JAMA | US Preventive Services Task Force | EVIDENCE REPORT

Interventions for Weight Management in Children and Adolescents
Updated Evidence Report and Systematic Review for the US Preventive Services Task Force

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IMPORTANCE Body mass index (BMI) of the 95th or greater percentile for age and sex is common among young people, and its prevalence has increased in recent decades.

OBJECTIVE To examine the benefits and harms of weight management interventions initiated in health care settings among children and adolescents with high BMI.

DATA SOURCES MEDLINE via Ovid, PsycINFO via Ovid, and the Cochrane Central Registry of Controlled Trials through January 12, 2023; ongoing surveillance through January 26, 2024.

STUDY SELECTION English-language studies of weight management interventions (behavioral and pharmacologic, including liraglutide, semaglutide, orlistat, and phentermine/topiramate) among children aged 2 to 18 years with high BMI (eg, ≥85th or ≥95th percentile for age and sex) conducted in or recruited from health care settings.

DATA EXTRACTION AND SYNTHESIS One investigator abstracted data; a second checked for accuracy. Outcomes with sufficient evidence for meta-analysis were pooled using random-effects models.

MAIN OUTCOMES AND MEASURES BMI and other weight-related outcomes, cardiometabolic measures, quality of life, physical activity, dietary pattern scores, and harms.

RESULTS Fifty-eight randomized clinical trials (RCTs) were included (N = 10 143). Behavioral interventions were associated with small reductions in BMI and other weight outcomes after 6 to 12 months (28 RCTs [n = 4494]; mean difference in change between groups, −0.7 [95% CI, −1.0 to −0.3]). Larger effects were seen in interventions with higher contact hours and that offered physical activity sessions. Reporting was sparse for outcomes other than BMI, with few significant findings. Semaglutide and phentermine/topiramate had the largest effects on BMI (eg, 1 RCT [n = 201] for semaglutide; mean difference, −6.0 [95% CI, −7.3 to −4.6]). The very few studies that evaluated outcomes after medication discontinuation showed immediate weight regain. Gastrointestinal adverse effects were common with liraglutide, semaglutide, and orlistat. Serious adverse effects were rare, but no studies had follow-up longer than 17 months.

CONCLUSIONS AND RELEVANCE In the short term, weight management interventions led to lower BMI in children and adolescents, with no evidence of serious harm. Evidence is lacking about how weight management interventions affect BMI beyond 1 year and after medication discontinuation and about longer-term effects on other outcomes.

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National Health and Nutrition Examination Survey data from 2017 to 2020 (before the COVID-19 pandemic) show that 19.7% of children and adolescents in the US have BMI 95th percentile or greater for age and sex, based on the 2000 Centers for Disease Control and Prevention growth charts.[1] The prevalence of BMI 95th percentile or greater among US children and adolescents has been increasing in recent years.[2] Concurrent with these trends are increases in the numbers of youth attempting to lose weight.[2] Year 2019 data from the Youth Risk Factor Behavior Surveillance System show that 48.3% of US 9th to 12th graders were trying to lose weight.[3]

In 2017, the US Preventive Services Task Force (USPSTF) recommended 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).[4] This systematic review updates the evidence on weight management interventions in children and adolescents and was used to update the 2017 USPSTF recommendation.[4,5]

Methods

Scope of Review

Figure 1 shows the analytic framework and key questions (KQs) that guided this review. Detailed methods and results are available in the full evidence review, including individual study results for all outcomes at all time points, eligible subgroup analyses, and additional forest plots for weight and cardiometabolic outcomes.

Data Sources and Searches

MEDLINE via Ovid, PsycINFO via Ovid, and the Cochrane Central Registry of Controlled Trials were searched for relevant English-language articles published after the search date for the prior review previously conducted for the USPSTF (January 1, 2016, to January 12, 2023) (eMethods in the Supplement). Additionally, all studies from the previous review[5] on this topic were assessed for inclusion in the current review. Active surveillance was conducted through January 26, 2024, via article alerts and targeted journal searches to identify major studies that might affect the conclusions of the review or understanding of the evidence. One new study was identified; however, it did not substantively change the review's interpretation of findings or conclusions and is not addressed further.[7]

Study Selection

Two reviewers independently screened titles, abstracts, and full-text article(s) against predefined eligibility criteria (eTable 1 in the Supplement). Eligible studies were randomized clinical trials (RCTs) of weight management interventions in children aged 2 to 18 years who were identified as having a higher body mass index (BMI), as defined by the study, but with a BMI cutoff no lower than the 75th percentile for age and sex. The interventions included were behavioral counseling and pharmacotherapy approved by the US Food and Drug Administration (FDA) for long-term weight loss/management in children or adolescents (ie, orlistat, liraglutide, semaglutide, phentermine/topiramate) that were conducted in or recruited from health care settings. Studies were eligible if their control condition was placebo, usual care, minimal control, or a weight-neutral healthy lifestyle intervention. Studies included for KQ1, KQ2, and KQ3 had to report outcomes with at least 6 months of follow-up. For KQ4 evaluating the potential harms of weight management interventions, no minimum follow-up was required. Large cohort or case-control studies examining harms of medications were also eligible in addition to RCTs for KQ4.

Data Extraction and Quality Assessment

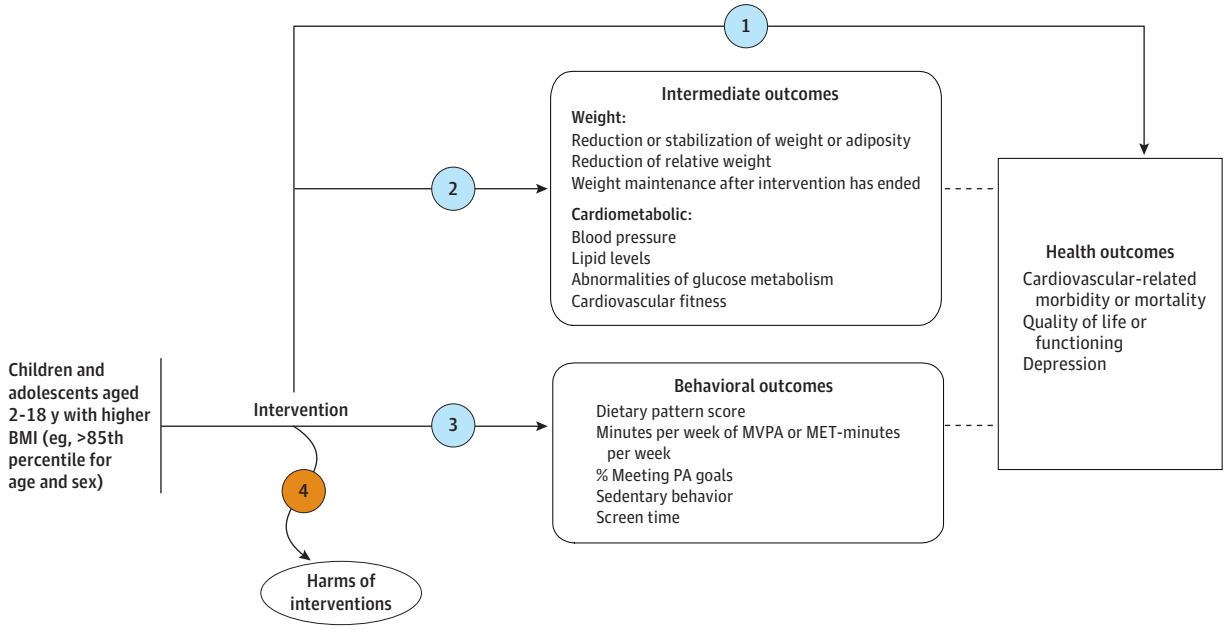
Two independent investigators applied USPSTF design-specific criteria to critically appraise each study (eTable 2 in the Supplement). Each study was assigned a rating of "good," "fair," or "poor." Discrepancies between raters were resolved by consensus. "Poor"-quality studies were excluded. One reviewer extracted data into standardized evidence tables and a second reviewer checked the tables for accuracy. Relevant outcomes included health outcomes (mortality, quality of life, functioning, depression, medical events or conditions that may be associated with high BMI [eg, cardiovascular events, asthma, sleep apnea]), intermediate outcomes (BMI, weight, physical fitness, cardiometabolic outcomes [eg, blood pressure, lipid levels, glucose parameters]), and behavioral outcomes (dietary pattern scores, measures of amount of physical activity).

Data Synthesis and Analysis

Evidence was synthesized separately for behavioral interventions and for each medication. Tables were developed to show study, population, and intervention characteristics, and outcomes for each of these interventions. Meta-analysis was conducted for behavioral interventions only, since only 1 to 3 trials for each medication were included. BMI was the primary outcome for this review because it was the most widely reported outcome among those recommended for measuring weight outcomes in children.[8] In children and adolescents, a BMI standard deviation score or BMI *z* score (zBMI) can also be calculated, showing the BMI in terms of standard deviation units on a normal or *z* distribution. So, a zBMI or BMI standard deviation score of 1.0 would indicate 1 standard deviation above the median BMI for age and sex. The previous review on this topic of the USPSTF used zBMI as the primary outcome; however, more recent evidence has suggested that zBMI does not adequately reflect weight change among young people with a BMI above the 97th percentile for age and sex.[8]

Among behavioral interventions, random-effects meta-analysis was conducted using the restricted maximum likelihood method with the Knapp-Hartung correction for all outcomes with comparable measures and sufficient evidence for pooling.[9,10] Study-reported between-group effects were used in the meta-analysis if they were reported, with adjusted analyses selected over unadjusted results. Crude between-group effect estimates were calculated if they were not reported. The meta-analysis used the follow-up time point closest to 12 months.[8] The between-group difference in change from baseline was analyzed, if available, and posttreatment scores were substituted if change scores were not available and could not be calculated. Negative values represent either greater BMI reduction or less BMI gain among participants in the intervention group. For simplicity this is referred to as greater "weight loss," but in some studies it represents smaller weight gain. Statistical heterogeneity was assessed using the I^2 statistic. Meta-regression was used to explore whether effect size was associated with a wide range of study or intervention characteristics.

Figure 1. Analytic Framework: Weight Management in Children and Adolescents



Evidence reviews for the USPSTF use an analytic framework to visually display the key questions that the review will address in order to allow the USPSTF to evaluate the effectiveness and safety of a preventive service. The questions are depicted by linkages that relate interventions and outcomes. A dashed line depicts a health outcome that follows an intermediate outcome. For further details see the USPSTF Procedure Manual.[6] BMI indicates body mass index; MET, metabolic equivalent; MVPA, moderate to vigorous physical activity; and PA, physical activity.

Stata 16.1 (StataCorp) was used for analysis. All significance testing was 2-sided, and results were considered statistically significant if $P \leq .05$.

Results

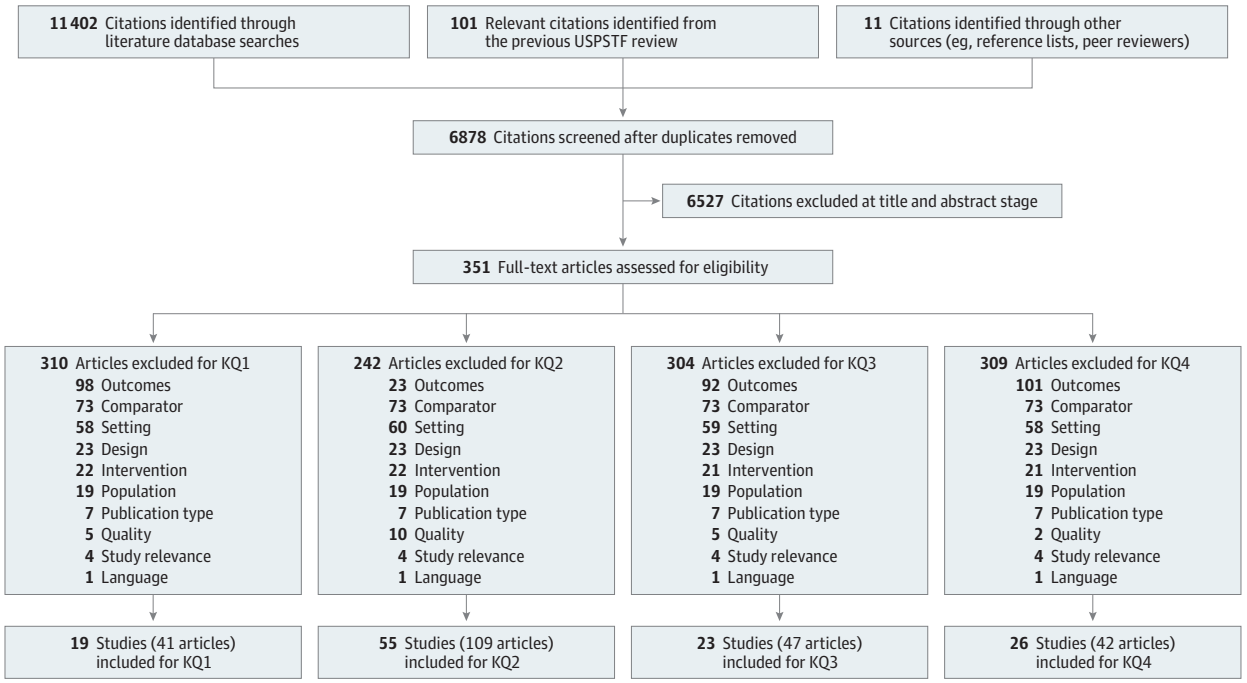
A total of 6878 abstracts and 351 full-text articles were screened for inclusion (**Figure 2**). After reviewing the full-text articles and performing critical appraisal, 58 RCTs (reported in 121 publications) were included (N = 10 143).[11-66] Fifty trials examined a behavioral intervention (eTable 3 in the Supplement). Eight trials examined the effects of pharmacotherapy. Three trials examined liraglutide,[60-62] 1 examined semaglutide,[67] 2 examined orlistat,[63,64] and 2 trials examined 2 dosing schemes for the combination of phentermine and topiramate (eTable 4 in the Supplement).[65,66] Three of the medication trials only followed up participants for 2 months or less and were therefore included only for KQ4 (harms): 2 liraglutide trials,[60,62] and 1 trial of phentermine/topiramate.[65]

Benefits of Interventions: Health Outcomes

KQ1. Do primary care–relevant behavioral, pharmacotherapy, or combined weight management interventions for children and adolescents with BMI improve health outcomes?

Health outcomes, including quality of life, depression, and cardiovascular-related morbidity or mortality, were reported in only 14 studies (n = 2558); 13 of these reported a measure of quality of life. Very few individual studies found any statistically significant improvements in quality of life at any follow-up. However, pooled analyses indicated small increases in total quality of life after 6 to 12 months (mean difference in change, 1.9 [95% CI, 0.2-3.5]; 11 RCTs [n = 1922]; I^2 = 48.4%) (eTable 5, eFigure 1 in the Supplement; most scales range from 0 to 100). Evidence from only 1 to 4 trials per outcome suggested that behavioral interventions had no impact on quality of life, depression, or social adjustment. Among the 4 pharmacotherapy studies that included a health outcome, semaglutide was associated with a 5.3-point greater improvement in weight-related quality of life (mean difference, 5.3 [95% CI, 0.2-8.3]; n = 201)[67] but the remaining 3 trials found no between-group differences in change in

Figure 2. Literature Search Flow Diagram: Weight Management in Children and Adolescents



Reasons for exclusion: Outcomes: Study did not report relevant outcomes. Comparator: Study did not use an included comparator. Setting: Study was not conducted in a country relevant to US practice, or not conducted in, recruited from, or feasible for primary care or a health system. Design: Study did not use an included design. Intervention: Study did not use an included intervention. Population: Study was not conducted in an included population. Publication type: Publication was a conference abstract only. Quality: Study was poor quality. Study relevance: Study aim was not relevant. Language: Study publication was not available in English. KQ indicates key question; USPSTF, US Preventive Services Task Force.

quality of life or depression incidence compared with placebo after 6 to 13 months.[61,63,64]

Benefits of Interventions: Intermediate Outcomes

KQ2. Do primary care–relevant behavioral, pharmacotherapy, or combined weight management interventions for children and adolescents with higher BMI affect weight outcomes or cardiometabolic outcomes?

Behavioral Interventions

Behavioral weight management interventions were associated with small reductions in BMI and other weight outcomes after 6 to 12 months (BMI mean difference, −0.7 [95% CI, −1.0 to −0.3]; 28 RCTs [n = 4494]; I^2 = 86.8%) (**Figure 3**; eTable 6 in the Supplement). Larger effects were seen in interventions with higher contact hours and that offered physical activity sessions as part of the intervention, rather than simply encouraging increased physical activity at home. The impact of contact hours could not be clearly disentangled from the impact of physical activity sessions because many of the higher contact interventions included physical activity sessions. There was no evidence of effect modification by other study or intervention characteristics (eFigure 2 in the Supplement). The clinical significance of the effect size is unclear, and evidence was exceedingly sparse beyond 12 months. Lipid levels, blood pressure, or fasting plasma glucose levels were reported by 16 of the 50 behavioral trials. Pooled effects indicated no impact on measures of cholesterol but suggested small improvements in blood pressure and fasting plasma glucose in trials offering 26 or more hours of contact; again, most of which also offered physical activity sessions (**Table 1**).

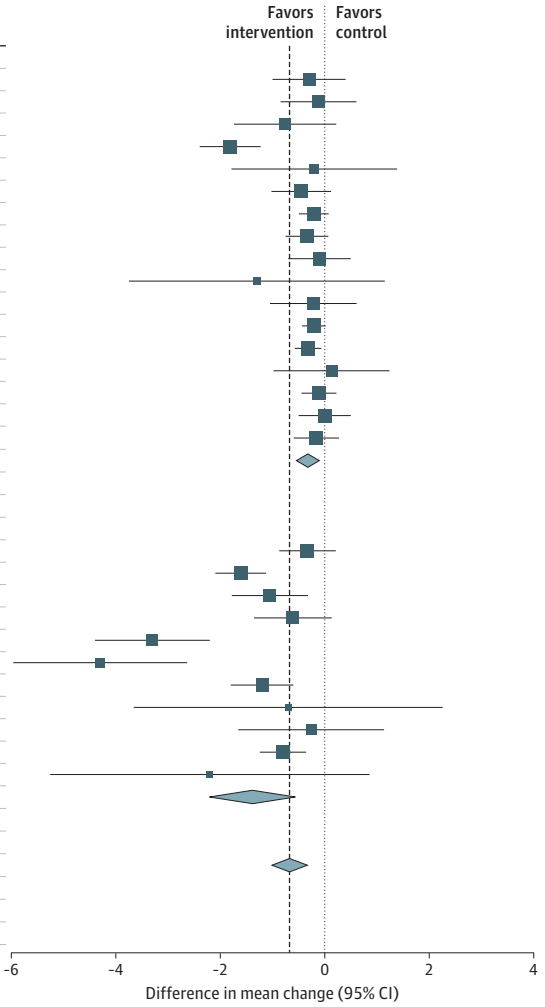
Pharmacotherapy Interventions

Intermediate outcomes were reported by 2 studies of orlistat[63,64] and 1 study each of phentermine/topiramate,[66] liraglutide,[61] and semaglutide[67] (eTables 7-12 in Supplement). Pharmacotherapy was associated with larger mean BMI reductions than placebo in all the studies except 1 small (n = 40) study of orlistat[64] (**Table 2**). The largest effect was seen with semaglutide, with a 6.0-point greater reduction in BMI (mean difference, −6.0 [95% CI, −7.3 to −4.6] after 16 months). All medications showed increases in the likelihood of losing both 5% and 10% of baseline weight or BMI. Group differences were not maintained in the liraglutide study after 6 months without treatment. Longer-term maintenance after medication withdrawal was not reported for any of the other medications.

The only medication that showed a clear benefit for blood pressure was phentermine/topiramate, and only at the higher dose level (mean difference for diastolic blood pressure, −4.0 [95% CI, −7.7 to −0.5]) (**Table 3**). Semaglutide was associated with improved low-density lipoprotein cholesterol levels (mean difference in percent change, −7.1 [95% CI, −11.9 to −1.8]) and phentermine/topiramate with improved high-density lipoprotein cholesterol levels (eg, 15/92 mg/d dose: mean difference in percent change, 8.8 [95% CI, 2.2-15.4]), but other medications had minimal to no impact on lipid levels. None of the trials found improvements in glucose-related parameters.

Figure 3. Pooled Analysis of Change in Body Mass Index in Behavioral Interventions Compared With Controls, by Estimated Contact Hours

Source	Follow-up, mo	Time since treatment end, mo	PA sessions, No.	Participants, No.		Mean change (SD)		Difference in mean change (95% CI)
				Intervention	Control	Intervention	Control	
<26 h								
Taylor et al,[53] 2015	12	-12[a]	0	91	90	0.1 (2.7)	0.4 (2.1)	-0.30 (-1.00 to -0.40)
Ho et al,[20] 2016	6	0	0	37	36	0 (1.6)	0.1 (1.5)	-0.12 (-0.85 to 0.61)
Hofsteenge et al,[21] 2014	6	0	0	53	44	-0.5 (4.7)	0.6 (5.2)	-0.76 (-1.74 to 0.22)
Köse and Yildiz,[25] 2021	6	0	0	37	27	-2.3 (1.2)	-0.5 (1.2)	-1.81 (-2.39 to -1.23)
Norman et al,[32] 2016	12	0	0	53	53	0.2 (4.2)	0.4 (4.1)	-0.20 (-1.79 to 1.39)
Stettler et al,[47] 2015	12	0	0	46	24	0.6 (2.7)	1.7 (3.3)	-0.45 (-1.02 to 0.12)
Taveras et al,[50] 2011	12	0	0	253	192	0.3 (1.4)	0.5 (1.4)	-0.21 (-0.49 to 0.07)
Taveras et al,[51] 2015	12	0	0	164	171	0.9 (4.4)	1.2 (4.4)	-0.34 (-0.75 to 0.07)
Wake et al,[58] 2013	12	0	0	56	49	0.9 (3.4)	0.8 (4.2)	-0.10 (-0.70 to 0.50)
Saelens et al,[39] 2002	7	3	0	18	19	0.1 (4.1)	1.4 (3.5)	-1.30 (-3.75 to 1.15)
Viner et al,[55] 2020	12	6	0	60	55	0.5 (NR)	0.8 (NR)	-0.22 (-1.05 to 0.61)
Derwig et al,[17] 2021	12	7.5	0	238	237	-0.2 (1.0)	0 (1.0)	-0.21 (-0.43 to 0.01)
Broccoli et al,[12] 2016	12	9	0	186	185	0.5 (1.3)	0.8 (1.2)	-0.32 (-0.57 to -0.07)
Tanofsky-Kraff et al,[48] 2010	12	9	0	19	19	0.8 (1.3)	0.7 (2.1)	0.13 (-0.98 to 1.24)
Wake et al,[57] 2009	12	9	0	127	115	0.6 (2.6)	0.7 (2.2)	-0.11 (-0.44 to 0.22)
McCallum et al,[29] 2007	15	12	0	70	76	1.2 (2.8)	1.2 (2.2)	0.00 (-0.50 to 0.50)
van Grieken et al,[54] 2013	24	12	0	277	230	1.4 (1.5)	1.4 (1.7)	-0.16 (-0.59 to 0.27)
Heterogeneity: $\tau^2 = 0.09$, $I^2 = 62.12\%$, $H^2 = 2.64$								-0.32 (-0.54 to -0.10)
Test of $\theta_i = \theta_j$: $Q_{16} = 32.79$, $P = .01$								
Test of $\theta = 0$: $t_{16} = -3.13$, $P = .01$								
≥26 h								
Croker et al,[14] 2012	6	0	0	31	27	-0.4 (1.1)	0 (1.1)	-0.33 (-0.87 to 0.21)
Reinehr et al,[36] 2010	6	0	1	34	32	-0.9 (1.0)	0.8 (1.0)	-1.61 (-2.10 to -1.12)
Savoye et al,[41] 2014	6	0	1	31	27	-0.4 (1.0)	0.7 (1.4)	-1.05 (-1.78 to -0.32)
Kalarchian et al,[22] 2009	12	0	0	97	95	0.5 (3.0)	1.1 (2.2)	-0.61 (-1.35 to 0.13)
Savoye et al,[40] 2007	12	0	1	105	69	-1.7 (3.1)	1.6 (3.2)	-3.30 (-4.40 to -2.20)
Weigel et al,[59] 2008	12	0	1	36	30	-1.5 (3.0)	2.8 (3.9)	-4.30 (-5.97 to -2.63)
Sacher et al,[38] 2010	6	3.75	1	37	45	-1.5 (3.5)	0.6 (5.1)	-1.20 (-1.80 to -0.60)
Boutelle et al,[11] 2014	8	4	0	21	18	-0.1 (4.7)	0.6 (4.7)	-0.70 (-3.66 to 2.26)
Smith et al,[43] 2021	12	6	0	141	99	1.1 (5.3)	1.4 (5.6)	-0.26 (-1.66 to 1.14)
Kalavainen et al,[23] 2007	12	6	1	35	35	-0.8 (0.9)	0 (1.0)	-0.80 (-1.24 to -0.36)
Nemet et al,[31] 2005	12	9	1	20	20	-1.6 (4.3)	0.6 (5.5)	-2.20 (-5.26 to 0.86)
Heterogeneity: $\tau^2 = 1.05$, $I^2 = 87.78\%$, $H^2 = 8.19$								-1.38 (-2.21 to -0.56)
Test of $\theta_i = \theta_j$: $Q_{10} = 47.05$, $P < .001$								
Test of $\theta = 0$: $t_{10} = -3.75$, $P < .001$								
Overall								-0.67 (-1.02 to -0.33)
Heterogeneity: $\tau^2 = 0.46$, $I^2 = 86.81\%$, $H^2 = 7.58$								
Test of $\theta_i = \theta_j$: $Q_{27} = 123.53$, $P < .001$								
Test of $\theta = 0$: $t_{27} = -4.05$, $P < .001$								
Test of group differences: $Qb_1 = 8.08$, $P < .001$								



Random-effects restricted maximum likelihood model with Knapp–Hartung confidence intervals. Body mass index (BMI) calculated as weight in kilograms divided by the square of height in meters. The size of data markers indicates the weight of each study in the analysis. NR indicates not reported; PA, physical activity.

[a]Study had a 24-month intervention but also measured BMI after 12 months; thus, the intervention was ongoing at the 12-month assessment.

Table 1. Meta-Analysis Results for Lipid Levels, Blood Pressure, and Insulin Outcomes for Behavioral Interventions

Outcome	All studies in meta-analysis			<26 Contact hours			≥26 Contact hours			*P* value (difference between contact levels)
	No. of studies (participants)	I^2, %	Mean difference in change (95% CI)	No. of studies (participants)	I^2, %	Mean difference in change (95% CI)	No. of studies (participants)	I^2, %	Mean difference in change (95% CI)	
Blood pressure, mm Hg										
Systolic	12 (1189)	63.5	−2.0 (−4.1 to 0.2)	4 (416)	0.0	1.4 (−1.3 to 4.1)	8 (773)	47.3	−3.6 (−5.7 to −1.5)	.001
Diastolic	12 (1190)	35.2	−2.2 (−3.8 to −0.7)	4 (417)	0.0	−0.8 (−2.3 to 0.7)	8 (773)	49.3	−3.0 (−5.2 to −0.7)	.12
Lipids, mg/dL										
LDL-C	7 (648)	56.9	−3.2 (−9.0 to 2.6)	4 (347)	74.6	−3.9 (−17.4 to 9.5)	3 (301)	0.0	−2.4 (−9.7 to 4.8)	.77
HDL-C	11 (916)	0.0	0.7 (−0.0 to 1.4)	7 (548)	0.0	0.6 (−0.2 to 1.3)	4 (368)	0.0	0.8 (−1.6 to 3.2)	.84
Total cholesterol	6 (534)	46.5	−4.3 (−12.1 to 3.4)	3 (233)	14.0	−2.2 (−18.4 to 13.9)	3 (301)	63.0	−5.9 (−28.2 to 16.4)	.57
Triglycerides	9 (800)	53.0	−4.7 (−14.5 to 5.1)	5 (433)	0.0	5.5 (0.6 to 10.5)	4 (367)	0.0	−16.9 (−29.7 to −4.0)	<.001
Fasting plasma glucose, mg/dL	9 (750)	28.5	−0.6 (−2.1 to 1.0)	5 (383)	5.0	1.0 (−1.4 to 3.4)	4 (367)	0.0	−1.9 (−2.7 to −1.2)	.02

Abbreviations: HDL-C, high-density lipoprotein cholesterol; LDL-C, low-density lipoprotein cholesterol.

SI conversion factors: To convert LDL-C, HDL-C, and total cholesterol values to mmol/L, multiply by 0.0259; triglycerides values to mmol/L, multiply by 0.0113; fasting plasma glucose values to mmol/L, multiply by 0.0555.

Benefits of Interventions: Behavioral Outcomes

KQ3. Do primary care–relevant behavioral, pharmacotherapy, or combined weight management interventions for children and adolescents with higher BMI improve behavioral outcomes?

Twenty-three of the 50 behavioral intervention trials reported on a behavioral outcome eligible for inclusion in this review (n = 3459).[12,16,18,19,24,27,29,31,33-36,38,39,42-46,50,53,57,58] Although some individual trial findings were statistically significant, most evidence and the meta-analyses indicated no effect on minutes per day of physical activity or sedentary behavior (physical activity: mean difference, 5.2 [95% CI, −2.0 to 12.4]; 10 RCTs [n = 1533]; I^2 = 85.5%; sedentary behavior: mean difference, −13.3 [95% CI, −26.9 to 0.4]; 11 RCTs [n = 1366]; I^2 = 41.4%) (eTable 13 in the Supplement). Only 5 trials reported overall dietary pattern scores, and findings were mixed (eFigure 3 in the Supplement). None of the pharmacotherapy studies reported behavioral outcomes.

Harms of Interventions

KQ4. Are there harms associated with weight management interventions for children and adolescents?

None of the 18 trials (n = 2539) that reported potential harms of behavioral weight management interventions found an increase in the risk of any adverse event or serious adverse events or decreases in self-esteem, body satisfaction, or disordered eating after 6 to 12 months (eTable 14 in the Supplement). Two trials of interpersonal therapy with limited counseling to change diet and physical activity found reductions in disordered eating,[48,49] suggesting a benefit rather than a harm of behavioral interventions. No information was available on the risk of harm beyond 12 months.

Gastrointestinal adverse effects were common among patients taking glucagon-like peptide-1 agonists and orlistat (eFigure 4 in the Supplement). Discontinuation due to adverse effects occurred in 10.4% in the larger trial of liraglutide compared with none in the group receiving placebo injections.[61] Discontinuation due to adverse effects was relatively rare with semaglutide, orlistat, and phentermine/topiramate, less than 5% in all groups. Serious adverse effects were rare for all medications and did not differ between groups in any study, although 5 participants taking semaglutide (3.8%) developed gallstones, compared with none taking placebo (calculated relative risk, 5.8 [95% CI, 0.3-106.1]). The most common nonserious adverse events reported with phentermine/topiramate were musculoskeletal and psychiatric, when taken at doses of 15 mg phentermine/92 mg topiramate. No evidence was available beyond 17 months for any of the pharmacologic interventions.

Discussion

The evidence in this review demonstrated that behavioral weight management interventions in children and adolescents typically resulted in small reductions in weight or weight gain for up to 1 year. Larger effects were seen in interventions with at least 26 hours of contact and that included physical activity sessions (**Table 4**). Very limited evidence suggested that these higher-dose interventions also resulted in small reductions in blood

Table 2. Change in Body Mass Index at End of Treatment With Pharmacotherapy

Source	Medication	Follow-up, mo (mo since treatment ended)	No. of participants		Baseline BMI, mean (SD)[a]		Follow-up change, mean (SD)[a]		Between-group difference in mean change (95% CI)[a]
			Intervention	Control	Intervention	Control	Intervention	Control	
Kelly et al,[61] 2020	Liraglutide	13 (0)	125	126	35.3 (5.1)	35.8 (5.7)	−1.4 (3.5)	0.2 (3.7)	−1.6 (−2.5 to −0.7)
Weghuber et al,[67] 2022	Semaglutide	16 (0)	134	67	37.7 (6.7)	35.7 (5.4)	−5.8 (NR)	0.1 (NR)	−6 (−7.3 to −4.6)
Chanoine et al[63] 2005	Orlistat	12 (0)	352	181	35.7 (4.2)	35.4 (4.1)	−0.6 (NR)	0.3 (NR)	−0.9 (NR)[b]
Maahs et al,[64] 2006	Orlistat	6 (0)	16	18	39.2 (5.3)	41.7 (11.7)	−1.3 (7.2)	−0.8 (13.4)	−0.5 (−7.9 to 6.9)
Hsia et al,[65] 2019	Intervention 1: phentermine (15 mg)/topiramate (92 mg)	13 (0)	113	56	39 (7.4)	36.4 (6.4)	−4.2 (3.3)	1.2 (3.4)	−5.4 (−6.4 to −4.3)
	Intervention 2: phentermine (7.5 mg)/topiramate (46 mg)	13 (0)	54	56	36.9 (6.8)	36.4 (6.4)	−2.5 (3.2)	1.2 (3.4)	−3.7 (−5.0 to −2.5)

Abbreviation: NR, not reported.

[a] Body mass index (BMI) calculated as weight in kilograms divided by square of height in meters.

[b] $P = .001$.

pressure, fasting glucose levels, and quality of life but had no apparent impact on lipid levels, other psychosocial outcomes, dietary pattern, or minutes per week of physical activity outside of the intervention sessions. Lower-contact interventions generally had minimal impact on weight or other outcomes, although some individual trials showed greater weight loss compared with control. The current review included 10 new trials of behavioral interventions, and findings remained consistent with those of the previous USPSTF review on this topic[5] as well as another recently-published review.[68]

The evidence on whether weight loss was maintained beyond 1 year was exceedingly sparse. Furthermore, there was extremely limited evidence on the impact of these interventions on other intermediate and health outcomes beyond 1 year.

Very minimal evidence suggested that behavioral interventions did not have a negative impact on self-esteem, body satisfaction, or disordered eating. However, these potential harms of behavioral interventions were reported in just a small subset of trials that reported weight outcomes, reporting was highly variable, and follow-up times may have been too short to detect important harms. Furthermore, these outcomes represent only the immediate potential harms of interventions. Many additional related harms have been hypothesized but were not addressed in this review, including the potential harm of being clinically labeled as having overweight or obesity, misclassification of "health" based solely on the BMI, perpetuation of weight stigma, or harms subsequent to potential weight regain and weight cycling.

Since the prior review for the USPSTF, several new pharmacotherapy agents have been approved for use in pediatric populations, and the 2023 Clinical Practice Guideline developed by the American Academy of Pediatrics (AAP) states that clinicians "may offer children ages 8 through 11 years of age with obesity weight loss pharmacotherapy, according to medication indications, risks, and benefits, as an adjunct to health behavior and lifestyle treatment."[69] However, the evidence base for each agent is limited, consisting of only 1 trial per medication with more than 6 months of treatment. Orlistat showed a similar effect size as behavioral interventions. Compared with placebo, glucagon-like peptide-1 agonists and phentermine/topiramate showed larger effects on weight (≈4 to 18 kg) than was observed with behavioral interventions. Gastrointestinal symptoms were common with orlistat and liraglutide in the short term, and there was no information on the harms of medication use beyond 13 to 17 months. Similar to behavioral intervention trials, pharmacotherapy trials reported no increased risks of harmful psychosocial outcomes such as poorer quality of life, mental health, body dissatisfaction, or disordered eating. For pharmacotherapy, when evidence was available on weight maintenance after discontinuation, weight rebounded quickly after medication use ended. This suggests that long-term use is required for weight maintenance and underscores the need for evidence about potential harms from long-term use.

Evidence on Health Benefits of BMI Reduction

The only improvement in health outcomes identified in the included studies was a 3.7- to 5.3-point increase in quality of life (on mostly 100-point scales) in trials of semaglutide and high-contact behavioral interventions compared with controls. This finding was statistically significant in the meta-analysis among the high-contact

Table 3. Change in Blood Pressure at End of Treatment With Pharmacotherapy

Source	Medication	Follow-up, mo (mo since treatment ended)	Outcome	No. of participants		Baseline, mean (SD), mm Hg		Follow-up change, mean (SD), mm Hg		Between-group difference in mean change (95% CI), mm Hg
				Intervention	Control	Intervention	Control	Intervention	Control	
Kelly et al,[61] 2020	Liraglutide	13 (0)	SBP	125	126	116 (10)	117 (12)	−1.2 (10.1)	0.8 (10.1)	−2.0 (−4.5 to 0.4)
			DBP	125	126	72 (8)	73 (8)	0.8 (7.7)	−0.5 (7.7)	1.2 (−0.7 to 3.1)
Weghuber et al,[67] 2022	Semaglutide	16 (0)	SBP	134	67	120 (11)	120 (12)	−2.7 (NR)	−0.8 (NR)	−1.9 (−5 to 1.1)
			DBP	134	67	73 (9)	73 (9)	−1.4 (NR)	−0.8 (NR)	−0.6 (NR)[a]
Chanoine et al,[63] 2005	Orlistat	12 (0)	SBP	347	180	114 (12)	114 (12)	1.1 (NR)	1.3 (NR)	−0.2 (NR)[a]
			DBP	347	180	68 (10)	67 (10)	−0.5 (NR)	1.3 (NR)	−1.8 (NR)[b]
Hsia et al,[65] 2019	Intervention 1: phentermine (15 mg)/topiramate (92 mg)	13 (0)	SBP	113	56	117.4 (10.2)	117.7 (10.4)	1 (11.1)	2.8 (12.1)	−1.8 (−5.6 to 2.0)
			DBP	113	56	72.9 (7.3)	71.7 (8.3)	0.1 (9)	3.1 (10)	−3.0 (−6.1 to 0.1)
	Intervention 2: phentermine (7.5 mg)/topiramate (46 mg)	13 (0)	SBP	54	56	121.4 (9.2)	117.7 (10.4)	−1 (11)	2.8 (12.1)	−3.8 (−8.1 to 0.6)
			DBP	54	56	75.8 (6.7)	71.7 (8.3)	−0.9 (9)	3.1 (10)	−4.0 (−7.5 to −0.5)

Abbreviations: DBP, diastolic blood pressure; NR, not reported; SBP, systolic blood pressure.

[a] $P > .05$.

[b] $P = .04$.

(but not the lower-contact) behavioral interventions and with semaglutide (but not orlistat or phentermine/topiramate). These findings are consistent with published minimal clinically important differences for the Pediatric Quality of Life Inventory, which range from 4.4 to 6.3.[70,71] While this evidence is promising, only a small proportion of the included studies reported quality of life, follow-up is short-term, and not all used the PedsQL, so this evidence is still quite limited.

Long-term RCT evidence about whether BMI reduction in childhood and adolescence is associated with reduced chronic disease or mortality later in life is not available. Such studies would require decades of follow-up and large sample sizes and are unlikely to ever be conducted. In the absence of these studies, investigators have analyzed large cohorts of children to evaluate the association between BMI in childhood with outcomes in adulthood (eFigure 5 in the Supplement). Large cohort studies suggest that high BMI in childhood is associated with an increased risk of premature mortality and cardiovascular disease risk factors relative to children with BMI below the 50th percentile for age and sex (eTable 15 in the Supplement), but this evidence has limitations.[72-75] Specifically, the 50th-percentile cutoff is not consistent with current definitions of overweight or obesity; moreover, the data are observational and cannot control for potentially important confounding factors such genetic contributors to early mortality, behavioral factors such as fitness and diet (eFigures 6 and 7 in the Supplement), engagement with health care, or whether negative consequences of higher BMI may be due in part of weight stigma and the avoidance of care by people with bigger bodies because of stigma experienced.

The most robust evidence regarding intermediate outcomes in pediatric populations suggests that zBMI reductions of at least 0.7 are needed to confer detectable change in cardiometabolic measures; however, the clinical importance of these changes is not established.[76] Mean reductions in zBMI found in the behavioral intervention trials included in this review were far smaller, generally ranging from 0.2 to 0.4 with higher-contact interventions and from 0 to 0.2 with lower-contact interventions. Semaglutide use was associated with zBMI reductions in this range, with a 1.1-point zBMI reduction (compared with a 0.1-point reduction among participants receiving a placebo injection). See the Contextual Findings section in the Supplement for more information on the association between BMI reduction or BMI and health.

The weight changes for most interventions found in this review likely leave most participants with a BMI that would still put them in the "overweight" or "obese" categories after the intervention ended. This issue raises the question of whether continued emphasis on weight is helpful after initial efforts, particularly given the association of weight cycling with ultimate weight gain,[77] type 2 diabetes (eTable 16 in the Supplement), and the known association between dieting and eating disorders.[78-80] Understanding individual patients' preferences and concerns is important to support shared decision-making, given the complex, heterogeneous, and poorly understood etiology of high BMI[81]; growing evidence that weight is largely influenced by factors that are not under the control of the individual[82,83]; limited information on longer-term outcomes; and relatively small BMI reduction associated with most weight management interventions such as those included in this review.

Table 4. Summary of Evidence: Weight Management in Children and Adolescents

Intervention	No. of studies; No. of observations	Summary of findings	Consistency and precision	Other limitations	Strength of evidence	Applicability
KQ1: Health outcomes						
Behavioral interventions	14 RCTs n = 2674	Few studies found any statistically significant improvements in quality of life at any time point; however, pooled analyses found small increases in total and physical quality of life after 6 to 12 mo, reported in only a small subset of the included trials (eg, total quality of life: mean difference, 1.9 [95% CI, 0.2 to 3.5]; 11 RCTs [n = 1922]) Other health outcomes were sparsely reported, and none suggested a benefit	Quality of life: consistent, imprecise Other health outcomes: consistency inconsistent or NA, imprecise	Sparse reporting of health outcomes QoL: only 1 study included a weight-specific quality of life instrument; studies varied in the use of child report vs parent proxy report of QoL; variation in the use of subscales vs total QoL scales	QoL: low Other health outcomes: insufficient	Six trials conducted in the US Limited information on effects in specific populations at risk of health inequities and higher-than-average BMI (Black, Hispanic, Native American; limited financial resources or other social needs)
Liraglutide	1 RCT n = 251	No group differences in mean change in either weight-related quality of life (mean difference, 1.3 [95% CI, −1.6 to 4.2]) or depression incidence (RR, 1.71 [95% CI, 0.40 to 7.31]) after 13 mo of treatment	Consistency NA, imprecise	Body of evidence limited to 1 study; follow-up limited to 13 mo; no posttreatment follow-up	Insufficient	Multinational study, including sites in Belgium, Mexico, Russia, Sweden, and US
Semaglutide	1 RCT n = 201	Semaglutide was associated with small improvement in weight-related quality of life (mean difference, 4.3 [95% CI, 0.2 to 8.3]) on a 100-point scale	Consistency NA, imprecise	Body of evidence limited to 1 study; follow-up limited to 16 mo; no posttreatment follow-up	Insufficient	Multinational study, including sites in Austria, Belgium, Croatia, Ireland, Mexico, Russian Federation, UK, and US
Orlistat	2 RCTs n = 579	One trial each reported weight-related quality of life and depression incidence, with no group differences on either outcome after 6 to 12 mo	Consistency NA, imprecise	Small body of evidence; follow-up limited to 6 to 12 mo; no posttreatment follow-up	Insufficient	Both studies conducted in the US, recruited from health care settings; smaller study (n = 40) included 62% Hispanic/Latino participants
Phentermine/topiramate	1 RCT n = 227	No group differences in quality of life or depression incidence	Consistency NA, imprecise	Body of evidence limited to 1 study; follow-up limited to 13 mo; no posttreatment follow-up	Insufficient	Study conducted in the US; included 27% Black participants and 32% Hispanic/Latino participants
KQ2: Intermediate outcomes						
Behavioral interventions: weight or adiposity	50 RCTs n = 8798	Pooled analysis indicated average small reductions in BMI with weight management interventions compared with control conditions in the short term (6-12 mo; mean difference, −0.65 [95% CI, −0.98 to −0.32]; 29 RCTs [n = 4639]) Effects on BMI were larger for interventions offering an estimated ≥26 h of contact and for those that provided physical activity sessions Evidence was extremely limited beyond 12 mo, and very limited evidence suggested attenuation of effects after treatment ended Other weight and adiposity outcomes showed similar patterns of results	Consistent, precise	Could not disentangle the impact of contact hours and inclusion of physical activity sessions during intervention sessions Clinical significance of the effect is unknown Minimal information on effects after 12 mo or maintenance after treatment ends	High for benefit up to 12 mo	Limited information on effects in specific populations at risk of health inequities and higher-than-average BMI (Black, Hispanic, Native American; limited financial resources or other social needs)

(continued)

Table 4. Summary of Evidence: Weight Management in Children and Adolescents (continued)

Intervention	No. of studies; No. of observations	Summary of findings	Consistency and precision	Other limitations	Strength of evidence	Applicability
Behavioral interventions: other intermediate outcomes	16 RCTs n = 1700	Pooled effects indicated no impact on measures of cholesterol but suggested slightly larger improvements in blood pressure and fasting plasma glucose compared with control groups, only in trials offering 26 or more h of contact, almost all of which also offered physical activity sessions For example, among trials with ≥26 contact h: HDL-C: mean difference, 0.8 (95% CI, −1.6 to 3.2) mg/dL; 4 RCTs SBP: mean difference, −3.6 (95% CI, −5.7 to −1.5) mm Hg; 8 RCTs DBP: mean difference, −3.0 (95% CI, −5.2 to −0.7) mm Hg; 8 RCTs Fasting plasma glucose: mean difference, −1.9 (−2.7 to −1.2) mg/dL; 4 RCTs	Blood pressure, fasting plasma glucose: consistent (that benefit only seen with >26 h), imprecise Lipids: inconsistent, imprecise	Few trials reporting Could not disentangle the impact of contact hours and inclusion of physical activity sessions during intervention sessions Clinical significance of the effects is unknown No information on effects after 12 mo, minimal information on maintenance after treatment ends	Blood pressure, fasting plasma glucose: low (benefit only with higher contact hours and physical activity sessions) Lipids: low (no benefit)	Limited information on effects in specific populations at risk of health inequities and higher-than-average BMI (Black, Hispanic, Native American; limited financial resources or other social needs)
Liraglutide	1 RCT n = 251	Pharmacotherapy was associated with larger mean BMI reduction than placebo after 13 mo (mean difference, −1.6 [95% CI, −2.5 to −0.7]), which translated to 4.5-kg greater weight reduction (mean difference, −4.5 [95% CI, −7.2 to −1.8]) Group differences not maintained 6 mo after treatment ended (BMI mean difference, −1.0 [95% CI, −2.0 to 0.01]) Liraglutide was associated with very small increases in all lipid measures including HDL-C, LDL-C, total cholesterol, and triglycerides (eg, LDL-C mean difference, 1.0 [95% CI, 0.94 to 1.05]) but had no impact on blood pressure or glucose metabolism after 13 mo of treatment	Consistency NA, precise	Evidence limited to 1 trial Clinical significance of the effects is unknown Effect on weight deteriorated after treatment ended; impact on other intermediate outcomes after treatment ended is unknown	Weight: low for benefit at up to 13 mo Intermediate outcomes: low with mixed findings	Multinational study, including sites in Belgium, Mexico, Russia, Sweden, and US
Semaglutide	1 RCT n = 201	Pharmacotherapy was associated with larger mean BMI reduction than placebo after 16 mo (mean difference, −6.0 [95% CI, −7.3 to −4.6]), which translated to 4.5-kg greater weight reduction (mean difference, −17.7 [95% CI, −21.8 to −13.7]) Group differences not reported after discontinuation Semaglutide was associated with greater percent reductions in LDL-C, total cholesterol, and triglycerides from baseline levels (eg, LDL-C mean difference, −7.0% [95% CI, −11.9% to −1.8%]) and a statistically nonsignificant increase in HDL-C (mean difference, 4.7% [95% CI, −1% to 10.7%]) but had no impact on blood pressure or glucose metabolism after 16 mo of treatment	Consistency NA, precise	Evidence is limited to 1 trial with no follow-up after medication was discontinued Clinical significance of the effects on cardiometabolic outcomes are unknown	Low for benefit	Multinational study, including sites in Austria, Belgium, Croatia, Ireland, Mexico, Russian Federation, UK, and US
Orlistat	2 RCTs n = 579	Pharmacotherapy was associated with larger mean BMI reduction than placebo after 12 mo in 1 of the 2 included trials (mean difference, −0.9 [95% CI, NR; *P* = .001]; n = 537), which was associated with 2.6-kg greater weight reduction (95% CI, NR) One orlistat study (n = 537) found no improvement in lipid levels, glucose levels, or SBP with orlistat use compared with placebo after 12 mo but a slightly larger improvement in DBP compared with placebo (mean difference, −1.8 [95% CI, NR; *P* = .04])	Consistent, precise	Evidence limited to 2 trials Clinical significance of the effects are unknown No information on maintenance of effects after treatment ended	Weight: low for benefit at up to 12 mo Intermediate outcomes: low for no benefit	Both studies conducted in the US, recruited from health care settings; smaller study (n = 40) included 62% Hispanic/Latino participants

(continued)

Table 4. Summary of Evidence: Weight Management in Children and Adolescents (continued)

Intervention	No. of studies; No. of observations	Summary of findings	Consistency and precision	Other limitations	Strength of evidence	Applicability
Phentermine/ topiramate	1 RCT n = 227	After 13 mo, phentermine/topiramate was associated with greater reductions in BMI: 15/92-Mg dose: mean difference, −5.4 (95% CI, −6.4 to −4.3) 7.5/46-Mg dose: mean difference, −3.7 (95% CI, −5.0 to −2.5) After 13 mo, phentermine/topiramate was associated with greater reductions in weight: 15/92-Mg dose: mean difference, −15.8 kg (95% CI, −18.8 to −12.8) 7.5/46-Mg dose: mean difference, −12.1 kg (95% CI, −15.6 to −8.6) HDL-C levels increased from baseline by 9 to 10 percentage points more with phentermine/topiramate than placebo, and the lower-dose group of the phentermine/topiramate study showed a reduction in DBP; however, no group differences were found for SBP or insulin sensitivity at either dose level	Consistency NA, precise	Evidence limited to 1 trial Clinical significance of the effects on cardiometabolic outcomes is unknown No information on maintenance of effects after treatment ended	Low for benefit	Study conducted in US, included 27% Black participants, 32% Hispanic/Latino participants
KQ3: Behavioral outcomes						
Behavioral interventions	23 RCTs n = 3459	Most evidence and meta-analyses indicated no impact on minutes per day of physical activity or sedentary behavior: Physical activity: mean difference, 5.2 (95% CI, −2.0 to 12.4); 10 RCTs Sedentary behavior: mean difference, −13.3 [95% CI, −26.9 to 0.4]; 11 RCTs Findings were mixed among 5 trials reporting overall dietary pattern	Physical activity, sedentary behavior: consistent, imprecise Dietary pattern: inconsistent, imprecise	Sparse reporting of behavioral outcomes Heterogeneity in specific measures	Low for no benefit	Limited information on effects in specific populations at risk of health inequities and higher-than-average BMI (Black, Hispanic, Native American; limited financial resources or other social needs)
Pharmacotherapy	0 studies	NA	NA	NA	Insufficient	NA
KQ4: Harms of interventions						
Behavioral interventions	18 RCTs n = 2539	None of the 18 trials reporting potential harms of behavioral weight management interventions found an increase in the risk of any adverse events, serious adverse events, self-esteem, body satisfaction, or disordered eating Outcomes reported 6 to 12 mo after baseline assessments	Consistent, imprecise	Very sparse evidence for all outcomes No information was available on the risk of harm beyond 12 mo Body satisfaction and self-esteem may be culturally influenced, but evidence was insufficient to examine cross-culturally Outcomes address only immediate harms of the intervention, and none examined larger effects related, for example, to labeling, stigma, or potential weight regain	Low for no increased risk of harm	Limited information on effects in specific populations at risk of health inequities and higher-than-average BMI (Black, Hispanic, Native American; limited financial resources or other social needs)

(continued)

Table 4. Summary of Evidence: Weight Management in Children and Adolescents (continued)

Intervention	No. of studies; No. of observations	Summary of findings	Consistency and precision	Other limitations	Strength of evidence	Applicability
Liraglutide	3 RCTs n = 296	The best data, from the largest study (n = 251), indicated an increased risk of gastrointestinal effects (RR, 3.20 [95% CI, 1.91 to 5.36]; 65% vs 36%) and discontinuation due to adverse effects (RR, 30.36 [95% CI, 2.78 to 516.57]; 10% vs 0%)	Consistent, imprecise	There may be rare harms that RCTs were underpowered to detect No information on harms of long-term use	Serious adverse events: insufficient Any adverse events: low for increased harm	Largest trial providing most of the evidence was a multinational study, including sites in Belgium, Mexico, Russia, Sweden, and US
Semaglutide	1 RCT n = 201	Gastrointestinal adverse effects were the most common harm (RR, 2.24 [95% CI, 1.23 to 4.07]; 62% vs 42%) Although not significantly different, 5 participants taking semaglutide (3.8%) developed gallstones, vs none taking placebo (calculated RR, 5.8 [95% CI, 0.3 to 106.1])	Consistent, imprecise	There may be rare harms that RCTs were underpowered to detect No information on harms of long-term use	Serious adverse events: insufficient Any adverse events: high for increased harm	Multinational study, including sites in Austria, Belgium, Croatia, Ireland, Mexico, Russian Federation, UK, and US
Orlistat	2 RCTs n = 579	Gastrointestinal adverse effects were more common with orlistat use, including flatus with discharge (RR, 8.74 [95% CI, 3.46 to 22.07]; 20% vs 3%) and fecal incontinence (RR, 17.38 [95% CI, 2.35 to 128.4]; 9% vs 1%) in the larger study Discontinuation and serious adverse events did not differ between groups	Consistent, imprecise	There may be rare harms that RCTs were underpowered to detect No information on harms of long-term use	Serious adverse events: insufficient Any adverse events: low for increased harm	Both studies conducted in the US, recruited from health care settings; smaller study (n = 40) included 62% Hispanic/Latino participants
Phentermine/topiramate	2 RCTs n = 269	Combining both studies, withdrawals due to adverse events was 2.4% in participants taking phentermine/topiramate and in those taking placebo Two persons experienced serious adverse events: bile duct stone and depression with suicidal ideation In the larger study, the adverse effects that were slightly more common with higher-dose phentermine/topiramate were musculoskeletal (experienced by 10 persons [8.8%] with phentermine/topiramate vs 1 [1.8%] with placebo) and psychiatric (10 persons [8.8%] with phentermine/topiramate vs 1 [1.8%] with placebo), although group differences were not statistically significant	Consistent, imprecise	There may be rare harms that RCTs were underpowered to detect No information on harms of long-term use	Serious adverse events: insufficient Any adverse events: low for increased harm	Larger study conducted in the US, included 27% Black participants and 32% Hispanic/Latino participants

Abbreviations: BMI, body mass index; DBP, diastolic blood pressure; HDL-C, high-density lipoprotein cholesterol; KQ, key question; LDL-C, low-density lipoprotein cholesterol; NA, not applicable; NR, not reported; QoL, quality of life; RCT, randomized clinical trial; RR, relative risk; SBP, systolic blood pressure.

Weight Stigma

Although monitoring weight is a routine part of medical care for young people, telling pediatric patients that they have overweight or obesity may have unintended negative consequences for some patients and should be handled carefully and sensitively, as noted in the AAP guidance.[69] Weight stigma is pervasive and damaging and has been documented among both patients and clinicians.[84-86] A panoply of critiques have been published about the weight-centered health paradigm (ie, discourse about health that centers on the importance of body weight), raising concerns about the harms of treating higher weight as a problem that must be solved or a disease that must be treated.[87] This body of work is primarily focused on adults and centers on the belief that diversity in body size is normal and expected among humans, the widespread and harmful stigma and inequities faced by people with higher weight, and the belief that weight loss is not a requirement for optimal health among people with high BMI.

Young people who perceive themselves as being too heavy are prone to potentially damaging weight loss methods and poor psychosocial outcomes, even after controlling for baseline BMI.[88] Another study found that youth with high BMI who underperceived their weight had lower blood pressure in adulthood than those who perceived themselves to be overweight.[89] See the Contextual Findings section in the Supplement for more information on weight stigma.

Weight and Health Equity

Diet and physical activity are heavily influenced by the local community environment and by family-level economics. These environmental influences are shaped by larger structural forces that have systematically disadvantaged communities that have experienced discrimination, such as Black, Hispanic/Latino, and Native American communities, with corresponding higher prevalence of high BMI in these communities (eFigure 8 in the Supplement).[90-92] For example, neighborhood environment has an impact on physical activity; crime rates and access to nearby parks are known to affect physical activity in young people.[90,93] Further, financial insecurity is an important driver of dietary behaviors; families with limited financial resources must spend a higher proportion of their household income on food, and insufficient food budgets can drive families to prioritize cost-effectiveness over healthfulness to help reduce financial strain.[91] Additionally, stress, uncertainty, and long work hours for parents constrain their ability to prepare and serve healthy foods and are associated with haphazard meal planning, emotional eating, and snacking on sweets among adults with higher BMI.[90]

There is also strong evidence documenting important barriers to health care for families with lower income,[94-96] which could lead to lower participation in weight management interventions in health care settings. In addition, there may be unequal access to weight loss medication based on insurance status and income. Weight loss medications may have high costs, which represents a substantial barrier for lower-income households.

Regarding weight stigma, critics have observed that maltreatment of people with high BMI has racist historic roots[97] and disproportionately affects people who are already disadvantaged by stigma and prejudice, such as people who are Black, Native American, and gender nonconforming.[87,98] See the Contextual Findings section in the Supplement for more information on health equity.

Limitations

First, the lack of evidence on long-term maintenance of weight loss is a critical limitation of this literature, especially since weight relapse after weight management interventions is acknowledged as common by the AAP.[69] This review found 1 small long-term follow-up study (n = 176) after family-based weight management interventions in which 52% of children met criteria for obesity 10 years later.[99] This rate was lower than that observed in naturalistic longitudinal studies, which have found that approximately 65% of children who meet criteria for obesity continued to meet criteria in adulthood.[100] However, evidence is limited, and the comparability of participants in the treatment trials, which included approximately 30 hours of contact, to participants in the naturalistic longitudinal studies is unknown. More long-term data are needed.

Second, a deeper understanding of potential longer-term harms of behavioral interventions is needed. While we found no evidence in the short-term trials suggesting an increased risk of disordered eating associated with behavioral interventions, evidence on the etiology of eating disorders suggests that dieting combined with body dissatisfaction is an important risk factor for binging- and purging-spectrum eating disorders[78-80]; however, it is not well understood who may be most vulnerable and what intervention characteristics may contribute to or protect against eating disorders.

Third, the potential harms of pharmacotherapy in children and adolescents are not well understood. While we found minimal evidence of increased risk of serious harm in the short term, FDA materials suggest that there may be important risks. For phentermine/topiramate, the FDA materials note that it may increase the risk of cleft lip and cleft palate in offspring if taken during pregnancy.[101] Other FDA warnings for phentermine/topiramate include increased heart rate, suicidal thoughts, and serious eye problems that can lead to permanent vision loss if not treated. Also, phentermine/topiramate is a federally controlled substance (schedule IV) because it contains phentermine and can be abused or lead to drug dependence. Liraglutide and semaglutide are also contraindicated during pregnancy and are associated with an increased risk of thyroid tumors, including cancer, as well as pancreatitis, gallbladder problems, acute kidney injury, serious allergic reaction, heart rate increase, depression, thoughts of suicide, and, among patients with type 2 diabetes, hypoglycemia and vision changes.[102] Very limited evidence in this review suggested that weight loss is not maintained when medications are discontinued, so young people may need to continue using medication for years to decades to maintain lower weight, and the impact of many years of pharmacotherapy is not known.

Conclusions

In the short term, weight management interventions led to lower BMI in children and adolescents, with no evidence of serious harm. Evidence is lacking about how weight management interventions affect BMI beyond 1 year and after medication discontinuation and about longer-term effects on other outcomes.

ARTICLE INFORMATION

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Editorial Disclaimer: This evidence report is presented as a document in support of the accompanying USPSTF recommendation statement. It did not undergo additional peer review after submission to *JAMA*.

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