Changes in childhood food consumption patterns: a cause for concern in light of increasing body weights[1–3]

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ABSTRACT

Childhood obesity is currently at its highest: recent statistics show that 16% of children between the ages of 6 and 11 y are overweight [≥ 95th percentile of body mass index (BMI; in kg/m^2) for age] and that an additional 14.3% are at risk of becoming overweight (≥ 85th percentile but < 95th percentile of BMI for age). As chidren's body weights have increased, so has their consumption of fast foods and soft drinks. The proportion of foods that children consumed from restaurants and fast food outlets increased by nearly 300% between 1977 and 1996. Children's soft drink consumption has also increased during those years, and now soft drinks provide soft drink consumers 188 kcal/d beyond the energy intake of nonconsumers. These changes in food intakes among children may partly explain the rise in childhood obesity observed in the past few years. Although the mechanism of appetite regulation will not be explored in this report, it is hypothesized that the greater energy intakes in children who consume large amounts of soft drinks and fast foods are not compensated for by increased physical activity or decreased energy intakes. Furthermore, overweight and obesity in childhood may predispose persons to morbidity in adulthood. Blood pressure and fasting insulin and cholesterol concentrations are higher in overweight children than in normal-weight children. This review focuses on current food patterns and eating habits of children, in an attempt to explain their increasing BMI. In addition, a critical review of food service and political practices regarding food choices for children at school is included. *Am J Clin Nutr* 2003;78:1068–73.

KEY WORDS Children, overweight, fast food, soft drinks, diabetes, obesity

INTRODUCTION

Many adult diseases have their origin during childhood, and excessive weight gain is a precursor to a wide variety of physiologic aberrations that ultimately predispose to morbidity and mortality (1). Overweight and obesity in children is of particular concern because of the associated developmental abnormalities and the long exposure to enlarged adipose tissue stores incurred by inordinate early-onset weight gain.

Body weights are increasing in all developed countries and across all age groups. Recent statistics from the National Health and Nutrition Examination Survey (NHANES) of 1999–2000 showed that ≈65% of adult Americans are overweight or obese (2). Similarly alarming are statistics in children showing that ≈30% of children aged 6–19 y are overweight (≥ 95th percentile for age) or at risk of overweight (≥ 85th percentile but < 95th percentile for age) (3). Rates of overweight have almost tripled since the first NHANES (1971–1974) (3).

These dramatic increases underscore the importance of looking for concurrent environmental changes that may ultimately explain these changes in child body weight. Recognition of underlying environmental weight-gain mechanisms may provide insights into preventive strategies that can slow or even reverse these disturbing trends.

Although it is understood that the balance between energy expenditure and energy intake is key to the maintenance of body weight, within the scope of the current review, only the energy intake side of the equation will be examined. This review focuses on how trends in childhood nutrition over the past 20–30 y, such as changes in fast food and soft drink consumption, may explain the increasing prevalence of overweight in children and will critically address the issues contributing to these changes in nutrient intake. This review is thus unique in that it encompasses food consumption trends and attempts to link them with childhood obesity and metabolic abnormalities. Furthermore, no previous report has examined the effect of the political and economic environment on children's food choices and how that effect may lead to a negative effect on body composition and to the occurrence of metabolic disorders in children.

CHANGES IN FAST FOOD CONSUMPTION

Over the past few decades, the food and home environments have changed tremendously. Environmental influences that affect eating behaviors include the changing nature of the food supply; increased reliance on foods consumed away from home; food advertising, marketing, and promotion; and food prices (4). Furthermore, there are more families in which both

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parents work, and time limitations have become an important factor in determining the types of foods consumed. The food industry responded to these new family issues by increasing the numbers of convenience foods and prepared meals available (5). In addition, portion sizes have increased over the past 2 decades (6), as has the per capita availability of added sugars and fats (7).

Our modern eating environment has had an effect on the way children eat. Several researchers have examined trends in food consumption in children with the use of cross-sectional surveys conducted in the 1970s, 1980s, and 1990s (8, 9). These surveys showed that, in adolescents aged 12–18 y, there was a decrease in the percentage of energy intake from foods consumed at home, whereas the proportion of energy intake from restaurant food and fast food increased over time (9). In these adolescents, 74.1% of total daily energy was provided by foods consumed at home in the 1977–1978 Nationwide Food Consumption Survey, but this proportion decreased to 68.3% and 60.5%, respectively, in the 1989–1991 and 1994–1996 Continuous Survey of Food Intake by Individuals (CSFII). The most dramatic increase in the proportion of foods consumed from restaurants and fast food outlets—from 6.5% to 16.7%—occurred between 1977–1978 and 1989–1991. In the latest CSFII (1994–1996), this proportion had risen yet further, to 19.3%. Accordingly, money spent on foods away from home represented 25% of total food expenditures in 1977–1978, whereas in 1995 it represented 40% of food spending (10).

In Project EAT (Eating Among Teens), a study that aimed to identify various factors associated with the nutritional intakes of adolescents, 75% of adolescents reported eating at a fast food restaurant during the previous week (11). Male students in grades 9–12 were more likely than those in grades 7 and 8 to report visiting a fast food outlet $\geq$ 3 times in the previous week; however, there was no effect of school grade in females. Male and female students who reported eating at a fast food restaurant $\geq$ 3 times in the past week had energy intakes 40% and 37%, respectively, higher than did those who did not eat at a fast food outlet (11). Fast food restaurant use was associated with greater intakes of soft drinks and lower intakes of fruit, vegetables, grains, and milk (11). When Lin et al (12) examined the overall at-home and away-from-home diet quality of children aged 2–19 y, they found that 26% of total meals and snacks were consumed as foods away from home and that those meals and snacks provided a total of 32% of total daily energy. Away-from-home meals were higher in fat, saturated fat, and sodium and lower in fiber, iron, and calcium than were at-home meals (11, 12).

Although cross-sectional studies did not find any association between fast food restaurant use and body weight or body mass index (BMI; in kg/m^2) in children (1), one longitudinal trial in young adult women found that the consumption of one additional fast food meal/wk was associated with an increase in energy intake of 56 kcal/d and a weight gain of 0.72 kg over and above the average weight gain that naturally occurs over a 3-y period (13). To our knowledge, no longitudinal study of the effect of a change in fast food restaurant use on body weights in children has been reported. Such studies would be complicated by growth in children, who require a greater energy imbalance to present with signs of overweight.

Snack food consumption showed trends similar to those of fast food consumption in children. Snacking was defined by study participants as the consumption of nonmeal foods. The proportion of snacks from home foods decreased from a high of 76.4% in 1977–1978 to a low of 64.8% in the 1994–1996 survey (9). When Jahns et al (8) examined trends in snacking behaviors in children, they found that the number of snacking occasions, defined as foods consumed within a 15-min period distinct from the meal, as reported by the child, increased by 24–32% in all age categories (2–5, 6–11, and 12–18 y). Because the weight and energy content of each snack remained stable over time, this change resulted in a 30% increase in the amount of daily energy provided by snacks: 378, 462, and 612 kcal/d for children aged 2–5, 6–11, and 12–18 y, respectively (8). When Cusatis and Shannon (14) studied influences on adolescent eating behaviors, they found that snack consumption was positively related to sugar scores for males and to sugar and fat scores in adolescent females. Fat and sugar scores consisted of the number of daily servings from the fat food group, which included foods with added fats and higher-fat versions of lower-fat foods on the questionnaire, and the sweets food group, which consisted of foods with added sugar and sugar-sweetened beverages, cereals, snacks, and desserts. These data are corroborated by the observation by Nielson et al (9) of an increase in the consumption of salty snacks, candy, and soft drinks from 1977 to 1996. Therefore, in the past 3 decades, the prevalence of snacking has increased (8), as has the prevalence of overweight in children (3). Although a causal relation cannot be inferred from these data, it is not unreasonable to believe that snack-food and soft drink consumption may have, at least in part, contributed to the greater prevalence of childhood overweight.

Trends in fast food restaurant use and snacking habits thus show that the quality of the diet of children and adolescents has deteriorated over the past several years. In the 1989–1991 CSFII, only 1% of children met all of the recommendations for servings from the US Department of Agriculture food guide pyramid for children (15), and current trends do not seem to show improvements in nutrient intakes. In fact, a study from 2000 showed that only 5% of 7–14-y-old children met the national recommendations for servings of fruit and 9% met the recommendations for dairy (16). Discretionary fat and added sugar, assessed as the quantity of added fat and sugar as well as the amount of sugar and fat consumed if the higher-fat and higher-sugar version of a food was chosen, accounted for 46% of total daily energy intake (16).

Furthermore, it seems that, as children age, fast food consumption increases. This increase can be balanced by a proportional decrease in energy from other, more nutritious foods such as fruit and vegetables, milk, and grains, or it may simply be an addition to an already balanced diet. Both options seem likely. In fact, if energy intake were balanced with expenditure, then weight gain would not occur. Although longitudinal data are not available concerning increased fast food consumption and body weight changes, one can propose that increases in body weight and increases in fast food and snack consumption are concurrent events that potentially are causally related. However, any reference to causal relations should be made with extreme caution, given that no data are currently available to show such a relation.

The dietary quality of school lunches is a public policy issue that has come to the forefront in the debate of the last decade on increasing body weights in children. In 1993, a report from

the US Department of Agriculture stated that school lunches tended to exceed the national recommendations for fat, saturated fat, and cholesterol (17). A few years later, similar observations were made with regard to meals offered in the National School Lunch Program (NSLP) and the National School Breakfast Program. Researchers found that lunches contained 38% of energy from fat and 15% from saturated fat, and that the sodium content was also elevated, at ≈1479 mg/meal (18). These values are far from the current recommendations to consume < 30% of energy as total fat, < 10% as saturated fat, and < 2400 mg Na/d (19).

Schools differ in methods of food delivery to children. Some schools have only cafeterias and provide the NSLP, whereas other schools also have a la carte food items and student stores. When the quality of meals consumed from these various sources was compared, it was found that cafeteria lunches provided an average of 31.1 g total fat, and bag lunches (from home) provided ≈20.8 g fat (20, 21). A la carte foods contained, on average, 13.1 g fat per item and student-store food items averaged 6.4 g fat per item (20). Because students who buy meals on an a la carte basis typically consume more than one item, that option would often lead to greater fat consumption than would cafeteria and bag lunches, and it would also lead to fat intakes that exceed national recommendations (20). If one considers that bag lunches are representative of overall food consumption patterns at home, then consuming a la carte foods or the school lunch would lead to greater overall daily fat consumption than would consuming a bag lunch.

Another disturbing aspect of the school food supply is that fresh fruit and vegetables were not available in student stores when Wildey et al (22) sampled 24 public middle schools in San Diego County, CA. These researchers reported that 47.2% of students attending schools where there is a student store shop at the store ≥ 1 time/wk, and the most popular food item was candy; cakes and cookies were the next most popular items. Eighty-eight percent of foods sold in these stores contained > 5 g fat, 20 g sugar, or both per item (22). The study reported that students consumed, on average, 8.7 g fat and 23.0 g sugar per snack, which represents a substantial contribution to daily energy intakes in US youths.

One method of improving the diets of school-aged children would therefore be to provide additional healthy food choices, such as fruit and vegetables, in student stores or to abolish these stores altogether. In fact, when fruit, juice, and vegetable intakes of 4th graders, who had access only to NSLP meals, were compared with those of 5th graders who had access to foods from a snack bar, the grade 5 students consumed significantly fewer servings of fruit, juice, and vegetables than did the grade 4 students (0.6 compared with 0.8 servings, respectively) (23). It is interesting that grade 5 students who had access only to NSLP meals consumed the same numbers of servings of fruit, juice, and vegetables as did the grade 4 students. It was concluded that the lack of fruit, juice, and vegetable choices in snack bars or the presence of competing snacks and high-fat, high-sugar desserts at snack bars may account for the differences in fruit, juice, and vegetable consumption between students who have access to a snack bar and those who do not (23). Price may be another incentive that could affect food choices, because it has been reported that, when the price of lower-fat or healthy food items is reduced, there is an increase in the purchase of these foods (6).

CHANGES IN BEVERAGE CONSUMPTION AND RISK OF OVERWEIGHT

As the prevalence of overweight increased in children over the past decades, so did the consumption of soft drinks, which has reached new heights. In adolescent boys, soft drink consumption more than tripled in the past 3 decades (24), and this trend has been accompanied by a decrease in milk consumption (24–26). It was reported that, between 1977–1979 and 1994, daily soft drink consumption increased by 65% in adolescent girls and by 74% in adolescent boys (25), and daily milk intake decreased from 72% to 57% in adolescent girls (27). This is not surprising when one considers that the typical single-serving bottle of Coca-Cola (The Coca-Cola Company, Atlanta) has increased in size from 192 mL in the 1950s to 591 mL in 2000 (6). There is also a trend toward increased soft drink consumption with increasing age (25, 28), such that approximately one-half of preschool children consume soft drinks, but 64.1% and 82.5% of school-age children and adolescents, respectively, do so (25). Moreover, in a longitudinal study spanning 2 school years, 57% of children who were in grades 6 and 7 at baseline had an increase in soft drink intake 19 mo later, and 25% of them consumed > 1 additional serving/d (29). Similarly, in following children from grade 3 to grade 8, Lytle et al (30) found that the proportion of children consuming soft drinks daily almost tripled, but milk consumption decreased by 10%. This change may have serious health implications, because milk is a good source of several nutrients, such as protein, calcium, and vitamins B-2, B-12, and D, some of which are not easily available from other food groups and thus may not be consumed at all when the displacement of milk in the diet occurs as a result of increased consumption of high-sugar beverages.

This increase in soft drink consumption and decrease in milk intake may partly explain the rise in pediatric body weights. In fact, a recent longitudinal trial linked increased soft drink consumption with weight gain and obesity in children (29). When the authors examined the odds of becoming obese with increased consumption of sugar-sweetened beverages, the odds ratio was 1.6 with each additional daily serving of sugar-sweetened drink consumed (29). It was previously stipulated that total energy intake was positively associated with soft drink intake in school-age children, with those school-age children who consumed ≥ 265 mL soft drinks/d having an energy intake 188 kcal/d more than that of children who did not consume any soft drinks (25).

There may be several explanations for the link between obesity and soft drink consumption: *1*) decreased energy expenditure with the consumption of soft drinks or high-sugar beverages than with that of mixed-nutrient beverages, such as milk; *2*) increased food intake due to decreased satiety and fullness sensations with high-sugar beverages; or *3*) decreased milk consumption coincident with the rise in soft drink intake.

The first 2 mechanistic explanations have now been studied by our group, and data show that, when adults consume a beverage of mixed nutrient composition containing fat, protein, and carbohydrate, such as milk, they have greater energy expenditure and feelings of satiety than they have after consuming a sugar-only beverage with the same energy load (31). The third possible explanation, decreased milk consumption, has been observed only lately in epidemiologic and clinical

trials and is the subject of a recently published supplement to the *Journal of Nutrition* (32). Although a meta-analysis of calcium consumption and weight loss did not show that calcium consumption is linked to greater loss of body weight (33), there is an increasing body of literature suggesting that dairy calcium may play a role in maintaining stable body weight (34, 35). However, the effect of milk consumption or of altered trends in milk intakes on body weight in children has, to date, not been evaluated. Extrapolating from our unpublished results and recent data and reviews (34–37), one can hypothesize that the displacement of milk by soft drinks in particular may have had an effect on the rise in childhood body weights.

Although no epidemiologic study has found a positive association between fast food or soft drink consumption and body weight in children, a recent report by the Food and Agriculture Organization and the World Health Organization (1) recognized that a high intake of sugar-sweetened beverages may promote weight gain, and thus the increase in consumption of such drinks is of serious concern. The joint expert consultation the recommended restricting the consumption of free sugar, sugar-sweetened drinks (particularly by children), and highly energy-dense but micronutrient-poor foods in attempt to reduce the risk of unhealthy weight gain (1).

However, it is unlikely that changes in energy intakes, through increased consumption of fast foods, snacks, and soft drinks, have been solely responsible for the increase in body weights in children. Research has shown that low physical activity and high television viewing are also associated with overweight (38). The additive effects of these 2 small changes from traditional behavior can theoretically lead to large effects on body weight and composition.

HEALTH CONSEQUENCES OF CHILDHOOD OBESITY

It is becoming increasingly apparent that childhood obesity, as well as adult obesity, is associated with metabolic dysfunctions. The prevalence of type 2 diabetes has increased in many developed countries in the past decade. A report from 1996 (39) showed that incident cases of type 2 diabetes increased from 2–4% of children from birth to 19 y of age before 1992 to 16% of the same group in 1994. Among the 10–19-y-olds, 3–10% of new diabetes cases before 1992 were type 2 diabetes, whereas in 1994, type 2 diabetes represented 33% of new cases. The authors also noted that the average BMI of type 2 diabetes patients (37.7) was much higher than the 90th percentile for age (27.0) and that 38% of patients were morbidly obese (BMI $>$ 40). Until recently, type 2 diabetes had not been reported in the white pediatric population of the United Kingdom. Four white adolescents in the United Kingdom have been newly discovered to have overt clinical type 2 diabetes (40). A recent study in the United States found that, among 55 obese children aged 4–10 y and 112 obese adolescents aged 11–18 y who had BMIs above the 95th percentile, 25% and 21%, respectively, had impaired glucose tolerance, and 4 adolescents had silent type 2 diabetes (41). The authors also found that BMI was higher among children and adolescents with impaired glucose tolerance or diabetes.

Fasting insulin and C-reactive protein concentrations are higher in subjects with impaired glucose tolerance than in those with normal glucose metabolism after adjustment for BMI (41). C-reactive protein has also been found to be linked to BMI category in children 6–18 y old (42). With the use of the NHANES III data, we found that the odds ratio for having C-reactive protein concentrations $>$ 2.1 mg/L was 2.2 if BMI fell between the 85th and 95th percentiles and 4.9 if BMI was at or above the 95th percentile (42). It was previously suggested that obesity may increase the risk for cardiovascular disease by inducing a state of low-grade inflammation, which may ultimately lead to insulin resistance and endothelial dysfunction (43). Elevated C-reactive protein acts as a marker for such nonspecific inflammation, and thus children with higher concentrations would theoretically be at increased risk for cardiovascular disease later in life.

In a recent publication, 491 young children aged 2–3 y were examined to establish a relation between relative obesity and the concentrations of fasting insulin and C-reactive protein (44). BMI, ponderal index (kg/m^3), the sum of skinfold thicknessess, and waist circumference were significantly correlated with fasting insulin but not with C-reactive protein in boys. In girls, weight, BMI, the sum of skinfold thicknesses, and waist circumference were positively correlated with fasting insulin, and weight and BMI were correlated with insulin resistance index. None of the obesity indexes were correlated with C-reactive protein concentrations in girls.

Children aged 5–17 y who participated in the Bogalusa Heart Study between 1973 and 1994 were examined to determine the relation between overweight status and blood pressure or adverse concentrations of lipids and insulin (45). The prevalence of overweight in that study, which is in no way an indicator of the prevalence of overweight in children at any point in time, was 10.8%. The prevalence of total cholesterol concentrations $>$ 200 mg/dL was 10%, that of triacylglycerols $>$ 130 mg/dL was 7%, and that of insulin concentrations and blood pressure above the 95th percentile was 5% each (45). In this population sample, insulin concentration was the factor most strongly associated with BMI, but the prevalence of all of the risk factors was increased substantially between BMI in the 95th–97th percentiles and in that above the 97th percentile. Compared with other school children, those who were overweight (BMI above the 95th percentile) were 2.4 times more likely to have high total cholesterol concentrations, 7.1 times more likely to have high triacylglycerol concentrations, and 12.6 times more likely to have high insulin concentrations (45). The study also examined risk clustering and found that, among children 5–10 y of age, those who were overweight were 9.7 and 43.5 times more likely to have 2 and 3 risk factors, respectively, than were normal-weight children. For adolescents aged 11–17 y, the odds ratio for having 2, 3, and 4 risk factors was 6.5, 22.6, and 29.8, respectively.

In adults, large amounts of visceral adipose tissue have been linked to insulin resistance and increased risk of metabolic syndrome. In fact, waist circumference has been found to be a better predictor of metabolic disorders than is BMI (46). In children, this relation has not been studied to a great extent. However, the relation between visceral adipose tissue and hemostatic measures was examined in obese children aged 7–11 y (47). All children in this trial were at or above the 85th percentile for triceps skinfold thickness, and they varied widely in body fat content; thus, the authors could correlate adiposity measurements with hemostatic measures. Fibrinogen and D-dimer, an end product of fibrin breakdown, were found to be positively correlated with percentage body fat, subcutaneous abdominal adipose tissue, total fat mass, and BMI. Plasminogen activator inhibitor 1 was positively correlated with visceral adipose tissue, subcutaneous abdominal adi-

pose tissue, fat-free mass, and insulin concentrations. Because elevated hemostatic factors are implicated in cardiovascular disease morbidity and mortality, these results suggest that childhood obesity may predispose young persons to cardiovascular disease later in life (47).

Although it is not entirely clear whether obesity in childhood leads to unfavorable metabolic profiles in adulthood, one retrospective study attempted to establish such a link (48). The authors examined the effect of obesity at age 7 y on the risk of having the metabolic syndrome as an adult. Although the prevalence of metabolic syndrome was low in this sample, only 6% of women and 8% of men, the authors found that BMI at age 7 y had been higher in the subjects who had the metabolic syndrome as adults than it had been in those who did not. The odds ratio of having the metabolic syndrome was 4.4 for those in the highest BMI category at age 7 y compared those in the lowest 3 quartiles. The risk became 2.4 after control for age, sex, and current obesity. Similarly, the odds ratio of having the metabolic syndrome was 2.3 for individuals who were in a higher BMI quartile at age 7 y than at birth compared with those who remained in the same quartile of BMI, but the odds ratio became 1.6 and nonsignificant, after control for age, sex, and adult obesity. These results show that obesity in childhood increases the likelihood of metabolic disturbances in adulthood.

POLITICAL AND ECONOMIC ENVIRONMENT

Changes in the children's food supply have been dictated largely by political and economic forces. Although fast foods and soft drinks may have detrimental effects on the nutritional status of children, and an increased consumption of these food items may lead to obesity and future health problems, school systems continue to allow these "junk" foods to be sold in schools (49). Restricted school budgets often lead to outsourcing of the food service department, which leaves the control of student food intakes to independent companies. In addition, whereas the NSLP prescribes a particular energy and nutrient profile for school lunches, these prescriptions are often not followed. Furthermore, even if these recommendations were followed, the inclusion in schools of student stores and vending machines, which sell mostly high-fat, high-sugar foods, leads to greater consumption of energy-dense, nutrient-deplete foods. In 2002, some school districts in California legislated against the sale of soft drinks and candy (Oakland) and against soft drinks on the cafeteria menu (Los Angeles) (49). In Los Angeles, the school board voted to end the sales of soft drinks in vending machines by 2004 (49). No study has analyzed the effect of removing vending machines and student stores from schools (49), but it can be hypothesized that the quality of children's diets would be improved by such a measure. Other states are also passing bills to promote the development of school nutrition and physical activity programs. In Missouri, this bill enables schools to implement initiatives to create a healthy school environment, one in which nutrition and physical activity would be taught and supported in the classroom and cafeteria and throughout the school, and it proposes to implement a Missouri Council on Obesity Prevention and Management to assess the extent of obesity and recommend solutions for this problem (50).

The presence of vending machines has been hotly debated in the press. Schools often have contracts with food companies to allow their foods to be sold in schools, and these contracts generate large revenues for the schools (49). The funds can then be used to improve extracurricular activities and other school programs. However, one must ponder the exact role of the school in shaping students' minds and bodies. Increased funds may result in better programs and school-based activities, but the source of these funds may be detrimental to the establishment of lifelong healthy eating habits.

Recently, it has also been suggested that manipulating the prices of foods through taxes on unhealthy food items or price supports for healthy food items might help the population achieve healthy dietary goals (51, 52). In fact, in a recent survey of 90 high school students, food cost ranked third among the 5 main reasons for selecting a food item, after personal preference or taste and custom or habit (53). In a study examining the effect of the price of foods on food selection, it was found that lowering the price of fresh fruit and vegetables by 50% increased sales by 2- to 4-fold in high school cafeterias (54). Furthermore, the extent of the price reduction has an effect on the increase in sales. For example, when the prices of low-fat vending machine food items were reduced by 10%, 25%, and 50%, their sales increased by 9%, 39%, and 93%, respectively (55). However, food price manipulations may have unpredictable results on dietary quality. In addition, such actions would trigger a large debate and intense lobbying by the food industry to prevent some foods from being taxed, and thus it may not solve the problem at hand.

CONCLUSION

Extensive social, political, economic, and environmental changes have occurred in the past decades: more families have 2 working parents, time is pressing and even lacking in many instances, government involvement in school food service is decreasing, and the increasing costs of maintaining a school-based food service program lead to much outsourcing and to more contracts with the food industry. The fast food and food service industries responded to this changing environment by making fast food outlets increasingly available (longer operating hours, delivery options, and convenient locations such as shopping malls and cinemas) and by augmenting the number of convenience foods that can be purchased in grocery stores. Unfortunately, food items promoted by these industries are often high in fat and sugar and thus are highly energy dense. Children are exposed to those unhealthy food choices and are vulnerable to their appeal, which may have greatly contributed to the increase in the prevalence of overweight observed among our youth in the past several years. Although energy intakes have not increased greatly in the past several years, small increases, compounded by small decreases in energy expenditure due to decreased physical activity or increased inactivity, may result in significant changes in body weight. Tracking of body weight, unhealthy behaviors, and risk factors for adult diseases such as cardiovascular disease is also a cause for concern in the pediatric population (1). It is thus imperative that interventions occur early in childhood and adolescence in an attempt to prevent or reverse the possible adverse health effects of overweight and poor eating habits.

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