Economic Research Service, USDA. (2011c). Available online: <http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1212>. Accessed February 2, 2012.

Economic Research Service, USDA. (2011d). Available online: <http://www.ers.usda.gov/Briefing/Vegetables/trade.htm>. Accessed February 2, 2012.



Foreign Agriculture Service, USDA. (2011). Available online: <http://www.fas.usda.gov/gats/default.aspx>. Accessed February 2, 2012.

Jetter, K.M., Chalfant, J.A., and Sumner, D.A. (2004). Does 5-a-Day Pay? Potential Gains to Growers from Increasing Consumption of Fruits and Vegetables to Recommended Levels in a Cancer Prevention Diet. Davis, CA: University of California, Agricultural Issues Center AIC Issues Brief 27. Available online: <http://aic.ucdavis.edu/pub/briefs/brief27.pdf>. Accessed January 20, 2012.

Jetter, K.M., Chalfant, J.A., and Sumner, D.A. (2006). An Analysis of the Costs and Benefits to Consumers and Growers from the Consumption of Recommended Amounts and Types of Fruits and Vegetables for Cancer Prevention. Davis, CA: University of California, Agricultural Issues Center AIC Issues Brief 27. Available online: <http://aic.ucdavis.edu/research1/5aDay.pdf>. Accessed January 20, 2012.

MacDonald, J.M., and McBride, W.D. (2009). *The Transformation of U.S. Livestock Agriculture Scale, Efficiency, and Risks*. Washington, D.C.: Economic Research Service EIB-43, USDA. Available online: <http://www.ers.usda.gov/Publications/EIB43/EIB43.pdf>. Accessed January 29, 2012.

MacDonald, J.M., O'Donoghue, E.J., McBride, W.D., Nehring, R.F., Sandretto, C.L., and Mosheim, R. (2007). *Profits, Costs, and the Changing Structure of Dairy Farming*. Washington, D.C.: Economic Research Service ERR-47, USDA. Available online: <http://www.ers.usda.gov/publications/err47/err47.pdf>. Accessed January 31, 2012.

National Oceanic and Atmospheric Administration, USDC. (2011). Available online: <http://www.st.nmfs.noaa.gov/st1/fus/fus10/index.html>. Accessed February 22, 2012.

O'Brien, P. (1995). Dietary Shifts and Implications for U.S. Agriculture. *American Journal of Clinical Nutrition*, 61:1390–1396.

Putnam, J., Allhouse, J., and Kantor, L.S. (2002). U.S. Per Capita Food Supply Trends: More Calories, Refined Carbohydrates, and Fats. *Food Review*, 25(3):2-15.

Wirsenius, S., Azar, C., and Berndes, G. (2010). How Much Land is Needed for Global Food Production Under Scenarios of Dietary Changes and Livestock Productivity Increases in 2030? *Agricultural Systems*, 103:621-638.

Young, C.E., and Kantor, L.S. (1999). *Moving toward the food guide pyramid: Implications for U.S. agriculture*. Washington, D.C.: Economic Research Service AER-779, USDA. Available online: <http://www.ers.usda.gov/publications/aer779/aer779.pdf>. Accessed January 27, 2012.

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## **WILL LOCAL FOODS INFLUENCE AMERICAN DIETS?**

**Dawn Thilmany McFadden, and Sarah A. Low**

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**T**here are a number of indicators that illustrate the increasing public attention and food supply chain responses to consumers choosing to “Go Local.” Included are the number of food retailers adopting new local procurement policies, the persistent, double digit growth in farmers markets throughout the United States as tracked by USDA Agricultural Marketing Service, and the more recent emergence of urban food systems in and near metropolitan areas (Martinez et al., 2010; Lockeretz, 1986). Onozaka, Nurse, and Thilmany McFadden (2010) found that a sizable number of buyers connect local food purchases with outcomes that may impact their environment, local economy, and of particular relevance to this theme, public health. But, some of the connections between local foods and issues of public importance are difficult to assess. In this article, we begin exploring the linkages between relocation and an increased propensity for households to integrate the USDA’s dietary guidelines into their lifestyles. This includes, in particular, those households facing health risks, but also, the broader public.

### **The Era of Food System Relocalization**

Before local foods came to the forefront of new policy initiatives at the state and Federal level, there were other USDA programs that may have indirectly created opportunities for more localized food systems. These included the Specialty Crop Block Grant Program, the Farmers Market Promotion Program and the Federal State Marketing Improvement Program, all administered by USDA’s Agricultural Marketing Service; and the USDA National Institute of Food and Agriculture’s (NIFA) regional research committees and competitive grants focused on the competitiveness of small and mid-size farms (Stevenson and Pirog, 2008). Perusing funded projects from these programs shows that place-based production models and marketing strategies were being explored and implemented with increasing frequency throughout the start of this century.

The local food segment was first officially defined by the United States Congress in the 2008 Food, Conservation, and Energy Act, with the following criteria: the total distance that a product can be transported and still be considered a “locally or regionally produced agricultural food product” is less than 400 miles from its origin, or within the state (Martinez et al., 2010). The intended outcomes used to support more localized initiatives were primarily to improve competitiveness of producers and support local economies. One specific example is the recent modification of the USDA Rural Development Value-Added Producer Grants program to designate local marketing as a form of value-added having equal importance with processing raw products into higher value goods.

To consider any potential connections between local food initiatives and the implications of USDA dietary guidelines, it is important to examine the public health community’s engagement in local food efforts as part of strategies to affect consumer behavior, as it relates to diet. Using the justification that food-related chronic diseases have become a serious burden on our national economy, the 2020 Healthy People initiative of the U.S. Department of Health and Human Services aims to increase the U.S. consumption of fruits and vegetables by 37% and 80% respectively by 2020, while reducing the number of outbreaks of food borne illnesses in fruits and vegetables by 10% (U.S. Department of Health and Human Services, 2010). This is an interesting goal because it connects a dietary goal with another public food safety goal that relates more to food supply chains and distribution models, inferring there are trade-offs in shifting the average diet of consumers. However, there seems to be no scientific evidence linking these two food system outcomes.

Most of the focus on food-based behavioral trends in the United States is on those that reverse the rates of overweight status and obesity. These include individuals’ shift in diet toward energy-dense foods high in fat and sugars but low in vitamins and micronutrients—junk, snack and fast food—and a trend toward lower levels of physical

activity due, in part, to changes in workplace behaviors and types of transportation used (Colorado Department of Public Health and Environment, 2010).

### ***Do Producers See New Opportunities for Fresh, Local Produce?***

The number of farms with direct sales to consumers grew by 39% between 1997 and 2007 according to the Census of Agriculture. An increasing number of producers market at least some share of their products through local marketing channels. As mentioned in the introduction, there are a variety of programs that have sought to support new models of agricultural production that involve a more diverse set of producers.

Here we are focused on the linkage between the health outcomes and demand for locally produced fruits and vegetables. The important question is whether this demand is associated with financially viable production and marketing strategies for producers.

### ***Regional Variation in Local Food Demand and Health Outcomes***

**Table 1**

**Correlation between population-level health outcomes and measures of local food marketing and production**

Pearson correlation coefficient	Obesity, % of adults	Cardiovascular disease mortality rate
US Country Totals		
Direct Sales*	-0.21	-0.15
Number of CSA's	-0.19	-0.16
Number of Farmers' Markets	-0.27	-0.14
Fruit and vegetable sales over total farm sales*	-0.18	-0.09

Sources: \* data from Census of Agriculture (2007)

Number of farmers' markets from USDA-ERS Food Environment Atlas (2010)

Cardiovascular mortality calculated using CDC Mortality Tape (98-00 and 03-05)

Notes: Correlations for 2990 U.S. counties for which data were available, all correlations are statistically significant ( $p < 0.001$ )

For U.S. counties, direct sales of food, the prevalence of farms with Community Supported Agriculture arrangements (CSAs), and the number of farmers' markets are negatively correlated with poor health outcomes, including the adult obesity rate and the cardiovascular disease mortality rate, at the county level (Table 1). These health outcomes are also negatively correlated with the share of agricultural sales from fruits and vegetables. This means that in counties where fruits and vegetables—healthy, edible farm products—represent a higher share of total agricultural sales, the adult obesity rate is lower, and a smaller share of deaths are due to cardiovascular disease. These correlations should be interpreted carefully, as they may suggest that regional variations in obesity and cardiovascular disease are somehow aligned with the types of foods available in local markets, but further research that integrates income, education, or cultural factors is necessary before any causal relationship is defined.

There is considerable regional variation in fruit and vegetable production, in part, due to different growing conditions, infrastructure, and market access. Regional consumption rates also vary, suggesting regional demand varies. In 2009, 26.3% of U.S. adults consumed vegetables three or more times per day and 32.5% of adults consumed fruit two or more times per day, but according to the Center for Disease Control and Prevention (2010) this rate varied regionally. Rates were highest in Florida, Colorado, and the Northeast and West of the continental United States. Regional data on local sales of fruit and vegetables, specifically, is not available. However, from the most recent Census of Agriculture we find the value of county-level fruit and vegetables sales and direct sales, are positively correlated (0.50). Counties

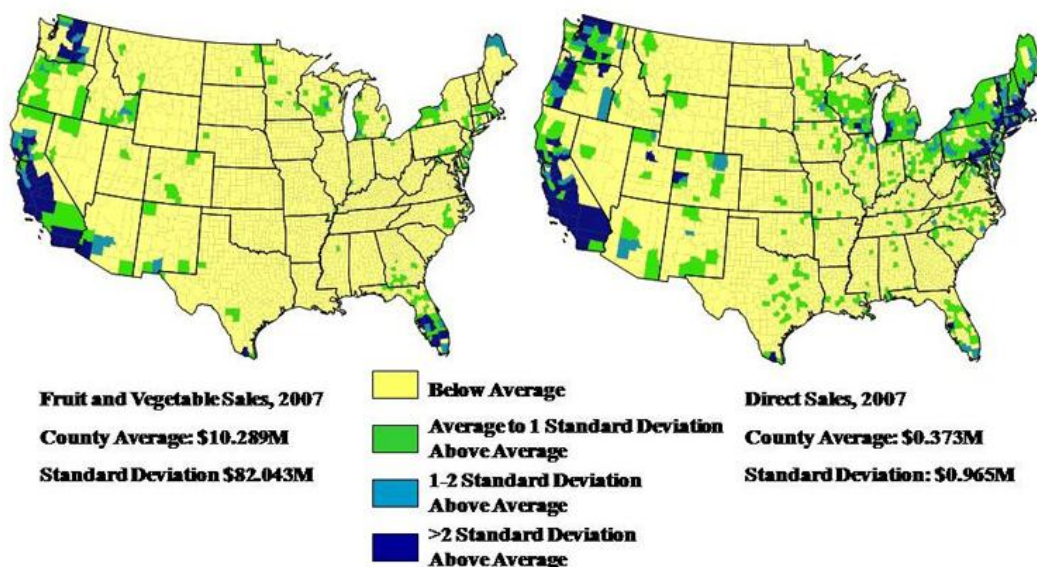
with above average sales in both characteristics exhibit positive spatial correlation (Figure 1); where direct sales are relatively high compared to fruit and vegetable sales, direct sales of livestock products is probable. In 2008, farms classified as fruit, nut, or vegetable farms represented only 6% of U.S. farms but accounted for 43% of all local food farms and generated 65% (\$3 billion) of total local food sales in 2008 (Low and Vogel, 2011).

### ***Local Food Farm Financial Performance***

Low and Vogel (2011) find sales per acre is highest for fruit and nut and vegetable farms selling locally (\$1,338 per acre on an average of 76 acres) when compared to that of all local food farms (\$590 per acre) and all farms (\$304 per acre) on average. Sales per acre for fruit, nut, and vegetable farms selling locally vary considerably with the type of local food marketing channels utilized. Farms using only direct marketing channels, such as farmers' markets or

CSAs, averaged sales of \$640 per acre. Farms using both direct and intermediated marketing channels, defined as sales to middlemen like grocers, restaurants, and regional distributors, averaged \$1,310 per acre. Farms using intermediated marketing channels exclusively, which tend to be the largest farms, averaged \$3,100 per acre. These data suggest local food farms generate the highest sales per acre when they focus on production, not on time-intensive direct marketing. Small farms are most likely to exclusively use direct marketing channels while large farms are more likely to utilize intermediated marketing outlets. This implies that larger farms using intermediated local marketing channels have the potential to generate relatively high sales per acre compared to other local food farms, increasing their financial viability and ability to produce affordable fruits and vegetables to be marketed locally.

**Figure 1: Regional Variation of Fruit and Vegetable Sales and Direct Sales**



**Note:** The standard deviation is a measure that shows how much variation exists from the average  
**Source:** Authors' calculations using 2007 Census of Agriculture data

It is reasonable to assume that local food farms must be financially viable if they are to continue making fresh fruits and vegetables available within their community. Information on the financial performance of farms selling local foods is sparse, however, due to the sensitive nature of the data. Low and Vogel (2011) calculate two farm financial performance measures for both local food farms and all farms. They found that the share of farms earning positive profits was equivalent for local food farms and all farms. They also found that the mean operating expense ratios—the ratio of total cash expenses to gross cash farm income—were similar between the two groups. The ratio, however, was lower for mid-sized local food farms than all mid-sized farms (sales of \$10,000 to \$250,000); the lower ratio of expenses to income suggests that mid-sized local food farms may reach profitability at a lower gross sales point.

It is likely that farms with local food sales are motivated by more than profitability. For example, Low and Vogel find that small- and medium-size local food farm operators were more committed to farming than the average equivalently-sized farm operator in that they were more likely to identify their primary occupation as farming and in devoting more time to their farm operation. Among large farms, with gross annual sales over \$250,000, these differences were not observed.

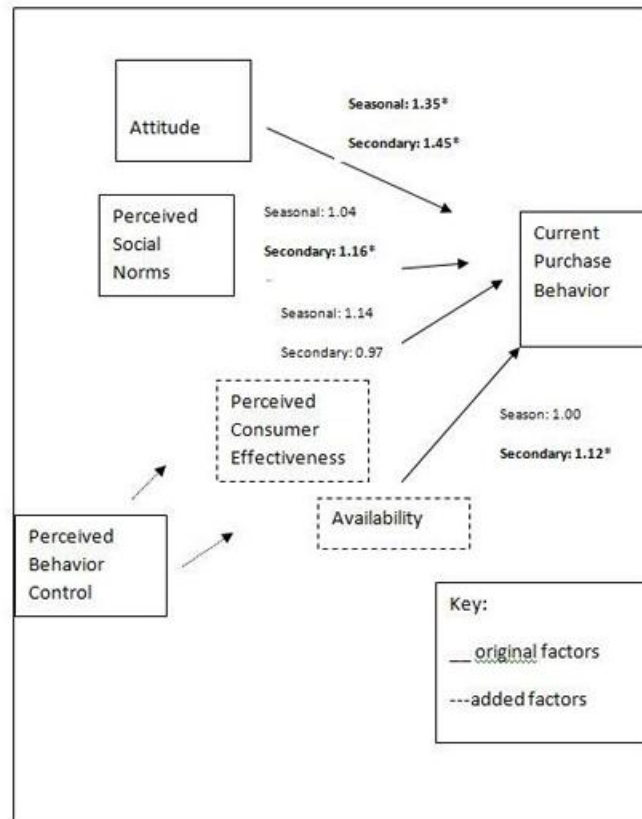
### **Consumer Perspectives on Local Markets and Consumers**

Producers responding to new food policies that call for more specialty crop production and marketing channels that may be more financially viable are only one part of this discussion. Even if more fresh fruits and vegetables become available, one must consider how local procurement and marketing will influence to what extent consumers adopt new dietary recommendations, and the role of food in their lifestyles. Supermarkets are still the dominant shopping choice for most consumers, yet it is important to understand the motivations of consumers who stray from the conventional behavior. The consumer psychology literature posits that market choices may be viewed as a way to mitigate the “gap” between intentions and behavior (Vermeir and Verbeke, 2006). The Theory of Planned Behavior (TPB) links attitudes and behaviors and generally posits how a consumer's choices may be shaped by beliefs and persuasion, so in this context it could be used to evaluate the role of social norms and other beliefs on purchase choices and willingness to pay (WTP) (illustrated in Figure 2). In this case, a consumer may be socially persuaded or



believe that their personal efforts—or higher shopping costs of seeking out directly sourced foods—can contribute to the solution of a problem, including improving their own health.

**Figure 2: Relationship between Secondary and Seasonal Direct Market Shoppers and Theory of Planned Behavior Factors (Attitude, Social Norms, PCE and Availability) on Self-Reported Participation in Direct Markets**



**Notes:** This figure illustrates that participation in direct markets was significantly predicted by the attitude, social norms, and PCE components of the expanded TPB model, but varied between those that used direct markets as a secondary source of fresh produce (at least 25% of all purchases) vs. those that primarily shop in more conventional food stores and shop only seasonally in direct markets.

In an earlier *Choices* theme on local foods, Onozaka, Nurse, and Thilmany McFadden (2010) concluded that one of the factors driving growth in the local foods segment was the buyers' perceptions that they were more likely to realize a series of Theory of Planned Behavior's intended outcomes related to their health, environment and community—among others—if they made purchases through shorter supply chains, like direct markets. Here we revisit that attitude-behavioral link, with a particular focus on perceived consumer effectiveness (PCE). In essence, PCE is a measure of self-efficacy, and the consumer psychology literature believes such efficacy is an important precursor to behavioral change (Nurse, 2009).

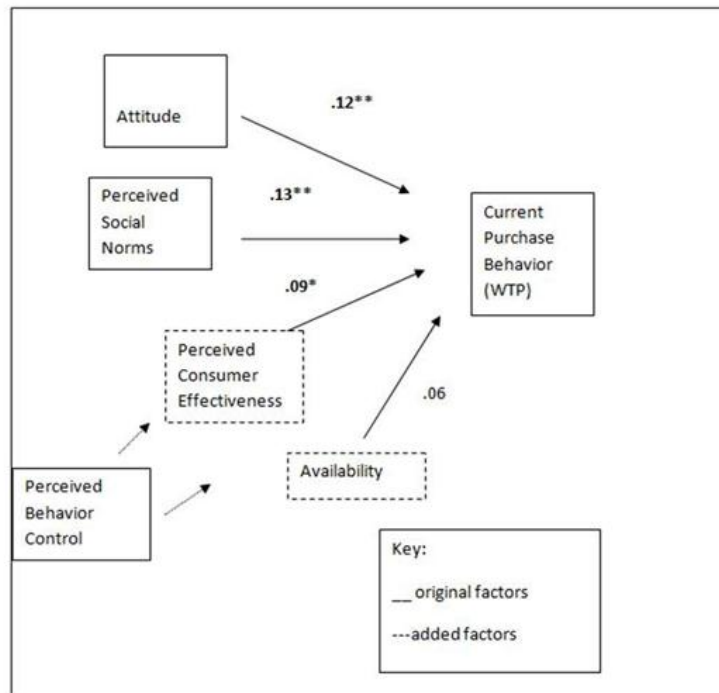
Of importance to producers is whether those who shop in direct markets are willing to pay a premium to account for additional marketing costs the producer may bear by selling direct. And, among the public health community, there should be interest about the specific motivations that drive consumers to purchase from more localized, direct markets. This is particularly the case if the public health community believes that procurement of local foods impact the consumers' health and may lead them to be more committed to changing their food choices.

In a study that reported consumer's WTP for directly marketed apples and tomatoes was significantly higher than for conventional apples, researchers also found consumers value the "local" label higher than the "organic" label (Onozaka, Nurse, and Thilmany McFadden, 2011). The same study found that perceived consumer effectiveness



about outcomes was influential on willingness to pay for organics and imports, and social norms were more important for local food. In contrast, for a sample of college students, Nurse (2009) found those who would pay more for apples that were labeled locally grown was significantly predicted by the attitude, social norms, and perceived consumer effectiveness components of the expanded TPB model (Figure 3). In short, producers selling in direct markets may gain some revenue from a subgroup of buyers' perceptions that buying direct is looked upon favorably by their peers, and supports any "consumer activism" they intend with their purchases, such as supporting the local economy.

**Figure 3: Relationship between Theory of Planned Behavior Factors and WTP for Locally Grown Apples.**



Adapted from Nurse (2009)

**Notes:** This figure illustrates that those who would pay more for apples that were labeled locally grown was significantly predicted by the attitude, social norms, and PCE components of the expanded TPB model with all participants included

Among the public health community, there is probably less concern about price premia, and more about how different shopping behavior relates to a buyer's confidence and intentions to affect health outcomes. In further analysis of a 2008 national survey reported in the 2010 *Choices* theme, Nurse (2009) decomposed the perceived consumer effectiveness variable into component parts, and found that health outcomes scored the highest among variables. This would be expected given that health outcomes may be easier to control and evaluate compared to the influence any one buyer might have on the environment, on the economy, or preserving farmland. But, more interestingly, respondents' perceived consumer effectiveness was highly correlated with marketing channels, with those who commonly use food cooperatives and direct markets reporting the highest perceived consumer effectiveness for health outcomes. The reasons cannot be probed further, but one could expect this result is because those venues offer a higher share of raw, nutrient dense foods, thereby constraining buyers from less healthful choices.

### Can Local Food Systems Influence Consumer Behavior?

A visible example of a public-health driven initiative linking to local markets is Wholesome Wave (<http://wholesomewave.org/>). Wholesome Wave was established in 2007 to connect local and regional food systems in order to increase access to and affordability of fresh, locally grown food. Their mission and programming efforts are multi-faceted as they simultaneously address food insecurity, through enhancing the dollars given to at-risk households, while also supporting farm viability through targeting those new dollars to local marketing channels. For example, their Double Value Coupon Program (DVCP) provide a direct linkage to local markets and potential benefits to producers who are serving those markets. The DVCPs were implemented in 26 states, 200 farmers markets and 1700 participating producers in 2011. Evaluation of 2010 efforts show:

- As a result of shopping at the markets in 2010, 87% of DVCP consumers increased or greatly increased their consumption of fresh fruits and vegetables.
- Over 90% of DVCP consumers agreed or strongly agreed that the amount of fresh fruits and vegetables they bought at the market made a big difference in their or their family's diet.
- Producers perceived benefits as well, and 55% said the extra sales and nonmonetary benefits of DVCP will lead them to continue with participating markets.
- Many producers were making enterprise changes in response to DVCP programs, with 15% reporting increased acreage, 12% diversifying crops and 10% making investments for season extension.

LiveWell Colorado is an organization that focuses on policy, environmental and lifestyle changes that remove barriers and increase access to healthy behaviors. Through one of their strategic initiatives, they have targeted several regional communities to grow the community and educational programs that target food-related health issues. These two programs, Wholesome Wave and LiveWell Colorado, also dovetail well with each other. The Greeley farmers market, located in Weld County, Colorado, was recruited into Wholesome Wave's program based on criteria such as low-income households, prevalence of childhood obesity, and designation as a food desert. In cooperation, these two programs have made strides towards their individual goals. The designation of Weld County as a LiveWell Community (<http://livewellcolorado.org/>) may explain why several public health reports show improvement, from a relatively low baseline, in that community's health outcomes (Thilmany and Hoffman, 2011).

### Concluding Remarks

This overview of the evidence connecting local food systems with the outcomes intended by new dietary guidelines is more of a starting point than a summary of what we know. We hope it begins to outline the needs for research and program evaluation of whether innovations in the marketing of foods—promotion of fresh produce through shorter supply chains, incentives to visit direct markets—have played a role in improving public health outcomes.

By integrating key concepts from the consumer psychology field, and what is known about stimuli to behavioral change, Figure 3 shows that social norms and availability of local produce are important drivers of purchase decisions, such as the choice of conventional versus organic or direct purchases. Therefore, current efforts by public health-oriented organizations to improve access through redevelopment of local food systems seem warranted. But another message is clear from the previous example of how an organization is innovating and evaluating efforts to use more community-based production and marketing models to influence the food choices of at-risk populations: evaluation metrics could be refined and more broadly analyzed if, new data initiatives are put into place.

### For More Information

Center for Disease Control. (2010). State indicator report on fruits and vegetables, 2009. Available online: [http://www.fruitsandveggiesmatter.gov/health\\_professionals/statereport.html](http://www.fruitsandveggiesmatter.gov/health_professionals/statereport.html)

Colorado Department of Public Health and Environment. (2010). The weight of the state: 2009 report on overweight and obesity in Colorado. Available online: <http://www.cdphe.state.co.us/pp/COPAN/ObesityReport.pdf>.

Lockeretz, W. (1986). Urban consumers' attitudes towards locally grown produce. *American Journal of Alternative Agriculture*, 1, 83-88.

Low, S., and Vogel, S. (2011). Direct and intermediated marketing of local foods in the United States. Economic Research Report-128. U.S. Department of Agriculture, Economic Research Service.

Martinez, S., Hand, M., DaPra, M., Pollack, S., Ralston, K., Smith, T., Vogel, S., Clark, S., Lohr, L., Low, S., and Newman, C. (2010). Local food systems: Concepts, impacts and issues. Economic Research Report-97. U.S. Department of Agriculture, Economic Research Service.

Nurse, G. (2009). Evaluation of motivations that influence consumer attitudes and behavior when purchasing local foods. Ph.D. Thesis. Colorado State University, Dept. of Psychology. OCLC Number: 607913660.

Onozaka, Y., Nurse, G., and Thilmany McFadden, D. (2010). Local food consumers: How motivations and perceptions translate to buying behavior. *Choices*, 25(1).

Onozaka, Y., Nurse, G., and Thilmany McFadden, D. (2011). Defining sustainable food market segments: Do motivations and values vary by shopping locale? *American Journal of Agricultural Economics*, 93(2), 583-589.

Stevenson, G. W., and Pirog, R. (2008). Values-based supply chains: Strategies for agrifood enterprises of the middle. In T. Lyson, G. W. Stevenson, & R. Welsh (Eds.), *Food and the mid-level farm: Renewing an agriculture of the middle* (pp. 119–143). Cambridge, MA: MIT Press, ISBN 978-0-62215-8.

Thilmany, D., and L. Hoffman. (2011). Northern Colorado food assessment: Final report. March. Available online: <http://www.larimer.org/foodassessment/report.cfm>

Vermeir, I., and Verbeke, W. (2006). Sustainable food consumption: exploring the consumer “attitude-behavior intention” gap. *Journal of Agriculture and Environmental Ethics*, 19(2), 169-194.

Wholesome Wave. (2011). 2011 outcomes for 2010 double value coupon programs. Available online: <http://wholesomewave.org/wp-content/uploads/2011/07/Outcomes-for-2010-Factsheet-final3.pdf>.

U.S.Department of Agriculture. (2007). Census of Agriculture, county level data. Available online: [http://www.agcensus.usda.gov/Publications/2007/Full\\_Report/Census\\_by\\_State/](http://www.agcensus.usda.gov/Publications/2007/Full_Report/Census_by_State/)

U.S.Department of Health and Human Services. (2010). 2020 Healthy people topics and objectives: Food safety. Available online: <http://www.healthypeople.gov/2020/topicsobjectives2020/default.aspx>

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