JAMA | US Preventive Services Task Force | RECOMMENDATION STATEMENT

Screening for Obesity in Children and Adolescents
US Preventive Services Task Force Recommendation Statement

US Preventive Services Task Force

IMPORTANCE Based on year 2000 Centers for Disease Control and Prevention growth charts, approximately 17% of children and adolescents aged 2 to 19 years in the United States have obesity, and almost 32% of children and adolescents are overweight or have obesity. Obesity in children and adolescents is associated with morbidity such as mental health and psychological issues, asthma, obstructive sleep apnea, orthopedic problems, and adverse cardiovascular and metabolic outcomes (eg, high blood pressure, abnormal lipid levels, and insulin resistance). Children and adolescents may also experience teasing and bullying behaviors based on their weight. Obesity in childhood and adolescence may continue into adulthood and lead to adverse cardiovascular outcomes or other obesity-related morbidity, such as type 2 diabetes.

SUBPOPULATION CONSIDERATIONS Although the overall rate of child and adolescent obesity has stabilized over the last decade after increasing steadily for 3 decades, obesity rates continue to increase in certain populations, such as African American girls and Hispanic boys. These racial/ethnic differences in obesity prevalence are likely a result of both genetic and nongenetic factors (eg, socioeconomic status, intake of sugar-sweetened beverages and fast food, and having a television in the bedroom).

OBJECTIVE To update the 2010 US Preventive Services Task Force (USPSTF) recommendation on screening for obesity in children 6 years and older.

EVIDENCE REVIEW The USPSTF reviewed the evidence on screening for obesity in children and adolescents and the benefits and harms of weight management interventions.

FINDINGS Comprehensive, intensive behavioral interventions (≥26 contact hours) in children and adolescents 6 years and older who have obesity can result in improvements in weight status for up to 12 months; there is inadequate evidence regarding the effectiveness of less intensive interventions. The harms of behavioral interventions can be bounded as small to none, and the harms of screening are minimal. Therefore, the USPSTF concluded with moderate certainty that screening for obesity in children and adolescents 6 years and older is of moderate net benefit.

CONCLUSIONS AND RECOMMENDATION The USPSTF recommends that clinicians screen for obesity in children and adolescents 6 years and older and offer or refer them to comprehensive, intensive behavioral interventions to promote improvements in weight status. (B recommendation)

Editorial page 2378

Author Audio Interview

Related article page 2427 and **JAMA Patient Page** page 2460

CME Quiz at jamanetwork.com/learning

Related articles at jamapediatrics.com jamainternalmedicine.com

Author/Group Information: The US Preventive Services Task Force (USPSTF) members are listed at the end of this article.

Corresponding Author: David C. Grossman, MD, MPH (chair@uspstf.net).

JAMA. 2017;317(23):2417-2426. doi:10.1001/jama.2017.6803

The US Preventive Services Task Force (USPSTF) makes recommendations about the effectiveness of specific clinical preventive services for patients without obvious related signs or symptoms.

It bases its recommendations on the evidence of both the benefits and harms of the service and an assessment of the balance. The USPSTF does not consider the costs of providing a service in this assessment.

The USPSTF recognizes that clinical decisions involve more considerations than evidence alone. Clinicians should understand the evidence but individualize decision making to the specific patient or situation. Similarly, the USPSTF notes that policy and coverage decisions involve considerations in addition to the evidence of clinical benefits and harms.

Summary of Recommendation and Evidence

The USPSTF recommends that clinicians screen for obesity in children and adolescents 6 years and older and offer or refer them to comprehensive, intensive behavioral interventions to promote improvements in weight status (B recommendation) (**Figure 1**).

Rationale

Importance

Approximately 17% of children and adolescents aged 2 to 19 years in the United States have obesity (defined as an age- and sex-specific body mass index [BMI] in the 95th percentile or greater, based on year 2000 Centers for Disease Control and Prevention [CDC] growth charts).[1-4] Almost 32% of children and adolescents are overweight (defined as an age- and sex-specific BMI in the 85th to 94th percentile) or have obesity.[2,3] Although the overall rate of child and adolescent obesity has stabilized over the last decade after increasing steadily for 3 decades, obesity rates continue to increase in certain populations, such as African American girls and Hispanic boys.[4,5] The proportion of children who meet the criteria for severe obesity (class II [≥120% of the 95th percentile] or class III [140% of the 95th percentile]) also continues to increase.[6]

Obesity in children and adolescents is associated with morbidity such as mental health and psychological issues, asthma, obstructive sleep apnea, orthopedic problems, and adverse cardiovascular and metabolic outcomes (eg, high blood pressure, abnormal lipid levels, and insulin resistance). Children and adolescents also may experience teasing and bullying behaviors based on their weight. Obesity in childhood and adolescence may continue into adulthood and lead to adverse cardiovascular outcomes or other obesity-related morbidity, such as type 2 diabetes.[3]

Detection

In 2005, the USPSTF found that age- and sex-adjusted BMI (calculated as weight in kilograms divided by the square of height in meters) percentile is the accepted measure for detecting overweight or obesity in children and adolescents because it is feasible for use in primary care, a reliable measure, and associated with adult obesity.[7-9]

Benefits of Early Detection and Treatment or Intervention

The USPSTF found adequate evidence that screening and intensive behavioral interventions for obesity in children and adolescents 6 years and older can lead to improvements in weight status. The magnitude of this benefit is moderate.

Studies on pharmacotherapy interventions (ie, metformin and orlistat) showed small amounts of weight loss. The magnitude of this benefit is of uncertain clinical significance, because the evidence regarding the effectiveness of metformin and orlistat is inadequate.

Harms of Early Detection and Treatment or Intervention

The USPSTF found adequate evidence to bound the harms of screening and comprehensive, intensive behavioral interventions for obesity in children and adolescents as small to none, based on the likely minimal harms of using BMI as a screening tool, the absence of reported harms in the evidence on behavioral interventions, and the noninvasive nature of the interventions.

Evidence on the harms associated with metformin is inadequate. Adequate evidence shows that orlistat has moderate harms, including abdominal pain or cramping, flatus with discharge, fecal incontinence, and fatty or oily stools.

USPSTF Assessment

The USPSTF concludes with moderate certainty that the net benefit of screening for obesity in children and adolescents 6 years and older and offering or referring them to comprehensive, intensive behavioral interventions to promote improvements in weight status is moderate.

Clinical Considerations

Patient Population Under Consideration

This recommendation applies to children and adolescents 6 years and older (**Figure 2**).

Assessment of Risk

Although all children and adolescents are at risk for obesity and should be screened, there are several specific risk factors, including parental obesity, poor nutrition, low levels of physical activity, inadequate sleep, sedentary behaviors, and low family income.[3]

Risk factors associated with obesity in younger children include maternal diabetes, maternal smoking, gestational weight gain, and rapid infant growth. A decrease in physical activity in young children is a risk factor for obesity later in adolescence. Obesity rates continue to increase in some racial/ethnic minority populations. These racial/ethnic differences in obesity prevalence are likely a result of both genetic and nongenetic factors (eg, socioeconomic status, intake of sugar-sweetened beverages and fast food, and having a television in the bedroom).[3] The prevalence of obesity is approximately 21% to 25% among African American and Hispanic children 6 years and older.[2,3] In contrast, the prevalence of obesity ranges from 3.7% among Asian girls aged 6 to 11 years to 20.9% among non-Hispanic white adolescent girls.[2,3]

Screening Tests

Body mass index measurement is the recommended screening test for obesity. Body mass index percentile is plotted on growth

Figure 1. US Preventive Services Task Force (USPSTF) Grades and Levels of Certainty

What the USPSTF Grades Mean and Suggestions for Practice

Grade	Definition	Suggestions for Practice
A	The USPSTF recommends the service. There is high certainty that the net benefit is substantial.	Offer or provide this service.
B	The USPSTF recommends the service. There is high certainty that the net benefit is moderate, or there is moderate certainty that the net benefit is moderate to substantial.	Offer or provide this service.
C	The USPSTF recommends selectively offering or providing this service to individual patients based on professional judgment and patient preferences. There is at least moderate certainty that the net benefit is small.	Offer or provide this service for selected patients depending on individual circumstances.
D	The USPSTF recommends against the service. There is moderate or high certainty that the service has no net benefit or that the harms outweigh the benefits.	Discourage the use of this service.
I statement	The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of the service. Evidence is lacking, of poor quality, or conflicting, and the balance of benefits and harms cannot be determined.	Read the Clinical Considerations section of the USPSTF Recommendation Statement. If the service is offered, patients should understand the uncertainty about the balance of benefits and harms.

USPSTF Levels of Certainty Regarding Net Benefit

Level of Certainty	Description
High	The available evidence usually includes consistent results from well-designed, well-conducted studies in representative primary care populations. These studies assess the effects of the preventive service on health outcomes. This conclusion is therefore unlikely to be strongly affected by the results of future studies.
Moderate	The available evidence is sufficient to determine the effects of the preventive service on health outcomes, but confidence in the estimate is constrained by such factors as the number, size, or quality of individual studies. inconsistency of findings across individual studies. limited generalizability of findings to routine primary care practice. lack of coherence in the chain of evidence. As more information becomes available, the magnitude or direction of the observed effect could change, and this change may be large enough to alter the conclusion.
Low	The available evidence is insufficient to assess effects on health outcomes. Evidence is insufficient because of the limited number or size of studies. important flaws in study design or methods. inconsistency of findings across individual studies. gaps in the chain of evidence. findings not generalizable to routine primary care practice. lack of information on important health outcomes. More information may allow estimation of effects on health outcomes.
The USPSTF defines certainty as "likelihood that the USPSTF assessment of the net benefit of a preventive service is correct." The net benefit is defined as benefit minus harm of the preventive service as implemented in a general, primary care population. The USPSTF assigns a certainty level based on the nature of the overall evidence available to assess the net benefit of a preventive service.	

charts, such as those developed by the CDC, which are based on US-specific, population-based norms for children 2 years and older.[10] Obesity is defined as an age- and sex-specific BMI in the 95th percentile or greater.

Screening Interval

The USPSTF found no evidence regarding appropriate screening intervals for obesity in children and adolescents. Height and weight, which are necessary for BMI calculation, are routinely measured during health maintenance visits.

Treatment and Implementation

The USPSTF recognizes the challenges that children and their families encounter in having limited access to effective, intensive behavioral interventions for obesity. Identifying obesity in children and how to address it are important steps in helping children and families obtain the support they need.

The USPSTF found that comprehensive, intensive behavioral interventions with a total of 26 contact hours or more over a period of 2 to 12 months resulted in weight loss (**Table 1**).[3,4] Behavioral interventions with a total of 52 contact hours or more demonstrated greater weight loss and some improvements in cardiovascular and metabolic risk factors. These effective, higher-intensity (≥26 contact hours) behavioral interventions consisted of multiple components.[3,4] Although these components varied across interventions, they frequently included sessions targeting both the parent and child (separately, together, or both); offered individual sessions (both family and group); provided information

Figure 2. Clinical Summary: Screening for Obesity in Children and Adolescents

Population	Children and adolescents 6 y and older
Recommendation	Screen for obesity; offer or refer children and adolescents with obesity to comprehensive, intensive behavioral interventions to promote improvements in weight status. Grade: B

Risk Assessment	All children and adolescents are at risk for obesity and should be screened; specific risk factors include parental obesity, poor nutrition, low levels of physical activity, inadequate sleep, sedentary behaviors, and low family income.
Screening Tests	BMI measurement, using height and weight, is the recommended screening test for obesity. Obesity is defined as an age- and sex-specific BMI in the 95th percentile or greater.
Interventions	Comprehensive, intensive behavioral interventions of ≥26 contact hours resulted in weight loss. Effective interventions consisted of multiple components, including: sessions targeting both the parent and child (separately, together, or both); offering individual sessions (both family and group); providing information about healthy eating, safe exercising, and reading food labels; encouraging the use of stimulus control (eg, limiting access to tempting foods and screen time), goal setting, self-monitoring, contingent rewards, and problem solving; and supervised physical activity sessions. Providers included primary care clinicians, exercise physiologists, physical therapists, dietitians, diet assistants, psychologists, and social workers, but the more intensive interventions usually involved referral outside the primary care office. Evidence regarding pharmacotherapy interventions was inadequate.
Balance of Benefits and Harms	The USPSTF concludes with moderate certainty that the net benefit of screening for obesity in children and adolescents 6 y and older and offering or referring them to comprehensive, intensive behavioral interventions to promote improvements in weight status is moderate.
Other Relevant USPSTF Recommendations	The USPSTF has made recommendations on screening for primary hypertension and lipid disorders in children and adolescents. These recommendations are available on the USPSTF website (https://www.uspreventiveservicestaskforce.org).

For a summary of the evidence systematically reviewed in making this recommendation, the full recommendation statement, and supporting documents, please go to https://www.uspreventiveservicestaskforce.org.

U.S. Preventive Services TASK FORCE

JAMA

BMI indicates body mass index; USPSTF, US Preventive Services Task Force.

Table 1. Components of Behavioral Interventions in 42 Trials for Treatment of Obesity in Children and Adolescents[a]

Contact Time, h	No. of Trials	No. of Participants	Trials With Physical Activity Sessions, No. (%)	Intervention Approach and Target
≥52	7	1252	7 (100)	Group sessions ± individual sessions Parent-only + child-only + family sessions Referral/specialty clinic setting Frequently provided sessions on healthy eating, safe exercising, and reading food labels; encouraged the use of stimulus control (eg, limiting access to tempting foods and limiting screen time), goal setting, self-monitoring, contingent rewards, and problem solving
26-51	9	838	5 (56)	
6-25	11	1085	4 (36)	Group sessions ± individual sessions Referral to specialty clinic setting
1-5	15	3781	0	Individual sessions Usually targeted parents + child together Frequently conducted in primary care settings Used motivational interviewing

[a] Behavioral interventions with 26 or more contact hours were found to be effective.

about healthy eating, safe exercising, and reading food labels; encouraged the use of stimulus control (eg, limiting access to tempting foods and limiting screen time), goal setting, self-monitoring, contingent rewards, and problem solving; and included supervised physical activity sessions. Intensive interventions involving 52 or more contact hours rarely took place in primary care settings but rather in settings to which primary care clinicians could refer patients. These types of interventions were often delivered by multidisciplinary teams, including pediatricians, exercise physiologists or physical therapists, dietitians or diet assistants, psychologists or social workers, or other behavioral specialists.[3,4]

Adherence to interventions can change their effectiveness. In the included trials, 68% to 95% of participants completed all of the sessions.[3] Lower adherence in clinical practice could decrease the overall benefit of these interventions.

Metformin has been used for weight loss in children but is not approved by the US Food and Drug Administration for this purpose. Metformin has a small effect on weight (BMI reduction <1), and this effect is of uncertain clinical significance. Although the harms of metformin use are probably small, evidence regarding long-term outcomes of its use is lacking. In addition, participants in the metformin trials had abnormal insulin or glucose metabolism, and most had severe obesity. This limits the applicability of the results to a general pediatric population with obesity. Orlistat is approved by the US Food and Drug Administration for use in adolescents 12 years and older. However, orlistat also has a small effect on weight (BMI reduction <1), and this effect is of uncertain clinical significance. In addition, orlistat is associated with moderate harms. Therefore, the USPSTF encourages clinicians to promote behavioral interventions as the primary effective intervention for weight loss in children and adolescents.

Clinically Important Weight Loss

Research studies use a standardized measure (*z* score) of BMI. This measure helps compare results among children of different ages and over time as children grow. A few observational studies have addressed the question of what change in BMI *z* score or excess weight represents a clinically important change. These studies showed that a BMI *z* score reduction of 0.15 to 0.25 is associated with improvements in cardiovascular and metabolic risk factors.[3,4] A German expert panel determined that a BMI *z* score reduction of 0.20 is clinically significant and is comparable to a weight loss of approximately 5%.[11] A BMI *z* score reduction in the range of 0.20 to 0.25 appears to be a suitable threshold for clinically important change.[3]

An analysis by Epstein et al of 10-year outcomes from 4 randomized clinical trials of family-based behavioral obesity treatment programs suggested an association between weight loss in childhood and decreased risk of obesity in early adulthood. Participants were aged 8 to 12 years at baseline (mean age, 10.4 years), and average age at follow-up was 20 years.[3,12,13] Almost all participants (about 85%) had obesity at baseline. The comprehensive behavioral interventions involved 30 or more contact hours with the families. Among children with obesity, 52% continued to have obesity as adults.[3,12,13] In contrast, naturalistic longitudinal studies with similar follow-up report obesity rates of 64% to 87% among adults who had obesity as children; US-based studies were often at the upper end of the range.[9,14-16]

Additional Approaches to Prevention

The Community Preventive Services Task Force recommends behavioral interventions to reduce sedentary screen time among children 13 years and younger.[17] It found insufficient evidence to recommend school-based obesity programs to prevent or reduce overweight and obesity among children and adolescents.[18]

The CDC recommends 26 separate community strategies to prevent obesity, such as promoting breastfeeding, promoting access to affordable healthy food and beverages, promoting healthy food and beverage choices, and fostering physical activity among children.[19]

Useful Resources

In a separate recommendation, the USPSTF concluded that there is insufficient evidence to assess the balance of benefits and harms of screening for primary hypertension in asymptomatic children and adolescents to prevent subsequent cardiovascular disease in childhood or adulthood (I statement).[20] The USPSTF has also concluded that there is insufficient evidence to assess the balance of benefits and harms of screening for lipid disorders in children and adolescents (I statement).[21]

Other Considerations

Research Needs and Gaps

The USPSTF identified several areas in need of further research. Trials evaluating the direct benefit and harms of screening for obesity in children and adolescents are needed. One such trial could implement a systematic screening and treatment program in 1 set of clinics and providers and continue with usual care in a separate set of clinics and providers. Reproducing existing effective interventions and conducting full trials of small feasibility studies are necessary next steps. Further investigations to determine the specific effective components of behavioral interventions are needed. Long-term follow-up of participants after completion of treatment is needed to confirm maintenance of weight loss and to assess long-term benefits and harms. More studies are needed that address behavioral interventions in diverse populations and younger children (age ≤5 years). Also, more evidence is needed about what constitutes clinically important health benefits and the amount of weight loss associated with those health benefits. The quality of study methods and reporting in recent studies is much better than in the earlier literature; however, the field would benefit further from improved consistency in how health outcomes are reported. Individual-patient meta-analysis could be beneficial in helping understand the differences between patients who lose weight and those who do not. Efficacy and safety trials of weight loss medications for pediatric populations with obesity are needed.

Discussion

Burden of Disease

Recent prevalence figures from 2011 to 2012 indicate that 17% of children and adolescents aged 2 to 18 years in the United States have obesity.[2] Children and adolescents aged 6 to 19 years are more likely to have obesity than children aged 2 to 5 years.[2,3] Although overt cardiovascular disease can take many years to develop, obesity is associated with poor cardiovascular and metabolic outcomes during childhood (eg, high blood pressure, abnormal lipid levels, and insulin resistance). In addition, conditions such as asthma, obstructive sleep apnea, orthopedic problems, early

maturation, polycystic ovarian syndrome, and hepatic steatosis are associated with childhood and adolescent obesity. Children may experience low self-esteem, impaired quality of life, and teasing and bullying behaviors based on their weight.[3]

Obesity can have short-term effects on the health of children and adolescents. In addition, obesity in childhood and adolescence often leads to obesity in adulthood, which leads to poor health outcomes. Large, prospective longitudinal studies show that almost 80% of adolescents with obesity will have obesity as adults (70% when BMI is measured at age ≥30 years).[3,14] Approximately 64% of preadolescents with obesity also had obesity as adults. Meta-analyses have shown a strong association between childhood and adult obesity; children with obesity are about 5 times more likely to have obesity as adults than children without obesity.[3,14]

Scope of Review

The USPSTF examined the evidence on screening for obesity in children and adolescents and the benefits and harms of weight management interventions. Bariatric surgery, which is limited to patients with morbid obesity, and obesity prevention interventions among children of normal weight were considered to be outside the scope of this review.

Accuracy of Screening Tests

The USPSTF previously found evidence that BMI is an adequate screening measure for identifying children and adolescents with obesity.[7-9]

Effectiveness of Early Detection and Interventions

The USPSTF found no direct evidence addressing the benefits of screening for obesity in children and adolescents to improve intermediate or health outcomes. Estimated time of contact was the only behavioral intervention component associated with effect size ($P < .001$).[3,4] The USPSTF found no evidence for or against the importance of any other specific intervention component.[3] Subgroup analysis of prespecified populations (ie, age, race/ethnicity, sex, degree of excess weight, socioeconomic status) was sparsely reported in trials, resulting in an inability to draw any conclusions about differential effectiveness on weight outcomes.[3] The USPSTF did not find sufficient evidence on screening in children younger than 6 years. Effective behavioral interventions were targeted at children 6 years and older.[3] Evidence on effective interventions in children younger than 6 years is limited.

Behavioral Interventions

The USPSTF reviewed 45 trials (n = 7099) of behavioral interventions for obesity. Of these, 42 trials (n = 6956) used multicomponent interventions targeting lifestyle change (eg, counseling on diet, increasing physical activity or decreasing sedentary behavior, and addressing behavior change) to limit weight gain or decrease weight. Three smaller trials assessed different behavioral approaches (weight loss maintenance, regulation of cues for overeating, and interpersonal therapy).[3]

Of the 42 behavioral intervention trials (n = 6956), 8 were good quality and 34 were fair quality. Half of the trials were conducted in the United States; the rest were conducted in Europe, Israel, or Australia.[3] Forty-three percent of trials were conducted in primary care settings and 43% in another health care setting. The remaining trials were conducted outside of a health care setting. Trials included children and adolescents aged 2 to 19 years; almost half of the trials were limited to elementary school–aged children (6 to 8 years, up to 12 years).[3] Slightly more than half of the participants were girls. Most trials did not report on race/ethnicity or included predominantly white participants. Trials included children with obesity only or both children with overweight and children with obesity.[3] Average baseline BMI was 18.7 in trials of preschool-aged children, 23.5 in trials of elementary school–aged children, and 32.2 in trials of adolescents. Time of contact in the interventions ranged from 0.25 to 122 hours (over 1 to 122 sessions); 7 studies had 52 contact hours or more, 9 studies had 26 to 51 contact hours, 11 studies had 6 to 25 contact hours, and 15 studies had 15 contact hours or less.[3] Sessions took place over 2.25 to 24 months. Data on follow-up beyond 1 year were limited. Trials with minimal contact time (≤5 hours) were often conducted in primary care settings and involved individual sessions.

All of the effective behavioral interventions included parents and delivered basic instructive information about healthy nutrition and physical activity. Additional components of the most effective interventions included being conducted in a specialty setting; targeting both children and their parents; helping parents and children engage in stimulus control (eg, limiting access to tempting foods and limiting screen time); and assisting participants in identifying goals, self-monitoring, and problem solving to accomplish their selected goals. Trials with 52 contact hours or more often included supervised physical activity sessions, as did approximately half of the trials with 26 to 51 contact hours.[3] Other common components included contingent use of rewards or reinforcement, motivational interviewing, teaching of coping skills, addressing body image, and the option of individual-family counseling to address family-specific issues. All of the effective studies emphasized eating healthy foods and using moderate portions.[3]

All 7 trials with 52 contact hours or more demonstrated benefits of treatment, with a pooled standardized mean difference in change of −1.10 (95% CI, −1.30 to −0.89; I^2 = 43%) (1 study did not have adequate data to pool). Nine trials with 26 to 51 contact hours showed smaller effects, with a pooled standardized mean difference in change of −0.34 (95% CI, −0.52 to −0.16; I^2 = 24%).[3] Among the more intensive trials (≥26 contact hours), intervention groups showed absolute reductions in BMI *z* score (a standardized measure of BMI based on age- and sex-specific norms to facilitate comparison across ages) of 0.20 or greater. Most participants maintained their baseline weight within 5 lb while growing in height. In comparison, control groups showed small increases or reductions in BMI *z* score of less than 0.10 or weight gain of 5 to 17 lb (**Table 2**).[3] Interventions were effective in reducing excess weight in children and adolescents after 6 to 12 months. Across all categories of intervention intensity, children in both the intervention and control groups showed a broad range of effects. Some participants had large reductions in weight, some showed no or modest changes, and some continued to gain weight.[3] Very limited evidence suggests that briefer interventions may be effective in children with overweight only. Only 3 of the 24 trials with less than 26 contact hours showed

Table 2. Summary of Change in BMI *z* Score in 28 Trials for Treatment of Obesity in Children and Adolescents[a]

Intervention Intensity, h[b]	No. of Trials	No. of Participants	Mean Change in BMI *z* Score		Difference in Change in BMI *z* Score From Baseline (95% CI)	Mean Change in Weight, lb[c]	
			Intervention	Control		Intervention	Control
≥52	5	875	−0.05 to −0.34	0.00 to 0.26	−0.31 (−0.16 to −0.46)	−7 to 3	8 to 17
26-51	7	489	−0.11 to −0.59	−0.20 to 0.40	−0.17 (−0.30 to −0.04)	Preschool: 1 to 5 Elementary: −6 to 15 Adolescent: 5	Preschool: 11 to 12 Elementary: 3 to 20 Adolescent: 7
6-25	7	513	0.05 to −0.24	0.09 to −0.13	0.01 (−0.06 to 0.08)	Elementary: 6 to 10 Adolescent: −3 to 7	Elementary: 6 to 10 Adolescent: −2 to 18
1-5	9	1315	0 to −0.20	0.10 to −0.10	−0.09 (−0.14 to −0.05)	Preschool: 1 to 4 Elementary: 1 to 12 Adolescent: 4	Preschool: 1 to 4 Elementary: 2 to 18 Adolescent: 6 to 12

Abbreviation: BMI, body mass index.

[a] Data presented in this table are limited to trials that reported BMI *z* score.

[b] Estimated.

[c] Age-specific results were available from trials that limited enrollment to only 1 of the 3 age categories (preschool, elementary, or adolescent). Trials with 52 or more hours of contact enrolled participants across the 3 age categories and both sexes, so age- and sex-specific results were not available.

statistically significant benefits of treatment. Two of the 3 studies were among children with overweight but not obesity.[3] Standardized effect sizes were typically small (absolute BMI *z* score reduction ≤0.10 in intervention groups). Although the effects in the less intensive trials were seldom statistically significant, intervention groups frequently showed greater average reductions in excess weight than control groups.[3]

Cardiovascular and metabolic risk factors were consistently reported in studies with 52 contact hours or more. Pooled reductions in systolic blood pressure (6 studies; pooled mean difference in change between groups, −6.4 mm Hg [95% CI, −8.6 to −4.2]; I^2 = 51%) and diastolic blood pressure (6 studies; pooled mean difference in change between groups, −4.0 mm Hg [95% CI, −5.6 to −2.5]; I^2 = 17%) were statistically significant.[3] Pooled results did not demonstrate statistically significant improvements in lipid or fasting plasma glucose levels but some improvements in insulin or glucose measures. Cardiovascular and metabolic risk factors were reported less frequently in trials with fewer contact hours, and pooled results were not associated with improvements in blood pressure, lipid levels, or insulin or glucose levels.[3]

Eleven trials (n = 1523) of behavioral interventions reported on quality of life or functioning, self-esteem, body satisfaction, and depression outcomes. Trial results mostly demonstrated small, statistically insignificant increases in quality-of-life scores.[3] Five of these trials reported on self-esteem outcomes, and 5 reported on body satisfaction outcomes; no group differences were found.[3] One trial reported no group differences in the percentage of participants screening positive for depression. No trials reported on other health outcomes, such as morbidity associated with type 2 diabetes or hypertension, orthopedic pain, sleep apnea, or adult obesity.[3]

The remaining 3 small trials, which either did not consist of multiple components or targeted weight loss maintenance, did not find benefit.[3] The small weight maintenance trial (n = 61) found no between-group differences in body weight, body composition, glucose or insulin levels, or lipid levels. Two small pilot trials (n = 82) that targeted overeating used regulation of cues for overeating or interpersonal therapy approaches and found no group differences in BMI *z* score or BMI.[3]

Pharmacotherapy Interventions

Metformin and orlistat are associated with small reductions in excess weight (BMI reduction <1 [about 5 to 7 lb]) compared with placebo, and both have mild to moderate gastrointestinal adverse effects, which, when considered collectively, provide small or no benefit on health outcomes.

Eleven trials (n = 1395) examined the benefits of pharmacotherapy interventions compared with placebo. Ten of these trials were fair quality, and the remaining trial was good quality. A little more than one-half of the trials focused on adolescents only; the rest included younger children. Approximately two-thirds of the participants were girls.[3] None of the trials were conducted in a primary care setting; rather, trials took place in pediatric obesity, endocrine, or research clinics. Trials were conducted in the United States (64%), the United Kingdom, Canada, Australia, Germany, and Switzerland. Among trials that reported race/ethnicity, 25% to 89% of participants were white. Most pharmacotherapy trials only followed up participants for 6 months.[3] Only 1 trial assessed the effects of pharmacotherapy after discontinuation.

The average baseline BMI in the pharmacotherapy intervention trials (36.0 vs 37.4 in metformin and orlistat trials, respectively) was higher than in the behavioral intervention trials. Adherence was reported inconsistently.[3] All but 1 pharmacotherapy trial included behavioral interventions, while 3 trials offered group physical activity sessions; none involved primary care clinicians. Metformin dosage ranged from 1 to 2 g/d; orlistat dosage was 360 mg/d in all 3 trials.[3]

Metformin | One good-quality and 7 fair-quality trials (n = 616) showed small effect sizes on weight reduction in intervention groups compared with placebo. Pooled results from 6 studies showed a reduction in BMI *z* score of −0.10 (95% CI, −0.17 to −0.03; I^2 = 13%) and a reduction in BMI of −0.86 (95% CI, −1.44 to −0.29; I^2 = 0%). All participants had abnormal insulin or glucose metabolism.[3] Most participants also met adult criteria for severe obesity. Trials showed no benefit on blood pressure or lipid levels and a small benefit on insulin or glucose levels. No metformin trials reported health outcomes.[3] One trial demonstrated that the effect of metformin dissipates after 12 to 24 weeks of discontinuation.[3]

Orlistat | Three fair-quality trials (n = 779) showed small reductions in excess weight in intervention groups compared with placebo. Orlistat was associated with small reductions in BMI ranging from −0.94 (95% CI, −1.58 to −0.30) to −0.50 (95% CI, −7.62 to 6.62) and weight ranging from −3.90 kg (95% CI, −25.54 to 17.74) to −2.61 kg (95% CI not reported; $P < .001$).[3] The 1 trial reporting BMI *z* score showed a between-group difference of −0.06 (95% CI, −0.12 to 0.00). Most studies found no benefits on cardiovascular and metabolic risk factors, except for a reduction in diastolic blood pressure levels in 1 trial (mean difference in change, −1.81 mm Hg [95% CI not reported]; $P = .04$). One trial reported quality-of-life measures and found no differences between intervention and placebo groups at 6 months.[3]

Potential Harms of Screening and Treatment or Interventions

The USPSTF found no direct evidence addressing the harms of screening for obesity in children and adolescents.

Behavioral Interventions

Ten trials (n = 1232) examined the harms of behavioral interventions. Four trials were good quality and 6 were fair quality. Five trials found no adverse or serious adverse events in the intervention group. Five trials found no group differences in disordered eating or body dissatisfaction.[3]

Pharmacotherapy Interventions

Fourteen trials (n = 1484) examined the adverse effects of pharmacotherapy.

Metformin | Eleven trials (n = 705) examined the harms of metformin. Ten trials were fair quality, and the remaining trial was good quality. Gastrointestinal adverse effects (eg, nausea, vomiting, or diarrhea) were common in both the intervention and placebo groups but not serious. Vomiting, for example, was reported by 15% to 42% of participants taking metformin in 2 trials and by 3% to 21% of control group participants.[3] Rates of discontinuation due to adverse effects were 3.8% in the metformin groups and 3.2% in the placebo groups. Trials showed no differences in kidney or liver function. No cases of lactic acidosis were reported.[3]

Orlistat | Three fair-quality trials (n = 779) found that gastrointestinal adverse effects were more common in the intervention groups than in the placebo groups.[3] Gastrointestinal adverse effects were common among patients taking orlistat. Fatty or oily stools were reported by 50% to 70% of participants taking orlistat and 0% to 8% of those taking placebo, and uncontrolled passage of stool or oil was reported by 60% of participants taking orlistat and 11% of those taking placebo.[3] Abdominal pain or cramping were reported by 16% to 65% of participants taking orlistat and 11% to 26% of those taking placebo; flatus with discharge was reported by 20% to 43% of those taking orlistat and 3% to 11% of those taking placebo; and fecal incontinence was reported by 9% to 10% of those taking orlistat and 0% to 1% of those taking placebo.[3] One possibly related serious adverse event (cholecystectomy) was reported in a participant who lost 15.8 kg. Rates of discontinuation due to adverse effects were twice as common in the intervention group as in the placebo group (3.2% vs 1.7%, respectively).[3] However, prescribing data from the United Kingdom show that rates of orlistat discontinuation among adolescents are about 50% after 1 month.[22]

Estimate of Magnitude of Net Benefit

The USPSTF previously found adequate evidence that BMI is an acceptable measure for screening for excess weight in children and adolescents. The USPSTF found adequate evidence that comprehensive, intensive behavioral interventions in children and adolescents 6 years and older who have obesity can result in improvements in weight status for up to 12 months. It found inadequate evidence regarding the effectiveness of less intensive interventions. The USPSTF found adequate evidence to bound the harms of behavioral interventions as small to none and judged the harms of screening to be minimal. Therefore, the USPSTF concludes with moderate certainty that screening for obesity in children and adolescents 6 years and older is of moderate net benefit.

How Does Evidence Fit With Biological Understanding?

Genetics and various environmental factors play important roles in the development of obesity. Once obesity has developed, an individual's biochemical feedback mechanisms work to sustain the body's weight gain.[23] Changes in neuronal signaling decrease satiety and perceptions of the amount of food eaten.[24] As a result, weight loss can be challenging. Prospective data suggest that cardiovascular risk factors among adults without obesity are similar between those who had obesity as children and those who did not.[3,25] This suggests that adverse cardiovascular effects in childhood may be reversible with weight loss. This is of particular importance because obesity in childhood and adolescence may continue into adulthood and lead to poor health outcomes.

Response to Public Comment

A draft version of this recommendation statement was posted for public comment on the USPSTF website from November 1 to November 28, 2016. Many comments asked about the components of effective interventions. In response, the USPSTF added language in the "Effectiveness of Early Detection and Interventions" section to describe the components of effective interventions and the types of health professionals who would deliver care in these interventions. Another frequently raised concern was the lack of a recommendation for children younger than 6 years. The USPSTF added language in the aforementioned section on the lack of sufficient evidence in young children. The USPSTF added language about subgroup analyses, access, and research gaps based on comments.

Update of Previous USPSTF Recommendation

This recommendation updates the 2010 USPSTF recommendation statement on screening for obesity in children 6 years and older (B recommendation).[5]

Recommendations of Others

In 2007, an American Medical Association expert committee recommended that clinicians' assessments include BMI calculation as

well as medical and behavioral risk factors for obesity.[26] The American Academy of Pediatrics endorsed these recommendations and further recommends annually plotting BMI on a growth chart for all patients 2 years and older.[27] In 2011, a National Heart, Lung, and Blood Institute expert panel recommended using BMI to screen for obesity in children and adolescents aged 2 to 21 years at high risk for obesity (ie, due to history of parental obesity, excessive gain in BMI, or change in physical activity).[28] In 2015, the Canadian Task Force on Preventive Health recommended growth monitoring for all children and adolescents 17 years and younger at all appropriate primary care visits. It also recommends that primary care clinicians offer or refer children and adolescents with overweight or obesity to structured behavioral interventions aimed at healthy weight management.[29]

The National Academies Health and Medicine Division (formerly the Institute of Medicine) recommends that clinicians measure weight and length or height at every well-child visit using World Health Organization (0 to 23 months) or CDC (24 to 59 months) growth charts.[30] The National Association of Pediatric Nurse Practitioners recommends assessing height and weight parameters, including height to weight ratio, in children younger than 2 years and BMI in children 2 years and older.[31]

ARTICLE INFORMATION

Accepted for Publication: May 11, 2017.

The US Preventive Services Task Force (USPSTF) members: David C. Grossman, MD, MPH; Kirsten Bibbins-Domingo, PhD, MD, MAS; Susan J. Curry, PhD; Michael J. Barry, MD; Karina W. Davidson, PhD, MASc; Chyke A. Doubeni, MD, MPH; John W. Epling Jr, MD, MSEd; Alex R. Kemper, MD, MPH, MS; Alex H. Krist, MD, MPH; Ann E. Kurth, PhD, RN, MSN, MPH; C. Seth Landefeld, MD; Carol M. Mangione, MD, MSPH; Maureen G. Phipps, MD, MPH; Michael Silverstein, MD, MPH; Melissa A. Simon, MD, MPH; Chien-Wen Tseng, MD, MPH, MSEE.

Affiliations of The US Preventive Services Task Force (USPSTF) members: Kaiser Permanente Washington Health Research Institute, Seattle (Grossman); University of California, San Francisco (Bibbins-Domingo); University of Iowa, Iowa City (Curry); Harvard Medical School, Boston, Massachusetts (Barry); Columbia University, New York, New York (Davidson); University of Pennsylvania, Philadelphia (Doubeni); Virginia Tech Carilion School of Medicine, Roanoke (Epling); Duke University, Durham, North Carolina (Kemper); Fairfax Family Practice Residency, Fairfax, Virginia (Krist); Virginia Commonwealth University, Richmond (Krist); Yale University, New Haven, Connecticut (Kurth); University of Alabama at Birmingham (Landefeld); University of California, Los Angeles (Mangione); Brown University, Providence, Rhode Island (Phipps); Boston University, Boston, Massachusetts (Silverstein); Northwestern University, Evanston, Illinois (Simon); University of Hawaii, Honolulu (Tseng); Pacific Health Research and Education Institute, Honolulu (Tseng).

Author Contributions: Dr Grossman had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. The USPSTF members contributed equally to the recommendation statement.

Conflict of Interest Disclosures: All authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest. Authors followed the policy regarding conflicts of interest described at https://www.uspreventiveservicestaskforce.org/Page/Name/conflict-of-interest-disclosures. All members of the USPSTF receive travel reimbursement and an honorarium for participating in USPSTF meetings. No other disclosures are reported.

Funding/Support: The USPSTF is an independent, voluntary body. The US Congress mandates that the Agency for Healthcare Research and Quality (AHRQ) support the operations of the USPSTF.

Role of the Funder/Sponsor: AHRQ staff assisted in the following: development and review of the research plan, commission of the systematic evidence review from an Evidence-based Practice Center, coordination of expert review and public comment of the draft evidence report and draft recommendation statement, and the writing and preparation of the final recommendation statement and its submission for publication. AHRQ staff had no role in the approval of the final recommendation statement or the decision to submit for publication.

Disclaimer: Recommendations made by the USPSTF are independent of the US government. They should not be construed as an official position of AHRQ or the US Department of Health and Human Services.

Additional Contributions: We thank Iris Mabry-Hernandez, MD, MPH (AHRQ), who contributed to the writing of the manuscript, and Lisa Nicolella, MA (AHRQ), who assisted with coordination and editing.

REFERENCES

1. Centers for Disease Control and Prevention (CDC). 2000 CDC growth charts. https://www.cdc.gov/growthcharts/cdc_charts.htm. Accessed May 26, 2017.

2. Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of childhood and adult obesity in the United States, 2011-2012. *JAMA*. 2014;311(8):806-814.

3. O'Connor EA, Evans CV, Burda BU, Walsh ES, Eder M, Lozano P. *Screening for Obesity and Intervention for Weight Management in Children and Adolescents: A Systematic Evidence Review for the US Preventive Services Task Force. Evidence Synthesis No. 150.* Rockville, MD: Agency for Healthcare Research and Quality; 2017. AHRQ publication 15-05219-EF-1.

4. O'Connor EA, Evans CV, Burda BU, Walsh ES, Eder M, Lozano P. Screening for obesity and intervention for weight management in children and adolescents: evidence report and systematic review for the US Preventive Services Task Force. *JAMA*. doi:10.1001/jama.2017.0332

5. Dietz WH, Economos CD. Progress in the control of childhood obesity. *Pediatrics*. 2015;135(3):e559-e561.

6. Skinner AC, Skelton JA. Prevalence and trends in obesity and severe obesity among children in the United States, 1999-2012. *JAMA Pediatr*. 2014;168(6):561-566.

7. Barton M; US Preventive Services Task Force. Screening for obesity in children and adolescents: US Preventive Services Task Force recommendation statement. *Pediatrics*. 2010;125(2):361-367.

8. US Preventive Services Task Force. Screening and interventions for overweight in children and adolescents: recommendation statement. *Pediatrics*. 2005;116(1):205-209.

9. Whitlock EP, Williams SB, Gold R, Smith PR, Shipman SA. Screening and interventions for childhood overweight: a summary of evidence for the US Preventive Services Task Force. *Pediatrics*. 2005;116(1):e125-e144.

10. Kuczmarski RJ, Ogden CL, Guo SS, et al. 2000 CDC Growth Charts for the United States: methods and development. *Vital Health Stat 11*. 2002;(246):1-190.

11. Wiegand S, Keller KM, Lob-Corzilius T, et al. Predicting weight loss and maintenance in overweight/obese pediatric patients. *Horm Res Paediatr*. 2014;82(6):380-387.

12. Epstein LH, Paluch RA, Roemmich JN, Beecher MD. Family-based obesity treatment, then and now: twenty-five years of pediatric obesity treatment. *Health Psychol*. 2007;26(4):381-391.

13. Epstein LH, Valoski A, Wing RR, McCurley J. Ten-year outcomes of behavioral family-based treatment for childhood obesity. *Health Psychol*. 1994;13(5):373-383.

14. Simmonds M, Burch J, Llewellyn A, et al. The use of measures of obesity in childhood for predicting obesity and the development of obesity-related diseases in adulthood: a systematic review and meta-analysis. *Health Technol Assess*. 2015;19(43):1-336.

15. Thompson DR, Obarzanek E, Franko DL, et al. Childhood overweight and cardiovascular disease risk factors: the National Heart, Lung, and Blood Institute Growth and Health Study. *J Pediatr*. 2007;150(1):18-25.

16. Stovitz SD, Hannan PJ, Lytle LA, Demerath EW, Pereira MA, Himes JH. Child height and the risk of young-adult obesity. *Am J Prev Med*. 2010;38(1):74-77.

17. Community Preventive Services Task Force. Obesity: behavioral interventions that aim to reduce recreational sedentary screen time among children. https://www.thecommunityguide.org/findings/obesity-behavioral-interventions-aim-reduce-recreational-sedentary-screen-time-among. 2014. Accessed May 3, 2017.

18. Community Preventive Services Task Force. Obesity prevention and control: school-based

programs. https://www.thecommunityguide.org/sites/default/files/assets/Obesity-School-based-Programs.pdf. 2013. Accessed May 3, 2017.

19. Centers for Disease Control and Prevention. Overweight & obesity: prevention strategies & guidelines. https://www.cdc.gov/obesity/resources/strategies-guidelines.html. 2015. Accessed May 3, 2017.

20. Moyer VA; U.S. Preventive Services Task Force. Screening for primary hypertension in children and adolescents: U.S. Preventive Services Task Force recommendation statement. *Pediatrics*. 2013;132(5):907-914.

21. Bibbins-Domingo K, Grossman DC, Curry SJ, et al; US Preventive Services Task Force. Screening for lipid disorders in children and adolescents: US Preventive Services Task Force recommendation statement. *JAMA*. 2016;316(6):625-633.

22. Viner RM, Hsia Y, Neubert A, Wong IC. Rise in antiobesity drug prescribing for children and adolescents in the UK: a population-based study. *Br J Clin Pharmacol*. 2009;68(6):844-851.

23. Schuster DP. Changes in physiology with increasing fat mass. *Semin Pediatr Surg*. 2009;18(3):126-135.

24. Rosenbaum M, Kissileff HR, Mayer LE, Hirsch J, Leibel RL. Energy intake in weight-reduced humans. *Brain Res*. 2010;1350:95-102.

25. Juonala M, Magnussen CG, Berenson GS, et al. Childhood adiposity, adult adiposity, and cardiovascular risk factors. *N Engl J Med*. 2011;365(20):1876-1885.

26. Barlow SE; Expert Committee. Expert committee recommendations regarding the prevention, assessment, and treatment of child and adolescent overweight and obesity: summary report. *Pediatrics*. 2007;120(suppl 4):S164-S192.

27. Committee on Practice and Ambulatory Medicine and Bright Futures Periodicity Schedule Workgroup. 2016 recommendations for preventive pediatric health care. *Pediatrics*. 2016;137(1):e20153596. http://pediatrics.aappublications.org/content/early/2015/12/07/peds.2015-3908. Accessed May 11, 2017.

28. Expert Panel on Integrated Guidelines for Cardiovascular Health and Risk Reduction in Children and Adolescents; National Heart, Lung, and Blood Institute. Expert panel on integrated guidelines for cardiovascular health and risk reduction in children and adolescents: summary report. *Pediatrics*. 2011;128(suppl 5):S213-S256.

29. Parkin P, Connor Gorber S, Shaw E, et al; Canadian Task Force on Preventive Health Care. Recommendations for growth monitoring, and prevention and management of overweight and obesity in children and youth in primary care. *CMAJ*. 2015;187(6):411-421.

30. Institute of Medicine. *Early Childhood Obesity Prevention Policies*. Washington, DC: National Academies Press; 2011.

31. NAPNAP. NAPNAP position statement on the prevention and identification of overweight and obesity in the pediatric population. *J Pediatr Health Care*. 2009;23(6):A15-A16.