Primary Care Behavioral Interventions to Prevent or Reduce Illicit Drug Use and Nonmedical Pharmaceutical Use in Children and Adolescents: A Systematic Evidence Review for the U.S. Preventive Services Task Force

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Background: Drug use among youths is associated with negative health and social consequences. Even infrequent use increases the risk for serious adverse events by increasing risk-taking behaviors in intoxicated or impaired persons.

Purpose: To systematically review the benefits and harms of primary care–relevant interventions designed to prevent or reduce illicit drug use or the nonmedical use of prescription drugs among youths.

Data Sources: PubMed, PsycINFO, and the Cochrane Central Register of Controlled Trials through 4 June 2013; MEDLINE through 31 August 2013; and manual searches of reference lists and gray literature.

Study Selection: Two investigators independently reviewed 2253 abstracts and 144 full-text articles. English-language trials of primary care–relevant behavioral interventions that reported drug use, health outcomes, or harms were included.

Data Extraction: One investigator abstracted data from good- and fair-quality trials into prespecified evidence tables, and a second investigator checked these data.

Data Synthesis: Six trials were included, 4 of which examined the effect of the intervention on a health or social outcome. One trial found no effect of the intervention on marijuana-related consequences or driving under the influence of marijuana; 3 trials generally found no reduction in depressed mood at 12 or 24 months. Four of the 5 trials assessing self-reported marijuana use found statistically significant differences favoring the intervention group participants (such as a between-group difference of 0.10 to 0.17 use occasions in the past month). Three trials also reported positive outcomes in nonmedical prescription drug use occasions.

Limitations: The body of evidence was small, and there were heterogeneous measures of outcomes of limited clinical applicability. Trials primarily included adolescents with little or no substance use.

Conclusion: Evidence is inadequate on the benefits of primary care–relevant behavioral interventions in reducing self-reported illicit and pharmaceutical drug use among adolescents.

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Drug use among adolescents is a serious public health problem in the United States. The 2012 National Survey on Drug Use and Health reported that 9.5% of children aged 12 to 17 years reported illicit drug use during the past month. Marijuana and prescription psychotherapeutics (including pain relievers) are the most commonly used drugs among children and adolescents. Seven percent of children aged 12 to 17 years reported current use of marijuana, and an estimated 5% used marijuana for the first time within the past year. In 2012, 2.8% of children aged 12 to 17 years reported using a prescription drug for nonmedical reasons, and 2.2% reported nonmedical use of opioid pain relievers. Illicit drug use was approximately 15 times higher among young persons who smoked cigarettes and drank alcohol during the past month (61.1%) than among those who neither smoked cigarettes nor drank alcohol during the past month (4.0%) (1).

Drug and alcohol use are the primary health risk behaviors that contribute to unintentional injuries, homicide, and suicide—the leading causes of morbidity and mortality among adolescents and young adults (2). Even infrequent drug or alcohol use increases the risk for serious adverse events by increasing risk-taking behaviors in intoxicated or impaired persons.

The Substance Abuse and Mental Health Services Administration and the American Academy of Pediatrics recommend that universal screening, brief intervention, and referral to treatment (SBIRT) for substance use should be a part of routine health care as a method to reduce the health burden associated with substance use (3, 4). Although SBIRT is appropriate for all levels of risk, it is a particularly useful early intervention approach to identifying and intervening with persons with nondependent substance use before they require extensive or specialized treatment. Among children and adolescents, primary care interventions can include positive feedback for nonusers as primary prevention; brief advice for those at low risk for abuse (secondary

See also:

Related article 634

prevention); or a motivational intervention directed at high-risk patients for reducing use, reducing associated high-risk behaviors, or accepting a referral to treatment.

In 2008, the U.S. Preventive Services Task Force (USPSTF) concluded that the evidence was insufficient to recommend for or against screening adolescents, adults, and pregnant women for illicit drug use (5). We undertook the current review to synthesize the evidence on the benefits and harms of primary care–relevant behavioral interventions designed to prevent or reduce illicit drug use or the nonmedical use of prescription drugs among children and adolescents only. The USPSTF used this review to update its recommendation for this population.

Methods

With input from the USPSTF, we developed an analytic framework and 3 key questions (KQs) to guide our review (**Appendix Figure 1**, available at www.annals.org). The proposed analytic framework and KQs were posted on the USPSTF's Web site for public comment for 4 weeks. On the basis of this input, we made appropriate revisions and received final approval for publication from USPSTF liaisons. The full report provides details on our methods and results, including search strategies and all evidence tables (www.uspreventiveservicestaskforce.org/uspstf13/drugmisuse/drugmisusedraftrep.htm).

Data Sources and Searches

We searched for English-language publications in PubMed, PsycINFO, and the Cochrane Central Register of Controlled Trials from January 1992 through 4 June 2013 and in MEDLINE through 31 August 2013. We also assessed the 2 trials that were specific to children and adolescents and were included in the 2008 review (6). We examined the reference lists of 6 relevant published reviews and meta-analyses (7–12), as well as the reference lists of included studies. We considered gray literature sources and recommendations from experts.

Study Selection

Two investigators independently reviewed abstracts against prespecified eligibility criteria. We dually reviewed all full-text articles for potential inclusion. We included randomized, controlled trials (RCTs) or controlled clinical trials designed to prevent or reduce drug use in children and adolescents (aged <18 years [no lower age restriction]) who were not diagnosed with a substance use disorder or seeking treatment for substance misuse. We included trials conducted in primary care or those that tested interventions we judged feasible for conduct in primary care that had a link to a health care setting or system, with or without referral to specialty treatment services. This included interventions employing the full SBIRT model and other approaches to primary prevention (to prevent initiation of use) or tertiary prevention (to prevent continued use and adverse effects in those already using). We also included interventions delivered exclusively through electronic media (such as the Internet or CD-ROMs) that were not linked to health care. We excluded trials among youths diagnosed with substance abuse or dependence because they represented specialty treatment only. We also excluded studies conducted among adolescents who were mandated or directly referred to substance abuse or dependence treatment via the juvenile justice system, social services, parents, or a similar referral system. In addition, we excluded interventions conducted in substance abuse treatment centers, schools, worksites, and other institutions (for example, juvenile detention centers). Included trials had control groups that offered minimal or no treatment and reported drug use or health or social outcomes at least 6 months after baseline.

Data Extraction and Quality Assessment

Two independent investigators rated the quality of all included trials as "good," "fair," or "poor" according to USPSTF standards (13). We excluded poor-quality trials. One reviewer abstracted data from studies that were rated fair or good. A second reviewer checked all abstracted data for accuracy and completeness. We resolved discrepancies through discussion.

Data Synthesis and Analysis

We summarized all included studies in narrative form and summary tables detailing the important features of the study populations, design, intervention, and results. We used the between-group differences that were reported by authors of included studies, when available. We identified too few trials to conduct any meta-analysis, as well as too much variability in several factors (such as population or intervention). As a result, we conducted a qualitative analysis for all KQs and stratified the results into 2 groups based on the intervention: primary care–based or computer-based. Primary care–based studies recruited directly from or were conducted in primary care clinics. Computer-based interventions were judged to be feasible for primary care because they used only electronic methods of delivery, although they did not recruit from or take place in primary care.

Role of the Funding Source

Agency for Healthcare Research and Quality (AHRQ) staff provided technical oversight for the project. Although USPSTF liaisons helped resolve issues around the review's scope, they were not involved in the review's conduct.

Results

We reviewed 2253 abstracts and 144 full-text articles for possible inclusion (**Appendix Figure 2**, available at www.annals.org). We identified 6 trials (reported in 7 publications) that met our inclusion criteria (14–20). The most common reasons for exclusion included settings (for example, not linked to or feasible for primary care [$k = 45$]), out-of-scope populations (for example, aged >18 years, seeking treatment, or diagnosed with substance

Table 1. **Summary of Evidence for Benefits and Harms of Drug Use Interventions**

Key Question	Intervention	Trials, *n*	Observations, *n*	Major Limitations	Consistency
1 (health, social, and legal outcomes)	Primary care–based	1	328	Only 1 trial	NA
	Computer-based	3	1615	Only 1 intervention was evaluated (with replication across 3 studies). No trials included boys.	Not consistent
2 (behavioral outcomes)	Primary care–based	3	3064	Inconsistent outcome measurement	Not consistent
	Computer-based	3	1615	Only 1 intervention was evaluated (with replication across 3 studies). No trials included boys. Drug use was measured in use occasions, which does not easily translate to clinical or public health benefit.	Consistent
3 (adverse events)	NA	0	0	NA	NA

NA = not applicable.

abuse or dependence [$k = 26$]), and not reporting any relevant outcomes ($k = 19$) (**Appendix Figure 2**). **Table 1** provides a summary of evidence for the benefits and harms of each included study by outcome (drug use behaviors [KQ 2], health and social outcomes [KQ 1], and harms [KQ 3]).

Effects of Interventions on Drug Use

Primary Care–Based Interventions

Three of the 6 studies were conducted in or recruited patients from primary care (**Appendix Tables 1** and **2**, available at www.annals.org) (16, 17, 20) and tested 4 active treatment groups. We rated all 3 studies as fair-quality according to USPSTF standards (13), with various threats to internal validity (see the full report for more detail on study quality). The smallest study had 41 participants (17), and the largest had more than 2500 (16). Ages ranged from 12 to 20 years, and girls were overrepresented—60% to 68% of participants were girls. All 3 studies took place in the United States, and 1 of them (16) also included a sample of adolescents in the Czech Republic. Two of the studies were conducted among a general primary care population (16, 20), whereas the remaining study was conducted among a sample of young persons diagnosed with asthma (17). One of the studies screened adolescents for drug use before enrollment; only those who reported any marijuana use in the past year were randomly assigned (20). In this trial, marijuana use was the primary focus; the other studies targeted drug, alcohol, or tobacco use.

All 3 studies took place during 1 office visit. Three of the interventions included brief counseling (2 to 40 minutes) by the primary care physician (16), family nurse practitioner (17), or trained research therapist (20), and all included a computer-based, self-administered educational component. The study by Walton and colleagues randomly assigned adolescents to a therapist-led brief intervention, computer-based brief intervention, or usual care control group (20). Interventions provided information and advice about substance use along with a decision-making exercise. One of the trials (16) was consistent with the SBIRT model: It included a computer-based, self-administered screening tool that asked adolescents about their lifetime and past-12-month use of substances (alcohol, marijuana, and "anything else to get high"), followed by the CRAFFT (Car, Relax, Alone, Forget, Friends, Trouble) screening questions (21), feedback on the participant's risk level (low, medium, or high), and approximately 5 minutes of reading scientific information and true-life stories about substance use on the computer. On the basis of the adolescent's screening results, the provider was given a report that displayed the patient's risk level and 6 to 10 talking points designed to prompt a 2- to 3-minute advice discussion. This advice was tailored to help the patient to "not start" or "stop" using substances on the basis of the adolescent's responses to the screening questionnaire.

Although all trials relied on self-reported drug use, the specific measures varied in ways that were difficult to compare (**Table 2**). In general, the prevalence and frequency of baseline drug use were relatively low in all of the samples. One study that was limited to individuals who had used marijuana during the past year did not report average frequency of use (20).

Only 1 of the 3 primary care–based studies found statistically significant differences in drug use at 12 to 24 months, and this positive finding was limited to non-U.S. participants. Among the cohort of U.S. adolescents, there were no between-group differences in marijuana use at 12 months (15.6% vs. 17.5% in the intervention and control groups, respectively; risk ratio, 0.85 [95% CI, 0.61 to 1.19]). In contrast, the Czech Republic cohort study found that 17.0% of participants in the intervention group reported marijuana use in the past 12 months compared with 28.7% of control participants (risk ratio, 0.47 [CI, 0.32 to 0.71]) after adjustment for several potential confounders (**Table 2**). However, these data may have limited applicability to adolescents in the United States (16).

Computer-Based Interventions

We included 3 RCTs that evaluated the effectiveness of the same computer-based prevention program for reduc-

Table 1—**Continued**

Applicability	Quality Ratings	Summary of Findings
Good: primary care–screened sample in the United States	Fair	No differences in marijuana use–related consequences at 12 mo among primary care adolescents.
Fair: no links to primary care, volunteer samples, all conducted in the United States	2: Good 1: Fair	1 of 3 trials found that girls in the intervention group reported less depressed mood than those in the control group after 6 mo.
Good: all studies in primary care, 1 study limited to patients with asthma	Fair	1 of 3 trials found a statistically significant benefit of the intervention among adolescents in the Czech Republic (but not the United States) in terms of any marijuana use, marijuana initiation, and marijuana cessation.
Fair: no links to primary care, volunteer samples, all conducted in the United States	2: Good 1: Fair	All trials found a statistically significant benefit of the intervention on marijuana use and nonmedical prescription drug use over 12 to 24 mo. One trial also showed a statistically significant effect for inhalant use.
NA	NA	No studies assessed adverse events of the intervention.

ing substance use among adolescent girls; results were reported in 4 publications (14, 15, 18, 19). The same authors conducted all 3 studies and implemented the same computer-based intervention designed for mother–daughter dyads (**Appendix Tables 1** and **2**). This intervention focused on improving mother–daughter communication; parental monitoring of behaviors; establishing rules and consequences for substance use among girls; building skills for managing stress, conflict, and mood; overcoming peer pressure; and improving body esteem and self-efficacy. Mother–daughter dyads were asked to work together to complete nine 45-minute (once per week over 9 weeks) interactive sessions in their homes. Two of the studies also included 1 (14, 15) or 2 (19) annual 45-minute booster sessions.

The samples within each study varied in size and demographic factors. The two 2009 studies by Schinke and colleagues randomly assigned 591 (18) and 916 (19) pairs of adolescent girls aged 11 to 13 years and their mothers. These studies recruited dyads through advertisements posted in local newspapers, online, and in subway trains and buses and broadcast on the radio. In both samples, approximately 75% of the girls were nonwhite. These studies used 2 distinct samples that occurred within the same time frame (Schinke SP. Personal communication.). In contrast, the study by Fang and colleagues exclusively recruited and randomly assigned 108 Asian American girls aged 11 to 14 years and their mothers (14, 15).

We rated 2 of these studies as good-quality (14, 19) and the third as fair-quality (18). Although all 3 studies had similar methods and achieved greater than 90% sample retention at 6 to 12 months, 1 study had a between-group difference in attrition greater than 15%, an issue that warranted a fair-quality rating (18).

All 3 computer-based studies found statistically significant group-by-time effects that favored the intervention group in the number of self-reported marijuana use occasions during the past 30 days at 1 (18) or 2 years of follow-up (15, 19) (**Table 2**). A use occasion score of 1.0 for a given substance indicates a single use in the past 30 days. Results were similar at the 1- and 2-year follow-ups: Marijuana use occasion scores ranged from 0.0 to 0.10 in the intervention group and from 0.11 to 0.20 in the control groups (**Table 2**). Likewise, all 3 studies reported statistically significant reductions favoring the intervention group in use of prescription drugs for nonmedical purposes from baseline to 1- and 2-year follow-ups (15, 18, 19). Use occasions in the intervention groups ranged from 0.0 to 0.09 in the past 30 days at both the 1- and 2-year follow-ups; in the control groups, they ranged from 0.10 to 1.6 at 1 year and from 0.11 to 3.6 at 2 years (**Table 2**). One of the studies (19) also found that girls in the intervention group reported fewer occasions of inhalant use than those in the control group ($P < 0.024$). Use occasions of prescription drugs were generally higher than for marijuana in all 3 samples, although this use was still generally low (range of use occasion scores at baseline across groups, 0.09 to 0.64). These studies did not report the prevalence of use among participants.

Effects of Interventions on Health, Social, Legal, and Other Outcomes

The primary care–based study conducted by Walton and colleagues reported no statistically significant group-by-time interactions at 12 months for the number of self-reported marijuana-related consequences (for example, got in a fight or kept smoking after promising self not to) or self-reported frequency of driving under the influence of marijuana for either the computer-based or therapist-led behavioral intervention compared with the control group (**Appendix Table 1**) (20).

All 3 computer-based studies evaluated the intervention's effect on depressed mood (**Appendix Table 2**) (14, 15, 18, 19), which was measured on a validated 5-point scale (the Children's Depression Index), with lower scores indicating less depressed mood. In 1 of the good-quality studies, girls in the intervention group reported less depressed mood than those in the control group at 6 months ($P = 0.045$). This finding, however, did not hold true over 2 years of follow-up (14, 15). The other 2 studies did not find statistically significant differences between groups. No studies reported other health, social, or legal outcomes that

Table 2. **Results of Interventions in Included Trials: Drug Use Behavioral Outcomes**

Study, Year (Reference)	Quality Rating	Setting	Population (Age)	Instrument
Primary care–based				
Harris et al, 2012 (16) (U.S. cohort)	Fair	Primary care practices	Adolescents (12–18 y)	12-mo timeline follow-back interview
Harris et al, 2012 (16) (Czech Republic cohort)	Fair	Primary care practices	Adolescents (13–17 y)	12-mo timeline follow-back interview
Rhee et al, 2008 (17)	Fair	Research center	Adolescents with asthma (14–20 y)	Periodic Assessment of Drug Use
Walton et al, 2013 (20) (therapist-led brief intervention)	Fair	Primary care clinics	Adolescents (12–18 y)	Add Health
Walton et al, 2013 (20) (computer-based brief intervention)	Fair	Primary care clinics	Adolescents (12–18 y)	Add Health
Computer-based				
Schinke et al, 2009 (18)	Fair	Home	Adolescent girls (11–13 y) and their mothers	American Drug and Alcohol Survey
Schinke et al, 2009 (19)	Good	Home	Adolescent girls (11–13 y) and their mothers	American Drug and Alcohol Survey

might relate to drug use among children and adolescents, such as drug-related injuries or accidents, other risky behaviors (for example, unprotected sex), or educational attainment.

Harms of Interventions

We identified no studies that reported adverse events related to interventions designed to prevent or reduce illicit drug use or nonmedical use of prescription drugs among children and adolescents.

Discussion

We conducted this systematic review to assist the USPSTF in updating its 2008 recommendation on screening and interventions for drug use among children and

Table 2—**Continued**

Primary Outcome Measure	Follow-up	Intervention Group		Control Group		Effect Size	*P* Value
		Participants, *n*	Result	Participants, *n*	Result		
Any past marijuana use, %	Baseline	765	12.4	758	13.3	Adjusted relative RR, 0.77 (95% CI, 0.56–1.05)*	NSD
	12 mo	765	15.6	757	17.5	Adjusted relative RR, 0.85 (CI, 0.61–1.19)*	NSD
Marijuana initiation, %†	12 mo	670	7.8	656	8.8	Adjusted relative RR, 0.81 (CI, 0.54–1.21)*	NSD
Marijuana cessation, %‡	12 mo	95	29.5	101	26.7	Adjusted relative RR, 1.01 (CI, 0.57–1.78)*	NSD
Any past marijuana use, %	Baseline	264	14.4	266	13.6	Adjusted relative RR, 1.02 (CI, 0.63–1.64)§	NSD
	12 mo	264	17.0	265	28.7	Adjusted relative RR, 0.47 (CI, 0.32–0.71)§	<0.05
Marijuana initiation, %†	12 mo	226	9.7	229	20.5	Adjusted relative RR, 0.47 (CI, 0.29–0.76)§	<0.05
Marijuana cessation, %‡	12 mo	38	39.5	36	19.4	Adjusted relative RR, 2.53 (CI, 1.06–6.05)§	<0.05
Mean (SD) illicit drug use risk score‖	Baseline	20	2.10 (9.16)	21	4.05 (10.63)	NR	NSD
	6 mo	17¶	0.63 (1.37)	18¶	3.31 (9.4)	NR	NSD
Mean (SD) marijuana use frequency in past 3 mo**	Baseline	118	3.1 (1.9)	110	3.3 (1.9)	NR	NSD
	6 mo	102	2.4 (2.1)	97	2.0 (2.1)		NSD
	12 mo	104	2.6 (2.2)	94	2.1 (2.2)	Effect estimate (±SE), 0.15 ± 0.14	NSD
Mean (SD) other drug use frequency in past 3 mo**	Baseline	118	0.5 (1.3)	110	1.2 (2.7)	NR	NSD
	6 mo	102	0.3 (0.9)	97	1.2 (4.6)	Effect estimate (±SE), −0.48 ± 0.42	NSD
	12 mo	104	0.4 (1.7)	94	0.6 (2.1)	Effect estimate (±SE), 0.33 ± 0.51	NSD
Mean (SD) marijuana use frequency in past 3 mo**	Baseline	100	3.1 (1.9)	110	3.3 (1.9)	NR	NSD
	6 mo	79	2.0 (2.1)	97	2.0 (2.1)	Effect estimate (±SE), 0.08 ± 0.16	NSD
	12 mo	77	2.0 (2.2)	94	2.1 (2.2)	Effect estimate (±SE), −0.03 ± 0.16	NSD
Mean (SD) other drug use frequency in past 3 mo**	Baseline	100	0.9 (3.0)	110	1.2 (2.7)	NR	NSD
	6 mo	79	0.1 (0.5)	97	1.2 (4.6)	Effect estimate (±SE), −1.41 ± 0.52	<0.01††
	12 mo	77	0.5 (2.1)	94	0.6 (2.1)	Effect estimate (±SE), 0.21 ± 0.48	NSD
Mean (SD) marijuana use occasions in past 30 d	Baseline	252	0.08 (0.01)	339	0.08 (0.02)	NR	NSD
	12 mo	205	0.10 (0.13)	327	0.20 (0.65)	NR	<0.01††
Mean (SD) prescription drug use occasions (for nonmedical reasons) in past 30 d	Baseline	252	0.21 (0.96)	339	0.10 (0.47)	NR	NSD
	12 mo	205	0.06 (0.46)	327	0.17 (1.58)	NR	<0.0001††
Mean (SD) marijuana use occasions in past 30 d	Baseline	458	0.08 (0)	458	0.09 (0)	NR	NSD
	12 mo	434¶	0.09 (0)	430¶	0.11 (0.2)	NR	–
	24 mo	415¶	0.10 (0.1)	413¶	0.20 (0.7)	NR	<0.016††
Mean (SD) prescription drug use occasions in past 30 d	Baseline	458	0.12 (0.2)	458	0.09 (0.1)	NR	NSD
	12 mo	434¶	0.09 (0)	430¶	0.10 (0.1)	NR	–
	24 mo	415¶	0.09 (0.1)	413¶	0.11 (0.2)	NR	<0.03††
Mean (SD) inhalant use occasions in past 30 d	Baseline	458	0.04 (0.3)	458	0.01 (0.1)	NR	NSD
	12 mo	434¶	0.02 (0.2)	430¶	0.04 (0.3)	NR	–
	24 mo	415¶	0.02 (0.1)	413¶	0.03 (0.2)	NR	<0.024††

Continued on following page

adolescents. Our review included 6 primary care–relevant studies examining the benefits of interventions designed to reduce substance use among children and adolescents who were not seeking or identified as needing specialty treatment. The studies varied considerably in terms of the included participants and reported outcomes, which limits our ability to draw conclusions from a body of evidence that is already limited by a small number of studies. Four of the 5 studies that measured marijuana use before and after the intervention found greater benefit in the intervention youths than in the control youths. None of the studies found benefit of the intervention on health, social, and legal outcomes at 6 months or later, which is not surprising given that the interventions focused on samples of children

Table 2—**Continued**

Study, Year (Reference)	Quality Rating	Setting	Population (Age)	Instrument
Fang et al, 2010 (14) and 2013 (15)	Good	Home	Asian American girls (11–14 y) and their mothers	American Drug and Alcohol Survey

Add Health = National Longitudinal Study of Adolescent Health; NR = not reported; NSD = no significant difference; RR = risk ratio.
* Adjusted for multisite sampling; substance use in past 12 mo at baseline; age; sex; parent education level; type of visit; perceived parent, sibling, and peer substance use; provider sex; and connectedness to provider.
† Only participants reporting no use in past 12 mo at baseline were analyzed.
‡ Only participants reporting any use in past 12 mo at baseline were analyzed.
§ Adjusted for multisite sampling, substance use in past 12 mo at baseline, age, and sex.
‖ Constructed by combining the average frequencies of use of 7 types of illicit drugs in the past year: marijuana; lysergic acid diethylamide (LSD) or other hallucinogens; cocaine or crack; glue or inhalants; tranquilizers; "uppers," such as speed; and "downers," such as sedatives or sleeping pills.
¶ Assumed.
** Assessed using 7-point scale, where 0 = never, 1 = 1–2 days, 2 = once a month or less, 3 = 2–3 days per month, 4 = 1–2 days per week, 5 = 3–5 days per week, and 6 = every day or almost every day. Other drugs included inhalants, cocaine, and sedatives.
†† Time × intervention group interaction effects.

and adolescents who reported low levels of drug use in general. Three of the trials were not conducted in primary care settings, but because they were entirely computer-based, we judged them to be potentially feasible for primary care. For example, a primary care provider or health care system could endorse such an intervention and provide a link to an online program.

The lack of research on behavioral interventions is probably heavily influenced by ethical and logistical issues related to including children as human subjects. These trials require assent from the child and permission from the parent or legal guardian (22), which may influence recruitment. Youths may have little interest in participating in a research study if they perceive that their parents might learn about their substance use, regardless of any assurances of confidentiality (23).

The results of our systematic review are similar to those of another recently published review on SBIRT for adolescent drug and alcohol use (24). That review included RCTs examining 1 or more SBIRT components (screening, brief intervention [≤3 sessions], or referral to treatment) among participants aged 12 to 22 years. Despite including a wider range of settings (primary care, emergency departments, schools, and other community settings), the review included only 13 studies, most of which addressed brief interventions for alcohol use among adolescents seeking care in emergency departments. None of the included studies reported on the referral process used for individuals identified as needing specialty treatment, and none of the studies addressed the full spectrum of SBIRT. The review reported promising findings for brief interventions in primary care (based on 1 study) and universal screening within schools for substance use. We did not include the single primary care–based trial from this SBIRT review because it reported only 3-month follow-up and we required a minimum of 6 months. One of our included trials would probably have met inclusion criteria for the SBIRT review, but the trial seems to have been published after that review's search window ended (16).

This body of evidence has several important limitations. We found few primary care–relevant trials that tested the effects of a behavioral intervention designed to reduce drug use among youths not meeting diagnostic criteria for drug abuse or dependence. Of the few trials we did include, none specifically addressed youths who were misusing or were identified as having harmful use of drugs that had not yet progressed to abuse or dependence. The included studies enrolled adolescents regardless of their current and past drug use, except for 1 study that only enrolled adolescents who reported marijuana use in the past year. Given the low prevalence of drug use among the samples, we can presume that most youths were not using drugs or had very low use, whereas a few could be progressing toward more harmful use. Therefore, the available evidence offers little direction for a provider seeking to treat a drug-using adolescent in order to prevent progression to drug use disorder.

Our report's scope was limited to studies that were linked to or could be feasibly administered within primary care. Schools, juvenile justice, and social service settings may offer other opportunities to provide behavioral interventions to reduce drug use among children and adolescents; however, their applicability to primary care is unknown and may be low. Although we would have included studies conducted in emergency departments if they had addressed all individuals, we identified no such studies that met this and other eligibility criteria.

All included studies relied on self-reported measures of substance use, for which social desirability reporting bias may be a concern. The available studies also used inconsistent measures of drug use, which makes generating comparisons across studies difficult. The 3 computer-based

Table 2—**Continued**

Primary Outcome Measure	Follow-up	Intervention Group		Control Group		Effect Size	*P* Value
		Participants, *n*	Result	Participants, *n*	Result		
Mean (SD) marijuana use occasions in past 30 d	Baseline	56	0.01 (0.12)	52	0.04 (0.19)	NR	NR
	12 mo	54	0 (0)	50	0.12 (0.32)	NR	–
	24 mo	50	0 (0)	43	0.17 (0.38)	NR	0.043††
Mean (SD) prescription drug use occasions in past 30 d	Baseline	56	0.64 (2.98)	52	0.46 (1.64)	NR	NR
	12 mo	54	0.07 (0.32)	50	1.6 (7.15)	NR	–
	24 mo	50	0 (0)	43	3.6 (12.99)	NR	0.047††

studies that found significant effects relied on a self-reported measure of marijuana, prescription drug, and inhalant use occasions, which has limitations in ease of recall among participants and limited clinical applicability. In addition, we have concerns with this group of computer-based studies that involved the same group of investigators. Although replication is an important component for validating and improving the accuracy and precision of effects, study replication among the same team of researchers may lead to spurious confirmation of effects due to group allegiance and other biases (25).

There is a clear need to continue replication of this and other promising interventions among other teams of investigators in well-controlled trials in larger, more representative samples of children and adolescents (for example, boys and girls of varying socioeconomic status, with or without preexisting health conditions). Given the limited number of studies, we were not able to answer any of the sub-KQs about effectiveness of the interventions on subgroups or what the elements of efficacious interventions were. Use of consistent and clinically meaningful measures of drug use is also needed.

Other areas where more research is needed include screening and brief interventions in primary care for adolescents who use illicit drugs or who use prescription drugs inappropriately, including those with problematic use. Research is also needed on stand-alone motivational interventions delivered in primary care that could treat problematic use and may also help facilitate adolescents accepting referrals to additional treatment. Also, we know of no attempt to comprehensively review and synthesize the evidence on screening and interventions for use of all substances (drugs, alcohol, and tobacco). Given the similar risk factors and the fact that adolescent substance users frequently use more than one of these substances, interventions designed to prevent or reduce their use would probably employ similar strategies (26, 27). Brief motivational interventions show promise for preventing and reducing alcohol and tobacco use among adolescents. These interventions, which include motivational interviewing and interventions based on the "5 A's", are the mainstay of SBIRT for substance use among adults. Future research should focus on high-risk adolescents and motivational interventions that are tailored for all substances. Given the biological, psychological, and social transformations that happen during adolescence, research evaluating regular screening and brief advice on all risky behaviors is warranted.

The evidence on the effectiveness of primary care behavioral interventions in reducing drug use among adolescents is limited in quantity, quality, and generalizability. Computer-based interventions that are self-administered in the home at convenient times and involve parents and adolescents show promise, but youths who were actively using drugs or had problematic use were not well-represented in the included trials and primary care–based interventions were generally not effective. Given the prevalence and burden associated with drug use among adolescents, continued research on the role that primary care can play in counseling young persons to remain abstinent or reduce use is essential.

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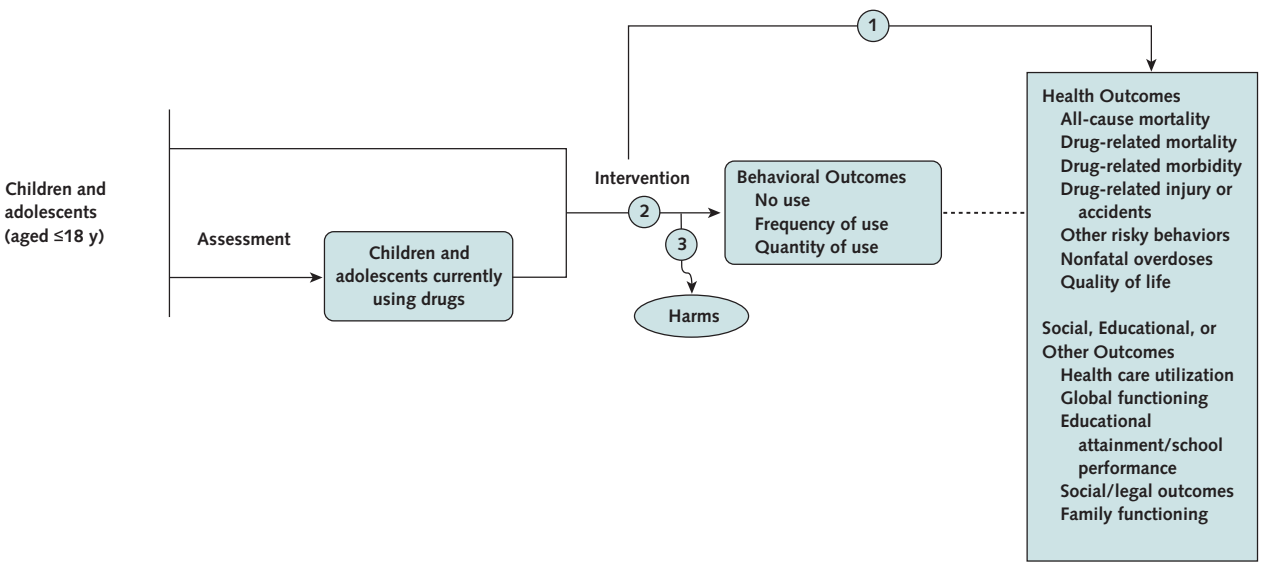
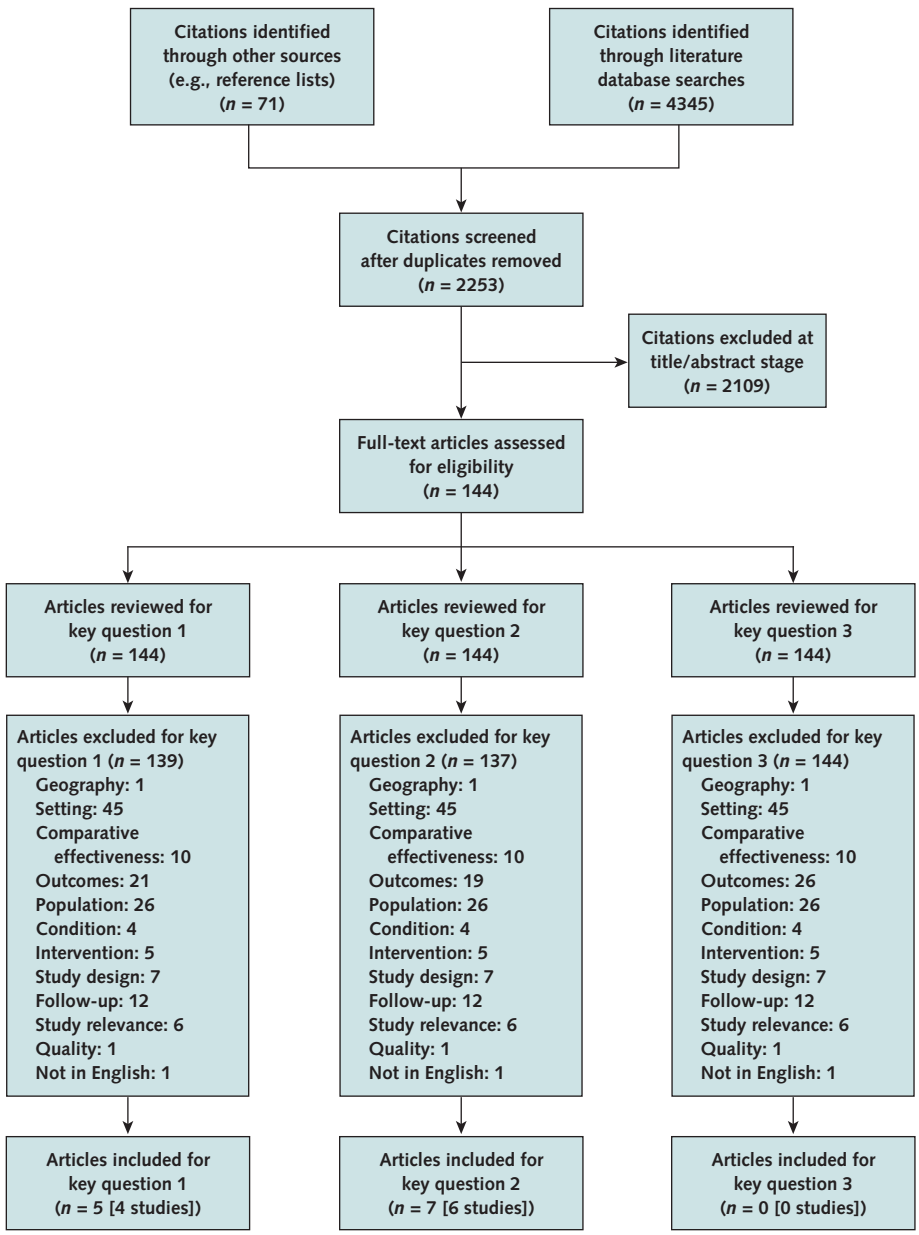
Appendix Figure 1. **Analytic framework and key questions.**



Key Questions:

1. Do primary care behavioral counseling interventions for drug use, with or without referral, improve mortality; morbidity; and other health, social, and legal outcomes in children and adolescents?
   a. Do outcomes differ in subgroups (e.g., as defined by age, risk level, sex, race, ethnicity, or types of substances used)?
   b. What are elements of efficacious interventions?
   c. What criteria are used to identify children and adolescents for primary care drug use interventions?
2. Do primary care behavioral counseling interventions for drug use, with or without referral, prevent drug use initiation in children and adolescents who do not currently use drugs or reduce drug use in children and adolescents who currently use drugs?
   a. Do outcomes differ in subgroups (e.g., as defined by age, risk level, sex, race, ethnicity, or types of substances used)?
   b. What are elements of efficacious interventions?
   c. What criteria are used to identify children and adolescents for primary care drug use interventions?
3. What are the adverse events of primary care behavioral counseling drug use interventions?

Appendix Figure 2. **Summary of evidence search and selection.**



Appendix Table 1. **Study Characteristics of Included Trials**

Study, Year (Reference)	Quality Rating	Country	Intervention Setting	Study Design	Participants Enrolled/Randomly Assigned, *n*		Follow-up, *mo**	Follow-up, %	Key Eligibility Criteria	Age Range (Mean), *y*	Female, %	Nonwhite, %
					Intervention Group	Control Group						
Primary care–based												
Harris et al, 2012 (16)	Fair	United States	Primary care practices	CCT	1031	1075	12	72.0	Patients aged 12–18 y arriving for routine primary care	12–18 (15.8)	58.2	35.4
		Czech Republic	Primary care practices	CCT	292	297	12	90.0		13–17 (15.0)	47.2	0
Rhee et al, 2008 (17)	Fair	United States	Research center	RCT	20	21	6	85.4	Current diagnosis of asthma by health care provider	14–20 (16.1)	68.3	31.7
Walton et al, 2013 (20)	Fair	United States	Primary care clinics	RCT	TBI: 118 CBI: 100	110	12	83.8	Patients aged 12–18 y reporting marijuana use in past year	12–18 (16.3)	66.5	60.7
Computer-based												
Schinke et al, 2009 (18)	Fair	United States	Computer-based intervention at home	RCT	252†	339†	12	90.0	Adolescent girls and their mothers with private access to a personal computer	11–13 (12.7)	100	73.6
Schinke et al, 2009 (19)	Good	United States	Computer-based intervention at home	RCT	458†	458†	12	94.3	Adolescent girls and their mothers with private access to a personal computer	11–13 (12.8)	100	76.8
Fang et al, 2010 (14) and 2013 (15)	Good	United States	Computer-based intervention at home	RCT	56†	52†	12	96.3	Asian American adolescent girls and their mothers with private access to a personal computer	11–14 (13.1)	100	100

CBI = computer-based brief intervention; CCT = clinical controlled trial; RCT = randomized, controlled trial; TBI = therapist-led brief intervention.
* Longer follow-up may be available. The common follow-up among the included trials is reported.
† Number of mother–daughter dyads.

Appendix Table 2. **Intervention Characteristics of Included Trials**

Study, Year (Reference)	Behavioral Targets	Person Targeted	Intervention Description	Role of Primary Care	Method of Intervention	Duration of Intervention	Estimated Time of Intervention	Control Group Description
Primary care–based								
Harris et al, 2012 (16)	Alcohol and drugs	Child	Self-administered, computer-facilitated screening asked about lifetime and past-12-mo drug use and was followed by the CRAFFT questionnaire. On completion, the individual's CRAFFT score and risk level were displayed. Adolescents completed an educational computer program containing information about drug use. The computer program was followed by brief provider advice informed by the adolescent's screening results.	Conducted in and recruited from primary care; provider delivered part of intervention	Face-to-face, computer	1 visit	8 min (2–3 min with interventionist)	Usual care
Rhee et al, 2008 (17)	Alcohol, tobacco, and illicit drugs	Child	Brief counseling came from family nurse practitioner and CD-ROM programs. The CD-ROM contained a decision-making module on all substance use and provided information about smoking and alcohol use. Intervention booster CD-ROMs were mailed at 2- and 4-mo contacts.	Recruited from primary care; nurse practitioner delivered part of intervention	Face-to-face, computer	1 visit plus 2 booster module mailings within 4 mo	4.2 h (10 min with interventionist)	Attention control
Walton et al, 2013 (20)	Marijuana (primary); alcohol, other illicit drug, and prescription drug use (secondary)	Child	TBI: motivational interviewing by trained research therapist CBI: stand-alone, interactive animated program	Conducted in and recruited from primary care	Face-to-face (TBI), computer (CBI)	1 visit	35–40 min (TBI: mean, 41 min; CBI: mean, 34 min)	Enhanced usual care
Computer-based								
Schinke et al, 2009 (18)	Alcohol, tobacco, marijuana, prescription drugs, and OTC drugs for nonmedical use	Child and parent	Mother–daughter dyads completed 9 weekly 45-min computer-based sessions at home. Each session was delivered through voiceover narration, skills demonstration, and interactive activities for mothers and daughters to complete jointly. Mothers and daughters each had private sessions addressing specific material. Joint session material covered importance of interpersonal relationships, depression from stress or pressure to succeed or look a certain way, emotional closeness, sharing difficult feelings about each other, and illustrating important ways to be supportive of each other.	No primary care or provider role	Computer	9 wk	6.8 h	No intervention
Schinke et al, 2009 (19)	Alcohol, tobacco, marijuana, prescription drugs for nonmedical use, and inhalants	Child and parent	Same as above	No primary care or provider role	Computer	9 wk plus 2 booster sessions within 2 y	8.3 h	No intervention
Fang et al, 2010 (14) and 2013 (15)	Alcohol, tobacco, marijuana, and prescription drugs for nonmedical use	Child and parent	Same as above	No primary care or provider role	Computer	9 wk plus 1 booster session within 12 mo	7.5 h	No intervention

CBI = computer-based brief intervention; CRAFFT = Car, Relax, Alone, Forget, Friends, Trouble; OTC = over-the-counter; TBI = therapist-led brief intervention.