SUPPLEMENT ARTICLE

Recommendations for Prevention of Childhood Obesity

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ABSTRACT

The majority of US youth are of healthy weight, but the majority of US adults are overweight or obese. Therefore, a major health challenge for most American children and adolescents is obesity prevention—today, and as they age into adulthood. In this report, we review the most recent evidence regarding many behavioral and practice interventions related to childhood obesity, and we present recommendations to health care providers. Because of the importance, we also suggest approaches that clinicians can use to encourage obesity prevention among children, including specific counseling strategies and practice-based, systems-level interventions. In addition, we suggest how clinicians may interact with and promote local and state policy initiatives designed to prevent obesity in their communities.

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Key Words
obesity, prevention

Abbreviations
ADA—American Dietetic Association
PE—physical education
YRBS—Youth Risk Behavior Survey
MI—motivational interviewing
OR—odds ratio
CI—confidence interval

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OBESITY THREATENS THE health of today's children to such an extent that they may, for the first time in US history, have a shorter lifespan than their parents.[1] The considerable challenges of addressing and treating obesity throughout the life cycle have led to increasing interest in preventing obesity altogether.

Recent summaries of evidence on the prevention of obesity[2,3] reviewed comprehensively the body of research in this field. Following those efforts, we have focused this report on what health care providers can do to prevent childhood obesity in their clinical practices and in their communities, on the basis of evidence from the literature. Current evidence is clearly stronger in some areas than in others, and we have endeavored to inform providers about the relative strength of evidence by classifying available evidence at distinct levels (in descending order of strength). In addition, the prevention writing group has recommended specific clinical strategies, on the basis of analysis of available data from obesity interventions and other medical and behavioral interventions, as well as from clinical experience.

The goal of this set of recommendations is to enable children's health care providers (physicians, nurse practitioners, dieticians, counselors, and others) to find in one document the latest summary of evidence for prevention opportunities in health care settings and local communities. The main areas of evidence reviewed for this report include (1) food and nutrients, (2) eating behaviors, (3) family interactions around food and meals, (4) physical activity and sedentary behaviors, and (5) working with parents to address children's eating and activity behaviors. In each of these domains, we review the evidence; at the end of the report, we present our recommendations to providers for prevention of childhood obesity.

We complement our evidence review with a separate section regarding approaches to obesity prevention, which details how clinicians can adopt and implement specific counseling approaches and practice-based interventions regarding childhood obesity prevention. Our goal is to provide practitioners with practical strategies they can readily apply in their clinical work to address childhood obesity. Finally, we assess opportunities to interact with and to advocate for local and state policy initiatives, as a means for clinicians to address childhood obesity in their communities through coordination with, and advocacy for, community prevention efforts.

EVIDENCE

Foods, Nutrients, and Childhood Obesity

Total Energy Intake

Total energy intake, as measured by using current dietary assessment methods, does not seem to have a strong association with obesity in children.[4] This lack of association is likely attributable to the difficulty of accurately assessing dietary intake by using current dietary assessment tools such as dietary recalls and food frequency questionnaires.[5] These methods are subject to the serious and pervasive problem of underreporting, which worsens as children age[6] and is especially prevalent among obese adolescent girls.[7]

An analysis of data from the 1994 to 1996 and 1998 US Department of Agriculture Continuing Surveys of Food Intakes by Individuals determined that 55% of children 3 to 19 years of age reported implausible energy intakes. Reported energy intake was not associated with BMI percentile in the total sample. In the sample of children who reported plausible energy intakes, however, reported energy intake was associated positively with BMI percentile for boys 6 to 11 years of age and adolescents 12 to 19 years of age. No relationship was found for children 3 to 5 years of age or girls 6 to 11 years of age. Therefore, it is important for future studies to exclude implausible dietary reports to discern dietary associations with BMI.[8]

Dietary Fat

Evidence supports an unclear association between dietary fat and obesity in children.[4] The American Dietetic Association (ADA) conducted an evidence analysis and identified 15 longitudinal studies from 12 different cohorts of children, 3 months to 18 years of age, published between 1992 and 2003.[9–23] Four studies found positive associations between dietary fat intake and adiposity.[13,17,19,23] Four studies had mixed results and found both positive associations and nonsignificant associations between dietary fat intake and adiposity.[9–12] The other 7 studies found no significant associations between dietary fat intake and adiposity.

In a longitudinal study of 70 white children 2 to 8 years of age, mean dietary fat intakes recorded between the ages of 2 and 8 years were positive predictors of BMI at 8 years.[24] In a tracking study conducted in China, 6- to 13-year-old obese children were monitored for a 2-year period. Those who remained obese after 2 years had higher fat intakes (as a percentage of energy), in comparison with children who shifted from obese to not obese.[25] There is no evidence in the literature to support the suggestion that low dietary fat intake is associated with childhood obesity.[4]

Calcium and Dairy Products

Recent research from some observational studies suggests that lower intakes of dairy products and/or calcium are associated with obesity in children.[4] Of 7 observational studies published between 1995 and 2004, 4 found no associations[26–29] and 3 found negative associations between calcium intakes and various measures of adiposity.[13,30,31]

In a longitudinal study of 52 white children monitored from 2 months to 8 years of age, dietary calcium

intake from milk, cheese, and yogurt was associated with lower percentage of body fat at 8 years of age.[30] Other researchers found that children who consumed cereal with milk were at lower risk of being obese than were children who ate less cereal.[32] Girls 9 to 14 years of age who consumed diets rich in calcium weighed less and had less abdominal fat than did girls who consumed less calcium.[33]

Numerous intervention trials involving calcium and/or dairy supplementation and a measure of adiposity were identified in an ADA evidence analysis,[4] with the majority showing no difference between intervention and control groups. Therefore, it is possible that calcium and dairy products are serving as markers for a better diet and/or healthier lifestyle in the observational studies and are not themselves the cause of lower body fatness in children.

Fruits and Vegetables

An ADA evidence analysis concluded that the evidence supports a modest effect of fruit and vegetable intake in protecting against increased adiposity in children.[4] Fruits and vegetables have been promoted for the prevention of childhood obesity because of their low energy density, high fiber content, and satiety value.[4] Fruits and vegetables are most likely, compared with other food groups, to be consumed in inadequate amounts by children.[34] Several studies found no association between fruit and vegetable intake and childhood adiposity[28,29,31,35–44]; nevertheless, in none of the 17 studies reviewed in the ADA evidence analysis was increased fruit and vegetable intake related to increased adiposity. The studies that found a significant inverse relationship between fruit or fruit and vegetable intake and adiposity tended to have larger sample sizes, compared with those that found no relationship. The evidence was stronger for fruits alone or for fruits and vegetables combined than for vegetables alone. Part of this disparity may be attributable to the fact that different fruits and vegetables may have different effects on childhood obesity and overweight. For instance, more than one third of the total daily amount of vegetables in the US food supply consisted of iceberg lettuce, frozen potatoes (mostly french fries), and potato chips.[4]

Fruit Juice

Intake of 100% fruit juice is not related to adiposity in children unless it is consumed in unusually large quantities.[4] The ADA reviewed 15 studies on the impact of fruit juice consumption on childhood obesity. Four of 6 longitudinal studies found no association between fruit juice intake and obesity,[16,38,45,46] whereas 2 other longitudinal studies found either no association or an inverse association.[36,47] Neither of 2 nationally representative, cross-sectional studies found a relationship between fruit juice consumption and reported BMI.[48,49] One case-control study and 3 other cross-sectional studies found a positive association between fruit juice intake and a measure of adiposity.[29,39,50,51] In 2 studies of related cohorts, only large amounts of juice (≥12 fl oz/day) were associated with increased obesity.[50,51] The remaining 3 cross-sectional studies found no relationship between 100% fruit juice intake and obesity.[44,52,53]

Largely on the basis of this evidence, the American Academy of Pediatrics recommends that intake of fruit juice should be limited to 4 to 6 oz (1 serving) per day for children 1 to 6 years of age. For children 7 to 18 years of age, juice intake should be limited to 8 to 12 oz (2 servings) per day.[54]

Sugar-Sweetened Beverages, Including Soft Drinks

Evidence strongly supports a positive association between the intake of calorically sweetened beverages and adiposity in children.[4] A total of 19 observational studies published between 1999 and 2004 that assessed intake of sweetened beverages and the association with some measure of adiposity in children were reviewed, including 6 longitudinal studies, 3 nationally representative, cross-sectional studies, and 10 case-control or other cross-sectional studies.* The ADA concluded that the larger, more strongly designed, and higher-quality studies substantiated that sweetened beverage intake is related to obesity among children.

Since completion of the ADA evidence analysis, additional studies support a positive association between sugar-sweetened beverages and childhood overweight and obesity. Nationwide food consumption survey data collected in the 1999 to 2000 National Health and Nutrition Examination Survey demonstrate that soft drinks and sugar-sweetened fruit drinks are the principal source of energy in the diets of US male and female adolescents.[64]

In a separate sample of 10 904 low-income children 2 to 3 years of age, consumption of sweetened drinks increased the odds of becoming obese among those who were at risk for obesity at baseline and of remaining obese among those who were already obese by ≥60%. The authors concluded that reducing sweetened drink consumption is one strategy to manage the weight of preschool children.[65]

Several nutrition policy documents make recommendations regarding sugar-sweetened beverages. The American Academy of Pediatrics policy statement on soft drinks in schools recommends that pediatricians should work to eliminate sweetened drinks in schools.[66] The 2005 Dietary Guidelines Advisory Committee stated that "available prospective studies suggest a positive association between the consumption of sweetened beverages and weight gain. A reduced intake of added sugars (especially sugar-sweetened beverages) may be helpful in

*Refs 29, 31, 36–38, 40, 44, 46, 48, 53, and 55–63.

weight control and in achieving recommended intakes of nutrients."[67] The 2005 Institute of Medicine report *Preventing Childhood Obesity* stated that "much remains to be learned about whether a unique association exists between intake of sweetened beverages and changes in BMI. Because of concerns about excessive consumption of sweetened beverages and the displacement of more nutrient-rich or lower calorie alternatives, children should be encouraged to avoid high-calorie, nutrient-poor beverages."[2]

Childhood Eating Behaviors and Obesity

Breakfast Skipping

Evidence supports the view that obese children and adolescents are more likely to skip breakfast than their leaner counterparts. Obese children also have been reported to eat smaller breakfasts than their nonobese peers.[4]

A total of 15 observational studies published between 1994 and 2004 were reviewed, including 2 longitudinal studies,[36,68] 2 nationally representative studies,[57,69] and 11 other cross-sectional studies.[42,60,70–78] The ADA concluded that the preponderance of evidence suggested that breakfast skipping may be a risk factor for increased adiposity, particularly among older children or adolescents. However, the strength of the evidence is somewhat limited because what constitutes a breakfast has not been defined consistently.[4]

Eating Out, Including Fast Food

Evidence supports the view that consumption of food away from home, particularly at fast food establishments, may be associated with adiposity, especially among adolescents.[4] A total of 10 observational studies published between 1996 and 2004 were reviewed, including 2 longitudinal studies,[36,79] 1 nationally representative, cross-sectional study,[57] and 7 other cross-sectional studies.[40,71,74,80–83] Study sample sizes ranged from >60 000[83] to just over 50.[80] A limiting factor in these studies is that "eating out" and "fast food" were not defined or assessed systematically. However, the evidence that is currently available suggests that frequent patronage of fast food restaurants may be a risk factor for obesity in children.[4]

Portion Sizes

Increased portion sizes may be associated with increased adiposity in children.[4] Of note, appropriate portion sizes vary according to age, and discussions with parents about portion sizes should reflect age-specific normative values, as suggested in the Food and Drug Administration Food Guide Pyramid (available at www.mypyramid.gov).

Research indicates that portion sizes may contribute to the increasing prevalence of overweight among children by promoting excessive energy intake. Three- to 5-year-old children consumed 25% more of an entrée and 15% more energy at lunch when presented with portions that were twice as large as the age-appropriate standard size.[84] In a nationally representative sample of 1-year-old children, food portions were related positively to body weight.[85]

A study of 16 preschool children 4 to 6 years of age found that the most powerful determinant of the amount of food consumed at meals was the amount served. These children displayed poor regulation of energy intake.[86]

Other investigators used the 1994–1996 and 1998 Continuing Surveys of Food Intakes by Individuals to categorize children 3 to 19 years of age according to plausible and implausible self-reported energy intake. Among children with plausible reported energy intake, meal portion size was associated positively with age-specific BMI percentiles for boys 6 to 11 years of age and adolescents 12 to 19 years of age.[8] Others examined intakes of 2- to 5-year-old children in the 1994–1996 and 1998 Continuing Surveys of Food Intakes by Individuals and found that portion size accounted for 17% to 19% of the variance in energy intake.[87]

Snacking

Snacking frequency or snack food intake is not likely associated with adiposity in children.[4] The majority of studies that examined snack food intake in a recent ADA evidence analysis found no association with adiposity.† The research on snacking is confounded by unclear definitions in the literature of what constitutes a snack or snack food.[4] Nevertheless, longitudinal studies demonstrate that snacking frequency has increased concurrently with the prevalence of overweight. Snacks tend to be higher in energy density and fat content than meals, and high levels of snack consumption have been associated with greater intakes of fat, sugars, and energy.[4]

Since completion of the ADA evidence analysis, additional studies of children's snack behaviors have been published. In the Growing Up Today study of 9- to 14-year-old girls and boys, there was no relationship between intake of snack food and subsequent changes in BMI among the boys; there was a weak inverse association with weight change among the girls. The authors concluded that, although snack foods may have low nutritional value, they are not an important independent determinant of weight gain among children and adolescents.[91] In the Growth and Development Study of 196 nonobese, premenarcheal, 8- to 12-year-old girls, energy-dense snack food intake did not influence subsequent weight status or fatness change.[61] In contrast, an analysis of data from the Bogalusa Heart Study found that, among 1562 children 10 years of age, the total

†Refs 29, 36, 37, 44, 60, 61, 70, 76, 78, and 88–90.

amount of food consumed, specifically from snacks, was associated positively with overweight status.[60]

Family Interactions Involving Meals and Nutrition

Family Meals

Evidence supports a positive association between frequency of family meals and dietary quality in adolescents.[92,93] Increased frequency of family meals is associated with greater intakes of fruits, vegetables, and milk and lower consumption of fried food and soft drinks. It is also associated with higher nutrient intakes (including calcium, iron, vitamins, and fiber) and lower intakes of saturated and trans fats. The Growing Up Today cohort of 7784 girls and 6647 boys 9 to 14 years of age found that the frequency of family dinners was associated inversely with overweight prevalence at baseline.[94]

Parental Control of Child Nutrient Intake

Parental control over children's dietary intake does not consistently seem to be related to obesity in children.[4] Five cross-sectional studies showed no association between parental control and adiposity.[39,95–98] One study found no association between parental control and adiposity among boys but demonstrated an inverse association between parental control and adiposity among girls.[99] Another study found a positive significant association of parental control with adiposity among both boys and girls in the sample.[100]

Physical Activity and Sedentary Behavior

Measurement of Physical Activity

It is generally accepted that the energy expenditure required to reduce total mortality rates among originally sedentary adults is 630 to 1680 kJ/day above habitual energy expenditure levels.[101,102] It is more difficult to quantify the energy expenditure required to produce beneficial health effects among children and adolescents. Ultimately, the prevention of obesity requires a balance between energy intake and expenditure over time. Energy expenditure includes resting metabolic rate, thermogenesis, and physical activity, but only physical activity is amenable to clinical or community prevention programs for obesity.

Although reviews have identified many benefits of physical activity in youths, including reduced blood pressure levels, improved lipid profile, increased bone mass and density, improved self-esteem, reduction of anxiety, and reduced symptoms of depression, this report focuses on overweight and obesity prevention. Physical activity among youths is challenging to measure because the capacity to understand and to recall the concepts of time, duration, and intensity of past activity is associated inversely with age and because the nature, context, and practice of physical activity vary with age. Objective measures of physical activity used more commonly in recent studies, such as accelerometry, represent an important improvement in physical activity measurement.

Longitudinal Trends in Physical Activity

Data from the Youth Risk Behavior Survey (YRBS) suggest decreases in physical activity among US adolescents over the past decade.[103,104] The proportion of adolescents in grades 9 to 12 defined as inactive increased from 10.9% in 1993 to 14.7% in 2003 for boys, but values remained stable for girls (20.8% and 22.2%, respectively).[104] The odds of being inactive in 2003, compared with 1993, were increased significantly only for boys (odds ratio [OR]: 1.41; 95% confidence interval [CI]: 1.16-1.71) and for adolescents in ninth or 10th grade (ninth grade: OR: 1.63; 95% CI: 1.27-2.09; 10th grade: OR: 1.32; 95% CI: 1.06-1.63).[104] In contrast, surveys conducted in Canada from 1981 to 1998 reported substantial increases in leisure time physical activity energy expenditure among youths 12 to 19 years of age.[105] In addition, the prevalence in the United Kingdom of vigorous exercise at least 3 times in the past week increased from 32% to 53% for boys 12 to 13 years of age and from 36% to 49% for boys 14 to 15 years of age from 1987 to 2003. Among girls, increases were from 24% to 37% and from 20% to 31%, respectively.[106]

The YRBS was conducted biannually from 1993 to 2003; in each survey, inactivity increased from grades 9 to 12 and was higher in black youths than in non-Hispanic white youths and in girls than in boys. Other reports confirm that girls report less physical activity than boys, both before[107] and during[108,109] adolescence. Differences between girls and boys are particularly apparent for vigorous physical activity, with girls being less likely than boys to engage in vigorous physical activity during their free time, in the context of organized physical activity, during school, and outside of school.[109] In addition, the decline in physical activity with increasing age[103] and with lower socioeconomic status is well documented.[110,111] Longitudinal studies show that only 12% of youths who originally achieve desirable levels of physical activity (≥5 weekly bouts of moderate or vigorous physical activity) remain as active as young adults.[112]

Increasing competition for classroom time has put pressure on physical education (PE) classes in schools in many countries, including Australia and the United Kingdom.[106] In the United States, the YRBS indicated that participation in daily PE classes decreased from 42% in 1991 to 32% in 2001.[103] The amount of time spent being active during PE classes has also decreased.[113] Boys have substantially higher energy expenditures during PE classes, compared with girls.[109,113,114] Although girls and boys are equally likely to be enrolled in organized physical activity and lessons outside school,[115] girls are less likely to belong to sports clubs or to participate in unor-

ganized physical activity or in school sports outside PE classes.[116] Boys and girls differ substantially in their physical activity preferences[117,118] and in their patterns of physical activity involvement.[119–121] Participation in organized sports has declined in Australia and Sweden but seems to have remained stable in the United Kingdom.[106]

Individual and environmental factors do not influence all children equally.[122–124] There is evidence both for and against genetic effects on sports participation and leisure time physical activity among youths.[125,126] Boys and girls differ in their attitudes and beliefs regarding physical activity,[127] as well as their motivation for[116,128] and barriers to[129,130] engaging in physical activity. Peer and family social support, perceived neighborhood opportunities, and physical features of the school environment are important determinants of children's physical activity levels.[131–135]

Active transport (eg, walking or cycling) can be an important method of successfully integrating physical activity into people's daily lives. However, the frequency of walking and cycling by US children decreased by 37% between 1977 and 1995.[136] The proportion of schoolchildren who used active transport to or from school decreased from 50% in 1969 to 15% in 2003.[137,138] Similar declines have been reported in the United Kingdom.[106]

Longitudinal Trends in Sedentary Behavior

A review concluded that total media use among youths in industrialized countries has remained stable in the past decades.[129] The most recent data from an extensive review of the literature show that boys watch an average of 137 minutes of television each day, compared with 128 minutes for girls. Boys 0 to 6, 7 to 12, and 13 to 18 years of age watch an average of 126, 135, and 121 minutes of television each day, respectively. Girls of the same age categories watch television 126, 125, and 106 minutes per day, respectively.[139] Approximately 30% of boys and 25% of girls of all ages watch ≥4 hours of television per day. Boys play video games twice as much as girls (59 and 23 minutes per day, respectively, on average) and spend more time using computers (38 and 26 minutes per day, respectively).[139]

Physical Activity and Obesity

The evidence is strong that daily moderate/vigorous physical activity helps reduce adiposity in overweight/obese youths. For normal-weight children, the evidence is inconsistent for an association of physical activity with prevention of obesity. Nevertheless, there is expert consensus that daily moderate/vigorous physical activity of ≥60-minute cumulative duration is likely to have a beneficial effect for normal-weight youths and is unlikely to harm them. In the following summary of studies, we include some studies in the physical activity section that also included measures of sedentary behavior, and vice versa; they appear in specific sections on the basis of the primary focus of each study.

Several reviews of observational epidemiologic studies have summarized the literature on the association between physical activity and obesity in youths. Most studies conducted between 1940 and 2000 were cross-sectional and involved highly selected patient groups, often of obese and nonobese subjects. Older studies measured energy expenditure with physical activity questionnaires only and more recent studies with heart rate monitoring, double-labeled water testing, or a combination of the 3 methods.[140] The studies reviewed generally (but not universally) reported significant inverse associations between physical activity and obesity, with no significant positive associations. The authors also reviewed 2 large, nationally representative surveys, the US National Children and Youth Fitness Study II, which recruited children in grades 1 to 4 and found strong positive associations between activity and reduced skinfold thickness,[141] and a Finnish survey of 15-year-old youths, which failed to find any relationship between physical activity and obesity measures.[142] Of the 7 longitudinal studies reviewed, 4 found significant inverse associations with physical activity levels measured with questionnaires or energy expenditure measured with double-labeled water testing,[18,19,143,144] but 3 did not.[145–147]

A more-recent review (including articles published between 2000 and 2004) identified 16 new cohort studies of children (age range: 3–14 years), including 11 studies with follow-up periods of >2 years and 4 studies with >1000 children.[148] Of the 11 studies that used questionnaires to assess physical activity, 5 found no association between activity levels and measures of adiposity[9,12,149–151] but the other 6 reported that weight gain was associated inversely with activity levels and associated positively with sedentary activities.[68,152–156] Five studies used objective measures to assess energy expenditure, and all had small sample sizes (26–115 subjects). The Framingham Children's Study reported an inverse association between energy expenditure measured with heart rate monitoring and changes in BMI after 8 years of follow-up monitoring for 103 children initially 3 to 5 years of age.[157] Another study of 47 subjects 4 to 9 years of age showed that energy expenditure measured with double-labeled water testing resulted in changes in fat mass measured with dual-energy x-ray absorptiometry after 1.6 years but not after 2.7 years of follow-up monitoring.[158] The other 3 studies, with follow-up periods of 1 to 3 years, showed no inverse association between energy expenditure and change in fat mass.[159–161]

Another review assessed 11 recent trials intended to prevent unhealthy weight gain by increasing physical activity or reducing sedentary behavior in children and adolescents, including 9 trials consisting of school-based interventions and 1 trial that measured outcomes >3 months after the end of the intervention.[148] Three trials

showed a small intervention effect on adiposity indices, including 2 that demonstrated effects only in boys[162,163] and 1 in both boys and girls.[164] The other trials failed to show intervention effects on body composition, although several trials reported improvements in physical activity measures.[165–172]

Three other reviews of randomized trials have been published, including 9 studies not previously reviewed.[129,173,174] Most of those studies were published before 2000; 8 were conducted in schools and 1 exclusively in the community. All except 3 of the intervention programs combined nutrition and physical activity components[175–180]; 2 trials focused exclusively on physical activity promotion[181,182] and 1 focused chiefly on reduction of sedentary activities.[183] Significant positive effects were reported in 5 of the 8 school-based trials,[177–179,182,183] including 2 trials that showed positive effects only among girls.[177,179]

Finally, a comprehensive review of evidence on physical activity for school-aged youths, published in 2005, reported that programs of 30- to 60-minute duration, performed 3 to 7 days per week, demonstrated reductions in total body fat and visceral adiposity among obese children and adolescents but did not influence the percentage of body fat in normal-weight children and adolescents.[184] The review also cited more-limited evidence that longer and more-intensive sessions (>80-minute duration) were more successful in reducing the percentage of fatness in normal-weight youths. This led to the consensus recommendation from the review that school-aged youths should participate every day in ≥60 minutes of moderate to vigorous physical activity that is developmentally appropriate and enjoyable.

Sedentary Behavior and Obesity

Evidence supports a strong association between limiting sedentary behavior (watching television and playing video/computer games) and preventing obesity, although the effect size of the association varies across studies. A review of the literature on the effect of sedentary behavior on body composition identified 52 independent studies on television and adiposity, 39 studies on television and physical activity, 6 studies on video/computer games and body weight, and 10 studies on video/computer games and physical activity. The authors concluded that, although television and video/computer games have a positive relationship with BMI and a negative impact on physical activity, these effects are small and are unlikely to be of clinical relevance.[185]

In contrast, more-recent cross-sectional studies report significant associations between sedentary activities and body fat. Stettler et al[186] reported that, among 922 Swiss children in grades 1 to 3, use of electronic games (OR: 2.0; 95% CI: 1.6–2.6), television (OR: 2.8; 95% CI: 2.1–3.9), and physical activity (OR: 0.80; 95% CI: 0.72–0.88) were associated independently with obesity. Among a nationally representative sample of Finnish adolescents 14, 16, and 18 years of age, the ORs of being overweight were 1.4 and 2.0 for girls watching 1 to 3 hours or ≥4 hours of television, respectively, compared with girls who watched <1 hour per day.[187] The use of computer games for >1 hour (compared with <1 hour) increased the OR by 1.5. Similar results were found for boys but did not reach statistical significance. Finally, analysis of the 1999 YRBS data indicated that watching >2 hours of television per day was associated with being overweight among white male and female youths and among Hispanic female youths.[188]

Three recent reports from cohorts of children and adolescents support a relationship between sedentary behavior and excess weight. A report from the 1970 British Birth Cohort, involving >11 000 subjects monitored for 30 years, showed that the mean number of hours spent in front of a television set at 5 years of age predicted higher BMI *z* scores 25 years later, even when adjusted for television viewing at 10 years of age, birth weight, parental BMI, gender, and socioeconomic status.[189] Each additional 1 hour of television watched during weekends increased the risk of adult BMI of ≥30 kg/m^2 by 7% (OR: 1.07; 95% CI: 1.01–1.13).

Other studies that included measures of sedentary behavior as well as physical activity found, in a cohort of ~150 children initially 3 to 4 years of age who were monitored from 1986 to 1989, that physical activity and sedentary behavior (television viewing) were the only significant predictors of BMI (other than baseline BMI).[119] Finally, a cohort of 355 adolescents in grade 7 in Wales were monitored for 4 years.[190] Multivariate regression analysis showed that sedentary behavior and physical activity predicted BMI measured in follow-up assessments, after adjustment for several sociodemographic variables.

APPROACHES TO OBESITY PREVENTION

Basis of Suggestions

In this section, we endeavor to present practitioners with helpful insights about addressing obesity prevention in clinical practice and in their communities. Given the state of the science in obesity prevention in the clinical setting, this section is based on a combination of best available evidence and consensus opinion and on expert opinion when the former are lacking.

Partnering With Parents to Prevent Childhood Obesity

Family Health Promotion

Families have a critical role in influencing children's health,[191] and health is a de facto characteristic of the family lifestyle.[192] Interventions in the parent-child dynamic have evolved from traditional psychotherapeutic models to direct coaching of parents as they interact with their children and to the current view of parenting

TABLE 1 **Acceptance and Behavioral Control as Determinants of Parenting Style**

	Parenting Style	
	High Acceptance	Low Acceptance
High control	Authoritative	Authoritarian
Low control	Indulgent	Disengaged

Adapted from the work of Chassin et al.[202]

through the lens of social learning theory. Social learning theory is based on the premise that changing a parent's behavior leads to a change in a child's behavior.[193] Including parents as active participants with their children in lifestyle changes has produced positive long-term improvement in weight control.[194] Two major reviews of obesity prevention in children by the Institute of Medicine[2,3] delineated and emphasized the pivotal role of parents in obesity prevention. Specifically, parents can have a strong influence on obesity prevention in their children through direct support, such as playing with their children, paying fees for programs that promote physical activity, and transporting their children to locations in their communities where they can be active.[195]

Parenting Styles

"Parenting styles" describe parent-child interactions across a wide range of situations and apply to the interactions independent of content.[196] The relationship between parents and children may be reflected in and affected by parenting style.[197] One classification of parenting style includes the categories of authoritarian, authoritative, permissive, and disengaged. Authoritarian parents are described as valuing obedience, favoring punitive forceful measures, and not encouraging verbal "give and take."[198] Authoritative parenting values both "self-will and disciplined conformity," using a reason as well as authority to discipline a child.[199] A permissive parent allows a child to regulate his or her own activities and is accepting, nonpunitive, and affirmative.[198] A disengaged style has been described as neglectful.[199] An authoritative parenting style has been associated with reduced smoking initiation[200] and increased physical activity and reduced sedentary behavior in girls.[201] Parental acceptance and behavioral control are 2 dimensions that can frame these 4 parenting styles (Table 1).[202]

Child Developmental Stages and Obesity Prevention

Prenatal Environment

The association of particular risk factors with childhood obesity manifests in very different ways, depending on a child's developmental stage. Maternal health status can have a direct impact on the risk for childhood obesity and obesity-related comorbidities.[203] Exposure to maternal diabetes mellitus increases an infant's risk of future diabetes and obesity.[204] Infants born small for gestational age are also at increased risk for obesity, diabetes, and hypertension, further suggesting the vulnerability of the child to the intrauterine environment,[205,206] although postnatal parenting factors may also play a role.

Infancy

Parent-child interactions regarding food and activity start at birth. There is evidence to suggest that breastfeeding has a small protective effect on later obesity.[207] The mechanism of action is unclear but may involve enhancement of the infants' ability to regulate intake and the effect of mother-infant feeding interactions. Associations with parental weight, socioeconomic status, and smoking may be confounders.[208] Practitioners' support of breastfeeding is recommended for obesity prevention by the American Academy of Pediatrics.[209]

Preschool Age

Parents are responsible for the type of food presented to young children, the portion sizes offered, and the emotional context in which food is eaten. Transitional diets of toddlers often mirror the problem areas found in parents' diets.[210,211] A majority of 1- to 2-year-old children consume dessert, ice cream, and/or candy once per day, and up to one half consume sweetened beverages daily; in contrast, only 1 of 10 consume a dark green vegetable daily.[212] Advice to parents to "provide a healthy array of foods in the correct portion size and allow children to decide what and how much to eat from what they are offered" has been suggested as an appropriate parental approach to feeding.[213]

Parents' activity level can also influence activity in children.[214] Moreover, television viewing and having a television in the bedroom both have been associated with overweight in 1- to 5-year-old children.[215]

School Age

School age is a time when parents and children are focused on development of competence, where "rules channel behavior into productive activities."[216] Although parents are transitioning self-care skills to children, parents need to recognize their continuing enormous influence over nutrition and activity. Overweight in school-aged girls has been associated with their fathers' energy intake and enjoyment of activity and their mothers' BMI.[12] Parental exercise has been associated with increased fitness and extracurricular sports participation in children.[217] Reduction in television viewing in the school-aged population has been associated with obesity prevention and treatment,[183,218] emphasizing the continuing role of parents in managing a child's energy environment.

Adolescence

Adolescent sedentary behavior is correlated with parental sedentary behavior.[219] Parental support of adoles-

cents' activity was a stronger predictor of child activity than was parental activity. Parental support was thought to act by increasing adolescent self-advocacy, by providing resources and motivation.[220]

Supporting parents through their children's adolescence is important for helping them maintain efficacy in influencing and supporting their adolescents' positive lifestyle behaviors. Before the 1980s, theories on adolescent development were based on a conflict-oriented model[221]; since then, a more-positive approach has emphasized continuity in the adolescent-parent relationship and continued acceptance of parental values,[222] with adolescents looking to adults for support and control.[223]

Parenting Interventions for Obesity

Each family and child is at a unique point in their readiness to accomplish lifestyle changes. Evaluating the stage of change has been recommended as a way of tailoring intervention to the family's needs. In a study of parents of obese and overweight children, 44% were in the precontemplation stage, 17% in the contemplation stage, and 38% in the preparation/action stage of change. Parents of overweight children and parents who thought that they themselves were overweight were more likely to be in the precontemplation stage. Parents of older and obese children were more likely to be in the preparation/action stage. Significantly, parents who were worried about their child's weight in the context of a health problem were more likely to be in the preparation/action stage. This effect was increased when the child's physician had commented about the effect of the child's weight on his or her health.[224]

In a study comparing parent-only versus child-only interventions, children in the parent-only intervention group had greater initial weight loss and follow-up weight loss at 7 years, compared with the child-only intervention group. Two patients in the child-only intervention group developed eating disorder symptoms during long-term follow-up monitoring, compared with no children in the parent-only intervention group. Weight change in the parent-only intervention group was hypothesized to be mediated through better control of the nutritional environment and possibly change toward the authoritative parenting style, which was emphasized in the intervention.[225]

Clinician Counseling Skills

In this section, we address ways in which clinicians can intervene in the dietary and activity behaviors discussed above, providing a concrete set of suggested strategies and approaches for obesity prevention in practice settings. Counseling in medical practice can be reduced to 4 essential skills, that is, (1) asking, (2) informing, (3) advising, and (4) listening. A framework for understanding how these skills are used in client-centered counseling was proposed by Rollnick et al.[226] The framework delineates how these 4 skills manifest as 3 styles of communication, namely, following, guiding, and directing. These styles are differentiated by the skills used and the phase of the counseling encounter. The early phase is predominantly characterized by following. In the following phase, by using reflective listening and open-ended questions, the counselor gathers information from the patient to determine the position of the patient with respect to the behavior or health issue in question. The clinician establishes the basic facts of the story, often with a discussion of the behavioral history and the advantages and disadvantages of change. During this phase, the patient and counselor identify collaboratively what behaviors can be addressed. The emphasis is on building rapport and communicating that the clinician is not going to push the client to change. In the opening phase, the counselor often simply reflects what is being said; during later phases of the consultation, more-challenging reflections, which perhaps build discrepancy and move the patient toward an action plan, are used.

Once the clinician has obtained the basic story, the transition to discussing and planning change can begin. This is the hallmark of the guiding phase. In this phase, specific strategies (discussed below) to elicit change talk, such as the 0 to 10 importance/confidence rulers and a values clarification activity, are often used. The counselor gently helps guide the patient toward a behavioral decision.

Directing, the third phase, generally occurs after a patient has made a behavioral decision. The focus may shift to helping the client make concrete plans, such as setting goals and delineating an action plan. As the encounter moves from following to guiding and directing, there is generally a shift from simply listening and asking to informing, advising, problem-solving, and goal-setting.

Action reflections are key tools during the guiding and directing phases. This type of reflection involves moving the patient forward by incorporating into the reflective statements possible solutions to barriers or potential action steps. Unlike unsolicited advice and direct persuasion, action reflections use words or solutions either mentioned directly or alluded to by the patient. Reflections can involve reframing a barrier into a possible action step or listing a possible plan that the client mentioned directly or that developed logically from the discussion. The tone of the reflection often "undersells" the action step or solution, with words such as "could work" or "might consider."

When practitioners over-rely on a directing style, they overuse questions, information, and advice. This can take the form of informing patients about what the clinician thinks they should do and why they should do it. Traditional anticipatory guidance can take this form. The clinician may adopt the role of an "expert" who is

attempting to persuade the patient, and the clinician overcontrols the flow of the encounter, doing the majority of talking. Conversely, when practitioners use the following and guiding styles, they rely less on persuasion and devote more time and effort to listening. Excessive directing can lead to a passive patient; when clinicians use more following and guiding modes, patients are more active and autonomous, exploring their ambivalence, motivation, and potential plans for change. The following and guiding styles are reflected strongly in patient-centered communication methods such as motivational interviewing (MI) and autonomy-supportive counseling.[227–230]

Each of the 3 styles can be appropriate, depending on the needs, preferences, and personalities of patients and their readiness for change. For example, although many patients report high satisfaction and improved outcomes with patient-centered communication approaches,[231–233] such as MI, some individuals, particularly older patients and perhaps immigrant groups, may prefer a more-directive, educational style.[234] With regard to pediatric practice, whereas younger children may be more responsive to the guiding/directing styles, adolescents, who often express resistance, may be particularly responsive to the following/guiding styles. Similarly, parents who do not see a strong need to change the diet and activity habits of their children (or themselves) may be more responsive to a less-directive mode of counseling. Because of the vast research base on MI, we use it as the model to describe and to implement patient-centered obesity prevention.

MI has been used extensively in the addiction field.[235–238] Numerous randomized trials have demonstrated its clinical efficacy for addictive behaviors.[239,240] In the past decade, there has been considerable interest from public health, medical, and dietetic practitioners in adapting MI to address various chronic disease behaviors.[240–251] Although MI has been used to modify diet and physical activity behaviors in adults, the evidence base for obesity prevention and treatment in children is just beginning to emerge.[252] In the current absence of health care-based interventions for childhood obesity prevention, using MI is an interim step clinicians can take that has some basis in evidence.

Overview of MI

MI is a patient-centered style of counseling that relies heavily on strategies such as reflective listening, shared decision-making, and agenda-setting. A key element of MI is that ambivalence is considered a normal phase in the behavior change process, rather than an obstacle to change. Patients are encouraged to express their ambivalence, while clinicians subtly place greater emphasis on exploring the potential benefits of change without dismissing or counter-arguing the barriers to change. MI seems to be particularly effective for individuals who are initially less ready to change.[237,249,253,254]

The tone of MI is nonjudgmental, empathetic, and encouraging. Clinicians establish a nonconfrontational and supportive climate in which patients feel comfortable expressing both positive and negative aspects of their current behavior. Many counseling models rely heavily on therapist insight, whereas traditional patient and nutrition education emphasizes information exchange. In contrast, a MI approach requires patients themselves to do much of the psychological work. MI counselors generally make no direct attempts to dismantle denial, to confront irrational or maladaptive beliefs, or to convince or to persuade patients. Instead, clinicians help patients think about and verbally express their own reasons for and against change, as well as how their current behavior or health status affects their ability to achieve their life goals or to fulfill core values. MI encourages patients to make fully informed and deeply contemplated life choices, even if the decision is not to change.

MI assumes that behavior change is affected more by motivation than by information. Although the essence of MI lies in its spirit, there are specific techniques and strategies that, when used effectively, help ensure that such a spirit is evoked. To achieve these ends, MI counselors rely heavily on reflective listening.

Reflective listening can be conceptualized as a form of hypothesis testing. The hypothesis can be stated in generic terms as "If I heard you correctly, this is what I think you are saying . . ." or "Where you are going with this is . . . ." Reflections, particularly by counselors who are new to the technique, often begin with the phrase, "It sounds like . . . ." More-skilled counselors often phrase their reflections as more-direct statements, such as, "You are having trouble with . . .," omitting the assumed, "It sounds like . . . ." The goals of reflecting include demonstrating that the counselor has heard and is trying to understand the client, affirming the client's thoughts and feelings, and helping the client continue the process of self-discovery. One of the most-important elements of mastering MI is suppressing the instinct to respond with questions or advice. Questions can be biased by what the counselor may be interested in hearing about, rather than what the client wants or needs to explore.

Reflecting helps ensure that the direction of the encounter remains client-driven. Reflections involve several levels of complexity or depth. The simplest level tests whether the counselor understood the content of the client's statement. Deeper levels of reflection explore the meaning or feeling behind what was said. Effective deeper-level reflections can be thought of as the next sentence or next paragraph in the story, that is, "where the client is going with it." A high level of reflective listening involves selectively reinforcing positive change

talk that may be embedded in a litany of barriers. Similarly, skilled MI counselors selectively reflect statements that build efficacy, by focusing on previous successful efforts or reframing past unsuccessful attempts as practice rather than failure.

In the directing style, practitioners often provide information about the risks of continuing a behavior or the benefits of change with the intent of persuasion. For the parent of an overweight child, a traditional counseling statement might be, "It is very important that your child get control of his/her weight now, before it becomes a bigger problem." In this style of communication, the practitioner often attempts to "push" motivation by increasing perceived risk. In contrast, information is presented through MI by first eliciting the client's understanding and information needs, providing new information in a more-neutral manner, and then eliciting what this means for the client with a question such as, "How do you make sense of all this?" MI practitioners avoid persuasion with "predigested" health messages and instead allow clients to process information and to find their own personal relevance. To this end, the guideline elicit-provide-elicit has been proposed as a framework for exchanging information in the spirit of MI. An outline of a patient-centered obesity prevention counseling session using these techniques is provided in the Appendix.

Confronting patients can lead to defensiveness, rapport breakage, and, ultimately, poor outcomes. Therefore, MI counselors avoid argumentation and instead "roll with resistance." A MI encounter resembles a dance more than a wrestling match.[255] For example, a parent may raise doubts that the child's weight is a problem or may suggest that the child's weight will improve on its own as the child ages. Rather than stating facts to counter such beliefs or to persuade the parent, a MI practitioner reflects the parent's doubt and then provides opportunities for the parent to voice any concerns he or she may have about the child remaining overweight or gaining weight. In cases in which a parent's resistance is severe, the practitioner may use an amplified negative reflection, such as, "It appears that you see no real problem with your child's weight," or "Having your child watch television most of the afternoon really works for you and your family." This potentially risky strategy is designed to "unstick" the entrenched client by short-circuiting the "yes-but" cycle.

A core principle of MI is that individuals are more likely to accept and to act on opinions that they voice themselves.[256] Patients are therefore encouraged to express their own reasons and plans for change (or lack thereof). This process is referred to as eliciting change talk. One technique to elicit change talk is the use of importance/confidence rulers.[253,255,257] This strategy begins with 2 questions. (1) "On a scale from 0 to 10, with 10 being the highest, how important is it to you to change your child's/family's (insert target behavior)?" (2) "On a scale from 0 to 10, with 10 being the highest, assuming you wanted to change this behavior in your child/family, how confident are you that you could (insert target behavior)?" These 2 questions assess the client's importance and confidence for change, respectively.[235,257] Clinicians follow each of these questions with 2 probes. If the client answered "5," for example, then the counselor would probe first with the question, "Why did you not choose a lower number, like a 3 or a 4?" and then with the question, "What would it take to get you to a 6 or a 7?" These probes elicit positive change talk and ideas for potential solutions from the client.

Another strategy to elicit change talk is to help build discrepancy between the patient's personally held values and goals and his or her current health practices. The strategy can be used for counseling parents or working directly with older children or adolescents. To execute this strategy, patients select 2 or 3 values from a list provided by clinicians (Tables 2 and 3). Practitioners then probe how, if at all, changing the behavior in question can help patients achieve their goals. Conversely, practitioners can understand how, if patients do not or cannot change, such values and goals may be impeded.

Other Specific Cognitive and Behavioral Strategies

Use of Other Strategies

Whereas MI represents a style of communication, a framework for how to talk with families about diet and physical activity, specific cognitive and behavioral strategies may be helpful to assist families in achieving their health goals. Relevant behavioral strategies include goal-setting, positive reinforcement, and self-monitoring. Cognitive strategies include counteracting "all-or-nothing" thinking and exaggerating negative consequences or "worsting." Some examples of how clinicians can incorporate these strategies into obesity prevention counseling are presented below.

Goal-Setting

Clearly defined behavioral goals for the target behaviors identified through the prevention assessment should be elicited from parents and children. Generally, initial goals should entail relatively modest changes. For example, goals could include adding 1 serving of fruits and vegetables or 15 minutes of physical activity each day or reducing 1 serving of sweetened beverages or 30 to 60 minutes of television viewing each day. Setting and achieving smaller, attainable goals may lead to increased feelings of self-efficacy, which in turn may spur additional persistence and continued progress while reducing disappointment and perceptions of failure. Having parents and/or children verbally express the behavioral

TABLE 2 *Current Procedural Terminology* and *International Classification of Diseases, Ninth Edition,* Coding for Obesity-Related Preventive Care

Code	Designation/Situation
Preventive medicine visit[a]	
99384–99385	New patient, preventive medicine visit; patient is 12–18 y of age
99394–99395	Established patient, preventive medicine visit; patient is 12–18 y of age
WN016-WN019 or WR016-WR019	Health check under Medicaid
Evaluation and management codes	
99201–99205	New patient, office or other outpatient visit
99212–99215	Established patient, office or other outpatient visit
99241–99245	Consultation, office, or other outpatient visit
Health and behavior assessment or intervention[b]	
96150	Health and behavior assessment (eg, health-focused clinical interview, behavioral observations, psychophysiological monitoring, health-oriented questionnaires)
96151	Reassessment
96152	Health and behavior intervention
96153	Health and behavior intervention with ≥2 patients
96154	Health and behavior intervention with family, with patient present
96155	Health and behavior intervention with family, without patient present
Medical nutrition therapy[b]	
97802	Medical nutrition therapy, initial assessment and intervention, individual, face to face with patient; each 15 min
97803	Medical nutrition therapy, reassessment and intervention, individual, face to face with patient; each 15 min
97804	Medical nutrition therapy, group, individual, face to face with patient; each 15 min
Other codes[b]	
S9445	Patient education, not otherwise classified, nonphysician provider, individual, per session
S9446	Patient education, not otherwise classified, nonphysician provider, group, per session
S9449	Weight management classes, nonphysician provider, per session
S9452	Nutrition class, nonphysician provider, per session[c]
S9455	Diabetic management program, nurse visit
S9465	Nutritional counseling, dietician visit[c]
No counseling provided (measurement only or pedometer download)[b]	
99211	Minimal visit, established patient (nurse visit)

[a] Counseling is included in the preventive medicine visit codes. The total time spent with the patient and the amount of counseling time must be documented, and discussion items must be delineated in the medical record.

[b] These codes can be used for subsequent visits, including those with a nurse, counselor, or dietician.

[c] For nutritional therapy assessment and/or intervention performed by the physician, the evaluation and management codes should be used.

goal may help solidify the behavioral contract and increase ownership over the proposed goals.

Positive Reinforcement

Children's efforts should be recognized and encouraged. Reinforcement may take the form of verbal praise for changes made or simply recognition of attempts at change. Tangible reinforcement, including financial incentives, can be considered, although there is some debate regarding whether such "extrinsic" motivation decreases long-term behavioral persistence.

Monitoring

Both clinicians and family members can monitor children's progress toward their agreed-on goals. For clinicians, this may entail inquiring about progress at subsequent visits, with simple prompts such as, "How have things gone with your eating or activity plan since we met a few months back?" If specific goals were set at a previous visit, then the clinician should refer to those goals. A more-detailed monitoring plan that entails daily charting of the child's behavioral progress can also be considered, particularly for children with BMI of 85th to 95th percentile without health complications. Generally, for healthy children following a prevention protocol (ie, BMI of <85th percentile or BMI of >85th to <95th percentile without obesity-associated complications), frequent monitoring of weight is not recommended.

Cognitive Restructuring

How children internally define their progress and interpret their actions can affect behavioral persistence significantly. One common maladaptive pattern of which clinicians should be aware is all-or-nothing thinking. All-or-nothing thinking, which is also referred to in the addiction field as abstinence-violation syndrome, entails exaggerated negative interpretation of small lapses or failures to adhere perfectly to a behavioral plan. For a child attempting dietary changes, this may take the form of "I failed at it" or "I can't do this," when in fact the child might have been successful on most days. This faulty thinking pattern tends to arise from expectations of perfect adherence, which can be anticipated and defused by clinicians and/or parents. This may entail pre-

TABLE 3 **Diagnosis Codes for Obesity-Related Visits**

Code	Diagnosis
Primary diagnoses for initial visit	
278.0	Obesity, unspecified
401.9	Essential hypertension, unspecified
611.1	Hypertrophy of breast
701.2	Acquired acanthosis nigricans
783.1	Abnormal weight gain
V18.0	Family history of diabetes mellitus
V18.1	Family history of endocrine or metabolic diseases
V61.20	Counseling for parent-child problem, unspecified
V62.89	Other psychological or physical stress, not elsewhere classified
V62.9	Unspecified psychosocial circumstances
V69.0	Lack of physical exercise
V69.1	Inappropriate diet and eating habits
V69.8	Other problems related to lifestyle; self-damaging behavior
V69.9	Problem related to lifestyle, unspecified
Primary diagnoses for subsequent visits	
V65.3	Dietary surveillance and counseling
V65.41	Exercise counseling
V65.49	Other specified counseling

paring children to expect "imperfect" adherence and providing them with alternative thinking patterns, such as, "I did great most of the time, which shows I can do this." A related faulty thinking pattern that clinicians may encounter is exaggerating the negative consequences of a single event. Clinicians and parents should reinforce the child's effort and focus on successes rather than failures.

Training in Patient-Centered Communication

Extensive training in communication skills of any kind is uncommon in pregraduate and postgraduate medical training. Therefore, it is often necessary for clinicians to obtain advanced training in counseling as part of their continuing medical education. Although autodidactic resources exist (eg, DVD- and Internet-based teaching products), clinicians are encouraged to obtain "hands-on" training that includes supervised clinical practice and real and/or simulated patient encounters. Such workshops are often available at regional and national medical and behavioral health conferences.

Framework for Practice-Based Interventions

Basis of Changes

Practice-based interventions recommended to prevent obesity in children are changes to be made at the system level in the health care providers' practice and are extrapolated from experience with the National Health Disparities Collaboratives on asthma, diabetes, and depression.[258–262] There is indirect evidence from these collaboratives to suggest that the following practice changes may improve care to prevent obesity in children.

Recommended Changes

Recommended practice-level changes include staff development in assessing and documenting BMI, practice-level self-assessment regarding obtaining BMI data and counseling families on appropriate interventions, quality control/quality improvement processes to evaluate practice performance, and disease management strategies adopted from the chronic care model. The chronic care model includes recommendations for self-management support, decision support, delivery-system redesign, and clinical information systems. The final issue to be addressed is reimbursement for obesity prevention visits.

Staff Development Skills

The health care provider involves the practice staff members in addressing the problem of preventing obesity in children by delegating the accurate measurement and documentation of BMI to them and by training them to perform these tasks. The Centers for Disease Control and Prevention and the US Department of Health Resources and Services Administration have established guidelines for accurate measurement and provide teaching modules on accurate measurement and BMI calculation (available at www.cdc.gov/nccdphp/dnpa/growthcharts/training/modules/index.htm and www.mchb.hrsa.gov/mchirc/dataspeak). The practice needs to obtain a reliable scale for infants and older children; regular calibration of the equipment should be assigned to a staff member. Recumbent length boards should be used for all children $\leq$2 years of age. Wall-mounted height stadiometers should be used to measure height for children $>$2 years of age. Staff members need to be trained and annually updated on accurate measurement techniques. Among physicians and nurse practitioners, staff development should include training for the motivational and behavioral counseling strategies described above.

Practice Self-assessment

The practice needs to establish a mechanism to evaluate its current procedures for assessing and addressing children at risk for overweight/obesity. A chart audit is suggested for evaluation of whether BMI is being measured, calculated, and documented on the growth charts. Children who meet the criteria for overweight or obesity should have growth documented on the problem list. The chart audit would reveal whether blood pressure, Tanner stage, and family history of overweight/obesity and cardiovascular risk factors are being documented on the charts. An initial chart audit can provide the practice staff with baseline data regarding the current status of the practice in addressing the needs of children at risk of overweight/obesity and can be used to evaluate the practice after changes are implemented.

Self-assessment measures regarding initiation of motivational and behavioral counseling strategies may also be considered.

Quality Control/Quality Improvement

Indirect evidence from the quality improvement literature suggests that the use of the rapid-cycle improvement model results in improved processes of change to improve practice.[263,264] The rapid-cycle improvement model, built on the work of Langley et al,[265] suggests that the practice needs to have a specific aim that is measurable and then needs to develop a plan to make practice changes by using the plan-do-study-act model (including assessment, documentation, and addressing of children at risk of becoming overweight). The plan-do-study-act model starts with the plan; the practice plans for the changes that need to occur to improve the prevention of overweight in youths and plans the method of measuring whether those changes are occurring. Do refers to implementing the changes that have been created to improve care for youths at risk of becoming overweight. Study refers to collecting the data on the current status of the practice and assessing the changes over time. The data are reviewed by the practice to monitor its progress. Act refers to modifying or changing the plan if the goals have not been achieved or cannot be implemented as planned. The cycle is repeated until the goals have been met; at that point, the next step is to disseminate the successful changes throughout the practice and to other practices.

Disease Management With the Chronic Care Model

Components of the Model

We propose approaching the issue of prevention of overweight/obesity in children with the disease management techniques outlined in the chronic care model. The chronic care model is a synthesis of evidence-based system changes that organizations can use to guide quality improvement and disease management activities. The model includes practice changes to provide self-management support for patients and family members, decision support for providers, delivery-system redesigns to promote better care, and clinical information systems to provide data for evaluation of the progress the practice is making in meeting its goals. Indirect evidence from the National Health Disparities Collaboratives on asthma, diabetes, and depression suggests that improved patient outcomes result from use of the chronic care model.[258,260–262]

Self-management Support

Self-management support empowers and prepares patients to manage their health and health care. We propose collaborative goal-setting between the patient and family and the provider, development of an action plan with the patient and family, and provision of education to the patient and family that gives them the necessary tools to monitor changes and addresses lifestyle changes needed to improve weight status.

Decision Support

Decision support refers to education for providers and support staff members regarding the latest evidence on preventing overweight in youths, assessment and monitoring of weight in children, counseling in effective techniques for behavior change, and rapid-cycle improvement to monitor practice improvement strategies. Decision support promotes clinical care that is consistent with scientific evidence and patient preferences.

One strategy is to embed available evidence-based guidelines or best-practice recommendations into daily clinical practice. We suggest ongoing continuing education for providers that updates them on recent literature and future clinical practice guidelines to promote effective care of children at risk of overweight. Support staff members may need training in calculating and documenting BMI. Primary care providers may need training in tracking the child's BMI and discussing the findings with the child and family. Another aspect of decision support is the integration of specialty expertise with primary care. Providers need to establish referral criteria so that providers know when to send patients for specialist care.

Indirect evidence from the National Health Disparities Collaboratives on diabetes suggests that ongoing provider education using interactive education strategies with case studies improves providers' knowledge and management skills. Similarly, embedding the BMI into daily practice by including the information in the daily routine and encounter forms helps to achieve the practice changes necessary to improve care.

Delivery-System Redesign

Delivery-system redesign ensures the delivery of effective, efficient, clinical care and self-management support. Indirect evidence from the National Health Disparities Collaboratives on asthma, diabetes, and depression shows improved outcomes with changes in the delivery-system design, such as planned visits that include regular patient assessment, review of the action plan, and routine updating of self-management goals.[258,260–262] Delivery-system redesign strategies that may be used to provide the care include group visits, case management, and the use of primary care teams.

Indirect evidence on the use of group visits[259,266] suggests that it is a cost-effective and efficient way to deliver care. The group setting allows the provider to offer information to larger groups of individuals at one time and allows family members to interact with others who are facing the same challenges.

Indirect evidence also suggests the value of case man-

agement techniques.[259,262] We suggest flagging charts to identify those who are at risk of overweight or are gaining weight at an accelerated rate, so that future providers can address the effects of weight gain on the child's health. Practice changes may be needed to provide ongoing support to clients in the at-risk category. The chronic care model also suggests that providers identify community resources and make referrals to specialists when appropriate.

Another aspect of practice redesign is implementation of primary care teams.[261] These are interdisciplinary teams created within the practice that include physicians, nurses, dieticians, behavioral health clinicians, and support staff members who provide the education and create tools to give patients and family members the information needed to implement changes. Each member of the team has an assigned role and duties specific to that team role. The primary care team incorporates the patient action plan into the routine clinic flow sheets, to ensure that the provider addresses the plan at each visit.

Clinical Information Systems

Clinical information systems organize patient and population data to facilitate efficient effective care.[258,260,261] Clinical information systems provide timely reminders and feedback for providers and patients. Patient registries can be developed to identify subpopulations for proactive care and to facilitate individual patient care planning.

The electronic medical chart is an effective tool that practice staff members have available to facilitate the identification of children at risk for overweight and to monitor practice changes in the identification and care of overweight children. Electronic medical charts are available to calculate BMI values and to graph them on the BMI growth charts.[267] Some electronic medical charts can also provide "red flags" to providers regarding patients with BMI of >85th percentile or >95th percentile. Some electronic medical charts also generate appointment cards as reminders to patients. The use of electronic medical charts also facilitates the practice of self-monitoring and use of data to evaluate progress, as part of quality improvement.[267]

Reimbursement

A challenge to health care providers in delivering adequate care and support to children at risk of overweight/obesity is the issue of reimbursement for health care visits. Coding for care of children at risk for obesity and related comorbidities is straightforward. The *Current Procedural Terminology* and *International Classification of Diseases, Ninth Edition,* codes (Table 2) are available for reporting of the services provided for management of pediatric overweight. However, the American Academy of Pediatrics advises practitioners that obtaining appropriate reimbursement is more complicated.[265] Many insurance carriers deny claims submitted with "obesity" codes. The American Academy of Pediatrics suggests that coding for obesity-related care is a 2-step process. The first step is to submit claims with appropriate codes (Table 2); the second step involves practice-level issues of denial management and contract negotiation. The American Academy of Pediatrics has developed a strategy and a template letter to be used by practices that are in negotiation regarding denial management (available at www.aap.org/moc/loadsecure.cfm/reimburse/denialtemplateltr.pdf). Diagnostic codes that may be appropriate for the initial and recurring assessments performed by the provider are presented in Table 3.

OPPORTUNITIES FOR OBESITY PREVENTION IN THE COMMUNITY AND ENVIRONMENT

Collaborative Opportunities for Health Care Providers

Need for Coordination

One of the greatest obstacles to effective obesity prevention at the community level is the lack of coordination of efforts across different sectors, that is, from the clinician's office to schools and day care settings, to parks and playgrounds, and to grocery stores and restaurants. Therefore, an important step for health care providers in addressing childhood obesity is to become aware of the status of ongoing obesity prevention initiatives in their communities and to interact with leaders of those initiatives to express and to offer their support. Where initiatives do not yet exist, health care providers are in positions of natural leadership and can help other community leaders shape prevention efforts, on the basis of the growing body of evidence regarding what works in other settings.

School-Based Initiatives

School-based obesity prevention efforts take 3 primary forms, that is, promotion of healthy foods and restriction/discouragement of less-healthy foods in the cafeteria and from vending machines, expanded and intensified health curricula regarding the importance of nutrition and physical activity, and availability of opportunities for exercise through PE and recess programs. The challenge of school-based efforts is that studies of their effects have generally demonstrated increases in program participation and improvements in desirable eating and activity behaviors but have less consistently demonstrated changes in body weight or fatness.[269]

Promoting healthy foods and discouraging less-healthy foods during the school day is an area of intense debate and mixed success in previous research. Some studies have demonstrated that it is possible to influence consumption strongly by limiting access to "competitive" foods (compared with school meal plans) during school hours, by enhancing availability of healthier alternative foods in vending machines, and by pricing healthier

alternative foods more favorably than less-healthy foods in the a la carte setting.[269] There are instructive instances in which schools have negotiated successfully with beverage distributors to place healthier alternatives in vending machines.[270]

The majority of states specify that diet and activity/fitness must be components of the health education curriculum in schools, but <10 hours/year are spent on these subjects together, on average.[269] Therefore, providing expanded and enhanced health curricula regarding nutrition and physical activity in schools may help students consider, adopt, and maintain healthier diets and more physically active habits.[2] Behavior-oriented, rather than solely information-focused, curricula are effective in promoting healthful food choices and physical activity. The Institute of Medicine report on childhood obesity prevention recommends ≥30 minutes of activity during each school day, as either PE classes or recess.[2] The National Association for Sport and Physical Education recommends 150 minutes of PE per week for children in elementary school and 225 minutes of PE per week for children in middle or secondary school.[271] Health care providers can support efforts to prioritize physical activity during the school day by asking about children's participation during routine office visits and then providing feedback to schools and school systems regarding physical activity as a central priority for health and wellness. An opportunity exists for providers to play a concrete role in the establishment and refinement of school wellness policies within their local districts and state educational systems.

Schools have been the central focus of most studies on nutrition and PE in childhood, and similar issues in child care settings for preschool-aged children and school-aged children (after school) have received increasing attention. As summarized recently, studies using accelerometers have demonstrated the importance of planned physical activity in the daily preschool schedule, organized as structured activity sessions that emphasize a wide variety of movements.[272] Nutrition programs in child care settings, particularly for school-aged children after the end of the regular school day, are also potential opportunities to prevent obesity and should be a topic of conversation with children and their families for health care providers.

Community-Based Initiatives

The "built environment" in the United States has attracted increasing attention as a contributor to the childhood obesity epidemic and as a growing threat to effective prevention of obesity.[273] Children with less access to opportunities for physical activity in their neighborhoods are more likely to be obese, and such access is more limited in lower-income communities of color. The movement of populations out of inner cities and into suburbs has generally created a greater dependence on automobile transportation and has left behind inner-city neighborhoods that used to offer superb connectivity and direct routes for pedestrians from point to point but that today (if perceived as unsafe by parents) no longer offer appealing options for regular physical activity for children through walking or riding bicycles. To address these challenges, children's health care providers can support efforts to preserve and to enhance parks as areas for physical activity, inform local development initiatives regarding the inclusion of walking and bicycle paths, and promote families' use of local physical activity options by making information and suggestions about physical activity alternatives available in their offices.

Obesity Policy Advocacy Opportunities for Health Care Providers

Children's health care providers will have opportunities to promote and to enhance child obesity prevention policies in their communities, states, regions, and the nation, as they have in recent policy efforts on tobacco and alcohol control and firearms and traffic safety. Although obesity prevention has much in common with those efforts, a key distinction is that eating is essential to life, whereas tobacco, alcohol, firearms, and automobiles are not. Therefore, the ways in which childhood obesity policy efforts evolve, particularly with respect to the role of the food industry, will need to strike a balance regarding food consumption; this is fundamentally more challenging than seeking blanket bans on cigarette sales and advertising to minors.[274]

A key role for health care providers will be to help childhood obesity efforts focus on a limited set of specific messages to the public regarding nutrition and activity and on a related set of specific policy goals that can be pursued at the local (eg, school and community), state, and national levels. Policy researchers at the University of Baltimore have developed a state "obesity policy report card" that assigns grades to states on the basis of the legislation they have passed and considered.[275] Providers can use this report card as a source of information about their own states and as a comparative tool to see what other states have done.

Another role for providers related to advocacy is following up state and local policy initiatives within the office setting. For example, a few states now require schools to measure height and weight and to report BMI values to students and their families, with encouragement to follow up with their health care providers.[269] Such programs are intended to raise general awareness about the challenges of the obesity epidemic and to alert children and their families regarding individual opportunities to address obesity when it can be reversed more easily, during the childhood and adolescent years. Health care providers can play a central role in helping children and families interpret and respond to these "BMI report cards," which also help providers detect

children whose BMI values are in the overweight or obese ranges. Providers can also play critical roles in helping children, families, and communities address issues of stigma and low self-esteem that can result from detection and information programs.

RECOMMENDATIONS FOR PREVENTION OF CHILDHOOD OBESITY

Patient-Level Interventions

1. The expert committee recommends that physicians and allied health care providers counsel the following for children 2 to 18 years of age whose BMI is 5th to 84th percentile: (*a*) limiting consumption of sugar-sweetened beverages (consistent evidence); (*b*) encouraging diets with recommended quantities of fruits and vegetables (mixed evidence); (*c*) limiting television and other screen time by allowing no more than 2 hours per day, as advised by the American Academy of Pediatrics (consistent evidence), and removing television and computer screens from children's primary sleeping areas (consistent evidence); (*d*) eating breakfast daily (consistent evidence); (*e*) limiting eating at restaurants, particularly fast food restaurants (consistent evidence); (*f*) encouraging family meals in which parents and children eat together (consistent evidence); and (*g*) limiting portion sizes (consistent evidence).
2. The expert committee also suggests that providers counsel families to engage in the following behaviors: (*a*) eating a diet rich in calcium; (*b*) eating a diet high in fiber; (*c*) eating a diet with balanced macronutrients (energy from fat, carbohydrates, and protein in proportions appropriate for age, as recommended by Dietary Reference Intakes); (*d*) initiating and maintaining breastfeeding; (*e*) participating in 60 minutes of moderate to vigorous physical activity per day for children of healthy weight (the 60 minutes can be accumulated throughout the day, rather than in single or long bouts; ideally, such activity should be enjoyable to the child); and (*f*) limiting consumption of energy-dense foods.

Practice- and Community-Level Interventions

1. The expert committee recommends that physicians, allied health care professionals, and professional organizations (*a*) advocate for the federal government to increase physical activity at schools through intervention programs from grade 1 through the end of high school and college and through the creation of school environments that support physical activity in general and (*b*) support efforts to preserve and to enhance parks as areas for physical activity, inform local development initiatives regarding the inclusion of walking and bicycle paths, and promote families' use of local physical options by making information and suggestions about physical activity alternatives available in doctors' offices.
2. The expert committee recommends the use of the following techniques to aid physicians and allied health care providers who may wish to support obesity prevention in clinical, school, and community settings: (*a*) actively engaging families with parental obesity or maternal diabetes, because these children are at increased risk for developing obesity even if they currently have normal BMI; (*b*) encouraging an authoritative parenting style (authoritative parents are both demanding and responsive) in support of increased physical activity and reduced sedentary behavior, providing tangible and motivational support for children; (*c*) discouraging a restrictive parenting style (restrictive parenting involves heavy monitoring and controlling of a child's behavior) regarding child eating; (*d*) encouraging parents to model healthy diets and portions sizes, physical activity, and limited television time; and (*e*) promoting physical activity at school and in child care settings (including after-school programs) by asking children and parents about activity in these settings during routine office visits.

APPENDIX: 15-MINUTE OBESITY PREVENTION PROTOCOL

Step 1: Assess

Weight/Height

Explain what you are assessing and why. Convert weight and height data to BMI percentile. Provide BMI percentile. Elicit and probe parent/child reactions. Reflect and probe.

Diet

Assess intake of fruit and vegetables (suggested measure: 2 items on daily usual intake; measure can be provided in handout), sweetened beverages (suggested measure: 2 items on daily usual intake; measure can be provided in handout), and fast food (suggested measure: 1 item on weekly average of meals at fast food establishments).

Activity

Assess sedentary time/screen time (suggested measure: 2 items on hours per day of television/video games/movies/computer; measure can be provided in handout) and daily activity (at least 60 minutes/day of moderate-to-vigorous activity).

Optional Behaviors to Assess

Consider assessing breakfast consumption (suggested measure not established), portion sizes (suggested measure not established), and family meals (suggested measure not established).

Provide/Elicit

Provide positive feedback for behavior(s) in optimal range. Elicit response. Reflect and probe. Provide behavior(s) not in optimal range. Elicit response. Reflect and probe.

Step 2: Set Agenda

Query which, if any, of the target behaviors not in the optimal range the parent/child/adolescent may be interested in changing or may be easiest to change. Sample language is as follows. Which, if any, of these might you and your child be able to change? Which of these might be a good place to start? Which of these do you think might be the easiest one to start with? Agree on possible target behaviors.

Step 3: Assess Motivation and Confidence

Willingness/Importance

Assess willingness and importance, as follows. On a scale of 0 to 10, with 10 being very important, how important is it for you/child/family to change (insert target behavior) or to lose weight?

Confidence

Assess confidence, as follows. On a scale of 0 to 10, with 10 being very confident, assuming you decided to change (insert target behavior) or weight, how confident are you that you/she/he could succeed?

Probes

Explore importance and confidence ratings with the following probes. Why did you not choose a lower number (benefits)? Why did you not choose a higher number (barriers)? What would it take to move you to a higher number (solutions)? Use reflective statements to explore the advantages and disadvantages of changing.

Step 4: Summarize and Probe Possible Changes

Summarize the advantages and disadvantages of change. Query possible next steps. Sample language is as follows. So where does that leave you? From what you mentioned, it sounds like (insert target step) may be a good first step. How are you feeling about making a change? If change is indicated, probe the plan of attack. Sample language is as follows. What might be a good first step for you and your child? What might you do in the next week or even day to help move things along? What ideas do you have for making this happen? From our discussion, it sounds like (insert possible suggestions raised in session) might be a good place to start. If the patient has trouble generating ideas, consider offering the following: If it's okay with you, I'd like to suggest a few things that have worked for some of my patients. Summarize the change plan. Provide positive feedback.

Step 5: Schedule Follow-up Visit

If a change plan emerges, agree to follow up within *x* weeks/months. Sample language is as follows. Let's schedule a visit in the next few weeks/months to see how things went. If no change plan emerges, agree to revisit the topic within *x* weeks/months. Sample language is as follows. Sounds like you aren't quite ready to commit to making any changes now. How about we follow up with you at your next visit? Although you (or your family) do not sound ready to make any changes, between now and our next visit you might want to think about (insert discussion point raised in session).

REFERENCES

1. Olshansky SJ, Passaro DJ, Hershow RC, et al. A potential decline in life expectancy in the United States in the 21st century. *N Engl J Med.* 2005;352:1138–1145
2. Koplan JP, Liverman CT, Kraak VI, eds. *Preventing Childhood Obesity: Health in the Balance*. Washington, DC: National Academies Press; 2005
3. Childhood obesity. *Future Child.* 2006;16:1–224. Available at: www.futureofchildren.org/pubs-info2825/pubs-info_show.htm?doc_id=349724. Accessed June 1, 2007
4. American Dietetic Association. Childhood Overweight Evidence Analysis Project: updated 2006. Available at: www.adaevidencelibrary.com/topic.cfm?cat=1046. Accessed June 1, 2007
5. Johnson RK, Hankin JH. Dietary intake methodology. In: Monsen ER, ed. *Research: Successful Approaches.* 2nd ed. Chicago, IL: American Dietetic Association; 2003
6. Johnson RK. Dietary intake: how do we measure what people are really eating? *Obes Res.* 2002;10(suppl 1):63S–68S
7. Bandini LG, Must A, Cyr H, Anderson SE, Spadano JL, Dietz WH. Longitudinal changes in the accuracy of reported energy intake in girls 10–15 y of age. *Am J Clin Nutr.* 2003;78:480–484
8. Huang TT, Howarth NC, Lin BH, Roberts SB, McCrory MA. Energy intake and meal portions: associations with BMI percentile in US children. *Obes Res.* 2004;12:1875–1885
9. Francis LA, Lee Y, Birch LL. Parental weight status and girls' television viewing, snacking, and body mass indexes. *Obes Res.* 2003;11:143–151
10. Magarey AM, Daniels LA, Boulton TJ, Cockington RA. Does fat intake predict adiposity in healthy children and adolescents aged 2–15 y? A longitudinal analysis. *Eur J Clin Nutr.* 2001;55:471–481
11. Lee Y, Mitchell DC, Smiciklas-Wright H, Birch LL. Diet quality, nutrient intake, weight status, and feeding environments of girls meeting or exceeding recommendations for total dietary fat of the American Academy of Pediatrics. *Pediatrics.* 2001;107(6). Available at: www.pediatrics.org/cgi/content/full/107/6/e95
12. Davison KK, Birch LL. Child and parent characteristics as predictors of change in girls' body mass index. *Int J Obes Relat Metab Disord.* 2001;25:1834–1842
13. Carruth BR, Skinner JD. The role of dietary calcium and other nutrients in moderating body fat in preschool children. *Int J Obes Relat Metab Disord.* 2001;25:559–566
14. Berkey CS, Rockett HR, Field AE, et al. Activity, dietary intake, and weight changes in a longitudinal study of preadolescent and adolescent boys and girls. *Pediatrics.* 2000;105(4). Available at: www.pediatrics.org/cgi/content/full/105/4/e56
15. Scaglioni S, Agostoni C, Notaris RD, et al. Early macronutrient

intake and overweight at five years of age. *Int J Obes Relat Metab Disord.* 2000;24:777–781
16. Alexy U, Sichert-Hellert W, Kersting M, Manz F, Schöch G. Fruit juice consumption and the prevalence of obesity and short stature in German preschool children: results of the DONALD Study: Dortmund Nutritional and Anthropometrical Longitudinally Designed. *J Pediatr Gastroenterol Nutr.* 1999; 29:343–349
17. Robertson SM, Cullen KW, Baranowski J, Baranowski T, Hu S, de Moor C. Factors related to adiposity among children aged 3 to 7 years. *J Am Diet Assoc.* 1999;99:938–943
18. Maffeis C, Talamini G, Tatò L. Influence of diet, physical activity and parents' obesity on children's adiposity: a four-year longitudinal study. *Int J Obes Relat Metab Disord.* 1998;22: 758–764
19. Klesges RC, Klesges LM, Eck LH, Shelton ML. A longitudinal analysis of accelerated weight gain in preschool children. *Pediatrics.* 1995;95:126–130
20. Boulton TJ, Magarey AM. Effects of differences in dietary fat on growth, energy and nutrient intake from infancy to eight years of age. *Acta Paediatr.* 1995;84:146–150
21. Rolland-Cachera MF, Deheeger M, Akrout M, Bellisle F. Influence of macronutrients on adiposity development: a follow up study of nutrition and growth from 10 months to 8 years of age. *Int J Obes Relat Metab Disord.* 1995;19:573–578
22. Shea S, Basch CE, Stein AD, Contento IR, Irigoyen M, Zybert P. Is there a relationship between dietary fat and stature or growth in children three to five years of age? *Pediatrics.* 1993; 92:579–586
23. Eck LH, Klesges RC, Hanson CL, Slawson D. Children at familial risk for obesity: an examination of dietary intake, physical activity and weight status. *Int J Obes Relat Metab Disord.* 1992;16:71–78
24. Skinner JD, Bounds W, Carruth BR, Morris M, Ziegler P. Predictors of children's body mass index: a longitudinal study of diet and growth in children aged 2–8 y. *Int J Obes Relat Metab Disord.* 2004;28:476–482
25. Wang Y, Ge K, Popkin BM. Why do some overweight children remain overweight, whereas others do not? *Public Health Nutr.* 2003;6:549–558
26. Fisher JO, Mitchell DC, Smiciklas-Wright H, Mannino ML, Birch LL. Meeting calcium recommendations during middle childhood reflects mother-daughter beverage choices and predicts bone mineral status. *Am J Clin Nutr.* 2004;79: 698–706
27. Phillips SM, Bandini LG, Cyr H, Colclough-Douglas S, Naumova E, Must A. Dairy food consumption and body weight and fatness studied longitudinally over the adolescent period. *Int J Obes Relat Metab Disord.* 2003;27:1106–1113
28. Ortega RM, Requejo AM, Andrés P, López-Sobaler AM, Redondo R, González-Fernández M. Relationship between diet composition and body mass index in a group of Spanish adolescents. *Br J Nutr.* 1995;74:765–773
29. Tanasescu M, Ferris AM, Himmelgreen DA, Rodriguez N, Pérez-Escamilla R. Biobehavioral factors are associated with obesity in Puerto Rican children. *J Nutr.* 2000;130:1734–1742
30. Skinner JD, Bounds W, Carruth BR, Ziegler P. Longitudinal calcium intake is negatively related to children's body fat indexes. *J Am Diet Assoc.* 2003;103:1626–1631
31. Rockett HR, Berkey CS, Field AE, Colditz GA. Cross-sectional measurement of nutrient intake among adolescents in 1996. *Prev Med.* 2001;33:27–37
32. Albertson AM, Anderson GH, Crockett SJ, Goebel MT. Ready-to-eat cereal consumption: its relationship with BMI and nutrient intake of children aged 4 to 12 years. *J Am Diet Assoc.* 2003;103:1613–1619
33. Novotny R, Acharya S, Grove JS, Daida YG, Vogt TM. Higher dairy intake is associated with lower body fat during adolescence. *FASEB J.* 2003;17:A453–A458
34. Baranowski T, Smith M, Hearn MD, et al. Patterns in children's fruit and vegetable consumption by meal and day of the week. *J Am Coll Nutr.* 1997;16:216–223
35. Newby PK, Peterson KE, Berkey CS, Leppert J, Willett WC, Colditz GA. Dietary composition and weight change among low-income preschool children. *Arch Pediatr Adolesc Med.* 2003;157:759–764
36. Sugimori H, Yoshida K, Izuno T, et al. Analysis of factors that influence body mass index from ages 3 to 6 years: a study based on the Toyama Cohort Study. *Pediatr Int.* 2004;46: 302–310
37. Bandini LG, Vu D, Must A, Cyr H, Goldberg A, Dietz WH. Comparison of high-calorie, low-nutrient-dense food consumption among obese and non-obese adolescents. *Obes Res.* 1999;7:438–443
38. Newby PK, Peterson KE, Berkey CS, Leppert J, Willett WC, Colditz GA. Beverage consumption is not associated with changes in weight and body mass index among low-income preschool children in North Dakota. *J Am Diet Assoc.* 2004; 104:1086–1094
39. Melgar-Quiñonez HR, Kaiser LL. Relationship of child-feeding practices to overweight in low-income Mexican-American preschool-aged children. *J Am Diet Assoc.* 2004;104: 1110–1119
40. Gillis LJ, Bar-Or O. Food away from home, sugar-sweetened drink consumption and juvenile obesity. *J Am Coll Nutr.* 2003; 22:539–545
41. Neumark-Sztainer D, Story M, Resnick MD, Blum RW. Correlates of inadequate fruit and vegetable consumption among adolescents. *Prev Med.* 1996;25:497–505
42. Boutelle K, Neumark-Sztainer D, Story M, Resnick M. Weight control behaviors among obese, overweight, and nonoverweight adolescents. *J Pediatr Psychol.* 2002;27:531–540
43. Hanley AJ, Harris SB, Gittelsohn J, Wolever TM, Saksvig B, Zinman B. Overweight among children and adolescents in a Native Canadian community: prevalence and associated factors. *Am J Clin Nutr.* 2000;71:693–700
44. Brewis A. Biocultural aspects of obesity in young Mexican schoolchildren. *Am J Hum Biol.* 2003;15:446–460
45. Skinner JD, Carruth BR, Moran J, Houck K, Coletta F. Fruit juice intake is not related to children's growth. *Pediatrics.* 1999;103:58–64
46. Berkey CS, Rockett HR, Field AE, Gillman MW, Colditz GA. Sugar-added beverages and adolescent weight change. *Obes Res.* 2004;12:778–788
47. Skinner JD, Carruth BR. A longitudinal study of children's juice intake and growth: the juice controversy revisited. *J Am Diet Assoc.* 2001;101:432–437
48. Forshee RA, Storey ML. Total beverage consumption and beverage choices among children and adolescents. *Int J Food Sci Nutr.* 2003;54:297–307
49. Riddick H, Kramer-LeBlanc C, Bowman SA, Davis C. *Is Fruit Juice Dangerous for Children? Nutrition Insights.* Washington, DC: US Department of Agriculture, Center for Nutrition Policy and Promotion; 1997
50. Dennison BA, Rockwell HL, Nichols MJ, Jenkins P. Children's growth parameters vary by type of fruit juice consumed. *J Am Coll Nutr.* 1999;18:346–352
51. Dennison BA, Rockwell HL, Baker SL. Excess fruit juice consumption by preschool-aged children is associated with short stature and obesity. *Pediatrics.* 1997;99:15–22
52. Kloeblen-Tarver AS. Fruit juice consumption not related to growth among preschool-aged children enrolled in the WIC program. *J Am Diet Assoc.* 2001;101:996
53. Ariza AJ, Chen EH, Binns HJ, Christoffel KK. Risk factors for

overweight in five- to six-year-old Hispanic-American children: a pilot study. *J Urban Health.* 2004;81:150–161
54. American Academy of Pediatrics, Committee on Nutrition. The use and misuse of fruit juice in pediatrics. *Pediatrics.* 2001;107:1210–1213
55. Giammattei J, Blix G, Marshak HH, Wollitzer AO, Pettitt DJ. Television watching and soft drink consumption: associations with obesity in 11- to 13-year-old schoolchildren. *Arch Pediatr Adolesc Med.* 2003;157:882–886
56. James J, Thomas P, Cavan D, Kerr D. Preventing childhood obesity by reducing consumption of carbonated drinks: cluster randomised controlled trial. *BMJ.* 2004;328:1237
57. Lin BH, Huang CL, French SA. Factors associated with women's and children's body mass indices by income status. *Int J Obes Relat Metab Disord.* 2004;28:536–542
58. Ludwig DS, Peterson KE, Gortmaker SL. Relation between consumption of sugar-sweetened drinks and childhood obesity: a prospective, observational analysis. *Lancet.* 2001; 357:505–508
59. Mrdjenovic G, Levitsky DA. Nutritional and energetic consequences of sweetened drink consumption in 6- to 13-year-old children. *J Pediatr.* 2003;142:604–610
60. Nicklas TA, Yang SJ, Baranowski T, Zakeri I, Berenson G. Eating patterns and obesity in children: the Bogalusa Heart Study. *Am J Prev Med.* 2003;25:9–16
61. Phillips SM, Bandini LG, Naumova EN, et al. Energy-dense snack food intake in adolescence: longitudinal relationship to weight and fatness. *Obes Res.* 2004;12:461–472
62. Rodríguez-Artalejo F, García EL, Gorgojo L, et al. Consumption of bakery products, sweetened soft drinks and yogurt among children aged 6–7 years: association with nutrient intake and overall diet quality. *Br J Nutr.* 2003;89:419–429
63. Troiano RP, Briefel RR, Carroll MD, Bialostosky K. Energy and fat intakes of children and adolescents in the United States: data from the National Health and Nutrition Examination Surveys. *Am J Clin Nutr.* 2000;72(suppl):1343S–1353S
64. Murphy M, Douglass J, Latulippe M, Barr S, Johnson RK, Frye C. Beverages as a source of energy and nutrients in diets of children and adolescents. *FASEB J.* 2005;19:A434
65. Welsh JA, Cogswell ME, Rogers S, Rockett H, Mei Z, Grummer-Strawn LM. Overweight among low-income preschool children associated with the consumption of sweet drinks: Missouri, 1999–2002. *Pediatrics.* 2005;115(2). Available at: www.pediatrics.org/cgi/content/full/115/2/e223
66. American Academy of Pediatrics, Committee on School Health. Soft drinks in schools. *Pediatrics.* 2004;113:152–154
67. US Department of Health and Human Services, US Department of Agriculture. *Dietary Guidelines for Americans, 2005*. 6th ed. Washington, DC: US Government Printing Office; 2005
68. Berkey CS, Rockett HR, Gillman MW, Colditz GA. One-year changes in activity and in inactivity among 10- to 15-year-old boys and girls: relationship to change in body mass index. *Pediatrics.* 2003;111:836–843
69. Siega-Riz AM, Carson T, Popkin B. Three squares or mostly snacks: what do teens really eat? A sociodemographic study of meal patterns. *J Adolesc Health.* 1998;22:29–36
70. Dwyer JT, Evans M, Stone EJ, et al. Adolescents' eating patterns influence their nutrient intakes. *J Am Diet Assoc.* 2001;101:798–802
71. Nicklas TA, Morales M, Linares A, et al. Children's meal patterns have changed over a 21-year period: the Bogalusa Heart Study. *J Am Diet Assoc.* 2004;104:753–761
72. O'Dea JA, Caputi P. Association between socioeconomic status, weight, age and gender, and the body image and weight control practices of 6- to 19-year-old children and adolescents. *Health Educ Res.* 2001;16:521–532
73. Ortega RM, Requejo AM, López-Sobaler AM, et al. Difference in the breakfast habits of overweight/obese and normal weight schoolchildren. *Int J Vitam Nutr Res.* 1998;68:125–132
74. Pastore DR, Fisher M, Friedman SB. Abnormalities in weight status, eating attitudes, and eating behaviors among urban high school students: correlations with self-esteem and anxiety. *J Adolesc Health.* 1996;18:312–319
75. Sampson AE, Dixit S, Meyers AF, Houser R. The nutritional impact of breakfast consumption on the diets of inner-city African-American elementary school children. *J Natl Med Assoc.* 1995;87:195–202
76. Sekine M, Yamagami T, Hamanishi S, et al. Parental obesity, lifestyle factors and obesity in preschool children: results of the Toyama Birth Cohort study. *J Epidemiol.* 2002;12:33–39
77. Summerbell CD, Moody RC, Shanks J, Stock MJ, Geissler C. Relationship between feeding pattern and body mass index in 220 free-living people in four age groups. *Eur J Clin Nutr.* 1996;50:513–519
78. Wolfe WS, Campbell CC, Frongillo EA, Haas JD, Melnik TA. Overweight schoolchildren in New York State: prevalence and characteristics. *Am J Public Health.* 1994;84:807–813
79. Thompson OM, Ballew C, Resnicow K, et al. Food purchased away from home as a predictor of change in BMI *z*-score among girls. *Int J Obes Relat Metab Disord.* 2004;28:282–289
80. Ebbeling CB, Sinclair KB, Pereira MA, Garcia-Lago E, Feldman HA, Ludwig DS. Compensation for energy intake from fast food among overweight and lean adolescents. *JAMA.* 2004;291:2828–2833
81. French SA, Story M, Neumark-Sztainer D, Fulkerson JA, Hannan P. Fast food restaurant use among adolescents: associations with nutrient intake, food choices and behavioral and psychosocial variables. *Int J Obes Relat Metab Disord.* 2001;25: 1823–1833
82. Kelishadi R, Pour MH, Sarraf-Zadegan N, et al. Obesity and associated modifiable environmental factors in Iranian adolescents: Isfahan Healthy Heart Program: Heart Health Promotion from Childhood. *Pediatr Int.* 2003;45:435–442
83. Mikkilä V, Lahti-Koski M, Pietinen P, Virtanen SM, Rimpelä M. Associates of obesity and weight dissatisfaction among Finnish adolescents. *Public Health Nutr.* 2003;6:49–56
84. Orlet Fisher J, Rolls BJ, Birch LL. Children's bite size and intake of an entrée are greater with large portions than with age-appropriate or self-selected portions. *Am J Clin Nutr.* 2003;77:1164–1170
85. McConahy KL, Smiciklas-Wright H, Birch LL, Mitchell DC, Picciano MF. Food portions are positively related to energy intake and body weight in early childhood. *J Pediatr.* 2002; 140:340–347
86. Mrdjenovic G, Levitsky DA. Children eat what they are served: the imprecise regulation of energy intake. *Appetite.* 2005;44:273–282
87. McConahy KL, Smiciklas-Wright H, Mitchell DC, Picciano MF. Portion size of common foods predicts energy intake among preschool-aged children. *J Am Diet Assoc.* 2004;104: 975–979
88. Locard E, Mamelle N, Billette A, Miginiac M, Munoz F, Rey S. Risk factors of obesity in a five year old population: parental versus environmental factors. *Int J Obes Relat Metab Disord.* 1992;16:721–729
89. Maffeis C, Provera S, Filippi L, et al. Distribution of food intake as a risk factor for childhood obesity. *Int J Obes Relat Metab Disord.* 2000;24:75–80
90. Takahashi E, Yoshida K, Sugimori H, et al. Influence factors on the development of obesity in 3-year-old children based on the Toyama study. *Prev Med.* 1999;28:293–296
91. Field AE, Austin SB, Gillman MW, Rosner B, Rockett HR, Colditz GA. Snack food intake does not predict weight change

among children and adolescents. *Int J Obes Relat Metab Disord.* 2004;28:1210–1216
92. Gillman MW, Rifas-Shiman SL, Frazier AL, et al. Family dinner and diet quality among older children and adolescents. *Arch Fam Med.* 2000;9:235–240
93. Videon TM, Manning CK. Influences on adolescent eating patterns: the importance of family meals. *J Adolesc Health.* 2003;32:365–373
94. Taveras EM, Rifas-Shiman SL, Berkey CS, et al. Family dinner and adolescent overweight. *Obes Res.* 2005;13:900–906
95. Wardle J, Sanderson S, Guthrie CA, Rapoport L, Plomin R. Parental feeding style and the inter-generational transmission of obesity risk. *Obes Res.* 2002;10:453–462
96. Baughcum AE, Powers SW, Johnson SB, et al. Maternal feeding practices and beliefs and their relationships to overweight in early childhood. *J Dev Behav Pediatr.* 2001;22:391–408
97. Saelens BE, Ernst MM, Epstein LH. Maternal child feeding practices and obesity: a discordant sibling analysis. *Int J Eat Disord.* 2000;27:459–463
98. Koivisto UK, Fellenius J, Sjödén PO. Relations between parental mealtime practices and children's food intake. *Appetite.* 1994;22:245–257
99. Robinson TN, Kiernan M, Matheson DM, Haydel KF. Is parental control over children's eating associated with childhood obesity? Results from a population-based sample of third graders. *Obes Res.* 2001;9:306–312
100. Johnson SL, Birch LL. Parents' and children's adiposity and eating style. *Pediatrics.* 1994;94:653–661
101. Haskell WL. J.B. Wolffe Memorial Lecture: health consequences of physical activity: understanding and challenges regarding dose-response. *Med Sci Sports Exerc.* 1994;26:649–660
102. Haskell WL. Dose-response issues from a biological perspective. In: Bouchard C, Shephard RJ, Stephens T, eds. *Physical Activity, Fitness, and Health: International Proceeding as Consensus Statement*. Champaign, IL: Human Kinetics Books; 1994:1030–1039
103. Brownson RC, Boehmer TK, Luke DA. Declining rates of physical activity in the United States: what are the contributors? *Annu Rev Public Health.* 2005;26:421–443
104. Adams J. Trends in physical activity and inactivity amongst US 14–18 year olds by gender, school grade and race, 1993–2003: evidence from the Youth Risk Behavior Survey. *BMC Public Health.* 2006;6:57
105. Eisenmann JC, Katzmarzyk PT, Tremblay MS. Leisure-time physical activity among Canadian adolescents, 1981–1998. *J Phys Act Health.* 2004;1:154–162
106. Dollman J, Norton K, Norton L. Evidence for secular trends in children's physical activity behaviour. *Br J Sports Med.* 2005;39:892–897
107. Simons-Morton BG, McKenzie TJ, Stone E, et al. Physical activity in a multiethnic population of third graders in four states. *Am J Public Health.* 1997;87:45–50
108. Higgins JW, Gaul C, Gibbons S, Van Gyn G. Factors influencing physical activity levels among Canadian youth. *Can J Public Health.* 2003;94:45–51
109. National Center for Chronic Disease Prevention and Health Promotion. *Physical Activity and Health: A Report of the Surgeon General*. Atlanta, GA: Centers for Disease Control and Prevention; 1996
110. Salmon J, Timperio A, Cleland V, Venn A. Trends in children's physical activity and weight status in high and low socio-economic status areas of Melbourne, Victoria, 1985–2001. *Aust N Z J Public Health.* 2005;29:337–342
111. Harris KM, Gordon-Larsen P, Chantala K, Udry JR. Longitudinal trends in race/ethnic disparities in leading health indicators from adolescence to young adulthood. *Arch Pediatr Adolesc Med.* 2006;160:74–81
112. Gordon-Larsen P, Nelson MC, Popkin BM. Longitudinal physical activity and sedentary behavior trends: adolescence to adulthood. *Am J Prev Med.* 2004;27:277–283
113. Lowry R, Wechsler H, Kann L, Collins JL. Recent trends in participation in physical education among US high school students. *J Sch Health.* 2001;71:145–152
114. Nader PR, National Institute of Child Health and Human Development Study of Early Child Care and Youth Development Network. Frequency and intensity of activity of third-grade children in physical education. *Arch Pediatr Adolesc Med.* 2003;157:185–190
115. Health Canada, Population and Public Health Branch. Exercise and leisure activities. In: *Trends in the Health of Canadian Youth.* Ottawa, Ontario, Canada: Health Canada; 1999
116. Wilson DK, Williams J, Evans A, Mixon G, Rheaume C. Brief report: a qualitative study of gender preferences and motivational factors for physical activity in underserved adolescents. *J Pediatr Psychol.* 2005;30:293–297
117. Aaron DJ, Storti KL, Robertson RJ, Kriska AM, LaPorte RE. Longitudinal study of the number and choice of leisure time physical activities from mid to late adolescence: implications for school curricula and community recreation programs. *Arch Pediatr Adolesc Med.* 2002;156:1075–1080
118. Mota J, Esculcas C. Leisure-time physical activity behavior: structured and unstructured choices according to sex, age, and level of physical activity. *Int J Behav Med.* 2002;9:111–121
119. Jago R, Anderson CB, Baranowski T, Watson K. Adolescent patterns of physical activity differences by gender, day, and time of day. *Am J Prev Med.* 2005;28:447–452
120. Nelson MC, Gordon-Larsen P, Adair LS, Popkin BM. Adolescent physical activity and sedentary behavior: patterning and long-term maintenance. *Am J Prev Med.* 2005;28:259–266
121. Mota J, Santos P, Guerra S, Ribeiro JC, Duarte JA. Patterns of daily physical activity during school days in children and adolescents. *Am J Hum Biol.* 2003;15:547–553
122. Brodersen NH, Steptoe A, Williamson S, Wardle J. Sociodemographic, developmental, environmental, and psychological correlates of physical activity and sedentary behavior at age 11 to 12. *Ann Behav Med.* 2005;29:2–11
123. Sallis JF, Zakarian JM, Hovell MF, Hofstetter CR. Ethnic, socioeconomic, and sex differences in physical activity among adolescents. *J Clin Epidemiol.* 1996;49:125–134
124. Sallis JF, Alcaraz JE, McKenzie TL, Hovell MF. Predictors of change in children's physical activity over 20 months: variations by gender and level of adiposity. *Am J Prev Med.* 1999;16:222–229
125. Maia JA, Thomis M, Beunen G. Genetic factors in physical activity levels: a twin study. *Am J Prev Med.* 2002;23(suppl):87–91
126. Stubbe JH, Boomsma DI, De Geus EJ. Sports participation during adolescence: a shift from environmental to genetic factors. *Med Sci Sports Exerc.* 2005;37:563–570
127. Vilhjalmsson R, Kristjansdottir G. Gender differences in physical activity in older children and adolescents: the central role of organized sport. *Soc Sci Med.* 2003;56:363–374
128. Ashford B, Biddle S, Goudas M. Participation in community sports centres: motives and predictors of enjoyment. *J Sports Sci.* 1993;11:249–256
129. Biddle SJ, Gorely T, Stensel DJ. Health-enhancing physical activity and sedentary behaviour in children and adolescents. *J Sports Sci.* 2004;22:679–701
130. Tergerson JL, King KA. Do perceived cues, benefits, and barriers to physical activity differ between male and female adolescents? *J Sch Health.* 2002;72:374–380
131. Anderssen N, Wold B. Parental and peer influences on lei-

sure-time physical activity in young adolescents. *Res Q Exerc Sport.* 1992;63:341–348
132. Duncan SC, Duncan TE, Strycker LA. Sources and types of social support in youth physical activity. *Health Psychol.* 2005; 24:3–10
133. Hume C, Salmon J, Ball K. Children's perceptions of their home and neighborhood environments, and their association with objectively measured physical activity: a qualitative and quantitative study. *Health Educ Res.* 2005;20:1–13
134. Sallis JF, Conway TL, Prochaska JJ, McKenzie TL, Marshall SJ, Brown M. The association of school environments with youth physical activity. *Am J Public Health.* 2001;91:618–620
135. McKenzie TL, Marshall SJ, Sallis JF, Conway TL. Leisure-time physical activity in school environments: an observational study using SOPLAY. *Prev Med.* 2000;30:70–77
136. Tudor-Locke C, Ainsworth BE, Popkin BM. Active commuting to school: an overlooked source of childrens' physical activity? *Sports Med.* 2001;31:309–313
137. US Department of Transportation, Federal Highway Administration. *1969 National Personal Transportation Survey: Travel to School*. Washington, DC: US Department of Transportation; 1972
138. US Environmental Protection Agency. *Travel and Environmental Implications of School Siting*. Washington, DC: US Environmental Protection Agency; 2003
139. Marshall SJ, Gorely T, Biddle SJ. A descriptive epidemiology of screen-based media use in youth: a review and critique. *J Adolesc.* 2006;29:333–349
140. Molnár D, Livingstone B. Physical activity in relation to overweight and obesity in children and adolescents. *Eur J Pediatr.* 2000;159(suppl 1):S45–S55
141. Ross JG, Pate RR. The National Children and Youth Fitness Study II: a summary of findings. *J Phys Educ Recreat Dance.* 1987;58:51–56
142. Marti B, Vartiainen E. Relation between leisure time exercise and cardiovascular risk factors among 15-year-olds in eastern Finland. *J Epidemiol Community Health.* 1989;43:228–233
143. Roberts SB, Savage J, Coward WA, Chew B, Lucas A. Energy expenditure and intake in infants born to lean and overweight mothers. *N Engl J Med.* 1988;318:461–466
144. Moore LL, Nguyen US, Rothman KJ, Cupples LA, Ellison RC. Preschool physical activity level and change in body fatness in young children: the Framingham Children's Study. *Am J Epidemiol.* 1995;142:982–988
145. Goran MI, Shewchuk R, Gower BA, Nagy TR, Carpenter WH, Johnson RK. Longitudinal changes in fatness in white children: no effect of childhood energy expenditure. *Am J Clin Nutr.* 1998;67:309–316
146. Davies PS, Day JM, Lucas A. Energy expenditure in early infancy and later body fatness. *Int J Obes (Lond).* 1991;15: 727–731
147. Beunen GP, Malina RM, Renson R, Simons J, Ostyn M, Lefevre J. Physical activity and growth, maturation and performance: a longitudinal study. *Med Sci Sports Exerc.* 1992; 24:576–585
148. Wareham NJ, van Sluijs EM, Ekelund U. Physical activity and obesity prevention: a review of the current evidence. *Proc Nutr Soc.* 2005;64:229–247
149. Mamalakis G, Kafatos A, Manios Y, Anagnostopoulou T, Apostolaki I. Obesity indices in a cohort of primary school children in Crete: a six year prospective study. *Int J Obes Relat Metab Disord.* 2000;24:765–771
150. Kimm SY, Barton BA, Obarzanek E, et al. Racial divergence in adiposity during adolescence: the NHLBI Growth and Health Study. *Pediatrics.* 2001;107(3). Available at: www.pediatrics.org/cgi/content/full/107/3/e34
151. Bogaert N, Steinbeck KS, Baur LA, Brock K, Bermingham MA. Food, activity and family: environmental vs biochemical predictors of weight gain in children. *Eur J Clin Nutr.* 2003; 57:1242–1249
152. O'Loughlin J, Gray-Donald K, Paradis G, Meshefedjian G. One- and two-year predictors of excess weight gain among elementary schoolchildren in multiethnic, low-income, inner-city neighborhoods. *Am J Epidemiol.* 2000;152:739–746
153. Horn OK, Paradis G, Potvin L, Macaulay AC, Desrosiers S. Correlates and predictors of adiposity among Mohawk children. *Prev Med.* 2001;33:274–281
154. Proctor MH, Moore LL, Gao D, et al. Television viewing and change in body fat from preschool to early adolescence: the Framingham Children's Study. *Int J Obes Relat Metab Disord.* 2003;27:827–833
155. Hancox RJ, Milne BJ, Poulton R. Association between child and adolescent television viewing and adult health: a longitudinal birth cohort study. *Lancet.* 2004;364:257–262
156. Tammelin T, Laitinen J, Nayha S. Change in the level of physical activity from adolescence into adulthood and obesity at the age of 31 years. *Int J Obes Relat Metab Disord.* 2004;28: 775–782
157. Moore LL, Gao D, Bradlee ML, et al. Does early physical activity predict body fat change throughout childhood? *Prev Med.* 2003;37:10–17
158. Figueroa-Colon R, Arani RB, Goran MI, Weinsier RL. Paternal body fat is a longitudinal predictor of changes in body fat in premenarcheal girls. *Am J Clin Nutr.* 2000;71:829–834
159. Treuth MS, Butte NF, Sorkin JD. Predictors of body fat gain in nonobese girls with a familial predisposition to obesity. *Am J Clin Nutr.* 2003;78:1212–1218
160. Wells JC, Ritz P. Physical activity at 9–12 months and fatness at 2 years of age. *Am J Hum Biol.* 2001;13:384–389
161. Johnson MS, Figueroa-Colon R, Herd SL, et al. Aerobic fitness, not energy expenditure, influences subsequent increase in adiposity in black and white children. *Pediatrics.* 2000; 106(4). Available at: www.pediatrics.org/cgi/content/full/106/4/e50
162. Kain J, Uauy R, Albala FV, Vio F, Cerda R, Leyton B. School-based obesity prevention in Chilean primary school children: methodology and evaluation of a controlled study. *Int J Obes Relat Metab Disord.* 2004;28:483–493
163. Sallis JF, McKenzie TL, Conway TL, et al. Environmental interventions for eating and physical activity: a randomized controlled trial in middle schools. *Am J Prev Med.* 2003;24: 209–217
164. McMurray RG, Harrell JS, Bangdiwala SI, Bradley CB, Deng S, Levine A. A school-based intervention can reduce body fat and blood pressure in young adolescents. *J Adolesc Health.* 2002;31:125–132
165. Sahota P, Rudolf MC, Dixey R, Hill AJ, Barth JH, Cade J. Randomised controlled trial of primary school based intervention to reduce risk factors for obesity. *BMJ.* 2001;323: 1029–1032
166. Robinson TN, Killen JD, Kraemer HC, et al. Dance and reducing television viewing to prevent weight gain in African-American girls: the Stanford GEMS pilot study. *Ethn Dis.* 2003;13(suppl 1):S65–S77
167. Baranowski T, Baranowski JC, Cullen KW, et al. The Fun, Food, and Fitness Project (FFFP): the Baylor GEMS pilot study. *Ethn Dis.* 2003;13(suppl 1):S30–S39
168. Caballero B, Clay T, Davis SM, et al. Pathways: a school-based, randomized controlled trial for the prevention of obesity in American Indian schoolchildren. *Am J Clin Nutr.* 2003; 78:1030–1038
169. Neumark-Sztainer D, Story M, Hannan PJ, Rex J. New Moves: a school-based obesity prevention program for adolescent girls. *Prev Med.* 2003;37:41–51

170. Pangrazi RP, Beighle A, Vehige T, Vack C. Impact of Promoting Lifestyle Activity for Youth (PLAY) on children's physical activity. *J Sch Health.* 2003;73:317–321
171. Warren JM, Henry CJ, Lightowler HJ, Bradshaw SM, Perwaiz S. Evaluation of a pilot school programme aimed at the prevention of obesity in children. *Health Promot Int.* 2003;18:287–296
172. Dennison BA, Russo TJ, Burdick PA, Jenkins PL. An intervention to reduce television viewing by preschool children. *Arch Pediatr Adolesc Med.* 2004;158:170–176
173. Bautista-Castaño I, Doreste J, Serra-Majem L. Effectiveness of interventions in the prevention of childhood obesity. *Eur J Epidemiol.* 2004;19:617–622
174. Ells LJ, Campbell K, Lidstone J, Kelly S, Lang R, Summerbell C. Prevention of childhood obesity. *Best Pract Res Clin Endocrinol Metab.* 2005;19:441–454
175. Luepker RV, Perry CL, McKinlay SM, et al. Outcomes of a field trial to improve children's dietary patterns and physical activity: the Child and Adolescent Trial for Cardiovascular Health. *JAMA.* 1996;275:768–776
176. Donnelly JE, Jacobsen DJ, Whatley JE, et al. Nutrition and physical activity program to attenuate obesity and promote physical and metabolic fitness in elementary school children. *Obes Res.* 1996;4:229–243
177. Gortmaker SL, Peterson K, Wiecha J, et al. Reducing obesity via a school-based interdisciplinary intervention among youth: Planet Health. *Arch Pediatr Adolesc Med.* 1999;153:409–418
178. Müller MJ, Asbeck I, Mast M, Langnäse K, Grund A. Prevention of obesity: more than an intention: concept and first results of the Kiel Obesity Prevention Study (KOPS). *Int J Obes Relat Metab Disord.* 2001;25(suppl 1):S66–S74
179. Flores R. Dance for health: improving fitness in African American and Hispanic adolescents. *Public Health Rep.* 1995;110:189–193
180. Stolley MR, Fitzgibbon ML. Effects of an obesity prevention program on the eating behavior of African American mothers and daughters. *Health Educ Behav.* 1997;24:152–164
181. Sallis JF, McKenzie TL, Alcaraz JE, Kolody B, Hovell MF, Nader PR. Project SPARK: effects of physical education on adiposity in children. *Ann NY Acad Sci.* 1993;699:127–136
182. Mo-suwan L, Pongprapai S, Junjana C, Puetpaiboon A. Effects of a controlled trial of a school-based exercise program on the obesity indexes of preschool children. *Am J Clin Nutr.* 1998;68:1006–1011
183. Robinson TN. Reducing children's television viewing to prevent obesity: a randomized controlled trial. *JAMA.* 1999;282:1561–1567
184. Strong WB, Malina RM, Blimkie CJ, et al. Evidence based physical activity for school-age youth. *J Pediatr.* 2005;146:732–737
185. Marshall SJ, Biddle SJ, Gorely T, Cameron N, Murdey I. Relationships between media use, body fatness and physical activity in children and youth: a meta-analysis. *Int J Obes Relat Metab Disord.* 2004;28:1238–1246
186. Stettler N, Signer TM, Suter PM. Electronic games and environmental factors associated with childhood obesity in Switzerland. *Obes Res.* 2004;12:896–903
187. Kautiainen S, Koivusilta L, Lintonen T, Virtanen SM, Rimpelä A. Use of information and communication technology and prevalence of overweight and obesity among adolescents. *Int J Obes (Lond).* 2005;29:925–933
188. Lowry R, Wechsler H, Galuska DA, Fulton JE, Kann L. Television viewing and its associations with overweight, sedentary lifestyle, and insufficient consumption of fruits and vegetables among US high school students: differences by race, ethnicity, and gender. *J Sch Health.* 2002;72:413–421
189. Viner RM, Cole TJ. Television viewing in early childhood predicts adult body mass index. *J Pediatr.* 2005;147:429–435
190. Elgar FJ, Roberts C, Moore L, Tudor-Smith C. Sedentary behaviour, physical activity and weight problems in adolescents in Wales. *Public Health.* 2005;119:518–524
191. Cohen RY, Felix MR, Brownell KD. The role of parents and older peers in school-based cardiovascular prevention programs: implications for program development. *Health Educ Q.* 1989;16:245–253
192. Black C, Ford-Gilboe M. Adolescent mothers: resilience, family health work and health-promoting practices. *J Adv Nurs.* 2004;48:351–360
193. Johnson G, Kent G, Leather J. Strengthening the parent-child relationship: a review of family interventions and their use in medical settings. *Child Care Health Dev.* 2005;31:25–32
194. Epstein LH, Valoski A, Wing RR, McCurley J. Ten-year outcomes of behavioral family-based treatment for childhood obesity. *Health Psychol.* 1994;13:373–383
195. Sallis JF, Prochaska JJ, Taylor WC. A review of correlates of physical activity of children and adolescents. *Med Sci Sports Exerc.* 2000;32:963–975
196. Kremers SP, Brug J, de Vries H, Engels RC. Parenting style and adolescent fruit consumption. *Appetite.* 2003;41:43–50
197. Darling N, Steinberg L. Parenting style as context: an integrative model. *Psychol Bull.* 1993;113:487–496
198. Baumrind D. Current patterns of parental authority. *Dev Psychol Mongr.* 1971;4:1–103
199. Baumrind D. Familial antecedents of adolescent drug use: a developmental perspective. In: Jones CL, Battjes RJ, eds. *Etiology of Drug Abuse: Implications for Prevention: National Institute on Drug Abuse Research Monograph 56*. Washington, DC; US Government Printing Office; 1985:3–14. DHHS publication (ADM)85–1335
200. Jackson C, Gee-Gates DJ, Henirksen L. Authoritative parenting, child competencies, and initiation of cigarette smoking. *Health Educ Q.* 1994;21:103–116
201. Schmitz KH, Lytle LA, Phillips GA, Murray DM, Birnbaum AS, Kubik MY. Psychosocial correlates of physical activity and sedentary leisure habits in young adolescents: the Teens Eating for Energy and Nutrition at School study. *Prev Med.* 2002;34:266–278
202. Chassin L, Presson CC, Rose J, Sherman SJ, Davis MJ, Gonzalez JL. Parenting style and smoking-specific parenting practices as predictors of adolescent smoking onset. *J Pediatr Psychol.* 2005;30:333–344
203. Barker D. Developmental origins of adult health and disease. *J Epidemiol Community Health.* 2004;58:114–115
204. Dabelea D, Pettitt DJ. Intrauterine diabetic environment confers risks for type 2 diabetes mellitus and obesity in the offspring, in addition to genetic susceptibility. *J Pediatr Endocrinol Metab.* 2001;14:1085–1091
205. McMillen C, Robinson J. Developmental origins of the metabolic syndrome: prediction, plasticity, and programming. *Physiol Rev.* 2005;85:571–633
206. Barker DJ. The intrauterine origins of cardiovascular disease. *Acta Paediatr Suppl.* 1993;82(suppl 391):93–99
207. Owen CG, Martin RM, Whincup PH, Smith GD, Cook DG. Effect of infant feeding on the risk of obesity across the life course: a quantitative review of published evidence. *Pediatrics.* 2005;115:1367–1377
208. Owen CG, Martin RM, Whincup PH, Davey-Smith G, Gillman MW, Cook DG. The effect of breastfeeding on mean body mass index throughout life: a quantitative review of published and unpublished observational evidence. *Am J Clin Nutr.* 2005;82:1298–1307
209. Krebs NF, Jacobson MS, American Academy of Pediatrics,

Committee on Nutrition. Prevention of pediatric overweight and obesity. *Pediatrics.* 2003;112:424–430
210. Skinner JD, Carruth BR, Bounds W, Ziegler P. Children's food preferences: a longitudinal analysis. *J Am Diet Assoc.* 2002;102:1638–1647
211. Fox MK. What are infants and toddlers really eating? *Pediatr Basics.* 2004;108:2–11
212. Fox MK, Pac S, Devaney B, Jankowski L. Feeding Infants and Toddlers Study: what foods are infants and toddlers eating? *J Am Diet Assoc.* 2004;104(suppl 1):S22–S30
213. Dietz WH, Stern L, eds. *American Academy of Pediatrics Guide to Your Child's Nutrition: Making Peace at the Table and Building Healthy Eating Habits for Life*. New York, NY: Villard Press; 1999
214. Hood MY, Moore LL, Sundarajan-Ramamurti A, Singer MR, Cupples LA, Ellison RC. Parental eating attitudes and the development of obesity in children: the Framingham Children's Study. *Int J Obes Relat Metab Disord.* 2000;24:1319–1325
215. Dennison BA, Erb TA, Jenkins PL. Television viewing and television in bedroom associated with overweight risk among low income-preschool children. *Pediatrics.* 2002;109:1028–1035
216. Kaye K. *Family Rules: Raising Responsible Children*. New York, NY: Walker; 1986
217. Cleland V, Venn A, Fryer J, Dwyer T, Blizzard L. Parental exercise is associated with Australian children's extracurricular sports participation and cardiorespiratory fitness: a cross-sectional study. *Int J Behav Nutr Phys Act.* 2005;2:3
218. Epstein LH, Paluch RA, Gordy CC, Dorn J. Decreasing sedentary behaviors in treating pediatric obesity. *Arch Pediatr Adolesc Med.* 2000;154:220–226
219. Fogelholm M, Nuutinen O, Pasanen M, Myöhänen E, Säätelä T. Parent-child relationship of physical activity patterns and obesity. *Int J Obes Relat Metab Disord.* 1999;23:1262–1268
220. Trost SG, Sallis JF, Pate RR, Freedson PS, Taylor WC, Dowda M. Evaluating a model of parental influence on youth physical activity. *Am J Prev Med.* 2003;25:277–282
221. Jackson C. Perceived legitimacy of parental authority and tobacco and alcohol use during early adolescence. *J Adolesc Health.* 2002;31:425–432
222. Brown BB, Mounts N, Lamborn SD, Steinberg L. Parenting practices and peer group affiliation in adolescence. *Child Dev.* 1993;64:467–482
223. Ungar M. The importance of parents and other caregivers to the resilience of high-risk adolescents. *Fam Process.* 2004;43:23–41
224. Rhee KE, De Lago CW, Arscott-Mills T, Mehta SD, Davis RK. Factors associated with parental readiness to make changes for overweight children. *Pediatrics.* 2005;116(1). Available at: www.pediatrics.org/cgi/content/full/116/1/e94
225. Golan M, Fainaru M, Weizman A. Role of behaviour modification in the treatment of childhood obesity with the parents as the exclusive agents of change. *Int J Obes Relat Metab Disord.* 1998;22:1217–1224
226. Rollnick S, Butler CC, McCambridge J, Kinnersley P, Elwyn G, Resnicow K. Consultations about changing behaviour. *BMJ.* 2005;331:961–963
227. Williams GC, Cox EM, Kouides R, Deci EL. Presenting the facts about smoking to adolescents: effects of an autonomy-supportive style. *Arch Pediatr Adolesc Med.* 1999;153:959–964
228. Williams GC, Deci EL. Activating patients for smoking cessation through physician autonomy support. *Med Care.* 2001;39:813–823
229. Williams GC, Freedman ZR, Deci EL. Supporting autonomy to motivate patients with diabetes for glucose control. *Diabetes Care.* 1998;21:1644–1651
230. Williams GC, Rodin GC, Ryan RM, Grolnick WS, Deci EL. Autonomous regulation and long-term medication adherence in adult outpatients. *Health Psychol.* 1998;17:269–276
231. Stewart MA. Effective physician-patient communication and health outcomes: a review. *CMAJ.* 1995;152:1423–1433
232. Wanzer MB, Booth-Butterfield M, Gruber K. Perceptions of health care providers' communication: relationships between patient-centered communication and satisfaction. *Health Commun.* 2004;16:363–383
233. Roter DL, Hall JA. Physician gender and patient-centered communication: a critical review of empirical research. *Annu Rev Public Health.* 2004;25:497–519
234. Swenson SL, Buell S, Zettler P, White M, Ruston DC, Lo B. Patient-centered communication: do patients really prefer it? *J Gen Intern Med.* 2004;19:1069–1079
235. Rollnick S, Heather N, Gold R, Hall W. Development of a short "readiness to change" questionnaire for use in brief, opportunistic interventions among excessive drinkers. *Br J Addict.* 1992;87:743–754
236. Miller WR. Motivational interviewing with problem drinkers. *Behav Psychother.* 1983;11:147–172
237. Heather N, Rollnick S, Bell A, Richmond R. Effects of brief counselling among male heavy drinkers identified on general hospital wards. *Drug Alcohol Rev.* 1996;15:29–38
238. Kadden RM. Project MATCH: treatment main effects and matching results. *Alcohol Clin Exp Res.* 1996;20(suppl):196A–197A
239. Burke BL, Arkowitz H, Menchola M. The efficacy of motivational interviewing: a meta-analysis of controlled clinical trials. *J Consult Clin Psychol.* 2003;71:843–861
240. Dunn C, Deroo L, Rivara FP. The use of brief interventions adapted from motivational interviewing across behavioral domains: a systematic review. *Addiction.* 2001;96:1725–1742
241. Colby SM, Monti PM, Barnett NP, et al. Brief motivational interviewing in a hospital setting for adolescent smoking: a preliminary study. *J Consult Clin Psychol.* 1998;66:574–578
242. Ershoff DH, Quinn VP, Boyd NR, Stern J, Gregory M, Wirtschafter D. The Kaiser Permanente prenatal smoking-cessation trial: when more isn't better, what is enough? *Am J Prev Med.* 1999;17:161–168
243. Stott NC, Rollnick S, Rees MR, Pill RM. Innovation in clinical method: diabetes care and negotiating skills. *Fam Pract.* 1995;12:413–418
244. Miller WR. Motivational interviewing: research, practice, and puzzles. *Addict Behav.* 1996;21:835–842
245. Velasquez MM, Hecht J, Quinn VP, Emmons KM, DiClemente CC, Dolan-Mullen P. Application of motivational interviewing to prenatal smoking cessation: training and implementation issues. *Tob Control.* 2000;9(suppl 3):III36–III40
246. Berg-Smith SM, Stevens VJ, Brown KM, et al. A brief motivational intervention to improve dietary adherence in adolescents: the Dietary Intervention Study in Children (DISC) Research Group. *Health Educ Res.* 1999;14:399–410
247. Smith DE, Heckemeyer CM, Kratt PP, Mason DA. Motivational interviewing to improve adherence to a behavioral weight-control program for older obese women with NIDDM: a pilot study. *Diabetes Care.* 1997;20:52–54
248. Emmons KM, Rollnick S. Motivational interviewing in health care settings: opportunities and limitations. *Am J Prev Med.* 2001;20:68–74
249. Resnicow K, Jackson A, Wang T, et al. A motivational interviewing intervention to increase fruit and vegetable intake through black churches: results of the Eat for Life trial. *Am J Public Health.* 2001;91:1686–1693
250. DiIorio C, Resnicow K, Soet JE, McDonnell M, Yeager K. Motivational interviewing: a technique to promote medication adherence. *Res Theor Nurs Pract.* In press

251. Resnicow K, DiIorio C, Soet JE, Ernst D, Borrelli B, Hecht J. Motivational interviewing in health promotion: it sounds like something is changing. *Health Psychol.* 2002;21:444–451
252. Resnicow K, Davis R, Rollnick S. Motivational interviewing for pediatric obesity: conceptual issues and evidence review. *J Am Diet Assoc.* 2006;106:2024–2033
253. Butler C, Rollnick S, Cohen D, Bachmann M, Russell I, Stott N. Motivational consulting versus brief advice for smokers in general practice: a randomized trial. *Br J Gen Pract.* 1999;49: 611–616
254. Rollnick S, Miller WR. What is motivational interviewing? *Behav Cogn Psychother.* 1995;23:325–334
255. Rollnick S, Mason P, Butler C. *Health Behavior Change: A Guide for Practitioners*. Edinburgh, United Kingdom: Churchill Livingstone; 1999
256. Bem D. Self-perception theory. In: Berkowitz L, ed. *Advances in Experimental Social Psychology*. New York, NY: Academic Press; 1972:1–62
257. Rollnick S, Butler CC, Stott N. Helping smokers make decisions: the enhancement of brief intervention for general medical practice. *Patient Educ Couns.* 1997;31:191–203
258. Bodenheimer T, Wagner EH, Grumbach K. Improving primary care for patients with chronic illness. *JAMA.* 2002;288: 1775–1779
259. Bray P, Roupe M, Young S, Harrell J, Cummings DM, Whetstone LM. Feasibility and effectiveness of system redesign for diabetes care management in rural areas: the eastern North Carolina experience. *Diabetes Educ.* 2005;31:712–718
260. Hupke C, Camp AW, Chaufournier R, Langley GJ, Little K. Transforming diabetes health care, part 1: changing practice. *Diabetes Spectrum.* 2004;17:102–106
261. McCullough DK, Davis C, Austin BT, Wagner EH. Constructing a bridge across the quality chasm: a practical way to get healthier, happier patients, providers, and health care delivery systems. *Diabetes Spectrum.* 2004;17:92–96
262. Norris SL, Olson DE. Implementing evidence-based diabetes care in geriatric populations: the chronic care model. *Geriatrics.* 2004;59:35–40
263. Margolis PA, Lannon CM, Stuart JM, Fried BJ, Keyes-Elstein L, Moore DE. Practice based education to improve delivery systems for prevention in primary care: randomised trial. *BMJ.* 2004;328:388
264. Montoye CK, Mehta RH, Baker PL, et al. A rapid-cycle collaborative model to promote guidelines for acute myocardial infarction. *Jt Comm J Qual Saf.* 2003;29:468–478
265. Langley G, Nolan K, Nolan T, Norman C, Provost L. *The Improvement Guide: A Practical Approach to Enhancing Organizational Performance*. San Francisco, CA: Jossey-Bass; 1996
266. Heyding RK, Cheung AM, Mocarski EJ, Moineddin R, Hwang SW. A community-based intervention to increase screening mammography among disadvantaged women at an inner-city drop-in center. *Women Health.* 2005;41:21–31
267. Benin AL, Vitkauskas G, Thornquist E, et al. Validity of using an electronic medical record for assessing quality of care in an outpatient setting. *Med Care.* 2005;43:691–698
268. American Academy of Pediatrics. *Obesity and Related Comorbidities Coding Fact Sheet for Primary Care Pediatricians*. Elk Grove Village, IL: American Academy of Pediatrics; 2005
269. Story M, Kaphingst KM, French S. The role of schools in obesity prevention. *Future Child.* 2006;16:109–142
270. Center for Science in the Public Interest. *Dispensing Junk: How School Vending Undermines Efforts to Feed Children Well*. Washington, DC: Center for Science in the Public Interest; 2004
271. National Association for Sport and Physical Education. *Physical Activity for Children: A Statement of Guidelines for Children 5–12*. 2nd ed. Reston, VA: National Association for Sport and Physical Education; 2004
272. Story M, Kaphingst KM, French S. The role of child care settings in obesity prevention. *Future Child.* 2006;16:143–168
273. Sallis JF, Glanz K. The role of built environments in physical activity, eating, and obesity in childhood. *Future Child.* 2006; 16:89–108
274. Dorfman L, Wilbur P, Lingas EO, Woodruff K, Wallack L. *Accelerating Policy on Nutrition: Lessons From Tobacco, Alcohol, Firearms, and Traffic Safety*. Berkeley, CA: Media Studies Group of the Public Health Institute; 2005
275. Cotten A, Stanton KR, Acs ZJ, Lovegrove M. *The University of Baltimore Obesity Report Card.* Balitmore, MD: University of Baltimore; 2006

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