Substance use in young people 3

Prevention, early intervention, harm reduction, and treatment of substance use in young people

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We did a systematic review of reviews with evidence on the effectiveness of prevention, early intervention, harm reduction, and treatment of problem use in young people for tobacco, alcohol, and illicit drugs (eg, cannabis, opioids, amphetamines, or cocaine). Taxation, public consumption bans, advertising restrictions, and minimum legal age are effective measures to reduce alcohol and tobacco use, but are not available to target illicit drugs. Interpretation of the available evidence for school-based prevention is affected by methodological issues; interventions that incorporate skills training are more likely to be effective than information provision—which is ineffective. Social norms and brief interventions to reduce substance use in young people do not have strong evidence of effectiveness. Roadside drug testing and interventions to reduce injection-related harms have a moderate-to-large effect, but additional research with young people is needed. Scarce availability of research on interventions for problematic substance use in young people indicates the need to test interventions that are effective with adults in young people. Existing evidence is from high-income countries, with uncertain applicability in other countries and cultures and in subpopulations differing in sex, age, and risk status. Concerted efforts are needed to increase the evidence base on interventions that aim to reduce the high burden of substance use in young people.

Lancet Psychiatry 2016

Published Online
February 18, 2016
http://dx.doi.org/10.1016/S2215-0366(16)00002-X

This is the third in a Series of three papers about substance use in young people

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Introduction

Substance use in young people is an important public health concern. As noted in the first paper of this Series by Degenhardt and colleagues,[1] adolescence is the peak period for initiation of substance use, which imparts large health burdens in this age group. Young people (defined here as aged 10–24 years)[2] are a broad and dynamic group that includes school-aged children, teenagers, and young adults. As a result, the responses to substance use in young people will differ substantially depending on their age, stage of life, level of substance use, and their socio-environmental context.

In thinking about the responses to substance use in young people, one must first take into account the differences to the adult population that young people experience during this period of rapid growth and development. These include the rapid physiological development during puberty,[3] which can affect cognitive reasoning, emotional regulation, and risk taking. In this respect, young people are progressing through a period of their lives that has both tremendous opportunity, but also much risk with respect to substance use, given the state of heightened emotion and the importance of peers during adolescence.[4] Additionally, young people are making developmental and life milestones such as the end of education, transition to a career, and a move towards independence including new intimate relationships and, in some cases, becoming a parent.

Second, given that young people are at a different stage of life to the adult population, the focus of responses to substance use is often heavily on prevention, early intervention, and reduction of harms in those who have begun to use substances rather than intensive treatment of dependent users. Third, most young people using substances, even heavy use, do not yet have established drug dependence (particularly in the teenage years), which has broad implications on the role of drug treatment services and the applicability of treatment approaches that have good evidence in adults. Finally, the platforms through which interventions can be delivered in this age group are unique. Educational settings can be a good fit to deliver interventions and mobile and online interventions might be more appealing and have greater uptake in this age group than older age groups.

In this Series paper, we review the responses to substance use in young people, building on the epidemiology of substance use in young people,[1] and the unique developmental and contextual risks of substance use and the resulting harms.[3] We critically assess evidence on the efficacy of various intervention approaches and how these differ according to age, level of substance use, and socioenvironmental context. These approaches range from macro-level population-based interventions (eg, legislation, regulation, and law enforcement) to individual-level interventions (eg, early intervention, reduction of harms in young people who are using substances who are at risk of acute adverse effects, and treatment of problematic or dependent substance use). The type and targets of interventions will vary according to age and level of substance use. For example, school-based approaches for young people who might not have started using substances will differ from approaches used for college students who might have begun their transition to independent living and could be experimenting with substances. Similarly, approaches will differ to target young adults who live independently from their families of origin, and might have begun to develop heavy patterns of substance use,

including dependence. We judge whether intervention approaches need to be structured differently for young people, and the important issues of treatment setting and confidentiality for those younger than 18 years.

Our primary sources of evidence were systematic reviews of randomised controlled trials or quasi-experimental designs that used a control condition. However, if no such evidence was available or the completion of randomised

	Hypothesised mechanism through which affect occurs	Has been applied (or applies) to		
		Alcohol	Tobacco	Illicit drugs
Population and prevention				
Scheduling of substances under international conventions that do not permit use for non-medical purposes	Substances will be available and used for only medical or scientific purposes, on the assumption that people will be deterred from using illegal substances in fear of criminal penalties for selling and use	NA	NA	✓
Availability restrictions	Restrict the number and type of outlets that can sell the substance to reduce sales and overall consumption	✓	✓	NA
Sales restrictions	Restriction of selling hours might reduce consumption and acute harms associated with use	✓	✓	NA
Minimum legal age for use	Substance use will be minimised because it is not legal to purchase; implemented through civil penalties for selling and use of substance	✓	✓	NA
Taxation	Increasing price will decrease demand and use	✓	✓	NA
Banning advertising of products	Reduces the extent to which substances are marketed and promoted to reduce acceptability and normalisation of use	✓	✓	NA
Mass media campaigns	Young people will receive messages from governments or other agencies about the harms of using drugs and might be deterred from doing so	✓	✓	✓
Psychologically-based interventions targeting populations of young people (eg, schools)	Young people will learn about the risks and harms of using substances, and develop skills to refuse offers to use substances	✓	✓	✓
Psychologically-based interventions targeting parents of young people	Family-based interventions focus on psychosocial development rather than exclusively on the prevention of the target drug use, and might potentially improve many areas of a young person's development, including information about substance use, development of rules, and monitoring and supervision and parent–child communication	✓	✓	✓
Early intervention and harm reduction with young people who already use substances				
Screening and brief interventions in primary care, general settings (eg, university or work), emergency departments, or hospitals	Screening, brief intervention, and referral to treatment aims to identify young people at risk of drug use and associated harms and intervene before problematic use and harms develop	✓	✓	✓
Social norms and expectancies	Provide education about peers' actual substance use to reduce substance use because young people typically overestimate substance use of their peers	✓	X	✓
Random roadside drug testing	Random testing of young people for alcohol and illicit drug use might deter them from driving after using these substances, thereby reducing traffic accidents and other harms	✓	X	✓
Reduction of injection-related harms	Of young people who inject drugs, provision of information, HIV and HCV testing, and needles and syringes might reduce unsafe injecting and thereby reduce risks of exposure to infectious diseases (eg, HIV and HCV)	NA	NA	✓
Treatment of substance use problems or dependence				
Motivational enhancement therapy	Identifies the young person's willingness to address their problematic substance use, and enhances their intrinsic motivation to address their substance use, so they become more open to the concept of treatment	✓	✓	✓
Self-help interventions (via phone, online, or written)	A young person with problematic substance use will change their patterns of substance use because of feedback they obtain on the potential risks of their own substance use patterns	✓	✓	✓
Self-help interventions with peers (eg, Alcoholics or Narcotics Anonymous)	Group members support each other to abstain from drug use and trust in a so-called higher power (eg, a deity or God) to address the urges to use the drug	✓	X	✓
Cognitive behavioural therapy	Assumes that improvements in client's recognition of high-risk situations for use, and acquiring of skills to address them, will reduce substance use	✓	✓	✓
Family-based interventions and multisystemic therapy	Aims to reduce substance use in young people by changing dysfunctional family patterns, relationships, and behaviour by improving communication, parenting skills, and adolescent integration in the extrafamilial environment	✓	✓	✓
Therapeutic communities	Addressing dependent use requires sustained intervention across several domains and a client needs time to gain skills, insight, and the capacity to return to their life and not return to substance use	✓	X	✓
Agonist pharmacotherapy	An individual dependent on a substance will be maintained on a prescribed medication with similar effects to this substance, allowing patients to avoid using via the usual route (eg, tobacco smoking, drug injecting)	✓	✓	✓
Antagonist pharmacotherapy	Young people will experience aversive effects if they use the substance (eg, disulfiram for alcohol) or find the drug effects less rewarding (eg, naltrexone for alcohol and opioid dependence)	✓	X	✓
Juvenile drug courts or diversion	Key goals are to reduce drug use and associated criminal behaviour by engaging and retaining drug-involved offenders in treatment and related services, with the judge playing a part in the recovery process	✓	X	✓

✓=Yes. X=No. NA=not applicable. HCV=hepatitis C virus.

Table 1: **Characteristics and hypothesised effects of interventions to prevent, intervene early, or treat substance use in young people**

controlled trials was impractical, unethical, or politically difficult, we assessed evidence from natural experiments (eg, observational studies), before-and-after studies, and time-series analyses. Additionally, we consulted other reviews[5–8] and searched for empirical studies in areas in which no reviews were found.

Framework for interventions

Table 1 and the figure summarise the logic of the major interventions to prevent young people initiating substance use, to intervene early, and to reduce harms or treat substance use problems. Prevention interventions are typically population-level interventions and can have different aims (table 1). They could aim to reduce young people's interest in using substances, limit availability of substances to make them more difficult to obtain or consume, or use criminal or other social sanctions to discourage young people from using substances. Many of the prevention policies used for use of tobacco and alcohol are not applicable to use of illicit drugs, whose use by adults is also illegal.

Early interventions aim to identify young people who might be at risk or who show signs of problematic substance use and reduce use before it escalates. Harm reduction approaches focus on restricting or minimising the negative effects of substance use on young people, their families, and peers. Treatment of problematic or dependent use is aimed at addressing heavy or dependent patterns of drug use; such interventions are usually focused at individuals, although these could also include family or important individuals in the young person's life, and might include broader community foci.

We have summarised the evidence from our review of reviews (table 2; appendix). Of importance is to be mindful that the evidence is almost exclusively from high-income countries (often the USA). Panel 1 discusses some of the issues that arise in judging the application of this evidence to other countries and cultures.[81,82]

Population-level interventions: preventing substance use and harm

Prohibition of the use of controlled substances

Non-medical use of cannabis, opioids, amphetamines, and cocaine is prohibited in countries that have signed the UN Single Convention on Narcotic Drugs.[83] Prohibition with severe criminal penalties for drug use remains controversial because only weak evidence is available to show that tough sanctions reduce criminal offending in general or drug use in particular.[6] In the past 5–10 years, policy changes in Uruguay, Portugal, and the USA have permitted some examination of the potential effects of moving away from criminalisation of cannabis use for medical and non-medical purposes. A 2015 US study[27] noted no increase in adolescent cannabis use in US States where medical cannabis use was legalised and even identified a reduction in cannabis use by 8th grade students (aged 13–14 years).

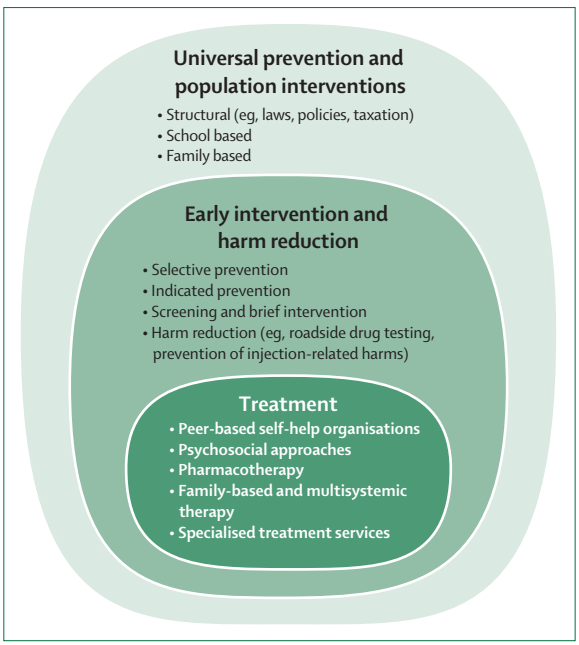

Figure: **Spectrum of interventions used to address substance use in young people**

Of importance, there are adverse health and social effects associated with the prohibition and widespread cultivation, manufacture, and trafficking of illicit drugs.[84,85] These include health effects such as HIV and hepatitis C virus transmission from unsafe injecting drug use (the peak ages for infection are in the first years of drug injection); social and legal effects of imprisonment and of young people having a criminal record. Furthermore, the adverse effects include the violence that occurs in drug markets in source countries and consumer drug markets—eg, in Latin America the high number of homicides in young people[86] can partly be attributed to violence in illegal drug markets.

See Online for appendix

Availability and sales restrictions

Restrictions to the number of outlets where alcohol is allowed to be sold can reduce young people's access to alcohol.[8] Evidence is conflicting on the effect of limiting hours of operation on alcohol consumption and alcohol-related harm in young people.[12] The effectiveness of restrictions depends on alcohol availability and hours of operation in surrounding areas. This strategy might be more effective if implemented regionally, nationally, or in isolated communities.[12] Tightened trading hours of licensed premises has been associated with both increases and decreases in harms. The most consistent finding is that the occurrence of alcohol-related harms remains stable after the introduction of restricted operating hours, but harms might occur earlier or be displaced to other locations.[9,12] Evidence on alcohol availability and

	Use			Problematic use			Injury or harm		
	Effect	Level of evidence	Size of effect	Effect	Level of evidence	Size of effect	Effect	Level of evidence	Size of effect
Population and prevention interventions									
Alcohol									
Scheduling under international conventions	NA	NA	NA	NA	NA	NA	NA	NA	NA
Availability or sales restrictions	?	B	Mixed findings[9]*	?	A	Mixed findings[9]*	N	A	No effect†, potential negative effect[9]‡
Minimum legal drinking age	?	A	Mixed findings[9]*	Y	A	Small meaningful benefit[10]*	Y	A	Small meaningful benefit[10]*
Sanctions	?	C	Insufficient evidence[11]§	?	C	Insufficient evidence[11]§	–	–	–
Provider (seller) training	N	B	No effect[10]†	N	B	No effect[10]*	?	B	Mixed findings[10]*
Taxation	Y	A	Moderate-to-large meaningful benefit[9,12]¶	Y	A	Large meaningful benefit[12]¶	Y	A	Moderate-to-large meaningful benefit[9,12]¶
Ban or regulate advertising	?	C	Insufficient evidence[13]§	?	C	Insufficient evidence[13]§	?	C	Insufficient evidence[13]§
Mass media	?	C	Mixed findings[12]*	–	–	–	?	C	Insufficient evidence[12]§
Psychologically-based prevention									
Education only	?	A	Mixed findings[12,14-16]*	?	A	Mixed findings[14,15]*	N	B	No effect[14,17]†
Skills training and CBT	?	A‖	Mixed findings[12,14-16]*	?	A‖	Mixed findings[12-16]*	–	–	–
Family or parenting interventions									
Education only	?	C	Insufficient evidence[18]§	?	C	Insufficient evidence[18]§	?	C	Insufficient evidence[18]§
Skills based	Y	A	Small meaningful benefit[12,15,18]**	?	A	Mixed findings[12]*	?	A	Mixed findings[12]*
Tobacco									
Scheduling under international conventions	NA	NA	NA	NA	NA	NA	NA	NA	NA
Availability restrictions or sales restrictions	N	A	No effect[19]†	–	–	–	NA	NA	NA
Minimum legal age for tobacco consumption	N	B	No effect[20]*	?	C	Insufficient evidence[20]§	NA	NA	NA
Sanctions	?	C	Insufficient evidence[20]§	?	C	Insufficient evidence[20]§	NA	NA	NA
Provider (seller) training	N	A	No effect[19]†	–	–	–	NA	NA	NA
Taxation	?	A	Mixed findings[21]*	Y	A	Moderate-to-large meaningful benefit[21]¶	NA	NA	NA
Ban or regulate advertising	Y	A	Large meaningful benefit[22]	Y	A	Large meaningful benefit[22]	NA	NA	NA
Public smoking bans	Y	B	Moderate-to-large meaningful benefit[20]¶	Y	B	Moderate-to-large meaningful benefit[20]¶	NA	NA	NA
Mass media	?	A	Mixed findings[23]*	–	–	–	NA	NA	NA
School-wide bans on smoking	N	C	Insufficient evidence[24]§	–	–	–	NA	NA	NA
Psychologically-based prevention									
Education only	N	A‖	No effect[25]†	–	–	–	NA	NA	NA
Skills training and CBT	Y	A‖	Moderate to large meaningful benefit[25]¶	–	–	–	NA	NA	NA
Family or parenting interventions									
Education only	?	B	Insufficient evidence[26]§	–	–	–	NA	NA	NA
Skills based	Y	A	Moderate-to-large meaningful benefit[26]¶	–	–	–	NA	NA	NA
Drugs									
Scheduling under international conventions	?	C	Mixed findings[27]*	?	C	Mixed findings[27]*	?	C	Mixed findings[27]*
Police and law enforcement	?	C	Mixed findings[27,28]*	?	C	Mixed findings[28]*	–	–	–
Availability or sales restrictions	NA	NA	NA	NA	NA	NA	NA	NA	NA

(Table 2 continues on next page)

	Use			Problematic use			Injury or harm		
	Effect	Level of evidence	Size of effect	Effect	Level of evidence	Size of effect	Effect	Level of evidence	Size of effect
(Continued from previous page)									
Minimum legal age	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sanctions	NA	NA	NA	NA	NA	NA	NA	NA	NA
Provider (seller) training	NA	NA	NA	NA	NA	NA	NA	NA	NA
Taxation	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ban advertising	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mass media	?	A	Mixed findings[29,30]*	–	–	–	–	–	–
Psychologically-based prevention									
Education only	N	A‖	No effect[31,32]††	–	–	–	–	–	–
Skills training and CBT	?	A‖	Mixed findings[33]*	?	A‖	Mixed findings[33]*	–	–	–
Family or parenting interventions									
Education only	N	B	No effect[34]††	–	–	–	–	–	–
Skills based	Y	A	Moderate-to-large meaningful benefit[34]¶	–	–	–	–	–	–
Early intervention and harm reduction									
Alcohol									
Social norms feedback	N	A‖	Small positive effect, no meaningful benefit[35–39]††	N	A‖	Small positive effect, but no meaningful benefit[35,38,39]††	N	A‖	Small positive effect but no meaningful benefit[35,38,39]††
College or university									
Education only	N	A‖	No effect[35,40–42]†	N	A‖	No effect[35,40–42]†	–	–	–
Screening and brief interventions in:									
Primary care	?	C	Insufficient evidence[43]§	?	C	Insufficient evidence[43]§	–	–	–
General settings (eg, university or work)	Y	A	Small meaningful benefit[44]*	Y	A	Small meaningful benefit[44]*	Y	A	Small meaningful benefit[44]*
Emergency departments or hospitals	?	A	Mixed findings[45,46]*	?	A	Mixed findings[45,46]*	?	A	Mixed findings[45,46]*
Random roadside drug testing	–	–	–	–	–	–	Y	A	Moderate-to-large meaningful benefit[12]¶
Tobacco									
Social norms feedback	?	B	Insufficient evidence[47]§	–	–	–	NA	NA	NA
College or university									
Education only	?	C	Insufficient evidence[48]§	–	–	–	NA	NA	NA
Skills based and CBT	?	C	Insufficient evidence[48]§	–	–	–	NA	NA	NA
Screening and brief interventions in:									
Primary care	?	C	Insufficient evidence[49]§	–	–	–	NA	NA	NA
General settings (eg, work or university)	?	C	Insufficient evidence[48]§	?	C	Insufficient evidence§	NA	NA	NA
Emergency departments or hospitals	N	A	No effect[50]†	–	–	–	NA	NA	NA
Drugs									
Social norms feedback	N	B	No effect[51]†	N	B	No effect[51]†	–	–	–
College or university									
Education only	N	B	No effect[51]†	N	B	No effect[51]†	–	–	–
Skills based and CBT	N	B	Insufficient evidence[51]§	N	B	Insufficient evidence[51]§	–	–	–
Screening and brief interventions in:									
Primary care	?	C	Insufficient evidence[52]§	?	C	Insufficient evidence[52]§	–	–	–
General settings (eg, work or university)	N	A	No effect[53–55]†	N	A	No effect[53–55]†	N	A	No effect[52–54]†

(Table 2 continues on next page)

	Use			Problematic use			Injury or harm		
	Effect	Level of evidence	Size of effect	Effect	Level of evidence	Size of effect	Effect	Level of evidence	Size of effect
(Continued from previous page)									
Emergency departments or hospitals	?	C	Insufficient evidence[56]§	?	C	Insufficient evidence[56]§	NA	NA	NA
Random roadside drug testing	–	–	–	–	–	–	–	–	–
Reduction of injection-related harms	–	–	–	–	–	–	Y	B	Moderate-to-large meaningful benefit[57,58]¶
Treatment of substance use problems or dependence									
Alcohol									
Motivational enhancement therapy	N	A	Small positive effect, no meaningful benefit[59]††	N	A	Small positive effect, no meaningful benefit[59]††	N	A	No effect[59]†
Self-help (via phone, online, written)	N	A	Small positive effect, no meaningful benefit[35,60–62]††	N	A	No effect[42,61,62]†	?	A	Mixed findings[42,61,62]*
Self-help interventions with peers	?	C	Insufficient evidence[63]§	?	C	Insufficient evidence[63]§	?	C	Insufficient evidence[63]§
CBT	N	B	Mixed findings, mostly no effect[64]*	–	–	–	–	–	–
Family-based interventions and multisystemic therapy	Y	A	Small meaningful benefit[64]**	?	C	Insufficient evidence[64]§	?	C	Insufficient evidence[64]§
Pharmacotherapy	?	B	Mixed findings, mostly no effect[65]*	–	–	–	–	–	–
Juvenile drug courts or diversion	?	B	Mixed findings[66,67]*	?	B	Mixed findings[66,67]*	?	B	Mixed findings[66,67]*
Tobacco									
Motivational enhancement therapy	N	A	No effect[68]†	–	–	–	NA	NA	NA
Self-help (via phone, online, or written)	?	B	Mixed findings[69–71]*	–	–	–	NA	NA	NA
CBT	?	A‖	No effect, but individual impact of this approach difficult to disaggregate[50]†	–	–	–	NA	NA	NA
Family-based interventions, multisystemic therapy	–	–	–	–	–	–	NA	NA	NA
Pharmacotherapy	N	A	No effect[72]†	–	–	–	NA	NA	NA

(Table 2 continues on next page)

sales restrictions applies to all ages that people drink. No reason exists to assume that this intervention has different effects in younger and older adults, but young people are in a different life stage with different reasons for drinking and different influences on their alcohol use.

Restrictions on tobacco smoking in public places—including workplaces, hospitals, restaurants, and bars—have reduced smoking prevalence in young people.[87] Several studies (including population-level surveys, longitudinal cohort studies, and cross-sectional studies) have suggested that smoking bans reduce smoking uptake, progression from experimental to regular smoking, and increase quitting in adolescents and young adults.[20] The mechanisms of the association are not known, but probably are due to a reduced opportunity to smoke and the creation of a social norm that smoking is unacceptable. Despite their theoretical promise, insufficient evidence is available for policies that ban smoking on school grounds to prevent smoking initiation in young people.[24]

Minimum legal age for consumption of alcohol and tobacco

In many countries age restrictions are set for the legal purchase of alcohol and tobacco. The legal age limit imposed by countries varies from 10 years (Antigua and Barbuda) to 21 years (several countries [eg, USA]), with most requiring people to be aged 18 years or older.[88] This policy can be supported by training workers in the hospitality sector in responsible service of alcohol and imposing of fines or other sanctions on alcohol sellers.

Raising of the minimum legal drinking age might reduce admissions to hospital for acute alcohol intoxication and reduce alcohol-related motor vehicle accidents, admissions to hospital, and mortality.[9,12] Some evidence shows that alcohol use is substituted for cannabis use[9] by those aged younger than the minimum legal drinking age (panel 2); however, findings have been mixed. Sanctions can be imposed on underage drinkers but insufficient evidence is available on the effectiveness of fines, drivers' licence suspensions, and community service in reduction of alcohol use.[11]

	Use			Problematic use			Injury or harm		
	Effect	Level of evidence	Size of effect	Effect	Level of evidence	Size of effect	Effect	Level of evidence	Size of effect
(Continued from previous page)									
Drugs									
Motivational enhancement therapy	?	B	Mixed findings[73]*	–	–	–	–	–	–
Self-help (via phone, online, or written)	?	B	More studies needed, but mostly no effect[74,75]†	?	B	More studies needed, but mostly no effect[6,74,75]	–	–	–
Self-help interventions with peers	?	C	Insufficient evidence[63]§	?	C	Insufficient evidence[63]§	?	C	Insufficient evidence[63]§
CBT	N	B	No effect[76]†	–	–	–	–	–	–
Family-based interventions and multisystemic therapy	?	B	Small positive effect, but limited by few studies and heterogeneity[77]**	–	–	–	–	–	–
Therapeutic communities	?	C	Insufficient evidence[78]§	?	C	Insufficient evidence[78]§	?	C	Insufficient evidence[78]§
Pharmacotherapy	?	B	Some positive findings, but insufficient evidence[79,80]§	?	B	Some positive findings, but insufficient evidence[79,80]§	?	B	Some positive findings, but insufficient evidence[79,80]§
Juvenile drug courts or diversion	?	B	Mixed findings[66,67]*	?	B	Mixed findings[66,67]*	?	B	Mixed findings[66,67]*

We define use as the initiation or quantity of substance used (eg, frequency or quantity of substance detected in blood). Problematic use is the heavy use of the drug which might cause harm to self or others (eg, binge drinking). Injury or harms are the negative social, physical, or emotional outcomes directly attributable to problematic use of the drug (eg, drink driving). NA=not applicable. Y=good evidence of effectiveness in reduction of negative outcomes, based on systematic reviews of randomised controlled trials. ?=inconclusive or mixed evidence of effectiveness, requires further research. N=good evidence of ineffectiveness in reduction of negative outcomes. –=no studies found. A=sufficient level of evidence: the effect is unlikely to be due to chance ($p<0·05$) or bias, as shown by a level 1 (evidence obtained from a systematic review of all relevant randomised controlled trials) study design, several good level 2 (evidence obtained from at least one properly designed randomised controlled trial), or several high quality level 3–1 (evidence obtained from well designed pseudorandomised controlled trials [alternate allocation or some other method]) or 3–2 (evidence obtained from comparative studies with concurrent controls and allocation not randomised [cohort studies], case-control studies, or interrupted time series with a control group) studies from which effects of bias can be reasonably excluded on the basis of design and analysis. B=low level of evidence: the effect was probably not due to chance (eg, $p<0·05$), but bias cannot be excluded; as shown by one level 2 study of uncertain or indifferent quality, evidence from one level 3–1 or 3–2 studies of insufficiently high quality to rule out bias as a possible explanation, or evidence from many level 3 studies that are not of good quality and consistent in suggesting an effect. C=inconclusive evidence: no position could be reached on the presence or absence of an effect of the intervention (eg, no evidence from level 1 or 2 studies, and few level 3 studies are available but are of poor quality, or only level 4 studies [evidence obtained from case series, pre–test, and post–test] are available). CBT=cognitive behavioural therapy. *Mixed findings: some positive and negative results were identified, but outcomes are too heterogeneous to provide a recommendation; issues with study quality might affect outcomes. †No effect: no significant results were found. ‡Negative effect: significant negative effect of the intervention on outcomes. §Insufficient high quality evidence to draw any conclusion on the intervention effect. ¶Moderate to large meaningful benefit: consistent moderate to large positive findings, which persist into the long term and are of immediate relevance to policy or practice. ||Although evidence for this intervention is drawn from multiple RCTs, methodological quality was poor and cautious interpretation is warranted.**Small meaningful benefit: consistent small but positive findings, which might persist into the medium term or long term and might be of relevance to policy or practice. ††No substantive meaningful benefit: although some significant positive results might have been found the effect sizes are too small or follow-up is too short to be of relevance to policy or practice.

Table 2: **Summary of intervention effects for the prevention or treatment of problematic use and harms of alcohol use, tobacco use, or cannabis and other illicit drug use in young people**

Several reviews reported that a minimum legal age of 18 years to purchase tobacco makes it difficult for young people to obtain cigarettes and reduces sales to children younger than 18 years.[91] This reduction can be partly circumvented by those under the legal age obtaining tobacco from older friends or family or from the illicit tobacco market, and so does not seem to reduce use.[20,92]

Evidence is mixed regarding the effectiveness of training in responsible service of alcohol and enforcement of minimum legal drinking age.[10] Quasi-experimental trials[93] have shown responsible service leads to a reduction in the number of highly intoxicated patrons and hospital admissions;[94] however, another quasi-experimental study showed no effect on service to intoxicated persons or alcohol-related violence.[95] Studies examining the effect of improving the responsible service of alcohol to young people in licensed venues have shown no effect on alcohol use; one study[96] even reported a significant increase in breath alcohol concentration. Attempts to improve merchants' compliance with minimum purchase age of tobacco do not seem to reduce smoking prevalence.[19,91]

Taxation and minimum pricing

Strong evidence is available showing that increasing alcohol taxation or alcohol price reduces overall alcohol consumption,[9,12] with a 10% increase in alcohol prices producing a 3–10% reduction in consumption.[97] Evidence might be scarce regarding the effect of increased taxation on problematic alcohol use, but consistent evidence shows that raised alcohol prices produce moderate-to-large reductions in alcohol-related morbidity and mortality, crime, violence, and sexually transmitted diseases.[9,12] Studies in young people report the same effects as those in the whole population.[97]

High-quality evidence is available that shows increasing the price of cigarettes via taxation reduces smoking participation and consumption of cigarettes in young people who have already started smoking, who seem to be two to three times more responsive to price changes than adults are.[21,87] Evidence is mixed on whether increased taxation prevents smoking initiation in young people.[21] The global coverage of taxation measures for alcohol and tobacco are shown in the appendix.

Panel 1: Application of existing intervention evidence across countries and cultures

Most research on substance use approaches in young people come from high-income countries, particularly the USA. The extent to which interventions deemed effective in those settings are applicable in countries where cultural, financial, structural, social, and sex-based contexts differ is unclear.[81,82] We list some issues that might need to be taken into account because they will probably affect the acceptability, feasibility, and effectiveness of interventions.

- **Epidemiology of substance use:** substantial variations exist in the extent to which different substances are used worldwide—eg, alcohol use in countries in the Middle East is very low, and standard prevention interventions might be less relevant (if applicable at all) in view of the values associated with this substance.
- **Social and cultural views of substance use:** substantial variation exists across cultures in the way in which substance use—and dependent use—are viewed culturally; two fairly common views are the medical view of substance dependence (ie, some users lose control over their substance use and develop a disorder that requires treatment) and a moral view (ie, substance use is voluntary and represents poor decisions and behaviour); these competing societal views can affect the preference for and availability of some interventions.[81,82]
- **Sex:** women's role in society varies hugely. Stigma related to substance use may be particularly prominent for women. Additionally, in some countries, spousal permission may be required for women to be allowed to seek medical treatment for substance use.
- **Age of life-role transitions:**[1] the architecture of adolescent to young adult transitions is changing in many countries, with trends towards greater retention in education and later social role transitions occurring in many countries; the extent to which these transitions have occurred by particular ages will determine the feasibility and reach of interventions—eg, in some countries with poor retention in high school, a large number of at-risk young people might have left formal schooling before prevention interventions are delivered, affecting the use of educational settings as a platform to address substance use.
- **Infrastructure, availability of services, and funding mechanisms:** availability of infrastructure to deliver interventions will shape which interventions can be delivered and through which platforms—eg, if few specialist services are available in a country, even well validated specialist interventions for substance dependence will not be able to be delivered;[81,82] how rural an area is might also affect service availability; additionally, intervention costs will be a major barrier to large-scale implementation, so interventions need to be not only evaluated in terms of efficacy, but also for cost-effectiveness.[81,82]

Restricting or banning of advertising substances

Consistent evidence shows that high exposure to alcohol advertising predicts drinking initiation and increased drinking in young people. Restrictions or bans for alcohol advertising might seem to be an effective approach to prevent and reduce problematic alcohol use and alcohol-related harm in young people. However, a 2014 Cochrane review[13] of a randomised controlled trial (RCT) and three interrupted time series studies reported that study quality was poor and results were too inconsistent to draw a conclusion on whether banning alcohol advertising reduces alcohol use in young people. High-quality, well monitored, long-term studies are needed.[13]

As with alcohol, evidence is consistent showing that young people who are exposed to tobacco advertising are more likely to smoke than those not exposed to advertising. However, unlike alcohol, bans on tobacco advertising are gradually being implemented worldwide, with about 12% of countries reporting advertising restrictions in 2014.[98] Restrictions or bans on tobacco advertising have been consistently effective in producing an average 7% reduction in smoking prevalence in these countries (appendix).[22]

Mass media or public awareness campaigns

Mass media approaches, typically delivered as short advertisement style campaigns aim to present positive role models who reject substance use, and whose behaviour the target audience might model (appendix). These approaches often have a specific theoretical basis (eg, the health belief model; appendix). To evaluate the effectiveness of mass media campaigns can be difficult, particularly for alcohol whereby the effects of mass media campaigns need to be judged against a background of widespread, youth-targeted alcohol advertising. Overall, the evidence is mixed about the efficacy of mass media campaigns in reducing substance use and related harms in young people. Whether they always reduce use and harms[12,23,29,30] is unclear because some studies suggest that mass media campaigns targeting illicit drugs might increase use by young people.[29]

Prevention interventions delivered in educational settings

Schools and other educational settings (eg, primary, secondary, or tertiary education) provide an opportune context for prevention, because of ease of delivery and access to young people, many more of whom complete secondary education. Most these interventions are part of classes in school time; very few have assessed the efficacy of preventive interventions delivered via the internet.[69,99] Substantial problems exist with the quality of studies of school-based preventions (panel 3). Although intended to reduce the incidence of use and problems, many studies report only changes in attitudes and knowledge of pupils.[101,102]

Overall, generic prevention programmes seem to have greater effectiveness than substance-specific programmes.[14] Interventions that focus on general psychosocial development and develop life skills might be effective in reducing alcohol use,[14,15] but not in reducing alcohol-related harm.[103] Interventions that target only knowledge and awareness of illicit-drug harms do not change drug use in young people.[6,31,32,40,104] Tobacco prevention strategies are widely implemented in school education curriculum in the absence of rigorous evaluation.[25] Most prevention interventions provide information about smoking rates and harms, with some training in refusal skills. Some multimodal programmes engage children, parents, teachers, and the community.[25]

Skills-based interventions that include components on social competence and social influences can be used to prevent tobacco smoking onset;[25,26] by contrast those with

only social influences or information,[25] and financial incentives to remain abstinent,[105] do not. Multimodal community-wide initiatives that engage children, parents, teachers, and the community have shown mixed results in reducing tobacco use.[106]

Small positive effects are noted for psychological interventions that aim to prevent cannabis use by young people.[107] A Cochrane review[31] reported small, but consistent, pooled effects of combined social competence and social influence interventions in preventing cannabis use 1 year after the intervention. However, not all studies showed effects and some showed negative effects, with wide confidence intervals. Little evidence shows that prevention programmes can prevent the use of amphetamine, heroin, and cocaine (including crack form) use. A major limitation of school-based prevention programmes is that they do not include young people who are frequently absent or have left school, a group at high risk of substance use.[1]

Prevention interventions delivered to family or parents

The family could be used to provide an opportunity for substance use prevention. Many family-based prevention interventions focus on psychosocial development rather than on prevention of target drug use. They have the potential to improve several aspects of a young person's development.[18] Other family-based prevention interventions provide information about substance use, develop rules, encourage parental monitoring and supervision, and improve parent–child communication.

Interventions focusing on parental skill building and parent–child relationships can delay the onset of alcohol use and reduce past month frequency of drinking.[18] These effects seem to be sustained at more than 3 years follow-up.[108] Moderate-quality evidence is available and shows that high intensity, family-based interventions reduce the initiation of tobacco use by young people.[26] Some evidence exists that parent training (using cognitive behavioural therapy), family skills training, and structured family therapy can prevent illicit drug use in low-risk and high-risk young people.[34] Parental education alone is not effective.[34]

Poor reporting of many studies prevents identification of which, if any, intervention components are effective. Additionally, the bulk of evidence on these interventions comes from high-income countries (particularly the USA), so the extent to which they would be appropriate or relevant to all countries and contexts is unclear.

Interventions with young people using substances: early intervention and harm reduction

Various interventions have been targeted at young people who have started using substances. These aim to reduce substance use, reduce risky patterns of substance use, and reduce the harms that might arise from use. Although the rationale for these early interventions is clear, evidence on their effectiveness is sparse and of low quality. Interventions that aim to reduce the adverse resulting effects of substance use (rather than reducing substance use per se) are often termed harm reduction interventions. Such interventions could be delivered at the population level (eg, random roadside drug testing to deter young people from driving after using substances, and thus reduce associated harms) or be individually targeted (eg, needle and syringe programmes to reduce harms for injecting drug users). Some of these interventions have been well evaluated, although evidence of their effectiveness in people younger than 18 years has typically not been shown.

Social norms interventions

Social norms interventions aim to reduce risky alcohol use in young people by providing corrective information about their peers' alcoholic consumption, which is typically overestimated by young people.[36] Studies assessing this intervention have been of low-to-moderate quality and effect sizes have been positive but small, and of doubtful benefit for policy or practice.[36]

We found no reviews that examined the effectiveness of social norms interventions in reducing smoking in young people. A cluster-randomised trial[109] in England

***Panel 2:* Addressing use of one substance versus all substances**

- **Substances as substitutes?** In the econometric literature a substance would be described as a substitute for another substance if decreasing access or availability of the primary substance led to increased use of the second substance[89]—eg, concerns have been expressed that reduced availability of alcohol, such as through increased taxation, might result in young people substituting cannabis for alcohol, thus leading to an increase in cannabis use.
- **Substances as complements?** Alternatively, if increasing use of one substance encourages increasing use of another, these are so-called complements and reduced access to and use of one substance might be associated with decreased use of others[89]—eg, if alcohol and cannabis are so-called complements, laws such as increasing taxation that restricts access and reduces use of alcohol might be expected to reduce cannabis use.
- **Implications for population level interventions:** Substitution of substances for one another in response to changes in availability has implications for the context and messages contained in population-level interventions. First, policies aimed at reducing access to and use of one substance (eg, alcohol) might have the unintended resulting effect of increasing use of other substances (eg, cannabis). Additionally, rather than delivering drug-specific prevention programmes, targeting substances perceived to have similar functions or which are used in complement with one another might be of merit. Such prevention efforts could focus on general motivations behind substance use, rather than attempting to discourage the use of specific drugs in isolation. If prevention approaches were designed to target a range of substances that have similar functions, these might address the issue of substitution of substances when the preferred drug is not available.[90] However, first high-quality evidence is needed to understand the direction and connection of any potential substitution between substances, because the implications for population-level interventions differ depending on whether reducing availability or use of a drug increases or decreases the use of another.

Panel 3: Improvements for the quality and coverage of evidence for prevention interventions

Recently, many studies have been completed that aimed to examine the effect of preventive interventions for substance use in young people. However, concerns have been raised regarding this seemingly impressive evidence base, whereby effects seem small but are almost exclusively positive. Until 2015, such prevention interventions were not required to report prospectively registered protocols, raising the possibility of a range of conflicts of interest that could affect the analysis and reporting of prevention trials.[100]

A key issue in such trials is the reporting of non-primary outcomes (eg, attitudes and knowledge) rather than incidence of substance use or harms, which is essential to establish the effect of such programmes on the incidence of substance use in young people, and to calculate the cost of healthy years of life gained in order to determine their cost-effectiveness.

Methodological and reporting issues are also apparent.[31] In a recent Cochrane review[31] of universal school-based prevention of substance use in young people, only one of the 51 identified randomised controlled trials satisfied all six Cochrane risk of bias criteria (random sequence generation, allocation concealment, blinding of participants, blinding of assessors, incomplete outcome data, and selective reporting), with most satisfying less than three. Additionally, the inconsistency of outcome measures (even within trials) and omission of raw data has hampered efforts to generate pooled estimates of programme effects. Many studies also do subgroup analyses despite restricted power due to low sample sizes.[31]

Finally, there has been a tendency to compare psychologically-based interventions with subtle differences in design (eg, varying number of sessions) rather than delivering true innovations in intervention design. Of note, little work has been done to address other risk factors for substance use and problems that could be targeted[1,3]—eg, interventions with children exposed to trauma, or interventions without an explicit focus on substance use (eg, the Positive Parenting Programme or the Good Behaviour Game).

For more about the **Positive Parenting Program** see http://www.triplep.net/glo-en/home

For more about the **Good Behaviour Game** see http://goodbehaviorgame.org/

and Wales suggested that a peer-led intervention targeting social norms might have led to a reduction in incident smoking, but more research is needed. Computerised norm-correcting interventions have not shown efficacy in reducing illicit drug initiation or use in college students.[51]

Screening and brief intervention to reduce substance use and related harms

Patterns of problematic use often develop soon after initiation of substance use. The rationale for screening and brief intervention in adolescents is to intervene before more problematic patterns of use are established. Screening young people for problematic substance use is an effective approach to identify individuals at high-risk of substance related harms.[110] Evidence on the efficacy of brief interventions after case identification is less conclusive,[111] and has not been clearly established for targeting of risky alcohol use and harms in young people.[43,112–114] For young people drinking at harmful levels, individual interventions delivered face-to-face (rather than via computer) that incorporate personalised feedback and motivational interviewing are most beneficial. Effects are small on young people's alcohol use and long-term results of these interventions are unknown.[44,45,60,115–117]

Scarce evidence is available for the efficacy of screening and brief interventions for tobacco smoking in primary-care settings.[49] Good-quality evidence shows that brief screening questionnaires can detect illicit drug use problems in adolescents in primary-care settings,[52] but insufficient evidence exists on their efficacy in reducing drug use and associated harms in young people in these settings.[52] One RCT[56] has been published with this intervention for cannabis use, which reported reduction in cannabis use with motivational interviewing in an emergency department.

Random roadside drug testing to reduce alcohol and illicit drug-related harms

Most evidence regarding the effectiveness of random roadside drug testing has focused on alcohol. Drink driving checkpoints have been consistently shown to reduce alcohol-related vehicle crashes and fatal crashes attributable to alcohol.[9,12] Furthermore, reductions in the legal blood alcohol content seems to reduce alcohol-related injuries and deaths in people aged 18–25 years.[9,12] No controlled evaluations of roadside testing for illicit drugs have been completed.

Reduction of injection-related harms

As noted by Degenhardt and colleagues[1] in paper one of this Series, young people who inject drugs are a very vulnerable group, with greatest risk of incident infection in the early years of starting injecting drugs. Needle and syringe programmes reduce injection-related risk behaviours and HIV transmission, but the evidence for their effect on hepatitis C virus transmission is more tentative.[57] Little research has been done assessing the effect of these interventions in young people (appendix). Treatment of dependent drug use might also decrease these associated harms (appendix), but not all young people who inject drugs are drug dependent, so harm reduction interventions have a broad reach. Vaccinations against hepatitis B virus are an effective and safe method to prevent hepatitis B viral infection, and should be routinely provided to young people at risk of infection.[58] Prisons, outreach programmes, needle and syringe programmes, and public-health clinics could be good settings to identify and refer young people at risk of injection-related harms to receive hepatitis B virus vaccinations.

Treatment of problematic substance use and substance dependence

In this section we summarise interventions targeting problematic or dependent substance use in young people. A summary of the issues and available evidence of cost-effectiveness of these interventions is available in the appendix.

A range of issues need to be thought about by any services targeting this population of young people, irrespective of the specific interventions being applied (panel 4). These include stigma surrounding substance use, the attractiveness to use services by young people, and confidentiality of young clients, which cannot be

assured in some countries where it is legally mandated that parents, guardians, and (for women) sometimes spouses must provide permission to access help (panel 1).

Motivational enhancement therapy (MET)

MET is designed to enhance intrinsic motivation for behavioural change via client-centred therapy, and is based on social learning theory and the trans-theoretical framework of change.[68] MET seems to have no effect on prevention of problematic alcohol use or alcohol-related harms.[59] A review[68] of 21 controlled studies examining overall substance use in young people noted small, but significant reductions after treatment for all forms of substance use (alcohol, tobacco, and illicit drugs). However, after the tobacco results were excluded, the average effect size was very small, with large uncertainty.[68] An RCT with young people using stimulants did not report differences in abstinence from ecstasy or cocaine compared with only giving information about the effects and health risks of stimulants.[73]

Self-help interventions via written form or online

Written information (eg, mailed newsletters) given to young people seems to produce very small positive changes in alcohol use and risky use in the short term, but these effects are not sustained after 6 months.[35,41] Online smoking cessation interventions for young people typically deliver information via a website or e-magazine. Some also offer MET, group therapy or tailored feedback. The use of text messages to provide motivation, feedback, and support to quit smoking is gaining popularity because of high use of mobile phones by young people.

Computer delivered interventions produce small but significant reductions in alcohol use and alcohol-related harms compared with controls who were given no intervention. However, no effect is reported compared with control conditions that include alcohol-related content.[60] Evidence for the effectiveness of online interventions for smoking cessation in young people is mixed.[69,70,123,124] Some studies have found increased cessation immediately after the intervention, whereas others reported the opposite or no effect.[69,70] We found only two studies of interventions for tobacco smoking delivered via text message, with inconsistent results.[71] Few studies have examined the effectiveness of internet delivered interventions for cannabis and other illicit drugs in young people. A review[125] of studies in university populations identified three studies, in which the interventions were all ineffective.

Self-help interventions with peers

These approaches include manualised 12-step programmes, such as Alcoholics/Narcotics Anonymous (AA/NA). One review[63] identified 19 studies (16 studies were single group design, two used waitlist control, and one was an RCT) of AA/NA approaches in young people. Eight studies focused on cannabis use, five on alcohol use, three on stimulants, and three did not specify the drug.[63] These approaches seem to reduce drug use but poor reporting of outcomes and a large loss to follow-up does not permit the size of any benefits to be established.[63]

Cognitive behavioural therapy (CBT)

Few studies have examined the effectiveness of CBT in the treatment of substance use disorders in young people. Two trials for alcohol use had mixed findings;[64] low-quality studies for tobacco have some evidence that CBT increases abstinence;[126,127] a few trials suggest CBT is effective for cannabis use disorders.[128] A 2015 US Institute of Medicine report[129] concluded that the quality of evidence for psychosocial interventions for substance use was poor.

Panel 4: Issues for health services in responding to substance use in young people

Health services for adolescents and young adults can have several important roles in responding to substance use in young people: they can provide preventive care; they play a major part in early and effective responses to emerging substance use disorders; and they play an essential part in preventing secondary harms from substance use, including blood-borne infectious diseases and injuries. Emerging evidence[3] suggests that improved access to treatment services for young people might help prevent the risks that problematic substance use poses for social, educational, and economic adjustment.

Nonetheless, many barriers exist for young people to access health-care for substance use. One major barrier is associated with the legal context of substances. For those aged younger than 18 years, alcohol cannot legally be purchased in most countries, and illicit drugs are, by definition, not legally available. These legislative frameworks might act as a barrier against seeking treatment for very young people. Beyond this, other barriers include the configurations of health services, and the possible skills and attitudes of health-care professionals towards young people who might be at risk of or engaged in problematic substance use. Having a youth friendly environment in which young people are respected, encouraged to share their ideas, and given a voice is integral to their successful engagement in treatment.[118]

Further, engaging young people in treatment for substance use disorders can raise ethical issues about confidentiality and disclosure of intimate information to parents if the person is younger than 18 years. International guidelines emphasise the importance of confidentiality, and recommend one-on-one consultations between young people and clinicians without parents present to engage young people in substance use treatment.[119–121] Education of parents and young people about the limits, protections, and benefits of confidentiality is crucial for clinicians to have a functional and productive relationship.[122]

At-risk young people might be unlikely to seek help for their substance use. Some at-risk young people, including those who are homeless or in contact with the criminal justice system, could have a history of problematic relationships with authority figures and find it difficult to trust the motives of supportive personnel (eg, social workers). Inclusion of at-risk young people in intervention programme designs, decision making, and implementation might increase the likelihood of their engagement in such services.[118] However, little guidance exists for best practices in engaging young people who are transient, who live in rural or remote populations, or who are from varying social and cultural contexts (eg, ethnic minorities or indigenous young people).[118]

Family-based treatments and multisystemic therapy

A small number of studies suggest that family-based interventions and multisystemic therapy reduce alcohol use in young people with alcohol use disorders.[64] However, many of these studies did not include a control group of no intervention, and had short follow-up periods. Small, positive changes in risky use and harms were identified in two studies,[64] but insufficient evidence was available to draw conclusions about effectiveness. No family-based interventions were identified for tobacco use. A review[77] of multisystemic and family-based therapies for illicit substance use in young people noted that these therapies had significant but small effects on adolescent substance use and delinquent behaviour. However, heterogeneity was high and statistical power was limited by small sample sizes.[77]

Therapeutic communities

Therapeutic communities require complete abstinence from the drug on entry. They usually operate as self-help, participatory treatment groups that provide a supportive environment in which young people cease substance use and recover. These programmes are not commonly used by young people, and have received little evaluation. Dropout rates for the longer-term programmes can be very high (up to 90%). Insufficient data exist to comment on the effectiveness of this treatment.[78]

Pharmacotherapy for substance dependence

Consistent evidence is available showing that pharmacotherapies for alcohol dependence in adults—including naltrexone and acamprosate—are effective in preventing relapse to heavy drinking.[130] However, little RCT evidence exists for pharmacotherapy for alcohol dependence in young people, and most studies target substance use disorders secondary to psychiatric disorders.[64] Lithium has been found to be effective in reducing alcohol use in young people with bipolar disorder.[64] An RCT[64] of sertraline plus CBT in treating adolescents with co-occurring alcohol dependence and depression, however, reported no effect. There is some evidence of effectiveness of acamprosate in increasing abstinence rates in young people with alcohol dependence, however, sample sizes were small.[65] Naltrexone has been shown to effectively reduce alcohol cravings in young people with alcohol dependence, but no RCTs have been completed.[65] More studies are needed.

Nicotine replacement therapies (eg, nicotine patch, lozenge, chewing gum, and inhaler), antidepressants (eg, bupropion and nortriptyline), and nicotine receptor partial agonists (eg, varenicline) increase cessation in adult smokers.[131] By contrast, a meta-analysis[72] of six RCTs in adolescent smokers reported no significant increase in cessation.

Opioid substitution therapy has been shown to be effective in adults dependent on this drug. Two identified studies in young people focused on opioid substitution therapy.[79] One study compared two opioid medications (methadone and levacetylmethadol) as maintenance therapy and recorded no difference between these medications on positive urine tests for non-prescribed drugs, side-effects, or social functioning.[79] The other study compared combined maintenance of buprenorphine and naloxone versus buprenorphine detoxification, showing no differences between groups in opiate-positive drug screens; however, participants who received maintenance treatment had lower dropout and lower self-reported heroin use.[79]

Juvenile drug courts and diversion

Young people who are charged with a substance-related offence may be referred to juvenile drug courts instead of going to jail. These courts assess, refer, treat, monitor, and provide feedback on progress of these young people during regular court appearances.[132] Studies of the effectiveness of juvenile drug courts have been hampered by weak study designs and a focus on crime outcomes. Evidence on their effectiveness to reduce illicit drug use is varied.[132] One RCT[66] reported lower rates of substance use by young people attending these courts than those with standard care, but no effect on criminal behaviour was reported. By contrast, another controlled trial[133] showed that juvenile drug courts were less effective than standard care in treatment of cannabis and cocaine use.

Discussion

Adolescence and young adulthood represent key periods during which substance use behaviours can become established. Therefore these are important periods in which to prevent these behaviours from occurring, reduce the escalation to heavy drug use, and intervene to address established problematic substance use. With evidence suggesting increasing use of substances in young people,[1] a solid evidence base is essential to help decide the best response to these public health issues.

To improve the coverage and quality of evidence for interventions in young people we have identified major gaps in the evidence for interventions across the full spectrum of young people's involvement with substance use, from prevention to treatment (table 3). In each of these areas very little targeted research or even analysis of the major issues has been completed. Interventions shown to be effective in substance dependent adults have rarely been trialled with young people. When such studies have been undertaken, sometimes differential effects have been noted in young people, indicating a need to trial interventions that are efficacious in adults with young people to ensure that they work in a similar way. As noted throughout this Series paper, the applicability of interventions that are effective in high-income countries (where the bulk of evidence has been generated) to low-income and middle-income countries, where cultural and structural factors might differ substantially, remains unclear.

 Published online February 18, 2016 http://dx.doi.org/10.1016/S2215-0366(16)00002-X

With the rapid growth in new technologies and communication systems, it is evident that innovations need to be tailored for delivery to individuals, and for identification of new ways of responding to emerging psychoactive substances. Computer-delivered and mobile phone interventions to reduce substance use in young people are appealing because they allow users to manage the pace of the intervention, ensure privacy, tailor content to their needs, use multimedia to engage young people, and potentially have a wide reach at a low cost. These interventions are typically very brief and include computerised tasks that include feedback on consumption, normative comparisons, and provision of tailored intervention materials. However, adherence is typically poor, uptake is low, and the evaluations have so far been of poor quality.

Finally, prevention efforts need to begin addressing the unique contextual risk factors for substance use in young people to avoid later substance use problems. As a result, substance use prevention needs to be thought about in a

	Alcohol			Tobacco		Illicit drugs		
	Reduce use	Reduce problematic use	Reduce harms related to use	Reduce use	Reduce problematic use	Reduce use	Reduce problematic use	Reduce harms related to use
Population and prevention interventions								
Scheduling of substances under international conventions	NA	NA	NA	NA	NA	X?	X?	X?
Law enforcement and policing	NA	NA	NA	NA	NA	X?	X?	–
Availability or sales restrictions	?	?	X?	X	–	NA	NA	NA
Minimum legal age for use	?	✓	✓	X	?	NA	NA	NA
Taxation	✓✓	✓✓✓	✓✓	?	✓✓	NA	NA	NA
Ban or regulate advertising	–	–	–	✓✓✓	✓✓✓	NA	NA	NA
Mass media campaigns	?	–	?	X?	–	X?	–	–
Public consumption bans	–	–	–	✓✓	✓✓	NA	NA	NA
Psychologically-based prevention with populations of young people (eg, schools)								
Education only	X?	X?	X	X	–	X	–	–
Education with skills training and CBT	?	?	–	✓✓	–	X?	X?	–
Psychologically-based prevention interventions with parents of young people								
Education only	?	?	?	?	–	X	–	–
Education with skills training and CBT	✓	X?	X?	✓✓	–	✓✓	–	–
Early intervention and harm reduction								
Education only	X	X	–	X	–	X	X	–
Social norms and expectancies	X	X	X	?	–	X	X	–
Screening and brief interventions in:								
Primary care	?	?	–	?	–	?	?	–
General settings (eg, university or work)	✓	✓	✓	?	?	X	X	X
Emergency departments or hospitals	X?	X?	X?	X	–	?	?	–
Random roadside drug testing	–	–	✓✓	NA	NA	–	–	–
Reduction of injection-related harm	NA	NA	NA	NA	NA	–	–	✓✓
Treatment of substance use problems or dependence								
Motivational enhancement therapy	X	X	X	X	–	X?	–	–
Self-help interventions (via written or online)	X	X	X?	X?	–	X	X	–
Self-help interventions with peers	?	?	?	NA	NA	?	?	?
CBT	X?	–	–	X?	–	X	–	–
Family-based treatment interventions	✓	?	?	–	–	?	–	–
Therapeutic communities	–	–	–	NA	NA	?	?	?
Pharmacotherapy	X?	–	–	X	–	✓?	✓?	✓?
Juvenile drug courts or diversion	?	?	?	NA	NA	?	?	?

CBT=cognitive behavioural therapy. NA=not applicable. X=not effective. ?=inconclusive or mixed evidence in reduction of negative outcomes. X?=mostly no effect in reduction of negative outcomes, but findings are mixed. ✓=small effect in reduction of negative outcomes. ✓?=mostly small effects in reduction of negative outcomes, but findings are mixed. ✓✓=moderate effect in reduction of negative outcomes. ✓✓✓=large effect in reduction of negative outcomes. –=insufficient evidence.

Table 3: **Summary of existing evidence for interventions to prevention, early intervention, and treatment of substance use and problems in young people**

Search strategy and selection criteria

Because of the vast and growing literature on substance use prevention and treatment in young people, we did a systematic review of reviews in two stages. First, in May, 2015, we did an initial exploratory search in the Project Cork bibliographies, PubMed Clinical Queries, and Scopus to refine our search strategy. Second, we searched MEDLINE, MEDLINE-in-process, Embase, PsycINFO, and the Cochrane Database of Systematic Reviews for reviews published in English between Jan 1, 1990, and April 23, 2015, using search terms pertaining to "Substance-Related Disorders", "Young Adult", "Primary Prevention", "Intervention Studies", and "Treatment Outcome". We searched for studies that included a population aged 10–24 years.

Peer-reviewed articles were initially assessed on the basis of title and abstracts, and those identified to be relevant were reviewed in full. The full search strategy is included in the appendix. If relevant reviews were not available we supplemented these searches with other reports[5–8] or searched for good quality empirical studies.

broad framework of global healthy development: approaches outside of addictions research to reduce oppositional and antisocial behaviour show promise in reducing conduct disorders and substance use disorders, given the strong connection between these disorders. For example, a public health evaluation[134] of the Positive Parenting Program suggested that it could be scaled up to reduce antisocial behaviour in the population, and that this method reduced crime and substance use problems in a cost-effective way. Similarly, a large scale analysis[135] of a Swedish national register noted that incidence of crime convictions of people with attention deficit hyperactivity disorder were lower when they received drugs for the disorder.

In judging the coverage and quality of evidence to prevent and treat substance use in young people, several key themes emerged (table 3). First, most evidence for effective interventions to reduce use, problematic use, and harms is for alcohol—the most used substance in many countries, contributing to a large public health burden in young people. Second, less information is available on effective tobacco interventions in this age group. Tobacco use becomes a key health issue later in life, so studies with longer-term follow-up are needed. Third, for alcohol and tobacco, similar structural policy interventions (namely taxation, and controls on the minimum legal age and availability) seem to be most effective. However, these approaches are not available for illicit drugs. In view of this, innovations are needed in prevention approaches for illicit drugs and an increased quality of research is needed to identify individualised strategies to reduce the use and harms associated with illicit drug use in young people.

Contributors

LD led the initial conceptualisation and framework of this Series paper with input from ES, WDH, GP, and JS. ES assisted with the literature searches, extracted the data, drew the maps, and led the synthesis of the findings. ES and LD led the drafting and revision of the manuscript. KIM provided input on cost-effectiveness. All authors contributed to the critical review of the Series paper, provided substantial comment, and approved the final version.

Declaration of interests

JS reports grants and consultancy payments from Martindale Pharma and Mundipharma, outside the submitted work. JS has a patent issued with Euro-Celtique, and a pending patent with King's College London. All other authors declare no competing interests.

Acknowledgments

We thank Mary Kumvaj, Megan Weier, and Sarah Yeates for their assistance with the literature searches. ES is funded through the Australian National Health and Medical Research Council (NHMRC) Centre for Research Excellence in Mental Health Systems Improvement (number 1041131). NR is supported by an NHMRC career development fellowship (number 1083394). LD is supported by an NHMRC principal research fellowship (number 1041472). GP is supported by an NHMRC senior principal research fellowship (number 1019887). The National Drug and Alcohol Research Centre at University of New South Wales (UNSW) Australia is supported by funding from the Australian Government under the Substance Misuse Prevention and Service Improvements Grant Fund. The Centre for Youth Substance Abuse Research receives funding from the Graeme Wood Foundation, University of Queensland, and the Queensland University of Technology. JS is supported by the National Institute for Health Research (NIHR) Biomedical Research Centre for Mental Health at the South London and Maudsley National Health Service Foundation Trust, and King's College London. No funder had any role in the conceptualisation or completion of this Series paper.

References

1 Degenhardt L, Stockings E, Patton G, Hall WD, Lynskey M. Substance use in young people 1. The global health priority of substance use in young people. *Lancet Psychiatry* 2016; published online Feb 18. http://dx.doi.org/10.1016/S2215-0366(15)00508-8.

2 United Nations Department of Economic and Social Affairs (UNESDA). Definition of youth. http://www.un.org/esa/socdev/documents/youth/fact-sheets/youth-definition.pdf. (accessed Sept 15, 2015).

3 Hall WD, Patton G, Stockings E, et al. Substance use in young people 2. Why young people's substance use matters for global health. *Lancet Psychiatry* 2016; published online Feb 18. http://dx.doi.org/10.1016/S2215-0366(16)00013-4.

4 Steinberg L. Age of opportunity: lessons from the new science of adolescence. Boston MA: Houghton Mifflin Harcourt, 2014.

5 Babor TF, Caulkins J, Edwards G, et al, eds. Drug policy and the public good. Oxford: Oxford University Press, 2010.

6 Strang J, Babor T, Caulkins J, Fischer B, Foxcroft D, Humphreys K. Drug policy and the public good: evidence for effective interventions. *Lancet* 2012; **379:** 71–83.

7 Toumbourou JW, Stockwell T, Neighbors C, Marlatt GA, Sturge J, Rehm J. Interventions to reduce harm associated with adolescent substance use. *Lancet* 2007; **369:** 1391–401.

8 Babor T, Caetano R, Casswell S, et al. Alcohol: no ordinary commodity. Research and public policy, 2nd edn. Oxford: Oxford University Press, 2010.

9 Latimer J, Guillaume L, Goyder E, Chilcott J, Payne N. Interventions on control of alcohol price, promotion and availability for prevention of alcohol use disorders in adults and young people. University of Sheffield School of Health and Related Research Public Health Evidence Report 2009. https://www.nice.org.uk/guidance/ph24/documents/review-1-macrolevel-interventions-for-alcoholuse-disorders-effectiveness-review2 (accessed Jan 18, 2016).

10 Brennan I, Moore SC, Byrne E, Murphy S. Interventions for disorder and severe intoxication in and around licensed premises, 1989–2009. *Addiction* 2011; **106:** 706–13.

11 Hafemeister TL, Jackson SL. Effectiveness of sanctions and law enforcement practices targeted at underage drinking not involving operation of a motor vehicle. In: Bonnie R, O'Connell M, eds. Reducing underage drinking: a collective responsibility. Washington, DC: National Research Council (US) and Institute of Medicine (US) Committee on Developing a Strategy to Reduce and Prevent Underage Drinking, National Academies Press (US), 2004.

12 Martineau F, Tyner E, Lorenc T, Petticrew M, Lock K. Population-level interventions to reduce alcohol-related harm: an overview of systematic reviews. *Prev Med* 2013; **57:** 278–96.

13 Siegfried N, Pienaar DC, Ataguba JE, et al. Restricting or banning alcohol advertising to reduce alcohol consumption in adults and adolescents. *Cochrane Database Syst Rev* 2014; **11:** CD010704.

14 Foxcroft DR, Tsertsvadze A. Universal school-based prevention programs for alcohol misuse in young people. *Cochrane Database Syst Rev* 2011; **5:** CD009113.

15 Foxcroft DR, Tsertsvadze A. Universal alcohol misuse prevention programmes for children and adolescents: Cochrane systematic reviews. *Perspect Public Health* 2012; **132:** 128–34.

16 Cairns G, Purves R, McKell J. Combining school and family alcohol education: A systematic review of the evidence. *Health Educ* 2014; **114:** 451–72.

17 Foxcroft DR, Tsertsvadze A. Universal multi-component prevention programs for alcohol misuse in young people. *Cochrane Database Syst Rev* 2011; **9:** CD009307.

18 Foxcroft DR, Tsertsvadze A. Universal family-based prevention programs for alcohol misuse in young people. *Cochrane Database Syst Rev* 2011; **9:** CD009308.

19 Fichtenberg CM, Glantz SA. Youth access interventions do not affect youth smoking. *Pediatrics* 2002; **109:** 1088–92.

20 Forster JL, Widome R, Bernat DH. Policy interventions and surveillance as strategies to prevent tobacco use in adolescents and young adults. *Am J Prev Med* 2007; **33** (suppl): S335–39.

21 Bader P, Boisclair D, Ferrence R. Effects of tobacco taxation and pricing on smoking behavior in high risk populations: a knowledge synthesis. *Int J Environ Res Public Health* 2011; **8:** 4118–39.

22 WHO. WHO Report on the Global Tobacco Epidemic, 2013: enforcing bans on tobacco advertising, promotion and sponsorship. Geneva: World Health Organization, 2013.

23 Brinn MP, Carson KV, Esterman AJ, Chang AB, Smith BJ. Mass media interventions for preventing smoking in young people. *Cochrane Database Syst Rev* 2010; **11:** CD001006.

24 Coppo A, Galanti MR, Giordano L, Buscemi D, Bremberg S, Faggiano F. School policies for preventing smoking among young people. *Cochrane Database Syst Rev* 2014; **10:** CD009990.

25 Thomas RE, McLellan J, Perera R. School-based programmes for preventing smoking. *Cochrane Database Syst Rev* 2013; **4:** CD001293.

26 Thomas RE, Baker PR, Thomas BC, Lorenzetti DL. Family-based programmes for preventing smoking by children and adolescents. *Cochrane Database Syst Rev* 2015; **2:** CD004493.

27 Hasin DS, Wall M, Keyes KM, et al. Medical marijuana laws and adolescent marijuana use in the USA from 1991 to 2014: results from annual, repeated cross-sectional surveys. *Lancet Psychiatry* 2015; **2:** 601–08.

28 Wen H, Hockenberry JM, Cummings JR. The effect of medical marijuana laws on adolescent and adult use of marijuana, alcohol, and other substances. *J Health Econ* 2015; **42:** 64–80.

29 Hornik R, Jacobsohn L, Orwin R, Piesse A, Kalton G. Effects of the National Youth Anti-Drug Media Campaign on youths. *Am J Public Health* 2008; **98:** 2229–36.

30 Ferri M, Allara E, Bo A, Gasparrini A, Faggiano F. Media campaigns for the prevention of illicit drug use in young people. *Cochrane Database Syst Rev* 2013; **6:** CD009287.

31 Faggiano F, Minozzi S, Versino E, Buscemi D. Universal school-based prevention for illicit drug use. *Cochrane Database Syst Rev* 2014; **12:** CD003020.

32 Ennett ST, Tobler NS, Ringwalt CL, Flewelling RL. How effective is drug abuse resistance education? A meta-analysis of Project DARE outcome evaluations. *Am J Public Health* 1994; **84:** 1394–401.

33 Gorman D. Does the Life Skills Training program reduce use of marijuana? [review]. *Addict Res Theory* 2011; **19:** 470–81.

34 Kumpfer KL, Alvarado R, Whiteside HO. Family-based interventions for substance use and misuse prevention. *Subst Use Misuse* 2003; **38:** 1759–87.

35 Zisserson RN, Palfai T, Saitz R. 'No-contact' interventions for unhealthy college drinking: efficacy of alternatives to person-delivered intervention approaches. *Subst Abus* 2007; **28:** 119–31.

36 Foxcroft DR, Moreira MT, Almeida Santimano NML, Smith LA. Social norms information for alcohol misuse in university and college students. *Cochrane Database Syst Rev* 2015; **1:** CD006748.

37 Riper H, van Straten A, Keuken M, Smit F, Schippers G, Cuijpers P. Curbing problem drinking with personalized-feedback interventions: a meta-analysis. *Am J Prev Med* 2009; **36:** 247–55.

38 Cronce JM, Larimer ME. Individual-focused approaches to the prevention of college student drinking. *Alcohol Res Health* 2011; **34:** 210–21.

39 Scott-Sheldon LA, Terry DL, Carey KB, Garey L, Carey MP. Efficacy of expectancy challenge interventions to reduce college student drinking: a meta-analytic review. *Psychol Addict Behav* 2012; **26:** 393–405.

40 Dejong W, Larimer ME, Wood MD, Hartman R. NIAAA's rapid response to college drinking problems initiative: reinforcing the use of evidence-based approaches in college alcohol prevention. *J Stud Alcohol Drugs Suppl* 2009; **16** (suppl): 5–11.

41 Larimer ME, Cronce JM. Identification, prevention, and treatment revisited: individual-focused college drinking prevention strategies 1999–2006. *Addict Behav* 2007; **32:** 2439–68.

42 Hunter Fager J, Mazurek Melnyk B. The effectiveness of intervention studies to decrease alcohol use in college undergraduate students: an integrative analysis. *Worldviews Evid Based Nurs* 2004; **1:** 102–19.

43 O'Donnell A, Anderson P, Newbury-Birch D, et al. The impact of brief alcohol interventions in primary healthcare: a systematic review of reviews. *Alcohol Alcohol* 2014; **49:** 66–78.

44 Fachini A, Aliane PP, Martinez EZ, Furtado EF. Efficacy of brief alcohol screening intervention for college students (BASICS): a meta-analysis of randomized controlled trials. *Subst Abuse Treat Prev Policy* 2012; **7:** 40.

45 Yuma-Guerrero PJ, Lawson KA, Velasquez MM, von Sternberg K, Maxson T, Garcia N. Screening, brief intervention, and referral for alcohol use in adolescents: a systematic review. *Pediatrics* 2012; **130:** 115–22.

46 Havard A, Shakeshaft A, Sanson-Fisher R. Systematic review and meta-analyses of strategies targeting alcohol problems in emergency departments: interventions reduce alcohol-related injuries. *Addiction* 2008; **103:** 368–76.

47 Crone MR, Reijneveld SA, Willemsen MC, van Leerdam FJ, Spruijt RD, Sing RA. Prevention of smoking in adolescents with lower education: a school based intervention study. *J Epidemiol Community Health* 2003; **57:** 675–80.

48 Murphy-Hoefer R, Griffith R, Pederson LL, Crossett L, Iyer SR, Hiller MD. A review of interventions to reduce tobacco use in colleges and universities. *Am J Prev Med* 2005; **28:** 188–200.

49 Christakis DA, Garrison MM, Ebel BE, Wiehe SE, Rivara FP. Pediatric smoking prevention interventions delivered by care providers: a systematic review. *Am J Prev Med* 2003; **25:** 358–62.

50 Stanton A, Grimshaw G. Tobacco cessation interventions for young people. *Cochrane Database Syst Rev* 2013; **8:** CD003289.

51 Dennhardt AA, Murphy JG. Prevention and treatment of college student drug use: A review of the literature. *Addict Behav* 2013; **38:** 2607–18.

52 Pilowsky DJ, Wu LT. Screening instruments for substance use and brief interventions targeting adolescents in primary care: a literature review. *Addict Behav* 2013; **38:** 2146–53.

53 Lee CM, Kilmer JR, Neighbors C, et al. Indicated prevention for college student marijuana use: a randomized controlled trial. *J Consult Clin Psychol* 2013; **81:** 702–09.

54 Lee CM, Neighbors C, Kilmer JR, Larimer ME. A brief, web-based personalized feedback selective intervention for college student marijuana use: a randomized clinical trial. *Psychol Addict Behav* 2010; **24:** 265–73.

55 Palfai TP, Saitz R, Winter M, et al. Web-based screening and brief intervention for student marijuana use in a university health center: pilot study to examine the implementation of eCHECKUP TO GO in different contexts. *Addict Behav* 2014; **39:** 1346–52.

56 Bernstein E, Edwards E, Dorfman D, Heeren T, Bliss C, Bernstein J. Screening and brief intervention to reduce marijuana use among youth and young adults in a pediatric emergency department. *Acad Emerg Med* 2009; **16:** 1174–85.

57 MacArthur GJ, van Velzen E, Palmateer N, et al. Interventions to prevent HIV and Hepatitis C in people who inject drugs: a review of reviews to assess evidence of effectiveness. *Int J Drug Policy* 2014; **25:** 34–52.

58 Centers for Disease Control and Prevention. Integrated prevention services for hiv infection, viral hepatitis, sexually transmitted diseases, and tuberculosis for persons who use drugs illicitly: summary guidance from CDC and the US Department of Health and Human Services. *MMWR Recomm Rep* 2012; **61:** 1–40.

59 Foxcroft DR, Coombes L, Wood S, Allen D, Almeida Santimano NM. Motivational interviewing for alcohol misuse in young adults. *Cochrane Database Syst Rev* 2014; **8:** CD007025.

60 Carey KB, Scott-Sheldon LA, Elliott JC, Bolles JR, Carey MP. Computer-delivered interventions to reduce college student drinking: a meta-analysis. *Addiction* 2009; **104:** 1807–19.

61 Elliott JC, Carey KB, Bolles JR. Computer-based interventions for college drinking: a qualitative review. *Addict Behav* 2008; **33:** 994–1005.

62 Walters ST, Miller E, Chiauzzi E. Wired for wellness: e-interventions for addressing college drinking. *J Subst Abuse Treat* 2005; **29:** 139–45.

63 Sussman S. A review of Alcoholics Anonymous/ Narcotics Anonymous programs for teens. *Eval Health Prof* 2010; **33:** 26–55.

64 Deas D. Evidence-based treatments for alcohol use disorders in adolescents. *Pediatrics* 2008; **121** (suppl 4)**:** S348–54.

65 Clark DB. Pharmacotherapy for adolescent alcohol use disorder. *CNS Drugs* 2012; **26:** 559–69.

66 Henggeler SW, Halliday-Boykins CA, Cunningham PB, Randall J, Shapiro SB, Chapman JE. Juvenile drug court: enhancing outcomes by integrating evidence-based treatments. *J Consult Clin Psychol* 2006; **74:** 42–54.

67 Gilmore AS, Rodriguez N, Webb VJ. Substance abuse and drug courts: the role of social bonds in juvenile drug courts. *Youth Violence Juv Justice* 2005; **3:** 287–315.

68 Jensen CD, Cushing CC, Aylward BS, Craig JT, Sorell DM, Steele RG. Effectiveness of motivational interviewing interventions for adolescent substance use behavior change: a meta-analytic review. *J Consult Clin Psychol* 2011; **79:** 433–40.

69 Park E, Drake E. Systematic review: internet-based program for youth smoking prevention and cessation. *J Nurs Scholarsh* 2015; **47:** 43–50.

70 Hutton HE, Wilson LM, Apelberg BJ, et al. A systematic review of randomized controlled trials: Web-based interventions for smoking cessation among adolescents, college students, and adults. *Nicotine Tob Res* 2011; **13:** 227–38.

71 Whittaker R, McRobbie H, Bullen C, Borland R, Rodgers A, Gu Y. Mobile phone-based interventions for smoking cessation. *Cochrane Database Syst Rev* 2012; **11:** CD006611.

72 Kim Y, Myung SK, Jeon YJ, et al. Effectiveness of pharmacologic therapy for smoking cessation in adolescent smokers: Meta-analysis of randomized controlled trials. *Am J Health Syst Pharm* 2011; **68:** 219–26.

73 Marsden J, Stillwell G, Barlow H, et al. An evaluation of a brief motivational intervention among young ecstasy and cocaine users: no effect on substance and alcohol use outcomes. *Addiction* 2006; **101:** 1014–26.

74 Laursen D. Counseling young cannabis users by text message. *J Comput Mediat Commun* 2010; **15:** 646–65.

75 Mason M, Ola B, Zaharakis N, Zhang J. Text messaging interventions for adolescent and young adult substance use: a meta-analysis. *Prev Sci* 2015; **16:** 181–88.

76 Filges T, Knudsen A-SD, Svendsen MM, Kowalski K, Benjaminsen L, Jørgensen A-MK. Cognitive-behavioural therapies for young people in outpatient treatment for non-opioid drug use: a systematic review. *Campbell Syst Rev* 2015; **11.**

77 Baldwin SA, Christian S, Berkeljon A, Shadish WR. The effects of family therapies for adolescent delinquency and substance abuse: a meta-analysis. *J Marital Fam Ther* 2012; **38:** 281–304.

78 Jainchill N, Bhattacharya G, Yagelka J. Therapeutic communities for adolescents. *NIDA Res Monogr* 1995; **156:** 190–217.

79 Minozzi S, Amato L, Davoli M. Maintenance treatments for opiate dependent adolescents. *Cochrane Database Syst Rev* 2009; **2:** CD007210.

80 Pecoraro A, Fishman M, Ma M, Piralishvili G, Woody GE. Pharmacologically assisted treatment of opioid-dependent youth. *Paediatr Drugs* 2013; **15:** 449–58.

81 Patel V, Chisholm D, Parikh R, et al, on behalf of the DCP MNS Author Group. Addressing the burden of mental, neurological, and substance use disorders: key messages from *Disease Control Priorities*, 3rd edition. *Lancet* 2015; published online Oct 7. http://dx.doi.org/10.1016/S0140-6736(15)00390-6.

82 Degenhardt L, Stockings E, Strang J, Marsden J, Hall W. Chapter 6: Illicit drug dependence. In: Patel V, Chisholm D, Dua T, Laxminarayan R, Medina Mora M-E, eds. Disease Control Priorities, third edition (volume 4): mental, neurological, and substance use disorders. Washington, DC: World Bank, 2015.

83 United Nations. Single Convention on Narcotic Drugs, 1961, as amended by the 1972 Protocol amending the Single Convention on Narcotic Drugs, 1961. 1972. https://www.unodc.org/unodc/en/treaties/single-convention.html (accessed Jan 18, 2016).

84 Room R, Reuter P. How well do international drug conventions protect public health? *Lancet* 2012; **379:** 84–91.

85 Degenhardt L, Hall W. Extent of illicit drug use and dependence, and their contribution to the global burden of disease. *Lancet* 2012; **379:** 55–70.

86 Murray CJL, Barber RM, Foreman KJ, et al, and the GBD 2013 DALYs and HALE Collaborators. Global, regional, and national disability-adjusted life-years (DALYs) for 306 diseases and injuries and healthy life expectancy (HALE) for 188 countries, 1990–2013: quantifying the epidemiological transition. *Lancet* 2015; **386:** 2145–91.

87 Wakefield M, Chaloupka F. Effectiveness of comprehensive tobacco control programmes in reducing teenage smoking in the USA. *Tob Control* 2000; **9:** 177–86.

88 WHO. Global health observatory data repository: age limits for purchasing alcohol (on-premise service and off-premise purchase). 2014. http://www.who.int/gho/alcohol/policies/age_limits_text/en/ (accessed May 5, 2015).

89 Cameron L, Williams J. Cannabis, alcohol and cigarettes: substitutes or complements? *Econ Rec* 2001; **77:** 19–34.

90 Boys A, Marsden J, Strang J. Understanding reasons for drug use amongst young people: a functional perspective. *Health Educ Res* 2001; **16:** 457–69.

91 Lantz PM, Jacobson PD, Warner KE, et al. Investing in youth tobacco control: a review of smoking prevention and control strategies. *Tob Control* 2000; **9:** 47–63.

92 McNeill A, Iringe-Koko B, Bains M, Bauld L, Siggens G, Russell A. Countering the demand for, and supply of, illicit tobacco: an assessment of the 'North of England Tackling Illicit Tobacco for Better Health' Programme. *Tob Control* 2014; **23:** e44–50.

93 Lang E, Stockwell T, Rydon P, Beel A. Can training bar staff in responsible serving practices reduce alcohol-related harm? *Drug Alcohol Rev* 1998; **17:** 39–50.

94 Holder H, Gruenewald PJ, Ponicki WR, et al. Effect of community-based interventions on high-risk drinking and alcohol-related injuries. *JAMA* 2000; **284:** 2341–47.

95 Hawks D, Rydon P, Stockwell T, White M, Chikritzhs T, Heale P. The evaluation of the Fremantle police-licensee accord: impact on serving practices, harm and the wider community. Perth, WA: Curtin University of Technology, National Drug Research Institute, 1999.

96 Krass I, Flaherty B. The impact of a responsible service training on patron and server behavior: a trial in Waverley (Sydney). *Health Promot J Aust* 1994; **4:** 51–58.

97 Elder RW, Lawrence B, Ferguson A, et al, and the Task Force on Community Preventive Services. The effectiveness of tax policy interventions for reducing excessive alcohol consumption and related harms. *Am J Prev Med* 2010; **38:** 217–29.

98 WHO. WHO Report on the Global Tobacco Epidemic, 2015: raising taxes on tobacco. Geneva: World Health Organization, 2015.

99 Buller DB, Borland R, Woodall WG, et al. Randomized trials on consider this, a tailored, internet-delivered smoking prevention program for adolescents. *Health Educ Behav* 2008; **35:** 260–81.

100 Gorman DM. 'Everything works': the need to address confirmation bias in evaluations of drug misuse prevention interventions for adolescents. *Addiction* 2015; **110:** 1539–40.

101 Wood E, Shakeshaft A, Gilmour S, Sanson-Fisher R. A systematic review of school-based studies involving alcohol and the community. *Aust N Z J Public Health* 2006; **30:** 541–49.

102 Foxcroft DR, Lister-Sharp D, Lowe G. Alcohol misuse prevention for young people: a systematic review reveals methodological concerns and lack of reliable evidence of effectiveness. *Addiction* 1997; **92:** 531–37.

103 Elder RW, Nichols JL, Shults RA, Sleet DA, Barrios LC, Compton R, and the Task Force on Community Preventive Services. Effectiveness of school-based programs for reducing drinking and driving and riding with drinking drivers: a systematic review. *Am J Prev Med* 2005; **28** (suppl)**:** 288–304.

104 Faggiano F, Vigna-Taglianti F, Burkhart G, et al, and the EU-Dap Study Group. The effectiveness of a school-based substance abuse prevention program: 18-month follow-up of the EU-Dap cluster randomized controlled trial. *Drug Alcohol Depend* 2010; **108:** 56–64.

105 Johnston V, Liberato S, Thomas D. Incentives for preventing smoking in children and adolescents. *Cochrane Database Syst Rev* 2012; **10:** CD008645.

106 Carson KV, Brinn MP, Labiszewski NA, Esterman AJ, Chang AB, Smith BJ. Community interventions for preventing smoking in young people. *Cochrane Database Syst Rev* 2011; **7:** CD001291.

107 Norberg MM, Kezelman S, Lim-Howe N. Primary prevention of cannabis use: a systematic review of randomized controlled trials. *PLoS One* 2013; **8:** e53187.

108 Foxcroft DR, Ireland D, Lister-Sharp DJ, Lowe G, Breen R. Longer-term primary prevention for alcohol misuse in young people: a systematic review. *Addiction* 2003; **98:** 397–411.

109 Campbell R, Starkey F, Holliday J, et al. An informal school-based peer-led intervention for smoking prevention in adolescence (ASSIST): a cluster randomised trial. *Lancet* 2008; **371:** 1595–602.

110 Sanci L, Chondros P, Sawyer S, et al. Responding to young people's health risks in primary care: a cluster randomised trial of training clinicians in screening and motivational interviewing. *PLoS One* 2015; **10:** e0137581.

111 Mitchell SG, Gryczynski J, O'Grady KE, Schwartz RP. SBIRT for adolescent drug and alcohol use: current status and future directions. *J Subst Abuse Treat* 2013; **44:** 463–72.

112 Patton R, Deluca P, Kaner E, Newbury-Birch D, Phillips T, Drummond C. Alcohol screening and brief intervention for adolescents: the how, what and where of reducing alcohol consumption and related harm among young people. *Alcohol Alcohol* 2014; **49:** 207–12.

113 Tanner-Smith EE, Lipsey MW. Brief alcohol interventions for adolescents and young adults: a systematic review and meta-analysis. *J Subst Abuse Treat* 2015; **51:** 1–18.

114 Boekeloo BO, Griffin MA. Review of clinical trials testing the effectiveness of physician approaches to improving alcohol education and counseling in adolescent outpatients. *Curr Pediatr Rev* 2007; **3:** 93–101.

115 Carey KB, Scott-Sheldon LA, Carey MP, DeMartini KS. Individual-level interventions to reduce college student drinking: a meta-analytic review. *Addict Behav* 2007; **32:** 2469–94.

116 Appiah-Brempong E, Okyere P, Owusu-Addo E, Cross R. Motivational interviewing interventions and alcohol abuse among college students: a systematic review. *Am J Health Promot* 2014; **29:** e32–42.

117 Tanner-Smith EE, Steinka-Fry KT, Hennessy EA, Lipsey MW, Winters KC. Can brief alcohol interventions for youth also address concurrent illicit drug use? Results from a meta-analysis. *J Youth Adolesc* 2015; **44:** 1011–23.

118 Paterson BL, Panessa C. Engagement as an ethical imperative in harm reduction involving at-risk youth. *Int J Drug Policy* 2008; **19:** 24–32.

119 Ford C, English A, Sigman G. Confidential health care for adolescents: position paper for the society for adolescent medicine. *J Adolesc Health* 2004; **35:** 160–07.

120 Larcher V. Consent, competence, and confidentiality. *BMJ* 2005; **330:** 353–56.

121 Royal Australian College of Physicians. confidential health care for adolescents and young people. Sydney: Royal Australian College of Physicians Publication, 2010.

122 Duncan RE, Vandeleur M, Derks A, Sawyer S. Confidentiality with adolescents in the medical setting: what do parents think? *J Adolesc Health* 2011; **49:** 428–30.

123 Champion KE, Newton NC, Barrett EL, Teesson M. A systematic review of school-based alcohol and other drug prevention programs facilitated by computers or the internet. *Drug Alcohol Rev* 2013; **32:** 115–23.

124 Wood SK, Eckley L, Hughes K, et al. Computer-based programmes for the prevention and management of illicit recreational drug use: a systematic review. *Addict Behav* 2014; **39:** 30–38.

125 Gulliver A, Farrer L, Chan JKY, et al. Technology-based interventions for tobacco and other drug use in university and college students: a systematic review and meta-analysis. *Addict Sci Clin Pract* 2015; **10:** 5.

126 Bryant J, Bonevski B, Paul C, McElduff P, Attia J. A systematic review and meta-analysis of the effectiveness of behavioural smoking cessation interventions in selected disadvantaged groups. *Addiction* 2011; **106:** 1568–85.

127 Curry SJ, Mermelstein RJ, Sporer AK. Therapy for specific problems: youth tobacco cessation. *Annu Rev Psychol* 2009; **60:** 229–55.

128 Dennis M, Godley SH, Diamond G, et al. The Cannabis Youth Treatment (CYT) Study: main findings from two randomized trials. *J Subst Abuse Treat* 2004; **27:** 197–213.

129 England M, Butler A, Gonzalez M, and the Committee on Developing Evidence-Based Standards for Psychosocial Interventions for Mental Disorders, Board on Health Sciences Policy, Institute of Medicine. Psychosocial interventions for mental and substance use disorders: a framework for establishing evidence-based standards. Washington DC: Institute of Medicine, 2015.

130 Jonas DE, Amick HR, Feltner C, et al. Pharmacotherapy for adults with alcohol use disorders in outpatient settings: a systematic review and meta-analysis. *JAMA* 2014; **311:** 1889–900.

131 Cahill K, Stevens S, Perera R, Lancaster T. Pharmacological interventions for smoking cessation: an overview and network meta-analysis. *Cochrane Database Syst Rev* 2013; **5:** CD009329.

132 Gilmore AS, Rodriguez N, Webb VJ. Substance abuse and drug courts: the role of social bonds in juvenile drug courts. *Youth Violence Juv Justice* 2005; **3:** 287–315

133 Henggeler SW. Juvenile drug courts: emerging outcomes and key research issues. *Curr Opin Psychiatry* 2007; **20:** 242–46.

134 Sanders MR, Kirby JN, Tellegen CL, Day JJ. The Triple P-Positive Parenting Program: a systematic review and meta-analysis of a multi-level system of parenting support. *Clin Psychol Rev* 2014; **34:** 337–57.

135 Lichtenstein P, Halldner L, Zetterqvist J, et al. Medication for attention deficit-hyperactivity disorder and criminality. *N Engl J Med* 2012; **367:** 2006–14.