

# ENVIRONMENTAL INFLUENCES ON EATING AND PHYSICAL ACTIVITY

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■ **Abstract** Obesity has increased dramatically over the past two decades and currently about 50% of US adults and 25% of US children are overweight. The current epidemic of obesity is caused largely by an environment that promotes excessive food intake and discourages physical activity. This chapter reviews what is known about environmental influences on physical activity and eating behaviors. Recent trends in food supply, eating out, physical activity, and inactivity are reviewed, as are the effects of advertising, promotion, and pricing on eating and physical activity. Public health interventions, opportunities, and potential strategies to combat the obesity epidemic by promoting an environment that supports healthy eating and physical activity are discussed.

## INTRODUCTION

Currently, over 107 million US adults are overweight (16a, 46, 79). The dramatic increase in overweight and obesity in the US during the past decade is clear and easily quantifiable. Less is known about recent changes in the two main behaviors that affect body weight: eating and physical activity. Documenting population trends toward lower physical activity and higher energy intake has been difficult, perhaps because of a lack of precise, sensitive measures of these complex behaviors. It is an accepted fact, however, that the changes in eating and exercise behaviors that are driving the obesity epidemic are largely due to an environment that encourages the former and discourages the latter (29). Documenting the environmental influences on population physical activity and eating behaviors has posed an even greater challenge than documenting individual behaviors because such influences are difficult to define, measure, and study experimentally.

The purpose of this article is to review what is known about environmental influences on physical activity and eating behaviors. Gaining a better understanding of such influences is critical in order to develop interventions that might reverse the increasing trend in the US population toward overweight. The eating-related

influences reviewed include trends in the food supply and eating away from home; food advertising, promotion, and education; and food pricing. Physical activity influences focus on physical activity trends, availability of sedentary versus active leisure time activities, advertising and promotion of automobiles and health clubs and fitness equipment, pricing, and interventions. Recommendations and potential environmental change strategies are also discussed.

The literature reviewed is selective rather than exhaustive. The method used was a systematic exploration of scientific, government, and industry sources for information related to a list of keywords generated a priori by the investigators. Keywords focused on nutrition, eating out, restaurant use, television viewing, physical activity, etc. Sources included computerized scientific literature databases (e.g. Medline, Social Science Citation Index), government publications and databases available through the internet (e.g. statistical abstracts, census data, government survey data), trade journals, survey data available online or through direct contact with industry or professional trade organizations (e.g. sporting goods manufacturing companies, health club organizations), market research data, and information about specific companies or industries located directly from the companies or through the internet. The search was exploratory, and intended to inspire thought rather than draw firm conclusions.

## EATING

### Food Supply Trends

Trends in the food supply data provide a perspective on changes in the food environment over the past three decades. Food supply and utilization data measure the flow of raw and semi-processed agricultural commodities through the US marketing system (40, 64). Consumption estimates based on food disappearance data tend to overestimate actual consumption by individuals because they include spoilage and waste. Food disappearance data reported below have been adjusted for spoilage and waste and have been converted into per capita servings by the USDA using a multistage process (40, 64, 78). These data are appropriately used as indicators in population food consumption trends over time. By contrast, the individual surveys of dietary intake, which are perhaps more familiar to behavioral researchers, reflect foods actually eaten by individuals (6, 51a, 60a). Such surveys tend to underestimate actual consumption due to under-reporting by individual respondents (40, 78). Data reported below on trends in the food supply are based on food disappearance data, except where explicitly noted with reference to the individual intake survey data. Per capita servings are adjusted for spoilage and waste.

**Energy and Fat** Overall energy availability per capita in the United States increased by 15% from 1970 to 1994, from 3300 kcal per capita in 1970 to 3800 kcal per capita in 1994. Overall, based on surveys of individual intake, there has been

a decrease in percentage of energy intake from fat, from 42% in 1970 to 38% in 1994 (27). However, the absolute grams of fat available per capita have increased 3%, from 154 g per day in 1970 to 159 g per day in 1994 (64). Consumption of added fats doubled between 1909 and 1998, from 32 lbs/year per capita to 63 lbs/year per capita (63). Added fats include those used directly by consumers, such as butter on bread and shortenings and oils used in commercially prepared cookies, pastries, and fried foods (63). Between 1970 and 1996 there was a 22% increase in added fats and oils in the food supply (40).

**Fruits and Vegetables** Availability of fruits and vegetables increased 19% between 1970 and 1995 (65). Per capita availability of fresh fruit increased from 101.2 lbs in 1970 to 126.1 lbs in 1995 (65). Per capita availability of fresh vegetables increased from 152.9 lbs in 1970 to 173.5 lbs in 1995 (65). Today, supermarkets carry over 400 produce items, compared with 250 in the late 1980s and 150 in the mid-1970s (64). The number of Farmer's markets increased from 1755 in 1993 to 2746 in 1998 (64).

Per capita, Americans consumed 24% more fruits and vegetables in 1997 than they did in 1970 (64). Total per capita use of 129 commercially produced fruits and vegetables rose 24% between 1970 and 1997 (from 573 to 711 lbs) (64). Most of this increase occurred after the 1982 expert scientific panel convened by the National Academy of Sciences published a report on fruit and vegetable intake and cancer risk (64). While food supply data show that the per capita average number of fruit and vegetable servings has increased over the past three decades, fruit and vegetable intake remains below recommended levels. For example, the average vegetable food supply servings per day was 3.1 from 1970 to 1975 and 3.8 in 1996, compared to a recommended 4 servings per day (40). Furthermore, in 1996 frozen potatoes (mainly french fries) and potato chips accounted for 17.5% of all vegetable servings. Per capita average number of fruit food supply servings per day was 1.1 from 1970 to 1975, and 1.3 in 1996, compared to a recommended 3 servings per day (40). Food supply vegetable servings are within 10% of recommended levels, but food supply fruit servings are more than 50% below recommended levels (40).

**Milk, Cheese, and Pizza** Per capita consumption of milk declined from 31 gallons in 1970 to 24 gallons in 1997 (64). Concurrently, cheese consumption increased 146%, from 11 lbs per person in 1970 to 28 lbs per person in 1997 (64). Two thirds of the cheese is used in commercially prepared products such as pizza, tacos, nachos, and fast-food sandwiches (64). Increases in cheese consumption also reflect the increased consumption of pizza, both frozen and restaurant or carryout. According to food supply data, pizza consumption increased 150% between 1977/1978 and 1994. Total pizza sales increased 25% from 1991–1995, to \$22.2 billion in 1995 (16).

**Soft Drinks** The decline in milk consumption occurred concurrent with the dramatic increase in soft drink consumption. Consumption of soft drinks has increased

131% during the period 1977/1978–1994/1996 (78). Market research data show that in the 1990s, soft drink consumption increased more quickly than consumption of any other food group (78). Consumption of soft drinks increased from 34.7 gallons per capita in 1987–1991 to 44.4 gallons per capita in 1997 (64, 65). This huge increase in soft drink consumption contributed to the added sugars that comprised 16% of total energy intake in 1994, based on surveys of individual dietary intake (26). Intake of added sugars was even higher among adolescents (20% of total energy intake). Soft drink consumption between 1977/1978 and 1994 nearly tripled among teenage boys (26, 80). Although dietary guidelines recommend no more than 10 teaspoons of added sugar/day for a 2000-kcal diet, actual intake in 1994 was 20 teaspoons/day. About one third of these added sugars were contributed by regular soft drinks (78). Data suggest that soft drinks are displacing milk consumption among children and adolescents (13, 25, 26, 28, 64, 78).

The increasing availability of soft drink vending machines could be contributing to the trend in soft drink consumption. In 1999, 2.8 million soft drink vending machines dispensed 25.9 billion drinks (71). Coca Cola's soft drinks are sold at 2 million stores, more than 450,000 restaurants, and 1.4 million vending machines and coolers (33). The trend toward increased availability of soft drink vending machines in schools and at work sites is a growing concern. Schools, work sites, and restaurants often have exclusive-rights contracts with specific manufacturers such as Pepsi or Coca Cola. Contracts often have written requirements about numbers of vending machines placed and required volumes of sales (62). In schools, the number of exclusive rights contracts for soft drinks doubled between 1997 and 1998, from 50 to over 100 (11, 33). Soft drink contracts in schools often stipulate maximizing student consumption either by increasing the number of vending machines placed and or by increasing in-school advertising. USDA requirements for not selling soft drinks in the cafeteria during lunch periods have been skirted by schools giving away of soft drinks during that time (62). In 1999, the first US city signed a 10-year contract with Coca Cola that allowed Coke advertising signs to be placed and beverages to be sold on all city property in return for \$300,000 in cash each year and \$300,000 in support of community programs (62).

## Eating Out

***Prevalence and Trends*** The increasing frequency of eating out at restaurants and eating food prepared away from home has an undeniably significant influence on eating behavior. Away-from-home foods are those prepared outside the home, such as in restaurants, fast-food places, convenience stores, delis, etc. Between 1972 and 1995, the number of commercial eating places grew 89%, from 203,448 in 1972 to 385,442 in 1995 (55). The number of fast-food restaurants grew 147%, from 72,850 in 1972 to 180,205 in 1995 (55). Between 1977 and 1995, the percentage of meals and snacks eaten at fast-food restaurants increased 200%; other restaurant use increased 150% (54). During 1998, 46% of all adults patronized a restaurant on any given day, and about 21% of US households used some form of restaurant

take-out or delivery (54). In 1970, money spent on away-from-home foods represented 25% of total food spending. By 1995, it comprised 40% of total food spending (5). It is currently projected that in 2010, 53% of food dollars will be spent away from home (54). Restaurant sales have risen dramatically in recent years, from \$42.8 billion in 1970 to \$376 billion in 2000 (54). Since 1990, there has been a 58% increase in dollar sales from restaurants (\$238 billion to \$376 billion). McDonalds sales were \$9.7 billion in 1999 (51). Burger King reported that sales increased 91% between 1989 and 1990, to \$10.9 billion (9). Per day Burger King serves 14 million customers and sells 4 million Whoppers; per year it sells 2.6 billion hamburgers and 1.6 billion Whoppers (9).

***Convenience of Eating Out*** The increasing popularity of fast food and eating out may be due in part to the fact that more women are in the workforce and thus their time is less available for food preparation activities. In 1900, 21% of women were in the workforce (7). The typical woman spent 44 h per week on meal preparation and cleanup. By 1950, 29% of women were in the workforce and an average of fewer than 20 h per week was devoted to meal preparation and cleanup. By 1998–1999, 60% of women were in the workforce; 71% of married women with husbands and children under the age of 18 years were working (versus 45% in 1975) and 27% of households with children were single-parent (7, 83). Ninety percent of households had microwaves, and fewer than 10 h per week were spent on food preparation. The increasing trend toward convenience with food preparation is reflected by the popularity of eating out and fast-food restaurants, as well as by the popularity of frozen/microwavable foods and quick-cooking devices such as microwaves, rice steamers, bread makers, food processors, and blenders (7). Of the 25 grocery categories that are most positively related to female labor force participation rates, 11 include frozen foods and other convenience foods, such as prepared rice, yogurt, and cereal bars (39).

***Energy and Fat Content of Away-From-Home Foods*** As foods eaten away from home comprise an increasingly significant portion of total energy intake, their nutritional quality becomes more of a concern. In 1977/1978, only about 18% of total energy intake was derived from food from away-from-home sources. By 1995, that number had risen to 34%, an increase from 1977/1978 of 89% (5). Available data suggest that foods from away-from-home sources are higher in energy and fat compared with at-home foods (5). In 1995, away-from-home food accounted for 27% of eating occasions, but 34% of energy intake, which suggests that away-from-home meals are higher in energy than at-home meals are. Both at-home and away-from-home foods have declined in fat content over the past 2 decades (5). However, the decline in percentage of fat energy was greater for at-home foods than away-from-home foods. In 1977/1978, both at-home and away-from-home foods comprised 41% fat energy. In 1995, at-home foods were 31% fat energy whereas away-from-home foods were 38% fat energy (5). In 1995, if away-from-home food had the same energy and fat density as at-home food, Americans would have

consumed 197 fewer calories per day and reduced their fat intake to 31.5% (versus the 33.6% observed) (5). As the trend toward increased eating out continues, the recent gains in reducing fat intake could be slowed or reversed (27, 5).

Cross-sectional studies of frequency of fast-food restaurant use have shown positive associations with intake of total energy and percent fat and negative associations with intake of fiber (17, 50). Longitudinal associations observed in 891 healthy adult women showed that increases in fast-food restaurant use over a 3-year period were associated with increased intake of hamburgers, french fries, and soft drinks, with an increased total energy intake of +56 kcal/day and an increased percent fat intake of +0.6%/day (17). Over a 3-year period, women who increased their fast-food restaurant use also gained 43% more weight than did women who did not increase their fast-food restaurant use (+0.72 kg, or 1.6 lb, over and above the average weight gain of 3.7 lb). These data suggest that over time, frequent fast-food restaurant use is associated with higher energy and fat intake and excess weight gain.

Use of fast-food restaurants could be associated with excess weight gain because of the high fat content of the foods offered. The most popular items are generally high in fat. For example, a Big Mac [216 g (~8 oz)] has 570 kcals and 32 g of fat; a medium order of french fries (147 g) has 450 kcal and 22 g of fat (51). Altogether, this meal has 1020 kcal and 54 g of fat, about half the total recommended daily energy requirement and about 83% of recommended daily fat intake based on a 2000 kcal/day diet. Part of the high fat content is due to increasingly larger portions (see below). However, the trends in fast-food fare have not been exclusively toward higher-fat options. Lower-fat or "light" options have been increasingly available at fast-food and other restaurants. In the early 1990s, when the popularity of lower-fat foods was on the rise, many fast-food restaurants developed and marketed lower-fat versions of their popular foods. In 1990, about 75% of restaurants offered lower-fat/lower-calorie items (13). For example, in 1991, McDonalds marketed the McLean Delux, a Big Mac-type sandwich with a lower-fat beef patty. In 1994, Taco Bell marketed its Border Lites, lower-fat burritos. However, both these lines were discontinued because of slow sales (38). Although some lower-fat options are still available and popular with customers, many of the lower-fat options were neither profitable nor popular with customers.

**Portion Sizes** Away-from-home foods might encourage higher energy and fat intake than at-home foods because of larger portion sizes. Portion sizes have been increasing both in prepackaged, ready-to-eat products and at restaurants. In 1916, for example, Coca Cola was sold in 6.5 ounce bottles (62). In the 1950s, a 10-oz and 12-oz "king-sized" Coke was available, but the 6.5-oz size still accounted for 80% of sales (62). Today, soft drinks intended for individual consumption are sold in 20- or 32-oz bottles. The 20-oz bottle has replaced the 12-oz can as the standard portion sold from vending machines and at convenience stores.

Fast-food restaurants typically offer a range of portion sizes, from "small" through "super-sized" items, and they are marketing even increasingly larger-sized

products. Menu analysis from 66 representative restaurants in 1988 and 1993 showed a 12% increase in the number of menus offering entrees with “king size” or “queen size” in their name (27). McDonalds markets “child size” 12-oz soft drinks. As noted above, this size was marketed as “king size” in 1950s (62). Adult “small” sizes are 16 oz, large size is 32 oz, and “super size” is 42 oz. McDonalds offers such sandwiches as a Big Mac (216 g, 570 kcal; fat, 32 g) and Big Xtra with Cheese (307 g, 810 kcals; fat, 55 g), and super-size french fries (198 g, 610 kcals; fat, 29 g) (51). The Monster Mac is comprised of four instead of two 1.6-oz beef patties (6.4 oz of beef). Other ready-to-eat foods are sold in increasingly large-sized packages for individual purchase and consumption. For example, bagels and muffins that used to be 2–3 oz are now 4–7 oz (100). Candy bars are now sold in 3.7-oz sizes in addition to their traditional 1-oz size; corn chips are often sold in 5-oz bags.

People may be increasingly underestimating their portion sizes and intake as they eat out more often or eat larger portions at home or outside the home. Evidence suggests that people have trouble accurately estimating portion-size information, especially as the portion size increases (100). “Super-size” and “monster” meals probably encourage consumption of larger portions. In fact, there is some experimental research supportive of this assumption (93). In a series of five studies, larger package sizes of familiar, branded products encouraged use of more product than did small package sizes. This effect was associated with consumers’ perceptions of lower unit cost. Larger packages made consumers believe that product cost for a given amount was less, and thus they used more of the product (93). It makes sense that people will eat more french fries from a “super-size” serving size than from a “small” one, especially if the price for the larger size is cheaper per unit. However, after a certain package size is reached, ceiling effects occur and larger size has little additional effect on the amount used. The saturation point depends on both personal characteristics (e.g. the number of bowls of cereal a person usually allows him or herself) as well as usage contextual factors (e.g. the size of the cereal bowl) (93).

## Advertising, Promotion, and Education

**Television Advertising** As the food environment has changed to increase food availability, there has also been a dramatic change in exposure to messages that encourage food consumption. Television has been cited as a contributing factor to higher dietary energy or fat intake (29, 36). Exposure to food advertising, especially commercials for fast food or convenience foods, may influence viewers’ food choices toward higher-fat or higher-energy foods (14, 29, 36, 43, 44, 76, 81, 82). Television is the most widely used advertising medium, which is not surprising given that televisions are present in 98% of US households and adults spend an average of 2 h per day watching TV (60). If the average adult views 2 h of television per day, or 15 h per week, at 6 min of commercials per h, potentially 90 min of commercial advertising could reach the average adult during a typical week.

In 1997, fast-food restaurants spent over 95% of their advertising budgets on TV ads (22). Food manufacturers, retailers, and food service spent \$11 billion in 1997 on mass media advertising, second only to the automotive industry (22). In 1997, food manufacturers spent \$7 billion on advertising. Advertising by food service, mostly fast-food restaurants, accounted for 28% of the total mass media advertising dollars spent by the food service industry. In 1997, Coca Cola spent \$277 million on advertising (33). In 1998, McDonald's spent \$571.7 million and Burger King spent \$407.5 million (1, 44). Contrast this figure with the \$29.8 million spent by the "milk mustache" and "got milk?" campaigns in 1996 and the \$1 million spent in 1999 by the National Institutes of Health/National Cancer Institute to promote the "5-a-day" message (22). In 1997, the entire amount spent by the USDA on nutrition education, evaluation, and demonstration was \$333.3 million, or 3% of what the food industry spent in 1997 (22).

Relative to national dietary recommendations, foods that are most heavily advertised are those that are over-consumed, while those that receive less advertising are under-consumed (22, 78). Confectionaries and snacks, prepared convenience foods, soft drinks, and alcoholic beverages are the most heavily advertised foods, whereas fruits and vegetables are among the least advertised foods (22, 43, 76). These data are consistent with overall food advertising expenditures, where in 1997 \$792 million was spent on advertising breakfast cereals, \$765 million on candy/gum, \$728 million on beer, and \$549 on carbonated soft drinks. By contrast, only \$105 million was spent advertising fruits and vegetables (22). Additional data are needed to evaluate whether exposure to food ads on television is associated with specific food choices or eating behaviors.

Television may also contribute to higher energy or fat intake due to snacking in front of the TV (48). A recent survey of 1000 shoppers in 40 supermarkets in Ohio found that 53% reported that when they snacked, most often it was in front of the television (48). Eating while watching television may lead to overeating because amounts consumed or types of foods consumed may be less well self-monitored. Few data are available to address these hypotheses regarding associations between television viewing and food intake. One study of 861 women and 198 men in a community-based sample found that every additional hour of TV viewing per day was significantly associated with a 50 kcal/day higher energy intake among higher-income women and a 136 kcal/day higher energy intake among lower-income women (36). In addition, TV viewing was significantly associated with a higher percentage of fat intake among low-income women only. No significant associations between TV viewing and energy or fat intake were observed among men (36). Additional studies are needed to evaluate associations between television viewing and dietary intake and to examine such mechanisms as exposure to advertising for specific foods or overeating due to less self-monitoring when eating in front of the television.

***National Media Campaigns to Promote Healthy Eating*** One of the largest and most widely recognized national campaigns to increase awareness and promote

the adoption of a healthful diet is the Food Guide Pyramid, which was developed by the USDA and the US Department of Health and Human Services to illustrate the Dietary Guidelines for Americans (85, 86). The guidelines have been used as educational tools in schools and at work sites and government agencies, and by industry to market the healthful properties of their products (96). Evaluation data are not available on the effectiveness of this campaign in increasing awareness or changing eating behaviors in the population.

A second major effort to promote population-wide healthy eating has been the "5-A-Day for Better Health" campaign to promote increased fruit and vegetable intake (96). The goal of the campaign is to increase fruit and vegetable intake to five or more servings per day. Efforts include national mass media campaigns, point-of-choice activities in supermarkets, and community interventions in schools and at work sites. National survey data suggest that the campaign has been successful in increasing awareness and consumption. In 1991, only 8% of US adults believed they should eat five servings of fruits and vegetables per day. In 1997, 38% agreed with this statement. USDA 1996 individual dietary intake survey data show that fruit consumption averaged 1.5 servings per day and vegetable consumption averaged 3.4 servings per day. Thus, average individual intakes are close to recommended intakes. According to individual dietary intake survey data, in 1989–1991, between 23% and 32% of adults met the five-a-day goal; by 1994, 36% met the goal (13, 45, 77).

**Nutrition Labeling** The broadest nutrition education program in the United States is probably the result of the Nutrition Labeling and Education Act, passed by congress in 1990 and implemented in 1994 (96). Its purpose was to heighten people's awareness of the nutritional content of foods and to motivate food manufacturers to improve the nutritional attributes of their food products (96). Because most adults come into contact with food labels while purchasing or preparing their food, the potential impact of this program on nutrition knowledge, awareness, and behavior is enormous.

In 1995, government survey data estimated that 96% of processed foods had nutrition-facts labels (52, 87). Survey data suggest that people are using the labels. In one survey, 43% of shoppers reported seeing the labels (96). Of those shoppers, 22% reported that the label influenced them to purchase a product they had not previously used, and 34% reported not purchasing a product they had previously used because of the information on the label (96). Another survey reported that 56% of the respondents had changed their food choices based on new label information (96). Current estimates show about 66% report using nutrition information labels; the Healthy People 2000 goal was 85% (52, 87, 96). Label reading is associated with eating a lower-fat diet and with perceptions that eating a low-fat diet is important (58). Thus, it appears that people who are interested in limiting their fat intake are using the labels to help them select lower-fat foods. However, no association was found between label reading and chronic disease history (e.g. cancer, hypertension, diabetes). No data were identified to

evaluate the extent to which nutrition labels have influenced the dietary quality of the population.

## Food Pricing

Food price is an environmental factor that influences food consumption (15, 30). Broad price changes can influence population consumption of specific foods. In the United States and other developed countries, income is not associated with total quantity of food consumed, but it is associated with the types of foods consumed (39). For example, grocery store purchases in high-income markets are less energy dense than in low-income markets (e.g. greater purchase of fruits and vegetables and less purchase of high-fat foods) (39). Although taking a larger percentage of income from lower-income groups, food costs are still small relative to total income and have been decreasing over time. In 1924, people spent about 38% of their income for food; in 1998, only 11% of income was spent for food (15). Changes in prices of certain foods may translate into purchase of different foods, which could affect the nutritional quality of dietary intake (30a). However, these potential changes in nutritional quality are small and are not likely to be of nutritional significance (30a). Overall, the greater affordability of food probably contributes to excess consumption. However, in the absence of dramatic changes in overall price of food or specific foods, recent changes in population trends in dietary intake cannot be attributed directly to changes in food prices.

At the individual level, pricing has a strong effect on food choices (19–21, 37). A study involving 12 secondary schools and 12 work sites showed that price reductions of 10%, 25%, and 50% on low-fat snacks in vending machines increased the percentage of low-fat snack sales by 9%, 39%, and 93%, respectively (19). Other studies have shown that lower pricing is just as effective in promoting sales of such nutritionally dense foods as fresh fruit and vegetables as it is for sales of less-nutritious vending machine snacks (20, 37). Pricing effects were observed despite minimal advertising or promotion and were equally effective in adolescent and adult populations. Pricing strategies have the potential to be a broad-based, effective intervention for changing population eating behavior. Additional community-based interventions are needed to better define the most effective form of such approaches and the scope of their impact, as well as their feasibility in terms of revenue sustainability and social/political acceptability.

## PHYSICAL ACTIVITY

### Physical Activity Trends

**Prevalence and Trends** By contrast with data on nutritional intake and food supply trends, data on population-level physical activity are limited in terms of detail and temporal trends. Available data are often difficult to interpret with respect

to national guidelines, or in comparison across studies, because of differences in the way physical activity is measured in different surveys and because of continually changing national physical activity guidelines (95). Sources of data on physical activity prevalence and trends include epidemiologic surveys, studies of time use, sports participation, television viewing and other sedentary pursuits, and transportation.

According to three national surveys conducted between 1986–1994 that used the same questions and administration protocols (the Behavioral Risk Factor Surveillance Surveys, Centers for Disease Control), the percentage of US adults age 18 years and older who report no leisure-time physical activity was 33% in 1986, 30% in 1990, 29% in 1992, and 31% in 1994 (10, 88). Overall, government-sponsored, population-based survey data suggest little, if any, change in physical activity levels during the past few decades, although the most recent data are 6 years old. There seems to have been a small decrease in the percentage of the population who report being completely inactive, a small decrease in the percentage reporting regular physical activity, and a small increase in the percentage reporting regular vigorous physical activity (10, 88). Data from other population-based surveys and trend data on sports and recreational participation between 1961 and 1985 suggest a more dramatic increase in leisure-time physical activity (75, 94). According to a Gallup telephone survey of adults, in 1990, 67% reported doing some activity on a daily basis to keep fit, an increase from 44% in 1985, 47% in 1982, 46% in 1980, and 25% in 1961 (94).

Community-based data on trends in physical activity are available from the Americans' Use of Time Project (66). The Americans' Use of Time Study conducted three national surveys of adults' use of time: in 1965, 1975, and 1985 (66). Availability of free time increased 14% between 1965 and 1985, from <35 h per week to almost 40 h per week (66). In 1985, sports and exercise accounted for 6%, hobbies 7%, and television 38% of free-time activities (66). Americans spent 1.0 h per week in sports/recreational activities in 1965 and 2.2 h per week in 1985, an increase of 1.2 h per week, or 120%. However, overall number of hours spent in sports was low, and increases over time were comparable to increases for sedentary activities, such as hours spent viewing television (66).

**Television** Increasing time devoted to television viewing (and other related media, such as VCR, video game, computer, and internet use) has been often cited as an important contributing factor to the hypothesized increase in the prevalence of sedentary behavior during leisure time, and the decline in physical activity in the United States in recent decades (29, 36, 68, 81, 82). Americans say that television is the least necessary part of their lives, but they devote more time to it than any other leisure-time activity (66). Data from the American's Use of Time Study show that in 1985, television was the main leisure-time activity by far, 15 h per week (66). People spent six times more time watching television than they did exercising or doing sports. Television viewing time increased 44% between 1965 and

1985, from 10.4 h per week to 15.1 h per week. More recent data from Nielsen surveys on television use yield much higher absolute estimates of television viewing time (60). According to Nielsen data, in 1999, the estimated hours of viewing for all persons age 12 and above was 28 per week (60). Trends over the past two decades are consistent with the Americans Use of Time Study data. Both studies show increases in television viewing time over the past 2 decades.

***Automobile Use for Transportation*** It has been suggested that decreases in work-related and transportation-related physical activity may also be contributing to the trend toward lower physical activity levels (32). There is some evidence to support this hypothesis. Between 1983 and 1990, daily vehicle miles traveled per household increased by 29% (91). An increasing proportion of Americans are driving to work. In 1970, 78% of the working population commuted via car, truck, or van (84) versus 87% in 1990, an increase of 11%. Census data indicate that in 1990, 4.0% of all workers, 4.5 million people, commuted to work by walking and 0.4%, 0.5 million people, commuted by bicycle. This represents a decrease from 1980 census estimated levels, which showed 5% for walking and 1% for bicycling to work (92). The overall time spent commuting to work appears to have remained stable between 1980 and 1990, however (21.7 vs 22.4 min) (84). There has also been a decline in the percentage of other trips made by walking and bicycling. In 1983, about 9% of all trips were made by walking, but by 1990 only 7% were made by walking (92). In 1995, the percentage of trips of a mile or less that were made by walking was 16%, and the percentage of trips 5 miles or fewer that were made by bicycling was 0.6% (89, 90). These data suggest that automobile use for commuting to work and other short trips has increased. People are less likely than in previous years to walk or bike for transportation.

***Occupational Activity*** Few data are available on trends in occupational activity over the past several decades. Anecdotal evidence suggests that occupational physical activity has declined since the turn of the twentieth century. The most prevalent occupations have shifted from heavy manual labor such as farming, masonry, carpentry, and heavy manual factory work, to service sector and high-technology occupations that require little energy expenditure. Census data show that the proportion of the workforce employed in occupations requiring higher energy expenditure has declined during recent decades, while the proportion of the workforce employed in more sedentary occupations has increased (LJ Harnack, KH Schmitz, RW Jeffery, KN Boutelle, SA Rydell, KL DeRosier, manuscript in preparation). For example, the percent of workers employed in agricultural occupations decreased 63%, and manufacturing decreased 47%, while those employed in finance increased 26%. However, business and repair services increased 71% and entertainment and recreation increased 31%. Data are difficult to interpret with respect to the energy expenditure in the various occupational categories. Even within job categories that were traditionally high in energy expenditure, modern labor-saving technology has significantly reduced the required

energy expenditure. National data on occupational energy expenditure would be useful as an additional data resource to monitor population trends in physical activity energy expenditure.

## Availability of Sedentary Versus Active Leisure-Time Activities

**Television** Televisions are present in virtually every household in the United States. In 1998, 98% of US households had a television (60). However, the percentage of households with two or more televisions has increased dramatically in recent years (60). In 1960, only 12% of US households had more than one television set (60). By 1980, 50% of US households had more than one television set, and by 2000, 76% of US households had more than one television set (60). The proportion of households with three or more sets has also rapidly grown, from 15% in 1980, to 24% in 1990, to 41% in 2000 (60). VCR ownership has also increased and is almost as universal as television ownership. In 1990, about 66% of households had a VCR; by 2000, 85% had a VCR (60).

**Computers** The proportion of US homes with computers increased from 8% in 1984 to 23% in 1993 (84). In 1995, 14% of US adults reported having used a home computer the previous day (42); 34% reported having a computer at home (66). The overall amount of time spent using home computers was 13 min per day; however, among those who used a computer the previous day, the overall time was 55 min, and among the 34% who had home computers, it was 40 min. During the first 3 months of 2000, 11 million personal computers were shipped by manufacturers to stores in the United States, a 14.5% increase over 1999 (59).

The impact of home computers on leisure-time activity is not clear. It is uncertain whether time spent using the computer is substituted for time spent in other sedentary activities, such as television viewing, or whether it takes the place of more active pursuits. In work settings, cumulative effects of small decreases in energy expenditure that occur by substituting e-mail for walking to a nearby office could be significant over long time periods. For example, a 145-lb person expends 3.9 kcal/min walking and only 1.8 kcal/min sitting. Energy expenditure thus doubles by walking versus sitting. If one spends 5 min/day, 5 days/week, walking to coworkers' offices to interact, it would result in approximately 5000 kcal/year expended, compared with only 2500 kcal/year for the same amount of time spent sitting at the computer sending those coworkers e-mails. Walking versus sending e-mail could expend about a pound more energy per year. Although this example is hypothetical, the point is that small but consistent reductions in energy expenditure due to increased computer use could have a significant cumulative impact over time.

**Automobiles** The pervasive availability of automobiles, combined with heavy advertising and urban and suburban designs that support the automobile as the most convenient transportation mode, is an important environmental influence on

physical activity levels. The number of cars in use in the United States remained stable between 1990 and 1995, estimated at 123 million. However, trucks in use increased a dramatic 25%, from 56 million in 1990 to 70 million in 1995 (83), probably attributable to the heavy marketing and inexpensive price of sports utility vehicles and light trucks during the late 1990s. In 1990, 50.3 billion households had at least two vehicles available, 31 billion had one vehicle available, and 10.6 billion had no vehicle available. It is a truism that Americans are in love with their cars, and sales figures support this. The number of automobile retail stores increased from 194,000 in 1987 to 207,000 in 1992 (83). Automotive sales increased from 387.6 billion in 1990 to 625.7 billion in 1997 (83). New motor vehicle sales increased from 12.9 billion in 1992 to 15.4 billion in 1997 (83).

***Park and Recreation Space*** Participation in regular physical activity depends in part on the availability and proximity to such facilities as community recreation or walking/bicycling trails. In a recent national survey, 51% of adults agreed that greater availability of exercise facilities would help them be more active (87). Only 46% of municipal and county park and recreation departments provided fitness trails, 29% provided hiking trails, and 21% provided bicycle trails. National Recreation and Park Association guidelines recommend at least one community swimming pool per 20,000 people within a travel-time radius of 15–30 min (53). Only 56% of municipal and county park and recreation departments provide a community swimming pool; national estimates are one pool per 53,000 people. Basketball and tennis court availability is also much lower than recommended. Little information is available regarding the availability and use of community physical activity programs and facilities (87). Trends in park use show stability. The number of recreation visits to parks was 263.4 million in 1985 and 265.8 million in 1996 (83).

Is accessibility to exercise facilities associated with higher physical activity levels? Few data are available to address this question. In one study, distance between homes and exercise facilities in relation to exercise frequency was examined in a random sampling of 2053 residents in San Diego (70). People who lived in neighborhoods with a greater density of pay exercise facilities were more likely to report exercising three or more times per week than those who lived in areas with fewer pay facilities, after adjusting for age, education, and income. No association was observed between density of free exercise facilities and exercise frequency. Reasons for this could be lack of perceived availability or access to the free facilities. Of the free facilities, 68% were schools (e.g. running track outdoors), sites that people might not be aware are available for public use. Use of free facilities might be increased by additional promotion of these sites to increase public awareness, and by including additional resources that are available at pay facilities (e.g. trained staff, equipment).

Two studies have examined free access to physical activity facilities and found that it did not increase people's use of the facilities or their overall physical activity levels (18, 72). In one study, increased facility use was observed in the first half

of the study, but it was not sustained; and overall physical activity levels did not differ by free facility access (18).

**Health Clubs and Sports Equipment Sales** In contrast to the physical activity surveillance survey data, data on health club memberships and availability are consistently positive in their upward trend. In the United States, there are currently 15,372 health clubs with over 29.5 million members, and industry revenues are 10.6 billion (31). The largest growth period for US health clubs occurred between 1982 and 1990, from 6,211 to 12,854, an increase of 123% (31). From 1990 to 2000, the number of health clubs increased 11%, to 15,372. Between 1988 and 1998, health club membership grew 51% (from 19.5 to 29.5 million) (31). The average number of days members use their health club has also increased, from 72 days/year in 1987 to 85.3 days/year in 1998 (31).

Health clubs aim for maximum exposure and accessibility by increasing the number of sites available to potential patrons. Bally Total Fitness, the largest commercial operator of fitness centers in the United States, has 4 million members and 360 facilities in 27 states and Canada (4). Members make 120 annual visits (or 0.6 visits per week per member). YMCAs are also maximally accessible in the community. With 2283 facilities and 16.9 million members, YMCAs are collectively the nation's largest not-for-profit charitable organization. Membership has grown by 5.5% in 1998 (98).

Sporting goods and bicycle shops increased in number from 50,000 in 1987 to 55,000 in 1992 (83). Sales from sporting goods and bicycle shops rose from \$11.3 million in 1987 to \$15.6 million in 1992 (83). Total sporting goods sales have steadily increased between 1988 and 1997, from \$43.9 to \$62.9 billion (83). In 1999, \$46.5 billion was spent (wholesale) on sporting goods equipment (sports apparel, sports equipment, athletic footwear) (56, 74). Consumers spent \$4.8 billion on home exercise equipment in 1996, more than a 100% increase from 1990 (73). Over 50% of all US adults own some type of home exercise equipment (73). Home exercise equipment is used at least once a week in 65% of households that own equipment (73). However, a small study that examined associations between availability of sports equipment in the home and overall physical activity levels found no association (34). A small significant positive correlation was found among women only ( $r = 0.22$ ) (34).

These data show a large and growing market for health clubs and sporting goods and equipment, especially among higher-income groups (see below). It is interesting that the "boom" in health club memberships occurred during 1982–1990 (75), a time when striking increases in weight gain in the population were observed. However, it is not clear whether the exercise and fitness boom is concentrated in upper-income and -education population groups or is a broader population trend.

**Labor-Saving Devices** Limited data are available on trends in the sales of labor-saving devices, or on their potential impact on physical activity levels. It has been

speculated that the use of such labor-saving devices as riding-lawnmowers, snowthrowers, and leaf-blowers could contribute to lower physical activity levels.

## Advertising and Promotion of Automobiles

The automotive industry is the largest in terms of spending on mass media advertising and accounts for 18% of the \$73 billion mass media advertising market (22). In 1998–1999, the automobile and truck industries spent \$9.8 billion on advertising in 15 different types of media (60). It is interesting that automotive manufacturers are among the largest advertisers during televised sports (60). Instead of spending time engaging in sports, Americans are busy watching them on television and are exposed to advertisements encouraging the purchase of more automobiles. For example, the top ten advertisers during TV sports programs spent over one billion dollars in 1998; Ford, Chevrolet, and Dodge spent \$323.6 million, or 31% of this total. During the first 6 months of 1999, Chevrolet, Ford, American Honda, and Dodge spent \$240.3 million, or 37% of the total dollars spent by the top ten advertisers during televised sports (60). Network advertising by the automotive industry was \$173.6 million in 1995 and \$232.3 million in 1997 (83). Local television advertising was \$444 million in 1995 and \$750 million in 1997 (83). Automotive advertising spending rose 18% between 1996 and 1997 (3).

## Pricing

The role of pricing on sales and use of automobiles, televisions, computers, and labor-saving devices is unclear, and few data are available to address this issue. As these items become less expensive, purchase and use of them should increase. Limited data are available on pricing of health club memberships and fitness equipment. Health club members tend to have higher incomes; 63% have annual incomes of  $\geq$ \$50,000 and only 14% have annual incomes of  $<$ \$25,000 (31). This is not surprising given the average enrollment fees for single adults of \$179 and monthly dues averaging \$58 (31). Average monthly dues have risen moderately from \$42 in 1991 to \$57 in 1998 (31). In 1987, health club members were predominantly young; 62% were under 35 years old. In 1997, health club members were predominantly older; 52% were over 35 years old (31). In fact, in 1997, the fastest growing membership segment of the health club industry was among people aged 55 years or older. Men and women are equally represented among health club members (31). In 1997, owners of home exercise equipment reported spending an average of \$473 on home exercise equipment, or \$392 for a single piece of equipment (73).

## Physical Activity Opportunities

**Availability of Community Resources** A tremendous potential exists for increasing the population's physical activity by making environmental changes that would

encourage and support the use of walking and bicycling as a mode of transportation (92). On average, people make 20 trips per week (including commuting to work and personal trips), only 8% of which are currently made by walking or bicycling (i.e. 1.6 trips per week). In 1990, the average trip length was 0.6 miles for walking and 2.0 miles for bicycling. Environmental interventions to increase the use of walking and bicycling as a transport mode have included policy and financial support for bike-path development and education and safety programs. For example, Minnesota has a long history of bike promotion, starting formally in 1976 with the creation of the State Bicycle Safety Commission. Minnesota's Comprehensive State Bicycle Plan is one of the most progressive in the United States. In 1989, Minnesota adults biked at twice the national average; two thirds of all Minnesotans rode their bikes once a year or more; 10% of all Minnesota adults bike to work at least once per year, and almost half of the 300 million miles biked per year are for transportation. Minnesota has a full-time bike coordinator to coordinate bikeway design and implementation. Stable funding has been allocated for the bicycle program, with over \$4.3 million allocated in 1990 for on-street and trail facility development and education and safety programs (92). Other model programs include one in Eugene, Oregon, where bicycle-trip volume increased an average of 76% at locations where bikeways were connected and counting was done. After connections between bike paths were developed in 1980, at one major connecting site the number of cyclists increased from the 1000 per day counted in 1970 to 3600 per day (92).

The environmental barriers to increased use of bicycling for transportation that need to be addressed include lack of bike trail access in terms of connections across roads and bridges over highways; safety concerns, including crime, lighting, and traffic; lack of changing facilities at work or a place to store bicycles; lack of employer support; and inconvenience transporting heavy items (92).

***Signs to Prompt Stair Use*** Inexpensive environmental prompts can have an impact on physical activity behaviors. Several studies have shown that small signs near stairways and escalators are effective in increasing use of stairs instead of escalators or elevators (8; KN Boutelle, RW Jeffery, DM Murray, MKH Schmitz, submitted for publication). In two studies, small signs prompting stair use were placed at choice points by the stairs and escalators in a train terminal, a bus terminal, and a shopping mall. In the first study, stair use increased twofold, from 6% to 14%, during times when the sign was posted (8). In the second study, a significant increase in stair use was observed up to 1 month after the sign was removed (8). Another study found the use of signs near stairs in an office building increased stair use by 14% (from 11% to 13%). When music and artwork were added to stairwells, stair use increased 39% above baseline level (to 16%) (KN Boutelle, RW Jeffery, DM Murray, MKH Schmitz, submitted for publication). A different study examined the effects of a sign discouraging elevator use in a university library (negative prompt) on stair use (69). Signs significantly increased stair use from 40% at baseline to 42%.

These studies are consistent in showing the effectiveness of inexpensive environmental sign prompts in increasing stair use in naturalistic settings. Over time, small increases could have a significant benefit. For example, Brownell et al (8) speculate that the energy expenditure of walking up and down two flights of stairs every day for 1 year amounts to 2.7 kg for an 80-kg man. Additional incentives such as music and artwork also appear to increase stair use (KN Boutelle, RW Jeffery, DM Murray, MKH Schmitz, submitted for publication).

**Television Viewing Reduction Interventions** Although results of cross-sectional studies that have examined associations between television viewing and total physical activity energy expenditure have been inconsistent (14, 36, 68, 81, 82), several intervention studies targeting reductions in television viewing among children have shown promise. One study with third and fourth graders used a TV time manager (locking device) for home televisions and an 18-session school-based curriculum (67). The intervention was associated with a 33% decrease in the number of hours spent viewing TV and smaller gains in body mass index and skin-fold thickness. However, the intervention did not increase physical activity levels, decrease sedentary behaviors, or decrease intake of high-fat foods or snacking behavior in front of the TV. The intervention did decrease the number of meals consumed in front of the TV. Another school-based intervention to prevent obesity among sixth, seventh, and eighth graders focused on decreasing television viewing time and increasing physical activity levels (24). Television timers that limited child access to television were distributed free of charge to interested parents of children in the intervention group. Of the eligible parents, 65% requested the timers. The intervention was successful in significantly reducing the time spent watching television, and television viewing mediated changes in obesity over the 2-year period. It is unclear whether many parents are willing to limit their children's viewing because it helps occupy children's time. Additional research is warranted to examine the effectiveness of television viewing reduction interventions among adults.

**Architectural Redesign/Urban Planning** The Federal Highway Administration/Department of Transportation is examining ways to increase the population's use of walking and bicycling as a transportation mode (91). Although the key barriers to walking or bicycling as a commuting modality are time and distance, a major opportunity to increase bicycle use is through improved on-street facilities that provide space for bicyclists to ride away from fast or heavy traffic (91). The potential market for commuter bicycling could be up to 50% of the population because that proportion live within 5 miles of work, a distance thought to be feasible for bicycle commuting (91).

Neighborhood design is associated with choice of automobile, walking, or bicycling as a transportation modality, which suggests that neighborhood redesign is a potentially fruitful intervention for increasing the use of walking and bicycling for transportation (12). A comparison of transit- versus automobile-oriented

neighborhoods matched on income and transit service level found that transit-oriented neighborhoods generated 120% more pedestrian and bicycle trips than did nearby automobile-oriented neighborhoods; 1.4% more work trips were made using mass transit in transit-oriented versus automobile-oriented neighborhoods. For every 1000 households, 19 more transit work trips were expected in transit than in automobile neighborhoods (12). Transit-oriented neighborhoods have gridded street patterns with four-way intersections and are initially built on a streetcar or railroad line. Automobile-oriented neighborhoods have random street patterns and are designed without regard for transit lines. Neighborhood design influences commuting behavior, and transit-oriented neighborhoods have higher walking and bicycling commuter trip rates than do automobile-oriented neighborhoods (12).

Architectural redesign might also increase physical activity by increasing stair use in buildings because people seem responsive to environmental cues in making choices about whether to use the stairs or an elevator or escalator. Placing elevators in inconvenient locations that are difficult to find and making only one elevator available so that wait time for elevator use serves as an incentive to use the stairs are two possible intervention designs that could increase the use of stairs in buildings. If stairways were open, visible, and easily accessible, social modeling could also encourage stair use.

***Community-Based Interventions*** Complete reviews of community-based interventions for physical activity can be found elsewhere (41, 70, 88). Results of two major community-based cardiovascular disease risk reduction studies that included a physical activity component were largely not significant. In the Minnesota Heart Health Program (47), there was a significant increasing secular trend for physical activity. In the cohort, there were significant intervention effects only during the last year of the follow up. In the cross-sectional sample, significant intervention effects were observed for physical activity during years 1–3; however, these effects disappeared with an increasing secular trend. The Stanford Five City Project (99) had no significant effects on physical activity levels. Women in the intervention group, however, experienced a small significant increase in the number of moderate physical activities done.

In 1990 and 1991, two national media campaigns to promote physical activity, with an emphasis on walking, were conducted in Australia by the National Heart Foundation of Australia (61, 88). Significant increases in message awareness were observed after each campaign. However, significant increases in walking were observed only among older people and only after the first campaign. No increases in walking were found after the second campaign. There were no changes in the percentage of people who were inactive following either campaign.

Marcus et al (49) reviewed studies on mass media interventions for physical activity behavior change and concluded that people generally remembered the intervention message but there was little evidence for behavior changes.

## SUMMARY AND RECOMMENDATIONS

Recent dramatic increases in the prevalence of obesity in virtually all segments of the US population and elsewhere in the world has heightened interest in its causes and in possible strategies to address it as a public health problem. Although it is widely agreed that increases in obesity prevalence must somehow be related to changes in the environment that encourage a positive energy balance, pinpointing specific environmental causes is difficult. As documented in this chapter, a number of recent environmental changes are plausible contributors. They include increases in the availability and marketing of food products, particularly “fast food” and other prepackaged convenience foods that are eaten away from home, increased time spent in sedentary forms of such entertainment as television and VCR viewing and computer use, and changes in the dynamics of family life driven by increased affluence and social conditions, such as dramatic increases in the proportion of women who work. Although some recent environmental trends seem more favorable, such as the increased availability and use of facilities for physical fitness, the cumulative effect of recent changes in the environment are clearly disastrous from the perspective of obesity.

Most public health interventions targeting healthy eating and exercise habits conducted to date have focused on public education. There have been some successes in this domain (e.g. increased consumption of fruits and vegetables), but the impact of these educational campaigns on obesity has so far been negligible. The current review suggests that an imbalance between resources available to educate people about good nutrition versus those that encourage the overconsumption of food may be a major contributing factor. A new generation of research on methods for influencing eating and exercise behavior that looks at such environmental factors as availability and cost of food and exercise opportunities has produced intriguing suggestions about new avenues that might be helpful in stemming the obesity epidemic. More research is clearly needed. Environmental change research could target a range of issues including the following: (a) community organization/action; (b) financial and economic incentives; (c) food assistance programs; (d) food packaging and labeling; (e) media and advertising; (f) schools and work sites; and (g) transportation and urban/rural development (35, 57, 97). Table 1 provides examples of potential change strategies for each of these areas. Innovative studies are needed to determine the feasibility, acceptability, and effectiveness of various approaches.

Along with research on environmental influences and obesity, there is also a need for the development of an effective collaboration among the major societal sectors (government, corporate, community, nonprofit) in trying to come to grips with the obesity problem. Environmental changes, such as modifying how food is marketed and priced, or architectural design and urban planning, clearly have far-reaching economic and social implications. Public health agencies, communities, government, health organizations, the media, the food and health industry, and advocacy organizations must form alliances and have a sustained commitment to

**TABLE 1** Potential environmental strategies and policy recommendations for obesity prevention<sup>a</sup>

Area of action	Examples of potential strategies
Community organizing/action	Establish wellness councils in neighborhoods and communities to organize and direct activities aimed at promoting healthy eating and physical activity Develop community-wide task forces to change community ordinances and change environmental conditions to support physical activity and healthy eating Establish standards for foods served at cafeterias, vending machines, snack stands on city/county property, and in government buildings
Financial and economic incentives	Use pricing strategies to promote purchase of healthy foods Levy state and local government taxes on soft drinks, candy, and high-fat, high-sugar snacks to fund subsidies for fruits and vegetables Levy taxes on gas, autos, snowblowers Remove sales taxes or provide incentives for purchase of exercise equipment or bicycles, or for use of active forms of transportation (walking, bicycling)
Food assistance programs	Develop an incentive system to encourage food stamp recipients to purchase healthful food Improve the USDA commodity food program on American Indian reservations by increasing availability of low-fat foods and fresh fruits and vegetables
Food packaging and labeling	Reward manufacturers for marketing foods in smaller package sizes Require chain restaurants to provide information about fat and calorie content on menus, menu boards, and nutrition labeling on food wrappers Require warning labels on high-fat or high-calorie, low-nutrient-dense foods
Media and advertising	Increase mass media promotion of healthy foods and physical activity Promote walking and cycling as a means of transportation Promote water as the main daily drink choice Regulate advertising and marketing practices to balance positive and negative media messages concerning food and physical activity

*(Continued)*

TABLE 1 (Continued)

Area of action	Examples of potential strategies
Schools and work sites	Eliminate the sale of soft drinks, candy bars, and foods high in fat or sugar in school buildings Require that foods that compete with school meals be consistent with the Dietary Guidelines Make schools ad-free and TV-free zones without commercial influences and messages Open school gyms and swimming pools to the community during nonschool hours Provide exercise and changing facilities at work Ensure the availability and accessibility of healthy foods at work sites
Transportation and urban/rural development	Create pedestrian zones in cities Construct safe walkways and cycle paths Modify building design to encourage use of stairs Add more water drinking fountains in public buildings and outdoor areas

<sup>a</sup>From References 2, 23, 35, 57, and 97. USDA, US Department of Agriculture.

create a more health-promoting social, economic, and physical environment in order to stop the increasing trend of obesity.

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