

## Implementing American Heart Association Pediatric and Adult Nutrition Guidelines

### A Scientific Statement From the American Heart Association Nutrition Committee of the Council on Nutrition, Physical Activity and Metabolism, Council on Cardiovascular Disease in the Young, Council on Arteriosclerosis, Thrombosis and Vascular Biology, Council on Cardiovascular Nursing, Council on Epidemiology and Prevention, and Council for High Blood Pressure Research

Samuel S. Gidding, MD, FAHA, Chair; Alice H. Lichtenstein, DSc, FAHA, Co-Chair; Myles S. Faith, PhD; Allison Karpyn, PhD; Julie A. Mennella, PhD; Barry Popkin, PhD; Jonelle Rowe, MD; Linda Van Horn, PhD, RD; Laurie Whitsel, PhD

Cardiovascular disease mortality rates have fallen by  $\approx 50\%$  over the past 50 to 60 years. However, cardiovascular disease prevalence remains high, and cardiovascular disease is still the leading cause of death and disability in the United States.<sup>1,2</sup> It has been estimated that preventive efforts have contributed to at least half of this decline, with the primary contribution coming from declines in mean blood cholesterol concentrations, mean blood pressure levels, and tobacco use rates. Regrettably, during this past decade, the increased prevalence of obesity and diabetes mellitus has dramatically slowed the secular decline in cardiovascular mortality rates.<sup>1,3,4</sup> In fact, in the United States, the contribution of prevention to the decline of cardiovascular mortality is now much lower than in other industrialized countries and the United States historically.<sup>1,5</sup>

The continuing challenge is preventing the development of cardiovascular disease, especially early in life. Nutrition remains a cornerstone of that effort. Modernization and industrialization of the food supply and distribution patterns, as with our lifestyles, have produced many benefits but also unanticipated consequences.<sup>6</sup> Decline in saturated fat and cholesterol intake, influenced by public awareness of adverse health consequences, coupled with increased availability of foods lower in cholesterol and saturated fat, has been associated with reductions in cardiovascular disease. However, recent studies of trends in the dietary

patterns of the United States suggest a significant drift toward less healthful eating patterns and overconsumption of energy, which have been associated with increases in prevalence of obesity, metabolic syndrome, and type 2 diabetes mellitus.<sup>1-4</sup> These data strongly suggest that additional emphasis is needed on ways to implement current guidelines in contemporary society. A great benefit can be achieved from adopting a heart-healthy nutrition pattern at a young age, thereby preventing the rise in cholesterol and blood pressure levels associated with excess saturated fat, *trans* fat, and salt ingestion; minimizing the development of obesity; and establishing lifelong dietary habits.<sup>7,8</sup>

Current American Heart Association (AHA) diet and lifestyle recommendations for both children and adults emphasize these goals: aim for a healthy body weight and recommended levels of blood lipids and lipoprotein, blood pressure, and glucose; engage in regular physical activity; avoid use of and exposure to tobacco products; and consume diets rich in vegetables and fruits, whole grains, low-fat and nonfat dairy products, legumes, fish (at least 2 times per week), and lean meat, coupled with food choices that minimize intakes of excess energy, saturated fat, *trans* fat, cholesterol, and salt.<sup>9,10</sup> The importance of focusing on the overall diet quality (dietary pattern) rather than individual foods or nutrients, balancing energy intake and expenditure, engaging in regular physical activity, and increasing the

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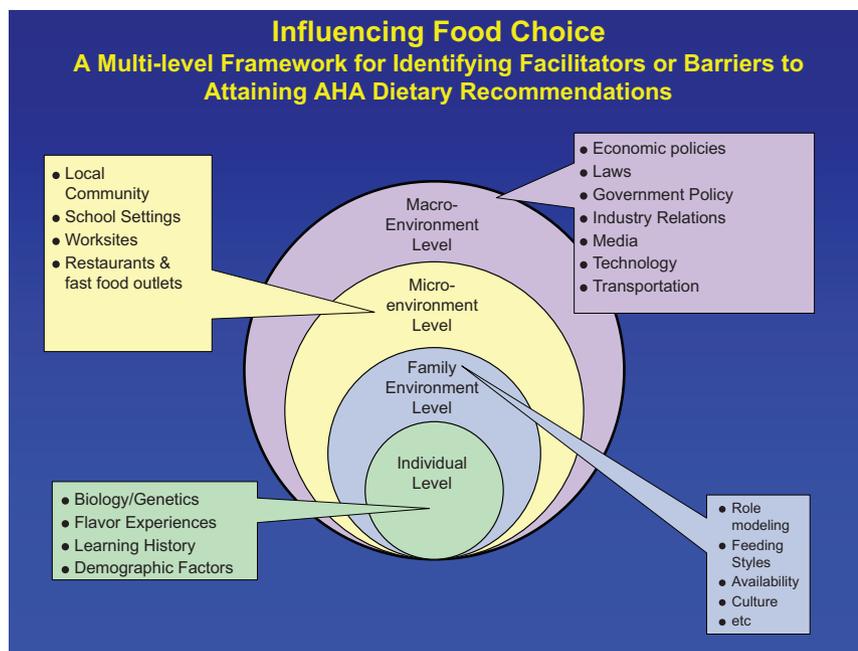
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**Figure.** Concentric circles of influence on eating behaviors.<sup>11-16</sup> The individual level refers to biological, genetic, demographic, and learning history influences within any person. The individual level is nested within the family environment, which includes influences such as role modeling, feeding styles, provision and availability of foods, and other aspects of the home food environment. The third level, the microenvironmental level, refers to the local environment or community in which the family and home are immediately nested. This includes local schools, playgrounds, walking areas, and shopping markets that enable or impede healthful eating behaviors. Level 4 is the macroenvironmental level. This level refers to broader economic policies, laws, and industry policies that operate at the regional, state, national, and international levels. The influence of level 4 factors can be pervasive and project down to individual choices. The model recognizes the importance of both the nesting of levels within one another and reciprocal influences among levels.

importance of following the AHA diet recommendations when eating outside the home is emphasized. Both pediatric and adult recommendations follow these guiding principles throughout the lifespan. Lacking but badly needed are more specific guidelines on how best to implement these recommendations.

The purpose of this scientific statement is to summarize current strategies on how to implement AHA nutrition recommendations for cardiovascular disease and stroke prevention throughout the life cycle, as well as providing suggestions and practical examples for strengthening these efforts. A similar approach has been developed recently for obesity.<sup>11</sup> Emphasized is the importance of a healthful overall dietary pattern within the complex nutrition environment of contemporary life. The Figure, adapted from several sources, presents a conceptual model for this complex environment and identifies facilitators or barriers to attaining AHA diet and lifestyle recommendations. The Figure shows nested concentric circles beginning at the individual level and working out toward the macroenvironmental level.<sup>12-16</sup> Each level offers a potential avenue for change, for helping individuals, families, and communities achieve AHA diet and lifestyle recommendations. It provides a framework for understanding the complexity of nutrition choices, organizing the existing

literature on nutrition, and interpreting future research and its impact. This report follows the approach suggested by the Figure and developed in a recent AHA statement on obesity in developing an implementation argument.<sup>11</sup> Because of the broad nature of the topic, this report is meant to suggest new approaches to implementing a healthful diet within the context of contemporary eating patterns rather than developing new specific nutrition recommendations.

### Current AHA Dietary Guidelines

Tables 1 through 5 summarize the current AHA dietary recommendations for children, adolescents, and adults and strategies for implementation.<sup>9,10</sup> For adults, the emphasis is on dietary management to achieve optimal lipid and lipoprotein profiles, blood pressure and blood glucose levels, and body weight. In addition, the importance of engaging in regular physical activity and avoidance of the use of and

**Table 1. AHA 2006 Diet and Lifestyle Goals for Cardiovascular Disease Risk Reduction**

Consume an overall healthy diet
Aim for a healthy body weight
Aim for recommended levels of low-density lipoprotein cholesterol, high-density lipoprotein cholesterol, and triglycerides
Aim for a normal blood pressure
Aim for a normal blood glucose level
Be physically active
Avoid use of and exposure to tobacco products

**Table 2. AHA 2006 Diet and Lifestyle Recommendations for Cardiovascular Disease Risk Reduction**

Balance calorie intake and physical activity to achieve or maintain a healthy body weight
Consume a diet rich in vegetables and fruits
Choose whole-grain, high-fiber foods
Consume fish, especially oily fish, at least twice a week
Limit your intake of saturated fat to <7% of energy, <i>trans</i> fat to <1% of energy, and cholesterol to <300 mg/d by
Choosing lean meats and vegetable alternatives
Selecting fat-free (skim), 1% fat, and low-fat dairy products
Minimizing intake of partially hydrogenated fats
Minimize intake of beverages and foods with added sugars
Choose and prepare foods with little or no salt
If you consume alcohol, do so in moderation
When you eat food prepared outside of home, follow the AHA diet and lifestyle recommendations

**Table 3. Practical Tips to Implement AHA 2006 Diet and Lifestyle Recommendations Lifestyle**


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Know your caloric needs to achieve and maintain a healthy weight

Know the calorie content of the foods and beverages you consume

Track your weight, physical activity, and calorie intake

Prepare and eat smaller portions

Track and, whenever possible, decrease screen time (eg, watching television, surfing the Web, playing computer games)

Incorporate physical movement into habitual activities

Do not smoke or use tobacco products

If you consume alcohol, do so in moderation (equivalent of no more than 1 drink in women or 2 drinks in men a day)

Food choices and preparation

- Use the Nutrition Facts panel and ingredients list when choosing foods to buy
- Eat fresh, frozen, and canned vegetables and fruits without high-calorie sauces and added salt and sugars
- Replace high-calorie foods with fruits and vegetables
- Increase fiber intake by eating beans (legumes), whole-grain products, fruits, and vegetables
- Use liquid vegetable oils in place of solid fats
- Limit beverages and foods high in added sugars; common forms of added sugars are sucrose, glucose, fructose, maltose, dextrose, corn syrups, concentrated fruit juice, and honey
- Choose foods made with whole grains; common forms of whole grains are whole wheat, oats/oatmeal, rye, barley, corn, popcorn, brown rice, wild rice, buckwheat, triticale, bulgur (cracked wheat), millet, quinoa, and sorghum
- Cut back on pastries and high-calorie bakery products (eg, muffins, doughnuts)
- Select milk and dairy products that are either fat free or low fat
- Reduce salt intake by
  - Comparing the sodium contents of similar products (eg, different brands of tomato sauce) and choosing products with less salt
  - Choosing versions of processed foods, including cereals and baked goods, that are reduced in salt
  - Limiting condiments (eg, soy sauce, ketchup)
- Use lean cuts of meat and remove skin from poultry before eating
- Limit processed meats that are high in saturated fat and sodium
- Grill, bake, or broil fish, meat, and poultry
- Incorporate vegetable-based meat substitutes into favorite recipes
- Encourage the consumption of whole vegetables and fruits in place of juices

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exposure to tobacco products are emphasized (Table 1 and 2). For children >2 years of age, the emphasis is on a dietary pattern that meets nutrition requirements for growth and development while minimizing the development of cardiovascular risk factors, primarily high blood cholesterol, blood pressure and glucose levels, and excessive body weight gain (Table 4). At birth, breast-feeding is strongly recommended for all infants. Then, at all ages, adequate caloric intake is emphasized to maintain appropriate growth and development while minimizing excess weight gain. Individuals with diagnosed risk factors require therapeutic lifestyle changes that address those risk factors that are often multifactorial and beyond the scope of the present statement.<sup>17,18</sup>

**Table 4. AHA Pediatric Dietary Strategies for Individuals >2 Years of Age: Recommendations to All Patients and Families**


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Balance dietary calories with physical activity to maintain normal growth

Engage in 60 min of moderate to vigorous play or physical activity daily

Eat vegetables and fruits daily and limit juice intake

Use vegetable oils and soft margarines low in saturated fat and *trans* fatty acids instead of butter or most other animal fats in the diet

Eat whole-grain breads and cereals rather than refined-grain products

Reduce the intake of sugar-sweetened beverages and foods

Use nonfat (skim) or low-fat milk and dairy products daily

Eat more fish, especially oily fish, broiled or baked

Reduce salt intake, including salt from processed foods

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To achieve dietary goals, the AHA recommends consumption of an overall diet rich in a wide variety of fruits and vegetables, grain products (especially whole grains), fat-free and low-fat dairy products, legumes, poultry and lean meats, and fish, preferably oily fish, at least twice a week (Tables 3 and 4). The aim should be for a moderate fat intake (25% to 35% of energy), with primary sources of added fats coming from vegetable oils such as soybean, canola, corn, olive, sunflower, and safflower oils. Within each category, choices should minimize the intake of excess calories, saturated and hydrogenated (*trans* fatty acids) fats, cholesterol, salt, and sugar. An emerging area of research, useful to help better understand the importance of a comprehensive approach to diet, is analysis of overall dietary patterns (as opposed to studies of individual foods or nutrients) and the association of these patterns with chronic disease risk.<sup>19,20</sup>

### Current US Diet and Eating Patterns

Data on US eating patterns were previously monitored by the US Department of Agriculture (USDA) and are now collected by the National Center for Health Statistics as part of the joint

**Table 5. Tips for Parents to Implement AHA Pediatric Dietary Guidelines**


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Reduce added sugars, including sugar-sweetened drinks and juices

Use canola, soybean, corn oil, safflower, or other unsaturated oils in place of solid fats during food preparation

Use recommended portion sizes on food labels when preparing and serving food

Use fresh, frozen, and canned vegetables and fruits and serve at every meal; be careful with added sauces and sugar

Introduce and regularly serve fish as an entrée

Remove the skin from poultry before eating

Use only lean cuts of meat and reduced-fat meat products

Limit high-calorie sauces such as alfredo, cream sauces, cheese sauces, and hollandaise

Eat whole-grain breads and cereals rather than refined products; read labels and ensure that whole grain is the first ingredient on the food label of these products

Eat more legumes (beans) and tofu in place of meat for some entrees

Breads, breakfast cereals, and prepared foods, including soups, may be high in salt and/or sugar; read food labels for contents and choose high-fiber, low-salt/sugar alternatives

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**Table 6. Caloric Intake and Nutrient Quality**

Eating patterns associated with increased caloric intake and poorer nutrient quality

- Increased frequency and caloric density of daily eating occasions, with low nutrient quality of these food choices
- Increased portion size
- Eating away from the home more often, particularly in fast-food restaurants
- Changing to a different food pattern on weekends
- Increased intake of calorically sweetened beverages

Targets for teaching about reducing caloric intake and improving nutrient quality

- Teach about the caloric content of snacks and know/advertise healthy snacking options, including the use of noncaloric beverages, especially water
- Teach about portion size; provide caloric information related to serving size in public establishments
- Encourage eating at home; provide nutrition information at point of purchase
- Teach what constitutes a meal, including incorporation of vegetables and fruits, whole grains, and lean/vegetable protein sources
- Encourage balancing occasions of increased eating (eg, weekends, holidays, celebrations) with reduced caloric intake returning to baseline weight
- Teach limiting calorically sweetened beverage intake, regulating portion size, and restricting availability of sweetened beverages

nutrition monitoring system. The USDA Nutrition Monitoring System focused on dietary intake and assessed detailed measures of eating behavior over longer periods of time. Surveys were performed in 1965, in 1977 to 1978, in 1989 to 1991, and for the last time in 1994 to 1998. The National Center for Health Statistics began the National Health and Nutrition Examination Survey using 24-hour dietary recalls. This survey is called "What We Eat in America."<sup>21–24</sup> Methodological differences among these surveys include major differences in the number of passes and approaches to questioning respondents, different coding of foods, shifting sources for food composition tables, and lack of a bridging methodology between the USDA and National Center for Health Statistics surveys. These problems have been partially overcome.<sup>25</sup> Another important limitation of the data presented in this section is that trends in eating behavior over the last 5 years have not been published.

Available data suggest that recommended intake of fruits and vegetables is not being achieved and that fluid milk and whole grains as a percent of energy intake are decreased. Dietary fiber intake is below recommended levels for all age groups.<sup>26</sup> Caloric intake has increased, consistent with increased body weight, in the US population.<sup>27</sup> These trends are seen across all age groups, including infants and toddlers, in whom there are significant increases in consumption of sugar-containing beverages.<sup>28–30</sup> For adolescents and young adults, it is important to note that the increased intake of snack foods and sugar-sweetened beverages (in place of milk) may be compromising overall nutritional diet quality.<sup>31</sup>

Equally important are the dietary patterns supporting these trends (Table 6). They include the following dimensions of eating behavior: increased number of eating events per day (snacks), larger portion sizes, greater proportion of food

consumed away from home, higher energy intakes on weekend days (Friday through Sunday), and higher consumption of sugar-sweetened beverages.<sup>32–39</sup> Table 6 also includes strategies that should be empirically evaluated.

Snacks, defined as eating at times other than traditional mealtimes, now represent  $\approx 21\%$  to  $25\%$  of total caloric intake, increased from  $18\%$  over the last several decades.<sup>32–34</sup> This is of particular note because the energy density of snack foods has increased over this time period, whereas the energy density of meals has not. The most common snacks are sugar-sweetened beverages and salty prepared foods such as chips that are low in nutrient density. In studies of smaller populations of elementary students, trends toward increased snacking have been observed despite participation in a high-quality dietary intervention program, suggesting that altering snacking behavior will be difficult.<sup>40</sup>

Over the past 20 years, there has been a substantial shift in eating location, with a significant decline in meals eaten at home and increase in meals eaten at restaurants and fast-food establishments, particularly among younger individuals.<sup>37</sup> This has been associated with a shift in foods consumed, with significant increases in sugar-sweetened beverages, fruit juice, french fries, pizza, and salty snacks with declines in reduced-fat and whole milk.

Shifts in patterns of beverage intake have contributed to the doubling of per capita intake of beverage calories for adults since 1965. Soda and fruit drinks accounted for  $70\%$  of the increase in caloric intake.<sup>29,30</sup> There has been a significant rise in the use of low-fat presweetened dairy drinks over the same interval; however, dairy drink consumption overall has fallen. Similar changes are seen in children and adolescents, with recent data suggesting continuing increases in sugar-sweetened beverage intake, with  $10\%$  to  $15\%$  of caloric intake from this source.<sup>41</sup> The impact of dairy and other additives to coffee/tea drinks is difficult to analyze but may be another source of increased caloric intake. A component of the increase in caloric intake related to beverages may be the lower relative satiety of beverages compared with solid foods.<sup>42–45</sup>

With respect to specific eating patterns, there is consistent evidence that eating breakfast, including consumption of high-fiber ready-to-eat cereals and milk, is associated with improved overall nutrition and weight maintenance.<sup>46–49</sup> Families that regularly consume dinners together generally have healthier diet patterns, but it is not clear from these studies whether this is secondary to better family knowledge.<sup>50</sup> At least 1 large-scale prospective study of adolescents concluded that the frequency of eating family dinner was inversely associated with overweight prevalence at baseline but did not predict the likelihood of becoming overweight.<sup>51</sup>

For very young infants, up to 4 to 6 months of age, most daily energy intake is obtained from milk, either breast milk or formula. After that, a transition to solid food starts that continues throughout the second year as the child moves from milk feeding to baby foods and then to adult foods. A nationally representative study of infants, with data derived from a study based on telephone interviews and 24-hour dietary recalls, found that  $>20\%$  of infants and toddlers did not consume 1 fruit or vegetable in a given day.<sup>28</sup> In contrast,  $>60\%$  of infants 6 to 11 months and  $80\%$  between 12 and 24

months had at least 1 fruit drink a day. By 2 years of age, parents reported that 10% of total energy came from sugar-sweetened beverages other than fruit juice. French fries were the most common vegetable consumed, and none of the top 5 vegetables consumed by those <2 years of age was a green leafy vegetable. The frequency of consumption of nutrient-poor, energy-dense snacks increases with age.<sup>52,53</sup>

### Taste Preferences

It is important to understand the development of taste preferences when devising strategies to improve the overall quality of the diet. At the individual level, taste preference is critical to food choice. The basic biology of human sensory systems determines the sensory impressions of foods and beverages. Flavor experienced from food or drink consumption is a product of several sensory systems, most notably those of taste, smell, and irritation (eg, coolness of mint, burn of chili peppers). When foods or liquids are taken into the mouth, the perceptions that arise through the senses of taste and smell combine to determine flavor.<sup>54</sup> Not only is the ability to detect tastes and flavors well developed before birth, but infants start learning about these flavors before their first tastes of foods because the flavors of the foods eaten by mothers during pregnancy and lactation are transmitted and flavor amniotic fluid and mothers' milk, respectively.<sup>55,56</sup>

Responses to sweet, salt, and bitter tastes have evolved because of their functional importance in nutrient selection, especially in children whose responses to salt and sweet are heightened. Salt is a signal for nutrients such as sodium that often accompany other minerals in food. Sufficient salt intake protects against dehydration. Bitterness protects against foods that might be poisonous. Preferences for bitter foods (eg, dark green vegetables) and beverages (eg, coffee) are largely learned. Saltiness antagonizes bitter and thus improves palatability of useful foods with bitter or irritating taste.<sup>57</sup> The sensation of optimum saltiness can be influenced by an individual's salt status and dietary level of exposure.<sup>58,59</sup>

Children have an innate preference for sweet and, as a group, prefer a 0.60-mol/L sucrose concentration. Not only do children like sweets, but sweets make them feel better. When they taste something sweet, it reduces pain.<sup>60,61</sup> By late adolescence, sweet preferences decline to  $\approx$ 0.3 mol/L sucrose. Findings from the USDA 1994 to 1996 Continuing Survey of Food Intakes<sup>62</sup> paralleled the findings from basic research of an age-related decline in sweet concentration preferences. That is, in cross-sectional data, the proportion of energy obtained from added sweeteners peaks in adolescents, with  $\approx$ 20% of energy derived from added sugars, and declines to  $\approx$ 12.4% of energy for those  $\geq$ 65 years of age. Longitudinal data suggest that consumption of foods with added sugar has increased over time.<sup>63</sup> There are striking individual and group differences in the levels of sweetness preferred. For example, across all age groups, blacks and non-Hispanics prefer significantly higher levels of sweetness than whites.<sup>64,65</sup>

Because taste preferences drive food choice, an understanding of the source of taste preferences can suggest strategies for dietary change. Lactating mothers can influence taste preference in their infants by consuming fruits and vegetables, transmitting these flavors to the child.<sup>55,56,66</sup>

Repeated offerings of healthy foods may increase acceptance. Memories of taste, flavor, and smell carry emotional content derived from culture, rewards, and pleasurable past experience that influences food choice; thus, early exposure to healthy foods may influence preference.<sup>67</sup> Although trying to limit sweet and salty food and beverage consumption is critical in reversing the obesity epidemic, this task will be difficult because of the inherent hedonic value of these tastes. These products are popular because they have undergone rigorous taste preference testing before release, correspond to natural taste preferences, and are heavily marketed. These observations provide the rationale for nutrition marketing to counter industry marketing concerning the pleasurable or normative quality of unhealthy foods.

### Individual- and Family-Based Interventions to Improve Cardiovascular Health

There is substantial evidence for the usefulness of dietary interventions to improve blood pressure and lipoprotein profiles.<sup>17,18</sup> However, meeting these objectives in clinical practice is challenging. Two recent reviews of the obesity intervention literature have concluded that at present there is no significant evidence for the efficacy of current strategies in children.<sup>68,69</sup> Current Canadian clinical practice guidelines concluded that the evidence for recommending diet intervention for obesity is excellent but the evidence for efficacy of specific strategies is generally lacking and based largely on consensus.<sup>70</sup> In general, qualitative and meta-analytic data from family-based weight loss approaches for pediatric obesity as administered by trained behavioral therapists in university-based settings show a significant reduction of excess body weight compared with wait-listed controls or those with simple nutrition education.<sup>71,72</sup> In contrast, there is little evidence to support the general efficacy of information-based strategies to cause weight loss in obese children.<sup>73</sup> The challenge to the medical community is making the former efficacious programs more cost effective and available beyond the current settings.

### Approaches to Implementation of Effective Diet Counseling

Diet counseling has historically been information based, more like teaching than counseling, with physicians and nutritionists providing factual information. The underlying assumption is that simply by learning the facts, patients and clients will change behavior. There are significant limitations to this strategy. First, counseling may not include an assessment of the patient's interest in making dietary change. Second, primary care providers have a notoriously low estimate of self-efficacy with regard to nutrition counseling. Third, providers are unwilling to confront patients with regard to weight issues. Finally, time constraints and restrictions on reimbursement impose important limitations on traditional medical office visits. Written material is often provided, but these materials may not be easily adapted by patients to their specific circumstances. The patient's literacy level may be too low to comprehend the material. The family's eating pattern, determined by diverse economic and social factors, may not easily adapt to the recommended changes. Easy access to recommended foods may not exist.

**Table 7. Assess for Barriers to Families Implementing Nutrition Advice**


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If present, direct counseling to barriers first

Chaotic lifestyle characterized by any or all of the following:

- Families rarely eat together
- Children have multiple caregivers providing food throughout the day
- No one person oversees the quality or quantity of food consumed
- Eating out frequently, especially at fast-food restaurants
- Complex work schedules
- Single parenting
- Significant geographic distance from traditional or intact family support systems

Underdeveloped parenting skills

Inadequate structuring of meal times, sleep schedules, or physical activity routines

Lack of basic family rules that enforce expectations around eating, sleeping, and playing

Limited food preparation skills

Low knowledge of daily caloric and nutritional needs

Nutrition beliefs/attitudes hostile to a healthy dietary pattern

Cost, mood, and convenience rather than health drive food choice<sup>133</sup>

Chooses fast food and snacks because they are convenient, comforting, and inexpensive

Susceptible to incorrect nutrition messages that stream from media, including television and computers

Use commercial media as a source of learning about food, portion size, and a "normal" meal

Think that the overweight physique is "normal"

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A listing of many common barriers to implementing nutrition advice is provided in Table 7. In many settings, it may be more useful to identify barriers and then help families overcome them, if possible, before providing specific advice on dietary pattern. These barriers limit parents' ability to act as role models for their children.

Improved outcomes to any intervention approach may be obtained by the use of general principles of behavior change theory, that is, by intervening at levels 1 and 2 of the Figure simultaneously.<sup>74</sup> The following discussion provides a summary of the sequential steps, which are summarized in Table 8. First, an assessment of readiness to change, a critical component of an intervention to change behavior, needs to occur. Concomitant with that assessment is the need for a self-evaluation by the patient of the behavior(s) targeted for change, which happens through, *self-monitoring* or keeping records over multiple days. The patient gets ready to make the change by understanding how

**Table 8. Implementing Behavior Change Principles Into Clinical Practice**


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The patient/client makes the decision to change behavior

Counseling begins with a self-evaluation by the patient; the patient prepares to make the change and establishes how the change will be monitored; specific behavior goals are established

The goal is attempted

A repeat self-evaluation occurs with goal review and reinforcement

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**Table 9. Examples of Eating Behaviors to Target in Counseling**


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Food selection

- Limiting sugar-containing beverages
- Use of a simply structured diet table that categorizes foods into 3 easily identifiable groups (eg, *go* for good foods and *slow* and *whoa* for poor foods)

Food presentation

- Eat more meals as a family
- Reduce portion size
- Choose healthy alternatives to poor food choices
- Repeat presentation of foods not well liked

Food acquisition

- Make healthier choices on foods prepared and/or purchased outside the home
- Shop for healthier foods
- Control food availability in the home

Self-monitoring

- Routine weighing so that caloric intake adjustments can be made
- Scheduled physical activity
- Record of caloric intake

Additional strategies

- Praise for meeting goals from peers and others in the home must be provided
- Behavioral contracting with nonfood rewards; reinforcement should be social and not related to food, money, or gifts
- Removal of stimuli for undesired or inappropriate food choices
- Parents must model desired or appropriate behaviors

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frequently he or she does the targeted behavior. Second, goals are established for changing the target behavior over a defined period of time (eg, 1 week). Goals should be realistic, should be agreed on by the patient, and should allow success. Third, the goal is attempted while the patient monitors the target behavior. Continued monitoring is critical for behavior change. Finally, there is a repeat self-evaluation with goal review and reinforcement and adjustments up or down in goal setting, depending on the patient's success in meeting prior goals. Effective counseling should generally reward behaviors that are considered satisfactory and ignore behaviors that are unsatisfactory. Critical to success is helping the patient maintain favorable self-esteem. A thorough review of behaviors useful in targeting in obesity management has been published.<sup>73</sup> Some examples are provided in Table 9.

An important question for promoting behavior change is the extent to which individuals and families are motivated and ready to change. Motivational interviewing is a series of clinical assessment strategies stemming from the drug and addiction field but more recently extended to the field of nutrition and pediatric weight control.<sup>75</sup> Those who do not perceive a problem or are too overwhelmed with other life challenges may not be receptive to prescriptions for dietary behavior change. The overarching aim of motivational interviewing is to help set the stage for behavior in individuals who are defensive or resistant to change by avoiding active prescriptions for behavior change or authoritatively telling patients what to do. Motivational interviewing uses strategies

such as open-ended questions, reflective listening, rephrasing of statements, and identification of discrepant beliefs to raise motivation level. Motivational interviewing may help to ease the frustrations or power struggles between health professionals and patients and is an important area for future research.

### Community-Based Interventions

Critical to community-based nutrition intervention will be access to healthier foods and the successful delivery of healthy nutrition messages that influence food choice. A large array of conflicting information about food and nutrition reaches the public, often with poorly documented claims and messages opposed to current diet recommendations.<sup>76</sup> Regulations on food marketing affect only health claims, allowing food and beverage marketers to make allusions to health without providing evidence. Many of these messages are directed at children who are unable to judge the merit of such advertising.<sup>76,77</sup> Consumers need reliable information on portion size, the caloric content of food, and the nutrient content of food to make choices.<sup>78</sup> This is particularly true for low-socioeconomic status groups at which unhealthy food marketing is often targeted and in which a prevalence of obesity is high.

Many studies addressing policy and environment have been conducted in schools; many of them have been reviewed in an AHA statement.<sup>79</sup> A smaller number of interventions have been nutrition interventions in communities or the workplace. Little research has been performed on community-based interventions to alter adult or elderly eating patterns; these studies have generally not been successful.<sup>13</sup> Therefore, a significant limitation of this discussion is inadequate research in populations other than school-aged children on community-based interventions; conversely, there has been limited evaluation of and inadequate dissemination of information on those community-based interventions that have been attempted in scientific or other types of professional literature.<sup>80</sup> Another limitation is that for many community-based interventions, measurement of health outcomes is difficult because of impracticality or insufficient resources to make measurements.<sup>81</sup> Newer research is starting to overcome these barriers; an example is the National Cancer Institute Black Churches Initiative.<sup>82</sup>

### Research in Schools and Other Influences on Children's Eating Behavior

Although some school-based programs have had favorable effects on body mass index (BMI),<sup>83–87</sup> several have not.<sup>88–90</sup> Where findings show minimal effects, interventions may suffer from insufficient doses, barriers to effective implementation, and the inability to effectively target children at highest risk; in addition, the behaviors targeted by interventions may not relate directly to body weight or other cardiovascular risk factors. In general, these programs have produced modest and only short-term reductions ( $\approx 5\%$ ) in percentage overweight.<sup>88,91–96</sup> Several school-based programs have attempted to improve cardiovascular disease risk factors in grade school children.<sup>89,90,97–101</sup> Other studies have investigated the impact of such initiatives on BMI.<sup>83,84,86,102</sup> To date, the results of these studies are mixed. Findings across interventions suggest that those that adopt a multifaceted

integrated approach, ie, those that intervene in many components of the school environment simultaneously, are more likely to be successful.<sup>83,84,86,102</sup>

Arkansas was the first state to implement BMI screening in schools. The Arkansas Center for Health Improvement, an independent entity, developed and validated a BMI measurement protocol, trained school staff on conducting BMI assessments, created a secure BMI database, and disseminated individual and confidential child health reports to parents.<sup>103</sup> Other states either have enacted similar legislation or have legislation or regulation under discussion. These programs are highly controversial; the Centers for Disease Control and Prevention, Institute of Medicine, and US Preventive Services Task Force have all published opinions on the issue, including recommendations on BMI screening in schools.<sup>104</sup> The efficacy of BMI screening may be difficult to assess. In Arkansas and Pennsylvania, screening was only part of a more comprehensive intervention that included increased access to healthier foods and physical activity initiatives. Although the Arkansas initiative met with early success, parents have raised concerns about labeling children as obese, and healthcare providers are concerned about the absence of effective treatments for identified children.

In the last few years, strengthening nutrition standards for foods sold in schools has been undertaken. The Institute of Medicine recently developed science-based nutrition standards for foods and beverages.<sup>105</sup> Putting these standards into practice will require significant policy work at the state and federal levels, industry reformulation of products, and a willingness to adopt standards such as these by communities, local school boards, school administrators, and staff. Substantial resistance to implementing the Institute of Medicine guidelines has emerged from sectors of industry, with legislation at the federal or state level preempting stricter standards in smaller jurisdictions. In 2006, the Alliance for a Healthier Generation (a partnership between the AHA and the William J. Clinton Foundation) negotiated with industry to establish voluntary nutrition standards for foods and beverages in schools. Annual assessment of this voluntary agreement will reveal the degree to which industry is implementing these standards and the extent to which schools are complying across the country. Careful research is needed to assess the impact of these programs on overall health.

The Child Nutrition and WIC [Women, Infants, and Children] Reauthorization Act of 2004 required schools to develop policies around nutrition education, physical activity, and overall school wellness and outline an implementation plan for these policies. The law required parents, students, school food service staff, school administrators, and members of local school boards to participate in the process through school wellness councils. School wellness councils or school health advisory councils are critical in creating a coordinated approach to a healthy school environment and are a leading factor in creating effective policies and maximal implementation.<sup>106</sup> To maximize the efficacy of school wellness policies, future reauthorizations of this federal legislation should address the transparency of the policies, quality of the wellness policies, periodic assessment of implementation and accountability for implementation, improved technical assis-

tance, more permanent wellness committees within schools and districts, and additional outcomes research on the efficacy of wellness policy implementation.

Examples of other current initiatives to improve school foods include the following: farm-to-school programs (partnerships between schools and local farms), school garden programs, the Fruit and Vegetable Program authorized by the Farm Bill (recently expanded in new legislation), and school wellness policies. In this decade, some schools, school districts, and states have begun to make programmatic changes to reduce cardiovascular risk exposure, including reduction of poor-nutritional-quality foods in vending machines, reduction in presentation of deep-fried potatoes, increased recess, and creation of smoke-free environments.

However, it is important to keep in mind that not all foods and beverages consumed by children throughout the day are derived from school sources themselves.<sup>63</sup> Concurrently, children and adolescents are influenced by food advertising and marketing strategies. Young people see >40 000 advertisements per year on television alone.<sup>78</sup> They also are targeted by carefully crafted marketing tactics for unhealthy foods used in multiple environments such as the Internet, magazines, schools, product placement, incentive programs, video games, social networking sites, podcasts, and cell phones, all designed to improve brand recognition and increase sales.<sup>107,108</sup> Children tend to spend their discretionary income on high-calorie, low-nutrient-dense foods, and advertising certainly leads them in this direction.<sup>109</sup> Other research shows that exposure to food advertisements produced substantial and significant increases in energy intake in all children and that the increase was largest in obese children.<sup>110</sup>

### Community Food Access

For people in disadvantaged areas, the *grocery gap* phenomenon can be traced back to the 1960s and 1970s when urban centers experienced population declines as residents fled inner cities for refuge in the suburbs. Among the factors that made the suburbs an attractive market were larger, less expensive tracts of land ready to be developed, simplified and business-friendly zoning and other regulations, more homogeneous consumer preferences, and less crime. Mirroring these demographic trends, supermarkets, along with other businesses, left urban areas. Studies to date demonstrate that lack of access to supermarkets is negatively associated with low-income residents' health and economic well-being.<sup>111</sup> Residents have to travel out of their neighborhoods to purchase food or shop at smaller corner and convenience stores that generally have lower-quality and limited fresh or frozen, heart-healthy food choices.<sup>111–116</sup> These stores also tend to charge substantially higher prices.<sup>117–119</sup> Although low-income households spend less money on food, a greater proportion of their income is spent on food.<sup>120</sup> Programs such as the Fresh Food Financing Initiative in Pennsylvania is an example of a program to bridge access gaps by providing funds to operators locating in underserved neighborhoods.<sup>121</sup>

Interventions at community corner stores are a relatively new mechanism to affect dietary intake in communities.<sup>122</sup> Programs typically include 1 or several components ranging from infrastructure changes (eg, the addition of refrigeration) to the use of social marketing. Current data suggest that these types of interventions hold promise for shifting shopping habits and knowledge.<sup>123</sup> A recent study demonstrated that proximity to a corner store selling healthy food was a positive predictor of fruit and vegetable intake.<sup>80</sup>

The USDA, state governments, healthcare institutions, and not-for-profit groups have recently encouraged the establishment of farmers' markets in communities with otherwise little access to healthy food.<sup>81,124</sup> Little research exists to date on the impacts of such markets on community health. Programs that support local agriculture such as the Farmers' Market Nutrition Education Program and WIC Farmers' Market Programs offer the dual benefit of increasing consumption of fruits and vegetables while supporting farmers who grow them.<sup>125,126</sup>

With the number of meals people eat outside of the home increasing, consumers should have adequate information at point of purchase to make healthful choices in restaurants. Caloric intake is often underestimated in these settings.<sup>127</sup> For consumers to make healthier food choices in restaurants, they need accurate, sufficient information provided in a usable format at the point of service. Three municipalities—New York, NY; King County (Seattle, Wash), Washington (DC), and San Francisco (Calif) city and county—have passed menu-labeling legislation.

### Workplace Interventions

Changing nutrition at work sites or at point of food purchase has received less attention. Interventions that have shown some success encourage purchase of healthier foods through price subsidies, adjusting prices so that healthy foods cost less.<sup>13</sup> The few studies that have examined strategies manipulating the ease at which food is accessed (changing food availability in vending machines, assessing food availability in local groceries) have not shown substantial efficacy. Effective and rigorously tested program evaluation tools have begun to identify the best practices, including those that pertain to program design and implementation. Programs have considered mechanisms for disseminating nutrition education and offering employee support for changes. Results suggest that online and Web-based programs were more effective than print materials, and long-term and interactive intervention efforts were proven to have more sustainable outcomes than 1-time, temporary, and passive efforts (ie, kickoffs and pamphlets).<sup>124–126</sup> An additional benefit to workplace intervention might be cost savings for health expenses, but providing proof is challenging. Challenges to workplace interventions are listed in Table 10.<sup>127</sup> Currently, there is insufficient evidence detailing the aspects of successful workplace nutrition interventions, including biological measures of outcome, although tools like education or labeling programs seem promising.<sup>128,129</sup>

An additional strategy to enhance community awareness is identifying the most appropriate individuals, beyond physicians, nurses, and dietitians, to carry the nutrition message. Focus group and training experiences from a federally funded

**Table 10. Challenges to Research on Workplace Interventions**


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Employee diversity makes a uniform intervention difficult
Cultural differences
Personality differences
Need for personal privacy
Diverse skills among employees
Diverse knowledge levels
Irregular timing of meals
Stress eating
Workplace logistics compete with a health agenda
Limited access to healthy food
Lunch break culture makes eating a social event
Frequent eating out
Methodological constraints
Limited funding
Limited time in the workday for intervention
Facilities constraints for making measurements
Small sample sizes
Selection bias in identifying participants

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program (<http://www.womenshealth.go/bodyworks/>) have shown that the characteristics that make good trainers are strong motivation, connection to the community, and previous experience teaching adult groups. Trainers know their audience and the barriers the audience faces in implementing recommendations. They may also be able to identify community members most receptive to intervention. Trainers should learn basic nutrition, interpretation of the food label, portion size, recommendations for physical activity, principles of behavior change, and how to encourage self-efficacy. These individuals may be recruited from such places as community health clinics, WIC programs, health departments, hospitals, and community organizations. Community-based intervention programs will require a combination of local financial support, grass roots improvisation to sustain community interest, and external educational support of trainers to sustain effective efforts. These individuals may be best suited to carry the healthy nutrition message into areas where conventional efforts have failed.

Finally, at the macroeconomic level, increasing attention has been paid to the relationship between the growth, regulation, and subsidization of the agriculture and the food industries.<sup>6,12</sup> Historically, the presence of a stable food supply was a vital social consideration and economic resource. Improvements in the ability to store and transport food have led to extraordinary reductions in food cost and increased convenience, ie, the ease with which food can be prepared (or have prepared outside the home) and consumed. This agricultural efficiency has been vital to the growth of the industrial and postindustrial economies. Food production has been driven largely by consumer preferences that, in turn, were driven by taste, cost, and convenience. The importance of nutrition in chronic disease (as opposed to infectious diseases) is a relatively new influence on consumer choice and has created a significant disjunction between capitalist economic forces driving the growth of the US food industry

**Table 11. Global Strategies to Implement AHA Nutrition Guidelines**


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Create a healthy food environment
Subsidize good food choices by creating financial and other incentives for consumption of nutritious food
Market nutrition; use media to counterbalance unhealthy food messages
Empower consumers by providing more comprehensive labeling of food and portion size; train professionals in nutrition by improving the skill level of healthcare practitioners and enlarging the pool of individuals qualified to provide nutrition advice

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and nutritional needs of the population. This disjunction has been further abetted by the consolidation of economic control of the US food supply into fewer and fewer corporations that thus have greater opportunity to influence food choice through the media and other mechanisms.

## Summary and Recommendations

### Approaches to Implementation of Dietary Advice Are Needed

For encounters between healthcare providers and clients/patients, levels 1 and 2 of the Figure, providers should learn behavior change and motivational interviewing strategies; these strategies should be incorporated into educational programs for physicians, nurses, and dietitians. Efficacy of referrals from physicians to dietitians or other ancillary healthcare personnel must be evaluated. Healthcare professionals must develop evaluation tools that increase sensitivity to clients' readiness to change eating behaviors, literacy level, ethnic preferences, and social constraints that affect dietary patterns.<sup>130,131</sup> It may be more important to focus on barriers to implementation before providing specific nutrition counseling. When time constraints are present in office encounters, healthcare providers should deliver simple positive messages directed at the major causes of poor nutrition. Examples include eating breakfast; eating fruits, vegetables, and whole grains; limiting intake of sugar-containing beverages to <12 oz/d; limiting snacks to once a day; eating smaller portions; weighing regularly; and adjusting dietary intake based on weight.

For level 3 of the Figure, we propose 5 community-based implementation strategies that should be evaluated for efficacy (Table 11). *Create a healthy food environment* means serving items of high food quality in schools and at work places. Collaboration with the various components of industry responsible for the food supply will be critical to achieving this goal. *Subsidize AHA-recommended food choices* means creating financial and other incentives for consumers to purchase and food producers to generate nutritious foods. *Market nutrition* means using media to counterbalance unhealthy food messages. *Empower consumers* means providing more comprehensive labeling of food and portion size. *Train professionals in nutrition* means improving the skill level of healthcare practitioners commonly consulted for nutrition advice and enlarging the pool of individuals qualified to provide nutrition advice. The net result of these strategies is to produce a food- and nutrition- literate society. For families, Table 12 provides

**Table 12. Examples of Strategies That Families Can Use to Create Healthy Food Environments: Implementation at Levels 2 and 3 of the Figure****At home**

Parents know that their children are being bombarded by carefully crafted marketing tactics used by the food industry in multiple environments such as the Internet, magazines, schools, product placement, incentive programs, video games, social networking sites, podcasts, and cell phones, all designed to improve brand recognition and increase product sales often when parents have little or no oversight or consent; parents should discuss these marketing strategies with their children as they reach the appropriate age to help them understand how these tactics influence their decision making

Parents should become advocates for their children's health and steer their children away from unhealthy meals in restaurants and those that are marketed with toys or licensed characters, discourage food and beverage marketing and advertising in their schools, and use their purchase power to stay away from unhealthy foods that are marketed by licensed characters

**In schools**

Parents should advocate for stronger nutrition standards for school meal programs and foods and beverages sold in competition with meal programs in vending machines, school stores, the cafeteria, fundraising, and other venues; parents should support these standards by sending healthy foods from home for eating at school

Parents should inquire about a wellness policy and find out how their school is addressing nutrition, nutrition education, and physical activity; they should make sure the school's wellness policy is fully implemented and regularly assessed; parents are important members of school wellness councils that address the healthy school environment

Parents should find out through school board meetings or from the local school district administration whether the district is prioritizing healthy offerings within school food and beverage contracts

Parents should explore whether the school has a farm-to-school program or implements the Department of Defense Fresh Program, a school garden program, the Fruit and Vegetable Program, or any other program that enhances incorporation of fresh, whole foods into the school meal program and throughout the school environment

**In the workplace**

Support a work site wellness program and preventive services at the place of employment; employers should offer wellness programs, education, and services that address the needs of all employees at a given workplace regardless of gender, age, ethnicity, culture, or physical or intellectual capacity; such programs should include modifications of the work site environment that facilitate healthy behaviors and decision making that promotes wellness; the work site should have a nutrition policy and healthy food offerings in meetings, on-site cafeterias, and vending machines

**In the community**

Seek access to fresh fruits, vegetables, lean meats, and locally grown foods through local farmers' markets and other venues; local markets should provide greater access to fresh, whole foods for low-income populations through voucher programs, Electronic Benefits Transfer Cards through the Food Stamp program, and the Seniors' Farmers Market Program; create transportation solutions for people to get to local markets

Families should advocate for grocery stores and/or supermarkets in their locale to increase access to fresh, whole foods

ways for parents to make their home and food environment more nutritionally healthy.

At the macroeconomic level (level 4), the 5 principles described above can inspire governmental policy, industry, foundations, and voluntary agencies to influence social

**Table 13. Examples of Macroenvironmental Strategies to Make Implementation of AHA Guidelines Easier for Families: Implementation at Levels 3 and 4 of the Figure****Improve consumer access to nutrition information**

Restaurants with standardized menus and recipes should provide calorie information on their menus and menu boards at point of purchase for families eating outside the home

Front-of-package food labeling should be streamlined to provide shoppers easy-to-read, at-a-glance information to inform them as to which foods and beverages are healthy options within product categories

**Government**

Provide subsidies that encourage agricultural production of more whole-grain products, *trans* fat-free oils, low-fat dairy, fruits, and vegetables

Provide greater funding and prioritize government and nonprofit consumer education campaigns (such as Fruit and Veggies—More Matters) around nutrition and healthy foods and beverages

Facilitate interagency communication to collaborate and incorporate solutions for obesity prevention, nutrition, and physical activity within departments' programming, strategic thinking, planning, and infrastructure

Regulate food and beverage industry marketing and advertising; require healthy food advertising

Develop, test, and implement indicators and systems for surveillance of policies and environmental conditions related to diet and nutrition and other risk factor prevention strategies at the national, state, and local levels

**The healthcare system**

Hospital systems should offer healthy nutrition choices throughout hospital food service for patients, providers, families, and visitors; just as many hospital campuses are going smoke-free, healthcare systems should model healthy food and beverage offerings

Healthcare providers should model healthy behaviors; they should commend parents who are modeling healthy behaviors; they should encourage and give guidance to parents who want to be effective role models

Healthcare providers should incorporate weight screening and BMI calculation into all healthcare visits for adults and children

change. A strong advocacy agenda is being formulated around the country to implement these principles. The most effective strategies to curb the epidemic of tobacco use originated and were implemented, sometimes grudgingly, by these large social forces. Social intervention informed by outcomes research can drive effective public policy. Table 13 provides examples of policies that could be advocated to facilitate AHA guideline implementation.

Fundamental to implementation must be the recognition of the social and environmental context of eating.<sup>132</sup> Strategies can no longer ignore the individual's taste preferences, understanding of food and nutrition, familial eating patterns, social/economic constraints on food choice, ethnicity, and literacy. More research into making healthy foods more preferred is critical. Research designs must incorporate an understanding of these complex social processes; consideration must be given to how study end points fit into the complex social forces surrounding dietary patterns.<sup>12,13</sup> More population-based research in the community at large and dietary patterns

must be undertaken. The observed adverse trends in US eating patterns must be reversed. Consumption of sugar-containing beverages and salty snacks must be reduced, along with a reduction in portion size and, most likely, eating

frequency. Better strategies allowing consumers to make healthier choices outside the home must be established. The next era in nutrition research will be defined by the degree of success in this endeavor.<sup>1,33</sup>

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Samuel S. Gidding	Nemours Cardiac Center	None	None	None	None	None	None
Alice H. Lichtenstein	Tufts University	NIH†	None	None	None	None	None
Allison Karpyn	The Food Trust	Robert Wood Johnson Foundation related to food environments and childhood obesity†; Federal Food Stamp Nutrition Education Program†	None	None	None	None	None
Julie A. Mennella	Monell Chemical Senses Center	NIAAA/NIH†; NIH/NICHD†; Commonwealth of Pennsylvania, Department of Health†; Draper Laboratory/DARPA/DOD†; PepsiCo Foundation, Monell Research Apprenticeship Program (\$50 000)†	None	None	None	None	None
Myles S. Faith	University of Pennsylvania	PI on NIH grant related to family interventions for pediatric obesity†	General Mills*	None	None	Merck (consultant)*	None
Barry Popkin	University of North Carolina	NIH†	Nestle Water,* Danome*	None	None	None	Unilever* (gift to do the US Beverage Guidance Panel)
Linda Van Horn	Northwestern University Medical School	NIH†	None	None	None	None	None
Laurie Whitsel	American Heart Association	None	None	3 or 4 Speaking engagements per year (Columbia University and the Council of State Governments meetings)*	None	None	None
Jonelle Rowe	Professor Emeritus of Pediatrics, University of Connecticut School of Medicine	None	None	None	None	None	None

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\*Modest.

†Significant.

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