

I. Introduction

The primary responsibility of schools is to foster academic achievement. Schools do this by providing a high-quality instructional program, but also by paying attention to the needs of the whole child that influence academic achievement. Student health has a tremendous impact on student learning. This chapter provides evidence of the link between nutrition, physical activity and academic achievement; presents statistics on student health; and examines the implications of these findings for schools. It is clear that schools can better prepare students to learn by helping them develop and practice healthy eating and physical activity habits.

The Surgeon General's 2001 "Call to Action to Prevent and Decrease Overweight and Obesity" encourages changing the school environment as a key to help address the national health challenge. The report recommends approaches in schools that extend beyond education to include school policy, the school physical and social environment, and links among schools, families and communities.

IMPACT OF NUTRITION ON ACADEMIC ACHIEVEMENT

"Even during difficult budget times, nutrition and fitness should be a priority for all schools and districts. Our schools have an exceptional opportunity to guide our children toward healthier lifestyles."¹

— Jack O'Connell
State Superintendent of Public Instruction

Nutrition is an essential first step toward a student's readiness to learn. Healthy, well-nourished children are more prepared to learn, more likely to attend school and class, and better able to take advantage of educational opportunities. Inadequate nutrition during childhood can have a detrimental effect on children's cognitive development and on productivity in adulthood.² Recent research provides compelling evidence that:

- Chronically undernourished children attain lower scores on standardized achievement tests, are more irritable, have difficulty concentrating and have

lower energy levels. Undernourished students have less ability to resist infection and are more likely to become sick, and therefore miss school, resulting in reduced revenues to schools.³

- Undernourishment impacts the behavior of children, their school performance and their ability to concentrate and perform complex tasks.⁴
- Children's brain function is diminished by short-term or periodic hunger or malnutrition caused by missing or skipping meals.⁵
- Inadequate consumption of key food groups deprives children of essential vitamins, minerals, fats and proteins that are necessary for optimal cognitive function.⁶
- Low protein intake has been associated with lower achievement scores.⁷
- Iron deficiency is one of the most prevalent nutritional problems of children in the United States. Iron deficiency can increase fatigue, shorten attention span, decrease work capacity, reduce resistance to infection, and impair intellectual performance. Consequently, anemic children tend to do poorly on vocabulary, reading and other tests.⁸

Furthermore, research shows a direct relationship between a nutritious breakfast and educational achievement. Studies have repeatedly demonstrated that breakfast at school not only enhances learning, but also reduces tardiness and improves daily attendance. Some important research findings indicate:

- Students who eat breakfast show a general increase in math grades and reading scores, increased attention, reduced nurse visits and improved behaviors.⁹
- Children who begin their school day without breakfast pay less attention in the late morning, have a negative attitude toward schoolwork and attain less in class.¹⁰
- Increases in participation in the School Breakfast Program are associated with increases in academic test scores, daily attendance, class participation and reductions in tardiness and absenteeism.¹¹
- When children eat a well-balanced meal, such as a school breakfast, they have higher sustained energy levels than children who select foods from only one or two food groups that are often high in sugar or fat.¹²

“The challenge now is to incorporate this new knowledge into programs and policies which improve the nutritional status and cognitive development of our youngsters.”

—Ernesto Pollitt, Ph.D., Professor of Pediatrics,
University of California, Davis

IMPACT OF PHYSICAL ACTIVITY ON ACADEMIC ACHIEVEMENT

Physical activity can also have a positive impact on student achievement. Physical activity is important because it plays a role in creating an optimal learning condition for the brain. Studies suggest a connection between physical activity and increased levels of alertness, mental function and learning. Research also indicates that physical activity increases blood flow to the brain, which allows more oxygen and glucose to flow through the brain, and releases endorphins, which have a positive impact on mood. A recent study found that California schools with high percentages of students who do not routinely engage in physical activity and healthy eating habits had smaller gains in test scores than did other schools.¹³ Some additional research indicates that:

- Schools that offer intense physical activity programs see positive effects on academic achievement. These include increased concentration, improved mathematics, reading and writing test scores, and reduced disruptive behavior, even when time for physical education classes reduces the time for academics.¹⁴
- Providing more opportunity for physical activity leads to increased test scores. In one program, redirecting 240 minutes per week from class time for academics to physical activity led to higher mathematics scores.¹⁵
- A review of results from nearly 200 studies including adults and children found that physical activity supports learning.¹⁶
- Students participating in daily physical education exhibit better attendance, a more positive attitude towards school and superior academic performance.¹⁷
- Moderate physical activity has a positive effect on immune function. Coupled with good nutrition, it can help prevent colds and the flu, two of the most common childhood ailments.¹⁸

- Higher achievement is associated with higher levels of fitness for fifth-, seventh- and ninth-graders. Females demonstrated higher achievement levels than males, particularly at higher fitness levels.¹⁹
- The relationship between academic achievement and fitness is greater in mathematics than in reading, particularly at higher fitness levels.²⁰

“Studies indicate important links between nutrition, physical activity and academic achievement. Healthy kids make better students. School board members are uniquely positioned to take powerful leadership roles in this effort.”

—William Potts-Datema, M.S., Director, Partnerships
for Children’s Health, Harvard School of Public Health

IMPACT ON PHYSICAL, SOCIAL AND EMOTIONAL HEALTH

Chronic Illnesses

“We like to think of ourselves as a youthful nation focused on healthy lifestyles, but behind this image is a troubling reality — a generation of young people that is in large measure inactive, unfit, eating poorly, and at an alarming rate, becoming obese. CDC is committed to working with health partners to foster healthy behaviors to help reduce the burden of obesity in our nation.”

—Dr. Julie Gerberding, M.D., M.P.H., Director
Centers for Disease Control and Prevention

The general health of children and youth is at risk, in part, due to poor nutrition and inadequate physical activity. For the first time in two centuries, the current generation of children in America may have shorter life expectancies than their parents due to the rapid rise in childhood obesity.²¹ Obesity is associated with 112,000 annual excess adult deaths in the United States.²² Two-thirds of all deaths in California result from four nutrition/fitness-related chronic diseases: heart disease, cancer, stroke and diabetes.

An increase in type 2 diabetes among children has paralleled the rising rates of obesity.²³ As many as 30,000

children have non-insulin-dependent diabetes that was once limited to adults.²⁴ One in three children born in 2000, and half of all children of color, are expected to develop type 2 diabetes during their lifetime.²⁵ Being overweight can trigger or exacerbate a variety of chronic medical conditions in school-aged children, including asthma, joint problems, type 2 diabetes, high blood pressure, high cholesterol, depression/anxiety and sleep apnea.²⁶

Risk factors for chronic diseases often are developed in childhood. For example, approximately 60 percent of obese children ages 5-10 years have at least one risk factor for cardiovascular disease, such as elevated total cholesterol, triglycerides, insulin or blood pressure; 25 percent have two or more risk factors.²⁷

Because chronic illnesses in adulthood result from habits acquired early in life, one of the most effective ways to prevent chronic diseases is to establish policies and programs that encourage children and adolescents to develop and sustain healthy eating and physical activity habits that they can maintain throughout their lives.

Increased Risk for Osteoporosis

When children and adolescents replace milk with soft drinks, they consume fewer valuable nutrients such as calcium and vitamin D, which are needed for bone development and can help to prevent osteoporosis (porous bones). According to the United States Department of Agriculture, per-capita soft drink consumption has increased almost 500 percent over the past 50 years.²⁸ This is important because by the age of 17, approximately 90 percent of children's bone mass has been established.²⁹ Weight-bearing exercise and the consumption of calcium-rich foods during childhood and adolescence are critical to ensure peak bone mass and reduce the risk of osteoporosis later in life. Since prevention occurs by reaching optimal bone mass during adolescence, it is not possible to make up any deficiencies later in life.

Dental Caries

More than 51 million hours of school time are lost every year because of dental-related illnesses.³⁰ If left untreated, dental disease in childhood can and does result

in acute infections, dental pain and tooth loss. This not only affects time in class, but also the ability to remain alert and engaged while in a learning environment. Poor oral health has been related to decreased school performance, poor social relationships and less success later in life.³¹

Dental caries affect over 50 percent of youth ages 5-17. Frequent exposure to sugar-sweetened soft drinks and candy increases risk for and severity of tooth decay, according to the American Dental Association. Americans consume the equivalent of 20 to 33 teaspoons of sugar per person per day; about 30 percent of it is in soft drinks. Dental caries are the single most common chronic childhood disease and are five times more common than asthma.³²

Social and Emotional Health

In addition to the health risks associated with overweight and obesity, research also indicates a higher than anticipated impact on self-esteem and quality of life. A recent study reported in the Journal of the American Medical Association found that emotional and social well-being decreases as soon as a child's weight rises above average; the results are not limited to severely obese children.³³

Effects of obesity on emotional health include lower self-esteem, negative body image and depression. Social health impacts include stigma, negative stereotyping, discrimination, teasing and bullying, and social marginalization.³⁴

The psychological stress of social stigmatization imposed on obese children may be just as damaging as the medical morbidities. Severely obese children exhibit a quality of life as bad as that of children undergoing chemotherapy.^{35,36}

EXTENT OF THE PROBLEM

Poor Nutrition

Today's students generally fail to meet the Dietary Guidelines for Americans which recommend that children two years and older eat a diet consisting of nutrient-dense foods. This includes eating foods that are low in fat, sugar and sodium, eating a variety of fruits, vegetables and whole grains, and consuming fat-free or low-fat milk or milk products. Alarming patterns that can harm

children’s health and deter their ability to successfully perform in school are:

- About 25 percent of the food that adolescents eat is considered to be junk food, such as deep-fried food, desserts, regular soft drinks, candy, cookies, pies and cakes.³⁷
- Females ages 9-19 do not meet the recommended intake for calcium, with only about one in 10 consuming the recommended number of daily servings of milk products.³⁸
- Fewer than half of California’s children and adolescents (47 and 40 percent, respectively) meet the California Department of Health Services’ goal of consuming five or more fruits or vegetables per day.³⁹
- A California study found that only 2 percent of teenagers met five key diet and physical activity recommendations.⁴⁰
- Soda consumption has almost doubled in the last 20 years.⁴¹

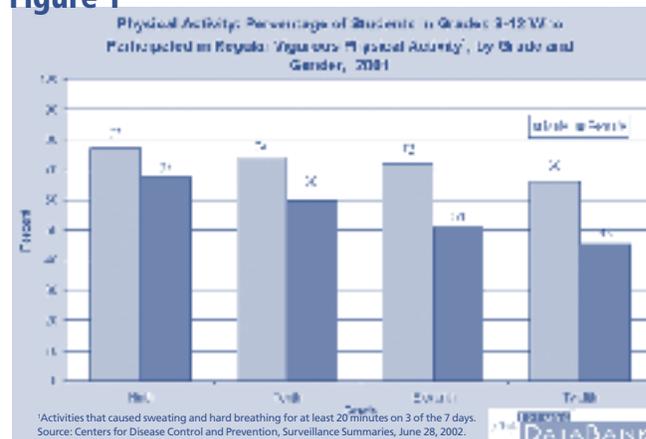
Declining Physical Activity

Physical inactivity among youth can cause short-term consequences such as high blood pressure, poor self-esteem, increased anxiety, stress and depression.⁴² It is also linked with long-term health consequences including obesity, cardiovascular disease, diabetes and colon cancer.

The 2005 Dietary Guidelines for Americans recommend that children two years and older be physically active at least one hour each day on most, but preferably all days of the week. However, children are less physically active than ever. Research indicates that:

- Only 29 percent of adolescents report getting the recommended minimum of one hour of physical activity per day.⁴³
- Children ages 9-11 spend an average of 152 minutes over 10 days engaged in physical education versus the California state-mandated 200 minutes.⁴⁴
- Participation in all types of physical activity declines as age or grade in school increases.⁴⁵ Also see Figure 1.
- Eight percent of elementary schools, 6 percent of middle/junior high schools and 6 percent of senior high schools across the nation provide daily physical education or its equivalent for the entire school year for students in all grades in the school.⁴⁶

Figure 1



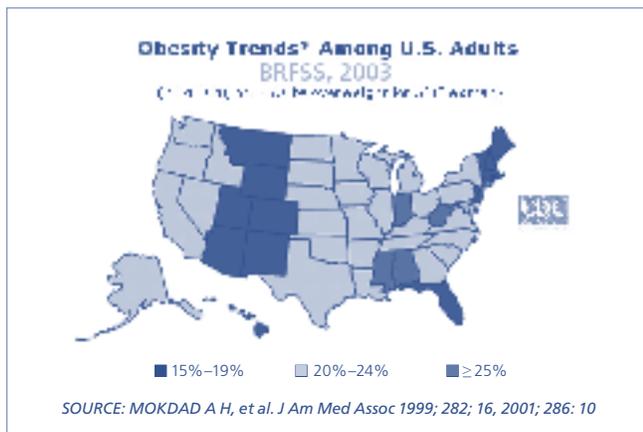
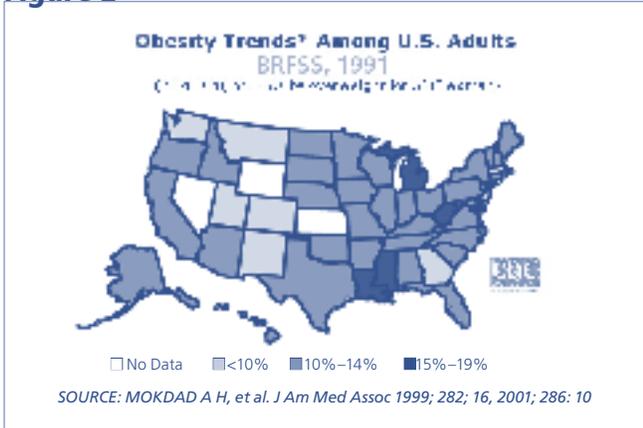
- Among California children in grades five, seven and nine who were tested with the state’s mandated physical fitness test in 2004, 73 percent failed to meet the state’s minimum fitness standards for all six areas of the test. Only about half met the minimum standard for aerobic capacity.⁴⁷
- Nearly 40 percent of California children are not physically fit.⁴⁸
- Only 63 percent of California adolescents report any vigorous activity in the previous month. Males participate in vigorous physical activities at higher levels than females (70 percent and 56 percent, respectively).⁴⁹

Overweight/Obesity

Figure 2 shows the obesity trends among U.S. adults in 1991 and 2003. In California, 10-14 percent of the population was obese in 1991. In 2003, California obesity rates had risen to 20-24 percent.⁵⁰ Physical inactivity, obesity, and overweight cost California more than \$21.7 billion in medical care.⁵¹

Continuing increases in the number of overweight children and adolescents are of public concern. Nationally, an estimated 16 percent of children and adolescents ages 6-19 years were classified as overweight in 1999-2002, a 45 percent increase over the previous reporting period (11 percent in 1988-1994); another 15 percent are at risk of becoming overweight based on their BMI.^{52,53} Over the past three decades, the childhood obesity rate has more than doubled for preschool children aged 2-5 years and adolescents aged 12-19 years, and it has more than tripled for children aged 6-11 years. Nine million

Figure 2



children over the age of 6 were considered obese.⁵⁴

The trend in California is similar. One 2002 study found that more than one quarter of California’s children are overweight.⁵⁵ California Department of Health Services’ surveys indicate that as many as 34 percent of children ages 9-11 years and 21 percent of 12-17 year olds are overweight or at risk for overweight (see Figures 3 and 4).⁵⁶ Other findings indicate:

- Latino adolescents were most likely to be overweight. More than one out of three Latino adolescents in California were overweight or at risk for overweight.⁵⁷
- Approximately one-third of overweight preschool children and about half of overweight school-aged children become overweight adults.⁵⁸
- Consumption of sugar-sweetened beverages, such as soda and fruit-flavored drinks, is associated with obesity in children.⁵⁹

Figure 3

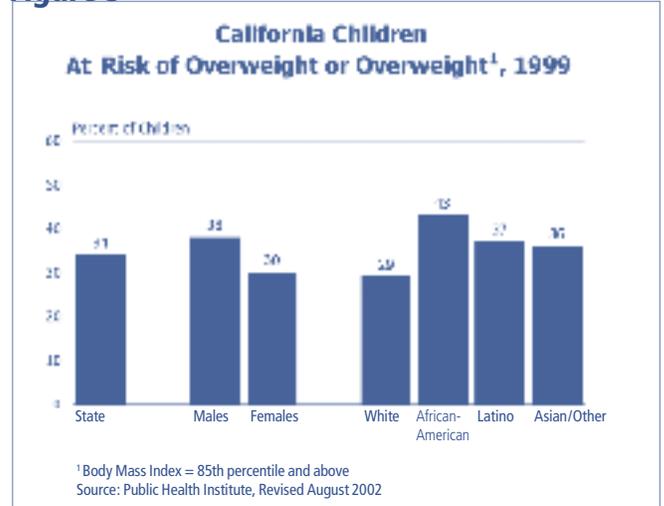
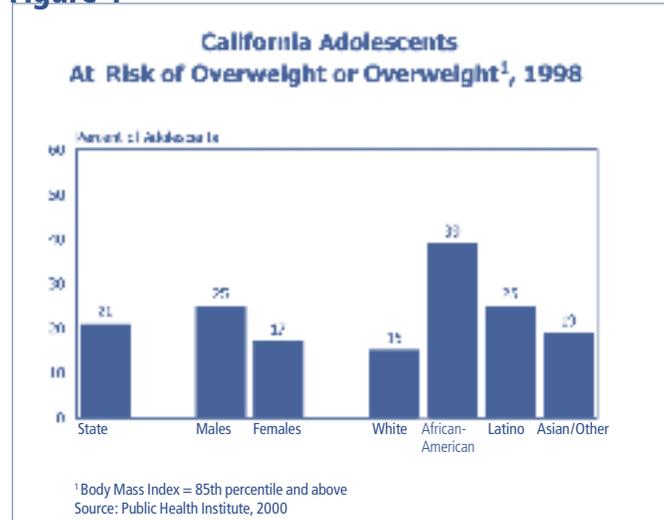


Figure 4



For a person already meeting his/her caloric need, one regular 20-ounce soda (250 calories) every day can translate into an extra 27 pounds of weight per year. For a 120-pound adolescent who has a healthy diet and exercises regularly, it would take two hours of moderate walking to burn off the extra calories for each soda consumed.

“Decreasing soda consumption is one of the most promising strategies for preventing obesity.”

—University California Berkeley, Center for Weight and Health⁶⁰

IMPLICATIONS FOR SCHOOLS

A Field Research Corporation study released in 2004 showed that nearly all Californians (92 percent) believe the problem of childhood obesity is serious. Two out of three Californians surveyed believe the best way to address the crisis is through a community approach, such as improvements in school health environments.⁶¹

A report from a national organization, Action for Healthy Kids, states that emerging research suggests an association between weight problems and lower academic achievement are likely due to increased absenteeism. If children miss just one day per month, an average size California school district could potentially lose \$160,000 per year.⁶² To better prepare students to learn, schools should provide education and an environment that give students the skills, opportunities and encouragement they need to adopt healthy lifestyles. This requires more than educating youth on the importance of eating healthy foods and being physically active. Students cannot practice what they learn if they are offered mostly foods and beverages high in fat and sugar, and little opportunity to be physically active. Schools also play a significant role in feeding children and thus contribute to the acquisition of lifetime dietary habits.⁶³

“The prevalence of high-fat and sugary foods in students’ lives outside of school doesn’t negate the positive effects schools can make. CATCH, Food on the Run, SPARK, and other school-based nutrition and physical activity programs have shown behavior and physiological improvement.”

—Howard Taras, M.D., Chair, Committee on School Health, American Academy of Pediatrics

School Meals

Schools can enhance the quality of students’ diets by offering and promoting a nutritious school breakfast. Research suggests that the availability of meal programs in public schools throughout the academic year increases the probability that children will eat breakfast and improve their educational standing.⁶⁴

In 2003-04, about 15 percent of California’s nearly 6.3 million school-age students ate a school breakfast. During

the 2003-04 school year, 83 percent of schools in California offered a school breakfast program. The 17 percent of schools that did not offer breakfast represent over 1,283 schools. This equates to 145,656 students who were eligible for free and reduced-price meals who attended schools that did not offer breakfast.⁶⁵

Many schools realize the relationship between breakfast and higher achievement on standardized tests and offer nutritious meals to students on test days. However, nutritious meals served daily can contribute to learning year-round.

Participation in school lunch programs is much higher: More than 2.8 million of California’s K-12 students (45 percent) participate in the National School Lunch Program.⁶⁶

The quality of these school meal programs is improving. According to the California Department of Education’s 1998-2003 survey on schools’ implementation of the United States Dietary Guidelines for Americans, about half of the school menus analyzed met the federal standard that lunches have no more than 30 percent of calories coming from fat.⁶⁷ More meals at school need to meet school meal nutritional standards. Students who eat lunches provided by their schools consume more fruits, vegetables and calcium, and less sugar and soda than other students. Girls from low-income families who consume a lunch provided by their school are less likely to be overweight than girls who do not eat school lunch.⁶⁸

A La Carte Foods and Beverages

Unfortunately, many students do not eat the school breakfast or lunch and purchase other a la carte foods and beverages, sometimes known as “competitive foods,” that are not part of the school meal program and are not required to meet nutrition standards. These competitive foods offered in school vending machines, snack bars, stores, and as fundraisers tend to be high in fat, added sugar and calories, while low in nutrients. These foods may be sold by the food service department, as well as by many different entities including the Associated Student Body, Parent Teacher Association, athletics department, or individuals and teachers.

These unhealthy foods compete with the school meal program, causing schools to lose potential revenues from

federal meal reimbursements as part of the National School Lunch and Breakfast Programs. A study from U.C. Berkeley showed that the greatest meal revenue increases were seen in sites that completely eliminated a la carte food sales, provided that the menu items meet a reasonable standard of quality and appeal.⁶⁹ Additional findings indicate that if reimbursable meals compete with non-food service sales, then food service can still improve revenues significantly provided that: (1) all non-food service venues are compliant with food standards in SB 19 (Chapter 913, Statutes of 2001), (2) a la carte sales are eliminated, (3) menu offerings are appealing, and (4) facilities and time are adequate to meet student meal needs.⁷⁰

Additionally, the readily available access of unhealthy foods conflicts with lessons taught in health and nutrition curricula. It is important to develop a school policy that sets nutrition standards for all foods sold on campus.

The California Fast Food Survey and School Health Policies and Programs Survey found a high prevalence of fast foods versus healthy options offered to students at school outside of the child nutrition program. Ninety-five percent of responding districts reported selling fast food as a la carte items.⁷¹ Additionally, a study by the Public Health Institute found that district beverage contracts contain provisions that limit school district control over the beverages sold at school, directly affecting students' nutritional choices.⁷²

Physical Activity and Physical Education

Schools have a powerful role in influencing students' physical activity behaviors. When developing physical activity programs for youth, physical education curricula should be developmentally appropriate and give students the knowledge, motivation, skills and confidence needed for lifelong physical activity. Children and adolescents should be provided with enjoyable experiences that build self-efficacy; provide significant amounts of physical activity; and promote cognitive learning related to lifelong participation in physical activity. Depending on the intensity of physical activity, a minimum time per day ranges from 15 to 45 minutes, and increasing the frequency, intensity and time of the activity can bring even more health benefits.⁷³

Schools have a unique opportunity to teach students about the value of fitness, while providing them with adequate time, space and facilities to be physically active on a daily basis in physical education classes, recess periods and before- and after-school programs. Schools can provide multiple opportunities for students to practice physical activity through participation not only in physical education class, but through intramural programs, sports and recreation clubs, interscholastic athletics, and links with community-based sports and recreation programs.

Schools can also implement programs and policies to support walking or biking to school. Schools should provide a concrete plan to ensure students' needs for regular physical activity will be met throughout the school year. This plan should ensure that all students in designated grades will participate in the mandated health-related fitness test during the designated testing months.⁷⁴

What Do School Board Members Think?

A California survey found that a majority of school board members believe policies supporting good nutrition on school campuses can contribute to the reduction of student cancer and heart disease risks in the future (70 percent) and the reduction of the number of overweight and obese students (62 percent); while physical activity related policies can contribute to the reduction of student cancer (50 percent), diabetes (68 percent) and heart disease (71 percent) in the future. A majority (75 percent) believed physical activity on a daily basis can contribute to the reduction of overweight and obese students. The most frequently reported barriers to healthier eating at school were student preferences and impact of the food program on the budget, while barriers to physical activity at school were budgets and academic requirements.⁷⁵ School board members support providing healthy food options in schools (i.e., fruits, vegetables, low-fat milk), establishing minimum nutritional standards for fast foods sold in school, and limiting and monitoring food and soda advertisements in school. They were more supportive of banning a la carte food sales and fast food sales in 2004 than in 2001.⁷⁶

Tracking of school district policies in 2004 by California Project LEAN found that more than 10 percent of California school districts maintaining at least one high school have

developed or are developing healthier nutrition policies.⁷⁷ A 2004 national online survey found that schools had taken a number of actions to improve student nutrition, including changing lunch menus/choices (47 percent), changing vending machine selections (30 percent) and reducing access to vending machines (30 percent). Few had removed vending machines (8 percent) or established longer lunch periods (5 percent).⁷⁸ In the same study, schools most frequently reported that they were promoting walking or biking to school (35 percent), making changes in the physical education curriculum (31 percent), increasing sports teams or intramural activities (23 percent), increasing recess time (13 percent) and increasing physical education time (12 percent).⁷⁹

Summary and Recommendations

The Institute of Medicine's Committee on Comprehensive School Health recommends that school meal programs serve as a learning laboratory for developing healthful eating habits and not be placed in a profit-making or competitive situation with other food options in school.⁸⁰ Schools can model healthy eating by limiting the sale of fast foods and snack foods and encouraging greater consumption of fruits and vegetables. Healthy food choices should be made available to children in all school-related settings, including vending machines, school stores, snack bars, fundraising activities and other school events. School policy must provide adequate time for students to consume meals, pleasant dining room environments with minimal conflicting activities, and supervising adults who are trained in the basic knowledge of nutrition and how to sensitively assist children during mealtime.

IOM also recommends that schools improve the extent and nature of the physical activity opportunities that are offered so that students can attain the recommended amount of daily physical activity while in school. Schools should expand the physical activity opportunities available through school, including intramural and interscholastic sports programs and other physical activity clubs, programs and lessons that meet the needs and interests of all students. Additionally, schools should develop policies and programs that encourage active ways of getting between school and home, such as walking and biking.⁸¹

The American Academy of Pediatrics encourages school administrators to work with pediatricians and others in the community on ways to decrease the availability of foods and beverages with little nutritional value and to decrease the dependence on vending machines, snack bars, and school stores for school revenue. Additionally, AAP recommends a districtwide school policy that restricts the sale of soft drinks to safeguard against health problems as a result of overconsumption.⁸² Regarding physical activity, AAP recommends physical education programs that emphasize and model learning of daily activities for personal fitness (as opposed to physical education limited to a few team sports).⁸³

“Many schools are meeting the challenge. While remaining financially sound, schools are offering healthy, appealing foods for students. Many schools have also integrated unique physical activity opportunities for students, such as dancing and martial arts.”

— Peggy Agron, M.A., R.D., Chief, California Project LEAN, California Department of Health Services

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