

Supplementary Online Content

O'Connor E, Thomas R, Senger CA, Perdue L, Robalino S, Patnode C. Interventions to prevent illicit and nonmedical drug use in children, adolescents, and young adults: updated evidence report and systematic review for the US Preventive Services Task Force. *JAMA*. doi:10.1001/jama.2020.1432

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eReferences

This supplementary material was provided by the authors to give readers additional information about their work.

eMethods. Literature Search Strategies for Primary Literature

Literature Search Strategies for Primary Literature

Sources searched:

Cochrane Central Register of Controlled Clinical Trials, via Wiley

Medline, via Ovid

PsycInfo, via Ovid

PubMed, publisher-supplied records

Key:

* = truncation

ab = word in abstract

ag= age group

id = keyword

kf = keyword heading [word not phrase indexed]

kw = keyword

md= methodology

ti = word in title

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#1 (drug or drugs or substance*):ti,ab,kw near/1 (use or using):ti,ab,kw

- #2 (drug or drugs or substance*) near/5 (abuse* or abusing or misus* or overus* or overutili* or nonprescri* or (non next prescri*) or nonmedical or "non medical" or extramedical or "extra medical" or illicit* or illegal* or recreation*):ti,ab,kw
- #3 (opioid* or opiate* or oxycodone or hydrocodone or ritalin or adderall or amphetamine* or methylphenidate or "laughing gas" or "nitrous oxide" or ketamine or dextromethorphan or GHB or gamma-hydroxybutyrate or inhalant* or stimulant* or sedative* or barbiturate* or benzodiazepine* or (sleep next medication*)):ti,ab,kw near/5 (use* or using or abuse* or abusing or misus* or overus* or overutili* or nonprescri* or (non next prescri*) or nonmedical or "non medical" or extramedical or "extra medical" or illicit* or illegal* or recreation*):ti,ab,kw
- #4 ("pain relief" or (pain next reliever*) or (pain next medication*) or medicine* or "over the counter" or OTC):ti,ab,kw near/5 (abuse* or abusing or misus* or overus* or overutili* or nonprescri* or (non next prescri*) or nonmedical or "non medical" or extramedical or "extra medical" or illicit* or illegal* or recreation*):ti,ab,kw
- #5 prescription*:ti,ab,kw near/5 (abuse* or abusing or misus* or overus* or overutili* or nonmedical or "non medical" or extramedical or "extra medical" or illicit* or illegal* or recreation*):ti,ab,kw
- #6 (street* or designer* or club):ti,ab,kw next drug*:ti,ab,kw
- #7 (legal next high*):ti,ab,kw
- #8 nmupd:ti,ab,kw
- #9 marijuana:ti,ab,kw
- #10 (Cannabi* or hash or hashish):ti,ab,kw
- #11 (cocaine or methamphetamine* or khat or "Catha edulis"):ti,ab,kw
- #12 (heroin or opium or kratom or "mitragyna speciosa" or "manufactured fentanyl"):ti,ab,kw
- #13 (mdma or ecstasy or flunitrazepam or rohypnol or "bath salts" or "synthetic cathinone"):ti,ab,kw
- #14 (salvia or phencyclidine):ti,ab,kw
- #15 (hallucinogen* or dimethyltryptamine or lsd or mescaline or psilocybin):ti,ab,kw
- #16 {or #1-#15}
- #17 counsel*:ti,ab,kw or advice:ti,ab,kw or advise*:ti,ab,kw
- #18 (behavio* next chang*):ti,ab,kw
- #19 (behavio* next intervention*):ti,ab,kw
- #20 (behavio* next modification*):ti,ab,kw
- #21 motivational next interview*:ti,ab,kw
- #22 (cognitive next behavio*):ti,ab,kw or (behavio* next therap*):ti,ab,kw or CBT:ti,ab,kw
- #23 (brief next intervention*):ti,ab,kw or "computer based":ti,ab,kw or "self help":ti,ab,kw
- #24 SBIRT:ti,ab,kw
- #25 email*:ti,ab,kw or internet:ti,ab,kw or (text next messag*):ti,ab,kw or web:ti,ab,kw or website:ti,ab,kw
- #26 (reduc* or decreas* or prevent* or delay or avoid):ti,ab,kw near/3 initiation*:ti,ab,kw
- #27 "patient education":ti,ab,kw or "health education":ti,ab,kw or "health promotion":ti,ab,kw
- #28 intervention*:ti or prevention:ti or preventive:ti or psychosocial:ti
- #29 {or #17-#28}
- #30 #16 and #29
- #31 ((reduc* or decreas* or prevent* or delay or avoid):ti,ab,kw near/3 (drug* or substance* or marijuana* or cannabi* or opioid* or opiate* or heroin or oxycodone or hydrocodone or crack or cocaine or "pain relief" or pain

reliever* or pain medication* or prescription* or medicine* or over the counter or OTC):ti,ab,kw) near/5 (abuse* or abusing or misuse* or misusing or overus* or overutili* or use* or using or experiment*):ti,ab,kw

#32 #30 or #31

#33 (child* or teen or teens or teenage* or adolescen* or youth or youths or "young people" or pediatric* or paediatric* or school age* or juvenile*):ti,ab,kw

#34 #32 and #33 Publication Year from 2013 to 2018 899

#35 (young or emerging or early):ti,ab,kw next adult*:ti,ab,kw

#36 late:ti,ab,kw next (teen* or adolescen*):ti,ab,kw

#37 (college* or universit*):ti,ab,kw

#38 (undergraduate or graduate):ti,ab,kw next student*:ti,ab,kw

#39 "high school":ti,ab,kw near/2 senior*:ti,ab,kw

#40 (12th next grade):ti,ab,kw

#41 {or #35-#40}

#42 #32 and #41 Publication Year from 1992 to 2018 1219

#43 #34 or #42 in Trials

MEDLINE

Ovid MEDLINE(R) <1946 to January Week 4 2019>, Ovid MEDLINE(R) Daily Update <January 30, 2019>, Ovid MEDLINE(R) Epub Ahead of Print <January 30, 2019>, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations <1946 to January 28, 2019>

1 substance-related disorders/

2 Drug misuse/

3 Prescription drug misuse/

4 Prescription drug overuse/

5 amphetamine-related disorders/

6 cocaine-related disorders/

7 inhalant abuse/ (183)

8 marijuana abuse/ (5652)

9 opioid-related disorders/

10 phencyclidine abuse/

11 substance abuse, intravenous/

12 substance abuse, oral/

13 street drugs/

14 hallucinogens/

15 ((drug or drugs or substance\$) adj1 ("use" or using)).ti,ab,kf.

16 ((drug or drugs or substance\$) adj5 (abuse\$ or abusing or misus\$ or overus\$ or overutili\$ or nonprescri\$ or non prescri\$ or nonmedical or non medical or extramedical or extra medical or illicit\$ or illegal\$ or recreation\$)).ti,ab,kf.

17 ((opiod\$ or opiate\$ or oxycodone or hydrocodone or ritalin or adderall or amphetamine\$ or methylphenidate or laughing gas or nitrous oxide or ketamine or dextromethorphan or GHB or gamma-hydroxybutyrate or inhalant\$ or stimulant\$ or sedative\$ or barbiturate\$ or benzodiazepine\$ or sleep medication\$) adj5 (use\$ or using or abuse\$ or abusing or misus\$ or overus\$ or overutili\$ or nonprescri\$ or non prescri\$ or nonmedical or non medical or extramedical or extra medical or illicit\$ or illegal\$ or recreation\$)).ti,ab,kf.

18 ((pain relief or pain reliever\$ or pain medication\$ or medicine\$ or over the counter or OTC) adj5 (abuse\$ or abusing or misus\$ or overus\$ or overutili\$ or non prescrip\$ or nonmedical or non medical or extramedical or extra medical or illicit\$ or illegal\$ or recreation\$)).ti,ab,kf.

19 (prescription\$ adj5 (abuse\$ or abusing or misus\$ or overus\$ or overutili\$ or nonmedical or non medical or extramedical or extra medical or illicit\$ or illegal\$ or recreation\$)).ti,ab,kf.

20 ((street\$ or designer\$ or club) adj drug\$).ti,ab,kf.

21 legal high\$.ti,ab,kf

22 nmupd.ti,ab,kf.

23 marijuana.ti,ab,kf.

24 (Cannabi\$ or hash or hashish).ti,ab,kf.

25 (cocaine or methamphetamine\$ or methamphetamine\$ or khat).ti,ab,kf.

26 (Heroin or opium or kratom or mitragyna speciosa or manufactured fentanyl).ti,ab,kf.

27 (mdma or ecstasy or flunitrazepam or rohypnol or bath salts or synthetic cathinone).ti,ab,kf.

28 (salvia or phencyclidine).ti,ab,kf.

29 (hallucinogen\$ or dimethyltryptamine or lsd or mescaline or psilocybin).ti,ab,kf.

30 or/1-29

31 Behavior Therapy/

32 Cognitive Therapy/

33 Counseling/

34 Directive Counseling/

35 Distance Counseling/

36 Patient Education as Topic/

37 Risk Reduction Behavior/

38 Feedback, psychological/

39 Health education/

40 Health promotion/

41 Motivation/

42 Internet/

43 Motivational interviewing/

44 Persuasive communication/

45 Preventive health services/

46 Primary prevention/

47 Self-help groups/

48 Text messaging/

- 49 Therapy, computer-assisted/
50 counsel\$.ti,ab,kf.
51 advice.ti,ab,kf.
52 advise\$.ti,ab,kf.
53 behavior?r\$ chang\$.ti,ab,kf.
54 behavior?r\$ intervention\$.ti,ab,kf.
55 behavior?r\$ modification\$.ti,ab,kf.
56 motivational interview\$.ti,ab,kf.
57 (cognitive behavior\$ or behavior\$ therap\$ or cbt).ti,ab,kf.
58 brief intervention\$.ti,ab,kf.
59 computer based.ti,ab,kf.
60 self help.ti,ab,kf.
61 email\$.ti,ab,kf.
62 internet.ti,ab,kf.
63 text messag\$.ti,ab,kf.
64 (web or website).ti,ab,kf.
65 ((reduc\$ or decreas\$ or prevent\$ or delay or avoid) adj3 initiation\$).ti,ab,kf.
66 (intervention\$ or prevent\$ or psychosocial).ti.
67 or/31-66
68 30 and 67
69 substance-related disorders/pc
70 amphetamine-related disorders/pc
71 cocaine-related disorders/pc
72 inhalant abuse/pc
73 marijuana abuse/pc
74 opioid-related disorders/pc
75 phencyclidine abuse/pc
76 substance abuse, intravenous/pc
77 substance abuse, oral/pc
78 ((reduc* or decreas* or prevent* or delay or avoid) adj3 (drug\$ or substance\$ or marijuana* or cannabi* or opioid* or opiate* or heroin or oxycodone or hydrocodone or crack or cocaine or pain relief or pain reliever\$ or pain medication\$ or prescription\$ or medicine\$ or over the counter or OTC) adj5 (abuse\$ or abusing or misuse\$ or misusing or overus\$ or overutili\$ or use\$ or using or experiment\$)).ti,ab,kf.
79 or/68-78
80 adolescent/ or child/
81 (child\$ or teen or teens or teenage\$ or adolescenc\$ or youth or youths or young people or pediatric\$ or paediatric\$ or school age\$ or juvenile\$).ti,ab,kf.
82 79 and (80 or 81)

83 (clinical trial or controlled clinical trial or randomized controlled trial or adaptive clinical trial or equivalence clinical trial or pragmatic clinical trial or meta analysis).pt.
84 clinical trials as topic/ or controlled clinical trials as topic/ or randomized controlled trials as topic/ or adaptive clinical trials as topic/ or equivalence clinical trials as topic/ or pragmatic clinical trials as topic/
85 Meta-Analysis as Topic/
86 Random allocation/
87 clinical trial\$.ti,ab,kf.
88 (control\$ adj3 (study or studies or trial\$)).ti,ab,kf.
89 random\$.ti,ab,kf.
90 (metaanaly\$ or meta analy\$).ti,ab,kf.
91 trial.ti.
92 or/83-91
93 82 and 92 (3022)
94 limit 93 to (english language and yr="2013 -Current")
95 remove duplicates from 94
96 Young adult/
97 Universities/
98 Student Health Services/
99 ((young or emerging or early) adj adult\$).ti,ab,kf.
100 (late adj (teen\$ or adolescen\$)).ti,ab,kf.
101 (college\$ or universit\$).ti,ab,kf.
102 ((undergraduate or graduate) adj student\$).ti,ab,kf.
103 (high school adj2 senior\$).ti,ab,kf.
104 12th grade.ti,ab,kf.
105 or/96-104
106 79 and 92 and 105
107 limit 106 to (english language and yr="1992 -Current")
108 remove duplicates from 107
109 95 or 108
110 Animals/ not (Humans/ and Animals/)
111 109 not 110

PsycINFO

Database: PsycINFO <1806 to January Week 3 2019>

1 Drug Abuse/
2 "substance use disorder"/
3 Drug Usage/

- 4 Inhalant Abuse/
- 5 Glue Sniffing/
- 6 Polydrug Abuse/
- 7 Drug Abstinence/
- 8 Intravenous Drug Usage/
- 9 Marijuana Usage/
- 10 Cocaine/
- 11 Opiates/
- 12 Hallucinogenic Drugs/
- 13 Phencyclidine/
- 14 Methamphetamine/
- 15 Methylenedioxymethamphetamine/
- 16 Lysergic Acid Diethylamide/
- 17 ((drug or drugs or substance\$) adj1 ("use" or using)).ti,ab,id.
- 18 ((drug or drugs or substance\$) adj5 (abuse\$ or abusing or misus\$ or overus\$ or overutili\$ or nonprescri\$ or non prescri\$ or nonmedical or non medical or extramedical or extra medical or illicit\$ or illegal\$ or recreation\$)).ti,ab,id.
- 19 ((opioid\$ or opiate\$ or oxycodone or hydrocodone or ritalin or adderall or amphetamine\$ or methylphenidate or laughing gas or nitrous oxide or ketamine or dextromethorphan or GHB or gamma-hydroxybutyrate or inhalant\$ or stimulant\$ or sedative\$ or barbiturate\$ or benzodiazepine\$ or sleep medication\$) adj5 (use\$ or using or abuse\$ or abusing or misus\$ or overus\$ or overutili\$ or nonprescri\$ or non prescri\$ or nonmedical or non medical or extramedical or extra medical or illicit\$ or illegal\$ or recreation\$)).ti,ab,id.
- 20 ((pain relief or pain reliever\$ or pain medication\$ or medicine\$ or over the counter or OTC) adj5 (abuse\$ or abusing or misus\$ or overus\$ or overutili\$ or non prescript\$ or nonmedical or non medical or extramedical or extra medical or illicit\$ or illegal\$ or recreation\$)).ti,ab,id.
- 21 (prescription\$ adj5 (abuse\$ or abusing or misus\$ or overus\$ or overutili\$ or nonmedical or non medical or extramedical or extra medical or illicit\$ or illegal\$ or recreation\$)).ti,ab,id.
- 22 ((street\$ or designer\$ or club) adj drug\$).ti,ab,id.
- 23 legal high\$.ti,ab,id.
- 24 nmupd.ti,ab,id.
- 25 marijuana.ti,ab,id.
- 26 (Cannabi\$ or hash or hashish).ti,ab,id.
- 27 (cocaine or methamphetamine\$ or methamphetamine\$ or khat).ti,ab,id.
- 28 (Heroin or opium or kratom or mitragyna speciosa or manufactured fentanyl).ti,ab,id.
- 29 (mdma or ecstasy or flunitrazepam or rohypnol or bath salts or synthetic cathinone).ti,ab,id.
- 30 (salvia or phencyclidine).ti,ab,id.
- 31 (hallucinogen\$ or dimethyltryptamine or lsd or mescaline or psilocybin).ti,ab,id.
- 32 or/1-31
- 33 Health Promotion/
- 34 Motivation/
- 35 behavio?r\$ chang\$.ti,ab,id.

36 behavior?r\$ intervention\$.ti,ab,id.
37 behavior?r\$ modification\$.ti,ab,id.
38 behavior therapy/
39 cognitive behavior therapy/
40 cognitive therapy/
41 Cognitive Techniques/
42 (cognitive behavior\$ or behavior\$ therapy or cbt).ti,ab,id.
43 brief intervention\$.ti,ab,id.
44 SBIRT.ti,ab,id.
45 Behavior Modification/
46 Behavior Change/
47 Persuasive Communication/
48 Motivational Interviewing/
49 motivational interview\$.ti,ab,id.
50 Health Knowledge/
51 Health Behavior/
52 Health Education/
53 Client Education/
54 Feedback/
55 Online Therapy/
56 Computer Assisted Therapy/
57 Computer Mediated Communication/
58 Internet/
59 computer based.ti,ab,id.
60 text messag\$.ti,ab,id.
61 email\$.ti,ab,id.
62 internet.ti,ab,id.
63 (web or website).ti,ab,id.
64 Self Help Techniques/
65 self help.ti,ab,id.
66 counseling/
67 Group Counseling/
68 counsel\$.ti,ab,id.
69 counselling.ti,ab,id.
70 advice.ti,ab,id.
71 advise\$.ti,ab,id.
72 (intervention\$ or prevention or preventive or psychosocial).ti.

73 ((reduc\$ or decreas\$ or prevent\$ or delay or avoid) adj3 initiation\$).ti,ab,id.
74 or/33-73
75 32 and 74
76 Drug Abuse Prevention/
77 ((reduc* or decreas* or prevent* or delay or avoid) adj3 (drug\$ or substance\$ or marijuana* or cannabi* or opioid* or opiate* or heroin or oxycodone or hydrocodone or crack or cocaine or pain relief or pain reliever\$ or pain medication\$ or prescription\$ or medicine\$ or over the counter or OTC) adj5 (abuse\$ or abusing or misuse\$ or misusing or overus\$ or overutili\$ or use\$ or using or experiment\$)).ti,ab,id.
78 75 or 76 or 77
79 (adolescence 13 17 yrs or childhood birth 12 yrs).ag.
80 (child\$ or teen or teens or teenage\$ or adolescen\$ or youth or youths or young people or pediatric\$ or paediatric\$ or school age\$ or juvenile\$).ti,ab,id.
81 79 or 80
82 78 and 81
83 (treatment outcome or clinical trial).md.
84 Experiment Controls/
85 (control\$ adj3 (study or studies or trial\$)).ti,ab,id.
86 clinical trial\$.ti,ab,id.
87 random\$.ti,ab,id.
88 meta analy\$.ti,ab,id.
89 metaanaly\$.ti,ab,id.
90 trial.ti.
91 or/83-90
92 82 and 91
93 limit 92 to (english language and yr="2013 -Current")
94 young adulthood 18 29 yrs.ag.
95 emerging adulthood/
96 colleges/ or community colleges/ or college students/
97 ((young or emerging or early) adj adult\$).ti,ab,id.
98 (late adj (teen\$ or adolescen\$)).ti,ab,id.
99 (college\$ or universit\$).ti,ab,id.
100 ((undergraduate or graduate) adj student\$).ti,ab,id.
101 (high school adj2 senior\$).ti,ab,id.
102 12th grade.ti,ab,id.
103 or/94-102
104 78 and 103
105 78 and 91 and 103
106 limit 105 to (english language and yr="1992 -Current")

PubMed, publisher-supplied records

#26	(#22 OR #25) AND publisher[sb]
#25	#24 AND ("1992/01/01"[Date - Publication] : "3000"[Date - Publication]) AND English[Language]
#24	#9 AND #18 AND #20 AND #23
#23	young adult*[tiab] OR emerging adult*[tiab] OR early adult*[tiab] OR late teen*[tiab] OR late adolescen*[tiab] OR college*[tiab] OR university*[tiab] OR undergraduate student*[tiab] OR graduate student*[tiab] OR high school senior*[tiab] OR 12th grade[tiab]
#22	#21 AND ("2013/01/01"[Date - Publication] : "3000"[Date - Publication]) AND English[Language]
#21	#9 AND #18 AND #19 AND #20
#20	random*[tiab] OR clinical trial*[tiab] OR controlled trial*[tiab] OR “controlled study”[tiab] OR “controlled studies”[tiab] OR trial*[title] or meta analy*[tiab] OR metaanaly*[tiab]
#19	child*[tiab] OR teen[tiab] OR teens[tiab] OR teenage*[tiab] OR adolescen*[tiab] OR youth[tiab] OR youths[tiab] OR "young people"[tiab] OR pediatric*[tiab] OR paediatric*[tiab] OR school age*[tiab] OR juvenile*[tiab]
#18	#10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17
#17	intervention*[ti] OR prevention[ti] OR preventive[ti] OR psychosocial[ti]
#16	"patient education"[tiab] OR "health education"[tiab] OR "health promotion"[tiab]
#15	email*[tiab] OR internet[tiab] OR text messag*[tiab] OR web[tiab] OR website[tiab]
#14	brief intervention*[tiab] OR SBIRT[tiab]
#13	cognitive behavio*[tiab] OR behavio* therap*[tiab] OR cbt[tiab]
#12	motivational interview*[tiab]
#11	behavio* chang*[tiab] OR behavio* intervention*[tiab] OR behavio* modification*[tiab]
#10	counsel*[tiab] OR advice[tiab] OR advise*[tiab]
#9	#3 OR #4 OR #5 OR #6 OR #7 OR #8
#8	marijuana[tiab] OR Cannabi*[tiab] OR hash[tiab] OR hashish[tiab] OR cocaine[tiab] OR methamphetamine[tiab] OR khat[tiab] OR "Catha edulis"[tiab] OR Heroin[tiab] OR

	opium[tiab] OR kratom[tiab] OR “mitragyna speciosa”[tiab] OR “manufactured fentanyl” [tiab] OR mdma[tiab] OR ecstasy[tiab] OR flunitrazepam[tiab] OR rohypnol[tiab] OR “bath salts”[tiab] OR “synthetic cathinone”[tiab] OR salvia[tiab] OR phencyclidine[tiab] OR hallucinogen*[tiab] OR dimethyltryptamine[tiab] OR lsd[tiab] OR mescaline[tiab] OR psilocybin[tiab]
#7	nmupd[tiab]
#6	legal high*[tiab]
#5	street drug*[tiab] OR designer drug*[tiab] OR club drug*[tiab]
#4	drug use*[tiab] OR substance use*[tiab] OR using drug*[tiab]
#3	#1 AND #2
#2	abuse*[tiab] OR abusing[tiab] OR misus*[tiab] OR overus*[tiab] OR overutili*[tiab] OR nonprescri*[tiab] OR non prescri*[tiab] OR nonmedical[tiab] OR "non medical"[tiab] OR extramedical[tiab] OR "extra medical"[tiab] OR illicit*[tiab] OR illegal*[tiab] OR recreation*[tiab]
#1	drug[tiab] OR drugs[tiab] OR substance*[tiab] OR opioid*[tiab] OR opiate*[tiab] OR oxycodone[tiab] OR hydrocodone[tiab] OR ritalin[tiab] OR adderall[tiab] OR Adderall[tiab] OR amphetamine*[tiab] OR methylphenidate[tiab] OR “laughing gas”[tiab] OR “nitrous oxide” [tiab] OR ketamine[tiab] OR dextromethorphan[tiab] OR GHB[tiab] or “gamma-hydroxybutyrate”[tiab] OR inhalant*[tiab] OR stimulant*[tiab] OR sedative*[tiab] OR barbiturate*[tiab] OR benzodiazepine*[tiab] OR sleep medication*[tiab] OR “pain relief”[tiab] OR pain reliever*[tiab] OR pain medication*[tiab] OR medicine*[tiab] OR “over the counter”[tiab] OR OTC[tiab] prescription*[tiab]

eTable 1. Quality Assessment Criteria

Study Design	Adapted Quality Criteria
Randomized and non-randomized controlled trials, adapted from the U.S. Preventive Services Task Force methods ¹	<p>Bias arising in the randomization process or due to confounding</p> <ul style="list-style-type: none"> • Valid random assignment/random sequence generation method used • Allocation concealed • Balance in baseline characteristics <p>Bias in selecting participants into the study</p> <ul style="list-style-type: none"> • CCT only: No evidence of biased selection of sample <p>Bias due to departures from intended interventions</p> <ul style="list-style-type: none"> • Fidelity to the intervention protocol • Low risk of contamination between groups • Participants were analyzed as originally allocated <p>Bias from missing data</p> <ul style="list-style-type: none"> • No, or minimal, post-randomization exclusions • Outcome data are reasonably complete and comparable between groups • Reasons for missing data are similar across groups • Missing data are unlikely to bias results <p>Bias in measurement of outcomes</p> <ul style="list-style-type: none"> • Blinding of outcome assessors • Outcomes are measured using consistent and appropriate procedures and instruments across treatment groups • No evidence of inferential statistics <p>Bias in reporting results selectively</p> <ul style="list-style-type: none"> • No evidence that the measures, analyses, or subgroup analyses are selectively reported

eTable 2. Study Characteristics of All Included Studies of Interventions to Prevent Illicit and Nonmedical Drug Use in Children, Adolescents, and Young Adults (29 Studies)

Study	Quality	No. rand (% FU)	Country	Brief population description	Baseline drug use, % used	IG description	Number of sessions (est hrs)	Other target behaviors	Intervention setting: format
Baldus, 2016 ²	Fair	302 (88.7)	DEU	Aged 10-14 youth not diagnosed with substance use disorder	Cannabis: 1.7 Any Drug: NR	IG1: Strengthening Families Program 10-14: 11 x 2-hour family-based group sessions to reduce risk of substance abuse and behavior problems	11 (22)	Alc, Tob, Fam, SocLeg	Social services agency: Group (in-person)
Bannink, 2014 ³	Fair	1702 (73.8)	NLD	Aged 15-16	Cannabis: NR Any Drug: NR	IG1: 1 x 45-minute computer-based program to assess health-risk behavior and well-being with tailored messages; referred for consultation if at-risk of mental health problems or if youth self-refers	2 (1.2)	Alc, Tob, MH, RSex	School: Individual (in-person), Computer-based
						IG2: 1 x 45-minute computer-based program to assess health-risk behavior and well-being with tailored messages; option to self-refer to nurse	1 (0.8)		School: Computer-based

Study	Quality	No. rand (% FU)	Country	Brief population description	Baseline drug use, % used	IG description	Number of sessions (est hrs)	Other target behaviors	Intervention setting: format
Barlow, 2006 ⁴	Fair	53 (77.4)	US	Pregnant American Indian youth aged 12 to 19	Cannabis: NR Any Drug: NR	IG1: Family Spirit: 25 x 90-minute in-home sessions on parenting, substance abuse prevention, coping, and other maternal and infant health topics	25 (37.5)	Alc, Oth	Home: Individual (in-person)
Barlow, 2013 ⁵	Good	322 (92.0)	US	Pregnant American Indian youth aged 12-19	Cannabis: 78.88 Any Drug: NR	IG1: Family Spirit: 43 x 60-minute in-home sessions on parenting, substance abuse prevention, coping, and other maternal and infant health topics	43 (43)	Alc, Oth	Home: Individual (in-person)
D'Amico, 2018 ⁶	Fair	1702 (73.8)	US	Adolescents aged 12 to 18 at risk for alcohol abuse	Cannabis: NR Any Drug: NR	IG1: 1 x 15-20 minute individual brief motivational interview for youth focusing on motivation to change and substance use prevention	1 (0.3)	Alc	Primary Care: Individual (in-person)
Dembo, 2016 ⁷	Fair	300 (93.7)	US	Truant youth, aged 11-17	Cannabis: 82.3 Any Drug: NR	IG1: 2 x 75-min youth sessions on substance use and consequences 1 x 75-min parent session on parental attitudes of use	3 (3.8)	SocLeg	Home: Individual (in-person)

Study	Quality	No. rand (% FU)	Country	Brief population description	Baseline drug use, % used	IG description	Number of sessions (est hrs)	Other target behaviors	Intervention setting: format
	Fair	300 (93.7)	US	Truant youth, aged 11-17	Cannabis: 82.3 Any Drug: NR	IG2: 2 x 75-minute individual sessions on substance use and consequences	2 (2.5)	SocLeg	Home: Individual (in-person)
Estrada, 2018 ⁸	Fair	230 (75.2)	US	Eighth graders with behavior problems	Cannabis: NR Any Drug: NR	IG1: Online version of Familias Unidas (eHealth Familias Unidas); 8 x 30-min online recorded e-parent group sessions accessed via the internet and 4 x 45-min parent-adolescent family sessions delivered by a facilitator via web-based video conferencing software	12 (7)	Alc, Tob, Fam, RSex	Home: Computer-based, Video
Fang, 2010 ⁹	Good	108 (96.3)	US	Asian American girls, aged 10-14	Cannabis: 3.8 Any Drug: NR	IG1: 10 x 35-45-minute interactive online sessions for mother-daughter dyads on family functioning, self-efficacy, social skills, and drug use prevention	10 (7.5)	Alc, Tob, Fam, MH	Home: Computer-based
Foxcroft, 2016 ¹⁰	Fair	614 (75)	POL	Children ages 10 to 14	Cannabis: NR Any Drug: 4	IG1: Strengthening Families Program 10-14: 7 x 120-min group substance use prevention sessions for parent-youth dyads	7 (14)	Alc, Tob, Fam	NR: Group (in-person), Video

Study	Quality	No. rand (% FU)	Country	Brief population description	Baseline drug use, % used	IG description	Number of sessions (est hrs)	Other target behaviors	Intervention setting: format
Gmel, 2013 ¹¹	Fair	853 (79)	CHE	Male conscripts, age 19 or greater	Cannabis: 46 Any Drug: NR	IG1: 2 x 20-minute counseling sessions targeting multi-substance use behaviors in men ages 19 and older	2 (0.7)	Alc, Tob	Other Medical: Individual (in-person)
Harris, 2012 ¹²	Fair	2685 (76.5)	US, CZE	Aged 12-18 (New England) or 13-17 (Prague) with a routine primary care appointment	Cannabis: 13.2 Any Drug: NR	IG1: 1 x 7-8-minute computer and clinician-based screening and intervention to not start/stop substance use	1 (0.1)	Alc	Primary Care: Individual (in-person), Computer-based
Jalling, 2016 ¹³	Fair	271 (83.8)	SWE	At-risk youth not being treated for alcohol or drug use, aged 12-18	Cannabis: NR Any Drug: 16.9	IG1: 6 x 120-min group sessions to increase parental understanding of youth development & skill improvement	6 (12)	Alc, Fam, SocLeg	NR: Group (in-person)
	Fair	271 (83.8)	SWE	At-risk youth not being treated for alcohol or drug use, aged 12-18	Cannabis: NR Any Drug: 16.9	IG2: 10 x 150-minute group parent sessions to help to develop and enhance their skills and self-efficacy for parenting	10 (25)	Alc, Fam, SocLeg	NR: Group (in-person)
Johnson, 2015 ¹⁴	Fair	200 (85.0)	US	Aged 14 to 21 with a primary care appointment	Cannabis: 18.5 Any Drug: NR	IG1: 3 positive youth development motivational interview sessions with phone or email followup targeting career readiness	6 (1.8)	RSex, SocLeg	Primary Care: Individual (in-person)

Study	Quality	No. rand (% FU)	Country	Brief population description	Baseline drug use, % used	IG description	Number of sessions (est hrs)	Other target behaviors	Intervention setting: format
						and addressing risky behaviors (time NR)			
Kerr, 2013 ¹⁵	Fair	1654 (90.4)	US	Aged 14 to 17	Cannabis: NR Any Drug: NR	IG1: 2 x 8-hour group workshops covering diet, physical activity, and drug prevention	2 (16)	Alc, Oth	NR: Group (in-person)
Kim, 2011 ¹⁶	Good	100 (90.0)	US	Girls in foster care, aged 10-12	Cannabis: NR Any Drug: NR	IG1: 6 group sessions of caregiver training; 6 group sessions of skill-building and 40 individual coaching sessions for adolescent girls (time NR)	46 (86)	Alc, Tob, Fam, MH, RSex, SocLeg	NR: Individual (in-person), Group (in-person)
Knight, 2019 ¹⁷	Fair	871 (87.5)	US	Adolescents aged 12 to 18	Cannabis: 12.2 Any Drug: NR	IG1: 1 X 2 to 5-minute conversation about the risks of substance abuse using motivational interviewing strategies	1 (0.2)	Alc	Primary Care: Individual (in-person)
Lee, 2010 ¹⁸	Good	341 (94.4)	US	Incoming college freshmen with any use of cannabis in previous 3 months	Cannabis: NR Any Drug: NR	IG1: 1 computer-based individualized personalized feedback session (time NR)	1 (0.5)	--	Home: Computer-based

Study	Quality	No. rand (% FU)	Country	Brief population description	Baseline drug use, % used	IG description	Number of sessions (est hrs)	Other target behaviors	Intervention setting: format
Malmberg, 2014 ¹⁹	Fair	2416 (92.0)	NLD	Aged 11 to 17	Cannabis: NR Any Drug: NR	IG1: 3 interactive modules (1 module per year for 3 years) on substance use prevention (time NR)	3 (1.5)	Alc, Tob	School: Computer-based
Mason, 2015 ²⁰	Fair	119 (98)	US	Youth at risk for substance use disorder, aged 14-18	Cannabis: NR Any Drug: NR	IG1: 1 x 20-minute individual motivational interviewing session with peer network counseling	1 (0.3)	Alc	NR: Individual (in-person)
Rhee, 2008 ²¹	Fair	41 (85)	US	Youth with asthma, aged 14-20	Cannabis: NR Any Drug: NR	IG1: 3 x 30-min CD-ROM sessions covering decision-making and risk behaviors	3 (3.2)	Alc, Tob	Other Medical, Home: Individual (phone), Computer-based
Sanci, 2015 ²²	Fair	901 (68.8)	AUS	Aged 14-24, attending a primary care visit	Cannabis: NR Any Drug: 26.5	IG1: Clinician training to screen for risky behaviors and discuss protective factors with youth, plus supported plan-do-study-act cycle.	1 (0.2)	Alc, Tob, MH, RSex, SocLeg	Primary Care: Individual (in-person)
Schinke, 2009a ²³	Fair	591 (90.0)	US	Females aged 11 to 13	Cannabis: 2.7 Any Drug: NR	IG1: 9 x 45-minute individual computer sessions for mother-daughter dyads aimed to reduce substance use through mother-daughter interactions	9 (6.8)	Alc, Tob, MH, Fam	Home: Computer-based

Study	Quality	No. rand (% FU)	Country	Brief population description	Baseline drug use, % used	IG description	Number of sessions (est hrs)	Other target behaviors	Intervention setting: format
Schinke, 2009 ^{b24}	Good	916 (94)	US	Females aged 11 to 13	Cannabis: NR Any Drug: NR	IG1: 9 X 45-minute weekly computer-based substance use prevention sessions plus two annual booster sessions for mother-daughter dyads	11 (8.2)	Alc, Tob, MH, Fam	Home: Computer-based
Schwinn, 2010 ²⁵	Fair	236 (91)	US, CAN	Females aged 13-14	Cannabis: NR Any Drug: NR	IG1: RealTeen: 12 x web-based modules and homepage access to curated online community	12 (5)	--	Home: Computer-based
Schwinn, 2015 ²⁶	Fair	236 (85)	US	Sexual-minority adolescents, aged 15-16	Cannabis: NR Any Drug: NR	IG1: 3 x 14-minute individual computer sessions for youth	3 (0.7)	--	Home: Computer-based
Schwinn, 2018 ²⁷	Good	788 (96.5)	US	Females aged 13 to 14 residing in the United States	Cannabis: NR Any Drug: NR	IG1: RealTeen: 9 x 15-minute online substance use prevention sessions for girls aged 13-14	9 (2.8)	--	Home: Computer-based
Walkup, 2009 ²⁸	Fair	167 (68.9)	US	Pregnant American Indian youth, aged 12-22	Cannabis: NR Any Drug: NR	IG1: Family Spirit: 25 x 60-minute in-home sessions on parenting, substance abuse prevention, and problem-solving and coping skills	25 (25)	Alc, Oth	Home: Individual (in-person)
Walton, 2013 ²⁹	Fair	328 (85)	US	Youth with previous-year cannabis use,	Cannabis: 100	IG1: 1 MI session (time NR)	1 (0.6)	Alc	Primary Care:

Study	Quality	No. rand (% FU)	Country	Brief population description	Baseline drug use, % used	IG description	Number of sessions (est hrs)	Other target behaviors	Intervention setting: format
				aged 12 to 18, attending a primary care visit	Any Drug: NR				Individual (in-person)
						IG2: 1 computer-based MI session (time NR)	1 (0.6)	Alc	Primary Care: Computer-based
Walton, 2014 ³⁰	Fair	714 (88.1)	US	Youth with no cannabis use in previous year, aged 12-18, attending a primary care visit	Cannabis: 0 Any Drug: 6.9	IG1: 1 x 38-minute MI session	1 (0.6)	Alc	Primary Care: Individual (in-person)
						IG2: 1 x 33-minute computer-based MI session	1 (0.6)	Alc	Primary Care: Computer-based

Abbreviations: Alc = Alcohol; AUS = Australia; CAN = Canada; CHE = Switzerland; CZE = Czech Republic; DEU = Germany; Est hrs = Estimated hours; Fam = Family functioning; FU = Followup; IG = intervention group; MH = Mental health; NR = Not reported; NLD = Netherlands; Oth = Other health behavior; POL = Poland; RSex = Risky sexual behavior; SocLeg = Social-legal; SWE = Sweden; Tob = Tobacco; US = United States

eTable 3. Summary of Study Characteristics of All Included Studies of Interventions to Prevent Illicit and Nonmedical Drug Use in Children, Adolescents, and Young Adults (29 Studies, N=18,353)

Characteristics	No. studies	%
All studies	29	100
Study design		
RCT	24	83
Cluster RCT	4	14
CCT	1	3
Quality rating ^a		
Good	6	21
Fair	23	79
Conducted in the US	22	76
Recruitment setting		
Primary care	11	38
Other health care	1	4
School (only)	4	14
Online, media (only)	6	21
Other	7	24
Prevention type		
Universal	20	69
Selective	9	31
Drug focus		
Cannabis	5	17
Any drug use	24	83
Primary Intervention Outcomes		
Drug only	4	14
Drug and alcohol	6	21
Drug, alcohol, tobacco	3	10
Drug and nonsubstance	2	7
Substance use and nonsubstance	14	48
Non-substance outcomes ^b		
Family functioning	8	28
Risky sexual behavior	5	17
Mental health	6	21
Other	10	34
Control Group		
No. intervention/usual care	17	59
Minimal intervention	7	24
Attention control	5	17
Median sample size (IQR), Range	322 (230-853)	41-2685
Median % followup at 6 to 12 months (IQR), Range	87.5 (79.0-92.0)	68.8-98.0

Abbreviations: CCT = Controlled clinical trial; IQR = Interquartile range; No. = Number; RCT = Randomized controlled trial; US = United States

^a6 additional studies were rated as poor quality and excluded from the review

^bInterventions may have multiple non-substance-related primary outcomes

eTable 4. Summary of Population Characteristics of All Included Studies of Interventions to Prevent Illicit and Nonmedical Drug Use in Children, Adolescents, and Young Adults (29 Studies)

Characteristics	No. of trials	% of all trials or SD
Limited to pregnant adolescents	3	10
Age; Mean, SD ^a	14.9	2.0
Age group		
Middle school (~10-14)	10	35
High school (~14-17)	3	10
Young adults (~18-25)	2	7
Wide age range	14	48
Majority Hispanic or non-white ^b	15	68
	Total % across all trials	IQR (No. trials reporting)
Female	59.4	50-66.5 (29)
Race ^b		
% Black	38.9	8.1-63.7 (17)
% Asian	6.4	1.2-5.6 (8)
% Native American	20.0	0.1-0.3 (8)
% White	42.1	11.5-72.3 (15)
Hispanic ethnicity ^{b,c}	16.5	8.6-23.1 (16)
Used cannabis, Median %	24.0	12.2-18.5 (11)
Used alcohol, Median %	37.7	32.3-53.1 (11)

Abbreviations: IQR = Interquartile range; SD = Standard deviation; US = United States

^aMean across all trials, weighted by number randomized in each trial

^bLimited to trials conducted in the US (20 trials)

^cAssuming majority white, non-Hispanic if race and ethnicity were not reported

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