

# California Food Guide

## Fruits and Vegetables

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### What's New?

The 2005 Dietary Guidelines for Americans recommends a range from 2½ to 6½ cups of fruits and vegetables depending on the calorie range of 1,200 - 3,200 calories.<sup>1</sup>

### Public Health Implications

Healthy People 2010 nutrition and overweight objectives:<sup>2</sup>

- Objective 19.5: Increase the proportion of persons aged two years and older who consume at least two daily servings of fruit.
- Objective 19.6: Increase the proportion of persons aged two years and older who consume at least three daily servings of vegetables, with at least one-third being dark green or orange vegetables.

Reduced risk of some cancers and cardiovascular disease for those with higher fruit and vegetable intake.<sup>3, 4</sup>

Potential reduced risk of overweight/obesity and type 2 diabetes for those with higher fruit and vegetable intake.<sup>5, 6</sup>

## Fruits and Vegetables and Health<sup>7</sup>

A variety of nutrients in fruits and vegetables promote good health:

- Folic acid helps reduce neural tube defects.
- Magnesium promotes healthier bones.
- Fiber contributes to bowel health, prevents constipation, and helps with satiety.
- Vitamin A (beta-carotene) and vitamin C help maintain healthy skin, eyes, and gums.
- Potassium may help to reduce blood pressure in subgroups of the population with various forms of hypertension.
- Phytochemicals may reduce the risk of multiple chronic diseases, such as cancer and cardiovascular disease.

## Definition

### ***Dietary Requirements***

One of the most important recommendations of the 2005 Dietary Guidelines for Americans (Dietary Guidelines) and the MyPyramid food guidance system is to consume a sufficient amount of fruits and vegetables while staying within energy needs.<sup>1</sup> The Dietary Guidelines recommend two cups<sup>∞</sup> of fruits and two and a half cups of vegetables per day for a reference 2,000 calorie intake, with higher or lower amounts depending on the age, gender, physical activity level, and caloric needs of each individual. The Dietary Guidelines do not set a “basic minimum” such as five daily servings of fruits and vegetables.

The Dietary Guidelines also provide specific direction about choosing a variety of vegetables by identifying five vegetable subgroups (dark green, orange, legumes, starchy vegetables, and other vegetables) and setting a recommendation to eat from each group several times per week. The vegetable subgroups were established to promote increased consumption of vitamin A (carotenoids), vitamin C, folate, and potassium, which are nutrients that are often lacking in the American adult diet.<sup>1</sup>

### **Vegetable Groups Established by the 2005 Dietary Guidelines for Americans**

Dark green	Broccoli, spinach, greens, dark green lettuce, bok choy
Orange	Carrots, sweet potatoes, winter (orange) squash, pumpkin
Legumes	Dry beans, lentils, chickpeas, tofu, soybeans (edamame)
Starchy vegetables	Corn, white potatoes, green peas, lima beans, taro
Other vegetables	Tomatoes, cabbage, Chinese cabbage, Brussels sprouts, peppers, cauliflower, mushrooms, onions, green beans, summer squash, lettuce, cucumber, and others

<sup>∞</sup> A half cup of most vegetables or a half cup of juice has a volume of about 125 milliliters and weighs roughly 100 grams.

In contrast to the vegetable group, fruits are not divided into subgroups. To ensure adequate fiber intake, however, the Dietary Guidelines promote whole fruit rather than juice in meeting the majority of the fruit requirement.<sup>1</sup>

As shown in Tables 1 and 2, the recommended daily number of cups for the fruit group ranges from one cup to 2.5 cups and the recommended daily number of cups for the vegetable group ranges from one cup to four cups. To obtain information about cup equivalents for fresh, frozen, or canned fruit; dried fruit; fruit juice; cut-up raw or cooked vegetables; raw leafy vegetables; and vegetable juice, go to <http://www.mypyramid.gov>.

**Table 1: Recommended Daily Number of Cups and Servings for the Fruit Group<sup>1</sup>**

Calorie Level	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	2,800	3,000	3,200
Fruits	1 cup	1 cup	1.5 cups	1.5 cups	1.5 cups	2 cups	2 cups	2 cups	2 cups	2.5 cups	2.5 cups	2.5 cups
	2 servings	2 servings	3 servings	3 servings	3 servings	4 servings	4 servings	4 servings	4 servings	5 servings	5 servings	5 servings

**Table 2: Recommended Daily Number of Cups and Servings for the Vegetable Group, with Subgroup Amounts Listed as Weekly Cups<sup>1</sup>**

Calorie Level	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	2,800	3,000	3,200
Vegetables	1 cup	1.5 cups	1.5 cups	2 cups	2.5 cups	2.5 cups	3 cups	3 cups	3.5 cups	3.5 cups	4 cups	4 cups
	2 servings	3 servings	3 servings	4 servings	5 servings	5 servings	6 servings	6 servings	7 servings	7 servings	8 servings	8 servings
Dark green vegetables	1 cup/week	1.5 cups/week	1.5 cups/week	2 cups/week	3 cups/week	3 cups/week	3 cups/week	3 cups/week	3 cups/week	3 cups/week	3 cups/week	3 cups/week
Orange vegetables	.5 cup/week	1 cup/week	1 cup/week	1.5 cups/week	2 cups/week	2 cups/week	2 cups/week	2 cups/week	2.5 cups/week	2.5 cups/week	2.5 cups/week	2.5 cups/week
Legumes	.5 cup/week	1 cup/week	1 cup/week	2.5 cups/week	3 cups/week	3 cups/week	3 cups/week	3 cups/week	3.5 cups/week	3.5 cups/week	3.5 cups/week	3.5 cups/week
Starchy vegetables	1.5 cups/week	2.5 cups/week	2.5 cups/week	2.5 cups/week	3 cups/week	3 cups/week	6 cups/week	6 cups/week	7 cups/week	7 cups/week	9 cups/week	9 cups/week
Other vegetables	4 cups/week	4.5 cups/week	4.5 cups/week	5.5 cups/week	6.5 cups/week	6.5 cups/week	7 cups/week	7 cups/week	8.5 cups/week	8.5 cups/week	10 cups/week	10 cups/week

## What are fruits and vegetables?

Deciding whether a produce item is a fruit or a vegetable can be challenging because they are defined by their botanical parts. A fruit is the edible reproductive body of a plant that contains seeds, such as apples, peaches, and pears.<sup>8</sup> Common garden vegetables that are actually fruits include cucumbers, squash, peppers, and tomatoes. Although they grow around a seed, olives are classified in the MyPyramid food guidance system as a member of the oil group. Vegetables, in contrast, encompass all other edible parts of a plant including stems, leaves, roots, tubers, bulbs, and flowers.<sup>8</sup> Celery, salad greens, carrots, potatoes, onion, and broccoli are just a few examples of vegetables.

Despite their botanical differences, fruits and vegetables are essential to maintain good health and prevent chronic diseases. The fruit and vegetable group is rich in vitamins and minerals, such as vitamin A, vitamin C, folic acid, and potassium, as well as dietary fiber and the phytochemicals that give fruits and vegetables their color. Most fruits and vegetables are also low in fat, calories, and sodium. Avocado, a fruit high in mono-unsaturated fat, is one of the few exceptions.

Research shows that the more colors of fruits and vegetables consumed, the greater the health benefits. Phytochemicals contained in the different colored fruits and vegetables include lycopene (red), anthocyanins (red, blue/purple), phenolics (blue/purple), lutein (green), indoles (green or white and from the crucifer family), beta-carotene (orange), bioflavonoids (orange/yellow), and allacin/allium (mostly white-members of the onion family).<sup>9</sup>

## **Burden**

Current research demonstrates a positive association with fruit and vegetable intake and improved health. Health benefits of fruit and vegetable consumption include a reduced risk of major diseases and health conditions, such as cardiovascular disease, hypertension, stroke, cancer, obesity, birth defects, and diverticular disease. Other possible health benefits of eating fruits and vegetables include reduced risk for type 2 diabetes and possibly delayed onset of age-related indicators, such as cataracts and macular degeneration.<sup>7</sup>

- Cardiovascular Disease - Heart disease and stroke, the principal components of cardiovascular disease, are the first and third leading causes of death for both men and women in the United States and California.<sup>10, 11</sup> In addition, approximately 70 million Americans are living with some type of cardiovascular disease. The cost of cardiovascular disease was estimated to be \$393.5 billion in 2005.<sup>12</sup> Large, prospective studies have demonstrated a direct, inverse relationship between consumption of fruits and vegetables and development of medical conditions such as heart attack and stroke.<sup>13</sup> Increasing evidence also indicates that dietary patterns characterized by a high intake of fruits and vegetables are associated with lower cardiovascular risk factors including obesity, hypertension, and type 2 diabetes.<sup>13</sup>

- Cancer - Cancer is the second leading cause of death in the United States and California.<sup>10, 14</sup> It is estimated that for 2005, approximately 570,280 Americans - more than 1,500 each day - are expected to have died of cancer and 1,372,910 new cases are expected to have been diagnosed.<sup>14</sup> Scientific evidence suggests that about one-third of those deaths are related to nutrition, physical inactivity, obesity, or overweight and could have been prevented.<sup>15</sup>

The National Institutes of Health put a national estimate of \$189.9 billion as the projected cancer cost burden in 2004.<sup>16</sup> Scientists at the National Cancer Institute found in their review of worldwide cancer research that, for most cancer sites, persons with low fruit and vegetable intake (at least the lower one-fourth of the population) experience about twice the risk of cancer compared to those with high intake.<sup>17</sup> In addition, an evidence based review of the literature shows a strong and consistent protective association of fruit and vegetable intake against cancers of the mouth, pharynx, esophagus, stomach, lung, colon, and rectum and probable for larynx, pancreas, breast, and bladder.<sup>3</sup> Some of these findings, however, are not unequivocal.<sup>18, 19</sup>

- Obesity - According to Eric Bost, the Undersecretary of Food, Nutrition, and Consumer Services of the USDA, approximately 60 million adults in the United States are obese and, if the trend continues, it is expected to rise to 69 million by 2010.<sup>20</sup>

The cost of obesity in the United States was \$117 billion in the year 2000, which included both indirect and direct costs.<sup>21</sup> In California, the total cost of physical inactivity, obesity, and overweight was estimated at \$21.7 billion in 2000 and projected to be \$28 billion in 2005.<sup>22</sup> There is an inverse relationship between eating fruit and being overweight. Adults and children who reported eating more servings of fruit daily had a lower body mass index (BMI) than others.<sup>23</sup> Consumption of fruits and vegetables, which are low in calories and high in fiber and water, may be useful in weight reduction and weight management.<sup>5</sup>

- Diabetes - In 2002, there were 13.3 million cases of diagnosed diabetes in the United States and five million undiagnosed cases. Total direct and indirect cost of diabetes in the United States in 2002 was estimated at \$132 billion. The cost includes disability, work loss, and premature mortality.<sup>24</sup> Some studies have suggested an association between increased fruit and/or vegetable consumption and decreased risk of developing type 2 diabetes and better control of blood sugars, especially for women.<sup>6, 25, 26</sup>
- Age-related conditions - Approximately 50 million people in the world are blind due to cataracts. Cataracts are most commonly found in the elderly. In the United States, age-related cataracts cost \$5 billion per year. Studies suggest that consuming high levels of antioxidants, such as vitamin C and carotenoids found in fruits and vegetables, are associated with delayed development of cataracts.<sup>27</sup>
- Birth defects - Birth defects affect approximately 120,000 newborns in the United States each year. They are the leading cause of infant mortality and contribute substantially to

illness and long-term disability. Lifetime costs for those infants born in a single year with one or more of the 17 most clinically important birth defects have been estimated to total \$6 billion. Folic acid, which is found in many fruits and vegetables, plays an important role in the prevention of neural tube defects.<sup>28</sup>

## **Incidence and Prevalence**

Mean fruit and vegetable consumption falls short of recommended levels among adults, adolescents, and children in California and the nation. This statement is consistent despite the use of various methods to measure fruit and vegetable intake through detailed 24-hour recalls or records, 24-hour recalls of limited foods, food frequency questionnaires, and single or two-item measures. In some national and California-based surveys, serving sizes are assumed (not quantified); in others they are explicitly explained or asked (quantified).<sup>29</sup> In some cases, all potatoes are included in the count of vegetable servings, and at other times only potatoes that are not fried are included. In addition, legumes may or may not be included in the data collection instruments. Consequently, one cannot easily compare findings from a study using one method to that using a different method. Yet another complicating factor is the use of “servings” rather than “cups” in the data collection instruments, data analyses, and published results. As such, all available data within this section describes fruit and vegetable consumption as measured by servings.

The California Dietary Practice Survey (CDPS) uses a structured, non-quantitative, limited 24-hour dietary recall to measure fruit and vegetable consumption of California adults biennially. In 2005, California adults reported eating an average 4.4 servings of fruits and vegetables, with 42 percent reporting five or more servings on the day prior to the interview.<sup>30</sup> Orange juice, bananas, and apples were the most frequently consumed fruit by Californians of all racial/ethnic groups and lower income Californians. Green salad, tomatoes, and potatoes were the top three vegetables for all groups except Asian/Other, in which case lettuce replaced tomatoes.<sup>31</sup>

For California adolescents, the biennial California Teen Eating, Exercise, and Nutrition Survey (CalTEENS) uses a structured, more quantitative 24-hour dietary recall focused on fruits and vegetables. In 2004, California teens reported an average 4.4 servings of fruits and vegetables, with 42 percent reporting eating five or more servings on an average day.<sup>32</sup> In addition, the California Children’s Healthy Eating and Exercise Practices Survey (CalCHEEPS) collects fruit and vegetable consumption data biennially from nine to 11-year-old children through a semi quantified, two-day, parent-assisted food diary. In 2005, CalCHEEPS participants reported an average 3.0 servings of fruits and vegetables, with 14 percent reporting eating at least five servings of fruits and vegetables on a typical school day.<sup>33</sup>

Only one fruit and vegetable surveillance instrument makes state-to-nation or between state comparisons possible. The Behavioral Risk Factor Surveillance System (BRFSS) is administered in all states and territories in the United States. The BRFSS questionnaire contains nonquantified questions about “how often” the respondents eat six categories of fruits and vegetables (i.e., fruit juice, fruit, green salad, non-fried potatoes, carrots, and other

vegetables).<sup>34</sup> In 2003, 27 percent of California adult respondents reported consuming fruits and vegetables five or more times per day; this compares with the national average of 23 percent.<sup>35</sup>

A comparable survey for adolescents is the Youth Risk Behavior Survey (YRBS). Nationwide, 22 percent of teens reported eating five or more daily servings of fruits and vegetables in 2003. Comparable population data for California is not available because the survey was given in only three California cities.<sup>36</sup> A different California statewide survey of seventh, ninth, and eleventh graders, the California Student Survey, asks the fruit and vegetable consumption question in a similar way. In 2003-04, 40 percent of seventh graders, 35 percent of ninth graders, and 30 percent of eleventh graders reported eating fruits and vegetables at least five times on the prior day.<sup>37</sup>

One in-depth source of nationally representative data is the Continuing Survey of Food Intake by Individuals (CSFII), a two-day, detailed, quantitative, 24-hour recall. This survey was supplanted by the National Health and Nutrition Examination Survey (NHANES) in 1999-00, which used the CSFII methodology. In 1999-00, individuals two years of age and older averaged, 4.7 daily servings of fruits and vegetables. Reported fruit consumption averaged 1.5 servings and vegetable consumption averaged 3.2 servings. Total mean vegetable intake included 0.3 servings of dark green/deep yellow vegetables, 1.4 serving of starchy vegetables (primarily fried potatoes), and 1.5 servings of tomatoes and other vegetables.<sup>38</sup>

National survey data also demonstrate that vegetable consumption tends to increase as individuals age, but fruit consumption is highest among the very young and oldest individuals in the population. Individuals of lower education and income levels tend to eat fewer servings of vegetables and fruits than do those with more education and higher income. In addition, African Americans tend to have the lowest intake of fruits and vegetables as compared to other ethnic and racial groups.<sup>39, 40</sup>

## **Trends/Contributing Factors**

According to *CDPS* data from the Network's 1997 baseline to 2005, fruit and vegetable intake showed a statistically significant increase from 3.8 to 4.4 mean servings among adults. The percent eating at least five daily servings of fruits and vegetables rose from 33 percent to 42 percent ( $p < .001$ ). Statistically significant increases were also seen in a variety of population sub groups, including those with at least high school education, who were white, who earned less than \$15,000 per year, who earned \$50,000 or more per year, who were women, and who were men, aged 25-50 years.<sup>30</sup> These findings coincide well with an increased, statewide social marketing effort to improve fruit and vegetable consumption, especially among Food Stamp eligible adult Californians, through the California Department of Public Health's Network for a Healthy California.

For California adolescents, CalTEENS data from 1998 to 2000 showed an increase in mean fruit and vegetable consumption from 4.3 to 4.5 servings; this increase was short of significance ( $p < .06$ ). White teens reported a significant increase from 4.1 one to 4.7 servings

( $p < .01$ ). These gains were not reflected in other racial/ethnic groups.<sup>32</sup> Given the short timeframe of the CalTEENS data, it is too soon to suggest that these findings are trends.

From 1999-2005, CalCHEEPS data showed that mean fruit and vegetable consumption remained statistically unchanged (3.2 to 3.0 servings) among 9-11 year-old children in California.<sup>33, 41</sup> Among children from Food Stamp households, however, there was nearly a serving increase in fruit and vegetable intake during this period (3.5 to 4.3 servings;  $p < .05$ ) from 1999-2003, while in 2005 fruit and vegetable intake dropped to 3.2 servings.<sup>33, 41, 42</sup> From 1999-2003, the proportion of children from Food Stamp households eating five or more servings of fruits and vegetables a day also doubled (25 to 50 percent;  $p < .01$ ); however, decreased significantly (50 to 22 percent;  $p < .01$ ) between 2003 and 2005.<sup>33, 42</sup> Interestingly, these increases coincide with the statewide implementation of the Network for a Healthy California--Children's Power Play! Campaign and projects within the Network for a Healthy California, which are designed to increase fruit and vegetable consumption among children from Food Stamp eligible households.

Between 1994 and 2002, national BRFSS data showed little change in fruit and vegetable intake, with a low of 22 percent eating five or more servings of fruits and vegetables per day in 1994, a peak of 24 percent in 1998, and a drop back to 23 percent in 2002.<sup>43, 44</sup> For teens, the national YRBS, with questions similar to BRFSS, showed no significant change in consumption of five or more daily servings between 1999 (24 percent) and 2003 (22 percent).<sup>36</sup>

Looking at both CSFII and NHANES daily servings of fruits and vegetables for individuals two years of age and older averaged 4.5 servings in 1989-91; 4.9 servings in 1994-96, and 4.7 servings in 1999-00. Daily vegetable intake increased from 3.2 to 3.4 servings, then decreased to 3.2 servings. Fruit intake increased from 1.3 to 1.5 servings over the same time frame. Neither trend is statistically significant.<sup>45</sup>

Increased out-of-home eating may be one of the most important factors contributing to the flat or falling state of fruit and vegetable consumption among many population segments nationally. From 1994-96 and in 1998, CSFII data showed that Americans ate about one-third of their calories from out-of-home foods, compared to less than one-fifth in 1977-78. To compound the issue, foods eaten away from home equal less than half a serving of fruit and one and a quarter servings of vegetables, 35 percent of which are French fries.<sup>46</sup> Among California adults, between 1989 and 1999, eating out, particularly fast food, was consistently related to lower fruit and vegetable consumption.<sup>47</sup>

## **Barriers to Implementation/Myths**

There are a variety of barriers associated with inadequate fruit and vegetable consumption. According to the 2005 CDPS, the most common reasons Californian's gave for not eating fruits and vegetables were they were hard to buy in fast food places, hard to get at work, hard to buy in restaurants, and too expensive. For lower income and less educated groups, cost was an even greater barrier.<sup>48</sup> When the respondents of CDPS were asked why they are not eating more fruits and vegetables, the most common reasons were that fruits and vegetables take too

much time to prepare, they are eating enough now, fruits and vegetables are not available, and they are not in the habit of eating fruits and vegetables. In addition to these barriers, there are numerous myths surrounding fruits and vegetables, which may contribute to decisions made by consumers to purchase, prepare, and eat them.

**Myth:** There are only a few fruits and vegetables that are the best for your health.

**Fact:** There is no single fruit or vegetable that is “the healthiest.” Different fruits and vegetables are rich in different nutrients, and that is why it is important to eat a variety of fruits and choose vegetables from each of the five vegetable subgroups (dark green, orange, legumes, starchy, and other vegetables) every day.<sup>1</sup>

**Myth:** Fresh fruits and vegetables are more nutritious than frozen, canned, or dried.

**Fact:** Most frozen, canned, and dried fruits and vegetables are processed immediately after harvest, preserving much of the produce’s nutrient content. For people who do not have access to local produce, frozen, canned, or dried fruits and vegetables can be just as nutritious or may even have more nutrients as compared to produce that has been shipped a long distance. Eating fruits and vegetables in a variety of forms (fresh, frozen, dried, and canned) will ensure a balance of important nutrients, as well as save money and preparation time. When choosing frozen, canned, or dried fruits and vegetables, select those without added sugar, high fat sauces, or added sodium.<sup>49</sup>

**Myth:** Drinking 100 percent fruit and vegetable juices throughout the day is just as healthy as eating whole fruits and vegetables.

**Fact:** The majority of daily fruit and vegetable requirements should be met by consuming whole fruits and vegetables. Consuming large amounts of juice can increase caloric intake without the health promoting properties of the fiber found in whole fruits and vegetables.<sup>1</sup>

**Myth:** Taking a daily multi-vitamin reduces the requirements for fruits and vegetables.

**Fact:** Pills, powders, or supplements cannot replicate the combined effects of the vitamins, minerals, fiber, and phytochemicals found in fruits and vegetables and other healthy plant foods. Taking a multi-vitamin may supplement vitamins and minerals that are missed on a given day, but it does not change the recommended daily amounts of fruits and vegetables that a person needs.<sup>50</sup>

**Myth:** Organically grown fruits and vegetables are much more nutritious than those that are not organically grown.

**Fact:** Organically grown food is food grown and processed using no synthetic fertilizers or pesticides. Pesticides derived from natural sources (e.g., biological pesticides) may also be used in producing organically grown food. There is no evidence, however, that organically grown fruits and vegetables have more vitamins, minerals, and phytochemicals than those that are not organically grown.<sup>51</sup>

**Myth:** Fruits and vegetables contain a lot of pesticides and are unsafe to eat.

**Fact:** The United States has strict standards to protect the food supply. While pesticides are used to protect food from pests, such as insects, rodents, weeds, mold, and bacteria, the Environmental Protection Agency sets standards on the amount of pesticides that may remain on food. These standards are monitored closely to ensure that food, including fruits and vegetables, are safe for all people to eat.<sup>52</sup>

**Myth:** Fruits and vegetables take too much time to prepare.

**Fact:** Fruits and vegetables are the “original fast food.” Many are ready-to-eat, like fresh or canned fruit for snacking, and ready-to-cook, like frozen pre-cut vegetables. Cooking vegetables in the microwave is another way to prepare a healthy entrée or side dish in minutes.

**Myth:** Fruits and vegetables are expensive.

**Fact:** According to a study conducted by the Economic Research Service of USDA that used 1999 A.C. Nielson Homescan data, a consumer can eat three servings of fruits and four servings of vegetables daily for 64 cents (this may under-represent costs in some states such as California).<sup>53</sup> This represents 12 percent of daily food expenditures per person, so consumers have 88 percent of their food dollars left to purchase food from the other primary food groups and low-income households have 84 percent of their food dollars left. The authors of the study note that the prices in 2003 would be ten percent higher on average than the prices in 1999. Likewise, prices vary widely depending upon the region, state, season, and type of produce items. To get the most produce at the best price, it is helpful to buy fresh fruits and vegetables in season, shop for daily or weekly specials, use fruit and vegetable coupons, and choose produce at local farmers’ markets.

**Myth:** Fruits and vegetables spoil too quickly, so buying them is a waste.

**Fact:** Fresh fruits and vegetables, like apples, sweet potatoes, and oranges, can last several weeks in the refrigerator, while other produce, such as strawberries, raspberries, and peaches need to be consumed shortly after purchase. The key to preventing spoilage is to select a reasonable quantity of fresh, high-quality, in-season produce that is free of bruises and not overripe. Once the produce is brought home, it needs to be stored in appropriate conditions and consumed in a timely fashion.<sup>54</sup> Fresh fruits and vegetables can also be canned or frozen to extend their shelf life for months.

## **Common Concerns/Strategies**

An overarching concern among the public health community, advocates, and consumers is that fruits and vegetables are not as readily available to purchase and consume as are other unhealthy foods, especially in low-income communities.<sup>55</sup> California cities and even rural areas are also surrounded with advertising and marketing messages and images that encourage unhealthy dietary practices. These conditions require the implementation of large scale, population-based, and systemic environmental and policy changes to make it easier for individuals and families to choose healthy foods.<sup>56</sup> The following approaches may contribute

to the development of communities that empower Californians to make healthy food choices on a regular basis:

- Support and invest in evidence-based social marketing campaigns that use a social ecological approach to increase fruit and vegetable consumption.
- Encourage the purchase of fruits and vegetables through point-of-sale merchandising, promotions, and advertising, and by increasing convenience and reducing costs.<sup>57, 58</sup>
- Increase the availability of affordable, quality fruits and vegetables and decrease the availability of unhealthy foods in schools, community youth organizations, child care centers, worksites, foodservice establishments, churches, grocery stores, convenience stores, and other places where Californians make food choices.<sup>57, 58</sup>
- Work with the media to publicize the need for increased fruit and vegetable consumption and communicate environmental, policy, and consumer oriented solutions and steps to action.
- Work with the entertainment industry and health advocates to achieve a better balance of healthy eating messages and images on television, radio, billboards, and in print publications.
- Work with the restaurant and vending industries and health advocates to achieve a better balance of healthful, competitively priced fruit and vegetable choices.
- Advocate for increased high quality, well prepared fruit and vegetable offerings through the federal school meal programs.
- Advocate for increased fruit and vegetable offerings through federal food programs, such as the Child and Adult Care Food Program and Woman Infants and Children (WIC) food package.
- Advocate for the implementation of innovative, practical, and effective programs, such as the California 5 a Day-for Better Health! Campaign and Fruit and Vegetable Snack Program for schools.

## **Opportunities for Improvement**

Access to a variety of colorful, affordable fruits and vegetables is essential to the short- and long-term health, vitality, and productivity of California's children, adolescents, and adults. Although little is known about the impact of policy approaches in increasing fruit and vegetable consumption among Californians, the following recommendations hold promise in shaping communities throughout the state where choosing fruits and vegetables is easy and socially supported.<sup>56</sup>

### **Opportunities for schools and after-school programs**

The California Obesity Prevention Plan Summary recommends that schools:<sup>59</sup>

- Advertise only healthy foods and beverages on school grounds and use alternatives to foods in fundraising, incentive, and other programs.
- Maximize the availability of fresh and regional foods through initiatives such as farm-to-school programs.

The California Nutrition Network for Healthy, Active Families and California 5 a Day-for Better Health! Campaign Joint Steering Committee had some of the following recommendations:<sup>60</sup>

- School boards overseeing schools that participate in child nutrition programs can adopt local school wellness policies that, at a minimum, implement and enforce nutrition and beverage standards, as defined in the California Education Code, for all foods and beverages available on school campus. The local school wellness policies can also promote increased consumption of fruits and vegetables.
- School boards can also adopt policies that:
  - Require the implementation of comprehensive Farm to School programs, which include school gardens, local purchasing of fruits and vegetables, salad bars, and comprehensive nutrition education where the school cafeteria models healthy eating.
  - Ensure full participation in federal nutrition assistance programs, including National School Lunch, School Breakfast, Summer Lunch, and the After School Snack programs.
  - Offer breakfast where it is not currently available and, where breakfast is already available, establish policies to increase participation through requirements for universal free breakfast and second chance breakfast.
  - Require all schools, where 50 percent or more of the children are at or below 185 percent of the Federal Poverty Level, to utilize the Provision two option to provide all children with National School Lunch and School Breakfast.
  - Schools and after-school programs can implement healthy fundraising policies, healthy reward policies, and incorporate healthy eating and sound nutrition principles into lessons and activities.

### **Opportunities for worksites<sup>61, 62</sup>**

Employers can:

- Assure that healthy foods, including fruits and vegetables, are served at meetings, potlucks, and other workplace gatherings.
- Arrange with local growers or produce distributors to have a box of fresh produce delivered weekly or at regular intervals to each subscribing employee.
- Collaborate with nearby restaurants to offer healthy foods to their employees and promote nutritious specials at reasonable prices.
- Take advantage of existing tax laws in order to provide healthy foods for their employees on a pre-tax basis and collect it through payroll deductions.
- Establish a culture that supports fruit and vegetable consumption by promoting healthy eating to employees.

Employers and employees can:

- Establish on-site farmers' markets.
- Work with catering truck owners and operators to encourage them to offer low cost, healthy choices, with an emphasis on fruits and vegetables.
- Set nutrition standards for worksite vending machines and cafeterias to ensure that quality, affordable fruits and vegetables are readily available.

### **Opportunities for supermarkets and other retail establishments**<sup>56, 57</sup>

Retailers can:

- Offer quality, affordable, and tasty fruits and vegetables in their stores.
- promote fruits and vegetables through point-of-purchase signs, multimedia advertisements, food demonstrations, in-store promotions, and store tours.
- Increase their produce display space and locate fruits and vegetables in high-traffic areas.

### **Opportunities for restaurants and other food service establishments**<sup>56, 58, 60</sup>

- Cities and counties can adopt policies that promote increased consumption of healthy foods, including fruits and vegetables, by requiring nutrition labeling in restaurants.
- Restaurants can:
  - Promote an appealing, tasty, and healthy menu items through point-of-purchase signs, labels, advertisements, and other forms of information sharing.
  - Offer more appealing, affordable, and tasty fruit and vegetable options.
  - Provide discounts and coupons for healthy entrées, side dishes, desserts, beverages, and entire meals.
  - Offer fruit and vegetable substitutions for French fries and other less than healthy side dishes at no extra charge to their customers.

### **Opportunities for communities**<sup>60</sup>

- Cities can design public transportation routes so that residents can access markets that sell fresh fruits and vegetables.

Cities and counties can:

- Establish general plan and zoning policies that require and encourage the development of community gardens, retail stores, farmers' markets, and other sources of healthy foods in communities throughout California, and establish restrictions on the density and location of fast food venues.
- Adopt policies that require and encourage all certified farmers' markets, particularly in low-income communities, to accept Electronic Benefit Transfer cards for the Food Stamp Program.
- Adopt local ordinances that promote outdoor advertising of healthy foods, including fruits and vegetables, and restrict outdoor advertising of unhealthy foods and beverages.
- Adopt policies that require at least 50 percent of all foods and beverages sold in vending machines and in food service venues at public facilities meet nutrition and beverage standards identified within California statute and that the pricing structure is designed to encourage the purchase of healthy options.

### Clinical Implications<sup>7</sup>

A variety of nutrients in fruits and vegetables promote good health and can help prevent or reduce such medical conditions as neural tube defects, high blood pressure, and chronic diseases such as cancer and cardiovascular disease.

### Resources/Web Sites

- American Cancer Society, <http://www.cancer.org>.
- American Diabetes Association, <http://www.diabetes.org>.
- American Heart Association, <http://www.americanheart.org>.
- California Avocado Commission, <http://www.avocado.org>.
- California Certified Organic Farmers, <http://www.ccof.org>.
- California Department of Education, <http://www.cde.ca.gov/re>.
- California Department of Food and Agriculture, <http://www.cdffa.ca.gov>.
- California Fig Advisory Board, <http://www.californiafigs.com>.
- California Foundation for Agriculture in the Classroom, <http://www.cfaitc.org>.
- California Kiwifruit Commission, <http://www.kiwifruit.org>.
- California Pear Advisory Board, <http://www.calpear.com>.
- California Project LEAN, <http://www.californiaprojectlean.org>.
- California Prune Board, <http://www.prunes.org>.
- California Strawberry Advisory Board, <http://www.calstrawberry.com>.
- California Table Grape Commission, <http://www.tablegrape.com>.
- California Tomato Board, <http://www.tomato.org>.
- California Tree Fruit Agreement, <http://www.caltreefruit.com>.
- Centers for Disease Control and Prevention, <http://www.cdc.gov>.
- Certified Farmers' Market, <http://cafarmersmarkets.com>.
- Dole Food Company, Inc., <http://www.dole5aday.com>.
- Fresh Produce and Floral Council, <http://www.fpfc.org>.
- Healthy Kids Resource Center, Alameda County Office of Education, <http://www.hkresources.org>.
- Melissa's/World Variety Produce Inc., <http://www.melissas.com>.
- Monterey Mushroom, Inc., <http://www.montmush.com>.
- National Cancer Institute, National 5 A Day For Better Health Program, <http://www.5aday.gov>.
- Network for a Healthy California, [www.networkforahealthycalifornia.net](http://www.networkforahealthycalifornia.net)
- Produce for Better Health Foundation, <http://www.5aday.com>.

- Produce Marketing Association, <http://www.pma.com>.
- Sunkist Growers, Inc., <http://www.sunkist.com>.
- United Fresh Fruit and Vegetable Association, <http://www.uffva.org>.
- United States Department of Agriculture, <http://www.usda.gov>.
- United States Department of Agriculture, MyPyramid, <http://www.MyPyramid.gov>; <http://www.mypyramid.gov/pyramid/vegetables.html>; and <http://www.mypyramid.gov/pyramid/fruits.html>.

## **References**

1. US Department of Health and Human Services and US Department of Agriculture, *Dietary Guidelines for Americans, 2005*, 6<sup>th</sup> Edition, Washington DC; US Government Printing Office; January 2005, page 24.
2. US Department of Health and Human Services. *Healthy People 2010*. (Conference Edition, in Two Volumes). Washington, DC:January 2000.
3. World Cancer Research Fund and American Institute for Cancer Research. Vegetables and fruits. Ch. 6.3 in *Food, Nutrition, and the Prevention of Cancer: A global perspective*. July 1997. Available at <http://www.wcrf-uk.org/report/chapter6/chapter6page303.lasso?WCRFS=C2C8FDFD02ee418DBDiWr1C9CFDC>. Accessed June 14, 2005.
4. Joshipura KJ, Hu FB, Manson JE, et al. The effect of fruit and vegetable intake on risk for coronary heart disease. *Annals of Internal Medicine*. 2001;134:1106-1114.
5. Rolls BJ, Ello-Martin, JA, Tohill BC. What can intervention studies tell us about the relationship between fruit and vegetable consumption and weight management? *Nutrition Reviews*. 2004;62:1-17.
6. Ford ES, Mokdad, AH. Fruit and vegetable consumption and diabetes mellitus incidence among US adults. *Preventive Medicine*. 2001;32:33-9.
7. Hyson D. *The Health Benefits of Fruits and Vegetables: A Scientific Overview for Health Professionals*. Produce for Better Health Foundation; 2002.
8. University of California Cooperative Extension, Vegetable Research and Information Center. FAQ for VRIC, What is the difference between a fruit and a vegetable? Available at <http://www.vric.ucdavis.edu/faq.htm>. Accessed November 10, 2005.
9. Heber D, Bowerman S. Applying science to changing dietary patterns. *Journal of Nutrition*. 2001;131(11 Suppl):3078S-81S.
10. California Department of Health Services. Vital Statistics Tables 2002. Table 1-8. Five leading causes of death, California 2002. Available at

<http://www.dhs.ca.gov/hisp/chs/OHIR/reports/vitalstatisticsofcalifornia/vsofca2002.pdf>. Accessed April 29, 2005.

11. Centers for Disease Control and Prevention. Cardiovascular Disease at a Glance. Heart Disease and Stroke: The Nation's Leading Killers. Available at [http://www.cdc.gov/nccdphp/aag/aag\\_cvd.htm](http://www.cdc.gov/nccdphp/aag/aag_cvd.htm). Accessed October 30, 2005.
12. American Heart Association. *Heart disease and Stroke Statistics - 2005 Update*. Dallas, TX: American Heart Association; 2004.
13. Bazzano, LA, Serdula M, Liu S. Dietary intake of fruits and vegetables and risk of cardiovascular disease. *Current Atherosclerosis Reports*. 2003;5:492-99.
14. American Cancer Society. *Cancer Facts and Figures 2005*. Atlanta: American Cancer Society; 2005.
15. Doll R, Peto R. The causes of cancer: quantitative estimates of avoidable risks of cancer in the United States today. *Journal National Cancer Institute*. 1981;66:1191-1308.
16. National Heart, Lung, and Blood Institute (NHLBI). *Fact Book, Fiscal Year 2003*. Bethesda (MD): NHLBI; 2003.
17. Block G, Patterson B, Subar A. Fruit, vegetables, and cancer prevention: A review of the epidemiological evidence. *Nutrition and Cancer*. 1992;18(1):1-29.
18. Lin J, Zhang SM, Cook NR, et al. Dietary intakes of fruit, vegetables, and fiber, and risk of colorectal cancer in a prospective cohort of women (United States). *Cancer Causes and Control*. 2005; 16(3):225-33.
19. Van Gils CH, Peeters PH, Bueno-de-Mesquita HB, et al. Consumption of vegetables and fruits and risk of breast cancer. *Journal of the American Medical Association*. 2005; 293(2):183-93.
20. United States Department of Agriculture, (n.d.). Statement of Eric M. Bost, Under Secretary Food, Nutrition, and Consumer Services; Before the Subcommittee on Agriculture, Rural Development, and Related Agencies. FY 2006 FNCS Budget Request. Available at <http://www.fns.usda.gov/cga/Speeches/CT041405-a.html>. Accessed January 24, 2006.
21. Wolf, AM, Manson JE, Colditz GA. The economic impact of overweight, obesity and weight loss. In: Eckel R, ed. *Obesity: Mechanisms and Clinical Management*. Lippincott, Williams and Wilkins; 2002.
22. Chenoweth, D. The Economic Cost of Physical Inactivity, Obesity, and Overweight in California Adults During 2000: A Technical Analysis. *Cancer Prevention and Nutrition*

Section, California Department of Health Services, Sacramento, California; 2005. Available at [www.dhs.ca.gov/cpns](http://www.dhs.ca.gov/cpns). Accessed January 24, 2006.

23. Lin B, Morrison, RM. Higher fruit consumption linked with lower body mass index. *Food Review*. 2002;25:28-32.
24. Centers for Disease Control and Prevention. At a Glance - Diabetes: Disabling, Deadly, and On The Rise. Revised May 2005. Available at [http://www.cdc.gov/nccdphp/aag/aag\\_ddt.htm](http://www.cdc.gov/nccdphp/aag/aag_ddt.htm). Accessed June 14, 2005.
25. Liu S, Serdula, M, Janket S, Cook, NR, et al. A prospective study of fruit and vegetable intake and the risk of type 2 diabetes in women. *Diabetes Care*. 2004;27:2993-96.
26. Montonen J, Jarvinen R, Heliövaara M, et al. Food consumption and the incidence of type 2 diabetes mellitus. *European Journal of Clinical Nutrition*. 2005;59(3):441-48.
27. Taylor A., Jacques PF, Epstein, EM. Relations among aging, antioxidant status, and cataract. *American Journal of Clinical Nutrition*. 1995;62(6 Suppl):1439S-47.
28. Centers for Disease Control and Prevention, Economic costs of birth defects and cerebral palsy---United States, 1992. *Morbidity and Mortality Weekly Report*. 1995;44:694-99.
29. Field AE, Colditz GA, Fox MK, et al. Comparison of four questionnaires for assessment of fruit and vegetable intake. *American Journal of Public Health*. 1998;88(8):1216-18.
30. *California Dietary Practices Survey: 2005* [Data file]. Sacramento, CA: Cancer Prevention and Nutrition Section, California Department of Public Health. (unpublished).
31. *California Dietary Practices Survey: 1999* [Data file]. Sacramento, CA: Cancer Prevention and Nutrition Section, California Department of Public Health. (unpublished).
32. *California Teen Eating, Exercise and Nutrition Survey: 1998-2004* [Data file]. Sacramento, CA: Cancer Prevention and Nutrition Section, California Department of Public Health. (unpublished).
33. *California Children's Healthy Eating and Exercise Practices Survey: 2005* [Data file]. Sacramento, CA: Cancer Prevention and Nutrition Section, California Department of Public Health. (unpublished).
34. CDC Behavioral Risk Factor Surveillance System website. Questionnaires. Available at <http://www.cdc.gov/brfss/questionnaires/english.htm>. Accessed May 22, 2005.
35. CDC Behavioral Risk Factor Surveillance System website. Prevalence data – fruit and vegetables; 2003. Available at

<http://apps.nccd.cdc.gov/brfss/list.asp?cat=FV&yr=2003&qkey=4415&state=US>.  
Accessed May 22, 2005.

36. CDC YRBSS website. Trends in the Prevalence of Dietary Behaviors and Weight Control Practices. Available at <http://www.cdc.gov/HealthyYouth/yrbs/pdfs/trends-dietary.pdf>. Accessed May 22, 2005.
37. WestEd. California Student Survey 2002-04 Technical Report - Module A: Core. Available at [http://www.wested.org/chks/pdf/cssinchkformat03\\_04.pdf](http://www.wested.org/chks/pdf/cssinchkformat03_04.pdf). Accessed May 22, 2005.
38. US Department of Agriculture. Agricultural Research Service. Pyramid Servings Data: Results from USDA's 1994 and 1996 Continuing Survey of Food Intake by Individuals. 1997. Available at <http://www.barc.usda.gov/bhnrc/foodsurvey/pdf/py9596.pdf>. Accessed May 22, 2005.
39. US Department of Agriculture. *Continuing Survey of Food Intakes by Individuals 1994-96, 1998*. 2004. PB2000-500027. CD-ROM.
40. US Department of Health and Human Services, National Center for Health Statistics. *National Health and Nutrition Examination Survey 1999-00*; 2004.
41. California Children's Healthy Eating and Exercise Practices Survey: 1999 [data file]. Sacramento, CA: Cancer Prevention and Nutrition Section, California Department of Public Health. Available at [http://www.dhs.ca.gov/ps/cdic/cpns/research/download/calcheeps/a\\_fruits\\_&\\_vegetables.pdf#page=2](http://www.dhs.ca.gov/ps/cdic/cpns/research/download/calcheeps/a_fruits_&_vegetables.pdf#page=2). Accessed November 21, 2005.
42. California Children's Healthy Eating and Exercise Practices Survey: 2003 [data file]. Sacramento, CA: Cancer Prevention and Nutrition Section, California Department of Public Health. Available at [http://www.dhs.ca.gov/ps/cdic/cpns/research/download/calcheeps\\_2003/fruit-and-vegetable-consumption-2003%202.pdf](http://www.dhs.ca.gov/ps/cdic/cpns/research/download/calcheeps_2003/fruit-and-vegetable-consumption-2003%202.pdf). Accessed November 21, 2005.
43. Serdula MK, Gillespie C, Kettel-Khan L, et al. Trends in fruit and vegetable consumption among adults in the United States: *Behavioral Risk Factor Surveillance System*. 1994-00; 2004.
44. CDC Behavioral Risk Factor Surveillance System website. Trends data – Not Enough Fruit and Vegetables. Available at <http://apps.nccd.cdc.gov/brfss/Trends/trendchart.asp?qkey=10150&state=US>. Accessed May 22, 2005.
45. 2005 Dietary Guidelines Advisory Committee. *Nutrition and Your Health: Dietary Guidelines for Americans*; 2005 Dietary Guidelines Advisory Committee Report submitted

to the Secretaries of the Departments of Health and Human Services and Agriculture, part D. Science Base, Section 6: Selected Food Groups; August 19, 2004.

46. Guthrie JF, Lin B, Reed J, et al. *Understanding Economic and Behavioral influences on Fruit and Vegetable Choices*. Amber Waves Economic Research Service, USDA; 2005.
47. Oppen M, Sugerman SB, Foerster SB. *Fruit and Vegetable Consumption in California Adults, Ten-year Highlights from the California Dietary Practices Survey, 1989-99*. California Department of Health Services and the Public Health Institute. Sacramento, CA; 2002.
48. *California Dietary Practices Survey: 2005* [data file]. Sacramento, CA: Cancer Prevention and Nutrition Section, California Department of Public Health.
49. Kendal P. (1997). Which is best? Canned, frozen, or fresh? Colorado State University Cooperative Extension. Available at <http://www.ext.colostate.edu/pubs/columnnnn/nn970122.html>. Accessed October 30, 2005.
50. American Heart Association. *Vitamin and Mineral Supplements*, AHA Scientific Position. Available at <http://www.americanheart.org/presenter.jhtml?identifier=4788>. Accessed November 10, 2005.
51. US Department of Agriculture. *Organic Food Standards and Labels: The Facts*. Available at <http://www.ams.usda.gov/nop/Consumers/brochure.html>. Accessed November 10, 2005.
52. US Environmental Protection Agency. *Pesticides and Food: What You and Your Family Need to Know*. Available at <http://www.epa.gov/pesticides.food/>. Accessed November 10, 2005.
53. Reed J, Frazao E, Itskowitz R. *How Much Do Americans Pay for Fruits and Vegetables?* US Department of Agriculture, Economic Research Service, Agriculture Information Bulletin 792-4; 2004.
54. Richter H. *Dr. Richter's Fresh Produce Guide*. Apopka, FL: Try-Foods International, Inc.; 2000.
55. Flournoy R, Treuhaft, S. *Healthy Food, Healthy Communities: Improving Access and Opportunities through Food Retailing*. Policy Link and the California Endowment; 2005.
56. Seymour JD, Yaroch AL, Serdula M, et al. Impact of nutrition environmental interventions on point-of-purchase behavior in adults: A review. *Preventive Medicine*. 2004; 39 (Supplement 2):S108-36.

57. Glanz K, Yaroch AL. Strategies for increasing fruit and vegetable intake in grocery stores and communities: policy, pricing, and environmental change. *Preventive Medicine*. 2004; 39 (Suppl 2), S75-80.
58. Glanz K, Hoelscher D. Increasing fruit and vegetable intake by changing environments, policy and pricing: restaurant-based research, strategies and recommendations. *Preventive Medicine*. 2004;39 (Suppl 2):S88-93.
59. *California Obesity Prevention Plan. A Vision for Tomorrow, Strategic Actions for Today*, Sacramento, CA, Department of Health Services; 2006.
60. *California Nutrition Network for Healthy, Active Families and California 5 a Day—for Better Health! Campaign*. Joint Steering Committee Local and Regional Policy recommendations—2005. Sacramento, CA: Cancer Prevention and Nutrition Section, California Department of Health Services; 2005.
61. Backman DR, Carman JS, Aldana S. *Fruits and Vegetables and Physical Activity at the Worksite: Business Leaders and Working Women Speak Out on Access and Environment*. Sacramento, CA: California Department of Health Services and Public Health Institute; 2004.
62. Sorensen G, Linnan L, Hunt, M.K. Worksite-based research and initiatives to increase fruit and vegetable consumption. *Preventive Medicine*. 2004;39 (Suppl 2):S94-100.